

Chittenden, Vermont Local Hazard Mitigation Plan



Flash Flood Damages on Mountain Top Road – April 2019

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Technical Assistance by the Rutland Regional Planning Commission



Other Key Partners

Rutland Natural Resources Conservation District
Western Vermont Floodplain Manager
Green Mountain National Forest
U.S. Forest Service
Green Mountain Power



**GREEN MOUNTAIN
& FINGER LAKES
National Forests**



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1 INTRODUCTION

The impact of expected, but unpredictable natural events can be reduced through community planning and action. The goal of this Plan is to provide a natural hazards local mitigation strategy that makes Chittenden (the Town) more disaster resistant and more resilient after disaster has struck.

Hazard Mitigation is any sustained policy or action that reduces or eliminates long-term risk to people and property from natural hazards and their effects. FEMA and state agencies have come to recognize that it is less expensive to prevent disasters than to repeatedly repair damage after a disaster has struck. This Plan recognizes that communities have opportunities to identify mitigation strategies and measures during all the other phases of Emergency Management – Preparedness, Response and Recovery. Hazards cannot be eliminated, but it is possible to determine what the hazards are, where the hazards are most severe, and identify local actions and policies that can be implemented to reduce the severity of the hazard.

2 PURPOSE

The purpose of this Plan is to assist the Town in identifying all natural hazards facing the community, ranking them according to local vulnerabilities, and developing strategies to reduce risks from those hazards. Once adopted, this Plan is not legally binding; instead, it outlines goals and actions to reduce the degree of injury and inconvenience to the townspeople and their private and municipal property.

The benefits of mitigation planning include:

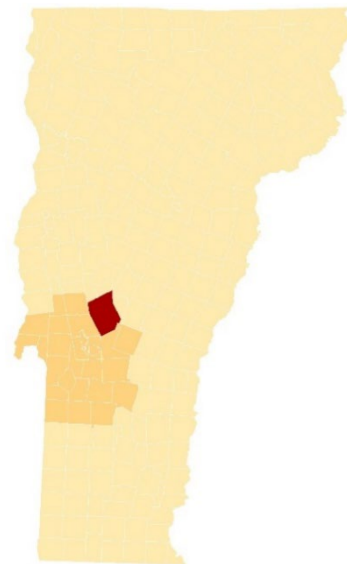
- Identifying actions for risk reduction that are agreed upon by stakeholders and the public.
- Focusing resources on the greatest risks and vulnerabilities.
- Increasing education and awareness of threats and hazards, as well as their risks.
- Communicating priorities to State and Federal officials.
- Aligning risk reduction with other community objectives.

Furthermore, the Town seeks to be in accordance with the 2018 State Hazard Mitigation Plan.

3 COMMUNITY PROFILE

Development Patterns and Land Use

Chittenden is in the northeastern part of Rutland County. It is the largest town in land area in Vermont, covering approximately 73 square miles. Despite the large land area, the population density is very low at 17 people per square mile. A large majority of the land remains in a wilderness state. The entire region is mountainous, with the Green Mountain Range dividing the town into two parts. The eastern slopes of the town are mostly uninhabitable and not easy to access from the west.



Settlement patterns in Chittenden were initially determined by available waterpower, transportation routes and quality agricultural land. The combination of these factors led logically to the development of North Chittenden and then South Chittenden. These two areas continue to be the most densely settled areas of town. However, over time residential units have filled in along the roadways radiating out from these two centers.

Principal nonresidential land uses are timber, and forestry management and production, farming, hydroelectric power generation, hunting and fishing and other recreational activities.

Two thirds of the land in Chittenden is owned by the U.S. Forest Service and managed by the Green Mountain National Forest.

Land Features

The significant irregularities in slope and elevation range from the 3,485-foot Bloodroot Mountain in the central-northeast sector of the Town to the 900-foot elevations shared by the East Creek and Furnace Brook stream valleys, both in the southwest corner of the Town. These two lower elevation areas support the population concentrations and the only maintained roads to and from Chittenden.

The East Creek and Furnace Brook valleys are each approximately one-quarter mile wide. From the valley floors, the wild and mountainous lands climb steadily and steeply into the higher elevations, with one exception: the Chittenden reservoir plateaus at 1,500 feet. From here, the forested and uninhabited hills and mountains tower to their summits where the Long Trail traverses the Town's entire north-south skyline.

Demographics and Growth Potential

The 2018 American Community Survey Five-Year Estimates prepared by the U.S. Census Bureau shows an estimated population of 1,342, and 665 housing units. Between 2010 and 2018, the population has increased by 18%. The median age of Chittenden residents is 46.4 years old. Chittenden's median age is 8% higher than the Vermont median age of 42.8. The portion of the population over 60 is 30%, compared to 25% in Vermont and 20.9% in the country.

Limited land availability, gaps in telecommunication service, roadway limitations, and a restricting road system (e.g., there is no throughway) are all challenges to the economic growth of Chittenden. The Town's topography and extensive stream network place physical limitations on growth.

Precipitation and Water Features

Average precipitation is 45 inches of rain; with July being the wettest month. Average snowfall is 96 inches, with January being the snowiest month.

The mountains feed several rivers and springs in the valley areas. Of these, Furnace Brook and East Creek have designated floodplains by FEMA.

The Town has a minimally sized floodplain along the East Creek, south of the South Chittenden town center.

The Chittenden Dam and Reservoir is located at the headwaters of East Creek, two miles northeast of South Chittenden. The reservoir is a 784-acre impoundment. The dam is owned, operated, and maintained by Green Mountain Power (GMP). It is a multi-purpose facility, providing a recreational benefit to central Vermont communities, but its primary function is hydroelectric power generation.

Lefferts Pond, at the southern end of the Chittenden Reservoir, is a 49 acre impoundment. It is a shallow pond (10-12 feet deep) with a large wetland area associated with it.

Drinking Water and Sanitary Sewer

On-site wells and springs provide the water for homes, businesses, and all public buildings. The Chittenden Grange Hall, Town Hall/Historical Society, and Municipal Building are regulated as Public Transient, Non-community (TNC) water systems.

On-site septic systems provide for sewage disposal for the individual homes, businesses, and all public buildings.

Transportation

There are ±40 miles of roads in Chittenden. Access is limited to two major roads - US Routes 4 and 7. There are no state highways except for 0.142 miles of US Route 73 in the far northeastern corner.

The most heavily traveled road in Chittenden is Chittenden Road. In addition, there are several other roads that have been identified as locally important for use as through-ways, detours, short-cuts, and access to critical facilities such as the fire station, town garage, town office, and school. These routes are shown in orange on the map in **Figure 1**.

Chittenden has a total of 12 bridges and ±280 culverts. All bridges are town owned and have a span of over 20 feet. The local transportation network is maintained by the Town Highway crew, whose garage is located on Holden Road.

According to the Town’s Road Stormwater Management Plan, 60% of the Town’s road mileage is hydrologically connected - meaning it is within 100-feet of a water resource (i.e., perennial/intermittent stream, wetland, lake, or pond). Proximity to water resources can make these sections of road more vulnerable to flooding and fluvial erosion.

Electric Utility Distribution System

Electric service to approximately 760 accounts is provided by Green Mountain Power via two circuits. Average annual outage statistics between 2015 and 2019 are summarized in **Table 1**.

Table 1: Power Outage Summary

5-Year Average (2015-2019)	
Avg # of times a customer was without power	4.77
Avg length of an outage in hours	3.78
# of hours the typical customer was without power	18.03
2019 only	
Avg # of times a customer was without power	4.30
Avg length of an outage in hours	3.47
# of hours the typical customer was without power	14.92

The longest power outage affecting the greatest number of accounts between 2015 and 2019 was 48.62 hours long and impacted 27 accounts. During this same period, there was a 61.27 hour long outage that impacted 13 accounts.

Public Safety

The Chittenden Volunteer Fire Department, Inc. (CVFD) was established in 1957 and is incorporated under the rules of the IRS as a not-for-profit corporation. CVFD owns all its equipment and inventory. Additional support is available through the Rutland County Fire Mutual Aid Association.

Law Enforcement is contracted through the Town of Pittsford Police Department.

Chittenden First Response (CFR), a part of CVFD, was licensed to provide basic emergency medical care to the town in 1982. While CFR provides on-scene emergency medical care, patients are transported to Rutland Regional Medical Center by the Regional Ambulance Service who is automatically dispatched to all CFR calls. Like CVFD, maintaining trained volunteers has been problematic.

Emergency Management

The Town has an appointed Emergency Management Director (EMD). The EMD is supported by a robust local Emergency Management Team, which includes an Emergency Management Coordinator (EMC), Public Information Officer (PIO), and five other members who work to keep the Local Emergency Plan up-to-date as well as to coordinate with the local school, businesses, nearby towns, and regional stakeholders on emergency planning efforts.

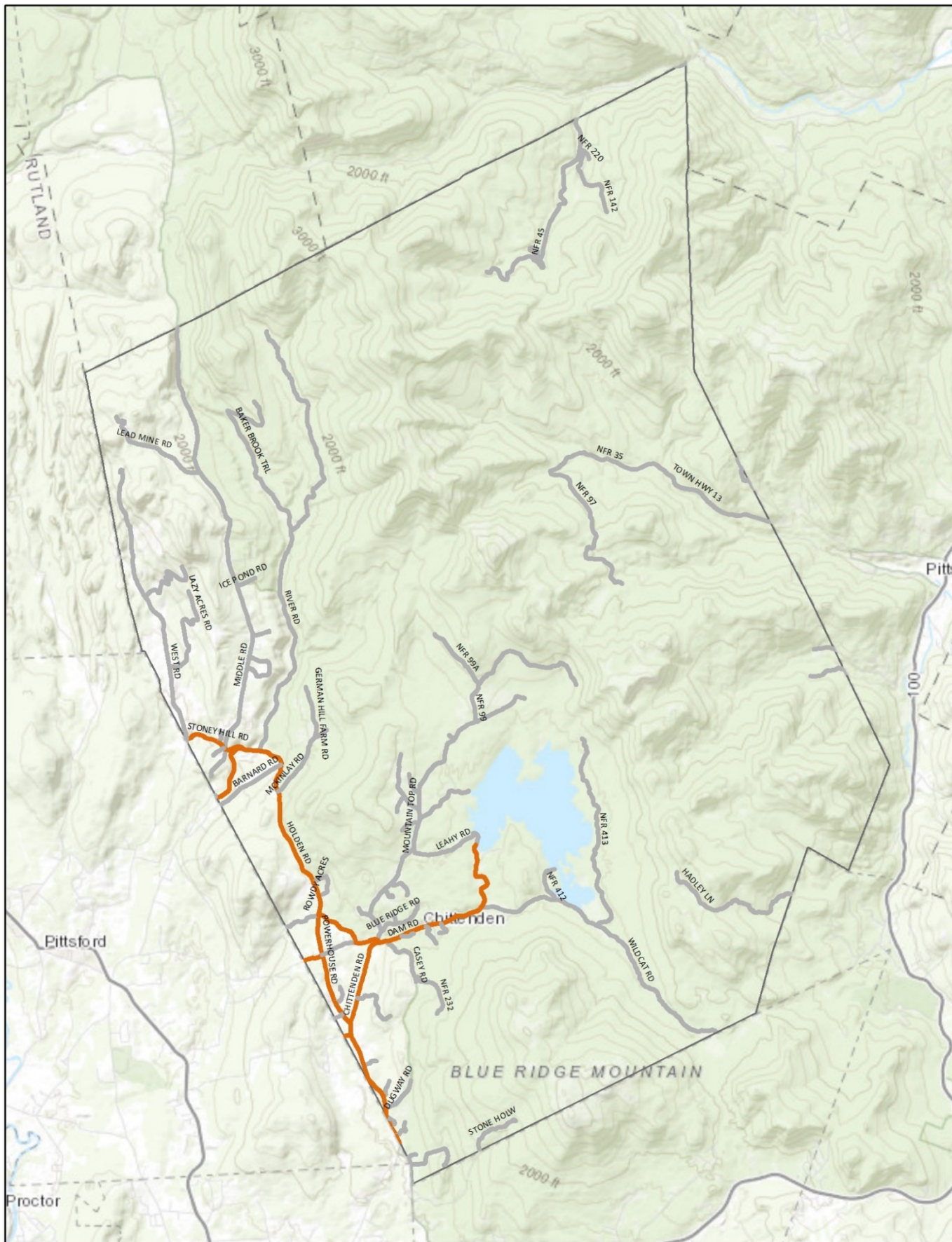


Figure 1: Locally Important Routes for Through-Ways, Detours, Short-Cuts, and Access to Critical Facilities
Shown in orange on Figure 1

4 PLANNING PROCESS

Plan Developers

Steffanie Bourque, an Emergency Management Planner at the Rutland Regional Planning Commission (RRPC), assisted the Town with updating its Local Hazard Mitigation Plan. Hazard Mitigation Grant Program funds from FEMA supported this process.

The Hazard Mitigation Planning Team members who assisted with the update include the local Emergency Management Director, Emergency Management Coordinator, Public Information Officer, Town Health Officer, Selectboard representative, and former Road Commissioner/Selectboard Chair (the current Road Commissioner was on medical leave). All Planning Team members are also members of the Chittenden Emergency Management Team.

Plan Development Process

The 2021 Chittenden Local Hazard Mitigation Plan is an update to the single jurisdiction mitigation plan drafted for the Town in 2016.

A summary of the process taken to develop this Plan is provided in **Table 2**.

Table 2: Plan Development Process

July 23, 2020: Hazard Mitigation Planning Team kick-off meeting. *Due to the COVID-19 pandemic, this was a web-based, virtual meeting.* Planning Team members were confirmed. Discussed what a LHMP is; the benefits of hazard mitigation planning; current plan status; the planning process; outreach strategy; and plan sections. Planning Team meetings were not open to the public.

Late July 2020: Public notice posted on RRPC and Town websites that the Town is engaged in hazard mitigation planning and updating their LHMP. Notices also posted at the Town Office, Town Hall, North Chittenden, and Wooden Barrel bulletin boards. No comments received. Emailed notice to officials in neighboring towns of Goshen, Rochester, Pittsfield, Killington, Mendon, Rutland Town, Pittsford, and Brandon. Name and contact information provided in notices for more information. No comments received from neighboring towns.

August 20, 2020: Planning Team meeting – confirmed the plan purpose and completed work on community profile. Began work on the hazard risk assessment, storm history, and identifying assets vulnerable to the highest risk natural hazards.

September 17, 2020: Planning Team meeting – discussed results of the hazard risk assessment and continued work on the storm history and assets vulnerable to the highest risk natural hazards.

October 8, 2020: Planning Team meeting – completed work on the hazard risk assessment, storm history, and vulnerability summary. Completion of the identification and risk assessment is a critical milestone in the plan update process. Draft readied for public input and prepared for November 5, 2020 Selectboard Special Meeting.

October 26, 2020: Public notice of the November 5, 2020 public meeting posted on the RRPC website and Facebook page as well as the Town Office and municipal website, Facebook page, and Front Porch Forum.

November 5, 2020: Working draft LHMP presented at public meeting of the Selectboard to encourage input from local government and public that could affect the plan’s conclusions and better integrate with related Town initiatives. Members of the public attended and discussed the Plan contents. Working draft posted on RRPC and Town websites. Public notice included instructions to email comments to the Chittenden Emergency Management Team. Comments on the draft plan were accepted until November 19, 2020.

November 5, 2020: Working draft LHMP emailed to Vermont Hazard Mitigation Officer, Rutland Natural Resources Conservation District, Green Mountain National Forest, Green Mountain Power, Mountain Top Inn, Chittenden Fire Department, Barstow School, and other local stakeholders for review and comment. Comments received from Green Mountain National Forest and incorporated into the Plan.

November 17, 2020: Planning Team meeting – incorporated comments received from Green Mountain National Forest into the draft Plan. Began work on the mitigation strategy – confirmed mitigation goals; identified community capabilities; began to evaluate a range of mitigation actions.

Table 2: Plan Development Process (cont.)

December 1, 2020: Planning Team meeting – completed work on community capabilities and continued work evaluating, prioritizing, and selecting mitigation actions for implementation.

December 8, 2020: Planning Team completed work on the mitigation strategy; plan maintenance; and changes since the 2016 plan. Draft LHMP finalized for presentation to local officials and public at the December 14, 2020 Selectboard meeting.

December 9, 2020: Notice of the December 14, 2020 public meeting posted on the RRPC website and Facebook page as well as the Town Office and municipal website, Facebook page, and Front Porch Forum. Final draft LHMP emailed to local officials in neighboring towns, Rutland Natural Resources Conservation District, Green Mountain National Forest, Green Mountain Power, Mountain Top Inn, Chittenden Fire Department, Barstow School, and other local stakeholders for review and comment. No comments received.

December 14, 2020: Final draft LHMP presented at public meeting of the Chittenden Selectboard for review and comment. Members of the public attended and discussed the plan contents. No plan revisions resulted from these discussions. Public notice included instructions to email comments to the Chittenden Emergency Management Team. Comments on the draft plan were accepted until December 23, 2020. No comments received during the public comment period.

December 30, 2020: Final draft LHMP submitted to VEM for Approval Pending Adoption.

In addition to the local knowledge of Planning Team members and other relevant parties, several existing plans, studies, reports, and technical information were utilized in the preparation of this Plan. A summary of these is provided in **Table 3**.

Table 3: Existing Plans, Studies, Reports & Technical Information

2020 Local Emergency Management Plan

2020 FEMA NFIP Insurance Reports

2019 Chittenden Town Plan

2019 Transportation Resiliency Planning Tool

2019-2015 Green Mountain Power Outage Data

2018 State of Vermont Hazard Mitigation Plan

2018 American Community Survey Five-Year Estimate

2017 Chittenden Highway Department Capital Improvement Plan, including Road Erosion Inventory

2012 Flood Hazard Area Regulations

2009 Phase 1 Stream Geomorphic Assessment (SGA) – East Creek Watershed

2007 Phase 2 SGA – Otter Creek Watershed Tributaries

RRPC Local Liaison Reports of Storm Damage

National Oceanic and Atmospheric (NOAA) National Climatic Data Center’s Storm Events Database

FEMA Disaster Declarations for Vermont

OpenFEMA Dataset: Public Assistance Funded Project Summaries for Vermont

United States Drought Monitor

U.S. Geological Survey National Water Information System- Stream Gage Data

FEMA Flood Insurance Rate Maps

Changes Since the 2016 Plan

The goals and recommendations in the Chittenden's 2019 Town Plan are meant to preserve and protect the town's assets while providing for improvements and growth that support the community. The Flood Resilience section of the Town Plan contains three goals:

- 1) The citizens, property and economy, and the quality of the town's natural resources are protected by using sound planning practices to address flood risks.
- 2) The Town is able to recover from flooding quickly and in a manner that improves flood resilience for the future.
- 3) Development in the town occurs in a manner that does not worsen flooding, and natural river functions are restored.

As described in the Community Profile section of this Plan, the Town's population has increased over the past decade. However, there are challenges and physical limitations on continued growth.

Chittenden does not have local zoning to regulate development in the community. However, they do have a Building Permit Ordinance to aid in tracking development. According to the Chittenden Listers, during the past five years the Town added 15 new single family homes and many accessory buildings such as sheds and garages. None of this development occurred in the floodplain or mapped river corridor.

Development in Chittenden since 2016 has not made the community more vulnerable to natural hazards.

The Town's mitigation priorities shifted a bit. In 2016, the Chittenden Local Hazard Mitigation Plan was an all-hazards (natural, manmade, and technological) plan. Floods, fluvial erosion, and ice jams; severe thunderstorms, hurricanes, and tornadoes; wildfires and forest fires; and snow and ice storms were the highest risk natural hazards.

The 2020 Plan update focused exclusively on natural hazards. The Town again ranked thunderstorms, winter storms, and wildfire as the most probable and highest risk natural hazards impacting Chittenden. In addition, they ranked drought as another highest risk natural hazard.

In 2020, the Town did not formally assess the risk associated with invasive species; however, they did discuss the potential hazards and risks associated with the Emerald Ash Borer (EAB) given the confirmed detection in Rutland County in October 2020. Invasive species were not included in the 2016 Plan.

Spurred by new legislation passed in October 2020 to modernize Vermont's tree warden statutes, the role of the local Tree Warden as a partner in hazard mitigation is also a change reflected in the 2020 update.

Chittenden has made considerable progress in completing the mitigation projects identified in the 2016 Plan – see **Appendix C**. A significant accomplishment was securing grant funding to install generators at three of four critical town facilities – Barstow School, Municipal Office, and Town Garage.

Actions taken by Chittenden since 2016 have made the community more prepared and less vulnerable to future natural hazard impacts.

Nonetheless, due to an increase in the frequency and intensity of weather events, the Town remains vulnerable to inundation and flash flooding, fluvial erosion, high winds, severe winter storms, drought, wildfire, as well as the Emerald Ash Borer.

As a result, the Town has identified a range of mitigation actions to address flooding, severe winter storms, wildfire, high winds, drought, and invasive species – see **Table 6**.

5 HAZARD IDENTIFICATION AND RISK ASSESSMENT

After engaging in discussions, the Town identified the following “highest risk hazards” that they believe their community is most vulnerable to:

Local Vulnerabilities and Risk Assessment

One of the most significant changes from the 2016 Plan is the way hazards are assessed. To be consistent with the approach to hazard assessment in the 2018 State Hazard Mitigation Plan, the Hazard Mitigation Planning Team conducted an initial analysis of known natural hazard events¹ to determine their probability of occurring in the future.

The Planning Team then ranked the hazard impacts associated with the known natural hazard events based on the probability of occurrence and potential impact to life, the economy, infrastructure, and the environment. The ranking results are presented in **Table 4**.

- *Thunderstorms with associated flash flooding, fluvial erosion, inundation flooding, and high winds*
- *Winter Storms with associated extreme cold, snow, ice, and high winds*
- *Drought with associated water shortage*
- *Wildfire*

Each of these “highest risk hazards” (**orange** in **Table 4**) are further discussed in this section and depicted in the Local Natural Hazards and Vulnerabilities Map in **Appendix B**.

The “lower risk hazards” that are considered to have a low probability of occurrence and low potential impact are not discussed. For information on these hazards, consult the State Hazard Mitigation Plan.

Table 4: Community Hazard Risk Assessment

Hazard Event	Hazard Impacts	Probability	Potential Impact				Average	Score
			Life	Economy	Infrastructure	Environment		
Thunderstorm	Flash Flooding/ Fluvial Erosion	4	2	3	3	2	2.50	10.00
Tropical Storm/Hurricane								
Landslide	Inundation Flooding	3	2	2	3	2	2.25	6.75
Ice Jam	High Winds	3	2	3	2	2	2.25	6.75
Tornado	Hail	2	1	2	1	1	1.25	2.50
Winter Storm	Cold/Snow /Ice/Wind	3	2	2	2	2	2.00	6.00
Drought	Heat	2	2	2	1	2	1.75	3.50
	Drought	3	2	2	2	2	2.00	6.00
Wildfire	Wildfire	3	2	2	2	3	2.25	6.75
Earthquake	Earthquake	3	1	1	1	1	1.00	3.00

*Score = Probability x Average Potential Impact

	Frequency of Occurrence: Probability of a plausibly significant event	Potential Impact: Severity and extent of damage and disruption to population, property, environment, and the economy
1	Unlikely: <1% probability of occurrence per year	Negligible: isolated occurrences of minor property and environmental damage, potential for minor injuries, no to minimal economic disruption
2	Occasionally: 1–10% probability of occurrence per year, or at least one chance in next 100 years	Minor: isolated occurrences of moderate to severe property and environmental damage, potential for injuries, minor economic disruption
3	Likely: >10% but <75% probability per year, at least 1 chance in next 10 years	Moderate: severe property and environmental damage on a community scale, injuries or fatalities, short-term economic impact
4	Highly Likely: >75% probability in a year	Major: severe property and environmental damage on a community or regional scale, - multiple injuries or fatalities, significant economic impact

¹ This Plan defines natural hazards as atmospheric, hydrologic, geologic, and wildfire phenomena. Hazards not necessarily related to the physical environment, such as infectious disease, were excluded from consideration by the Planning Team.

Dam Breach - Chittenden Reservoir

As previously described in Section 3, the Chittenden Reservoir is a 784 acre man-made impoundment that is owned and operated by Green Mountain Power (GMP) for hydroelectric power generation. The dam is 51 feet high and 937 feet long and consists of earth and rock embankments, a concrete spillway and two outlet conduits. The dam is considered a high hazard dam and is regulated by the Vermont Public Utilities Commission.

Conditions that could create an emergency include operator error/equipment failure, a man-made incident, or a very strong earthquake.

While the Planning Team did not evaluate a Dam Breach as a natural hazard in this Plan, it is worth noting this risk and actions the Town has taken given that a breach of the Chittenden Reservoir would cause catastrophic flooding with loss of life in Chittenden and several downstream towns.

Chittenden works closely with GMP to develop its Emergency Action Plan (EAP) and local evacuation/response plans for this critical infrastructure. The Chittenden Emergency Management Team and Fire Department have access to the EAP, which further describes the facility and the course of action in case of dam failure. The EAP includes a system for regular communication between GMP and town officials. Local officials in downstream towns are notified by email when the water level is lowered due to a heavy rain event or when maintenance is needed.

In 2015, the Town assessed a need to develop an early warning system that would be activated by the GMP Command Center, which monitors the reservoir water level 24/7/365. All involved agreed that using land lines or cell phones could not be done soon enough to start evacuation in the immediate downstream area. The Town applied for and received a FEMA HMGP grant of \$42,000 to purchase and install a warning siren at the GMP hydro-station at 5 Powerhouse Road. Since then it was determined that extended coverage was needed, so three used sirens were purchased and will be installed and tested soon. Sites for these sirens are Chittenden Road north of the Wooden Barrel Store, Dam Road and East Pittsford.

Highest Risk Hazard Profiles

Inundation/Flash Flooding/Fluvial Erosion

Floods can damage or destroy public and private property, disable utilities, make roads and bridges impassable, destroy crops and agricultural lands, cause disruption to emergency services, and result in fatalities. People may be stranded in their homes for a time without power or heat or they may be unable to reach their homes. Long-term collateral dangers include the outbreak of disease, loss of livestock, broken sewer lines or wash out of septic systems causing water supply pollution, downed power lines, loss of fuel storage tanks, fires, and release of hazardous materials.

As noted in the State Hazard Mitigation Plan, “Flooding is the most common recurring hazard event in Vermont” (2018: 55). There are two types of flooding that impact communities in Vermont: inundation and flash flooding. Inundation is when water rises onto low lying land. Flash flooding is a sudden, violent flood which often entails fluvial erosion.

Inundation flooding of land adjoining the normal course of a stream or river is a natural occurrence. If floodplain areas were left in their natural state, floods likely would not cause significant damage.

While inundation-related flood loss can be a significant component of flood disasters, the more common mode of damage in Vermont is associated with fluvial erosion, often associated with physical adjustment of stream channel dimensions and location during flood events. These dynamic and oftentimes catastrophic adjustments are due to bed and bank erosion of naturally occurring unstable stream banks, debris and ice jams, or structural failure of or flow diversion by human-made structures. An ice jam occurs when the ice layer on top of a river breaks into large chunks which float downstream and cause obstructions (State HMP 2018). The Town does not have a high incidence or probability of ice jams. Infrequent ice jamming on Furnace Brook has caused flooding on a low-lying section of River Road about ½ mile from the Holden Road intersection. A streambank restoration project completed in 2017 mitigated this problem. There are no documented ice jams on East Creek.

Several major flooding events have affected the state in recent years, resulting in multiple Presidential Disaster Declarations. From 2003 to 2010, Rutland County experienced roughly \$1.4 million in property damages due to flood events.

The worst flooding event in recent years came in August of 2011 from Tropical Storm Irene (DR4022), which dropped up to 10-11 inches of rain in some areas of Rutland County. Irene caused 2 deaths and \$55,000,000 in reported property damages and \$2.5 million in crop damages in Rutland County. Although the storm was technically a tropical storm, the effects of the storms are profiled in this flooding section, since the storm brought only large rainfall and flooding to the Town, not the high winds typically associated with tropical storms. This caused most streams and rivers to flood in addition to severe fluvial erosion.

From 2012 to 2019, Rutland County experienced approximately \$3.5 million in property damages; with \$1.9 million due to a flash flood event in July 2017 (DR4330) and \$1 million due to a flash flood event in April 2019 (DR4445).

Damage due to flooding usually consists of impacts to roads, culverts, and bridges; however, residential and public buildings, commercial properties, farms, a historic monument, and the National Fish Hatchery also potentially vulnerable.



Inundation Flood Damage on Wildcat Road – April 2019
(Bridge 22 in background)

As shown on the Local Natural Hazards and Vulnerabilities Map in **Appendix B**, Chittenden is vulnerable to inundation flooding. Specifically, at the intersection of Dam / Chittenden / and Holden Roads; on Powerhouse Road by bridge B44; a few spots on River Road; Stoney Hill Road (due to beaver activity on the west side of the road); Furnace Brook Road; and Wildcat Road.



Flooding along Wildcat Road – April 2019

In Chittenden, flooding is a risk. Damages from the April 2019 storm (DR4445) were significant, resulting in approximately \$450,000 in impacts.

21 structures are in the Special Flood Hazard Area (3% of community structures); including residential dwellings and one commercial property. According to FEMA, 10% of these properties have flood insurance. In total, these 4 policies cover \$497,300 in value.

There are no repetitive loss properties.

Flash flooding can impact areas in Town that are located outside of designated floodplains, including along streams confined by narrow valleys. Flash flooding events periodically wash out sections of several roads – Wildcat Road; Casey Road; Mountain Top Road; Lower Mountain Top Road; Mountain Springs Road; and McKinlay Road.



Flash Flood Damage on Mountain Top Road – April 2019

In 2017, the Town completed a Road Erosion Inventory of hydrologically-connected roads for the Municipal Roads General Permit. This inventory identified areas vulnerable to flash flooding and recommended corrective actions to make these areas more resilient.



Flash Flood Damage on Mountain Spring Rd – April 2019

Phase 2 Stream Geomorphic Assessment (SGA) of the East Creek Watershed was completed in 2007. This assessment includes potential restoration/corridor protection projects such as berm removal.

Phase 1 SGA of several Otter Creek Watershed tributaries, including Furnace Brook, was completed in 2009. This assessment focused on current condition of the stream system and generated data for prioritizing reaches where Phase 2 SGA should be conducted. There were ten reaches on Furnace Brook identified. In addition, the assessment recommended development and implementation of a River Corridor Management Plan as a tool for reducing fluvial erosion hazards, minimizing land use conflicts, and providing structure for identifying river restoration and corridor protection projects.

Occurrences of fluvial erosion along Furnace Brook and a tributary to Furnace Brook have been noted with encroachment on River Road and Furnace Brook Road. In addition, fluvial erosion is occurring along East Creek with impacts to Wildcat Road and private property off Powerhouse Road.

High Wind

Severe thunderstorms can produce high winds, lightning, flooding, rains, large hail, and even tornadoes. Thunderstorm winds are generally short in duration, involving straight-line winds and/or gusts more than 50 mph. Thunderstorm winds can cause power outages, transportation and economic disruptions, significant property damage, and pose a high risk of injuries and loss of life. From 2004 to 2010, for thunderstorms that caused more than \$200,000 in damage, Rutland County experienced nearly \$2 million in property damage. From 2011 to 2019, thunderstorms resulted in just under \$2.2 million in property damage in Rutland County, with \$525,000 due to a high wind event in May 2017.

Violent windstorms are possible here. Local topography and effects of the Jet Stream are such that high winds are possible at any time of year, with or without accompanying precipitation. Areas of most frequent impact include Middle Road and Mountain Top Road.

Many storms with high winds result in downed trees, damaged phone and power lines, buildings, and other property. Chittenden is vulnerable to power outages and they present a potentially significant risk to many residents.



High Wind Damage – September 2017

Areas in the Town are served by a broadband phone service and when the power goes out, an in-home battery provides the electricity necessary to make a call. The battery life is about two hours, whether the phone is used or not. Due to the natural terrain in Chittenden, there are many areas that cannot receive cell phone service. During a power outage lasting longer than two hours many will not be able to contact the fire department, police, or ambulance service. This is of concern, especially for Chittenden's elderly and many remote and isolated homes.

To mitigate the impacts of power outages, the following public buildings/critical facilities have been equipped with back-up power: Town Office (which serves as the primary local emergency operations center), Town Garage, and Barstow Memorial School (which serves as the primary local shelter and alternate local emergency operations center).

The North Chittenden Grange Hall, which serves as community's alternate local shelter, is the only remaining critical facility lacking back-up power.

Wildfire

A wildfire is any outdoor fire that is not controlled, supervised, or prescribed. Wildfire probability depends on local weather conditions (lightning, drought, extreme heat); outdoor activities (camping, debris burning, construction); and the degree of public cooperation with fire prevention measures. The 2017 Vermont Wildland Fire Program Annual Report notes that most fires in Vermont are caused by burning debris. Chittenden reported nine (9) wildfires to the State from 1998 to 2018. Campfires were the cause for most of these. The worst reported fire during this time burned 6 acres.

Wildfires can result in widespread damage to property and loss of life. Once a wildfire threatens a community, it is often too late to protect nearby structures, and people must be evacuated.

According to the 2018 Vermont Hazard Mitigation Plan, Vermont has a reliable system of fire suppression infrastructure coordinated at the State-level. Furthermore, Vermont's climate, vegetation type, and landscape tend to discourage major wildfire resulting in a wildfire threat in Vermont that is relatively low based on historical occurrences.



Wildfire behind Chittenden Reservoir – May 2020
Unattended Campfire Burned 1.5 Acres

Although wildfires are currently uncommon, the Town believes there is a risk for wildfire in Chittenden given the fact that fire has been absent from the landscape for quite some time and two-thirds of the land in Chittenden is under control of the U.S. Forest Service, Green Mountain National Forest.

Any occurrence of a larger wildfire in Chittenden would likely be the result of local weather conditions (e.g., long period of drought followed by a large scale wind event increasing the fuel loading), but the average return interval of catastrophic large fires range upwards to 600 years.

The vulnerability to wildfire is considered to be higher in the wildland-urban interface – the area where infrastructure interacts with undeveloped land, creating the potential for fire to move from a forested environment to residential development.

Extreme Cold/Snow/Ice/Wind

In the Rutland Region, most winter weather events occur between the months of December and March. Throughout the season, winter weather events can include snowstorms, mixed precipitation events of sleet and freezing rain, blizzards, glaze, extreme cold, the occasional ice storm, or a combination of any of the above. Events can also be associated with high winds or flooding, increasing the potential hazard.

The costs of these storms come in the form of power outages due to heavy snow or ice accumulations, damaged trees, school closings and traffic accidents. From 2002 to 2010, Rutland County experienced \$1.1 million in property and crop damages from winter storms. From 2011 to 2019, Rutland County experienced \$1.5 million in property damage, with \$300,000 due to a 10” to 20” heavy, wet snowfall across the county on December 9, 2014.

There have been four winter storm-related federally declared Disasters in the county (the ice storm of January 1998 – DR 1201; severe winter storms in December 2000 and 2014 – DR 1358 and DR 4207, respectively; and severe storm and flooding in April 2007 – DR 1698).

Typically, towns’ vulnerability to snow and ice storms are power outages and loss of road accessibility. As previously described, except for the serious issue of loss of broadband telephone communication, the Town is prepared for a power outage caused by ice/wet snow accumulation on power lines or trees falling on powerlines due to weight of ice accumulation in a storm, especially if the outage coincided with a large scale sheltering event.

In general, snow accumulation has not made the Town vulnerable to loss of road accessibility. The Town’s fleet of snowplows has ensured that roads are accessible, even in major snow accumulation events. There is only one area prone to minor drifting on West Road and it is maintained accordingly.

Drought

Drought, in the most general sense, is a period of lower-than-average precipitation that results in a water shortage.

It is typically a slow-onset natural hazard that can last for months or years. Drought is a natural part of the climate cycle. Higher temperatures, water demands that exceed availability, low winter snowpack and lack of rainfall are all causes that can lead to a significant drought.

The USDA rates droughts from D0-D4, depending on the severity of the drought, the amount of time it will take for vegetation to return to normal levels, and the possible effects of the drought on vegetation and water supply:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought



Ice Storm Damage – December 2018

Drought is a natural phenomenon that has unique characteristics that make it different from other hazards. Reference the 2018 State Hazard Mitigation Plan for a full discussion of how drought differs from other natural hazards.

In addition to the obvious effects on the quantity and quality of drinking water, drought can compromise food and nutrition; increase incidents of illness and disease; and diminish the ability of water ecosystems to properly function.

Municipal water supply and delivery, municipal wastewater, transportation systems, and parks and recreational facilities can all be adversely impacted by drought.

There may be situations where water-intensive industries and agricultural production shift to different locations due to lack of water. Other industries directly affected include energy, tourism, and fisheries. The wide-ranging impacts of drought can include job losses, business failures, and lost investments.

When different natural hazards overlap, such as drought and flood, it can lead to cascading hazards, with one event compounding the other. Drought is particularly likely to be part of a cascading hazard because it can cover a large area and go on for a long time.

In the Rutland region, there have been several instances of moderate drought (D1) and one instance in the last 20 years of severe drought (D2). The region is in a moderate drought at the time of this writing.

Drought impacts of concern in Chittenden include the following:

- Loss of snow cover with moderate to severe impacts on ski and snowmobile recreation, tourism, and the local economy.
- Reduced fall foliage with moderate impacts on the local tourism economy.
- Interruption of water supply with minor to moderate impacts on drinking water supplies and surface waters for fire suppression.



Drought Impacts on Teenie's Pond – August 2020
Historically Used for Fire Suppression

Several residences and camps experienced the loss of water in their wells/springs during the summer of 2020. In some cases, landowners indicated this is the first time this has happened in over twenty years.

- Increased occurrences of wildland fires with minor to moderate impacts on human life, built infrastructure, and the natural environment (particularly for spruce/fir forests and deer wintering areas).
- Crop and agricultural losses with minor to moderate impacts on maple syrup production and minor impacts on hay production, perennial fruit and orchards, and livestock.
- Increases in human/wildlife conflict with minor impacts due to shift from natural food systems (mast crops, etc.) to human food sources and habituation.

Invasive Species

The Planning Team did not formally assess the risk associated with invasive species; however, they did discuss the potential hazards and risks associated with the Emerald Ash Borer (EAB) specifically.

Vermont's EAB infestation was first detected in 2018 in northern Orange County. In October 2020, a new detection of EAB in West Rutland was confirmed. This is the first confirmed detection in Rutland County, making Chittenden a "High Risk Area" for EAB. An inventory of trees within the road right-of-way is needed to determine how many Ash trees are at risk. The potential risk to private woodlots and impacts on the local economy have not been quantified.

Highest Risk Hazard History

Note: These are the most up to date significant events impacting Chittenden. Federal declarations are depicted in **bold**.

Inundation/Flash Flooding/Fluvial Erosion

4/15/2019: DR4445 1-2” rain with significant snow melt: **\$450,000 local damage**

7/1/2017: DR4330 3-4” rain the previous 3-4 days with flash flooding on 7/1/17: **no reported local damage**

7/9/2013: 2-3” rain: no reported local damage

6/25-7/11/2013: DR4140 with heavy rain over multiple days: **no damage reported**

8/28/2011: DR4022 Tropical Storm Irene with ±5” rain: **\$180,133 local damage** (\$5,414 Individual/\$174,719 Public)

10/1/2010: 4-5” rain: \$40,000 regional damage

4/13/2002: 1-3” rain with snow melt: \$69,596 local damage

12/17/2000: DR1358 2 ½-4” rain: **\$21,900 local damage**

7/14/2000: DR1336 heavy rain: **\$6,000 local damage**

High Wind

2/24/2019: 48 mph winds: \$25,000 regional damage

9/6/2018: 55 mph wind: \$2,000 local damage

4/1/2018: 55 mph winds: \$50,000 regional damage

10/30/2017: 40 mph wind: \$100,000 regional damage

9/5/2017: 55 mph winds: \$25,000 local damage

5/27/2014: 55 mph winds: \$5,000 local damage

10/29/2012: 50 mph winds: \$25,000 regional damage

7/6/2011: 50 mph winds: \$5,000 local damage

8/25/2007: 55 mph wind: \$400,000 regional damage

8/16/2007: 60 mph wind / 1.5” hail: \$150,000 local damage

6/9/2004: 50 mph wind: \$5,000 local damage

Extreme Cold/Snow/Ice/Wind

3/31/2017: 8” snow: \$10,000 regional damage

2/1/2015: Record cold month with 15 to 20+ days below zero: no reported impact

1/7/2015: 0 - 10° with winds of 15-30 mph creating wind chills colder than -20 to -30 below zero: no reported impact

12/9/2014: DR4207 10-20” snow: **\$8,165 local damage**

11/26/2014: 8-12” snow: \$25,000 regional damage

2/13/2014: 24” snow: \$10,000 regional damage

12/26/2012: Snowfall rate of 1-2” per hour with accumulations of 6-8”: \$10,000 regional damage

2/23/2010: 6-30” snow: \$200,000 regional damage

12/2/2007: 15” snow: \$10,000 regional damage

4/15-16/2007: DR1698 “Nor’icane” with 3” snow and rain with winds of 60 to 80 mph: **no reported local damage**

3/5/2001: EM3167 2-18” snow: **no reported local damage**

Drought

11/11/2020: USDA Disaster S4869 2020 Crop Year

Jun – Aug 2020: D1 drought in 50-100% of county

Jun – Sept 2018: D1 drought in 50-100% of county

Sept 2016 – Feb 17: D1 drought in 50-100% of county

Oct – Nov 2016: D2 drought in 60% of county

Sept 2001 – Mar 02: D1 drought in 50-100% of county

Vulnerability Summary

Inundation/Flash Flooding/Fluvial Erosion

Location¹: *Inundation Flooding* – Dam/Chittenden/Holden Rd intersection, Powerhouse Rd, and Wildcat Rd along East Creek; River Rd, Stoney Hill Rd, and Furnace Brook Rd along Furnace Brook

Flash Flooding – Wildcat Rd, Casey Rd, Mountain Top and Lower Mountain Top Rds, Mountain Springs Rd, McKinlay Rd

Fluvial Erosion – Wildcat, River, West, and Powerhouse Rds

Vulnerable Assets¹: Roads, culverts, bridges, homes, farms, public buildings, commercial property, rec trails, US Fish Hatchery, historic monument

Extent: ±5” rain; extent data for fluvial erosion unavailable

Impact: \$450,000 local damage

Probability: Inundation Flooding: >10% but <75% chance per year; Flash Flooding/Fluvial Erosion: >75% chance per year

High Wind

Location¹: Town-wide; Middle and Mountain Top Rds

Vulnerable Assets¹: Phone and power lines; buildings; other property; trees

Extent: ±60 mph winds

Impact: \$400,000 regional / \$150,000 local damage

Probability: >10% but <75% chance per year

Extreme Cold/Snow/Ice/Wind

Location¹: Town-wide

Vulnerable Assets¹: Roads, culverts, bridges, trees, power and phone lines

Extent: Up to 30” of snow; 80 mph winds, 15 to 20+ days below zero

Impact: \$200,000 regional / \$8,165 local damage

Probability: >10% but <75% chance per year

Drought

Location¹: Town-wide

Vulnerable Assets¹: Water supplies, natural ecosystems, agriculture

Extent: D2 drought in 60% of county for 2 months

Impact: Data on financial impacts is unavailable

Probability: >10% but <75% chance per year

¹ See **Appendix B:** Local Natural Hazards and Vulnerabilities Map

6 HAZARD MITIGATION STRATEGY

The highest risk natural hazards and vulnerabilities identified in the previous section of this Plan directly inform the hazard mitigation strategy outlined below, which the community will strive to accomplish over the coming years. The mitigation strategy chosen by the Town includes the most appropriate activities to lessen vulnerabilities from potential hazards.

Mitigation Goals

The Hazard Mitigation Planning Team discussed mitigation goals and identified the following as the community's main mitigation goals:

- Reduce or avoid long-term vulnerabilities to identified hazards.
- Reduce the loss of life and injury resulting from these hazards.
- Mitigate financial losses incurred by municipal, residential, industrial, agricultural, and commercial establishments due to disasters.
- Reduce the damage to public infrastructure resulting from these hazards.
- Encourage hazard mitigation planning as a part of the municipal planning process.
- Encourage the adoption and implementation of existing mitigation resources, such as River Corridor Plans and Fluvial Erosion Hazard Maps, if available.
- Recognize the connections between land use, stormwater, road design, maintenance, and the effects from disasters.
- Ensure that mitigation measures are sympathetic to the natural features of community rivers, streams, and other surface waters; historic resources; character of neighborhoods; and the capacity of the community to implement them.

Community Capabilities

Each community has a unique set of capabilities, including authorities, programs, staff, funding, and other resources available to accomplish mitigation and reduce long-term vulnerability. Chittenden's mitigation capabilities that reduce hazard impacts or that could be used to implement hazard mitigation activities are listed below.

Administrative and Technical

In addition to the Emergency Management staff described in Section 3, municipal staff that can be used for mitigation planning and to implement specific mitigation actions include: Town Clerk, Town Treasurer, Road Commissioner, highway crew, and Highway Grant Administrator.

In addition to paid staff, there is a 5-member Selectboard, Town Health Officer, Town Tree Warden, Town Fire Warden, Fire Chief, and First Response Administrator.

Note: Due to vacancies, the Chittenden Selectboard is currently functioning as the local Planning Commission.

To augment local resources, the Town has formal mutual aid agreements for emergency response - fire, EMS, and public works. Technical support is available through the RRPC in the areas of land use planning, emergency management, transportation, GIS mapping, and grant writing. Technical support is also available through the State ANR for floodplain administration; VTrans Districts for hydraulic analyses; and the US Forest Service for land management.

Strengths: High functioning local emergency management (EM) team whose members are trained in damage assessment to lessen burden on Highway crew ● accounting system to utilize EM team as paid temporary employees ● dedicated staff person to administer grants for highway infrastructure ● strong partnerships with major stakeholders

Areas for Improvement: Highway staff training on road maintenance protocols and VOSHA requirements ● Tree Warden needs to take a more proactive role in highway maintenance programs ● written job descriptions with annual performance evaluations for paid employees ● consider assistants for positions that are a single person such as Town Health Officer ● increase number of fire fighter and rescue personnel, consider paying staff

Planning and Regulatory

Planning and regulatory capabilities are the plans, policies, codes, and ordinances that prevent and reduce the impacts of hazards. Examples of planning capabilities that can either enable or inhibit mitigation include land use plans, capital improvement programs, transportation plans, stormwater management plans, disaster recovery and reconstruction plans, and emergency preparedness and response plans. Examples of regulatory capabilities include the enforcement of zoning ordinances, subdivision regulations, and building codes that regulate how and where land is developed, and structures are built.

Strengths: Plans are regularly updated on schedule ● recent town ordinance on building permits ● strong partnerships with major stakeholders

Areas for Improvement: Plan for regular and ongoing maintenance of paved and gravel roads ● keep Highway Department Capital Improvement Plan current ● appoint an Administrative Officer to implement the Flood Hazard Area Regulations ● staff training on the value of capital planning ● inform residents about the value of river corridor protections ● Continuity of Operations Plan ● expand cellular and broadband coverage re-establish a local Planning Commission

Flood Hazard Area (FHA) Regulations: Adopted February 2012

Description: Apply to all areas in the Town identified as areas of special flood hazard.

Relationship to Natural Hazard Mitigation Planning: Ensures the design and construction of development in flood and other hazard areas are accomplished in a manner that minimizes or eliminates the potential for flood loss or damage to life and property.

Road and Bridge Standards: Adopted on August 12, 2019

Description: Provide minimum codes and standards for the construction, repair, and maintenance of all town roads and bridges.

Relationship to Natural Hazard Mitigation Planning: The standards include management practices and are designed to ensure the safety of the traveling public, minimize damage to road infrastructure during flood events, and enhance water quality protections.

Fire Department ISO Rating: Issued in 2020

Description: The Chittenden Volunteer Fire Department's ISO rating is 10. This rating is a score from 1 to 10 that indicates how well-protected the community is by the local fire department.

Relationship to Natural Hazard Mitigation Planning: Everyone wants to keep family, home, and business safe from fires. The ISO rating is a measure of the effectiveness of a community's fire services.

Municipal Plan: Adopted October 19, 2015, Amended July 22, 2019

Description: A framework for defining and attaining community aspirations through public investments, land use regulations, and other implementation programs.

Relationship to Natural Hazard Mitigation Planning: The Emergency Management and Flood Resilience sections of the Municipal Plan include specific goals and objectives related to natural hazard mitigation.

Local Emergency Management Plan: Last adopted on April 27, 2020

Description: Establishes lines of responsibility and procedures to be implemented during a disaster and identifies high risk populations, hazard sites, and available resources.

Relationship to Natural Hazard Mitigation Planning: Includes actions for tracking events and response actions including damage reports to facilitate funding requests during recovery. This type of information can be essential to preparing hazard mitigation project applications for FEMA funding.

Highway Department Capital Improvement Plan: December 2017

Description: Comprehensive plan for equipment replacement, paving and structures projects, with estimated costs and revenues.

Relationship to Natural Hazard Mitigation Planning: Includes an equipment replacement schedule to ensure the town maintains adequate road and debris clearing capabilities; culvert replacement schedule for all culverts in poor condition; and very high priority projects from the road erosion inventory designed to minimize or eliminate flood impacts on hydrologically-connected road segments.

Financial

Financial capabilities are the resources that a community has access to or is eligible to use to fund mitigation actions.

Chittenden's current annual budget is approximately \$962,870, with \$123,200 to fund the Highway Department. Although the Town has not done so in the past, it is eligible to incur debt through general obligation bonds to fund mitigation actions.

Strengths: Maximize grant opportunities

Areas for Improvement: Establish a line of credit for unexpected road damages ● tax revenues are sufficient for daily operations to maintain the status quo but insufficient to handle contingencies and/or improvements ● capital improvement financing ● difficult to understand Town financial records in town report ● develop a 501(c)3 to collect donations

Education and Outreach

Chittenden has several education and outreach opportunities that could be used to implement mitigation activities and communicate hazard-related information:

- Chittenden Public Library
- Friends of Chittenden Public Library
- Chittenden Historical Society
- Barstow School PTO
- Chittenden Dammers Snowmobile Club
- Mendon Fish and Game Club
- Bone Builders
- Chittenden Senior Group
- Barstow Youth Club
- Boys and Girls Club

Strengths: Strong Facebook and town web page ● frequent collaboration with Chittenden Public Library and Volunteer Fire Department ● well-established emergency planning relationship with Barstow School ● volunteer support on Town initiatives ● local newspaper *Chit Chat* (on hold during the COVID-19 pandemic)

Areas for Improvement: Expand use of Front Porch Forum ● consider ways to provide information to those who do not use internet/cell phones

National Flood Insurance Program Compliance

The Town joined the National Flood Insurance Program (NFIP) in 1985. In the absence of a current Administrative Officer, the Selectboard enforces NFIP compliance through permit review requirements in its Flood Hazard Area regulations. Chittenden's regulations outline detailed minimum standards for development in flood hazard areas defined as FEMA Special Flood Hazard and Floodway Areas. To continue NFIP compliance, the Town:

- 1) Provided information to residents on safe building initiatives and the availability of flood insurance.
- 2) Will consider adopting river corridor protection language in the flood hazard regulations bylaw.
- 3) Works with the RRPC to ensure that floodplain and river corridor maps are kept up to date.
- 4) Is currently working with USGS to update the FEMA FIRM in the Otter Creek Watershed.

State Incentives for Flood Mitigation

Vermont's Emergency Relief Assistance Funding (ERAF) provides state funding to match FEMA Public Assistance after federally-declared disasters. Eligible public costs are generally reimbursed by FEMA at 75% with the State matching 7.5%. The State will increase its match to 12.5% or 17.5% of the total cost if communities take steps to reduce flood risk as described below.

12.5% funding for eligible communities that have adopted four (4) mitigation measures:

- 1) NFIP participation
- 2) Town Road and Bridge Standards
- 3) Local Emergency Plan
- 4) Local Hazard Mitigation Plan

17.5% funding for eligible communities that also participate in FEMA's Community Rating System OR adopt Fluvial Erosion Hazard or other river corridor protection bylaw that meets or exceeds the Vermont ANR model regulations.

Chittenden's current ERAF rating is 12.5% because they have adopted all four mitigation measures. Chittenden could increase their ERAF rate to 17.5% by adopting river corridor bylaws.

Mitigation Action Identification

The Hazard Mitigation Planning Team discussed the mitigation strategy, reviewed projects from the 2016 Plan, and identified possible new actions from the following categories for each of the highest risk natural hazards identified in Section 5:

- 1) **Local Plans and Regulations:** These actions include government authorities, policies, or codes that influence the way land and buildings are developed and built.
- 2) **Structure and Infrastructure Projects:** These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This applies to public or private structures as well as critical facilities and infrastructure. Many of these types of actions are projects eligible for funding through the FEMA Hazard Mitigation Assistance Program.
- 3) **Natural Systems Protection:** These are actions that minimize damage and losses and preserve or restore the functions of natural systems.
- 4) **Education and Awareness Programs:** These are actions to inform and educate the public about hazards and potential ways to mitigate them. Although this type of mitigation reduces risk less directly than structural projects or regulation, it is an important foundation. A greater understanding and awareness of hazards and risk is more likely to lead to community support for direct actions.

Local Plans and Regulations

Integrate Mitigation into Capital Improvement Programs: Hazard mitigation can be included in capital improvement programs by incorporating risk assessment and hazard mitigation principles into the capital planning efforts.

Manage Development in Erosion Hazard Areas:

The intent of River Corridor Bylaws is to 1) allow for wise use of property within river corridors that minimizes potential damage to existing structures and development from flood-related erosion, 2) discourage encroachments in undeveloped river corridors and 3) reasonably promote and encourage infill and redevelopment of designated centers that are within river corridors.

Improve Stormwater Management Planning: Rainwater and snowmelt can cause flooding and erosion in developed areas. A community-wide stormwater management plan can address stormwater runoff.

Reduce Impacts to Roadways: The leading cause of death and injury during winter storms is from automobile or other transportation accidents, so it is important to plan for and maintain adequate road and debris clearing capabilities.

Map and Assess Vulnerability to Wildfire: Identify wildfire hazard areas and assess overall community vulnerability.

Develop a Wildland-Urban Interface Code: Develop specific design guidelines and development review procedures for new construction, replacement, relocation, and substantial improvement in wildfire hazard areas.

Develop a Community Wildfire Protection Plan: A CWPP 1) identifies and prioritizes areas for hazardous fuel reduction treatments, 2) recommends the types and methods of treatment on Federal and non-Federal land that will protect an at-risk community and essential infrastructure; and 3) recommends measures to reduce structural ignitability through the at-risk community. A CWPP may address issues such as wildfire response, community preparedness, and structure protection.

Develop a Drought Contingency Plan: A strategy or combination of strategies for monitoring the progression of a drought and preparing a response to potential water supply shortages resulting from severe droughts or other water supply emergencies.

Structure and Infrastructure Projects

Remove Existing Structures from Flood Hazard Areas: FEMA policy encourages and may provide funding for the removal of structures from flood-prone areas to minimize future flood losses and preserve lands subject to repetitive flooding.

Improve Stormwater Drainage Capacity: Improving the stormwater drainage capacity can help to minimize inundation flooding and fluvial erosion by: 1) increasing drainage/absorption capacities with green stormwater management practices;

2) increasing dimensions of undersized drainage culverts in flood-prone areas; 3) stabilizing outfalls with riprap and other slope stabilization techniques; and 4) re-establishing roadside ditches.

Conduct Regular Maintenance for Drainage Systems: Regular maintenance will help drainage systems and flood control structures continue to function properly. Techniques include: 1) routinely cleaning and repairing stormwater infrastructure – culverts, catch basins, and drain lines; 2) routinely cleaning debris from support bracing underneath low-lying bridges; and 3) inspecting bridges and identifying if any repairs or retrofits are needed to maintain integrity or prevent scour.

Protect Infrastructure and Critical Facilities: Mitigation techniques can be implemented to help minimize losses to infrastructure and protect critical facilities from flood events by: 1) elevating roads above the base flood elevation to maintain dry access; 2) armoring the banks of streams near roadways to prevent washouts or 3) rerouting a stream away from a vulnerable roadway; and 4) floodproofing critical facilities.

Protect Power Lines: Power lines can be protected from the impacts of natural hazards by: 1) incorporating inspection and maintenance of hazardous trees within the road right-of-way into the drainage system maintenance process and 2) burying power lines.

Retrofit Critical Facilities: Critical facilities can be protected from the impacts of high winds and winter storms. Techniques include: 1) retrofitting critical facilities to strengthen structural frames to withstand wind and snow loads; 2) anchoring roof-mounted mechanical equipment; and 3) installing back-up generators or quick connect wiring for a portable generator.

Retrofit At-Risk Structures with Ignition-Resistant Materials: Protect existing structures in wildfire hazard areas using non-combustible materials and technologies.

Create Defensible Space Around Structures and Infrastructure: Local governments can implement defensible space programs to reduce risk to structures and infrastructure.

Invest in Infrastructure to Expand Water Supplies: Improve water supply and delivery systems to ensure adequate supply for fire suppression during times of drought.

Natural Systems Protection

Protect and Restore Natural Flood Mitigation Features: Natural conditions often provide floodplain protection, riparian buffers, groundwater infiltration, and other ecosystem services that mitigate flooding. It is important to preserve such functionality. Possible projects include: 1) establishing vegetative buffers in riparian areas; 2) stabilizing stream banks; 3) removing berms; 4) minimizing impervious area development; and 5) restore incision areas.

Implement a Fuels Management Program: To reduce hazards vegetation fuels on public lands, near essential infrastructure, or on private lands by work with landowners. The program can include: 1) performing fuel management techniques; 2) using prescribed burns to reduce fuel loads; 3) sponsoring local “slash and clean-up days” to reduce fuel loads along the wildland-urban interface.

Education and Awareness Programs

Educate Property Owners About Freezing Pipes: Extreme cold may cause water pipes to freeze and burst, which can cause flooding inside a building. Consider: 1) educating building owners on how to protect their pipes and 2) informing homeowners that keeping water within the pipes moving by letting a faucet drip during extreme cold weather may prevent freezing and the buildup of excessive pressure in the pipeline, avoiding bursting.

Assist Vulnerable Populations: Measures could be taken to ensure vulnerable populations are adequately protected from the impacts of natural hazards, such as: 1) organizing outreach and 2) establishing and promoting accessible heating or cooling centers in the community.

Increase Wildfire Awareness: Target citizens and businesses to increase awareness of wildfire risk and strategies for protecting homes and infrastructure. Consider: 1) offering online GIS hazard mapping; 2) working with Green Mountain National Forest to provide wildfire safety information to area residents.

Educate Residents on Drought-related Hazards and Water Saving Techniques:

Increase awareness of drought-related hazards such as brush fire, diminished water quality and quantity. Encourage residents to take water-saving measures, such as 1) installing low-flow water saving showerheads and toilets; 2) checking for leaks in plumbing or dripping faucets; and 3) installing rain-capturing devices for irrigation.

Mitigation Action Evaluation and Prioritization

For each mitigation action identified, the Hazard Mitigation Planning Team evaluated its potential benefits and/or likelihood of successful implementation. Each action was evaluated against a broad range of criteria, including a planning level assessment of whether the costs are reasonable compared to the probable benefits. Results of this evaluation are presented in **Table 5**.

Mitigation Action Implementation

After careful evaluation and prioritization, the Planning Team agreed upon a list of actions that are acceptable and practical for the community to implement.

Those actions without overall public support/political will were not selected for implementation. Those actions whose costs were not reasonable compared to the probable benefits were also not selected.

For the selected actions, the Planning Team then 1) assigned a responsible party to lead the implementation of each action; 2) identified potential funding mechanisms; and 3) developed a timeframe for implementing each action. This action plan is presented in **Table 6**.

Note that the Town will make every effort to maximize use of future Public Assistance Section 406 Mitigation opportunities when available during federally declared disasters.

Table 5: Mitigation Action Evaluation and Prioritization

Mitigation Action	Life Safety	Prop Protect	Tech	Political	Admin	Other Obj	Benefit Score	Est Cost	C/B
Local Plans and Regulations									
Improve Stormwater Management Planning by Completing a Stormwater Management Plan	1	1	1	1	1	1	6	1	Y
Plan for and Maintain Adequate Road and Debris Clearing Capabilities	1	1	1	1	1	1	6	1	Y
Update Road Erosion and Culvert Inventories	1	1	1	1	1	1	6	1	Y
Review VTrans Bridge Inspection Reports ¹ and Plan for Identified Repairs to Prevent Scour	1	1	1	1	1	1	6	1	Y
Integrate Mitigation into Capital Improvement Programs	1	1	1	0	1	1	5	1	Y
Manage Development in Erosion Hazard Areas with River Corridor Bylaws	1	1	1	0	-1	1	3	1	Y
Map and Assess Vulnerability to Wildfire	1	1	1	0	-1	1	3	1	Y
Develop a Community Wildfire Protection Plan	1	1	1	1	1	1	6	1	Y
	Planning Team did not recommend this action for implementation; however, the Town will consider developing a Community Wildfire Protection Plan when grant funding through the VT Wildland Fire Program becomes available.								
Develop a Drought Contingency Plan	1	1	1	1	1	1	6	1	Y
	Planning Team did not recommend this action for implementation; however, the Town will monitor for drought and collaborate with the Town Health Officer if property/business owners experience issues with water supply.								
Develop a Wildland-Urban Interface Code	1	1	0	0	-1	0	1	1	Y
	Planning Team did not recommend this action for implementation because the Town does not have the administrative capacity to enforce a code.								
Structure and Infrastructure Projects									
Routinely Clean and Repair Stormwater Infrastructure	1	1	1	1	1	1	6	1	Y
Protect Power Lines and Roadway by Inspecting and Removing Hazardous Trees in Road ROW	1	1	1	1	1	1	6	1	Y
Install Back-up Generators or Quick Connect Wiring at Critical Facilities	1	1	1	1	1	1	6	1	Y
Increase Dimension of Drainage Culverts in Flood-Prone Areas	1	1	1	1	1	1	6	1-3	Y
Invest in Infrastructure to Expand Water Supplies	1	1	1	0	0	1	4	1	Y
Stabilize Outfalls	1	1	1	1	1	1	6	1-2	Y
	Planning Team did not recommend this action for implementation due to lack of information about the condition of culvert outfalls. Once the Town updates the culvert inventory, then data should be available to identify outfalls that require stabilization and a plan to address them will be developed.								
Install/Re-establish Roadside Ditches	1	1	1	1	1	1	6	1-2	Y
	Planning Team did not recommend this action for implementation due to lack of information about where new or re-worked ditches are needed. As the Town develops a schedule for addressing non-compliant road segments under the MRGP, areas for new or re-worked ditches will be identified and addressed.								
Increase Drainage/Absorption Capacities with Green Stormwater Management Practices	1	1	0	0	0	1	3	1	Y
	Planning Team did not recommend this action for implementation due to lack of information about appropriate locations for these practices. Once the Town completes a Stormwater Management Plan, appropriate locations may be identified and addressed accordingly.								

¹ VTrans inspects all town-owned bridges in the State's Town Highway Bridge Program every two years. Bridge inspection reports are available on the VTrans website.

Mitigation Action	Life Safety	Prop Protect	Tech	Political	Admin	Other Obj	Benefit Score	Est Cost	C/B
Elevate Roads Above Base Flood Elevation to Maintain Dry Access	1	1	1	1	1	1	6	3	Y
	Town is currently elevating a section of Wildcat Road with grant funding through the ANR Ecosystem Restoration Program. No additional road elevation projects are recommended for implementation.								
Create Defensible Space Around Structures and Infrastructure	1	1	0	0	0	0	2	2	N
Bury Power Lines	1	1	-1	-1	-1	0	-1	3	N
Retrofit At-Risk Structures with Ignition-Resistant Materials	1	1	-1	-1	-1	0	-1	3	N
Routinely Clear Debris from Support Bracing Underneath Low-Lying Bridges	No low-lying bridges, so the Planning Team did not evaluate this action.								
Remove Existing Structures from Flood-Prone Areas	No repetitive loss structures in flood-prone areas, so the Planning Team did not evaluate this action.								
Floodproof Critical Facilities	No critical facilities that need floodproofing, so the Planning Team did not evaluate this action.								
Retrofit Critical Facilities to Strengthen Structural Frames to Withstand Wind and Snow Loads	No critical facilities that need structural retrofits, so the Planning Team did not evaluate this action.								
Anchor Roof-Mounted Mechanical Equipment on Critical Facilities	No critical facilities with roof-mounted mechanical equipment, so the Planning Team did not evaluate this action. The base radio antenna was anchored in 2016 using funds from FEMA EMPG.								
Natural Systems Protection									
Stabilize Stream Banks	1	1	1	1	1	1	6	2	Y
Establish Vegetative Buffers in Riparian Areas	Planning Team did not evaluate these actions because there are no known areas; however, the Town will collaborate with the Rutland Natural Resources Conservation District to identify and implement natural systems protection projects that meet the goals of this Plan.								
Remove Berms									
Restore Incision Areas									
Implement Fuels Management Program	0	1	-1	0	-1	1	0	1	Y
	Planning Team did not recommend this action for implementation because the Town lacks technical/administrative capacity to implement the program.								
Education and Awareness Programs									
Educate Property Owners about Freezing Pipes	1	1	1	1	1	1	6	1	Y
Increase Wildfire Risk Awareness	1	1	1	1	1	1	6	1	Y
Educate Residents on Drought-related Hazards and Water Saving Techniques	1	1	1	1	1	1	6	1	Y
Participate in Firewise Program	1	1	0	0	0	1	3	1	Y
Keep the Ditches Clean Campaign	0	1	0	0	0	1	2	1	Y
Assist Vulnerable Populations	Town already has a plan in place to assist vulnerable populations – see 2020 Local Emergency Management Plan.								

Table 5 Evaluation Criteria:

Life Safety – How effective will the action be at protecting lives and preventing injuries?

Property Protection – How effective will the action be at eliminating or reducing damage to structures and infrastructure?

Technical – Is the mitigation action a long-term, technically feasible solution?

Political – Is there overall public support/political will for the action?

Administrative – Does the community have the administrative capacity to implement the action?

Other Community Objectives – Does the action advance other community objectives, such as capital improvements, economic development, environmental quality, or open space preservation?

Rank each of the above criteria in Table 5 with a -1, 0, or 1 using the following table:

1= Highly effective or feasible

0 = Neutral

-1 = Ineffective or not feasible

Estimated Cost – 1 = less than \$50,000; 2 = \$50,000 to \$100,000; 3 = more than \$100,000

C/B – Are the costs reasonable compared to the probable benefits? Yes or No

Table 6 Community Lifelines Description: A Community Lifeline enables the continuous operation of critical government and business functions and is essential to human health and safety or economic security. The primary objective of lifelines is to ensure the delivery of critical services that alleviate immediate threats to life and property when communities are impacted by disasters. These critical services are organized into one of seven lifelines:








 Safety and Security	 Food, Water, Shelter	 Health and Medical	 Energy (Power & Fuel)	 Communications	 Transportation	 Hazardous Materials
<ol style="list-style-type: none"> 1. Law Enforcement 2. Fire Service 3. Search & Rescue 4. Government Service 5. Community Safety 	<ol style="list-style-type: none"> 1. Food 2. Water 3. Shelter 4. Agriculture 	<ol style="list-style-type: none"> 1. Medical Care 2. Public Health 3. Patient Movement 4. Medical Supply Chain 5. Fatality Management 	<ol style="list-style-type: none"> 1. Power Grid 2. Fuel 	<ol style="list-style-type: none"> 1. Infrastructure Responder 2. Communications 3. Alerts, Warnings, & Messages 4. Finance 5. 911 & Dispatch 	<ol style="list-style-type: none"> 1. Highway/Road/Motor Vehicle 2. Mass Transit 3. Railway 4. Aviation 5. Maritime 	<ol style="list-style-type: none"> 1. Facilities HAZMAT, Pollutants, Contaminants

Table 6: Mitigation Action Implementation

Develop a Stormwater Management Plan: A Stormwater Management Plan can guide the town in planning, funding, and implementing a comprehensive program for addressing current and future requirements for managing stormwater runoff, flooding problems, and the Town’s natural resources. Chittenden will explore the feasibility of developing this Plan.

ADDRESSED HAZARDS



Flooding

Lead Party

Selectboard

Type of Project

Local Plans and Regulations

COMMUNITY LIFELINES



Safety & Security



Transportation
Primary Lifeline

Area of Impact

Town-wide

FUNDING SOURCES

- Local funding

PARTNERSHIPS

- Rutland Natural Resources Conservation District (NRCD)

BENEFIT SCORE = 6

PROJECT TIMELINE

Outreach to Rutland NRCD to explore funding and technical assistance in Jul 2021

Plan for and Maintain Adequate Road and Debris Clearing Capabilities: This includes capital planning and funding to support the appropriate number of staff and equipment needed to maintain the transportation network in Chittenden.

ADDRESSED HAZARDS



Winter Storm
Primary Hazard



High Winds

Lead Party

Selectboard

Type of Project

Local Plans and Regulations

COMMUNITY LIFELINES TARGETED



Safety & Security



Transportation
Primary Lifeline

Area of Impact

Town-wide; ±40 mile road network

FUNDING SOURCES

- Local funding

PARTNERSHIPS

- Road Commissioner

BENEFIT SCORE = 6

PROJECT TIMELINE

To coincide with preparing the annual Town budget each fall

Update Road Erosion and Culvert Inventories: These inventories were completed in 2017 and 2015, respectively and serve as the basis for asset management and should be kept up-to-date annually, with a full re-assessment every 5 years. Driveway culverts should be included in the next culvert inventory re-assessment.

ADDRESSED HAZARDS**Flooding****Lead Party**

Road Commissioner

Type of Project

Local Plans and Regulations

COMMUNITY LIFELINES TARGETED**Safety & Security****Transportation**
Primary Lifeline**Area of Impact**

Town-wide; ±23 miles of hydrologically-connected roads and ±280 culverts

FUNDING SOURCES

- Local funding
- VTrans Better Roads

PARTNERSHIPS

- Selectboard
- Rutland Regional Planning Commission (RPC)

BENEFIT SCORE = 6**PROJECT TIMELINE**

Re-assessment in 2022 construction season

Plan for Bridge Repairs: Every two years, VTrans inspects all town-owned bridges that are in the State's Town Highway Bridge Program. These inspection reports will be reviewed and used to plan for any identified flood-related bridge repairs.

ADDRESSED HAZARDS**Flooding****Lead Party**

Road Commissioner

Type of Project

Local Plans and Regulations

COMMUNITY LIFELINES TARGETED**Safety & Security****Transportation**
Primary Lifeline**Area of Impact**

Twelve (12) town-owned bridges: B10, B11C, B12, B19, B20, B22, B23, B24, B25, B26, B27, B28

FUNDING SOURCES

- Local funding

PARTNERSHIPS

- Selectboard
- VTrans

BENEFIT SCORE = 6**PROJECT TIMELINE**

Consult with engineer on bridges B10, B11C, B12, and a short structure on Lower Mountain Top Rd in Dec 2020

Manage Development in Erosion Hazard Areas with River Corridor Bylaws: River Corridor Bylaws can be used in conjunction with Flood Hazard Area Regulations to manage development in areas prone to flood impacts. Chittenden will explore the feasibility of adopting River Corridor Bylaws.

ADDRESSED HAZARDS**Flooding****Lead Party**Selectboard /
Planning Commission**Type of Project**

Local Plans and Regulations

COMMUNITY LIFELINES TARGETED**Safety & Security****Transportation**
Primary Lifeline**Area of Impact**

Town-wide

FUNDING SOURCES

- Local funding

PARTNERSHIPS

- Rutland RPC

BENEFIT SCORE = 5**PROJECT TIMELINE**Gauge the public support/political will in Jul 2021
Determine administrative capacity to adopt and implement bylaws by Sept 2021
Decide whether to pursue development and adoption by Dec 2021

Map and Assess Vulnerability to Wildfire: The first step in local planning is to identify wildfire hazard areas and assess overall community vulnerability. Chittenden will develop a GIS-based map of wildfire hazard areas to facilitate analysis and planning decisions through comparison with existing development and future land use maps.

ADDRESSED HAZARDS



Wildfire

Lead Party

Emergency Management Team

Type of Project

Local Plans and Regulations

COMMUNITY LIFELINES TARGETED



Safety & Security

Area of Impact

Town-wide

FUNDING SOURCES

- Local funding

PARTNERSHIPS

- Selectboard
- Town Fire Warden
- Chittenden Vol Fire Dept
- Rutland RPC
- US Forest Service

BENEFIT SCORE = 3

PROJECT TIMELINE

Jan 2022 – Dec 2022

Routinely Clean and Repair Stormwater Infrastructure: Regular maintenance is one of the most effective ways to mitigate the impacts of flooding. Routine cleaning and repairs of ditches, culverts, and catch basins will be done according to the Highway Department’s maintenance schedule and the Municipal Roads General Permit (MRGP).

ADDRESSED HAZARDS



Flooding

Lead Party

Road Commissioner

Type of Project

Infrastructure

COMMUNITY LIFELINES



Safety & Security



Transportation

Primary Lifeline

Area of Impact

Town-wide; ±40 mile road network and ±280 culverts

FUNDING SOURCES

- Local funding
- VTrans Better Roads
- Grants-In-Aid

PARTNERSHIPS

- Selectboard

BENEFIT SCORE = 6

PROJECT TIMELINE

See Highway Department’s Maintenance Schedule and MRGP

Remove Hazardous Trees in Road Right-of-Way: Hazardous trees in the road right-of-way can contribute to power and communication outages as well as debris in the roadway during winter storms and high wind events. Chittenden will remove hazardous trees within their road right-of-way as they are identified and/or request removal by Green Mountain Power if also within the power line right-of-way. This work will be done in accordance with the Rural Road Resilient Right-of-Ways Vegetation Assessment, when completed.

ADDRESSED HAZARDS



Winter Storm



High Winds

Lead Party

Emergency Management Team

Type of Project

Infrastructure

COMMUNITY LIFELINES TARGETED



Energy

Primary Lifeline



Transportation



Communications

Area of Impact

Town-wide

FUNDING SOURCES

- Local funding

PARTNERSHIPS

- Selectboard
- Road Commissioner
- Tree Warden
- Green Mountain Power

BENEFIT SCORE = 6

PROJECT TIMELINE

As needed
See Rural Road Resilient Right-of-Ways Vegetation Assessment

Install Back-up Power at Critical Facilities: Generators are emergency equipment that provide a secondary source of power to a facility. Chittenden has identified one critical facility in need of back-up power.

ADDRESSED HAZARDS

All Hazards

Lead Party

Selectboard

Type of Project

Infrastructure

COMMUNITY LIFELINES TARGETED

Energy
Primary Lifeline



Food, Water, Shelter

Area of Impact

North Chittenden Grange Hall
(alternate local shelter)

FUNDING SOURCES

- Local funding
- FEMA Hazard Mitigation Grant

PARTNERSHIPS

- None

BENEFIT SCORE = 6**PROJECT TIMELINE**

Jan 2023 – Dec 2023

Expand Cell Phone Coverage and Internet Access: Several locations have inadequate (or no) access to cell coverage and internet access. Using the assessment completed in 2019, Chittenden will explore ways to expand access to these utilities.

ADDRESSED HAZARDS

All Hazards

Lead Party

Selectboard

Type of Project

Infrastructure

COMMUNITY LIFELINES TARGETED

Communications

Area of Impact

Town-wide

FUNDING SOURCES

- Local funding
- VT Dept of Public Service

PARTNERSHIPS

- VT Rural Broadband Program
- Otter Creek Communication Union District

BENEFIT SCORE = PRIORITY FROM 2016**PROJECT TIMELINE**

Ongoing

Adequately Size Drainage and Perennial Stream Culverts in Flood-Prone Areas: Undersized culverts can lead to road washouts and flooding. Chittenden has identified several locations where upsized culverts are needed.

ADDRESSED HAZARDS

Flooding

Lead Party

Road Commissioner

Type of Project

Infrastructure

COMMUNITY LIFELINES

Safety & Security



Transportation
Primary Lifeline

Area of Impact

- Mountain Top Rd (Mountain Top Inn parking lot to Leahy Rd) – drainage system improvements to address cross culvert that discharges onto 182 Mt Top Rd causing flooding impacts
- Wildcat Road culvert #258, #264, #266, #267, and #270
- Dam Road culvert #77 and #125
- Stoney Hill culvert #20
- Others, including driveway culverts, as required by MRGP

FUNDING SOURCES

- Local funding
- VTrans Better Roads
- VTrans Structures Grant
- Grants-In-Aid
- FEMA Hazard Mitigation Grant

PARTNERSHIPS

- Selectboard
- ANR Stream Engineer
- US Army Corps of Engineers

BENEFIT SCORE = 6**PROJECT TIMELINE**

- Mountain Top Rd Scoping Study start Sept 2021 / end Jun 2022 Construction in 2023
- Culverts #258, 77, 125 in 2021 construction season
- Culverts #264, 266, 267, 270, 20 in 2022 construction season
- Others See MRGP

Expand Water Supplies for Fire Suppression: Lacking municipal drinking water infrastructure, Chittenden relies exclusively on a system of dry hydrants for fire suppression. During times of drought, surface water sources relied upon could become compromised. To improve fire suppression, Chittenden will assess functionality of all existing dry hydrants and explore locations for additional hydrants that might be needed.

ADDRESSED HAZARDS**Drought****Lead Party**

Emergency Management Team

Type of Project

Infrastructure

COMMUNITY LIFELINES**Safety & Security****Area of Impact**

Town-wide

FUNDING SOURCES

- Local funding
- Vermont Rural Fire Protection Task Force

PARTNERSHIPS

- Chittenden Vol Fire Dept

BENEFIT SCORE = 4**PROJECT TIMELINE**

Complete assessment summer 2021

Stabilize Stream Banks: Stream bank stabilization is needed where existing infrastructure is jeopardized, the rate of and/or the potential for erosion could threaten future planned improvements, or the actual or potential erosion puts significant features at risk. Chittenden has identified an eroding section of bank on Furnace Brook that is encroaching on Furnace Brook Road.

ADDRESSED HAZARDS**Flooding****Lead Party**

Selectboard

Type of Project

Natural System Protection

COMMUNITY LIFELINES**Safety & Security****Transportation**

Primary Lifeline

Area of Impact

Furnace Brook Road, below the Fish Hatchery

FUNDING SOURCES

- Local funding
- VTrans Better Roads – Cat C
- VANR Water Quality Grants

PARTNERSHIPS

- Road Commissioner
- ANR Stream Engineer
- US Army Corps of Engineers

BENEFIT SCORE = 6**PROJECT TIMELINE**

Funding application in Dec 2020
 Final Plans/Permits by May 2021
 Complete Construction by Dec 2021

Educate Property Owners about Freezing Pipes; Wildfire Risks; Drought-related Hazards; Emerald Ash Borer; and Keep the Ditches Clean Campaign: Chittenden will undertake education and awareness efforts on 1) steps to prevent your water pipes from freezing and other severe winter storm best practices; 2) best practices for preventing wildfires; 3) drought-related hazards (e.g., brush fires, diminished water quality, water conservation; 4) the Emerald Ash Borer and the impacts of infestation; and 5) the importance of keeping the municipal ditches free of yard waste and other debris.

ADDRESSED HAZARDS**All Hazards****Lead Party**

Emergency Management Team

Type of Project

Education and Awareness

COMMUNITY LIFELINES**Safety & Security****Transportation**

Primary Lifeline

Area of Impact

Town-wide

FUNDING SOURCES

- Local funding

PARTNERSHIPS

- Tree Warden / Fire Warden
- Chittenden Vol Fire Dept
- US Forest Service
- Forest, Parks, and Recreation
- Public Library

BENEFIT SCORE = 6**PROJECT TIMELINE**

Jul 2021 – Dec 2021

Participate in Firewise Program: The national Firewise Program offers a series of practical steps that individuals and communities can take to reduce their vulnerability to wildfire. Chittenden will consider becoming a Firewise USA site.

ADDRESSED HAZARDS



Wildfire

Lead Party

Emergency Management Team

Type of Project

Education and Awareness

COMMUNITY LIFELINES



Safety & Security

Area of Impact

Town-wide

FUNDING SOURCES

- Local funding

PARTNERSHIPS

- Selectboard
- Chittenden Vol Fire Dept

BENEFIT SCORE = 3

PROJECT TIMELINE

Evaluate program in Jul 2022
Determine administrative capacity to enroll and participate by Sept 2022
Enrollment decision by Dec 2022

Process for Incorporating Plan Requirements into Other Planning Mechanisms

For Chittenden to succeed in reducing long-term risks, the information and recommendations of this Plan should be integrated throughout government operations.

The following are specific examples of how the Town will incorporate this Plan into other plans, programs, and procedures:

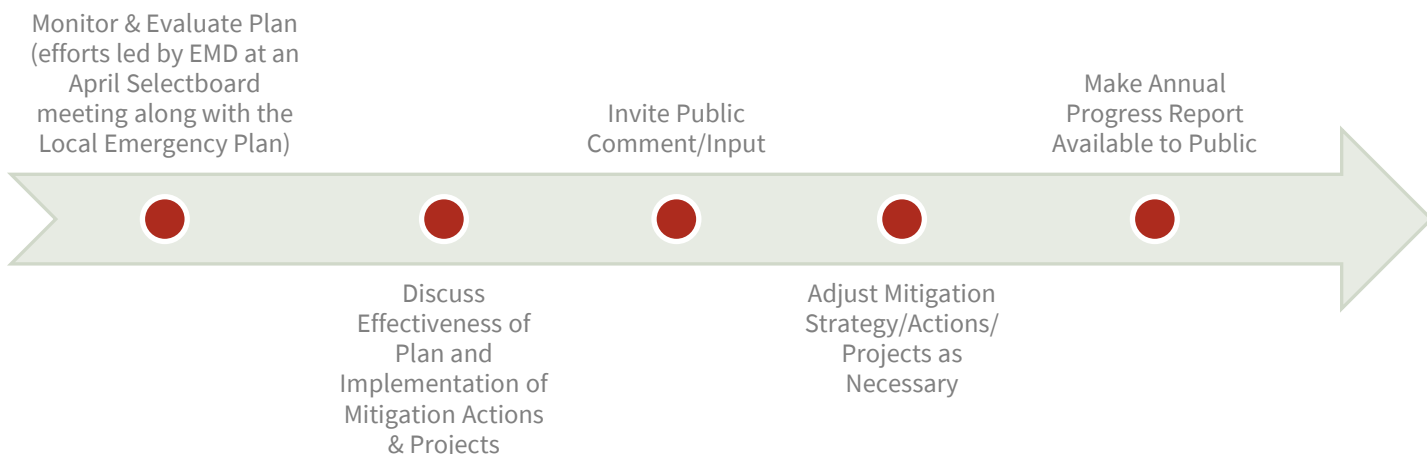
- The Selectboard will work with the Road Commissioner to incorporate risk assessment and hazard mitigation goals into capital planning efforts and improvement programs.
- The Planning Commission (when they resume work) will integrate the hazard mitigation goals for disaster resiliency into the goals and objectives of the next updates to the Town Plan and Flood Hazard Area Regulations.
- The Road Commissioner will implement several mitigation infrastructure projects (e.g., upsize perennial and drainage culverts in flood-prone areas, re-work roadside ditches) through existing plans (2018 Road Erosion Inventory and Report for hydrologically-connected road segments).
- The Selectboard (or an appointed committee) will work with the Rutland Natural Resources Conservation District to identify opportunities to collaborate on addressing the hazard mitigation projects identified in the 2007 Phase 2 Stream Geomorphic Assessment (SGA) for the East Creek Watershed and 2009 Phase 1 SGA for the Otter Creek Watershed Tributaries – Furnace Brook, Roaring Brook and Baker Brook.
- The Selectboard (or an appointed committee) will participate in the development of the Fire Danger Operating Plan for the Green Mountain National Forest. The Fire Danger Operating Plan will ultimately steer how wildland fire management is carried out in Green Mountain National Forest staffing, response, prevention, and coordination with partners.

7 PLAN MAINTENANCE

This Plan is dynamic. To ensure the Plan remains current and relevant, it is important it be monitored, evaluated, and updated periodically.

Monitoring and Evaluation

This Plan will be monitored and evaluated annually starting in 2022 in accordance with the following process:



The status (e.g., in progress, complete) of each mitigation action should be recorded in **Table 7**. If the status is “in progress” note whether the action is on schedule. If not, describe any problems, delays, or adverse conditions that will impair the ability to complete the action.

Updating

This Plan will be updated at a minimum every five (5) years in accordance with the following process:

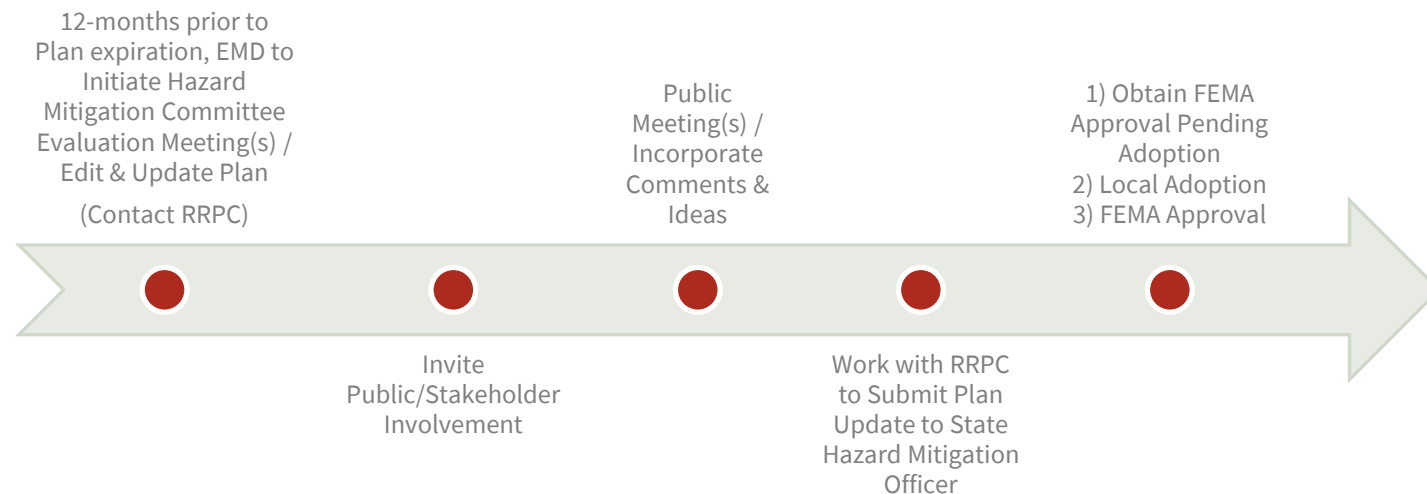


Table 7: Mitigation Action Status

Mitigation Action	2022	2023	2024	2025	2026
Local Plans and Regulations					
Develop a Stormwater Management Plan					
Plan for and Maintain Adequate Road and Debris Clearing Capabilities					
Update Road Erosion and Culvert Inventories					
Plan for Bridge Repairs					
Management Development in Erosion Hazard Areas with River Corridor Bylaws					
Map and Assess Vulnerability to Wildfire					
Structure and Infrastructure Projects					
Routinely Clean and Repair Stormwater Infrastructure					
Remove Hazardous Trees in Road ROW					
Install Back-up Power at Critical Facilities					
Expand Cell Phone Coverage and Internet Access					
Adequately Size Drainage and Perennial Stream Culverts in Flood-Prone Areas					
Expand Water Supplies for Fire Suppression					
Natural Systems Protection					
Stabilize Stream Banks					
Education and Awareness Programs					
Best Practices for Preventing Wildfires Awareness					
Drought-related Hazards Educational Outreach					
Emerald Ash Borer Educational Outreach					
Keep the Ditches Clean Campaign					
Best Practices for Severe Winter Storms Awareness					
Participate in Firewise Program					

COPY

CERTIFICATE OF ADOPTION
Town of Chittenden, Vermont Selectboard
A RESOLUTION ADOPTING THE CHITTENDEN, VERMONT 2021 LOCAL HAZARD MITIGATION PLAN

WHEREAS, the Town of Chittenden has historically experienced severe damage from natural hazards and it continues to be vulnerable to the effects of the hazards profiled in the **2021 Chittenden, Vermont Local Hazard Mitigation Plan**, which result in loss of property and life, economic hardship, and threats to public health and safety; and

WHEREAS, the Town of Chittenden has developed and received conditional approval from the Federal Emergency Management Agency (FEMA) for its **2021 Chittenden, Vermont Local Hazard Mitigation Plan (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 Chittenden; and

WHEREAS, the **Plan** recommends several hazard mitigation actions (projects) that will provide mitigation for specific natural hazards that impact the Town of Chittenden 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 Chittenden eligible for funding to alleviate the impacts of future hazards; now therefore be it

RESOLVED by Town of Chittenden Selectboard:

1. The **2021 Chittenden, Vermont Local Hazard Mitigation Plan** is hereby adopted as an official plan of the Town of Chittenden;
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** will 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 Chittenden this 11 day of JAN 2021.

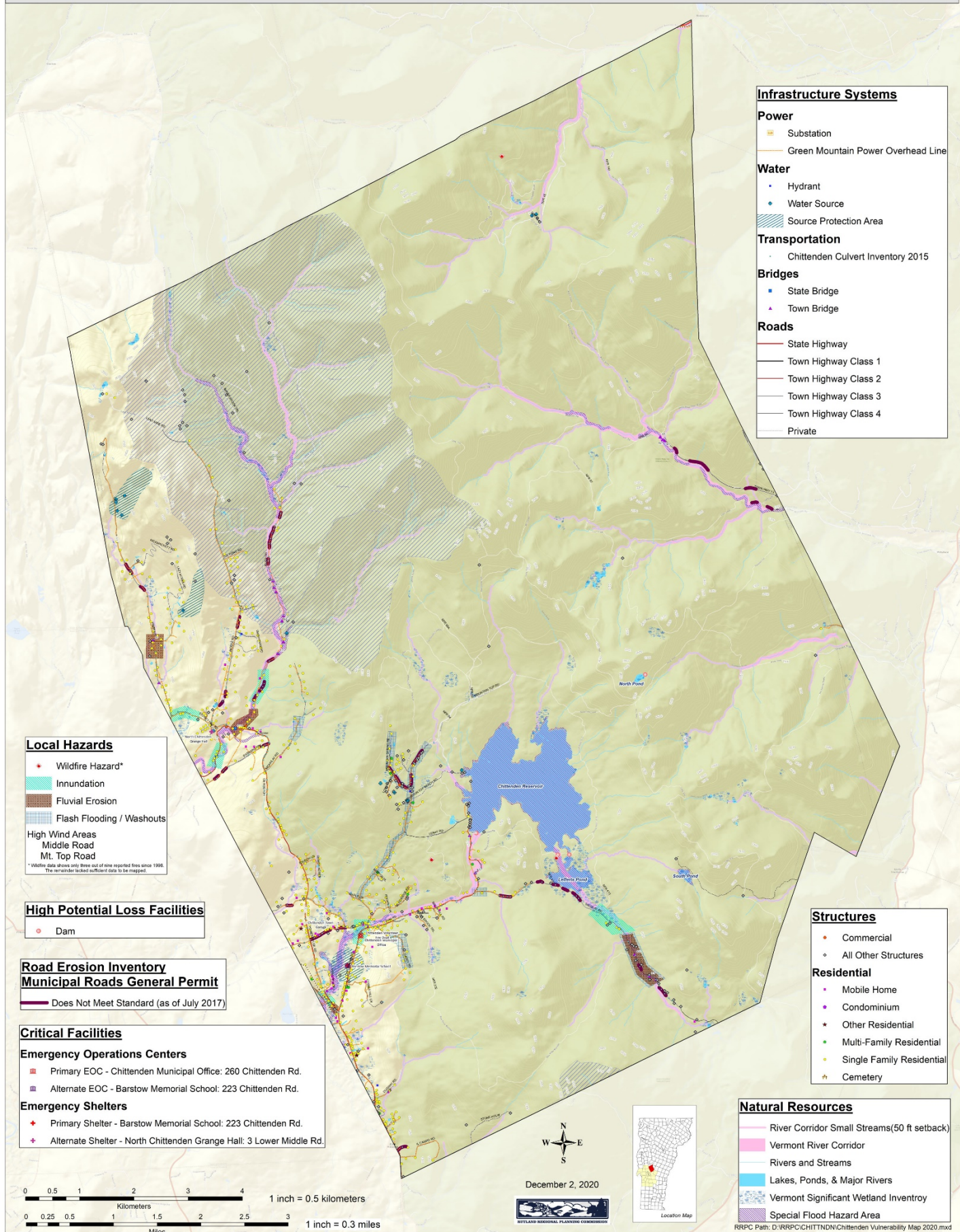
ATTEST

Kristina Janoski
Town Clerk



Kathleen Pratt
Selectboard Chair
Andrew D. Clark
Selectboard Member

Chittenden, Vermont: Local Natural Hazards and Vulnerabilities Map



Hazard Addressed: Flooding and Fluvial Erosion.

Vulnerability Addressed: The Accessibility and Viability of Roads, Structures, and Ecologically Sensitive Areas.

Priority Score	Mitigation Action	Local Leadership & Funding Resources	Target Start/ End	2021 Status
34	Complete culvert replacement on River Road. The Bridge and the culvert on this road were not up to standards and were in fact failing. Flooding and high water were occurring, and this was affecting the Dwight D Eisenhower Fish Hatchery that is located near the failing culvert. The new culvert is a larger box culvert, which was installed based on a hydraulic study by VTrans.	Leadership: Select Board Funding: Town Budget, HMGP, PDM, FMA, Town Highway Class 2 Roadway Program, Town Highway Structures Program	June 2014 - June 2015. Completed	Completed 2015
32	Complete changes to intersection of West Road and Stony Hill to address water pooling. This is a high risk area for two reasons: 1. The culverts at this intersection are failing and are causing 3-4 inches of water to pool in the road. 2. The road tilts toward the steep slopes, and the water pools in a blind curve. Based on a study by VTrans, the intersection should be changed and the culverts should be larger.	Local Leadership: Select Board, Highway Dept. Funding: HMGP, PDM, FMA	June 2015 – September 2015	Completed Oct 2017
28	Conduct public outreach regarding NFIP, including distributing pamphlets. Especially reach out to those living in the Special Flood Hazard Area or the River Corridor; and those whose home access may be jeopardized by high water. Chittenden will relate this task to the public outreach planned as a component of adopting river corridor protection language in their flood hazard regulations.	Local Leadership: EMD, EMC Funding: Town Budget	April 2016 to April 2018	Completed Apr 2017

Hazard Addressed: Flooding and Fluvial Erosion, Thunderstorms, Snowstorms

Vulnerability Addressed: Keeping Critical Facilities Operational.

Priority Score	Mitigation Action	Local Leadership & Funding Resources	Target Start/ End	2021 Status
33	Install generators at Barstow School and North Chittenden Grange Hall shelter sites, Municipal Office and Highway Garage. Due to the rural and mountainous nature of the town, many power outages are sustained power outages. Generators for the critical facilities will keep the town online/functional through the power outages and will assist residents who are not self-sustaining in their own homes.	Local Leadership: Select Board, School Principal. Funding: Town Budget, HMGP, PDM	September 2015 – October 2017	Completed in 2016 – School (HMGP) Office (Town) Garage (Town) Grange Hall remains a priority
32	Floodproof and conduct overall upgrades to Town Office and Fire Station/EOC. These structures are within the River Corridor, and flood proofing is necessary to ensure that these critical facilities remain online in an emergency.	Local Leadership: EMD, EMC, CVFD Funding: Town Budget, AFG, EOC Grant Program, HMGP, PDM	October 2015 - May 2020	No longer a priority – these buildings not in river corridor

Hazard Addressed: Wildfires**Vulnerability Addressed:** Safety of Remote Mountain Homes from Fire

Priority Score	Mitigation Action	Local Leadership & Funding Resources	Target Start/ End	2021 Status
32	Install additional dry hydrants for emergency water resources. Homes in the remote mountainous terrain of Chittenden have limited accessibility by the fire department.	Local Leadership: CVFD Funding: Town Budget, RC&D Rural Fire Protection	March 2016 – October 2016	No longer a priority for CVFD

In addition to the mitigation actions and projects outlined above, the town has compiled a list of preparedness actions and projects that they would like to undertake.

Preparedness Actions**Hazard Addressed:** Flooding and Fluvial Erosion

Preparedness Action	Local Leadership & Funding Resources	Target Start	2021 Status
Develop a formal communication system with GMP when there is a need for controlled water release from the Dam	Local Leadership: Select Board Funding: Town Budget	Mar 2015	Completed 2017
Review GMP Emergency Action Plan to ensure identified hazard areas and strategies are addressed	Local Leadership: EMD, EMC, Select Board, CVFD, CFR Funding: Town Budget	Feb 2015	Completed 2017; remains an ongoing priority
Develop town response plan for dam flooding contingencies	Local Leadership: Select Board, EMD/CVFD Funding: HMGP, PDM, FMA	June 2015	Completed 2019
Implement emergency notification system for immediate reservoir flooding	Local Leadership: EMD, EMC Funding: Town Budget	Apr 2015	Completed 2018; remains a priority for additional sirens

Hazard Addressed: Wildfires

Preparedness Action	Local Leadership & Funding Resources	Target Start	2021 Status
Consider Community Wildfire Protection Plan participation	Local Leadership: CVFD, Select Board, EMD, EMC Funding: Town Budget	Aug 2015	Remains a priority
Increase CVFD/CFR volunteer membership by 5% each year	Local Leadership: Fire Chief Funding: CVFD/CFR Budget, SAFER, AFG (for training)	Aug 2015	Remains a priority; consider paid staff

Hazard Addressed: Multiple

Preparedness Action	Local Leadership & Funding Resources	Target Start	2021 Status
Establish mutual aid agreements with neighboring communities to deal with major flooding events, and for other hazards	Local Leadership: CVFD, EMD, EMC Funding: Town Budget	Nov 2014	Completed 2020
Incorporate Barstow School Emergency Action Plan into town and fire dept. response plans	Local Leadership: Select Board, Principal, CVFD Funding: Town Budget	Sept 2015	Completed 2019
Conduct outreach to local businesses regarding Tier II reporting compliance	Local Leadership: EMC, CVFD Funding: Town Budget, HMEP	Feb 2016	Completed 2018
Develop evacuation routes in the event of uncontrolled wildfires or severe flooding with emphasis on potential road closures and out of town egress routes, e.g. Mendon, Pittsfield, Pittsford	Local Leadership: Select Board, neighbor Select Boards, Green Mountain National Forest Funding: Town Budget	Nov 2014	Completed 2019
Work with ARC to develop a training plan for shelter volunteers	Local Leadership: Select Board/ARC Funding: Town Budget	Jan 2015	Completed 2018
Explore ways to expand cell phone coverage and internet access in areas lacking service	Local Leadership: Select Board Funding: Work with VTA to I.D. funding	Sept 2015	Remains a priority
Inventory locations of large fuel storage tanks (1,100+ gallons), and encourage owners/managers to have ability to pump during emergency events that prevent fuel truck access	Local Leadership: Chittenden Planning Commission Funding: Town Budget	Feb 2015	Completed 2018