

TOWN of GLOVER, VERMONT
ALL HAZARDS MITIGATION PLAN UPDATE
(Original Approval: 2006)



Sand Hill Road – a Class 4 road in Glover
after an intense summer rain event
June, 2014

FEMA Applicant ID#: 019-28075-00

**Glover Planning Commission
Glover Selectboard
April 13, 2017
Town of Glover
51 Bean Hill Rd
Glover, VT 05839**

CERTIFICATE OF LOCAL ADOPTION

Town of Glover, Vermont

A Resolution Adopting the All-Hazards Mitigation Plan Update

WHEREAS, the Town of Glover has worked with its residents and stakeholders to identify its hazards and vulnerabilities, analyze past and potential future losses due to natural and human-caused hazards, and identify strategies for mitigating future losses; and

WHEREAS, the Town of Glover All-Hazards Mitigation Plan contains recommendations, potential actions and future projects to mitigate damage from disasters in Glover; and

WHEREAS, the Town of Glover and the respective officials will pursue implementation of the strategy and follow the maintenance process described in this plan to assure that the plan stays up to date and compliant; and

WHEREAS, a meeting was held by the Town of Glover Selectboard to formally approve and adopt the Town of Glover All Hazards Mitigation Plan Update.

NOW, THEREFORE BE IT RESOLVED that the Town of Glover adopts this All-Hazards Mitigation Plan Update for the town.

Date: April 13, 2017

Jack Sumberg
Select Board Chair

Michael Ladd
Selectman

Brian Carroll
Selectman

Donna Sweeney
Attested to by Town Clerk

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1. INTRODUCTION

Hazard mitigation planning identifies actions that a community can take to reduce or eliminate long term risk to people and property from natural and manmade hazards. The Federal Emergency Management Agency (FEMA) further describes it as a process state and local governments can use to identify risks and vulnerabilities associated with natural disasters, in order to develop long-term strategies to protect people and property from future hazard events (www.fema.gov/plan/mitplanning).

Purpose. The purpose of this hazard mitigation plan update is to continue to identify and plan for hazards facing the town, including the development of new strategies intended to reduce long-term risks from known hazards. Mitigation planning has changed considerably in the town and the state as a whole since 2005 and the town has made great efforts to develop a viable plan update that can be used as the new standard in mitigation planning efforts in the next five-year planning cycle and beyond. Hazards cannot be eliminated, but it is possible through planning to determine what hazards are most frequent, where they may be most severe, and what actions can be taken to reduce their impact on the community.

Benefits of hazard mitigation planning include:

1. Increased public awareness and understanding of natural and manmade hazards, associated risks, and community vulnerabilities,
2. Reduced physical, financial, and emotional losses caused by disasters,
3. Improved understanding of potential risks and possible risk reduction measures associated with future development,
4. Increased community and voter support for specific actions the town may take to reduce future losses,
5. Strengthened partnerships and lines of communication among diverse interests, including opportunities to leverage and share resources, and
6. Community eligibility for federal hazard mitigation grants and aid prior to and following federally declared disasters.

2. PROCESS

The Glover Selectboard recruited new members to the Planning Commission for the purpose of hazard mitigation planning update. The Planning Commission now includes: Ann Lindner, chairperson; Liz Nelson, secretary; Skip Borrell; Hope Coburn; Ann Creaven; Vicki Plaster; and Peter Letzelter-Smith. Selectboard members Brian Carroll and Jack Sumberg participated in the hazard mitigation planning process. This group includes: a former employee of the VT Dept of Health as an Emergency Preparedness Specialist and of VT Emergency Management as part of the Hurricane Irene Recovery

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Team, current employee of VEM in the EOC (Emergency Operations Center) during emergencies and exercises, former Emergency Management Director for the Town of Woodbury, member of the Waterbury Ambulance and a member of the Waterbury Backcountry Rescue Team; a retired US Navy submariner; a retired dairy farmer/artist; a retired district office Director, VT Dept. of Health; a local bank branch manager; a nurse; a home-schooling parent; an education administrator; and a contractor.

The following were the main topics discussed at Glover Planning Commission meetings on the dates indicated:

5/15/2014

- Hazard Mitigation Plans in general
- Previous Glover All Hazard Mitigation Plan
- Review of planning process
- Division of work among commission members

5/19/2014

- Report from Harvey Dunbar, Glover road foreman
- Review of town bridges, culverts, and dams
- Collection of weather data

6/5/2014

- Review of planning process and need for plan
- Hazards identification
- Plan for Glover Day survey

7/31/2014

- Risk assessment
- New emergency generator
- Review of Glover Day survey results

9/4/2014

- Review of Flood Resilience Plan proposals
- Shadow Lake Dam Emergency Action Plan

10/16/2014

- Agencies and utilities contacted for information
- FEMA Mitigation Plan Review Guide
- Plan to submit draft

10/21/2014

- Review of draft Town of Glover All Hazards Mitigation Plan
- Submission of draft plan
- Creation of Glover Energy Committee

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12/18/2014

- Review of comments from VEMS on draft plan
- next steps to revise plan

1/15/2015

- Final steps in plan update revision

To encourage public participation, we advertised in the Barton Chronicle and posted notices in town that at the June 12 regular Selectboard meeting we would solicit input from Glover residents on the topic of hazard mitigation planning. We also posted notices prior to the July 17 Planning Commission meeting that we would be soliciting public comment on hazard mitigation planning at that meeting, and that the meeting was open to the public. These meetings all had opportunities for public comment and open discussion on hazard mitigation, and specifically discussed the development of the hazard mitigation plan.

We received input from Allen Matthews, Chief of the Glover Volunteer Fire Department at the June 12 Selectboard meeting, but received no response from Glover residents at either the June 12 or July 17 meetings. Chief Mathew's input was used in the *Community Profile* section of this plan.

To further solicit public comment, since the public meeting format had marginal success, Planning Commission members developed a questionnaire for Glover residents on hazard history and areas of concern. On July 26, 2014, Glover Day, we talked with approximately 36 residents and were able to collect 16 completed questionnaires. This information was utilized in the *Hazards Identification* and *Vulnerability and Risk Assessment* sections of this plan.

The Glover Planning Commission members reviewed the 2005 *Town of Glover, Vermont All-Hazards Mitigation Plan* as well as the FEMA *Local Mitigation Planning Handbook 2013* and the *Local Mitigation Plan Review Guide* as well as the *State of VT Hazard Mitigation Plan 2013*. Commission members gathered new data from the sources listed below to update the *Community Profile* and *Hazards Identification* portions of the existing plan. We reviewed the new data and, based on that review and our own experiences as residents of Glover, refined the *Vulnerability and Risk Assessment* sections of this plan.

- A. FEMA (Federal Emergency Management Administration) data.
- B. SHEL DUS (Spatial Hazard Events & Losses Database for the United States) data
- C. NOAA (National Oceanic and Atmospheric Administration) data

In the planning process, Ann Lindner, Planning Commission Chairperson, has corresponded with the following individuals to collect specific information, and request their feedback throughout plan development: Adam Heuslein of the Glover Volunteer Ambulance Squad; Allen Matthews, Chief of the Glover Volunteer Fire Department; Harvey Dunbar, Glover Road Foreman; Job Breitmeyer, Glover First Constable; Donna

Sweeney, Glover Town Clerk & Treasurer; Alison Low, Senior Planner at Northeast Vermont Development Association (NVDA), Bruce Melendy, Emergency Management Coordinator at NVDA; Kateri Stokes, VT Department of Health; Dale Perron, VTrans District 9 Transportation Administrator; Liz Gamosh, VT Electric Cooperative; Denise Bouchard, FairPoint Communications; and Mark Breen, Fairbanks Museum Meteorologist. The revised draft was made available for review at the town office and residents were informed via meeting minutes and the town bulletin board of the ability to review the draft and additional opportunity for formal comment and suggestions. All neighboring town offices were sent a formal indication of the town's planning process and an opportunity for review and comment as well. Minor edits were made to the plan following state recommendations and the final draft was resubmitted to DEMHS and then to FEMA for formal review and approval pending municipal adoption. A resolution of adoption is anticipated following final FEMA approval.

3. COMMUNITY PROFILE

Topography and Drainage. The Town of Glover, covering an area of 36 square miles, contains the headwaters of the Barton River, which rises in the southeast corner of the town and flows north through a narrow valley. The village of Glover straddles the river near the north edge of town. There are two dozen hills with elevations of 1,700 feet or higher and five lakes and ponds within the town.

Streams tributary to the Barton River drain most of the town, but a small section of south Glover drains to the Lamoille River, the southwest corner drains to the Black River, and a small part of the east edge of town drains to the Passumpsic River. Lake Parker, at 239 acres and with a maximum depth of 45 feet, is the largest lake. Its watershed is the northwest quarter of the town and its waters flow north through Roaring Brook across the town line to the Barton River.

Shadow Lake, covering 199 acres and with a maximum depth of 139 feet, receives drainage from Daniels Pond and flows east to the Barton River. Daniels Pond, covering 66 acres, flows to Shadow Lake. Tildy's Pond, covering 31 acres, is part of the headwaters of the Barton River. An unnamed pond (the "Beaver Pond") west of Daniels Pond flows southwest to the Black River in Craftsbury.

The Black Hills and Pepin Hill, in the south part of town are the highest hills at 2,258 and 2,260 feet in elevation. The Barton River drops 412 feet from 1,357 feet in elevation at the south edge of town to 945 feet in Glover Village 5.75 miles to the north.

Route 16, a state highway, follows the Barton River up the east side of town, and is joined by Route 122 coming west from Sheffield. Shadow Lake Road and Bean Hill Road are the main east-west town roads. Shadow Lake Road carries traffic from Route 16 across the south part of town to Greensboro, Craftsbury and Albany. Bean Hill Road connects Glover Village to West Glover Village in the north part of town. In West Glover

it intersects Roaring Brook Road to Barton, the Irasburg Road, and County Road which, with Andersonville Road, travels down the west edge of town and connects with Albany and Craftsbury.

There are 14 miles of Class 2 road, 37 miles of Class 3, and 7 miles of Class 4 road in Glover. Many of the Class 3 roads are dead ends serving one or a few residences.

Development Pattern. The Town of Glover is a familiar example of Vermont's tradition of compact village centers surrounded by open land of working farms, forests, streams and lakes. Many outlying farms have been abandoned over the years and once-cleared land has reverted to woods. Some new residential development has occurred along major roads and some along the less traveled roads, but relatively little in the village centers.

Seasonal homes, mainly on the lakes and ponds, were first built as camps in the years around 1900, and have continued to be built and upgraded. Today most of the developable shoreland has structures in place and some seasonal camps are being converted to year-round homes.

In the 19th century, waterpower from the Barton River and other streams was used to power sawmills and gristmills in the village centers and outlying areas. Other local industries included a tannery, box factory, potato starch factory, furniture and wagon shops, and blacksmith shops. Most were small operations, but several of the sawmills did considerable business over the years, some converting from waterpower to steam. There were creameries, general stores, and two hotels. The present Route 16 once carried stagecoach traffic and railroad access was in Barton.

Glover Village has a general store, a small diner, and a nursing home plus a few home-based businesses. West Glover Village has a pizza restaurant and store. There are a few businesses along Route 16 and home-based businesses scattered around the town. Since the villages of Glover and West Glover are no longer incorporated, this plan includes the village areas and residents.

Population. The town of Glover has a population of 1,122 people according to the latest statistics from the U.S. Census Bureau. Growth of population has been slow in the past five years amounting to less than two tenths of one percent.

Housing. There are 773 housing units in the town of Glover with 89.5% being single units, 6% mobile homes and 2.5% two units or more. Owner occupied units are at 90.2% and rental units are 9.8%. The town of Glover is second to Westmore (in the county) for second home ownership.

Local Economy.

- According to Sperling's (<http://www.bestplaces.net/economy/city/vermont/glover>), the following data was obtained in 2012
 - i. Unemployment Rate- 6.9%
 - ii. Recent job growth- -0.78%

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- iii. Future job growth – 31.54%- projected for the next 10 years.
- iv. Income
 - 1. < 15K- 14.48%
 - 2. 15K to 25K -12.92%
 - 3. 25K to 35K- 10.91%
 - 4. 35K to 50K – 23.16%
 - 5. 50K to 75K - 24.05%
 - 6. 75K to 100K- 8.46%
 - 7. 150K to 250K – 1.34%
 - 8. Income per capita- \$19,971
 - 8. Median household income- \$41,832
 - 9. Estimated Median Housing Value- \$153, 317 (City-DATA.com)
- v. Occupations (City-DATA.com)
 - 10. Agriculture, forestry, fishing and hunting- (24%)
 - 11. Construction (16%)
 - 12. Educational Services (13%)
 - 13. Furniture and product manufacturing (10%)
 - 14. Accommodations and Food Services (3%)
 - 15. Wood Products (3%)
 - 16. Building material and equipment dealers (3%)

Town Government.

- Glover is governed by an elected 3 member selectboard who meet twice a month.
- Has limited staff consisting of
 - i. Town Clerk/Treasurer,
 - ii. Assistant Clerk/Treasurer
 - iii. Road Foremen
 - iv. (2) Road Crew.
 - v. (2) Library Staff
 - vi. (3) Listers
 - vii. (4) Auditors
 - viii. (2) Constables
 - ix. Health Officer
 - x. Planning Commission
 - xi. Flood Hazard Area Administrative Officer
 - xii. Emergency Manager
 - xiii. Cemetery Commissioners
 - xiv. Dog Warden
 - xv. Fire Warden
 - xvi. Law Enforcement is by contract with the County Sheriff
- Town Volunteer Organizations
 - i. Fire Department- volunteer
 - FY 2014 budget of \$40,000
 - 18 trained firefighters
 - 3,200 gallon tanker and 3 pumper trucks
 - 5 dry hydrants in town
 - fire station equipped as Emergency Operations Center
 - fire station certified Red Cross Shelter

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- PA system on 3 trucks for emergency notification of residents
- ii. Volunteer Ambulance Squad
 - 6 Advanced Providers
 - 7 EMTs
 - 2 support staff
 - 3 ambulances and a command/treatment trailer
- iii. Recreation Committee
- iv. Historical Society
- v. Library Trustees and Friends of the Glover Library
- vi. Recycling Committee
- Glover’s latest Town Plan was adopted in June of 2006.
- Glover has no zoning, however relies on Vermont’s ACT 250 to regulate growth and development. Additionally, Glover participates in the National Flood Insurance Program (NFIP) and thus maintains and enforces the NFIP required regulations governing development restrictions in flood vulnerable locations. See Section 7 below for more information.
- There are (9) Town Ordinances:
 - Ordinance for Licensing and Control of Domestic Dogs or Wolf-hybrids
 - Sewer Ordinance
 - Private Roads and Driveways Ordinance
 - Municipal Parks, Beaches and Forests Ordinance
 - Parking Ordinance
 - All-Terrain Vehicle Ordinance
 - Mass gathering ordinance
 - Regulation of Solid Waste by Dumping Ordinance
 - Open Burning of Solid Waste Ordinance

Glover Community. The Town of Glover is located at the approximate “heart” of the Northeast Kingdom, about thirty (30) miles south of the Canadian border; 25 miles west of the New Hampshire border and northwest of the Town of St. Johnsbury; at Exit 25 off Vermont Interstate Highway 91. The unincorporated Village of Glover concentrates housing, town offices, Currier’s General Store and the Glover Fire Station on VT State Route 16, along the valley path of the Barton River. Another population “settlement”, West Glover, is located about two and one-half miles west of Glover’s Town center near Lake Parker. West Glover is a hilltop community, with a small store and pizza restaurant and the Glover Ambulance Bay.

The Town of Glover is a familiar example of Vermont’s tradition of compact village centers surrounded by open land of working farms, forests, streams and lakes. Glover is one of the 19 towns in Orleans County.

With the exception of village centers in Glover and West Glover, the predominant land uses in the rest of Glover are forestry, recreation, and agriculture. Timber harvesting, woodlots, maple sugaring, Christmas tree farms and recreational use of forest lands are all evident in the Town of Glover.

There is municipal sewer service in Glover Village and West Glover Village. Glover’s sewage is pumped to the sewage treatment plant in neighboring Barton. Located along the Barton River, the system could be vulnerable during severe flooding.

There is a private water company in Glover Village with 11 connections. The water source is well outside the flood plain and the system does not depend on electricity.

Emergency services in Glover are volunteer and responders are well trained. The Glover Fire Department, Ambulance Service, two Town Constables, and County Sheriff contracted services constitute public safety services for the town. Emergency communication is difficult in town due to hills and valleys, and the same is true with cell phone service. There is a small back-up generator for the ambulance in West Glover.

There is a K-8 school with approximately 100 children. Students in grades 9-12 go to the Lake Region High School in nearby Barton. The fire department building doubles as one shelter and the school acts as the second shelter and has a generator. The Town Hall can also serve as a backup shelter. The fire station and the school are outside the flood plain.

Special needs populations in Glover include two daycares, a 40-bed nursing home, and 12-unit senior housing. The nursing home could be vulnerable to severe flooding.

4. HAZARD IDENTIFICATION AND RISK ASSESSMENT

Introduction: Climate Change:

“Climate change, once considered an issue for a distant future, has moved firmly into the present. Corn producers in Iowa, oyster growers in Washington State, and maple syrup producers in Vermont are all observing climate-related changes that are outside our recent experience.”

National Climate Assessment Report

2014

Vermont experienced the warmest year on record in 2012. The year 2011 was the second wettest with extensive flooding in the spring and from Tropical Storm Irene in the fall. According to the Agency of Natural Resources Vt.’s average temperature has increased by 1.8 degrees F since 1970 with the winter temperature increasing faster than the summer temperature. Precipitation has increased by 15 -20% over the past 50 years with 67% of this falling in heavy precipitation events. In 2006 the Northeast Kingdom went from a USDA Hardiness Zone 3 to a Zone 4 with the growing season increasing by 2 weeks. According to one model areas of the northeast near the Canadian border are projected to shift from having less than 5 to more than 15 days per year over 90 degrees F by the 2050s. Alan Betts, an independent atmospheric scientist living in Pittsford, Vt. describes what we can expect to see in the coming decades from the warming trend in our climate. Some of the changes include:

- Warmer winters with increased precipitation including more wet snow and freezing rain
- More overwintering pests
- Shortened ski, snowmobile, ice-fishing season
- Multiple melt events in winter with possible flooding
- Reduced productivity of sugar maples
- Hotter summers with more heat waves
- Summer/fall heavy rain events with more frequent floods
- Increased warm-weather pests – mosquitoes, ticks, and algae

These climate changes will impact agriculture, water, human health, energy, transportation, forests and our ecosystems and pose a growing challenge to the region’s environmental, social, and economic systems. As with other hazards it is important to take steps that will support the town and community to adapt to these changes. The Planning Commission will explore local interest in forming a town Energy Committee in order to support an increase in energy efficiency and conservation.

While projections of the effects of climate change vary, it is generally predicted that Vermont will have warmer temperatures year-round, with wetter winters and drier summers. An increase in the size and frequency of storms is also predicted. As a result, climate change in the next century will likely increase the likelihood of weather-related hazards occurring. An increase in precipitation may also result in increased flooding and fluvial erosion. Drier summers may increase the chance of drought and wildfire. A warmer climate may also result in the influx of diseases and pests that cold winters previously prevented. The severity of climate change is also difficult to predict, though the effects may be mitigated somewhat if greenhouse gas emissions are reduced in the near future. In 2011, Governor Shumlin formed the *Vermont Climate Cabinet*. The Cabinet, chaired by the Secretary of Natural Resources, is a multidisciplinary approach to enhance collaboration between various state agencies. Its primary objectives include providing the Governor with advisory information and facilitating climate change policy adoption and implementation. In 2013, the Vermont Agency of Natural Resources (ANR) released the Climate Change Adaptation Framework which addresses climate change exposures, vulnerability-specific elements within each of the natural resource sectors, and ongoing and proposed actions that can be or have been taken to prepare for the expected changes. In line and conjunction with the ANR report, the primary goal of a VTtrans climate change adaptation policy is to minimize long-term societal and economic costs stemming from climate change impacts on transportation infrastructure. Regardless of cause, the frequency of declared disasters for the county is increasing.

Table 4: *Summary of Vermont Emergency Declarations*

Number	Year	Type
3338	2011	Hurricane Irene
3167	2001	Snowstorm
3053	1977	Drought

Table 4.1: *Summary of Vermont Major Disaster Declarations since 1998 (Orleans County: Bold)*

4207	2015	Severe Winter Storm
4232	2015	Severe Storms and Flooding
4178	2014	Severe Storms and Flooding
4163	2014	Severe Winter Storm
4140	2013	Severe Storms and Flooding
4120	2013	Severe Storms and Flooding
4066	2012	Severe Storms, Tornado and Flooding
4043	2011	Severe Storms and Flooding
4022	2011	Tropical Storm Irene
4001	2011	Severe Storms and Flooding
1995	2011	Severe Storms and Flooding
1951	2010	Severe Storm
1816	2009	Severe Winter Storm
1790	2008	Severe Storms and Flooding
1784	2008	Severe Storms, Tornado and Flooding
1778	2008	Severe Storms and Flooding
1715	2007	Severe Storm, Tornado and Flooding
1698	2007	Severe Storms and Flooding
1559	2004	Severe Storms and Flooding
1488	2003	Severe Storms and Flooding
1428	2002	Severe Storms and Flooding
1358	2001	Severe Winter Storm
1336	2000	Severe Storms and Flooding
1307	1999	Tropical Storm Floyd
1228	1999	Severe Storms and Flooding
1201	1998	Ice Storm

The number of natural disasters in Orleans County (11) is near the US average (12). There have been 10 major disasters (Presidential) declared and three emergencies declared. The causes of the natural disasters have been; Floods: 9; Storms: 7; Winds: 2; Heavy Rain; 1 Landslide: 1; Snowstorm: 1; Tropical Storm: 1 (Note: Some incidents may be assigned to more than one category). The following discussion on natural hazards is based upon information from several sources but specific extent data for Glover was largely not available. However, Orleans County and specifically, nearby Newport City data can be used to capture the extent of natural hazard events for the town. General descriptions are based upon the *2013 Vermont State Hazard Mitigation Plan*.

Table 4.2. Town of Glover Disaster History

Disaster Number	Declaration Date	Incident Type	Number of Projects	Federal Share Obligated
1307	11/10/1999	Severe Storm(s)	1	\$2,039.38
1715	08/03/2007	Severe Storm(s)	7	\$58,779.31
1995	06/15/2011	Severe Storm(s)	3	\$70,191.37
3167	04/10/2001	Snow	1	\$1,547.61
4066	06/22/2012	Severe Storm(s)	7	\$302,100.87
4163	01/29/2014	Severe Ice Storm	1	\$7,312.46

This update is based on the profiled hazards of the 2005 plan. These included: flooding (including dam failure, hazardous materials, fire (urban), landslides and school safety issues). For this update, the planning team has removed hazardous material incidents, fire, landslides and school safety issues. Based on low occurrences of these hazards, the town has chosen to concentrate efforts on flood-related and winter-related hazards with the inclusion of high wind hazards. Therefore, the highest risk hazards profiled in this update are:

- **flooding (including fluvial erosion and dam breach)**
- **severe winter storm (including ice storms)**
- **extreme cold**
- **high winds**

These hazards have been profiled to provide the basis of future mitigation strategies. However, lower risk natural hazards (hurricane/tropical storms, drought, tornado, extreme heat, hail, earthquake, naturally-occurring radiation, lightning, landslides and fire hazards) are omitted from full profiling because they do not pose enough risk to substantiate mitigation efforts at this time.

Table 4.3. Declared Disaster Project Funding Summary

Disaster Number	PW Number	Application Title	Application ID	Damage Category Code	Project Amount	Federal Share Obligated	Total Obligated
1307	13	DEBRIS REMOVAL	019-28075-00	A - Debris Removal	\$2,719.17	\$2,039.38	\$2,184.59
1715	84	SQUARE ROAD	019-28075-00	C - Roads & Bridges	\$27,868.81	\$20,901.61	\$22,172.43
1715	85	WHITE ROAD	019-28075-00	C - Roads & Bridges	\$1,943.71	\$1,457.78	\$1,546.42
1715	86	MUD ISLAND ROAD	019-28075-00	C - Roads & Bridges	\$8,742.00	\$6,556.50	\$6,955.13

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1715	87	HINMAN ROAD	019-28075-00	C - Roads & Bridges	\$16,488.52	\$12,366.39	\$13,118.27
1715	88	QUARRY HILL ROAD	019-28075-00	C - Roads & Bridges	\$8,972.91	\$6,729.68	\$7,138.84
1715	89	BEACH HILL ROAD	019-28075-00	C - Roads & Bridges	\$8,237.24	\$6,177.93	\$6,553.55
1715	90	KING ROAD	019-28075-00	C - Roads & Bridges	\$6,119.23	\$4,589.42	\$4,868.45
1995	389	NCORLGLO rodger1B	019-28075-00	B - Protective Measures	\$5,146.40	\$3,859.80	\$3,859.80
1995	396	NCORLGLO rodger1	019-28075-00	C - Roads & Bridges	\$35,417.35	\$26,563.01	\$26,563.01
1995	501	NCORLGLO rodger2	019-28075-00	C - Roads & Bridges	\$53,024.75	\$39,768.56	\$39,768.56
3167	42	EMERGENCY PROTECTIVE MEASURES (SNOW REMOVAL ASSISTANCE)	019-28075-00	B - Protective Measures	\$2,063.48	\$1,547.61	\$1,641.70
4066	31	GWGLOB1 Sargent Bridge Cat B	019-28075-00	B - Protective Measures	\$6,572.84	\$4,929.63	\$4,929.63
4066	50	GWGLOC3 King Rd	019-28075-00	C - Roads & Bridges	\$15,740.41	\$11,805.31	\$11,805.31
4066	51	Sargent Lane Bridge	019-28075-00	C - Roads & Bridges	\$317,344.00	\$238,008.00	\$238,008.00
4066	52	GWGLOC4 Borland Rd aka Cemetery Loop	019-28075-00	C - Roads & Bridges	\$11,313.99	\$8,485.49	\$8,485.49
4066	53	GWGLOC6 Sargent Ln Slope	019-28075-00	C - Roads & Bridges	\$3,216.64	\$2,412.48	\$2,412.48
4066	61	GWGLOC1 Dexter Mtn Rd	019-28075-00	C - Roads & Bridges	\$42,270.85	\$31,703.14	\$31,703.14
4066	67	GWGLOC5 Parker Rd	019-28075-00	C - Roads & Bridges	\$6,342.42	\$4,756.82	\$4,756.82
4163	12	GLOVA01 Debris Removal	019-28075-00	A - Debris Removal	\$9,749.94	\$7,312.46	\$7,312.46

4.1 Profiled Hazards

Estimating Risk of Future Events

Although estimating the risk of future events is far from an exact science, the Planning Team used best available data and best professional judgment to conduct an updated Hazards Risk Estimate analysis, which was subsequently reviewed and revised by town officials in the fall 2015. This analysis assigns numerical values to a hazard's affected area, expected consequences and probability. This quantification allows direct comparison of very different kinds of hazards and their effect on the town, and serves as a method of identifying which hazards hold the greatest risk based on prior experience and best available data. The following scoring system was used in this assessment:

Area Impacted: Scored from 0-4, rates how much of the municipality's developed area would be impacted.

Consequences: Consists of the sum of estimated damages or severity for four items, each of which are scored on a scale of 0-3:

1. Health and Safety Consequences
2. Property Damage
3. Environmental Damage
4. Economic Disruption

Probability of Occurrence: Scored from 1-5, estimates the anticipated frequency of occurrence. To arrive at the overall risk value, the sum of the Area and Consequence ratings was multiplied by the Probability rating. The highest possible risk score is 80.

According to the updated Hazard and Risk Estimation for Glover, the following natural hazards received the highest risk ratings out of a possible high score of 80:

- Severe Winter Storm (32)
- Flooding (30)
- High Winds (18)
- Extreme Cold (16)

Flooding remains the most likely event to incur the most cost for the town based on historical analysis and disaster declaration-related funding since 2004 has all been a result of severe rain storms. Given the magnitude of damage to such few areas during DR 4001, the realization that a major flooding event can result in major expense is evident, lending support that that flooding is likely to have a significant impact over a smaller area while a severe winter storm tends to affect the entire town. As with most Vermont towns, there is almost an inherent resilience to winter weather events because they are expected. However, as severity increases and consequences mount (e.g.

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power outage, road closures, etc.), the risk for health and safety also increases. High wind and lightning events happen and have the potential to disrupt functionality of the town but the town is not at any increased risk in comparison to other areas of the state but the sum area impacted and probability of occurrence raise these two events in the hazard analysis methodology.

Table 4.4.- Natural hazards risk estimation matrix

Glover, VT Hazard & Risk Analysis: NATURAL HAZARDS		Drought	Flooding	High Winds	Fluvial Erosion	Landslide	Lightning	Multi-Structure Urban Fire	Wildfire	Winter Storm	Extreme Cold
		Area Impacted									
Key: 0 = No developed area impacted											
1 = Less than 25% of developed area impacted											
2 = Less than 50% of developed area impacted											
3 = Less than 75% of developed area impacted											
4 = Over 75% of developed area impacted		3	3	2	0	0	1	1	4	4	3
Consequences											
<i>Health & Safety Consequences</i>											
Key: 0 = No health and safety impact											
1 = Few injuries or illnesses											
2 = Few fatalities or illnesses											
3 = Numerous fatalities		1	1	1	1	1	1	1	1	1	1
<i>Property Damage</i>											
Key: 0 = No property damage											
1 = Few properties destroyed or damaged											
2 = Few destroyed but many damaged											
3 = Few damaged but many destroyed											
4 = Many properties destroyed and damaged		0	1	1	1	1	1	4	1	2	2
<i>Environmental Damage</i>											
Key: 0 = Little or no environmental damage											
1 = Resources damaged with short-term recovery											
2 = Resources damaged with long-term recovery											
3 = Resource damaged beyond recovery		2	2	1	0	0	0	1	2	0	0
<i>Economic Disruption</i>											
Key: 0 = No economic impact											
1 = Low direct and/or indirect costs											
2 = High direct and low indirect costs											
2 = Low direct and high indirect costs											
3 = High direct and high indirect costs		1	3	1	1	1	1	2	1	1	2
Sum of Area & Consequence Scores		7	10	6	3	3	4	9	9	8	8
Probability of Occurrence											
Key: 1 = Unknown but rare occurrence											
2 = Unknown but anticipate an occurrence											
3 = 100 years or less occurrence											
4 = 25 years or less occurrence											
5 = Once a year or more occurrence		1	3	3	1	1	2	1	1	4	2
TOTAL RISK RATING											
Total Risk Rating =		7	30	18	3	3	8	9	9	32	16
Sum of Area & Consequence Scores											
x Probability of Occurrence											

4.2 Hazard Summary

According to the risk estimation analysis, the highest rated hazards for Glover are:

Flooding
Severe Winter Storm
High Winds
Extreme Cold

It should be noted that the natural hazards listed above could be the cause of power loss and a major transportation incident, where-by making these vulnerabilities additional considerations. Regardless of causation, power loss and a major transportation incident pose a risk to the town and will be considered vulnerabilities associated with these hazards. Flooding and a severe winter storm are the highest rated hazards for Glover, due in large part to their widespread nature and frequent occurrence. A severe winter storm is expected and while the town is well-equipped to handle winter storms, the resilience of its residents is dependent on effective town emergency planning when intervention strategies are required.

4.3. Profiled Hazard's Impact and Extent Data

Flooding/Fluvial Erosion

Flooding is the most common recurring hazard event in the state of Vermont. June, 2015 broke records across the state for the wettest on record. Glover, along with other towns in the NEK received 7 to 8 inches of rain in June. Recent history, including the flooding events of 2011 and the records set in 2015 suggest that increases in total rain fall and severity in terms of rainfall per given unit of time are to be expected along the lines seen with the records seen across the state recently. The following excerpt is from the 2015 Glover Flood Resilience Plan, written in conjunction with the NorthWoods Stewardship Center and paid for, in part, by a grant from the Barton Hydro Project Municipal Planning Grant:

Approximately 92% of the town of Glover (22,740 acres) falls within the Lake Memphremagog Watershed, with the remaining area lying within the Lake Champlain and Connecticut River watersheds.

The Memphremagog watershed includes 4 sub-basins; the Johns River, Black River, Barton River, and Clyde River watersheds. Of these, the Black River and Barton River watersheds include portions of Glover, with most of the town's surface waters draining from the Barton River watershed. Each of these rivers flow generally north into Lake Memphremagog, which in turn drains north via Quebec's Magog and St. Francis rivers to the St. Lawrence River. The Barton River watershed is fed by an area of approximately 162 square miles, from its headwaters in southern Glover to its outlet into Lake Memphremagog at the South Bay Wildlife Management Area in Coventry, VT. The Black River watershed runs from headwaters in the town of Albany and also empties

into Lake Memphremagog in Coventry. The Black River itself does not flow through Glover.

The Upper Lamoille River watershed is fed by an area of approximately 722 square miles, beginning at headwaters located in the town of Greensboro. The Lamoille River flows southwest from Greensboro until it reaches the Jackson Dam in Hardwick, where it turns west until emptying into Lake Champlain in Milton, VT. The Lamoille River itself does not flow through Glover, but 1,856 acres of its watershed lies within the southern part of the town.

The 64-acre portion of the Miller's Run watershed, a subwatershed of the Passumpsic River watershed, that falls within Glover also excludes the Passumpsic River itself. The Passumpsic River watershed is fed by an approximately 504 square mile area, with many branches converging in the town of Lyndon and flowing south before reaching the Connecticut River at Barnet. The Passumpsic River is one of the largest tributaries of the northern Connecticut River.

The Town of Glover contains two lakes, Shadow Lake and Lake Parker; four ponds, Clarks Pond (also known as Tildy's Pond), Daniels Pond, an unnamed pond called the Beaver Pond by locals, and Sweeney Pond; and many streams and rivers including an approximately 7.9 mile stretch of the Barton River and its headwaters.

Elevation/Topography

Glover is characterized by a highly-varied topography; with tall hills contrasting sharply with low, wet valleys. In high volume rain events, this topography causes water flowing across impervious surfaces (such as roads) to pick up speed and cause erosive damage, as well as transporting sediment and debris and causing culvert blockages. Blocked culverts can lead to flooding across roads and driveways, property loss or damage, and the washing out of the culverts. The tallest prominences in Glover, all over 2,200 feet in elevation, are the two peaks of the Black Hills in the south, and Pepin Hill to the west.

Soil Types

Within Glover, soil types fall into 4 categories of sensitivity to erosion; Highly Erodible, Potentially Highly Erodible, Not Erodible, and Unrated (NRCS HELCLASS). The majority of the soils in Glover (62%) are ranked as Potentially Highly Erodible, due to soil textures and slopes that result in a high sensitivity to erosion when the soils are disturbed or exposed.

Vermont experienced major floods long before Federal disaster assistance became available. A very destructive event occurred in November of 1927. The last two decades

have resulted in an increase in flood events for the town. Below are the notable, flood-related events for the town (source: Glover Flood Resilience Plan):

- 1810 – June 6th – a work crew consisting of 40 to 60 men and boys from Glover, in an attempt to increase water flow to power their mill, began excavating a channel from what was, then, Long Pond to Clarks Pond and then to the Barton River. The unstable, sandy soil of the area gave way, emptying the entire pond into the Barton River within a few minutes, destroying bridges, mills, riparian trees, and farm fields.
- 1927 – November – record-breaking rainfall and the resulting flooding caused significant damage, including one bridge lost in West Glover and a damaged sawmill. In Glover Village, one house and a blacksmith shop were lost. For more information on this infamous flood, see History of the town of Glover, Vermont.
- 1997 – July – flooding in Glover village caused damage to the town hall, church, and firehouse. Cellars were flooded in several homes and many culverts washed out (approximately 200 were replaced). Some erosion also occurred at the bridge in Glover village and Sand Hill Road was washed out.
- 2011 – May – heavy rain caused two culverts on Rodgers Rd to be washed out. They had previously been partially blocked by beavers.
- 2011 – August – during Hurricane Irene the King Road culvert washed out, and there was some erosion on Phillips Rd.
- 2012 – May 29 – heavy rain in north end of Glover caused significant damage to King Road and Dexter Mountain Road, the Sargent Lane Bridge abutment was undermined, and there was some damage to Sand Hill Road.

Glover's worst experience with flooding was in 1927 when damage in the villages was significant, but roads and bridges were affected throughout the town. The cause of the 1927 flood cannot be attributed to one single factor, but a combination of many. The excess rain during the month of October saturated the soil to the point where it could not hold anymore. The final factor, the excessive rain culminating on November 4, pushed the landscape over the edge. The flood occurred on November 2, 3, and 4 of 1927. Rainfall averages over this period of time range from four to nine inches total. The month of October, 1927 saw one hundred-fifty percent more rain than normal. In Northern and Central Vermont, there was nearly three hundred percent more; this completely saturated the ground. The water ran into the already high rivers, causing mass flooding all over the state. The flood greatly changed the landscape, causing failing on slopes, destruction of homes and bridges, and forcing a mass rebuilding effort in all counties (<http://www.erh.noaa.gov/btv/events/27flood.shtml>). There have been numerous smaller incidents of flooding since then, ranging from wet lawns and cellars to damage to a few buildings.

Fluvial Erosion:

Erosion occurs on a consistent, but small-scale, basis within the riparian corridor of the town's streams and rivers. This is a part of normal natural processes and as such is necessary for the proper functioning of the ecosystem of these waterways. However, fluvial erosion on a large scale can damage stream banks and undercut infrastructure such as roads, bridges and culverts as well as agricultural land and structures, causing severe damage. Fluvial erosion on a large scale can cause stream bank collapses, which are generally classified as landslides. Most flood damage is associated with fluvial erosion rather than inundation. The *2013 Vermont State All-Hazards Mitigation Plan* contains the following discussion of fluvial erosion:

“Vermont’s landscape has historically contributed greatly to the widespread practice of the channelization of rivers and streams in order to maximize agricultural land uses and facilitate the development of transportation infrastructure. Channelization, in combination with widespread flood plain encroachment, has contributed significantly to the disconnection of as much as 70% of Vermont’s streams from their flood plains. In this unsustainable condition and when energized by flood events, catastrophic adjustments of the channel frequently occur, usually with consequent fluvial erosion damage to adjacent or nearby human investments. All areas of the state suffer equally from fluvial erosion hazards. Some areas have suffered more than others simply because of the location of storm tracks. Transportation infrastructure and agricultural property are the most frequently endangered types of human investment affected by fluvial erosion hazards. Residential, commercial and other municipal properties are also frequently endangered. Changes in watershed hydrology that significantly influence fluvial stability are commonly associated with urbanization or with silvicultural practices. However, watershed scale hydrologic changes have been observed in Vermont as a localized phenomenon either in small, highly urbanized watersheds or in small, rural sub watersheds where clear cutting of a large percentage of the watershed land area has recently occurred. Stream geomorphic assessments and a fluvial geomorphic database maintained by the Agency of Natural Resources have identified main stem rivers typically channelized from 60-95% of their lengths. When human investments and land use expectations include all the land in the valley up to the river banks, there results extreme public interest in maintaining this unsustainable morphological condition despite its great cost and resultant hazard to public safety.”

The Vermont Agency of Transportation (VTTrans) applies the term “scour critical” to stream crossing structures especially vulnerable to streambed scour—the undermining of bridge supports by water action and erosion. A spreadsheet database is maintained by VTTrans and continually updated by the Bridge Inspection Program. Structures inspected are only those 20’ or longer owned by a municipality or the state. The scour critical rating is

based on the structure itself, and does not take into account debris jams, outflanking, channel change, or other issues commonly associated with fluvial erosion. Water supply source and distribution systems are also endangered by fluvial erosion. Many water distribution systems involve buried pipes that cross streams, which are vulnerable to fluvial erosion, however, the town does not have a municipal water supply. In December, 2014 the Vermont Department of Environmental Conservation (DEC) released the “Flood Hazard Area and River Corridor Protection Procedures” guide, outlining specific actions and considerations for all towns in the state. Town bridges suffered the greatest damage in 2011(DR 4022) due the magnitude of water and resulted in the greatest expense to repair. The 2011 flooding events did result in enhanced erosion, further data was not available to determine the extent of this erosion.

Dam Failure

According to the 2013 Vermont State All-Hazards Mitigation Plan, “The VT Agency of Natural

Resources (ANR) Dam Safety Program maintains an inventory of 1205 dams (including 85 ANR owned dams) with impoundments greater than 500,000 cubic feet”. Failure of any of these dams could result in significant downstream flooding. There are 55 high hazard dams on the dam inventory.

There are three dams within the town of Glover. The Shadow Lake Dam is the largest of these with the potential to cause the most damage in the event of a breach. It is classified as a “Class 2” or “Significant Hazard” dam by the Vermont Dam Inventory (VDI) and at the last inspection of the dam in 2012, it was determined to be in poor condition due to a general lack of upkeep. Since this report, all cited issues (i.e. cutting of trees and brush on the dam and immediately downstream, patching concrete, filling in low spots on the dam, rebuilding stone walls at the gatehouse outflow, and updating of the Emergency Action Plan) have been corrected. This dam drains into the Barton River by way of the Shadow Lake Brook, which runs generally parallel to Shadow Lake Road. In the event of a sunny-day failure of this dam, the report states that the result could be stream bank erosion, overtopping of at least one road crossing within the area studied, and inundation of the first floor of a house in the low area adjacent to Perron Hill Road. A storm-day failure of this dam could result in stream bank erosion, overtopping of at least 4 road crossings, and inundation of two houses in the low area adjacent to Perron Hill Road. Any major breach in the Shadow Lake Dam will have downstream consequences, not only for the 3 miles of riverside addressed in the dam break report, but for any low-lying and highly developed areas such as Glover Village and Barton. This is discussed further in the Areas of Special Consideration section.

The dam located at the outlet of Lake Parker is classified as a “Class 3” or “Low Hazard” dam. The Daniels Pond Dam does not appear on the VCGI dams layer because it consists of a granite block set across the culvert at the outlet which controls the height of the water and is not adjustable.

The dam at the outlet of Shadow Lake in Glover is rated as a Class 2, “significant hazard” dam based on a Dam-break Flood Analysis done in April 1991 done by Dubois & King of Randolph, VT for the U.S. Army Corps of Engineers and the VT Department of Environmental Conservation Dam Safety Program. The significant hazard rating is based on:

1. Loss of Life (few) and Extent of Development (no urban developments and no more than a small number of inhabitable structures).
2. Potential Economic Loss (appreciable) and Extent of Development (notable agriculture, industry or structures).

The general description given of the dam is:

“The dam is an earthen embankment with masonry headwalls and is approximately 129 feet in length. The maximum height is 11.5 feet and the crest width is 16 feet. The principal spillway is a gatehouse with stop logs and a three (3) foot diameter drain pipe. The emergency spillway is located to the left of the gatehouse and is a 33.5 ft. long, 15 ft. wide concrete chute. The control section is set at an elevation of approximately 1392.6 National Geodetic Vertical Datum (NGVD). At normal water level the lake’s surface area is 188 acres. The actual date of construction is unknown, however, the year 1929 is cast in the side of the spillway. The current primary purpose of the dam is recreational.”

The watershed for Shadow Lake is approximately 3,300 acres.

The most recent inspection of the dam, in September, 2012, by Stephen Bushman, P.E., Dam Safety Engineer, rates the overall condition of the dam as “poor” but notes that “commendable efforts are being made to clear the dam of trees and perform other maintenance items.” These maintenance items have since been completed and an updated *Emergency Action Plan for Shadow Lake Dam, Glover, VT* was adopted by the Glover selectboard on January 22, 2015.

Under *Spillway Hydraulic Capacity* the report states: “Shadow Lake Dam does appear to have adequate storage and hydraulic spillway capacity to route and pass the 100-year and ¼ PMF storm events without overtopping the dam; no resulting failure was assumed.”

The dam break analysis is limited to the area within 3 miles downstream of the dam. Within this area, in the event of a dam failure, 3 bridges on town roads and one private driveway bridge would be overtopped and one residence would be threatened with flooding. Glover Village is 1½ miles further downstream and the river valley is confined so a dam failure at Shadow Lake would certainly impact Glover Village. The Barton river valley flattens and widens considerably between Glover Village and Barton Village.

The Emergency Action Plan calls for monitoring of the dam during normal conditions and during periods of heavy precipitation, flooding, or any unusual hydrologic events

that might cause structural damage to the dam. The plan names a monitor and alternate monitor, provides an assessment checklist, specifies preventative action, and lists officials and downstream residents to contact in the event of imminent possible failure.

Lake Parker

The Lake Parker dam is a Class 3 “low hazard” dam and, as such, is not considered in this Mitigation Plan.

NOAA DATA. (National Oceanic & Atmospheric Administration)

NOAA documents the occurrence of storms and other significant weather phenomena having sufficient intensity to cause loss of life, injuries, significant property damage, and/or disruption to commerce." For the Orleans County Zone (one of the National Weather Service forecast zones) the majority of recorded regional events are due to winter storms and winter weather. However, the local Glover events are due to thunder storms, high winds, and flooding. Based on local and national data flooding and high winds account for the most damaging of all the natural hazards.

While the NOAA database contains data from January 1950 to October 2014, from 1950 through 1954 only tornado events were recorded. From 1955 through 1992 only tornados, thunderstorm wind and hail events were put into the digital database. And from 1993 through 1995 only tornado and thunderstorm wind and hail events were extracted from the unformatted text files. For Orleans County from 1958 through 1993 there were 16 listed thunderstorm and wind events, 6 hail events, and 3 tornado events.

Table 4.5 NOAA recorded storms that were recorded as county-wide events.

DATE	EVENT TYPE
1-8-1998	Flash flood
3-29-1998	Flash flood
4-1-1998	Flash flood
4-4-2000	Flash flood
4-22-2001	Flash flood
9-27-2002	Heavy rain
10-26-2003	Heavy rain
8-12-2004	Heavy rain
7-8-2005	Heavy rain
8-30-2005	Heavy rain
5-19-2006	Flood

Table 4.6 NOAA STORM EVENTS – GLOVER, VT, 2001 THROUGH 2013

DATE	EVENT TYPE	PROPERTY DAMAGE
8/3/2004	Thunder, wind	\$5,000
6/10/2005	Flash flood	\$50,000
8/7/2006	Thunder storm, wind	\$10,000
8/25/2007	Thunder storm, wind	\$5,000

5/29/20012	Thunder, wind, hail	\$5,000
5/29/20012	Flash flood	\$50,000
7/20/2013	Thunder, wind	\$15,000

Table 4.7 NOAA SUMMARY INFO 2001 through 2013:

DURATION/FREQUENCY	GLOVER REGION	GLOVER
# of days with events	258	7
# of days with events & death	0	0
# of days with events & death or injury	0	0
# of days with events & property damage	218	7
# of days with events & crop damage	5	0
# of event types reported	17	5

Flood/Fluvial Erosion and Dam Breach Vulnerability:

There are three main types of flooding that occur in Vermont: flooding from rain or snow melt, flash flooding and urban flooding. Flooding has also been known to occur as a result of ice jams in rivers adjoining developed towns and cities. These events may result in widespread damage in major river floodplains or localized flash flooding caused by unusually large rainstorms over a small area. The effects of all types of events can be worsened by ice or debris dams and the failure of infrastructure (especially culverts), private dams and beaver dams. Rain storms are the cause of most flooding in Glover but as a whole, the town’s infrastructure has not seen nearly as much damage as other areas in the state during major rain events. Winter and spring thaws, occasionally exacerbated by ice jams, are another significant source of flooding. Much of this flooding is flash flooding, occurring within hours of a rainstorm or other event. Flash flooding, as opposed to flooding with a gradual onset, causes the largest amount of damage to property and infrastructure. Floods cause two major types of damage: water damage from inundation, and erosion damage to property and infrastructure. The 2013 Vermont State All-Hazards Mitigation Plan discusses flooding extensively.

The number and steepness of Glover’s hills combined with the scattered pattern of development and the “casual” nature of early road layout has left the town with numerous sections of gravel road vulnerable to fluvial erosion. Quick, intense summer storms or too rapid snow melt can overflow roadside ditching, washout undersized or blocked culverts, and cut into or across road surfaces and base materials.

In the Village of Glover, especially on the west side of the river, the shallow slope and relatively high development density creates an area that seems likely to be affected during a flood event. In this area, Red Sky Trading, the Currier’s Store & Post Office, the Union House Nursing Home, and the Federated Church are fully or partially within

the FEMA flood zone, the 100-Year-Flood Zone. In this flood zone, there is a 26% chance that there will be a flood within a thirty-year period. Although the Glover Village School is located outside of the FEMA-mapped flood zone, it is within 100 feet of both the flood zone to the south and the unnamed brook to the north. The firehouse is located approximately 40 feet outside of the flood zone. Though these structures are within the flood zone, historically they have not been repetitive loss structures and have not suffered damage as a result of their proximity to the Barton River, including during the recent dramatic flood events which affected the rest of the state. For this reason, no actions are recommended for this area at this time.

Other areas to consider are those immediately surrounding lakes and ponds. These are also areas of high structure density, as well as areas which are likely to be affected during floods. These areas are also historically unaffected by flooding, and the VT Shoreline Protection Act restricts development and land management within 250 feet of any lake or pond which is greater than 10 acres. There are 5 such lakes in Glover including Lake Parker, Shadow Lake, Daniels Pond, Clarks Pond, and the Beaver Pond. For these reasons, no actions are recommended for this area at this time.

In the future, if (a) the predictions of a pattern of increasing severity and frequency of storms hold true and (b) these become areas of repetitive losses, then this course of inaction will need to be reevaluated (2015 Glover Flood Resilience Plan). No detailed data was available for fluvial erosion damage in Glover in terms of numbers of acres lost during each event.

Flooding Summary

Location: low lying areas of Glover Village along the Barton River.

Impact: a few wet cellars to significant damage to buildings and roads/bridges (e.g. DR 4066 (6/2012) resulted in over \$300,000 in flood-related damage to town infrastructure

Previous Occurrences: flood of 1927 caused significant damage to buildings and roads/bridges; a few minor to moderate events since then.

Probability of Future events: medium (4%) to high (100%).

Extent: 1927, November: record-breaking rainfall and the resulting flooding caused significant damage

Vulnerability: All village residences and businesses, nursing home, town office.

Fluvial Erosion Summary

Location: roads on steeper hills throughout town.

Extent: Unknown

Previous Occurrences: numerous, but not every year.

Probability of Future Events: medium (4%) to high (100%).

Impact: potential for significant losses, although new road maintenance practices are leading to a more resilient town road system. Significant damage possible, but usually restricted to certain areas, not the entire town.

Vulnerability: Moderate can result in temporarily closed roads.

Dam Failure Summary

Location: along outlet stream of Shadow Lake and Barton River valley north through town and village.

Extent: n/a

Previous Occurrences: none. The dam was cause for concern in the flood of 1927, was sandbagged, and survived. Upgrades were made in 1929.

Probability of Future Events: low (1% to 4%).

Impact: potential for significant damage to roads/bridges and buildings. Significant damage possible to bridges crossing the outlet stream and Barton River. Possible flooding of buildings closest to Barton River.

Vulnerability: could result in temporarily closed roads and evacuation of residents in flood prone areas.

Severe Winter Storm/Ice Storm/Extreme Cold

A winter storm is defined as a storm that generates sufficient quantities of snow, ice or sleet to result in hazardous conditions and/or property damage. Ice storms are the result of cold rain that freezes on contact with the surfaces coating the ground, trees, buildings, overhead wires and other exposed objects with ice, sometimes causing extensive damage and dangerous travel conditions. Periods of extreme cold can occur with or just after these events. Heavy snow generally affects the entire town, although especially deep drifts are usually confined to certain areas depending on the prevailing winds during a storm. Ice storm damage can be confined to certain elevations or exposures or can be more generally spread throughout the town.

Severe Winter Storm

A winter storm is defined as a storm that generates sufficient quantities of snow, ice or sleet to result in hazardous conditions and/or property damage. Ice storms are the result of cold rain that freezes on contact with the surfaces coating the ground, trees, buildings, overhead wires and other exposed objects with ice, sometimes causing extensive damage and dangerous travel conditions. Periods of extreme cold can occur with or just after these events.

Heavy snow generally affects the entire town, although especially deep drifts are usually confined to certain areas depending on the prevailing winds during a storm. Ice storm damage can be confined to certain elevations or exposures or can be more generally spread throughout the town. Winter storm frequency and distribution varies from year to year depending on the climatological patterns. Because such storms are expected during a Vermont winter, the town is well-equipped to deal with snow removal and traffic incidents. The most damaging types of snowstorms are ice-storms caused by heavy wet snow or rain followed by freezing temperatures. This leads to widespread and numerous power and telephone outages as lines either collapse due to the ice weight or are brought down by falling trees and branches. According to the *2013 Vermont State All-Hazards Mitigation Plan*:

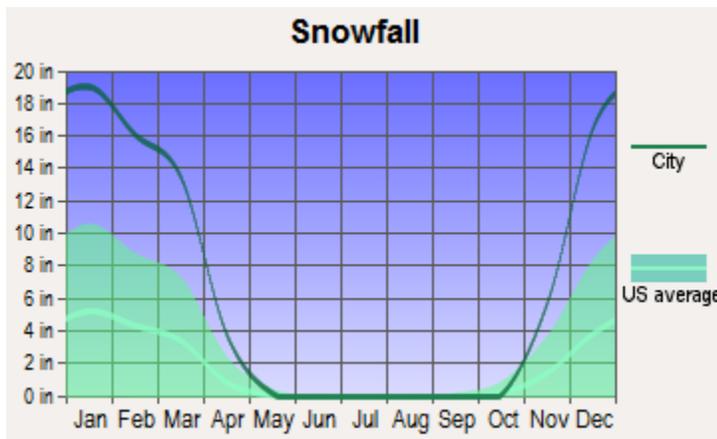
“A winter storm can range from moderate snow to blizzard conditions. A severe winter storm deposits four or more inches of snow during a 12-hour period or six inches of snow during a 24-hour period. A blizzard is a snowstorm with sustained winds of 40 miles per hour or more with heavy falling or blowing snow and temperatures of ten degrees Fahrenheit or colder. An ice storm involves rain, which freezes upon impact. Ice coating at least one-fourth inch in thickness is heavy enough to damage trees, overhead wires, and similar objects and to produce widespread power outages.”

The winter of 2010-2011 was the third-snowiest on record with a total of 124.3 inches. The record of 145.4 inches was set in 1970-1971. The potential for a major snowstorm that exceeds the capabilities of town exists every year but with the recent increase in snow fall totals and cold temperature duration, the town realizes the further consideration are required. NOAA's National Centers for Environmental Information is now producing the Regional Snowfall Index (RSI) for significant snowstorms that impact the eastern two thirds of the U.S. The RSI ranks snowstorm impacts on a scale from 1 to 5, similar to the Fujita scale for tornadoes or the Saffir-Simpson scale for hurricanes. NCEI has analyzed and assigned RSI values to over 500 storms going as far back as 1900. New storms are added operationally. As such, RSI puts the regional impacts of snowstorms into a century-scale historical perspective. The index is useful for the media, emergency managers, the public and others who wish to compare regional impacts between different snowstorms. The [RSI and Societal Impacts Section](#) allows one to see the regional RSI values for particular storms as well as the area and population of snowfall for those storms. The area and population are cumulative values above regional specific thresholds. For example, the thresholds for the Southeast are 2", 5", 10", and 15" of snowfall while the thresholds for the Northeast are 4", 10", 20", and 30" of snowfall. 2010, 2012 and 2015 have some of the highest rankings for notable storms. These rankings are based, in part on the severity of the storm using the following system. Since 2000, there has only been one event that reached a category 4 in the Northeast, five reached Category 3, eight were “significant” and all others were notable. Despite having considerably more snow than the U.S. average, Glover has had no major PA funding related to damage from snow events.

Table 4.8. NOAA's Regional Snowfall Index (RSI)

CATEGORY	RSI VALUE	DESCRIPTION
1	1–3	Notable
2	3–6	Significant
3	6–10	Major
4	10–18	Crippling
5	18.0+	Extreme

Table 4.9. Glover Snowfall vs. US Average



While declared snow storm disaster have been declared for the county, Glover has not received PA funding for these events. Because such storms are expected during a Vermont winter, the town is well-equipped to deal with snow removal and traffic incidents. The most damaging types of snowstorms are ice-storms caused by heavy wet snow or rain followed by freezing temperatures. This leads to widespread and numerous power and telephone outages as lines either collapse due to the ice weight or are brought down by falling trees and branches. The winters of 1969-72 produced record snowfalls, and greater than normal precipitation was recorded in 8 of the 11 years during 1969-79.

Ice Storm:

Major Ice Storms occurred in January, 1998 and again in December, 2013 and January, 2014. The North American Ice Storm of 1998 was produced by a series of surface low pressure systems between January 5 and January 10, 1998. For more than 80 hours, steady freezing rain and drizzle fell over an area of several thousand square miles of the Northeast, causing ice accumulation upwards of 2” in some areas. Glover

received .5 to 1 inch of ice with significant damage to forest stands (total acreage unknown). Power was disrupted for over seven days. On December 13th, 2013, another ice storm hit portions of Caledonia County, including Glover but the extent of this storm is unknown. The 2014 event resulted in a declared disaster (DR4163) but damage was minimal for the town. While there is evidence that supports an increase in weather and precipitation severity, the incidence of ice storms remains fairly spaced out. The town expects to have another ice storm but unlike rain and snow events, the occurrence of a major ice storm is not expected every year.

Extreme Cold

Recent extremes in cold temperatures is a concern. 2015 tied the coldest winter (January to March) on record (1923) for Vermont as a whole according to the NOAA's National Climatic Data Center whose dataset dates to 1895. Glover's winter of 2015 was the coldest anyone could remember with a mean temperature of 7.8 degrees Fahrenheit. However, the January of 1994 had a mean temperature of 2.7 degrees Fahrenheit which is the coldest mean temperature since 1930 and January is the statistically coldest month in all of Vermont. Since 1930, January produced temperatures in the negative 20's and 30's consistently for Orleans County with record cold temperatures occurring in 1957 (-38). Cold temperatures are expected in the Northeast but they can pose a serious threat to health and safety, especially as the severity and duration increases in conjunction with other technological (e.g. power outage, fuel oil delivery disruption) and societal (ability to purchase heating fuel) factors. Maintaining a safe living environment for livestock during extreme temperatures, especially cold extremes, is a real concern for farmers in Glover and the rest of the state and while the temperatures for the town remain within averages seen in the last 85 years, the town expects dangerously cold temperatures every winter and the impact is town-wide.

Winter Storm/ Ice Storm Summary

Location: entire town, though heavy drifts or heaviest ice accumulation may be scattered according to exposure or elevation.

Extent: 2015 tied the coldest winter (January to March) on record (1923) for Vermont. The winter of 2010-2011 was the third-snowiest on record with a total of 124.3 inches. The record of 145.4 inches was set in 1970-1971. 1998 Ice Storm resulted in significant damage to forest stands.

Previous Occurrences: numerous, but not every year.

Probability of Future Events: medium (4%) to high (100%).

Impact: potential for significant damage to electric lines and increased workload for town road crew.

Vulnerability: Can result in temporarily closed roads. Extended power outage may require shelters for at risk residents.

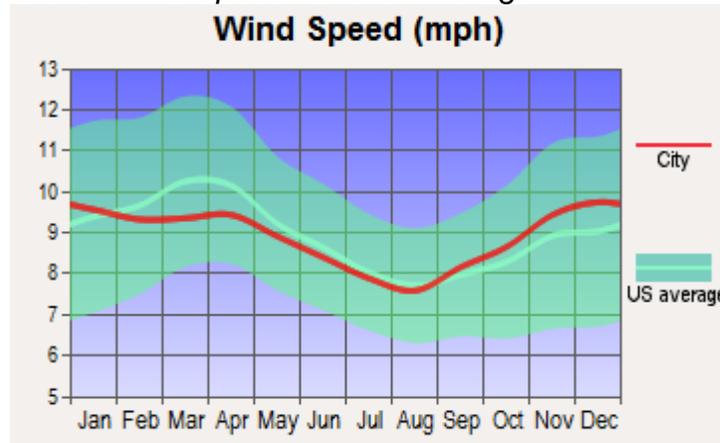
High Wind

High wind is defined as an event with sustained wind speeds of 40 m.p.h. or greater lasting for 1 hour or longer or an event with winds of 58 m.p.h. or greater for any duration. Thunderstorms can generate high winds and down hundreds of large trees within a few minutes. High winds can impact the entire planning area. In a study completed by the Worcester Polytechnic Institute (Extreme Wind Speed Region in New England and New York, 2008), using wind speed data from the National Climatic Data Center, National Institute of Standards and Technology, and the US National Meteorological Service to develop a probability for extreme wind speeds and their corresponding mean recurrence interval, The purpose of this study was to develop recommendations for transmission line construction based on land contour data. The last recorded high wind event as tracked by the National Weather Service was recorded on 17-18 January 2012. An 81 mph wind gust was measured atop Vermont's highest peak Mount Mansfield. These strong gusts caused numerous power outages across northern New York and parts of central and northern Vermont. At the peak of the event, over 10,000 people were without power across northern New York, including the Saint Lawrence Valley and over 2,500 people had no power in parts of Vermont. During this event, Orleans County had wind speeds of 30-40 mph (category 7-8 on the Beaufort scale). With two declared disasters due to wind, this hazard remains a concern. Transportation route access and electric power supply are at risk during a major wind event. The following table describes the Beaufort Scale for non-hurricane winds.

Table 4.9.1: Beaufort Scale and Glover Windspeed vs. U.S. Average

Beaufort*	Avg Miles per Hour	Knots	Surroundings
0 calm		0-1	Smoke rises vertically and the sea is mirror smooth
1 light air	1.2 - 3.0	1 - 3	Smoke moves slightly with breeze and shows direction of wind
2 light breeze	3.7 - 7.5	4 - 6	You can feel the breeze on your face and hear the leaves start to rustle
3 gentle breeze	8.0 - 12.5	7 - 10	Smoke will move horizontally and small branches start to sway. Wind extends a light flag
4 moderate	13.0 - 18.6	11 - 16	Loose dust or sand on the ground will move and larger branches will sway, loose paper blows
5 fresh breeze	19.3 - 25.0	17 - 21	Surface waves form of water and small trees sway
6 strong breeze	25.5 - 31.0	22 - 27	Trees begin to bend with the force of the wind and causes whistling in telephone wires. Some spray on the sea surface
7 moderate gale	32.0 - 38.0	28 - 33	Large trees sway. Moderate sea spray
8 fresh gale	39.0 - 46.0	34 - 40	Twigs break from trees, and long streaks of foam appear on the ocean
9 strong gale	47.0 - 55.0	41 - 47	Branches break from trees
10 whole gale	56.0 - 64.0	48 - 55	Trees are uprooted and the sea takes on a white appearance
11 storm	65.0 - 74.0	56 - 63	Widespread damage
12 hurricane	75+	64 +	Structural damage on land, and storm waves at sea

Glover Wind Speed vs. U.S. Average



SHELDUS DATA. (Spatial Hazard Events & Losses Database for the United States) SHELDUS is a national hazard events database that gathers information from the National Climatic Data Center, the Storm Prediction Center, and the National Geophysical Data Center. The data set is county-level data for 18 different natural hazard events such as thunderstorms, hurricanes, floods, wildfires and tornadoes. It includes only those events that cause more than \$50,000 in damages or at least one death. As with the above FEMA data, SHELDUS shows that flooding and high winds stand out as the natural hazard type that causes the most damage for Orleans County.

Table 4.9.2. WIND and RAIN STORM EVENTS - GLOVER 1998 - 2013

DATE	DETAILS
8/3/2004	Thunderstorm winds, trees blown down blocking some roads
6/10/2005	Locally very heavy rainfall, numerous roads washed out, flooding of farm fields
8/7/2006	Strong damaging winds, penny-size hail, knocked down trees & power lines blocking access to Barton on RT 16
5/29/2012	Confirmed EFO (gale) tornado in W. Glover, hail greater than an inch in diameter, damaging winds, flash flooding, total rainfall of 3-5 inches
7/20/2013	Localized microburst, numerous trees down & shingle & roof damage

High Wind Summary

Location: throughout town, although usually restricted to certain exposures.

Extent: 5/2012 event: Confirmed EFO (gale) tornado in W. Glover, hail greater than an inch in diameter, damaging winds, flash flooding, total rainfall of 3-5 inches

Significant damage possible to trees, power lines, building roofs.

Previous Occurrences: Glover sustained damage from high winds in 2004, 2006 and 2013 and a confirmed tornado touched down in West Glover in 2012.

Probability of Future Events: medium (4% to 100%).

Impact: usually limited, could be significant.

Vulnerability: possible road closings, power outage, personal injuries.

Table 4.9.3. Town of Glover Hazard Risk and Vulnerability Summary

Hazard Type	Probability¹	Vulnerability²	Impact³
Flood/Fluvial Erosion	Medium to High	All village residences and businesses, nursing home and town office.	June, 2012 flooding resulted in most damage for the town, including sergeant lane bridge and 6 other sites. Over \$300,000 in PA was received
Winter Storm/Ice Storm/Extreme Cold with Power Failure	High	The entire Town is vulnerable, including road infrastructure, town and privately owned buildings and utility infrastructure	For roof collapse: monetary damages will depend on each structure but, collapse of barn roof is often a total loss. This does not include the loss of livestock. Collapse of a house roof may be at a 50% loss. For car crashes due to poor driving conditions: minimal damage to vehicle to totaled vehicle and operator injury. Health impacts could vary significantly. Loss of energy or communication capabilities may occur and impede recovery.
High Wind	Medium	The entire town is vulnerable to the results of high wind exposure. Significant damage possible to trees, power lines, building roofs.	5/2012 event: Confirmed EFO (gale) tornado in W. Glover, hail greater than an inch in diameter, damaging winds, flash flooding, total rainfall of 3-5 inches

¹ High – near 100% probability in the next year.

Medium - 4% to 100% probability in the next year or once in the next 25 years.

Low – 1% to 4% probability in the next year or at least once in the next 100 years.

² Yes - hazard presents the threat of a disaster. No - hazard presents a routine emergency.

³ Hazards with a Low level impact are not considered in this plan.

Repetitive Losses:

Glover is a participant in the FEMA National Flood Insurance Program (NFIP) and development in identified Special Flood Hazard Areas is regulated by a Flood Hazard Area Regulation first adopted by the Glover selectboard on April 16, 1987 and amended on June 27, 1991. There are no repetitive loss properties in Glover.

Estimating Potential Losses in Designated Hazard Areas:

According to the latest NFIP insurance report (2015), Glover has 5 properties in the A-Zone and none in the V-Zone. The Median Housing Value (MHV) for Glover is \$176,500. The Equalized Value for all properties in Glover in May of 2010 was \$127,225,294. There have been no repetitive loss claims since 1978. There are 7 policies with a total coverage of \$705,100. There have been 7 claims since 1978 with a total of \$23,433 paid. No further information on these claims was available.

Values of municipal property are as follows:

Municipal Building and Fire Station: 513,800
Office Equipment: \$11,000
Town Hall: \$172,000 + 2,800 (furnishings)

While the potential exists to estimate the total loss of all properties in designated hazard areas, the likelihood of this is low. Using prior history, the greatest risk is for bridges and they are expensive to replace. Without a history of structural loss, the need for further analysis is not needed at this time.

5: MITIGATION STRATEGIES

In understanding that a requirement for this update is to explain what the town has accomplished in relation to the actions identified in the 2005 plan, the town must address this requirement by explaining that there was very little adherence or attention to the 2005 plan and the actions established in it were generalized for the region. The greatest advancement in mitigation planning the town has achieved since 2005 has come from the direct experiences in responding to, and recovering from, the major disasters that have impacted the town in the last decade. These disasters, have, to a very large extent, redefined how the entire state views and addresses mitigation. The work of state agencies, including those devoted to transportation, planning and emergency management have also changed the way towns go about their day-to-day operations and planning, both in emergency situations and out. It is because of this that the town views this update as the new standard in their mitigation planning efforts. This plan allows for the systematic documentation of efforts in the next planning cycle in formats that the town will continue to use. There has not been a formula for ongoing, documented, mitigation efforts prior to this update. While the town has learned a great

deal and put much of the knowledge to practice in its highway department and planning efforts, these have not come as a result of the 2005 plan. We feel that the implementation matrix captures specific progress in certain areas but more importantly, gives the town a guide from which all future action and updates can be based on. The following information explains what the town is currently engaged in to support hazard mitigation, what changes occurring in the town have increased or decreased vulnerability and the specific mitigation actions that the town will attempt to accomplish in the next planning cycle. While there is general support for mitigation efforts, the town's ability to manifest each action described herein is largely dependent on staffing and financial resources.

5.1. Glover Town Goals and Policies that support Hazard Mitigation

Land Use and Development Trends Related to Mitigation

The town has no zoning regulations and does not intend to in the near future. It does stand to reason that the town is aware of higher risk areas and would certainly utilize this knowledge in any plan to develop or relocate its structures but this event is not foreseen in the near or distant future. As part of this plan's development, the town will make available and informally promote the No Adverse Impact best practices via informational brochure,

Future Development and Housing

The town adheres to the recommended practices under the NFIP and all continued compliance and participatory requirements are managed by the Zoning Administrator. As a participating community in the NFIP, the Administrative Officer (AO) enforces the flood hazard regulations. The AO receives and reviews permit applications and forwards for board review as appropriate. In accordance with FEMA requirements, the AO maintains records of all permits issued for development in areas of special flood hazard; elevations, in relation to mean sea level, of the lowest floor, including basement, of all new or substantially improved buildings; elevations, in relation to mean sea level, to which buildings have been flood proofed; flood proofing certifications; and all variance actions, including justification for their issuance.

The town welcomes future development but there have been no recorded increases in development since 2005, therefore, no perceived change in vulnerability. While the town does not anticipate significant new buildings or infrastructure development in the next planning cycle, it will consider a "No Adverse Impact" methodology when opportunity arises to discuss the potential of new structure development. The town has 15 mobile home residences and will develop an outreach plan to support the enhanced resilience of this population based on best practices and recommendations from UVM and ACCD.

Roads

The town has listed the following recommendations regarding future town road plans
No new construction of roads is necessary

The present classification system should remain as is, and there should not be any up grading of classifications

The town has identified the following sites as priority:

1. Perron Hill Rd. - culvert #369 - eroded concrete culvert, needs hydraulic study to determine required size for new standards.
2. Pine Place - culvert #392 - 72" steel culvert, stone headwalls failing, needs hydraulic study to determine required size for new standards.
3. King Rd. - culvert #249 - needs upgrading to 14' x 6' concrete box culvert
4. Tetrault Lane - culverts 537, 538, 539, 540, 541 - series of small culverts can't handle the water in a wet area, should be replaced with one large structure. Needs hydraulic study to determine required size for new standards.
5. Beach Hill Rd, approx. 0.20 miles from intersection with Parker Rd, bank erosion on steep hill, needs stone riprap to hold bank and road.
6. Shadow Lake Rd., approx. 0.10 miles from intersection with VT Rte. 16, outlet brook from Shadow Lake is cutting close to the road, needs stone riprap to hold bank and road.

Flood Resilience Goals

- a. Continue supporting state standards with local, POS and municipal water/sewer sources.
- b. Take advantage of the UVM/ACCD mobile home park preparedness programs to support resiliency of this disproportionately impacted population during disasters.
- c. Consider implementation of special population tracking within the community whereby residents unable to drive or that have no one to depend on can self-identify for inclusion in a maintained data-base so that rescue personal and emergency managers can account for this demographic.
- d. Mitigate Glover's flood hazards in the most cost-effective manner possible.
- e. Ensure the Town and its facilities are prepared to meet the demands of the next flood.
- f. Ensure the Town can receive the maximum outside assistance in the event of the next Federally declared disaster.

Capital Improvement Goals

- a. Provide services and facilities deemed necessary for the orderly and rational development of the Town.
- b. Assure that the Highway Department has enough funding to fulfill the goals of the following year and in adjunct, increase awareness on eligibility requirements for infrastructure projects under the Hazard Mitigation Grant Program (HMGP).
- c. Continue to meet or exceed the VTrans Road and Bridge standards. Participate in regional road foreman trainings and Transportation Advisory Committee meetings to stay abreast of flood resilience measures for the Town's roads and bridges.
- d. Update the Town's transportation infrastructure information in the Vermont Online Bridge and Culvert Inventory Tool (vtculverts.org).
- e. Replace undersized and failing culverts with upgraded/sized structures

Public Participation Goals

- a. Continue to solicit input regarding planning issues from town residents and from other entities which can help to offer solutions and insight into the problems the Town faces both now and in the future via formal meetings and advertised opportunities for input.
- b. Utilize LEPC meetings, drills and exercises to increase awareness, enhance planning and promote resilience in the community.

Regulatory Devices Goals

- a. The town has opted to not have zoning regulations and considers this in their best interest.

Land Use

- a. Follow recommendations associated with a "No Adverse Impact" methodology in land use decisions.
- b. Employ institutional awareness when considering development or relocation of town property.

Natural Resources

- a. With recent FEMA guidance on Climate Resilient Mitigation Actions funded under the HMA program, the town will incorporate recommendations accordingly. In line with the VTrans mission statement regarding climate change, the town remains committed to:
Ensure that there are viable alternative routes around vulnerable infrastructure such as bridges and roadways
Make safety a critical component in the development, implementation, operation and maintenance of the transportation system
Develop contingency plans for a wide-variety of climate impacts to be implemented as data/information becomes available
Utilize information technology to inform stakeholders during times of emergency
Educate of the public and other stakeholders on the threats posed by climate change and fluvial erosion hazards
Increase inspection of infrastructure if warranted by climate change indicators
Apply a decision-making framework to incorporate cost-benefit analyses into adaptive plans and policy

Work to protect essential ecosystem functions that mitigate the risks associated with climate change

Educate individuals within the town to use best-practices during recovery periods to avoid ecological damage that may further exacerbate risk

Recognize the interconnected nature of our built environment with ecological processes

Protect the state's investment in its transportation system and adapting transportation infrastructure to the future impacts of climate change

b. In line with DEC's best practices regarding fluvial erosion, the town will work to:

Slowing, Spreading, and Infiltrating Runoff (The State Surface Water Management Strategy is found at: <http://www.watershedmanagement.vt.gov/swms.html> and

<http://www.watershedmanagement.vt.gov/stormwater.htm>)

Avoiding and Removing Encroachments.

http://www.watershedmanagement.vt.gov/rivers/htm/rv_floodhazard.htm

http://www.watershedmanagement.vt.gov/rivers/docs/rv_RiverCorridorEasementGuide.pdf

River and Riparian Management: DEC has prepared a compendium of *Standard River Management Principles and Practices* to support more effective flood recovery implementation; improve the practice of river management; and codify best river management practices in Vermont. The document compiles the most current river management practices based on the best available science and engineering methods to create consistent practice and language for risk reduction while maintaining river and floodplain function. Best practices are established to address common flood damages, including:

Erosion of banks adjacent to houses and infrastructure

Erosion of road embankments

Channel movement across the river corridor

River bed down-cutting that destabilizes banks, undermines structure foundations, exposes utility crossings, and vertically disconnects rivers from adjacent floodplains

Bridge and culvert failure

Source:

http://www.watershedmanagement.vt.gov/permits/htm/pm_streamcrossing.htm

Policies

a. Through both town and state-level management, work to:

Encourage and maintain naturally vegetated shorelines, buffers and setbacks for all rivers, ponds and streams

Reduce flood hazard and repetitive road and driveway washout through continued updates and adherence to the Culvert Monitoring Program and Road Erosion Site Inventory

Identify and manage pollution, flooding and fluvial erosion hazards along rivers and streams as they arise

Transportation

In adjunct to town-specific planning, the town is committed to continually subscribing to all current state standards related to:

- a. Maintaining safe operating conditions on the present system of town roads through design to keep traffic at appropriate speeds and timely maintenance, including consideration of additional paving (though only on portions of roads prone to damage) should state funding become available.
 - b. Protection of existing town roads from flood damage and uncontrolled storm water runoff.
 - c. Preserving the capacity of town roads and maintain adequate traffic flows and safety.
 - d. Support the road maintenance crew through Town-provided training sessions.
 - e. Ensuring that owners and managers of recreational areas provide and maintain adequate and safe parking facilities.
 - f. Continuing long term access opportunities to gravel and sand deposits for future road maintenance use.
 - g. Continue to enhance understanding of the Incident Command Structure (ICS) as means to achieving enhanced communications during a response phase where significant increases in highway department responsibilities are required.
 - h. Using ICS as a foundation, develop a Standard Operating Procedure for enhanced Highway Department activity (snow and/or flood related) that details the relationship and responsibilities of the Road Commission (Selectboard), Road Foreman and employees that is based on best practices and needs through a collaborative effort.
- Additionally, the town will work towards implementation of a formal tracking mechanism by-which all infrastructure work is accounted for on a site-by-site basis. The purpose of this is to open funding possibilities under the HMGP.

Utilities and Facilities Goals

- a. Maintain current relationships with the Vermont State Police/County Sheriff and rescue for police and emergency medical services, respectively.
- b. Identify effective locations for tanker truck access to water in portions of town that currently do not have adequate supplies.
- c. Promote high-speed internet access throughout town to assist and encourage local businesses to reside in Glover.
- d. Identify resources/grant programs that can serve to enhance the equipment resiliency of the fire department.

Educational Facilities

- a. Ensure that the necessary equipment exists at the school for its use as an emergency shelter.
- b. Increase emergency planning cohesion between school and town EOPs through mutual participation and presentation at scheduled LEPC meetings and town and/or school meetings.

5.2 Existing Town of Glover Actions that Support Hazard Mitigation

Hazard Mitigation Strategies and Measures **avoid** the hazard by stopping or limiting new exposures in known hazard areas, **alter** the hazard by eliminating or reducing the frequency of occurrence, **avert** the hazard by redirecting the impact by means of a structure or land treatment, and **adapt** to the hazard by modifying structures or standards.

Existing authorities, policies, programs, and resources that support Town of Glover mitigation efforts:

<p>Town Plan - this document contains goals and objectives for community growth, health, safety and welfare for public and private interests. The Town Plan is drafted by the Planning Commission and adopted by the Selectboard.</p>
<p>NFIP – National Flood Hazard Insurance Program – Glover is a member of the NFIP program. The town maintains the adoption and enforcement of floodplain management requirements, including regulating new construction in Special Flood Hazard Areas (SFHAs). The town has worked at floodplain identification and mapping and makes best effort to satisfy local requests for map updates as part of its community assistance and monitoring activities related to floodplain management requirements under the NFIP.</p>
<p>Flood Regulations – Glover adopted Flood Hazard Area Regulations in 1987, amended in 1991, to prevent increases in flooding caused by uncontrolled development of lands in areas of special flood hazards and to minimize losses to floods by restricting or prohibiting uses that are dangerous to health, safety or property in times of flood or cause excessive increase in flood heights or velocities; and requiring that uses vulnerable to floods, including public facilities that serve such uses, shall be protected against flood damage at the time of initial construction. Permits are issued by the Flood Hazard Area Administrative Officer. Appeals would be heard by a Board of Adjustment appointed by the Selectboard.</p>
<p>Town Road and Bridge Standards – Glover has adopted the Vermont Transportation Agency’s new Town Road and Bridge Standards in 2014. This is perhaps the one of the most beneficial mitigation programs in Vermont. By adopting these codes, all maintenance and new construction on roads, highways, bridges and culverts must be enhanced to meet the new standards to withstand large flood events. Town road maintenance is the responsibility of the Glover Selectboard. Day-to-day operations are under the supervision of the Road Foreman. The road crew is comprised of the foreman and 2 additional full-time employees.</p>
<p>Bridge and Culvert Inventory - Glover has performed a bridge and culvert inventory to assess the condition of its bridges and culverts. Maintenance of the inventory is the responsibility of the Road Foreman.</p>
<p>VTRC - Vermont Red Cross has a Shelter Pre-Agreement with the community. Local representatives are trained to open a shelter if needed. This will allow for a more efficient use of the VT Red Cross if and when needed. The current Fire Chief is also the Emergency Manager.</p>
<p>Emergency Operation Plan (EOP) – Glover, assisted by a grant and the Northeastern Vermont Development Association (NVDA) updated its EOP in 2005 to include all-hazards.</p>
<p> </p>
<p> </p>

<p>Local Emergency Operations Plan (LEOP) – Glover has updated its LEOP as of April 10, 2014. The plan is kept up to date annually by the Emergency Manager and the Selectboard Chairman.</p>
<p>Emergency Training - Fire and rescue personnel continue to participate in training.</p>
<p>Flood Resilience Planning - A new Flood Resilience Element for the Glover Town Plan is being prepared by Northwoods Stewardship Center as part of the Barton Hydro Study Municipal Planning Grant.</p>

Table 5-1: Existing municipal actions that support hazard mitigation

Type of Existing Protection	Description /Details/Comments	Issues or Concerns
Emergency Response		
Police Services	Vermont State Police/ Orleans County Sherriff	None at this time
Fire Services	Glover VFD	None at this time
Fire Department Personnel	Glover VFD	None at this time
Fire Department Mutual Aid Agreements	Northeast International Mutual Aid (19 participants)	None at this time
EMS Services	Glover Ambulance Squad	None at this time
Other Municipal Services		
Highway Services	Town Highway Department	ICS training. Establish SOP with Road Commission in times of heightened response
Highway personnel	3 FTE field personnel	
Water / Sewer Department	Yes	None at this time.
Planning and Zoning personnel	no	None at this time
Residential Building Code / Inspection	no	None at this time
Emergency Plans		
Local Emergency Operations Plan (LEOP)	2016	Assure sheltering plans and contact information are up to date and vulnerable populations addressed.
School Emergency/Evacuation Plan(s)	2016	Increased collaboration (with town staff, LEPC, NVDA), knowledge of roles and drills are next step. Investigate logistics of using school notification for all-hazard notification.
Municipal HAZMAT Plan	None	Not required but enhanced knowledge via HMEP funded transportation study through LEPC would benefit town and fire.
Shelter, Primary	Glover School	Work with ARC with Sheltering Initiative to obtain training and supplies. Include volunteer staff in planning communication and schedule drills to test efficacy.
Replacement Power, backup generator	Yes, installed	None at this time
Shelter, Secondary:	Fire Station & Town Hall	None at this time
Replacement Power, backup generator	Fire station only	None at this time
Municipal Plans		
Town / Municipal Comprehensive Plan	Update in Process	

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Town of Glover Culvert Monitoring Program	2016	Update as required and track all work expenditures.
Hazard Specific Zoning (slope, wetland, conservation, industrial, etc.)	none	
Participation in National Flood Insurance Program (NFIP) and Floodplain/Flood Hazard Area Ordinance	Yes	Continue best practices and a no-adverse-impact policy approach to development.
Culvert and bridge Inventory	2011	VT Culverts site needs to be populated and up to date.

5.3 Town of Glover All-Hazards Mitigation Goals

1. Reduce at a minimum, and prevent to the maximum extent possible, the loss of life and injury resulting from all hazards.
2. Mitigate financial losses and environmental degradation incurred by municipal, educational, residential, commercial, industrial and agricultural establishments due to various hazards.
3. Maintain and increase awareness amongst the town's residents and businesses of the damages caused by previous and potential future hazard events as identified specifically in this Local All-Hazards Mitigation Plan.
4. Recognize the linkages between the relative frequency and severity of disaster events and the design, development, use and maintenance of infrastructure such as roads, utilities and storm water management and the planning and development of various land uses.
5. Maintain existing municipal plans, programs and ordinances that directly or indirectly support hazard mitigation.
6. Develop a mechanism for formal incorporation of this Local All-Hazards Mitigation Plan into other municipal operations and procedures as described in 24 VSA, Section 4403(5).
7. Develop a mechanism for formal incorporation of this Local All-Hazards Mitigation Plan particularly the recommended mitigation actions, into the town's operating and capital plans & programs as they relate to public facilities and infrastructure. Town Meeting Day will serve as the formal time that mitigation strategy budgetary considerations will be approved and incorporated into the town budget.
8. Support long-term solutions over short-term fixes to community needs and problems
9. Promote collaboration and cooperation through working partnerships between governments, non-profits, institutions, and businesses

5.4 Mitigation Actions

In following FEMA guidance, the following mitigation action categories form the basis of the town's future mitigation actions. The planning team, after considering the basic and generalized format of the 2005 plan, decided to adopt this approach for this update and all future mitigation work. While the town does not anticipate significant new buildings or infrastructure development in the next planning cycle, the town does not have the resources, political will or community support to limit new development in hazard areas. However, it will consider a "No Adverse Impact" methodology when opportunity arises to discuss the potential of new structure development. Regarding the mitigation actions outlined in the previously approved plan, they town does not include them in the following matrix because they were too general and are either a reflection of normal operations for the town or are no longer considered acceptable mitigation activities (e.g. preparedness). Priorities have shifted for the town since the last approved plan but this shift is based on flooding events and recent extremes in cold weather. With what has been mentioned relating to the lack of efficacy and awareness of the last approved plan, any change in priority is due to experience, the increased awareness of mitigation actions on the state-level due to disaster events in the last decade and enhanced local awareness and access to resources. For each mitigation action to follow, an indication of group will be given with the abbreviations listed below:

Mitigation Action Groups:

(P) Prevention: Government administrative or regulatory actions or processes that influence the way land and buildings are developed and built. These actions also include public activities to reduce hazard losses. Examples include planning and zoning, building codes, capital improvement programs, open space preservation, and storm water management regulations.

(PP) Property Protection: Actions that involve the modification of existing buildings or infrastructure to protect them from a hazard, or removal from the hazard area. Examples include acquisition, elevation, relocation, structural retrofits, flood proofing, storm shutters, and shatter-resistant glass.

(PEA) Public Education & Awareness: Actions to inform and educate citizens, elected officials, and property owners about potential risks from hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and school-age and adult education programs.

(NRP) Natural Resource Protection: Actions that, in addition to minimizing hazard losses also preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.

(SP) Structural Projects: Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include storm water controls (e.g., culverts), floodwalls, seawalls, retaining walls, and safe rooms

Current Capabilities and Need for Mitigation Actions

Generally, the Town considers its existing capabilities are adequate to address the identified priority hazards in this Plan.

Priority Hazard Narrative:

- 1) Severe Winter Storm – The Town regards its current hazard mitigation efforts carried out by the road departments as adequate to address winter storm impacts to local roads, however temporary road closure due to winter storms may isolate parts of town. Winter storms are often the cause of the power loss and telecommunications failure. An SOP in addition to current Winter Operations Emergency Plan could benefit the operational capacity of both the Road Commission and Highway Department in addition to building institutional awareness of the principles of ICS and adhering to this structure as deemed necessary in events exceeding normal operations.
- 2) Flooding – Major infrastructure that has seen repeated damage due to flooding is a concern. Highway Department functionality could benefit the operational capacity of both the Road Commission and Highway Department in addition to building institutional awareness of the principles of ICS and adhering to this structure as deemed necessary in events exceeding normal operations. Continuing the culvert monitoring program and road erosion site inventory will allow the town a formal path to planning for and revising infrastructure most at risk and/or most critical.
- 3) Extreme Cold – Recent cold snaps, coupled with social and technological vulnerabilities such as an aging community, unemployment and power failure are indicative of the need to address this hazard. Of all hazards, this poses the greatest potential threat to health and safety.
- 4) High Winds – High winds are common in the region and can cause major damage and disruptions in transportation and power/telecommunication lines. Readiness of highway department to triage a wide spread event becomes the best mitigation effort at this time.

5.5. Prioritization of Mitigation Strategies

Descriptions of specific projects, where available, are listed in Section 5.5.3 and in Table 5-2 below. Because of the difficulties in quantifying benefits and costs, it was necessary to utilize a simple “*Action Evaluation and Prioritization Matrix*” to affect a simple prioritization of the mitigation actions identified by the town. The following list

identifies the questions (criteria) considered in the matrix to establish an order of priority. Each of the following criteria was rated per a numeric score of “1” (indicating poor), “2” (indicating below average or unknown), “3” (indicating good), “4” (indicating above average), or “5” (excellent).

- Does the action respond to a significant (i.e. likely or high risk) hazard?
 - What is the likelihood of securing funding for the action?
 - Does the action protect threatened infrastructure?
 - Can the action be implemented quickly?
 - Is the action socially and politically acceptable?
 - Is the action technically feasible?
 - Is the action administratively realistic given capabilities of responsible parties?
 - Does the action offer reasonable benefit compared to its cost of implementation?
-
- Is the action environmentally sound and/or improve ecological functions?

The ranking of these criteria is largely based on best available information and best judgment, as many projects are not fully scoped. The highest possible score is 45. It is anticipated that, as the town begins to implement the goals and actions of their Mitigation Strategies, they will undertake their own analysis to determine whether the benefits justify the cost of the project.

Table 5-2: Glover Action Evaluation and Prioritization Matrix

Rank	Mitigation Action	Responds to high hazard	Funding potential	Protection value	Time to implement	Social and Political acceptance	Technical feasibility	Admin feasibility	Benefit to Cost	Environmental advantage	TOTAL
2	Improve highway, culvert and bridge programs and infrastructure.	5	4	5	4	5	5	4	5	4	41
3	Improve resilience to severe winter storms	4	4	5	4	5	3	3	5	2	39
7	Reduce risk and impact of extreme cold snaps	2	2	3	2	3	2	2	3	2	21
4	Increase resilience of mobile homes through accepted structural modifications and resident awareness of programs and opportunities	4	5	5	4	5	3	3	5	4	38
5	Mitigate high wind vulnerability	2	3	3	3	5	1	1	5	1	24
1	Raise public awareness of hazards, hazard mitigation and disaster preparedness	4	5	5	5	5	5	5	5	3	43
6	Continue fluvial geomorphology (in coordination with state recommendations and protocol) assessments and develop strategies in response to any identified risk	3	2	4	2	2	2	2	3	3	23

5.6. Specific Mitigation Actions

Action #1: Improve highway, culvert, dam and bridge protection programs **Group: SP, NRP, PP**

Lead Responsible Entity: Town of Glover Road Foreman and Selectboard

Potential Partner Entities: Vermont Agency of Natural Resources; Vermont Agency of Transportation; NVDA, DEMHS, FEMA and the Agency of Commerce and Community Development

Funding Requirements and Sources: FEMA or other hazard mitigation grants; FHWA grants; VAOT grants; Municipal Operating and Capital budgets.

Progress: The Road Foreman continually monitors road and storm water management capabilities. The town has established a Culvert Monitoring Program and Road Erosion Site Inventory that serves to guide action by identifying areas of road erosion, estimated costs of repair and future needs.

Specific Identified Tasks:

- 1) Infrastructure Assessment for Storm Water Vulnerability – Funding and staff resources permitting, assess the vulnerability and operational capability of municipal-owned roads, culverts and other storm water management infrastructure to predicted storm water and snowmelt in areas with a documented history of recurring problems. The infrastructure will be evaluated regularly prior to replacement or upgrades of the existing infrastructure.
- 2) Assessment for Fluvial Erosion/Landslide Vulnerability – Identify streambanks that have high risk of fluvial erosion that could benefit from riparian plantings or Better Roads grant. Riparian buffers prevent erosion, restore river floodplain, and help reduce the intensity of flood events; therefore protecting town infrastructure and human health.
- 3) Culvert Upgrades - Develop a schedule and program to replace undersized culverts. Appropriately sized culverts effectively handle the hydraulic capacity of streams and therefore protect town infrastructure from flooding damage.
- 4) Continued Monitoring of Vulnerable Infrastructure - Inventory bridges to document future damage from flooding. A constantly updated inventory will allow Glover to keep track of frequently damaged infrastructure and will guide planning to avoid future infrastructure damage.
- 5) Road Improvements - Within political and financial restraints, consider re-engineering certain sections of roads to lower overall maintenance costs, improving snow plowing speeds and improve overall capability of roads to handle current and projected traffic volumes. Utilize the Vermont Stream Alteration Permit process when replacing or installing new culverts and bridges as required by State Statute.

Specific projects include:

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- Perron Hill Rd. - culvert #369 - eroded concrete culvert, needs hydraulic study to determine required size for new standards.
 - Pine Place - culvert #392 - 72" steel culvert, stone headwalls failing, needs hydraulic study to determine required size for new standards.
 - King Rd. - culvert #249 - needs upgrading to 14' x 6' concrete box culvert
 - Tetrault Lane - culverts 537, 538, 539, 540, 541 - series of small culverts can't handle the water in a wet area, should be replaced with one large structure. Needs hydraulic study to determine required size for new standards.
 - Beach Hill Rd, approx. 0.20 miles from intersection with Parker Rd, bank erosion on steep hill, needs stone riprap to hold bank and road.
 - Shadow Lake Rd., approx. 0.10 miles from intersection with VT Rte. 16, outlet brook from Shadow Lake is cutting close to the road, needs stone riprap to hold bank and road.
- 6) Documenting – Develop a methodology that serves to efficiently capture work and expenditures on sites and keep this information at the town office.
 - 7) Increase Awareness of Funding Opportunities - Increase understanding of FEMA's HMGP program so that this potential funding source can be utilized.
 - 8) ICS Training and Emergency Operations (SOP) Plan Development – Enhance knowledge of the principles of ICS and develop a Standard Operating Procedures that details the relationship, roles and responsibilities of the Highway Department and Road Commission during major events.
 - 9) Perform maintenance and upgrades of the Shadow lake Dam as recommended by the Dam Safety Engineers of the Vermont department of Environmental Conservation.
 - 10) Review and update the Emergency Action Plan for Shadow Lake Dam annually

Rationale / Cost-Benefit Review: Conducting vulnerability assessments facilitates a targeted and effective approach to road and storm water management infrastructure. This will prove useful in the development and implementation of municipal capital and operating plans as well as the development and implementation of grant-funded mitigation projects. Some areas suffer low-level but consistent damage during heavy rains and snowmelt. Mitigating against these problems would reduce short and long term maintenance costs and improve the flow of traffic for personal and commercial purposes during flooding events. Tracking road work and understanding the HMGP program can open funding streams into the town and can make the application process much easier when required information is already available. A basis understanding of ICS will serve the town and at little or no cost. As a requirement for an approved LEOP, municipal ICS-awareness is seen as necessary state-wide. During an emergency event when the Highway Department personnel are required to work beyond normal capacity, increased communication and collaboration between the Highway Department and local entities can be enhanced with a basic SOP. An SOP can also serve to increase

institutional memory when there are staff changes at every level as well as provide a template from which tabletops and drills can be based off of.

Action #2: Improve resilience to severe winter storms

Group: SP, PP, PEA

Primary Responsible Entities: Town of Glover selectboard, planning commission and highway department.

Potential Partner Entities: LEPC, Glover Fire Chief, ARC's Sheltering Initiative Program

Funding Requirements and Sources: DEMHS or FEMA hazard mitigation funding; existing programs, contingent on available resources and funding.

Progress: Roads are monitored and altered, when necessary so that plowing can occur without damage to trucks and/or road. Glover Elementary School has been identified as the primary emergency shelter. The school does have an emergency generator. Snow clearing equipment is regularly serviced and the town maintains an adequate supply of winter sand.

Specific Identified Tasks:

- 1) Maintain Existing Shelter Capability: Improve capabilities of existing shelters. Notification procedures and shelter staffing is a priority for the town and intends to move forward on planning and public involvement. More formalized training is required and the ARC's "Shelter Initiative Program" can be used at no cost to the town to enhance both shelter management knowledge and sheltering supply cache.
- 2) Reduce risk of power failure due to ice storms: Enhance collaboration between town road foreman and electric company related to down-limbed induced power failure. Maintain function of generators.
- 3) Notification: Develop a notification/communication plan that conveys essential sheltering information using school phone system and back-up methodology (email, text, etc.)
- 4) Residential Programs: Provide guidance and communication to residents on the structural and mechanical actions that can occur to reduce risk to severe winter storms (e.g. weather-proofing, anchoring, alternative heating sources, tree trimming, financial programs, etc.)
- 5) Continue to monitor roads for safe and effective plowing: Efficient snow removal is the foundation to winter storm (snow) events, assuring roads are plowable before winter remains an important facet of highway department functions.
- 6) Maintain an adequate supply of diesel fuel and road sand for use in winter emergencies

- 7) Assure vehicle maintenance programs are adhered to and documented.
- 8) Increase awareness of ICS structure and recommended practices: The town can mitigate the effects of a severe winter by understanding how a large scale storm is managed when the State EOC is operational. Additional awareness of local-level roles and responsibilities during statewide event is a mitigation action.

Rationale / Cost-Benefit Review:

This mitigation action serves to reduce the economic impact and risk to both human and animal (livestock and pet) health and safety during severe winter storm events by reducing risk and enhancing the mechanisms of winter storm mitigation in the long term. More formalized policy formation in both staffing and notification procedures, especially pertaining to vulnerable populations where transportation and special needs are a concern could potentially significantly reduce the physical, psychological and social impacts of a disaster.

Action #3: Reduce risk and impact of extreme cold durations

Group: PEA, PP, SP

Risk or Hazard Addressed: Risk to infrastructure, livestock and residents

Primary Responsible Entities: Town of Glover Selectboard and planning commission, NVDA, Glover School, local/regional assistance organizations.

Potential Partner Entities: Vermont DMEHS, LEPC

Funding Requirements and Sources: Financial factors may produce barriers to change. Strategic planning and understanding of the total scope of needs and potential for change is logical first-step.

Specific Identified Tasks:

- 1) Economic Resilience: Establish relationships with utility companies to offer special arrangements for paying heating bills, if not already required by state law. Develop and sustain a program that serves to connect resource organizations with residents in need of support services.
- 2) Maintain Existing Shelter Capability: Maintain and improve capabilities of existing shelters. Notification procedures and shelter staffing is a priority for the city and intends to move forward on planning and public involvement. More formalized training is required and the ARC's "Shelter Initiative Program" can be used at no cost to the town to enhance both shelter management knowledge and sheltering supply cache.
- 3) Assess Vulnerable Population— Develop an awareness of the most at-risk community members during an evacuation and/or sheltering event. Focusing on those that lack resources or capability to reach facilities when in need and create plans, including outreach protocol on how to address this potential hurdle.

- 4) Notification and Education – Investigate and develop a notification/communication plan that conveys essential sheltering information. Educating citizens regarding the dangers of extreme cold and the steps they can take to protect themselves when extreme temperatures occur by sustaining a process that serves to disseminate educational resources for homeowners and builders on how to protect pipes, including locating water pipes on the inside of building insulation or keeping them out of attics, crawl spaces, and vulnerable outside walls. Inform homeowners that letting a faucet drip during extreme cold weather can prevent the buildup of excessive pressure in the pipeline and avoid bursting through a yearly public service campaign.

Rationale / Cost-Benefit Review:

With an increase in extreme weather, including cold, there is a need to protect property and the population. Given the magnitude of population dependence on social services, indicating economic and other social vulnerabilities, effective outreach, education and collaboration with resources supports this mitigation action category.

Action #4: Increase resilience of mobile homes through accepted structural modifications and resident awareness of programs and opportunities

Group: PP, PEA, SP

Risk or Hazard Addressed: Risk to infrastructure, residents

Primary Responsible Entities: Town of Glover, NVDA

Potential Partner Entities: Vermont DMEHS, UVM, ACCD

Funding Requirements and Sources: Financial factors may produce barriers to change at POS locations but much of the outreach materials have been developed and are available.

Specific Identified Tasks:

- 1) Collect recommendations from both UVM and ACCD programs devoted to MH resilience
- 2) Develop outreach mechanism that serves to address needs, resources and agencies that can assist the resident and/or owner of the MH. Develop and/or acquire informational brochure regarding accepted mitigation actions specific to mobile homes (e.g. anchoring home and fuel tanks, elevating electric and furnaces, etc.) and distribute to residents in most economical way. UVM program and ACCD have the recommendations and information to use

- 3) Work with NVDA to map all mobile homes in the town and use this map to assess flood risk, create risk ranking and gauge outreach accordingly

Rationale / Cost-Benefit Review:

Research in Vermont has proven that mobile homes are disproportionately impacted during disasters and making efforts to protect these structures to the greatest degree possible is a viable strategy. In doing so, the town is taking steps to protect its tax base as well as its residents.

Action #5: Raise public awareness of hazards and hazard mitigation actions
Group: PEA

Risk or Hazard Addressed: Risk to property, residents

Lead Responsible Entities: Town of Glover, Glover Fire Chief, LEPC, NVDA

Potential Partner Entities: Vermont state agencies and regional organizations

Funding Requirements and Sources: Majority of information is available and both state agencies and organizations can provide materials for outreach

Progress: As mitigation planning continues to integrate into normal, day-to-day operations, the town has an opportunity to engage its residents with information that will serve to mitigate several risks. The LEPC meets regularly and covers a host of topics related to emergency preparedness and raises awareness in the community about what organizations are doing around emergency response planning and chemical safety. Town meeting day can serve as an annual update and outreach opportunity as well.

Specific Identified Tasks:

- 1) Hazard Resilience for Property Owners- Develop and maintain education materials to inform property owners on how to protect their homes and businesses through accepted hazard resilience actions (e.g. securing their structures from high winds, elevating their electrical equipment/furnaces in basements, protecting from lightning strikes by grounding electrical outlets, etc.).
- 2) HMGP Awareness: Attend informational sessions on the HMGP funding opportunities for acquisition, elevation and flood-proofing projects. Work with NVDA to develop an information brochure for residents.
- 3) School Programs – Assure the school is structurally ready to handle natural hazard risks to the greatest extent possible. Continue school programs to raise student awareness of hazards, safety, preparedness and prevention. Explore establishing the school emergency notification system as the primary methodology for all emergency notification procedures and build in the contact information accordingly.

- 4) Family Programs – Continue family programs, such as car safety seat and bike safety programs, to raise family awareness of hazards, safety, preparedness and prevention.
- 5) Fire Prevention Programs – Continue National Fire Prevention Week and other programs to raise public awareness of fire hazards, safety, preparedness and prevention.
- 6) Other hazard awareness programs – Develop public awareness programs, based on all-hazards needs. Programs to address pandemic hazards, preparedness and mitigation may be appropriate as directed by the state department of health and its jurisdictional offices of local health

Rationale / Cost-Benefit Review: Improved public awareness could potentially significantly reduce the loss of life and property damage through ongoing, formal, ongoing, public information campaigns that address property protection actions (flood proofing, elevation, anchoring mobile homes/propane tanks, electric and watersystem elevation, electric grounding, etc.) Improved awareness would also build understanding and public support for municipal mitigation actions to reduce potential infrastructure and liability costs.

**Action #6: Reduce vulnerability to high wind events with accepted best practices
Group: SP, PEA, PP**

Risk or Hazard Addressed: Risk to infrastructure, residents

Primary Responsible Entities: Town of Glover, NVDA

Potential Partner Entities: ANR, VTTrans, electric providers

Funding Requirements and Sources: External agencies are responsible for some of the actions.

Specific Identified Tasks:

1. Developing and maintaining a database to track community vulnerability to severe wind: Use GIS to map areas that are at risk to the wind hazard associated with different non-hurricane conditions and identify concentrations of at-risk structures. Create a severe wind scenario to estimate potential loss of life and injuries, the types of potential damage, and existing vulnerabilities within a community to develop severe wind mitigation priorities.
2. Establish standards for all utilities regarding tree pruning around line: Incorporate inspection and management of hazardous trees into the drainage system maintenance process. Support and suggest the testing of power line holes to determine if they are rotting. Support the inspection of utility poles to ensure they meet specifications and are wind resistant. When feasible, support burying power lines to provide uninterrupted power after severe winds. Avoid use of aerial extensions to water, sewer, and gas lines when possible. Support use of

designed-failure mode for power line design to allow lines to fall or fail in small sections rather than as a complete system to enable faster restoration.

3. Public Outreach: Ensure that school and hospital officials are aware of the best area of refuge in buildings and that their plans are viable in high wind mitigation events. Instruct property owners on how to properly install temporary window coverings before a storm. Support education to design professionals to include wind mitigation during building design/modification to an extent deemed necessary.

Rationale / Cost-Benefit Review:

High winds have impacted the town and do pose a risk for infrastructure, transportation and public safety. Many mitigation actions associated with high wind risk also address and reduce risk associated with other hazards affecting the city and maintaining the functionality of the city is not only important for the city and its residents but for the region as well.

Action #7: Continue fluvial geomorphology assessments in collaboration with DEC and develop strategies and regulatory actions in response to identified risks Group: P, NRP, PEA, PP

Risk or Hazard Addressed: Risk to infrastructure, residents

Primary Responsible Entities: Department of Environmental Conservation, NVDA, Agency of Natural Resources (VT ANR), Town of Glover.

Potential Partner Entities: Nonprofits, other Town of Glover officials, and other appropriate entities.

Funding Requirements and Sources DEC has completed assessments for Basin ID 15 (Passumpsic). NVDA can assist in enhanced mapping of the floodplain (if and when these are developed) within the town and has provided the town with updated River Corridor Maps.

Specific Identified Tasks

- 1) Fluvial Geomorphic Assessments – The town will work with DEC through coordinated meetings, workshops and communication to increase understanding of current findings and develop an applicable framework to help guide decisions related to priority infrastructure work and vulnerability.
- 2) Fluvial Erosion Hazard Mapping – Develop a fluvial erosion hazard map for the waterways, using the GIS extension known as SGAT (or Stream Geomorphic Assessment Tool) for assessed stream reaches. As assessments are completed, a map of all assessed waterways in the town will be created.

- 3) River Corridor Management Plans – Using the River Corridor Maps, the town will develop an outreach strategy to residents/structures in or near the defined corridor. This communication should focus on flood resilience measures and opportunities. With the lack of repetitive loss properties in the town, the likelihood of viable HMGP acquisition projects is low but increasing awareness of this program can serve the town well.
- 4) Fluvial Erosion Hazard Mitigation Implementation - The town will draft strategies to avoid or mitigate losses from the identified fluvial erosion hazards. These strategies may include the adoption and implementation of programs, mechanisms or regulations to prevent endangerment of persons and property in riparian corridor areas from fluvial adjustment processes. Efforts could range from a relatively simple, public information campaign about the map to the adoption of a municipal ordinance or by-law that restricts development in such hazard areas.

Rationale / Cost-Benefit Review:

Continuing this project will require a sustained succession of grants, state appropriations and other funding to complete assessments in Glover. Successful completion will provide municipal and regional benefits. The municipality's fluvial erosion areas would be adequately and electronically mapped. This will enable the municipality to make residents and businesses aware of fluvial erosion hazards and potentially lead to municipally-directed programs, mechanisms and regulations that further mitigate against this hazard, protecting existing structures and infrastructure. Identifying fluvial erosion hazard areas could also help the municipality restrict future development in hazardous areas, if that should be an advantage to the town in the future. More accurate knowledge of fluvial geomorphology will enable the community to have a better understanding of hazard areas and what mitigation measures might most effectively address those concerns. Flooding is the most common and most significant hazard that can trigger a Federal disaster declaration in Glover. Along with the creation of flood hazard area maps, identifying the fluvial erosion hazard areas provides improved opportunities for the community to mitigate potential losses and gauge future development initiatives.

6. PLAN MAINTENANCE PROCESS

IMPLEMENTATION AND MONITORING OF MITIGATION STRATEGIES

6.1. Public Involvement Following Plan Approval

After adoption, the town will continue to maintain web-presence of the mitigation plan with an opportunity for community input available on its website. Additionally, the town will hold an annual public meeting after performing the annual progress report for the

mitigation plan to discuss achievements and the following year's implementation plan. At town meeting, the town will present mitigation information and provide the public an opportunity to increase understanding and involvement with planning efforts. The LEPC will also host an annual mitigation plan presentation where response/state agencies, neighboring communities and other stakeholders can provide input. The town will also notify its neighboring municipalities of the availability of information for review and any significant risks and/or mitigation actions that have an impact on surrounding towns.

6.2. Project Lead and Monitoring Process

The town designee (a selectman or planning commission member) will remain the project lead and will work in conjunction with the Selectboard, community, town officials and NVDA to complete the yearly progress report included in the plan. The town will create a mitigation action collection system that will be used as the source of future updates following the annual evaluation that will occur in conjunction with the progress report using the Plan Implementation Matrix provided below. While mitigation actions are, by default, often addressed at monthly Selectboard meetings, the town will schedule one meeting annually to formally assess the plan and adopt updates following the annual progress report and community meeting regarding the LHMP. Once the plan is approved by FEMA, the calendar will begin for annual review. The town will take the following implementation matrix and add actions to it each year, modifying tasks and/or needs as required so that the next LHMP update will be populated with the specific actions related to each mitigation strategy by year.

6.3. Plan Evaluation and Update Process

The town's Selectboard chair (or planning designee) will lead the plan evaluation process as part of the annual progress report. Prior to the January Budget Meeting and in preparation for the annual town report, a mitigation section will be included that provides an executive summary for the public that addresses the following topics:

- Status of recommended mitigation actions for the five-year planning period
- Identification of barriers or obstacles to successful implementation or completion of mitigation actions, along with possible solutions for overcoming risk
- Identification of a lead person to take ownership of, and champion the Plan if different from Selectboard Chair.

An approach to evaluating future conditions (i.e. socio-economic, environmental, demographic, change in built environment etc.)

Discussion of how changing conditions and opportunities could impact community resilience in the long term. Discussion of how the mitigation goals and actions support the long-term community vision for increased resilience

By engaging in the annual evaluation, the town will have a viable method for capturing the facets of efficacy and areas needing revision and improvement in its mitigation plan. The town is committed to "institutionalizing" mitigation into its normal operating procedures and with approval of this plan, embarks on the formal incorporation of mitigation actions and discussion, maintaining an awareness that involves not only the Selectboard, Town Clerk and Road Foreman but also the community at large, including the organizations represented by the current planning team. Along these lines, the town

will maintain a contact list of the current planning team and make revisions as required, including the team on the evaluation process each year. Through this consistent attention resulting from the evaluation process, progress reports and communication in the annual town report, the town will achieve the consistency required to enhance resilience through planning, assessment and actions devoted to mitigation.

6.4. Plan Update Process

The plan update process will be led by the Selectboard Chair or designee. Depending on funding availability, the town may elect to acquire the assistance of NVDA and/or a consultant to update the plan following a declared disaster and/or the next five-year planning cycle. To assure that the Plan does not expire, the town will begin the update process within no less than six months of the current Plan's expiration date. Following a disaster and during the recovery phase, the town will use the experience to assess the current Plan's ability to address the impact of the most recent disaster and edit the plan accordingly. Using the annual progress reports and evaluation narratives as a guide, along with perceived changes in risk or vulnerabilities supported by data and/or observation, strategies will be captured in accordance with FEMA guidelines, which includes reconvening the planning team during the update process. The town will establish a "Mitigation File" that documents all evaluations and progress reports, along with actions, especially related to infrastructure improvement projects. While the progress reports are designed to capture the specific actions the town has accomplished related to implementation, keeping a narrative list with dates on all actions relatable to mitigation (e.g. school drills, LEOP updates, Fire Safety Awareness, meetings, etc.), will provide the town the bulk of information required in the update process.

6.5. Implementation Matrix for Annual Review of Progress

The following table is intended to aid municipal officials in implementing the mitigation actions for Glover and to facilitate the annual monitoring and progress reporting. Progress has been included as a guide to future updates. Each year, the town will reserve a Selectboard meeting to review and update the Implementation Matrix as means to establishing an accurate evaluation of the plan's efficacy and the information required for the succeeding update to the plan.

6.6. Integration of Plan into Other Planning Mechanisms

The town plan, flood resilience plan, sewer system maintenance plan, Shadow Lake Dam Emergency Action plan and the local emergency operation plan are all updated and viable documents that will continue to serve the town's mitigation planning efforts. The most important integration process for the town is to include the defined infrastructure project costs into its formal budgeting process and the town will accomplish this by reserving mandatory consideration of all mitigation actions for each fiscal year of the planning cycle and budget accordingly. With town meeting serving as a formal planning mechanism, the town will formally incorporate mitigation efforts and

reporting for its annual report. Additionally, the town will assure that school safety plans, and emergency operations plans include relevant integration on a yearly basis.

7. IMPLEMENTATION MATRIX FOR ANNUAL REVIEW OF PROGRESS

The following table is intended to aid municipal officials in implementing the mitigation actions for Glover and to facilitate the annual monitoring and progress reporting. Progress has been included as a guide to future updates. Each year, the town will reserve a Selectboard meeting to review and update the Implementation Matrix as means to establishing an accurate evaluation of the plan's efficacy and the information required for the succeeding update to the plan.

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Table 7: Glover All-Hazards Mitigation Plan Implementation Matrix

Instructions: At each annual update, the following chart should be edited to reflect the progress of that year so that when the next update is required, there will be 5 charts (2018, 2019, 2020, 2021, 2022), one for each annual update.

2017 Hazard Mitigation Action Implementation Matrix					
Action	Primary Responsible Entity	Timeframe	Task	Brief Description	Progress
Continue fluvial geomorphology assessments and develop strategies in response to identified risk.	VT DEC, TransCanada, NVDA, VT ANR	Spring 2019- Fall 2022	Fluvial Geomorphic Assessments and assessment-based mapping/action	Continue Phase I and Phase II fluvial geomorphic assessments on streams and waterways in Glover.	DEC has a comprehensive and interactive database for Basin 15 and TransCanada has done some of this work in the past that the town can build from.
	NVDA, VT ANR	Spring 2019- Fall 2022	Fluvial Erosion Hazard Mapping	Rate the fluvial erosion hazard for each assessed reach and develop a fluvial erosion hazard map for the waterway using SGAT. Create map of all assessed reaches. Submit to VT ANR for QA/QC.	none
	Planning Commission and Selectboard	Spring -summer 2019	River Corridor Management Plans	Where Phase I and II assessments are complete, develop River Corridor Management awareness	The town opts for no zoning but understanding that river corridor mapping and planning is suggested
	Glover Planning Commission	January-October 2018	Fluvial Erosion Hazard Mitigation Implementation	Develop strategies to mitigate losses from identified fluvial erosion hazards.	Major infrastructure enhancement has occurred as result of DR4022

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Action	Primary Responsible Entity	Timeframe	Task	Brief Description	Progress
Improve highway, culvert, dam and bridge protection programs maintenance programs.	Road Foreman, Commission	January 2017- Winter 2022	Infrastructure Assessment for Storm water Vulnerability	Assess the vulnerability and operational capability of municipal roads, culverts and storm water infrastructure.	Town has developed a culvert monitoring program to address problems, priority and estimated budget. With great institutional memory of town infrastructure, the highway department is well-equipped to assess, monitor and prioritize needs.
	Road Foreman, Commission	Spring 2018- Fall 2019	Infrastructure Assessment for Fluvial Erosion/Landslide Vulnerability	Assess the vulnerability and operational capability of municipal roads, culverts, bridges and other infrastructure to fluvial erosion.	Road and Bridge Standards met as of 4/2015
	Road Foreman	Spring 2017- Fall 2022	Culvert Upgrades	Upgrade culverts and ditching along roads to mitigate against repeated damages from storm water or spring snowmelt.	VTCULVERTS.ORG Culvert and Bridge Inventory has not been populated. Town has a functioning culvert monitoring program that addresses problem, priority and estimated budget.

continued	Selectboard, Road Foreman	Winter- spring 2018	Develop SOP for emergency events	Building on current Emergency Operations Plans for the Highway Department and Road Commission, and SOP can help clearly define expectations, roles and responsibilities. Develop understanding of eligibility criteria for HMGP projects.	Communication between Highway Department and Road Commission is ongoing.
	Road Foreman	January 2018- Spring 2022	Road Improvements and tracking system	Consider re-engineering certain road sections to lower overall maintenance costs, improve snow plowing speeds and improve overall capability of roads to handle current and projected traffic volumes. Develop process by which all Highway Department actions and expenses are documented.	

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	Road Foreman	Spring-fall 2018	Erosion/Landslide Mitigation	Undertake erosion or landslide mitigation projects where roads regularly incur damage from adjacent rivers/streams and hillsides.	
	Selectboard-led with Road Foreman and ANR	Spring 2017- Spring 2022	Perform maintenance and upgrades of the Shadow lake Dam	Use recommendations by the Dam Safety Engineers of the Vermont department of Environmental Conservation.	
	Selectboard Chair	Spring 2017- Spring 2022	Review and update the Emergency Action Plan for Shadow Lake Dam annually		
	Highway Department and Road Foreman	Spring 2017- Spring 2022	Road Improvement Projects	<p>Perron Hill Rd. - culvert #369 - eroded concrete culvert, needs hydraulic study to determine required size for new standards.</p> <p>Pine Place - culvert #392 - 72" steel culvert, stone headwalls failing, needs hydraulic study to determine required size for new standards.</p> <p>King Rd. - culvert #249 - needs upgrading to 14' x 6' concrete box culvert</p> <p>Tetrault Lane - culverts 537, 538, 539, 540, 541 - series of small culverts can't handle the water in a wet area, should be replaced with one large structure. Needs hydraulic study to determine required size for new standards.</p> <p>Beach Hill Rd, approx. 0.20 miles from intersection with Parker Rd, bank erosion on steep hill, needs stone riprap to hold bank and road.</p> <p>Shadow Lake Rd., approx. 0.10</p>	

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Action	Primary Responsible Entity	Timeframe	Task	Brief Description	Progress
Maintain and improve resilience to severe winter storms and extreme cold durations	Emergency Management Director selectboard	Fall-winter 2018	Maintain and Improve Existing Shelter Capability	Maintain and improve on capabilities of existing emergency shelter capability, including emergency generator functionality	Explore other sheltering options and secure funding for emergency power if required. Use Red Cross sheltering initiative to acquire supplies and training
	Road Foreman	Spring 2018-Winter 2019	<p>Assure optimal snow response and removal capabilities</p> <p>Reduce risk of power failure due to ice storms:</p> <p>Notification:</p> <p>Residential Programs:</p> <p>Continue to monitor roads for safe and effective plowing:</p>	<p>Through operational measures, work to improve response and efficiency with best practices in previous snow emergencies.</p> <p>Enhance collaboration between town road foreman and electric company related to down-limbed induced power failure. Maintain function of generators.</p> <p>Develop a notification/communication plan that conveys essential sheltering logistics pre-event</p> <p>Provide guidance and communication to residents on the structural and mechanical actions that can occur to reduce risk to severe winter storms (e.g. weather-proofing, anchoring, alternative heating sources, tree trimming, financial programs, etc.)</p> <p>Efficient snow removal is the foundation to winter storm (snow) events, assuring roads are plowable before winter remains</p>	Current road foreman has been with town long enough to understand the subtle characteristics and logistics of responding to major snow/ice events.

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			Increase awareness of ICS structure and recommended practices:	<p>an important facet of highway department functions</p> <p>The town can mitigate the effects of a severe winter by understanding how a large scale storm is managed when the State EOC is operational. Additional awareness of local-level roles and responsibilities during statewide event is a mitigation action.</p>	
Action	Primary Responsible Entity	Timeframe	Task	Brief Description	Progress
Improve Resilience to Extreme Cold	Planning commission and Selectboard	Spring 2018-Fall 2019	<p>Economic Resilience</p> <p>Assess Vulnerable Population</p>	<p>Establish relationships with utility companies to offer special arrangements for paying heating bills, if not already required by state law. Develop and sustain a program that serves to connect resource organizations with residents in need of support services.</p> <p>Develop an awareness of the most at-risk community members during an evacuation and/or sheltering event. Focusing on those that lack resources or capability to reach facilities when in need and create plans, including outreach protocol on how to address this potential hurdle.</p>	

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Action	Primary Responsible Entity	Timeline	Task	Brief Description	Progress
Increase resilience of mobile homes through accepted structural modifications and resident awareness of programs and opportunities	Emergency Management Director, Glover Fire Chief	September 2018-September 2019	Outreach	Develop and/or acquire informational brochure regarding accepted mitigation actions specific to mobile homes (e.g. anchoring home and fuel tanks, elevating electric and furnaces, etc.) and distribute to residents in most economical way. UVM program and ACCD have the recommendations and information to use	new
	NVDA planners,	March – May 2018	Mapping	Work with NVDA to map all mobile homes in the town and use this map to assess flood risk, create risk ranking and gauge outreach accordingly	new
Reduce vulnerability to high wind events with accepted best practices	Selectboard and Road Foreman	June 2018-December 2022	<p>Developing and maintaining a database to track community vulnerability to severe wind:</p> <p>Create a severe wind scenario to estimate potential loss of life and injuries</p> <p>Establish standards for all utilities regarding tree pruning around line</p> <p>Support and suggest the testing of power line holes</p>	<p>Use GIS to map areas that are at risk to the wind hazard associated with different non-hurricane conditions and identify concentrations of at-risk structures.</p> <p>Learn the types of potential damage, and existing vulnerabilities to develop severe wind mitigation priorities.</p> <p>Incorporate inspection and management of hazardous trees into the drainage system maintenance process.</p> <p>Avoid use of aerial extensions to water, sewer, and gas lines when possible. Support use of</p>	new

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			<p>to determine if they are rotting. Support the inspection of utility poles to ensure they meet specifications and are wind resistant.</p> <p>Public Outreach:</p>	<p>designed-failure mode for power line design to allow lines to fall or fail in small sections rather than as a complete system to enable faster restoration.</p> <p>Ensure that school and hospital officials are aware of the best area of refuge in buildings and that their plans are viable in high wind mitigation events. Instruct property owners on how to properly install temporary window coverings before a storm. Support education to design professionals to include wind mitigation during building design/modification to an extent deemed necessary</p>	
Raise public awareness of hazards, hazard mitigation and disaster preparedness.	Emergency Management Director; Glover Fire Chief	March 2018-December 2022	<p>Hazard Resilience for Property Owners</p> <p>HMGP Awareness:</p>	<p>Develop and maintain education materials to inform property owners on how to protect their homes and businesses through accepted hazard resilience actions (e.g. securing their structures from high winds, elevating their electrical equipment/furnaces in basements, protecting from lightning strikes by grounding electrical outlets, etc.).</p> <p>Attend informational sessions on the HMGP funding opportunities for acquisition, elevation and flood-proofing projects. Work</p>	new

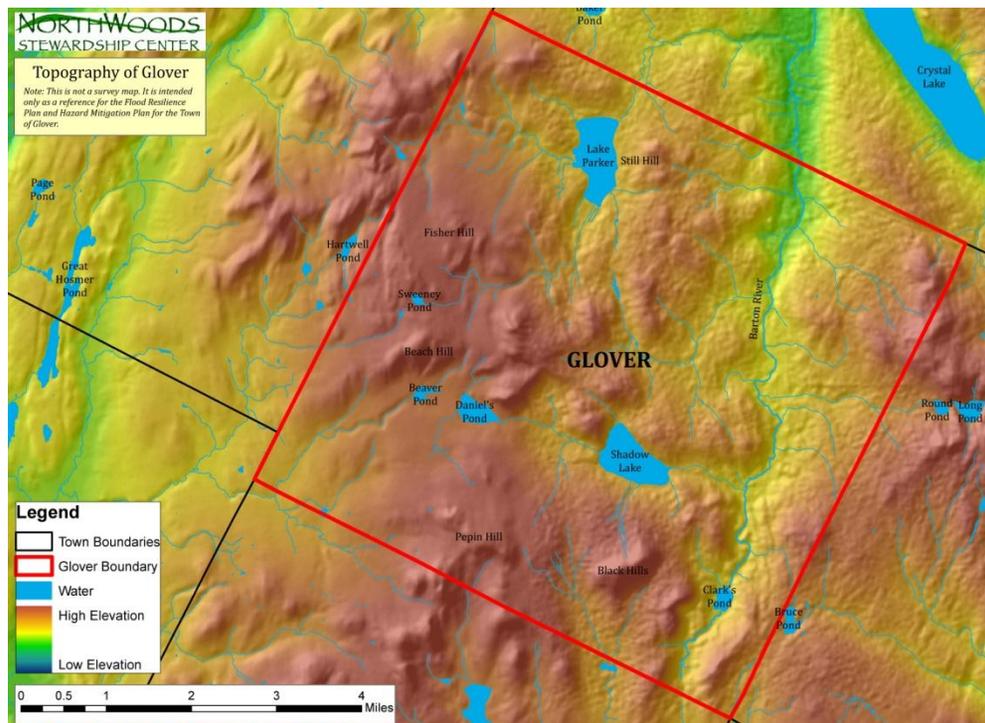
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			<p>School Programs:</p> <p>Family Programs:</p> <p>Fire Prevention Programs:</p> <p>Other hazard awareness programs:</p>	<p>with NVDA to develop an information brochure for residents.</p> <p>Assure the school is structurally ready to handle natural hazard risks to the greatest extent possible. Continue school programs to raise student awareness of hazards, safety, preparedness and prevention. Explore establishing the school emergency notification system as the primary methodology for all emergency notification procedures and build in the contact information accordingly.</p> <p>Continue family programs, such as car safety seat and bike safety programs, to raise family awareness of hazards, safety, preparedness and prevention.</p> <p>Continue National Fire Prevention Week and other programs to raise public awareness of fire hazards, safety, preparedness and prevention.</p> <p>Develop public awareness programs, based on all-hazards needs. Programs to address pandemic hazards, preparedness and mitigation may be appropriate as directed by the state department of health and its jurisdictional offices of local health</p>	
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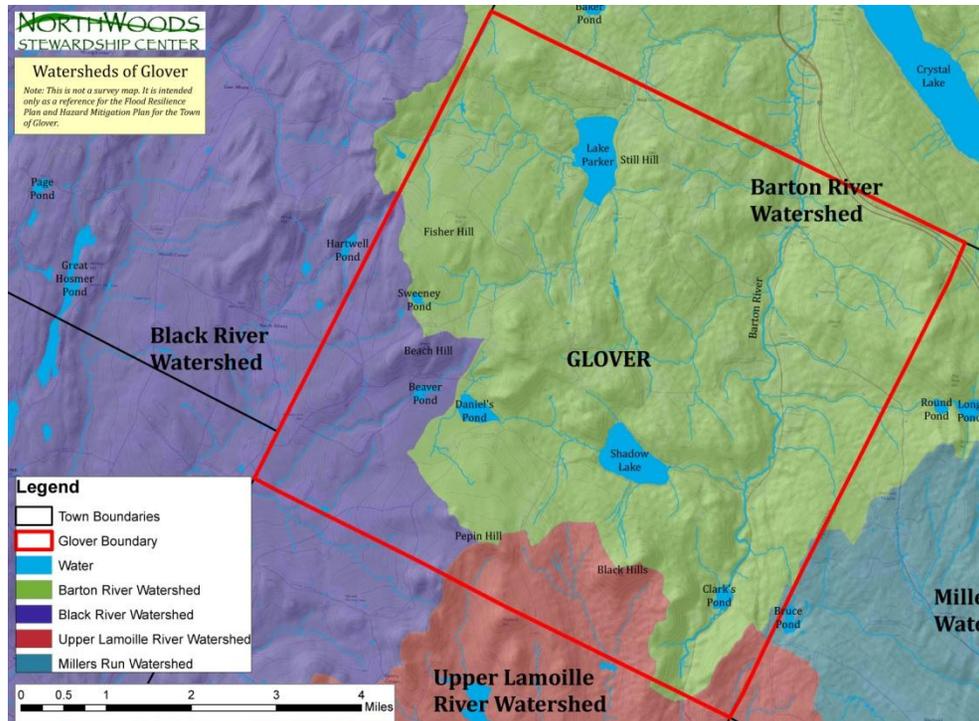
APPENDICES

Appendix A: MAPS

(Courtesy of Meghann Carter, NorthWoods Stewardship Center)

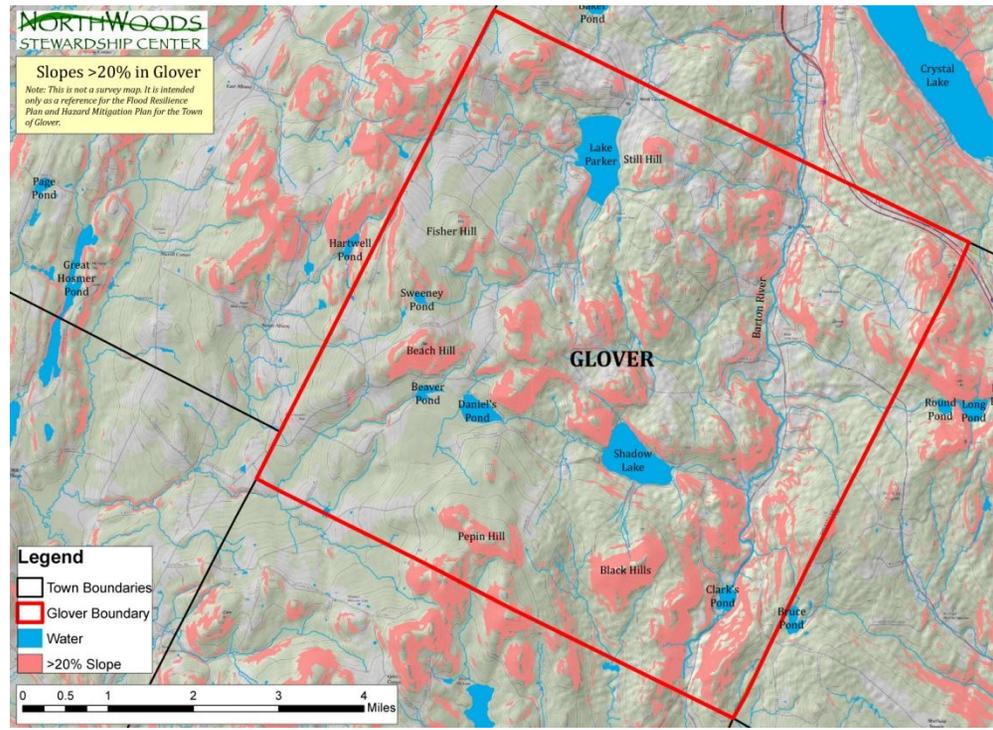


GLOVER TOPOGRAPHY

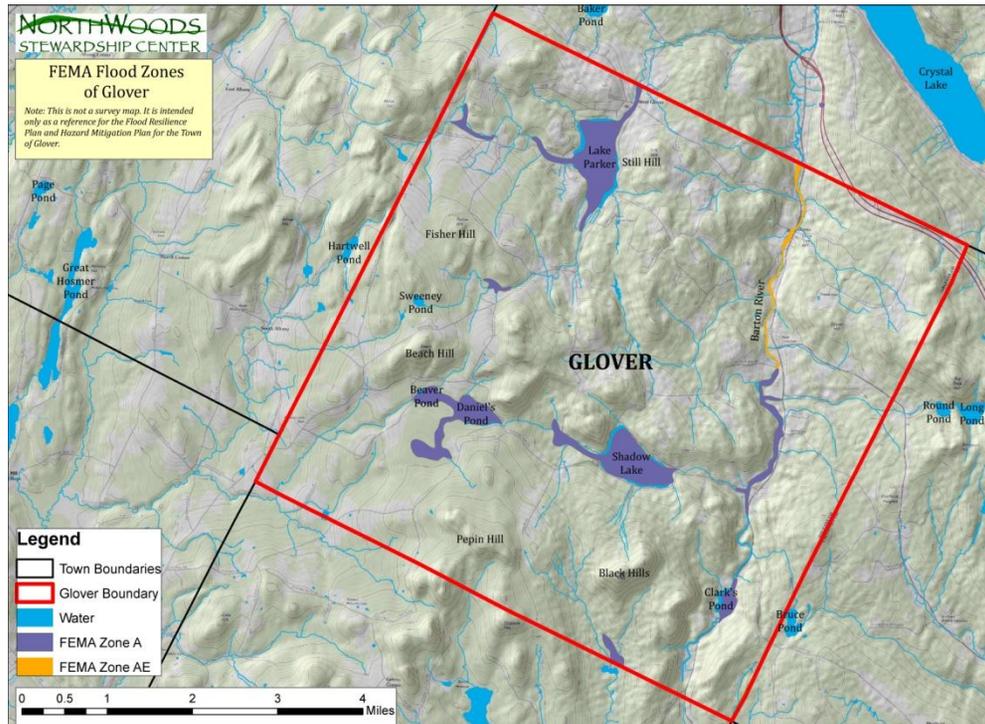


GLOVER WATERSHEDS

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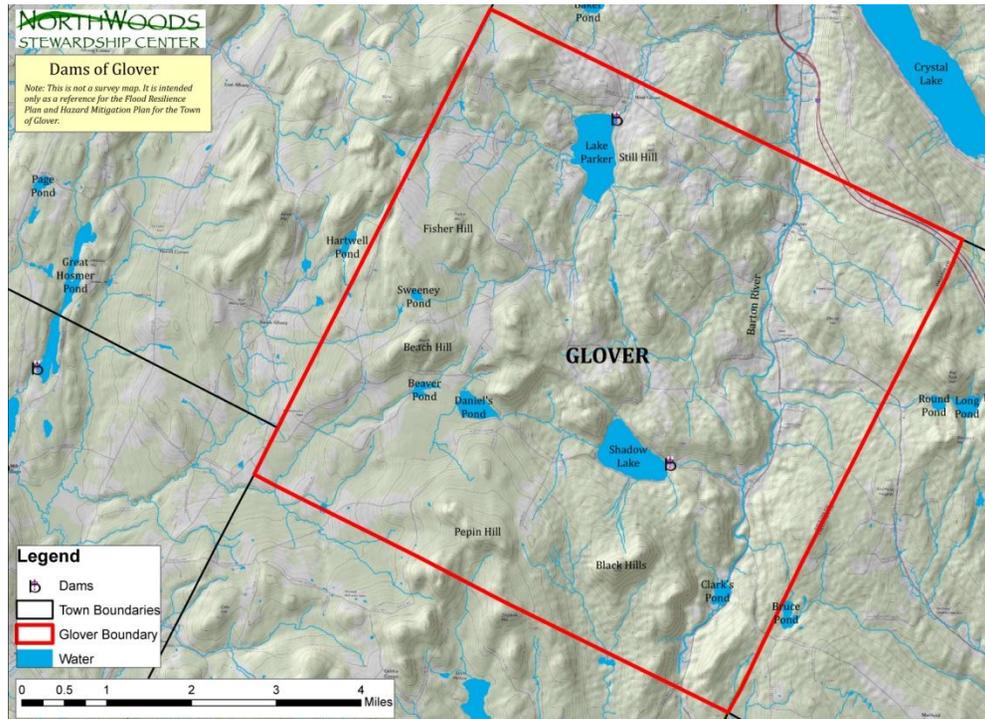


GLOVER SLOPES OVER 20%



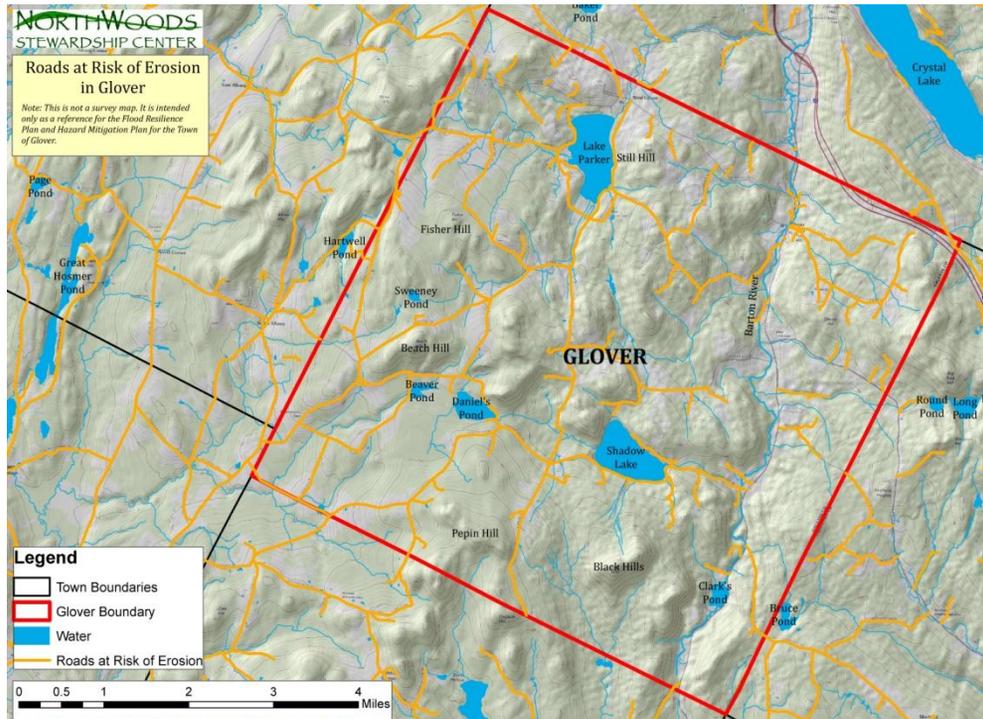
GLOVER FLOOD ZONES

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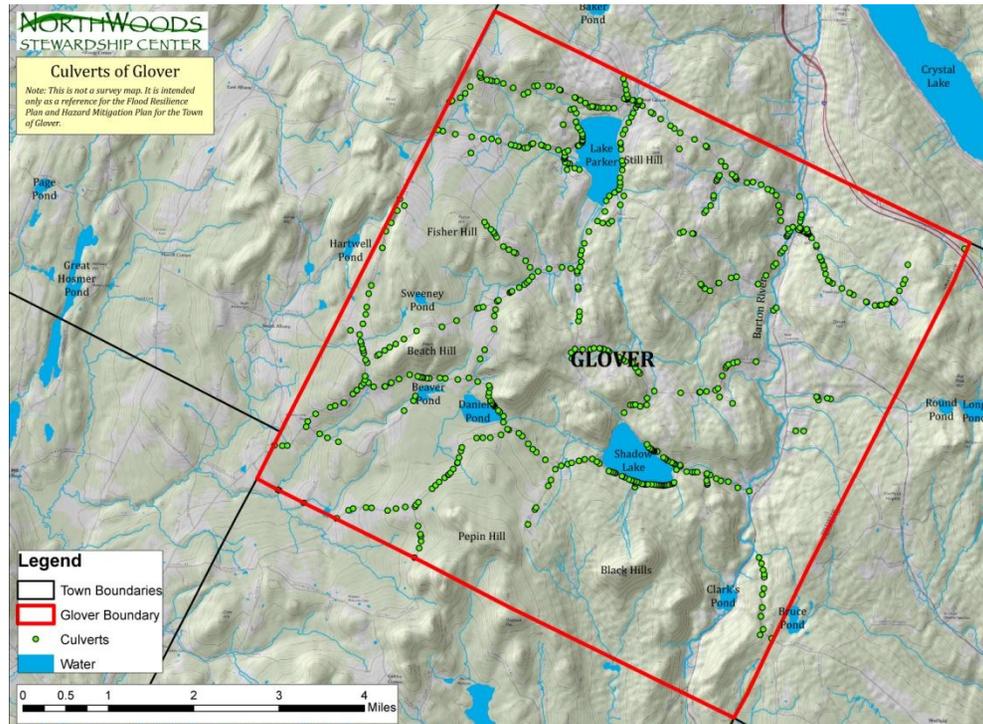
GLOVER LAKES & DAMS

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GLOVER ROADS

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GLOVER CULVERTS

Appendix B: SURVEY FORM

SURVEY
TOWN OF GLOVER MITIGATION PLAN

Do you know of any homes or businesses accessed by a private bridge?

Yes No Location:

Do you know of road sections that could be particularly at risk to washout?

Yes No Location:

Do you know of areas of steep slope and unstable rock or soil that might be subject to slope failure?

Yes No Location:

Do you know of any storm water run off rapidly causing a hazard?

Yes No Location:

Do you know any road sections where gravel runs off noticeably quickly and directly into ditches and streams?

Yes No Location:

Do you know of any homes or structures in particularly vulnerable locations?

Yes No Location:

Do you know of any home businesses or storage buildings in particularly vulnerable locations?

Yes No Location:

Do you know of any hazardous materials stored in particularly vulnerable locations?

Yes No Location:

Would you be interested in volunteering during an emergency situation?

Yes No Name:

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Physical Address:

Phone Numbers:

Thank you for taking the time to complete this survey. The information you have provided is appreciated by the Town of Glover.

The Town of Glover Planning Commission

Appendix C: Community Reports (Flood Ready Vermont)

Appendix D: No Adverse Impact Floodplain Management Fact Sheet (ASFPM)