Town of Plymouth, Vermont

Local Hazard Mitigation Plan

Adopted July 13, 2015

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Approved August 4, 2015

Prepared by the Two Rivers-Ottauquechee Regional Commission and the Town of Plymouth

CERTIFICATE OF ADOPTION
<<DATE>>
TOWN OF Plymouth, Vermont Selectboard
A RESOLUTION ADOPTING THE Plymouth, Vermont 2015 Local Hazard Mitigation Plan

WHEREAS, the Town of Plymouth has historically experienced severe damage from natural hazards and it continues to be vulnerable to the effects of the hazards profiled in the **Plymouth, Vermont 2015 Local Hazard Mitigation Plan (Plan)**, which result in loss of property and life, economic hardship, and threats to public health and safety; and

WHEREAS, the Town of Plymouth has developed and received conditional approval from the Federal Emergency Management Agency (FEMA) for its **Plan** under the requirements of 44 CFR 201.6; and

WHEREAS, the **Plan** specifically addresses hazard mitigation strategies, and Plan maintenance procedures for the Town of Plymouth; and

WHEREAS, the **Plan** recommends several hazard mitigation actions (projects) that will provide mitigation for specific natural hazards that impact the Town of Plymouth with the effect of protecting people and property from loss associated with those hazards; and

WHEREAS, adoption of this **Plan** will make the Town of Plymouth eligible for funding to alleviate the impacts of future hazards; now therefore be it

RESOLVED by Town of Plymouth Selectboard:

1. The **Plymouth, Vermont 2015 Local Hazard Mitigation Plan** is hereby adopted as an official plan of the Town of Plymouth;

2. The respective officials identified in the mitigation action plan of the **PLAN** are hereby directed to pursue implementation of the recommended actions assigned to them;

3. Future revisions and **Plan** maintenance required by 44 CFR 201.6 and FEMA are hereby adopted as part of this resolution for a period of five (5) years from the date of this resolution; and

4. An annual report on the process of the implementation elements of the Plan should be presented to the Selectboard by the Emergency Management Director or Coordinator.

IN WITNESS WHEREOF, the undersigned have affixed their signature and the corporate seal of the Town of Plymouth this 13th day of July 2015.

Selectboard Chair

Selectboard Member

ATTEST

Town Clerk

U.S. Department of Homeland Security
FEMA Region I
99 High Street, Sixth Floor
Boston, MA 02110-2132

FEMA

SEP 25 2015

Ralph Michael, Chair
Selectboard
Town of Plymouth
Municipal Building
68 Town Office Rd.
Plymouth, VT 05056

Dear Mr. Michael:

Thank you for the opportunity to review the Town of Plymouth, Vermont 2015 Local Hazard Mitigation Plan. The Department of Homeland Security (DHS), Federal Emergency Management Agency (FEMA) Region I has evaluated the plan for compliance with 44 C.F.R. Pt. 201. The plan satisfactorily meets all of the mandatory requirements set forth by the regulations.

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

Approved mitigation plans are eligible for points under the National Flood Insurance Program's Community Rating System (CRS). Complete information regarding the CRS can be found at **www.fema.gov/business/nfip/crs.shtm,** or through your local floodplain administrator.

The Town of Plymouth, Vermont 2015 Local Hazard Mitigation Plan must be reviewed, revised as appropriate, and resubmitted to FEMA for approval within **five years of the plan approval date of August 4, 2015** in order to maintain eligibility for mitigation grant funding. We encourage the Town to continually update the plan's assessment of vulnerability, adhere to its maintenance schedule, and implement, when possible, the mitigation actions proposed in the plan.

SEP 25 2015

Once again, thank you for your continued dedication to public service demonstrated by preparing and adopting a strategy for reducing future disaster losses. Should you have any questions, please do not hesitate to contact Marilyn Hilliard at (617) 956-7536.

Sincerely,

Paul F. Ford
Acting Regional Administrator

PFF: mh

cc: Ray Doherty, Vermont State Hazard Mitigation Officer
Rob Evans, Vermont State NFIP Coordinator
Ben Rose, Recovery and Mitigation Section Chief, VT DEMHS
Lauren Oates, Hazard Mitigation Planner, VT DEMHS
Ellie Ray, Planner, TRORC

Enclosure

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I. Introduction

Natural and human-caused hazards may affect a community at any time; they are not usually avoidable, however, their impact on human life and property can be reduced through community planning. Accordingly, this Plan seeks to provide an all-hazards mitigation strategy that will make the community of Plymouth more disaster resistant.

"Mitigation" is defined as any sustained action that reduces or eliminates long-term risk to people and property from natural and human-caused hazards and their effects. Previous Federal Emergency Management Agency (FEMA), State and Regional Project Impact efforts have demonstrated that it is less expensive to anticipate disasters than to repeatedly ignore a threat until the damage has already been done. While hazards cannot be eliminated entirely, it is possible to identify prospective hazards, anticipate which might be the most severe, and recognize local actions that can be taken ahead-of-time to reduce the damage. These actions, also known as 'hazard mitigations strategies' can (1) avert the hazard by redirecting its impact by means of a structure or land treatment, (2) adapt to the hazard by modifying structures or standards or, (3) avoid the hazard through improved public education, relocating/removing buildings in the flood zone, or ensuring development is disaster resistant.

II. Purpose of the Plan

The purpose of this Hazard Mitigation Plan is to assist Plymouth in identifying all hazards facing the town and identify strategies to begin reducing risks from known hazards.

The Town of Plymouth seeks to be in accordance with the strategies, goals, and objectives of the State Hazard Mitigation Plan.

The 2014 Plymouth Local Hazard Mitigation Plan is an update of the 2009 Annex to the Regional Pre-Disaster Mitigation Plan. This update has been reorganized and new sections have been added:

- Program eligibility subsequent to plan approval
- Authority for plan development
- Participating jurisdictions
- Funding for plan development
- Brief information about community

Old assumptions have been challenged throughout and new information has been added to make the plan stronger and more useful for those Plymouth town officials and residents who will implement the hazard mitigation strategies in the future.

III. Community Profile

The Town of Plymouth comprises an area of 29,861 acres or almost 46 square miles. It consists of two physiographic areas separated by the north-south running valley formed by the Black River. To the west of this valley are a section of the Green Mountains, characterized by steep slopes and rugged terrain. To the east are intermountain valleys and low foothills, containing only a few peaks above 2,000 feet. Most of the town's commercial/retail establishments are local or tourist in nature and are located on or near the state highways.

Between 2000 and 2010, the total number of housing units in Plymouth increased 11% from 773 to 864. During recent years Plymouth has seen substantial growth in vacation home development. Vacation homes numbered 427 in 1987, or 72% of the housing units and in 1992 they number 591, or 75% of the housing stock. In 2000, only about 65% of housing stock in town was seasonally or occasionally used, and most recently, in 2010, about 62% of housing in Plymouth was used occasionally or on a seasonal basis. Primary residences account for over 33% of the housing stock in Plymouth, a figure that partially reflects the conversion of vacation homes to permanent residences. Single family homes continue to be the predominant housing type in both the rural areas and village areas. The town also has several condominium dwelling units. There is very little commercial or industrial growth in Plymouth. Some of the existing non-residential developments in Plymouth include the Echo Lake Inn, the Calvin Coolidge State Park and Plymouth Artisan Cheese. Both the Echo Lake Inn and the Calvin Coolidge State Park are located on Route 100. These establishments are relatively small, and there are no known plans of their expansion.

Plymouth has no local electrical generation, present or foreseen. Power needs are supplied by Green Mountain Power from generating plants in surrounding communities. Various power transmission lines feed necessary power requirements to both residences and businesses. Power from this line feeds the areas of Plymouth Notch and Pinney Hollow. Sections of Tyson are powered by Ludlow Electric and portions of Pinney Hollow and Plymouth Five Corners are fed through Woodstock. Clearing and the upgrading of transmission lines in recent years resulted in fewer power outages and more dependable power. However, some areas of the Town of Plymouth have poor power reliability.

The Fire Department is a volunteer organization funded in part by Town taxes and by fund raising activities, which include annual solicitations for donations from taxpayers, barbecues, and solicited donations. No members are paid for any time rendered. The Fire Department Station, located in the Town Offices Building on Route 100, contains one tanker trucks, two pumper trucks, and a utility truck.

The Plymouth Fast Squad is composed of volunteers who respond to vehicle accidents and other emergencies requiring first aid prior to the arrival of an ambulance and EMTs. Ambulance service and advanced medical treatment is available from town EMTs as well as those from Ludlow and Woodstock. The closest hospitals are the Springfield Hospital and the Rutland Regional Medical Center, located in Rutland. Medivac services are available by the DHART helicopter.

IV. The Planning Process

A. Plan Developers

Samantha Holcomb and Ellie Ray, both Land Use Planners at the Two Rivers-Ottauquechee Regional Commission (TRORC), assisted the Town of Plymouth with updating and developing its Hazard Mitigation Plan.

Committee members who assisted with the revisions include:

This section of the Plan satisfies 44 CFR 201.6(b)(1) and 201.6(c)(1) (or, A3.a and A3.b of FEMA's Local Mitigation Plan Review Guide, 2011).

Name	Role/Organization	How Participation Was Solicited
Ralph Michael	Selectboard Chair	On 06/17/2013, TRORC staff sent an introductory letter and e-mail to Selectboard members (Ralph Michael, Andrew Crossman, Russ Tonkin). In this letter, TRORC's staff requested names and contact information for potential committee members to revise Plymouth's HMP. Plymouth representatives responded by the end of July with a list of individuals they wanted to participate. TRORC staff proposed a meeting date and time in mid-August and an initial introductory meeting was scheduled. TRORC staff continued to meet with the update committee until the Hazard Mitigation Plan was adopted by the Selectboard.
Russ Tonkin	Selectboard	
Al Poirier	Emergency Management Director	
Larry Lynds	Road Foreman	
Joe Rebideau	Fire Warden/ Volunteer	

Additional Participants in the Process:

- Kirk Turner—Fire Chief
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B. Plan Development Process

The 2009 Plymouth Annex was originally part of the 2008 multijurisdictional Regional Hazard Mitigation Plan drafted by Two Rivers-Ottauquechee Regional Commission, and approved by FEMA on September 30, 2008. The Plymouth Annex received FEMA approval on September 30, 2008. While this plan is an update of the 2009 Annex, it has been reconstructed as a single jurisdiction, standalone Plymouth Local Hazard Mitigation Plan that will be submitted for individual approval to FEMA. As such, several sections have been added or updated to include all necessary information.

This section of the Plan satisfies the Element A: Planning Process requirements set out in 44 CFR 201.6.

The changes to this Plan include:

- **General**
  - New sections: Plan Development Process, 2009 Mitigation Strategies Status Update chart, Existing Hazard Mitigation Programs, Projects & Activities, Plan Maintenance;
  - Data updates: New hazard incidents, emergency declarations, census data;
  - Hazards have been reevaluated with the hazard ranking system used by the Vermont Division of Emergency Management and Homeland Security.
- **Hazards Analysis**
  - Severe Weather, Landslides/Mudslides, and Hurricanes/Tropical Storms are now on the list of "top threats;"
  - Severe Weather events are now depicted in a chart that shows the multiple hazards involved during each event;
  - Hazardous Material Spill has been removed from list of "top threats"
  - For each hazard, a location/vulnerability/extent/impact/likelihood table has been added to summarize the hazard description.
- **Maps**
  - Added map of the Town of Plymouth depicting critical facilities, town infrastructure, and the NFIP designated floodway and 100 year floodplain.

The following represent the avenues taken to draft the Plymouth Hazard Mitigation Plan:

- **Activities and Public Participation and Involvement**

** The meetings listed below were public sessions.

  - 06/17/2013: Introductory letter and email indicating that the town's HMP would soon expire and explaining the process for revising and readopting. Requested names and contact information for potential committee members to revise HMP. Sent to Selectboard members (Ralph Michael, Andrew Crossman, Russ Tonkin).
  - 08/28/2013: Met with members of Plymouth's Update Committee and introduced the Hazard Mitigation Plan update process. Reviewed the Mitigation Actions identified in 2009 and determined the current status. Also reviewed and discussed the Town's existing hazard mitigation programs, projects and activities.
  - 09/25/2013: Met with the Plymouth Update Committee to discuss and rank hazards the Town of Plymouth was most vulnerable to. After the hazards were ranked, a discussion ensued of the hazards the committee would like to focus on, and the final "top threats" were chosen.
  - 01/08/2014: Met with the Plymouth Update Committee to discuss and review the first draft of the Plymouth Hazard Mitigation Plan. TRORC staff made note of all comments made by the Committee and later incorporated those comments into the revised draft.
  - 02/28/2014: Met with the Plymouth Update Committee to discuss and identify Hazard Mitigation Strategies for each "Top Hazard" addressed in the Plan.

- 06/02/2014: TRORC staff attended a Selectboard meeting to inform Plymouth residents about the work that had been done to update the Town's Hazard Mitigation Plan. The Selectboard agenda is posted at the Town Office, and the draft Hazard Mitigation Plan was posted on the Town's website in advance of the public information session. TRORC staff also asked for comments at the meeting, but none were received.

- **Governmental participation and involvement** *(44 CFR 201.6(b)(2)*)
  - Sent revised draft to Plymouth Planning Commission Chair and provided contact information for receiving comments via hard copy —05/08/2014
    - No comments were received.
  - Sent revised draft to Northwest Regional Planning Commission—06/03/2014
    - No comments were received.
  - Sent revised draft to Vermont Emergency Management—06/10/2014
    - Comments received on 06/11/2014. The comments were integrated into Section IV. The Planning Process; Section V. Community Vulnerability by Hazard; and Section VI. Mitigation.
- **Neighboring community participation and involvement** *(44 CFR 201.6(b)(2)*)
  - October 2013: A notice was placed in the Two Rivers-Ottauquechee Regional Planning Commission Newsletter alerting recipients that Plymouth was engaging in hazard mitigation planning and updating their Hazard Mitigation Plan.
  - Posted a notice in four local papers alerting the public to the Hazard Mitigation Planning process that was taking place.
    - Valley News—ran October 23, 2013
    - The Herald of Randolph—ran October 24, 2013
    - Journal Opinion—ran October 23, 2013
    - Vermont Standard—ran October 24, 2013
  - Sent revised draft to neighboring Selectboards for comment and provided contact information for receiving comments via hard copy —05/08/2014
    - Towns of: Bridgewater, Killington, Shrewsbury, Mount Holly, Ludlow, and Reading.
    - No comments were received.
- **Review of existing plans, studies, reports, and technical information** (*44 CFR 201.6(b)(3)*)
  - State of VT Hazard Mitigation Plan, 2013
  - Plymouth Hazard Mitigation Plan (Adopted April 20, 2009)
    - This Plan was referenced extensively during the update process, especially in regard to the worst threats and mitigation action strategies identified in 2009.
  - Plymouth Town Plan (Adopted June 13, 2012)
    - This Plan provided TRORC's staff with background information on the community, as well as more detail on their emergency services.

This section of the Plan satisfies 44 CFR 201.6(b)(3) (or, A4.a and A4.b of FEMA's Local Mitigation Plan Review Guide, 2011).

- Plymouth Zoning Ordinance (Adopted June 10, 2013)
  - The Zoning Ordinance was referenced when completing the Flood/Flash Flood/Fluvial Erosion section of this Hazard Mitigation Plan.
  - Also contains Flood Hazard Protection Overlay District
    - This was referenced when completing the Flood/Flash Flood/Fluvial Erosion section of this Hazard Mitigation Plan.

- Plymouth's Local Emergency Operations Plan (LEOP)
  - Last Adopted May 5, 2014
  - This Plan provided TRORC's staff with general information about Plymouth's emergency operations.

- Phase 2 Stream Geomorphic Assessment data are available for the following bodies of water in Plymouth:
  - Buffalo Brook/Reading Pond Brook; Patch Brook; Black River; Great Roaring Brook; Tinker Brook; Reservoir Brook; Piney Hollow Brook; and Broad Brook.
  - This information was incorporated into the mapping/GIS components of this Plan; specifically in determining the number of structures that are vulnerable to fluvial erosion hazards.
- Flood Insurance Study: Windsor County, Vermont (September 28, 2007)
  - The Flood Insurance Study was referenced for general knowledge of the Black and Ottauquechee Rivers and peak discharge information for each.
  - Relevant peak discharge information for the Black River can be found on page 20 of Volume 1. Peak discharge information for the Ottauquechee River can be found on page 24 of Volume 1.
  - For the next Local Hazard Mitigation Plan update, the Town will review the 2007 Flood Insurance study in greater depth.

C. Status Update on Mitigation Actions Identified in 2009

The following table outlines the mitigation actions that were proposed in the 2009 All-Hazard Pre-Disaster Mitigation Plan for the Town of Plymouth (adopted on April 20, 2009 as an appendix to the Two Rivers-Ottauquechee Regional Commission's multi-jurisdictional Pre-Disaster Mitigation Plan). Participants in the plan update process reviewed those actions and reported on the status of each (in order of priority in 2009):

This section of the Plan satisfies the requirements of 44 CFR 201.6(d)(3).

2009 Mitigation Action	Who (Leadership)	When (Timeframe)	How (Funding/ Support)	2014/2015 – Status of Mitigation Actions
<u>ALL HAZARDS</u> 1. Ensure that the Rapid Response Plan (RRP) is current.	Selectboard	Yearly	With TRORC assistance	The new iteration of RRP is the Local Emergency Operations Plan (LEOP). Plymouth updates this document annually. The date of the 2015 LEOP update/adoption was 03/16/2015.
2. Use PDM plan for Hazard Identification and Mapping. (Mitigation)	Emergency Management Coordinator	Ongoing	With TRORC Assistance	Not complete.
3. Re-write and update existing Emergency Operations Plan.	Emergency Management Coordinator	Yearly	With TRORC assistance	This measure is not currently being undertaken by the State. The most analogous action is updating the BEOP, which was last done in May 2013.
4. Equip town office with backup power so that it can function during an emergency.	Emergency Management Coordinator	2009	Local resources	Upgrade completed in 2013. The generator is also located above Base Flood Elevation (BFE).
<u>FLASH FLOOD</u> 5. Continue the planned road maintenance program and update existing culvert inventory. Upgrade culverts and ditching. (Mitigation)	Highway Department	Ongoing	Local resources	Completed in 2013 with assistance from TRORC.
6. Consider adopting Fluvial Erosion Hazard regulations. (Mitigation)	Planning Commission and Selectboard	2009	Local resources, TRORC assistance	This action has been completed. The Town adopted Fluvial Erosion Hazard regulations on 05/20/2013.

2009 Mitigation Action	Who (Leadership)	When (Timeframe)	How (Funding/ Support)	2014/2015 – Status of Mitigation Actions
HAZMAT 7. Pursue HAZMAT training for Fire Department.	Fire Department	2009	Funded by Fire Service Training Academy	In process. Two individuals are trained at the Firefighter 1 level, 3 individuals have Operations level training, and others have Awareness level training.
FIRE 8. Obtain training and equipment appropriate that will allow the fire department to fight wildfires safely.	Fire Department	2009	Funded by Fire Service Training Academy, for training purposes only; not equipment	In process. This action is continuous.
9. Develop additional dry hydrant sites in rural locations. (Mitigation)	Fire Department	Ongoing	Local resources, George Aiken RC&D	In process and carried into 2015. Dry hydrants have been located on Colby Pond and Buzzwell Pond Roads, and Town Highway #44 (Deadend) since 2009. Hale Hollow Road also completed in 2013.
WINTER STORM 10. Encourage utilities to continue regular tree trimming along power lines (Mitigation)	Emergency Planning Coordinator	Yearly	Local resources	The utilities have done a good job keeping up with tree trimming thus far.

There are no plans for development in the Town of Plymouth. The Town of Plymouth has a very small population, and therefore, the pressures for large-scale development are relatively small. While there may be some primary and secondary home development in Plymouth, the pressures for this type of development are relatively minimal as well. Overall, Plymouth is quite rural in character. Due to the mountainous terrain and steep valleys in the Town of Plymouth, new development may be vulnerable to either flood hazards or fluvial erosion hazards. The vulnerability of any new growth would be dependent on its location near a Special Flood Hazard Area (SFHA), near a small stream, or on a steep hill. The Town's Zoning Ordinance prohibits new development in the SFHA, and the Town has fluvial erosion hazard bylaws to regulate development vulnerable to fluvial erosion. The Town also plans to use the river corridor maps produced by the State of Vermont for hazard mitigation and planning purposes.

D. Existing Hazard Mitigation Programs, Projects & Activities

This section of the Plan satisfies the requirements of 44 CFR 201.6(c)(3).

The Town of Plymouth is currently engaged in the following hazard mitigation programs, projects and activities:

	Type of Existing Authority / Policy / Program / Action	Resources: Staffing & Funding	Ability to Expand/Improve on
Community Preparedness Activities	Program—Annual update of Plymouth's Local Emergency Operations Plan (LEOP). Current copy was updated and formally approved on 05/05/2014.	Volunteer time from the Emergency Management Director/ Coordinator; assistance from TRORC. Funding from Vermont DEMHS.	Current program works well, no need to expand or improve on.
	Completed Action—Red Cross Shelter training as a requirement to have an approved shelter.	Volunteer – Selectboard, Emergency Management Director/ Coordinator. Funding from American Red Cross.	One time action.
	Program—attendance at Local Emergency Planning Commission (LEPC) #12 meetings.	Volunteer –Emergency Management Director/ Coordinator. Funding from Vermont DEMHS.	No need to expand or improve on attendance.
Insurance Programs	Authority/ Program—participation in National Flood Insurance Program (NFIP) [Note: This section of the Plan satisfies the requirements of 44 CFR 201.6(c)(3)(ii).]	The Plymouth Zoning Administrator acts as the Town's NFIP Administrator. Assistance from TRORC and Vermont ANR. Funding from local resources—annual budget.	Plymouth's initial Flood Hazard Boundary Map was identified on 1/10/75. The Town's initial Flood Insurance Rate Map (FIRM) was dated 6/19/89. The Town's FIRM and Flood Insurance Study (FIS) has been updated, and the current effective date for both is 9/28/07.
Land Use Planning	Policy/Program—Plymouth Town Plan (Adopted June 13, 2012)	Volunteer time from Planning Commission, and assistance from TRORC and other state agencies on specific subject matter. Funding from Municipal Planning Grants.	The Town Plan is updated every five years, as required by statute. The Planning Commission may expand or improve on any section it deems necessary, or that is required by changes in state statue.
	Completed Authority—Plymouth Zoning Ordinance (Adopted June 10, 2013). Also contains the Flood Hazard Protection Overlay District.	Volunteer time from the Planning Commission, and assistance from TRORC. Funding from Municipal Planning Grants.	During the Town Plan review/update period, the Zoning Ordinance is also reviewed and updated if needed.
	Policy/Program—Plymouth Hazard Mitigation Plan (Adopted April 20, 2009)	Volunteer time from Town officials; assistance from TRORC and Vermont DEMHS. Funding from FEMA; Vermont DEMHS; TRORC.	The 2014 Plymouth Hazard Mitigation Plan will replace the 2009 Plan. The 2014 HMP has evolved from the 2009 Plan and has greatly expanded and improved upon it. Future iterations of the Town's LHMP will be updated by the Town at least every five years.

	Type of Existing Authority / Policy / Program / Action	Resources: Staffing & Funding	Ability to Expand/Improve on
Hazard Control & Protection of Critical Infrastructure & Facilities	Completed Action—Generator at Town Office, which is located above Base Flood Elevation	Volunteer time from Selectboard/ Emergency Management Director/ Coordinator. Funding from Local resources—annual budget; grants	This is a one-time action, and improving/expanding upon it is not necessary.
	Completed Action— Alarm system installed in Town Office building.	Volunteer time from Selectboard/ Emergency Management Director/ Coordinator. Funding from Local resources—annual budget	This is a one-time action, and improving/expanding upon it is not necessary.
	Completed Action—Alarm system at Old School Community Center was upgraded to include carbon monoxide sensors.	Volunteer time from local officials. Local funding resources.	This is a one-time action, and improving/expanding upon it is not necessary.
	Program—Better Backroads culvert inventory completed in late fall 2013.	Town Road Foreman; assistance from TRORC. Funding from Better Backroads grant; local personnel time and funding	The Town is currently using the culvert inventory to further its culvert improvement program, and seeking funding through the Better Backroads grant program for implementation projects.
Education/ Public Outreach	Completed Action—Public trained in Red Cross Shelter operations	Volunteer time—Selectboard, Emergency Management Director/ Coordinator. Funding from American Red Cross.	This is a one-time action, and improving/expanding upon it is not necessary.
	Completed Action— DLAN training in August 2012	Volunteer time—Selectboard, Emergency Management Director/ Coordinator. Funding from FEMA; Vermont DEMHS.	This is a one-time action, but a working knowledge of this program should be maintained.
	Completed Action— ICS100 and 700 for all town employees, and ICS402 or higher for all Selectboard members	All town employees. Funding from FEMA; Vermont DEMHS.	This is a one-time action, but a working knowledge of this ICS should be maintained.

E. Plan Maintenance

This Plan (the Plymouth Local Hazard Mitigation Plan) will be updated and evaluated, by discussing its effectiveness and making note to incorporate any necessary revisions in the update process, annually at an April Selectboard meeting along with the review of their Local Emergency Operations Plan (LEOP). At this meeting, the Selectboard will monitor the implementation of the hazard mitigation strategies outlined in this Plan, by noting those that have been completed, are in the process of completion, or any issues with initiating the activity. Any comment s from local officials and the public will be incorporated when relevant. This meeting will constitute an opportunity for the public and other town officials to hear about the town's progress in implementing mitigation strategies and to give input on future activities and Plan revisions. The public will be given the opportunity to comment at this meeting, and the comments will be incorporated when relevant.

This section of the Plan satisfies 44 CFR and 201.6(c)(4)(i), 201.6(c)(4)(ii), and 201.6(c)(4)(iii).

Updates and evaluation of this Plan by the Selectboard, the local Emergency Coordinator/Director, or the Town Manager will also occur within three months after every federal disaster declaration directly impacting the Town of Plymouth. The Town will monitor, evaluate and update this Local Hazard Mitigation Plan at every April Selectboard meeting and after every federally declared disaster according to the graphic on page 46. The Town shall reference the Local Hazard Mitigation Plan when working on Town Plan amendments or changes to the Town's bylaws.

At least one year before the Plan expires, the update process will begin (though annual updates, monitoring of progress and evaluation will occur at the April Selectboard meeting). For this next Plan update, the Two Rivers-Ottauquechee Regional Commission (TRORC) will help with Plan updates if assistance is requested by the Town of Plymouth and funding is available. If TRORC is unable to assist the Town, then Plymouth's Town Clerk, Administrative Assistant, or Selectboard will update the Plan, or the Selectboard may appoint a committee of interested citizens (including the current local Emergency Coordinator/Director) to draft changes. Ultimately, it will be the Town's responsibility to update their Local Hazard Mitigation Plan.

The process of evaluating and updating the plan will include continued public participation through public notices posted on the municipal website, notice in the municipal building, The Valley News and TRORC newsletter and blog inviting the public to the scheduled Selectboard (or specially scheduled) meeting. The public will be given the opportunity to comment during this process. Additional stakeholders shall be invited to the meeting; these include: Calvin Coolidge State Park, Hawk Mountain Resort, Farm Wilderness, Bethany Birches Camp, Camp Plymouth State Park, and the Vermont Agency of Natural Resources (VT ANR). VT ANR will be invited because they can provide assistance with NFIP outreach activities in the community, models for stricter floodplain zoning regulations, delineation of fluvial erosion hazard areas, and other applicable initiatives. These efforts will be coordinated by the Selectboard.

Updates may include changes in community mitigation strategies; new town bylaws, zoning and planning strategies; progress on the implementation of initiatives and projects; effectiveness of implemented projects or initiatives; and evaluation of challenges and opportunities effectiveness in reducing town's vulnerabilities and meeting plan goals. If new actions are identified in the interim period, the plan can be amended without formal re-adoption during regularly scheduled Selectboard meetings.

Plymouth shall also incorporate mitigation planning into their long-term land use and development planning documents. The 2013 Vermont Legislature passed a law requiring all towns to incorporate flood resiliency elements into their town plans as of July 2014. To do so, flood hazard and fluvial erosion hazards will be identified, and strategies and recommendations will be provided to mitigate risks to public safety, critical infrastructure, historic structures and public investments. This Local Hazard Mitigation Plan will help the town to comply with the new community flood resiliency requirement for town plans adopted after July 2014.

It is recommended the Town review and incorporate elements of the Local Hazard Mitigation Plan when updating the municipal plan, zoning regulations, and flood hazard/FEH bylaws. The incorporation of the goals and strategies listed in the Local Hazard Mitigation Plan into the municipal plan, zoning regulations and flood hazard/FEH bylaws will also be considered after declared or local disasters. The Town shall also consider reviewing any future TRORC planning documents for ideas on future mitigation projects and hazard areas.

V. Community Vulnerability by Hazard

A. Hazard Identification

Mitigation efforts must be grounded in the rational evaluation of hazards to the area and the risks these hazards pose. This is done through a process, which in essence asks and answers three basic questions:

- What bad things can happen?
- How likely are they to occur?
- How bad could they be?

This process, which is laid out in the table (below), is an attempt to inventory the known hazards, establish the likelihood of them occurring in the future, and then assess the community's potential vulnerability to each. By performing this analysis, we are then able to prioritize actions that are designed to mitigate the effects of each of these disaster types and ultimately make Plymouth a safer place.

It is important that we learn from the past in order to avoid the same disasters and their outcomes. Disasters that have occurred within the Town of Plymouth, the larger region, and the State of Vermont can give us good information about what types of disasters we can expect in the future and what kinds of damage they might cause. However, while this historical data can inform our perspective of what might happen in the future, it is by no means a prophecy. While Plymouth might not have been impacted by a specific hazard in the past, this does not necessarily mean it will never be affected in the future. Indeed, the advance of climate change means that old weather patterns may not hold. For instance, in recent years, Vermonters have seen an increase in the number and severity of storms, especially rainfall events. Armed with historical data and a healthy respect for climate change and the unknown, we have tried our best to identify hazards and prepare for the future.

The following table reflects the hazards that we believe can be expected, or are at least possible, in the central Vermont area. We have considered factors such as frequency of occurrence, warning time and potential community impact to rank each and determine which hazards pose the greatest threats to life and property in Plymouth.[1] The top threats (bolded in the table, below) are then followed-up with discussion and mitigation strategies throughout the rest of this Plan.[2] It should be noted that hazards assigned with the same "Hazard Score" are not in order and their placement in the table should not be assumed to reflect their potential to create hazards for the town.

[1] The ranking methodology used in this Plan (see Appendix A) is closely modeled on that which is used by the Vermont Division of Emergency Management & Homeland Security (VDEMHS). The only changes made were intended to reflect the more limited geographical scope of this analysis, which is focused on a small, rural town rather than the entire State of Vermont (which is the focus of VDEMHS).

[2] It's important to note that those hazards which were not found to pose the greatest threats may still occur in Plymouth's future; however, they are not the focus of this Plan.

Hazard	Frequency of Occurrence	Warning Time	Potential Impact	Hazard Score
Landslides/Mudslides	**Likely**	**None**	**Moderate - Major**	**10.5**
Earthquake	Likely	None-minimal	Minor	9
Hail Storm	Highly likely	3 - 6 hrs.	Minor	9
High Wind	Highly likely	3 - 6 hrs.	Minor	9
Lightning	Highly likely	3 - 6 hrs.	Minor	9
Severe Weather (Thunderstorm, Lightning, High Winds, Hail, and Flooding) ****Note: We have defined 'Severe Weather' to include two or more of the above listed hazards.***	**Highly likely**	**3 - 6 hrs.**	**Minor**	**9**
Flash Flood/Flood/Fluvial Erosion	**Likely**	**6 - 12 hrs.**	**Moderate - Major**	**8.5**
Dam Failure (There are no large dams in the Town of Plymouth; and no large dams upstream.)	Unlikely	None	Moderate	8
Structure Fire	**Occasionally**	**None**	**Minor**	**8**
Hurricanes/Tropical Storms	**Likely**	**> 12 hrs.**	**Moderate - Major**	**7.5**
Hazardous Material Spill	Occasionally	None	Negligible	7
Avalanche	Unlikely	None	Negligible	6
Extreme Cold/Snow/Ice Storm	**Highly likely**	**> 12 hrs.**	**Negligible**	**6**
Ice Jams	Occasionally	3 - 6 hrs.	Negligible	6
Tornado	Unlikely	6 - 12 hrs.	Moderate	6
Wildfire	Occasionally	None	Minor	6
Extreme Heat	Occasionally	> 12 hrs.	Negligible	4
Drought (Town believed this hazard, given Vermont's climate presented very minimal risks and wanted to eliminate it from their hazard analysis.)	N/A	N/A	N/A	N/A
Invasive Species/Infestation (Town believed this hazard presented very minimal risks and wanted to eliminate it from their hazard analysis.)	N/A	N/A	N/A	N/A
Tsunami (Vermont is landlocked.)	N/A	N/A	N/A	N/A
Volcano (Vermont has no active volcanoes.)	N/A	N/A	N/A	N/A
Water Supply Contamination (The Town does not have a public water system.)	N/A	N/A	N/A	N/A

Note: Although *Lightning, High Wind and Hail Storm* were all given a **Hazard Score of 9, the Committee decided to eliminate them from further individual analysis. They believed these three hazards would be adequately addressed in the *Severe Weather* section. *Earthquake* was eliminated

from further analysis because, while earthquakes are common, they are typically very weak and Town officials did not believe they presented any significant risk to the Town.

The Town of Plymouth identified the following "top hazards," which they believe their community is most vulnerable to in terms of potential consequences and likelihood (listed in anticipated frequency of occurrence):

- Severe Weather (Thunderstorm, Lightning, High Winds, Hail, and Flooding)
- Extreme Cold/Snow/Ice Storm
- Flash Flood/Flood/Fluvial Erosion
- Hurricanes/Tropical Storms
- Landslides/Mudslides
- Structure Fire

Each of these top hazards will be discussed in the following sections. Within each section, previous occurrences of each hazard will be listed, including the County-wide FEMA Disaster Declarations (DR-#) when applicable. Hazards information was gathered from local sources (ex. town history book), the National Climatic Data Center's (NCDC's) Storm Events Database (1950-2012 and 2006-2012), the Spatial Hazard Events and Losses Database for the United States (SHELDUS) 1960-2012, and Special Reports produced by the National Weather Service in Burlington, Vermont. Each section also includes a description of each top hazard and a hazard matrix that will also include the following information:

Hazard	**Location**	**Vulnerability**	**Extent**	**Observed/ Anticipated Impact**	**Likelihood/ Probability**
Type of hazard.	General areas in community that may be vulnerable to the hazard.	Strength or magnitude, and details of a notable event(s).	General details of the most notable event(s).	Dollar value or percentage of damages.	Occasionally: 1–10% probability of occurrence per year, or at least one chance in next 100 years Likely: >10% but <100% probability per year, at least 1 chance in next 10 years Highly Likely: 100% probable in a year

B. Hazard Profiles for "Top Hazards"

The Hazard Profiles below are addressed in order of their anticipated frequency of occurrence, as determined by Town officials using the best available local knowledge.

1. Severe Weather (Thunderstorm, Lightning, High Winds, Hail, Flooding)

More common than hurricanes or tropical storms are severe thunderstorms (usually in the summer), which can cause flooding as noted above, and are associated with lightning, high winds, hail and tornadoes. Hailstorms have occurred in Vermont, usually during the summer months. While local in nature, these storms are especially significant to area farmers, who can lose entire fields of crops in a single hailstorm. Large hail is also capable of property damage. 382 hail events were recorded between 1950 and 2008 in the state, making hail an annual occurrence in some part of the state. Most of these events had hail measuring .75 inches, but many had hail at least 1.5 inches in size. The largest hail during the period was 3-inch hail that fell in Chittenden County in 1968 (NCDC). Tennis ball-sized hail was reported in the town of Chittenden during a storm in the summer of 2001. Thunderstorms can generate high winds, such as hit the region on July 6, 1999, downing hundreds of large trees in a few minutes.

This section of the Plan satisfies the requirements of 44 CFR 201.6(c)(2)(i), 201.6(c)(2)(ii), and 201.6(c)(2)(iii) for **Severe Weather (Thunderstorm, Lightning, High Winds, Hail, Flooding)**.

In Plymouth, severe weather is quite common, typically in the late spring and summer months when the region experiences high temperatures. Severe thunderstorms tend to bring other hazards such as high winds, hail, and lightning, and flooding. These hazards are often experienced in combinations which create many unique weather and emergency management situations. Over the years, Plymouth has been hit with high winds that have downed and uprooted numerous trees, and knocked out electricity to residents in the Town. Town specific wind data could not be easily found, but the "Remarks" section of NCDC Database helps to illuminate the impact strong winds can have on Plymouth.

The following list indicates the history of occurrence with regard to this hazard in Windsor County, given the relatively small population of Plymouth town-specific data is limited. Federal disaster numbers are listed when appropriate. Damage estimates will only be provided when the weather event is only listed for the Town of Plymouth, and if that data is available. In an attempt to capture the individual hazards that may arise, and the different circumstances caused by the hazards in concert, the separate hazards are documented in the table below.

History of Occurrences:

Severe Weather Date	Event Characteristics					Location	Extent
	Thunderstorm/ severe storm	Flooding	Hail	High Wind	Lightning		
Period of 06/25/2013— 07/11/2013 (DR-4140)	✓	✓				County-wide	Damage varied county-wide; widespread slight to moderate damage.

Severe Weather Date	Event Characteristics					Location	Extent
	Thunderstorm/ severe storm	Flooding	Hail	High Wind	Lightning		
09/08/2012	✓			✓		County-wide	Town specific data unavailable.
07/17/2012	✓			✓		County-wide	Town specific data unavailable.
08/28/2011 (DR 4022 VT for period of 08/26/2011 – 09/2/2011)	✓	✓				Plymouth, County-wide	Tropical Storm Irene. 6-7" of rain in Plymouth. Severe damage to state and town road infrastructure including Kingdom Road, Hale Hollow Road, Patch Brook Road, Round Top Road, Grandview Lodge Road, Frog City Road, Dublin Road. $1,591,621.06 in town-wide damages (captures at least 70% of total damage costs).
08/21/2011	✓		✓	✓		County-wide	Town specific data unavailable.
07/06/2011	✓			✓	✓	Plymouth, County-wide	Trees down along Routes 100 and 100A. Wind at 50 knots, property damage $5,000. 15,000+ customers in Vermont lost power.
05/26/2011 - 05/27/2011 (DR 4001 VT)		✓				County/ region-wide	Town specific data unavailable.
05/09/2009	✓			✓		County-wide	Town specific data unavailable.
08/07/2008 (DR-1719)	✓	✓				County-wide	Town specific data unavailable.
08/16/2007	✓			✓		County, region-wide	These storms produced 60-80mph straight-line winds in Rutland County (to the west of Windsor County).
07/11/2007 (DR-1715)	✓	✓				County-wide	Town specific data unavailable.
06/19/2007	✓			✓		County-wide	Town specific data unavailable.
07/15/2002			✓			Plymouth	A few of the storms were severe with large hail.
07/09/2001	✓			✓		Plymouth	Trees and power lines blown down in Plymouth.

Severe Weather Date	Event Characteristics					Location	Extent
	Thunderstorm/ severe storm	Flooding	Hail	High Wind	Lightning		
7/6/1973 (DR 397 VT)	✓	✓				Plymouth, County-wide	Severe storms; landslides in region. Damage to Hale Hollow Road, Patch Brook Road, Frog City Road, Dublin Road, and Lynds Hill Road. 5-8" County-wide. Rainfall as much as 6 inches in 24 hours in some locations. State declared disaster area. Deaths, 3; damage, $64 million.
11/3/1927-11/4/1927 ("The Great Flood of 1927")	✓	✓				Plymouth, County/ region-wide	Approximately 8" of rain fell in the Town of Plymouth and surrounding areas.

The Town of Plymouth has received high wind events in the past. Thankfully, the damage caused by high winds has been has been relatively minimal. Often power outages occur as a result of trees and tree limbs falling on power lines. However, the utility companies currently serving the Town of Plymouth, including Ludlow Electric and Green Mountain Power, have followed a regular tree-trimming schedule.

The main hazard caused by severe weather throughout the Town is flooding. During the flooding caused by Tropical Storm Irene, Vermont Routes 100 and 100a, Hale Hollow Road, MacDonald and Townsend Barn Roads were severely damaged. The most recent flooding events occurred between late June and mid-July in 2013. During "regular" flooding events, some Town roads wash out due to fluvial erosion. Many other Town roads are subject to erosional flooding when heavy rain events drop large amounts of rain in a short period of time.

In an attempt to improve the flow of floodwater through the Town, Plymouth has upgraded culverts on the following roads: Kingdom Road, Hale Hollow Road, Patch Brook, Round Top, Grandview Lodge, Frog City, and Dublin Road. The Town maintains an up-to-date culvert inventory, which it updates annually. With the help of TRORC staff, the Town completed a Better Backroads culvert inventory in the fall of 2013 that accessed the condition and georeferenced the Town's culverts, and then prioritized them for replacement. The work to upgrade or replace culverts remains ongoing.

Hazard	Location	Vulnerability	Extent	Observed Impact	Likelihood/ Probability
Severe Weather	Town wide for wind, hail, high winds, lightning and thunderstorm impacts; for flooding: Routes 100 and 100A, Kingdom, Hale Hollow, Townsend Barn and MacDonald Roads. Many other roads may be subject to erosional flooding, especially in steep areas.	Town and private buildings, and utilities; culverts, bridges, road infrastructure.	Most recent severe flooding event: Tropical Storm Irene- 5-7" across county (6-7" in Plymouth).**	From TS Irene: $1,591,621.06 for Plymouth from FEMA's Public Assistance database (captures at least 70% of total damage costs).**	Highly likely

***Note*: The main hazard caused by severe weather is typically flooding (though not always). In addition, flooding is often the most expensive hazard caused by severe weather. Therefore, the Extent and Impact categories for Severe Weather will reflect the data reported in the Flash Flood/Flood/Fluvial Erosion, as it represents the higher limits of damage caused by severe weather.

2. Extreme Cold/Snow/Ice Storm

Winter storms are a regular occurrence in Vermont. However, severe winter storms can cause serious damage, including collapse of buildings due to overloading with snow or ice, brutal wind chills, downed trees and power lines and stranded vehicles. People can be at risk of freezing in extended power outages if they lack wood heat or backup power, and individuals shoveling large accumulations of snow can also be at risk from frostbite, hypothermia and heart attacks due to cold and overexertion. While snow removal from the transportation system is standard fare in Vermont winters, extreme snow or ice can close road systems, further jeopardizing any stranded persons that are in danger of freezing or needing medical assistance.

This section of the Plan satisfies the requirements of 44 CFR 201.6(c)(2)(i), 201.6(c)(2)(ii), and 201.6(c)(2)(iii) for **Extreme Cold/Snow/Ice Storm**.

Severe winter storms include a blizzard on February 15-17 in 1958 that dumped over 30 inches and resulted in 26 deaths in New England. On December 26-27 in 1969, another blizzard left 18-36 inches of snow in northwestern Vermont and a whopping 45 inches in Waitsfield. A string of storms in March 2001 hit the state, beginning with 15-30 inches on March 5-6 (later declared a federal disaster), 10-30 inches on the 22nd and 10-20 inches on the 30th. Recent years have seen wet snow storms that have leveled trees and caused widespread power outages.

The worst winter storm in terms of damage to hit the state recently was not a snow storm, but an ice storm. In January of 1998, just the right combination of precipitation and temperature led to more than three inches of ice in spots, closing roads, downing power lines, and snapping thousands of trees. This

storm was estimated as a 200-500 year event. Power was out up to 10 days in some areas and 700,000 acres of forest were damaged in Vermont. Amazingly, there were no fatalities in Vermont, unlike Quebec where 3 million people lost power and 28 were killed.

Over the past few winters, Plymouth has received numerous snow storms that have dropped significant amounts of snow over a day or two. However, the details of these events and the damage they caused are overshadowed by winter weather events of the past. This is not to say such extreme events will not repeat themselves. It should be assumed that extreme winter weather events will occur at some point in the future. The following table documents the occurrence of extreme cold/snow/ice storms in the Town of Plymouth and Windsor County.

History of Occurrences:

Date	Event	Location	Extent
12/29/2013	Winter storm (heavy, wet snow mixed with rain and sleet)	County-wide	Town specific data unavailable.
03/18/2013 – 03/19/2013	Winter storm	County-wide	8-14" of snow fell across the county, with higher amounts above 1000 ft. Numerous vehicle accidents.
02/27/2013— 02/28/2013	Winter storm	County-wide	Snow across the county, 6-12" of snow fell across the southern Green Mountains.
12/29/2012— 12/30/2012	Winter storm	County-wide	Snowfall totals across the county were generally 5-8".
03/01/2012	Winter storm	County-wide	Widespread 4-8" inches of snowfall occurred in Windsor county with 10-14" inches along the eastern slopes of the Green Mountains.
11/22/2011— 11/23/2011	Winter storm (heavy, wet snow mixed with rain and sleet)	County-wide	6-12" across the county. Numerous vehicle accidents, scattered power outages due to heavy snow on trees.
03/06/2011— 03/07/2011	Winter storm	County-wide	4-16" across the county.
12/26/2010— 12/27/2010	Winter storm (Nor'easter)	County-wide	Snowfall totals of 6-15" with localized higher amounts occurred as well as considerable blowing and drifting of the snow due to north winds of 15 to 25 mph with gusts approaching 40 mph.
02/23/2010— 02/24/2010	Winter storm	County-wide	A heavy wet snow fell across Vermont that resulted in snowfall accumulations of 6 to 30 inches with the higher amounts in the higher terrain of central and southern Vermont. 50,000+ customers without power in the region.
12/09/2009	Winter storm	County-wide	6-12" of snow along the eastern side of the Green Mountains. 60-85 mph wind knocked down power lines and caused some structural damage.
02/26/2008 – 02/27/2008	Snow	Plymouth, County-wide	6-8" in Plymouth. Storm broke previously set all-time snow record for February (42.3" in 2008, as recorded at National Weather Service in Burlington, VT).
04/12/2007	Winter storm (heavy wet snow, sleet, rain)	Plymouth, County/region-wide	6" in Plymouth. Dangerous road conditions. Some downed tree limbs and power lines.

Date	Event	Location	Extent
04/04/2007	Winter storm (rain mixed with/turned into sleet/snow)	County/region-wide	Town specific data unavailable.
03/16/2007—03/17/2007	Winter Storm	County/region-wide	9" of snow.
03/09/2007	Extreme cold/wind chill	County-wide	Morning lows were 10 to 34 degrees below zero.
03/06/2007	Extreme cold/wind chill	County/region-wide	Very low temperatures accompanied by 15-20mph winds. -8 to -25 across the county.
02/14/2007	Snow	County-wide	Snowfall totals ranged from 15 to 25" in the Connecticut River valley. The deep snowfall (18-30 inches) and deeper snow drifts (4-6+ feet) caused numerous problems, including the blocking of numerous heat vents that resulted in the build-up of carbon monoxide and sent dozens of people seeking treatment at area hospitals. The weight of the heavy snowfall on some weaker roofs, resulted in the partial or total collapse of 20 or more barn roofs and the deaths of more than 100 cattle.
01/25/2007—01/26/2007	Extreme Cold/wind chill	County/region-wide	Combination of brisk northwest winds of 10 to 15 mph and temperatures 5 to 20 degrees below zero for wind chill readings of 25 to 40 degrees below zero.
1/19/2007	Snow	County/region-wide	4-6" of snow common across region.
12/30/2006	Snow	County/region-wide	2-6" of snow. "Extremely dangerous" road conditions.
02/18/2003	Snow	County-wide	Town specific data unavailable.
01/07/1998 – 01/09/1998 (DR 1201 VT)	Ice Storm	County/region-wide	Town specific data unavailable.

The Town of Plymouth is no stranger to winter weather and the hazards that it brings. Depending on the event, particularly with heavy, wet snow or ice, electricity may be knocked out for a few hours or days. The utility companies currently serving the Town of Plymouth, including Ludlow Electric and Green Mountain Power, have followed a regular tree-trimming schedule. Plymouth town officials believe this is satisfactory to mitigate damage and the power outages caused by downed trees and tree limbs during a heavy, wet snow or ice event. In the event of an extended power outage, the Town would open the emergency shelter by the Emergency Management Team.

Heavy, wet snow or large quantities of snow may also leave structures vulnerable to roof collapse. Roof collapse occurs when the structural components of a roof can no longer hold the weight of the snow. Flat roofs are most vulnerable to collapse because they do not drain well and the snow on the roof soaks up water like a sponge, increasing the weight that the roof must bear. More common it seems is the collapse of barns commonly used for livestock sheltering and other agricultural purposes. Unfortunately, livestock in the barn are often killed and equipment stored in the barn may be damaged or ruined. It is difficult to determine whether a residential structure or a barn would be rebuilt after a roof collapse, because the decision to rebuild would likely depend on the extent of damage. The

collapse of a barn roof is likely to be a total loss, and the collapse of a house roof may be a 50% loss. While roof collapse has not occurred in Plymouth recently, very heavy snow in the region on February 14, 2007 resulted in the partial or total collapse of 20 or more barn roofs, and led to the deaths of more than 100 cattle.

However, in general, winter weather is most hazardous to travelers. Icy and snow-covered roads present multiple examples of dangerous driving conditions and situations. In Plymouth, the mountainous terrain, steep slopes, and remoteness of some roads further complicate travel. The Town relies on Travel Advisories issued by the State of Vermont Department of Emergency Management Homeland Security and the National Weather Service to alert residents of dangerous travel weather. However, it is difficult to prohibit people from driving during winter weather events. As a result, emergency services personnel must always be prepared to provide assistance to stranded drivers or to those who have been in an accident.

Hazard	Location	Vulnerability	Extent	Anticipated Impact	Likelihood/ Probability
Extreme Cold/Snow /Ice Storm	Town wide	The entire Town is vulnerable, including road infrastructure, town and privately owned buildings, utility infrastructure.	Snow fall has varied, from a few inches to over a foot or more. Heavy snow and wind downed trees and power lines. Snow/ice contributed to hazardous driving conditions.	For roof collapse: Monetary damages will depend on each structure but, collapse of barn roof is often a total loss. This does not include the loss of livestock. Collapse of a house roof may be at a 50% loss. For car crashes due to poor driving conditions: minimal damage to vehicle to totaled vehicle. Health impacts could vary significantly.	Highly likely

3. Flash Flood/Flood/Fluvial Erosion

Flooding is one of the worst threats to Plymouth's residents and infrastructure. Past instances of flooding in Plymouth have included rain and/or snowmelt events that cause flooding in the major rivers' floodplains and intense rainstorms over a small area that cause localized flash flooding. Both kinds of events can be worsened by the build-up of ice or debris which can contribute to the failure of important infrastructure (such as culverts, bridges, and dams).

This section of the Plan satisfies the requirements of 44 CFR 201.6(c)(2)(i), 201.6(c)(2)(ii), and 201.6(c)(2)(iii) for **Flash Flood/Flood/Fluvial Erosion**.

Perhaps the worst flood disaster to hit the Town of Plymouth, as well as the overarching region and the State of Vermont, occurred on November 3, 1927. This event was caused by nearly 10 inches of heavy rain from the remnants of a tropical storm that fell on frozen ground. Eighty-four Vermonters, including the Lieutenant Governor, were killed. The flooding in the White River valley was particularly violent,

with the river flowing at an estimated 900,000 gallons per second on the morning of the 4th (Vermont Weatherbook). Like many towns in the region, the Town of Plymouth received heavy precipitation.

A more recent flood that devastated the region and the state was the result of Tropical Storm Irene, which occurred on August 28, 2011. Record flooding was reported across the state and was responsible for several deaths, and millions of dollars of home, road and infrastructure damage. Due to the strong winds, 50,000 Vermont residents were initially without power, and many did not have electricity restored to their homes and businesses for over one week. Despite the damage wrought, the flooding caused by Tropical Storm Irene is considered to be the second greatest natural disaster in 20th and 21st century Vermont; second only to the Flood of 1927.

The Town of Plymouth suffered major damage to property and infrastructure during Tropical Storm Irene, although no lives were lost. It is estimated that Tropical Storm Irene dropped 6-7 inches in the Town of Plymouth in a very short span of time, and 5-7 inches across the county. Flooding destroyed three structures along Routes 100 and 100A. Many of Plymouth's roads and culverts were damaged by the storm, including parts of Route 100, Route 100A, Kingdom Road, Hale Hollow Road, Patch Brook Road, Round Top Road, Grandview Lodge Road, Frog City Road, Dublin Road. The county-wide damage totaled $32.5 million, and Town-wide damage was over $1.5 million for this flooding event. Following the flood damage, the state of Vermont and FEMA has been coordinating on the home buy-out process across the state. There are three home buy-outs in Plymouth, two of which are along Route 100 and one on Route 100A.

Unfortunately, flooding is very common across the region, with many events impacting the Town of Plymouth specifically. The following list indicates the history of occurrence with regard to this hazard in Windsor County and given the relatively small population of Plymouth, town-specific data is somewhat limited. Federal disaster numbers are listed when appropriate.

History of Occurrences:

Date	Event	Location	Extent
Period of 06/25/2013— 07/11/2013 (DR 4140 VT)	Flooding	County, region wide	Town specific data unavailable.
08/28/2011* (DR 4022 VT for period of 08/26/2011 – 09/02/2011)	Severe Flash Flooding	Plymouth, County, region wide	5-7" of rain across region, 6-7" in Plymouth. Significant damage to state and local roads/culverts/bridges. $1,591,621.06 in damages in the Town of Plymouth, according to FEMA's Public Assistance database.
05/26/2011 – 05/27/2011 (DR 4001 VT)	Flash & riverine flooding	County wide	3-5+" of rain county-wide
10/01/2010	Flooding	County wide	Heavy rain, including moisture associated with the dissipated remnants of Tropical Storm Nicole, spread into Vermont and produced four to five inches of rain. $1.9 million dollars of public assistance.

Date	Event	Location	Extent
07/21/2008— 08/12/2008 (DR 1790 VT)	Flooding	County wide	Town specific data unavailable.
07/09/2007— 07/11/2007 (DR 1715VT)	Flash flooding	County-wide	Town specific data unavailable.
05/15/2006	Flooding	County wide	Town specific data unavailable.
04/04/2000	Flooding	County wide	Steady rain combined with melting mountain snows.
06/27/1998	Flash flooding	County, region wide	3-6" of rain.
08/09/1976- 08/10/1976	Flash flooding	Plymouth	Extensive flooding. Hurricane Belle brought intense rains to much of State. Damage to Kingdom Road, and Hale Hollow Road.
07/06/1973 (DR-397 VT)	Flash flooding	Plymouth, County-wide	Damage to Kingdom Road, Hale Hollow Road, Apple Hill Road, Vermont Route 100A, Route 100 at Money Brook. 5-8" County-wide. Rainfall as much as 6 inches in 24 hours in some locations. State declared disaster area. Deaths, 3; damage, $64 million.
11/02/1927 – 11/04/1927* ("The Great Flood of 1927")	Flash flooding	Plymouth, County-wide	4-9" of rain across the region. Approximately 8" in Plymouth.

The Town of Plymouth Flood Hazard Overlay zone, contained within the Town's Zoning Regulation, prohibits new structures in the floodplain and places restrictions on other types of activities within the floodplain. It also specifies land, area and structural requirements in the Special Flood Hazard Area.

There are 36 residences and 1 commercial structure within the 500-year floodplain, which equals $6,355,012 if all properties were damaged/destroyed in a severe flooding event. The residential property total includes 3 mobile homes and 17 camps. The 500 year floodplain was chosen as a basis for this analysis to demonstrate the number of Plymouth properties that are or may be vulnerable to flooding. In addition, the flooding that occurred as a result of Tropical Storm Irene is considered to slightly less than or equal to a 500 year flood. Therefore, in order to be more forward-looking, the damage to structures in the 500-year is documented in this plan.

Due to the development restrictions mountainous terrain places on an area, "at-risk populations," such as children or the elderly, loss income housing and critical infrastructure may be located in flood hazard areas. Across Vermont, most child and elder care facilities are not registered with the State. All the child day care is likely private and in-home in Plymouth, as the Town does not have any facilities that are licensed with the State of Vermont. With that being said, there is no way of knowing where a private child care provider's home maybe located, whether in a flood hazard area or not. There are no elder care facilities in the Town of Plymouth. Finally, low income housing is not registered with the State, but there are no mobile home parks in Plymouth.

Recent studies have shown that the majority of flooding in Vermont is occurring along upland streams, as well as along road drainage systems that fail to convey the amount of water they are receiving. These areas are often not recognized as being flood prone and property owners in these areas are not typically

required to have flood insurance (DHCA, 1998). It should be noted that although small, mountainous streams may not be mapped by FEMA in NFIP FIRMs (Flood Insurance Rate Map), flooding along these streams is possible, and should be expected and planned for. Flash flooding in these reaches can be very erosive, causing damage to road infrastructure and to topographic features including stream beds and the sides of hills and mountains. The presence of undersized or blocked culverts can lead to further erosion and stream bank/mountain side undercutting. Furthermore, precipitation trend analysis suggests that intense, local storms are occurring more frequently.

In the Town of Plymouth, there are 2 commercial structures, 31 residential structures, and 1 community center located in the fluvial erosion hazard area. Plymouth Notch, a small village located with the Town of Plymouth, was heavily damaged by fluvial erosion caused by Great Roaring Brook during Tropical Storm Irene. Because much of Plymouth Notch is located on an alluvial fan, there is a high potential of future flooding damage at this location. Money Brook, which runs along Route 100, also forms an alluvial fan and has the potential for fluvial erosion.

Many areas in the Town of Plymouth have been flooded or washed-out repeatedly in the last few decades. Kingdom Road flooded in 1973, 1976, and 2011 (during Tropical Storm Irene). The road and bridge on Hale Hollow Road was damaged in 1973, 1976 and in 2011. In addition, properties along Route 100 and Route 100A have been flooded and damaged repeatedly over the years, in the 1973, 1976 and 2011 flooding events. Lastly, floodwater has caused damage on MacDonald and Townsend Barn Roads in 1973, 1976 and 2011. A considerable number of other roads and road infrastructure were damaged in 1973 or 2011, or in both flooding events. Patch Brook, Dublin, Round Top and Scout Camp Roads are also areas of repetitive washout and flooding concern.

Additionally, the hamlet of Tyson, straddling the Ludlow-Plymouth border, is at risk for flooding. It is base of the both Amherst and Echo Lakes. The Stickney Bridge crosses the Black River, the outlet of Echo Lake, in the middle of the village. In 2007, the Bridge was plugged with a residential dock and debris that had come loose from Echo Lake. Monitoring this bridge and any debris jams is critical during a rain event.

A number of culverts have been replaced or upgraded since Plymouth's 2009 Annex was adopted. In an attempt to improve the flow of floodwater through the Town, Plymouth upgraded culverts on the following roads: Kingdom Road, Hale Hollow Road, Patch Brook, Round Top, Grandview Lodge, Frog City, and Dublin Road.

In 2008, the culvert inventory was completed with 480 culverts. With all the Irene damage, the town of Plymouth applied and received a $4,000 2013 Better Back Roads grant to update their culvert inventory. The inventory now includes 502 culverts, of which 40 are in poor or bad condition. Many of the culverts were replaced with a minimum of 18" HDPE plastic. There are still many steel undersized culverts remaining which will be prioritized for future replacement. This update addresses culvert changes made after T.S. Irene but also integrate GPS and mapping into the inventory. The assessment identified and prioritized poor condition culverts which will develop a working capital plan for the Highway Department. The process of upgrading culverts is ongoing.

No development projects are planned in Plymouth in areas that would be vulnerable to flooding. There are three insured repetitive losses indicated in Plymouth on FEMA's NFIP list. All of these losses have been incurred by the same building which is classified as "Other Residential."

Hazard	Location	Vulnerability	Extent	Observed Impact	Likelihood/ Probability
Flooding	Routes 100 and 100A, Kingdom Road, Hale Hollow Road, Townsend Barn Road, MacDonald Road repeatedly flood. Areas near Great Roaring and Money Brooks subject to fluvial erosion, such as Plymouth Notch.	Culverts, bridges, road infrastructure, public and private property. 36 residences and 1 commercial structure within the 500 year floodplain.	Most recent severe flooding event, Tropical Storm Irene- 5-7" across county (6-7" in Plymouth).	From TS Irene: $1,591,621.06 in the Town of Plymouth from FEMA's Public Assistance database (captures at least 70% of total damage costs).	Highly likely

4. Hurricane/Tropical Storm

Hurricanes (storms with sustained winds greater than 74 mph) rarely reach as far inland as Vermont; more often they have weakened to tropical storms. In either case, the high winds, heavy rains, and large affected areas from hurricane or tropical storms can make these rare events major disasters. The most infamous example of this was the disastrous hurricane of 1938. On September 21, 1938 a very fast moving hurricane hit Vermont in the early evening, but was moving so fast that wind damage was more severe than damage from rain in places. However, there was severe flooding, as over 4 inches of rain accompanied the storm and followed upon the heels of preceding storms that had saturated the ground and raised river levels. Buildings were lost, power lines downed, and many trees were felled. Tropical Storm Floyd in September 1999 caused flooding and wind damage in parts of Vermont, as well as one fatality, and resulted in a federal disaster declaration.

The most recent flood that devastated Vermont, Orange County and Plymouth was the result of Tropical Storm Irene, which occurred on August 28, 2011. Record flooding was reported across the state and was responsible for several deaths, and millions of dollars of home, road and infrastructure damage. Due to the strong winds, 50,000 were without power initially, and many did not have power restored for over a week. Despite the damage wrought, the flooding caused by Tropical Storm Irene is considered to be the second greatest natural disaster in 20th and 21st century Vermont, second only to the Flood of 1927.

The following list indicates the history of occurrence with regard to this hazard in Windsor County (given that small population of Plymouth, town-specific data is limited); an asterisk "*" denotes the few instances in which town-specific data is available, and federal disaster numbers are listed where appropriate.

History of Occurrences:

Date	Event	Location	Extent
08/28/2011* (DR 4022 VT for period of 8/26/2011 – 9/2/2011) (Tropical Storm Irene)	Severe Flash Flooding	Plymouth, County-wide	6-7" of rain in Plymouth. Severe damage to state and town road infrastructure including VT Route 100, 100A, Kingdom Road, Hale Hollow Road, Patch Brook Road, Round Top Road, Grandview Lodge Road, Frog City Road, and Dublin Road, among others. $1,591,621.06 in Town-wide damages (captures at least 70% of total damage costs).
10/01/2010	Flooding	County-wide	Heavy rain, including moisture associated with the dissipated remnants of Tropical Storm Nicole, spread into Vermont and produced four to five inches of rain. Severe storms and flooding in Addison, Caledonia, Essex, Lamoille, Orange, Washington, and Windsor Counties. FEMA disaster declaration with 1.9 million dollars of public assistance.
9/16/1999 – 9/21/1999 (DR 1307 VT) (Tropical Storm Floyd)	High winds, flooding	County and State-wide	Tropical Storm Floyd brought high winds and heavy rainfall of 3 to 6 inches to Southern Vermont. The rain produced significant flooding across the region, which proved destructive. The combination of the wind and very saturated ground produced widespread downing of trees and power lines across much of Southern Vermont and as many as 2,000 people lost power.
08/09/1976* (Hurricane Belle)	Intense rains, flooding	Plymouth, County- and State-wide	Hurricane Belle brought intense rains to much of State. Damage to Kingdom Road, and Hale Hollow Road in Plymouth.
9/21/1938 ("The Great New England Hurricane")	High winds	State-wide	Hit Vermont as a Category 1 storm. High winds severely damaged trees, buildings, power lines.

The impacts of a tropical storm or hurricane in the Town of Plymouth are very similar to the impacts caused by severe weather events, such as high wind and flooding damage. However, the damage caused by a tropical storm or hurricane is often much more devastating. Thus, properties and road infrastructure vulnerable to wind damage and flooding caused by severe weather events are also likely to be impacted by tropical storms and hurricanes, but to a greater degree.

The most recent tropical storm to impact the Town of Plymouth was Tropical Storm Irene. It severed damaged Plymouth's road infrastructure included parts of Routes 100 and 100A, Kingdom Road, Hale Hollow Road, Patch Brook Road, Round Top Road, Grandview Lodge Road, Frog City Road, and Dublin Road. Plymouth Notch was also severely damaged by the fluvial erosion caused by Great Roaring brook. As a result of flood damage, the Town of Plymouth was physically isolated for a period of time in the aftermath of Tropical Storm Irene.

Hazard	Location	Vulnerability	Extent	Observed Impact	Likelihood/ Probability

Hurricane/ Tropical Storm	Town wide for wind impacts. For flooding: Routes 100 and 100A, Hale Hollow Road, Kingdom Road, Townsend Barn Road, MacDonald Road and many others.	Culverts, bridges, road infrastructure, structures in floodplain	TS Irene: 5-7" of rain across region; significant damage to roads/ bridges.	TS Irene damage in Windsor Co.: $32.5 million in property damage. $1,591,621.06 in Town-wide damages from FEMA's Public Assistance Database (captures at least 70% of total damage costs).	Likely

5. Landslide/Mudslide

This section of the Plan satisfies the requirements of 44 CFR 201.6(c)(2)(i), 201.6(c)(2)(ii), and 201.6(c)(2)(iii) for **Landslide/Mudslide**.

The movement of a mass of rock, debris or earth down a slope by force of gravity is considered a landslide. A landslide occurs when the slope or soil stability changes from stable to unstable due to an outside force, such as an earthquake, a severe storm, erosion, fire or a human-induced activity. Slopes greater than 10 degrees and slopes where the height from the top of the slope to its toe is greater than 40 feet are more likely to slide. A lack of vegetative cover and/or soils with a high water content contribute to the slope's vulnerability to fail.

In simple terms, the two factors needed to trigger a landslide are gravity and precipitation. Therefore, because much of Vermont is mountainous and receives relatively high levels of precipitation, the land areas in Vermont have certain predisposition towards landslides. Heavy winter snows combined with spring snow melt and heavy rains in the spring, summer and fall all contribute to high water content in the soil. The majority of landslides within Vermont involve a small quantity of rock and soil materials, but they frequently occur without any warning. Over 200 years ago (1783), landslides in Vermont were made famous in newspaper accounts that chronicled devastating spring flooding events. It is important to highlight the connection between precipitation, flooding and landslides in Vermont.

The following data was retrieved from various sources, including the NCDC Database, and publications issued by the State of Vermont.

History of Occurrences:

Date	Event	Location	Extent
08/28/2011*	Rockslide, Mudslide	Town of Plymouth	Money Brook rockslide, mudslide on 100A.

Date	Event	Location	Extent
(DR 4022 VT for period of 08/26/2011 – 09/02/2011)			
08/09/1976—08/10/1976	Flash flooding; landslides	Town of Plymouth	Slide reported on Money Brook.
07/06/1973 (DR-397 VT)	Flooding, landslides	Town of Plymouth; County-, region-wide	Slides reported on Money Brook and Great Roaring Brook.
11/3/1927—11/7/1927 "The Great Flood of 1927"	Severe flooding, landslides	Ludlow (Town directly south of Plymouth), Region-wide	7" of rain in less than 18 hours. Many landslides occurred near Ludlow and in the Connecticut River Valley.

Landslides within the Town of Plymouth are likely to be associated with heavy precipitation, flooding, erosion and/or snow melt. According to town officials, a major landslide has not occurred in the Town of Plymouth in recorded history. However, with the anticipated increase in precipitation events, this particular hazard may become more prevalent in the future. Because much of the Town of Plymouth is mountainous, there are areas that are currently vulnerable to landslides. These areas include: Money Brook; Kingdom Road; Patch Brook Road; Hale Hollow Road; Lynds Hill Road and Granview Lodge Road.

Hazard	Location	Vulnerability	Extent	Observed/Anticipated Impact	Likelihood/ Probability
Landslide/ Mudslide/ Rockslide	Money Brook; Kingdom Road; Patch Brook Road; Hale Hollow Road; Lynds Hill Road and Granview Lodge Road	Road infrastructure, public and private property.	Some areas experience slides in heavy rain events, and others are currently at risk of slides.	Slides occurred during the flooding events of 1927, 1973, 1976 and 2011 but their specific impacts are unknown. Typically, roads may be blocked or damaged by slides, but slides in some areas, such as on Round Top Road, have the potential to impact residents as well.	Likely

6. Structure Fire

Vermont has one of the highest per capita death rates from fire in the nation. This is in fact the deadliest form of disaster throughout the state. In 2010, there were 1,956 reported structural fires in the state, which included 5 fatalities and over $18 million dollars in damage. Although there have been requirements for smoke detectors in rental housing for over 20 years, and requirements for smoke detectors in single-family dwellings since 1994, there was only one building involved in the fatal fires in 2000 that had evidence of working smoke alarms.

This section of the Plan satisfies the requirements of 44 CFR 201.6(c)(2)(i), 201.6(c)(2)(ii), and 201.6(c)(2)(iii) for **Structure Fire**.

Structure fires may occur at any point, and are typically initiated within a single fuel object. Smoke produced by the burning object forms a smoke plume and rises, creating a layer of smoke while also

transporting heat to the smoke layer. Fire then spreads quickly by radiation from the flames, or from the smoke layer. Once other objects are engulfed, more smoke plumes are formed and heat radiates to other objects. Fire burns and moves across different materials depending on the material's composition, orientation, surface to mass ratio and air supply in the structure/room.

A review of the fires listed in the "History of Occurrences" chart below demonstrates the potential for structures located in the Town of Plymouth to be completely or severely destroyed by fire. The following list indicates the history of occurrence with regard to this hazard in the Town of Plymouth. The details of these events were obtained from the archives of local newspapers, The Plymouth Press Online archives and/or local knowledge, chiefly the local fire department.

History of Occurrences:

Date	Event	Location	Extent
11/26/2011	Chimney fire	Town of Plymouth	Minor damage sustained.
03/07/2011	Condominium building fire	Upper Round Top Road, Plymouth	One of the eight condominiums was lost. The adjoining unit had extensive smoke and water damage.
01/10/2011	Shed fire	Town of Plymouth	No serious damage.
07/22/2010	Residential structure fire	Town of Plymouth	Serious damage to two rooms of a single family home.
02/01/2010	Shed fire	Town of Plymouth	Damage to an abandoned shed caused by a bucket of ashes left beside the structure.
01/07/2009, 03/12/2009, 04/15/2009	Chimney fires	Town of Plymouth	No serious damage.
02/25/2009	Barn fire	Town of Plymouth	Structure completely destroyed.
02/24/2008	Chimney fire	Town of Plymouth	No serious damage.
01/26/2006, 02/21/2006	Chimney fires	Town of Plymouth	No serious damage.
08/01/2006	Shed fire	Town of Plymouth	Shed damage while on roof.
02/14/2005	Chimney fire	Town of Plymouth	No serious damage.

**No injuries to occupants or firefighters have been sustained in any structure fire events to date.*

Poor access to fires, limited water supply for firefighting, and distances of homes from the Fire Station are a few of the challenges that leave Plymouth vulnerable to the impacts of structure fires. Some recreational and retirement homes with single access roads and no fire-fighting water supply are in jeopardy.

There are four areas of relatively intensive settlement in the Town. These are the village of Plymouth Union, the hamlets of Plymouth Notch and Tyson, and the Hawk Inn and Mountain Resort. These areas contain relatively high densities of single family residences as well as most of the town's

commercial enterprises. Another large concentration of single family residences is in the southern part of the town around or near Lake Amherst and Echo Lake.

Areas of relatively dense development pose greater fire hazards due to the threat of the fire spreading to adjacent buildings. In addition, a fire in a multi-family building has the potential to injure or displace a larger number of people. The condominium building fire in 2011 on Upper Round Top Road demonstrates the ability of a structure fire to spread to and damage attached or nearby buildings. The limited access to the site of the fire made firefighting a difficult task.

To help combat structure fires, the Plymouth Volunteer Fire Department attends yearly firefighting trainings. Dry hydrants have been located on Colby Pond and Buzzwell Pond Roads, and Town Highway #44 (Deadend) since 2009.

Hazard	Location	Vulnerability	Extent	Observed Impact	Likelihood/Probability
Structure Fire	Town-wide.	Public and privately owned structures.	Depends on fire location and conditions.	Depends on fire. Some structures have had the potential for a serious fire (chimney fires), some structures have sustained only minor damage, and some have been severely or completely destroyed.	Occasionally

VI. Mitigation

A. Mitigation Goals

1. To reduce injury and losses from the natural hazard of severe weather.
2. To reduce injury and losses from the natural hazard of extreme cold/snow/ice storm
3. To reduce injury and losses from the natural hazard of flash flood/flood/fluvial erosion
4. To reduce injury and losses from the natural hazard of hurricanes/tropical storms
5. To reduce injury and losses from the natural hazard of landslides/mudslides/rockslides.

6. To reduce injury and losses from the hazard of structure fire(s).

B. Town Plan Goals & Objectives Supporting Local Hazard Mitigation

- To provide a pleasant and convenient environment for the people of the town, including residential areas suited to their varied needs, business and consumer services to meet their wants, increased opportunities for employment within the town, and the proper level of public services such as fire protection, utilities, and recreation. (page 1)
- It is a policy of the town to preserve floodplains and associated risk areas in a state where they can handle flood flows without damage to property. (page 17)
- To improve the quality of Plymouth's transportation and road systems in order to promote safety and maintain the scenic quality of roads wherever possible. (page 19)

The Plymouth Town Plan was adopted on June 13, 2012 and has a 5-year lifespan.

C. Hazard Mitigation Strategies: Programs, Projects & Activities

This section of the Plan satisfies the requirements of 44 CFR 201.6(c)(3)(ii), 201.6(c)(3)(iii) and 201.6(c)(3)(iv).

Vermont Division of Emergency Management & Homeland Security encourages a collaborative approach to achieving mitigation at the local level through partnerships with Vermont Agency of Natural Resources, VTrans, Vermont Agency of Commerce and Community Development, Regional Planning Commissions, FEMA Region 1 and others. That said, these agencies and organizations can work together to provide assistance and resources to towns interested in pursuing hazard mitigation projects.

With each mitigation strategy, general details about the following are provided: local leadership, possible resources, implementation tools, and prioritization. The prioritization category is based upon the economic impact of the action, Plymouth's need to address the issue, the cost of implementing the strategy, and the availability of potential funding. The cost of the strategy was evaluated in relation to its benefit as outlined in the STAPLEE guidelines (includes economic, political, environmental, technical, social, administrative, and legal criteria). A range of mitigation strategies was vetted by the committee, and those that were determined to be feasible are included in the table below.

Strategies given a "High" prioritization indicate that it is either critical or potential funding is readily available, and should have a timeframe of implementation of less than two years. A "Medium" prioritization indicates that a strategy is less critical or the potential funding is not readily available, and has a timeframe for implementation of more than two years but less than four. A "Low" prioritization indicates that the timeframe for implementation of the action, given the action's cost, availability of funding, and the community's need to address the issue, is more than four years.

The Town of Plymouth understands that in order to apply for FEMA funding for mitigation projects that a project must meet FEMA benefit-cost criteria, and a project seeking FEMA funds will undergo a full benefit-cost assessment in the FEMA-approved format. The Town must have a FEMA approved Hazard Mitigation Plan as well.

Hazard(s) Mitigated	Mitigation and Preparedness Actions	Local Leadership	Prioritization	Possible Resources*	Time Frame
All Hazards	*Ensure that Plymouth's Local Emergency Operations Plan (LEOP) is kept up-to-date.*	Emergency Management Director	High	Local resources	1 year after Plan Approval
	Maintain the Town's Front Porch Forum to disseminate emergency information (ex. weather-and road condition- related information) during emergency operations or when the Town's Emergency Operations Center (EOC) has been activated.	Community Center Coordinator	High	Local resources	As needed
	Continue to monitor state-issued weather information and disseminate to community if necessary.	Emergency Management Director	High	Local resources	Daily
Severe Weather// Flash Flood/ Flood/ Fluvial Erosion// Hurricane/ Tropical Storm	*Improve culverts determined to be of a "High Priority" in the Town's 2013 Better Backroads culvert inventory to improve the flow of floodwaters (see red section in Appendix C). Depending on the specific culvert project, the improvement may involve maintenance (i.e. cleaning) but for culverts that are undersized, a new culvert with increased dimensions will replace the old one.*	Road Foreman in coordination with the Selectboard	High	Local resources; Better Backroads grants; HMGP and PDM grants; Class II VT State Roads grants	1-2 years after Plan Approval
Severe Weather// Flash Flood/ Flood/ Fluvial Erosion// Hurricane/ Tropical Storm	*Improve culverts determined to be of a "Medium Priority" in the Town's 2013 Better Backroads culvert inventory to improve the flow of floodwaters (see yellow section in Appendix C). Depending on the specific culvert project, the improvement may involve maintenance (i.e. cleaning) but for culverts that are undersized, a new culvert with increased dimensions will replace the old one.* (Mitigation)	Road Foreman in coordination with the Selectboard	Medium (new)	Local resources; Better Backroads grants; HMGP and PDM grants; Class II VT State Roads grants	2-4 years after Plan Approval

Hazard(s) Mitigated	Mitigation and Preparedness Actions	Local Leadership	Prioritization	Possible Resources*	Time Frame
	Improve culverts determined to be of a "Low Priority" in the Town's 2013 Better Backroads culvert inventory to improve the flow of floodwaters (see green section in Appendix C). Depending on the specific culvert project, the improvement may involve maintenance (i.e. cleaning) but for culverts that are undersized, a new culvert with increased dimensions will replace the old one. (Mitigation)	Road Foreman in coordination with the Selectboard	Low (new)	Local resources; Better Backroads grants; HMGP and PDM grants; Class II VT State Roads grants	3-5 years after Plan Approval
	Incorporate and use the State of Vermont's river corridor (fluvial erosion) maps for hazard mitigation mapping and planning purposes. (Mitigation)	Planning Commission & Selectboard	Medium (#1 priority of 5 nat. haz. mit. projects in 2009 Plan)**	Local resources	2-4 years after Plan Approval
Severe Weather// Flash Flood/ Flood/ Fluvial Erosion// Hurricane/ Tropical Storm	*Promote and support floodplain restoration projects on private property, such as the work currently being done on the Flaster property.* (Mitigation)	Selectboard & Planning Commission	Medium (new)	Local resources	2-4 years after Plan Approval
	Work with private owner to develop a plan for mitigating the 1 Plymouth property on the NFIP's repetitive and severe repetitive loss list (may include voluntary buyout/floodproofing/elevation, or an infrastructure project if one is found to address the source of flooding, or no action if property owner is not interested or willing to participate and no feasible alternative is found). (Mitigation)	Selectboard & Planning Commission	Medium (new)	Local resources; private owner; FEMA HMGP or PDM-C or FMA	2-4 years after Plan Approval

Hazard(s) Mitigated	Mitigation and Preparedness Actions	Local Leadership	Prioritization	Possible Resources*	Time Frame
Extreme Cold/Snow / Ice Storm	*Periodically clear and maintain town road rights-of-way, and work with local utilities to ensure that utility corridors are cleared and maintained.* (Mitigation)	Road Foreman	High (#5 priority of 5 nat. haz. mit. projects in 2009 Plan)**	Local resources	1 year after plan Approval
	Install "living snow fences" (i.e. trees, shrubs) on Kingdom Road and as needed to reduce blowing and snow drift over critical road segments. (Mitigation)	Selectboard	Low (new)	Local resources	4-5 years after Plan Approval
	Plan for, budget, and maintain town roads for safe winter travel.	Selectboard	High	Local resources	1 year after plan Approval
Extreme Cold/Snow / Ice Storm	*Plan for the enlargement of the Town's salt storage facility (will allow the Town to store more salt on-site and minimize the chance of shortage).*	Selectboard	Medium	Local resources	2-4 years after Plan Approval
Landslide/ Mudslide/ Rockslide	*Complete an inventory of high-risk areas and of locations where critical facilities, buildings and infrastructure are vulnerable to landslides/ mudslides/rockslides.* (Mitigation)	Emergency Management Director & Road Foreman	High (new)	Local resources, assistance from TRORC	1-2 years after Plan Approval
	Install water bars on the Class 4 section of TH-20 (Old Kingdom Road) to prevent future landslides. (Mitigation)	Road Foreman	High (new)	Local resources; Better Backroads grants	1-2 years after Plan Approval
	Stabilize banks on Kingdom Road. (Mitigation)	Road Foreman	Low (new)	Local resources; Better Backroads grants	4-5 years after Plan Approval
Structure Fire	*Develop a flyer discussing chimney fires and how to help prevent them.*	Fire Department	High	Local Resources	1 year after Plan Approval
	Develop a flyer discussing smoke and CO alarms.	Fire Department	High	Local Resources	1-2 years after Plan Approval

Hazard(s) Mitigated	Mitigation and Preparedness Actions	Local Leadership	Prioritization	Possible Resources*	Time Frame
	Develop and present an education piece for residents on wild land fires and how to landscape and help protect their home.	Fire Department	Medium	Local resources	2 years after Plan Approval
Structure Fire	*Install dry hydrants to improve the fire-fighting capabilities in Plymouth, including on Hale Hollow and in the area of the library foot bridge.* (Mitigation)	Fire Department	Medium (#4 priority of 5 nat. haz. mit. projects in 2009 Plan)**	Local resources	2-4 years after Plan Approval
	Upgrade equipment as needed, or as equipment budgets allow.	Fire Department	Medium	Local resources	2-4 years after Plan Approval

*Depending on the mitigation action, local resources may include the following: town personnel/staff time; town volunteer time; town budget line items, donations, cash from capital campaigns, among others.

** Two other 2009 mitigation projects were completed: culvert and ditching inventory and adoption of fluvial erosion regulations.

Appendices

Appendix A: Hazard Ranking Methodology

Frequency of Occurrence Probability	Warning Time Amount of time generally given to alert people to hazard	Potential Impact Severity and extent of damage and disruption
1 = *Unlikely* <1% probability of occurrence in the next 100 years 2 = *Occasionally* 1–10% probability of occurrence per year, or at least one chance in next 100 years 3 = *Likely* >10% but <100% probability per year, at least 1 chance in next 10 years 4 = *Highly Likely* 100% probable in a year	1 = More than 12 hours 2 = 6–12 hours 3 = 3–6 hours 4 = None–Minimal	1 = *Negligible* Isolated occurrences of minor property damage, minor disruption of critical facilities and infrastructure, and potential for minor injuries 2 = *Minor* Isolated occurrences of moderate to severe property damage, brief disruption of critical facilities and infrastructure, and potential for injuries 3 = *Moderate* Severe property damage on a neighborhood scale, temporary shutdown of critical facilities, and/or injuries or fatalities 4 = *Major* Severe property damage on a metropolitan or regional scale, shutdown of critical facilities, and/or multiple injuries or fatalities

Appendix B: Critical Stream Crossings

Critical crossings in the table below includes stream crossing structures on town highways that cross third order streams or larger. Headwater streams generally include first through third order. Third order was included as these headwater streams will have larger drainage areas and may have larger structures that are more difficult to replace and have a larger impact on the road network. Most of these are bridges. Structures that have a "Y" in the "AOTSTRUCT" column are state-owned.

RDFLNAME	STRUCT_NUM	CATEGORY	STRUCTYPE	STRC_LBL	AOTCLASS	X_COORD	Y_COORD	AOTSTRUCT
HALE HOLLOW RD	101412003114121	B	TL	B31	0	-72.6652	43.5576	
HALE HOLL0W RD	401412001914121	B	TS	B19	3	-72.6591	43.5499	Y
APPLE HILL RD	101412003214121	B	TL	B32	0	-72.6578	43.5473	
GRIFFIN ROAD	101412004114121	B	TL	B41	0	-72.6563	43.5383	
HALE HOLL0W RD	401412002014121	B	TS	B20	3	-72.657	43.5367	Y
HALE HOLLOW RD	101412003814121	B	TL	B38	0	-72.6634	43.5341	
HALE HOLLOW RD	101412003714121	B	TL	B37	0	-72.6728	43.5345	
HALE HOLL0W RD	401412003614121	B	TS	B36	3	-72.6772	43.5265	Y
PINE LEE RD	401412001414121	B	TS	B14	3	-72.7165	43.5442	Y
RICKS RD	401412002214121	B	TS	B22	3	-72.7449	43.5387	Y
PAILLE RD	401412004814121	B	TS	B48	3	-72.7354	43.5259	Y
DEAD END RD	101412003414121	B	TL	B34	0	-72.7403	43.5297	
MCDONALD RD	101412003514121	B	TL	B35	0	-72.7441	43.5374	
FROG CITY RD	401412002314121	B	TS	B23	3	-72.7246	43.5011	Y
FROG CITY RD	101412003314121	B	TL	B33	0	-72.7242	43.5022	
BILLINGS RD	101412004014121	B	TL	B40	0	-72.7121	43.4998	
SCOUT CAMP RD	101412004614121	B	TL	B46	0	-72.7065	43.4951	
KINGDOM RD	101412003914121	B	TL	B39	0	-72.7034	43.4651	

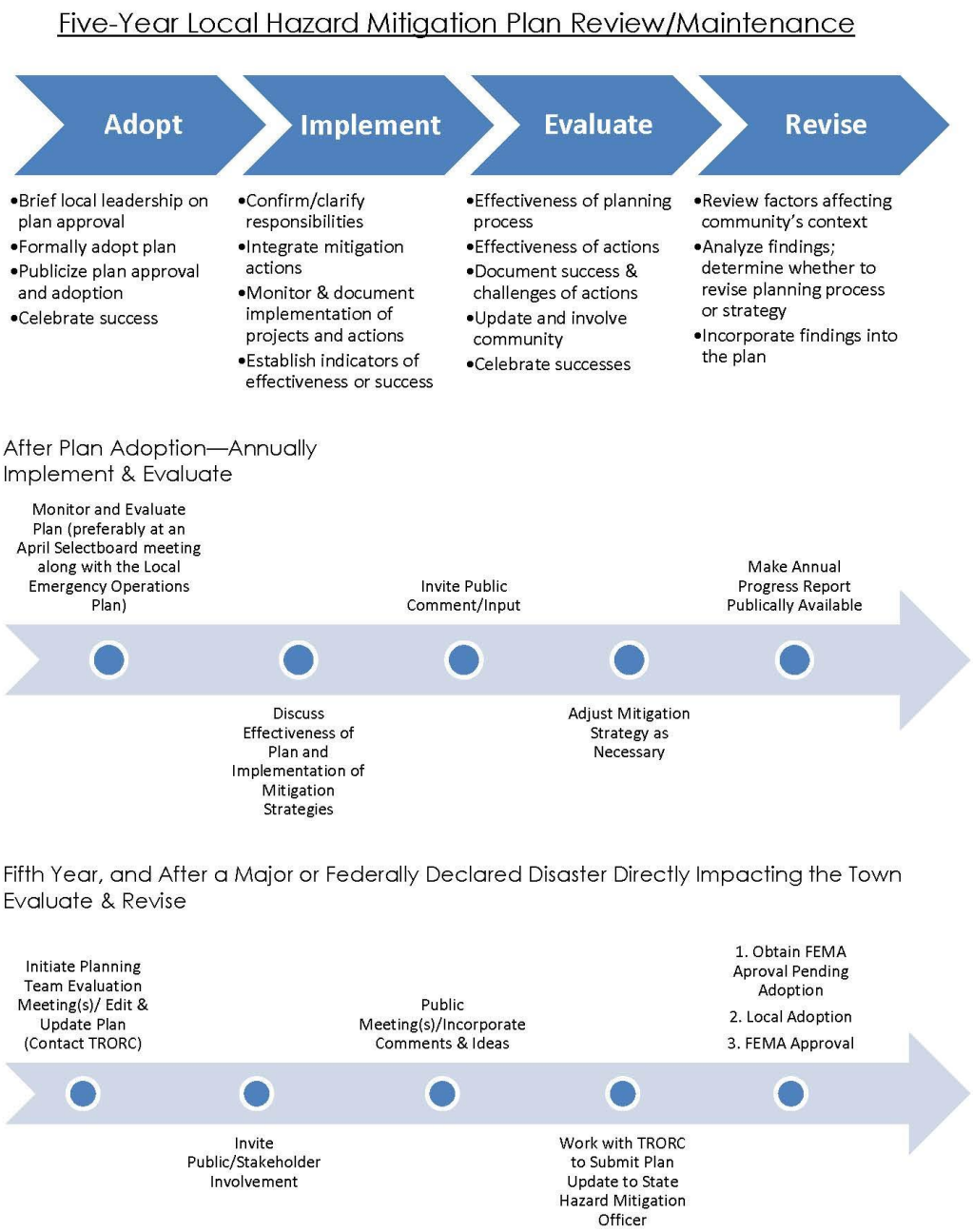
Appendix C: Culvert Prioritization List from Plymouth's Better Backroads Culvert Inventory

Town of Plymouth Culvert Replacement Priorities

	Road	Culvert No.	width	height	length	Material	Type	Condition	Priority
1	BRADLEY HILL RD	6	15	15	34	Steel Corrugated	Round	Poor	High
2	CHAPMAN RD	4	15	15	40	Steel Corrugated	Round	Critical	High
3	DUBLIN RD	18	15	15	40	Steel Corrugated	Round	Closed	High
4	FARM & WILDERNESS RD	2	18	18	28	Steel Corrugated	Round	Poor	High
5	FARM & WILDERNESS RD	9	24	24	50	Steel Corrugated	Round	Critical	High
6	HALE HOLLOW RD	40	12	12	20	Steel Corrugated	Round	Critical	High
7	ROUND TOP RD	5	15	15	35	Steel Corrugated	Round	Critical	High
8	SCOUT CAMP RD	20	15	15	29	Steel Corrugated	Round	Poor	High
9	SCOUT CAMP RD	23	15	15	30	Steel Corrugated	Round	Poor	High
10	SCOUT CAMP RD	24	12	12	30	Steel Corrugated	Round	Poor	High
11	SCOUT CAMP RD	25	15	15	44	Steel Corrugated	Round	Critical	High
12	SCOUT CAMP RD	26	15	15	30	Steel Corrugated	Round	Closed	High
13	SCOUT CAMP RD	27	15	15	30	Steel Corrugated	Round	Closed	High
14	BUSWELL POND RD	1	15	15	34	Steel Corrugated	Round	Poor	Med
15	BUSWELL POND RD	4	15	15	40	Steel Corrugated	Round	Poor	Med
16	COOLIDGE FARM RD	1	12	12	20	Steel Corrugated	Round	Poor	Med
17	CROWN POINT RD	2	15	15	30	Steel Corrugated	Round	Poor	Med
18	CROWN POINT RD	7	18	18	36	Steel Corrugated	Round	Poor	Med
19	DUBLIN RD	5	15	15	40	Steel Corrugated	Round	Poor	Med
20	KINGDOM RD	2	12	12	29	Steel Corrugated	Round	Poor	Med
21	KINGDOM RD	3	12	12	33	Steel Corrugated	Round	Poor	Med
22	LYNDS HILL RD	42	15	15	20	Steel Corrugated	Round	Poor	Med
23	LYNDS HILL RD	43	15	15	30	Steel Corrugated	Round	Poor	Med
24	MESSER HILL RD	17	15	15	35	Steel Corrugated	Round	Poor	Med
25	MESSER HILL RD	21	18	18	40	Steel Corrugated	Round	Poor	Med
26	COLBY POND RD	1	18	18	27	Steel Corrugated	Round	Poor	Low
27	COLBY POND RD	2	18	18	26	Steel Corrugated	Round	Poor	Low
28	DIX HILL RD	6	18	18	40	Steel Corrugated	Round	Poor	Low
29	HALE HOLLOW RD	3	15	15	40	Steel Corrugated	Round	Poor	Low

30	HALE HOLLOW RD	26	15	15	40	Steel Corrugated	Round	Poor	Low
31	HALE HOLLOW RD	33	15	15	20	Steel Corrugated	Round	Poor	Low
32	HALE HOLLOW RD	36	12	12	20	Steel Corrugated	Round	Poor	Low
33	HALE HOLLOW RD	42	12	12	20	Steel Corrugated	Round	Poor	Low
34	HAWK SPUR RD	1	18	18	40	Steel Corrugated	Round	Poor	Low
35	PATCH BROOK RD	33	15	15	30	Steel Corrugated	Round	Poor	Low
36	REGGIES RD	15	12	12	25	Steel Corrugated	Round	Poor	Low
37	ROUND TOP RD	2	15	15	58	Steel Corrugated	Round	Poor	Low
38	ROUND TOP RD	4	15	15	24	Steel Corrugated	Round	Poor	Low
39	ROUND TOP SPUR RD	2	15	15	31	Steel Corrugated	Round	Poor	Low
40	UPPER ROUND TOP RD	7	18	18	41	Steel Corrugated	Round	Poor	Low
41	WEAVER HILL RD	3	15	15	40	Steel Corrugated	Round	Poor	Low
42	WEAVER HILL RD	4	18	18	40	Steel Corrugated	Round	Poor	Low

Appendix D: Five Year Review and Maintenance Plan



Attachments

Attachment A: Map of Plymouth

Flood Region:
National Flood Insurance Program
Digital Flood Insurance Rate Map Data

Stream Geomorphic Assessment Data:
Obtained from the Data Management Sys.
Maintained by the VANR
River Management Program

0 1 Miles

KILLINGTON
MENDON
BRIDGEWATER
WOODSTOCK
READING
SHREWSBURY
LUDLOW
CAVENDISH

Madden Brook
Pinney Hollow Brook
Mecawee Pond
Whetstone Brook
Woodward Reservoir
Black Pond
Tinker Brook
Grass Pond
Upper Moore Pond
Moores Ponds
Great Roaring Brook
Reading Pond
Barker Brook
Reading Pond Brook
Buffalo Brook
Amherst Lake
Echo Lake
Colby Pond
Twentymile Stream
Russell Brook
Tiny Pond
Lake Rescue
Cook Pond
Whitney Brook

Pcn RD
Farm and Wilderness Camps
Shrewsbury RD
Cell Tower
Vt Route 100
Whetstone Brook
Quarry RD
Rangers RD
Messer Hill RD
Town Line RD
Coolidge State Park RD
Sfh
Pine Lee RD
Vt Route 100a
Calvin Coolidge State Park
Public Water Supply
Calvin Coolidge State Park
Public Water Supply
Emergency Shelter
Johnson Farm RD
Th 17
Broad Brook
Merrill Hill RD
Bradley Hill RD
Hale Hollow RD
Lyndis Hill RD
Round Top RD
Great Roaring Brook
Inset
VERMONT 100
Hawk Inn Mountain Resort
Billings RD
Frog City RD
Scout Camp RD
Reggies RD
Crown Point RD
Th 22
Th 23
Unknown Soldier RD
Th 24
Th 15
Patch Brook RD
Patch Brook
Dam RD
Dublin RD
Th 19
Th 28
Colby Pond RD
Reading Pond RD
Camp Plymouth State Park
Echo Lake Inn
Sfh
SUB

Inset

Plymouth Union
Great Roaring Brook RD
Rick's RD
Round Top RD
Plymouth Old School
Emergency Operations Center
Public Water Supply
Town Office
Emergency Shelter
Fire Department
Emergency Operations Center
Town Garage
Bear Hill RD
Vt Route 100
Black River
Dead End RD
VERMONT 100A
N
0 0.1 Miles

Floodplain eSITES	
RESIDENTIAL	
CAMP	17
MOBILE HOME	3
SINGLE FAMILY DWELLING	16
COM/IND/PUB	
COMMERCIAL	1
Grand Total	**37**

Hazard Mitigation Plan
Essential Services Map
Plymouth, Vermont

- TH cls 1 (village VT rt)
- TH cls 2
- TH cls 2 gravel
- TH cls 3
- TH cls 3 gravel
- TH cls 4 impassable
- VT forest hwy
- trail
- private
- VT route
- US route
- US interstate
- TH cls 4 gravel
- TH cls 4 primitive
- Railroad
- Major Electric Transmission

- Critical Facility
- Critical Stream Crossing
- Church
- Cemetery
- Significantly Undersized Structure
- Culvert Under 18" Wide
- Bridge
- Electric Substation

- e911 in Floodplain
- e911 Within 1000' of Major Route
- e911 Address
- Floodway
- 100 Year
- 100 Year, No BFE
- 500 Year

Two Rivers-Ottauquechee Regional Commission
GIS Service Center
128 King Farm Rd
Woodstock, VT 05091
802-457-3188
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