Town of East Montpelier, VT
Local Hazard Mitigation Plan
Created December, 2011 – Adopted October, 2012
Prepared by the Town of East Montpelier and CVRPC

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1. Introduction

The impact of expected, but unpredictable natural and human-caused events can be reduced through community planning. The goal of this Local Hazard Mitigation Plan is to provide a local mitigation plan that makes the Town of East Montpelier more disaster resistant.

Hazard mitigation is any sustained action that reduces or eliminates long-term risk to people and property from natural and human-caused hazards and their effects. Based on the results of previous Project Impact efforts, FEMA and State agencies have come to recognize that it is less expensive to prevent disasters than to repeatedly repair damage after a disaster has struck. This Plan recognizes that communities have opportunities to identify mitigation strategies and measures during all of the other phases of emergency management – preparedness, response, and recovery. Hazards cannot be eliminated, but it is possible to determine what the hazards are, where the hazards are most severe, and identify local actions that can be taken to reduce the severity of the hazard.

Hazard mitigation strategies and measures 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, adapt to the hazard by modifying structures or standards, or avoid the hazard by preventing or limiting development.

2. Purpose

The purpose of this Local Hazard Mitigation Plan is to assist the Town of East Montpelier in recognizing hazards facing the region and their community and identify strategies to begin reducing risks from acknowledged hazards.

3. Community Profile

The Town of East Montpelier is approximately 32-square miles in size and is located in the heart of Washington County. It is bordered by Worcester and Calais to the north, by Marshfield and Plainfield the East, by Barre Town, Berlin and Montpelier to the south and Middlesex to the west. East Montpelier is characterized by its rural agricultural landscape of rolling hills and broad river valleys. The Town is located with in the Winooski Valley watershed and major waterways include the Kingsbury Branch and the Winooski River which flows from Plainfield in the east, through the southern region of East Montpelier and into the City of Montpelier.

The major arterial road, Route 2 runs parallel to the Winooski River and provides regional access from Montpelier and Interstate 89 in the west to St. Johnsbury and Interstate 91 in the east. Route 14 is an additional arterial road which runs north to south through the eastern region of East Montpelier. The Village of East Montpelier, North Montpelier and East Montpelier Center are the three historic village settlements with the town boundaries. Yet according to the town plan “residential areas of East Montpelier now cover nearly the entire town.”

According to the US Census, the population of East Montpelier in 2010 numbered 2,576 living in 1,129 housing units. According to the municipal plan "East Montpelier is primarily a rural residential community, contributing its well educated labor force and an important segment of consumer demand to the surrounding region" in part due to the town "provides only about 2.41 percent of the jobs in the region."

Development in East Montpelier continues to be dispersed rural residential. In the past 10 years, 122 housing units have been built, including 6 new condominium complexes. In the past 15-20 years, four new roads have been built – Clark Rd, Captain Kidd Rd, Jordan Rd, Boulder Ridge Rd. Most of these new roads only access one or two residential units. The Town is interested in developing a driveway ordinance so that residential owners are responsible for driveway culvert maintenance.

East Montpelier has no municipal water or wastewater treatment facility, which limiting factor for large scale development. Most residents rely on private wells and ground-treatment septic systems with a few exceptions. There is one private water supplier, Crystal Springs, which contains 115 connections. The Town has created a fire district in 2011 with the intention to serve the East Village area. Additional exceptions include the schools, apartment complexes and campgrounds which are either able to connect to the adjacent towns systems due to their proximity or the private investment in community system to serve the respected complex or development. Electricity is provided by Washington Electric Co-op and Green Mountain Power (GMP). GMP primarily serves customers who are situated along the Route 2 corridor, including East Montpelier Village and residents in East Montpelier Center.

In regard to public safety police services are provided by the Vermont State Police. The town has two elected constables. The Town contracts with the East Montpelier-Calais Volunteer Fire Department to provide emergency services and respond to fire in both East Montpelier and Calais. The Fire Department operates from two locations: one on Templeton Road and one located in East Village. According to the 2010 East Montpelier Town Report the Fire Department responded to a total of 527 calls during 2010.

The East Montpelier Town Plan includes descriptions, goals and actions in regards to water quality protection, fire protection and emergency services, and disaster planning. The East Montpelier Land Use & Development regulations (2009) contain Flood Hazard Regulations. East Montpelier has an approved Local Emergency Operations Plan adopted in 2011.

4. Planning Process and Maintenance

4.1 Planning Process

The Central Vermont Regional Planning Commission (CVRPC) coordinated the East Montpelier Local Hazard Mitigation Plan process. CVRPC was contacted by the Town Administrator (TA) and sent Town-Specific hazard mitigation material for review. After assessing the material, the TA and CVRPC staff held a meeting along with members of the community on October 19, 2011 at the Municipal Offices. The East Montpelier Hazard Mitigation Meeting focused on assessing

Comment [SSA1]: I recommend addressing D1 in this section—you're already starting to address it here. (You did not previously address the "D" requirements since the last plan was new and they are specific to updates.)

Note what development, if any, has occurred since the previous plan was developed. Also note whether that development had any impact on vulnerability in town, e.g. vulnerability has remained the same, increased, or decreased. Briefly explain.

Comment [SSA2]: A1: Include that this plan was previously FEMA approved in 2013 and that this is an update.

Include how the committee was formed (e.g. by the Selectboard at a specific meeting), who was on the committee (titles is fine), the meetings that were held, and generally what was addressed at each meeting (e.g. updating risk assessment, developing mitigation actions).

Comment [SSA3]: A3: include that the committee meetings were public, advertised meetings—note how the meetings were advertised (e.g. local paper, via Front Porch Forum), note whether anyone from the public attended.

It is also helpful to engage the community in other ways, e.g. through a survey to gauge input on the hazards you are addressing, or on the mitigation actions you should be taking.

past mitigation projects and compiling information on its current and future hazard mitigation programs, projects and activities. Attendees included individuals from these town offices:

Town Administrator
Road Foreman
Select Board
Chief of Fire Department
Planning Commission

A separate review meeting with the Planning Commission, CVRPC, and FEMA occurred on 12/15/2011 to go over the draft plan and receive input from additional members of the Planning Commission.

The meeting indicated that the Town is most vulnerable to dam failures, flood/flash flood/fluvial erosion, hurricane/severe storms, winter storms/ice storm in conjunction with power failure. The town will focus most of its mitigation on flooding as it is the most common and damaging hazard.

Once the draft was updated, CVRPC placed a notice for public comments of the draft update on the CVRPC blog and newsletter. The draft update was also available at East Montpelier Municipal offices, East Montpelier Sign Post and by request from CVRPC for public review and comments from 11/28/2011 to 12/23/2011. The announcement of the draft update in the CVRPC newsletter reached over 150 people and businesses in the Region's 23 towns, including the adjacent towns of Montpelier, Plainfield, Marshfield, Barre Town, Berlin, Middlesex, Worcester and Calais. No comments were received by CVRPC or East Montpelier Staff. Public comments submitted in the future will be reviewed by the Town Administrator (and CVRPC Staff dependant on funding) and attached as an appendix. In the future, the draft plan will be made available during Town Meeting Day and local meetings with State and local officials to allow for more public comment and review. After Approval Pending Adoption, the plan will go before the Select Board for adoption.

This East Montpelier Local Mitigation Plan will be submitted as a single jurisdiction plan.

Existing Hazard Mitigation Programs, Projects & Activities

The ongoing or recently completed programs, projects and activities are listed by mitigation strategy and were reviewed for the development of the plan. The 2008 Town Plan, 2010 Town Report, 2009 Land Use regulations, CVRPC's past Regional Mitigation Plan (2005), and Local Emergency Operations Plan (2011), and past newspaper articles were reviewed for pertinent information. The Upper Winooski Corridor Plan (2008) and VT State Hazard Mitigation Plan (2011) were reviewed as well for information and future mitigation projects. Information from these sources is incorporated into appropriate sections of the plan.

Community Preparedness Activities

Comment [SSA4]: A3: when the draft is available for public review, note again where the plan was available, e.g. in the office or on the website, how the public was notified of the opportunity to review the draft, and how the public was instructed to provide feedback (e.g. via email to the Town Administrator), and whether any comments were received.

Comment [SSA5]: A2: typically towns will send out a draft to neighboring towns when this plan is out for a final review, in which case, FEMA will want to know which towns the draft plan was sent to as you note here, who at the town the draft was sent to (e.g. town clerk), how the neighboring towns were instructed to provide feedback (e.g. via email to the Town Administrator), and whether any comments were received.

If comments were not received, note this. If comments were received, note that they were received and incorporated (you can include what the comments were, but you don't have to).

Comment [SSA6]: I would include a new section somewhere in here on updates from the previous plan.

The easiest way to meet D2 is to include the action table from the 2013 plan with a new column titled 2018 Status. Include whether actions have been completed, are no longer seen as important, or are carried over into the new plan.

I would address D3 in this section as well. FEMA will be looking for a very specific statement of either: priorities have remained the same from the previous plan, or priorities have changed, with a brief explanation of what those priories were/are.

Comment [SSA7]: The list below is a good start at meeting C1. FEMA will want to know specifically whether these capabilities need any expansion/improvement to implement the mitigation actions, and if expansion/improvement is needed, whether the town has the ability to expand/improve (or not at this time due to lack of political will, lack of funding, etc.).

Comment [SSA8]: Good, include something similar in the new plan to meet A4.

- Emergency Operations Plan, 2011
- Capital Equipment Plan reserve
- U-32 High School and East Montpelier Elementary School disaster plans – have own response plans; working with Assistant Principal to integrate with Town

Hazard Control & Protective Works

- Maintenance Programs (Short Bridge Inventory & Culvert Inventory) – performed through CVRPC
- Bridge and culvert structures grant
- Mutual Aid Agreement

Insurance Programs

- Participation in NFIP

Land Use Planning/Management

- East Montpelier Master Plan 2008
- East Montpelier Land Use & Development Regulations 2009

Protection/Retrofit of Infrastructure and Critical Facilities

- Red Cross certified Emergency Shelters – U-32, B.O.R. in Barre City
- Back-up generators at shelters - Full emergency operations center at Fire Department, U-32

Public Awareness, Training & Education

- Fire safety educational programs (Captain No Burn Program, Annual Extradition Training) – Local schools, after school programs, Community Connections
- Motor vehicle accident response training – Jaws of Life, heavy rescue capabilities
- First responder CPR & hazmat trainings – advanced life support
- School Fire Safety Program

4.2 Plan Maintenance

The East Montpelier Local Hazard Mitigation Plan will be evaluated and, if necessary, updated annually at an April meeting of the Planning Commission (PC). Evaluation and updates by the PC will also occur within six months after every federal disaster declaration and as updates to town plan/zoning and river corridor plans come into effect. The plan will be reviewed by the Select Board, Town Administrator and public at the abovementioned April Planning Commission meeting. CVRPC will help with updates or if no funding is available, the Planning Commission will update the plan.

The process of evaluating and updating the plan will include continued public participation through public notices posted on the municipal website, East Montpelier Sign Post, Times Argus and CVRPC newsletter and blog inviting the public to the scheduled Select Board (or specially scheduled) meeting. Additional stakeholders invited to the meeting will be the large business owners located throughout town. Also invited in the future will be the VT Agency of Natural Resources (VT ANR), as they are able to provide assistance with NFIP outreach activities, models for stricter floodplain zoning regulations, delineation of fluvial erosion hazard areas, and other applicable initiatives. These efforts will be coordinated by the Town Administrator and Planning Commission.

Comment [SSA9]: This paragraph is good for A5.

Monitoring of plan progress, implementation, and the 5 year update process will be undertaken by the Town Administrator and Planning Commission. Monitoring updates may include changes in community mitigation strategies; new town bylaws, zoning and planning strategies; progress of implementation of initiatives and projects; effectiveness of implemented projects or initiatives; and evaluation of challenges and opportunities. The plan is to be a "living document" to allow for new actions to be identified in the five year interim period and amended without formal re-adoption during regularly scheduled Select Board meetings. Prior to the end of the five year period, the plan will be undergo a formal update and submitted to FEMA for re-adoption following the process outlined the schematic found in the Attachments section.

Comment [SSA10]: A6: this is good for monitoring. I would clarify that this is what is happening at the annual meetings. Include that the plan will be evaluated at this annual meeting to assess the effectiveness at meeting plan goals.

Comment [SSA11]: A6: good, keep this schematic in the new plan.

East Montpelier shall incorporate mitigation planning into their long term land use and development planning documents. It is recommended the Town reviews and incorporates elements of the Local Mitigation Plan when updating the Municipal Plan and Inundation Hazard bylaws. The incorporation of the Local Mitigation Plan into the municipal plan, possible future zoning regulations and additional flood hazard bylaws will also be considered after declared or local disasters. The Town shall also consider reviewing future Upper Winooski Corridor planning documents for ideas on future mitigation projects and hazard areas.

5. Risk Assessment

5.1 Hazard Identification and Analysis

In the table below, the following natural disasters were discussed and the worst threat hazards were identified based upon the likelihood of the event and the community's vulnerability to the event. Hazards not identified as a "worst threat" may still occur. Greater explanations and mitigation strategies of "non-worst threat" hazards can be found in the State of Vermont's Hazard Mitigation Plan.

Comment [SSA12]: B1: you'll need to include a specific statement here explaining why the hazards you are not addressing are being omitted—e.g. due to low probability/vulnerability, due to the town's inability to address all hazards, etc.

If you address the same hazard in this plan update, that's fine—if anything changes, point that out and explain it here.

Hazard	Probability [1]	Community Vulnerability[2]	Worst Threat[3]
Landslide	Med	No	
Dam Failures	Med	Yes	X
Drought	Low	No	
Earthquake	Low	No	
Flood/Flash Flood/Fluvial Erosion	High	Yes	X
High Wind	Low	No	
Hurricane/Severe Storms	Med	Yes	X
Structure Fire	Med	No	
Tornado	Low	No	
Water Supply Contamination	Low	No	
Wildfire/Forest Fire	Low	No	
Winter Storm / Ice Storm/Extreme Cold with Power Failure	High	Yes	X

The following hazards were found to be most significant in the Town of East Montpelier:

- Dam Failures
- Flood/Flash Flood/Fluvial Erosion
- Hurricane/Severe Storms
- Winter Storm/Ice Storm/Extreme Cold with Power Failure

Due to the frequent and severe nature of flooding events, East Montpelier feels flooding is the worst natural hazard within the Town and will focus on mitigation efforts to reduce the impacts from flooding events.

Moderate threat hazards include:

- Landslide

A discussion of each worst and moderate hazard is included in the proceeding subsections and a map identifying the location of each hazard is attached (See map titled *Areas of Local Concern.*) Each subsection includes a list of past occurrences based upon County-wide FEMA

[1] High Probability of happening: Near 100% probability in the next year.
Medium Probability of happening: 10% to 100% probability in the next year or at least once in the next 10 years.
Low Probability of happening: 1% to 10% probability in the next year or at least once in the next 100 years.

[2] Does the hazard present the threat of disaster (Yes)? Or is it just a routine emergency (No)?

[3] Worst threat – Identified hazard presents threat of loss of life and property – hazard mitigation activities are identified; Moderate threat – Town is aware of potential hazard impacts

Comment [SSA13]: Good descriptions. This probability description meets part of B3 (plus the previous occurrence data).

Disaster Declarations (DR-#) plus information from local records, a narrative description of the hazard and a hazard matrix containing the following overview information:

Hazard	Location	Vulnerability	Extent	Impact	Probability
Type of hazard	General areas within municipality which are vulnerable to the Identified hazard.	Types of structures impacted	Magnitude of hazard – scale dependant on hazard	Dollar value or percentage of damages	Probability of hazard occurring based upon past events: HIGH = Near 100% probability in the next year. or at least once in the next 10 years. MED =10% to 100% probability in the next year or at least once in the next 10 years. Low = 1% to 10% probability in the next year or at least once in the next 100 years.

Comment [SSA14]: This table is great, I would keep this in for each hazard you address.

Comment [SSA15]: B3: the vulnerability summaries are good, but still somewhat general. It would help to add an overview of critical facilities somewhere in the plan and note how any of them are vulnerable. Or if there are specific facilities that are vulnerable to flooding, for example, note that in the flooding section.

5.2 Worst Threat Hazards

Comment [SSA16]: B2: for all of your profiled hazards, make sure you include recent occurrences since the last plan.

Dam Failure

There are four dams of concern for East Montpelier. Three are located outside of the Town Boundaries in the neighboring towns of Calais and Marshfield. The four dams of concern are the Marshfield Dam, North Montpelier Dam, Adamant Dam and Curtis Pond Dam. To date there have been several dam failures or close calls; however, no events created further damages.

Marshfield Dam, Cabot – The Marshfield Dam is a hydroelectric facility operated by Green Mountain Power (GMP). On August 28, 2011, due to the large amount of rain from TS Irene, officials were afraid the dam would breach. Officials were considering releasing a large amount of water to ease pressure behind the dam; however, the rain subsided and the release was called off. Massive flooding would have occurred downstream in East Montpelier and Montpelier had the dam been released. GMP is now working with adjacent towns to improve communications with businesses and residents in times of emergency. GMP is also working with the Army Corps of Engineers to develop inundation models to simulate dam failure and identify what sites will be impacted.

North Montpelier Dam – The North Montpelier Dam is a natural dam that was the site of a hydroelectric facility. The operation was washed out in the 1980's due to a large rain event. The dam does not hold back a large amount of water. This dam is not of large concern as there are no vulnerable buildings down river of the dam.

Adamant Pond Dam, Calais – A beaver dam found some fifty feet above the Adamant Pond Dam failed on May 3, 2010. According a WCAX news article, over 2 million gallons of water

flowed from the dam and caused flood waters more than 4 feet deep at times. The flood waters washed out a section of the main road in Adamant Village. East Montpelier was not damaged because down the majority of the water flowed into downstream Sodom Pond. Below is a picture of the flooding in downtown Adamant.

Curtis Pond, Calais – To date there has been no breaches of the Curtis Pond Dam; however, the Curtis Pond Dam is stated to be in "poor" condition by the State's Engineer. The Town of Calais Select Board has developed a Curtis Pond Dam task force to determine replacement strategies. Engineering studies have not determined the actual problem with the dam, but do indicate that there is a slow leak with gradual erosion of the dam. Replacement option estimates range from $175,000 - $230,000 range. As of summer 2011, engineering studies were in the initial stages. East Montpelier is concerned with flooding impacts to properties along North Montpelier Pond if the Curtis Pond dam were to breach.

The extent of flooding depth from dam failure in East Montpelier is unknown. There have been no inundation studies performed and there are few historical records to base estimates. For the next plan update, East Montpelier can work with Green Mountain Power and Calais to determine the extent of flooding if a dam were to breech.

Hazard	Location	Vulnerability	Extent	Impact	Probability
Dam Failure	Area downstream from Marshfield Dam, North Montpelier Dam, Adamant Dam, Curtis Pond Dam	Private property, roads, culverts, bridge infrastructure	Marshfield dam during TS Irene – 542 ft above sea level (normally at 536 feet), data gap for inundation level	$70 million based on potential residential home loss (average grand list value $200,000)	Medium

Flood/Flash Flood/Fluvial Erosion

History of Occurrence (from NCDC website and FEMA DR list). The closest river gauge is located in Montpelier, approximately 8 miles downstream.

Date	Event	Location	Extent
8/28/2011	Flash Flood (TS Irene)	E. Montpelier Washington County	Winooski River crested at 19.05 feet in Montpelier– flood stage is at 15'; 5-7" of rain -DR 4022
5/26/2011	Flash Flood	E. Montpelier, Washington County	4" of rain; Montpelier gauge at 17.59' – DR4001
4/23-5/9/2011	Flash Flood	Washington County	DR 1995 – E. Montpelier not affected
8/2/2008	Flash Flood	Washington County	Not a historical crest; data gap
7/11/2007	Flash Flood	Northeast Washington County	3-6" of rain in 2 hrs – DR 1715, not a historical crest
6/26/2006	Flood	Washington County	3-4" of rain, not a historical crest
9/16/1999	Tropical Storm Floyd	E. Montpelier, County Wide	Montpelier flood gauge at 9.30 feet, 5-7" rain county wide DR 1307
6/27/1998	Flash Flood	County Wide	3-6" of rain over 2 day period - DR 1228, not a historical crest
6/12/1996	Flash Flood	East Montpelier	Data gap - $15k damage, not a historical crest
8/5/1976	Flood	County Wide	Montpelier flood gauge at 12.31 feet – DR 518
6/30/1973	Flood	County Wide	Montpelier gauge at 17.55 ft DR 397
9/22/1938	Flood/Hurricane	E. Montpelier, County Wide	Montpelier flood gauge at 14.11 feet
11/03/1927	Flood	E. Montpelier, County Wide	Montpelier flood gauge at 27.10 feet

Flooding/flash flooding/fluvial erosion is East Montpelier's most commonly recurring hazard. Flooding is the overflowing of rivers, streams, drains and lakes due to excessive rain, rapid snow melt or ice. Flash flooding is a rapidly occurring flood event usually from excessive rain. Fluvial erosion is the process of natural stream channel adjustments. Fluvial erosion causes erosion of sediment in some areas, while causing aggradation of sediment in other. Fluvial erosion processes occur more quickly and severely during flood events.

East Montpelier is located in the Upper Winooski watershed, a sub watershed of the Winooski River. East Montpelier is a mix of rolling hills with some steep valley approaches towards the river. The water within East Montpelier primarily drains into the Upper Winooski River. The land uses are a mix of large hay farms and pastures, coniferous forest, as well as broadleaf

Comment [SSA17]: B1: one thing a lot of towns miss is extent data for fluvial erosion. FEMA will be looking for the physical size of the largest eroded area. If that data is unavailable, note that extent data for fluvial erosion is unknown. If there are any specific eroded areas that you can mention, that will help as well.

forest. There are three small villages within East Montpelier, with limited commercial development. Residential development is scattered and rural.

East Montpelier participates in the NFIP and has adopted flood hazard regulations, as well as adopted stream buffer zones. The Flood Rate Insurance Maps (FIRM) of the 100 year floodplain along the Upper Winooski designate flood plain areas through East Montpelier. Based on results of overlaying East Montpelier's current FIRMs with the location of E911 points, 31 structures and 281 properties (1,114 acres) are located within the NFIP's designated 100-year floodplain. There are no repetitive loss properties in East Montpelier. The effective FIRM date is 5/2/1983. The estimated loss for a severe flooding event for all properties within the Town's 100 year floodplain is approximately $34,225,800. East Montpelier has 16 active NFIP policies in force, for a total coverage of $2,578,800.

Comment [SSA18]: C2: this paragraph and the one below are good—just update anything that has changed.

Comment [SSA19]: Good for B4 as long as this is still true.

The Conservation Overlay district limits development in certain areas to protect natural resources and in some places may extend beyond NFIP floodplain boundaries. Stream buffers of 50 feet from Town designated waters also limit some infringement on floodplain areas. Development is limited within the vegetated buffer and its purpose is to prevent soil erosion, protect wildlife habitat and maintain water quality. Within the area mapped by the State of Vermont as a fluvial erosion hazard zone, there are 54 properties totaling 314 acres. The total value of these properties is $6,577,200. The Zoning Administrator is responsible for enforcement of flood hazard regulations and development in the Conservation Overlay District. The Town has not reported any flood hazard regulation compliance issues. There have been no new structures built in the flood plain. Properties in the floodplain that are undergoing a change of use have permits reviewed and issues by the Development Review Board. Also, the Town has created a map that compares the old and new draft flood plain to identify structures that weren't previously in the floodplain so that owners may obtain flood insurance.

Specific extent data for flood depth levels in East Montpelier is lacking as the closest flood gauge is located in Montpelier. During Tropical Storm Irene, the Montpelier flood gauge was 4 feet above flood stage. The worst flooding event in East Montpelier's history was the 1927 event; however, exact data from that event is not available. In 1927 event, the Montpelier flood gauge was at 27.10 feet; however, since the 1927 flood a number of flood control dams have been installed in the region to prevent the same flooding extent. During Irene, the Coburn Road experienced 8 feet of flooding, while the Town Hill Rd area experienced 5 feet of flooding. This is an estimate of the worst extent. Lesser but more regular flooding occurs in East Montpelier, with generally 1 foot of water in areas designated on the areas of concern map. For the next update, East Montpelier can better monitor flood waters by having individuals record flood water levels and submit to the Town Administrator for the Town's records.

East Montpelier incurred damages from flooding in the spring 2011 floods and Tropical Storm Irene. Damages from these floods are outlined in the Hurricane/Tropical Storm/Severe Storm hazard analysis. The hazard analysis map identifies flooding locations as well as future hazard mitigation grant program projects.

The Upper Winooski Corridor Plan is a valuable tool to help restore the River's health and prevent future flooding impacts. Mitigation and restoration strategies for East Montpelier's section of the Upper Winooski are attached as an appendix for the Town to refer to if future project ideas area needed.

Hazard	Location	Vulnerability	Extent	Impact	Probability
Flood/flash flood/fluvial erosion	Along Upper Winooski, see roads in Hurricane/ Tropical Storm/Severe Storms section	Culverts, bridges, roads, private property	6" of rain in 24 hrs, 8 feet flooding on Coburn Rd, 5 feet flooding Town Hill Rd, 1-2 ft in low lying area	$310,000 + for damages in May and August 2011	High

Hurricane/Tropical/Severe Storms

History of Occurrence (from NCDC website and FEMA DR List. The closest river gauge is located in Montpelier, approximately 8 miles downstream):

Date	Event	Location	Extent
8/28/2011	Tropical Storm, Flash Flood (TS Irene)	East Montpelier, Washington County	Montpelier flood gauge at 19.05', flood stage at15'; 5" of rain – DR 4022
7/06/2011	Thunderstorm	East Montpelier, County Wide	50 knot winds; 15,000 people in VT lost power
5/26/2011	Hail/Thunderstorms/Flash Flooding	East Montpelier, County Wide	1" hail, 50 knot winds, 25,000 customers lost power in VT, 3-5" of rain - DR 4001, Montpelier gauge at 17.59 feet
8/9/2010	Thunderstorm/Wind/Hail	Worcester (adjacent town)	50 knot winds
7/21/2010	Hail	East Montpelier, County Wide	1" Hail
7/18/2008	Hail	East Montpelier, County Wide	1" Hail, 30 knot winds
7/9/2007	Hail, thunderstorms	East Montpelier, County Wide	Baseball sized hail - DR 1715
6/19/2006	Hail, thunderstorms	East Montpelier, County Wide	50 knot winds
6/9/2005	Severe thunderstorms	Calais (adj town)	Downed power lines, 60 knot winds
9/16/1999	Tropical Storm Floyd	Statewide	Tropical storm winds and flooding – DR 1307, Montpelier

			flood gauge at 9.30 feet,
6/17/1998	Severe Storms	East Montpelier, County Wide	3-6" of rain, DR 1228, not a historical crest in Montpelier
7/15/1997	Severe Storms	County Wide	3-5" of rain
5/19/1982	Thunderstorm winds	East Montpelier, County Wide	56 knot winds
7/3/1964	Hail	County Wide	1.5" hail
9/22/1938	Hurricane	Statewide	Category 1 force winds

Hurricanes and tropical storms are violent rain storms with strong winds that have large amounts of rainfall and can reach speeds up to 200 mph. Hurricane season is between the months of June and November. These types of storms originate in the warm waters of the Caribbean and move up the Eastern seaboard where they lose speed in the cooler waters of the North Atlantic. A severe thunderstorm is a thunderstorm that contains any one or more of the following three weather conditions: hail that is 3/4 of an inch or greater in diameter, winds 58 miles per hour or greater, and/or tornadoes. Severe storm events can occur late spring and early summer as temperatures increase in the summer season. The frequency and intensity of hurricanes, tropical storms, and severe storms is expected to increase with climate change.

Similar to flooding, the extent of severe storms is not well documented in the Town of East Montpelier. The impact of storms is usually flood related. See flood extent description in flood section above. Flooding impacts areas along the Winooski River and roads listed in the table at the end of the analysis. Wind impacts are town wide. Wind extent from storms is not well documented as there is no monitoring station in East Montpelier. Estimates for wind are gathered from county wide data off the NCDC website. An estimate of the worst anticipated wind extent in East Montpelier based on past occurrences would be Category 1 force hurricane winds and H8 hail according to the Hail/Torro scale. In the future, East Montpelier could consider installing a monitoring station to better gather data for wind events. Wind events can be recorded using the Beaufort, Saffir Simpson. Hail events can be recorded using the Torro/Hailstorm Scale.

Beaufort Scale

Beaufort number	Wind Speed (mph)	Seaman's term		Effects on Land
0	Under 1	Calm		Calm; smoke rises vertically.
1	1-3	Light Air		Smoke drift indicates wind direction; vanes do not move.
2	4-7	Light Breeze		Wind felt on face; leaves rustle; vanes begin to move.
3	8-12	Gentle Breeze		Leaves, small twigs in constant motion; light flags extended.
4	13-18	Moderate Breeze		Dust, leaves and loose paper raised up; small branches move.
5	19-24	Fresh Breeze		Small trees begin to sway.
6	25-31	Strong Breeze		Large branches of trees in motion; whistling heard in wires.
7	32-38	Moderate Gale		Whole trees in motion; resistance felt in walking against the wind.
8	39-46	Fresh Gale		Twigs and small branches broken off trees.
9	47-54	Strong Gale		Slight structural damage occurs; slate blown from roofs.
10	55-63	Whole Gale		Seldom experienced on land; trees broken; structural damage occurs.
11	64-72	Storm		Very rarely experienced on land; usually with widespread damage.
12	73 or higher	Hurricane Force		Violence and destruction.

Saffir-Simpson Scale for Hurricane Classification				
Strength	**Wind Speed (Kts)**	**Wind Speed (MPH)**	**Pressure (Millibars)**	**Pressure**
Category 1	64- 82 kts	74- 95 mph	>980 mb	28.94 "Hg
Category 2	83- 95 kts	96-110 mph	965-979 mb	28.50-28.91 "Hg
Category 3	96-113 kts	111-130 mph	945-964 mb	27.91-28.47 "Hg
Category 4	114-135 kts	131-155 mph	920-944 mb	27.17-27.88 "Hg
Category 5	>135 kts	>155 mph	919 mb	27.16 "Hg
Tropical Cyclone Classification				
Tropical Depression	20-34kts			
Tropical Storm	35-63kts			
Hurricane	64+kts or 74+mph			

Combined NOAA/TORRO Hailstorm Intensity Scales

Size Code	Intensity Category	Typical Hail Diameter (inches)	Approximate Size	Typical Damage Impacts
H0	Hard Hail	up to 0.33	Pea	No damage
H1	Potentially Damaging	0.33-0.60	Marble or Mothball	Slight damage to plants, crops
H2	Potentially Damaging	0.60-0.80	Dime or grape	Significant damage to fruit, crops, vegetation
H3	Severe	0.80-1.20	Nickel to Quarter	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
H4	Severe	1.2-1.6	Half Dollar to Ping Pong Ball	Widespread glass damage, vehicle bodywork damage
H5	Destructive	1.6-2.0	Silver dollar to Golf Ball	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
H6	Destructive	2.0-2.4	Lime or Egg	Aircraft bodywork dented, brick walls pitted
H7	Very destructive	2.4-3.0	Tennis ball	Severe roof damage, risk of serious injuries
H8	Very destructive	3.0-3.5	Baseball to Orange	Severe damage to aircraft bodywork
H9	Super Hailstorms	3.5-4.0	Grapefruit	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open
H10	Super Hailstorms	4+	Softball and up	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open

On Aug 28, 2011, Tropical Storm Irene hit Vermont and proceeded to deposit 4-5" of rain over East Montpelier. Total damages from the storm have not yet been calculated, but the Town has performed $35,000 of road repairs to date. Roads that received the greatest damage were: Coburn Rd, Quaker Hill Rd, Cherry Tree Hill, Cate Farm Rd (and bridge), the Covered Bridge, and Muddy Brook Rd. Irene left the Town without power for 3 days as well.

East Montpelier infrastructure incurred $275,000 worth of damage during the May 28, 2011 severe storm event. The roads most severely damaged were: Brazier Rd, Butterfield Rd, Cherry Tree Hill Rd, Clark Rd, Coburn Rd, East Hill, Factory Rd, Green Rd, Guyette Rd, Hammett Hill Rd,

Kelton Rd, Muddy Brook, Quaker Rd, Towne Hill Rd, Bliss Rd, North St, Perkins Rd, Center Rd, Lyle Young, Putnam Rd, Murray Rd, Mc Knight and Snow Hill.

The majority of roads have been repaired and are ready for winter use. There are three road projects which the town needs funding in order to fully repair the road and prevent future flood/storm damage. These projects are: culvert upgrade and expansions on Kelton and Quaker Roads, and reengineering of Coburn Road. The Town is interested in applying for hazard mitigation grant program funds to perform these projects.

In a July/August 2008 storm event, the town was hit be a series of severe storms and again lost power. Roads that were damaged included: Clark Rd, Bliss Rd, Brazier Rd, Cherry Tree Hill Rd, Lyle young Rd, Muddy Brook Rd, and Green Rd. FEMA reimbursed the town for $27,000 worth of culvert and road damages in the Towne Hill Road area.

The town also suffered significant road damage from flash floods during the July 9-11, 2007 storm event. FEMA reimbursed the town for $14,000 worth of damage to Horn of the Moon Rd, Center Rd, Jacobs Rd, County Rd, and Towne Hill Rd.

In May 2005, a microburst took down multiple trees in the areas of Chickering Rd, North St, and Horn of the Moon. The homes in this area lost power. The incident was very isolated.

In 1999, Tropical Storm Floyd passed through Vermont. The primary impact from Floyd was downed trees and power lines due to high winds. 5-7" of rain fell over the Central Vermont Region; however, flood impacts were offset by drought conditions caused earlier in the year.

Hazard	Location	Vulnerability	Extent	Impact	Probability
Hurricane/ Tropical/ Severe Storms	Town Wide for Wind impacts; Flooding – Clark Rd, Bliss Rd, Brazier Rd, Cherry Tree Hill Rd, Lyle young Rd, Muddy Brook Rd, and Green Rd., Horn of the Moon Rd, Center Rd, Jacobs Rd, County Rd, and Towne Hill Rd.	Large trees, power lines, culverts, bridges	Tropical Storm/Cat 1 hurricane wind speeds during Irene and Floyd; 5-7" of rain; H8 hail	$310,000 + for damages in May and August 2011	Medium

Extreme Cold/Winter Storm/Ice Storm in conjunction with Power Failure

History of Occurrences (county wide)
Snow and/or ice events occur on a regular basis. Recent significant events have included:

Date	Event	Location	Extent
3/6/2011	Winter storm	East Montpelier, County wide	12-18" of snow, 10,000 customers lost power statewide
2/23/2010	Winter Storm	East Montpelier, County wide	20" of snow and 50,000 customers lost power statewide
2/22/2009	Winter Storm	East Montpelier, County Wide	16" of snow, 30 mph wind gusts
2/1/2008	Winter storm	East Montpelier, County wide	3-7" of snow and ice ¼-1/2"thick, 50 mph wind gusts
2/14/2007	Winter storm	East Montpelier, County wide	22" of snow
2/14/2006	Winter storm	East Montpelier, County Wide	30" of snow
1/4/2003	Winter storm	East Montpelier, County wide	19" of snow
3/5/2001	Winter storm	East Montpelier, County wide	15-30" of snow
12/31/2000	Winter storm	County wide	10" of snow
1/15/1998	Winter storm	East Montpelier, County wide	10-12" snow (not a DR in Washington County)
12/29/1997	Winter storm	East Montpelier, County wide	21" of snow
12/7/1996	Winter Storm	East Montpelier, County wide	12" of snow
3/21/1994	Winter storm	East Montpelier, County Wide	5-11" of snow
11/1/1993	Winter storm	East Montpelier, County wide	15" of snow
1/3/1993	Freezing Rain	East Montpelier, Statewide	¼-1/2" freezing rain

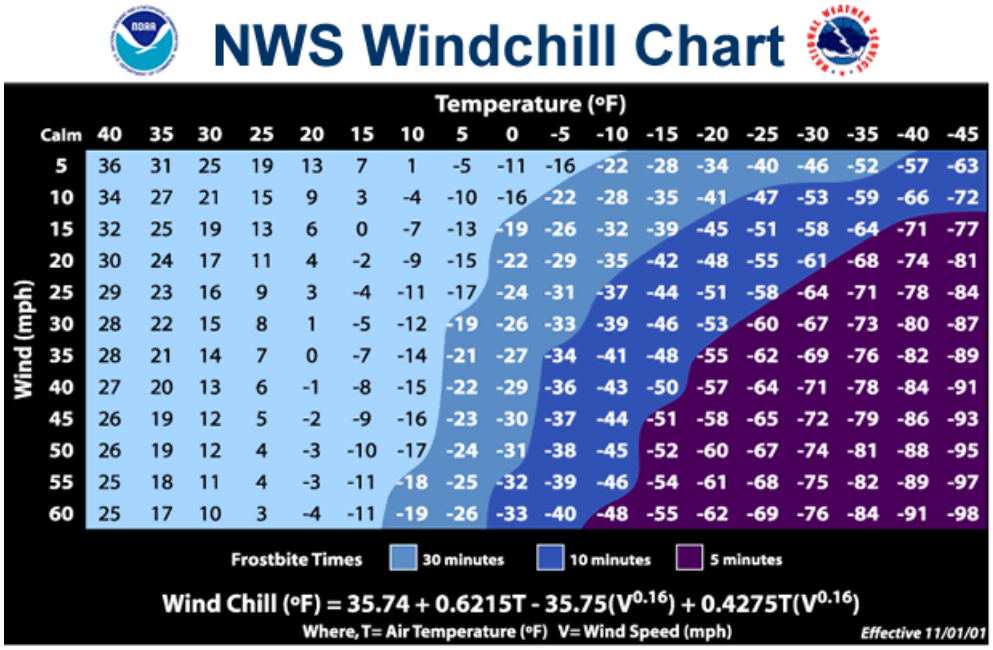
A winter storm is defined as a storm that generates sufficient quantities of snow, ice or sleet to result in hazardous conditions and/or property damage. Ice storms are sometimes incorrectly referred to as sleet storms. Sleet is similar to hail only smaller and can be easily identified as frozen rain drops (ice pellets) that bounce when hitting the ground or other objects. Sleet does not stick to wires or trees, but in sufficient depth, can cause hazardous driving conditions. 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. Periods of extreme cold tend to occur with these events.

The physical impacts of winter storms are town wide due to the expansive nature of winter storms. For the next plan update, East Montpelier will more closely monitor winter storms to determine the worst impacts possible on the Town. Based on past occurrences, the worst anticipated winter weather East Montpelier could experience would be 2-3' in 24 hrs of snow with more at higher elevations and several days of power outages. The worst recent storm was in March 2011 and after that the Blizzard of 1888. Scales to measure the extent of winter storms are:

Heavy snowfall – East Montpelier is significantly affected when they experience an accumulation of 7 inches or more of snow in a 12-hour period or 13 inches or more in a 24-hour period.
Blizzard – East Montpelier is significantly affected when they experience sustained wind speeds in excess of 40 mph accompanied by heavy snowfall or large amounts of blowing or drifting snow.
Ice storm – East Montpelier is significantly affected when they experience ice accumulations of ¼" or greater.

Wind Chill Extent Scale



One of the major impacts associated with ice storms is the loss of electrical power. Major electric utility companies have active, ongoing programs to improve system reliability and protect facilities from damage by ice, severe winds and other hazards. Typically, these programs focus on trimming trees to prevent encroachment of overhead lines, strengthening vulnerable system components, protecting equipment from lightning strikes and placing new distribution lines underground.

Additionally, sensitive populations such as the elderly or handicapped may be susceptible to extreme cold when power is lost and heating systems are run on electricity (versus gas or natural fuels). If power is lost, some populations may need to be relocated to areas with power so that medical equipment can function. Additionally limited mobility of some persons may make it difficult to relocate in general or in times of emergencies. The Town encourages neighbors to check on those neighbors who they may believe to be at risk during times of emergency. The Fire Department also has a list of those with medical needs. In the future, the Town can map the location of sensitive populations and trouble spots on roads that reach those populations in order to identify additional routes. Also, the Town can continue to provide outreach and education of the impacts of winter storms to these populations.

Other major impacts include closed roads, restricted transportation and large buildings collapsing under the weight of heavy snows.

As a result of the Valentine's Day storm in 2006, power was out for extended days and two privately owned barns collapsed due to heavy snow loads. Route 2, a major thoroughfare was closed for about half of the day. Ice was a major factor in the delay of Route 2 opening. No public shelters were opened, and the Town encouraged those without power to seek shelter with friends and family.

By observing winter storm watches and warnings, adequate preparations can usually be made to lessen the impact of snow, ice and sleet, and below freezing temperature conditions on the Town of East Montpelier. Providing for the mass care and sheltering of residents left without heat or electricity for an extended time and mobilizing sufficient resources to clear broken tree limbs from roads, are the primary challenges facing community officials. East Montpelier should plan and prepare for these emergencies. That planning and preparedness effort should include the identification of mass care facilities and necessary resources such as cots, blankets, food supplies and generators, as well as debris removal equipment and services. Sheltering areas in East Montpelier include U-32 Middle and High School and the Barre B.O.R facility. Additional shelters can be opened at the local elementary school if necessary. The Town encourages residents who are in remote locations to be equipped with generators and backup fuel supplies in the event of prolonged power outages and travel restrictions.

Hazard	Location	Vulnerability	Extent	Impact	Probability
Extreme Cold/Winter or Ice Storm in conjunction with power failure	Town Wide	Elderly & handicapped populations, remote structures, old/under insulated structures, utilities, trees	18+" snow in March 2011 storm in 24 hrs, Blizzard of 1888	additional sheltering/ plowing/ emergency services costs for town - $15,000	High

Moderate threat hazards

Landslide

A landslide is the sliding of a large mass of rock material, soil, etc., down the side of a mountain or cliff. Landslides can be caused by rainstorms, fires, alternate freezing or thawing and/or by the steepening of slopes by erosion or human modification.

East Montpelier has suffered numerous landslides over the years, generally caused by fluvial erosion of banks along the Winooski River. In 2004 along Coburn Road between Cate Farm Bridge and Coburn Road Covered Bridge 400+ feet of bank was stabilized using funding from NRCS, state grants and local money. In 2005 state grants, town funds and private donations funded stabilization of the bank above the Winooski at the end of Pine Ridge Road.

The impact of landslides on East Montpelier is primarily road closures, traffic related disruptions and high costs for repairs.

In 2011 slides occurred in three areas, mostly due to the very wet spring compounded by the effects of T.S. Irene. On May 5th a massive slide occurred above U.S. Rte. 2 near the confluence of Muddy Brook and the Winooski. The slide caused one lane of Rte. 2 to be closed for a day with occasional closures occurring during the stabilization effort. The cost to repair this slide was approximately $1 million. About that same time a slide took off a slice of VT Rte. 14 N just above the East Montpelier Village Bridge. The Crystal Springs waterline was damaged during the slide, shutting down the water service to the east side of town for two days. This section of road slid again during T.S. Irene, further damaging the waterline and resulting in a large-scale restoration effort by the VT Agency of Transportation to stabilize the bank. Also during the May period Coburn Road suffered both a lane-blocking slide from above and multiple slides along the riverbank. More bank erosion occurred during T.S. Irene. FEMA is providing approximately $60,000 for stabilization of the "between-the-bridges" section of Coburn Road.

In the future, the extent of landslides in East Montpelier can be recorded using the Alexander Scale for Landslide Damage for structures or measuring the volume of fill displaced. Based on

past occurrences an estimate of the extent of the worst landslide East Montpelier could incur is roughly 10,000 cubic yards of fill.

Hazard	Location	Vulnerability	Extent	Impact	Probability
Landslide	Route 2 hillside, Coburn/Cate Farm Rd, Route 14 N	Water and road infrastructure	10,000 cubic yards of fill for Route 2 slide	$1 million	Medium

6. Mitigation

6.1 Town Plan (2008) Polices that Support Local Hazard Mitigation

Comment [SSA20]: C6: describe how the latest town plan update used this plan as a resources, explain how this updated plan was informed by the current town plan, and describe how these plans will be integrated going forward.

- Protect and improve quality of ground water and surface water of East Montpelier and protect the health of its citizens. (Wastewater Goal)
- Maintain and plan for a network of roads that will provide safe and adequate transportation for all road users balanced with the desire to retain scenic beauty and natural areas of town. (*Transportation Goal*)
- Ensure that police, ambulance, and disaster services continue to meet the needs of residents. (*Police, Ambulance and Disaster Planning Goal*)

East Montpelier's town plan will be updated in 2013. The Town is interested in adding goals which relate to mitigation planning.

The goal of this hazard mitigation plan is:

Comment [SSA21]: Good for C3.

- To take actions to reduce or eliminate the long-term risk to human life and property from:
  - Dam failure
  - Flooding/Flash Flooding/Fluvial Erosion
  - Hurricanes/Tropical Storms/Severe Storms
  - Extreme Cold/Winter Storms/Ice Storms

Specific hazard mitigation strategies related to goals of the Plan include:

- Ensure existing and future drainage systems are adequate and functioning properly.
- Preserve and prevent development in areas where natural hazard potential is high.
- Ensure that all residents and business owners are aware of the hazards that exist within East Montpelier and ways they can protect themselves and insure their property.
- Ensure that emergency response services and critical facilities functions are not interrupted by natural hazards.

6.2 Identified Hazard Mitigation Programs, Projects & Activities

Hazard mitigation programs, projects and activities that were identified for implementation at the Town Local Hazard Mitigation meeting are:

Hazard Mitigated	Mitigation Action	Local Leadership[4]	Prioritization (High, Med, Low)	Possible Resources[5]	Time Frame
Flooding, Severe Storms	Upgrade and expansion of culvert on Kelton Road	SB, PC, Road Foreman	High	HMGP	1-2 years
Flooding, Severe Storms	Upgrade and expansion of culvert on Quaker Road	SB, PC, Road Foreman	High	HMGP	1-2 years
Flooding, Severe Storms, Landslide	Upgrade and expansion of bridge on Coburn Road; reengineering of section of Coburn Road	SB, PC, Road Foreman	High	HMGP	1-2 years
Flooding, Severe Storms, Landslide	Upgrade and expand culverts, and stabilize hillside on Muddy Brook	SB, PC, Road Foreman	Med	HMGP	3 years
Dam Failure	Work with Calais to improve communications regarding Curtis Pond Dam and Adamant Dam issues	SB	Med	Town Funds	Annually
Dam Failure	Develop inundation model with Green Mountain Power	SB, PC	High	Town Funds	Annually / ongoing
Flooding, Severe Storms	Implement strategies outlined in Upper Winooski River Corridor Plan	PC	Med	Town Funds, HMGP	3 years
Severe Storms, Winter Storms	Install generators for Town Office, Town Garage and Elementary School	SB	Med	EMGP	2-3 years
Winter Storms/ Severe Cold	Provide training to residents on how to insulate homes (pipes, attics) for extreme cold spells	SB, PC, Fire Dept	Medium	EMGP	2 years

Comment [SSA22]: C4: when you come up with new actions, FEMA will be looking for at least one action that specifically speaks to future development (e.g. further limiting development in the floodplain through updated bylaws, or specific building codes). If the town decided not to implement any actions related to future development, include that these actions were considered but not found to be feasible at this time (e.g. due to lack of community support/political will).

FEMA will also be looking for actions in the following categories, defined on pg. 72 of the LHMP handbook:

- Local Plans and Regulations (this is where future development comes in)
- Structures and Infrastructure Project (e.g. culvert upgrades)
- Natural Systems Protection (e.g. stream bank restoration)
- Education and Awareness Programs (e.g. educating residents on elevating utilities out of the floodplain)

For each of these categories, you need to either include an action or note that actions were considered, but the town is not taking action at this time.

Comment [SSA23]: C5: for the timeframes, FEMA will be looking for specific start and end dates, e.g. fall 2018-spring 2019 or January 2019-June 2019. You could also say year 1-2 of the plan implementation. You won't be held to these, but will need to include them.

[4] SB – Select Board, PC - Planning Commission, ANR – Agency of Natural Resources
[5] HMGP – Hazard Mitigation Grant Program, EMGP – Emergency Management Grant Program, PSIC/NTIA – National Telecommunications and Information Administration, USDA – United States Dept. of Agriculture

Winter storms/ extreme cold/ice storms	Upgrade electrical systems in municipal buildings and shelters to prevent surge/equipment damage from fluctuating current during ice and wind storms	Fire Dept, SB	Med	General Funds, EMGP, DPIG	3-4 years
NFIP Compliance	Work with elected officials, the State and FEMA to correct existing compliance issues and prevent any future NFIP compliance issues through continuous communications, training and education	PC, ANR	Med	HMGP	2 years
Emergency Preparedness	Narrowband upgrade for all town radios and installation of repeaters	SB, Road Foreman	High	EMGP, PSIC/ NTIA, USDA	<2 years until mandate

VEM also emphasizes a collaborative approach to achieving mitigation on the local level, by partnering with ANR, VTrans, ACCD, Regional Planning Commissions, FEMA Region 1 and other agencies, all working together to provide assistance and resources to towns interested in pursuing mitigation projects and planning initiatives.

The Hazard Mitigation Activities Matrix (Attached) lists mitigation activities in regards to local leadership, possible resources, implementation tools, and prioritization. Prioritization was based upon the economic impact of the action, the Community's need to address the issue, the action's cost, and the availability of potential funding. The action's cost was evaluated in relation to its benefit as outlined in the STAPLEE[6] guidelines. Due to the frequency and damage caused by flooding, mitigation actions which address areas that are frequently flooded will be the highest priority of the Town. Other mitigation actions listed will be performed as funds become available and dependent on public interest.

East Montpelier understands that in order to apply for FEMA funding for mitigation projects, a project must meet FEMA benefit cost criteria. In addition, the Town must also have a FEMA approved Hazard Mitigation Plan.

A High prioritization denotes that the action is either critical or potential funding is readily available and should have a timeframe of implementation of less than two years. A Medium prioritization is warranted where the action is less critical or the potential funding is not readily available and has a timeframe for implementation of more than two years but less than four. A Low prioritization indicates that the timeframe for implementation of the action, given the

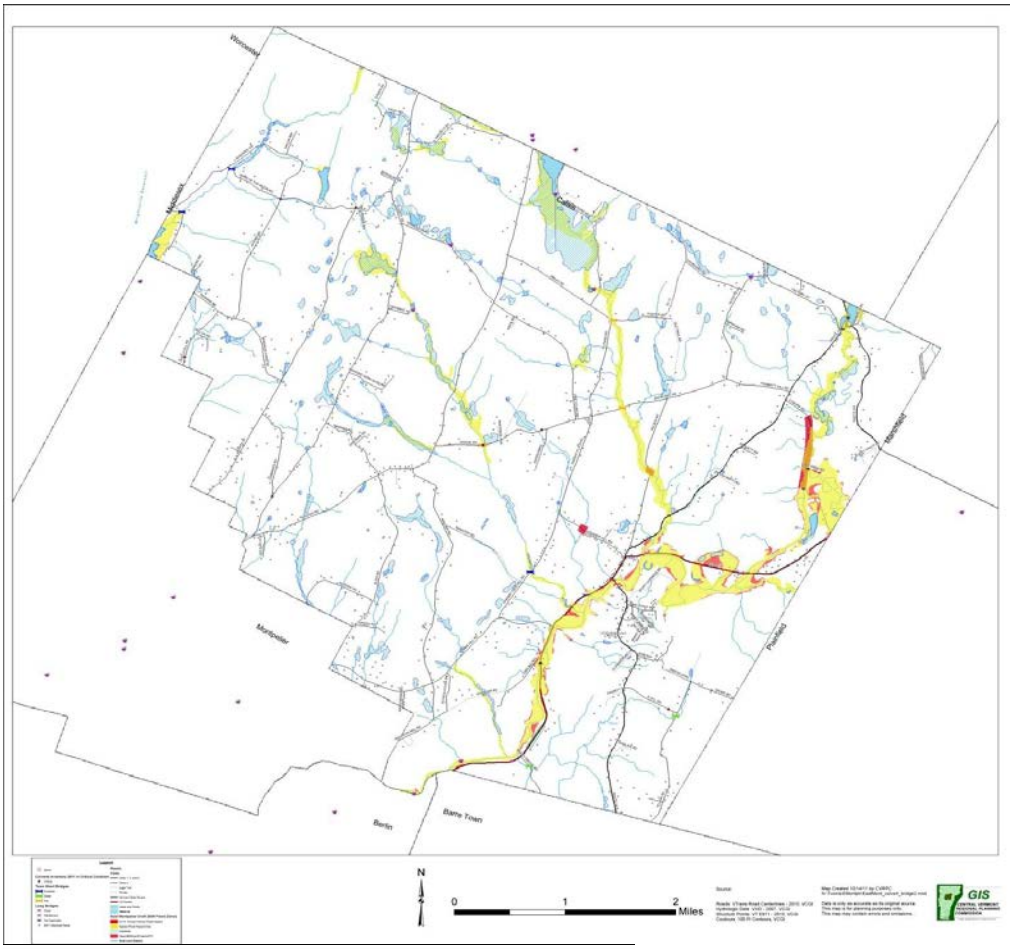
Comment [SSA24]: C5: I would include specific language relating to the benefit of prioritization each category. High priorities have a significant benefit to the town in reducing vulnerability, etc.

[6] A method of evaluating mitigation actions based on **S**ocial, **T**echnical, **A**dministrative, **P**olitical, **E**conomic, **E**nvironmental criteria

action's cost, availability of funding, and the community's need to address the issue, is more than four years.

Attachments

Hazards Analysis Map
Upper Winooski Corridor Plan Strategies for stream reaches in East Montpelier
5 Year Plan Maintenance and Review Process
Town Resolution Adopting the Plan



Local Area of Concerns Map

Figure 12: The Coburn Covered bridge (R24) was elevated to increase the area through which water can flow. Despite this, the bridge abutments still constrict the channel and upstream and downstream erosion is a result (see fallen tree on right bank).

TABLE 3: UPPER WINOOSKI RIVER BRIDGES: PROBLEMS AND POTENTIAL FAILURE MODES

Town	Reach #	Road	F1	F2	F3	F4	F5	F6	P1	P2	P3	P4	P5	P6	P7	Width
Marshfield	R27-B	Stephen Fowler	-	-	-	-	X	X	-	-	-	X	X	-	X	94 %
Plainfield	R27-A	Main Street	-	X	X	X	X	X	-	X	-	X	X	-	X	71 %
Plainfield	R25	Route 2	-	X	-	X	X	X	-	-	-	X	X	-	X	87 %
East Montpelier	R24	Coburn Road	-	X	X	X	-	X	-	X	X	-	-	-	X	80%
East Montpelier	R23	Route 2	-	-	-	-	X	X	-	-	-	X	-	-	X	95%
East Montpelier	R23	Route 14 S	-	X	X	X	-	X	-	X	-	-	X	-	X	98%
East Montpelier	R22-A	Route 2	-	X	-	X	X	X	-	-	-	X	X	-	X	82%
East Montpelier	R22-A	Hanging Bridge	-	-	-	-	-	X	-	X	X	X	-	-	-	103%
Montpelier	R19	Route 2	-	-	-	X	X	X	X	X	X	X	-	-	X	81%
Montpelier	R19	Railroad	-	X	X	X	X	X	-	-	-	X	X	-	X	85%
Montpelier	R18-B	Route 2	-	-	-	X	-	X	-	-	-	X	-	-	-	75%
Montpelier	R18-B	Railroad	-	-	-	-	-	X	-	-	-	X	-	-	-	87%
Montpelier	R18-A	Pioneer St.	-	-	-	X	X	X	-	-	-	X	-	-	X	93%
Montpelier	R18-A	Railroad	-	-	-	X	-	X	-	-	-	X	-	-	X	103%
Montpelier	R18-A	Granite St.	-	-	-	-	-	X	-	-	-	X	-	-	X	103%
Montpelier	R18-A	Main Street.	-	-	-	X	X	X	-	-	-	X	-	-	X	91%

Failure Modes

F1	Concern for structure due to fluvial condition or process
F2	Potential failure due to out-flanking
F3	Potential failure due to scour
F4	Potential failure due to ice or debris jam
F5	Structure related damage due to flooding of adjacent property
F6	Structure related damage due to erosion of adjacent property

Existing Problems

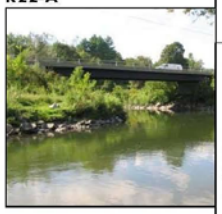
P1	Upstream sediment deposit
P2	Upstream Scour and/or erosion present
P3	Downstream Scour and/or erosion present
P4	Inlet obstruction present
P5	Poor location or alignment
P6	Beaver activity
P7	Floodplain filled entirely or partially by roadway approaches
Width	Structure width divided by channel width as a percent (% bankfull width)

REACH NUMBER	METHOD	BENEFIT	DESCRIPTION	FEASIBILITY/ CONSTRAINTS	COST	LANDUSE CONVERSION	PARTNERS	PRIOR -ITY
R26 (cont.) 	Remove Berms	Allow for flood flows to disperse and move laterally **across a** forested floodplain. Allow for trees to develop on bank and shade river and provide habitat.	A second separate berm removal project would be the relocation, reconfiguration of the Rec. Field Road/private driveway. Investment in maintaining this driveway has been historically high (based on the extensive armoring) and is likely to continue with detrimental effects to channel stability, fish habitat, and the ability of the river to access historic floodplain on the left bank.	This road appears to serve a single residence/farm which would need to have viable access for maintaining its operation/ occupancy.	Unk.	Road/berm to floodplain forest.	Landowners Town VTANR	High
R25 	Restore Riparian Buffer	Long term channel stability, reduce flood velocities, nutrient uptake, habitat and other ecosystem **services.**	This is a highly dynamic reach whose movement has likely been exacerbated by the historic removal of riparian vegetation. Long term management towards equilibrium condition as well as provision of ecosystem services to the community and towns downstream would be improved through reforestation.	Plantings should be at the margin of the river corridor and **where oxbows are** being formed as this reach is still actively adjusting laterally.	Mod.	Open Land and Ag fields to Forest	Landowners FWR, WNRCD, FWS	High
	Replace Undersized Structure	Open the river channel to allow for sediment transport, channel migration, and riparian habitat **connectivity.**	Replace highly undersized Route 2 bridge which is currently creating excessive instability upstream.	Project will need to ensure protection of house downstream.	High	Remains a bridge crossing, opens up transport and riparian area connectivity which is currently pinched by the **structure.**	Landowners VTRANS, ***Towni*** VTANR	High

REACH NUMBER	METHOD	BENEFIT	DESCRIPTION	FEASIBILITY/ CONSTRAINTS	COST	LANDUSE CONVERSION	PARTNERS	PRIORITY
R25 (cont.)	Protect River Corridor	Sediment Attenuation Area (Conserve and Enhance) and Fluvial Erosion Hazard Reduction	This mostly undeveloped reach is already attenuating floodwaters **and coarse sediment. Due to its** proximity along the Route 2 corridor it is conceivable that further development may be proposed in the river corridor. **Long term river corridor protection** would reduce future conflict and ensure that valuable watershed **services are secured for future generations.**	Currently few **structures near the** river. Habitat and flood storage value of oxbow wetlands are important features to protect from fill/drainage.	High	Open land and **forest remains** structure free	Landowners **Town**t CVRPC, VTANR	High
R24 	**Remove or** Replace **Structures**	Improve sediment and flood water flow under Coburn Covered Bridge	Expand bridge abutment widths to allow for sediment transport under **structure.**	Bridge was recently **raised but more** investment may be difficult to gather.	High	None	Landowners **Town**t VTANR, FWS, VTRANS,	Low
	Restore Riparian Suffer	Long term channel stability, reduce flood velocities, **nutrient uptake** habitat and other ecosystem **services.**	This is a predominately stable reach with already large sections of intact riparian forest. Improving connectivity on the left bank especially will ensure ecosystem services and habitat improvement for this reach.	**Few major structures** along reach. River stability is good overall which will allow trees to grow.	Low	Unforested land to forest.	Landowners FWR, WNRCD, FWS	Low

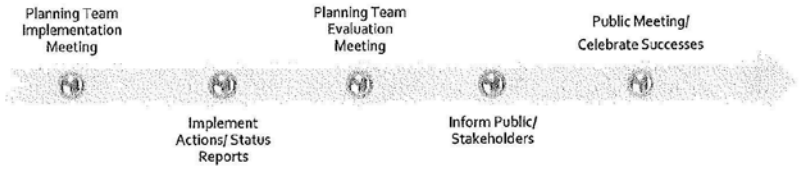
REACH NUMBER	METHOD	BENEFIT	DESCRIPTION	FEASIBILITY/ CONSTRAINTS	COST	LANDUSE CONVERSION	PARTNERS	PRIORITY
R24 (cont.)	Remove Berm	Open up floodplain to receive extreme high water flows.	Tailings piles left over from gravel mining operations on the left bank form a berm that would hinder floodplain access and potential floodwater storage in the quarry pond. Flood water access to the pond is acceptable, however, lateral migration of the river into the pond itself must be prevented.	State owned property. Lateral migration of river into pond must be prevented due to potential disruption of sediment transport and downstream affects.	Low	Restoration of riparian forest in conjunction with berm removal.	Landowners VTANR FWR, WNRCD, FWS	High
	Protect River Corridor and Buffer	Sediment Attenuation Area (Conserve and Enhance) and Fluvial Erosion Hazard Reduction	A large portion of the corridor is currently forested and or marginal land. Protection of the relatively thin strip of land that encompasses the river corridor in this reach would reduce future conflict and ensure that valuable watershed services are secured for future generations.	Currently few structures near the river.	High	Open land and forest remains structure free	Landowners Town, CVRPC, VTANR	Low
R23 	Restore Riparian Buffer	Long term channel stability, reduce flood velocities, nutrient uptake, habitat and other ecosystem services.	This is a dynamic reach whose movement has likely been exacerbated by the historic removal of riparian vegetation and straightening. Long term management towards equilibrium condition as well as provision of ecosystem services to the community and towns downstream would be improved through reforestation.	Plantings should be at the margin of the river corridor and where oxbows are being formed as this reach is still actively adjusting laterally.	Mod.	Open Land and Ag fields to Forest	Landowners FWR, WNRCD, FWS	Med

REACH NUMBER	METHOD	BENEFIT	DESCRIPTION	FEASIBILITY/ CONSTRAINTS	COST	LANDUSE CONVERSION	PARTNERS	PRIOR-ITY
R23 (cont.) 	Remove Berm	Restore floodplain and channel meander ability	Future road work and intersection work at the Route 2 and 14 intersections in East Montpelier should consider a realignment of Route 2 which has cut off the floodplain on the right bank in the lower end of the reach. Rock armoring along the road bank has reduced habitat quality of this reach. Wetlands/floodplain on the north side of Route 2 have been cut-off from the river channel.	Considerable planning and community discussion would need to occur before a major road realignment would take place.	High	Relocation of road would impact undeveloped land while rehabilitating currently impacted land.	Landowners Town, VTRANS, CVRPC, VTANR	Low
	Protect River Corridor	Sediment Attenuation Area (Conserve and Enhance) and Fluvial Erosion Hazard Reduction	This mostly undeveloped reach has significant potential for future river corridor ecosystem services. A large portion or the channel is currently forested. Annual crop fields would be reduced or possibly converted to perennial crops that would provide similar function as a riparian buffer. Protection of this reach from development would reduce future conflict and ensure that valuable watershed services are secured for future generations.	Currently few structures near the river.	Unk.	Open land and forest remains structure free	Landowners Town, CVRPC, VTANR	High

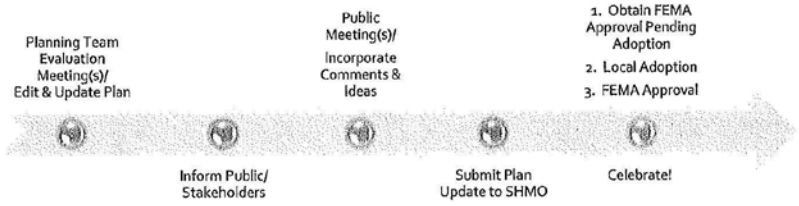
REACH NUMBER	METHOD	BENEFIT	DESCRIPTION	FEASIBILITY/ CONSTRAINTS	COST	LANDUSE CONVERSION	PARTNERS	PRIOR-ITY
R22-A 	Replace Undersized Structure	Open the river channel to allow for sediment transport, channel migration, and riparian habitat connectivity.	Replace highly undersized Route 2 bridge which is currently creating instability upstream.	Project will need to ensure protection of houses upstream and downstream.	High	Remains a bridge crossing, opens up for sediment transport.	Landowners VTRANS, Town, VTANR	High
	Restore Riparian Buffer	Long term channel stability, reduce flood velocities, nutrient uptake, habitat and other ecosystem services.	This is an incised and historically straightened reach. The left bank is predominately a road (Route 2), and the right bank has had significant riparian deforestation. Efforts to improve the riparian forest on the right bank may help improve instream channel condition and habitat along this reach. As well as provide long term ecosystem services for the community.	Few major structures along reach. River stability is good overall which will allow trees to grow.	Low	Pasture land to forest. Productivity shift to other economic, ecologic, and social gains.	Landowners FWR, WNRCD, FWS	Low
R21-A 	Remove or Replace Structures	Improve sediment flows upstream. Improve fish passage.	Remove old concrete dam. Provide slope control to channel to prevent channel incision.	Extensive study and permitting. River will breach dam someday on its own. A controlled breach may prevent a nickpoint from migrating upstream uncontrolled.	Unk.	Dam to free flowing river.	Landowners VTANR, ACOE	Low

5-Year Plan Review/Maintenance

After Plan Adoption-Annually
Implement and Evaluate



Fifth Year, and After Major Disaster
Evaluate and Revise



Certificate of Adoption

Town ofEast Montpelier, Vermont Selectboard

Resolution Adopting the East Montpelier Local Hazard Mitigation Plan
October 1, 2012

WHEREAS, the Town of East Montpelier has worked with the Central Vermont Regional Planning Commission to identify hazards, analyze past and potential future losses due to natural and manmade-caused disasters, and identify strategies for mitigating future losses; and,

WHEREAS, the East Montpelier Local Hazard Mitigation Plan contains several potential projects to mitigate damage from disasters that could occur in the Town of East Montpelier; and,

WHEREAS, a duly-noticed public meeting was held by the Town of East Montpelier Selectboard on October 1, 2012, to formally adopt the East Montpelier Local Hazard Mitigation Plan;

NOW, THEREFORE BE IT RESOLVED that the East Montpelier Selectboard adopts the East Montpelier Local Hazard Mitigation Plan.

Comment [SSA25]: One thing FEMA has been picky about lately is making sure the adoption resolution language includes the intent to implement the plan.

E.g. by adding: *The respective officials identified in the mitigation action plan are hereby directed to pursue implementation of the recommended actions assigned to them.*

Seth Gardner

Casey Northrup

Carl Etnier

Steve Sparrow

C. Bruce Johnson, Chair

ATTEST

Teresa Conti
East Montpelier Town Clerk

Date