

Town of Highgate, Vermont HAZARD MITIGATION PLAN Draft Update 2020



VT78 in East Highgate during January 1998 Ice Storm.

Adopted by the Town of Highgate, Selectboard

Date: January 8, 2015

Update: July 16, 2020

Approved by FEMA

Date: June 12, 2015

Update: _____, 2020

Whereas, natural and man-made disasters may occur at any time, we recognize that by lessening the impacts of these disasters we will save resources, property and lives in the Town of Highgate, Vermont;

And whereas the creation of the Town of Highgate Hazard Mitigation Plan is necessary for the development of a risk assessment and effective mitigation strategy;

And whereas, the Town of Highgate is committed to the mitigation goals and measures as presented in this plan;

And whereas, the respective officials identified in the mitigation action plan are hereby directed to pursue implementation of the recommended actions assigned to them;

Therefore, the Town of Highgate Select Board hereby adopts the 2020 Highgate Hazard Mitigation Plan.

AUTHORIZING SIGNATURES

Date: July 16, 2020

Sharon Bouge
Selectboard Chair

Bruce Butler
Vice Chair

Richard Flout
Selectboard

[Signature]
Selectboard

Selectboard

TABLE OF CONTENTS

1. INTRODUCTION.....3

2. PURPOSE3

3. PLANNING PROCESS4

4. COMMUNITY PROFILE.....8

5. RISK ASSESSMENT/VULNERABILITY ANALYSIS.....15

6. MITIGATION STRATEGY40

7. PLAN IMPLEMENTATION, MONITORING & EVALUATION49

ACKNOWLEDGEMENTS

Project Steering Committee

Sharon Bousquet – Highgate Selectboard

Planning Commission Chair – Luc Dupuis

Wendi Dusablon – Highgate Town Clerk

Shelley – Town Treasurer

Joe Depatie – Highgate Fire Chief

Butch Brosseau – Highgate Road Foreman

Heidi Britch-Valenta – Highgate Town Administrator

Project Coordinator:

Shaun Coleman – Northwest Regional Planning Commission

Project Participants:

Town of Highgate Town Administrator
Town of Highgate Highway Department
Town of Highgate Planning Committee
Northwest Regional Planning Commission
Local Emergency Planning Committee (Franklin County)
Town of Highgate Fire Departments
Vermont Agency of Transportation District 8
Vermont Emergency Management
Vermont Agency of Natural Resources
Vermont Fire Academy
Northeast States Emergency Consortium
Federal Emergency Management Agency
National Weather Service
Vermont Geological Survey

This plan should be considered dynamic due to the continual changing environment in which these hazards present themselves. This plan must also be reviewed and adjusted as growth in population, industry, and overall community demographics change.

1. INTRODUCTION

This is an update to the 2015 FEMA approved and locally adopted Hazard Mitigation Plan for the Town of Highgate, Vermont.

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 Town of Highgate more disaster resistant.

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

Hazard Mitigations 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 stopping or limiting development and could include projects such as:

- Flood-proofing structures
- Tying down propane/fuel tanks in flood-prone areas
- Elevating furnaces and water heaters
- Identifying & modifying high traffic incident locations and routes
- Ensuring adequate water supply
- Elevating structures or utilities above flood levels
- Identifying & upgrading undersized culverts
- Proactive land use planning for floodplains and other flood-prone areas
- Proper road maintenance and construction
- Ensuring critical facilities are safely located
- Buyout & relocation of structures in harms way
- Establish & enforce appropriate building codes
- Public information

2. PURPOSE

The purpose of this Hazard Mitigation Plan is to assist the Town of Highgate in identifying all hazards facing the county and their community and identify strategies to begin reducing risks from identified hazards. Once adopted, the local mitigation plan is not legally binding; instead, it outlines goals and actions to prevent future loss of life and property.

Adopting and maintaining the Local Hazard Mitigation Plan will provide the following benefits:

- Make certain funding sources available to complete the identified mitigation initiatives that would not otherwise be available if the plan was not in place.

- Ease the receipt of post-disaster state and federal funding because the list of mitigation initiatives is already identified including Vermont Emergency Relief Assistance Funding.
- Support effective pre and post disaster decision making efforts.
- Lessen the Town's vulnerability to disasters by focusing limited financial resources to specifically identified initiatives whose importance has been ranked.
- Connect hazard mitigation planning to community planning where possible.

3. PLANNING PROCESS

Incorporation of Existing Plans, Studies, Reports and Technical Information

Mitigation plans from around the country, current State Mitigation Plans, FEMA planning standards, the FEMA Flood Mitigation Assistance Program requirements and the National Flood Insurance Program's Community Rating System were examined. Other materials examined consisted of community plans, including:

- Town of Highgate, Vermont Town Plan 2015
- Town of Highgate, Zoning Bylaws March 5, 2015
- State of Vermont Hazard Mitigation Plan 2018
- Town of Highgate Landslide Inventory, December 30, 2015
- Vermont Agency of Natural Resources Corridor Planning Project and Phase 2 Stream Geomorphic Assessment Rock River Watershed, Highgate, VT (2005)
- Town of Highgate, Swanton Town and Village of Swanton Hazard Mitigation Plan 1999
- Town of Highgate Flood Insurance Rate Maps 1983
- Northwest Regional Planning Commission Regional Plan 2014

A complete list of references may be found in Attachment F.

Plan Update Process

This is an update to the 2015 Town of Highgate, Vermont Hazard Mitigation Plan. The Plan was originally adopted by the Town on January 8, 2015 following notice from FEMA Region 1 that the plan was "Approved Pending Adoption". NRPC staff has worked with the Town to update the Plan.

The Town Administrator and Planner Heidi Britch-Valenta coordinated the Highgate Local Hazard Mitigation Plan update process. During the process, municipal officials were interviewed including the Emergency Management Director and Selectboard Chair Sharon Bousquet, Road Foreman Butch Brousseau, Planning Commission Chair Luc Dupuis, Fire Chief Joe Depatie, Town Clerk Wendi Dusablon and Northwest Regional Planning Commission Planner Shaun Coleman. The interviews identified commonalities related to natural, man-made hazards and identified key long and short-term strategies/activities to reduce risks from these hazards. Preparation of the meeting included a review of the Highgate Municipal Plan, the Highgate Hazard Mitigation Plan, Highgate Zoning Regulations and the Town's Road Erosion Inventory. Information from these sources is incorporated into the various sections of this plan.

The first meeting was held with the hazard mitigation committee on October 15, 2019 at the Highgate Town Office. The committee reviewed the previous plan, including the risk assessment section, provided updates to the status of mitigations actions, discussed hazard mitigation planning and disaster resilience initiatives. Outcomes included updates to the types of hazards the town was subjected to and what they believed the top hazards were, update of progress on past mitigation actions from the 2015 plan, identification of mitigation projects and strategies for implementation.

Town of Highgate, Vermont Draft Hazard Mitigation Plan 2020 Draft Update

The meeting was publicly warned, following Vermont's Open Meeting Law. There were two members of the public present and they provided no comments when offered.

A second hazard mitigation committee meeting was held on January 2, 2020 at the Highgate Town Office. Participants reviewed the draft LHMP, reviewed the town's policies and current mitigation actions, and identified mitigation goals and new mitigation projects. The meeting was publicly warned and members of the public were present. After this final committee meeting, NRPC staff communicated with committee members on an individual basis to gather final pieces of information, and the draft plan was finalized. The final draft plan was distributed to the entire committee for their review.

- Copies of the draft plan were made available to the public at the Town Office from January 24, to February 7, 2020 for review and comment.
- The public was invited to comment on the draft plan update via a public notice that was circulated in the local newspaper County Courier, the Town's website, the NRPC newsletter and NRPC website. This opportunity served to make the public aware where they can find hard copies to review or request either hard copies or digital format. Instructions were also included to direct comments to Shaun Coleman, Senior Planner at Northwest Regional Planning Commission either by email, phone or fax.
- The draft plan update was circulated via email from to the Planning Commission and Selectboard for review and comment.
- Copies of the draft plan update were sent to the neighboring Town Clerk's in Swanton, Franklin, Sheldon, Saint Albans Town and Alburgh for review and comment. A copy of the plan was also sent to Vermont State Hazard Mitigation Officer for review.

The Swanton Town Clerk, Franklin Town Clerk, Saint Albans and Sheldon Town Clerks acknowledged receipt of the plan but that was all. No public comments were received. The Highgate Fire Department and Public Works Department provided some updated information regarding department resources and capabilities. None of the comments contained or suggested new mitigation strategies or actions.)

The draft was then finalized and submitted to Vermont Division of Emergency Management (VEM) and FEMA for review. After receiving FEMA's "Approval Pending Adoption", the plan will go before the Selectboard for adoption.)

The plan has been reorganized with the following sections updated/added during the process:

Table 3.1 Changes Made to the Highgate LHMP

Section of Plan	Changes Made
1. Introduction	None.
2. Purpose	Purpose explains benefits of plan. Note: Section 2 was Methodology. Methodology Section was renamed to Planning Process and moved to Section 4. Methodology from original 2015 LHMP was removed.
3. Planning Process	Formerly Section 4. Additional details on process including: names of individuals

Town of Highgate, Vermont Draft Hazard Mitigation Plan 2020 Draft Update

	involved, meeting locations and dates, previous plan update process removed, progress since last plan added, list of sections updated, and table on status of the town's current mitigation actions added.
4. Community Profile	Formerly Section 3. Census data and other information updated with information from Municipal Plan and US Census. Maps added.
5. Community Hazard Inventory and Risk Assessment	List of hazards was consolidated. Committee wanted to focus on top three highest risk rating to reduce plan size. Risk assessment table added, local hazard information updated, data tables added. Maps added.
6. Critical Facilities	Updated information.
7. Mitigation Strategy	Added maps and more information on SFHA, Repetitive Loss Properties, updated critical facilities, updated market value of structures, updated NFIP participation information and added development trends data and Grand List summary information. Updated mitigation goals, mitigation actions, town policies and plans table. Added Development Trends.
8. Plan Implementation, Monitoring & Evaluation	General updates including details on routine plan maintenance and methods to continue public involvement.
9. Appendices	Maps updated with new data, tables updated, sources updated.

Progress Since 2015

The plan update was revised to address changes in priorities however the focus remains on flooding, severe winter storms (ice storms), fluvial erosion and landslides. Many of the actions identified in the previous plan were completed or were determined to be emergency response actions and not mitigation actions. Changes in staff and locally elected officials have brought a change in priorities. The Town's overall mitigation goals have remained consistent and supported in particular with addressing issues at the Highgate capped landfill site. New vulnerabilities were identified and are listed in the Prioritized Mitigation Action Table in Section 7. The following table provides an overview of Highgate's local hazard mitigation actions from the 2015 LHMP along with their current status. Note that mitigation actions which are completed have been deleted from the Mitigation Actions & Projects Table in Section 7 of this plan.

Status of Hazard Mitigation Actions

Mitigation Action	Status
Emergency response training for emergency personnel.	Removed: This is an on-going "Preparedness" activity and not a "Mitigation" action and has been removed from the plan.
Property buyouts for 38 and 70 Riverview Lane residences.	Completed: FEMA buyout of both residences occurred in 2016.
Transfer Station property and road slope	In Progress: Town currently has FEMA HMGP

Town of Highgate, Vermont Draft Hazard Mitigation Plan 2020 Draft Update

stabilization	funding for design and possibly construction. Road work has been done to stabilize slope but additional work needs to be done.
East Highgate Bridge 25 on Machia Road (TH4)	Completed: Project completed through Vermont Agency of Transportation's Structures Program in 2019.
Mill Hill Road runoff improvements, bank stabilization.	Completed: Project completed through Vermont's Better Back Roads Program in 2018.
Durkee Rd, north of the intersection with Hanna Rd culvert replacement.	Completed: Culvert was installed following Town Highway Standards in 2016.
St. Armand Road Culvert upgrade.	Incomplete: Other projects took precedent.
Rollo Road drainage improvements (1.5 miles east of the intersection with Ballard Road)	In Progress: Project will be implemented under Vermont's Grants-In-Aid program. Project will be completed by June 30, 2020.
Tarte Road drainage improvements (1/4 mile north of intersection with Parent Road)	Completed: Project completed following Town Highway Road Standards in 2018.
Tarte Road improvements (near intersection with Gore Road)	Completed: Project completed following Town Highway Road Standards in 2016.
Install generator and transfer switch at MVU High School	Completed. Generator installed to power school during emergencies.
Procure and install generator at the Highgate Elementary School	On-going: Town applied for funding but was denied. Town remains active in trying to find funding source.
Improve cell service coverage throughout Town	On-going: T-Mobile and AT&T installed cell equipment to expand coverage. Central Dispatch installing new tower for Fire Dept.

Public Involvement

The Hazard Mitigation Committee recognizes the need for even greater public involvement for the rural community in future updates of the plan. Notices of specific Hazard Mitigation Steering Committee meetings will be warned in local newspapers, websites, etc. Additionally, efforts will be made to outreach to businesses, academia, nonprofits and other interested parties. Such groups will be encouraged to become involved in the planning process. The Local Emergency Planning Committee (LEPC) for Franklin County is comprised of representatives from these groups. Based on demographics of the county and the rural nature of the greater community, outreaching to the LEPC to gain more input from the public sector was a logical step. Future updates should coincide with Town Meeting Day to gain greater involvement from the public as well.

4. COMMUNITY PROFILE

Highgate is located in the northwestern corner of the State of Vermont in Franklin County. Three towns, a lake, and a country border it. The Town of Franklin borders it to the east, the Town of Sheldon borders it to the southeast, and the Town of Swanton borders it to the southwest. Lake Champlain makes up Highgate's western border while Quebec, Canada makes up the northern border. The Town covers approximately 33,803 acres, which is 52.82 square miles.

Settlement in Town is typically spread out either along the existing roadways or along the shoreline. Commercial and industrial development is primarily located along VT 78 and within the village areas. Commercial "strip" forms of development have been occurring along State Road 78 west of Highgate Center, particularly near the Franklin County State Airport. The great majority of residential land use occurs within about two miles of Highgate Center, particularly east and west along State Route 78. Increased residential land use is also developing near U.S. Route 7 in the southwest quadrant and north of the State-owned airport.

Highgate's topography is defined by two watersheds; the Rock River Watershed and the Missisquoi Watershed. Its dominant surface water resources are the Missisquoi River and Missisquoi Bay. The Missisquoi River serves as an important resource for hydroelectric energy to the region's development. However, such projects have greatly reduced the recreational benefits over the years. The Missisquoi River drains into Missisquoi Bay, a valuable recreational and water resource for the Town and region.

The Missisquoi National Wildlife Refuge consists of 6,642 acres of quiet waters and wetlands that attract large flocks of migratory birds. It is located on the eastern shore of Lake Champlain near the Canadian border. The 5,839-acre refuge includes most of the Missisquoi River Delta where it flows into Missisquoi Bay. The river delta, shared by the towns of Highgate and Swanton, consists of approximately 1,500 acres of freshwater marsh and swamp. Aside from its rich ecological wildlife value, the area has hydrological potential as a major source of potable ground water.

Population

The US Census estimated the population of Highgate was 3,535 in 2018 compared to 3,397 in 2000. According to the 2018 estimated Census figures, there were 1,544 total housing units, of which 1,311 are occupied throughout the year. There are 194 units classified as seasonal, recreational or occasionally occupied and 243 are either vacant, for sale or rent. Most housing units are single-family structures.

The 2017 municipal Grand List values of all structures is \$459,041,200.00. The median value of owner-occupied housing unit \$211,900 (US Census estimates 2014-2018).

Existing Land Use

Land in Highgate is used primarily for agriculture or is considered forestland. The Town covers 59.8 square miles (38,279 acres), 11.5 square miles (7,291 acres or 19 percent) of which are covered by water. Of the 38,279 total acres, the number of acres in agricultural use is 16,057 acres, or 42 percent of the total. The number of acres of forested land is approximately 9,559 acres, or 18 percent of the total. Wetlands, shorelines and other non-buildable locations account for 14 percent of the land area in Highgate. The remaining 7 percent of the acreage in the Town is used for

residential purposes, as either available for residential development, or for transportation purposes.

The Town of Highgate has three areas of State-owned land covering a total of 340 acres. These areas include Highgate State Park (which is within the Highgate Cliffs Natural Area) covering 37 acres, the Rock River Access Area covering 7 acres, and the Rock River Wildlife Management Area covering 296 acres.

Settlement in the Town is typically spread out either along the existing roadways or along the shoreline. The overwhelming majority of development since 1980 has followed this pattern. Commercial and industrial development is primarily located along VT 78 and within the village areas. A small number of individual enterprises are scattered throughout the Town, and many home occupations are operating as well, although the exact number is unknown. Commercial "strip" forms of development have been occurring along State Road 78 west of Highgate Center, particularly near the Franklin County State Airport. The Missisquoi Valley Union High School is also in the area, and combined with commercial development, has created serious traffic conflicts along this stretch of roadway.

Residential development is by far the greatest growth industry in Highgate, making it somewhat of a "bedroom" community in many respects. The great majority of residential land use occurs within about two miles of Highgate Center, particularly east and west along State Route 78. Increased residential land use is also developing near U.S. Route 7 in the southwest quadrant and north of the State-owned airport. Other lesser areas of existing and growing residential land use are Highgate Springs and East Highgate. Mobil homes on single-family lots are a substantial land use, and offer an affordable option to conventional single-family homes.

The population centers of Highgate Center and Highgate Falls contain the densest residential use, consumer services, and public/semipublic buildings. The Public Library, School, Town Offices, Tri-Town Arena and facilities all lie in Highgate Center.

The village of East Highgate is a somewhat static residential community with no commercial services. The village of Highgate Springs is also characterized as a residential enclave but is affected by the seasonal resort activities along the Missisquoi Bay shore. It should be noted that, like many other towns in Franklin County, Highgate has experienced a decline in seasonal dwellings.

The recent increase in residential use is due primarily to the demand for new homes by Franklin and Chittenden County commuters. The rate at which agricultural and forested lands are being developed appears to be closely related to employment growth in both counties. Conversion of seasonal dwellings to year-round housing continues to be an issue in the Town.

The mineral extractive industry consumes a large portion of land use in the Town of Highgate; sand, and gravel deposits were once abundant in the area but are being depleted with increased demand. This industry has been used to support rapid development in Northwest Vermont over the years. The rise and fall in this industry should be assessed as it will affect both the land use and the economic development in the region.

Economy

The dairy industry accounts for a significant proportion of Highgate's economy. National and local factors have impacted the dairy industry as a whole. The Town's economy is still largely

divided between agriculture and a few related services, with most non-agricultural employment located in neighboring communities. The continued residential growth of Highgate seems assured, while industrial growth has lagged. The Town is proximate to the local job markets of Swanton and St. Albans, has a State-owned airport facility and is accessible to the interchanges of I-89, and railroad facilities. Large areas of developable soils in the southwest quadrant provide adequate land for industrial expansion. Employers in the community range from manufacturing to Homeland Security and Casella Waste Systems. There are also long-standing family businesses which include DeSorcie's Market and McCuin & Sons True Value. Additionally, Charlebois Truck Repair and Harvest Farm Equipment draw business to the area.

Tourism is a constantly growing industry in the County. Recreational resources such as the developing Lamoille Valley Rail Trail and designated Northern Forest Canoe Trail pass through the town. The Tyler Place is a premiere family resort located off Route 7 on Lake Champlain. Other popular tourist destinations include Carmen Brook Family Farm tours and LaPierre Maple Industries. Many Canadian bicycling touring companies travel south through Highgate.

The Town of Highgate lies in a fertile and agriculturally important part of the Champlain Valley. Dairy farming, orchards, and truck farming are the primary agricultural activities still being practiced in the Town. Prime agricultural soils are an important Town resource. In Highgate, the number of acres in active agricultural use is, approximately 42 percent of the total.

The Town of Highgate has a diverse agricultural sector which includes Choiniere Organics and Boucher Family Farm (Boucher Blue Cheese). According to the 2017 Grand List, there are approximately 54 farms in Highgate. This number has decreased by 11 since 1987. According to the US Census of Agriculture, there were 729 farms operating in Franklin County of which 12% are in Highgate. In 2002, there were 770 farms in operation in Franklin County. The loss of productive agricultural land may be due to the development of existing farmland for residential use which is currently more profitable for the individual landowners. This creates strong pressure for development, presenting landowners in Highgate with difficult decisions to make.

Future Land Use

Land Use Districts were delineated for the Town of Highgate. The Districts are conceptual (not necessarily site specific), have a 1 acre minimum and are the basis for the Zoning Districts; zoning bylaw updates closely follow the District delineation in the Plan. Referring to the District land use map, the intent of classification is as follows:

1) Agricultural District

The Agricultural District is designated for land best suited for, and primarily used for, agricultural purposes. This District includes the prime tillage areas, pastureland, and farm woodlots. Due to soil conditions and the District's location with respect to existing and anticipated land use patterns, much of this District remains economically viable for agriculture and should, to the extent possible, be preserved for agricultural use. Agriculture business (agribusiness) and limited residential uses are permitted so as not to interfere with, or materially alter, the primary character and designated uses of the Agricultural District.

2) Medium Density Residential

This District is intended to accommodate traditional country living characteristics. Due to the soil characteristics, terrain and highway access, the land in this zone must be put to a

lower intensity of use than the zone. A medium density of development should manage to preserve the environment and character of this zone, even though Planned Unit Developments are permitted as a conditional use. The highest densities in the classification should be located closest to village centers, where public water and sewer facilities can be provided most efficiently. Residential development should provide for a variety of dwelling types and for the needs of people of all income levels and ages.

3) *High Density Residential/Retail*

This District of high residential density consists of the locations within the Town where it is desired that development occur which can accommodate the majority of the population growth in Highgate. These Districts have been selected because of existing settlements, anticipated patterns, existing and future public facilities and services, suitable soils and other physical characteristics. The development of these districts with urban uses affords the best opportunity for the existing and future provision of economically feasible public facilities and services while providing an orderly separation of these uses from other legitimate land uses within the Town. High density residential, commercial and many public and quasi-public facilities and services are intended to develop in these Districts. This provides for the highest level of access to shopping for persons living in a multifamily housing environment, i.e. senior housing complexes. This District also provides the more concentrated forms of commercial use in village centers and restricts the tendency toward roadway "strip" development.

4) *Industrial/Commercial*

This District is intended to afford the opportunities of increased municipal tax base and employment opportunities in manufacturing, warehousing, and service functions for the citizens of Highgate and the entire region. It enables commercial uses that specifically serve the industries or their employers. The District needs to be serviced by good transportation facilities and public utilities. Single family dwellings and duplexes have been approved as conditional uses in this District. To service the industrial potential, Highgate may consider developing and maintaining adequate water supply, sewage disposal facilities, and roads for this District.

5) *Shoreline*

The Shoreline District in Highgate is shoreland along Missisquoi Bay. The purpose of the Shoreline District is to provide management policies reasonably consistent with existing development and use, to provide for the beneficial use of public waters by the general public, to provide a balance between the bay resource and bay uses including the protection of habitat and water quality, and to protect areas unsuitable for development. New residential development within this shoreline district should protect public access to the bay, be compatible with the visual quality of the area, protect existing vegetation, and not cause any water pollution problems. Outdoor recreation uses are encouraged. Expanding or new commercial development should not be permitted.

6) *Protected Areas*

Protected Areas are so designated to control development in unique and irreplaceable areas of natural beauty, where shallow soils, steep slopes, fragile vegetation, wetlands, or wildlife habitat may occur. Areas providing significant recharge to the ground and surface water supplies lie in this District. Because of the fragile resources and limitations to development, no community facilities and services (water and sewer) are provided to these areas. Limited compatible land uses could be permitted in this District, such as outdoor

recreational activities that do not involve large structures and forestry that does not create erosion problems or harm unique and fragile areas.

7) *Forest Reserve*

The purpose of the Forest Reserve District is to protect the natural resource value of a portion of Highgate that is essentially undeveloped, lacks direct access to collector roads, is important for wildlife and wildlife habitat, has potential for commercial forestry use, has one or more physical limitations to development, and includes significant natural, recreational, or scenic resources. Class III roads in the District are to be maintained but no Class IV roads are to be upgraded for at least the next five years. No further facilities or services should be considered for this district other than what has already been planned or established. This limits the residential development to only what can be accommodated by existing infrastructure. Outdoor recreational uses, conservation uses and forestry practices that are compatible with the District purposes and do not require additional facilities and services are permitted.

8) *Airport Overlay*

The purpose of the Airport Overlay District is to limit the height of objects in the vicinity of the Franklin County Airport and to prevent their interference with safe and efficient operations of the airport. In addition, the district is created to encourage and enhance the ability to establish associated industry and commercial uses as appropriate, and in conformance with the Airport Master Plan completed by the State of Vermont.

9) *Flood Plain*

The Flood Plain District is the area delineated on the Flood Insurance Rate Map for the Town of Highgate by the Federal Emergency Management Agency (FEMA). The requirements of this district are promulgated to minimize and prevent the loss of life and property, the disruption of commerce, the impairment of the tax base, and all extraordinary public expenditures required following flood disasters. Establishment of this zone is also meant to ensure that the design and construction of development in special flood hazard areas is accomplished in a manner that minimizes or eliminates the potential for flood damage. This District is to be administered according to the National Flood Insurance Program (NFIP), which is required for community eligibility in the NFIP and thereby ensures availability of flood insurance to property owners.

Emergency Services

The Town of Highgate utilizes the services of the Vermont State Police and the Saint Albans Police Department for public safety and law enforcement. The U.S. Customs and Border Protection also has a significant presence in town contributing to law enforcement efforts. Dispatching services are based out Central Dispatch in Saint Albans. Crime statistics for the region can be obtained from the Department of Public Safety – Criminal Justice Services. To provide additional coverage at MVU, the School received a grant for a full-time resource officer. The deputy officer patrols the school five days a week.

Firefighting and rescue services are two services that are absolutely essential for communities to function. The Highgate Volunteer Fire Department provides fire protection for the Town. The department has twenty-eight active members. The department is funded by Town appropriations, donations, and fundraisers. They offer fire safety and educational programs to local schools.

The fire station is a town-owned building located on Vermont Route 78 in Highgate Center along with the Municipal Offices. The 60 x 79-foot building is divided into four bays. The building has

room for an office/communications center, a training room, a maintenance area, and a storage facility. The meeting space is located in the municipal complex and is 30 x 22 feet in size. The fire station is adequate for the present inventory of equipment. However, as population growth continues, pressure may be placed on the department to expand.

The Department responded to 112 calls in 2018 with 1 call for a structure fire in Town. The department assisted with several Mutual Aid calls in neighboring towns.

Ambulance and rescue services are provided Highgate by Missisquoi Valley Rescue, Inc. (MVR), a nonprofit volunteer organization, based in the neighboring Town and Village of Swanton. The Town of Highgate contracts with Swanton for their ambulance services. MVR is dispatched by Middlebury. In 2013, the rescue squad responded to 231 calls from Highgate.

The nearest hospitals are the Northwest Medical Center in St. Albans, Copley Hospital in Morrisville and University of Vermont Medical Center in Burlington. The Northwest Medical Center offers a walk-in clinic in nearby Georgia, VT just of I89.

Energy

Electrical power resources are provided through the Village of Swanton and Vermont Electric Cooperative, which serve the home and business needs of Highgate. Power originates from Hydro Quebec, which sends power over major transmission wires (345 KV) to a converter station west of Highgate Center and north of the Missisquoi River. This "converter" acts to synchronize power support infrastructure with that of the Central Vermont Public Service Corporation; from there the generation of 115,000 volts serves the needs of one-fourth of Vermont. Swanton Village provides electric service using power from the Orman E. Croft Generating Plant located in Highgate Falls and from other sources purchased from VELCO. VELCO sells Swanton Village power converted at a 44,000-volt substation just north of the converter.

The converter lies adjacent to the site of a proposed industrial area in Highgate between VT 78 and VT 207 and the capacity of this utility may prove valuable in powering industrial and consumer needs for Highgate's future.

Vermont Gas has installed natural gas distribution lines from Lamkin Street to Highgate Center along VT Route 78. From there services continue north on Gore Road to the elementary school and east on Lamkin Street. The Town benefits from the natural gas lines extended to the center of Town serving municipal, residential, and business needs.

According to the American Community Survey (ACS 2011-2015) fuel oil is the most popular home heating fuel (56.0%); propane is second (22.6%); wood is third (16.8%); all other fuels is fourth (2.20%), electricity is fifth (1.4%), natural gas is sixth (1.0%). With the increased use of solar in the state, it is possible that several households have switched to this renewable resource in recent years.

Water Supply & Wastewater Disposal

Water is primarily supplied by individual wells and wastewater disposal is handled on an individual, on-site basis. There is no municipal water supply or wastewater treatment system in the Town. There are state regulations that must be met for proper waste disposal. Compliance with these requirements is crucial to the health and well-being of the community. The Town has 2 wastewater studies of the village and airport areas.

Currently, the Town uses culverts and ditches to handle stormwater drainage. Increasing areas of impervious surfaces (ex. paved, blacktop) has the potential to create more stormwater runoff and landslides since the water cannot be absorbed into the ground. As development occurs in Highgate, the current infrastructures' ability to handle the volume of stormwater should be monitored. If stormwater runoff is not managed properly it can impair water quality in local watersheds by carrying more sediment and pollutants into streams, rivers and lakes.

Solid Waste

The Town of Highgate has an approved Solid Waste Implementation Plan (SWIP). State statute requires all municipalities to adopt a SWIP, which emphasizes recycling and tracking disposal amounts and materials. Since most of the businesses are family owned and operated, there is strong support for the proper management of solid waste and recycling.

In 1987, the Town opened a sanitary landfill on 9.8 acres of Town owned land. The landfill remained open until July of 1992. At this time, the State of Vermont directed the closing of all unlined landfills, which applied to Highgate, and many other towns. During this same time, the Highgate Transfer Station and Recycling Center (HTS) opened. The Town signed a ten-year contractual agreement with Waste USA (WUSA) in June of the same year, which privatized solid waste management. Waste USA left the facility and contract at the end of 1994 and Casella began operating the facility in early 1995.

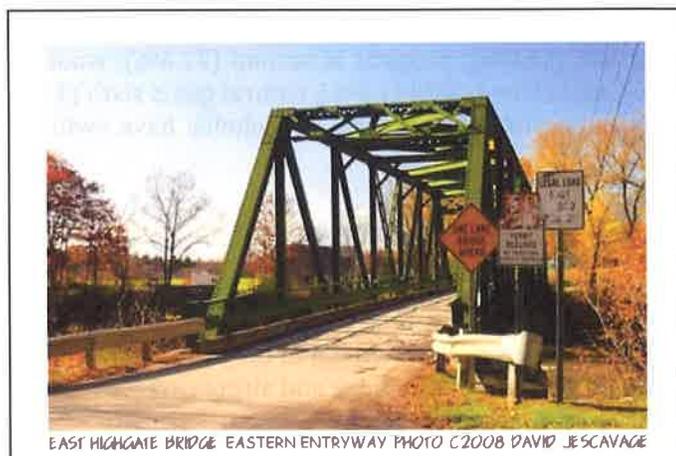
The Town owns the building and land while Casella operates all daily business. The land for the whole area for the transfer station and capped landfill is estimated at 11 acres with a land value of \$102,500. The buildings are valued at \$96,100.

The transportation of solid waste to the HTS is done by residents contracting a private hauler or by bringing the solid waste to the site in private vehicles. Casella then transports the product from the station to the lined landfill in Coventry, the Moretown Landfill or the Clinton County Landfill in New York State. Recycling is offered at the HTS for the duration of the Casella contract.

Transportation

Highgate is fortunate to have diverse transportation facilities with links to the Region, State, and Canada. The primary transportation mode is the roadway network, with Interstate 89 at the highest hierarchical level. Within the Town of Highgate, one I-89 Interchange (Exit 22) is available as the last on the facility before entering Quebec, Canada. The next southernmost interchange (Exit 21) lies within the Town of Swanton, 3.5 miles south and is readily accessible to Highgate.

There are 15.935 miles of State Highway in Highgate of which 7.735 are VT-78, 1.991 miles are VT-207 and 6.209 miles are US-7. There are 6.760 miles of Interstate 89 which parallels US-7 from North to South to the west of Town. There are 20.990 miles of Class 2 Town Highway and 42.540 miles of Class 3 for a total of 86.225 miles of traveled highways in Town (excluding Class 4 and legal trails).



Air and Rail: The Lamoille Valley Railroad and the Franklin County Airport are two transportation assets of future benefit to the community, particularly in the area of industrial development. The Franklin County Airport in Highgate is the region's sole public airport facility. The Airport has the advantage of being relatively close to Burlington International Airport (BIA) and Interstate 89. The airport has a runway extension scheduled for 2021 at the earliest. The new types of planes that will be utilizing the airport will require the Town Fire Department to acquire different fire protection equipment.

The Lamoille Valley rail corridor roughly parallels VT-78 from west to east. Under the direction from the Vermont Legislature following an assessment by Vermont Agency of Transportation, rail service has been abandoned, and the corridor rail banked. The corridor is leased to the Vermont Agency of Snow Travelers and developed into a multi-use trail. Upgrades to corridor are scheduled for the year 2015.

The Town uses Road Surface Management System (RSMS) to determine the condition of roadway surfaces for paved and unpaved surfaces. The Town has also conducted an inventory of culverts and bridges following Vermont State Bridge and Culvert inventory standards. The bridge and culvert inventory is updated on a semi-annual basis. This information provides the Town a greater percentage of cost-share from the State when receiving AOT grants. It is also used in the Town's capital planning efforts. The Vermont Agency of Transportation's Codes and Standards were adopted in 2013.

5. RISK ASSESSMENT/VULNERABILITY ANALYSIS

The risk assessment portion of a Hazard Mitigation Plan contributes to the decision-making process for allocating available resources to mitigation projects. 44 CFR Part 201.6(c)(2) of FEMA's mitigation planning regulations requires local municipalities to provide sufficient hazard and risk information from which to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.

Methodology

A vulnerability analysis for each community begins with an inventory of possible hazards and an assessment of the risk that they pose. These are the questions to be answered. What hazards can affect your community? How bad can it get? How likely are they to occur? What will be affected by these hazards? How will these hazards affect you?

The following is a description of the risk characteristics used to classify each hazard:

Frequency of Occurrence / Future Probability:

1. Rare: Unknown but rare occurrence
2. Unlikely: Unknown but anticipate an occurrence
3. Possible: 100 years or less occurrence
4. Likely: 25 years or less occurrence
5. Highly Likely: Once a year or more occurrence

Magnitude or % Community Affected:

0. Negligible: < 10% of developed area impacted.
1. Limited: 10% to < 25% of developed area impacted.
2. Critical: 25% to 50% of developed area impacted.

3. Catastrophic: > 50% of developed area impacted.

Health & Safety Impacts:

0. No health and safety impact
1. Few injuries or illnesses
2. Few fatalities but many injuries or illnesses
3. Numerous fatalities

Property Damage:

0. No property damages
1. Few properties destroyed or damaged
2. Few destroyed but many damaged
3. Few damaged but many destroyed
4. Many properties destroyed and damaged

Environmental Damage:

0. Little or no environmental damage
1. Resources damaged with short term recovery practical
2. Resources damaged with long term recovery feasible
3. Resources destroyed beyond recovery

Economic:

0. No economic disruption
1. Low direct and/or indirect costs
2. High direct and low indirect costs
3. Low direct and high indirect costs
4. High direct and high indirect costs

The risk estimation matrix (See Attachment A) for the Town derives a “relative risk score” using a qualitative process in which to compile estimates of the likely **frequency** of occurrence, the **extent** of the community that would be impacted, and the likely **consequences** in terms of public safety, property damage, economic impacts and harm to environmental resources. The total is considered this plan to constitute the relative risk score.

The hazards with the highest risk scores are flooding, severe winter storm (ice storm) followed by fluvial erosion/landslide. It should be noted that the community’s overall risk rating is low (225 out of a possible high of 935). Due to time and funding for the project, the Town chose not to profile in depth the remaining hazards list in Table 5.2 mostly because the remaining hazards are not considered high risk to the community. Additionally, for this update, the Town removed man-made hazards including hazardous materials, loss of electric service, terrorism/WMD, civil disturbance and telecommunications failure. The

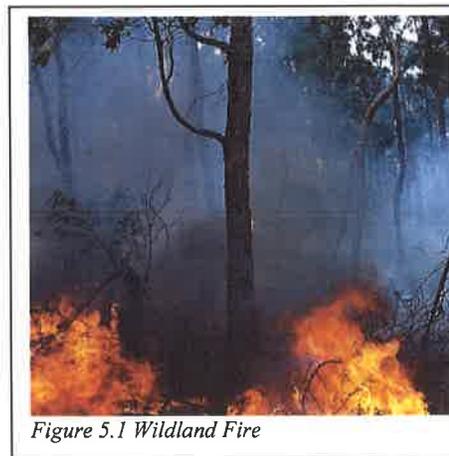


Figure 5.1 Wildland Fire

justification was that these hazards would fall under emergency preparedness and response activities.

Vulnerability assessments build on the identification of hazards in the community and the risk that the hazards pose to the community. The vulnerability assessment process examines more specifically how the facilities, systems of the town would be damaged or disrupted by the identified hazard. Vulnerability assessments are included in each hazard profile and in Table 5.2.

Each hazard was analyzed to estimate losses within the Town of Highgate. The results are included in each hazard profile and in Table 5.2. Human losses were not calculated during this exercise, but could be expected to occur depending on the type and severity of the hazard. Most of these figures exclude both the land value and contents of the structure. The data was calculated using FEMA's *Understanding Your Risks: Identifying Hazards and Estimating Losses* (August 2001). Damage estimates were made in 2013 and it should be noted that projected dollar losses change with inflation and time. As future development in Highgate is unpredictable at this time, it is uncertain as to how many future structures could be threatened by hazards.

Flooding

Description

Historically in Vermont, flooding has been the number one natural disaster in loss of life and property. In recent years, the intensity and severity of flooding appear to be increasing in recent years according to committee members given the annual cost of road repairs following flood events. Most flash flooding is caused by heavy rain from thunderstorms over a small area. The impacts are increased when ice or debris jams cause road infrastructure to fail (undersized culverts). Smaller creeks and streams are particularly vulnerable to flash flooding.

Flooding in Highgate typically occurs as inundation flooding and is caused by rainfall, rainfall mixed with snowmelt, ice jams, and by a combination of the three. Flash floods typically occur during summer when a large thunderstorm or a series of rain storms result in high volumes of rain over a short period of time. Higher-elevation drainage areas and streams are particularly susceptible to flash floods. Flooding is most likely to occur during the spring when snowmelt and rainfall cause water levels to rise. Major floods have occurred on the Missisquoi River during all seasons of the year.

Fluvial erosion is streambed and streambank erosion associated with physical adjustments of stream channels (width and depth) and is addressed under the fluvial erosion/landslides hazard profile.

Impact and Geographic Area of the Hazards

The Missisquoi River, Rock River, Hungerford Brook, Kelly Brook, Saxe Brook, Carmen Brook and Youngman Brook flow within the town of Highgate. Flood plains in Highgate follow along the brooks and creeks of undeveloped areas of forest lands and marshes and land that is in agricultural use. Flooding along the Missisquoi River, within the boundaries of the Missisquoi National Wildlife Refuge, is controlled by the floodwaters of Lake Champlain. Since the Refuge is primarily wetland, the water levels do not rise rapidly but disperse into a wide flood plain.

There are approximately 3.5 miles of developed Lake Champlain shoreline in Missisquoi Bay in northern Highgate. Much of the lakeshore is densely developed with a mix of year-round and seasonable residences. There are notable undeveloped sections at Highgate Cliffs Natural Area, the Missisquoi River Delta, and the Rock River outlet. There is a mix of year-round and seasonal

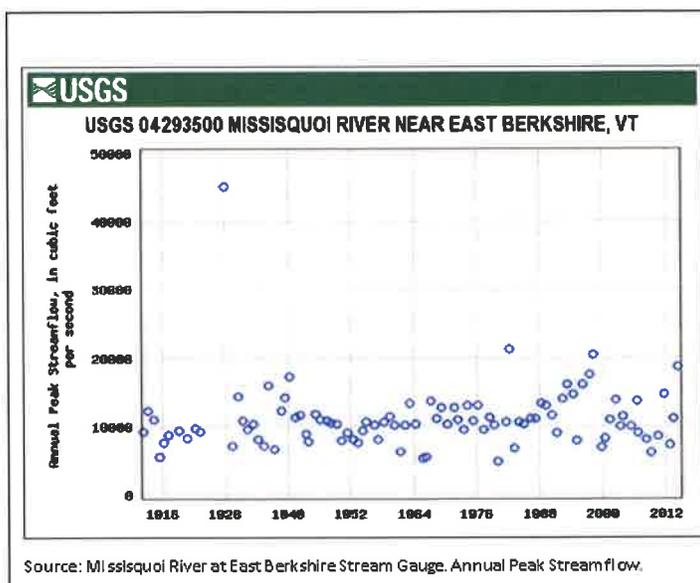
residences in the Highgate Springs area. Several of the properties are at risk of spring inundation flooding from Lake Champlain. Since the record-breaking Lake Flood event in 2011, many property owners have taken steps to flood proof their properties.

Ice jams typically happen during the late winter or early spring, but in recent years they have formed during early winter months. Ice jam related flooding on the Missisquoi River typically occurs upstream from the Swanton Village Hydroelectric Facility to East Highgate where the River almost forms and oxbow along Machia Road, Route 78 and Lamkin Street. Ice tends to build up in the bends of the river in this area. Route 78 is sometimes reduced to one lane from ice jams and water backing up and inundating the road. The section of Route 78 is monitored by VAOT when conditions warrant. Traffic is detoured from Route 78 to the Machia Road (TH4) across Bridge 25. No other structures along VT78 are at risk from the flooding. Since the highway is owned and operated by the state, the Town is not responsible for mitigation.

According to the National Climatic Data Center, there have been 16 recorded flash flood events and 30 flood events causing approximately \$9,605,000 and \$193,000 and 0 deaths respectively in eastern Franklin County between 1996 and 2019.

The town has an excellent history of road maintenance and inventory including culvert upgrades in addressing flooding problem areas.

Several residences lie near the floodplain but there is generally minimal damage when flooding conditions occur. Many buildings are built outside the floodplain for the most part, although many portions of private properties, mostly lawns, are in the floodplain and may be damaged. Residences along Monument Road have experienced flood inundation related damages during severe floods.



Transportation facilities that parallel the Missisquoi River are subject to periodic flooding, such as the sections of State Route 78 near East Highgate. Public Utilities such as water mains and electric lines as well as bridge crossings are also vulnerable to flooding damages.

Extent and Probability

There is a stream gauge on the Missisquoi River east of Town in Berkshire. This is the closest gauge to Highgate. The highest recorded measurement was 23.10 feet which occurred on November 3, 1927. Average height for this reach is about 12.59 feet.

According to the 2014 National Climate Assessment¹, the average annual precipitation in the United States has increased by approximately 5%. The Assessment also notes that northeastern

¹ <https://nca2014.globalchange.gov>

United States is projected to experience more frequent, heavier rainfall events. Using the assessment, the Vermont State Mitigation Plan notes that Since 1991, the incidence of these heavy precipitation events has been 30% above average. In Vermont, average annual precipitation has risen 0.7" per decade since 1895 and 1.5" per decade since 1960, suggesting an increasing trend in increased precipitation. Committee members agreed based on their observations that this trend was evident.

Flooding disrupts transportation systems which affect day-to-day life for many residents who have to travel outside of town for employment or for health care visits. Flash floods are likely to occur in Highgate in a limited area and have the potential for damaging Monument Road, VT78 and Route 7.

When Missisquoi River floods along the Monument Road, damages are typically flooded lawns and basements and the road becoming topped with water. Historically no severe (total loss) damages have occurred to properties but several were severely damaged (damaged/destroyed electrical appliances, sheet rock, structural damages) from ice jam related flooding in 2018. There have been considerable investments made in Highgate to flood proof properties and road infrastructure against flooding including a current project along the Monument Road.

Agriculture is an important and growing part of the economy. Flooding disasters pose a major threat to the industry. Severe flooding in October of 2017 (FEMA-4356-DR) had a significant impact across Franklin County, with severe damages in the Upper Missisquoi River Basin. The impacts from flooding substantially threaten the future agricultural viability of this part of the region. The failure of even a small number of farms would have a significant negative economic impact.

Severe weather can destroy crops, prevent farmers from planting or prohibit them from harvesting. It should be noted that agricultural crop damage insurance claims related to flooding have increased in recent years according to the USDA for farm-based businesses in Franklin County. USDA crop insurance data from 2017 demonstrates the severity severe floods. There were \$1,473,502 in loss claims in Franklin and Grand Isle Counties that year, which represents 17.14% of the total value of all insured crops. Since not all types of crops and stored crops are not covered by crop insurance, the actual losses from the disaster are likely even greater.

A GIS based overlay analysis was conducted using FIRM data with the Vermont E-911 data of structure locations. The results found that there are fifty (50) structures within the 100-year flood plain and none in the 500-year floodplain in Highgate. Seven (7) are mobile homes, one (1) classified as a commercial farm, twenty-nine (29) as single-family residential units, one (1) as industrial, nine (9) as camps, one (1) as gated with no building and one (1) as "other". This represents 3% of E-911 surveyed structures within the community.

Estimating flood damage of the 3% of structures with 20% damage is \$2,024,625. Cost of repairing or replacing the utilities, roads, bridges, culverts, and contents of structures is not included. Impacts to future populations, residences, new buildings, critical facilities and infrastructure are anticipated to remain the same.

Past Occurrences

The flood of November 3, 1927 is documented as the most severe flood in the town. Within the Missisquoi River Basin upstream from the Town of Highgate, the Village of Enosburg Falls recorded 6.35 inches of rainfall. The Missisquoi River rose 17 feet over the Highgate Falls Dam. Several bridges along the Missisquoi River were swept away and various businesses were damaged by the

flood. Other floods of minor impact occurred causing relatively minor damage to the community specifically in 1936 and 1940.

Based on discussions with local residents, significant flooding occurred in 1984.

The winter storm that occurred on January 15, 1996 (FEMA 1101-DR) triggered flooding throughout the Town and County. The flooding damaged many roads throughout Town.

During the night of July 14 through to the morning of July 15, 1997, heavy rain fell continuously throughout eastern Franklin County (FEMA-1184-DR). Several roads, bridges and culverts were damaged in Town. There are no records of damage costs available.

In 1998, above average precipitation events occurred in January, March and April. On August 11, 1998, a warm air mass produced a torrential downpour causing widespread flooding in Town. Several roads were closed in Town.

Mild weather produced rain and melting snow on January 24, 1999. The conditions resulted in a few rivers reaching or exceeding their banks during Sunday

Based on interviews with local residents, there was also a relatively large flood event which occurred on June 5th, 2002. Several roads were flooded. There are no damage costs available.

There were three flood events in 2004. The Burlington Weather Service reports that 2004 was the third wettest summer on record. On September 23, 2004 a disaster declaration (FEMA-1559-DR) was declared due to severe storms and flooding from August 12th through September 12th, 2004. Franklin County was included in the disaster declaration. Flooding occurred as a result of heavy rain produced from Tropical Storm Francis.

On October 15, 2005 an ocean storm system moved to northern New England bringing heavy rain. There was approximately 2.5 inches rainfall across Franklin County. Minor river flooding of the Missisquoi resulted in minor low land flooding. The river gage at East Berkshire exceeded flood stage during this period.

A powerful storm tracked northeast across Ontario and Quebec provinces on January 18, 2006. Ahead of this storm, brisk south winds caused temperatures to rise into the 40s creating snow melt. Widespread rainfall of 1.5 to 2.5 inches fell during the night and continued through the early afternoon of the following day. Increased run-off caused widespread field flooding and ponding of water on local roads. Localized ice jams along the Missisquoi River near East Highgate caused flooding and left large ice chunks along Route 78 and Route 105 between Enosburg and Berkshire. There was an estimated \$10,000 in damages.

May 2006 experienced above normal monthly rainfall amounts. A two-day heavy rainfall event on May 18 and 19, 2006 brought of 3 to 5 inches of rain in Franklin County with locally more than 6 inches along the western slopes of the Green Mountains at nearby Jay Peak. Widespread flooding occurred from May 19th to the 20th resulting in numerous flooded roads, as well as some road and culvert washouts.

A series of storms affected the entire state from June 14-17, 2008, (DR 1778). Stronger storms on Monday June 16 produced up to 1-inch hail. These storms also produced heavy rainfall, but were moving more quickly. No flooding resulted. On Tuesday June 17th strong thunderstorms produced

pea sized hail and heavy rain in the Trout River basin in northwest Vermont. Flash flooding occurred in the eastern parts of Franklin County.

The year 2011 was a record year for flooding in the state of Vermont. The first floods occurred over a two-week period in April and May of 2011 (DR 1995, 4043). These floods impacted the northern half of the state, including the counties of Addison, Chittenden, Essex, Franklin, Grand Isle, Lamoille, Orleans, Washington, and Windham. The damage totaled over \$1.8 million in FEMA assistance. In the spring, heavy rains in late March/early April on top of a deep late season snowpack resulted in riverine flooding and sent Lake Champlain well over the 500-year flood elevation breaking the 140-year-old peak stage elevation. Additional spring runoff events resulted in Lake Champlain being above base flood elevation for more than a month. High lake levels coupled with wind driven waves in excess of 3 feet resulted in major flood damages for shoreline communities.

Additionally, flooding and fluvial erosion caused by Tropical Storm Irene in late August 2011 was catastrophic, destroying property and taking lives, and again eliciting a disaster declaration (DR-4022). The details and impacts of Tropical Storm Irene are provided in the Hurricanes/Tropical Storms section of this risk assessment. However, it is important to underscore that the majority of damages resulting from Tropical Storm Irene were due to flooding and fluvial erosion.

On June 9-10, 2015, a cold front was stalled across the Adirondacks in New York and central Vermont producing repeated periods of heavy rain. Early morning rainfall, of one to two inches, saturated the ground and brought streams and ditches to bankful. An additional inch or more later in the day exacerbated conditions. Morey Road at intersection with Brousseau Road was washed out from flooding. The Town accessed AOT Emergency Funding to make repairs to the road in compliance with Town Road Standards.

In addition to free-flowing flood events, there is documented history of ice jams. On March 6, 1979 an ice jam event resulted in a flood elevation 3 feet above the November 3, 1927, flood.

From March 31 to April 3, 2005, an ice jam occurred on the Missisquoi River which resulted in minor flooding of Route 78 in East Highgate. Route 78 was closed to through traffic. There was minor flooding of low-lying areas and fields. There was an estimated \$1,000 in damages.

On January 13, 2018, rapidly rising water from an ice jam on the Missisquoi River caused some serious flooding for residences along Monument Road in Highgate. A rapid winter thaw on January 12 caused snowpack and ice on the Missisquoi River to rapidly melt creating an ice jam in East Highgate and just downstream from Highgate Falls. In the early morning hours of January 13th, the ice jams caused the river to back up thus spilling icing waters on to Route 78 in Swanton and Monument Road in Highgate. Multiple agencies and departments worked together to save 35 people in Swanton and Highgate stranded from their homes as water rose. Many of the properties were damaged and several received substantial damages on Monument Road. No one was injured or killed. A similar event occurred in mid-February and many of the properties that were flooded on the 13th, were flooded again. One homeowner considered a buyout but decided against it due to the timeliness of the process.

Floods are a reminder to the residents of Highgate of the power inherent in nature. Floods are an urgent reminder of the need



EAST HIGHGATE BRIDGE STEEL DOUBLE SPAN PHOTO 2008 DAVID JESCAVAGE

for proper management and appropriate use of critical floodplain areas. Development within floodplains poses significant risks and should generally be avoided. River channels and floodplains function as a single hydrologic unit, periodically transferring floodwaters and sediment from one to the other. Appropriate uses of floodplains are those that can accommodate this cycle. Examples of uses that are appropriate to floodplains include agriculture, open space, and recreation.

In addition to the previously mentioned road structure projects, the Town has identified the following priority road projects to address flooding issues. The projects identified were selected due to the frequency of maintenance and road repairs on each road following rain events. The projects include the Transfer Station property stabilization and St. Armand Road culvert upgrade.

St. Armand Road between Route 7 and Ballard Road is prone to flooding from Rock River. There is some visible evidence of damage to bridge structure during past high flow events. There is the potential for channelization and overflow at bridge crossing. This structure was identified during the Phase 2 Stream Geomorphic Assessment as “constricting the bankful channel width”.

Transfer Station Road and transfer station property experienced damaging rains in the spring of 2003 and in late April and early May 2011 and again in late August 2011. These events caused damages to the slope that supports the northerly embankment of the Transfer Station Road and the adjacent capped landfill. The slope continues to slowly erode downward toward an intermittent brook. The Town recommends reestablishing a structurally sound slope that will safely support the Transfer Station Road and prevent future slope failure.

The Town of Highgate has an NFIP compliant floodplain ordinance, which gives residents access to discount flood insurance and enables the Town to regulate development within the SFHA. SFHAs are subject to inundation by the 1% annual chance flood (100-year flood). Official Special Flood Hazard Area (SFHA) maps from FEMA can be found in the vault at the Town Office or online at the FEMA Map Service Center.

Severe Winter Storm (Ice Storm)

Description

In northwestern Vermont where Highgate is situated, a severe winter storm can last for several days and can be accompanied by strong winds

creating blizzard conditions with blinding wind-driven snow, severe drifting, and dangerous wind chill. Strong winds, accumulations of ice and heavy snow can knock down trees, utility poles, communication towers and power lines. Communications and power can be disrupted for days while utility companies work to repair the extensive damage. People have been trapped at home for up to two weeks, without utilities or other services.

Impact and Geographic Area of the Hazard

The primary impacts of a winter storm (ice storm) typically includes disruptions to transportation networks due to fallen limbs and trees, school closings and occasionally telecommunications and power outages. Communications and power can be disrupted for days while utility companies work to repair the extensive damage. Even small accumulations of ice may cause extreme hazards along roadways.

Burlington, Vermont Top 10 Fall Snowfall Totals Sep-Nov					
Highest			Lowest		
Rank	Snowfall	Year(s)	Rank	Snowfall	Year(s)
1	24.0"	1900	1	0	2009/1948/1937/1915
2	23.0"	1921	2	0.1"	2004
3	21.9"	1906	3	0.4"	2010/1953/1930
4	20.4"	2002	4	0.5"	2003/1946/1941/1934/1918
5	19.4"	1910	5	0.7"	1999/1960/1894
6	19.2"	1971	6	0.8"	1982
7	18.8"	1968	7	0.9"	1988/1929
8	16.1"	1997	8	1.0"	1931
9	16.0"	1977	9	1.3"	1964
10	15.6"	1969	10	1.4"	1939

Source: National Oceanic and Atmospheric Administration

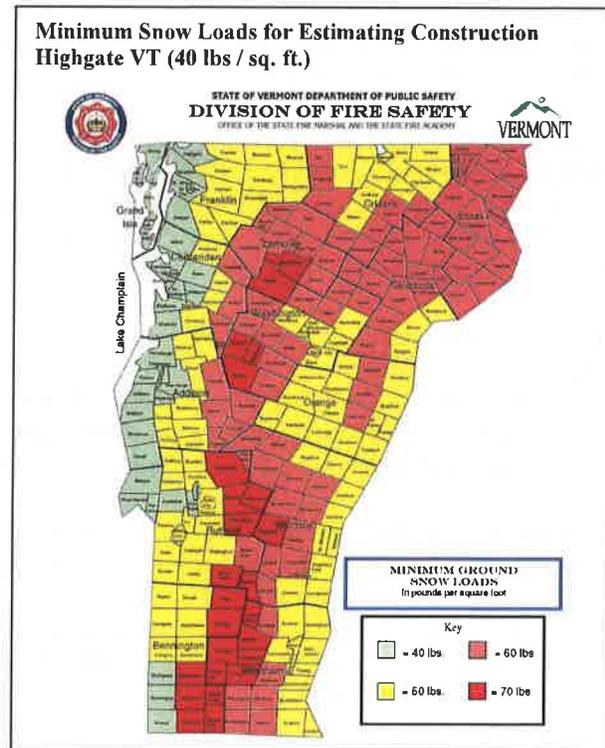
Winter storms / ice storms affect the entire Town and generally cause disruptions to public and private services. Construction standards for snow load (see map below) indicate that structures in Richford should be built to withstand loads of 50 pounds per square foot. At that point, design standards would be exceeded and the structure runs the risk of collapse. Given this standard, a snowstorm which dumped 40 inches of snow or 10 inches of ice would likely result in a few collapsed roofs, especially on structures which are not built to these standards.

Extreme cold often accompanies a severe winter storm or is left in its wake. Prolonged exposure to the cold can cause frostbite or hypothermia and become life-threatening. Infants and elderly people are most susceptible. Even small accumulations of ice may cause extreme hazards along roadways. Heavy snowfall and blizzards can trap motorists in their cars. Attempting to walk for help in a blizzard can be a deadly decision.

Extent and Probability

The National Weather service defines a blizzard as “a storm which contains large amounts of snow or blowing snow, with winds in excess of 35 mph and visibilities of less than 1/4 mile for an extended period of time (at least 3 hours). Some of the worst historical storms in Highgate have left snow depths of 14” (March 2001), wind speeds up to 40 mph (January 1998), and ice accumulations of 2-4” (January 1998 and December 2013).

The primary impacts of a storm typically include the disruption to transportation networks, school closings and occasionally telecommunications and power outages. Vulnerable populations such as the elderly, those dependent on medical equipment and specialized health or physical care are at risk to winter storms. Farms and associated structures and livestock are at risk. Barns can collapse due to heavy snow loads. Dairy cattle are susceptible to mastitis if they are unable to be milked.



Severe winter storms/ice storms occur annually in Highgate, typically in the form of a Nor'easter. Nor'easters occur most often in the winter and early spring, but also sometimes during the fall. These storms can leave inches of rain or several feet of snow on the region, and sometimes last for several days.

The Town's recent history has not recorded any loss of life due to severe winter storms (ice storms). These random events are difficult to set a cost to repair or replace any of the structures or utilities affected. Impacts to future populations, residences, new buildings, critical facilities and infrastructure are anticipated to remain the same.

Past Occurrences

A FEMA declared disaster (FEMA 1101-DR-VT) for the county was made following a January 19th, 1996 winter storm. A warming trend produced heavy rains causing rapid snow melt that led to flooding.

On January 5, 1998, intermittent freezing rain developed over northern New York and New England. The freezing rain and drizzle became steadier on January 7 and continued through January 9. The overall weather pattern of the ice storm was caused by a low-pressure system that developed in the Gulf of Mexico. The low pressure had moved northward to the Great Lakes area and then into Quebec by the morning of January 10. In Highgate, snow turned to freezing rain. This storm is referred to as the Ice Storm of 1998 (FEMA-1201-DR-VT). Intermittent freezing rain, freezing drizzle, rain, drizzle, and snow persisted during the 5-day period before skies cleared. On January 11 a drier cold front moved in.

Another low-pressure system moved through the area on January 12, 1998 followed by strong and gusty west to northwest winds. Maximum wind gusts were generally between 30 and 40 mph, but higher gusts were reported. These winds caused additional damage to the trees that were still laden with ice. The town experienced wide spread power outages and treacherous driving conditions during this period.

A major snowstorm occurred on March 5th and 6th, 2001 resulted in 14 inches of snow in Highgate. The storm began early Monday morning with a brief burst of snow then transitioned during the midday hours to intermittent light snow, sleet, freezing rain and rain. The storm developed into a nor'easter during the afternoon and continued through the evening. Damage estimates for cleanup are unknown.

A rare autumn Nor'easter struck Franklin County on October 25, 2005. The Nor'easter was fed by the remnants of Hurricane Wilma. There were reported snowfall amounts in the County varied from 6 to 14 inches. Trees still laden with fall foliage, were downed due to the weight of heavy, wet snow. There were many reports of snapped power lines from downed trees and branches. Many homes serviced by Vermont Electric Cooperative were without power for several days.

On February 14, 2007 a winter storm blanketed most of New England. In Vermont, snow fell heavy at times from late morning through early evening before dissipating during the night. Snowfall rates of 2 to 4 inches per hour and brisk winds of 15 to 25 mph caused near whiteout conditions at times, along with considerable blowing and drifting snow, making roads nearly impassable. Temperatures in the single numbers combined with brisk winds created wind chill values of 10 degrees below zero or colder in Highgate.

On December 22, 2010, Vermont received a Presidential disaster declaration (DR 1951) to supplement state and local recovery efforts in the areas struck by severe storms during the period of December 1-5, 2010. FEMA's public assistance funds were made available to affected counties including Franklin County.

During December 20-26, 2013 (DR-4163) a wide-spread low-pressure system that brought snow and freezing rain through Ontario, Quebec, and Northern New England. These areas experienced an ice storm that brought wide-spread power outages. Many Towns throughout Franklin County, Vermont were affected by the ice storm. Vermont Electric Cooperative responded to over 60,000 customer outages during the week and estimated costs of restoring power at \$7,400,000. In Highgate, the highway department was active keeping roads open and removing ice damaged trees and limbs from local roads. The Highgate Elementary School was opened as a community shelter. Several residents were without power for several days.

February 29, 2015: Snow overspread Vermont around Midnight on December 29th and ended by mid to late afternoon, changing to sleet and freezing rain before ending. Snowfall amounts across the area was 3 to 7 inches with limited icing. A combination of snow and sleet accumulated 3 to 5 inches across Franklin county along with some light freezing rain at times.

February 12-13, 2017: Widespread snow moved across Vermont during the morning hours, becoming steadier/heavier for much of eastern VT during the 4th. Wraparound snowfall during the night of the 4th and the day of the 5th added snowfall to Vermont's northern peaks and western slope communities. Overall snowfall statewide was 3 to 7 inches with upwards of 8-12 inches along the northern western slopes of the Green Mountains.

January 4, 2018: Widespread snow moved across Vermont during the morning hours, becoming steadier/heavier for much of eastern VT during the 4th. Wraparound snowfall during the night of the 4th and the day of the 5th added snowfall to Vermont's northern peaks and western slope communities. Overall snowfall statewide was 3 to 7 inches with upwards of 8-12 inches along the northern western slopes of the Green Mountains.

Burlington, Vermont Top 10 Winter Snowfall Totals Dec-Feb					
Highest			Lowest		
Rank	Snowfall	Year(s)	Rank	Snowfall	Year(s)
1	103.4"	2007-08	1	18.4"	1912-13
2	97.9"	2010-11	2	20.4"	1979-80
3	96.9"	1970-71	3	21.9"	1928-29
4	90.1"	2009-10	4	23.6"	1936-37
5	81.7"	1965-66	5	24.0"	1898-99
6	80.7"	2003-04	6	25.0"	1904-05
7	80.0"	1957-58	7	25.6"	1940-41
8	79.4"	2008-09	8	26.3"	2011-12
9	78.6"	1946-47	9	27.0"	1900-01
10	75.7"	1969-70	10	27.4"	1960-61

Source: National Oceanic and Atmospheric Administration

January 13, 2018: Rapidly falling temperatures overnight into Saturday morning accounted for rain changing to freezing rain, sleet then snow. Significant sleet occurred in the Champlain Valley and much of central VT with 4 to 8 inches of snow as well across northwest VT. Sharply falling temperatures allowed for a flash freeze of area roads making for extremely hazardous travel.

The main impacts of this storm were flooding from ice jams and are profiled under the flooding section below.

Burlington, Vermont Top 10 Spring Snowfall Totals Mar-May					
Highest			Lowest		
Rank	Snowfall	Year(s)	Rank	Snowfall	Year(s)
1	52.7"	1933	1	0.1"	1945
2	47.8"	2001	2	1.0"	1903
3	45.7"	1971	3	2.0"	1910
4	37.7"	1974	4	2.7"	1927
5	36.4"	1916	5	3.1"	1934
6	36.1"	1997	6	3.2"	1991
7	34.4"	1994	7	3.9"	1946
8	33.9"	1983	8	4.0"	1905
9	31.0"	2007/1972	9	4.1"	1915
10	30.1"	2011	10	4.2"	1921

Source: National Oceanic and Atmospheric Administration

November 27-28, 2018: Precipitation moved into the North Country on the afternoon of November 26th, falling as snow at elevations above 1500 feet and rain at lower elevations. By early morning of November 27th, the atmosphere cooled enough to allow for precipitation to changeover to snow. Highest snowfall totals at elevations above 1500 feet, where more than 12-15 inches fell. In Franklin county, snow accumulated 4 to 8 inches. The heavy wet snow accounted for more than 40,000 outages, effecting 100,000 customers without power due to snow

loading on power lines

March 22, 2019: Heavy wet snow fell across Franklin county with snowfall totals of 5 to 15 inches with the higher totals in the higher elevations, especially along the western slopes of the Green Mountains. Some specific totals include; 14 inches in eastern St. Albans, and 6 inches in Highgate.

Fluvial Erosion and Landslides

Description

Fluvial erosion is the natural process of the wearing soil, vegetation, sediment, and rock from the river channel bed and banks by the action of water. Erosion is an ongoing natural river process. A landslide is defined as the movement of a mass of rock, debris, or earth down a slope. Landslides are any large down-slope movement of soil and rock under the direct influence of gravity. The rate of fluvial erosion and landslides is affected by local soil type, slope, precipitation, and volume. Additionally, specific to fluvial erosion is the velocity of stream or river discharge. Other natural or human activities accelerate the natural rate of erosion and landslides, such as large storm events, removal or alteration of riparian vegetation, modification of runoff flow patterns, and physical alteration of land within the floodplain or slope and the active river area.



Impact and Geographic Area of the Hazard

The impacts of both fluvial erosion and landslides are significant to town by disrupting transportation systems, threatening solid waste management, causing damages to the environment including water quality and economic impacts to both public and private entities related to repair and maintenance of failing slopes. There have been no fatal impacts. Financial impacts to individuals and families are significant. In 2015, two property owners took part in a home buyout when their homes were threatened by the sudden onset of a landslide far above the Missisquoi River.

In many areas of Highgate, the soil composition is primarily sand on top of clay. Precipitation and snow melt permeate the porous upper layers of sand and then settles on top of the clay layer. This causes the upper sand layer to slide off the denser clay layer along stream banks and hill slopes through town. Woody debris roots help anchor the soil to the slopes and when it is removed, there is little to hold the soil in place exacerbating bank erosion and land slide conditions.

This is particularly evident in Highgate Center, East Highgate and Monument Road along the banks of the Missisquoi River. In Highgate Center, the Highgate Transfer Station area has a history of small slumping slopes and landslides due to the soil conditions. The Machia Road in East Highgate has a history of road shoulder repairs and stream bank stabilization measures due to landslides and fluvial erosion. Fluvial erosion from flood events over the past 9 years has weakened the road shoulders along the Monument Road in places. The Transfer Station Road, Machia Road and Monument Road have been closed due to the threat of road failures from erosion of the shoulders.

Local interviews noted that extensive bank erosion occurred in selected locations along the Missisquoi River and Rock River. Fluvial erosion and landslides were reported to have undermined the few remaining trees along the banks of the Missisquoi and many large trees have been lost into the river. Associated with bank erosion, river channels have become wider and shallower in recent years.

Extent and Probability

Fluvial erosion and landslides are becoming more common within the town and the region. Historic land uses within the Missisquoi River and Rock River watersheds, including flood plain encroachments and woody debris removal on stream banks and slopes have increase the risk of erosion and landslides. The committee noted that there is a high annual probability of fluvial erosion and landslides occurring in Town.

The Town has been working with the FEMA, Vermont Emergency Management, the State Geologist and Vermont Agency of Natural Resources to address the slope stability problems with the parcel of landfill that encompasses the closed Highgate Landfill and the Highgate Transfer Station. Due to sandy soils and groundwater discharges, the steep slopes have been prone to erosion and landslides. The work is being performed under FEMA's Hazard Mitigation Grant Program. Cost estimates to fix two sites are \$2,800,000 based on BCA for FEMA application and engineering designs. The BCA also noted that costs to repair the closed landfill if damages by another landslide are estimated to be \$6,779,000.

Fluvial erosion hazard mapping was released by the VT Agency of Natural Resources (ANR) in early December 2014. This mapping could be used to assist municipalities in developing bylaws and effective mitigation strategies to regulate development within fluvial erosion hazard zones. The Town of Highgate is considering developing a river corridor bylaw, which could be incorporated into their zoning regulations. This bylaw would be considered interim for the river corridor criteria set by Vermont Agency of Natural Resources and Vermont Emergency Management (VEM). The Town Zoning Bylaws do

There are many areas throughout Town where stream bank erosion is causing in - stream sedimentation. It is noted in the 2007 Geomorphic Assessment of Rock River and tributaries that stormwater runoff and sedimentation would be decreased following road maintenance practices such as stabilization of road surfaces (different gravel materials), improvement of roadside ditches (excavation, stone lining and/or seeding and mulching), alternative grading practices (turnouts,

check-basins); re-orientation of culvert crossings; and protection of culvert headers. In agricultural settings, increased flows from drainage tiles, ditches and erosional gullies can be addressed through design and retrofitting of tile networks to provide for energy dissipation at tile outlets; gully stabilization; and consideration of crop rotation or alternative farming practices that reduce the need for drainage tiles.

Past Occurrences

On July 14–16, 1997, flooding in northern Vermont caused severe local damage and resulted in a Presidential disaster declaration (FEMA-1184-DR-VT). The erosion and deposition were significant at numerous locations. Local officials and residents are concerned that the accumulation of sand, gravel, and cobbles in stream channels magnified the severe flooding. Currently, Vermont stream-management policies restrict the removal of these materials.

In 2003, the transfer station experienced bank erosion along 100 feet of bank. The erosion threatened some of the buildings. The town hired an engineering firm and contractor to stabilize the bank in 2003 through rip rap, erosion matting and planting vegetation. In May 2011, a landslide at the ravine located on the northern edge of the landfill road near the northern side of the existing closed landfill occurred. The slope was stabilized and drainage was installed to prevent future landslides along the slope. Another landslide occurred in 2019.

During a prolonged rain event in June 2008 (DR 1778), flooding occurred along many streams and tributaries. Evidence of stream bank scouring near bridges along the Missisquoi River and Rock River were identified by the town's highway department. The transfer station experienced 100 feet of bank erosion. The erosion threatened some of the buildings. The town hired an engineering firm and contractor to stabilize the bank in 2008 through rip rap, erosion matting and planting vegetation.

Northern Vermont experienced record rainfalls during the spring of 2011 (DR1995 and DR4043). High precipitation combined with snowmelt resulted in prolonged saturated conditions and significantly elevated and/or perched water tables. The saturated ground and high-water table conditions contributed to slope instability and landslides at several locations throughout northern Vermont. In Highgate, the saturated conditions combined with steep natural terrains and unique geologic conditions, resulted in three landslides. The slides occurred on and after May 4th following a period of prolonged rainfall. The landslide activity occurred on a slope adjacent to the Town Landfill along Transfer Station Road, at the power line corridor adjacent to Route 207, and on a northerly slope (100 feet wide x 45 feet wide with a top thickness of approximately 10 feet) adjacent to Brosseau Road (TH6).

In August 2011 (DR-4022), flooding during Hurricane Irene caused a massive landslide around the landfill. The slope was built back with stone and graded. The stream at bottom is blocked by sediment. The town used excavators to channel the stream, but the stream flow has been greatly restricted. A tile drain was installed. Water flows off the parking area down SW bank, causing gully erosion.

June 10, 2015: Flash flooding from heavy rainfall occurred along the western slopes of the Green Mountains in northwest Vermont. Repeated periods of heavy rain (2-3") through the night on June 9th into early morning (1") on June 10th, brought streams and ditches to bankful. Brosseau and Morey Roads in Highgate VT were damaged and closed due to washouts.

January 13, 2018: Above average temperatures on January 12 caused rapid snowmelt across northern Vermont. Rapidly falling temperatures overnight into Saturday morning accounted for rain changing to freezing rain, sleet then 4-8" snow in NW Vermont. The conditions caused a large ice jam to form along various point of the Missisquoi River. A large ice jam formed on the Missisquoi River in the Village of Swanton, VT, extending from below the Route 78 bridge upstream for several miles. Numerous structures were impacted with dozens of homes evacuated. State Route 78 was closed for nearly 24 hours due to high water. Several of the impacted homes were heavily damaged.

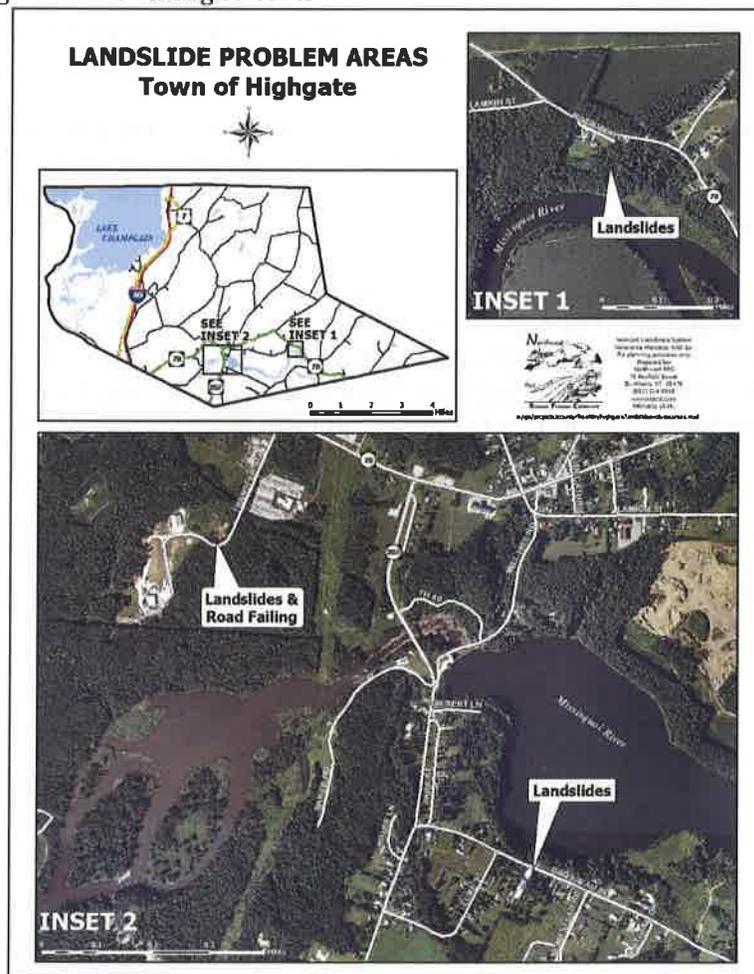
The Town of Highgate has not mapped fluvial erosion hazards. Such data could be used in a GIS overlay analysis to estimate potential losses similar to flood losses. The town is considering incorporating a landslide overlay district as part of the zoning bylaws. Fluvial erosion and landslide hazard maps could be used as a tool for Town planners to guide development away from areas that pose a high risk of erosion and landslides.

Additionally, to mitigate the rates of erosion, riparian buffers of woody vegetation could be cultivated along stream banks. Selective armoring of the lower portions of stream banks would very likely be needed until a dense root system develops. Currently, several working farms within Town utilize buffer strips to mitigate erosion along streams.

Flooding during Irene caused massive landslide along the Transfer Station Road. The road has been built back with stone and graded to approximately a 60-degree angle. The stream at the bottom of the slope was blocked by sediment. Excavators were used to channel the stream, but the flow has been greatly restricted.

A grassy area on top of the landfill site now has a surface drain and a tile drain was also installed. Storm water flows from the parking area down the southwest bank, causing gully erosion. In some places the erosion is 8" deep. The Town would like to mitigate this erosion/landslide risk.

In 2017, the Transfer Station Road was repaired and a new drainage pipe was installed. However, the pipe came apart and will need to be



replaced/repared before further damage is done to the road and slope. The Town is aware of the issue and working on mitigating the erosion/landslide hazard.

Loss estimates for this hazard are unavailable due to insufficient data. Future plan updates will reflect any changes in data for estimating losses. Impacts to future populations, residences, new buildings, critical facilities and infrastructure are anticipated to remain the same as the Town is proactive in addressing the impacts of this hazard.

The maintenance and enhancement of streamside and lakeside vegetation is the easiest and most effective means of protecting the many benefits and values associated with Highgate's waters. Thus, the Town of Highgate's Development Regulations require that an undisturbed naturally vegetated buffer strip be maintained from the shores of lakes and ponds. This will reduce the risks of fluvial erosion hazard areas by allowing for the natural movement of the river corridor and it will stabilize stream banks and hold soils in place.

Severe Thunderstorm (High Winds, Hail, Lightning)

Typically, high winds accompany strong thunderstorms that often generate lightning and/or hail. Micro bursts with high wind speeds and high precipitation accumulations over brief periods often down trees and branches and power lines and can overwhelm local drainage networks for brief periods. There are rare instances where lightning has caused structure fires (barns) and grass fires during dry periods. The Town's road crew is equipped with associated debris removal equipment.

Death or serious injury could occur to individuals exposed to lightning. Private properties in Highgate have experienced lightning strikes. High elevations and areas around bodies of water such as lakes and ponds are more susceptible. The Town's Highway Department has appropriate debris removal equipment.

There are no loss estimates for lightning because it is extremely difficult to predict where the event will occur and the type of associated structural damage. Damages could come in the form of destroyed electrical appliances, structure fires, or wildland fires. Impacts to future populations, residences, new buildings, critical facilities and infrastructure are anticipated to lessen with the implementation of U.S Lightning Protection Codes and Standard which are used State fire inspectors.

High Winds

High winds are a hazardous threat to the town and most commonly accompany other storm events. Violent windstorms are possible in Highgate. The Town is far inland and is unlikely to receive a direct hit from a hurricane, however high winds and hail storms have occurred in Town as weakened tropical storms track near the region.

The National Weather Service (NWS) issues a wind advisory when winds are sustained at 31 to 39 mph for at least one hour or any gusts 46 to 57 mph. Winds of 58 mph or higher cause the NWS to issue a High Wind Warning. In Vermont, high winds are most often seen accompanying severe thunderstorms. In fact, straight-line winds are often responsible for most of the wind damage associated with a thunderstorm. These winds are often confused with tornadoes because of similar damage and wind speeds.

Typically, high winds accompany strong thunderstorms that often generate lightning and/or hail. Micro bursts with high wind speeds and high precipitation accumulations over brief periods often

down trees and branches and power lines and can overwhelm local drainage networks for brief periods. There are rare instances where lightning has caused structure fires (barns) and grass fires during dry periods.

High winds track generally occur from weather systems that track west to east over the Champlain Valley. High winds are common along the Missisquoi River corridor, as well as the shoreline areas of Lake Champlain to the west and north of Town.

Power lines and trees are most vulnerable to high winds. Power outages may occur resulting in significant loss of business as well as threatening public safety. The town has a limited ability in quickly restoring lost power caused by damaging high winds. Cleaning up debris following high wind events can be costly depending on the severity of the event.

Hail

A damaging phenomenon from thunderstorms is hail. Hail is typically a localized event and can cause a large amount of damage over a short period. There is no area in Town more susceptible to hail damage than other areas. Power outages may occur resulting in significant loss of business as well as threatening public safety. Cleaning up debris following high wind events can be costly depending on the severity of the event. Farmers have sometimes called hail the “white plague,” because entire fields of crops can be destroyed in minutes.

The impacts of hail storms are difficult to predict due to the randomness of the event. It is difficult to set a cost to repair or replace any of the structures or utilities affected. Every structure is susceptible to damage. There are no defined areas where this event will occur. Impacts to future populations, residences, new buildings, critical facilities and infrastructure are anticipated to remain the same.

BEAUFORT WIND CHART (SOURCE: NOAA)

Beaufort Number	Wind Speed Range (mph)	NOAA Terminology	Description
0	0	Calm	Smoke rises vertically.
1	1-3	Light air	Direction shown by smoke but not by wind vanes
2	4-7	Light breeze	Wind felt on exposed skin; leaves rustle.
3	8-12	Gentle breeze	Leaves and small twigs in constant motion; wind extends light flag.
4	13-18	Moderate breeze	Raises dust and loose paper; small branches are moved.
5	19-24	Fresh breeze	Small trees sway.
6	25-31	Strong breeze	Large branches in motion; umbrellas used with difficulty
7	32-38	Near gale	Whole trees in motion, inconvenience felt when walking against the wind.
8	39-46	Gale	Breaks twigs off trees. Cars veer on road. Generally, impedes progress
9	47-54	Severe Gale	Light structural damage.
10	55-63	Storm	Trees uprooted. Considerable structural damage
11	64-73	Violent Storm	Widespread structural damage.
12	74-95	Hurricane	Considerable and widespread damage to structure

In September 2002, Tropical Storms Hannah and Isidore produced winds and heavy rain in Highgate on September 14-15 and September 27 respectively. No damages or flooding were reported.

On July 8, 2005 Tropical Storm Cindy produced heavy rain across much of the state including Highgate. Rain amounts were estimated between 1 and 3 inches with no reported damages.

In August, 2005 tropical moisture from Katrina reached Highgate on August 30th. The rain was initially steady then became heavy on the 31st. Rainfall totals across Franklin County were generally between 2.5 and 4 inches. No damages were reported.

August 16, 2007: A cold front moved across the region from Canada and was accompanied by high winds. Many trees were uprooted and several residents in Town reported damages.

September 8, 2012: A squall line of severe thunderstorms developed and pushed east into Vermont. There was isolated minor wind damage in the form of large tree branches knocking out powerlines across town.



October 9, 2012: Superstorm Sandy brought high winds along the western slopes of the Green Mountain. Much of the state experience 50 knot wind speeds. Strong east winds of 25 to 35 mph, enhanced by downslope from the Green Mountains caused frequent wind gusts in excess of 45 mph.

September 11, 2013: A weak area of low pressure resulted in a series of thunderstorms that moved across Vermont during the late afternoon and evening. Some of these thunderstorms produced hail and damaging winds that downed trees and utility lines.

September 11, 2016: A strong front moved into the area from the west generating damaging winds and lightning. Trees were blown down and parts of northern Franklin County were without power overnight.

October 30, 2017: A strong front from the west generated dangerously high winds. Numerous trees were felled in western Franklin County and several towns were without power for several days.

Using the 2017 Grand List data, the estimated damage of 10% of structures with 20% damage is \$6,748,750.00. The estimated cost does not include building contents, land values or damages to utilities. Impacts to future populations, residences, new buildings, critical facilities and infrastructure are anticipated to remain the same.

Structure Fire

Structure fires can occur anywhere. The Town Fire Department received 112 dispatch calls in 2018 of which 1 was in response to a structure fire. The Fire Department also provided assistance to other Towns through Franklin County Mutual Aid. The Fire Department actively upgrades equipment through federal grant programs. The Town has mutual aid agreements in preparation for a coordinated response to structure fires in the area. Fire codes are in place and enforced by the State. The department also provides fire safety educational programs to the schools and local daycare providers.

The town has received funding from the state dry hydrant grant program to install 6 dry hydrants to improve water supply in rural areas. Recently, the Fire Department received a Rural Development Grant for purchasing a new fire truck which is scheduled for delivery in 2020.

Highgate Center contains structures that are relatively close thus raising the risk for a multiple structure fire. The impact of this type of incident would primarily be on the residential sector. Older historic buildings that lack fire alarms and sprinkler systems are greater at risk for damages.

Estimated loss due to fire damage on 10 structures annually using median home values is \$2,119,000 (US Census estimate median housing cost 2014-2018). This loss estimate does not include building contents. Impacts to future populations, residences, new buildings, critical facilities and infrastructure are anticipated to lessen due to new building construction codes and standards which address fire safety.

Drought

Droughts are rare in occurrence and relatively brief in duration. Droughts have impacted residential and commercial water supplies, particularly to dairy farms and horse ranches. Drought can be a problem in late summer with local springs and wells reduced to minimal flows.

Droughts can pose a serious threat to the town, especially to agriculturally based businesses, such as commercial farms and horse boarding stables, that are more directly affected by droughts.

Water tables reached an all-time low during the drought of 1988, however recovery was fairly rapid.

Loss estimates are difficult to ascertain due to lack of data. Impacts to future populations, residences, new buildings, critical facilities and infrastructure will likely remain the same.

Wildland Fire

Wildfire typically comes in the form of grass fires. Forest fires are rare however the fuel potential for large fires exist. Grass fires occur in spring and early summer as fields are cleared of fall and winter debris. Wildfire suppression comes from the local fire department and mutual aid organizations.

Throughout Highgate, there are large tracks of forested land could be at risk during sustained dry periods. The entire Town has minimal wildfire protection due to the on-call basis of the Fire Department. The potential for wildfire increases with the increase of fuel loads. Structures in forested areas without adequate fire breaks are difficult to access due to their remote nature and are more susceptible than others. A wild fire complex similar to what occurs in Florida, Texas, and western states during dry periods, has not occurred in the Town.

Potential loss estimates are difficult to ascertain due to a lack of data on losses. Impacts to future populations, residences, new buildings, critical facilities and infrastructure are anticipated to remain the same.

Tornado

Tornados may form when strong thunderstorms track through the area. These phenomena are rare in Highgate. There is no defined area to predict where this event will happen. Environmental impacts would include felled trees, while business impacts would be in the form of destroyed crops. Building damages may include destroyed windows, torn roofs, and destroyed barns.

Tornado events occurred in Franklin County on June 18, 1957, June 13, 1961, August 3, 1970, and July 19, 1972.

A Tornado Watch for Franklin County was issued by the National Weather Service on June 3, 2008. There were no observed tornados but high winds toppled trees, knocking out power during the late afternoon and early evening.

For a tornado event, the estimated potential loss to 10% of structures with 20% damage is \$6,748,750². The estimate does not include building contents, land values or damages to utilities. Impacts to future populations, residences, new buildings, critical facilities and infrastructure are anticipated to remain the same.

Earthquake

Earthquakes have been felt in Highgate and remain a geologic possibility. The Town is situated in a moderate earthquake zone. Although earthquakes are not a frequent event, they have the potential to cause extensive damage to masonry (brick) buildings that are not reinforced and older bridges. A HAZUS earthquake risk analysis and loss estimate was conducted at the regional level. There is moderate potential for serious damage to buildings and infrastructure in older portions of Town.

Structures are mostly of wood frame construction. The estimated loss of 20% of Town structures is \$1,125,982². Costs of repairing or replacing roads, bridges, power lines, telephone lines, or the contents of the structures are not included due to lack of resources to dedicate to a comprehensive loss analysis. Impacts to future populations, residences, new buildings, critical facilities and infrastructure are anticipated to remain the same.

Vulnerability Scores

The combination of the *impact of the hazard* and the *frequency* determined the community's *vulnerability* (risk score) as LOW (0-24), MODERATE (25-49) or HIGH (50-75). For example, a flood event is *highly likely* (nearly 100% probability in the next year) in many communities within Franklin County but the degree of impact varies, so a *highly likely* flood with *critical* or *catastrophic* impact rates the community vulnerability as HIGH. A community with a *highly likely* or *likely* (at least one chance in the next 10 years) flood with a *limited* impact would receive a vulnerability rating of MODERATE. The vulnerability of a community having the occurrence of an event as *possible* or *unlikely* with *limited* or *negligible* impact would be LOW.

A full summary of hazards and impacts is provided in the following table:

Table 5.2 SUMMARY OF HAZARDS AND IMPACTS FOR THE TOWN OF HIGHGATE

Hazard Type	Frequency of Occurrence	Severity	Risk	Estimated Potential Losses (Dollars)	Vulnerability

² Town of Highgate Grand List Value 2017.

Town of Highgate, Vermont Draft Hazard Mitigation Plan 2020 Draft Update

Flooding	Highly Likely	Limited to Catastrophic	Moderate to High	\$2,411,854	Loss of road access, power loss, telecommunications loss. Roads, bridges, commercial and residential structures, seasonal homes and utilities. Water quality.
Severe Winter Storm (Ice Storm)	Highly Likely	Limited to Catastrophic	Moderate to High	n/a	Roads, bridges, commercial and residential structures, seasonal homes, Town Office, Public Safety Building, Post Office and utilities.
Fluvial Erosion / Landslide	Highly Likely	Limited to Catastrophic	Moderate to High	n/a	Structures, road access, loss of agricultural land. Roads, bridges, commercial and residential structures, seasonal homes, utilities. Water quality.
Severe Thunderstorms (High Winds, Hail, Lightning)	Highly Likely	Limited to Catastrophic	Moderate to High	\$451,658	Falling limbs and/or trees, power loss, telecommunications loss, church, structural damage, crop damage. Commercial structures, residential and seasonal homes, public buildings, utilities.
Structure Fire	Highly Likely	Limited	Moderate	\$1,861,000	All structure types, especially those lacking early detection systems.

Town of Highgate, Vermont Draft Hazard Mitigation Plan 2020 Draft Update

Extreme Cold	Rare	Limited	Low	n/a	Vulnerable populations. Agricultural economy. Residential and Commercial underground infrastructure.
Extreme Heat	Rare	Limited	Low	n/a	Vulnerable populations. Transportation infrastructure (pavement). Agricultural econom. Water quality.
Drought	Rare	Limited to Catastrophic	Low	n/a	Dairy farms, livestock, private wells, public structures (water reservoir, water pumping station and wastewater treatment plant), residential and seasonal homes and vulnerable populations. Water quality
Major Fire - Wildland	Unlikely	Limited	Low	n/a	Residential and seasonal homes, commercial structures, utility poles and lines, road closures, fires in rural areas lacking fire breaks.
Earthquake	Rare	Limited to Catastrophic	Low	\$31,894,148	Infrastructure (roads, bridges), structural damage to residences, seasonal homes, commercial building, Town Office, Town Garage, Post Office, utilities.

Tornado	Rare	Limited	Low	\$451,658	Falling limbs and/or trees, power loss, telecommunications loss. Structural damage to residential and seasonal homes, public buildings Town Office, Town Garage, Fire Station, commercial structures, & Post Office.
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Critical Facilities

A critical facility is defined as a facility in either the public or private sector that provides essential products and services to the general public, is otherwise necessary to preserve the welfare and quality of life in the appropriate jurisdictions, or fulfills important public safety, emergency response, and/or disaster recovery functions. The current scope of this plan is to address these facilities and associated infrastructure. Once this plan is accepted, there is the possibility to expand the plan to cover other facilities and structures within the community.

The critical facilities identified in the Town of Highgate’s Hazard Mitigation Plan include the Highgate Elementary School, Highgate Municipal Complex, Highgate Sports Arena, electric and communication utilities, public safety facilities, Highgate Springs Port of Entry, government offices (post office Highgate Springs Port of Entry), municipal library, Highgate Daycare and Community Center and places of worship. Data from the Highgate Planning Commission, Northwest Regional Planning Commission, Local Emergency Planning Committee #4, and Town of Highgate were used to assist in the analysis of areas affected by various hazards. Limited data sets from GIS were available for this analysis; however, the Northwest Regional Planning Commission GIS Service Center is committed to providing this in the future as data, time and funding permit. The results of the analysis are listed in Attachment B.

The community hazard mitigation map is included in Attachment E. The community map depicts hazard areas, critical facilities, and vulnerable sites based on the best available data derived from local, regional, state and federal sources.

Market Values of Structures in Highgate

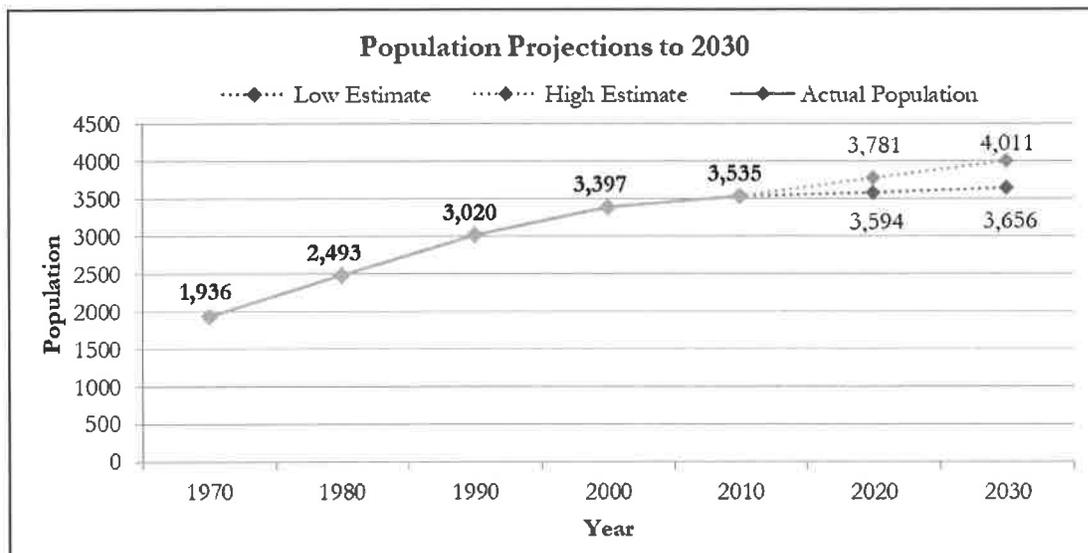
Type	Number	Value Includes Land
Residential Homes	947	\$205,765,200
Seasonal Homes	109	\$15,975,200
Mobile Homes - Unlanded	83	\$2,847,000
Mobile Homes - Landed	216	\$33,623,800
Commercial	88	\$42,031,100
Commercial Apts.	4	\$1,120,300
Industrial	1	\$1,749,000

Town of Highgate, Vermont Draft Hazard Mitigation Plan 2020 Draft Update

Farm	54	\$34,325,900
Other (Utilities, Woodland, Miscellaneous)	59	\$99,637,100
Source: 2017 Town of Highgate Grand List		

Development Trends

Highgate has experienced a moderate increase in residential development since the 1990s until the recession in 2009. Prior to the last economic downturn, the demand for housing was generated by the growing number of workers commuting to St. Albans and Chittenden County. Current residential development has been in keeping with the housing market demands. There is a need of more affordable housing. Trends in land use in neighboring communities parallel those in Highgate. Development trends since the last LHMP have remained the same. There has been some protection of large areas of previous agricultural lands in Highgate through purchase of development rights by land trust organizations and various conservation easements.



The area continues to receive spillover growth from the greater Burlington area, thus influencing market area housing development, and is likely to feel increasing growth pressure in the future. Constraints on housing growth include a developable land supply that is limited by extensive prime agricultural and. This represents a loss in agricultural land and, subsequently a weakening of the traditional economic base. The demand for land and housing is caused by good commuter access to job markets, the majority of which are located to the south in St. Albans or Burlington, Vermont. As long as the Greater Burlington area predominates in the rapid expansion of job opportunities, the relatively inexpensive yet accessible land in Highgate will continue to attract.

The Town continues to have potential for industrial and commercial growth. The Franklin County Airport and access to Interstate 89 are important resources for attracting industrial and commercial development. Currently, existing businesses are located along VT 78. While increased economic activity and well-paying jobs are an important goal of the Town, development must be in accord with the character of the community, landscape, and environment.

Participation and Compliance with the National Flood Insurance Program (NFIP)

The National Flood Insurance Program (NFIP) is a voluntary program organized by the Federal Emergency Management Agency (FEMA) that includes participation from 20,000 communities nationwide and 247 Vermont towns and cities. Combined with floodplain mapping and floodplain management at the municipal level, the NFIP participation makes affordable flood insurance available to all homeowners, renters, and businesses, regardless of whether they are located in a floodplain.

Federal Emergency Management Agency conducted a flood hazard study for the Town of Highgate in 1979 and flood hazard areas were identified along the Missisquoi River, Rock River, Hungerford Brook, Kelly Brook Saxe Brook, Carmen Brook and Youngman Brook. Flood Insurance Rate Maps (FIRM) were prepared by FEMA in 1983. They are available for review at the Highgate Town Office and on-line at FEMA.gov. FEMA is currently in the process of updating the FIRMs for the Missisquoi River Basin which includes the Town of Highgate.

Creation of the Flood Hazard District in the Town's Subdivision and Zoning bylaws enabled Highgate to be eligible for FEMA's National Flood Insurance Program (NFIP), which permits residents within the Flood Hazard District to purchase flood insurance. The purpose of the district is to prevent increases in flooding caused by development in flood hazard area, to minimize future public and private losses due to floods, and to promote the public health, safety and general welfare. The Town is committed to enforcing floodplain regulations and ordinances to be eligible to participate in the NFIP program and protect the people and property of Highgate by restricting development in flood prone areas.

Highgate is a member in good standing with the NFIP (CID 500055). The latest floodplain ordinance was adopted March 15, 2015.

Highgate has zoning bylaws in place that protects high risk areas such as flood zones. The Town has a Zoning Administrator whose job is to enforce existing flood plain regulations and review future development proposals. Currently the town has stream buffer protection measures as part of their zoning bylaws to limit future development along stream areas. The Town works with the elected officials, the State, the Northwest Regional Commission, and FEMA to correct existing compliance issues and prevent any further NFIP compliance issues through continuous communications, training and education.

According to FEMA's National Flood Insurance Program as of June 26, 2018, the Town of Highgate has 4 policies in force with \$2,725 total premium. There have been 3 claims since 1978 totaling \$29,097. There are no repetitive loss properties in Highgate. There are currently no large or small developments planned in Highgate that would be considered in the floodplain.

How the Previous Plan was Integrated into Other Planning Mechanisms

There have been and will continue to be many efforts to improve the resiliency of the Town of Highgate since the Town formalized hazard mitigation planning efforts. The flood identification and risk section of this plan was used in the development of the 2015 Comprehensive Municipal Plan update to address the flood hazard resiliency requirement of Municipal Planning as required under state statute. It was also used to develop the stream buffer regulation within the Town's Zoning bylaws. The hazard mitigation plan was used for capital budgeting for the highway department for road infrastructure projects to reduce impacts from flooding and fluvial erosion. The plan was used in the planning process for Missisquoi River and Rock River watershed stormwater mitigation activities and to improve community wide disaster resilience with an emphasis on reducing flood risk to municipal, state and private infrastructure. The Plan's hazard identification and risk assessment section was and will continue to be referenced each year during the update to the

Town's Local Emergency Management Plan for identifying critical infrastructure, risk areas and vulnerable sites.

Since the last mitigation plan, impacts from development on the Town's vulnerability have decreased. There have been no new or proposed developments in the flood plain or in hazardous areas. There have been no large commercial or industrial developments projects in town. The Fire Station and Town Garage was built well outside of any areas of risk. Residential development has typically been single family homes. The Town has worked with the power company to ensure that trees and branches are removed along utility lines. Policies and programs are needed which manage growth rates to lessen land impacts, and to ensure that municipal infrastructure can accommodate growth.

In a growing town, community facilities and services are often in transition. Existing facilities and services become inadequate. In Highgate it is apparent that both population growth and the increasing expectations of residents regarding community services will continue to result in facility and service expansions and improvements. The Town has done well over the past 15 years with mitigating hazards such as home buyouts, addressing areas affected by fluvial erosion along the Missisquoi River and in East Highgate. While town budgets have not increased substantially, the prospect of future service and facility improvements, as well as need for new services, will undoubtedly have fiscal effects. This plan update was revised to target mitigation actions in areas of town where growth is expected.

6. MITIGATION STRATEGY

The Hazard Mitigation Goals were developed by the Committee for the Highgate Local Hazard Mitigation Plan.

General Goals

- Prevent/reduce the loss of life and injury resulting from all-hazards events.
- Prevent/reduce the financial losses and infrastructure damage incurred by municipal, residential, agricultural and commercial establishments due to disasters.
- Include hazard mitigation planning in the municipal planning process including the Town Plan, Capital Improvement Plan and Local Emergency Management Plan.
- Ensure the general public is part of the hazard mitigation planning process.

Town Plan (Adopted 2015) Goals and Policies that support Hazard Mitigation

- Prevent the loss of life and injury resulting from flooding and other natural hazards.
- Encourage and foster an all hazards disaster resilient community
- Reduce damages to public infrastructure resulting from all hazards events through hazard mitigation planning and project implementation.
- Encourage the protection and restoration of floodplains and upland forested areas that attenuate and moderate flooding and fluvial erosion.
- Implement resiliency measures that are compatible with natural features (including floodplains, river corridors, wetlands, and upland forests), historic resources, character of neighborhoods, and the capacity of the community to implement them.
- Evaluate the flood hazard regulations for opportunities to incorporate measures to increase public safety, and reduce future damages.
- Adopt and implement river corridors and buffers to prohibit future development in high risk areas for flooding or erosion hazards and enable the town to seek additional state matching funds from the Vermont Emergency Relief and Assistance Fund (ERAF).

- Conduct an evaluation of the landslide potential in Highgate and identify if provisions should be addressed in zoning to account for specific development concerns in these areas.
- Incorporate mitigation measures when developing improvements or expansion to municipal infrastructure.
- Adopt the most recent VTrans Town Road and Bridge Standards.
- Review zoning and subdivision bylaws to allow for higher density housing in appropriate locations in and near the village center.
- Protect ecological and resource sensitive areas such as wetlands, fragile soils, steep slopes, wildlife habitat, and State designated natural and fragile areas from inappropriate development.
- Prohibit development in areas that threaten potable water supplies, such as wellhead protection areas.
- Regulate shore lands to ensure land use development and other activities do not degrade water quality in the Bay.
- Guide new development away from productive agricultural and forest soils and consider slope and soil characteristics when reviewing individual development proposals.
- Protect ecological and resource sensitive areas from inappropriate development.

Existing Hazard Mitigation Programs, Projects and Activities

Flooding

- The Town has Zoning Bylaws which designates a Flood Hazard District whose purpose is to minimize future public and private losses caused by development in flood hazard areas. The town participates in the National Flood Insurance Program (NFIP). Maintaining compliance with NFIP regulations both now and in the long term is a high priority activity.
- Flood Hazard Areas in Highgate are identified on Flood Hazard Boundary Maps (FHBMs) and Flood Insurance Rate Maps (FIRMs) produced by FEMA. The purpose of these districts, which are located along the flood plains of rivers and streams throughout the Town, is to prevent increases in flooding caused by excessive development of lands within flood hazard areas.
- Ditches located in areas susceptible to flooding are inspected and maintained on an annual basis. Ditches in general are inspected and cleaned.
- 2015 - Tarte Road (.25 north of Parent Road) culvert and drainage upgraded to Road Standards.
- 2015 - Tarte Road (near Gore Road) culvert and drainage upgraded to Road Standards.
- 2019 - East Highgate Bridge 25 on Machia Road (TH4) was installed over the Missisquoi River.
- 2015 - Park and Ride Lot stormwater and runoff project.
- Culverts are inspected at least once a year. Seasonal maintenance is developed based on annual inspections. Most road erosion issues have been identified by Better Back Roads inventory in 2015 that identified road issues and then addressed the issues through ANR's Municipal General Roads Permit program.

Severe Winter Storms (Ice Storm)

- Town Highway Department has snow removal equipment.
- Shelter agreement between Highgate Elementary School and American Red Cross currently being considered.
- Road crews have response equipment to deal with downed trees and branches.
- Applied for FEMA HMGP funding for emergency generator for school but was denied. Seeking alternate funding sources.

Fluvial Erosion/Landslide

- Phase 1 and 2 Geomorphic Assessments conducted for Rock River and select tributaries (25.9 river miles) in 2005 and 2006 (revised 2007) following Vermont Agency of Natural Resources standards. This goal is connected to the larger objective of reducing phosphorus and other pollutants entering the Missisquoi River and Lake Champlain. Study results have also informed landowner and community planning efforts for reducing fluvial erosion hazards and improving aquatic and riparian habitats.
- 2006 - Phase 2 stream geomorphic assessments were completed on 15 reaches (25.9 river miles) of the Rock River and select tributaries in the towns of Highgate and Franklin.
- 2013 – present. State Geologist and geotechnical firm have been monitoring slide activity at Town owned capped landfill on Transfer Station Road. Currently working with VEM and FEMA under an HMGP grant to mitigate landslide issues at the site.
- 2015 – Two home buyouts on Riverview Lane for properties that were in imminent danger due to landslide on high banks of Missisquoi River.
- 2011 - The slope adjacent to the Highgate landfill was stabilized and drainage was installed to prevent future landslides along the slope. In 2011, the town expended \$102,260 towards stabilizing the slope plus \$10,000 on engineering design. In 2017, another slide occurred at station. Town has State Hazard Mitigation Grant for engineering design to fix slope.
- 2012 - Slope stabilization and repairs were made along Brosseau Road above the Missisquoi River to address erosion along the northern bank (\$150,000 approx.).
- Currently, several working farms within Town utilize buffer strips to mitigate erosion along streams.
- 2016 - Durkee Road bank erosion addressed by removing cattle from site. A 24” culvert was installed to replace an undersized culvert.
- 2018 – Mill Hill Road erosion between Lamkin Street and Highgate Road addressed with Better Back Roads Grant.
- 2020 – The state will lead effort for bank stabilization along major slide area on Monument Road. Engineering currently completed.
- Town is currently developing a landslide overlay map and is considering incorporating a landslide overlay district into the Town’s Zoning Bylaws.

Structure Fire and Wildland Fire

- Annual ISO inspection.
- Fire fighter personal protection equipment upgrades through Federal grant programs.
- Upgrades to fire fighting offensive and defensive equipment through Federal grant programs.
- Town applies annually for grant funding for Rural Hydrant Program.
- Fire fighter training through Vermont Fire Academy
- Member of Franklin County Mutual Aid and Franklin County International Firefighters Association
- NIMS/ICS Training for members to meet state NIMS strategy
- Installing dry hydrants to improve rural water supply on Hanna Road.
- Public Works Department/Fire Department installed new repeater for 2019 to fix communications with Central Dispatch and Middlebury.

Loss of Electrical Service

- The Municipal Complex has a portable generator with transfer switches installed.
- On-going regularly scheduled road maintenance programs includes cutting vegetation away from utility lines

Hazardous Materials (Fixed Site and Transport)

- Fire department members have attended VT Fire Academy’s HazMat awareness course
- Fire department upgrades fire fighter personal protection equipment as necessary
- Town maintains active membership in Local Emergency Planning Committee District 4

Terrorism/WMD/Civil Disturbance

- School has updated State School Response Guide to handle variety of emergency situations
- School Board proactive in addressing school safety issues
- Security system installed at Town Office in 2013; security cameras at Highgate Arena in 2014 and security Key Fob access in 2016.

On-Going Community Preparedness Activities

- Enforcing flood plain regulations
- Annual update of the town’s local Emergency Management Plan
- Town applies for state grants (Local Roads, Bridge and Culvert) to address road construction/improvement projects.
- Emergency Responders attend professional training sessions as appropriate including ICS training
- Town continually works towards achieving compliance with State NIMS strategy including having staff and elected officials, as appropriate, attend ICS training
- Town of Highgate is member of Franklin County Mutual Aid Agreement (NIMS)
- Continue to equip, as appropriate, emergency shelter and emergency operations center.
- Regular maintenance of town fleet and emergency equipment.
- Community participates in the Vermont Enhanced 911 System Program.
- Regularly scheduled maintenance programs ongoing (culvert survey & replacement, ditching along roadways, removing vegetation to allow visibility at intersections).
- Purchased new fire truck in 2019.

Table 6.1 TOWN OF HIGHGATE POLICIES AND PLANS

Existing Protection	Description	Effectiveness/Enforcement/ Hazard that is addressed	Gaps in Existing Protection / Improvements Needed
Town Plan	Policies and vision for future land use. Adopted in 2015.	Policies that provide protection and limited development in wellhead protection areas, wetlands, steep slopes, and shallow soils. Addresses: Flooding, fluvial erosion, structure fire, and overview of public safety.	None found.
Zoning Bylaws and Subdivision Regulations	Land Use Regulation. Local provisions related to the division of a lot tract or parcel of land. Last amended and adopted	Restrictions on development in potentially hazardous areas such as steep slopes, floodplains, and waters source areas. Fire hydrants, water, sewage, public and private utilities, stormwater management, public health and safety. Addresses: Flooding, fluvial erosion/landslide, structure fire,	Need to incorporate River Corridor Overlay

Town of Highgate, Vermont Draft Hazard Mitigation Plan 2020 Draft Update

	2015.	HazMat, telecommunications, utility related.	
Local Emergency Management Plan	Summary of response and notification procedures. Adopted 2019.	Semi annual updates. Address: All-hazards.	Missing Evacuation Annex.
Franklin County Mutual Aid Agreement	Franklin County Mutual Aid. 2007, Updated 2017.	Resource assistance from municipal and first response agencies through the county during an emergency event. Addresses: All-hazards.	No gaps identified.
School Emergency Response	School Crisis Guide.	Responses by various type of emergency incident. Addresses: Terrorism/WMD/Civil Disturbance.	School staff should be trained every year in emergency response procedures.
Road and Bridge Standards	Bridge Standards Design and construction standards for roads and drainage systems.	Adopted VTRANS Standards. Addresses: Flooding, fluvial erosion.	No gaps identified.
Emergency Shelters	Designated emergency housing facilities for communities.	EOP identifies two shelters, one with American Red Cross designation. Addresses: All-hazards.	Need to identify shelter managers in the community.

Risk Reduction Goals

Through current plans, policies and mitigation actions, Highgate is working to decrease damages from flooding, severe winter storms (ice storms), fluvial erosion/landslides, high winds and structure fires. Other less hazardous risks are also being addressed.

Identified Hazard Mitigation Actions

The below table outlines mitigation programs, projects, activities and describes the overall direction the Town is taking to work toward mitigating risks from natural, technological and societal hazards. These mitigation strategies have been chosen by the Town, through surveys and interviews with community officials, as the most appropriate policies and programs to lessen the impacts of potential hazards. The Town of Highgate understands that in order to apply for FEMA funding for mitigation projects, a project must meet FEMA benefit cost criteria. In addition, the Town must also have a FEMA approved Hazard Mitigation Plan.

The following list documents the questions (criteria) considered in establishing an order of priority. Each of the following criteria was rated according to a numeric score of "1" (indicating Poor), "2" (indicating Average) and "3" (indicating Good). The highest possible score is 36. The full scoring matrix used is located in Attachment C.

- 1) Do the identified actions and projects address reducing the effects of hazards on existing buildings and infrastructure?
- 2) Does the action contribute to community objectives?
- 3) Does the action meet existing regulations?
- 4) Does the action protect historic structures or structures critical to Town operations?
- 5) Can the action be implemented quickly?
- 6) Is the action socially acceptable?
- 7) Is the action technically feasible?
- 8) Is the action administratively possible?
- 9) Is the action politically acceptable?
- 10) Is the action legal?
- 11) Does the action offer reasonable benefits compared to its cost of implementation?
- 12) Is the action environmentally sound?

Mitigation actions are listed in terms of mitigating threat or risk to public health and safety, reduction of hazard to community assets, reducing the effects of hazards on new buildings and infrastructure, adherence to Town plan and local ordinances, cost, and feasibility. Actions items are activities which the municipality may be capable of implementing in either the short - term (six months to one year), medium-term (one to five years) or long-term (five to ten years). On-going action items are those that occur at least once per year.

Cost-Benefit Analysis

Each action item will incorporate a full benefit - cost analysis (BCA) following FEMA's BCA methodology and software to ensure cost effectiveness and maximize savings.

The below cost and benefits table addresses the priorities that are stated in the Mitigation Actions Table. There was a rough cost/benefit analysis done for each action listed.

Cost Estimates

High	=>\$100,000
Medium	=\$25,000 - \$100,000
Low	=<\$25,000

Benefit Estimates

High	Public Safety
Medium	Infrastructure / Functionality
Low	Aesthetics / General Maintenance

Time Frame

Short-term	Less than a year
Medium-Term	1 - 5 years
Long-term	5+ years

Implementation of the mitigation actions is summarized in the below table, as far as who, when and how they will be carried out. Further details about some actions can be found following the mitigation actions table, in text.

Table 6.2: Implementation Schedule for Prioritized Mitigation Actions

Town of Highgate, Vermont Draft Hazard Mitigation Plan 2020 Draft Update

Priority / Score	Mitigation Project / Hazard Addressed	Responsibility/ Oversight	Funding/Support	Time - Frame	Cost / Benefit	Status
High / 35	Transfer Station property and road slope stabilization / Flooding, fluvial erosion, land slide.	Selectboard	FEMA Hazard Mitigation Grant Program (HMGP). Vermont AOT Structures grant, Vermont Better Roads Program. Local Funding.	Medium - term. Project January 2020 - September 2023	High / High	In progress. HMGP funding conditionally secured. Geo analysis completed. Initial Engineering completed. Continue to work the SHMO and FEMA to meet grant funding requirements.
High / 35	Machia Road Bank Stabilization / Flooding, Fluvial Erosion, Landslide	Selectboard	FEMA Hazard Mitigation Grant Program (HMGP), Vermont AOT Structures Grant, Local Funding.	Medium - Term January 2020 - September 2023	High/High	Vermont AOT conducted slope stability engineering at site to determine cause and severity. Town monitoring road. Seeking grant funding source.
Medium / 33	Property buyouts for Monument Road Residences / Flooding, Fluvial Erosion, Landslide	Selectboard	FEMA Hazard Mitigation Grant Program (HMGP), Vermont AOT Structures Grant, Local Funding.	Long - Term April 2020 - December 2025	High/High	Selectboard would have to secure funding and property owners would need to be educated on program and approached for consideration.
High / 33	Highgate/Swanton Monument Road Flood Proofing (road elevation, bank stabilization, drainage improvements) Flooding, Fluvial Erosion, Landslide, Severe Winer Storm (Ice Storm)	Selectboard	FEMA Hazard Mitigation Grant Program (HMGP), Vermont AOT Structures Grant, Local Funding.	Long-Term May 2020 - December 2025	High / High	Selectboard approach Swanton Town Officials regarding joint project to reduce flooding along road. Design/engineering.
Medium / 34	St. Armand Road Culvert upgrade / Flooding, Fluvial Erosion, Landslide, Severe Winter Storm (Ice	Selectboard	FEMA Hazard Mitigation Grant Program (HMGP). Vermont AOT Structures grant, Vermont Better	Medium-Term January 2020 - September 2023	High / High	Site design/engineering study. Obtain necessary permits from state.

Town of Highgate, Vermont Draft Hazard Mitigation Plan 2020 Draft Update

	Storm)		Back Roads Program.			
Medium / 33	Pine Plains Road Erosion Control. Flooding, Fluvial Erosion, Landslide	Selectboard	Better Back Roads grant. Grants In Aid project funding.	Medium - Term January 2020 - September 2023	Medium / High	Site design/engineering study. Obtain necessary permits from state.
Medium / 34	Rollo Road drainage improvements (1.5 miles east of the intersection with Ballard Road) / Flooding Fluvial Erosion	Selectboard	VT Grants in Aid Program. Local Funding.	Short - Term (Start May 1, 2020. End June 30, 2020)	Medium - High	Funding secured. Construction to begin spring of 2020.
High / 34	Procure and install generator for water system building at the Highgate elementary school. / All-Hazards	Selectboard/School Board	VT Rural Development Grant, local funding	On-going	Medium / High	Load requirements and needs to operate as a shelter have been determined. Estimates received from different vendors following procurement procedures. Determine maintenance, liability responsibilities. Apply for funding.
High / 34	Support Power Utility Efforts to Protect Utility Corridors (tree / branch removal. Severe Winter Storm (Ice Storm), Severe Thunderstorm (High Winds, Hail, Lightning)	Selectboard	Local	Short Term Start: May 2020 End: October 2020	Low / High	Support power utility standards of in identifying utility corridors in need of tree pruning.

The Town has identified the following actions to mitigate the impacts on the community due to severe winter storms (ice storms):

Transfer Station Property and Road Slope Stabilization - Transfer Station Road and Transfer Station property experienced damaging rains in the spring of 2003 and in late April and early May 2011 and again in late August 2011. These events caused damages to the slope that supports the northerly embankment of the Transfer Station Road and the adjacent capped landfill. The slope continues to slowly erode downward toward an intermittent brook. The Town recommends

reestablishing a structurally sound slope that will safely support the Transfer Station Road and prevent future slope failure.

Machia Road Bank Stabilization - The Machia Road in East Highgate has a history of road shoulder repairs and stream bank stabilization measures due to landslides and fluvial erosion from the Missisquoi River. In recent years, a 300' section of road and shoulder (opposite side of road are addresses 2165 & 2071 Machia Road) has begun to slump. The streambank below the road shoulder has begun to slide according to a geo technical survey by VTRANS in 2017. The Machia Road is a heavily traveled road and serves as a major route for residents, busses, emergency vehicles, agricultural vehicles and agricultural vendors vehicles (grain trucks, fuel trucks, etc).

St. Armand Road Culvert Upgrade: St. Armand Road between Route 7 and Ballard Road is prone to flooding from Rock River. There is some visible evidence of damage to bridge structure during past high flow events. There is the potential for channelization and overflow at bridge crossing. This structure was identified during the Phase 2 Stream Geomorphic Assessment as "constricting the bankful channel width".

Property buyouts for Monument Road Residences - Several residences along the west end of Monument Road (no road outlet) were impacted by flooding events along the Missisquoi River. The residences are single family homes. In January 2018, ice jam related flooding caused residential damages to approximately 12 homes. On November 1, 2019, several residents were again flooded. To prevent further damage and repair costs to those affected individuals and families, the town is interested in potentially conducting home buyouts for those homeowners who who are interested.



Machia Road: Surficial sloughing of saturated silty sand/sandy silt on upper half of slope.
Photo Courtesy VTRANS.

Highgate/Swanton Monument Road Flood Mitigation - The road shoulder of Monument Road has been damaged by flooding and fluvial erosion from the Missisquoi River in several locations. The Town is interested in working with neighboring Swanton Town to mitigate flood and fluvial erosion damages to the road. There is no outlet for residences who live on the western end. Some work has been done by the Town of Highgate to stabilize two low spot problem areas. Stabilizing the stream bank, elevating the road and improving the drainage network would help mitigate flood and erosion damages.

Pine Plains Road Erosion Control – In East Highgate, Pine Plains Road has significant erosion in sections from VT78 to the Town Line. Turnouts have been constructed leaving substantial sediment deposits in adjacent woodlands. The Town will implement Best Management Practices under the Vermont Municipal Roads General Permit to mitigate the erosion.

Rollo Road Drainage Improvements – Ditching and drainage upgrades following Best Management Practices under the Vermont Municipal Road General Permit for section of road that is 1.5 miles east of intersection with Ballard Road. This will address flooding and erosion issues. Funding has been secured through FY20 Grants In Aid Program.

Procure and install a generator and automatic transfer switch at the Highgate Elementary School for the school's water system. – The School has a generator that is used to provide emergency back up power, however, the water system is separate. The water system does not have emergency backup power which is needed for the water/wastewater. The Town has applied for funding through FEMA's HMGP program but was unsuccessful. The Town is continuing to seek a funding source. The Town works with the American Red Cross to designate local facilities as Red Cross Shelters, identify and train volunteers within the community who could set up and run the shelter and store basic shelter preparedness items (cots, MRE's, water) at the facility prior to an activation.

7. PLAN IMPLEMENTATION, MONITORING & EVALUATION

Initial Approval

In addition to public involvement in the initial development of the plan, opportunities for public comment included interviews with the Town Selectboard, Highway Foreman, Town Clerk and updates to the Local Emergency Planning Committee (LEPC) and to the full Northwest Regional Commission Board of Directors. Local citizens were interviewed as well. A copy of the draft will be provided to the Town Road Foreman, Town Emergency Management Coordinator, Town Clerk, Selectboard and Fire Chief for comment. Future updates of the plan will include more opportunities for public comment.

Following consideration of the comments from those forums, the draft Mitigation Plan will be presented to the State Hazard Mitigation Officer (SHMO) for review and comment. When the document meets all the requirements, VEM (FEMA) grants "Approval Pending Adoption" (APA) by notifying the Selectboard Chair. The Highgate Selectboard will then adopt the plan at a public meeting. The Selectboard Chair will return the final plan containing copy of the Adoption Resolution to FEMA (via the SHMO). FEMA will conduct one final review to ascertain that no changes were made to the plan (other than removing watermarks and inserting dates) then the plan is deemed "FINAL".

Monitoring and Updating the Plan – Yearly Review

Once the plan is approved and adopted, the Highgate Town Administrator, along with interested and appointed volunteers and stakeholders, will continue to work with the Emergency Planner at the Northwest Regional Commission to monitor, evaluate, and update the plan throughout the next 5-year cycle. The plan will be reviewed annually at the April Selectboard meeting along with the review of the town's Local Emergency Management Plan (LEMP). During the annual review, the Selectboard will evaluate the plan effectiveness at achieving its stated purpose and goals. This meeting will allow town officials and the public to discuss the town's progress in implementing mitigation actions and determine if the town is interested in applying for grant funding for projects

that can help mitigate future hazardous events; e.g., bridge and culvert replacements, road replacements and grading, as well as buying out any repetitive loss structures that may be in the Special Flood Hazard Area, and revise the plan as needed. Northwest Regional Commission's emergency planner will assist the Highgate Town Administrator with this review, as requested by the Town. Progress on actions will be kept track using a table the NRPC will provide to the Town EMD to update. There will be no changes to the plan, unless deemed necessary by the Town. If so, the post disaster review procedure will be followed.

Routine Plan Maintenance

The Hazard Mitigation Plan is dynamic and should not be fixed. To ensure that the plan remains current and relevant, it is important that it be updated periodically. Updates and evaluation by the Select Board will also occur within three months after every federal disaster declaration and as updates to town plan/zoning and river corridor plans come into effect.

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

At a minimum, the plan will be updated every five years in accordance with the following procedure:

1. The Town will be notified by the Northwest Regional Planning Commission. The Highgate Selectboard will appoint a team to convene a meeting of the Review/Update committee. The team will be led by staff from the Northwest Regional Planning Commission and may include a Selectboard representative, Emergency Management Coordinator, Road Foreman, Town Administrator and Fire Chief.
2. The committee will discuss the process to determine if the evaluation criteria is still appropriate or modifications or additions are needed due to changing conditions since the last update occurred. Data needs will be reviewed, data sources identified and responsibility for collecting information will be assigned to members.
3. A draft report will be prepared based on these evaluation criteria and in conformance with the FEMA *Local Hazard Mitigation Plan Toolkit*.
 - Changes in community and government processes, which are hazard-related and have occurred since the last review.
 - Progress in implementation of plan initiatives and projects.
 - Effectiveness of previously implemented initiatives and projects.
 - Cost-benefit review of new mitigation projects
 - Evaluation of unanticipated challenges or opportunities that may have occurred between the date of adoption and the date of the report.
 - Evaluation of hazard-related public policies, initiatives and projects.

- Verification of and commitment to compliance with NFIP program requirements including review and update as necessary of local flood damage reduction regulations.
 - Review and discussion of the effectiveness of public and private sector coordination and cooperation.
4. The Selectboard will review the draft report. Consensus reached on changes to the draft.
 5. The changes will be incorporated into the Plan.
 6. The Plan will be reviewed by appropriate representatives from VEM's and FEMA Region 1.
 7. VEM and FEMA comments will be addressed in the Plan.
 8. The Selectboard will notify and schedule a public meeting and the review/update committee prepares presentation.
 9. The public will observe presentation and provide comments on draft report.
 10. The Selectboard will incorporate community comments into draft report.
 11. The Selectboard will finalize and adopt the report and distributes to interested parties.

Continued Public Involvement

The Highgate Selectboard is dedicated to involving the public directly in the continual review and updates of the Hazard Mitigation Plan. Copies of the plan will be kept at the Town Office. The existence and location of these copies will be publicized in the media (newspaper, web sites, Town Annual Report, etc.). The plan will also include the Selectboard Chair's contact information to facilitate and track public comments. In addition, any proposed changes will be publicized in the media and posted on the Town and Regional Planning Commission's website.

Programs, Initiatives and Projects Review

Although the plan should be reviewed in its entirety every five years as described above, the Town may review and update its programs, initiatives and projects more often directly with the State Hazard Mitigation Officer (SHMO) based on changing local needs and priorities.

The Town of Highgate should incorporate elements of this plan, such as identified projects, into capital planning initiatives and annual budget reviews during Town Meeting. The plan should be available for distribution during public meetings particularly Town Meeting in order to educate the public on mitigation programs and receive public input regarding the process.

**Attachment A
Hazard Identification and Risk Assessment
Town of Highgate**

Refer to Section 4 of this plan for a description of the risk characteristics used to classify each hazard.

Hazard	Impacted Area	Probability Of Occurrence	Consequence of Occurrence				Total
			Health & Safety	Property	Environment	Economic	
Flooding	2	5	0	1	1	3	35
Severe Winter Storm (Ice Storm)	3	5	0	1	1	2	35
Fluvial Erosion / Landslide	2	5	1	1	1	2	35
Severe Thunderstorm (High Winds, Hail, Lightning)	2	5	1	1	1	1	30
Structure Fire	0	5	1	2	1	2	30
Extreme Cold	1	4	0	1	1	1	16
Extreme Heat	1	4	0	1	1	1	16
Drought	3	1	1	1	1	3	9
Major Fire - Wildland	1	2	0	1	1	1	8
Earthquake	1	1	1	1	1	2	6
Tornado	1	1	0	1	1	2	5
Total Risk Rating							225

Total = Probability x (Impacted Area + Consequence of Occurrence)

**Attachment B
Critical Facilities, Hazmat Storage Facilities, and Vulnerable Sites
Town of Highgate**

Facility Name or Facility Designation	Facility Owner / Operator	Function	Street or Location
A. G. Anderson	Anderson	Hazmat storage site	Frontage Road
Franklin County Airport & State Garage	VTRANS	Transportation Facility	Airport Road
Desorcie's Market	Desorcie's	Hazmat storage site	9 St. Armand Road
Franklin County State Airport	Vermont Agency of Transportation	Hazmat storage site	Airport Road
US Post Office (Highgate Center)	US Post Office (Highgate Center)	Government Transportation Facility, Hazmat storage site	Airport Road (VT 78)
G. Boucher Fertilizer	G Boucher	Hazmat storage site	207 North Gore Road
Highgate Converter Station	VELCO, Inc.	Energy Facility	2694 VT Route 78
Highgate Dam	Swanton Village and Electric Department	Energy Facility	Mill Hill Road
Highgate Elementary School	Highgate School District	Education Facility Hazardous Materials Facility	219 Gore Road
Highgate Fire Station	Town of Highgate	Government Facility Emergency Ops Center	Route 78
Highgate Municipal Building	Town of Highgate	Government Facility	Route 78
Highgate Public Library	Town of Highgate	Library	Lamkin St
Highgate Sports Arena	Town of Highgate	Public Building	Gore Road
Highgate Springs Port of Entry	Homeland Security, US Customs and Border Protection	Government Facility	189 at the Border
Highgate Transfer Station	Town of Highgate	Government facility	Transfer Station Road
Highgate United Methodist Church Community Center and Daycare Center		Place of worship	3723 Route 78
Hydroelectric Plant	Town of Highgate		
Jolley's	S. B. Collins, Inc.	Hazmat Storage Facility	60 Gore Road
Martins Store	S.B. Collins, Inc.	Hazmat storage site	Route 7 Highgate Springs
McCuin Fuels	Route 78	Hazmat Storage Facility	3337 Route 78
MCI	Hyperion	Telecommunications Facility	Route 78
Missisquoi Valley Union High School	MVU District	Education Facility	Thunderbird Drive

Town of Highgate, Vermont Draft Hazard Mitigation Plan 2019

Mobile Station	R.L. Vallee	Hazmat Storage Facility	3108 VT Route 78
St. Louis Church	Saint Louis Church	Place of Worship	222 Lamkin Street
Substation (Highgate)	VELCO, Inc.	Energy Facility	2731 Route 78
Highgate Town Garage	Town of Highgate	Government Facility Transportation Facility	Route 78
US Post Office (Highgate Center)	US Postal Service	Government Facility	St. Armand Road
US Post Office (Highgate Springs)	US Postal Service	Government Facility	Route 7
Vermont Gas Systems, Inc.	Vermont Gas Systems, Inc.	Energy Facility Hazmat Facility	Highgate Springs Border Station
Vermont Gas Systems (VT Brick)	Vermont Gas Systems, Inc	Energy Facility Hazmat storage facility	VT78 Leduc Industrial Park
Vermont State Garage	Vermont Agency of Transportation	Government Facility Transportation Facility	VT78

Attachment C

Town of Highgate Priority Matrix

1 = Poor, 2 = Average, 3 = Good

Each of the following criteria was rated according to a numeric score of "1" (indicating Poor), "2" (indicating Average) and "3" (indicating Good).

- 1) Do the identified actions and projects address reducing the effects of hazards on existing buildings and infrastructure?
- 2) Does the action contribute to community objectives?
- 3) Does the action meet existing regulations?
- 4) Does the action protect historic structures or structures critical to Town operations?
- 5) Can the action be implemented quickly?
- 6) Is the action socially acceptable?
- 7) Is the action technically feasible?
- 8) Is the action administratively possible?
- 9) Is the action politically acceptable?
- 10) Is the action legal?
- 11) Does the action offer reasonable benefits compared to its cost of implementation?
- 12) Is the action environmentally sound?

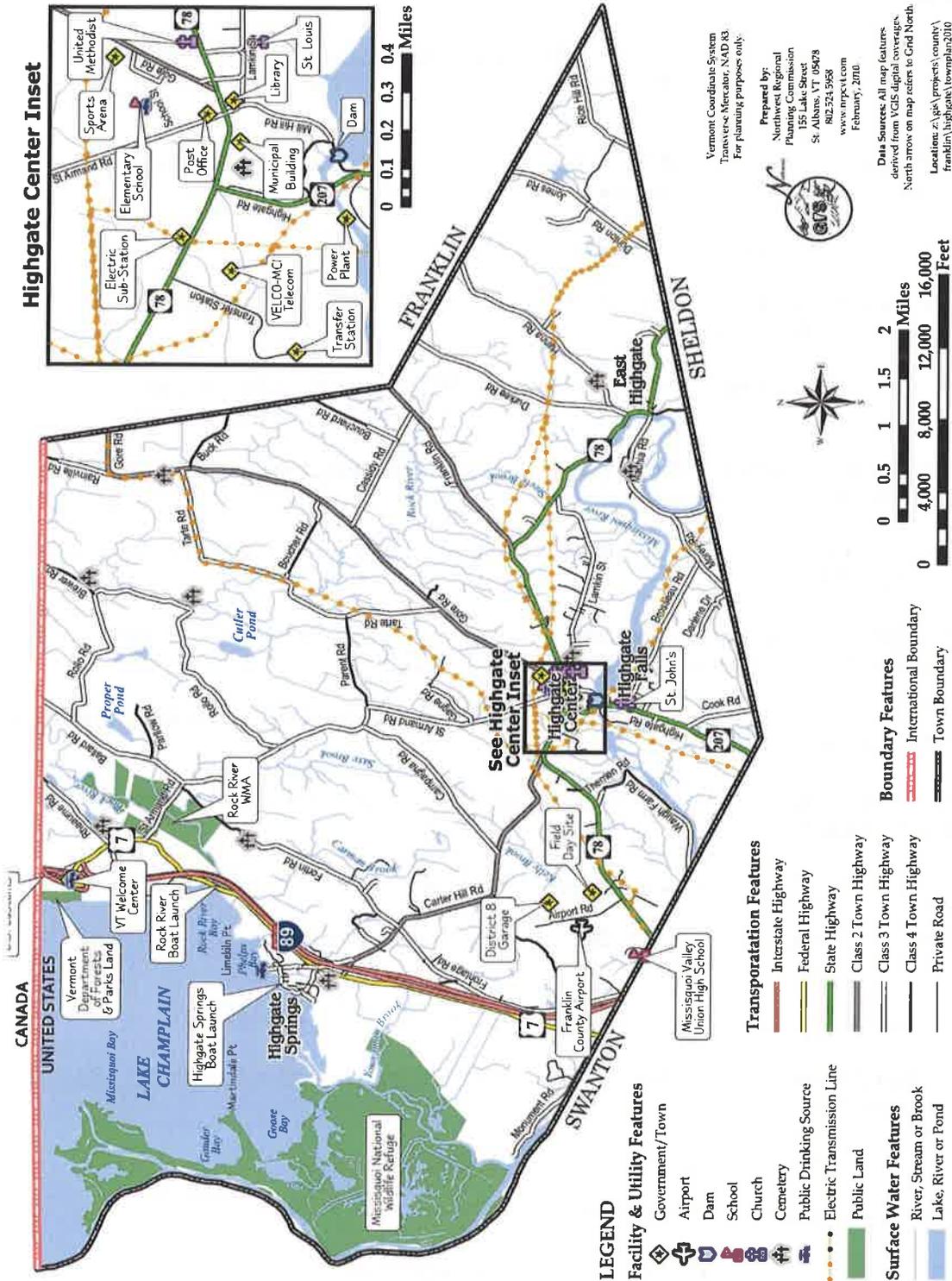
													Total Score	
	1	2	3	4	5	6	7	8	9	10	11	12		
Mitigation Action	Property buyouts Monument Road residences.	3	3	3	1	2	3	3	3	3	3	3	3	33
	Transfer Station property and road slope stabilization	3	3	3	3	2	3	3	3	3	3	3	3	35
	Machia Road Bank Stabilization	3	3	3	3	2	3	3	3	3	3	3	3	35
	Highgate/Swanton Monument Road Flood Proofing	3	3	3	1	2	3	3	3	3	3	3	3	33
	St. Armand Road culvert upgrade	3	3	3	1	3	3	3	3	3	3	3	3	34
	Pine Plains Road Erosion Control. (East Highgate)	3	3	3	1	3	3	3	3	3	2	2	3	33
	Rollo Road drainage improvements (1.5 miles east of the intersection with Ballard Road)	3	3	3	1	2	2	3	3	3	3	3	3	34
	Procure and install generator for water system at the Highgate Elementary School	3	3	3	3	2	2	3	3	3	3	3	3	34
	Support Power Utility Efforts to Protect Utility Corridors (tree / branch removal).	3	3	3	3	2	2	3	3	3	3	3	3	34

Attachment D
Public Government Participation

Information in the Hazard Mitigation Plan is based on research from a variety of sources. It encompassed research using a historical perspective and future projections for the vulnerability assessment. The research methods and various contributions to the plan included but were not limited to:

- Town of Highgate Select Board
- Town of Highgate Emergency Management
- Town of Highgate Planning Committee
- Town of Highgate Highway Department
- Local Emergency Planning Committee #4 (Franklin County)
- Highgate Volunteer Fire Department
- Northwest Regional Planning Commission
- Franklin County Sheriff's Office
- Vermont Department of Transportation District 8
- Vermont Emergency Management
- Vermont Agency of Natural Resources
- Vermont Homeland Security Unit
- Vermont Fire Academy
- Northeast States Emergency Consortium
- Federal Emergency Management Agency
- National Weather Service
- National Oceanic Atmospheric Administration
- Vermont Geological Survey

Attachment E
Town of Highgate Map 1



Attachment F

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