

# TOWN OF DEERFIELD, NEW HAMPSHIRE



*Patriot's Day Flood Damage, April 2007, Town of Deerfield, New Hampshire,*

## HAZARD MITIGATION PLAN UPDATE 2019



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## HAZARD MITIGATION PLAN

UPDATE 2019

**Prepared by the Southern New Hampshire Planning Commission**

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### **Town of Deerfield 2019 Hazard Mitigation Plan Update Committee Members**

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John Harrington, Town Administrator, Town of Deerfield

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- The Auburn, Bedford, Chester, Derry, Goffstown, Hooksett, Londonderry, Manchester, New Boston and Deerfield Hazard Mitigation Committees and their respective Hazard Mitigation Plans.

All the above publications served as models for this plan.

*"We will of course be there to help after disaster strikes, but as you all know, there's no substitute for mitigation before it does....*

*As a poet once wrote, "the test of men lies in action." We as emergency managers and first responders cannot afford to wait for action....*

*Through planning, mitigation, education, and cooperation, we can make sure our at-risk communities are prepared before the first drop of rain or gust of wind ever threatens our shores."*

—Joe Allbaugh, Director of FEMA,  
addressing the 2002 National Hurricane Conference

## Preface

Hazard mitigation planning is a relatively new field, spearheaded by the Federal Emergency Management Agency (FEMA) during the 1990s after Hurricane Andrew caused more than \$20 billion in damage across several southern states. That event resulted in 54 fatalities and the disruption of millions of lives. The Disaster Mitigation Act of 2000, developed by FEMA, was intended to help both communities and states prepare for, and deal with, such disasters. While New England normally does not have hurricanes of Andrew's magnitude, this area does experience many types of natural disasters that cost both lives and money.

These disasters and other natural hazards occur during all four seasons in the Northeast: winter ice, snow, and nor'easters; spring flooding; summer downbursts and thunderstorms; and fall hurricanes. Planning to make a community *disaster-resistant* before these events occur can help save lives as well as homes and infrastructure. FEMA has several programs designed to strengthen the nation's disaster resistance by reducing risks and changing conditions and behaviors before a disaster in order to protect lives and prevent the loss of property.

A community's eligibility for hazard mitigation funding depends upon its having adopted a hazard mitigation plan that addresses these issues. Mitigation measures contained within the *Town of Deerfield Hazard Mitigation Plan* may be sufficient to receive grant funding.

It is hoped that this document will be a good first step toward analyzing hazards in Deerfield, forecasting where potential disasters might occur, and reducing their impact on people and the community.

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## TOWN OF DEERFIELD Hazard Mitigation Plan Executive Summary

The *Deerfield Hazard Mitigation Plan* has been developed to help Deerfield become a disaster-resistant community by taking measures to reduce future losses from natural or man-made hazardous events before they occur. The Deerfield Hazard Mitigation Committee (DHMC), made up of community members and town officials, developed the plan.

Natural hazards are addressed as follows:

- |             |                        |                   |
|-------------|------------------------|-------------------|
| A. Flooding | C. Fire                | E. Seismic Events |
| B. Wind     | D. Ice and Snow Events | F. Other Hazards  |

The Deerfield Hazard Mitigation Committee identified critical facilities, areas at risk, commercial economic impact areas, and hazardous materials facilities.

### **Critical Facilities:**

- Town Offices
- Post Offices
- Police and Fire Stations
- Emergency Operations Centers
- Emergency Shelters
- Emergency Fuel Facilities
- Fuel Facilities
- Cell Towers
- Public Works Garages
- Bridges

### **Areas at Risk:**

- Solid Waste and Recycling Facilities
- Bridges
- Dams
- Historic Properties
- Libraries
- Schools
- Child Care Facilities
- Community Centers
- Recreation Areas
- Commercial Resources
- Religious Facilities

## **Existing Hazard Mitigation Strategies**

The Deerfield Hazard Mitigation Committee identified existing strategies related to hazard mitigation as follows:

- Emergency Operations Plan
- Floodplain Development Regulations
- Elevation Certificates
- Wetlands Zone Land Planning Ordinance
- Residential Manufactured Housing Districts
- Excavation and Soil Removal
- Erosion and Sediment Control Regulations
- Wetlands Conservation District
- Pleasant Lake Watershed Overlay District
- Setbacks from Water bodies
- Drainage Requirements
- Road Design Standards
- Fire Protection Cistern Regulations
- Deerfield Building Codes
- Deerfield Fire Department Regulations
- Hazardous Materials Regulations
- Town Radio System
- Police Department
- Snow Ordinance
- Comprehensive Emergency Management Planning for Schools (CEMPS)
- NH State Dam Program
- NH Shoreland Protection Act
- Best Management Practices

## **New Mitigation Programs and Policies**

The Deerfield Hazard Mitigation Committee identified *new* hazard mitigation strategies as follows:

- Continue to amend or include money in the Capital Improvement Plan for water drafting site development, fire equipment, and training
- Continue to implement a network to check on elderly and special needs populations during hazardous or extreme weather events
- Complete the upgrade to the Emergency Operations Center at the town office to install any needed equipment needed for town department heads to carry out their responsibilities under the Emergency Operation Plan.
- Complete the house numbering project and post a notice in the Town newsletter or local newspaper to remind residents of the importance of having house/address numbers that are visible to emergency responders
- Complete the upgrade of the Town's mobile and portable radio systems
- Provide potable water to residents whose wells run dry during a drought or other hazard conditions
- Establish Mutual Aid Agreements with non-profits and/or Community Action Programs (CAP), and with the local chapter of the American Red Cross (ARC)
- Outreach and Education on NFIP and Flood Insurance Rate Maps (FIRMs)

- Continue to assess whether Town specific erosion and sediment control regulations and guidelines are needed
- Continue to encourage referral to Water Resource Plan and maps by Planning Board when reviewing subdivision proposals
- Purchase Portable Electronic Signs to be used during emergencies

This plan is to be reviewed on an annual basis and updated every three to five years by the Deerfield Emergency Management Team in coordination with the Deerfield Board of Selectmen. The next review will be during 2021 and the update will be due in 2022.



## SECTION I INTRODUCTION

*"Plans are worthless. Planning is essential." –Dwight D. Eisenhower*

### **Natural Hazards and Their Consequences**

During the past decade, the United States has suffered a record number of natural disasters. In 1992, Hurricane Andrew caused an estimated \$25 billion in damage. The 1993 Midwest floods resulted in some \$12-\$16 billion in damage. The 1994 Northridge earthquake caused \$20 billion in damage, and the 2002 summer flooding in central Texas is expected to top \$1 billion in damage. In 2005, Hurricane Katrina inflicted unprecedented financial and human costs. Flooding 80 percent of the City of New Orleans, damage is estimated to surpass \$75 billion, making it the costliest hurricane in United States history. Katrina was also the deadliest U.S. hurricane since the 1928 Okeechobee Hurricane with at least 1,383 lives lost.



*Photo of four homes lost in Tennessee due to a mile-wide tornado during November 2002. Portions of the Midwest and South are assessing the damage from more than 70 tornadoes that touched down. The death toll stands at 35 throughout five states. President George W. Bush declared a major disaster for Tennessee, opening the way for the use of federal disaster funds to help meet the recovery needs of families and businesses devastated by the tornadoes. Mossy Grove, Tennessee, was among the hardest hit areas as 12 people were killed and the rural town was destroyed. (FEMA photo courtesy of Jason Pack)*

In New England, more than 100 natural disasters during the past quarter century have been sufficiently catastrophic to be declared "disaster areas" by the president, making them eligible for federal disaster relief. That is about four

major disasters per year. Nine out of ten of these disasters were the result of flooding.

The October 2005 floods in southwestern New Hampshire caused catastrophic damage. At least five bridges were washed out, up to 18 families were left homeless, more than 1,000 people were displaced by evacuations and there were seven deaths. Rainfall amounts of approximately 9 inches in southwestern New Hampshire from October 7-12 made for swollen rivers, streams and brooks. While events of this magnitude are not commonplace, damage could be averted or reduced with the implementation of foresighted hazard mitigation efforts.



*North of the Village of Gilsum, Southwestern New Hampshire  
October 2005*

One of the most recent severe flooding events in New Hampshire took place over Mother's Day weekend 2006. Like the October 2005 floods, this flood was due to record breaking amounts of rainfall of 8.8 inches, as recorded in Concord, from May 13<sup>th</sup> to the 16<sup>th</sup>. Damage assessments estimate 25 homes in the State were destroyed, another 235 severely damaged, and another nearly 4,750 damaged. Over 600 roads were closed statewide. Additionally, over 200 schools closed for at least the Monday and Tuesday following the onset of flooding. Three dams were breached, another four required controlled breaches, and two other dams failed. Additional damages to businesses are estimated to be greater than four million dollars and 115 businesses were damaged. Damages to state and local infrastructure are estimated to be beyond \$14 million.

Since 2006 the Town of Deerfield experienced severe flooding (2007, 2008, 2010, 2011), a historic icestorm (December 2008), a tornado (July 2008), windstorm

(February 2010) and nor'easter (October 2011), as well as many other natural disasters.

Floods, tornadoes, winter storms, hurricanes, earthquakes, and wildfires - natural disasters - are part of the world around us. Their occurrence is inevitable. These events can wreak havoc on the natural environment by uprooting trees, eroding riverbanks and shorelines, carving new inlets, and blackening forests. Yet the natural environment is amazingly resilient, often recuperating in a matter of days or weeks.

When these events strike the man-made environment, however, the result is often more devastating. Disasters occur when a natural hazard crosses paths with elements of the man-made environment, including buildings, roads, pipelines, or crops. When hurricanes tear roofs off houses, it is a disaster. When tornadoes ravage a town, it is a disaster. When floods invade low-lying homes, it is a disaster. If only undeveloped wetlands and floodplains are flooded, rather than homes and businesses, few take notice. The natural environment takes care of itself. The fabricated environment, in contrast, often needs some emergency assistance.

### **What Is Hazard Mitigation?**

Hazard mitigation is the practice of reducing risks to people and property from natural hazards. FEMA's Federal Response Plan defines hazard mitigation as "activities designed to alleviate the effects of a major disaster or emergency or long-term activities to minimize the potentially adverse effects of future disaster in affected areas (A-5)." It includes both structural interventions, such as flood control devices, and nonstructural measures, such as avoiding construction in the most flood-prone areas. Mitigation includes not only avoiding the development of vulnerable sections of the community, but also making existing development in hazard-prone areas safer. For example, a community could identify areas that are susceptible to damage from natural disasters and take steps to make these areas less vulnerable. It could also steer growth to less risky areas. Keeping buildings and people out of harm's way is the essence of mitigation.

Mitigation should not be seen as an impediment to growth and development. On the contrary, incorporating mitigation into development decisions can result in a safer, more resilient community, one that is more attractive to new families and businesses.

### **Why Develop a Hazard Mitigation Plan?**

The full cost of the damage resulting from natural hazards—personal suffering, loss of lives, disruption of the economy, and loss of tax base—is difficult to

measure. New Hampshire is subject to many types of natural disasters: floods, hurricanes, nor'easters, winter storms, earthquakes, tornadoes, and wildfires, all of which can have significant economic and social impacts. Some, such as hurricanes, are seasonal and often strike in predictable locations. Others, such as floods, can occur any time of the year and almost anywhere in the state.

### **Benefits of Hazard Mitigation**

Hazard mitigation offers many benefits for a community. It can:

- **Save lives and property.** A community can save lives and reduce property damage from natural hazards through identifying risks and taking action, such as elevating structures in the floodplain.
- **Reduce vulnerability to future hazards.** By having a mitigation plan in place, a community is prepared to take steps that will permanently reduce the risk of future losses. This opportunity is often lost when communities are built without regard to natural hazards, or when they are rebuilt after a disaster "just like they were before." While it is natural to want to return things to the way they were, it is important to remember that, in many cases, the disaster would not have been as severe if a mitigation plan had been implemented.
- **Facilitate post-disaster funding.** By identifying and ranking recovery projects before the next disaster, a community will be in a better position to obtain post-disaster funding because much of the background work necessary for applying for federal funding will already be done.
- **Speed recovery.** By developing a mitigation strategy, a community can identify post-disaster mitigation opportunities in advance of a disaster and be ready to respond quickly after a disaster.

### **Background: Deerfield Hazard Mitigation Planning**

The Federal Emergency Management Agency (FEMA) has recommended that all communities establish local hazard mitigation plans as a means to reduce future losses from natural or man-made hazard events before they occur. Beginning November 1, 2004, FEMA has mandated an approved hazard mitigation plan be in place to receive specific disaster related grants. With a Pre-Disaster Mitigation Grant from FEMA, New Hampshire Homeland Security and Emergency Management (NH HSEM) provided funding to the Southern New Hampshire Planning Commission (SNHPC) to develop a local hazard mitigation plan for the Town of Deerfield. SNHPC began working with Deerfield representatives during November 2005 to produce this plan and in November 2011 to update it.

### **Purpose**

The *Deerfield Hazard Mitigation Plan* serves as a strategic planning tool for use by the Town of Deerfield in its efforts to reduce future losses from natural or



man-made hazard events before they occur. This *Plan* may constitute a new section of the Deerfield Master Plan, in accordance with RSA 674:2.

### **Authority**

This *Hazard Mitigation Plan* was prepared in accordance with the Town of Deerfield's Emergency Operations Plan, effective in 2009, and under the authority of the Planning Mandate of Section 409 of Public Law 93-288 as amended by Public Law 100-707, the Robert T. Stafford Act of 1988, and the Disaster Mitigation Act of 2000. The *Deerfield Hazard Mitigation Plan* will be referred to as the "*Plan*." After a public meeting was held at the Deerfield Town Offices on August 19, 2019 the Deerfield Board of Selectmen formally adopted this *Plan* on August 23, 2019. Documentation of this *Plan's* adoption is provided in Appendix B.

### **Scope of the Plan**

The scope of the *Deerfield Hazard Mitigation Plan* includes the identification of natural hazards affecting the Town, as identified by the Deerfield Hazard Mitigation Committee. The committee reviewed hazards in the following categories as outlined in the *State of New Hampshire Natural Hazard Mitigation Plan* and identified by the Committee:

- A. Flooding - including riverine flood events, hurricanes, debris-impacted infrastructure and river ice jams, erosion and mudslides, rapid snowpack melt, and dam breach or failure.
- B. Wind - including hurricanes, tornadoes, nor'easters, downbursts, and lightning.
- C. Fire - including wild land fires, target hazards, and isolated homes.
- D. Ice and snow events - including heavy snowstorms, ice storms, and hailstorms.
- E. Seismic events - including earthquakes and landslides.
- F. Other events - including utility pipe failure, geomagnetism, drought, extreme heat, and extreme cold.

### **2019 Plan Update Methodology**

In January 2018, the Deerfield Hazard Mitigation Plan Update Committee (DHMPUC) was formed to begin updating the plan. The Update Committee used the same ten-step planning process set forth in the *Hazard Mitigation Planning for New Hampshire Communities* handbook as did the original Committee. Each section of the plan was reviewed and updated according to new information and the events of the past 5 years. The Update Committee consisted of representatives from various local agencies, including Emergency

Management, Fire Department, Police Department, Highway Department, Welfare Department and Building Inspection. The Committee held a total of 3 public meetings beginning in January 2018 and ending in 2019 to collect information, compile the plan update, and review the plan update.

#### **Town of Deerfield 2019 Hazard Mitigation Committee Members**

Kevin Barry, Co-Emergency Management Director, Town of Deerfield  
Denise Greig, Co- Emergency Management Director, Town of Deerfield  
John Harrington, Town Administrator, Town of Deerfield  
Gary Duquette, Chief, Police Department, Town of Deerfield  
Richard Pelletier, Building Inspector, Town of Deerfield  
Mark Young, Highway Agent, Town of Deerfield  
John Dubiansky, Fire Captain, Town of Deerfield  
Ray Ellis, Building Supervisor, Town of Deerfield

#### **Coordination with Other Agencies and Individuals and Public Input**

The Hazard Mitigation Committee members and their respective town departments contributed the contents and reviewed the *Plan* drafts.

The Committee Chair, Richard Pelletier contacted the following individuals and agencies for their review and comment on the *Plan* drafts.

- Deerfield Conservation Commission
- Deerfield School District
- Deerfield Fire Department
- Deerfield Board of Selectmen
- Deerfield Police Department
- Deerfield Fair Board

Deerfield Hazard Mitigation Update Committee meeting notices were posted on both SNHPC and the Town of Deerfield's websites. SNHPC attended a Deerfield Planning Board meeting on June 13, 2018 and received comments from Planning Board members. Their comments regarding potential hazards were incorporated into the plan.

Documentation of the public process may be found in Appendix A.

#### **Incorporation of Existing Planning Documents, Studies, Reports and Technical Information**

##### **Deerfield Emergency Operations Plan**

The Town of Deerfield last updated the *Town of Deerfield Emergency Operations Plan* in 2009. This *Plan* describes *preparedness* activities to improve the Town's ability to respond to an incident; *response* activities, including rescue operations, evacuation, emergency medical care, and emergency personnel training; and

*recovery* activities that begin after the disaster. *Mitigation* activities help to reduce or eliminate the damages from future disaster events, and can occur before, during and after a disaster. The *Deerfield Emergency Operations Plan* identifies the following hazards in its hazard analysis (Deerfield EOP, 2009, Appendix D):

- *Civil Disorder*
- *Hazardous Materials (Fixed)*
- *Hazardous Materials (Transport)*
- *Nuclear Accident*
- *Multiple Vehicle Accident*
- *Wildland/Urban Fire*
- *Plane Crash*
- *Conventional Bomb*
- *Chemical Agent*
- *Arson*
- *Cyber-Terrorism*
- *Agri-Terrorism*
- *Radiological*
- *Nuclear Bomb*
- *Flooding*
- *Wind*
- *Ice & Snow Event*

The vulnerability assessment was used to guide the vulnerability assessment in the Hazard Mitigation Plan and to be consistent with hazard rankings.

### **Capital Improvement Program**

Since the last Hazard Mitigation Update, the town has incorporated some of the 2013 Mitigation Actions into the town's Capital Improvement Program, including the replacement and upgrades of culverts. However, not every mitigation action identified in the 2013 Hazard Mitigation Plan was incorporated into town planning processes.

### **State of New Hampshire Legislation Related to Master Plans**

During 2002, the State of New Hampshire adopted legislation related to master plans that requires municipalities to "provide more definitive guidance in planning and managing future growth." This new legislation allows a natural hazards section to be considered during the master planning process and incorporated into the master plan. The *Deerfield Hazard Mitigation Plan* may serve as a new section of the existing or future *Deerfield Master Plan*. This legislation, RSA 674:2 *Master Plan; Purpose and Description*, reads:

*The Master Plan may also include the following sections:*

*... (e) A natural hazards section which documents the physical characteristics, severity, frequency, and extent of any potential natural hazards to the community. It should identify those elements of the built environment at risk from natural hazards as well as extent of current and future vulnerability that may result from current zoning and development policies.*

The 2009 Deerfield Master Plan was reviewed for this update and goals, objectives and strategies relating to hazard mitigation were incorporated as

appropriate. The last update to the Deerfield Master Plan was completed in 2009. The 2007 Deerfield Hazard Mitigation Plan was incorporated by reference into the Master Plan and into the goals outlined. Specifically, goal CF-3.4 is to “work to accomplish the implementation strategies, created to potentially reduce hazard impacts, as set forth in the Town’s Hazard Mitigation Plan.”

### **Deerfield Water Resources Plan**

The Deerfield Water Resources Plan was developed by the Southern New Hampshire Resources Conservation and Development Area Council. The purposes of this plan are to identify and, to the extent possible, to evaluate the adequacy of existing and potential water resources to meet the current and future needs of the Town; to identify existing and potential threats to surface and groundwater supplies; and to identify regulatory and non-regulatory programs that could further enhance water resources management and protection efforts. The Deerfield Water Resources Plan recommendations were incorporated into the Deerfield Hazard Mitigation Plan when it was originally developed in 2007 and will continue to be incorporated as they pertain to hazard mitigation in the Town of Deerfield.

The following narrative explains how the 2011 Deerfield Hazard Mitigation Plan was used during each step of the planning process to make revisions that resulted in this Plan

Tasks to complete the Plan Update were as follows:

**Task 1: Determine the Planning Area & Resources:** This task was conducted by town staff and the Regional Planning Commission. Information from the previous plan was reviewed and revised. The results of this research can be found in Section II, “Community Profile”.

**Task 2: Building the Planning Team:** This task was conducted by town staff and the Regional Planning Commission. Commission staff contacted department heads and land use board volunteers. Town staff made further inquiries and posted notices for residents and other stakeholders who might wish to volunteer their time and serve on a committee.

**Task 3: Create an Outreach Program:** This task was conducted by town staff and the Regional Planning Commission throughout the plan’s update. Together multiple efforts were made to involve and educate the public regarding the process and input of the plan. Details of various outreach efforts can be found in this section of the plan.

**Task 4: Review Community Capabilities:** The Committee reviewed each type of hazard and which sections or town were vulnerable to that type of hazard. Furthermore, the Committee identified and catalogued all of the critical facilities and areas at risk within the town, see Section V and maps “Critical Facilities,” and “Areas at Risk”.

**Task 5: Conduct a Risk Assessment:** The Committee conducted several assessments to help determine the gaps in coverage. These include Assessing Probability, Severity, and Risk (Section IV) and Vulnerability Assessment (Section V).

**Task 6: Develop a Mitigation Strategy:** The Committee reviewed all hazards and the existing mitigation strategies meant to address those hazards in Section VI. In addition, the Committee evaluated the effectiveness of the existing measures to identify where they can be improved. Section VII summarizes the Committees efforts in reviewing “complete”, “completed and ongoing”, “deferred” and “new” mitigation action items. They evaluated all mitigation actions and prioritized them. The results are found in Section VIII, which provides the Committee’s rank, the projects STAPLEE score, problem statement,

mitigation action, hazard addressed, responsible party, anticipated cost, potential funding source and timeframe.

**Task 7: Keep the Plan Current:** The Town of Deerfield understands the ramifications for ensuring that this plan be monitored and updated annually or after a presidentially declared disaster.

**Task 8: Review & Adopt the Plan:** The Committee members reviewed and approved each section of the plan as it was completed. After acceptance by the Committee, the Plan was submitted to the New Hampshire Homeland Security and Emergency Management and the Federal Emergency Agency Region 1 Office, for review. At a public meeting, the Board of Selectmen formally adopted the plan on August 23, 2019. The plan was then granted formal approval by FEMA on August 26, 2019.

**Task 9: Create a Safe & Resilient Community:** The committee discussed the mitigation actions in the Action Plan and the ways in which the implementation of the actions will be beneficial to the community. Annual reviews of the Action Plan by the committee are needed to maintain the timeframes identified for completion of activities. Incorporation of the plan into other land use plans and the Capital Improvement Plan help to ensure that the goals of the plan are met.

*"... [M]itigation works. The Seattle-Tacoma area did not suffer significant losses [following the February 28, 2001, earthquake] because 20 to 30 years ago local leaders invested in its future by passing building codes and issuing municipal bonds that implemented solid protective measures."*

—Joe Allbaugh, Director of FEMA  
Congressional testimony, May 16, 2001

## **Hazard Mitigation Goals of the Town of Deerfield**

The *Town of Deerfield Hazard Mitigation Plan*, which was prepared by the Southern New Hampshire Planning Commission and the Deerfield Hazard Mitigation Committee and is maintained by the Deerfield Fire Chief and the Co-Emergency Management Directors, sets forth the following hazard mitigation goals:

1. To improve upon the protection of the general population, citizens and guests of the Town of Deerfield, from all natural and Human-caused hazards.
2. To reduce the potential impact of natural and Human-caused disasters on the Town's Critical Support Services, Critical Facilities and Infrastructure.
3. To improve the Town's Emergency Preparedness, Disaster Response and Recovery Capability.
4. To reduce the potential impact of natural and Human-caused disasters on the Town's Economy, Environment, Historical & Cultural Treasures and Private Property.
5. To identify, introduce and implement cost effective Hazard Mitigation measures in order to accomplish the Town's Goals.
6. To reduce the Town's liability with respect to natural and Human-caused hazards generally.
7. To address the challenges posed by climate change as they pertain to increasing risks in the Town's infrastructure and natural environment.

The Deerfield Hazard Mitigation Committee adopted the above goals, derived from the State of New Hampshire Hazard Mitigation Plan, for the Town of Deerfield, New Hampshire, at the January 11, 2018 committee meeting.

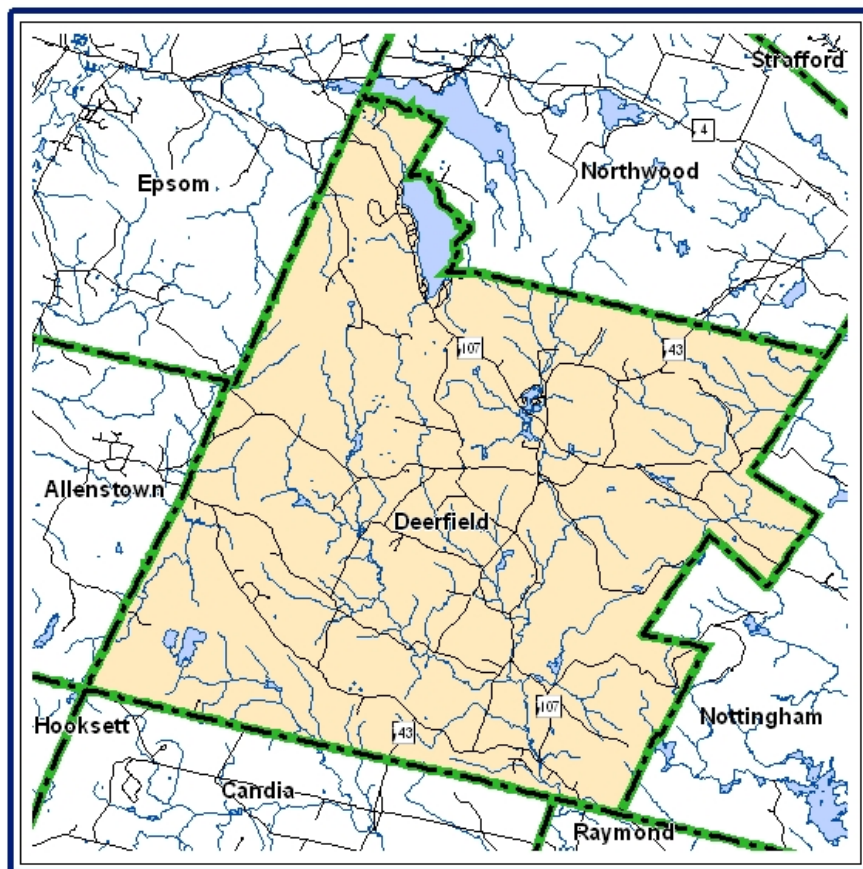
More specific objectives, established after the Committee's analysis of past and potential hazards and review of existing mitigation strategies, may be found at the beginning of Section V: Newly Identified Mitigation Strategies and Critical Evaluation.

## SECTION II

### HAZARD IDENTIFICATION

#### **Location, Population, Topography, and Climate**

The Town of Deerfield is located in the south-central portion of the State of New Hampshire in Rockingham County. Deerfield is bordered by the Town of Northwood to the north; the Town of Nottingham to the east; the Towns of Raymond and Candia to the south; and the Towns of Epsom and Allenstown to the west. It is located approximately 20 miles northeast of the City of Manchester and about 21 miles southwest of the City of Concord. New Hampshire Routes 43 and 107 provide primary highway access to the Town.



*Location map of Deerfield, New Hampshire*



Deerfield encompasses a total of approximately 52.1 square miles, of which 50.8 square miles is land area. The 2010 U.S. Census population of Deerfield was 4,280. This is approximately 82.2 persons per square mile. Deerfield has retained over time its natural and rural quality.

There are two major water bodies in Deerfield. Pleasant Lake covers 495 acres (NH Dept of Safety, Marine Patrol Bureau) and is located in Northern Deerfield, along the Deerfield/Northwood border. Freese's Pond, on the northern side of town, is the other major water body in Deerfield. The total area of surface water in Deerfield covers approximately 765 acres. Additional watercourses in Deerfield include Lamprey River, Bean River, Beaver Creek, Nicholls Brook, Dead Pond, Hartford Brook, North Branch River, Beaver Pond, Spruce Pond and Bear Brook.

The climate of Deerfield is typical of Southern New Hampshire, with warm summers and cool winters. Temperatures during the month of July range from an average high of 83 degrees Fahrenheit to an average low of 58 degrees. January temperatures range from an average high of 33 degrees to an average low of 13 degrees. Prolonged periods of severe cold are rare. Annual average precipitation is 44.5 inches. (WeatherChannel.com)

### **Current Land Use Development Trends in Deerfield**

Deerfield's land use development patterns and residential development have remained constant since 1960. Deerfield's convenient access to State Routes 107 and 43 make it an attractive location to live for those who commute to Concord or Manchester. Deerfield has largely developed into a "bedroom community." The 2010 Deerfield Open Space Plan describes the land use and development in Deerfield as follows:

"The Town of Deerfield is a rural town with a tradition of land protection. The Town consists of 33,375.5 acres, of which approximately 6,085.9 acres, or 18% of the municipality, are currently protected or conserved. Of these, 3,044 are conserved by the town with the remaining lands conserved by state or federal government. Additionally, the Town has conserved 32.8% of the 2,491.3 acres of NWI Wetlands and 24.23% of the 25,879.4 acres of forest land. There were 4,960 acres conservation lands 1998, 5,226 acres in 2004 and 6,085.9 in 2009 or 18% of the municipality. The data is provided by GRANIT.

The Town of Deerfield has seen extreme changes in developed versus undeveloped land in the past decade. An estimated 293 acres was developed between 1998-2003, with 59 acres developed each year (Source: Society for the Protection of NH Forests 2005). Currently it is estimated that Deerfield has 3,529 acres of developed land or 10.6% of the town. According to the Town Assessor's

Records (2010), there are a total of 74 lots consisting of 1008.48 acres of Town-owned lands in Deerfield. In addition, there are a total of six lots consisting of 3,224 acres of State-owned lands located within the Town. Some of these lands may be considered for open space protection in the future.

The majority of the Town-owned properties are located in the northeast quadrant of the city, where the Town made previous efforts to connect several conservation parcels. The town also has many other significant parcels scattered throughout Deerfield. The most significant state parcels are Bear Brook State Park in the southwestern corner of the Town and Pawtuckaway State Park in the eastern section of the Town.”

The lack of public water and sewer systems will likely constrain Deerfield's growth in the future, ensuring that low and high density residential development is the primary type of growth.

Deerfield’s current land use development trends have resulted in the following:

- Agricultural land is being lost to development
- Private woodland covers a large percent of the Town
- Approximately 4,500 acres are in residential use (SNHPC 2010 Land Use Report)
- Most commercial land use is located along Route 107/43 in the central part of Town
- There is very little area developed as commercial/industrial land in Deerfield

Deerfield's 2009 Master Plan identifies a number of goals for development. These goals were developed based on the community’s assets, needs and desires. The following are highlights of some of the Town’s goals:

- Promote development that will preserve the natural and cultural features that contribute to Deerfield’s rural character.
- Guide and Promote development and growth in areas that are already developed in an effort to reduce impacts on natural resources and infrastructure and to minimize sprawl.
- Provide safe, affordable housing for all age groups;
- Encourage limited economic development that will be consistent with the Town’s rural character, as well as support the needs of the community, to create a sustainable local economic base.
- Encourage the Town’s public safety facilities and equipment to adequately support the community’s needs
- Update the land use regulations to specifically address erosion and sediment control.

The Master Plan sets objectives for future growth and land use development to channel development away from natural constraints and promote environmental protection. The Town's Future Land Use Plan attempts to achieve the following: Protecting the rural character and natural environment of Deerfield; (2) Creating strong Town Villages; and (3) Implementing the principles of smart growth.

The Town of Deerfield's existing Zoning Ordinance, Floodplain Development Regulations, and Subdivision and Site Plan Regulations all work to minimize the impacts, if not eliminate any development in the flood hazard areas. Within the special flood hazard area, which is an area subject to a 1 percent or greater possibility of flooding each year, no new development is allowed without a building permit. These programs are further outlined in Section IV "Existing Mitigation Strategies and Proposed Improvements."

The land outside of the special flood hazard areas and areas of steep slopes remain the preferred location of development in Deerfield by the town and developers and extensive acreage of vacant developable land still exists outside these areas. Future development, beyond current rates of growth, may increase pressure to utilize these hazard areas, despite their inherent risks. Nonetheless, any proposed new developments or significant improvements in these zones would require a building permit and must adhere to specific provisions. The purpose of these provisions is to prevent or minimize damage and destruction to structures in the event of a flood. The Town may assure low risk and low impact future development in the hazard zones given these review opportunities. The town's development has had no impact on the degree to which it is vulnerable to hazards, and the vulnerability to hazards has largely remained the same.

### **National Flood Insurance Program**

Deerfield has been participating in the National Flood Insurance Program (NFIP) since 1989. Flood Insurance Rate Maps, bearing the effective date of May 17, 2005, are used for flood insurance purposes and are on file with the Deerfield Planning and Building Departments. In addition the town has implemented the following actions related to continued compliance with NFIP:

- Participate in NFIP training offered by the State and/or FEMA (or in other training) that addresses flood hazard planning and management
- Address NFIP monitoring and compliance activities
- Revise/adopt subdivision regulations, erosion control regulations, board of health regulations, etc. to improve floodplain management in the community
- Prepare, distribute or make available NFIP, insurance and building codes explanatory pamphlets or booklets

- Identify and become knowledgeable of non-compliant structures in the community
- Identify and become knowledgeable of submit-to-rate structures
- Identify cause of submit-to-rate structure and analyze how to prevent non-compliant structures in the future
- Inspect foundations at time of completion before framing to determine if lowest floor is at or above Base Flood Elevation (BFE), if they are in the floodplain
- Require the use of elevation certificates
- Enhance local officials, builders, developers, local citizens and other stakeholders' knowledge of how to read and interpret the FIRM
- Work with elected officials, the state and FEMA to correct existing compliance issues and prevent any future NFIP compliance issues through continuous communications, training and education

According to the most recent FEMA Biennial Report for Deerfield, there were 75 residential structures located in the FEMA designated special flood hazard areas (100 year floodplain).

The Town currently has 31 NFIP policies in force. Eleven claims have been filed with NFIP totaling \$97,679.28. There is currently one residential repetitive loss property insured under the NFIP within the Town of Deerfield.

## Past and Potential Hazards

The Deerfield Hazard Mitigation Committee identified past hazard events, which include flooding, wind, wildfire, ice, snow, and seismic events. Other hazards include geomagnetism, radon, drought, and extreme heat or cold. These hazards were identified in a brainstorming session with the Committee. The State of New Hampshire Hazard Mitigation Plan was consulted. The Areas at Risk Map at the end of this section reflects the impact areas for each hazard. The Committee reviewed background information, areas at risk, and the potential for each hazard to occur, pose a risk to, or cause damage to structures, infrastructure or human life. Due to the minimal probability of occurrence in Deerfield, the following hazards were omitted from the Plan: Avalanche, Infectious Diseases, Solar Storm and Space Weather.

This section references material from the 2018 State of New Hampshire Multi-Hazard Mitigation Plan, 2013 State of New Hampshire Multi-Hazard Mitigation Plan, FEMA, NOAA, USGS, and more. In some instances, the 2013 State of New Hampshire Multi-Hazard Mitigation Plan was referenced to include hazard descriptions not defined in the 2018 Plan.

1. Assigning Low, Medium, or High values (numerically 1, 2 or 3) to each hazard type for its possible impact to Human, Property, and Business factors (vulnerability). (A score of zero is given if the hazard is considered non-applicable).
2. The same process is used to assign Low, Medium, or High, values (numerically 1, 2, or 3) to each hazard type with respect to the probability that the hazard would occur in the next 25 years
3. The Severity is calculated by determining the average of the Human, Property, and Business impacts.
4. Risk is calculated by multiplying severity by probability.
5. Relative Threat Results: Low, Medium, High risk is assigned as follows:

(0-3.3 – Low) (3.4-6.6 Med) (6.7-10 High)

### Hazard Vulnerability Assessment

0-N/A 1-Low 2-Moderate 3-High	Human Impact  Probability of death or injury	Property Impact  Physical losses and damages	Business Impact  Interruption of Service	Probability  Likelihood this will occur in 5 years	Severity  Avg. of humans/ property business	Relative Threat  Severity-x-Probability
Event						
Flooding						

Flooding (100-YR)	2	2	2	2	2.00	4.00
Riverine Flooding	2	2	2	2	2.00	4.00
Hurricanes	2	2	2	2	2.00	4.00
Debris Impacted Infrastructure	1	1	1	1	1.00	1.00
Erosion/Mudslides	1	1	1	1	1.00	1.00
Rapid Snow Pack Melt	1	2	2	1	1.67	1.67
Dam Breach/Failure	1	1	1	1	1.00	1.00
Road Wash Out/Culvert Crossings	2	2	2	2	2.00	4.00
Wind						
Hurricanes	2	2	2	2	2.00	4.00
Tornadoes	2	2	2	2	2.00	4.00
Nor'easter	2	2	2	2	2.00	4.00
Downbursts	2	2	2	2	2.00	4.00
Lighting	1	1	1	1	1.00	1.00
Fires						
Wild Land Fires	2	2	1	2	1.67	3.33
Isolated Homes	2	1	1	1	1.33	1.33
Ice and Snow Events						
Heavy Snowstorms	1	1	2	3	1.33	4.00
Ice Storms	2	2	2	3	2.00	6.00
Hailstorms	1	1	1	1	1.00	1.00
Seismic Events						
Earthquakes	2	2	2	2	2.00	4.00
Landslides	1	1	1	1	1.00	1.00
Other Hazards						
Geomagnetism	3	3	3	1	3.00	3.00
Radon	2	2	1	2	1.67	3.33
Drought	2	2	2	2	2.00	4.00
Extreme Heat	2	1	1	2	1.33	2.67
Extreme Cold	2	2	1	1	1.67	1.67
Arsenic in Wells	2	2	1	2	1.67	3.33
Civil Disorder	2	2	1	1	1.67	1.67
Terrorism	2	2	1	1	1.67	1.67

## A. Flooding

The Deerfield Hazard Mitigation Committee reviewed the following kinds of hazards related to flooding:



*Route 43, Deerfield, April 2007 Floods*

### Inland Flooding (100-Year Flood)

Inland flooding is generally defined as a high flow, overflow, or inundation by water, which causes or threatens damage.<sup>1</sup> Flooding results from the overflow of rivers, their tributaries, and streams throughout the State, primarily from high precipitation events. Flash flooding is defined as a flow with a rapid rise in water level and extreme velocities in a river or stream, beginning within six hours of the causative event (e.g., intense rainfall, dam failure, ice jam). Ongoing flooding can intensify to flash flooding in cases where intense rainfall results in a rapid surge of rising flood waters.<sup>2</sup> Because of New Hampshire's steep terrain in the headwaters of watersheds, particularly outside of the coastal plain, flash floods also lead to riverbank and bed erosion. Extreme precipitation events in recent years, such as Tropical Storm Irene, have led to buildings on the edges of streambanks becoming at risk to river erosion, or culvert failures.<sup>3</sup>

#### 100-year Floodplain Events

Floodplains are usually located in lowlands near rivers, and flood on a regular basis. The term 100-year flood does not mean that flood will occur once every 100 years. It is a statement of probability that scientists and engineers use to describe how one flood compares to others that are likely to occur. It is more accurate to use the phrase "1% annual chance flood". What this means is that there is a 1% chance of a flood of that size happening in any year. The flood hazard areas that are identified in

<sup>1</sup> <http://w1.weather.gov/glossary/index.php?letter=f>

<sup>2</sup> <https://www.fema.gov/what-mitigation/federal-insurance-mitigation-administration>

<sup>3</sup> State-of-New-Hampshire-Multi-Hazard-Mitigation-Plan-Update-2018

Windham are defined as follows (according to FEMA's website:  
[http://www.fema.gov/fhm/fq\\_term.shtm](http://www.fema.gov/fhm/fq_term.shtm))

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no Base Flood Elevations or depths are shown within this zone. Mandatory flood insurance purchase requirements apply.

Zones AE and A1-A30 are the flood insurance rate zones that correspond to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. In most instances, Base Flood Elevations (BFEs) derived from the detailed hydraulic analyses are shown at selected intervals within this zone. Mandatory flood insurance purchase requirements apply.

Zone AO is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. The depth should be averaged along the cross section and then along the direction of flow to determine the extent of the zone. Average flood depths derived from the detailed hydraulic analyses are shown within this zone. In addition, alluvial fan flood hazards are shown as Zone AO on the FIRM. Mandatory flood insurance purchase requirements apply.

Zone X is the flood insurance rate zones that correspond to areas outside the 100-year floodplains, areas of 100-year sheet flow flooding where average depths are less than 1 foot, areas of 100-year stream flooding where the contributing drainage area is less than 1 square mile, or areas protected from the 100-year flood by levees. No BFEs or depths are shown within this zone.

The extent of inland flooding in Deerfield can be found on the Areas at Risk Map following Section II. The Areas at Risk Map illustrates the extent of special flood hazard areas, including the 100 Year Floodplain and 500 Year Floodplain. While flooding can be common in certain areas in Deerfield, there have been no significant flooding events in Deerfield since 2013.

**All Special Flood Hazard Areas (SFHAs) in the Town of Deerfield** are potentially at risk in the event of riverine flooding. The SFHAs are located on the Areas at Risk Map at the end of this section.



*Moderate probability for Inland flooding to occur and cause damage in Deerfield.*

Riverine flood events

Riverine flooding is the most common disaster event in the State of New Hampshire. In recent years some areas in the State have experienced multiple disastrous flood events at recurrence intervals of less than ten years. New Hampshire usually has a climate of abundant precipitation. Weather ranges from moderate coastal to severe continental, with annual precipitation ranging from about 35 inches in the Connecticut and Merrimack River valleys, to about 90 inches on top of Mount Washington. (2013 State Multi-Hazard Mitigation Plan)

The most significant water features in the Town of Deerfield are Pleasant Lake and Freeses Pond. Other water bodies in Town include Lamprey River, Bean River, Beaver Creek, Nicholls Brook, Dead Pond, Hartford Brook, North Branch River, Beaver Pond, Spruce Pond and Bear Brook. The Lamprey River is identified as one of the main flooding sources in Rockingham County (FIS 9).

"The goal of flood hazard mitigation planning is to eliminate or reduce the long-term risks to human life and property from flooding by reducing the cause of the hazard or reducing the effects through preparedness, response, and recovery measures. Hazard mitigation is the only phase of emergency management that can break the cycle of damage, reconstruction, and repeated damage (1999 New Hampshire Natural Hazards Mitigation Plan, NHBEM, pg 13)." Riverine flooding is the most common and significant hazard event in the State of New Hampshire as well as all of its municipalities.

Some of the more severe flooding in Deerfield occurs during the spring, fall, and winter seasons. Spring floods are typically due to rapid snowmelt and heavy rains. Fall floods are frequently caused by heavy rainfall associated with tropical storms. However, Deerfield is prone to flooding at all points in the year from heavy thunderstorms, causing rapid runoff and flooding.



*Intersection of Routes 103 and 47, Deerfield April 2007*

From 1973 through the present, there have been eight flood-related FEMA-declared disasters in Rockingham County:

April 1987  
November 1991  
October 1996  
July 1998  
May 2006  
April 2007  
August 2008  
May 2010

(FEMA, "Federally Declared Disasters by Calendar Year")

During the May 2006 event, some areas in Rockingham County saw as much as 14 inches of rainfall. During the "Patriots Day Flood" in April 2007, major road damage occurred due to flooding which closed areas of Route 43, cutting off access in and out of Town. Route 107 and Route 43 were closed at the South Road Split; Route 43 was closed at the lower fairgrounds entrance; Route 107 was closed at the Epsom/Deerfield Town line (at Yeaton Farm); and Route 43 was closed at Lucas Pond Road in Northwood.



*Candia Road at Nicholls Brook, Deerfield, April 2007*

**All Special Flood Hazard Areas (SFHAs) in the Town of Deerfield** are potentially at risk in the event of riverine flooding. The SFHAs are located on the Areas at Risk Map at the end of this section.

*Moderate probability for riverine flooding to occur and cause damage in Deerfield.*

## Hurricanes

A hurricane is a tropical cyclone during 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. High winds are a primary cause of hurricane-inflicted loss of life and property damage.

The primary threats associated with hurricanes come from flooding due to a coastal storm surge, inland flooding due to heavy precipitation and severe winds. Hurricanes are known for their high winds and the damage they can cause, but about 80 percent of deaths during hurricanes are due to drowning. Since 1850, about 14 hurricanes (wind speeds of at least 74 mph) have made landfall along the southern coasts of Long Island and New England, according to Mary Stampone, assistant professor of geography at the University of New Hampshire and the New Hampshire state climatologist. Of these New England hurricanes, five crossed the state of New Hampshire as minimal hurricanes (wind speed of 74 to 110 mph), including the unnamed storms of September 1858 and 1869 as well as the more recent hurricanes Carol (1954), Donna (1960), and Gloria (1985). Other 20th century New England hurricanes to impact New Hampshire include the "Long Island Express" (1938), the "Great Atlantic Hurricane" (1944), and Hurricane Bob (1991). The September 1938 hurricane was the most notable flooding event to strike Deerfield and other municipalities in southern New Hampshire, with wind velocity reaching 163 mph at the summit of Mount Washington.

Potential effects of a hurricane include flooding; runoff not handled adequately, and disrupted travel. The most recent hurricanes were:

September 1985 - Gloria

August 1991 - Bob

September 1999 - Floyd

August 2011 - Irene

October 2012 - Sandy

October 2016 - Matthew

During these events trees and power lines came down, and there was minimal structural damage. Hurricane Bob was a Presidentially Declared Disaster for the State of New Hampshire and caused about \$2.3 million in damages statewide. Most recently, Hurricane Irene was also a Presidentially Declared Disaster for the State. (FEMA, "Federally Declared Disasters by Calendar Year"). The Town fared

well in Irene with only minimal downed trees and no flooding. During Hurricane Sandy, Deerfield Highway Department worked to clear down trees and debris in roadways. There have been no significant hurricane/high wind events in Deerfield since the last plan update.

**All areas of the Town of Deerfield** are potentially at risk if a hurricane reaches Rockingham County, New Hampshire.

*High probability for hurricanes to occur and cause flood damage in Deerfield.*

#### Debris-impacted infrastructure and river ice jams

Debris carried by floodwaters can significantly compromise the effectiveness of otherwise adequately designed bridges, dams, culverts, diverting structures, etc. Storm debris carried by floodwaters may exacerbate a given flooding hazard by becoming obstructions to normal storm water flow. Culverts and bridge crossings that are undersized in relation to the river or stream in which they are contained can lead to sedimentation and debris accumulation, potentially causing structural failures and major flooding downstream. (2013 State Multi-Hazard Mitigation Plan)

Historically, floods in Deerfield have been due to snowmelt and heavy rains in conjunction with debris-impacted infrastructure. If flooding occurs in the Town of Deerfield, there is the potential for debris-impacted infrastructure and ice jams to cause damage. Problems with debris obstruction have occurred along the Lamprey River at the intersection of Raymond Road and Route 107, causing the road to become flooded. Please see the table of past flooding events under Riverine Flooding for descriptions of each of these areas, past events, and event severity. Occasionally, beaver dams obstruct culverts and watercourses and have caused significant flooding. In the April 2007 floods a stray boat plugged the culvert on Route 107 just north of the junction of Rt. 107 and 43 on Freeses pond and caused the road to flood.

**All Special Flood Hazard Areas in the Town of Deerfield** are potentially at risk if there is an ice jam or debris-impacted infrastructure. Particular concern should be given to bridges and culverts across the many brooks in Deerfield including Nicholls Brook, Freeses Pond, Griffin Brook, Hartford Brook and the Lamprey River.

*High probability for debris-impacted infrastructure or ice jams to occur and cause damage in Deerfield.*

#### Erosion and mudslides

The New Hampshire Department of Environmental Services (NHDES) defines erosion as "the process in which a material is worn away by a stream of liquid

(water) or air, often due to the presence of abrasive particles in the stream (NHDES Watershed Management Bureau)." As it relates to this *Plan*, erosion is the gradual or rapid wearing away of stream banks or shores, due to prevailing winds, natural water movement, and more catastrophic events. Additional causes of erosion are removal of vegetation and soil disturbance. Riparian construction sites are one non-natural contributor (NHDES Shoreland Protection). Stream bank erosion may eventually result in mudslides.

Land in Deerfield which has at least a 15 percent slope, a vertical rise of 15 feet over a horizontal run of 100 feet, is scattered throughout the Town, usually occurring around hills and stream banks. Areas of steep slopes in Deerfield are shown on the Areas at Risk map at the end of this section.

The Hazard Mitigation Committee was not aware of any known or recorded erosion related events in Deerfield.

**All areas of steep slopes**, as mapped in this *Plan*, are potentially at risk in the case of erosion and mudslide events.

*Low to Moderate probability for erosion and mudslides to occur and cause moderate damage in Deerfield.*

#### Rapid snowpack melt

The State's climate, mountainous terrain increases the susceptibility to flooding which may be accelerated by the seasonal rapid melting of the snowpack, coupled with moderate temperatures and heavy rains. The upland areas may be exposed to associated erosion and deposition issues in or near streambeds. The lower-lying areas of the State may experience either flash-flooding or inundation events accelerated by the rapid melting of the snowpack. (2013 State Multi-Hazard Mitigation Plan)

Structures and improvements located on, along, or at the base of steep slopes are most vulnerable to rapid snowpack melt. These areas can be seen on the Areas at Risk map's depiction of steep slopes. There have been no known past rapid snowpack melt events in the Town of Deerfield that the Hazard Mitigation Committee was aware of.

**All areas of steep slopes**, as mapped in this *Plan*, are potentially at risk in the event of rapid snowpack melt.

*Low to moderate probability for rapid snowpack melt to occur and cause minimal to moderate damage in Deerfield.*

#### Dam breach or failure

Dams can sustain damage during an unusually heavy rain event or a rain event that occurs in conjunction with runoff produced during the spring thaw, which can stress a dam beyond its design capabilities. An example would be if a storm event produced more runoff than a dam's outlet works (spillways and gates, etc.) could pass. (2013 State Multi-Hazard Mitigation Plan). Additionally, failure may be triggered because of significant seismic activity, particularly earthquakes.

The State of New Hampshire uses a hazard potential classification based on the impact of dam breach or failure. All Class H (High Hazard) and S (Significant Hazard) dams have the potential to cause damage if they breach or fail. Deerfield has 5 Class NM dams (non-menace hazard potential), 2 Class L dams (low hazard potential), and no Class S (significant hazard potential) or Class H dams (high hazard potential).

"The Department of Environmental Services (DES), through its Dam Bureau, is responsible for the regulation of the state's dams to ensure that they are constructed, maintained and operated in a manner to promote public safety (2013 State Multi-Hazard Mitigation Plan)." In 1988, the New Hampshire State Legislature recognized the need for dam owners to prepare a plan to assist the local community in responding effectively to a dam failure. The legislature amended RSA 482:2 and RSA 482:12 and adopted RSA 482:11a to require that dam owners develop an Emergency Action Plan for all dams that may be a menace to public safety due to their condition, height, and location. (NH DES Dam Bureau, Environmental Fact Sheet DB-11) The most notable private dam is Harantis Lake dam.

There are no Class H or S dams located in the Town of Deerfield. Freeses Pond Dam is classified by the State as a Low Hazard structure (Class L), which means it has a low hazard potential because it is in a location and of a size that failure or mis-operation of the dam would result in any of the following:

- No possible loss of life.
- Low economic loss to structures or property.
- Structural damage to a town or city road or private road accessing property other than the dam owner's that could render the road impassable or otherwise interrupts public safety services.
- The release of liquid industrial, agricultural, or commercial wastes, septage or contaminated sediment if the storage capacity is less than two-acre-feet and is located more than 250 feet from a water body or water course.
- Reversible environmental losses to environmentally-sensitive sites.

Thurston Pond Dam is classified by the State as a Non Menace structure (Class NM), which means it is a dam that is not a menace because it is in a location and of a size that failure or mis-operation of the dam would not result in probable loss of life or loss to property, provided the dam is:

- Less than six feet in height if it has a storage capacity greater than 50 acre-feet; or
- Less than 25 feet in height if it has a storage capacity of 15 to 50 acre-feet.

The Hazard Mitigation Committee indicated that the Freeses Pond Dam was breached in the 1980's. The landowner breached the dam on purpose because it was no longer considered safe and then sold the land to the town. There have been no dam failures since 2013.

**The SFHAs in proximity to Deerfield's dams** as well as their designated floodways would be impacted by a dam breach.

*Low probability for dam breach or failure to occur and cause significant damage in Deerfield.*

*Since 2013, there has been one Severe Storm and Flooding event in Rockingham County, on March 02, 2018 to March 08, 2018 ([DR-4370](#)).*

## **B. Wind**

The most frequent problem and risk associated with all types of wind storms in the Town of Deerfield is downed trees and the secondary impacts of their falling, including downed power lines. In February 2010, New Hampshire experienced a strong windstorm that was a Presidential Declared Disaster, but it was classified as a "severe winter storm" (FEMA, "Federally Declared Disasters by Calendar Year").

The February 2010 windstorm, classified as a "severe winter storm," is the only recorded storm with severely high winds from 1950 to 2011, which was not associated with one of the specific wind event types as identified below (NOAA National Climatic Data Center). The Town had a significant number of downed trees and a major power outage; it opened its overnight shelter for three nights.

There are seven areas in Deerfield with an increased susceptibility of downed trees, some with greater associated risks as well. Due to the topography of Deerfield, there are several areas in which wind tunnels develop. These areas include:

1. Daniel Way

2. Griffin Road
3. Mt. Delight Road
4. Mountain Road
5. Nottingham Road
6. Ridge Road
7. South Road

All 7 of these locations should be considered risk areas for the following kinds of hazards related to wind, reviewed by the Deerfield Hazard Mitigation Committee.

### 1. Hurricanes

Severe hurricanes reaching south-central New Hampshire in the late summer and early fall are the most dangerous of the coastal storms that pass through New England from the south. Tropical depressions are considered to be of hurricane force when winds reach 74 miles per hour (see the following table for hurricane categorization according to the Saffir-Simpson Scale). Substantial damage may result from winds of this force, especially considering the duration of the event, which may last for many hours. Potential effects of hurricane force winds include fallen trees, telephone poles, and power lines.

Category	Sustained Winds	Types of Damage Due to Hurricane Winds
1	74-95 mph	<b>Very dangerous winds will produce some damage:</b> Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	96-110 mph	<b>Extremely dangerous winds will cause extensive damage:</b> Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3	111-129 mph	<b>Devastating damage will occur:</b> Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4	130-156 mph	<b>Catastrophic damage will occur:</b> Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5	157 mph or	<b>Catastrophic damage will occur:</b> A high percentage of framed homes



	<b>higher</b>	will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
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Winds from the Hurricane of 1938, previously mentioned, reached a high of 186 miles per hour, a category 5 on the Saffir-Simpson Scale. (NHBEM III-22)

**All areas of Deerfield** are at risk if a hurricane reaches Rockingham County, New Hampshire.

*High probability for hurricane force winds to occur and cause damage in Deerfield.*

## 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. They may also occur singularly or in multiples. Tornadoes 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. (NH 2013 State Multi-Hazard Mitigation Plan)

Tornadoes are measured using the Fujita Tornado Damage Scale, as seen in the following table (National Oceanic and Atmospheric Administration).

## Enhanced Fujita Tornado Damage Scale

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

Source: NOAA

Between 1950 and 2011, there were 10 known tornadoes in Rockingham County. Two of these were F0, two were F1, five were F2 (August 1951, June 1957, July 1961, May 2006 and July 2008), and one was F3 (June 1953). The July 2008 Tornado set down in Deerfield and cut a path of destruction through Griffin Road, Echo Valley Road, Baker Road and others. One Deerfield resident perished in a collapsed home. The path of the July 2008 tornado can be seen on the Areas at Risk map at the end of this section.



Damage from the July 2008 tornado that hit Deerfield, (Photo taken by Richard Pelletier)

**All areas of Deerfield** are potentially at risk if a tornado reaches the Town.

*High probability for tornadoes to occur and cause moderate damage in Deerfield.*

### 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 strike the coast and inland areas from a Northeasterly direction. In the winter months, oftentimes heavy snow conditions accompany these events. It can form over land or over the coastal waters. These winter weather events are notorious for producing heavy snow, rain, and tremendous waves that crash onto Atlantic beaches, often causing beach erosion and structural damage. Wind gusts associated with these storms can exceed hurricane force in intensity. A nor'easter gets its name from the continuously strong northeasterly winds blowing in from the ocean ahead of the storm and over the coastal areas. " Hazards from nor'easters include icing and heavy snows which cause downed trees and power lines to go down (NOAA. National Weather Service. Glossary).

"Unlike the relatively infrequent hurricane, New Hampshire generally experiences at least one or two significant 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 three days, while the duration of hurricanes ranges from six to 12 hours (Ibid)." Nor'easters are measured on the Dolan- Davis Scale, as seen in the following table.

Dolan-Davis Nor'easter Classification Scale				
Storm Class	% of Nor'easters	Avg. Return Interval	Avg. Duration (hours)	Impact
1- WEAK	49.7	3 days	8	No property damage
2- MODERATE	25.2	1 month	18	Modest property damage
3- SIGNIFICANT	22.1	9 months	34	Local-scale damage and structural loss
4- SEVERE	2.4	11 years	63	Community scale damage and structural loss
5- EXTREME	0.1	100 years	95	Extensive regional-scale damage and structural loss

Source: State of NH 1999 Natural Hazards Mitigation Plan and NC Division of Emergency Management

In past events, Deerfield has experienced damage to power lines and road blockages in various areas throughout town. The Nor'easter in October 2011, nicknamed "Snowtober" brought record amounts of snowfall to many parts of New England and was the third biggest storm in terms of power outages across New Hampshire (behind the December 2008 icestorm and the February 2010 windstorm). The Town received fourteen inches of snow and had a major power outage as a result of damage to major lines elsewhere in the State.

**All areas of Deerfield** are potentially at risk for property damage and loss of life due to nor'easters.

*High probability for nor'easters to occur and cause significant wind damage in Deerfield.*

#### 4. Downburst

"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: *Microburst* which covers an area less than 2.5 miles in diameter, and *Macrobust* which covers an area at least 2.5 miles in diameter. " (1999 New Hampshire Natural Hazards Mitigation Plan, NHBEM, pg III-20)

The Hazard Mitigation Committee was not aware of any past known downburst events in the Town of Deerfield.

**All locations in Deerfield** are at risk for property damage and loss of life due to downbursts.

*Moderate probability for downbursts to occur and cause minimal to moderate damage in Deerfield.*

### 5. Lightning

Lightning is a giant spark of electricity that occurs within the atmosphere, or between the atmosphere and the ground. As lightning passes through the air, it heats the air to a temperature of 50,000 degrees Fahrenheit, considerably hotter than the surface of the Sun. During a lightning discharge, the sudden heating of the air causes it to expand rapidly. After the discharge, the air contracts quickly as it cools back to ambient temperatures. This rapid expansion and contraction of the air causes a shock wave that we hear as thunder, a shock wave that can damage building walls and break glass. In the United States, it is reported that an average of 54 people are killed by lightning annually. (2013 State Multi-Hazard Mitigation Plan)

Lightning can be measured to determine how likely it may be for starting fires. Using a Level system of 1 to 6 corresponding with storm development and the number of lightning strikes, the Lightning Activity level (LAL) measures the magnitude of lightning strikes as displayed in the below table.

Level	LAL Cloud and Storm Development	Cloud to Ground Strikes per 5 Minutes	Cloud to Ground Strikes per 15 Minutes
LAL 1	No thunderstorms	n/a	n/a
LAL 2	Isolated thunderstorms. Light rain will occasionally reach the ground. Lightning is very infrequent, 1 to 5 cloud to ground strikes in a five minute period.	1 to 5	1 to 8
LAL 3	Widely scattered thunderstorms. Light to moderate rain will reach the ground. Lightning is infrequent, 6 to 10 cloud to ground strikes in a 5 minute period.	6 to 10	9 to 15
LAL 4	Scattered thunderstorms. Moderate rain is commonly produced. Lightning is frequent, 11 to 15 cloud to ground strikes in a 5 minute period.	11 to 15	16 to 25
LAL 5	Numerous thunderstorms. Rainfall is moderate to heavy. Lightning is frequent and intense, greater than 15 cloud to ground strikes in a 5 minute period.	>15	>25
LAL 6	Dry lightning (same as LAL 3 but without rain). This type of lightning has the potential for extreme fire activity and is normally highlighted in fire weather forecasts with a Red Flag Warning.	6 to 10	9 to 15

In the past, lightning strikes have occurred on Tandy Road, Mount Delight Road, Haynes Road, and on the higher elevations of Middle Road. Damages that have resulted from lightening strikes include equipment damage and other damage due to electrical surges. However, there has been no recorded damage as the

result of lightning strikes in Deerfield; therefore the estimated cost of damage due to lightening strikes is not available.

**All areas of Deerfield** are potentially at risk for property damage and loss of life due to lightning.

*Moderate probability for lightning to occur and cause minimal damage in Deerfield.*

### **C. Fires**

The Deerfield Hazard Mitigation Committee reviewed the following kinds of hazards related to fires:

#### **1. Wildland Fire**

Wildfire is defined as any unwanted and unplanned fire burning in forest, shrub or grass and is frequently referred to as forest fires, shrub fires or grass fires, depending on their location. They often occur during drought and when woody debris on the forest floor is readily available to fuel the fire. The threat of wildfires is greatest where vegetation patterns have been altered by past land-use practices, fire suppression and fire exclusion.

New Hampshire is a heavily forested state and is therefore vulnerable to this hazard, particularly during periods of drought and/or large- scale natural disturbances causing unusual fuel buildup. The proximity of many populated areas to the State's forested lands exposes these areas and their populations to the potential impact of wildfire. The Granite State is the second most forested state in the United States (trailing Maine). Forests occupy 84 percent, or 4.8 million acres. The southern portion of the State has seen rapid commercial and residential development which has extended into previously forested areas. Although this development has slowed, this sprawl has created its own concerns regarding the increased risk of damage in the wildland-urban interface. In a study conducted by the United States Forest Service in 2006, New Hampshire was ranked as having the highest percentage of homes in the wildland-urban interface of any state in the nation. Present concerns are that the Ice Storm of 2008 has also left a significant amount of woody debris in the forests of the region and may fuel future wildfires. (2013 State Multi-Hazard Mitigation Plan)

The potential magnitude of a hazard event, also referred to as the extent, scale or strength of a disaster, provides a measurement of how large and significant a hazard can become. The Table below shows the National Wildfire Coordinating Group (NWCG) Size Fire Classification.

<b>National Wildfire Coordinating Group (NWCG) Size Fire Classification</b>
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Class A	1/4 acre or less
Class B	More than 1/4 acre, but less than 10 acres
Class C	10 acres or more, but less than 100 acres
Class D	100 acres or more, but less than 300 acres
Class E	300 acres or more, but less than 1,000 acres
Class F	1,000 acres or more, but less than 5,000 acres
Class G	5,000 acres or more

The Town of Deerfield has two fire stations serving approximately 52 square miles. Data pertaining to fires can be found in the Deerfield Town and School Annual Reports. There were a total of 169 fires from 2007-2011, including tree, brush, and grass fires, structure fires, vehicle fires, and other fire types including cooking, trash, or chimney fires, and other unauthorized burns. There was an average of 33.8 fires a year.

Past wild land fire events in the Town of Deerfield have occurred at:

- Bear Brook State Park;
- Coffeetown Rd (including Cate and Woodman Roads);
- Griffin Road;
- Middle Road to South Road;
- Mt. Delight Rd to Middle Rd;
- Mountain Rd;
- Nottingham Rd;
- Pawtuckaway State Park (borders Brown and Reservation Roads);
- Perry Road;
- Saddleback Mountain; and
- Swamp Road

The locations listed above are considered areas at risk due to the size of the land area and lack of accessibility.

**In the Town of Deerfield, the following areas are susceptible to wild land fires:**

- All new developments – when trees are cut the soil dries leaving dead grass and creates a new urban-wild land interface;
- Trails – hiking, biking, hunters, RV (ATV use), etc; and
- Campgrounds – unattended fires at Pawtuckaway and Bear Brook State Parks pose an additional risk.

These areas have been identified on the Areas at Risk map.

Since 2013, Deerfield has averaged 142 fires per year. However, there have been no significant fire events since 2013.

*High probability for wild land fires to occur and cause damage in Deerfield.*

## 2. Target Hazards

Target Hazards are facilities or areas of town that require a greater amount of pre-fire tactical planning to address emergencies larger than the average fire event. In the Town of Deerfield, a couple areas have high concentrations of either combustible or hazardous materials which, if a fire were to occur, could increase the severity of the fire and possibly have catastrophic results.

**In the Town of Deerfield, the following areas are susceptible to target hazard related fires due to the amount of forest land present, ATV use and camp fires:**

- Bear Brook State Park
- Pawtuckaway State Park
- Deerfield Fairgrounds

These areas have been identified on the Areas at Risk map.

*Moderate probability for target hazard related fires to occur and cause moderate damage in Deerfield.*

## 3. Isolated Homes

Isolated homes are more susceptible to the impacts of wildfire due to the challenges of reaching them with fire-fighting capabilities. Isolated homes are a concern for New Hampshire, as it is heavily forested and there has been an increase in the urban-wildlife interface as towns develop and grow.

In the Town of Deerfield, Whittier Road has four semi-isolated residences and Whittier Road Extension has three semi-isolated residences that are potentially at risk.

There is also an isolated residence at the end of Reservation Road. The residence is actually located in Nottingham, but the only access to the home is through Deerfield.

These areas have been identified on the Areas at Risk map.

*Low probability for isolated homes to receive minimal damage in Deerfield.*



## **D. Ice and Snow Events**

The Deerfield Hazard Mitigation Committee reviewed the following kinds of hazards related to ice and snow events:

### **1. Heavy snowstorms**

A heavy snowstorm is generally considered to be one that deposits four or more inches of snow (or 10 cm) in a twelve-hour period. A blizzard is a violent snowstorm with winds blowing at a minimum speed of 35 miles (56 kilometers) per hour and visibility of less than one-quarter mile (400 meters) for three hours. A Nor'easter is a large weather system traveling from south to north, passing along the coast. As the storm's intensity increases, the resulting counterclockwise winds which impact the coast and inland areas in a Northeasterly direction. Winds from a Nor'easter can meet or exceed hurricane force winds. (2013 State Multi-Hazard Mitigation Plan)

For the intents of this *Plan*, heavy snowstorms include all storms with four or more inches of snow in a 12-hour period, including all blizzards and nor'easters (as defined under wind events) with large snow accumulation.

In the past 13 years, the Federal Emergency Management Agency declared five snowstorm-related Emergency Declarations for Rockingham County.

The most recent declared emergency was for October 29-30, 2011 and was declared for Hillsborough and Rockingham Counties. The Town of Deerfield received fourteen inches of snow and had a major power outage as a result of damage to major lines elsewhere in the State.



**All areas of Deerfield** are potentially at risk for property damage and loss of life due to heavy snows.

*High probability for heavy snowstorms, blizzards, and nor'easters to occur and cause damage in Deerfield.*

## 2. Ice Storms

"Ice Storms occur when a mass of warm moist air collides with a mass of cold arctic air. The less dense warm air will rise and the moisture may precipitate out in the form of rain. When this rain falls through the colder more dense air and comes in contact with cold surfaces, ice will form and may continue to form until the ice is as thick as several inches. (1999 New Hampshire Natural Hazards Mitigation Plan, NHBEM, pg III-25)"

Despite the beauty of ice events, the extreme weight of ice build-up may strain tree branches, power lines and even transmission towers to the breaking point, resulting in a loss of power, telephone service, or other services. Fallen trees, limbs, or utility poles may obstruct roads and restrict emergency vehicle passage. Additionally, ice creates treacherous conditions for highway travel and aviation.

Deerfield, including the rest of New Hampshire and much of the Northeast, experienced an intense ice storm from December 11-12, 2008. A major disaster declaration was declared for 10 counties in New Hampshire, including Rockingham. The damage was widespread and approximately 400,000 residents of New Hampshire lost power from the storm. Restoring power to a majority of the State took approximately 14 days and in some extreme cases it took 17 days.

*"It was absolutely unprecedented in devastation. Take the largest number of outages in any past storm, multiply that figure by three, and it still won't equal the outages in the 2008 ice storm." PSNH spokesman, Matt Chagnon, went on to say that, "the response was as unprecedented as the storm itself. PSNH put 2,400 linemen to work. On average, they restored power to 28,000 customers a day."*<sup>4</sup> *The 2008 ice storm is believed to be the worst ice storm ever recorded in New Hampshire.*

The Town of Deerfield had many downed trees and a complete power outage. Multiple roads were closed. Restoring power took approximately four to fourteen days; the Town opened an overnight shelter at the Deerfield Community School.

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<sup>4</sup> Sullivan, Margo. *State, power companies explore ice storm response*. 12/29/08.  
[http://www.eagletribune.com/punews/local\\_story\\_364030134.html](http://www.eagletribune.com/punews/local_story_364030134.html)

There was a similar icestorm event in 1998 which was also a Federally Declared Disaster by FEMA. Other ice storms in southern New Hampshire with impacts in Deerfield occurred in March of 1991 and January of 1979.

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

*High probability for ice storms to occur and cause moderate damage in Deerfield.*

### 3. Hailstorms

Hailstorms are characterized by showery precipitation in the form of irregular pellets or balls of ice more than five mm in diameter, falling from a cumulonimbus cloud (NOAA. National Weather Service. Glossary).

"Most hailstones are smaller in diameter than a dime, but stones weighing more than a pound has been recorded. Details of how hailstones grow are complicated but the results are irregular balls of ice that can be as large as baseballs, sometimes even bigger. While crops are the major victims, hail is also a hazard to vehicles and windows. Hail damage events can be severe to persons, property, livestock and agriculture (Ibid)."

Since 1963 the National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center (NCDC) online database has recorded 119 incidents of hail in Rockingham County. Storms occurred during the months of May, June, July, August and September. Hailstone diameters recorded ranged from .75 to 2 inches.

The Hail Size Description Chart developed by the National Oceanic and Atmospheric Administration (NOAA) and enhanced by other National Weather Service local sites depicts the potential size of hail during a hurricane or severe storm event. **Some examples from the Hail Size Description chart include "1/2 inch=Pea Size" and "2 inches=Hen Egg Size."**

### **Hail Size Description**

Hailstone Diameter in Inches	Size Description
<1/4	Bb
1/4	Pea Size
1/2	Mothball Size
3/4	Penny Size
7/8	Nickel Size
Severe Criteria 1	Quarter Size
1 1/4	Half Dollar Size
1 1/2	Walnut or Ping Pong Ball Size
1 3/4	Golf Ball Size
2	Hen Egg Size
2 1/2	Tennis Ball Size
2 3/4	Baseball Size
3	Teacup Size
3 4/5	Softball Size
4	Grapefruit Size
4 3/4	CD/DVD
Note: Hail size refers to the diameter of the hailstone.	

<http://w1.weather.gov/glossary/index.php?letter=n>. 02-06-14.

**All areas of Deerfield** are potentially at risk from this hazard.

*Moderate probability for hailstorms to occur and cause minimal damage in Deerfield.*

*Since 2013, there has been three Severe Winter Storm and Snowstorm events in Rockingham County, listed below:*

[New Hampshire Severe Winter Storm and Snowstorm \(DR-4105\)](#)

Incident period: February 08, 2013 to February 10, 2013

[New Hampshire Severe Winter Storm and Snowstorm \(DR-4209\)](#)

Incident period: January 26, 2015 to January 28, 2015

[New Hampshire Severe Winter Storm And Snowstorm \(DR-4371\)](#)

Incident period: March 13, 2018 to March 14, 2018

While the Town of Deerfield was hit by each storm, there were no significant impacts to the community.

## **E. Seismic Events**

The Deerfield Hazard Mitigation Committee reviewed the following kinds of hazards related to seismic events:

### **1. Earthquakes**

An earthquake is defined as a series of vibrations induced in the Earth's crust by the abrupt rupture and rebound of rocks in which elastic strain has been slowly accumulating. New Hampshire is considered to lie in an area of moderate seismic hazard with respect to other areas within the United States. New Hampshire has had and will continue to experience large damaging earthquakes; however, the intervals between such events are greater in New Hampshire than in high hazard areas.

Earthquakes in the New Hampshire cannot be associated with specific, known faults. Though there are no identified active faults in New Hampshire, no doubt that there are active faults located beneath the surface. With that said, there is a "zone" that extends from north of the Lakes Region south along the Merrimack River into Massachusetts where most New Hampshire earthquakes have occurred. New Hampshire is in the low attenuation of seismic waves in the eastern United States. Attenuation is a term in physics that means the slow loss of intensity of flow through any kind of medium. Seismic waves can cover an area 4 to 40 times greater in the east than they do in the west because of the cold hard rock geology of New Hampshire. The importance of this to emergency planning and response is that damages can be expected to be spread over a much greater area, and an earthquake's location does not have to be close to a particular point to cause damage. (2013 State Multi-Hazard Mitigation Plan)

There are two scales that measure earthquakes, the Modified Mercalli (MM) and the Richter scales. 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.<sup>5</sup> The Modified Mercalli scale denotes the intensity of an earthquake, as it is perceived by humans, their reactions and damage created. It is not a mathematically based scale but a ranking of perception. (USGS)

#### Modified Mercalli Scale

Intensity	Shaking	Description/Damage
I	Not felt	Not felt except by a very few under especially favorable conditions.
II	Weak	Felt only by a few persons at rest, especially on upper floors of buildings.

<sup>5</sup> USGS Earthquake Glossary: Richter Scale. Retrieved from <https://earthquake.usgs.gov/learn/glossary/?term=Richter%20scale>

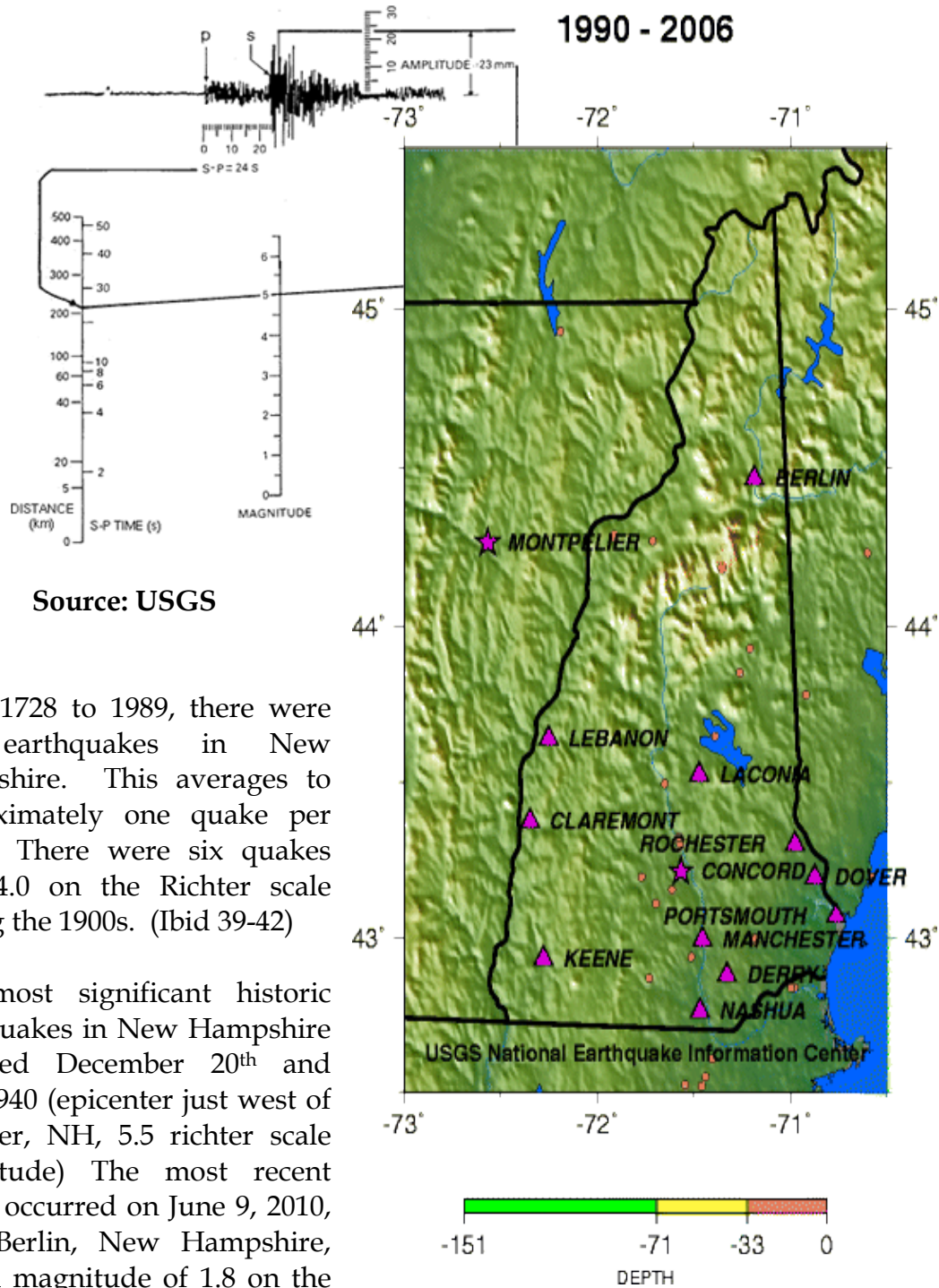
III	Weak	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Light	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Moderate	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Very strong	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Severe	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Violent	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Extreme	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.

Source: United States Geological Survey

### Richter Scale



## Seismicity of New Hampshire



**All areas of Deerfield** are potentially at risk for property damage and loss of life due to earthquakes.

*Moderate to high probability for earthquakes to occur and cause damage in Deerfield.*

## 2. 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. Seismicity may play a role in the mass movement of landforms.” (1999 New Hampshire Natural Hazards Mitigation Plan, NHBEM, pg III-17)

While no universally accepted standard or scientific scale has been developed for measuring the severity of all landslides, severity can be measured several other ways:

- Steepness/grade of the Slope (measured as a percent)
- Geographical Area
  - Measured in square feet, square yards, etc.
  - More accurately measured using LiDAR/GIS systems
- Earthquake, either causing the event or caused by the event (measured using the Moment Magnitude Intensity or Mercalli Scale)

There are also multiple types of landslides:

- Falls: A mass detaches from a steep slope or cliff and descends by free-fall, bounding, or rolling
- Topples: A mass tilts or rotates forward as a unit
- Slides: A mass displaces on one or more recognizable surfaces, which may be curved or planar
- Flows: A mass moves downslope with a fluid motion. A significant amount of water may or may not be part of the mass

Like flooding, landslides are unique in how they affect different geographic, topographic, and geologic areas. Therefore, consideration of a multitude of measurements is required to determine the severity of the landslide event. (2018 *Multi Hazard Mitigation Plan*)

The primary impacts of a landslide are the damage and destruction to property and infrastructure located in the area that the landslide occurred. The land material moved during a landslide can cause damage to roads, buildings, and infrastructure at the base of the slope on which the landslide occurred. Buildings



or infrastructures that are atop the slide, or on the side of the slope where the slide occurs, can be severely damaged or destroyed through its consumption by the slide. The hazard of death and injury to individuals atop, on, or at the base of a slide exists if such individuals are present in those locations when the landslide occurs.

A change in topography or geology can also affect the flora and fauna as well as crops and farmland. Landslides that occur adjacent to a waterbody, such as a river or lake, can introduce excess sediment, increasing the turbidity of the receiving waterbody and impacting water quality if the quantity of sediment is of sufficient quantity. A very large landslide into a river could cause an obstruction that acts like a dam, creating an impoundment of water which leads to sediment and woody material deposition within it. This could also further create an additional risk of a “dam failure” at some future time when the natural dam breaks down, resulting a rapid release of the stored water from upstream. (2018 Multi Hazard Mitigation Plan)

There have been no known past landslides in the Town of Deerfield that the Hazard Mitigation Committee was aware of.

**All areas of steep slopes** in Deerfield, as shown on the Areas at Risk Map, are at risk for landslides.

*Moderate probability for landslides to occur and cause damage in Deerfield.*

#### **F. Other Hazards**

The Deerfield Hazard Mitigation Committee reviewed the following other kinds of hazards:

##### **1. Geomagnetism**

The State of New Hampshire Natural Hazards Mitigation Plan defines geomagnetism as "...of, or pertaining to, the earth's magnetic field and related phenomena. Large geomagnetic disturbances commonly known as magnetic storms, if global in scale, or as magnetic substorms, if localized in scale and limited to night time high altitude auroral regions, are of particular significance for electric power utilities, pipeline operations, radio communications, navigation, satellite operations, geophysical exploration and GPS (global positional system) use. (1999 New Hampshire Natural Hazards Mitigation Plan, NHBEM, pg 50)"

Geomagnetism includes both solar wind coupling and magnetic storms. Solar wind coupling is the relationship between solar events and winds with geomagnetic activity within the earth's magnetosphere. "Magnetic storms occur when the radiation belts become filled with energetic ions and electrons. The

drift of these particles produces a doughnut shaped ring of electrical current around the earth...Magnetic storms are often initiated by the sudden arrival of a high-speed stream of solar wind, carrying high particle density and high magnetic field. (Ibid)"

No known events of geomagnetism have been recorded for the Town of Deerfield.

**High-tension lines and communications towers** are at risk in Deerfield.

*Low probability for geomagnetism to occur and cause minimal damage in Deerfield.*

## 2. Drought

A drought is the absence of water in a region that occurs slowly due to below-average precipitation over an extended period, resulting in low stream flows, low surface water, and low groundwater levels.<sup>6</sup>

New Hampshire breaks the State into five Drought Management Areas: one in the north; one across the central region; and three along the southern portion of the State. Federal agencies have coordinated to develop the National Drought Monitor which classifies the duration and severity of the drought using precipitation, stream flow, and soil moisture data coupled with information provided on a weekly basis from local officials. The New Hampshire Drought Management Team, whose efforts are coordinated by the NH DES, utilizes these maps to help determine which areas are hit the hardest. NH DES also maintains a "Situation Summary" where precipitation, stream flow, groundwater level, lake level and fire danger data from all over the state can be accessed to assess if areas in New Hampshire are being impacted by drought.

While droughts are not as devastating as other hazards, low water levels can have negative effects on existing and future developed areas that depend on groundwater for water supply. Additionally, the dry conditions of a drought may lead to an increase wild fire risk.

There are five magnitudes of drought outlined in the New Hampshire State Drought Management Plan. The highest magnitude is Exceptional, followed by Extreme, Severe, Moderate and Abnormally Dry. Each level has varying responses. (2013 State Multi-Hazard Mitigation Plan)

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<sup>6</sup> <https://www.des.nh.gov/organization/divisions/water/dam/drought/index.htm>

The severity of a drought is assessed using the US Drought Monitor's intensity scale, shown below.

	<b>WATCH D0</b> Abnormally Dry	<b>ALERT D1</b> Moderate	<b>WARNING D2</b> Severe	<b>EMERGENCY D3</b> Extreme	<b>DISASTER D4</b> Exceptional
<b>Conditions to be used by NH Drought Management Team as basis for recommendations to the US Drought Monitor</b>					
<b>PRECIPITATION</b> 1-month SPI 3-month SPI 6-month SPI 12-month SPI	<0.0 Not Applicable Not Applicable Not Applicable	Not Applicable <0.0 Not Applicable Not Applicable	Not Applicable <-1.0 Not Applicable Not Applicable	Not Applicable Not Applicable <-1.0 Not Applicable	Not Applicable Not Applicable Not Applicable <-1.0
<b>STREAMFLOW</b> 28-day streamflow 65% normal	Up to 1 Month	1-3 Months	3-6 Months	6-9 Months	>9Months
<b>PALMER INDEX PDSI</b>	Not Applicable	<0.0	<-1.0	<-2.0	<-3.0
<b>GROUNDWATER</b>	Not Applicable	Monthly Levels Drop Below Mean	Monthly Levels Persist Below Monthly Mean		Not Quantified

*Drought Management Parameters, NHDES Drought Management Plan*

In the past five years, New Hampshire has experienced two significant drought periods. In spring of 2012, New Hampshire experienced a statewide drought. In 2016, southern New Hampshire experienced a severe to moderate drought. As of September 1, 2016, Rockingham County experienced a severe drought (NH Drought Management Team: Drought Status in New Hampshire 9/1/2016) .

Deerfield, as have other communities in southern New Hampshire, has experienced several droughts since the 1920s. The table below summarizes the droughts that may have impacted Deerfield since that time.

<b>Hazard</b>	<b>Date</b>	<b>Location</b>	<b>Critical Facility or Area Impacted</b>	<b>Remarks/Description</b>
Drought	1929-36	Statewide	Unknown	Regional
Drought	1939-44	Statewide	Unknown	Severe in southeast NH
Drought	1947-50	Statewide	Unknown	Moderate
Drought	1960-69	Statewide	Unknown	Longest recorded continuous period of below normal precipitation
Drought Warning	June 6, 1999	Most of State	Unknown	Governor's office declaration; Palmer Drought Survey Index indicate "moderate drought" for most of state.
Drought	2001-2002	Statewide	Unknown	Third worst drought on record, exceeded only by the drought of 1956-1966 and 1941-1942

Extreme Drought	2016-2017	Statewide	Impacts to water systems, private wells and agricultural crops	This was the first time that an Extreme drought was declared for New Hampshire since the National Drought Monitor became operational in 2000.
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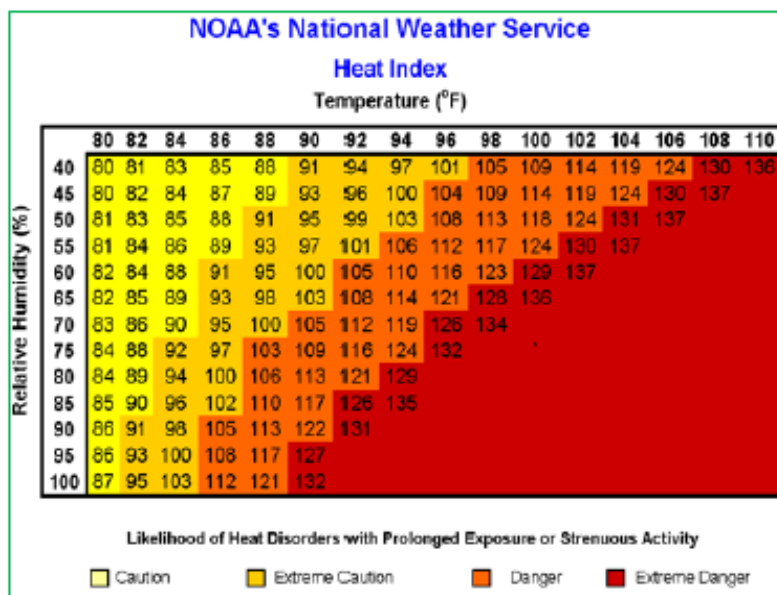
All areas of Deerfield would be affected by a drought.

*Moderate probability for drought to occur and cause damage in Deerfield.*

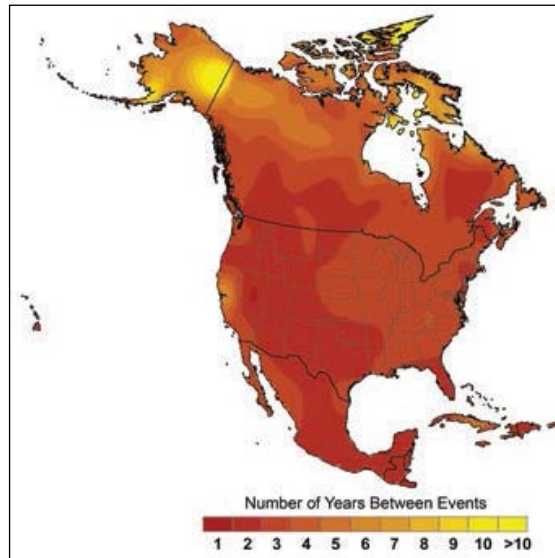
### 3. Extreme Heat

A Heat Wave is defined as a “Prolonged period of excessive heat, often combined with excessive humidity.” Heat kills by pushing the human body beyond its limits. In extreme heat and high humidity, evaporation is slowed and the body must work extra hard to maintain a normal temperature. Most heat disorders occur because the victim has been overexposed to heat or has over-exercised for his or her age and physical condition. Older adults, young children and those who are sick or overweight are more likely to succumb to extreme heat. Conditions that can

induce heat-related illnesses include stagnant atmospheric conditions, and poor air quality. Consequently, people living in urban areas may be at greater risk from the effects of a prolonged heat wave than those living in rural areas. Also, asphalt and concrete store heat longer and gradually release heat a night, which can produce higher nighttime temperatures known as the “urban heat island effect” (NOAA, **Index/Heat Disorders**). NOAA’s National Weather Service has prepared the following Heat Index identifying likelihood of heat disorders under prolonged exposure or strenuous activity.



Extreme heat is an occasional and short-lived event in Southern New Hampshire. While there have been no extended periods of extreme heat in Hooksett, the state has seen a significant increase in mean annual temperature over the past 50 years (Hubbard Brook Ecosystem Study. November 2006). By the end of this century, an extreme heat event that currently occurs once every 20 years could occur every two to four years in most parts of the country. This example is based on



how the climate is expected to change under a high greenhouse gas emissions scenario.

*Projected Number of Years Between Extreme Heat Events in the U.S.*

*Source: Karl, T.R., J.M. Melillo, and T.C. Peterson (eds.). 2009.*

*Global Climate Change Impacts in the United States*

**All areas of Deerfield** would be affected by extreme heat, in its event. Particular areas and populations at a greater risk are:

- elderly populations and day care centers;
- the power system that may become overburdened; and
- communication infrastructure negatively affected by power burden.

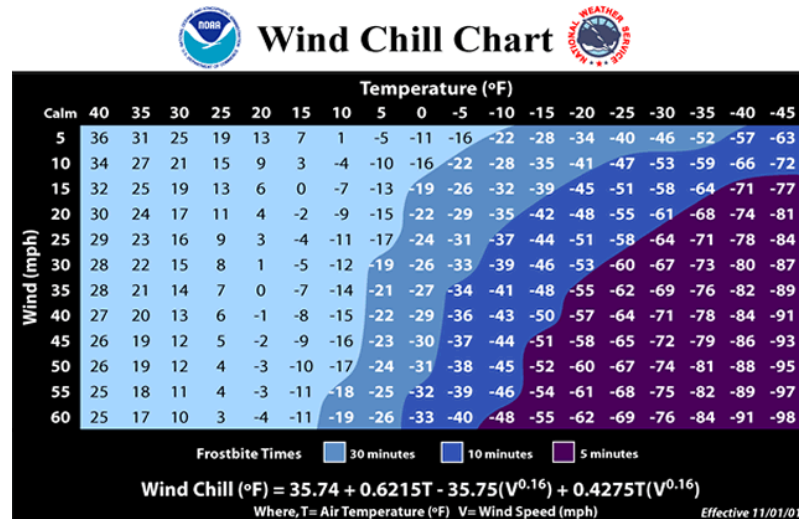
***Low probability for extreme heat to occur and cause damage in Deerfield.***

#### 4. Extreme Cold

While most New Hampshire residents are rather habituated to the extreme cold situations in the State, and this is not a section identified by the State of New Hampshire Natural Hazards Mitigation Plan, it was decided to include a statement in this *Plan*. For the purposes of this *Plan* extreme cold will be referred to in a general manner, without a scientific definition. Periods of extreme cold pose a life-threatening situation for Deerfield's low-income populations. With the rising costs of heating fuel and electric heat, many low-income citizens are

not able to adequately heat their homes, exposing themselves to cold related medical emergencies or death. This is an even greater concern for homeless persons who may be unable to escape the extreme temperatures.

NOAA's National Weather Service has prepared the following windchill chart for calculating the dangers from winter winds and freezing temperature.



SOURCE: NOAA

In Concord, New Hampshire there are on average 21 days below 32 degrees Fahrenheit in November, 29 days in December, 30 days in January, 27 days in February, and 26 days in March (Concord National Weather Service Office is closest to Deerfield, NH reporting to the Northeast Regional Climate Center database). The coldest temperatures recorded for each month were -5 degrees Fahrenheit in November, -22° in December, -33° in January, -37° in February, and -16° in March. (Northeast Regional Climate Center)

**All areas of Deerfield** would be affected by extreme cold, in its event. Particular areas and populations at a greater risk are:

- elderly populations and day care centers;
- power system that may become overburdened; and
- low-income populations.

***Moderate to high probability for extreme cold to occur and cause minimal damage in Deerfield.***

A GIS-generated map, following this page, was prepared to illustrate the Identified Hazard Zones.



### SECTION III

### VULNERABILITY ASSESSMENT

#### Disaster Risk and Vulnerability Assessment

Based on the hazards outlined in Section II, the following is an estimate of damage, in dollars, that may result if a natural hazard occurs in the Town. These estimates were calculated using FEMA's *Understanding Your Risks: Identifying Hazards and Estimating Losses*, August 2001. The publication's methodology was modified for this *Plan* based on the data available. The vulnerability estimates utilize available NFIP data, 2010 town valuation, and identified essential facilities. Data is not yet available in a format (i.e. assessing data linked to a GIS layer of tax maps and building footprints) to locate property specific information in a given hazard zone other than as produced expressly for this *Plan*. The following calculations used available current or historical data and "Worksheet 4" in the Estimating Losses section of *Understanding Your Risks: Identifying Hazards and Estimating Losses*. Background, historical information, associated risks, and summary of assets considered in the estimation process are described in the following estimates.

Human losses were not calculated during this exercise, but could be expected to occur depending on the type and severity of the hazard. The estimates typically represent only structural loss, unless sufficient data was available to incorporate contents, structure use, or function loss. The most current town valuation is:<sup>7</sup>

Assessed Value			
DEERFIELD	Buildings	Land	Total
Residential	271,426,493	198,680,700	470,107,193
MFG Housing	4,044,600	N/A	4,044,600
Commercial			
Industrial	12,741,700	5,174,100	17,915,800
Current Use	N/A	1,606,488	1,606,488

<sup>7</sup> NH Dept. of Revenue Administration.

[http://www.nh.gov/revenue/munc\\_prop/documents/2010\\_tables\\_by\\_county\\_county\\_order.pdf](http://www.nh.gov/revenue/munc_prop/documents/2010_tables_by_county_county_order.pdf)



## **Flooding**

**\$1.2 – 4.3 million**

According the most recent FEMA Biennial Report, Deerfield had 75 residential structures located in the floodplain, with an estimated population of 224 persons. The 2011 average residential house sale price is \$224,900 (NHHFA). Two scenarios were considered with a low estimate assuming damage to 15 percent of the structures with a one-foot flood depth and a high estimate assuming damage to 28 percent of the structures with a four-foot flood depth. These estimates also assume the residential structures are one- or two-story homes with basements. Standard values for percent damage, functional downtime and displacement time were used from FEMA's *Understanding Your Risks: Identifying Hazards and Estimating Losses* and its "Worksheet 4- Estimate Losses" was used to determine the actual estimates.

The low estimate was \$632,531 in structural damages, \$474,398 in contents loss, and \$45,351 in structure use and function loss. The total low estimate loss was \$1,152,281. The high estimate was \$2,361,450 in structural damages, \$1,771,088 in contents loss, and \$112,731 in structure use and function loss. The total high estimate loss was \$4,245,268.

Infrastructure damage could also be extensive, including roads, bridges, utilities, towers, etc. If a devastating flood were to occur, the damage to properties located within the floodplain could exceed this estimated amount. It is clear that Deerfield could benefit greatly from any flood mitigation measures that would help reduce typical losses that occur during a major flood event.

## **Hurricanes**

**up to \$5.7 million**

Most of the damage from hurricanes is caused by high water and strong winds. While Deerfield is less vulnerable to hurricanes than coastal areas, significant damage could be expected, particularly in areas with manufactured homes. Assuming a community-wide assessed structural valuation of approximately \$515 million, damaging 1 percent of these structures could result in losses of up to \$5.15 million. This does not include other damages expected to occur on public property within the community.

## **Debris-Impacted Infrastructure and River Ice Jams**

**\$10,000 to \$1 million**

Damage from these two hazards could be expected to occur not only to privately owned structures, but also to infrastructure such as roads, bridges, and culverts. An estimate of damage, in dollars, from this type of hazard can range widely, depending on the nature and severity of the hazard. Past debris-impacted infrastructure, in Deerfield, has been minimal. Therefore, it is difficult to separate actual damages to represent this type of hazard. A small-to-medium-sized event could be expected to produce a loss from \$10,000 to \$1 million.

**Erosion, Mudslides and Rapid Snowpack Melt** **\$36,881 to \$184,403**

Erosion, mudslide, and rapid snowpack melt damage usually affects infrastructure such as roads and bridges, but can also affect individual structures and businesses. The inventory of essential facilities located in the areas of steep slopes was used to prepare an estimate of this type of damage, since a complete inventory was not available. For a moderate event, assuming from 1 percent to 5 percent structural damages, and from .5 percent to 3 percent content loss, damages could be expected between \$36,881 and \$184,403. Since this hazard has not been widespread in Deerfield, damages from this hazard should be minimal.

**Dam Breach or Failure** **\$288,070 to \$3.2 million**

Deerfield has no Class H or S dams that could cause serious failure damage. Deerfield has one Class L dam and one Class NM dam, which have a low to very low potential for causing damage in the surrounding areas. Damage estimates could be expected to be about 25-75 percent of the flooding estimate, or \$288,070 to \$3.2 million.

**Tornadoes** **\$2.4 million**

The Fujita Scale is used to determine the intensity of tornadoes. Most tornadoes are in the F0 to F2 Class, in a range that extends to F5 Class. Building to modern wind standards provides significant property protection from tornadoes. The design wind speed in Deerfield is 90 miles per hour, Exposure Category B, in accordance with the 2009 International Building Code. While it is difficult to assess the monetary impact a tornado may have on a community, as there are no existing standard loss estimation models, the dollar range shown above indicates an approximation of what might be expected from loss estimates after the 2008 tornado in Deerfield. Losses were estimated based on damage to 23 buildings with 5 complete losses as reported by the Deerfield Fire Dept.

**Heavy Snowstorms, Nor'easters, Ice Storms** **\$10,000 to \$3 million**

Damage from heavy snowstorms, nor'easters and ice storms vary greatly depending on the amount of snow and ice that accumulates during the storm. The ice storm of 2008 caused much damage to power lines, structures, and the agricultural economy in northern New England and southeastern Canada. These types of storms in Deerfield could be expected to cause damage ranging from several thousand dollars to several million, depending on the severity of the storm.

**Lightning** **\$1,000 - \$200,000**

Damage from lightning is typically minimal and occurs in isolated events without record of actual costs incurred. Within the Town of Deerfield there have been no recorded lightning strikes. Other incidences throughout the region and

in neighboring communities, occurring to residential structures in Candia and Northwood, have incurred damages ranging between \$150,000 and \$200,000.

### **Wild Land Fires**

**\$224,900 to \$4.5 million**

A fire can strike at any time, but may be expected to occur during years of drought and particularly in the spring and fall months. From 2007 through 2011 there were 169 fires encompassing small isolated events, car fires, building and structural fires, and wild land fires.

Grass or wild land fires can spread more rapidly between structures due to the increased intensity and size of the fire. Presuming a small-to-medium-sized fire that destroys from one to 20 homes, damage from this hazard could be expected to range from \$224,900 to \$4.5 million. Other damage potential, such as to utilities was not included in this estimate.

### **Earthquakes**

**up to \$779,651 - 2.3 million**

Assuming a moderate earthquake occurs in Deerfield, where structures are not built to a high seismic design level and are mostly of wood frame construction, there could be both partial and total substantial damage to the community's structures.

This estimate used "Worksheet 4" and the town-wide assessed valuation adjusted to market value of residential, commercial, and industrial structures. Deerfield's actual peak ground acceleration (PGA) is .0654g. This represents the average strength of an earthquake with a 10 percent probability of recurring in 50 years. FEMA's *Understanding Your Risks: Identifying Hazards and Estimating Losses* provides data to conduct damage estimates for PGAs of .05g or .07g. The following estimate uses these two PGA levels, assumes low seismic design for all structures, and estimates the upper limits of expected damages if an earthquake were to impact Deerfield. The first calculation (.05 PGA) yields \$367,373 in structural damages, \$96,494 in content damages, and \$315,784 in structure use loss for a total estimate of \$779,651 in damages. The second calculation (.07 PGA) yields \$1,176,939 in structural damages, \$306,444 in content damages, and \$744,264 in structure use loss for a total estimate of \$2,227,647 in damages.

### **Downbursts, Hailstorms, Landslides, Geomagnetism, Drought, Extreme Heat/Cold**

No major damage is known to have occurred in the Town of Deerfield related to these types of events. Therefore, no potential loss estimates have been prepared for these categories.

*Note: The aforementioned figures are estimates only. The amount of damage from any hazard will vary from these figures depending on the time of occurrence, severity of impact, weather conditions, population density, building construction at the exact event local, and the triggering of secondary events.*

## Critical Facilities

The following are summary tables of the critical facilities located in each of the five identified hazard zones within the Town. For the purposes of this *Plan* a critical facility is defined as a building, structure or location which:

- is vital to the hazard response effort;
- maintains an existing level of protection from hazards for the Town; and
- would create a secondary disaster if a hazard were to impact it.

These summaries were queried from a database of all essential facilities created for this *Plan*. The Hazard Mitigation Committee, based on its knowledge of the Town and the SNHPC, using various directories, were the primary sources for the Critical Facilities listing. The assessed values presented are the total building value and do not include the cost of land or building contents.

The five identified hazard zones are:

- **Town Wide Hazards** - includes hurricanes, tornadoes, nor'easters, downbursts, lightning, heavy snow, ice storms, hailstorms, earthquakes, geomagnetism, utility pipe failure, drought, or extreme heat/cold.
- **Special Flood Hazard Areas** - includes riverine flooding, hurricanes, debris-impacted infrastructure, ice jams, rapid snowpack melt, or dam breach.
- **Steep Slopes** - includes erosion, mudslides, or landslides.
- **Wild Land Fires** - includes wild land fire hazards.
- **Target Hazards**- includes target hazards.

Summary of Critical Facilities by Hazard Zones		
Hazard Zone	No. of Facilities	Total Assessed Building Value
Town Wide	11	\$14,610,400
Special Flood Hazard Areas	2	N/A
Steep Slopes	1	\$1,353,800
Wild Land Fires	2	\$1,410,200
Wind Hazards	2	N/A

Town Wide Hazards (Summary of all Critical Facilities)		
Facility Type	No. of Facilities	Total Assessed Building Value
Government Facilities		
Town Offices	1	\$1,353,800
Post Offices	1	\$71,900
Emergency Response Facilities		
Police Station	1	\$1,353,800
Fire Stations	2	\$264,800
Emergency Operations Centers	1	\$1,353,800
Emergency Shelters	4	\$8,249,600
Emergency and Other Fuel Facilities	2	\$870,600
Utility Systems		
Cell Towers	2	N/A

Special Flood Hazard Areas		
	No. of Facilities	Total Assessed Building Value
Bridges	2	N/A

Steep Slopes		
Facility Type	No. of Facilities	Total Assessed Building Value
Utility Systems		
Cell Tower	1	\$185,000

Wild Land Fires		
Facility Type	No. of Facilities	Total Assessed Building Value
Electrical Power Substation	1	N/A
Fire Station	1	\$56,400
Town Offices	1	\$1,353,800
Police Station	1	\$1,353,800
Cell Tower	1	N/A

## Areas at Risk

The following are summary tables of the areas at risk located in each of the five identified hazard zones within the Town. For the purposes of this *Plan* an area at risk is defined as emergency equipment or areas not needed to respond at the time of a natural disaster, but which could still be threatened if a natural disaster were to occur. These include:

- critical facilities not utilized for emergency response;
- people and facilities to be protected in the event of a disaster; and/or
- potential resources for services or supplies in the event of a disaster.

These summaries were queried from a database of all essential facilities created for this *Plan*. Resources for the Areas at Risk database entries included the Committee, SNHPC, NH Department of Environmental Services GIS data, NH Office of Energy and Planning GIS data, UNH GRANIT GIS data, and the National Register of Historic Places. The assessed values presented are the total building value and do not include the cost of land or building contents.

The five identified hazard zones are:

- **Town Wide Hazards** - includes hurricanes, tornadoes, nor'easters, downbursts, lightning, heavy snow, ice storms, hailstorms, earthquakes, geomagnetism, utility pipe failure, drought, or extreme heat/cold.
- **Special Flood Hazard Areas** - includes riverine flooding, hurricanes, debris-impacted infrastructure, ice jams, rapid snowpack melt, or dam breach.
- **Steep Slopes** - includes erosion, mudslides, or landslides.
- **Wild Land Fires** - includes wild land fire hazards.
- **Target Hazards**- includes target hazards.

Summary of Areas at Risk by Hazard Zones		
Hazard Zone	No. of Facilities	Total Assessed Building Value
Town Wide	76	\$2,6482,200
Special Flood Hazard Areas	16	N/A
Steep Slopes	2	\$1,183,700
Wild Land Fires	14	\$1,591,000
Target Hazards	2	N/A

Town Wide Hazards (Summary of all Areas at Risk)		
Facility Type	No. of Facilities	Total Assessed Building Value
Utility Systems		
Transfer Station	1	N/A
Special Consideration		
Bridges/Culverts	29	N/A
Dams	3	N/A
Historic Facilities (includes library)	15	\$3,228,400
Vulnerable Populations		
Schools	2	\$7,631,500
Child Care Facilities	2	\$1,694,600
Elderly Housing & Nursing Homes	1	\$131,300
Other Resources		
Community Centers	1	\$231,800
Recreation - Outdoor Facilities	3	N/A
Commercial Resources	14	\$3,482,100
Religious Facilities	3	\$1,610,500

Special Flood Hazard Areas		
Facility Type	No. of Facilities	Total Assessed Building Value
Special Consideration		
Bridges/Culverts	14	N/A
Dams	1	N/A
Other Resources		
Recreation - Outdoor Facilities	1	N/A

Steep Slopes		
Facility Type	No. of Facilities	Total Assessed Building Value
Special Consideration		
Bridge	1	N/A
Vulnerable Populations		
Schools	1	\$1,104,900

Wild Land Fires		
Facility Type	No. of Facilities	Total Assessed Building Value
Special Consideration		
Bridges/Culverts	13	N/A
Vulnerable Populations		
Schools	1	\$1,104,900
Other Resources		
Commercial Resources	3	\$1,692,700
Outdoor Recreation	2	N/A
Community Center	1	\$231,800

Wind Hazard Zones		
Facility Type	No. of Facilities	Total Assessed Building Value
Commercial Resources	1	\$94,300
Special Needs	1	\$832,200

### Areas at Risk

The following are summary tables of the areas at risk located in each of the five identified hazard zones within the Town. For the purposes of this *Plan* an area at risk is defined as emergency equipment or areas not needed to respond at the time of a natural disaster, but which could still be threatened if a natural disaster were to occur. These include:

- critical facilities not utilized for emergency response;
- people and facilities to be protected in the event of a disaster; and/or
- potential resources for services or supplies in the event of a disaster.

These summaries were queried from a database of all essential facilities created for this *Plan*. Resources for the Areas at Risk database entries included the Committee, SNHPC, NH Department of Environmental Services GIS data, NH



Office of Energy and Planning GIS data, UNH GRANIT GIS data, and the National Register of Historic Places. The assessed values presented are the total building value and do not include the cost of land or building contents.

The five identified hazard zones are:

- **Town Wide Hazards** - includes hurricanes, tornadoes, nor'easters, downbursts, lightning, heavy snow, ice storms, hailstorms, earthquakes, geomagnetism, utility pipe failure, drought, or extreme heat/cold.
- **Special Flood Hazard Areas** - includes riverine flooding, hurricanes, debris-impacted infrastructure, ice jams, rapid snowpack melt, or dam breach.
- **Steep Slopes** - includes erosion, mudslides, or landslides.
- **Wild Land Fires** - includes wild land fire hazards.
- **Target Hazards**- includes target hazards.

### Commercial Economic Impact Areas

The following is a summary table of the commercial-economic impact areas located in each of the five identified hazard zones within the Town. For the purposes of this *Plan*, a commercial economic impact area includes organizations and businesses with more than 25 employees. These are facilities that are vital to the community's economic well-being.

This summary was queried from a database of all essential facilities created for this *Plan*. The 10 facilities included were taken from a GIS data layer maintained by Southern New Hampshire Planning Commission for Commercial Economic Impact Areas in Deerfield and it was updated by the Hazard Mitigation Committee. Number of Employees data source is New Hampshire Employment Security and is not available for all employers.

The five identified hazard zones are:

- **Town Wide Hazards**- includes hurricanes, tornadoes, nor'easters, downbursts, lightning, heavy snow, ice storms, hailstorms, earthquakes, geomagnetism, utility pipe failure, drought, or extreme heat/cold.
- **Special flood hazard areas**- include riverine flooding, hurricanes, debris-impacted infrastructure, ice jams, rapid snowpack melt, or dam breach.
- **Steep Slopes**- includes erosion, mudslides, or landslides.
- **Wild Land Fires**- includes wild land fire hazards.
- **Wind Hazards**- includes wind hazards such as hurricanes and windstorms.

Commercial Economic Impact Areas		
Hazard Zone	Number of Employers	Number of Employees

Town Wide	11	170-397
Special Flood Hazard Areas	0	N/A
Steep Slopes	0	N/A
Wild Land Fires	4	N/A
Wind Hazards	1	20-49

## Hazardous Materials Facilities

The following is a summary table of the hazardous materials facilities located in each of the five identified hazard zones within the Town. For the purposes of this *Plan*, hazardous materials facilities include active hazardous waste generators, underground storage tanks, and above-ground storage tanks. As defined by the NH Department of Environmental Services, active hazardous waste generators may include businesses that produce household hazardous waste, or treat, store or dispose of hazardous waste, or are a waste handler or used oil marketer.

This summary was queried from a database of all essential facilities created for this *Plan*. The listing of Hazardous Materials Facilities was created from the NH Department of Environmental Services GIS data layers for hazardous waste generators, above ground, and underground storage tanks.

The five identified hazard zones are:

- **Town Wide Hazards-** includes hurricanes, tornadoes, nor'easters, downbursts, lightning, heavy snow, ice storms, hailstorms, earthquakes, geomagnetism, utility pipe failure, drought, or extreme heat/cold.
- **Special flood hazard areas-** include riverine flooding, hurricanes, debris-impacted infrastructure, ice jams, rapid snowpack melt, or dam breach.
- **Steep Slopes-** includes erosion, mudslides, or landslides.
- **Wild Land Fires-** includes wild land fire hazards.
- **Target Hazards-** includes target hazards.

Number of Hazardous Material Facilities within the Hazard Zones			
Hazard Zone	Hazardous Waste Generators	Above Ground Storage Tank Sites	Underground Storage Tank Sites
Town Wide	3	6	8
Special Flood Hazard Areas	0	0	0
Steep Slopes	1	0	0
Wild Land Fires	1	1	2
Wind Hazards	0	0	0



## **SECTION IV**

### **EXISTING MITIGATION STRATEGIES AND PROPOSED IMPROVEMENTS**

#### **Description of Existing Programs**

The Town of Deerfield has adopted several programs and ordinances for hazard mitigation. Below are brief descriptions of these programs and how they aid in hazard mitigation.

#### **Emergency Operations Plan**

Deerfield maintains an Emergency Operations Plan, dated **2009**. The plan coordinates the town departments' actions and responses before, during, and after a disaster. Events planned for range from multiple vehicle accidents and hazardous materials incidents to flooding and snowstorms. The plan was prepared to conform to guidelines by the Federal Emergency Management Agency, US Nuclear Regulatory Commission, Federal Energy Regulatory Commission, the New Hampshire Emergency Management Agency and the NH Emergency Operations Plan. The plan establishes the Emergency Operations Center (at the Town Offices). The Emergency Operations Plan identifies or addresses shelters, evacuation procedures, emergency notification, and health and medical services.

#### **Floodplain Development Regulations (Zoning Ordinance)**

Floodplain district regulations apply to all lands designated as special flood hazard areas by FEMA in the "Flood Insurance Study for the Town of Deerfield, NH" together with the Flood Insurance Rate Maps (FIRMs), dated May 17, 2005. Encroachments, including fill, new construction, substantial improvements to existing structures, and other development, are prohibited unless certification by a registered professional engineer is provided by the applicant demonstrating that such encroachment will not result in any increase in flood levels during the occurrence of the 100-year base flood. Additionally, the Zoning Ordinance specifies that there shall be no development permitted in the floodway. The building inspector shall review all building permit applications for new construction or substantial improvements to determine whether proposed building sites will be reasonably safe from flooding. Deerfield participates in the National Flood Insurance Program (NFIP), described on page 15).

#### **Elevation Certificates**

An Elevation Certificate is required when a structure is built or substantially improved within a known flood zone, or if the flood map shows a part of the lot within the flood zone and the certified foundation plan shows the house is located within the flood zone. The land surveyor must supply the footing elevation.

**Wetlands Zone Land Planning Ordinance (Zoning Ordinance)**

The Wetlands Zone Land Planning Ordinance, contained within the Zoning Ordinance, regulates the area within 100 feet from the edge of bodies of water, brooks, streams, and wetlands. The primary objectives of this ordinance are to mitigate any development that may negatively interfere with these water systems' natural functions and reduce any potential financial impacts that may be caused by the inappropriate use of these lands.

**Residential Manufactured Housing District (Zoning Ordinance)**

Regulations are established to provide suitable and affordable living environments on individual lots in the Agricultural-Residential district and in Article IV of the Zoning Ordinance for manufactured housing. Minimum standards are set regulating construction and safety standards in order to protect the occupants and reduce the homes' vulnerability to natural disasters.

**Pleasant Lake Watershed Overlay**

The Town of Deerfield adopted a Watershed Protection Overlay District and accompanying regulations to ensure adequate protection and preservation of Pleasant Lake and its watershed from the effects of point and non-point source pollution, including sedimentation. This overlay district also reduces impervious surfaces, which lead to run-off related hazards.

**Excavation and Soil Removal Regulations (Zoning Ordinance and Excavation Regulations)**

Earth removal regulations minimize safety hazards created by open excavations, safeguard the public health and welfare, preserve the natural assets of soil, water, forests and wildlife, maintain aesthetic features of the environment, prevent land and water pollution, and promote soil stabilization.

**Erosion and Sediment Control Regulations (Subdivision Regulations)**

The Town of Deerfield has extensive erosion and sediment control regulations in place to address runoff, soil erosion, and sedimentation from development sites. Efforts must be taken to minimize any impacts from stormwater runoff and erosion. Additionally, the post-development peak runoff rate must not exceed pre-development rates for the 2-year 24-hour storm event.

**Wetlands Conservation District (Zoning Ordinance)**

The Wetlands Conservation Ordinance was established to control the development of structures and land uses that may negatively interfere with these water systems' natural functions; to protect the existing wildlife habitats; and to reduce any potential financial impacts that may be caused by the inappropriate use of these lands. The Ordinance also establishes 100-foot setbacks from wetlands for buildings constructed on newly created lots.

**Set-Backs from Water Bodies (Zoning Ordinance)**

Article III, Section 305 of the Deerfield Zoning Ordinance precludes the issuance of a building permit for any structure that does not maintain a minimum 100 foot setback from any river, stream, lake or pond.

**Drainage Requirements (Subdivision and Site Plan Regulations)**

Deerfield's Subdivision Regulations set engineering design standards to minimize any adverse impacts from stormwater drainage.

**Road Design Standards (Subdivision and Site Plan Regulations)**

Deerfield maintains road design regulations as part of the Town's Subdivision and Site Plan Regulations. The Subdivision Regulations establish construction standards to ensure the safe flow of travel on all new roads and improvements to existing roads.

**Fire Protection Cistern Specifications (Subdivision Regulations)**

The Town of Deerfield maintains extensive regulations governing the use, construction, and maintenance of all cisterns in the Town. These regulations are critical for safety and the mitigation of fire hazards.

**Deerfield Building Codes**

The Deerfield Building Department enforces the *State of New Hampshire Building Code as authorized in RSA 155-A* Building codes set minimum safety standards for occupants utilizing structural, fire and life safety provisions, wind loads and design, seismic design, flood proofing, and egress design.

**Fire Department Regulations**

The Town of Deerfield Fire Department Regulations contain all state codes mandated by the National Fire Protection Association (NFPA) and include sections of the *State of New Hampshire Building Code* to protect residents from fire hazards in residential and non-residential facilities. The regulations establish protection requirements for fire alarm systems and smoke detectors for single family residential, multi-family residential, commercial and industrial facilities and occupants.

**Hazardous Materials Regulations**

The Town of Deerfield enforces state regulations regarding hazardous materials as mandated by the New Hampshire Department of Environmental Services and the Federal Government.

**Town Radio System**

The Fire, Police, and Highway Departments maintain separate, but interoperable, radio networks for day-to-day operations. The systems can also interface with regional mutual aid and State agencies. Additionally, the Town of Deerfield's

emergency dispatch service is provided by Rockingham County and ambulance service from the Town of Raymond.

### **Police**

The Chief of Police is charged with preserving public peace, preventing riots and disorder, and receiving and issuing emergency warnings. During fires the police are to prevent theft and further unwarranted destruction of property.

### **Snow Emergency Ordinance**

The Snow Emergency Ordinance allows the Town to expedite the flow of traffic and snow removal. Additionally, the ordinance prohibits shoveling and plowing snow into or across roads.

### **Comprehensive Emergency Management Planning for Schools (CEMPS)**

Comprehensive Emergency Management Planning for Schools is available from the NH Homeland Security and Emergency Management. CEMPS outlines training for school teachers, administrators, and students on actions to be taken during an emergency at school. Deerfield's one school building participates in this program.

### **State Dam Program**

The 5 Class NM dams and 2 Class L dam in Deerfield are maintained in compliance with the State Dam Program. The two registered, Town-owned dams are inspected on a regular basis by the Water Commissioners with assistance from the Highway Department. It is assumed that the other dam owners similarly conduct examinations. Inspections look for seepage, erosion, animal burrows, spalling, cracking, vegetation growth, and security issues. Preventive maintenance is conducted as needed.

### **New Hampshire Shoreland Protection Act**

The Shoreland Protection Act, adopted during 1994 and recently updated in 2008, establishes minimum standards for the future subdivision, use, and development of all shore lands within 250 feet of the ordinary high water mark. When repairs, improvements, or expansions are proposed to existing development, the law requires these alterations to be consistent with the intent of the Act. The NH Department of Environmental Services is responsible for enforcing the standards within the protected shoreland, unless a community adopts an ordinance or shoreland provisions that are equal to or more stringent than the Act.

### **Best Management Practices**

The State has established Best Management Practices (BMPs) for erosion and sediment control. These BMPs are methods, measures or practices to prevent or reduce water pollution, including, but not limited to, structural and



nonstructural controls, operation and maintenance procedures, and other requirements and scheduling and distribution of activities. Usually, BMPs are applied as a system of practices rather than a single practice. BMPs are selected because of site-specific conditions that reflect natural background conditions.

### **Existing Protection Matrix**

The Deerfield Hazard Mitigation Committee has developed a summary matrix of existing strategies that support hazard mitigation efforts, which is presented on the following pages. This matrix, a summary of the preceding information, includes the existing protection program (column 1), a description of the existing protection (column 2), the area of town affected (column 3), the enforcing department or agency (column 4), and the identified improvements or changes needed and funding sources (column 5).

## Existing Protection Policies, Programs and Proposed Improvements for the Town of Deerfield

<u>COLUMN 1:</u> TYPE OF EXISTING PROTECTION	<u>COLUMN 2:</u> RESPONSIBLE AGENT/DESCRIPTION	<u>COLUMN 3:</u> HAZARD/AREA OF TOWN COVERED	<u>COLUMN 4:</u> EFFECTIVENESS	<u>COLUMN 5:</u> IMPROVEMENTS OR CHANGES NEEDED
Emergency Operations Plan	EMD	Entire Town	Good	Update in 2019
Floodplain Development Regulations (Zoning Ordinance)	Town Administrator/Zoning Board	Entire Town	Good	No changes needed
Elevation Certificates	Town Administrator/Zoning Board	Entire Town	Good	No changes needed
Wetlands Zone Land Planning Ordinance (Zoning Ordinance)	Town Administrator/Zoning Board	Entire Town	Good	Town is considering revisiting ordinance in the near future
Residential Manufactured Housing District (Zoning Ordinance)	Town Administrator/Zoning Board	Entire Town	Good	No changes needed
Pleasant Lake Watershed Overlay District	Town Administrator/Zoning Board	Entire Town	Good	No changes needed
Excavation and Soil Removal Regulations (Zoning Ordinance and Excavation Regulations)	Town Administrator/Zoning Board	Entire Town	Good	No changes needed
Erosion and Sediment Control Regulations (Subdivision Regulations)	Town Administrator/Zoning Board	Entire Town	Good	No changes needed
Wetlands Conservation District (Zoning Ordinance)	Town Administrator/Zoning Board	Entire Town	Good	No changes needed
Setbacks from Water Bodies (Zoning Ordinance)	Town Administrator/Zoning Board	Entire Town	Good	No changes needed
Drainage Requirements (Subdivision and Site Plan Regulations)	Planning Board	Entire Town	Good	No changes needed
Road Design Standards (Subdivision Regulations)	Planning Board	Entire Town	Good	No changes needed

Fire Protection Cistern Specifications (Subdivision Regulations)	Planning Board/Fire Department	Entire Town	Good	No changes needed
Deerfield Building Codes	Building Inspector	Entire Town	Good	No changes needed
Deerfield Fire Department Regulations	Fire Department	Entire Town	Good	No changes needed
Hazardous Materials Regulations	Fire Department	Entire Town	Good	No changes needed
Town Radio System	Town Administrator/Fire Department	Entire Town	Good	Town is looking into equipping all fire staff with radio systems
Deerfield Police	Police Department	Entire Town	Good	No changes needed
Snow Emergency Ordinance	Town Administrator/Zoning Board	Entire Town	Good	No changes needed
Comprehensive Emergency Management Planning for Schools (CEMPS)	EMD	Entire Town	Good	No changes needed
NH State Dam Program	State	Entire Town	Good	No changes needed
NH Shoreland Protection Act	State	Entire Town	Good	No changes needed
Best Management Practices (BMPs)	State/Building Inspector/Planning Board	Entire Town	Good	No changes needed

## Mitigation Strategy Evaluation Process

Using a similar methodology as the previous plan, the HMP Committee identified new actions based on the updated risk assessment and capability assessment. The new actions were prioritized in combination with the actions carried forward from the previous plan. The STAPLEE method analyzes the Social, Technical, Administrative, Political, Legal, Economic and Environmental aspects of a project and is commonly used by public administration officials and planners for making planning decisions.

The following questions were asked about the proposed mitigation strategies identified in the table below:

- **Social:** Is the proposed strategy socially acceptable to the community? Are there equity issues involved that would mean that one segment of the community is treated unfairly?
- **Technical:** Will the proposed strategy work? Will it create more problems than it solves?
- **Administrative:** Can the community implement the strategy? Is there someone to coordinate and lead the effort?
- **Political:** Is the strategy politically acceptable? Is there public support both to implement and to maintain the project?
- **Legal:** Is the community authorized to implement the proposed strategy? Is there a clear legal basis or precedent for this activity?
- **Economic:** What are the costs and benefits of this strategy? Does the cost seem reasonable for the size of the problem and the likely benefits?
- **Environmental:** How will the strategy impact the environment? Will the strategy need environmental regulatory approvals?

Each mitigation strategy was evaluated and assigned a score (Good = 3, Average = 2, Poor = 1) based on the above criteria by the Committee. An evaluation chart with total scores for each strategy can be found in the table below. Each strategy was evaluated and prioritized according to the final score. The highest scoring strategies were determined to be of most importance, economically, socially, environmentally, and politically.

<b>STAPLEE CHART</b>  <b>Mitigation Strategy</b>								Total Score
	Is it <b>Socially</b> acceptable?	Is it <b>Technically</b> feasible & potentially successful?	Is it <b>Administratively</b> workable?	Is it <b>Politically</b> acceptable?	Is there <b>Legal</b> authority to implement?	Is it <b>Economically</b> beneficial?	Is it <b>Environ-mentally</b> beneficial?	
1. Amend or include money in the Capital Improvement Plan for water drafting site development, fire equipment, and training	3	3	3	2	3	3	3	20
2. Implement a network to check on elderly and special needs populations during hazardous or extreme weather events	3	3	3	2	2	3	3	19
3. Complete the upgrade to the Emergency Operations Center at the town office to install laptops, phone, and other equipment needed for town department heads to carry out their responsibilities under the Emergency Operation Plan.	3	3	3	2	3	3	3	20
4. Complete the house numbering project and post a notice in the Town newsletter or local newspaper to remind residents of the importance of having house/address numbers that are visible to emergency responders	3	3	3	3	3	3	3	21
5. Implement education and outreach to residents on community preparedness and mitigation techniques for all hazards	3	3	3	3	3	3	3	21
6. Complete the upgrade of the Town's mobile and portable radio systems	3	3	3	3	3	3	3	21
7. Provide potable water to residents whose wells run dry during a drought or other hazard conditions	3	3	3	2	3	3	3	20
8. Establish Mutual Aid Agreements with non-profits and/or Community Action Programs (CAP), and with the local chapter of the American Red Cross (ARC)	3	3	3	3	3	3	3	21
9. Outreach and Education on NFIP and Flood Insurance Rate Maps (FIRMs)	3	3	3	3	3	3	3	21
10. Assess whether Town specific erosion and	2	3	2	2	3	3	3	18

sediment control regulations and guidelines are needed								
11. Encourage referral to Water Resource Plan and maps by Planning Board when reviewing subdivision proposals	3	3	3	2	2	2	3	18
12. Portable Electronic Signs to be used during emergencies (Update on costs?)	3	3	3	3	3	3	3	21

## SECTION V

### NEWLY IDENTIFIED MITIGATION STRATEGIES AND CRITICAL EVALUATION

#### Summary of New Strategies

Initial selection of mitigation projects was based on meeting the above objectives or filling in the perceived gaps in hazard protection within the Town. The Deerfield Hazard Mitigation Committee then brainstormed additional actions of benefit to the Town and its residents with the potential to reduce future damages. Projects were reviewed, and keyed below, for their ability to reduce hazard impacts to both existing (E) and future (F) buildings and infrastructure, as well as improve the Town's ability to respond (R) to disasters. The Deerfield Hazard Mitigation Committee identified the following new mitigation strategies<sup>8</sup>, which includes those developed as part of the Water Resources Plan:

Priorities and Programs Outlined in 2013 Plan	Update	Next Steps
All Tasks	Completed, Ongoing, or Needing Action?	
1. Complete the construction of a Dry hydrant at the fire pond on South Road at Chatterbrook Farm (D6, elev. 462 ft)	Deleted	This item is no longer needed. The town will utilize the Highway Department for dredging.
2. Complete the purchase of GPS units for all emergency response vehicles (including highway department vehicles)	Deleted	Due to technology improvements since 2013, each ERVs has GPS units.
3. Amend or include money in the Capital Improvement Plan for water drafting site development, fire equipment, and training	Completed & Ongoing	The town will continue to support funding through CIP and other means to ensure funds for water drafting site development, fire equipment, and training.
4. Complete the construction of a Dry Hydrant system at the fire pond on Old Center Road (D16, elev. 486 ft)	Deleted	This item is no longer needed. The town will utilize the Highway Department for dredging.

<sup>8</sup> More specific details on each new hazard mitigation strategy can be found in Section V "Prioritized Implementation Schedule and Funding Sources."

5. Implement a network to check on elderly and special needs populations during hazardous or extreme weather events	Completed & Ongoing	The town continues to check on elderly and special needs populations during hazardous and/or extreme weather events.
6. Complete the upgrade to the Emergency Operations Center at the town office to install laptops, phone, and other equipment needed for town department heads to carry out their responsibilities under the Emergency Operation Plan.	Completed & Ongoing	The town will continue to upgrade the EOC with updated technology.
7. Place a statement in the subdivision and site plan regulations that requires "Best Management Practices" for all construction projects	Completed	
8. Clear debris in the water way at the intersection of Routes 107 and 43 on a regular basis in order to prevent blockages and potential flooding	Completed	
9. Complete the house numbering project and post a notice in the Town newsletter or local newspaper to remind residents of the importance of having house/address numbers that are visible to emergency responders	Completed & Ongoing	The town continues to post notices in the town newsletter, town website, and local newspaper on the importance of having address numbers visible to emergency responders.
10. Implement education and outreach to residents on community preparedness and mitigation techniques for all hazards	Completed & Ongoing	The Emergency Management Department continues to update their town web-page with information on preparedness in the event of a disaster
11. Upsize the culvert on Baker Avenue	Completed	
12. Complete the upgrade of the Town's mobile and portable radio systems	Completed & Ongoing	The town will continue to upgrade the town's communication systems and keep up-



		to-date with emerging and upgraded technologies.
13. Provide potable water to residents whose wells run dry during a drought or other hazard conditions	Need Action	Town will develop a comprehensive potable water plan for residents whose wells run dry during a drought or other hazards.
14. Establish Mutual Aid Agreements with non-profits and/or Community Action Programs (CAP), and with the local chapter of the American Red Cross (ARC)	Amended & Ongoing	The town will continue to update its mutual aid agreements with non-profits and other organizations.
15. Outreach and Education on NFIP and Flood Insurance Rate Maps (FIRMs)	Completed & Ongoing	The town will continue to provide FIRMS and NIFP educational materials in public spaces including the town's website.
16. Appoint an NFIP Manager in town	Completed	
17. Assess whether Town specific erosion and sediment control regulations and guidelines are needed	Completed & Ongoing	Continue to monitor and assess Planning Board and Subdivision Regulations
18. Encourage referral to Water Resource Plan and maps by Planning Board when reviewing subdivision proposals	Completed & Ongoing	Continue to monitor and encourage Planning Board to refer to the town's Water Resource Plan and maps when reviewing subdivision proposals.
19. Investigate alternative methods of water control at Freeses Pond Dam for better flood control and protection of properties	Deleted	The Committee finds that this strategy is no longer a priority for the town.
<b>2018 New Proposed Strategies</b>		
Purchase Portable Electronic Signs to be used during emergencies		

<p align="center"><b>SECTION VI</b></p> <p align="center"><b>PRIORITIZED IMPLEMENTATION SCHEDULE AND FUNDING SOURCES</b></p>
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### Implementation Strategy for Priority Mitigation Actions

The Deerfield Hazard Mitigation Committee created the following prioritized implementation schedule for the newly identified strategies and improvements. All agency and grant source acronyms are listed at the end of this section.

Rank / ID	Problem Statement	Mitigation Action	Hazard Addressed	Responsible Party	Anticipated Cost	Potential Funding Source	Time-frame
1	Funding equipment and training will help the Fire Department and the town to be better prepared for emergencies	Amend or include money in the Capital Improvement Plan for water drafting site development, fire equipment, and training	Fire	Fire Department, Planning Board	< \$10,000	<i>Town Operating Budget</i>	Update Annually
2	A functioning radio system is critical for emergency services. Improved communications is vital to the success of emergency response actions and has the potential to save lives and prevent property damage. As seen in recent disaster radio communications is always functional.	Complete the upgrade of the Town's mobile and portable radio systems	All Hazards	Emergency Management Director, Police Department, Highway Department	\$10,000-\$25,000	<i>Town Operating Budget, NH HSEM, COPS</i>	Analyze and update as needed annually

Rank / ID	Problem Statement	Mitigation Action	Hazard Addressed	Responsible Party	Anticipated Cost	Potential Funding Source	Time-frame
3	Low cost method of ensuring all residents are safe, cared for, and also quickly identifies those in need of emergency services. Engaging the assistance of residents when living next to elderly and sickly neighbors.	Implement a network to check on elderly and special needs populations during hazardous or extreme weather events	All Hazards	Fire Department, Police, Neighbors, Welfare, EM	< \$10,000	Town Operating Budget	Analyze and update as needed annually
4	The cost of water provisions at the fire stations would be outweighed by the potential impacts to the Town's residents if their wells were to run dry during a drought	Provide potable water to residents whose wells run dry during a drought or other hazard conditions	Drought, or other hazards	Fire Department	\$10,000-\$25,000	Town Operating Budget	Analyze and update as needed annually
5	Minimal cost and continued education and outreach is always needed to increase community preparedness and levels of self-reliance in the event of an emergency	Implement education and outreach to residents on community preparedness and mitigation techniques for all hazards	All Hazards	Emergency Management	< \$10,000	Town Operating Budget	Analyze and update as needed annually
6	These regulations are already in force. Ongoing, more diligent enforcement needs to be followed through by departments	Assess whether Town specific erosion and sediment control regulations and guidelines are needed	Flooding	Planning Board & Building Department	< \$10,000	Town Operating Budget	Ongoing

Rank / ID	Problem Statement	Mitigation Action	Hazard Addressed	Responsible Party	Anticipated Cost	Potential Funding Source	Time-frame
7	This is a low cost method form of improving emergency response and saving lives. Distribute numbering markers with new building permits to be installed with construction of all new homes.	Complete the house numbering project and post a notice in the Town newsletter or local newspaper to remind residents of the importance of having house/address numbers that are visible to emergency responders	Fire and Other Hazards	Building and Planning Departments	< \$10,000	Town Operating Budget /Add fee to building permits for markers	Analyze and update as needed annually
8	The existing Emergency Operations Center is in need of basic equipment upgrades in order to be most suited to handle an emergency. These upgrades would allow for better rescue services, potentially saving lives, as well as assets.	Complete the upgrade to the Emergency Operations Center at the town office to install laptops, phone, and other equipment needed for town department heads to carry out their responsibilities under the Emergency Operation Plan.	All Hazards	Co-Emergency Management Directors, Fire Department, Police Department	\$10,000-\$25,000	EMPG, Town Operating Budget	Short Term (1-3 years) and update as needed

Rank	Problem Statement	Mitigation Action	Hazard Addressed	Responsible Party	Anticipated Cost	Potential Funding Source	Time-frame
9	This is an ongoing process. The Planning Board should remain diligent in this process and see to it that the most current data is being utilized.	Encourage referral to Water Resource Plan and maps by Planning Board when reviewing subdivision proposals		Planning & Zoning Board	< \$10,000	<i>Town Operating Budget</i>	Analyze and update as needed annually
10	High incidence of residents with floodplain boundary issues since the FIRMs were updated. Local guidance on floodplain boundaries and education on NFIP and FIRMs will help to educate residents on flooding issues and these resources.	Outreach and Education on NFIP and Flood Insurance Rate Maps (FIRMs)	Flooding	NFIP Manager	< \$10,000	<i>Town Operating Budget</i>	Analyze and update as needed annually
11	This would not incur any other cost than already appropriated for this department. Many communities already have mutual aid agreements between fire, highway, police and building. This would be an addition of similar agreements. Agreements have been established with several neighboring communities and the town continues to pursue agreements with the rest of the communities adjacent to	Establish Mutual Aid Agreements with non-profits and/or Community Action Programs (CAP), and with the local chapter of the American Red Cross (ARC)	All Hazards	Welfare Department	< \$10,000	<i>Town Operating Budget</i>	Analyze and update as needed annually

	Deerfield.						
12	Important event related messaging should be provided on a number of different platforms to ensure Deerfield residents have had multiple opportunities to receive information. Portable electronic signs will allow the town to communicate storm event warnings for residents traveling on roads.	Purchase Portable Electronic Signs to be used during emergencies	All Hazards	Emergency Management Directors	>\$100,000	<i>Town Operating Budget</i>	Short Term (1-3 years)

## SECTION VII

### ADMINISTRATIVE PROCEDURES REGARDING ADOPTION, EVALUATION AND MONITORING OF THE PLAN

*"Incorporating hazard mitigation considerations into the thought processes and decision making that comprise local planning reinforces community sustainability and strengthens community planning programs. It ensures that the community survives natural disasters so that it can grow and develop as it was envisioned."*

– Michael J. Armstrong, Associate Director for Mitigation, FEMA

#### **Adoption**

Upon notification that FEMA has conditionally approved this *Plan*, a public hearing will be held and the Deerfield Board of Selectmen will formally adopt the ***Deerfield Hazard Mitigation Plan*** as an official statement of town policy. In the future, this *Plan* may constitute a new section of the Deerfield Master Plan, in accordance with RSA 674:2. The public hearing shall be properly posted and advertised by the Town in accordance with New Hampshire state law. Documentation that the Deerfield Board of Selectmen has formally adopted the *Plan* will be included in the Appendix B.

Adoption of the ***Deerfield Hazard Mitigation Plan*** demonstrates the Town's commitment to hazard mitigation. It also qualifies the municipality for federal, state, and local funding and prepares the public for what the community can be expected to do both before and after a natural hazard disaster occurs.

Following adoption, the Hazard Mitigation Committee and the Board of Selectmen shall seek to incorporate the mitigation actions identified in the Prioritized Implementation Schedule of Section VI of the *Plan* into other planning mechanisms, including the Town's Master Plan.

#### **Monitoring, Evaluating and Updates**

The ***Deerfield Hazard Mitigation Plan*** shall be monitored and evaluated annually to track progress in implementing the mitigation strategies and actions as well as updating the goals and objectives of the *Plan*. The Deerfield Emergency Management Team shall be responsible for initiating this review and scheduling an annual meeting of the Hazard Mitigation Committee. In addition to reviewing Hazard Mitigation Committee members' progress on projects, the strategy for the following year will be reviewed and new projects will be selected for implementation at the annual meeting.

The Deerfield Emergency Management Team will conduct updates in coordination with the Hazard Mitigation Committee and Deerfield Board of Selectmen. **Updates should be made to the *Plan* every three to five years<sup>9</sup> to accommodate actions that have failed or are not considered feasible after a review for their consistency with STAPLEE, the timeframe, the community's priorities, and funding resources.** Priorities that were not ranked high, but identified as potential mitigation strategies, should be reviewed as well during the monitoring and update of this *Plan* to determine feasibility of future implementation. Also, at that time any other items identified during the annual meetings will be updated in the *Plan*, including, but not limited to, goals, objectives, identification of past hazard events, and the inventory of town assets vulnerable to hazards.

Keeping with the process of adopting the *Deerfield Hazard Mitigation Plan*, a public hearing to receive comment on the *Plan* maintenance and updating shall be held during the review period, and the Board of Selectmen will adopt the final product.

### **Continued Public Involvement**

The public will continue to be invited and encouraged to be involved during this process at monitoring, evaluation and update meetings. All meetings involving implementation or updates of the *Plan* shall be open to the public as is required by RSA 91-A and notices of the meetings will be posted at least 24 hours in advance in a minimum of two locations, such as the town offices and library. The meetings may also be publicized in the local newspaper, Town Newsletter and Town Website. To gain additional public involvement, draft copies of the amended *Hazard Mitigation Plan* will be made available at a minimum of two public locations for review and comment. Additional feedback on any *Plan* updates may be gathered electronically via the Town's Website. The document should be left for a minimum of two weeks and then all comments will be considered in drafting final revisions.

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<sup>9</sup> FEMA Disaster Mitigation Act of 2000 44 CFR Part 201.6(d)(3) mandates "Plans must be reviewed, revised if appropriate, and resubmitted for approval within five years to continue to be eligible for HMGP project grant funding." (Federal Register Vol. 36, No. 38, Feb 26, 2002, Rules and Regulations, p8852)





## **Appendix A: Meeting Documentation**

# **Deerfield Hazard Mitigation Committee Meeting**

**AGENDA: Meeting # 1**  
January 11, 2018  
Town Offices, 8 Raymond Road  
Deerfield, NH

## **1. Introductions**

- a. Elect Chair
- b. Minute Taker
- c. Ground Rules (Plan requirements, Time Match, Who's Missing?)

## **2. Overview of the Hazard Mitigation Planning Process**

- a. Review of materials (including maps)
- b. Posting requirements
- c. Public Involvement and Outreach
- d. Purpose and benefits of Hazard Mitigation Plans
- e. Tasks to complete the plan update (see attached)
- f. Review HMP Goals (page 11)
- g. Development Trends

## **3. Identify/Update Past and Potential Hazards (HMP Section II)**

- a. Identify past hazard events in Deerfield  
Natural hazards are addressed as follows:
  - i. Flooding
  - ii. Wind
  - iii. Wildfire
  - iv. Ice and Snow Events
  - v. Earthquakes
  - vi. Other Hazards
- b. Discuss maps
- c. Hazard Vulnerability Assessment

## **4. Task List for Meeting #2**

- a. Hazard Identification and Probability
- b. Hazard Vulnerability Assessment
- c. Costs
- d. Photos

## **5. Next Meeting Schedule\_\_\_\_\_ and Adjournment**

## **Hazard Mitigation Meeting 1/11/17**

Rick P. was elected chair of committee

John D. was appointed recorder

Cameron Prolman discussed how the Committee should track their time to meet the in-kind match requirements. Denise Greig passed out a form where Committee members can fill out time a log for any time spent on Hazard Mitigation plan for SNHPC record keeping. Time sheets need to be filled out for time match for funding for the grant. The form is available both in paper and digital format. SNHPC can track official meeting times, members are responsible for tracking their time outside of meetings.

Adding planning and conservation reps was discussed. Denny G. has reached out to them.

Mr. Prolman noted that Members should review existing plan.

The maps were specifically pointed out for members to review for changes in locations or existence of critical facilities as high hazard location. Mr. Prolman will bring larger maps for the committee to review during the second meeting.

Meetings must be posted the same as any public meeting.

HSEM and FEMA want public involvement in process. Other communities have used existing PR events to inform public. Documentation of public outreach is advised.

The benefits of having a plan were reviewed.

Required tasks were reviewed (in the packet).

Establishing set goals for the committee were discussed. Denny asked what types of changes other communities have made. They have addressed climate change and anything the feds have changed.

Plan development steps were reviewed (page 9 in existing plan).

Members were asked to review the listed events on page 1 of the packet and provide a brief overview of the department's response.

Denny requested climatic events such as heat waves or droughts be added to the list.

Members reviewed the Past and Potential hazards list on page 2 of the packet. See included pages for results. Discussed items were culvert sizes, Mark felt were in very good shape. The effects of flooding on roads was discussed, it was agreed we are in pretty good shape as well.

Wind events were discussed, the vast majority of the issues surround power outages. We have had a range of outage lengths in town after events. Forrest fire were discussed. While major fires are a concern, it seems unlikely a fire would have town wide impact. Isolated homes were discussed as Deerfield has several.

Major snow events were discussed, members felt that we were well prepared for snow events. Some impact on businesses may be possible due to driving conditions. Snow load on roofs were discussed. Specifically, the school was discussed.

Ice storms were discussed as a possibility of significant damage they also seem to be more frequent.

Denny requested that there be some guidance on what constitutes a public health issue. Specifically, if things that are largely a homeowner matter should be under the purview of the committee. Historically Radon and well issues were not included in the plan.

Radon and arsenic was brought back up and discussed as to whether it was a matter for the committee. It was decided to include it in the plan.

Geomagnetism (solar storms) was also added to the plan.

Specific ratings for downed trees were added.

The Committee began a discussion of the Town's Critical Facilities.

The new tower in Brigg's field was added

Food pantry was added.

Adding other events at the fair should be added.

Town events were discussed (parades, public events) it will be researched as to what's already in the plan.

Afterschool program will be added.

A category for adult care facilities will be added to the plan.

Hartford brook ball field will be added to the recreational facilities list.

The definition of emergency power source was determined to be available back up power for residents and responders to access.

Next Meeting 1/25/18 at 0900

Respectfully submitted,

Capt. John Dubiansky

# **Deerfield Hazard Mitigation Committee Meeting**

**AGENDA: Meeting # 2**  
9:00 AM January 25, 2018  
Town Offices, 8 Raymond Road  
Deerfield, NH

- 1. Call to Order**
- 2. Approve the Minutes of January 11, 2018 meeting**
- 3. Review Task List From Meeting #1**
  - a. Hazard Identification and Probability, and related actions
  - b. Costs
  - c. Photos
  - d. Overview of Recent Development Trends
- 4. Mitigation Programs (Sections IV & VI)**
  - a. Review existing mitigation strategies & programs, matrix, and summary
  - b. Identify new mitigation strategies
- 5. Task List for Meeting #3**
  - a.
  - b.
  - c.
  - d.
- 6. Next Meeting Schedule\_\_\_\_\_ and Adjournment**

## **Hazard Mitigation Meeting 1/25/18**

Call to order @ 0904

Larger versions of included maps are available for members to view.

Minutes were reviewed, motion to approve by Rick P. Second by John H. approved by voice vote.

Discussion about past declared disasters. Mr. Prolman is going to see if he can access list of times Deerfield received federal funds

### **Discussion of development in the last five years.**

Forrest Glen, off South Rd has seen many new homes

Browns Mill, off Mount. Delight has had significant expansion

A large tract of land was purchased on Mount. Delight, no info yet on owner's plans.

Fire was believed to be the only potential risk for those areas, and even that would be low.

Denny G. Requested clarification on how much detail we need for costs when researching past incidents. Mr. Prolman responded they are only looking for costs over and above normal operating costs.

### **Review of plan from 2013**

(categories below refer directly to action items from 2013 plan, rate poor, average, good)

The Emergency Operations Plan was reviewed in 2014, Denny G. felt it was in good shape, we will be reviewing it again in 2018

Floodplain plan, Rick P. stated there have not been any claims under the floodplain insurance program, and there is no pending construction in floodplains. Rick felt the 2013 plan was working well.

Elevation Certificates, Rick P. feels this is also working well. Most applications are being removed due to not actually being in a floodplain.

Wetlands Zoning, Rick P. felt it was effective to the point of being overbearing and the town may consider revisiting soon.

Residential Manufactured Housing, no significant regulation in Deerfield

Pleasant Lake overlay. good

Excavation and Soil Removal, good

Erosion and Sedimentation, good

Wetlands Conservation District, good

Setbacks from waterbodies, good

Drainage, good

Road Design, good

FD, good

Hazmat, effective

Town Radio System, good

Police, good

Snow Ordinance, good

CEMPS, good, updated recently

State Dam Program, good

Shore lands, Good

BMP, good

### **Discussion of Mitigation Actions from 2013 plan**

(Items below reference action needed items from 2013 plan)

Cistern at Chatterbrook Farms (South Rd) has not been done, John D. will speak with the chief about current plans

GPS for trucks are no longer a priority due to improvements in smart phone technology.

Water source funding, members felt this item could be reworded and simplified to cover current water source plans.

Implement a network to check in on special needs populations during incidents. Ongoing, forms have been sent out and a list has been formed of special needs individuals that should be checked in on during events.

Upgrades to EOC, ongoing to keep up with evolving technology.

Zoning best practices, done and can be removed.

Debris removal at the south split, done by state, can be removed from list

House numbering project, first round went well. Members felt it was a good project to open again in the future.

Public outreach, Ongoing.

Baker Ave culvert, status unknown, Mark Y. will investigate.

Town radio equipment, up to date.

Potable water availability, will need review

Welfare M/A, ongoing.



Outreach regarding NFIP, up to date

Appoint NFIP manager, done.

Erosion control and water resource planning. Up to date, will be updated when laws change.

New Freeze's Pond dam management ideas, deemed un-necessary, will be removed.

### **New Strategies**

Explore communication and outreach methods and technologies.

John H. spoke about reverse 911 and limitations involving cell phones.

Discussion about purchasing a digital message board.

We are in good shape for generators.

Culverts are in good shape.

Denny G. requested climate change/drought issues be added.

**Next meeting: 2/7/18 @ 9am**

Respectfully submitted,

Capt. John Dubiansky

# **Deerfield Hazard Mitigation Committee Meeting**

**AGENDA: Meeting # 3**  
9:00 AM March 28, 2018  
Town Offices, 8 Raymond Road  
Deerfield, NH

- 1. Call to Order**
- 2. Approve the Minutes of January 25, 2018 meeting**
- 3. Review Task List From Meeting #2**
  - a. Vulnerability Assessment (Section III): Identify/Update Critical Facilities
  - b. Review existing mitigation strategies & programs, matrix, and summary
  - c. Identify new mitigation strategies, next steps
- 4. STAPLEE Process**
- 5. Prioritize Implementation Schedule**
  - a. Rank mitigation actions, consider STAPLEE scores, costs, political will, relative necessity, timeliness, etc.
- 6. Tentative Next Meeting Schedule\_\_\_\_\_ and Adjournment**

## **Appendix B: Documentation of Adoption**

Town of Deerfield, New Hampshire  
Deerfield Board of Selectmen

A Resolution Approving the Deerfield Hazard Mitigation Plan Update  
2019

**WHEREAS**, the Southern New Hampshire Planning Commission received funding from the New Hampshire Department of Safety - Homeland Security and Emergency Management under a Pre-Disaster Mitigation Grant to assist the Town of Deerfield in the preparation of the Deerfield Hazard Mitigation Plan Update; and

**WHEREAS**, several public planning meetings/hearings were held between January 2018 and August of 2019 regarding the development and review of the Deerfield Hazard Mitigation Plan Update; and

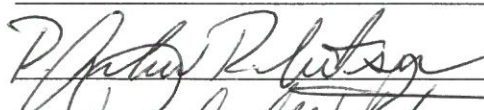

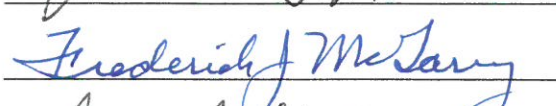
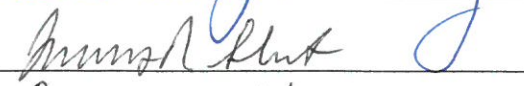
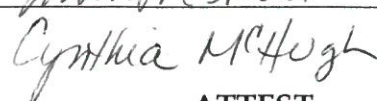
**WHEREAS**, the Deerfield Hazard Mitigation Plan Update contains several potential future projects to mitigate hazard damage in the Town of Deerfield; and

**WHEREAS**, a public meeting was held by the Deerfield Board of Selectmen on August 19, 2019 to formally approve and adopt the Deerfield Hazard Mitigation Plan Update.

**NOW, THEREFORE BE IT RESOLVED** that the Deerfield Board of Selectmen approve the Deerfield Hazard Mitigation Plan Update.

**APPROVED and SIGNED** this 23<sup>rd</sup> day of August, 2019.

**Board of Selectmen**

**ATTEST**



JOHN H. HARRINGTON JR.  
Justice of the Peace - New Hampshire  
My Commission Expires April 19, 2022



**FEMA**

SEP 10 2019

Alexxandre Monastiero, State Hazard Mitigation Officer  
New Hampshire Department of Safety, Homeland Security and Emergency Management  
33 Hazen Drive  
Concord, New Hampshire 03303

Dear Ms. Monastiero:

As outlined in the FEMA-State Agreement for FEMA-DR-4316, your office has been delegated the authority to review and approve local mitigation plans under the Program Administration by States Pilot Program. Our Agency has been notified that your office completed its review of the Town of Deerfield, New Hampshire Hazard Mitigation Plan Update 2019 and approved it effective **August 26, 2019** through **August 25, 2024** in accordance with the planning requirements of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), as amended, the National Flood Insurance Act of 1968, as amended, and Title 44 Code of Federal Regulations (CFR) Part 201.

With this plan approval, the jurisdiction is eligible to apply to New Hampshire Homeland Security and Emergency Management for mitigation grants administered by FEMA. Requests for funding will be evaluated according to the eligibility requirements identified for each of these programs. A specific mitigation activity or project identified in this community's plan may not meet the eligibility requirements for FEMA funding; even eligible mitigation activities or projects are not automatically approved.

The plan must be updated and resubmitted to the FEMA Region I Mitigation Division for approval every five years to remain eligible for FEMA mitigation grant funding.

Thank you for your continued commitment and dedication to risk reduction demonstrated by preparing and adopting a strategy for reducing future disaster losses. Should you have any questions, please contact Melissa Surette at (617) 956-7559 or [Melissa.Surette@fema.dhs.gov](mailto:Melissa.Surette@fema.dhs.gov).

Sincerely,

A handwritten signature in black ink, appearing to read "W. Russ Webster".

Captain W. Russ Webster, USCG (Ret.), CEM  
Regional Administrator  
FEMA Region I

WRW:ms

cc: Fallon Reed, Chief of Planning, New Hampshire