

Local Hazard Mitigation Planning Committee Meeting
June 4th, 2021 9:30am-11am

Remote Meeting via Zoom

Present: Chief Robert Gowans, Grace Vinson, Kurt Motyka, Eric Nordenson,

Agenda:

1. Introductions
2. Approval of Minutes
3. Review Draft of the LHMP
 - a. Group discussed the following: Montpelier 2021 LHMP Remaining Info Needs as of 6/1/21
 - b. Dam failure: Status of dam inundation maps posted to website?
 - i. Chief Gowans will coordinate with Cameron to scan and post these. Anticipate this will be done before LHMP adoption on 7/28/21
 - c. Should PFAS go in water supply contamination or hazardous materials section?
 - i. Kurt M says PFAS info should go in hazardous materials
 - d. Fluvial Erosion/Inundation Flooding: Need to clarify/add info on historic properties in the floodplain (have initial list from Audra, but she indicated she was going to refine this--get rid of the selected buildings that are not contributing, figure out what all the blank properties are that are listed in the spreadsheet but without description.)
 - i. Grace to follow up with Audra on this
 - e. Group discussed the following pending items, and reviewed the LHMP draft as shown below in the minutes.
 - i. Still waiting on some info from VC3 for the Cyber Disruption section so that section is a little light currently.
 - ii. There is also a placeholder for the dam inundation maps (or we can just add a link to the website once they are posted there).
 - iii. On page 19 there is a draft template including the evaluation metrics the LHMP Committee discussed at the 4/23/21 meeting
4. Review Next Steps (below)
5. Adjourn

Next steps are:

- June 11: Submit revised draft to VEM
- June 11 to early July: VEM reviews
- Early July: Comments from VEM, meet w/ Montpelier LHMP Committee if necessary to review comments and changes needed
- Early/mid- July: Final LHMP submitted
- Mid-July: VEM approves final plan and issues "Approval Pending Adoption"
- July 28: Montpelier adopts LHMP at City Council meeting

City of Montpelier

Local Hazard Mitigation Plan

DRAFT

Adopted - Approved

Prepared by the City of Montpelier and the Central Vermont Regional Planning Commission

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1. Introduction

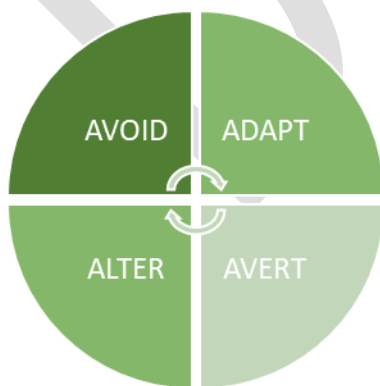
In accordance with the Stafford Act, municipalities may perform mitigation planning and be eligible to receive increased federal funding for hazard mitigation measures (42 U.S.C. 5165).

The impact of expected, but unpredictable natural and human-caused events can be reduced through community planning. The goal of this Plan is to provide an all-hazards local mitigation strategy that makes the community of 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 Impact¹ efforts, the Federal Emergency Management Agency (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.

¹ Project Impact was a national initiative started by the Federal Emergency and Management Agency (FEMA) in 1997 to help build disaster resistant communities. This federal initiative shifted the focus of emergency management from responding to disasters to helping to prevent potential damage by taking actions beforehand.

2. Purpose

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

The 2021 Montpelier Local Hazard Mitigation Plan is an update of the City's adopted 2015 Local Hazard Mitigation Plan approved by FEMA on April 15, 2015. This Local Hazard Mitigation Plan assists the City to catalogue hazards facing the region and community, and to identify strategies that reduce risks from acknowledged hazards based on current information. The City reviewed, evaluated, and revised the 2015 plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities. New information has been incorporated into the plan, making it up to date, stronger, and more useful to City officials and residents who will implement the actions and measures going forward. Implementation of this plan will make Montpelier more resistant to harm and damages in the future, and will help to reduce public costs.

Montpelier strives to address the strategies, goals and objectives of the 2018 State Hazard Mitigation Plan, including an emphasis on proactive pre-disaster flood mitigation for public infrastructure, appropriate floodplain and river management practices, and fluvial erosion risk assessment initiatives.

The 2021 Montpelier Local Hazard Mitigation Plan is an update of the 2015 adopted plan. The plan consists of the modified, as described below, sections of the existing plan, which have been reorganized, and new sections:

- Information from the 2015 plan was updated.
- Hazards reflecting the community's priorities were updated.
- The Plan Update Process was updated.
- Plan Maintenance activities were updated.
- The Hazard Analysis Map was updated to reflect current information.
- The status of 2015 mitigation strategies was reviewed and documented.
- The new mitigation strategies section was updated and enhanced to reflect current priorities and intended actions of the community over the next five years.

The long term and overall goal of this plan is to protect life and property from harm/damages caused by natural and man-made disasters.

3. Community Profile

3.1 Environment

The City of Montpelier, Vermont's State Capitol, is located at the geographic center of Washington County. The City is bounded to the north and east by East Montpelier, to the south by Berlin, and to the west by Middlesex. Totalling 10.3 square miles, the City is located in the upper segment of the Winooski watershed and according to the City of Montpelier Master Plan "its location at the confluence of the Winooski and North Branch Rivers has influenced development not only along the valleys, but also on the hillside slopes that overlook the valley."

3.2 Development Patterns

According to the 2019 American Community Survey, Montpelier has a population of 7,447 people living in 4,001 housing units. The Master Plan states that Montpelier's residential population has "been stable at a little over 8,000 residents for the past 60 years." The City is a regional hub for employment due to the Capitol complex and the influx of commuters that causes the day time population to more than double.

The City of Montpelier had seen a dramatic change in the pace of new development over the previous four or five years according to the 2017 Master Plan. Between 2014 and 2019, about 67 net new residential units were created – a rate of approximately 13 per year. According to the US Census Bureau, 215 total housing units were added between 2010 and 2019. Notable development since the 2015 Plan includes:

- In 2020, the City's Taylor Street project was completed, consisting of a new Transit Center, 30 new apartment units managed by Downstreet Community Development & Housing Vermont, a new alternative transportation path and bridge connecting Taylor Street to Main Street, and an open public area at the confluence of the North Branch and Winooski River. Future plans include the development of a Confluence Park through a partnership between the City and the Vermont River Conservancy.
- Upper floors of the French Block building were redeveloped into 18 new housing units, with a grand opening in January 2019.

The 2017 Master Plan states that *"the pace and prevalence of new residential development in Montpelier has been accelerating...new, mostly high density, residential projects have been proposed- particularly within recommended Growth Center boundary "* The plan also states that *"soaring energy costs are likely to be another factor that will*

encourage people to live closer to jobs, schools, and shopping.”

3.3 Utilities and Facilities

In Montpelier, electricity is provided by Green Mountain Power Corporation (GMP), who maintains two transmission substations within city boundaries.

The municipal water facility is located in the neighboring town of Berlin and services a majority of Montpelier and a few residential customers in Berlin, distributing an average of 1 million gallons per day. Residential developments not serviced by the treatment facility rely on private wells. The municipal wastewater treatment facility is located on the western edge of the City at the confluence of the Dog and Winooski River.

Notable updates in utilities and facilities since the 2015 plan include:

- In 2017, the City, working with the Towne Hill Road Association, organized Montpelier Fire District 1 and obtained financing to construct a water storage tank with sufficient capacity to serve the District and the City. Now completed, the City is leasing and operating the Fire District 1 system.
- The City is currently replacing the transmission lines on Northfield Street to improve the deficiencies along this corridor.
- In 2019, the City received a grant from the United States Department of Agriculture – Rural Development (USDA) to aid in the cost of major infrastructure improvements to the City’s Water Resource Recovery Facility (WRRF). As of 2020, the renovation is underway. These improvements will enable the WRRF to accept High Strength Organic Waste (HSOW) from breweries and food product manufacturers; aging equipment will also be replaced or refurbished.

3.4 Public Safety

The Montpelier Police Department provides local law enforcement to the City. The department employs 17 full-time uniformed officers and has two part-time (full-time certified) police officers. According to Montpelier’s 2020 Annual Report, the police department managed 16,811 calls for service in 2019, which includes all fire, EMS and police related calls. The City’s fire and ambulance department is staffed by full-time career fire fighters, part-time emergency medical technicians and on-call paid fire fighters. The department services the City of Montpelier and provides services via mutual aid agreement to the surrounding towns of Middlesex, Moretown and Worcester. The City of Montpelier has a Local Emergency Management Plan, most recently adopted in 2021.

3.5 Municipal Plan

The 2017 Montpelier Master Plan includes descriptions, goals and recommendations in regards to public safety, resource protection, transportation and emergency services. Montpelier Zoning Regulations, last amended in January 2018, include a Flood Hazard Area District and development standards which include *Vehicular Access & Circulation Development Standards* for the safety of citizens and the efficient mobility of vehicles; *Site Protection Design Development Standards* for the prevention of erosion and protection of water quality; and *Water Supply Development Standards* for the insurance of fire protection for all developments.

In 2018, Montpelier adopted River Hazard Area Regulations, requiring a River Hazard Area Development permit for any development in the “area of special flood hazard” and/or “river corridor” (collectively referred to as River Hazard Area). These new regulations are discussed in more detail in Section **6.1 Fluvial Erosion/Inundation Flooding**.

In partnership with SE Group consultants, the City developed a Downtown Core Master Plan which “provides a blueprint for the City’s *investments in its streetscape, establish a playbook for managing urban stormwater within the core, and frame policy decisions on future land use*. The Plan was adopted by City Council in March 2020.

Due to the City’s vulnerability and history of flooding events caused by ice jams the City of Montpelier, in cooperation with Federal Emergency Management Agency, Region 1, completed the Montpelier Flood Hazard Mitigation Plan in July 1998. The purpose of the plan is to “assess the flood risks which confront the City and community of Montpelier and to articulate a comprehensive strategy for the implementing technically feasible flood mitigations activities.” Information from the Flood Hazard Mitigation Plan has been incorporated into this plan.

Additionally, the City worked with Stone Environmental to develop the 2016 Stormwater Master Plan. Information from this plan has been incorporated into the LHMP. City Public Works officials identified more than 20 areas of concern and priority projects throughout Montpelier, many of which sustained damage during the May 2011 flooding event. These projects and opportunities were narrowed to the ten highest priority projects. Seven of these projects have been advanced to concept design. Regular maintenance activities identified in the SWMP are performed and evaluated for improvement on an annual basis, and the City recently purchased a hydro-seeder to implement best management practices related to stormwater quality.

3.6 National Flood Insurance Program

Montpelier joined the National Flood Insurance Program (NFIP) in 1973. The City also received approval from FEMA to be designated a Level 8 community which became effective in October 1998. A rating of 8 reduces flood insurance rates by 10% for policy holders. The City was granted this reduced rating based upon existing City programs such as participation in the NFIP, mapping of the flood plain, public outreach and education, zoning regulations, and the amount of open space in the flood plain. The City designation is reviewed by FEMA on an annual basis to ensure the required programs are retained. The City recently submitted recertification for its CRS rating in February 2021. With the adoption of new flood hazard regulations in 2018, the City now regulates new construction in the Special Flood Hazard Area.

In 2013, FEMA produced updated digitized floodplain maps (DFIRMs) for Washington County. Part of the updating process included re-studying sections of the Winooski watershed and as a result changed the boundaries of the floodplain in some areas.

3.7 Emergency Relief & Assistance Funding (ERAF)

Vermont's Emergency Relief & Assistance Fund (ERAF) provides State funding to match FEMA Public Assistance grants following a federally declared disaster. In 2014, the ERAF criteria were revised to incentivize communities to be more proactive prior to disasters. The default rate for State contribution towards non-federal Public Assistance match following a declared disaster dropped to 7.5%, requiring municipalities to cover the other 17.5% for Public Assistance projects. Municipalities that take four proactive measures are awarded 12.5% State match. The measures are:

- Participate in the National Flood Insurance Program (NFIP).
- Adopt Town Road and Bridge Standards that meet or exceed the VTTrans 2013 template.
- Adopt a Local Emergency Management Plan which is renewed and adopted annually.
- Adopt a Local Hazard Mitigation Plan approved by FEMA every five years.

Municipalities that wish to further decrease their cost share to 7.5%, with a 17.5% State match, must also meet one of the following criteria:

1. Adopt ANR's River Corridor bylaws, or
2. Enroll in the NFIP's Community Rating System CRS)², whereby the community

² The NFIP Community Rating System (CRS) was implemented in 1990 as a voluntary program for recognizing and encouraging community floodplain management activities exceeding the minimum NFIP standards. Any community in full compliance with the minimum NFIP floodplain management requirements may apply to join the CRS.

must earn credit under Activity 430.3.

At the time this plan was developed, Montpelier had an ERAF rating of 7.5%. Montpelier has taken the following steps to reduce flood damage by:

- Participating in the National Flood Insurance Program,
- Adopting Town Road and Bridge Standards that meet or exceed the VTrans 2016 Template,
- Adopting a Local Emergency Management Plan which is renewed and adopted annually.

The City looks forward to the adoption and approval of this Local Hazard Mitigation Plan, and adoption of River Corridor bylaws, to reduce flood damage and increase the City's ERAF to 17.5%.

4. Planning Process and Maintenance

4.1 Planning Process

The Central Vermont Regional Planning Commission (CVRPC) coordinated the Montpelier Local Hazard Mitigation Plan process. CVRPC Executive Director, Bonnie Waninger, and Grace Vinson, Planner, met with Montpelier's Fire Chief, Chief Robert Gowans for an introductory meeting on January 8, 2020.

CVRPCs Executive Director, Bonnie Waninger, and Grace Vinson, Planner, met with members of the core planning team (Audra Brown, Cameron Neidermayer, Chief Robert Gowans, Mike Miller, Donna Barlow-Casey, Capt. Eric Nordenson, and Kris Hepburn) on February 12, 2020 to begin the process of updating the plan. Grace Vinson summarized the hazard mitigation plan update process and public engagement. In March 2020, Grace Vinson hung up a dot poster at City Hall to gather input on hazard impacts. The public's response to various hazard impacts in Montpelier was considered by the LHMP Committee and is included as a summary in the **Attachments**.

The COVID-19 pandemic interrupted meeting progress between March 2020 and August 2020 as Montpelier shifted to maintaining municipal operations and responding to the health and economic impacts of the situation. On August 25, Grace Vinson, Planner, facilitated an online meeting as a refresher for planning team members to restart the update process. For a more robust planning process, the City formed a LHMP Committee which was adopted by City Council

³ Activity 430 (Higher Regulatory Standards) is the primary CRS activity for crediting floodplain development regulations that are more restrictive than the NFIP requirements.

on September 23, 2020. See **Table 1** for a list of Committee members and meeting topics. All meetings were held virtually due to the COVID-19 pandemic.

Table 1: LHMP Committee Members	
• Cameron Neidermayer, Assistant City Manager • Chief Robert Gowans, Montpelier Fire Chief/EMD • Mike Miller, Planning Director • Donna Barlow-Casey, Director of Public Works • Audra Brown, Planning & Zoning Assistant	• Captain Eric Nordenson, Montpelier Police Department • Kris Hepburn, Public Safety Support Services Administrator • James Quinn, Deputy Fire Chief • Vicky Arthur, Resident
LHMP Committee Meetings	
Meeting 1: 12/4/20 • Refresher on scope and process, project timeline, and role of the planning team Meeting 2: 1/08/21 • Public Engagement • 2015 Project Status, Plans/documents to include, hazard identification and analysis Meeting 3: 2/12/21 • Public engagement results • Existing projects/programs/activities discussion • Hazard assessment discussion	Meeting 4: 3/12/21 • Review draft text, discuss hazard profiles Meeting 5: 3/26/21 • 2021 Mitigation Goals, activities, strategies and actions Meeting 6: 4/09/21 • 2021 Mitigation Goals, activities, strategies and actions Meeting 6: 4/23/21 • Draft Action Plan, maintenance process

The first meeting of the LHMP Committee on December 4, 2020, served as a formal kick off meeting for the LHMP update process. Grace Vinson of CVRPC summarized the hazard mitigation plan update process and project timeline. Grace Vinson distributed worksheets to allow each Committee member to rank hazards individually.

At the January 8, 2021 meeting, Grace Vinson and the Committee discussed survey questions and held a discussion on the assessment and prioritization of hazards affecting Montpelier based on individual scores. The Committee determined the City is most vulnerable to Fluvial Erosion/Inundation

Flooding, Severe Winter Storms (Snow, Ice), Cold, Pandemic, Dam Failure, Water Supply Contamination, Hazardous Materials, and Cyber Disruption. The City will

Home > Services > City Projects > Current Projects > Local Hazard Mitigation Plan (LHMP) update 2020 Local Hazard Mitigation Plan (LHMP) update 2020 Hazard mitigation is any action that reduces or eliminates long-term risk to people and property from disasters and their impacts. The goals of the hazard mitigation plan are to: • Reduce or eliminate threats to life and property, • Ensure that a comprehensive review of all possible activities and mitigation measures is conducted so that the most appropriate solutions will be implemented to address the hazard, • Ensure that the recommended activities meet the goals and objectives of the community, are in coordination with land use and comprehensive planning, do not create conflicts with other activities, and are coordinated so that the cost of implementing individual activities are reduced, • Solve repetitive problems, • Build public and political support for activities and projects that prevent new problems and reduce losses. • Build a constituency that sees the plan's recommendations implemented. A hazard mitigation plan can help the community understand how natural hazards impact the immediate environment and aid with development siting and design to limit damages from natural hazards. Having a Local Hazard Mitigation Plan makes towns eligible for FEMA grants such as the Hazard Mitigation Grant Program, Flood Mitigation Assistance, and the Pre Disaster Mitigation Competitive Grant.

focus most of its mitigation on flooding as it is the most common and damaging hazard. City Staff also developed a webpage for the LHMP Update process.

CVRPC and the Committee developed a Montpelier-specific survey about hazards and emergency planning. This survey was opened on January 8, 2021 and closed on February 12, 2021. There were 26 respondents. A summary of survey results is included in **Attachments**.

At the February 12, 2021 meeting, Grace Vinson of CVRPC provided a synopsis of the hazard mitigation survey results, and the Committee provided updates on existing projects, programs, and activities. Grace Vinson also provided the Committee with requests for information on the identified hazards to develop the vulnerability assessment.

During the March 12, 2021 meeting, the Committee reviewed draft text and discussed hazard profiles, noting changes in vulnerabilities, impacts, and information to complete hazard assessment tables for each 2021 hazard.

During the March 26, 2021 and April 9, 2021 meeting, the Committee discussed the 2021 Mitigation strategy, goals, and activities.

During the April 23, 2021 meeting, the Committee drafted an Action Plan and discussed the maintenance process.

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 available at Montpelier City Hall and by request from CVRPC for public review and comments from May 7 to May 21, 2021. 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 municipalities of East Montpelier, Berlin, Barre, and Middlesex. Staff received comments from NAME, description. These comments are attached at the end of the plan. Public comments submitted, in the future, will be reviewed by the Assistant City Manager (and CVRPC Staff dependent on funding) and attached as an appendix. In the future, the draft plan will be made available during the annual City Council Orientation 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 City Council for adoption.

Table 2: List of individuals who were invited to comment on the plan

<i>Organization</i>	<i>Name, Position</i>	<i>Email</i>
Vermont Emergency Management (VEM)	Caroline Massa, State Hazard Mitigation Planner	Caroline.Massa@vermont.gov
Vermont Emergency Management	Stephanie Smith, State Hazard Mitigation Officer	Stephanie.Smith@vermont.gov
Vermont Emergency Management	Josh Cox, Critical Infrastructure Planner	josh.cox@vermont.gov
Central Vermont Regional Planning Commission	Grace Vinson, Emergency Management Planner	vinson@cvregion.com
Vermont Department of Environmental Conservation (DEC)	Ned Swanberg, Regional Floodplain Manager	ned.swanberg@vermont.gov
Vermont DEC	Gretchen Alexander, Regional Rivers Scientist	gretchen.alexander@vermont.gov
Vermont DEC	Eric Blatt, Division Director	Eric.Blatt@vermont.gov
Vermont DEC	Rob Evans, River Corridor and Floodplain Manager	rob.evan@vermont.gov
Vermont Department of Forests, Parks & Recreation (FPR)	Dan Singleton, Washington County Forester	dan.singleton@vermont.gov
Vermont DEC	Benjamin Green, Dam Safety Engineer	Benjamin.Green@vermont.gov
City of Montpelier	Mike Miller, Director of Planning and Community Development	MMiller@montpelier-vt.org
Montpelier Fire Department	Chief Robert Gowans, Fire Chief	RGowans@montpelier-vt.org

Table 2: List of individuals who were invited to comment on the plan

<i>Organization</i>	<i>Name, Position</i>	<i>Email</i>
Montpelier Elementary School	Ryan Herarty, Principal	ryanheraty@mpsvt.org
U-32 Middle & High Schools	Steven Dellinger-Pate, Principal	sdpate@u32.org
Central Vermont Supervisory Union	Susette Bollard, Superintendent	sbollard@cvsu.org
Green Mountain Power	Brenda Spafford	Brenda.Spafford@greenmountainpower.com
Washington Electric Coop, Inc.	Dan Weston, Director Engineering & Operations	dan.weston@wec.coop
Washington County Sheriff's Department	W. Samuel Hill	samuel.hill@vermont.gov
Vermont State Police, Middlesex Barracks	Lieutenant David White	david.white@vermont.gov
Local Emergency Planning Committee 5	Katina Johnson, Chair	Kjohnson_398@comcast.net

Table 3: List of surrounding communities who were invited to comment on the plan

<i>Municipality</i>	<i>Person</i>	<i>Role</i>	<i>Email</i>
Town of East Montpelier	Rosie Laquerre	Town Clerk	clerk@eastmontpeliervt.org
Town of Berlin	Rosemary Morse	Town Clerk	townclerk@berlinvt.org
Town of Middlesex	Sarah Merriman	Town Clerk	mdxclerk@comcast.net
Town of Barre	Donna Kelty	Town Clerk	dkelty@barretown.org

4.2 Existing Mitigation, Maintenance, and Preparedness 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 Municipal Plan (2017), 2020

Annual Report, and 2021 Local Emergency Management Plan were reviewed for pertinent information. Information from these sources is incorporated into appropriate sections of the plan.

Table 4: Status of Existing Mitigation Programs, Projects, and Activities			
	<i>Type of Existing Authority / Policy / Program / Action</i>	<i>Resources: Staffing and Funding</i>	<i>Ability to Expand/Improve upon</i>
Community Preparedness Activities	Program –Montpelier's Local Emergency Management Plan (LEMP) is updated annually.	Emergency Management Director	Reviewed and updated annually and sent to Vermont Emergency Management for their records. As the current program works well, there is no need to improve on the process or expand it.
	Program- Capital Equipment Plan is maintained by the City on an annual basis	Public Works	Ongoing, updated annually. Sufficient at this time
	Program- Montpelier Safe School Team (crisis and evacuation plan for Montpelier High School, Middle School and Elementary School.)	N/A	No ability to expand upon- as of 2021, the Montpelier Police Department is no longer involved with Montpelier public schools. Response plans will be carried out and maintained by the schools.
Insurance Programs	Program – Montpelier will remain as a participant in the National Flood Insurance Program (NFIP).	Planning & Community Development	Ongoing, state periodically does Community Assistance Visits. No need to be improved or improved upon.
	Participation in NFIP's Community Rating System Program (Montpelier rating = 8)	Planning & Community Development	Ongoing, annual review and 5-year review. Working to increase class rating to 7.
Land Use Planning/	Policy- Montpelier City Master Plan - 2010	City-wide effort.	Adopted by the City in 2017 and approved by CVRPC. Currently

Table 4: Status of Existing Mitigation Programs, Projects, and Activities			
	Type of Existing Authority / Policy / Program / Action	Resources: Staffing and Funding	Ability to Expand/Improve upon
District and General Use Standards			being updated for 2022
	Montpelier Zoning Regulations, amended 2011; Revisions include: • Definition of Flood Plain Lands (Section 309.B.) • Standards for Development in All Flood Hazard Areas (Section 716.A.) • Standards for Development in Numbered Flood Hazard Areas (Section 716.B.) • Notice of Violation relating to noncompliant structures and enforcement in the Floodplain (Section 1104.A) • Definitions of Terms (Section 1303)	Planning & Community Development	Zoning regulations were amended in 2019. River Corridor bylaws adopted in 2018
	Montpelier Flood Hazard Mitigation Plan, 1998	Planning & Community Development	Standalone document developed in 1998. No need to expand upon/improve at this time.
	Berlin Pond Watershed Conservation Project, 2005	Public Works	Ongoing, parcel purchased for conservation in 2018
	Source Protection Plan	Public Works	Reviewed annually, updated every 3 years (most recently in 2019)

Table 4: Status of Existing Mitigation Programs, Projects, and Activities			
	Type of Existing Authority / Policy / Program / Action	Resources: Staffing and Funding	Ability to Expand/Improve upon
	Sprinkler Ordinance	Fire Dept./ Building Inspection	Continually reviewed, updated as needed
Hazard Control and Protection of Critical Infrastructure & Facilities	Program: Tree Pruning/Removal	Tree Warden	Ongoing, as needed
	Program: Alternate Side Parking (2020)	DPW	Evaluated and adjusted as needed
	Program: Maintenance Programs (Bridge & Culvert Inventory – 2007)	Public Works	City maintains GIS mapping for culvert inventory, bridges maintained through VTrans
	Program: Mutual Aid Agreement	Fire Dept	Continually reviewed and updated as needed
	Program: Enforcement of building and safety codes	Building Inspection	Ongoing, updated as needed. Looking to update residential building codes in the near future.
	Program: Informal dam release contract	Public Works	Ongoing
	Program: Ice Movement Detection Units	Public Works	Water levels continually monitored.
	Program: Ice Deterioration Techniques (Thermal & Mechanical)	Public Works	Long-arm excavator, sewer effluent program implemented as needed, reliance on State for permission.
	Program: Continue to enforce local restrictions on hunting/fishing/trapping on the Berlin Pond land to reduce water supply	Public Works	None at this time

Table 4: Status of Existing Mitigation Programs, Projects, and Activities			
	<i>Type of Existing Authority / Policy / Program / Action</i>	<i>Resources: Staffing and Funding</i>	<i>Ability to Expand/Improve upon</i>
	contamination		
Protection/ Retrofit of Infrastructure and Critical Facilities	Project: Red Cross certified Emergency Shelters, capable of sheltering animal	EMD	Barre Auditorium serves as shelter. MOU in development for animal shelters.
	Project: Back-up generators at Local Emergency Shelters	EMD	Backup generators at Barre Auditorium.
	Project: Support of emergency shelters	City Management	Continue to support partnerships in opening emergency shelters for emergency cold
	Policy: Adopted Road and Bridge Standards (2011)	Public Works	Continually readopted to align with VTrans standards.
Education/ Public Outreach	Program: Fire safety educational programs (Captain No Burn Program, Annual Extradition Training)	Fire Dept/Building Inspector	Ongoing, was annual program prior to COVID-19 pandemic.
	Program: Commercial Building Inspection	Building Inspector	Ongoing, no need to expand or improve upon.
	Program: Home Inspection Program	Building Inspector	Ongoing, homes inspected upon request.
	Program: Motor vehicle accident response training	Police Department	One-time training for new Officers at Police Academy.
	Program: First responder CPR & hazmat trainings	Fire Dept.	Ongoing, conducted annually.
	Program: School Fire	Fire Dept.	Ongoing, conducted annually.

Table 4: Status of Existing Mitigation Programs, Projects, and Activities			
	<i>Type of Existing Authority / Policy / Program / Action</i>	<i>Resources: Staffing and Funding</i>	<i>Ability to Expand/Improve upon</i>
	Safety Program		
	Flood outreach and education	Planning & Community Development	Ongoing, conduct different programs each year.
	Flood Notification Plan (via web, phone, TV, radio and sirens)	Planning & Community Development	In development
	Program: River Watch Program	Emergency Management personnel	Daily/ 2x day review of gauges
	Program: Blackboard Connect Emergency Notification System	Emergency Management personnel	Implemented in 2011
	Project: Montpelier Parks –Riverbank Restoration Volunteer Projects	Friends of the Winooski/Parks & Recreation	Ongoing, funding dependent.
	Education re: invasive species (zebra mussel); signage at Berlin Pond	Parks & Rec, VFW	Ongoing

4.3 Plan Maintenance

The City's CRS Coordinator currently evaluates implementation of LHMP actions on an annual basis in compliance with the annual CRS recertification process, engaging with multiple City departments and other stakeholders to gather information on the status of LHMP mitigation actions. To leverage this ongoing work and strengthen the LHMP maintenance process, the Committee discussed an enhanced maintenance process whereby the CRS Coordinator will share this annual CRS report with City Council at a Spring City Council meeting, coinciding with the annual LEMP update and adoption process. This will increase visibility of the maintenance

process and inform future plan updates. The process of evaluating and updating the plan will include continued public participation through public notices posted on the municipal website notice in City Hall, Front Porch Forum, and CVRPC newsletters and blogs inviting the public to the scheduled City Council meeting where the annual CRS report will be presented. Additional stakeholders invited to the meeting will be City residents, and representatives from the Planning Commission. These efforts will be coordinated by the Director of Planning and Community Development.

Updates and evaluation by City Council will also occur within 3 months after every federal disaster declaration directly impacting the City of Montpelier. CVRPC will help with updates or if no funding is available, the City Manager and Director of Planning and Community Development will update the plan.

The LHMP Committee is also interested in enhancing the LHMP evaluation process. To that end, at the 4/23/21 meeting, the LHMP Planning Committee discussed potential metrics to evaluate the effectiveness of the LHMP at achieving its stated purpose and goals. CVRPC and the Committee will develop a template to track these metrics, and the Committee will meet annually to fill in information. This template is intended to be revised as needed to add additional metrics. See below for a draft template.

Evaluation Metric	Goal 1: Ensure existing and future drainage systems are adequate and functioning properly	Goal 2: Preserve and prevent development in areas where natural hazard potential is high/ minimizing risk of damage from flooding/natural high hazard areas	Goal 3: Ensure that all residents and business owners are aware of potential hazards and educated on ways they can protect themselves and their property	Goal 4: Improve communication plans and public messaging of hazards at all stages (before, during, after)	Goal 5: Ensure that emergency response services and critical facilities functions are not interrupted by all hazards	Goal 6: Provide and maintain a reliable, functional infrastructure that meets the needs of the public and adapts to a changing climate
# of stormwater permits issued to maintain function of system	X	X				
# of stormwater permits issued to improve function of system	X				X	X
DPW work permits	X					
# of website visits following posting of info (dam inundation maps, etc.)			X	X		
# of people signed up for VT			X	X	X	

Alert (compare annually)						
# of people who receive VT Alerts (compare annually)			X	X	X	
Adoption of LEMP annually		X	X	X	X	X
COOPs updated annually		X	X	X	X	X
# of permits issued to administer and enforce Flood Hazard regulations		X				
# of engineering plans submitted for development in steep slope areas		X				
Accomplishment of proposed initiative actions re: sustainable infrastructure (see 2020 Strategic Plan)	X					X

Prior to the end of the five year period, the plan will undergo a formal update and be submitted to FEMA for re-adoption following the process outlined the schematic found in the **Attachments** section. Montpelier shall also consider incorporation of mitigation planning into their long term land use and development planning documents as well. It is recommended the City reviews and incorporates elements of the LHMP when updating the Master Plan.

4.4 Status of Prior Plan's Mitigation Actions

Table 5: Mitigation actions from the 2015 LHMP and 2021 completed and in-progress actions	
Mitigation Action	2021 Status
Coordinate another formal ice watcher training with CRREL	In progress, delayed due to COVID-19.
Initiate the wastewater effluent bypass station to melt ice formation around cemetery bend based on monitoring of the ice cover situation	Streamlined authorization process set up with ANR through NPDES permit for WRRF. System is managed and operated by WRRF staff. System is utilized on an as needed basis determined through weekly inspections of ice conditions. Continue to 2021 list.
Continue situating crane at Cemetery Bend during the winter months as needed	Two local contractors have long reach excavators and are available within 24 hours. Continue to 2021 list.
Study the area of the Winooski River from the Bailey Ave bridge to Cemetery Bend to determine if rock vans to encourage improved hydraulic grade lines would be beneficial.	USACE Winooski Ice Jam Feasibility study (2019) reviews area and briefly discusses rock vans. CRREL did not recommend vanes as solution because little was known about performance of rock vanes on ice affected rivers.
Explore feasibility of ice retention, bypass channels, etc. through COE Feasibility Study currently ongoing.	Recommended alternative in study (ice retention structure with bypass channel) has not been implemented due to budget constraints
Implement results of the COE Feasibility Study.	Conclusion to expand City's wastewater system for thermal weakening has proven to be effective and continue mechanical efforts
Develop Stormwater Master Plan	Completed and adopted 10/28/2016
Update floodplain regulations in zoning ordinance	Updated 2018, has been updated as recently as 1/2020

Table 5: Mitigation actions from the 2015 LHMP and 2021 completed and in-progress actions	
Mitigation Action	2021 Status
Review Strategies in Community Rating System program	Ongoing, completed during last 5 year review
Implement Capital Area Neighborhoods (CAN) communications system; identify neighborhood leaders	City is no longer involved; being implemented through partnership with Sustainable Montpelier, 2
Remove flood-prone heating systems below from structures connected to District Heating Plant	Majority of district heating components are flood resistant, including piping and heat exchangers; flood prone items include circulator pumps and controls. Continue to 2021 list.
Training for City Staff in non-internet based communication in case of internet failure	Ongoing; each City department has Continuity of Operations Plans (COOP). Currently planning drill for Fall 2021 to exercise COOPs which could include communication failures.

5. Community Vulnerability by Hazard

5.1 Hazard Identification and Analysis

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 in Montpelier. Greater explanations and mitigation strategies of moderate threat hazards can be found in the State of Vermont's Hazard Mitigation Plan.

Hazard impacts were rated on their probability and potential impact to infrastructure, life, economy, and environment. The impact was then averaged, and multiplied by the probability to develop a score to compare hazard impacts in Montpelier. For information regarding the ranking criteria, please refer to **Table 6**.

Table 6: Hazard Assessment Ranking Criteria		
	Frequency of Occurrence:	Potential Impact:

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

Table 7: 2021 Montpelier Hazard Table

Hazard Impact	Probability	Potential Impact					Score *
		Infrastructure	Life	Economy	Environment	Average	
Fluvial Erosion	3	2.3	1.7	1.6	2.6	2	6
Inundation Flooding	2.6	2.9	2.6	2.4	2.3	2.5	7.6
Wind	2.4	2.1	1.1	1.6	1.6	1.6	3.2
Ice	2.6	2.1	1.6	2.0	1.3	1.8	5.3
Invasive Species	3.6	1.0	1.0	1.3	2.3	1.4	4.2
Snow	3.7	2.4	2.1	1.6	1.6	1.9	7.7
Cold	3.0	2.0	2.3	1.7	1.1	1.8	7.1
Landslides	1.7	2.4	2.3	1.4	2.1	2.1	4.1
Wildfire	2.1	2.1	1.7	1.6	2.4	2	2
Pandemic	2.0	1.0	3.3	3.4	1.0	2.2	4.4
Heat	2.3	1.3	2.0	1.6	1.4	1.6	3.1
Drought	2.1	1.4	1.9	1.7	2.1	1.8	3.6
Hail	1.6	1.6	1.1	1.1	1.3	1.3	2.6

Earthquake	1.3	2.1	1.7	1.7	2.0	1.9	1.9
Dam Failure	2.0	3.0	2.4	2.4	2.7	2.6	5.3
Water Supply Contam.	2	3	1	3	3	2.5	5
Hazardous Materials	2.5	3	2	2	2.5	2.4	5.9
Cyber Disruption	2.5	3.5	3.5	3.5	1	2.8	7.2

*Score = Probability x Average Potential Impact

The City of Montpelier identified the following hazards as presenting the worst threat to the community:

- Fluvial Erosion/Inundation Flooding
- Severe Winter Storms (Snow, Ice)
- Extreme Cold
- Pandemic
- Dam Failure
- Water Supply Contamination
- Hazardous materials
- Cyber Disruption

The City is interested in focusing a majority of mitigation efforts into reducing impacts from fluvial erosion and inundation flooding, as the events occur most frequently, severely and cause the most damage to public and private infrastructure.

Other hazards not identified as worst threat may still occur in Montpelier, but the City decided to prioritize the above hazards as they pose a consistent, historical threat with a large impact to most Montpelier residents. The City recognizes that the hazards of wildfire, heat, earthquake, landslide, and hail may pose a threat to Montpelier residents, but due to a lack of consistent historical occurrences and lower potential impact, these hazard impacts have been excluded from this plan. A review of the Vermont State Hazard Mitigation Plan of November 2018 provides a greater explanation of these hazards and possible mitigation strategies to address them.

Like the State of Vermont Hazard Mitigation Plan, Montpelier did not include the following hazards in the risk and vulnerability assessment due to the low occurrence, low vulnerability, and

or geographic proximity: civil disturbance, coastal erosion, expansive soils, karst topography, sinkholes, tsunami, and volcano.

The 2021 update to the 2015 LHMP adds several new hazards:

- Extreme Cold (new)
- Severe Winter Storms (classified as moderate threat hazard in 2015 LHMP)
- Pandemic (new)
- Dam Failure (new)
- Water Supply Contamination (classified as moderate threat hazard in 2015 LHMP)
- Cyber Disruption (classified as moderate threat hazard in 2015 LHMP)

A discussion of each hazard is included in the proceeding subsections and a map identifying the location of each hazard is attached (See **Attachments**.) Each subsection includes a list of past occurrences based upon County-wide FEMA 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	Likelihood
Type of hazard	General areas within municipality which are vulnerable to the identified hazard.	Types of structures impacted	<u>Minimal:</u> Limited and scattered property damage; no damage to public infrastructure contained geographic area (i.e., 1 or 2 communities); essential services (utilities, hospitals, schools, etc.) not interrupted; no injuries or fatalities. <u>Moderate:</u> Scattered major property damage (more than 50% destroyed); some minor infrastructure damage; wider geographic area (several communities) essential services are briefly interrupted; some injuries and/or fatalities. <u>Severe:</u> Consistent major property damage; major damage to public	Dollar value or percentage of damages (if known).	<u>Highly Likely:</u> >75% probability in a year. <u>Likely:</u> >10% but <75% probability per year, at least 1 chance in the next 10 years. <u>Occasionally:</u> 1-10% probability of occurrence per year, or at least one chance in the next 100 years. <u>Unlikely:</u> <1%

Hazard	Location	Vulnerability	Extent	Impact	Likelihood
			infrastructure (up to several days for repairs); essential services are interrupted from several hours to several days; many injuries and fatalities.		probability of occurrence per year

6. Threat Hazards

6.1 Fluvial Erosion/Inundation Flooding

Flooding is the most common recurring hazard event in the state, and is a common occurrence in Montpelier, with damages associated from both inundation flooding and fluvial erosion. Both of these processes occur naturally in stable rivers, and typically occur as a result of rainfall, snowmelt, and ice jams. These impacts increase in rate and intensity due to human alterations of the river, floodplain, or watershed.

Fluvial erosion is a "streambed and streambank erosion associated with physical adjustment of stream channel depth and width" (2018 SHMP). This erosion process may occur more quickly and severely during flood events. Where buildings are placed too close to streams, and the channel becomes straightened and armored, the stream flow becomes faster and more powerful, often directing subsequent damage to nearby roads, culverts and property. Most flood-related damage in Vermont is due to fluvial erosion. The 2018 SHMP states "*The more trapped the river is, the greater power it will gain, which eventually results in a greater degree of damage to critical public infrastructure...homes, businesses, community buildings and other man-made structures built near rivers.*"

Inundation Flooding is the overflowing of rivers, streams, ponds and lakes due to excessive rain, rapid snow melt or ice. Water flows out of the river bank, and spreads across the floodplain.

It is important to note that LHMP Committee members noted that while most flood related damage in the state comes from fluvial erosion that is less the case for Montpelier. Members noted that they don't observe a lot of channel movement; the North Branch is protected by the Wrightsville Dam (slowing the energy in that channel) and the downtown area is armored. Small stream channels on steep slopes (Blanchard

Brook for example) and the lower parts of the Winooski River (Montpelier Junction area) and Dog River were noted as areas with risk of erosion.

History of Occurrences (from NCDC website and FEMA DR list) within Central Vermont – City- specific data not available.

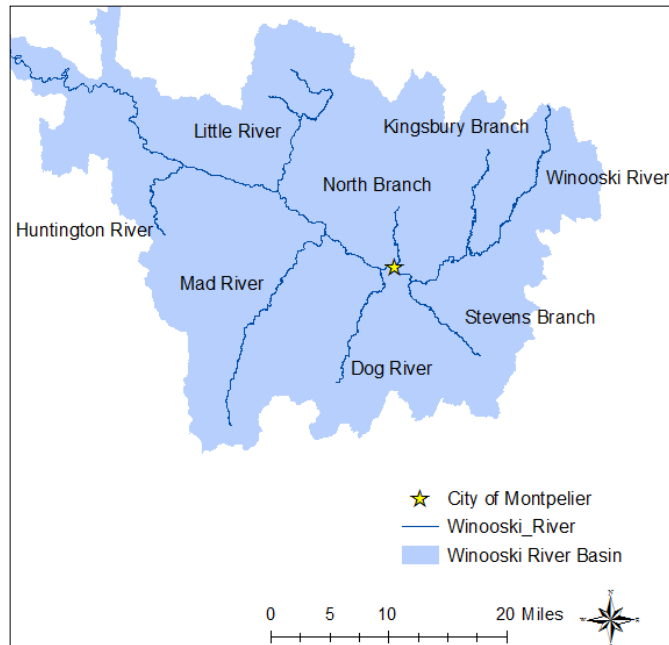
*S.S= Severe Storms

Table 8: Fluvial Erosion/Inundation Flooding Hazards Occurrences			
Date	Event	Location	Extent
10/31/2019	Flood	County-wide,	DR 4474
4/17/2019	Flood/S.S*.*	County Wide	DR 4445
02/25/2016	Ice Jam, Flooding	Lower State St west of Bailey Ave Bridge	Minor flooding along the Winooski River, focused mostly along lower State Street west of the Bailey Ave Bridge. It was blamed on heavy rain and ice jamming. High water reported along the edge of Rt 12 from Worcester to Montpelier.
4/15/2014-4/19/2014	Flood/ S.S.	County Wide	DR 4178
01/12/2014	Ice Jam, Flooding	Lower State St to Taylor St, Montpelier	The Winooski River jammed from Lower State St to Taylor St; breakup jam followed a period of subzero temperatures, building ice, and January thaw with rain. No residences and only one business were affected.
01/10/2014	Ice Jam	Confluence of Stevens Branch & Winooski River, Montpelier	Ice build-up/jam further down river in Montpelier near Tractor Supply.
6/25/2013	Flood/ S.S.	County Wide	DR 4140
03/09/2012	Ice Jam	Cemetery Bend Area, Montpelier	USGS Water Resources Data for Vermont WY 2012 reported an annual maximum peak stage of 9.78ft on 9-MAR-2012 due to ice effects at USGS gaging station 04290500 Montpelier, VT. The average daily discharge was estimated at 7,140cfs
11/08/2011	Flood/S.S.	County Wide	DR 4043
8/28/2011	Flash Flood (TS Irene)	County Wide	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	County Wide	4" of rain; Montpelier gauge at 17.59' – DR4001
4/23/11-5/9/2011	Flash Flood	County Wide	DR 1995

Table 8: Fluvial Erosion/Inundation Flooding Hazards Occurrences			
Date	Event	Location	Extent
01/25/2010	Ice Jam, Minor Flooding	1 mile upstream of Langdon St, Montpelier VT, on the North Branch of the Winooski River, Bailey Ave, extending down to Lower State St	Ice jam approximately 1 mile upstream of Langdon St, on the North Branch of the Winooski River; released sending a wall of water downstream. City Manager Fraser described how quickly the water rose, likening it to the 1992 Flood. Another jam formed downstream 20 minutes after the jam broke near Langdon St Bridge. Police Chief Facos, described an additional jam on Bailey Ave, extending down to Lower State St. Some basements noted to have flooded on Langdon St, but jam released before affecting the Capital City's streets. Annual maximum peak stage of 13.24ft on 1/25/2010 due to an ice jam at Montpelier gage. The average daily
02/01/2010	Ice Jam	Bailey Ave Bridge, Montpelier	Ice jam was noted across main stem around Bailey Bridge. Date of jam is unknown
12/28/2008	Ice Jam	Ice Jam	Cemetery Bend Area, Montpelier
12/22/2008	Ice Jam	Cemetery Bend Area, Montpelier	No Flood
8/2/2008	Flash Flood	County Wide	Not a historical crest; data gap
7/11/2007	Flash Flood	NE Washington Cty.	3-6" of rain in 2 hrs. – DR 1715, not a historical crest
3/2007	Ice Jam	Between Granite St Bridge & Main St Bridge, Montpelier	No flood
6/26/2006	Flood	County Wide	3-4" of rain, not a historical crest
9/16/1999	Tropical Storm Floyd	County Wide	Montpelier flood gauge at 9.30 feet, 5-7" rain county wide DR 1307
3/11/1992	Ice Jam Flooding	Railroad Bridge (briefly), downstream of Bailey Ave Bridge, Montpelier	Fractured ice stalled approximately 300 feet downstream of the Bailey Avenue bridge, Water depths up to 5 feet covered downtown Montpelier.
3/4/1991	Ice Jam	Cemetery Bend Area,	No flood
6/27/1998	Flash Flood	County Wide	3-6" of rain over 2 day period - DR1228, not a historical crest
3/19/1986	Ice Jam	Cemetery Bend Area, Montpelier	No flood
6/6- 6/8/1984	Flood/S.S.	Mont., County Wide	DR-712
2/12/1981	Ice Jam	Cemetery Bend Area, Montpelier	No flood

Table 8: Fluvial Erosion/Inundation Flooding Hazards Occurrences

Date	Event	Location	Extent
3/18/1980	Ice Jam	Vicinity of Bailey Ave Bridge, Montpelier	No flood
1/8/1978	Ice Jam Flooding	Bailey Ave Bridge, Montpelier	An ice jam formed near the Bailey Ave bridge resulting in high water within the Winooski River and North Branch and flooding within the City. The basements in buildings along State and Elm St flooded resulting in damages to contents.
8/5/1976	Flood	County Wide	Montpelier flood gauge at 12.31 feet – DR 518
12/21/1973	Ice Jam Flooding	Bailey Dam, Montpelier	No data available.
6/30/1973	Flood	County Wide	Montpelier gauge at 17.55 ft. DR 397
3/5/1964	Ice Jam Flooding	Main St Bridge, Middlesex, Montpelier	An ice jam formed at the Main St bridge, resulting in high water reaching Rte. 2 and adjacent local roads. Businesses along the North Branch damaged by flood waters
12/30/1948	Ice Jam	Main St Bridge & upstream of Granite St Bridge, Montpelier	No flood
9/22/1938	Flood/Hurricane	County Wide	Montpelier flood gauge at 14.11 feet
3/16-3/17/1936	Ice Jam Flooding	Cemetery Bend, Middlesex, confluence with Steven's Branch, Montpelier	The high water caused localized flooding of the highway toward Middlesex. The Granite Street bridge was threatened by high water and ice.
1/9/1935	Ice Jam Flooding	Bailey Dam, below Cemetery, Silver Ledge, Middlesex Dam, Montpelier	Subsequent high water caused flooding of basements along State, Main and Elm Streets. Another jam occurred near the Granite St bridge, causing the inundation of Berlin St.
1/9/1930	Ice Jam	Confluence with Dog River & confluence with Steven's Branch, Montpelier	No flood
1/19/1929	Ice Jam Flooding	Granite St Bridge & below Cemetery Bend, Montpelier	No data available.
11/03/1927	Flood	County Wide	Montpelier flood gauge at 27.10 feet
3/26/1920	Ice Jam Flooding	Bailey Dam, Montpelier	No data available.
2/28/1917	Ice Jam	Downstream of Granite St Bridge & below Cemetery, Montpelier	No flood

**Table 8: Fluvial Erosion/Inundation Flooding Hazards Occurrences**

Date	Event	Location	Extent
2/25/1915	Ice Jam Flooding	Langdon Farm, Granite St Bridge, Montpelier	Ice jamming in the river caused water to back up the North Branch and flood basements. The ice crested just below the Langdon St bridge. Out of bank flooding was reported along Lower State St and Pioneer St
2/13/1900	Ice Jam Flooding	Cemetery Bend, Montpelier	The downtown area of Montpelier, including State, Main, and Elm St, was inundated by about 2 feet of water above the street level. Ice also jammed against upstream bridges causing extensive damages to at least two bridges when the ice released

The City of Montpelier is located in a narrow river valley at the confluence of two rivers and has been affected by flooding since its settlement over 300 hundred years ago. The Winooski River, whose headwaters begin in the Town of Cabot, runs southwest to northwest in Montpelier and extends approximately 4 ½ miles within the City limits. The North Branch tributary of the Winooski originates north of the Wrightsville Reservoir on the Montpelier and Middlesex border and flows to the south, feeding into the Winooski in the City's downtown core. Other rivers within the City boundaries include the Stevens Branch on the eastern boundary and the Dog River on the western boundary, both feed into the main stem of the Winooski River. See **Figure 1** for a map of Montpelier's location in relation to the Winooski Basin and its tributaries.

Figure 1: Watershed Boundaries. Source: Winooski River Ice-Jam Induced Flood Risk Mitigation Feasibility Study

Two flood control reservoirs are located upstream of the City. Wrightsville Reservoir is primarily located in the town of Middlesex with the southern tip of the water body and dam located within Montpelier city limits. The Reservoir was designed and constructed by the US Corps of Engineers in the 1930's as a flood control measure following the devastating flood of 1927. The dam is classified by the Agency of Natural Resources (ANR) Vermont Dam Inventory (VDI) as a "High Hazard", meaning it is a dam where failure or misoperation will cause loss of human life and significant property destruction. Additionally, the East Barre Dam is located on the Jail Branch in East Barre, approximately 13 miles upstream of Montpelier. The dam provides flood control to over 38 miles of the Winooski Watershed. This dam is also classified by ANR as a High Hazard dam. (See **Areas of Local Concern Map**).

In more recent times, residents, city government, state government, the Army Corps of Engineers, and the Federal Emergency Management Agency have constructed flood mitigation devices, enacted various forms of legislation, and initiated numerous activities and programs designed to mitigate flooding and flood damage in the city. While many of these strategies have been successful in reducing some forms of flooding, the threat of flooding and flood damage remains significant.

Past floods have caused millions of dollars in damages to the city and its residents and the potential exists for further damage to the city's buildings, property, infrastructure, and people. In 1998, the City of Montpelier adopted a stand-alone Flood Hazard

Mitigation Plan which presented strategies to mitigate future flood losses in the event flooding does occur.

The majority of Montpelier's floodplain development is commercial, retail and institutional. Much of the land surrounding each of the city's four rivers is located within the flood plain. In most areas, the flood plain consists of only a small area on either side of the river; however, in the downtown area near the confluence of the Winooski and North Branch Rivers the floodplain widens considerably.

Based on the results of overlaying the 2013 FIRM flood maps with the location of E911 points, there are 255 properties located within the National Flood Insurance Program's designated 100- year floodplain. Currently there are 176 flood insurance policies in force; of these policies, 128 are identified as being in a flood hazard area (Zone A), meaning 50% of the structures at risk are carrying flood insurance. There are 18 critical or public structures in the SFHA or 500 year floodplain (estimated from e911 sites). There have been 259 closed paid losses totaling \$3,135,101 in paid losses. Eight of these losses are substantial damage. The estimated loss for a severe flooding event for all properties located within the City's 100-year floodplain is approximately \$135,846,291. This flood loss potential represents 23.99% of the total value of properties within Montpelier.

Pursuant to the Biggert-Waters Act of 2012, Pre-FIRM structures will be paying much higher premiums than in the past. Currently 106 of the flood insurance policies in the Special Flood Hazard Area are for Pre-FIRM structures, which may affect insurance use and ownership.

Montpelier has 47 repetitive loss properties as identified through the NFIP and the City ranks fourth among the top ten repetitive loss flood communities in the state. All repetitive loss properties in Montpelier are located within A Zones, including one building with 4 or more claimed losses. Most of the recurring damage to repetitive loss properties stem from water coming into basements.

In 2011, two widespread floods caused significant damage to residences, businesses and infrastructure. Montpelier suffered the most damage in the May 2011 flooding event, during which washouts occurred on numerous roads within the City and the wastewater treatment plant flooded. To mitigate for future events, numerous culverts were resized and replaced and drainage-ways were reinforced. During Tropical Storm Irene in August 2011 additional basement flooding occurred, though damages were minimized in the City due to repairs and mitigation measures following the May event. FEMA administered \$1,621,722 in Irene Relief and Recovery funds overall to the

residents and the City of Montpelier (see **Figure 2**). Failure or emergency release of the Marshfield Dam, located less than 20 miles upstream from the City of Montpelier, and potential ensuing flooding to areas within the City was a concern during TS Irene, though no emergency release did occur.

Program	Subtotal	Total
Individuals and Households Program		\$1,195,196
Housing Assistance	\$1,064,657	
Other Needs	\$130,539	
Public Assistance		\$19,745
Hazard Mitigation Grant Program		\$0
National Flood Insurance		\$406,781
Total		\$1,621,722

Figure 2: Montpelier: FEMA Irene Relief & Recovery Funds

As previous events have made clear, even areas beyond the NFIP designated 100-year floodplain may be vulnerable to flood related hazards. Channel adjustments with devastating consequences have frequently been documented wherein such adjustments are linked to historical channel management activities, floodplain encroachments, adjacent land use practices and/or changes in watershed hydrology associated with conversion of land cover and drainage activities, within and beyond the NFIP floodplain.

In 2017, CVRPC conducted a Road Erosion Inventory to identify locations that result in problematic road erosion- the sites with the most significant hydrological impact due to erosion. The inventory found that out of the 175 hydrologically connected road segments in Montpelier, 22% do not fully meet the standards of the Municipal Roads General Permit (MRGP). Twenty-six segments were identified as Very High Priority- segments on slopes greater than 10% that do not meet standards. See **Attachments** for a full list of very high priority segments. Implementation plans to bring segments to MRGP compliance standards will include measures like grass and stone-lined drainage ditches, stone check-dams, sheet flow infiltration, ditches and turnouts disconnected from surface waters, road crowning, upgrading culverts, installing outlet stabilization headwalls, and stabilizing exposed soil.

Effects of flooding on life safety and the need for warning and evacuating

residents and visitors

According to the LHMP Committee, the top life safety issue with flooding is residents driving through flooded roads. A secondary risk would be contact with hazardous materials in floodwaters and electrocution. In 2011, City staff heard multiple stories of residents entering basements to turn off equipment before it became submerged, posing a danger of electrocution.

Effects of flooding on public health, including health hazards to individual from flood waters and mold

According to the LHMP committee, because of the large drainage area into Montpelier, hazardous materials and debris are likely to enter the Montpelier area increasing health hazards from mold and other contaminants. Members noted that E. coli is also a health hazard due to the risk of combined sewer overflow during flooding events. According to the 2020 Montpelier Downtown Core Master Plan, the sewer treatment plan is known to have handled up to 12 million gallons during Hurricane Irene, which is an estimated 80% of capacity. Storm events lead to combined sewer vulnerabilities after 4.5 million gallons in the plant.

Critical facilities and infrastructure impacted by flooding

City water facilities are relatively safe due to their elevated location. The City's Water Resource Recovery Facility (WRRF) is vulnerable, but the facility has been hardened during recent renovations in 2019 and 2020. Committee members noted it would likely take a 500 year event or higher to reach the critical pieces of the WRRF.

As noted above, storm events such as short duration events of heavy precipitation or long duration events of light precipitation could lead to sewer vulnerabilities. The Montpelier Downtown Core Master Plan notes that stormwater piping is "primarily corrugated metal installed in the 1980s that is failing due to corrosion, with limited funds for replacement".

Historic Properties

LHMP Committee members noted that Montpelier's floodplain overlaps with the historic district, and properties are subject to flooding, but most properties have not been elevated. The 2017 Master Plan notes that "over 650 Montpelier sites and structures (563 main properties and 90 accessory properties) are listed on the National Registry of Historic Places. Historic properties in the floodplain include:

- Vermont State House

See **Attachments** for a map of the historic district and flood hazard area.

Effects of flooding on Montpelier's economy and major employers

Economic impacts of fluvial erosion/inundation flooding are likely to be minor. One impact is the relocation of businesses following the 2011 flood. Most large employer in the City, such as National Life Insurance, are at high elevations. Other insurance companies are located on State Street, but are multi-story or elevated buildings. LHMP Committee members noted that the most severe economic impacts would likely be to small businesses, especially those who store merchandise in basements susceptible to flooding. While the impact would be relatively small based on raw numbers, those losses would have an outsized impact in that small family businesses are the ones that residents and visitors frequent, and give Montpelier its downtown character.

Future trends in redevelopment and vulnerability

Montpelier LHMP Committee members noted that population models forecast population decline, but it is the City's expectation that they will see small increases in population over time. New river corridor regulations passed in 2018 will help to reduce vulnerability by preventing new development in the North Branch corridor. New zoning regulations passed in 2018 will require stream setbacks and riparian buffers. These requirements will also help to reduce vulnerability by requiring naturally vegetated stream banks which will help stabilize banks. The setbacks will require for the first time that new development keep a safe distance from the top of bank. These riparian buffers/setbacks apply City wide, while the River Corridor regulations only apply to the North Branch corridor. New development should be well protected from flooding hazards (setback from streams, elevated, or out of the Flood Hazard Area. Members noted that most of the Montpelier downtown is built out, so new housing tends to be in other locations with less flooding risk.

Ice Jams

The City of Montpelier is also susceptible to ice jams, which for the purposes of this plan are a hazard event resulting from both fluvial erosion and inundation flooding. See **Table 8** for a history of ice jam flooding occurrences. The 1998 Montpelier Flood Hazard Mitigation Plan states Montpelier is susceptible to ice jams due to "the relatively steep river gradient upstream of the City and the flat gradients downstream", and the USACE *Winooski River Ice-Jam Induced Flood Risk Mitigation Feasibility Study* notes that in general, ice jams in Montpelier are associated with "breakup during a mid to late winter thaw", and "...ice cover in the steeper sections of the Winooski River, Dog River, Stevens Branch, or North Branch will break up and run downstream during or shortly after periods of warm temperature and rainfall". According to the Montpelier Flood Hazard Mitigation Plan "in the event of a major ice jam flood, the entire downtown area of Montpelier including the historic business district, and the floodplain throughout the rest of the study area may be inundated depending on the location of the ice jam.

The most recent major ice jam flooding event occurred in March 1992 where according to *Ice & Water: The Flood of 1992 - Montpelier, Vermont*, "in less than an hour, the two swollen rivers effectively shut down 120 businesses, left more than 50 residents homeless, threw the workings of much of state government into disarray, and caused upwards of \$5 million in damage. Miraculously, there was no loss of life, but the lifeblood of Montpelier's historic downtown was devastated by the second great flood to strike the city in this century." See **Figure 3** and **Figure 4** for images of the event.



Figure 3: A view of the ice and the still intact railroad bridge from the Taylor Street Bridge. Source: <https://www.montpelier-vt.org/604/Flood-of-1992>

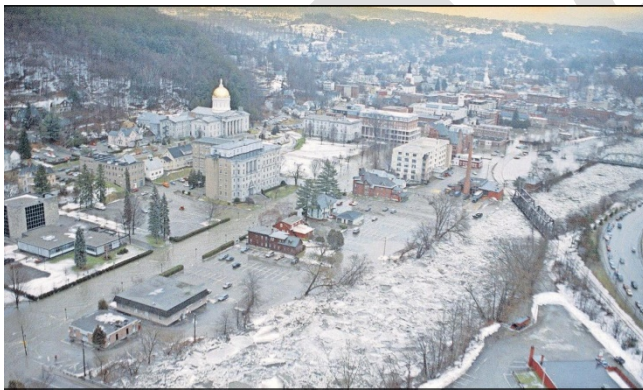


Figure 4: An aerial view of the ice jam flood in Montpelier on March 11, 1992. Source: https://www.timesargus.com/water-ice-25-years-ago/article_1d4a0c1c-a337-5530-83c3-c271d1d00a22.html

The threat of flooding due to ice jams is more prevalent than the history of flooding occurrences indicates. In addition to the dates listed above the City of Montpelier has experienced the following ice jam events where flooding did not result:

- March 28, 1917
- January 9, 1930
- December 30, 1948
- March 11, 1992
- March 18, 1980
- March 2007

- January 8, 1978
- February 12, 1981
- March 19, 1986
- March 4, 1991
- December 2008
- February 2010
- March 2012
- January 2014

The most recent ice jam event in March 2007, according the City's flood web page, was a result of "an unusual combination of above-average river discharge followed by several weeks of very cold air temperatures resulted in a freeze up ice jam downstream of the city of Montpelier." During this event the City of Montpelier employed a combination of mitigation techniques, yet the techniques do not and will not decrease the probability of future ice jam events. During this ice jam event an ad hoc interagency mitigation team was formed with members from the following organizations: VT Emergency Management, ANR, US Corps of Engineers, Cold Regions Research Laboratory (CRREL), National Weather Service, FEMA Region 1, city officials and Congressional Staff. The City has also formed a flood committee which has been charged with evaluating river restoration and flood mitigation projects.

With funding from the Army Corps of Engineers, the State, and the City of Montpelier, Dubois & King completed the *Winooski River Ice-Jam Induced Flood Risk Mitigation Feasibility Study* in 2019. The purpose of the study was to determine whether a cost-effective federal project is capable of mitigating some of the risks associated with ice jam induced flooding. The feasibility study evaluated four alternatives:

- Single ice retention structure (ice piers) upstream of Granite Street with a bypass channel
- Two ice retention structures (upstream of Granite Street and near Main Street) with a single bypass channel upstream of Granite Street
- Mechanical and/or thermal weakening/breaking (no structures)
- No Action

The study recommended Alternative 2 (two ice retention structures with a single bypass channel). As of the writing of this plan, no alternatives have proceed to design or construction. Currently, the City is engaging in real-time monitoring of river stages linked to an automated warning system that notifies individuals at pre-defined rivers stages. Additionally, the City has begun to implement the Sewer Affluent Ice Melting Pumping System to assist in removing ice jams, where treated water from the wastewater treatment plant is redirected into the Winooski River. The City is currently authorized to release effluent from 6 discharge points between the WRRF and Bailey Avenue Bridge. Long-arm excavators are also staged to break up ice jams. In preparation of ice jams in 2019, the City employed both these methods.

Structures impacted by flooding resulting from ice jams include: downtown businesses and retailers, City and State government buildings, schools, residences and transportation corridors (Route 2 and Route 12). Areas in Montpelier that are particularly susceptible to ice jams include the reach from Bailey Ave Bridge to the Dog River, including Cemetery Bend; this area “usually keeps its sheet ice after the upstream river breaks up, further resisting ice passage”. (USACE Winooski River Flood Damage Risk Mitigation Study).

Considering past occurrences, the potential for future occurrences is high. (For additional information about flooding and ice jams in Montpelier see the [Montpelier Flood Mitigation Plan](#). The USACE *Winooski River Flood Damage Risk Mitigation Study* states that existing methods may be insufficient to mitigate ice jam flooding events similar to the 1992 event and “may continue to risk inundation during severe ice jam-induced flood events that could incur damages at the rate of \$431,275 annually in the form of flood prevention costs, emergency costs, and damages.” The study also notes damages could include “long term damages associated with reduced investment and development or undue anxiety for residents and businesses of the community”.

Table 9: Fluvial Erosion Flooding Hazard Matrix

Hazard	Location	Vulnerability	Extent	Impact	Probability
Fluvial Erosion Flooding	Some risk in small stream channels on steep slopes (Blanchard Brook). Lower parts of the Winooski River (Montpelier Junction area) and Dog River are at risk of erosion.	Montpelier junction area, Dog River (residences and businesses; roads, bridges and culverts	Severe—May 2011 flooding caused significant damage to businesses, residences infrastructure, washouts on numerous roads, WWTP flooded. FEMA administered \$1,621,722 in Irene Relief and Recovery funds	Losses to businesses and residences; Replacements of culverts and road reconstruction	Highly likely

Table 10: Inundation Flooding Hazard Matrix

Hazard	Location	Vulnerability	Extent	Impact	Probability
Inundation Flooding	100yr. Floodplain, Areas adjacent to Winooski River and North Branch Ice Jams: Bailey Ave Bridge to Dog River, including Cemetery Bend	Downtown residences and businesses; roads, bridges and culverts <i>Ice Jams:</i> Downtown business and retailers, City and State government buildings, schools, residences and transportation corridors.	Severe-worst case: Up to 5 feet of water covering downtown Montpelier (1992 ice jam flooding)	Losses to businesses and residences; Replacements of culverts and road reconstruction <i>Ice jams:</i> 1992 = >\$5 million in damages	Highly likely

6.2 Severe Winter Storms (Snow, Ice)

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.

Table 11: Severe Winter Storms (Snow, Ice) Hazards Occurrences

Date	Event	Location	Extent
03/23/20-03/24/20	Winter Storm	State-wide; Washington County	Total snowfall ranged from 2" to 4" in northwest VT to 4" to 7" across much of the state, pockets of 7" to 10" in eastern VT.

Table 11: Severe Winter Storms (Snow, Ice) Hazards Occurrences			
Date	Event	Location	Extent
02/07/20	Winter Storm	State-wide; Washington County	Storm total snowfall of 10" to 16" fell across the region, up to 1/4 " of ice accumulated. 10-20,000 people lost power across the State
03/22/2019-03/23/2019	Winter Storm	Washington County/Montpelier	A heavy wet snow fell across Washington County, 7" in Montpelier
02/12/2019-02/13/2019	Winter Storm	Washington County/Montpelier	A widespread 7" to 15" of snow fell across Washington County
01/29/2019-01/30/2019	Winter Storm	Washington County/Montpelier	A widespread 6" to 10" of snow fell across Washington County
01/19/2019-01/20/2019	Winter Storm	Washington County/Montpelier	Widespread snowfall of 10" to 18" occurred across Washington County, 14" in Montpelier
01/08/2019	Winter Storm	Washington County/Montpelier	8" in Montpelier
11/26/2018-11/28/2018	Winter Storm	State-wide; Washington County/Montpelier	Heavy wet snow resulted in downed tree limbs and power outages across VT. In Washington county, snow accumulated 6" to 14", including 6" in Montpelier
03/13/2018-03/15/2018	Winter Storm	State-wide; Washington County/Montpelier	12" to 30 "across Washington County. Unknown accumulation in Montpelier, 29" in East Barre. Some isolated to scattered power outages
03/07/2018-03/08/2018	Winter Storm	State-wide; Washington County/Montpelier	7" to 13" across Washington county; unknown accumulations in Montpelier, 11" in Barre
12/22/2017	Winter Storm	Washington County/Montpelier	A widespread 5" to 10" of snow fell across central VT. Hundreds of vehicle accidents and blocked highways for several hours. Snowfall amounts of 6" to 12" reported.
04/01/2017	Winter Storm	State-wide; Washington County/Montpelier	Widespread 6" to 12"s of a heavy, wet snow fell across the region, including 6" in Montpelier.
3/14/2017 - 3/15/2017	Winter Storm	State-wide; Washington County	A major nor'easter with heavy intense snowfall. Total snowfall across Vermont was 12" to 36" + with northwest Vermont experiencing the heaviest snowfall. 14" in Montpelier. Blizzard to near blizzard conditions in areas. Numerous schools, businesses and local government offices, numerous vehicle accidents and stranded vehicles

Table 11: Severe Winter Storms (Snow, Ice) Hazards Occurrences			
Date	Event	Location	Extent
2/11/2017- 2/13/2017	Winter Storm	State-wide; Washington County	6" to 12" of snow statewide with some localized higher amounts. Impacts were largely travel related with nearly all school districts closed on the 13th.
2/2/2015	Winter Storm	State-wide; Washington County	Snowfall across the County ranged from 6" to 12"
12/9/2014 - 12/12/2014 DR 4207 VT	Winter Storm	State-wide, County-wide; Washington County	12" in Northfield, Barre, and Waterbury. Snow to water ratios of 8:1 or less accounted for snow-loaded trees that resulted in more than 175,000 power outages and numerous vehicular accidents. This was the 2nd most power outages due to weather in the state of Vermont.
11/26/2014 - 11/27/2014	Winter Storm	County-wide; Washington County	Snowfall totals of 8" to 12" reported; numerous vehicle accidents across the state.
3/12/2014 - 3/13/2014	Winter Storm	State-wide; Washington County/Montpelier	Heavy snow fall accumulation over two days with strong wind gusts up to 50 mph. Numerous motor vehicle accidents, and school and business closures. 17" accumulation in Montpelier
2/13/2014- 2/14/2014	Winter Storm	State-wide; Washington County, City of Montpelier	Snowfall rates of 1-2" plus an hour. Total snowfall ranged from 15" to 24" in central and eastern Vermont; 12" in Montpelier. Hazardous travel, school closings.
2/5/2014	Winter Storm	State-wide; Washington County	6" to 10" fell across the county. Snowfall was at its peak during both the morning and afternoon/evening commutes causing hazardous travel.
12/14/2013 - 12/14/2013	Winter Storm	State-wide; Washington County	A widespread 10" to 15" of snow fell across the county. Numerous vehicle accidents
2/8/2013 - 2/9/2013	Winter Storm	State-wide; Washington County	6"- 15" inches of snow fell across the County with the higher totals across southern sections.
12/26/2012 - 12/28/2012	Winter Storm	State-wide; Washington County	Snow fell heavily at times (snowfall rate of 1-2 inches per hour). Snowfall accumulations of 12" to 18" with 6" – 15" observed in the County. 15" in Montpelier
02/24/2012 - 02/25/2012	Winter Storm	State-wide; Washington County	Storm total snowfall accumulations ranged from 4" to 18" with 12" to 18" in Waterbury, 12" in Worcester, 11" in Waitsfield and 8" in Cabot

Table 11: Severe Winter Storms (Snow, Ice) Hazards Occurrences			
Date	Event	Location	Extent
11/23/2012	Winter Storm	State-wide; Washington County	5" to 12" of a heavy, wet snow fell across Washington county. 7" in Berlin, 9" in Moretown, Waterbury Center and Middlesex with 11" in Warren and 12" in Waitsfield.
03/06/2011-03/07/2011	Winter Storm	State-wide; Washington County	Snowfall amounts of 15" to 30" were reported in Washington county, including 27" in Cabot, 26" in Waitsfield and Waterbury, 10,000 customers lost power statewide
02/02/2011	Winter Storm	State-wide; Washington County	Snowfall totals across Washington county were 10 to 20"
01/12/2011	Winter Storm	State-wide; Washington County	Generally 8" to 12" of snow fell across Washington County: 13" in Waitsfield, 12" in Cabot, 11" in Waterbury, 10" in Calais, Woodbury and Marshfield, 9" in Northfield and Middlesex with 8" in Worcester and Moretown
12/06/2010-12/07/2010	Winter Storm	State-wide; Washington County	Snowfall amounts included: 15-20" in Waterbury, 13" in Cabot and 6" in Worcester.
02/23/2010-02/25/2010	Winter Storm	State-wide; Washington County	Heavy wet snow fell across VT that resulted in snowfall accumulations of 6 to 30", widespread power outages across the region resulted in upwards of 50,000 customers without power. Some specific snowfall totals include; 32" in Warren, 31" in Waitsfield, 22" in Northfield
02/22/2009-02/23/2009	Winter Storm	State-wide; Washington County	Light snow overspread Vermont during the morning of February 22nd and became moderate to heavy across much of central and eastern Vermont. 13" in Marshfield
01/07/2009-01/08/2009	Winter Storm	State-wide; Washington County	Total snowfall accumulations of 6" to 10" in northern Vermont with and 4" to 7" in central and southern Vermont with up to 1/4 an inch of ice accumulation.
12/21/2009	Winter Storm	State-wide; Washington County	Snowfall accumulations of 10" to 18" across central and eastern Vermont. 18" in Marshfield, 15" in Moretown and Waterbury Center
2/1/2008	Winter Storm	State-wide; Washington County	16" of snow, 30mph wind gusts
02/14/2007	Winter Storm	State-wide; Washington County, Montpelier	Snowfall rates of 2" to 4" per hour and brisk winds of 15 to 25 mph caused near whiteout conditions at times, along with considerable blowing and drifting of the snow, making roads nearly impassable. 30" total in Montpelier
2/14/2006	Winter Storm	State-wide; Washington County, Montpelier	22" of snow

Table 11: Severe Winter Storms (Snow, Ice) Hazards Occurrences			
Date	Event	Location	Extent
1/4/2003	Winter Storm	State-wide; Washington County, Montpelier	19" of snow
3/5/2001	Winter Storm	State-wide; Washington County, Montpelier	In Washington county, Northfield reported 16"
12/31/2000	Winter Storm	Washington County, Montpelier	Accumulations generally ranged from 8" to 15" with higher amounts in the Mountains. In Washington County 10" at Worcester and 17" at Waitsfield
2/13/2000	Winter Storm	Washington County, Montpelier	Heavy snow fell across the area with accumulations generally around a foot. 12" in Montpelier. Schools were closed throughout the area and minor accidents reported
12/11/1999	Winter Storm	Washington County, Montpelier	Across Washington county, generally 6" to 12" fell. The greatest amounts fell in the western half of the county, with 14" in Worcester and Waitsfield
03/21/1998 - 03/22/1998	Winter Storm	State-wide; Washington County	Snow accumulations generally 15" to 20" across northwest and north central Vermont
03/14/1998 - 03/15/1998	Winter Storm	State-wide; Washington County	Montpelier accumulations unknown, 14" in Waitsfield.
03/05/1997	Winter Storm	State-wide; Washington County, Montpelier	Accumulations of heavy wet snow were generally 10" to 20" across North Central and Northeast Vermont. At least 25,000 people lost power in the counties of: Orange, Windsor, Caledonia, Rutland, Essex, Addison and Washington. Montpelier accumulations unknown, 16" in Waitsfield
12/7/1996	Winter Storm	State-wide; Washington County, Montpelier	Generally, a foot or more of heavy wet snow fell in southern and eastern Vermont. Montpelier accumulations unknown, 20" in Marshfield
01/13/1996	Winter Storm	State-wide; Washington County, Montpelier	11" in Montpelier
1/03/1996	Winter Storm	State-wide; Washington County, Montpelier	14" in Montpelier

LHMP Committee members also noted anecdotal information on damage from winter storms, including some pipes in the City freezing two years ago. Since the 2015 LHMP update, Montpelier Department of Public Works has purchased new equipment to respond to severe winter storms including a plow truck and multiple snow blowers. The extent of winter storms on Montpelier is difficult to estimate as it is dependent on the size and path of the storm. For the

next plan update, Montpelier will more closely monitor winter storms to determine the worst impacts possible on the City.

One of the major problems 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. Since the 2015 Plan update, the City hired a Tree Warden to periodically prune hazardous and old trees (including both Park and neighborhood/City Trees. The City also has multiple power grids in place serving different areas, which minimizes the probability that a City-wide power outage will occur. Other major problems associated with ice storms include closed roads and restricted transportation. Montpelier LHMP Committee members noted that with COVID-19, less people are commuting into Montpelier and driving in general, so closed roads and restricted transportation had less of an impact in winter 2020 and 2021 than previous winters, and this may continue into future winters as more remote work continues. Additionally, the City adopted new parking regulations in October 2020, instituting an Alternate-Side Parking Ban from November 2020 through April 2021. This means all cars must be parked on the correct side of the street as indicated by whether building numbers are odd or even, according to the odd or even day. According to the City Council, this parking ban is intended to benefit the City in the following ways⁴:

- Plowing, snow removal, and sidewalk clearing will be streamlined and made more efficient, resulting in improved timing for the completion of snow clean-up; and
- Fewer tickets would need to be issued, as this new parking structure will be easy to predict and plan for; and
- Some streets that are too narrow to allow winter parking on both sides of the street will be able to accommodate overnight parking; and
- The need for the City-wide parking ban events would be drastically reduced.

Previously, many cars were left on streets during snow storms, reducing the ability to plow and tow cars.

By observing winter storm watches and warnings, adequate preparations can usually be made to lessen the impact of snow, ice, and sleet on the City. Mobilizing sufficient resources to clear broken tree limbs from roads, traffic signal impacts due to power outages, stream and roadway erosion, and restricted drainage systems are the primary challenges facing community officials.

⁴ <https://www.facebook.com/MontpelierVT/posts/3518945978145254>

Montpelier should plan and prepare for these emergencies. That planning and preparedness effort should include the identification of debris removal equipment and services.

Table 12: Severe Winter Storms Hazard Matrix

Hazard	Location	Vulnerability	Extent	Impact	Probability
Severe Winter Storms (Snow, Ice)	City-wide	Remote structures, old/under-insulated structures, utilities, trees	Below freezing and severe wind chill factor for multiple days; depends on severity of event;	Depends on severity – additional sheltering/ plowing/ emergency services costs for City	Highly Likely

6.3 Extreme Cold

Periods of extreme cold tend to occur with events described in the previous section on **Severe Winter Storms (Snow, Ice)**. Extreme cold is arctic air, together with brisk winds, that can lead to dangerously cold wind chill values. People exposed to extreme cold are susceptible to frostbite in a matter of minutes. Areas most prone to frostbite are uncovered skin and the extremities, such as hands and feet. Hypothermia is another threat during extreme cold. Hypothermia occurs when the body loses heat faster than it can produce. Wind chills can be life threatening. The wind chill temperature is how cold a person or animal feels when outside. Wind chill is based on the rate of heat loss from exposed skin caused by wind and cold. As wind increases, it draws the heat from the body through exposed skin and reduces the body's skin temperature and eventually the body's core temperature. Often times exposed skin can freeze within minutes of exposure. These extremely cold temperatures can pose a significant risk to vulnerable populations who live in Montpelier, especially when combined with Wind.

Table 13: Extreme Cold Hazards Occurrences

Date	Event	Location	Extent
2/1/2015-2/28/2015	Extreme Cold	State-wide, Washington County, Montpelier	February 2015 record cold for much of VT. Recorded 15 to 20+ days below zero and on several days, dangerously cold wind chills of 30 below zero or colder occurred. Many communities witnessing the coldest month since December 1989 or January 1994. The average departure was 13 to 17 degrees below normal. Record cold February for Montpelier, 2 nd coldest all time for Montpelier since 1940s. Damage to infrastructure, frozen water mains, etc. totaled at least \$1 million county-wide.

Table 13: Extreme Cold Hazards Occurrences

Date	Event	Location	Extent
1/7/2015 - 1/8/2015	Extreme Cold	State-wide, Washington County, Montpelier	Plummeting temperatures and brisk, strong winds (15 to 30+ mph) caused dangerously cold wind chills of 25 to 40 degrees below zero during the evening of January 7th into the morning hours of January 8th.
1/14/2009-1/18/2009	Extreme Cold	State-wide, Washington County, Montpelier	Temperatures averaged 20 to 25 degrees below normal values, daytime maximum temperatures ranged from single digits above and below zero while nighttime minimums were 10 to 30 below zero with isolated readings colder than 40 below zero at times. Montpelier-Barre Airport measured 26 degrees below zero. Numerous cold weather related problems including numerous dead vehicle batteries and broken home/business water pipes.
12/08/2008	Extreme Cold	State-wide, Washington County, Montpelier	Temperatures of 5 above to 10 below zero by the morning of 12/08 along with brisk northwest winds of 10 to 20 mph with higher gusts at times. Wind chill readings during the early to mid-morning hours of 12/08 were 15 to 25 below zero across the state.
03/09/2007	Extreme Cold	State-wide, Washington County, Montpelier	Morning lows on the 9th were 10 to 34 degrees below zero, -22 degrees in Montpelier
01/25/2007-01/26/2007	Extreme Cold	State-wide, Washington County, Montpelier	-14 degrees in Montpelier on 1/25, -15 degrees on 1/26
02/27/2006	Extreme Cold	State-wide, Washington County	Combination of brisk winds and very cold temperatures produced wind chills of 15 to 30 degrees below zero.
02/18/2006	Extreme Cold	State-wide, Washington County	Brisk winds of 10 to 20 mph with higher gusts; wind chills of 15 to 25 below zero in northern Vermont
01/15/2006	Extreme Cold	State-wide, Washington County	An arctic cold front moved across northern Vermont during the early morning of 15th. Blustery northwest winds 20 to 30 mph with gusts to 40 mph created wind chills of 10 to 25 degrees below zero and an apparent temperature change from Saturday (14th) of 50 to 70 degrees colder.
01/15/2004	Extreme Cold	State-wide, Washington County	Wind chills during 01/15 and 01/16 were generally between 25 and 45 below zero. Some sprinkler systems froze and burst in several area locations. Record low maximum temperatures of minus 11f set in Montpelier, 11F, previous record was minus 8F.
01/19/1997	Extreme Cold	State-wide, Washington County	An arctic air mass centered over the Northeast resulted in bitterly cold early morning low temperatures on 01/19/1997. Minus 27 in Montpelier

Table 13: Extreme Cold Hazards Occurrences			
Date	Event	Location	Extent
01/17/1997	Extreme Cold	State-wide, Washington County	An outbreak of arctic air resulted in extreme wind chills across much of Vermont. Wind chills ranged from between 30 and 60 below zero
01/05/1996	Extreme Cold	Montpelier	Record low temperature of minus 17 set at Montpelier

The NOAA Wind Chill Chart identifies those temperatures and associated wind speeds that may cause frostbite if skin is exposed to the air over a certain period of time (**Figure 5**).

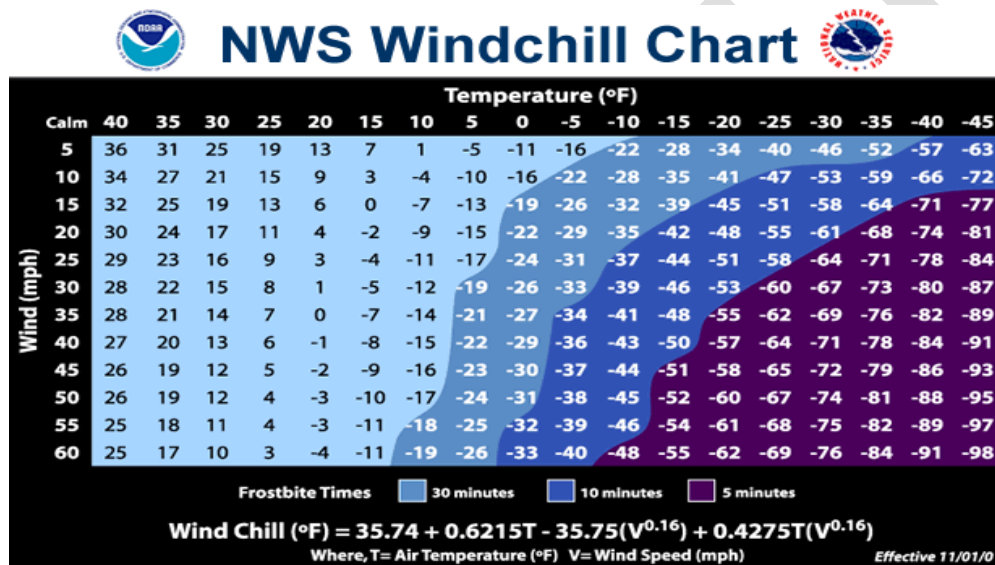


Figure 5: Wind Chill Temperature Index. Source: NOAA

To reduce the potential for frozen pipes during extreme cold, the City has developed a list of customers notified to run their water during winter months (see **Figure 6**).

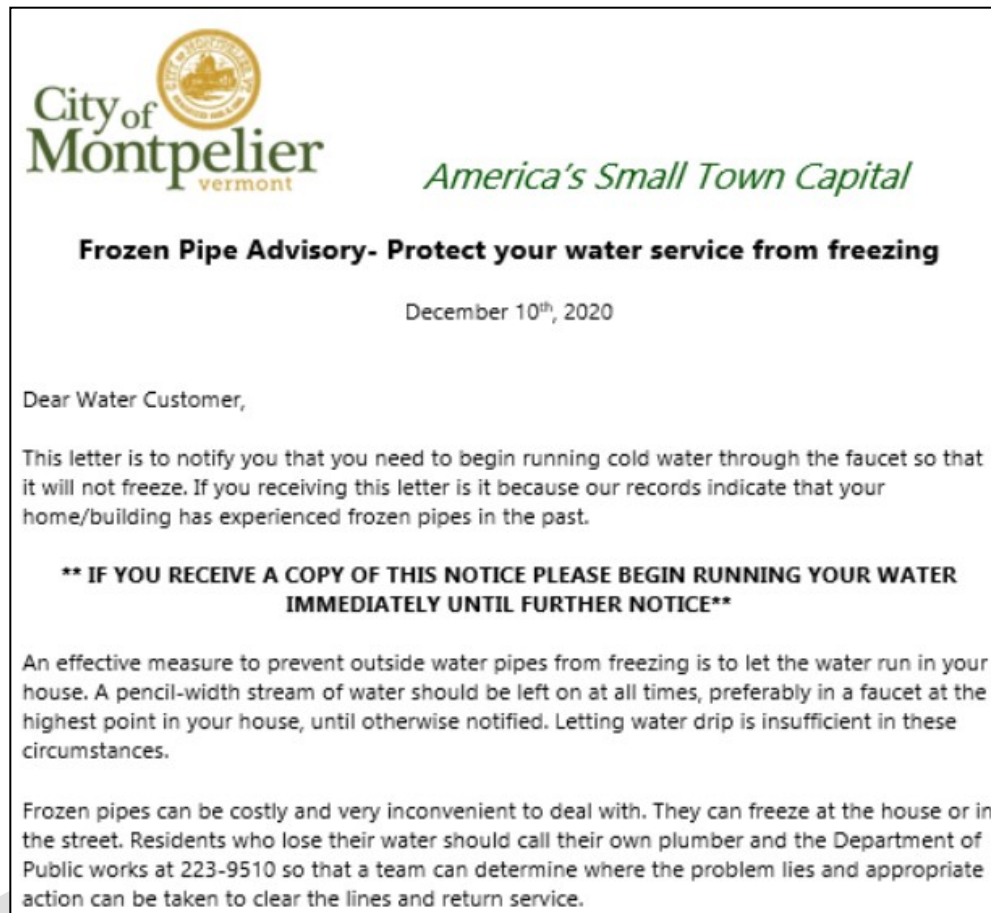


Figure 6: Montpelier Frozen Pipe Advisory. Source: Montpelier Department of Public Works

The City also tracks water leak repairs on GIS and prioritizes replacement areas based on the number of leaks.

Individuals experiencing homelessness are especially vulnerable to extreme cold events. There has been a dramatic increase in the number of persons experiencing homelessness in Washington County, especially during the COVID-19 pandemic. On the night of March 4, 2021, in Montpelier alone, there were 63 adults and 10 children who were homeless⁵. The Homelessness Task Force was formed in August 2019, in response to growing concern for Montpelier residents experiencing homelessness. The mission of the Task Force is to “to identify and understand the needs of individuals who are experiencing homelessness in Montpelier and the surrounding areas, and make recommendations to the municipality and its partners to address those unmet needs”. The Task Force provided a project update to City Council on April 14, 2021. Noted successes in the last year of the Task Force related to extreme cold include:

- Advocating to the general public and policy makers for humane responses to homelessness
- Provide a clearinghouse of information between stakeholders in a timely fashion.
- Helped establish the coordination of meal providers, networking on behalf of vulnerable people- helping deliver food to those not in shelters
- Advocated for the necessity of street-outreach workers and peer support for those experiencing homelessness
- Awarded RFP to Good Samaritan Haven to provide continued peer support work
- Evaluating winter season shelter model and environment, ensuring service gaps are identified, and participating in planning efforts for shelter expansion

By observing winter storm watches and warnings, adequate preparations can usually be made to lessen the impact of below freezing temperature conditions on the City of Montpelier. Providing for the mass care and sheltering of residents left without heat or electricity for an extended time and power outages are the primary challenges facing community officials. Sensitive populations such as the elderly, handicapped, or people experiencing homelessness may be especially susceptible to extreme cold. Montpelier plans and prepares for these emergencies. That planning and preparedness effort include the identification of mass care facilities and necessary resources such as cots, blankets, food supplies, and generators. The City maintains partnership with local providers to ensure warming shelters are in place during extreme cold events. Shelters within Montpelier include Montpelier High School, Main St. School, Union School, Vermont College, Trinity Church, Kellogg-Hubbard Library and City Hall. Additionally, the Montpelier Senior Center serves as a warming shelter.

Table 14: Cold Hazard Risk Assessment

⁵ <https://civicclerk.blob.core.windows.net/stream/MONTPELIERVT/e039babb7a.pdf?sv=2015-12-11&sr=b&sig=oM58sZDm5UHe%2FF%2BWJ1gzgAamdKJc39f5GmS3qlbyOo%3D&st=2021-04-26T16%3A20%3A24Z&se=2022-04-26T16%3A25%3A24Z&sp=r&rscc=no-cache&rsct=application%2Fpdf>

Hazard	Location	Vulnerability	Extent	Impact	Probability
Extreme Cold	City wide	Elderly & disabled populations, individuals experiencing homelessness, remote structures, old/under- insulated structures, infrastructure (roads, water/sewer pipes)	Below freezing and severe wind chill factor for multiple days; depends on severity of event; (1997- wind chill of -30 to 60 below zero; 2015: 15 to 20 days below zero)	Depends on severity – additional sheltering, emergency services costs for City (2015- \$1 million in damages County wide-- infrastructure, water mains)	Highly Likely

6.4 Pandemic

The Vermont State Hazard Mitigation Plan states, *"An epidemic emerges when an infectious disease occurs suddenly in numbers that are in excess of normal expectancy. Infectious disease outbreaks put a strain on the healthcare system and may cause continuity issues for local businesses. These outbreak incidents are a danger to emergency responders, healthcare providers, schools, and the public. This can include influenza (e.g. H1N1), pertussis, West Nile virus, and many other diseases."* The World Health Organization defines pandemic as "an epidemic occurring worldwide, or over a very wide area, crossing international boundaries and usually affecting a large number of people"⁶.

The most recent pandemic was the influenza (H1N1) pandemic of 2009-2010. The H1N1 flu was relatively mild, but killed three people in Vermont. The locations of those deaths have not been reported. The novel coronavirus (SARS-CoV-2) was first detected in China at the end of 2019. It has now spread to more than 100 locations internationally, including the United States. The disease the virus causes has been named "coronavirus disease 2019" (abbreviated "COVID-19").

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Major dates in the COVID-19 pandemic include:

- December 2019: first human cases of COVID-19 reported by officials in
- March 24, 2020: Governor Scott enacts a 'Stay Home, Stay Safe' order directing

⁶ <https://www.who.int/bulletin/volumes/89/7/11-088815/en/#:~:text=A%20pandemic%20is%20defined%20as,are%20not%20considered%20pandemics.>

7

Wuhan, China • <u>January 21, 2020</u>: U.S. reports first confirmed case of COVID-19 • <u>February 2020</u>: first case of COVID-19 reported in U.S. • <u>March 7, 2020</u>: health officials announce first case of novel coronavirus in Vermont • <u>March 11, 2020</u>: State Emergency Operations Center (SEOC) partially activates in response to COVID-19 • <u>March 11, 2020</u>: World Health Organization (WHO) confirms COVID-19 is a pandemic • <u>March 13, 2020</u>: COVID-19 is declared a national emergency • <u>March 13, 2020</u>: Governor Scott declares a state of emergency • <u>March 13, 2020</u>: Montpelier limits public access to public facilities. City Hall remains closed as of the writing of this plan, and all City meetings are being held remotely.	closure of in-person operations for all non-essential businesses, requiring remote work if possible, and directing residents to reduce trips outside the home to limit human-to-human contact. • <u>April 10, 2020</u>: Stay Home, Stay Safe order extended to last until May 15, 2020, and has been extended monthly since then. • <u>April 17, 2020</u>: Governor Scott issues phased "restart" plan • <u>January 27, 2021</u>: Vaccinations for Vermonters age 75+ begin • <u>April 6, 2021</u>: Governor Scott releases Vermont Forward Plan- phased reopening guide • <u>April 19, 2021</u>: Vaccinations for all Vermonters age 16+ open
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As of the writing of this plan (March 2021), there have been:

- Statewide: 18,498 cases, 224 deaths
- Washington County: 1,574 cases; 14 deaths
- Montpelier: 168 cases, deaths unknown

As shown in **Figure 6** cases in Washington County increased sharply in November and December and have continued to climb into 2021. Individuals 60+ are especially vulnerable to pandemics including COVID-19.

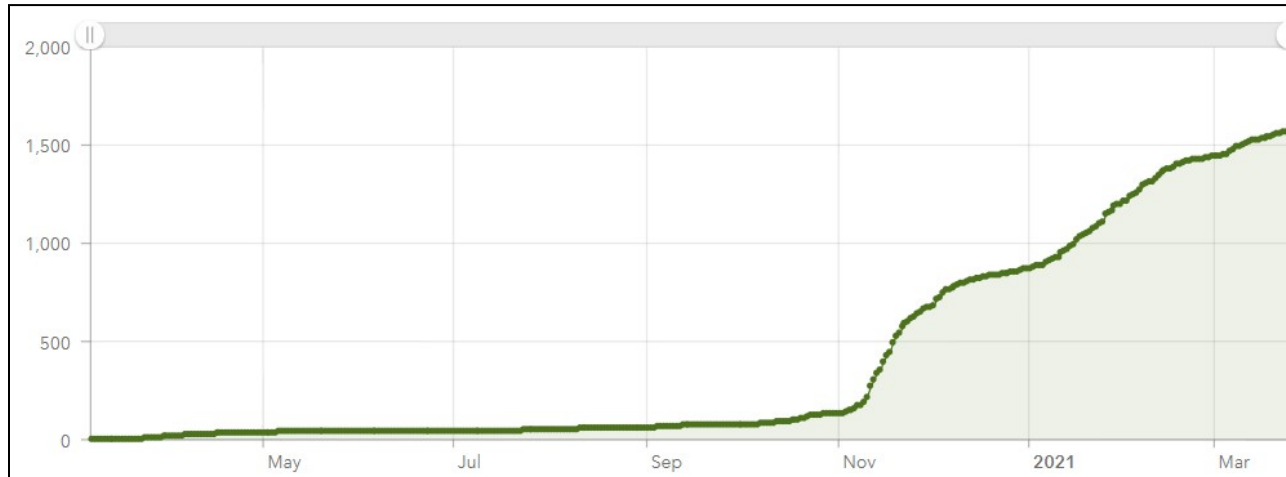


Figure 6: COVID-19 Cumulative Cases by Date in Washington County. Source: VDH COVID-19 Public Dashboards

As shown in **Figure 7**, 50% (778) of COVID-19 cases in Washington County have been in residents age 40 or older.

To mitigate impacts from COVID-19, the Town implemented several policies and procedures including:

- Highly limiting access to public facilities
- Moving Council and Committee meetings to remote, setting up online payment options to encourage residents to interface with the City remotely
- Postponing events and limiting services at the Senior Center to protect vulnerable populations
- Changes to town services
- Increasing frequency of scheduled cleaning and sanitation efforts at City facilities, especially in common spaces and highly trafficked areas
- Suspending use of parking meters

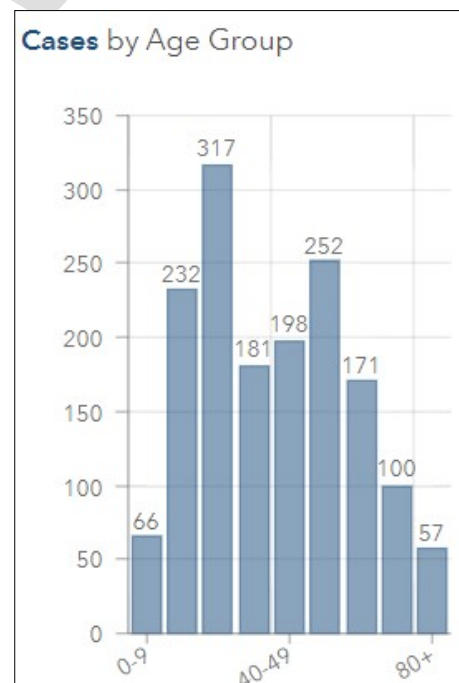


Figure 7: COVID-19 Cases in Washington County by Age Group. Source: VDH COVID-19 Public

- Initiating reformation of the Capital Area Neighborhoods (CAN) program to create local support systems for residents.

To keep residents and staff apprised of changes in state and national guidance, the City put weekly response updates in the weekly report (available online) and through frequent social media updates. This included updates on the City's phased reopening plans. They also developed a webpage compiling resources for the public. See **Figure 8** and **Figure 9** for graphics of the COVID updates and the City's phased reopening plan

Phase I Re-Opening Plans: <u>FACILITIES</u>		
The table below provides a higher level view of the Phase I Reopening Plans for the City of Montpelier's <u>facilities</u> , which will be in place by July 1 st :		
Facility	Current Facility Status	Phase I Facility Status Updates
City Hall 39 Main St, Montpelier, VT 05602	• Closed to Public • Remote Services only	• Limited public access, only on Tuesdays and Thursdays • Bathroom access limited- building open Tuesdays/Thursdays- upstairs bathrooms reserved for employees only, basement bathrooms open to the public (closest entrance to public restrooms will be the back of the City Hall building) • Masks required for public access

Figure 8: Montpelier Phased Reopening Plan. Source: <https://www.montpelier-vt.org/1155/Coronavirus-Response>

2020 Updates

7/24 Daily Update
7/22 Daily Update
7/21 Daily Update
6/26 Daily Update
6/23 Daily Update
6/17 Daily Update
6/16 Daily Update
6/15 Daily Update
6/10 Daily Update
6/9 Daily Update
6/01 Daily Update
5/28 Daily Update
05/27 Daily Update
5/22 Daily Update

Figure 9: Montpelier COVID-19 Updates.

Source:

<https://www.montpelier-vt.org/1155/Coronavirus-Response>

The scale and complexity of COVID-19 has not been seen in this country since the 1918 Spanish Flu. With a major pandemic, the hazard to Montpelier is its effect on individuals, vulnerable populations, the medical system, and the economy. The current evolving situation makes it

impossible at this time to fully understand and capture short and long term impacts in this LHMP. Some impacts that have been observed since March 2020 include:

Economic impacts: The City experienced a \$1.44 million decrease in revenue, including \$525,000 in loss of parking revenue. Montpelier Alive, a non profit working to enhance and support economic, social, and cultural resources in Montpelier, surveyed Montpelier business owners on the impact of COVID-19. Some impacts noted:

- 38% of respondents noted their 2020 revenue was 75-89% of their 2019 revenue. 20% of respondents noted their 2020 revenue was 60-74% of their 2019 revenue.
- 27.6% of respondents said their business was not currently breaking even.
- 22% of respondents said that 60-74% of their lost revenue was offset by grant

Social impacts:

Prior to COVID-19, the Montpelier Senior Activity Center (MSAC) was a critical resource for many in the region, offering more than 75 courses and classes. MSAC closed on March 13, 2020 and as of the writing of this plan, it remains closed for in-person group programs based on COVID-19 guidance from the State and City. In an interview with Vermont Public Radio, MSAC Director Janna Clar noted that COVID has had a significant impact on MSAC visitors⁸. These impacts include:

- Meals on Wheels delivery shifted from daily to 1x a week
- Event cancellations from spring 2020 to fall 2020 due to staff furlough
- Prioritizing communications and supporting people connecting to other public services to address food insecurity and grocery needs
- Social isolation: members lost connection to their immediate community, or are unable to travel or receive visits from family. MSAC started to develop strategies to help members connect including training on broadband access or virtual tools, and conducting wellness calls through an AmeriCorps member

Montpelier area schools also went remote, which impacted childcare. The City set up an afterschool daycare center to mitigate these impacts.

Disproportionate impacts on black, indigenous, people of color (BIPOC): The COVID-19 pandemic has had a disproportionate impact on BIPOC populations nationwide, as well as Vermont. While BIPOC Vermonters represent 6% of the population, they represent 18% of COVID-19 cases. The Vermont Health Department notes that while white Vermonters represent the majority of COVID-19 cases (79.3%), nearly 1 in 7 COVID-19 cases are BIPOC, and rates of

⁸ <https://www.vpr.org/post/how-one-vt-senior-activity-center-has-adapted-covid-19#stream/0>

COVID-19 are 2 times higher for BIPOC compared with white non-Hispanic households (see **Figure 10**).

1 in 7 COVID-19 cases are BIPOC. Rates of COVID-19 are 2 times higher for BIPOC compared with white non-Hispanic residents.

Rates per 10,000 Vermont BIPOC or white non-Hispanic residents

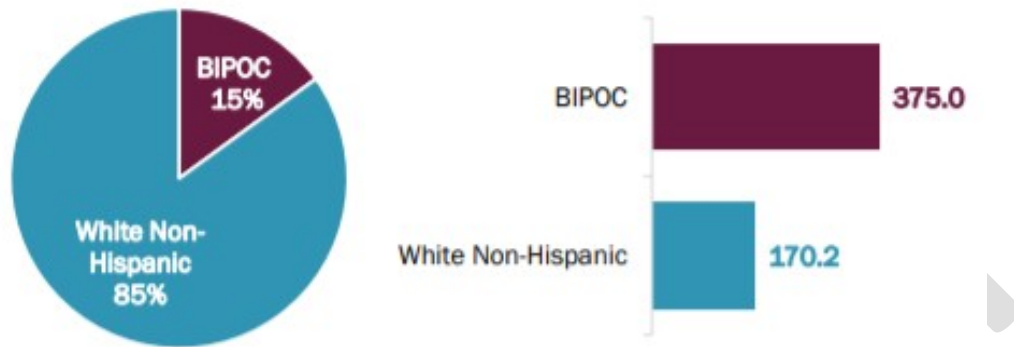


Figure 10: COVID Rate per 10,000 Vermonters. Source: COVID-19 VDH Weekly Summary

Additionally, BIPOC with COVID-19 have a higher hospitalization rate than non-white Hispanic people with COVID-19 (9 versus 5.9). Chittenden County has the highest rate of COVID-19 among BIPOC (637.7 cases per 10,000 BIPOC)

VDH notes several contributing factors that have led to these disparities, including systemic and structural racism. The VDH Weekly Summary from 2/26/21 notes “people in communities that are underserved may have higher rates of underlying medical conditions, work in jobs with higher risk for exposure...be more likely to live in multi-generational housing or congregate living spaces...have less access to personal protective equipment and hand sanitizer”.

In February 2020, VDH instituted a change in vaccination policy to address health inequities, allowing eligible Vermonters to bring other household members to be vaccinated at vaccine clinics being held statewide.

Table 15: Pandemic Hazard Risk Assessment					
Hazard	Location	Vulnerability	Extent	Impact	Probability
Pandemic	City-wide, County-wide, statewide	Individuals experiencing homelessness, elderly and disabled	Severe --\$1.44 million decrease in City	Social, economic impacts on vulnerable populations	Unknown; likely to reoccur seasonally

		population, BIPOC, school-aged children	revenue --Statewide: 18,498 cases, 224 deaths --Washington County: 1,574 cases; 14 deaths --Montpelier: 168 cases, deaths unknown	(seniors, persons experiencing homelessness, disproportionate impacts on BIPOC residents- higher case rate, higher hospitalization rate)	
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6.5 Dam Failure

Wrightsville Dam

The Wrightsville Dam is located on the northeast border of Middlesex and the North Branch of the Winooski River, approximately 4.5 miles from the confluence of the Winooski River and Montpelier and 3 miles north of Montpelier. The dam primarily provides flood control to the City of Montpelier and also reduces flood damage in downstream communities including Middlesex and Waterbury. Construction was completed in 1935; the dam consists of an earthen embankment approximately 115 feet tall and 1,525 feet long. The reservoir behind the dam is approximately 190 acres and stores 2,800 acre feet of water including sediments. The dam is classified by the ANR Vermont Dam Inventory (VDI) as a “High Hazard”, meaning it is a dam where failure or misoperation will cause loss of human life and significant property destruction (see **Figure 11**). A new modeling report with inundation maps was completed in 2018; these maps can be found on the City website [\[\[HERE—PLACEHOLDER\]\]](#).

CLASS	HAZARD CATEGORY	POTENTIAL LOSS OF LIFE	POTENTIAL ECONOMIC LOSS	INSPECTION FREQUENCY
3	Low	None expected (No permanent structures for human habitation)	Minimal (Undeveloped to occasional structures or agriculture)	5-10 years
2	Significant	Few (No urban developments and no more than a small number of inhabitable structures)	Appreciable (Notable agriculture, industry or structures)	3-5 Years
1	High	More than few	Excessive (Extensive community, industry or agriculture)	1 Year (Annually)

Figure 11: Dam Hazard Classifications. Source: Vermont DEC

East Barre Dam

The East Barre Dam is located on the Jail Branch in East Barre, approximately 13 miles upstream of Montpelier. The dam was one of four flood damage reduction projects constructed by the Civilian Conservation Corps in the 1930s, and provides flood control to primarily Barre and Montpelier and over 38 miles of the Winooski Watershed. Construction was completed in 1933 and consists of an earth fill dam that is 65 feet high and 1,632 feet long. The State of Vermont owns the dam and the DEC operates it, and is responsible for performing dam inspections and maintenance. The flood storage area of the dam totals 687 acres; the maximum capacity the dam stores is approximately 23,550 acre feet of water. The dam is classified by the ANR Vermont Dam Inventory (VDI) as a "High Hazard", meaning it is a dam where failure or misoperation will cause loss of human life and significant property destruction (see **Figure 11**). The 2018 Barre City LHMP notes "the extent of flooding that could occur would be the equivalent of 5.8 inches of water covering the drainage area of 38.7 square miles." The Dam's Emergency Action Plan (EAP) was last updated in 2012. To date, there have been no occurrences of the dam breaching. CVRPC performed a dam inundation model and found that if the dam were to breach, 549.9 acres, including all of Barre City, would be flooded. This equates to 1,136 properties for a total damage amount of \$149, 531, 680. A dam inundation map can be found on the City website [\[\[HERE—PLACHEHOLDER\]\].](#)

Marshfield Dam (Molly's Falls Dam)

Molly's Falls Dam is located on the Molly's Brook in Cabot, upstream of Montpelier. Construction was completed in 1927 and consists of an earthen dam that is 48 feet high and 1,100 feet long, and impounds 4,000 acre feet of water. The dam is classified by the ANR Vermont Dam Inventory (VDI) as a "High Hazard", meaning it is a dam where failure or misoperation will cause loss of human life and significant property destruction (see **Figure 11**).

During May 2011 flooding, high water levels reached more than 3.3 feet above the top of the service spillway; the flow of water over the spillways caused damage to roads and culverts downstream of the dam. During Tropical Storm Irene in August 2011, high water levels caused similar damage⁹.

In 2012, the Vermont Land Trust purchased the property from Green Mountain Power (GMP), and in 2015, Vermont Department of Forest, Parks, and Recreation purchased the property, creating a new Molly's Falls Pond State Park. Additionally, in 2013, an action plan and failure study was completed, with a table top exercise attended by the City's Fire Chief/EMD. GMP is currently planning modifications to improve dam safety, including regarding "the low areas of the crest [which will] provide adequate freeboard for the probable maximum flood (PMF) event and help prevent the dam from erosion due to overtopping by wave action during floods". (Reservoir Water Level Management and Downstream Effects of Flood Routing Review; Kleinschmidt Group, January 2018). Dam inundation maps can be found on the City website **[[HERE—PLACEHOLDER]]**.

Thurman W. Dix Reservoir Dam

The Thurman W. Dix Reservoir Dam is located upstream of Montpelier on the Orange Brook in Graniteville. Construction was completed in 1950 and consists of an earth/gravity dam that is 50 feet high and 920 feet long. The reservoir is owned by Barre City, while the dam structure and water reservoirs are owned by the State. The flood storage area of the dam totals 1,070 acre feet; the maximum capacity the dam stores is approximately 2,280 acre feet of water. The dam is classified by the ANR Vermont Dam Inventory (VDI) as a "High Hazard", meaning it is a dam where failure or misoperation will cause loss of human life and significant property destruction (see **Figure 11**). The Barre City 2018 LHMP notes that the spillway is of concern, but several

⁹ <https://cabotvt.us/wp-content/uploads/2019/05/Exh.-GMP-AH-5-Hydrologic-and-Hydraulic-Analysis-of-Downstream-Flooding.pdf>

leaks have been repaired over the years to prevent leaks onto the road below the dam¹⁰. The Reservoir's Emergency Action Plan (EAP) identifies one home, one business, and four roads (with the extent of overtopping that will occur) if dam failure should occur. Dam inundation maps can be found on the City website [\[\[HERE—PLACEHOLDER\]\]](#).

Table 16: Dam Failure Hazard Risk Assessment

Hazard	Location	Vulnerability	Extent	Impact	Probability
Dam Failure	<u>Wrightsville</u>: area along North Branch and Winooski Rivers (Route 12 from Dam to Winooski River, Route 2 along Winooski River to confluence w/ Stevens Branch, railroad facilities in Montpelier, Berlin, Moretown, Middlesex) <u>Marshfield</u>: Area downstream of Marshfield Dam <u>East Barre</u>: Mapped inundation areas include populations in Barre City, Barre Town, Montpelier, Middlesex, and Moretown, public and private infrastructure, roads, residences, natural features (38.7 sq. mile drainage area)	Commercials and residential structures, road and culvert infrastructure	<u>Wrightsville Dam</u>: <u>Marshfield Dam</u>: During TS Irene, 542 ft above sea level (normally 536 ft.) <u>East Barre Dam</u>: 5.8" of water over 38.7 sq. mile drainage area <u>Thurman W Dix</u>: 1 home, 1 business, 4 roads	<u>Wrightsville</u>: \$187, 200,000 in potential property losses <u>Marshfield</u>: \$10 million in potential damage if damage to power plant <u>East Barre Dam</u>: If all of Barre City flooded, \$149, 531, 680 in damages <u>Thurman W. Dix</u>: financial impact unknown	Low

¹⁰

https://www.barrecity.org/client_media/files/DPS/Barre%20City%202017%20Reduced%20Hazard%20Mitigation%20Plan.pdf

	Thurman Dix Dams: Orange, Barre City, Montpelier (9.1 sq mile drainage area)				
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6.6 Water Supply Contamination

The City of Montpelier distributes an average of 1 million gallons of water to Montpelier and Berlin residents each day. (Montpelier provides municipal water service to over 2,500 commercial and residential customers within the city limits and about 500 customers in Berlin Fire District 1, and the Montpelier Junction Railroad Station, the U-32 Junior/Senior High School, the Hill Top Apartments in Berlin, as well as four residences in Berlin. In addition, there is one private water system—a private well and storage tank serving the Murray Hill development. All other home owners are on private wells.)

The city's municipal water is drawn by siphon from its source at Berlin Pond, and passes through a rapid sand filtration plant before being transmitted into the city's grid of mains. The system has capacity to about 900 feet. Special pressure districts operate in the Terrace Street area and on Towne Hill. Potential service areas are generally established below the 900-foot elevation, except where special infrastructure can be installed, as on Terrace Street and Towne Hill.

The purity and security of its water supply is one of the City's greatest concerns. While Montpelier appears to have an adequate supply of water, there is some concern over the yield and quality of the system over time. The City maintains a Source Water Protection Plan (SPP) for Berlin Pond and the contributing drainage area. This plan was last amended in 2019. The Plan notes *"There are no other potable water sources of supply available to the City. There are no regional interconnections to systems having alternative sources of water supply."* The Plan notes that the Pond is susceptible to contamination from several sources:

- On-pond recreation.
- Chemical spills from vehicles traveling on Interstate 89 and chemical spills from vehicles traveling on secondary roads within the source protection areas.
- Potential vehicle fluid contamination from towing and oil change business located within the Source Protection Area. Potential leaks from possible underground fuel storage tanks as well as indoor fuel tanks near floor drain.
- Residential Properties which use subsurface septic systems located within the source protection area. The improper use and disposal of pesticides, herbicides, and fertilizers or other household wastes.

- Logging Activities within Source Protection Area (SPA).
- Hazardous Waste Sites.

Recreational use currently includes swimming, fishing and boating (non- combustion motors only). Ice fishing shanties are allowed and gas-powered ice augers are specifically prohibited. The SPP notes that *“other groups are continuing work to have the Pond again closed to recreation.”* City staff have noted an increase in turbidity levels in the summer month since the last LHMP update in 2015. The City has discussed treatment of contaminants including Cryptosporidium, the treatment system would include an early warning detection system and Ultraviolet disinfection. The estimated cost for this system is \$5 million. Additional recommendations outlined in the 2017 plan include:

- Continue water quality monitoring at designated tributary sites.
- Distribute a letter that explains source protection and active strategies for homeowner participation. Include educational pamphlet about septic tank maintenance (SepticSmart brochure) and the SPA map
- Consider adding Source Protection Area Map to Consumer Confidence Report.
- Updated Source Protection Area Map will be sent to local emergency agencies.
- Coordinate with all appropriate agencies & entities to plan and participate in a mock hazardous waste spill on I-89.
- Continue to pursue the purchase of land in the Source Protection Area.
- Educate source protection area land owners about source protection.
- Communicate annually with Towing/Oil change business about hazardous chemical containment and proper disposal.
- Investigate whether the underground storage tanks on previously identified properties are still present (2000 Map Appendix A). Encourage the removal of tanks if applicable.

Table 17: Water Supply Contamination Hazard Matrix					
Hazard	Location	Vulnerability	Extent	Impact	Probability
Water Supply Contamination	Municipal Water Supply at Berlin pond	City of Montpelier and Town of Berlin	Severe- Berlin Pond is sole source of readily available drinking water for City	Costs associated with remediation of potential petroleum pollution or clearing of water intake pipe- \$5 million or more	Low

6.7 Hazardous Materials (fixed & transport)

Recent History of Occurrences (from Vermont Agency of Natural Resources Vermont Environmental Research Tool

*MODF: Mineral oil dielectric fluid

Year	Facility Name	Nature of Incident	Product Contaminants	Quant	Responsible Party
2015	Cabot Distributing	Ammonia leak	Vapors/Odors/Smoke		Cabot Creamery
2015	CV Transfer	Capacitor and Transformer	MODF	2 G	GMP
2015	DJs Convenience Store	Loose fitting on tank top; tank overfilled; ~3 g fuel oil on floor.	#2 Fuel Oil	3 G	Packards? John Seviti (property owner)? Unclear
2015	GMP Montpelier facility	Leaking transformer	MODF	<1 G	GMP
2015	Montpelier ROW	Impacted soil found during bike path project prep		--	City of Montpelier
2015	Roadside	Transformer leak	MODF	3 G	GMP
2015	Roadside	Hose reel fell off delivery truck	#2 Fuel Oil	<2 G	Bourne's Energy
2015	Roadside	Weather related electric pole/transformer collapse	MODF	10 G	GMP
2015	VT Land Trust Property	Release from tank during excavation	Gasoline	20-30 G	Vermont Land Trust
2015	Whalen Residence	Oil out vent	#2 Fuel Oil	2 G	Irving Energy
2016	Aja Residence	Release from UST	#2 Fuel Oil	--	Joe Aja
2016	Champlain Farms Shell	Fuel Station; failed shut off	Gasoline	5 G	Wesco, Inc./ Champlain Farms
2016	Champlain Farms Shell 240-M1	Not nozzle - hose failure	Gasoline	2.5 G	Wesco, Inc/ Champlain Farms
2016	Cumberland	Fuel Station; failed shut	Gasoline	5-10 G	Cumberland

Year	Facility Name	Nature of Incident	Product Contaminants	Quant	Responsible Party
	Farms	off			Farms Inc.
2016	Cumberland Farms	Fuel Station; failed shut off	Gasoline	2 G	Cumberland Farms Inc.
2016	Cumberland Farms #4024	Delivery truck leaking diesel fuel from generator.	Diesel	2 G	Cumberland Farms Inc.
2016	Dog River	Sheen on Dog River	Biological (e.g. Algae, Bio-sheen)	--	NA
2016	GMP Montpelier Service Center	Not failed shut-off. Leak at nozzle	Diesel	<2 G	GMP
2016	Kurrle Fuels	Elevated PID readings in soil	#2 Fuel Oil, Diesel, Kerosene	--	Kurrle Fuels
2016	McNeer Residence	closed in place UST removal	#2 Fuel Oil	--	Craig McNeer
2016	Nedde Essex LLC.	Hydraulic equip. failure in elevator.	Hydraulic Oil	UNK --	Neti Essex LLC
2016	No. Montpelier Garage VTRANS	Hydraulic Equip. Failure	Hydraulic Oil	30 G	VTrans
2016	Roadside	Equip. failure-Antifreeze	Anti-freeze	10 G	VTrans
2016	Roadside	Vehicle accident, vehicle fluids lost	Diesel	10-15 G	Don Gallison Trucking, LLC
2016	Wayside Restaurant	Release from service truck	Diesel	<50 G	Unknown
2016	Weatherization & Renovation of Montpelier	Fuel release near North Branch of the Winooski River	Diesel	10 G	Elliot Curtin
2017	Anderson Property	Leaking AST	#2 Fuel Oil	--	Jon Anderson

Year	Facility Name	Nature of Incident	Product Contaminants	Quant	Responsible Party
2017	Champlain Farms/Wesco	Fuel Station; vehicle drove off w/hose attached	Gasoline	25 G	Wesco, Inc/Champlain Farms
2017	Cumberland Farms	Gasoline release	Gasoline	15 G	Cumberland Farms Inc.
2017	Griefen Residence	Above Ground Tank leak or failure	#2 Fuel Oil	UNK --	Zachary Griefen
2017	Montpelier WWTP	Spilled acid container	Corrosives (Acids/Bases)	1 G	City of Montpelier WWTP
2017	Newman Residence	Above Ground Tank overflow	#2 Fuel Oil	2 G	Trono Fuels
2017	roadside	Car hit pole	MODF	2 G	GMP
2017	Roadside	Cont. found during subsurface work	Gasoline	UNK --	City of Montpelier
2017	roadside	New transformer leaked	MODF	1 G	GMP
2017	Roadside	Staining on road	N/A	UNK --	Percy's Construction
2017	Roadside	Transformer/ Capacitor release	MODF	4-5 G	GMP
2017	roadway	Strong gasoline odor reported	Gasoline	--	Unknown
2017	roadway/roadside	Truck rear ended causing release of cargo		100 G	Pike Industries
2017	Sampson residence	Contamination found during tank pull	#2 Fuel Oil	UNK Gs	Harold Sampson
2017	State House	Lithium-ion battery malfunction		--	Not Provided
2018	Capitol Deli	Fuel disp. release; vehicle drove off w/hose attached	Gasoline	2-3 G	Wesco, Inc/Champlain Farms

Year	Facility Name	Nature of Incident	Product Contaminants	Quant	Responsible Party
2018	Cumberland Farms	Customer in car during fueling, shut off failed.	Gasoline	2 G	Cumberland Farms Inc.
2018	Fechter Residence	Above Ground Tank line (piping), fitting, filter leak	#2 Fuel Oil	UNK --	Juliana Fechter
2018	GMP	Transformer fell over	MODF	24 G	GMP
2018	GMP Montpelier Service Center	Transformer tipped over in back of truck	MODF	2 G	GMP
2018	GMP Montpelier Service Center	Transformer/ Capacitor release	MODF	2 G	GMP
2018	GMP Transformer	Hole in 10 Kv Transformer	MODF	10 G	GMP
2018	Montpelier WWTP	Above Ground Tank overfill	#2 Fuel Oil	1 G	Irving Energy
2018	Parker's Quick Stop	Fuel dispenser/dispensing release	Gasoline	1 G	Parker's Quick Stop
2018	Roadside	Downed transformer due to wind storm	MODF	8 G	GMP
2018	Roadside	Downed transformer due to wind storm	MODF	1 G	GMP
2018	Roadside	Oil pan on car ruptured during recovery from ditch	Motor Oil	1 G	Michael Leyward
2018	Roadside	Construction vehicle crash	Diesel	45 G	Walker Construction
2018	Roadside	Coolant line damaged on Casella truck.		3 G	Casella Waste Management, Inc.
2018	Roadway @ Pelky Property	Release from drip pan under equipment	Hydraulic Oil	2 G	John Pelky
2018	Washington	Blown hose on truck	Hydraulic Oil	3-4 G	Casella Waste

Year	Facility Name	Nature of Incident	Product Contaminants	Quant	Responsible Party
	Electric Co-op				Management, Inc.
2019	Bridge Project	Motor Fuel; UST release	Gasoline	Unknown	City of Montpelier
2019	Champlain Farms	Hose started leaking	Gasoline	4-6 G	Wesco, Inc/ Champlain Farms
2019	Champlain Farms	Contamination found during UST upgrades (lining single-wall tanks)	Diesel, Kerosene	unknown	Wesco, Inc/ Champlain Farms
2019	Costagliola Residence	Newly installed AST leaked	#2 Fuel Oil	2-5 G	Oil Co, Tank Installer, or landlord
2019	CV Transfer Station	Above Ground Tank overflow	Diesel	200 G	S.B. Collins, Inc./Jolley/Smart Stop
2019	Former Bulk Facility	Historic contamination from bulk facility identified during redevelopment		Unknown	Global Partners LP/Jiffy Mart
2019	Jiffy Mart	Petroleum releases observed during UST removals at multiple locations on property.	#2 Fuel Oil, Gasoline	TBD --	Global Partners LP/Jiffy Mart
2019	Jiffy Mart Store (Formerly Kurrle Fuels)	Customers overfilling fuel cans, spilling fuel	Diesel	UNK Gallons	Global Montello Group Corp/Jiffy Mart
2019	Montpelier City ROW	Cont. found during subsurface work.	Unknown/unspecified Petroleum	UNK-	City of Montpelier
2019	Montpelier Service Center	Hydraulic Equipment Failure	Hydraulic Oil	3.5 G	GMP
2019	Montpelier Stump Dump	Release from drum(s) awaiting proper disposal	#2 Fuel Oil	--	City of Montpelier
2019	National Life	blown hose on garbage	Hydraulic Oil	50 G	Myers Container

Year	Facility Name	Nature of Incident	Product Contaminants	Quant	Responsible Party
		truck			Co
2019	Parking lot	Vegetable oil spill in parking lot		10 G	BGS
2019	Roadside	diesel spill on roadside	Diesel	UNK G	unknown
2019	Roadside	Vehicle/Equipment accident, vehicle fluids lost	Diesel	UNK --	Walker Construction
2019	Roadside	Vehicle/Equipment accident, vehicle fluids lost	Anti-freeze, Motor Oil	5 G	Todd Howard
2019	Roadside	Vehicle/Equipment fluids release (non-accident)	Hydraulic Oil	25 G	Fairmont Farms
2019	Roadway	Hydraulic Equipment Failure	Hydraulic Oil	7 G	GMP
2019	Montpelier Service Center	Hydraulic Equipment Failure	Hydraulic Oil	3.5 G	GMP
2020	Associated Industries of Vermont	Heating Oil UST leak	#2 Fuel Oil	--	Vermont Federal Bank
2020	CV Transfer Station	TT tipped over	Motor Oil	5-15 G	Salvation Army
2020	Dewey Building - National Life Campus	Refrigerant Leak		--	National Life Group
2020	Former Grossman's Property	slow leak from pole mounted transformer.	MODF (mineral oil dielectric fluid)	<2 G	GMP
2020	Gonyaw Residence	Above Ground Tank overflow	#2 Fuel Oil	2.5-3 G	Irving Energy
2020	North Branch River	Vehicle in river	N/A	UNK --	Unknown
2020	Post Office	Vehicle/Equipment fluids release (non-accident)	Diesel	5 G	Unknown

Year	Facility Name	Nature of Incident	Product Contaminants	Quant	Responsible Party
2020	Roadside	TT accident, vehicle fluids lost	Diesel	UNK --	Todd Chaney LLC
2020	Roadside	Antifreeze leak.	Anti-freeze	3 G	GMP
2020	Roadway	Presumed leaking vehicle gas tank	Gasoline	Unknown - -	

The Montpelier LHMP Committee found the Montpelier Junction area and the adjacent road network in the vicinity of and extending to the Interstate 89 to be particularly vulnerable to hazardous material events. Montpelier Junction is located in the neighboring town of Berlin but due to its proximity it is an area of concern to Montpelier. Montpelier Junction is located at the confluence of the Dog and Winooski Rivers, and at the interchange of Central Vermont's most significant railroads, the Montpelier Junction area contains a variety of industrial uses. The Capitol Steel & Supply Company is located within the area's NFIP designated 100-year floodplain and Duke Energy's Berlin Propane Terminal (120,000 gallons of pressurized propane in above ground tanks) is located just beyond the floodplain, in addition to various storage facilities in and out of the floodplain. The railroad transports a variety of materials that could pose a threat to the area, in addition to the hazardous materials located onsite. The Berlin Police Department estimates that 100,000 gallons of additional propane sits in railcars and approximately 30 trucks make stops in Montpelier Junction daily.

The grade and approach to northbound Interstate 89 Exit 8 has contributed to transport accidents of vehicles carrying hazardous materials. The September 2002 incident cost the City of Montpelier \$1,377 for response and clean-up efforts. This type of incident not only affects the City financially but can detrimentally affect public safety of travelers along Interstate 89, potentially close a major transportation corridor in the State of Vermont (Interstate 89) and can have negatively affect the environment. Considering the factors which contribute to this hazard plus past occurrences, the probability and likelihood of a reoccurring incident is likely.

Mobile sources are in addition to the Tier II sites that are depicted on the Hazardous Analysis Map. Areas potentially affected by a hazardous material incident in this area are the Winooski River, the New England Central Railroad, the Washington County Railroad, Interstate 89, Route 2, the Montpelier Wastewater Treatment Plant, and potentially the Vermont State House. The nearest hazmat truck is located 35 miles away at the IBM Facility in Essex Junction. The nearest hazmat decontamination trailer is located 5 miles

away at the Berlin Fire Station.

In addition to hazardous materials incidents, Montpelier LHMP Committee members noted the potential presence of hazardous materials in soil and water should also be discussed.

Fixed Hazardous Materials

In accordance with Act 52 (H.269) *An Act relating to the transportation and disposal of excavated development soils legally described as solid waste (2015)*, the Vermont Department of Environmental Conservation (DEC) conducted statewide soil sampling to determine background concentrations of polycyclic aromatic hydrocarbons (PAHs), arsenic, and lead in urban areas¹¹. As a result of this study, a designated Urban Background Area was created on the Vermont Natural Resources Atlas, which displays various environmental information through GIS. A portion of Montpelier is in this Designated Urban Soil zone, designating specific options for the reuse or disposal of soils contaminated with PAHs, arsenic, or lead. Additionally, DEC set thresholds based on current background concentrations of these contaminants¹².

Montpelier has several Brownfield sites. One site is 1 Taylor Street, which has subsequently been redeveloped as the Taylor Street Transit Facility. Primary contaminants at the site included polychlorinated biphenyls (PCB), metals (primarily lead), and polynuclear aromatic hydrocarbons (PAHs). The City website notes "Remedial efforts have included removal and disposal of PCB contaminated shallow soils and installation of a cap of clean gravel. These efforts have reduced the risk of public exposure to contaminants for the current use as a parking lot. However, significant volumes of contaminated materials remain beneath the Subject Area which will require management/remediation should use of the area change."

Additionally, per- and polyfluoroalkyl substances (PFAS) is an emerging contaminant of concern that will require more research and analysis in future years. The primary concern surrounding PFAS is contaminated drinking water. The Vermont DEC website notes that "*since discovering PFOA in Bennington and North Bennington in 2016, the Vermont Department of Environmental Conservation (DEC) has partnered with other state and federal agencies to clean up existing PFAS and mitigate current and future exposures*"¹³. Act 21 (passed in 2019) required approximately 650 Public Community and Non-Transient Drinking Water systems to test for PFAS. DEC has also initiated litigation against PFAS manufacturers, seeking damages which could result in funding for cleanup, treatment, and removal.

Comment [GV1]: Question for Montpelier LHMP Planning Committee: keep this in hazardous materials, or move to Water Supply Contamination section?

¹¹ https://dec.vermont.gov/sites/dec/files/wmp/Sites/4.11.17.TextOnly.Vermont.Soil_Report.FINAL_.pdf

¹² https://dec.vermont.gov/sites/dec/files/wmp/Sites/2020.02.21.development.soils_factsheet.pdf

¹³ <https://dec.vermont.gov/pfas>

In Montpelier, potential sources of PFAS contamination are from landfill leachate (liquid that leaches from a landfill). This liquid is collected and trucked to the Montpelier Water Resource Recovery Facility (WRRF) to be processed. In FY18, the MWRRF received 10, 946,113 gallons of leachate; 6,930,321 gallons were from Casella's Coventry landfill. The State has found low levels of PFAS in leachate from the Coventry landfill and has conducted two rounds of sampling at the Montpelier WRRF.¹⁴ The first report, released in the spring of 2018, found PFAS levels in influent and effluent samples to be generally very low, less than 10 ng/L. The second report found average concentration levels in the effluent to be around 69.5 ng/L based on nine (9) sample points. The current wastewater treatment process is unable to remove PFAS substances from wastewater (raw sewage/leachate/septage/biosolids). The Health Advisory Limit set by EPA is 70 ng/L in drinking water, so the average PFAS levels in the WRRF effluent meet EPA drinking water standards. Vermont has not established a PFAS discharge limit for wastewater treatment plans and the timeline for regulation is unknown. As of February 2020, the City plans on:

- Continuing to work with the State of Vermont to evaluate and monitor PFAS levels at the WRRF.
- Working with Casella in looking at PFAS treatment alternatives. Casella's Act 250 permit for their recent expansion requires exploring alternatives for treatment at both the landfill and at Wastewater treatment facilities.
- Allow Montpelier to continue to accept and treat leachate as it is currently the only viable treatment alternative with the lowest environmental impact.¹⁵

Table 18: Hazardous Materials Hazard Matrix

Hazard	Location	Vulnerability	Extent	Impact	Probability
Hazardous Materials (fixed and transport)	Interstate 89 northbound Exit 8, exit ramp, section of Memorial Drive to Dog River Road to Montpelier Junction (see <i>Areas of Local Concern Map</i>) Fixed hazardous materials: Urban Soil areas, brownfield sites,	Winooski River, the New England Central Railroad, the Washington County Railroad, Interstate 89, Route 2, the Montpelier Wastewater Treatment Plant, and potentially the Vermont State House.	Moderate	September 2002 incident \$1,377 for response and clean-up efforts	Highly likely

¹⁴ <https://civicclerk.blob.core.windows.net/stream/MONTPELIERVT/1f72aac44f.pdf?sv=2015-12-11&sr=b&sig=xmZHbxKsipY60Ag%2FV58rvOs8ZxAM1Xp5YTBzv7w6jlo%3D&st=2021-04-19T19%3A45%3A35Z&se=2022-04-19T19%3A50%3A35Z&sp=r&rsc=cache&rsct=application%2Fpdf>

¹⁵ <https://civicclerk.blob.core.windows.net/stream/MONTPELIERVT/1f72aac44f.pdf?sv=2015-12-11&sr=b&sig=xmZHbxKsipY60Ag%2FV58rvOs8ZxAM1Xp5YTBzv7w6jlo%3D&st=2021-04-19T19%3A45%3A35Z&se=2022-04-19T19%3A50%3A35Z&sp=r&rsc=cache&rsct=application%2Fpdf>

Table 18: Hazardous Materials Hazard Matrix

Hazard	Location	Vulnerability	Extent	Impact	Probability
	possible PFAS contamination				

6.8 Cyber Disruption

Cyber disruptions may be driven by criminal motives for profit, extortion, or theft, or deliberate attacks to destroy, damage, or interfere with infrastructure systems. Cyber terrorism is a deliberate act of computer-to-computer attack that undermines the confidentiality, integrity, or availability of a computer or computer system or information. Cyber disruption is a hazard that touches many aspects of our communities: industry, government, health, business, and private. The rapid growth of social media use and technology has increased the potential of cyber disruption exponentially. The commonplace use of computers in practically every office and system contributes to the complexity of protecting and mitigating cyber threats. Because Montpelier is the capital city and seat of state government in Vermont, there exists a heightened threat of cyber terrorism on state systems that could have potential ripple effects on the City's information systems. In order to mitigate for this risk, the City's Information Technology Department regularly monitors information systems for viruses and other potential threats and the City has redundant server locations to prevent any disruptions. City staff also regularly participates in state cyber security efforts to assess and mitigate these threats.

[[PLACEHOLDER]]

- Discuss VC3- handles City's IT services, developing IT Infrastructure Plan
- Mention that computers are not connected so less vulnerable to hacking
- Working on increasing election security
- Mention that EMS is cloud based- dispatch center could be target, back up plans are in place to move to Barre City

Table 19: Cyber Disruption Hazard Matrix

Hazard	Location	Vulnerability	Extent	Impact	Probability
Cyber Disruption	Information systems	City of Montpelier, residents, businesses, State Offices	Severe; Generally no direct effects on built environment	Costs associated with data loss, secure or personal information leaks, etc.	Low?

7. Mitigation

7.1 Master Plan Goals that Support Local Hazard Mitigation

The following goals were incorporated into the 2017 City Master Plan related to hazard mitigation:

- Expand set-backs and buffer ordinances around water-ways to increase natural flood protection.
- Alter mowing practices to ensure that landowners near waterways allow natural vegetation to re-emerge for flood protection.
- Consider the addition of a Shoreline Overlay District to the zoning ordinance and design guidelines that can preserve and enhance the pollution filtering, flood mitigating, aesthetic, and recreational value of riverfronts.
- Conform and comply with existing National Flood Insurance Program requirements by analyzing and updating our existing floodplain regulations as per the NFIP Community Floodplain Management Regulations Review Checklist and Agency of Natural Resources suggestions.
- Articulate a pattern of safe and flood-resilient growth by designating zones of uses and densities in flood hazard areas.
- Develop higher standards of review and/or regulatory requirements in the floodplain.
- Consider policies that provide density bonuses for development that avoids the floodplain.
- Preserve and promote open spaces and the natural and beneficial functions of floodplains.
- Maintain Montpelier's Community Rating System (CRS) standing by preserving the natural and beneficial functions of the floodplain. Consider:
 - Identifying all portions of the city and county parks, forest preserves, state parks and state forests, publicly owned beaches, or natural areas within the floodplain that may be counted for open space credit.
 - Maintaining private wildlife or nature preserves for open space purposes.
- Work with State and Federal authorities to reduce the risk of ice jam flooding.

The Montpelier City Master plan will be updated in 2022. The goal of this Local Hazard Mitigation Plan is to:

- To take actions to reduce or eliminate the long-term risk to human life and property from:
 - Fluvial Erosion/Inundation Flooding
 - Severe Winter Storms (Snow, Ice)
 - Cold
 - Pandemic

- Dam Failure
- Water Supply Contamination
- Hazardous Materials
- Cyber Disruption

Specific hazard mitigation strategies related to goals of the 2015 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 potential hazards and educated on ways they can protect themselves and their property
- Improve communication plans and public messaging of hazards at all stages (before, during, after)
- Ensure that emergency response services and critical facilities functions are not interrupted by all hazards
- Provide and maintain a reliable, functional infrastructure that meets the needs of the public and adapts to a changing climate

7.2 Identified Hazard Mitigation Programs, Projects & Activities

Hazard mitigation programs, projects and activities that were identified for implementation are:

Table 20: 2021-2026 Mitigation Strategies

Hazard Mitigated	Mitigation Action	Local Leadership	Prioritization	Possible Resources ¹⁶	Time Frame
All hazards	Periodically update COOPs to include all hazards approach (include cyber disruption, hazardous material) and regularly exercise COOPs	Emergency Mgmt team, City staff	Medium	Local Staff	Ongoing
All hazards	Education and awareness re: VT Alert	Planning Dept	Low	Local Staff	2+ years
All hazards	Investigate methods to gather information from residents on streets and areas of local concern	CAN network	Low	CAN network	2+ years
All hazards	Produce/distribute emergency preparedness information about severe winter weather hazards, extreme cold hazards	City Mgmt	Low	Local Staff	Annual
Fluvial Erosion/ Inundation Flooding	Create flood notification plan (web, TV, phone, radio). Could include multi-hazard public communication/ notification plan, policy for when/how/who (SOP)	Planning Department	High	Local resources	1-2 years?
Fluvial Erosion/ Inundation Flooding	Remove flood-prone heating systems below from structures connected to District Heating Plant	Public Works	High	HMGP/ Local Resources	1-2 yrs.
Fluvial Erosion/ Inundation Flooding	Amend 2018 River Hazard Area Regulations and Zoning Regulations to add critical facilities language (not developing critical facilities in floodplain)	Planning & Comm. Dev	Low/medium	Local resources	Will be amended in tandem with other amendments

¹⁶ HMGP – Hazard Mitigation Grant Program, EMGP – Emergency Management Grant Program, PSIC/NTIA – National Telecommunications and Information Administration, USDA – United States Dept. of Agriculture

Table 20: 2021-2026 Mitigation Strategies

Hazard Mitigated	Mitigation Action	Local Leadership	Prioritization	Possible Resources ¹⁶	Time Frame
Fluvial Erosion/ Inundation Flooding	Extend underground wastewater effluent piping further upriver to melt ice formation around Cemetery Bend (1,000 ft.)	Public Works, Fire Dept	High/ Medium	FEMA, WW Discharge permit	4+ years
Fluvial Erosion/ Inundation Flooding	Continue partnership with River Conservancy to develop Confluence Park riparian area to repair riparian buffers, provide safe access to the river, provide educational components to inform/educate on importance of riparian buffers	City staff, River Conservancy	Low	Local Resources	2+ years
Fluvial Erosion/ Inundation Flooding	Upgrade segments identified as Very High Priority in Road Erosion Inventory	CVRPC, DPW	High (annual in order to maintain compliance w/ MRGP)	Local staff, CVRPC, VTrans (Grants in Aid, Better Roads)	Annual in compliance w/ MRGP
Fluvial Erosion/ Inundation Flooding	Develop strategy to address repetitive loss properties	Planning Dept	Low	Local Staff	2+ years
Fluvial Erosion/ Inundation Flooding	Implement priority stormwater projects identified in Montpelier SWMP (City recently purchased hydro-seeder to implement best management practices)	DPW	High (annual in order to maintain compliance w/ MRGP)	VTDEC, MRGP Grants in Aid, Better Roads, Local Staff, CVRPC	Regular maintenance activities identified in SWMP are performed and evaluated for improvement on an annual basis to maintain compliance w/ MRGP
Extreme Cold	Prioritize pipe replacement based on number of leaks (tracked via GPS)	DPW	Medium	Local staff	Ongoing

Table 20: 2021-2026 Mitigation Strategies

Hazard Mitigated	Mitigation Action	Local Leadership	Prioritization	Possible Resources ¹⁶	Time Frame
Extreme Cold	Maintain supplies (floor heaters) in the Fire Dept to loan out in case of severe emergency; develop internal use policy for loaning out equipment	Fire Dept	Medium	Local Staff	1-2 years
Pandemic	Create resiliency within departments for technology needs (laptops, network extenders, etc.) including Mobile Dispatch Center, transitioning to cloud platform	City Management	Medium	Local Resources	1-2 years
Pandemic	Create emergency plans for Council meetings and elections to ensure community and staff safety	City Management	Medium	Local Resources	1-2 years
Dam Failure	Add inundation maps from 4 local dams to City website, information on dam failure to website	EMD	High	Local Resources	<1 year
Dam Failure	Investigate funding for study to examine impacts of Marshfield dam breach/develop response plan- roads impacted, infrastructure impacted, etc.	EMD/ DPW	Medium	FEMA, Local funds	2+ years
Water Supply Contamination	Implement recommendations in 2019 Source Protection Plan	DPW	Medium	Local staff	1-2 years
Water Supply Contamination	Continue to engage w/ DEC and Casella to monitor PFAS regulatory and litigation process	DPW	High	DEC, Local staff	Timeline for DEC to public regulations for water discharge standard is unknown
Hazardous Materials	Incorporate Tier 2 report and chemical inventory into LEMP	EMD	High	Local Resources	Annual

VEM also emphasizes a collaborative approach to achieving mitigation on the local level. Partnering efforts among ANR, VTrans, ACCD, Regional Planning Commissions, FEMA Region 1 and other agencies result in these agencies and organizations working together to provide assistance and resources to towns interested in pursuing mitigation projects and planning initiatives.

The 2021-2026 Mitigation Strategies table lists mitigation actions in regards to local leadership, prioritization, possible resources, and timeframe. 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. 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 City. Other mitigation actions listed will be performed as funds become available and dependent on public interest.

Montpelier understands that to apply for FEMA funding for mitigation projects, a project must meet FEMA benefit cost criteria. The City also must 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 action's cost, availability of funding, and the community's need to address the issue, is more than four years.

8. Attachments

- Areas of Local Concern
- River Corridor Map
- Montpelier Historic District & Special Flood Hazard Area Map
- Stormwater Master Plan priority projects
- **[[PLACEHOLDER]] Dam inundation Maps**
- Dot Poster
- Hazard Analysis Survey Questions & Results

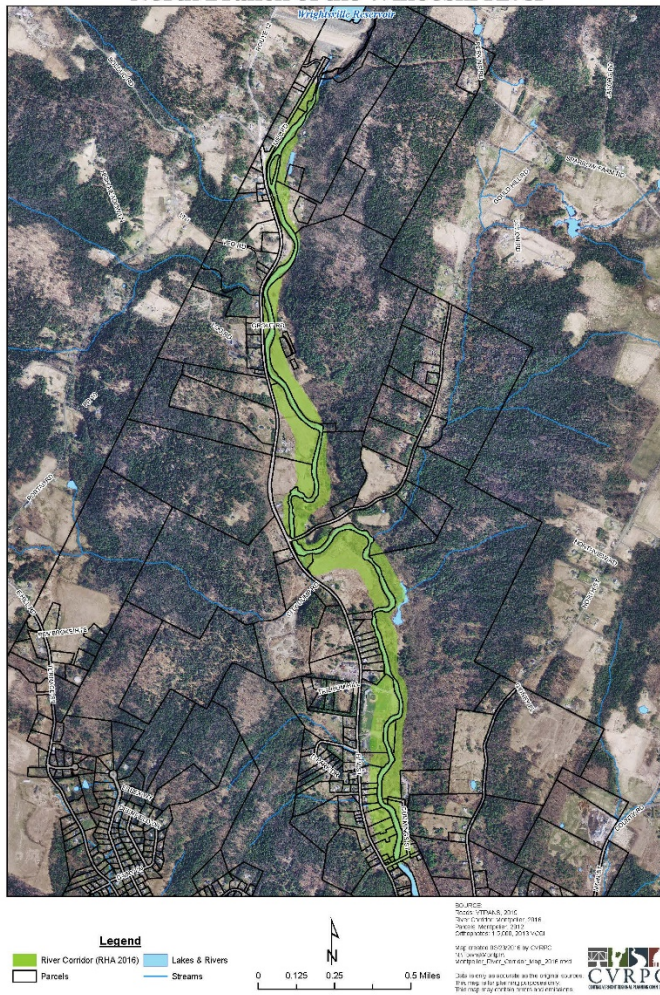
- 5-Year Plan Maintenance and Review Process
- Resolution adopting the Plan

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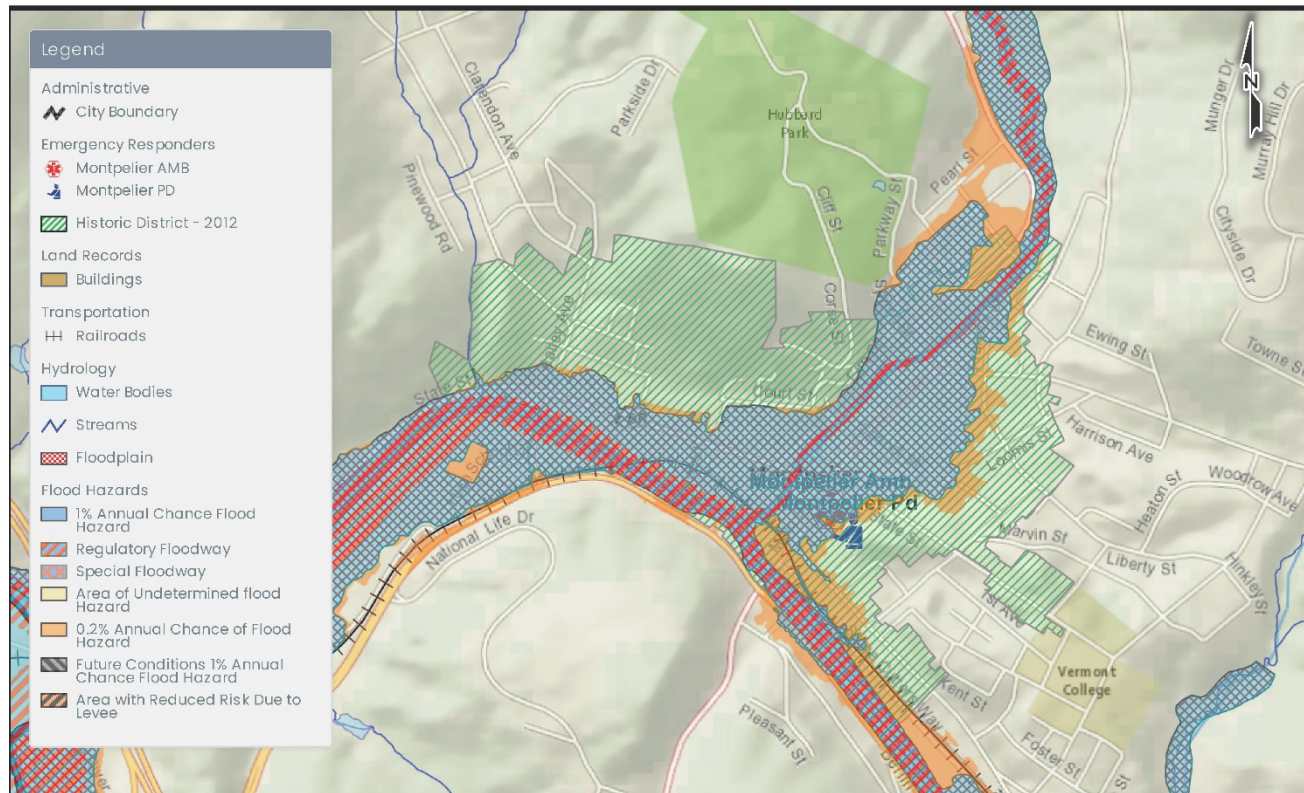
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Montpelier River Corridor Map

Montpelier VT - River Corridor North Branch of the Winooski River



Montpelier Historic District & Special Flood Hazard Area Map



Stormwater Master Plan priority projects

Site ID	Site Name	Project Type	Implementation Score ≥ 10 ?	Priority Location?	Notes on Planned Improvements, if any
WR-04	National Life Dr. & Memorial Dr./Route 2	D	Y	Y	Nat. Life Drive is City street, Memorial Drive is VTrans. Potential future pedestrian crossing. Develop illustrative concept as case example of a centralized green infrastructure practice.
WR-06	Northfield St./Route 12	D	N	Y	Full-depth reconstruction planned – opportunity to incorporate green infrastructure
WR-08a	Old Country Club Road	C	Y		Will be addressed as part of bike path project
WR-08b	Old Country Club Road	C	Y		
WR-12	Wheelock Street	C	Y	Y	Consider including NEA inlet improvement
WR-15a	Bailey Ave.	C	Y		Road recently repaved, lower priority
WR-15b	Bailey Ave.	D	Y		
WR-16	Montpelier High School	C	Y		
WR-18	Hackamore Rd.	C	Y		Recently repaved
SB-01	Crossway Saab / Cody Chevrolet	D	Y		Ecosystem Restoration Program grant application submitted
SB-02	Moonlight Terrace	C	Y		
SB-04	A Quilter's Garden, Barre-Montpelier Rd.	A	Y		Partner with WNRCD? On private property.
NB-01	Parking lots west of Main St.	C	Y	Y	Illustrative concept as a case example for integrating green infrastructure in City parking lots

[[PLACEHOLDER]] Dam Inundation Maps

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Dot Poster

Montpelier's Local Hazard Mitigation Plan

What is a Local Hazard Mitigation Plan?

- Montpelier is revising its Local Hazard Mitigation Plan (LHMP) in 2020!
- LHMPs identify hazards in a community and long-term strategies for protecting people and property from future hazard events.
- LHMPs are key to breaking the cycle of disaster damage, reconstruction, and repeated damage.

What is the benefit of having an LHMP?

- Towns with approved LHMPs are eligible to receive increased federal funding following a federally declared disaster through Vermont's Emergency Relief & Assistance Fund (ERAF).
- LHMPs help towns take action before a disaster to reduce impacts when a disaster occurs.
- Hazard mitigation planning protects public safety, prevents loss of life and injury, and reduces risk to people and property from natural and human-caused hazards.

What is a hazard?

Natural or human-caused event or condition that has the potential to harm people or property.

Hazard Examples

- Ice Jam
- Fluvial Erosion (erosion of stream and river banks)
- Hazardous Materials
- Severe Winter Weather (heavy snow, extreme cold, ice storms)
- Water Supply Contamination

For more information, please call (802)-229-0389 or email vinson@cvregion.com



Natural Hazards: Which are the Most Important for Montpelier to Plan For?

PLACE 3 DOTS! →

Ice Jam 	Fluvial Erosion (Erosion of Stream & River Banks) 	Hazardous Materials 	Severe Winter Weather Heavy Snow, Extreme Cold, Ice Storm, etc. 
Water Supply Contamination 	Cyber Attacks 	Write In Is a different hazard more important? Please add it below! <i>Road repairs!</i>	Write In Is a different hazard more important? Please add it below!

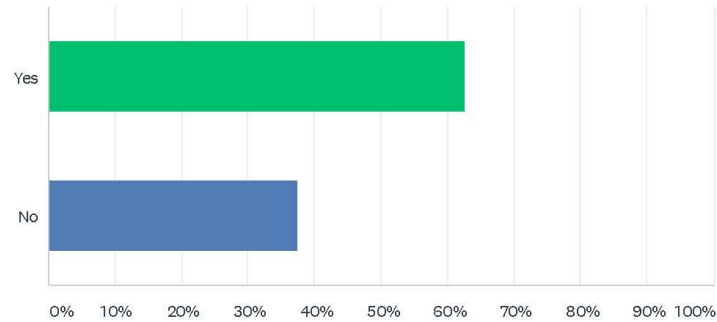
Hazard Analysis Survey Questions & Results

Q1 What street do you live on?

Harrison
11, Cross St.
College Street
Greenfield Terrace
13 Cliff Street
College
Cedar Street
River St., corner of Blackwell St.
Vine St
Elm Street
elm street
Main
Franklin Street
Berlin
Terrace St
Main
Bailey Ave, corner with Clarendon
Berlin Street
Elm Street
Mather Terrace
603 North Street
Colonial Drive
Barre Street

Q2 In the last 5 to 10 years, have you been impacted by a natural or other disaster in Montpelier?

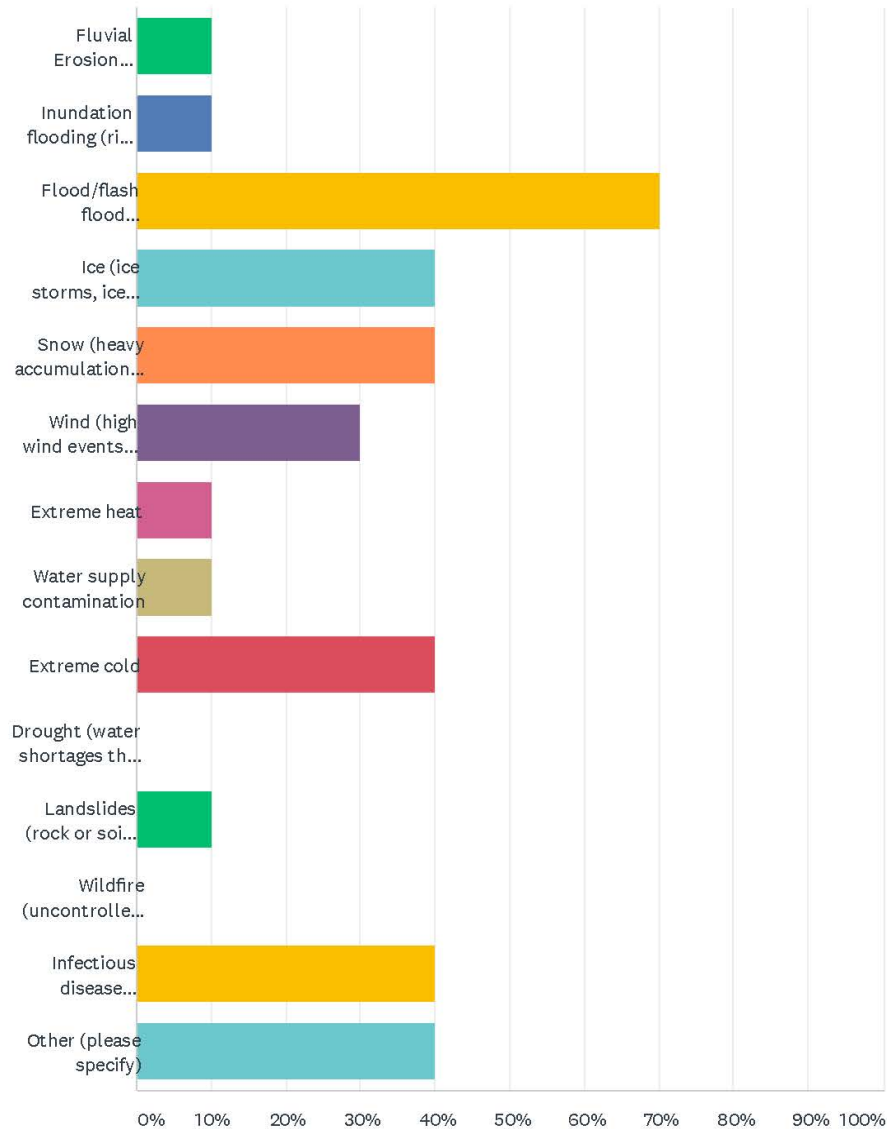
Answered: 16 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	62.50%	10
No	37.50%	6
TOTAL		16

Q3 If yes, what was it? (Check all that apply)

Answered: 10 Skipped: 6



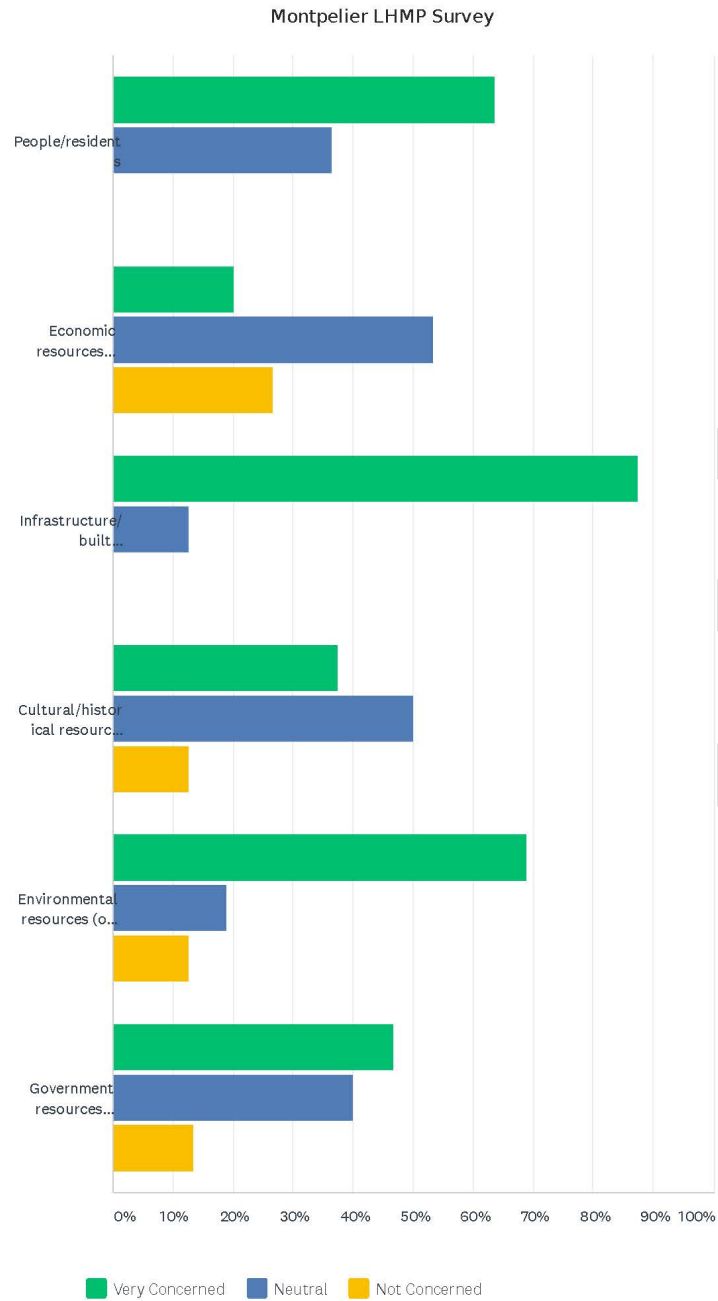
ANSWER CHOICES	RESPONSES	
Fluvial Erosion (streambed and streambank erosion caused by adjusting width and depth of a stream)	10.00%	1
Inundation flooding (rise of river or lake water levels)	10.00%	1
Flood/flash flood (significant amount of precipitation over a short amount of time)	70.00%	7
Ice (ice storms, ice jams)	40.00%	4
Snow (heavy accumulation of snow which can also include drifting snow, low visibility, hazardous travel)	40.00%	4
Wind (high wind events that can damage trees, electrical lines, etc.)	30.00%	3
Extreme heat	10.00%	1
Water supply contamination	10.00%	1
Extreme cold	40.00%	4
Drought (water shortages that can lead to damage to crops, pastures, etc.)	0.00%	0
Landslides (rock or soil that falls/slides/spreads across an area and can damage infrastructure, buildings, and the environment)	10.00%	1
Wildfire (uncontrolled burning of forest, brush, or grasslands)	0.00%	0
Infectious disease (bacteria, viruses, or parasites- could include COVID-19, Lyme disease, West Nile Virus)	40.00%	4
Other (please specify)	40.00%	4
Total Respondents: 10		

Other (please specify)
Lead paint removal; herbicide removal on the railroad tracks; indoor moisture/mold growth.
Tree fall on house. Multiple water main breaks.
Water main break leading to street flooding, street debris, and period without water service
Dirt, stones, etc. with heavy rain flowed over inadequate curbing by loaded storm drains on Clarendon to our yard and neighbors' yards.
I was affected by both flash flood (water flooding down from Hubbard Park onto my property) and extreme cold while living on Bailey Avenue - not on Berlin Street.

Montpelier LHMP Survey

Q4 How concerned are you about hazard impacts on these resources in your community?

DRAFT



	VERY CONCERNED	NEUTRAL	NOT CONCERNED	TOTAL
People/residents	63.64% 7	36.36% 4	0.00% 0	11
Economic resources (losing your job as a result of disasters, for example)	20.00% 3	53.33% 8	26.67% 4	15
Infrastructure/built environment (your home, roads, sidewalks, bridges, water supply)	87.50% 14	12.50% 2	0.00% 0	16
Cultural/historical resources (access to parks, playgrounds, the State House, historical buildings)	37.50% 6	50.00% 8	12.50% 2	16
Environmental resources (open green space, streams, rivers, trees, for example)	68.75% 11	18.75% 3	12.50% 2	16
Government resources (library, City Hall, other public facilities)	46.67% 7	40.00% 6	13.33% 2	15

Other (please specify)
Safety of children in residential spaces.
I wish there was an option between "neutral" and "very concerned" = if so I would say "somewhat concerned" or "concerned" about the ones where I said "neutral"
The sense of shared and cherished community places that could be lost.
Economic vitality of downtown flood district

Q5 Think about your home and community. What hazards are you concerned about that you would like the Hazard Mitigation Plan to include?

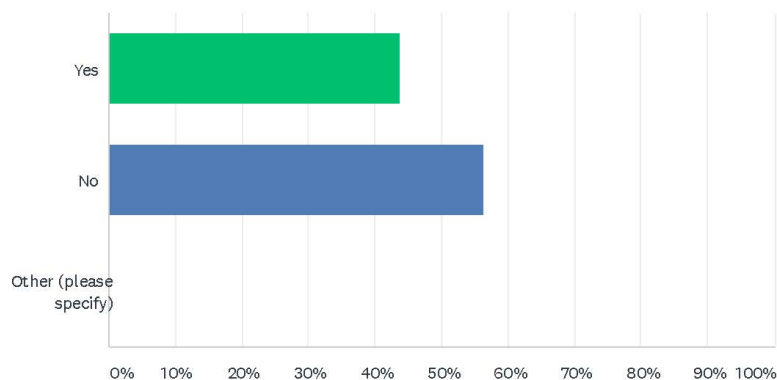
Answered: 15 Skipped: 1

A way to remove plant/tree growth around electrical lines w/o using herbicides!
Sidewalk on the south side of Cross St. is breaking up and could easily trip someone up.
Remove obsolete dams. Develop more storm water gardens. Separate storm water from sewer system. Clean up behind Shaw's in Montpelier. There is trash if all kinds, including shopping carts, sliding down the bank behind the store.
Flooding, poor drainage, ice dam risk, poor erosion control; lack of widespread backup electricity if winter outage prevents ability to heat homes in subzero temps
Infrastructure integrity- roads and cliff being better adapted to water flow, and use of Hubbard Park having a minimal impact on the habitats there
ice jams and flooding on the Winooski river and North Branch affecting
Runoff from uphill properties causing water damage, street damage and erosion
Many dead/overgrown trees at risk of deadfalls throughout town.
Timely snow removal in public housing
Road maintenance must be improved. It's ridiculous.
Property in/near flood plain that isn't insured and owned by moderate to low income folks
Water main breaks, power outages, flash flooding from streams
100+ year old water mains, sewage over flows, poor drainage throughout the city, pavement throughout the city is horrible I could go on
how best to address impacts to our aging infrastructure
Flooding
Flash flood; flow from paved surfaces uphill.

Main Concern is that my heat/AC, water and refrigeration all rely on electricity. If we had a massive power outage, especially in winter, that would be a total disaster. As a Berlin Street resident, I have concerns if there is a reason for a mass exodus of Montpelier that my road would be congested and impossible to traverse. I also notice that the drainage grates on Berlin street regularly clog up with leaves and debris, which would render them useless in the event of heavy rain and flooding.
Ice jams, flooding, and Wrightsville water release for our home along the North Branch.
Because Hubbard park is closed to through traffic there is only on way to get from say the state house to Worchester. problem existed with the 1992 flood
landslides on steep clay slopes; flooding; ice storms; Lyme disease
Landscape creep or erosion caused by groundwater
large scale power outages, food shortages, petroleum shortages

Q6 Have you ever received information about how to make your home safer from natural or other disasters?

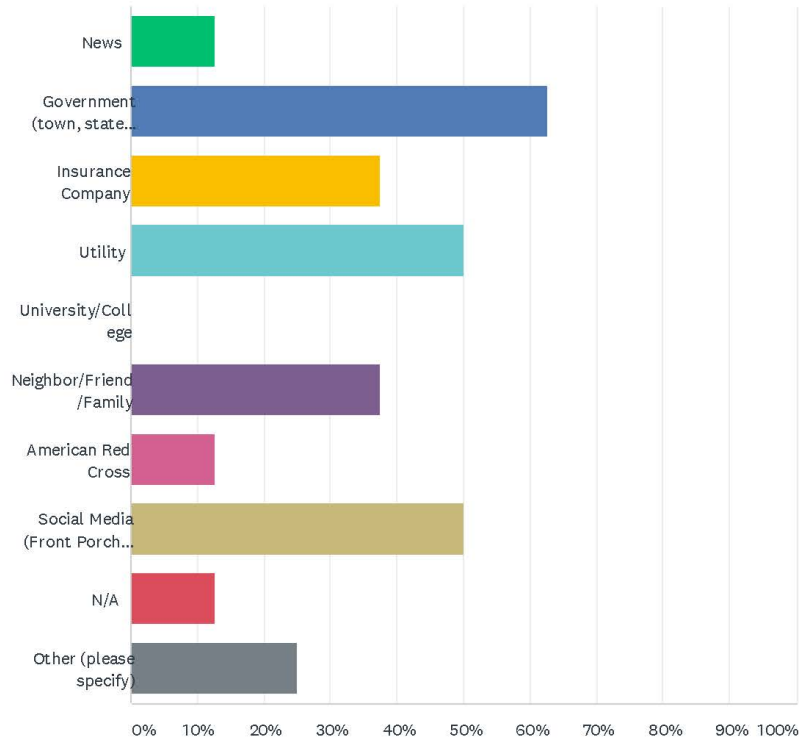
Answered: 16 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	43.75%	7
No	56.25%	9
Other (please specify)	0.00%	0
TOTAL		16

Q7 If so, from what source (check all that apply)

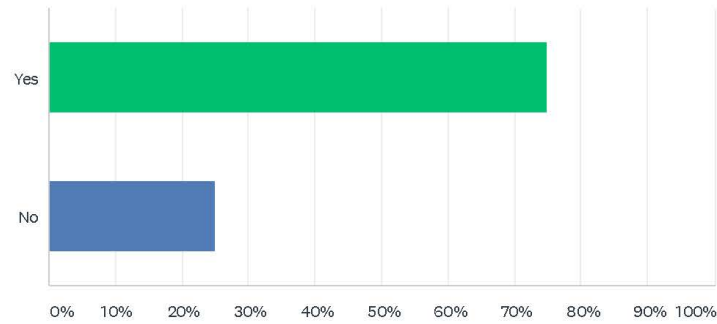
Answered: 8 Skipped: 8



ANSWER CHOICES	RESPONSES	
News	12.50%	1
Government (town, state, neighborhood network)	62.50%	5
Insurance Company	37.50%	3
Utility	50.00%	4
University/College	0.00%	0
Neighbor/Friend/Family	37.50%	3
American Red Cross	12.50%	1
Social Media (Front Porch Forum, Facebook, Twitter)	50.00%	4
N/A	12.50%	1
Other (please specify)	25.00%	2
Total Respondents: 8		

Q8 Are you signed up for VTAlert? (Link to sign up: <https://vem.vermont.gov/vtalert>)

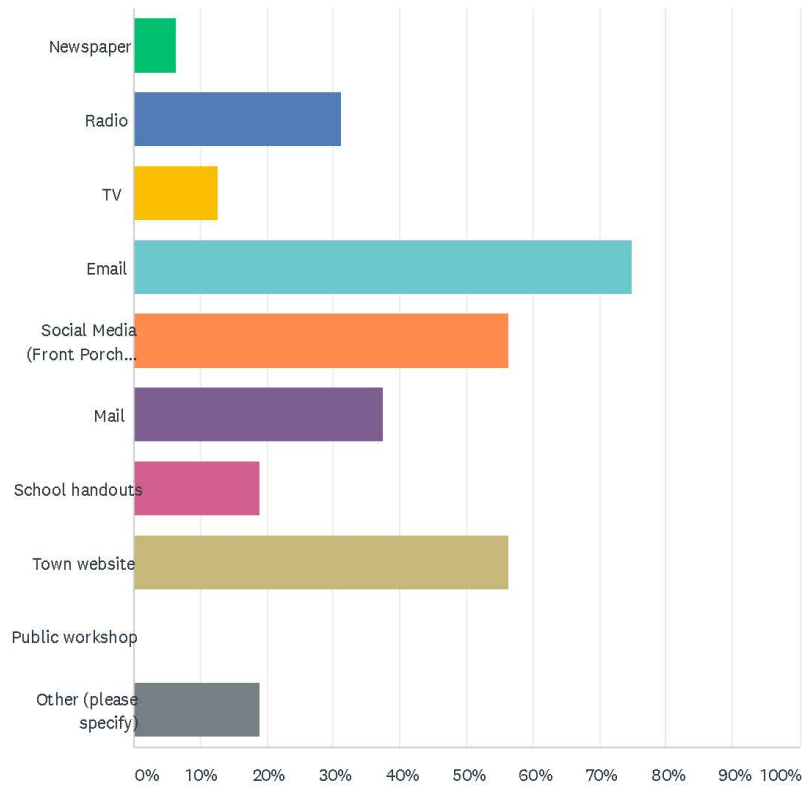
Answered: 16 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	75.00%	12
No	25.00%	4
TOTAL		16

Q9 What is the most effective way for you to receive information about making your home safer from natural or other disasters? (check all that apply)

Answered: 16 Skipped: 0

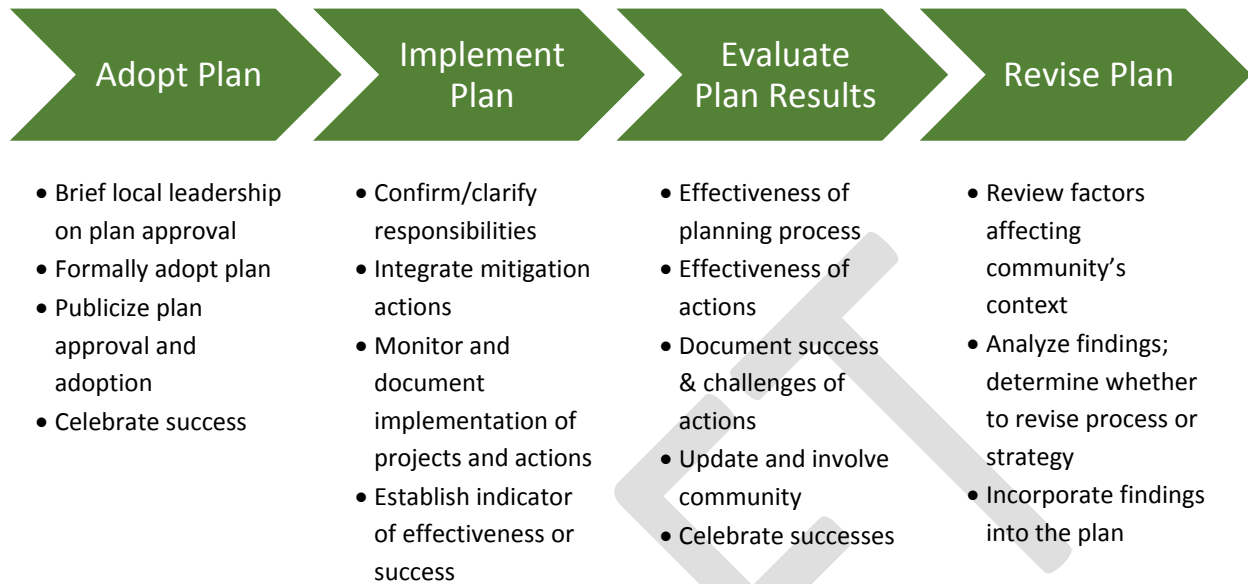


ANSWER CHOICES	RESPONSES	
Newspaper	6.25%	1
Radio	31.25%	5
TV	12.50%	2
Email	75.00%	12
Social Media (Front Porch Forum, Facebook, etc)	56.25%	9
Mail	37.50%	6
School handouts	18.75%	3
Town website	56.25%	9
Public workshop	0.00%	0
Other (please specify)	18.75%	3
Total Respondents: 16		

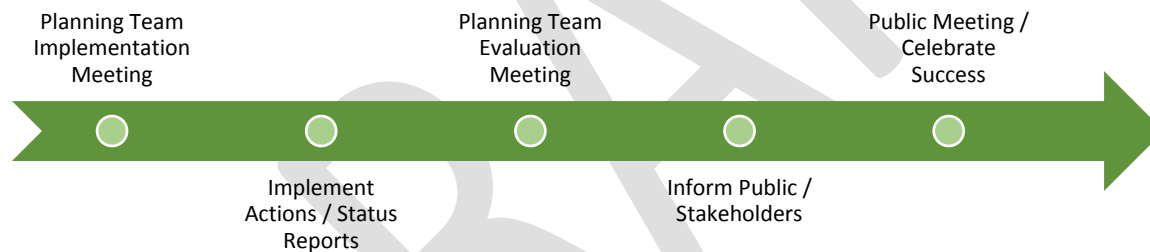
Q10 Please provide any additional information that you feel will be beneficial in the drafting of our hazard mitigation plan (short answer)

Remove invasive knotweed which is spreading along roads and waterways, including Blanchard Brook in Sabins Pasture. Plant native trees and shrubs along the Winooski and its branches and tributaries.
Ever since Stonewall Meadows was built, all of the downhill property owners have had problems with runoff and erosion.
Focus more on improving local infrastructure (drainage, water & sewer, roads) to benefit residents instead of paying to mitigate the damages of crumbling/neglected systems.
Concern for low income elders and housing deprived individuals to keep icy streets cleaned.
Fix the roads. Streetlights!
Our driveway constantly deteriorates
Recognize that many Montpelier residents don't own a car. Services and C-PODs accessible only by car are inequitable and discriminatory.
Info for residents who will lose heat in the event of a power outage that lasts any significant amount of time in the winter - or who will lose food in the event of a power outage in summer. I have no idea what to do should this event occur.
River and stream flooding and ice jams should likely be top priority. Landslides and erosion on the steep clay slopes along the North Branch, in particular, should be addressed. Address infrastructure damage - roads, sewer, and water - from flooding and soil instability. Pay attention to and monitor health of upstream dams - Wrightsville and Molly's Falls in particular.

5-Year Plan Review/Maintenance Process



After Plan Adoption – Annually Implement and Evaluate



Fifth Year, and After Major Disaster Evaluate and Revise



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[[Placeholder]] City Resolution Adopting the Plan

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