Town of Topsham, Vermont

2017 Local Hazard Mitigation Plan

Prepared by the Two Rivers-Ottauquechee Regional Commission and the Town of Topsham

Date of Town Adoption: August 28, 2017

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Date of Final Approval by FEMA

CERTIFICATE OF ADOPTION
<<DATE>>
TOWN OF Topsham, Vermont Selectboard
A RESOLUTION ADOPTING THE Topsham, VT 2017 Local Hazard Mitigation Plan

WHEREAS, the Town of Topsham has historically experienced severe damage from natural hazards and it continues to be vulnerable to the effects of the hazards profiled in the **Topsham, Vermont 2017 Local Hazard Mitigation Plan,** which result in loss of property and life, economic hardship, and threats to public health and safety; and

WHEREAS, the Town of Topsham has developed and received conditional approval from the Federal Emergency Management Agency (FEMA) for its **Topsham, Vermont 2017 Local Hazard Mitigation Plan (Plan)** under the requirements of 44 CFR 201.6; and

WHEREAS, the **Plan** specifically addresses hazard mitigation strategies, and Plan maintenance procedures for the Town of Topsham; and

WHEREAS, the **Plan** recommends several hazard mitigation actions (projects) that will provide mitigation for specific natural hazards that impact the Town of Topsham with the effect of protecting people and property from loss associated with those hazards; and

WHEREAS, adoption of this **Plan** will make the Town of Topsham eligible for funding to alleviate the impacts of future hazards; now therefore be it

RESOLVED by Town of Topsham Selectboard:

1. The **Topsham, Vermont 2017 Local Hazard Mitigation Plan** is hereby adopted as an official plan of the Town of Topsham;

2. The respective officials identified in the mitigation action plan of the **Plan** are hereby directed to pursue implementation of the recommended actions assigned to them;

3. Future revisions and **Plan** maintenance required by 44 CFR 201.6 and FEMA are hereby adopted as part of this resolution for a period of five (5) years from the date of this resolution; and

4. An annual report on the process of the implementation elements of the Plan will be presented to the Selectboard by the Emergency Management Coordinator.

IN WITHNESS WHEREOF, the undersigned have affixed their signature and the corporate seal of the Town of Topsham this 28 day of August 2017.

James Bulger
Selectboard Chair

Thomas Flannigan
Selectboard Member

Wendell Timmons

BJC

ATTEST

Cynthia Flannigan
Town Clerk

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I. Introduction

Natural and human-caused hazards may affect a community at any time. Natural hazard events cannot be stopped; however, their impact on human life and property can be reduced through community planning. Accordingly, this Local Hazard Mitigation Plan (hereafter referred to simply as the Plan) seeks to provide an all-hazards mitigation strategy that will make the community of Topsham more disaster resistant.

"Mitigation" is defined as any sustained action that reduces or eliminates long-term risk to people and property from natural and human-caused hazards and their effects. Previous Federal Emergency Management Agency (FEMA), State and Regional Project Impact efforts have demonstrated that it is less expensive to anticipate disasters than to repeatedly ignore a threat until the damage has already been done. While hazards cannot be eliminated entirely, it is possible to identify prospective hazards, anticipate which might be the most severe, and recognize local actions that can be taken ahead-of-time to reduce the damage. These actions, also known as 'hazard mitigation strategies' can (1) avert the hazards through redirecting impacts by means of a structure, land treatment, or land use pattern change (2) adapt to the hazard by modifying structures or standards or, (3) avoid the hazard through improved public education, relocation/removal of buildings in the flood zone, or ensuring development is disaster resistant.

II. Purpose of the Plan

The purpose of this Plan is to assist Topsham in identifying all hazards facing the town, ranking them according to local vulnerabilities, and identifying strategies to reduce risks from vulnerabilities of highest concern. Implementation of this plan will make our community more resistant to harm and damages in the future, and will reduce public costs.

The Town of Topsham seeks to be in accordance with the strategies, goals, and objectives of the State Hazard Mitigation Plan.

The 2017 Topsham Local Hazard Mitigation Plan is the first single jurisdiction mitigation plan drafted for the Town. Previously, the Town had a town-specific 2011 Annex in the Regional (mulit-jurisdiction) Pre-Disaster Mitigation Plan. This new Plan has been reorganized and new sections have been added:

- Program eligibility subsequent to plan approval
- Authority for plan development
- Participating jurisdictions
- Funding for plan development
- Brief information about the community

Old assumptions have been challenged throughout, and new information has been added to make the plan stronger and more useful for the Topsham town officials and residents who will implement the hazard mitigation strategies in the future.

III. Community Profile

The town of Topsham, consisting of approximately 31,315 acres, is located in the northeast section of Orange County. It borders the Town of Newbury to the east, Corinth to the south, Groton to the north, and Orange to the west. Topsham consists of steep hills and valley bottoms throughout the Town, with some of the higher elevated areas occurring in the western part of Town. The eastern corner of Town features Pine Mountain at 1,470 feet in elevation and the Pine Mountain Wildlife Management Area, which consists of 2,274 acres altogether in Topsham, Newbury, Ryegate, and Groton. The eastern part of Town also features Galusha Hill at 1,950 feet, Mason Mountain at 1,8000 feet, and Burnham Mountain at 1,620 feet. Significant natural features in the central part of Topsham include Williams Hill (1,714 feet) and Pierson Hill at (1,962). The western part of Topsham features its highest elevated areas, including Allen Hill at 2,052 feet, Willey Hill at 2,231 feet, and Fuller Hill at 2,340 feet.

The major waterbodies in Topsham include the Main Branch of the Waits River, which enters Town along its east central borders and flows southeast as it parallels Route 25. The Tabor Branch of the Waits River originates in Town north of Willey Hill Road along Territory Road, it continues into East Topsham, and it parallels Topsham Corinth Road and joins the Main Branch of the Waits River south of Topsham.

Topsham was originally founded in 1763 with a land grant from King George III. The town consists of three villages: East Topsham, West Topsham, and Waits River. The mixed uses present in the Topsham villages consist of stores, Post Offices, the Town Office, Town Halls, Churches, and the School. Due to topography, Topsham's working landscape (agriculture, etc.) is fairly limited. Most active farming takes place on the valley floors along Route 25, Powder Spring/Corinth Topsham Road.

In 2010 the population of Topsham was 1,173. From 1990 to 2010, the Town's population grew by 24.3%; however it only grew by 2.7% from 2000-2010. Despite this population growth of the past two decades, Topsham's current population is lower than its historical high of 1,745 in the 1840s.

Although Topsham consists of many hills with steep slopes, development has occurred throughout the Town, mostly on rural roads, such as Willey Hill, East Orange Road, and Powder Spring Road. According to Vermont Housing data, there were 661 housing units in Topsham in 2010, which is an increase of 13.6% from 2000 (equivalent to almost 8 housing units being added to housing stock figures per year). In 2010, there were 156 units, or 23.6% of all housing units, devoted to seasonal, recreational or occasional use. While about 12% of housing units in Topsham were built from 2000 to 2010, slightly over 34% of Topsham residences were built prior to 1939, according to 2010 U.S. Census information.

Fire protection services are provided by the Tri Village Fire Association. With 10 firefighters in each of the Topsham stations, this all- volunteer department provides twenty-four hour coverage for the Town and surrounding areas. Neighboring communities' fire departments are called on in large fires requiring outside resources. The Fire Association is part of formal mutual aid agreements that cover 28 towns, going as far north as Stowe. The East Topsham and West Topsham Fire departments are owned and operated by the Tri-Village Fire Association (which includes the Orange Volunteer Fire Department as

well). It is a private organization, and is not run by the Town. Both facilities are in good condition and are meeting the needs of the Tri-Village Fire Association.

Washington Electric Coop provides electricity to the majority of the town; however, there is a small portion of the town that is serviced by Green Mountain Power.

The Town of Topsham does not maintain a police force. Any issues or incidents requiring Police action fall to the Vermont State Police. The Orange County Sheriff's department does offer coverage in the Topsham area but is not under contract with the Town, and therefore does not handle enforcement. Police coverage is Topsham is sufficient for the needs of the Town.

The Topsham-Corinth Fast Squad is the first response to medical emergencies. They are trained to handle situations until responders from the Barre Town EMS squad can arrive. The closest hospital is Central Vermont Hospital in Berlin. Medivac services are available by the DHART helicopter when necessary. There is a DHART landing zone at the Waits River Valley School. The Town has appointed a Public Health Officer that is empowered, along with the Selectboard, to protect public health in Town.

IV. The Planning Process

A. Plan Developers

Michael Storace, a land use planner at the Two Rivers-Ottauquechee Regional Commission (TRORC), assisted the Town of Topsham with updating its Local Hazard Mitigation Plan. Committee members who assisted with the revisions include:

This section of the Plan satisfies 44 CFR 201.6(b)(1) and 201.6(c)(1) (or, A3.a and A3.b of FEMA's Local Mitigation Plan Review Guide, 2011).

Name	Role/Organization	How Participation Was Solicited
Wendell Downing	Tri-Village Fire Association	On 10/5/2015, Michael Storace reached out to the Topsham Selectboard (Brad Calhoun, Carl Hildebrandt, James Bulger, Thomas Flannigan, and Wendell Downing), the Town Emergency Management Coordinator (Brad Calhoun) and the Town Clerk (Cindy Flannigan). TRORC staff coordinated with Topsham town officials to set up an introductory meeting. The first meeting was scheduled for 11/9/2015. TRORC's staff attended that meeting, followed by many more meetings in which participants revised and developed the LHMP. See below for more meeting-specific details.
Brad Calhoun	Emergency Manager Coordinator & Selectboard member	
Tom Flannigan	Selectboard	
Steve Otterman	School Board Member	
Polly Stryker	Planning Board Member	
Brooke Hayward	Planning Board	
James Bulger	Selectboard Chair	
Carl Hildebrandt	Selectboard member	
Pete Arnold	Road Foreman	
Matt Stacy	Former Planning Board Chair	
Steve Ottis	Planning Board Chair	

B. Plan Development Process

The 2011 Topsham Annex was originally part of the 2008 multi-jurisdictional Regional Hazard Mitigation Plan, drafted by Two Rivers-Ottauquechee Regional Commission, and approved by FEMA on September 30, 2008 with its first local annex. The Topsham Annex received subsequent FEMA approval, but, since it was part of a larger plan, FEMA treats its start date as September 30, 2008, meaning the Topsham Annex expired on September 30, 2013.

This section of the Plan satisfies the Element A: Planning Process requirements set out in 44 CFR 201.6.

This Plan has been reconstructed now as a single jurisdiction, stand-alone Topsham Local Hazard Mitigation Plan that will be submitted for individual approval to FEMA. As such, several sections have been added or updated to include all necessary information.

The changes to this Plan include:

- **General**
  - New sections: Plan Development Process, 2011 Mitigation Strategies Status Update chart, Existing Hazard Mitigation Programs, Projects & Activities, Plan Maintenance;
  - Data updates: New hazard incidents, emergency declarations, Census data;
  - Hazards have been reevaluated with the hazard ranking system used by the Vermont Division of Emergency Management and Homeland Security.
- **Hazards Analysis**
  - Hazardous Material Spills and Flash Flood/Flood/Fluvial Erosion remain on the list of "top hazards," which reflect the local officials' belief that the Town is still vulnerable to these hazards;
  - Extreme Cold/Snow/Ice Storm has been added to the list of "top hazards," which reflects the intention/priorities of local officials to expand their analysis of hazards that the Town is or may be vulnerable to in the next five years;
  - Structural Fire has been removed from the list of "top hazards;"
  - For each hazard, a location/vulnerability/extent/impact/likelihood table has been added to summarize the hazard description.
- **Maps**
  - A map of the Town of Topsham depicting critical facilities, town infrastructure, and the NFIP designated floodway, the 100-year and 500-year floodplain has been added.

The following represent the avenues taken to draft the Topsham Local Hazard Mitigation Plan:

- **Activities and Public participation and involvement (44 CFR 201.6(b)(1))**

***Note: The meetings listed below were public sessions (the agenda was posted prior to the meeting).*

  - 11/9/2015: Michael Storace met with Topsham LHMP committee members to introduce the update/plan development process, reviewed Topsham's existing Hazard Mitigation Plan (adopted in June 2011), considered the status of various mitigation actions,

potential hazards, and the data collection/research process. The Topsham committee also discussed and ranked hazards to determine the "Top Hazards" in the Town that expose our greatest vulnerabilities. Michael explained to the committee what the next steps in the process are (draft plan, and then schedule a meeting to review and discuss it). The agenda and minutes for this meeting were properly warned in Town. Comments were received and reflected in the Plan.

- 2/8/2016: Michael Storace met with the LHMP committee members to assess the Town Capabilities for implementing the mitigation strategy and existing hazard mitigation programs. Hazard Mitigation Committee also participated in a mapping exercise to identify areas in Town that are vulnerable to flooding and other hazards. Michael and Hazard Mitigation Committee also developed and assessed hazard mitigation strategies to address the previously identified hazards that pose a threat to the Town. The agenda and minutes for this meeting was properly warned in Town. Comments were received and reflected in the Plan.
- December 2015: A notice was placed in the Two Rivers-Ottauquechee Regional Planning Commission Newsletter alerting recipients that Topsham was engaging in hazard mitigation planning and updating their Local Hazard Mitigation Plan. Contact information was provided in the notice to allow those interested in Topsham's efforts to receive more information and how to find out about upcoming meetings. No comments from the public were received.
- December 2016: A notice was posted in the Two Rivers-Ottauquechee Regional Planning Commission newsletter alerting recipients that Topsham was engaging in hazard mitigation planning and updating their Local Hazard Mitigation Plan. Contact information was provided in the notice to allow those interested in Topsham's efforts to receive more information and how to find out about upcoming meetings. No comments from the public were received.
- 7/10/2017: Michael Storace met with the LHMP committee, Planning Board, and several Selectboard members to discuss the draft Topsham Local Hazard Mitigation Plan. Michael Storace received numerous comments and reflected them in the Plan .

- **Governmental participation and involvement** *(44 CFR 201.6(b)(2)*)
  - Sent revised draft to the Selectboard Chair, Jim Bulger, and provided contact information for receiving comments via email/hard copy—7/7/2017
    - No comments were received.
  - Sent revised draft to Planning Commission Chair, Matt Stacy, and provided contact information for receiving comments via email/hard copy—7/7/2017
    - No comments were received.
  - Sent revised final draft to Division of Emergency Management and Homeland Security—7/14/2017
    - Plan sent to FEMA

- Note: Town officials were given the opportunity to review, provide feedback and approve the changes that were made through the Plan revision and FEMA review process.

- **Neighboring community participation and involvement** *(44 CFR 201.6(b)(2)*)
  - December 2015: A notice was placed in the Two Rivers-Ottauquechee Regional Planning Commission Newsletter alerting recipients that Topsham was engaging in hazard mitigation planning and updating their Local Hazard Mitigation Plan. Contact information was provided in the notice to allow those interested in Topsham's efforts to receive more information and how to find out about upcoming meetings. No comments from the public were received.
  - Posted a notice in four local papers alerting the public to the hazard mitigation planning process that was taking place. Contact information was provided in the notice to allow those interested in Topsham's efforts to receive more information and how to find out about upcoming meetings. No comments from the public were received.
    - Valley News—ran 2/8/2016
    - The Herald of Randolph— ran 2/8/2016
    - Journal Opinion— ran 2/8/2016
    - Vermont Standard— ran 2/8/2016
  - December 2016: A notice was placed in the Two Rivers-Ottauquechee Regional Planning Commission Website alerting the public that Topsham was engaging in hazard mitigation planning and updating their Local Hazard Mitigation Plan. Contact information was provided in the notice to allow those interested in Topsham's efforts to receive more information and how to find out about upcoming meetings. No comments from the public were received.
  - Sent revised draft to neighboring towns' Selectboards for comment and provided contact information for receiving comments via email/hard copy—07/7/2017
    - Towns of: Newbury, Corinth, Groton, and Orange.
    - No comments were received.

- **Review of existing plans, studies, reports, and technical information** (*44 CFR 201.6(b)(3)*)
  - State of Vermont Hazard Mitigation Plan, 2013
  - Topsham Hazard Mitigation Plan (Adopted 06/13/2011)
    - This Plan was referenced extensively during the plan development process, especially in regard to the worst threats and mitigation action strategies identified in 2011.
  - Topsham Town Plan (Adopted 09/25/2012)
    - The Town Plan provided TRORC's staff with background information on the community, as well as more detail on their emergency services.
  - Topsham, Vermont Flood Hazard Area Bylaws (Adopted 05/19/2008)
    - The Flood Hazard Area Bylaw was referenced for general knowledge and for Topsham's Flood Hazard Regulations.

This section of the Plan satisfies 44 CFR 201.6(b)(3) (or, A4.a and A4.b of FEMA's Local Mitigation Plan Review Guide, 2011).

- Topsham Local Emergency Operations Plan (LEOP) (Adopted 05/08/2017)
    - The Topsham LEOP was referenced for general knowledge regarding the Town's emergency operations.
- Flood Insurance Study: Town of Topsham, Vermont (September 27, 1991)
    - The Flood Insurance Study was referenced for general knowledge of Topsham's water bodies, the Waits River and The Tabor Branch and for historic flooding information.

C. Status Update on Mitigation Actions Identified in 2011

This section of the Plan satisfies the requirements of 44 CFR 201.6(d)(3).

The following table outlines the mitigation actions that were proposed in Topsham's 2011 All-Hazard Pre-Disaster Mitigation Plan for the Town of Topsham (adopted on June 13, 2011 as an appendix to the Two Rivers-Ottauquechee Regional Commission's multi-jurisdictional Pre-Disaster Mitigation Plan). Participants in the new Plan update process reviewed these actions and reported on the status of each. Actions related to long-term mitigation of natural hazards are so noted.

Mitigation Action	Who (Leadership)	When (Timeframe)	How (Funding/ Support)	2017 – Status of Mitigation Actions
ALL HAZARDS 1. Ensure that BEOP is current	Selectboard	Yearly	With TRORC assistance	The newest iteration of the BEOP is the Local Emergency Operations Plan (LEOP). The Topsham LEOP undergoes an annual update and it was last updated and approved on 05/08/2017.
2. Use Pre-Disaster Mitigation (PDM) plan for Hazard Identification and Mapping.	Emergency Management Coordinator	Ongoing	With TRORC assistance	The previous iteration of this plan, the PDM plan, was used in the development of this plan.
3. Encourage utilities to continue a regular schedule of tree trimming along power lines	Emergency Management Coordinator	Yearly	Local Resources	Washington Electric Company currently works to trim trees along power lines while it partakes in utility work. This action has been carried over into the 2017 Plan.
FLOOD 4. Continue the planned road maintenance program and update existing culvert inventory. Upgrade culverts and ditching. (Mitigation)	Highway Department	Ongoing	Local resources	The Town consistently upgrades culverts. The fully inclusive culvert inventory has not been completed since 2006. This action has been carried over into the 2017 Plan.
5. Revise flood hazard regulations. (Mitigation)	Planning Commission/ Selectboard	2009	Local resources with TRORC assistance	Flood hazard ordinance was completed in 2008.
HAZMAT 6. Pursue HAZMAT training for Fire Department.	Fire Department	2009	Funded by Fire Service Training Academy	Most Fire Department members are certified to the Awareness level; and this training/recertification remains ongoing.
FIRE 7. Develop additional dry	Fire Department	Ongoing	Local resources,	The Fire Department has installed 6 dry hydrants in the last 10 years and have ensured all villages have a dry hydrant.

Mitigation Action	Who (Leadership)	When (Timeframe)	How (Funding/ Support)	2017 – Status of Mitigation Actions
hydrant sites in rural locations.				

This 2017 Topsham Local Hazard Mitigation Plan reflects several changes in priorities from the 2011 Plan. This 2017 Plan and the 2011 Plan both recognize and detail Flash Flooding, Hazardous Material Spills, and Structural Fires as the hazards that pose the greatest risk to health and property in the Town of Topsham. However, this 2017 Plan also addresses Severe Weather/Tropical Storms/Hurricanes and Extreme Cold/Snow/Ice Storm as hazards that present risk to health and property in the Town. The 2011 Plan did not detail these hazards. This 2017 Plan also expands the Flash Flooding hazard to include fluvial erosion, which was not detailed in the 2011 Plan. Specific vulnerabilities of the Town have changed as a result of Tropical Storm Irene, which was a Tropical Storm to affect the Town in 2011. This storm caused major flooding due to periods of high intensity rain. Tropical Storm Irene revealed new vulnerabilities in Town, specifically on upstream unmapped flood zones. This 2017 Plan identifies more detailed hazard mitigation strategies to reduce the risk to health and property as a result of the hazards that pose the greatest risk to the Town of Topsham. However, mitigation actions identified in the 2011 Plan and the previous chart that were not specifically completed were carried over into this 2017 Plan.

Depending on the location, new development in the Town of Topsham may be vulnerable to flood or fluvial erosion hazards. Fortunately, the town's slow growth rate and interest in pursuing options for reducing flood risks help reduce these risks. The Town's Flood Hazard Ordinance regulates new development within the Special Flood Hazard Area, which helps to reduce threats to structures built near flood hazards. However, the areas vulnerable to flood hazards and fluvial erosion hazards are not necessarily analogous; therefore, the Town's Flood Hazard Ordinance may not protect new development from fluvial erosion hazards. Similarly flooding may occur outside of mapped Special Flood Hazard Area, making it difficult for the Flood Hazard Ordinance to properly plan for and limit development from flooding and erosion hazards. The desire to focus development and growth within the Villages of Waits River, West Topsham, and East Topsham in the face of vulnerability to flooding represents a land use challenge. These challenges are currently being experienced in towns throughout Vermont. From 2000 to 2010 there were 79 new housing units constructed in the Town of Topsham, making a total of 661 total housing units. The Town of Topsham has a slow growth rate with a slow level of development. Structures that are within the mapped River Corridor may be vulnerable to fluvial erosion. Recent development in Topsham, which has occurred since the 2011 Plan was adopted, has occurred on Cross Road, Macdonald Road, Willey Hill Road, and Powder Spring Road. These developments are not vulnerable to flooding and fluvial erosion.

D. Town Capabilities for Implementing the Mitigation Strategy (Existing Hazard Mitigation Programs, Projects & Activities)

This section of the Plan satisfies the requirements of 44 CFR 201.6(c)(3).

The Town of Topsham is currently engaged in the following hazard mitigation programs, projects and activities:

	Type of Existing Authority / Policy / Program / Action	Resources: Staffing & Funding	Ability to Expand/Improve on
Community Preparedness Activities	Program—Annual update of Topsham's Local Emergency Operations Plan (LEOP). Last updated and approved on 05/08/2017.	Volunteer time from the Emergency Management Coordinator; assistance from TRORC. Funding from Vermont DEMHS.	This document is reviewed and updated each year to ensure that the contact information of emergency response personnel is up-to-date. This information is then sent to Vermont Emergency Management for their records. Current program works well, no need to expand or improve on.
	Program—Participation in LEPC #12	Volunteer time from Emergency Management Coordinator and sometimes the Fire Chief. Funding from LEPC #12 and assistance from TRORC.	The Town's current participation in the LEPC #12 is satisfactory. Therefore, there is currently no need to expand or improve on this program.
	Action— Designation of Red Cross Shelter: Waits River Valley School.	Staff/volunteer time from the Town Clerk, Emergency Management Coordinator. Funding from American Red Cross.	This is a one-time action, so there is no need to expand on it. The Fire House is a backup shelter.
Insurance Programs	Authority/ Program— participation in National Flood Insurance Program (NFIP) [Note: This section of the Plan satisfies the requirements of 44 CFR 201.6(c)(3)(ii).]	Assistance from TRORC and Vermont ANR. Funding from local resources— annual town budget.	The Town's initial Flood Insurance Rate Map (FIRM) was dated 10/29/76. The Town's current Flood Insurance Rate Map (FIRM) was dated 09/27/91. The Town of Topsham adopted a Flood Hazard Ordinance on 05/19/2008. This ordinance prohibits construction in floodways and regulates new construction in the Special Flood Hazard Area. The Town employs Jim Bulger as its NFIP Administrator. The Town would like to request map revisions from FEMA.
Land Use Planning	Policy/Program— Topsham Municipal Plan Adopted on 09/25/2012, includes a "Flood Hazard Area and Floodplains" in the "Natural Resources" section.	Volunteer time from Planning Commission, and assistance from TRORC and other state agencies on specific subject matter.	The Town Plan is updated every eight years, as required by statute. The Planning Commission may expand or improve on any section it deems necessary, or that is required by changes in state statue. Town will adopt Flood Resilience Element in Town Plan in 2017 when Town Plan is updated.
	Completed Authority— Topsham Flood hazard Ordinance Adopted on 05/19/2008.	Volunteer time from the Planning Commission, and assistance from TRORC.	During the Town Plan review/update period, the Flood Hazard Area Bylaw may be updated if needed. However, there is no need to expand upon this action at this time.

Hazard Control & Protection of Critical Infrastructure & Facilities	Policy/Program—Topsham Hazard Mitigation Plan Adopted on 06/13/2011	Volunteer time from Town officials; assistance from TRORC and Vermont DEMHS. Funding from FEMA; Vermont DEMHS; TRORC.	The 2017 Topsham Local Hazard Mitigation Plan will replace the 2011 Plan. The 2017 LHMP has evolved from the 2011 Plan and has greatly expanded and improved upon it. Future iterations of the Town's LHMP will be updated by the Town at least every five years.
	Program—Town-wide Class III road inventory and capital budget planning	Staff time from the Town Road Foreman; and assistance from TRORC. Funding from VTran's Better Backroad grant program.	The Town is currently using the road inventory to improve its class III roads, and seeking funding through the Better Roads grant program for implementation projects. It makes road improvements every year.
	Program— Full culvert inventory was completed with TRORC assistance in 2006.	Staff time from Town Road Foreman; assistance from TRORC. Funding from VTrans; local personnel time and funding.	The Town is currently using the culvert inventory to further its culvert improvement program, and seeking funding through for implementation projects. However, a full update to the culvert inventory, with georeferenced culvert locations and a prioritized list of mitigation improvement projects, should be updated every few years. Culvert updates should be added to www.vtculverts.org
	Ongoing Action— the Fire Department distributes fire prevention fliers at the school	Time from the Volunteer Fire Department and funding from Fire Department budget.	In the past, the Fire Department has completed this action. It has been carried over to this Plan.
	Ongoing Action— the Town places emergency-related information in the Annual Report and on the Town's website (when active)	Staff time from Town Office personnel and funding from the Town's budget.	This is an ongoing action and there is no need to expand upon it at this time.

E. Plan Maintenance

This Plan (the Topsham Local Hazard Mitigation Plan) will be updated and evaluated by discussing its effectiveness and making note to incorporate any necessary revisions in the update process. This update and evaluation will occur annually at an April Selectboard meeting along with the annual review of the Local Emergency Operations Plan (LEOP). At this meeting, the Selectboard will monitor the implementation of the hazard mitigation and preparedness strategies outlined in this Plan by noting those that have been completed, and identifying the next steps required to implement the Plan's remaining strategies. Comments from local officials and the public will be incorporated when relevant. This meeting will constitute an opportunity for the public and other town officials to hear about the town's progress in implementing mitigation strategies and to give input on future activities and Plan revisions. The public will be given the opportunity to comment at this meeting. Evaluation of the Local Hazard Mitigation Plan will consist of a thorough analysis of the status of mitigation and preparedness strategies and whether they are being implemented according to the time frames included in tables in this Plan. The Town of Topsham will evaluate the status of mitigation strategies to assess that goals of the Local Hazard Mitigation Plan are being met. Adherence to the mitigation, preparedness, and ongoing strategy implementation tables included in this Plan will constitute the degree of effectiveness of the Plan. The Town will also evaluate the status of vulnerabilities detailed in this Plan to evaluate their validity. The update of the Plan will bring up to date materials that have become outdated due to the passage of time. Topsham's Emergency Manager will be the principal point of contact and will take primary responsibility for the monitoring, evaluation, and update process described here. He or she will bring the Plan's maintenance activities to the Selectboard's agenda and discussions.

Updates and evaluation of this Plan by the Selectboard and the local Emergency Management Coordinator will also occur within three months after every federal disaster declaration directly impacting the Town of Topsham. The Town will monitor, evaluate and update this Local Hazard Mitigation Plan at an April Selectboard meeting and after every federally declared disaster directly impacting the Town according to the graphic in Appendix C. The Town shall reference the Local Hazard Mitigation Plan when working on Town Plan amendments or changes to the Town's bylaws.

This section of the Plan satisfies 44 CFR and 201.6(c)(4)(i), 201.6(c)(4)(ii), and 201.6(c)(4)(iii).

At least one year before the Plan expires, the update process will begin (through annual updates, monitoring of progress and evaluation that will occur at the April Selectboard meeting). For this next Plan update, the Two Rivers-Ottauquechee Regional Commission (TRORC) will help with Plan updates if assistance is requested by the Town of Topsham and if funding is available. If TRORC is unable to assist the Town, then Topsham's Town Clerk, Administrative Assistant, or Selectboard will update the Plan, or the Selectboard may appoint a committee of interested citizens (including the current local Emergency Coordinator) to draft changes. Ultimately, it will be the Town's responsibility to update their Local Hazard Mitigation Plan.

The process of evaluating and updating the plan will include continued public participation through public notices posted on the municipal website (if active), notice within the municipal building, and notice in The Journal Opinion, the Valley News, and the TRORC newsletter, inviting the public to the scheduled Selectboard (or specially scheduled) meeting. The public will be given the opportunity to comment during this process. Additional stakeholders may be invited to the meeting these include: Barre Town Ambulance, VTrans, and the Vermont Agency of Natural Resources (VT ANR). VT ANR may be invited because they can provide assistance with NFIP outreach activities in the community, models for stricter floodplain regulations, delineation of fluvial erosion hazard areas, and other applicable initiatives.

Updates will address changes in community mitigation strategies; new town bylaws, planning strategies if appropriate; progress on the implementation of initiatives and projects; effectiveness of implemented projects or initiatives; and evaluation of challenges and opportunities including overall effectiveness of plan goals and actions in reducing vulnerabilities. If new actions are identified in the interim period, the plan can be amended without formal re-adoption during regularly scheduled Selectboard meetings.

Topsham shall also incorporate mitigation planning into their long-term land use and development planning documents. The 2011 Topsham Annex, the previous version of this Local Hazard Mitigation Plan for the Town of Topsham, provided guidance in the development of the Topsham Municipal Plan, including directing goals, policies, and recommendations towards mitigating the effects of future hazards on health and property in the Town. The 2013 Vermont Legislature passed a law requiring all towns to incorporate flood resiliency elements into their town plans as of July 2014. To do so, flood hazard and fluvial erosion hazards will be identified, and strategies and recommendations will be provided to mitigate risks to public safety, critical infrastructure, historic structures and public investments. This Local Hazard Mitigation Plan will help the town to comply with the new community flood resiliency requirement for town plans adopted after July 2014.

It is also recommended that the process work both ways and the Town review and incorporate elements of the Local Hazard Mitigation Plan into updates for the municipal plan and flood hazard/ River Corridor bylaws. The Town shall also consider reviewing any future TRORC planning documents for ideas on future mitigation projects and hazard areas. The Topsham Planning Commission will incorporate hazard mitigation strategies developed and identified in this Local Hazard Mitigation Plan directly into goals, policies, and recommendations in future updates to the Topsham Town Plan. Mitigation strategies will directly influence goals, policies, and recommendations in future updates to the Topsham Town Plan. The incorporation of the goals and strategies listed in the Local Hazard Mitigation Plan into the municipal plan, s and flood hazard/River Corridor bylaws will also be considered after declared or local disasters.

V. Community Vulnerability by Hazard

A. Hazard Identification

Mitigation efforts must be grounded in the rational evaluation of hazards to the area and the risks these hazards pose. This is done through a process, which in essence asks and answers three basic questions:

- What bad things can happen, given the town's vulnerabilities?
- How likely are they to occur?
- How bad could they be?

This process, which is laid out in Appendix A, is an attempt to inventory the known hazards, establish the likelihood of them occurring in the future, and then assess the community's potential vulnerability to each. In performing this analysis, we are then able to prioritize actions that are designed to mitigate the effects of each of these disaster types and ultimately make Topsham a safer place.

It is important that we learn from the past in order to avoid the same disasters and their outcomes. Disasters that have occurred within the Town of Topsham, the larger region, and the State of Vermont can give us good information about what types of disasters we can expect in the future and what kinds of damage they might cause. However, while this historical data can inform our perspective of what might happen in the future, it is by no means a prophecy. While Topsham might not have been impacted by a specific hazard in the past, this does not necessarily mean it will never be affected in the future. Indeed, the advance of climate change means that old weather patterns may not hold. For instance, in recent years, Vermonters have seen an increase in the number and severity of storms, especially rainfall events. Armed with historical data and a healthy respect for climate change and the unknown, we have tried our best to identify hazards and prepare for the future.

The following table reflects the hazards that we believe can be expected, or are at least possible, in the central Vermont area. We have considered factors such as frequency of occurrence, warning time, and potential community impact to rank each and determine which hazards pose the greatest threats to life and property in Topsham.[1] The worst threats (bolded in the table, below) are then followed-up with discussion and mitigation strategies throughout the rest of this Plan.[2] It should be noted that hazards assigned with the same "Hazard Score" are not in order and their placement in the table should not be assumed to reflect their potential to create hazards for the town.

[1] The ranking methodology used in this Plan (see Appendix A) is closely modeled on that which is used by the Vermont Division of Emergency Management & Homeland Security (VDEMHS). Those hazards which were not found to pose the greatest threats to Topsham - including Drought, Extreme Heat, Tornadoes, Hail Storms, water supply contamination, dam failure, severe weather, avalanches, radon, Invasive Species Infestation, Landslides/Mudslides/Rockslides, and Earthquakes - were not addressed in this plan due to low probability of impact and scarce community resources (time and money). For these hazards, please a review of the Vermont State Hazard Mitigation Plan. The changes made were intended to reflect the more limited geographical scope of this analysis, which is focused on a small, rural town rather than the entire State of Vermont (which is the focus of VDEMHS).

[2] It's important to note that those hazards which were not found to pose the greatest threats may still occur in Topsham's future; however, they are not the focus of this Plan.

Hazard	Frequency of Occurrence	Warning Time	Potential Impact	Hazard Score
Flash Flood/Flood/Fluvial Erosion	***Highly Likely***	***3-6 Hours***	***Moderate***	***10***
Severe Weather (Thunderstorm, Lightning, High Wind, Hail, and Flooding) ***Note: We have defined "Severe Weather" to include two or more of the above hazards. The Hazard Mitigation Committee decided to combine this hazard with Hurricane/Tropical Storm and Hail Storms.**	**Highly Likely**	**3-6 hours**	**Moderate**	**10**
Hazardous Material Spill	***Occasionally***	***None-minimal***	***Major***	***10***
Extreme Cold/Snow/Ice Storm	***Highly Likely***	***12+ hours***	***Major***	***9***
Structural Fire	**Likely**	**None-minimal**	**Minor**	**9**
Ice Jams	*Occasionally*	*3-6 Hours*	*Minor*	*8*
Dam Failure	Unlikely	None	Moderate	8
Landslides/Mudslides/Rockslides	Occasionally	None-minimal	Minor	8
Earthquake	Occasionally	None-minimal	Negligible	7
Hurricanes/Tropical Storms*	Occasionally	12+ hours	Major	7
Hail Storms*	Occasionally	None-minimal	Negligible	7
Invasive Species/Infestation	Highly Likely	12+ hours	Minor	7
Wildfire	Unlikely	None-minimal	Negligible	6
Tornado	Unlikely	None-minimal	Negligible	6
Drought	Occasionally	12+ hours	Negligible	4
Extreme Heat	Unlikely	12+ hours	Minor	4

The Topsham LHMP committee discussed the results of the hazard ranking activity and decided to focus on hazards that had the potential to impact the Town on a town-wide scale and/or were either **Occasionally**, ***Likely*** or ***Highly Likely*** to occur. For the purposes of this Plan, Severe Weather and Hurricanes/Tropical Storms will be combined into one hazard profile area for analysis due to their overlapping events and potential impacts to the Town. The Topsham LHMP also determined that hail storms are included as an aspect of severe weather, and therefore included an analysis of hail storms in

the Severe Weather section. The Topsham LHMP committee decided not to address ice jams in detail because it was determined that ice jams and flooding have similar vulnerabilities, mitigation actions, impacts, and effects, and flooding sections would address Topsham's vulnerabilities and abilities to address the ice jam hazard.

Due to low probability of impact, small potential impact, and scarce community resources (time and money), the mitigation committee chose not to detail the following hazards in this LHMP: extreme heat, drought, earthquakes, dam failure, tornadoes, landslides/mudslides/rockslides, avalanches, radon, wildfires, and invasive species infestation. Refer to Appendix A for definitions of the hazard ranking terms used in the above chart.

After engaging in discussions using their best available knowledge, the Town of Topsham identified the following "top hazards" (based on frequency of occurrence and potential impact) that they believe their community is most vulnerable to:

- Flash Flood/Flood/Fluvial Erosion
- Severe Weather
- Hazardous Material Spills
- Extreme Cold/Snow/Ice Storm
- Structural Fire

The impact of a loss of services is a common element of the hazards discussed in this Plan. These include not only large scale services such as the loss of transportation and communication ability, but also the loss of services more directly associated with basic needs such as water, food preparation, and heat. Loss of power for an extended period of time has the potential to greatly impact households who are entirely reliant on a functional power supply in order to prepare food, heat the household, and ensure that the water supply is available. While many residences in Topsham utilize a variety of methods to ensure these basic needs, it is important to be aware that a number of households rely on electricity alone for all of these functions. In addition to the plans described in the Topsham LEOP, it is important to reinforce the need for adequate generators in this Plan, so that the town is prepared to ameliorate the effects of a sustained power loss in Topsham. Included in this would be an adequate supply of fuel for these generators.

A further focus that is important to address in this Plan includes the awareness of the population demographics of Topsham. This includes a comprehensive idea regarding the number of individuals in the town who may require assistance in the event of a severe weather incident. Age and ability should be factors taken into account, and as discussed in the LEOP, there should be individuals responsible for creating and updating such a list, including members of the ambulance service, town offices, the health officer, and service officer.

Each of these "top hazards" will be discussed in the following sections. Within each section, previous occurrences of each hazard will be listed, including the County-wide FEMA Disaster Declarations (DR-#), where applicable. Hazards information was gathered from local sources, the National Climatic Data Center's (NCDC's) Storm Events Database (1950-2012 and 2006-2012), the Spatial Hazard Events and

Losses Database for the United States (SHELDUS) 1960-2012, and Special Reports produced by the National Weather Service in Burlington, Vermont. This section also includes a description of each "top hazard" and a hazard matrix that will also include the following information (please see each hazard profile for a hazard-specific matrix):

Hazard	**Location**	**Vulnerability**	**Extent**	**Observed Impact**	**Likelihood/Probability**
Type of hazard.	General areas in community that may be vulnerable to the hazard.	Community structures, systems, populations, or other assets as defined by the community that are susceptible to damage and loss from hazard events.	The strength or magnitude and details of the most notable event(s).	Financial impact from an event and/or the number of structures that are impacted	Occasionally: 1–10% probability of occurrence per year, or at least one chance in next 100 years Likely: >10% but <100% probability per year, at least 1 chance in next 10 years Highly Likely: 100% probable in a year

B. Hazard Profiles for Hazards Posing Highest Vulnerabilities

1. Flash Flood/Flood/Fluvial Erosion

This section of the Plan satisfies the requirements of 44 CFR 201.6(c)(2)(i), 201.6(c)(2)(ii), and 201.6(c)(2)(iii) for **Flash Flood/Flood/Fluvial Erosion**.

The most frequent form of flooding in the State of Vermont and the Town of Topsham is riverine flooding, or overbank flooding, which occurs to rivers when they receive more rain or snowmelt from their watershed than they typically experience. Flooding causes the inundation of land that is normally dry. Overbank flooding is experienced more frequently in mountainous and hilly areas where water moves with higher velocities. Flash floods occur when severe storms drop high amounts of rainfall in short periods of time. Flash floods occur more frequently in areas with steep slopes and narrow stream valleys. Riverine erosion is the gradual wearing away of land masses by rivers and streams. River channels are constantly changing. As rivers flow and water moves downstream, water exerts energy upon riverbanks and causes erosion.

Flooding is one of the worst threats to Topsham's residents and infrastructure. Past instances of flooding Topsham have included rain and/or snowmelt events that cause flooding in the major rivers' floodplains and intense rainstorms over a small area that caused localized flash-flooding. Both kinds of events can be worsened by the build-up of ice or debris, which can contribute to the failure of important infrastructure (such as culverts, bridges, and dams).

The worst flood disaster to hit the Town of Topsham, as well as the overarching region and the State of Vermont, occurred on November 3, 1927. This event was caused by up to 10 inches of heavy rain from the remnants of a tropical storm that fell on frozen ground. Eighty-four Vermonters, including the Lieutenant Governor, were killed. The flooding in the White River valley was particularly violent, with an estimated 120,000 to 140,000 cubic feet/second (cfs) flowing out of the White River at West Hartford, Vermont. Like many towns in the region, the Town of Topsham received heavy precipitation, seeing roughly 7-8 inches of rainfall over the storm period.

A more recent flooding event that devastated the region and the state was the result of Tropical Storm Irene, which occurred on August 28, 2011. Record flooding was reported across the state and was responsible for several deaths, as well as hundreds of millions of dollars of home, road and infrastructure damage. Due to the strong winds, 50,000 Vermont residents were initially without power, and many did not have electricity restored to their homes and businesses for over a week. Despite the damage wrought, the flooding caused by Tropical Storm Irene is considered to be the second greatest natural disaster in 20th and 21st century Vermont, second only to the Flood of 1927.

The Town of Topsham suffered some damage to property and infrastructure during Tropical Storm Irene, and no lives were lost. It is estimated that Tropical Storm Irene dropped 6-7 inches of rain over the Town of Topsham in a very short span of time, some of the highest precipitation totals in Orange County (which averaged 5-7+ inches over its land area). A few of Topsham's roads were damaged by the storm. The county-wide damage for Orange County totaled $5 million. As luck would have it, the Town of Topsham received only moderate damage during Tropical Storm Irene (approximately $75,861

according to FEMA's PA database). However, this was likely due in large part to localized variability of rainfall and the path of the tropical storm than the Town's invulnerability to flooding.

Unfortunately, flooding is very common across the region, with many events impacting the Town of Topsham specifically, and Topsham has been hit hard by other flooding events that pre-date Tropical Storm Irene. As such, flooding is one of the worst threats to Topsham's residents and infrastructure. The following list indicates the history of occurrence with regard to this hazard in Orange County (given the small population of Topsham, town-specific data is limited); an asterisk "*" denotes the instances in which town-specific data is available, and federal disaster numbers are listed where appropriate. Specific fluvial erosion data in terms of number of acres lost and amount of fill used to replace eroded material was unavailable for the following events.

History of Occurrences:

Date	Event	Location	Extent and Impacts
6/11/2014 (DR 4178)	Flooding and Fluvial Erosion	Topsham; Orange County	2014 consisted of a very wet summer with daily rainfall that led to permeated soils and high water volumes in streams and rivers. On 6/13 Topsham received .54 inches of precipitation and on 6/14 it received .66 inches. Two weeks later, on 6/26, Topsham received 1.41 inches of rain. On 6/18, 3 Washington Electric Cooperative customers lost power for 4.2 hours and on 6/28 6 WEC customers lost power for 1.5 hours. Topsham experienced at least $33,253.55 in damage according to FEMA's Public Assistance database.
Period from 06/25/2013—07/11/2013 (DR-4140)*	Severe Storms, Flooding, and Fluvial Erosion	County-; region-wide	Severe storms caused flooding throughout the region, causing damage to some infrastructure and facilities. During this period, Topsham received 4.69 inches of precipitation. Widespread outages occurred in Topsham. On 6/24 13 Washington Electric Coop customers were affected for 2.26 hours, and on 7/8 16 WEC customers were affected for 2.4 hours. No damage was claimed in the Town of Topsham.
08/28/2011 (DR-4022, TS Irene)*	Tropical Storm, Flooding, and Fluvial Erosion	Topsham, County-wide	Widespread rainfall amounts of 3-5 inches occurred across Vermont with 5 to 7+ inches across much of southern, central Vermont. Devastating flash flooding and fluvial erosion occurred across much of central and southern Vermont mountain valleys with substantial and some record breaking flood stages on larger rivers. This flood event will likely rank second to the November 1927 flood in the scope of meteorological and hydrological conditions/impacts as well as loss of life (84 in 1927), but likely first in monetary damage (approximately $500. million statewide vs $350. million (1927 in 2010 dollars). There were nearly 2,400 roads, 800 homes/businesses, 300 bridges and a half dozen railroad tracks destroyed or damaged from the flooding caused by Irene. According to spotter's reports, Topsham received over 6.79" of rain. $75,861 in damage total for Topsham according to FEMA's Public Assistance database (captures at least 70% of total damage). On 8/28 445 Washington Electric Power Customers lost power for 15 hours. On 8/29 241 WEC lost power for 4.24 hours.
9/30/2010-10/1/2010*	Flooding and Fluvial erosion	Topsham, County-wide	An area of low pressure and a pocket of tropical moisture associated with the remnants of Tropical Storm Nicole caused heavy rain in Vermont on September 30 and October 1, 2010. Topsham experienced 3.75 inches of rain in 24 hours, and experienced 5 inches in 48 hours. On 9/28 36 Washington Electric Coop customers lost power for 20 minutes. On 9/29 1 WEC customer lost power for 13 minutes. On 9/30 8 WEC customers lost power for 3.31 hours.
07/21/2010*	Flash Flooding	Topsham; County-	Several storms strengthened into super cells that produced widespread wind damage to trees, power poles and structures as well as large hail in excess of golf ball size in

Date	Event	Location	Extent and Impacts
		wide	diameter. Very heavy localized rains caused some temporary problems in many communities. 2.43 inches of precipitation was experienced in Topsham. On 7/22 4 WEC customers lost power for 2.5 hours. 3 Washington Electric Customers lost power for 1.15 hours and 5 WEC customers lost power for 5.36 hours.
08/21/2009*	Flash Flooding	Topsham; County-wide	Thunderstorms produced torrential downpours in nearby Chelsea, who experienced significant damage on several roads due to flash flooding. Damage was not as severe in Topsham, which received 1.26 inches in precipitation. Specific outage was unavailable for this event. .
08/07/2008* (Part of DR-1790 VT)	Flash Flooding and Fluvial Erosion	Topsham; County-wide	Thunderstorms with heavy rainfall in a moist atmosphere moved through central and southern Vermont during the afternoon and evening hours. Topsham received 2.6 inches of rain in 24 hours with an additional 1.22 inches of rain in the previous 24 hours. Specific power outage data for this event is unavailable. Topsham experienced $25,483.95 in damages.
8/3/2007	Flooding and Fluvial Erosion	Topsham, County-wide	Significant rain fell multiple days in a row to cause flooding and fluvial erosion. Topsham received .75 inches of rain in 24 hours and 1.31 inches of rain in 48 hours. Specific power outage data for this event is unavailable. Topsham experienced $5,737.50 in damages.
06/28/1973—06/30/1973 (DR-397)	Flooding	County-wide	Rainfall as much as 6 inches in 24 hours in some locations. State declared disaster area. 3 deaths occurred and $64 million in damage occurred in Vermont.
11/02/1927—11/04/1927 (“Flood of 1927”)	Flooding and fluvial erosion	County-wide	Considered to be on of VT’s most devastating events, the flood took our 1285 bridges, miles of roads and railways, and countless homes and buildings. 84 people were killed, including Lt. Gov. S. Hollister Jackson. Rainfall totaled 4-9” statewide, following a month with 150% the normal amount of rain.

The Town of Topsham has a standalone Flood Hazard Ordinance that was adopted on May 19, 2008. The Flood Hazard Ordinance prohibits development in the floodway and restricts development in the Special Flood Hazard Area, or the area that has a 1% chance flooding annually.

Mapped floodways exist for the Waits River. Special flood hazard area mapping also exists for the Tabor Branch of the Waits River. Altogether, there are 17 structures in the mapped special flood hazard area, including 8 single family dwellings, the Topsham post office, 4 mobile homes, 2 camps, and 2 buildings classified as other. If all of these properties were to be destroyed in a flooding hazard, the resulting damage would result in $2,499,000. Mapped River Corridor Areas exist for the Waits River, the Tabor Branch of the Waits River, Powder Springs Brook, the East Orange Branch of the Waits River, Hedgehog Brook, and Levi Brook.

Across Vermont, most child and elder care facilities are not registered with the State. Most child day care in Topsham is likely private in-home care, but there is one licensed childcare provider. It is located at 439 Willey Hill Road in Topsham, which is at the end of Willey Hill Road near Powder Spring Road. Due to its location at the confluence of the Tabor Branch of the Waits River and Powder Spring Brook Road, this facility is at moderate risk of flood damage or fluvial erosion. There are no elder care facilities and no low income housing units in the Town of Topsham.

Recent studies have shown that the majority of flooding in Vermont is occurring along upland streams, as well as along road drainage systems that fail to convey the amount of water they are receiving. These

areas are often not recognized as being flood prone, and property owners in these areas are not typically required to have flood insurance. It should be noted that, while small, mountainous streams may not be mapped by FEMA in NFIP FIRMs (Flood Insurance Rate Maps), flooding along these streams is possible, and should be expected and planned for. Flash flooding in these reaches can be extremely erosive, causing damage to road infrastructure and to topographic features including stream beds and the sides of hills and mountains. The presence of undersized or blocked culverts can lead to further erosion and stream bank/mountainside undercutting. Furthermore, precipitation trend analysis suggests that intense, local storms are occurring more frequently. According to Vermont Agency of Natural Resources' river corridor[3] maps issued in late 2014, there are 48 structures in Topsham that are located in the river corridor area, but *not* located in FEMA's Special Flood Hazard Area. This includes 31 single family dwellings, the town garage, 1 multi-family dwelling, 9 camps, 4 mobile homes, and 2 buildings classified as other.

Topsham has engaged in culvert upgrading since the 2011 Topsham Annex was drafted, and the Town is continuously upgrading culverts to allow additional floodwaters to pass through the structure. In addition, the Town's last comprehensive culvert inventory was completed in 2006.

Topsham is rural and mountainous in nature. It consists of many steep slopes with streams, brooks, and rivers that meander at valley bottoms. Due to Topsham's steep slopes, many roads have been constructed alongside water bodies, making them vulnerable to flooding. Specific areas that are vulnerable to flooding include Vermont Route 25, especially close to the Waits River Valley School; Perry Road; Willey Hill, especially near its junction with Powder Springs Road; Honey Corners Road; Kimball Hill Road; Galusha Hill Road, which has seven undersized culverts in poor condition; Zion Hill Road; and Powder Springs Road, especially in East Topsham Village.

There is one repetitive loss residential property in the Town of Topsham on Route 25 with three claims, according to FEMA's NFIP list.

[3] River corridors encompass an area around the present channel for fluvial erosion, channel evolution and down-valley meander migration are most likely to occur. River corridor widths are calculated to represent the narrowest band of valley bottom and riparian land to accommodate the least erosive channel and floodplain geometry (i.e. equilibrium conditions) that would be created and maintained naturally within a given valley setting. Vermont DEC Flood Hazard Area and River Corridor Protection Procedures; Draft October 06, 2014; pages 6-7.

Hazard	Location	Vulnerability	Extent	Observed Impact	Likelihood/ Probability
Flash Flood/ Flood/ Fluvial Erosion	East Topsham Village; Vermont Route 25; Perry Road; Willey Hill; Honey Corners Road; Kimball Hill Road; Galusha Hill Road; Zion Hill Road; and Powder Springs Road	Culverts, bridges, road infrastructure, public and private infrastructure. There are 17 structures in the mapped special flood hazard area, including 8 single family dwellings, the Topsham post office, 4 mobile homes, 2 camps, and 2 buildings classified as other. If all of these properties were to be destroyed in a flooding hazard, the resulting damage would result in $2,499,000.	Tropical Storm Irene—4-7" across county (6.79" in Topsham).	$33,253.55 in damage total for Topsham during Tropical Storm Irene according to FEMA's Public Assistance database (captures at least 70% of total damage).	Likely

2. Severe Summer Weather, Hurricanes, & Tropical Storms

More common than hurricanes or tropical storms are severe thunderstorms (usually in the summer), which can cause flooding as noted above, and are associated with lightning, high winds, hail and tornadoes. Hailstorms have occurred in Vermont, usually during the summer months. While local in nature, these storms are especially significant to area farmers, who can lose entire fields of crops in a single hailstorm. Large hail is also capable of property damage. 382 hail events were recorded between 1950 and 2008 in the state, making hail an annual occurrence in some part of the state. Most of these events had hail measuring .75 inches, but many had hail at least 1.5 inches in size. The largest hail during the period was 3-inch hail that fell in Chittenden County in 1968. Tennis ball-sized hail was reported in the town of Chittenden during a storm in the summer of 2001. Thunderstorms can generate high winds, such as hit the region on July 6, 1999, downing hundreds of large trees in a few minutes.

This section of the Plan satisfies the requirements of 44 CFR 201.6(c)(2)(i), 201.6(c)(2)(ii), and 201.6(c)(2)(iii) for **Severe Weather**.

In Topsham, severe weather is quite common, typically in the late spring and summer months when the region experiences high temperatures. Severe thunderstorms tend to bring other hazards such as high winds, hail, lightning, and flooding, and these hazards are often experienced in combinations which create many unique weather and emergency management situations. Over the years, Topsham has been hit with high winds that have downed and uprooted numerous trees, and knocked out electricity to residents in the Town. Town specific wind data could not be found, but the "Remarks" section of NCDC Database helps to illuminate the impact strong winds can have on Topsham. Sizeable hail has also accompanied storms moving through the Town and region.

The following list indicates the history of occurrence with regard to this hazard in Orange County (given that small population of Topsham, town-specific data is limited); an asterisk "*" denotes the few instances in which town-specific data is available, and federal disaster numbers are listed when appropriate. In an attempt to capture the individual hazards that may arise, and the different circumstances caused by the hazards in concert, the separate hazards are documented in the table below.

History of Occurrences:

Severe Weather/ Hurricane/ Tropical Storm Date	Event					Location	Extent
	Thunderstorm/ severe storm	Flooding	Hail	High Winds	Lightning		
6/25/2013-7/11/2013* (DR-4140 VT)	✓	✓	✓	✓		County-wide	Severe storms over a nearly one month period. Rains caused flooding in the region, winds downed trees, power outages were reported. On 7/8 16 Washington Electric Cooperative customers lost power for 2.41 hours. Overall during the disaster period, Topsham received 7.94 inches of rain.
9/11/2013	✓			✓	✓	Topsham, County-wide	A weak area of low pressure embedded in an unseasonably warm and unstable air mass resulted in thunderstorms that moved across Vermont. Topsham received 1.86 inches of rain in 96 hours. Widespread power outages occurred, on 9/11 and 9/12 in Topsham. On 9/11 93 Washington Electric Cooperative Customers lost power for 3.31 hours, on 9/12 32 WEC customers lost power, 17 of which were for 5.27 hours and 11 of which were for 1.49 hours.
6/2/2013	✓		✓	✓		Topsham, County-wide	Thunderstorms with pockets of damaging winds and large hail occurred in Orange County. At its peak, roughly 20k customers lost power. Topsham received .61 inches of rain in 24 hours. Significant power outages did not occur in Topsham.
7/4/2012	✓			✓	✓	Topsham, County-wide	A moderately strong upper level disturbance ahead of a surface cold front moved through Vermont on July 4. Storm caused widespread wind damage and frequent lighting. Topsham received .3 inches of rain in 24 hours. 10 Washington Electric Cooperative customers lost power for 5.3 hours..
8/28/2011 (DR-4022 VT)	✓	✓		✓		County-wide	Tropical Storm Irene prompted wide-spread, devastating flooding throughout the region. Topsham received 6.79 inches of rain in 48

							hours. Topsham had $75,861.28 in damages. Widespread power outages occurred to Washington Electric Cooperative customers. 445 customers were without power for 15 hours, 231 customers were without power for 4.24 hours, 15 customers were without power for 2.34 hours, 9 customers were without power for 12.45 hours, 10 customers were without power for 53 hours, and 3 customers lost power for 29 hours.
06/09/2011	✓		✓	✓		County-wide	Scattered thunderstorms and a few isolated reports of damaging winds and large hail were reported. Only 1 Washington Electric Cooperative customer was affected for 3.39 hours. .33 inches of rain fell in Topsham.
05/26/2011-05/27/2011 (DR-4001 VT)	✓	✓		✓		County-wide	Region struck by severe storms and flooding. Minimal damage occurred in Topsham. Topsham received .3 inches of rain in 24 hours. 43 Washington Electric Cooperative customers were affected for 5.44 hours.
07/21/2010	✓		✓	✓		Topsham, County-wide	Thunderstorms hit the area along with high winds, developing into supercells that caused widespread damage to trees, power poles and structures. Also, golf ball-sized hail. Thunderstorm winds damaged a farm along Rt. 5, including flattening one barn and severely damaging others. No significant precipitation occurred in Topsham. 8 Washington Electric Cooperative customers lost power from 1.15 to 5.36 hours.
5/31/2009	✓		✓	✓		County-wide	40-55mph wind gusts and hail caused fallen trees and power outages in the region. Topsham received 1.21 inches of rain in 24 hours. Power outage information was unavailable for this event.
7/21/2008-8/12/2008 (DR-1790 VT)*	✓			✓		County-wide	Thunderstorms with heavy rainfall in a moist atmosphere moved through central and southern Vermont during the afternoon and evening hours. Topsham received 2.6 inches of rain in 24 hours with an additional 1.22 inches of rain in the previous 24 hours. Power outage information was unavailable for this event.
9/12/2008	✓	✓				Topsham	Specific storm information was

							unavailable for this event, but Topsham reported $25,483.95 in damages. Topsham received .94 inches of rain in 24 hours on 9/7 and .7 inches in 24 hours on 9/10.
6/5/2007	✓		✓			Topsham; County-wide	An unseasonably strong mid-level atmospheric disturbance moved across a marginally unstable airmass. This caused showers and scattered yet severe thunderstorms. Nickel size hail occurred in Topsham. Topsham also received 1.95 inches of rain in 24 hours. Power outage data was unavailable for this event.
07/09/2007-07/11/2007 (DR-1715 VT)	✓		✓	✓	✓	Topsham; County-wide	An area of low pressure moved across Canada and south to Vermont causing thunderstorms, hail, winds, and lighting. Topsham experienced 1.65 inches of rain in 24 hours. Power outage information was unavailable for this event.
8/3/2007		✓				Topsham	Storm information was unknown for this event, but $5,737.50 in damages was reported for Topsham. Power outage information was unavailable for this event.
8/30/2007	✓		✓	✓		Topsham; County-wide	A cold front moved through a warm and unstable arimass across southern and eastern Vermont. A few widely scattered thunderstorms moved across the region. Significant precipitation did not occur in Topsham. Power outage information was unavailable for this event.
04/15/2007-04/21/2007 (DR-1698 VT)	✓	✓		✓		County-wide	Severe storms and flooding impacted Orange and surrounding counties. 7.5 inches of wet heavy snow mixed with warming temperatures led to flooding. Power outage information was unavailable for this event.
7/18/2006	✓			✓		County-wide	A strong mid-level atmospheric disturbance moved into a marginally unstable airmass across Vermont to cause severe thunderstorms. The thunderstorm knocked down trees along Interstate. Specific precipitation and power outage data was unavailable for this event.
8/2/2006	✓			✓	✓	County-wide	A mid-atmospheric disturbance moved into a very warm, humid and unstable airmass across Vermont during the

							afternoon of the 2nd, which lead to the development of scattered thunderstorms. Some of these thunderstorms were locally severe and produced damaging winds that knocked down trees. Specific precipitation and outage data was unavailable for this event.
07/21/2003-08/18/2003 (DR-1488 VT)	✓	✓		✓		County-wide	Severe storms and flooding impacted Orange and surrounding counties. Specific precipitation and outage data was unavailable for this event.
07/14/2000-07/18/2000 (DR-1336 VT)	✓	✓		✓		County-wide	Severe storms and flooding impacted Orange and surrounding counties. Specific precipitation and outage data was unavailable for this event.
9/16/1999-9/21/1999 (DR-1307 VT)	✓	✓		✓		County-wide	Tropical Storm Floyd's rains and winds caused road and culvert washouts. Specific precipitation and outage data was unavailable for this event.
7/6/1973 (DR-397 VT)		✓		✓		County-wide	One of the largest flood events of the 20th century in VT. Landslides reported in the region.
11/3/1927	✓	✓				County-wide	"Great Flood of 1927." Worst recorded flood in VT. The White River crested at a record of 29.30 feet.

Beaufort Wind Chart – Estimating Winds Speeds

Beaufort Number	MPH Range	MPH Average	Terminology	Description
0	0	0	Calm	Calm. Smoke rises vertically.
1	1-3	2	Light air	Wind motion visible in smoke.
2	4-7	6	Light breeze	Wind felt on exposed skin. Leaves rustle.
3	8-12	11	Gentle breeze	Leaves and smaller twigs in constant motion.
4	13-18	15	Moderate breeze	Dust and loose paper is raised. Small branches begin to move.
5	19-24	22	Fresh breeze	Smaller trees sway.
6	25-31	27	Strong breeze	Large branches in motion. Whistling heard in overhead wires. Umbrella use becomes difficult.
7	32-38	35	Near gale	Whole trees in motion. Some difficulty when walking into the wind.
8	39-46	42	Gale	Twigs broken from trees. Cars veer on road.
9	47-54	50	**Severe gale**	**Light structure damage.**
10	55-63	60	**Storm**	**Trees uprooted. Considerable structural damage.**
11	64-73	70	**Violent storm**	**Widespread structural damage.**
12	74-95	90	**Hurricane**	**Considerable and widespread damage to structures.**

Webpage: http://www.weather.gov/iwx
Twitter: @nwsiwx
Facebook: NWSNorthernIndiana

High winds have caused damage in Orange County and in the Town of Topsham specifically. Damage caused by high winds has included downed trees and power lines, and, as a result, power outages during or after severe weather, hurricanes, or tropical storm events. Power outages can be particularly serious for "power critical customers" that do not have the luxury of having a generator, particularly vulnerable population segments (i.e., the elderly or disabled). However, in general, high winds cause relatively minor damage on a town-wide scale.

One of the main hazards caused by severe weather, hurricanes, and tropical storms, throughout the Town is flooding. The most recent major flooding event to occur in the region was in the summer of 2013. Severe storms brought heavy rain and strong winds over a three-week period in late June and early to mid-July. The flooding was widespread and severe enough for a federal Disaster Declaration, DR-4140 VT, to be issued for Orange and other counties in Vermont. The Town of Topsham was impacted by this event, and sustained power outages and heavy rainfall

The Town underwent a comprehensive culvert inventory in 2006. This inventory helped the Town to identify and prioritize culverts to upgrade and upsize. This work to upgrade culverts will help to lessen the adverse impacts of flooding events that are often attributable to severe storms. There are a number of existing culverts the Town intends to upgrade in the near future. There is one repetitive loss residential property in the Town of Topsham on Route 25 with three claims, according to FEMA's NFIP list.

Hazard	Location	Vulnerability	Extent	Observed Impact	Likelihood/ Probability
Severe Weather	Town-wide for wind, hail, high winds, lightning and thunderstorm impacts. The following areas are regularly or sometimes impacted by flooding: East Topsham Village; Vermont Route 25; Perry Road; Willey Hill; Honey Corners Road; Kimball Hill Road; Galusha Hill Road; Zion Hill Road; and Powder Springs Road	Town and private buildings, and utilities; culverts, bridges, road infrastructure. There are 17 structures in the mapped special flood hazard area, including 8 single family dwellings, the Topsham post office, 4 mobile homes, 2 camps, and 2 buildings classified as other. If all of these properties were to be destroyed in a flooding hazard, the resulting damage would result in $2,499,000.	During Tropical Storm Irene- 6-7" of rainfall in Topsham.	$75,861.28 in damage total for Topsham according to FEMA's Public Assistance database (captures at least 70% of total damage).	Highly likely

3. Hazardous Material Spill

Hazardous materials include any biological, chemical, or physical substances that can harm human beings or the environment. [4] These materials can be released in a variety of different ways to varying degrees of severity. When hazardous materials are released, response is required in order to minimize the extent of contamination and to reduce the impact on human health and property.

Based on available VT Tier II data, there are four sites in Town that have sufficient types and/or quantities of hazardous materials to require reporting. These are the Topsham Town Garage, located at 2 School House Road; the Topsham Town Clerk, located at 6 Harts Road; the Waits River Valley School, located at 6 Waits River Valley School Road; the Waits River Country Store and Deli, which is located at 149 Route 25; and the Topsham Fire Station, which is located at 24 Powder Spring Road.

This section of the Plan satisfies the requirements of 44 CFR 201.6(c)(2)(i), 201.6(c)(2)(ii), and 201.6(c)(2)(iii) for **Hazardous Materials Spill**.

Although no major, functioning interstate highways or railways run through Topsham, there are two major routes that pass through Town's boundaries. Vermont Route 25 enters Topsham through its southern border with Corinth, follows the Waits River, and continues through the southwest corner of Town. US Route 302 is located in the northwest corner of Topsham and is another frequently used US highway. The intersection of these two Routes is located in the Town of Orange, just west of the Topsham Town Boundary. The Village of Waits River and the West Topsham Village are both located along Vermont Route 25 and the main stem of the Waits River. Many single-family residences are located along Route 25 in these villages.

There are 329 residences (including 52 camps, 50 mobile homes, and 227 single family dwellings) and 24 commercial/industrial/or public buildings (including 6 commercial buildings, 1 commercial farm, 2 educational buildings, 2 fire stations, 3 government buildings, and 4 houses of worship) within 1,000 feet of a potential HAZMAT spill on major roads, such as Routes 302 and 25. This includes the West Topsham Post Office, the Waits River Valley School, the West Topsham Community Church, New Hope United Methodist Church, and Limlaw Family Maple Farm. In the event that 5% of these structures were involved in a HAZMAT incident, the estimated damage to property would be $3,007,406.

The State of Vermont currently has one fully-trained HAZMAT response team, with vehicles located in Lyndonville, Essex Junction, Brandon, and Putney. The HAZMAT crew chief is available within minutes of a call for the team but on-scene response would be a matter of hours. In the event of a serious accident in Town, there would be little time for evacuation and response would be difficult. Two members of the HAZMAT response team reside in Bradford.

The following data was retrieved from the Vermont Department of Environmental Conservation's Spill List. The table above is used to illustrate the ease with which trucks and the day-to-day activities in the Town have the potential to create a hazardous material spill and dangerous conditions for emergency responders and town residents.

[4] Tufts University. (2016). *Hazardous materials spill.* Office of Emergency Management. Retrieved from http://emergency.tufts.edu/guide/hazardous-spill/

History of Occurrences:

Date	Event	Location	Extent and Impacts
11/11/2015	Motor Oil Spill	6 Lime Kiln Road	Oil cap was left off and resulted in 3 gallon spill.
5/17/2004	Kerosene Spill	16 Barberry Road	An AST leak led to 200 gallon spill.
2/27/2002	Gasoline Spill	Halls Hill Road	Spill resulted from car crusher operation.
4/10/2001	Kerosene Spill	5 Cross Street	A chimney fell on a AST and resulted the release of 50 gallons of kerosene. The product soaked into soil. Possible contamination could have occurred in the downgrade wetland.
10/19/2000	Hydraulic Oil Leak	16 Barberry Road	Diesel oil was released.
10/11/2000	Kerosene Spill	Willey Hill Road	A leak in the above ground piping caused the release of 100 gallons of kerosene.
4/30/1999	Gasoline Spill	Route 125: Waits River General Store	A customer abandoned 20 gallon gasoline which resulted in water contamination.
1/2/1994	Kerosene Spill	Fire House Lane	An AST leak led to the release of 125 gallons of kerosene.

While only a small number of large hazardous material spills have occurred in the Town of Topsham, the potential for a major spill exists. Vermont Route 25 is a major arterial traffic route that connects Topsham with the Towns of Corinth, Orange, and Bradford, and is the principal route to Interstate-91. Topsham also contains a small portion of US Route 302, and it connects the Town to Groton, Ryegate, and Wells River. The villages of West Topsham and Waits River are especially vulnerable to a HAZMAT spill, as they are both located principally along Route 25. Route 25 parallels the Waits River, so a HAZMAT spill would also provide a significant threat to the quality of surface water in this River.

These routes serve as the main thoroughfares for trucks and other motor vehicles transporting a wide-range of goods, including a wide range of hazardous materials, within the confines of Topsham. A truck accident and a resulting hazardous material spill could be exceedingly disastrous for the Town and its residents

In order to prepare for hazardous material spills in Topsham, most members of the Topsham Fire Department are trained to the HAZMAT Awareness level.

Hazard	Location	Vulnerability	Extent	Impact	Likelihood/ Probability
Hazardous Materials Spill	Vermont Route 25, US Route 302, and local roads.	Road infrastructure, nearby structures, and the Waits River.	Initially, local impacts only; but depending on material spilled, extent of damage may spread (ex. into groundwater).	There are 329 residential and 24 commercial, industrial or public buildings within 1,000 feet of a potential HAZMAT spill on major roads (Vermont Routes 302 and 25). In the event that 5% of these structures were involved in a HAZMAT incident, the estimated damage would be $3,007,406.	Ocasionally

4. Extreme Cold/Snow/Ice Storm

Winter storms are a regular occurrence in Vermont. However, severe winter storms can cause serious damage, including collapse of buildings due to overloading with snow or ice, brutal wind chills, downed trees and power lines, and stranded vehicles. People can be at risk of freezing in extended power outages if they lack wood heat or backup power, and individuals shoveling large accumulations of snow can also be at risk from frostbite, hypothermia, and heart attacks caused by cold and overexertion. While snow removal from the transportation system is standard fare in Vermont winters, extreme snow or ice can close rail and road systems, further jeopardizing any stranded persons that are in danger of freezing or needing medical assistance. Extreme cold in the Town of Topsham is defined as below zero degrees Fahrenheit for two or more consecutive days.

This section of the Plan satisfies the requirements of 44 CFR 201.6(c)(2)(i), 201.6(c)(2)(ii), and 201.6(c)(2)(iii) for **Extreme Cold/Snow/Ice Storm**.

Severe winter storms include a blizzard on February 15-17 in 1958, which dumped over 30 inches and resulted in 26 deaths in New England. On December 26-27 in 1969, another blizzard left 18-36 inches of snow in northwestern Vermont and a whopping 45 inches in Waitsfield. A string of storms in March 2001 hit the state, beginning with 15-30 inches on March 5-6th (later declared a federal disaster), 10-30 inches on the 22nd, and 10-20 inches on the 30th. Recent years have seen wet snow storms that have toppled trees and caused widespread power outages.

The worst winter storm in terms of damage to hit the state recently was not a snow storm, but an ice storm. In January of 1998, just the right combination of precipitation and temperature led to more than three inches of ice in spots, closing roads, downing power lines, and snapping thousands of trees. This storm was estimated as a 200-500 year event. Power was out up to 10 days in some areas, and 700,000 acres in of forest were damaged in Vermont. Amazingly, there were no fatalities in Vermont, unlike Quebec where 3 million people lost power and 28 were killed. The Town of Topsham was impacted by this ice storm.

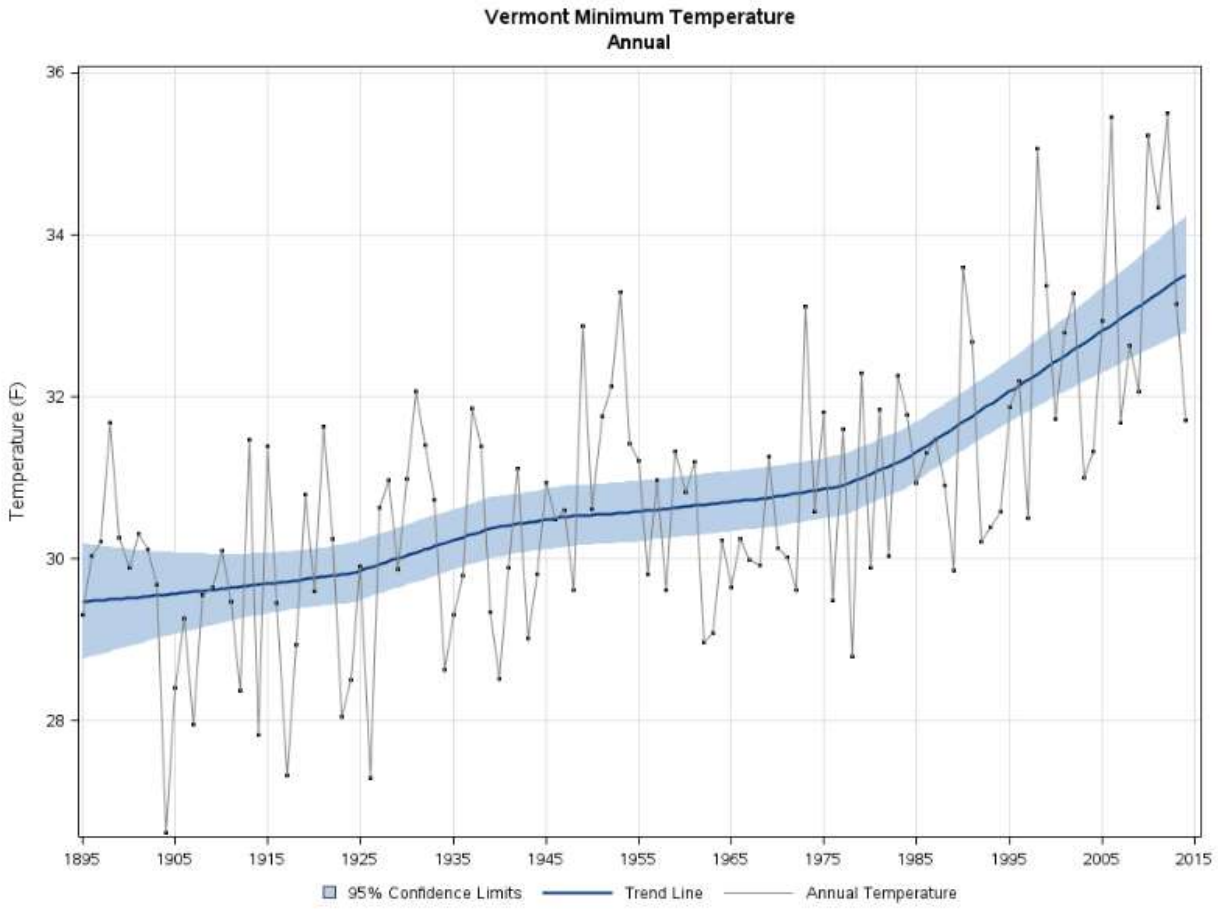
The most recent severe winter storm to hit Vermont began on December 9th, 2014 and lasted until December 11th, 2014. During this period of time, much of the state of Vermont was hit with heavy, wet snow that ranged from accumulation totals anywhere from a few inches to almost two feet along parts of the Green Mountains. The heavy, wet snow stuck to tree limbs and power lines, which led to widespread power outages and significant damage to the state's power infrastructure. Over 100,000 customers were without power statewide, some for multiple days, and the damage to power infrastructure caused by the storm surpassed that which was incurred as a result of the 1998 ice storm or Tropical Storm Irene. In addition to damage to power infrastructure, towns hit by the storm had significant amounts of debris clean up and removal to contend with in the spring of 2015.

Over the past few winters, Topsham has received numerous snow storms that have dropped significant amounts of snow over a day or two day period. However, the details of these events and the damage they caused are overshadowed by winter weather events of the past. This is not to say such extreme events will not repeat themselves. It should be assumed that extreme winter weather events will occur

at some point in the future. The following table documents the occurrence of extreme cold/snow/ice storms in the Town of Topsham and in Orange County.

ICE DAMAGE INDEX	DAMAGE AND IMPACT DESCRIPTIONS
0	Minimal risk of damage to exposed utility systems; no alerts or advisories needed for crews, few outages.
1	Some isolated or localized utility interruptions are possible, typically lasting only a few hours. Roads and bridges may become slick and hazardous.
2	Scattered utility interruptions expected, typically lasting 12 to 24 hours. Roads and travel conditions may be extremely hazardous due to ice accumulation.
3	Numerous utility interruptions with some damage to main feeder lines and equipment expected. Tree limb damage is excessive. Outages lasting 1 – 5 days.
4	Prolonged & widespread utility interruptions with extensive damage to main distribution feeder lines & some high voltage transmission lines/structures. Outages lasting 5 – 10 days.
5	Catastrophic damage to entire exposed utility systems, including both distribution and transmission networks. Outages could last several weeks in some areas. Shelters needed.

(Sperry-Piltz Ice Accumulation Index (SPIA), 2009).



History of Occurrences:

Date	Event	Location	Extent and Impacts
1/7/2015-1/8/2015	Extreme Cold	Topsham; County Wide; State-wide*	An arctic cold front pushed across Vermont with plummeting temperatures and brisk strong winds of 15-30 mph caused dangerously cold wind chills of 25-40 degrees below zero during the evening of January 7 and morning of January 8. Temperatures in the morning of January 8 were 15-25 degrees below zero on the morning of January 8 in Orange County. Topsham registered 25 degrees below zero. Significant outages did not occur.
2/1/2015-2/28/2015	Cold/Wind Chill	County-State-wide	A persistent deep could trough settled across the northeast United States for the month of February, which registered the coldest month on Vermont record since December 1989 or January 1994. Many towns recorded 15 to 20 days below zero in the month, and several days with dangerously cold wind chills of 30 below zero or colder.
Period from 12/09/2014—12/12/2014 (DR-4207 VT)	Snow/ Winter Storm	Topsham; County-; region-wide	A powerful prolonged heavy, wet snow event occurred from December 9th through December 11th. Snowfall totals ranged from a few inches to almost 2' near Warren, VT. The snow to liquid ratios ranged from 5-7" of snow to 1" of rain, which lead to the snow sticking to trees and power lines. Approximately 6 inches of snow and 1.88 inches of ice fell in Topsham. Significant power outages occurred in Topsham from 12/9-12/10. Overall 501 Washington Electric Cooperative (WEC) customers were affected. 173 customers were affected for 8.5 hours, 103 customers were

			affected for 19.4 hours, and 173 customers were affected for 2.3 hours. 4 WEC customers were without power for 3 days, and many other WEC customers were affected for durations over 12 hours.
Period from 03/12/2014—03/13/2014	Snow Storm	County-; region-wide	A major snowstorm with near blizzard conditions at times impacted portions of northern New York on March 12th and lingered into the morning hours of March 13th. Numerous motor vehicle accidents, school and business closures resulted due to the storm on both March 12th and 13th. Snowfall totals across Orange county were generally 15 to 20+ inches. Significant power outages did not occur in Topsham. Nearby Corinth received 16.2 inches of snow and 1.46 inches of ice.
Period from 02/13/2014—02/14/2014	Winter Storm	County-; region-wide	A Winter storm, responsible for record ice and snow across the southeast United States on February 12th, moved and redeveloped off the southeast United states coastline on February 13th. Snowfall across Orange county was 12 to 18 inches. Nearby Corinth received 17.6 inches of snow and 1.32 inches of ice. Significant power outages did not occur in Topsham.
02/05/2014	Snow Storm	County-; region-wide	Snowfall was at its peak during both the morning and afternoon/evening commutes causing hazardous travel. Eight to twelve inches of snow fell across Orange county. Topsham received 11.5 inches of snow and .7 inches of ice. Significant power outages did not occur in Topsham.
Period from 12/29/2014—12/30/2014	Winter Storm	County-; region-wide	Snow mixed with rain developed across southern Vermont during the late afternoon and changed to snow during the evening hours of December 29th. A wet, heavy 5 to 10 inches of snow fell across Orange county. 7.8 inches of snow and .72 inches of ice fell in Topsham. Significant power outages did not occur in Topsham.
Period from 12/14/2013—12/15/2013	Snow Storm	County-; region-wide	This was the first widespread snowfall of the 2013-14 winter season. The typical impacts associated with this storm were the numerous vehicle accidents, especially being the first storm of the season. A widespread 10 to 15 inches of snow fell across Orange county, and Topsham received 10 inches. 26 WEC customers were without power for 13 hours.
2/19/2011	Cold Front; Strong Winds	County; region-wide	A strong cold front associated with a powerful storm across Canada moved across Vermont the night of February 18th into the early morning of February 19th. Strong west to northwest winds of 20 to 30 mph and gusts of 40-50 mph caused numerous power outages. 10 WEC customers in Topsham were affected for 6 hours and 2 WEC customers were without power for 15.5 hours.
12/1/2010	Ice Storm	Topsham	Sleet and frozen rain precipitation caused power outages in Topsham. 1.5 inches of sleep/frozen rain precipitation occurred. 13 WEC power customers in Topsham were without power for 5 hours, 5 WEC customers lost power for .34 minutes, and 1 WEC customer lost power for 2 days.
Period from 11/27/2009-11/28/2009	Winter Storm	County; region-wide	A strong area of low pressure combined with a cold upper atmospheric low moved across Vermont causing snow and strong gusty winds. Snowfall occurred heavily on the eastern slope of the Green Mountains and wind gusts occurred in excess of 40 mph. Topsham did not experience heavy precipitation, but heavy winds caused widespread power outages. 507 WEC customers lost power for 1.27 hours, 202 GMP customers lost power for 3.3 hours, and 107 GMP customers lost power for 6 hours.
Period from 2/22/2009-2/23/2009	Winter Storm	County; region-wide	Light snow overspread Vermont during the morning of February 22nd and became moderate to heavy across much of central and eastern Vermont during the evening hours to early morning on 2/23. Snowfall totals ranged from 10 to 18 inches in central and eastern Vermont. The nearby Town of Chelsea received 13 inches of snow. 7 WEC customers lost power for 1 hour.
Period from 02/26/2008—02/28/2008	Snow Storm	County-wide; statewide	Snow overspread over Vermont during the morning of February 26th and continued through he afternoon hours of the 27th before tapering to scattered snow showers in the evening. Storm totals ranged from 3 to 6 inches in the St. Lawrence River

			Valley, 5 to 10 inches across northern New York and 6 to 12 inches across Vermont with the heaviest along those favored northwest slopes of the northern Green Mountains as well as some higher elevations in south central Vermont. 10 inches were reported in the neighboring town of Chelsea. Topsham did not experience significant power outages.
02/01/2008	"Mixed" Winter Storm	County-wide; statewide	This storm system transported a great deal of moisture and milder air above a surface that had a cold, dry airmass established across the region. This resulted in a significant wintery mix of snow, sleet, and freezing rain across north central and northeast Vermont. Snow began late morning February 125 in Vermont and changed to sleet and freezing rain during the afternoon and continued into the night. The precipitation turned back to snow shower during the night and continued into the morning of February 2nd. Snowfall reports were generally 2 to 5 inches with localized amounts up to 7 inches. In addition, one quarter to one half of ice accumulation (accretion) occurred as well. Finally, strong south to southeast winds around 3000 feet and above transferred to a few hilltops along the western slopes and produced wind gusts in excess of 50 mph. Numerous reports of motor vehicle accidents throughout the region. Topsham received 3.5 inches of new snow and about 1.2 inches of ice/sleet. Significant power outages did not occur in Topsham.
12/31/2007	Snow Storm	County-wide; statewide	Snow began to overspread New York and Vermont around Midnight Monday (31st) with snowfall rates rapidly increasing to near an inch per hour at times, but this was a quick-hit storm with steady accumulating snowfall ending across much of Vermont and northern New York by mid-morning. The storm contributed to Burlington's 4th snowiest December. 6 inches were reported in neighboring Town of Corinth. Power outage data was not available for this event.
Period from 12/16/2007— 12/17/2007	Snow Storm with Freezing Rain	County-wide; statewide	Snowfall totals from this pre-winter storm ranged from 6 to 12 inches in southern Vermont, where a prolonged period of sleet and/or freezing rain occurred, to a rather uniform 12 to 18 inches across the rest of Vermont and northern New York. 9.1 inches of snow and 1.07 inches of rain/sleet were reported in Topsham. Power outage data was not available for this event.
Period from 04/15/2007— 04/16/2007	Winter/ Snow Storm	County-wide; statewide	A powerful Nor'easter drifted east of New England and caused a mixture of snow and rain over Vermont. The storm started a mixture in the morning on the 15th and changed over to snow in the afternoon, continuing into mid-morning on the 16th. Snowfall totals were generally 4 to 7 inches in the valleys with locally up to a foot along the east-facing slopes of the higher elevations of the Green mountains. This was a heavy, wet snow that caused numerous power outages, as well as extremely slick and treacherous roads that resulted in numerous vehicle accidents. 7.5 inches of snow and .73 of rain/sleet occurred in Topsham. Power outage data was not available for this event.
Period from 04/04/2007— 04/05/2007	Snow Storm	County-wide; statewide	Rain mixed with and then changed to sleet and snow across Vermont during the afternoon of the 4th and continued through midday on the 5th.|Combined snow and sleet accumulations ranged from 4 to 12 inches with the higher amounts in the higher elevations. This caused some hazardous travel as well as some scattered power outages due to fallen tree limbs and branches. Power outage data was not available for this event. 7.58 inches of precipitation were reported in nearby Chelsea.
03/17/2007	Snow Storm	County-wide; statewide	Heavy snow started in southern Vermont by late evening and reached the rest of the region by Midnight Saturday (17th) with snowfall rates of 1 to 2 inches per hour at times. 10 inches of snow were reported in Topsham. Power outage data was not available for this event.
02/14/2007	Snow Storm	County-wide; statewide	Low pressure developed over the central Appalachians and pushed north into Vermont at around midnight on the 14th. Snow fell through the night into the morning and was very heavy at times, and continued into the afternoon and

			evening. Snowfall rates as heavy as 2 to 4 inches per hour and brisk winds of 15 to 25 mph caused whiteout conditions, blowing and drifting snows, and impassible roads. Snowfall totals ranged from 15 to 25 inches in the Connecticut River valley. 19 inches were reported in neighboring Chelsea. Power outage data was not available for this event.
12/15/2003	Snow Storm	County-wide; statewide	Snow developed Sunday afternoon, December 14th, and became heavy Sunday night into Monday morning, December 15th. 10 inches were reported in nearby Chelsea. Power outage data was not available for this event.
01/03/2003	Snow Storm	County-; state-wide	A storm system over Virginia Friday morning (1/3/03) moved to coastal New Jersey Friday evening and then to near Cape Cod Saturday morning (1/4/03). Snow spread across the area late Friday afternoon, and became heavy at times late Friday night into Saturday morning. 8.2 inches were reported on 1/4 and another 3.3 inches were reported on 1/5 in nearby Chelsea. Power outage data was not available for this event.

The Town of Topsham is no stranger to winter weather and the hazards that it brings. Depending on the event, though especially with heavy, wet snow or ice, and sometimes in combination with high winds, electricity may be knocked out for a few hours or days. The utility companies currently serving the Town of Topsham, Green Mountain Power and Washington Electric Coop, have followed a regular tree-trimming schedule. Topsham town officials believe this is satisfactory to mitigate damage and the power outages caused by downed trees and tree limbs during a heavy, wet snow or ice event. In the event of an extended power outage, the Town would open its emergency shelter. More often, those without power would seek accommodations with friends or relatives.

Another complication of falling utility poles is the potential loss of the telephone line. If the landlines are impacted, the possibility presents itself that there is no reliable means of communication in the affected parts of Town as cell reception can be spotty. If the power is out, an internet connection is unlikely to be available.

Heavy, wet snow or large quantities of snow may also leave structures vulnerable to roof collapse. Roof collapse occurs when the structural components of a roof can no longer hold the weight of snow. Flat roofs are most vulnerable to collapse because they do not drain well and the snow on the roof soaks up water like a sponge, increasing the weight that the roof must bear. More common, it seems, is the collapse of barns commonly used for livestock sheltering and other agricultural purposes. Unfortunately, livestock in the barn are often killed, and equipment stored in the barn may be damaged or ruined. It is difficult to determine whether a residential structure or a barn would be rebuilt after a roof collapse because the decision to rebuild would likely depend on the extent of damage. The collapse of a barn roof is likely to be a total loss, and the collapse of a house roof may be a 50% loss.

In general, winter weather is most hazardous to travelers. Icy and snow-covered roads present multiple examples of dangerous driving conditions and situations. In Topsham, the mountainous terrain, steep slopes, and remoteness of some roads further complicate travel. The Town relies on Travel Advisories issued by the State of Vermont Department of Emergency Management Homeland Security and the National Weather Service to alert residents of dangerous travel weather. Despite this, it is difficult to prohibit people from driving during winter weather events. As a result, emergency services personnel

must always be prepared to provide assistance to stranded drivers or to those who have been in an accident.

Hazard	Location	Vulnerability	Extent	Observed Impact	Likelihood/ Probability
Extreme Cold/ Snow/ Ice Storm	Town wide	The entire Town is vulnerable, including road infrastructure, town and privately owned buildings, utility infrastructure.	Snowfall has varied, from a few inches to over a foot or more. Heavy snow and wind downed trees and power lines. Snow/ice contributed to hazardous driving conditions.	For roof collapse, monetary damages will depend on each structure, but collapse of barn roof is often a total loss. This does not include the loss of livestock. Collapse of a house roof may be a 50% loss. For car crashes due to poor driving conditions, minimal damage to vehicle to totaled vehicle and operator injury. Health impacts could vary significantly.	Highly likely

5. Structural Fire

Structural fires occur all over the state of Vermont, and occur when a building structure, including residential buildings, becomes enflamed resulting in high heats and partial or complete collapse. Vermont has one of the highest per capita death rates from fire in the nation. This is, in fact, the deadliest form of disaster throughout the state. In 2010, there were 1,956 reported structural fires in the state, which included 5 fatalities and over $18 million dollars in damage. Although there have been requirements for smoke detectors in rental housing for over 20 years, and requirements for smoke detectors in single-family dwellings since 1994, there was only one building involved in the fatal fires in 2012 that had evidence of working smoke alarms.

This section of the Plan satisfies the requirements of 44 CFR 201.6(c)(2)(i), 201.6(c)(2)(ii), and 201.6(c)(2)(iii) for **Structure Fire**.

Structure fires may occur at any point, and are typically initiated within a single fuel object. Smoke produced by the burning object forms a smoke plume and rises, creating a layer of smoke while also transporting heat to the smoke layer. Fire then spreads quickly by radiation from the flames, or from the smoke layer. Once other objects are engulfed, more smoke plumes are formed and heat radiates to other objects. Fire burns and moves across different materials depending on the material's composition, orientation, surface-to-mass ratio, and air supply in the structure/room.

The Town of Topsham is quite rural in nature, and it consists of primarily single-family residences that are spread out across Town. Some growth is structured around main roads, such as Route 25; however much of it is also relatively difficult to access in a quick and timely manner by fire departments. A review

of the fires listed in the "History of Occurrences" chart below demonstrates the potential for structures located in the rural Town of Topsham to be completely or severely destroyed by fire.

The following occurrences were reported by the Committee or obtained from local sources. It is reasonable to assume that more structural fires have occurred in the period of time between the entries listed below, and that such fires have caused varying extents of property damage.

History of Occurrences:

Date	Event	Location	Extent
2015	Structural Fire	Topsham	Specific location unknown, however, Topsham Town Report includes data stating 2 structural fires occurred in 2015. Damage extent for this fire is unknown.
2015	Structural Fire	Topsham	Specific location unknown, however, Topsham Town Report includes data stating 2 structural fires occurred in 2015. Damage extent for this fire is unknown.
2011	Structural Fire	Topsham	Specific location unknown, however, Topsham Town Report includes data stating 1 structural fire occurred in 2011. Damage extent for this fire is unknown.
4/10/2009	Structural Fire	53 Karl Nye Road	An unfortunate accident resulted in a large fire that destroyed a farm. Residents were welding near the structure and fire spread quickly before Tri Village Fire Association could respond. Structural fire resulted in the loss of family home and 3 barns.
4/28/2009	Fire	Topsham	An unknown source, possibly grass, a 30 acre fire in Topsham.

As noted, recognized fire protection problems for the community include the following: development in areas distant from the village center of the Town, development on class 3 and 4 roads, distance from water sources (rivers, hydrants and/or fire ponds), inaccessibility to fires that may spread from the forest, and inadequate snow removal (for building access).

Hazard	Location	Vulnerability	Extent	Observed Impact	Likelihood/ Probability
Structural Fire	Town-wide	All housing, municipal buildings, retail/commercial sites.	Depends on the location and extent of the fire.	Varies depending on the location and extent of the fire.	Likely

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C. Vulnerability Summary

As a result of the above profile of hazards, the town believes the following vulnerabilities to be of highest concern because of their potentially severe consequences and potential likelihood:

- **Flash Flood/Flooding/Fluvial Erosion**: One of the worst threats, flooding impacts roads and the village, especially facilities for children, elders, and low income housing. Under-sized bridges and culverts factor into the threat, as do outdated flood hazard mapping. Furthermore, flood hazard mapping (Special Flood Hazard Areas) does not adequately encompass all areas that could be flooded, thus potentially making some residents too complacent in regard to the threat. In addition, the town's current flood bylaw does not address fluvial erosion that is a threat at higher elevations, especially along roadways. .
- **Severe Weather, Tropical Storms/Hurricanes:** Damage to public and private property and municipal infrastructure can be extensive during severe weather events. Prolonged power outages and downed cellular communications can greatly hamper public and business services for indeterminate periods of time. There are numerous homes, public facilities, and commercial facilities are located in the SFHA and could be impaired in a major severe weather event including 8 single family dwellings, the Topsham post office, 4 mobile homes, 2 camps, and 2 buildings classified as other. Specific areas that are vulnerable to flooding include Vermont Route 25, especially close to the Waits River Valley School; Perry Road; Willey Hill, especially near its junction with Powder Springs Road; Honey Corners Road; Kimball Hill Road; Galusha Hill Road, which has seven undersized culverts in poor condition; Zion Hill Road; and Powder Springs Road, especially in East Topsham Village.
- **Hazardous Material Spill**: A truck traffic accident on Routes 25 or 302 could cause a major spill. This has the potential to contaminate the Waits River and would threaten private residents;
- **Extreme Cold/Snow/Ice Storm/Winter Weather**: Another threat to the town is from heavy snow loads that can down power lines, communications, and collapse roofs. Prolonged power outages can interrupt public and business services
- **Structural Fire :** All housing, municipal buildings, and retail/commercial sites are vulnerable to fires. However, members of the hazard mitigation committee specifically identified single family households as lacking sufficiently working smoke and carbon dioxide detection devices, therefore magnifying their vulnerability.

VI. Mitigation

A. Mitigation Goals

- To reduce injury and losses, including loss of life and to infrastructure, structures and businesses, from the natural hazard of flash flooding, flooding and fluvial erosion
- To reduce injury and losses, including loss of life and to infrastructure, structures and businesses, from the natural hazard of severe weather, hurricanes, tropical storms, and hail storms.
- To reduce injury and losses, including loss of life and to infrastructure, structures and businesses, from the hazard of hazardous material spill(s).
- To reduce injury and losses, including loss of life and to infrastructure, structures and businesses, from the natural hazard of extreme cold/snow/ice storms.
- To reduce injury and losses, including loss of life and to infrastructure, structures and businesses, from the natural hazard of structural fire.

B. Excerpted Town Plan Goals & Objectives Supporting Local Hazard Mitigation

- It is the policy of the town that the location of housing, related amenities and land uses should be planned with due regard to the physical limitations of the site and location to current or planned public and private services such as roads and commercial/service centers (page 16).
- Town support for improvements or enhancements to emergency services should be planned as to not place an undue financial burden on the capacity of town to provide such services (pg 21).
- To provide residents with a safe and healthy place to live (page 21).
- To enable the best opportunity to protect Town health and safety at the most equitable cost to the Town's taxpayers (page 21).
- To provide pedestrians with safe areas to travel within the Topsham & Waits River villages (page 29).
- Only projects of a size and scale which do not materially interfere with the function, safety, and efficiency of town and state highways should be permitted (page 37).
- Increases in traffic should not create unreasonable congestion or unsafe conditions; developments which generate considerable round-trip truck or automobile travel should be limited (page 37).
- To enhance and maintain wise use of flood hazard areas as open space, greenways, non-commercial recreation and/or agricultural land (page 40).
- To ensure no net loss of flood storage capacity in order to minimize the loss of life and property, disruption of commerce, and demand for extraordinary public services and expenditures which result from flood damage (page 40).
- It is the policy of the town that the preferred uses for flood hazard areas shall be for open space, greenbelts, and non-commercial recreational or agricultural uses (page 40).

- Any land use activity (filling, or removal of earth or rock) within flood hazard areas which would result in net loss of flood storage or increased or diverted flood levels or increased risk to adjacent areas should be prohibited (page 40).

The Topsham Municipal Plan was updated and adopted on 09/25/2012, and has a 5-year lifespan. The Topsham Planning Commission will begin work to update the Town Plan during the next several years. The 2011 Topsham Annex, the previous version of this Plan, provided guidance in the development of the Topsham Municipal Plan, including directing goals, policies, and recommendations towards mitigating the effects of future hazards on health and property in the Town.

C. Hazard Mitigation Strategies: Programs, Projects & Activities

This section of the Plan satisfies the requirements of 44 CFR 201.6(c)(3)(ii), 201.6(c)(3)(iii) and 201.6(c)(3)(iv).

Vermont's Division of Emergency Management & Homeland Security encourages a collaborative approach to achieving mitigation at the local level through partnerships with Vermont Agency of Natural Resources, VTrans, Vermont Agency of Commerce and Community Development, Regional Planning Commissions, FEMA Region 1 and others. That said, these agencies and organizations can work together to provide assistance and resources to towns interested in pursuing hazard mitigation projects.

With each mitigation strategy, general details about the following are provided: local leadership, possible resources, implementation tools, and prioritization. The prioritization category is based upon the economic impact of the action, Topsham's need to address the issue, the cost of implementing the strategy, and the availability of potential funding. The cost of the strategy was evaluated in relation to its benefit as outlined in the STAPLEE guidelines (includes economic, political, environmental, technical, social, administrative, and legal criteria). A range of mitigation strategies was vetted by the committee, and those that were determined to be feasible are included in the table below.

Strategies given a "High" prioritization indicate they are either critical or potential funding is readily available, and should have a timeframe of implementation of less than two years. A "Medium" prioritization indicates that a strategy is less critical or the potential funding is not readily available, and has a timeframe for implementation of more than two years but less than four. A "Low" prioritization indicates that the timeframe for implementation of the action, given the action's cost, availability of funding, and the community's need to address the issue, is more than four years.

The Town of Topsham understands that, in order to apply for FEMA funding for mitigation projects, a project must meet more formal FEMA benefit cost criteria. A project seeking FEMA funds would undergo a full benefit-cost assessment in the FEMA-approved format. The Town must have a FEMA-approved Local Hazard Mitigation Plan as well.

The following strategies will be incorporated into the Town of Topsham's long-term land use and development planning documents. In addition, the Town will review and incorporate elements of this Local Hazard Mitigation Plan into updates for the municipal plan and flood hazard/river corridor bylaws. The incorporation of the goals and strategies listed in the Local Hazard Mitigation Plan into the municipal plan and flood hazard/FEH bylaws will also be considered after declared or local disasters. The Town shall also consider reviewing any future TRORC planning documents for ideas on future mitigation projects and hazard areas.

Hazards Mitigated	Mitigation Action	Local Leadership	Prioritization (Mitigation Project Status)	Possible Resources*	Time Frame
All Hazards	*Communicate with Washington Electric Coop to clear and maintain utility corridors, which will protect town and utility infrastructure. (Mitigation)*	Emergency Management Coordinator	High (Action #3 out of 7 in 2011 Plan)	Washington Electric Cooperative, Local Resources	Summer 2018-Fall 2019
Structural Fire	*Install dry hydrants on Colby Road to reduce the loss of life and infrastructure from structure fires. (Mitigation)*	Fire Chief/Fire Department	Medium (Action #7 out of 7 in 2011 Plan)	Local resources. VT Dry Hydrant Grant Program	Summer 2020-Fall 2020
Extreme Cold/Snow/Ice Storm	*Obtain Power Critical Customers List from Washington Electric Coop to keep in Town Office. Maintain existing list of populations that are vulnerable to extreme cold and other hazards. Call and visit vulnerable residents, if necessary, in the event that a hazard occurs. By maintaining this list, the health of vulnerable populations will be protected. (Mitigation)*	Selectboard, Emergency Management Coordinator	Medium (New)	Local resources	Fall 2020-Winter 2020
Flooding/Fluvial Erosion/Severe Weather/Hurricane /Tropical Storm	*Obtain an Emergency Protective Measure Stream Alteration Permit to remove debris from streams, especially that frequently flood or that are a risk for ice*	Selectboard	High (New)	Local resources	Spring 2017 (if necessary if debris in stream presents an emergency hazard)

	jams or fluvial erosion. Removed debris would otherwise divert stream flows normally constrained in channel and present a threat to life or property. (Mitigation)				This would be a one time action.
	Replace culvert on Honey Corners Road that is in poor condition and are structurally unsound. Upgraded culverts appropriately handle the hydraulic capacity of streams and therefore protect town infrastructure from flooding. (Mitigation)	Selectboard	Medium (Action #4 of 7 in 2011 Plan).	VTrans Structures grants; Better Roads Grants; FEMA HMGP/PDM grants; local resources	Fall 2020-Fall 2021
	Replace culvert on Galusha Hill Road that is in poor condition and are structurally unsound. Upgraded culverts appropriately handle the hydraulic capacity of streams and therefore protect town infrastructure from flooding. (Mitigation)	Selectboard	Medium (Action #4 of 7 in 2011 Plan).	VTrans Structures grants; Better Roads Grants; FEMA HMGP/PDM grants; local resources	Fall 2021-Fall 2022
	Develop a schedule and capital budgeting program to replace undersized culverts to allow for greater volumes of water to be cleared, therefore protecting town infrastructure. (Mitigation)	Selectboard/Road Foreman	Medium (Action #4 of 7 in 2011 Plan)	Local resources; VTrans	Spring 2020-Spring 2021
	Revise Topsham Flood Hazard Area	Planning Commission	High (Action #5 of 7	Local resources, TRORC.	Fall 2018 during

	Ordinance to prevent the construction of infrastructure in areas that are vulnerable to flooding and severe weather. (Mitigation)		in 2011 Plan)		Town Plan update- Fall 2019.
	Consider adopting river corridor regulations, which will incorporate VT ANR's river corridor maps, helping residents and planners know what land is necessary for riparian functions and to prevent the threat to current and future development. (Mitigation)	Planning Commission	Low (New)	Local Resources; TRORC; Municipal Planning Grant; Vermont Agency of Natural Resources	Spring 2021- Spring 2022
	Support projects to protect or restore, including riparian planting, strategic areas of floodplain to provide areas for flood storage, which will help alleviate peak flood flows and reduce the loss of property during a flood. (Mitigation)	Selectboard/ Planning Commission	Low (New)	Upper Valley Land Trust; Upper Valley Trout Unlimited; local resources	Spring 2021- Fall 2021
	Prohibit the removal of natural vegetation along streambanks. Riparian vegetation improves stream floodplains and also reduces the damaging effects of stream channel erosion on town and private infrastructure. (Mitigation)	Selectboard	Medium (New)	Local Resources; TRORC; Vermont Agency of Natural Resources	Spring 2020- Spring 2021
	Elevate existing buildings in Special	Selectboard	Low (New)	Local resources; Hazard Mitigation	Summer 2024-

	Flood Hazard Areas in Topsham so that they are 1 foot above base flood elevations. Elevation of structures located in areas vulnerable to flooding will reduce the risk to flooding and will reduce the loss of private infrastructure (Mitigation).			Grant Program	Summer 2025
	Conduct a road erosion road inventory to determine projects for stormwater improvement to reduce erosion sources from town road infrastructure. Proper road erosion reduction will reduce erosion and its damaging effects on public and private infrastructure. (Mitigation)	Selectboard; Road Crew	High (New)	Better Roads Grant	Summer 2018-Fall 2019
	Request an updated flood map from FEMA that more accurately identifies areas that are subject to flooding, therefore diminishing the loss of health and property from development in these areas. (Mitigation)	NFIP Administrator	Medium (Action #5 of 7 in 2011 Plan)	Local resources; FEMA	Fall 2020-Winter 2021

Hazards Mitigated	Ongoing Actions to Support Mitigation and Preparedness Actions	Local Leadership	Prioritization (Mitigation Project Status)	Possible Resources*	Time Frame
All Hazards	*Alert residents to upcoming hazards, bad weather, and potentially treacherous travel conditions by means of Topsham Listerv. This town-wide notification system will reduce the loss of life during a hazard. (Mitigation)*	Selectboard, Town Clerk	High (New)	Local resources	Winter 2017-Winter 2018 and ongoing during winter seasons.
	Ensure that Topsham's Local Emergency Operations Plan (LEOP) is kept up-to-date and identifies vulnerable areas and references this Plan. (Preparedness)	Selectboard/Emergency Management Coordinator	High (Action #1 of 7 in 2011 Plan).	Local resources; TRORC; Vermont Department of Emergency Management & Homeland Security (DEMHS)	Spring 2018 and occurring yearly.
	Consistently document infrastructure damage after weather events. (Preparedness)	Road Foreman	High (new)	Local Resources; TRORC; VT DEMHS	Starting Summer 2018 and will occur after weather events
Flood/Fluvial Erosion	*Keep up-to-date with Vermont Road and Bridge Standards so that Topsham effectively maintains its road infrastructure to be resilient to hazard events.*	Road foreman/ Selectboard	Medium (New)	Local resources	Spring 2018 (or when they are updated by VTrans)
Structural Fire	*Ensure that fire department*	Topsham Fire Department	High	Local Resources	Spring 2018 and updated

	personnel maintain their firefighter certifications. (Preparedness)				routinely to ensure certification
	Distribute fire prevention fliers at the school. (Preparedness)	Fire Chief/Fire Department	High (New)	Local resources	Ongoing. Occurs once per year in the fall.
	Maintain and clean existing dry hydrants. Proper maintenance of hydrants will reduce the loss of life and infrastructure from structure fires. (Mitigation)	Fire Chief/Fire Department	High (Action #7 of 7 in 2011 Plan).	Local Resources	Ongoing and occurs yearly.
	Continue to maintain mutual aid agreements with surrounding towns (Preparedness).	Selectboard	High (New)	Local Resources	Spring 2017 and maintained regularly.
Extreme Cold/Snow/Ice Storm	*Clear and maintain town road rights-of-way, which will reduce the loss of life and infrastructure damage during snow and ice storms. (Mitigation)*	Highway Department/Selectboard	Medium	Local resources	Summer 2018 and occurring yearly during summer.
	Plan for, budget, and maintain roads for safe winter travel. (Mitigation)	Selectboard	High (Action #4 of 7 in 2011 Plan)	Local resources	Ongoing and occurs yearly.
Hazardous Material Spills	*Ensure that fire department update and maintain HAZMAT Awareness training at a minimum. (Preparedness)*	Fire Department/ Emergency Management Coordinator	High Action #6 of 7 in 2011 Plan).	Local resources	Ongoing/ Fall 2017

*Depending on the mitigation action, local resources may include the following: personnel/staff time; volunteer time; budget line items, donations, cash from capital campaigns, among others.

Appendices

Appendix A: Hazard Ranking Methodology

Frequency of Occurrence Probability	Warning Time Amount of time generally given to alert people to hazard	Potential Impact Note: Severity of damage and disruption generally correlates with magnitude (extent) of event
1 = *Unlikely* <1% probability of occurrence in the next 100 years 2 = *Occasionally* 1–10% probability of occurrence per year, or at least one chance in next 100 years 3 = *Likely* >10% but <100% probability per year, at least 1 chance in next 10 years 4 = *Highly Likely* 100% probable in a year	1 = More than 12 hours 2 = 6–12 hours 3 = 3–6 hours 4 = None–Minimal	1 = *Negligible* Isolated occurrences of minor property damage, minor disruption of critical facilities and infrastructure, and potential for minor injuries 2 = *Minor* Isolated occurrences of moderate to severe property damage, brief disruption of critical facilities and infrastructure, and potential for injuries 3 = *Moderate* Severe property damage on a neighborhood scale, temporary shutdown of critical facilities, and/or injuries or fatalities 4 = *Major* Severe property damage on a metropolitan or regional scale, shutdown of critical facilities, and/or multiple injuries or fatalities

Appendix B: Critical Stream Crossings

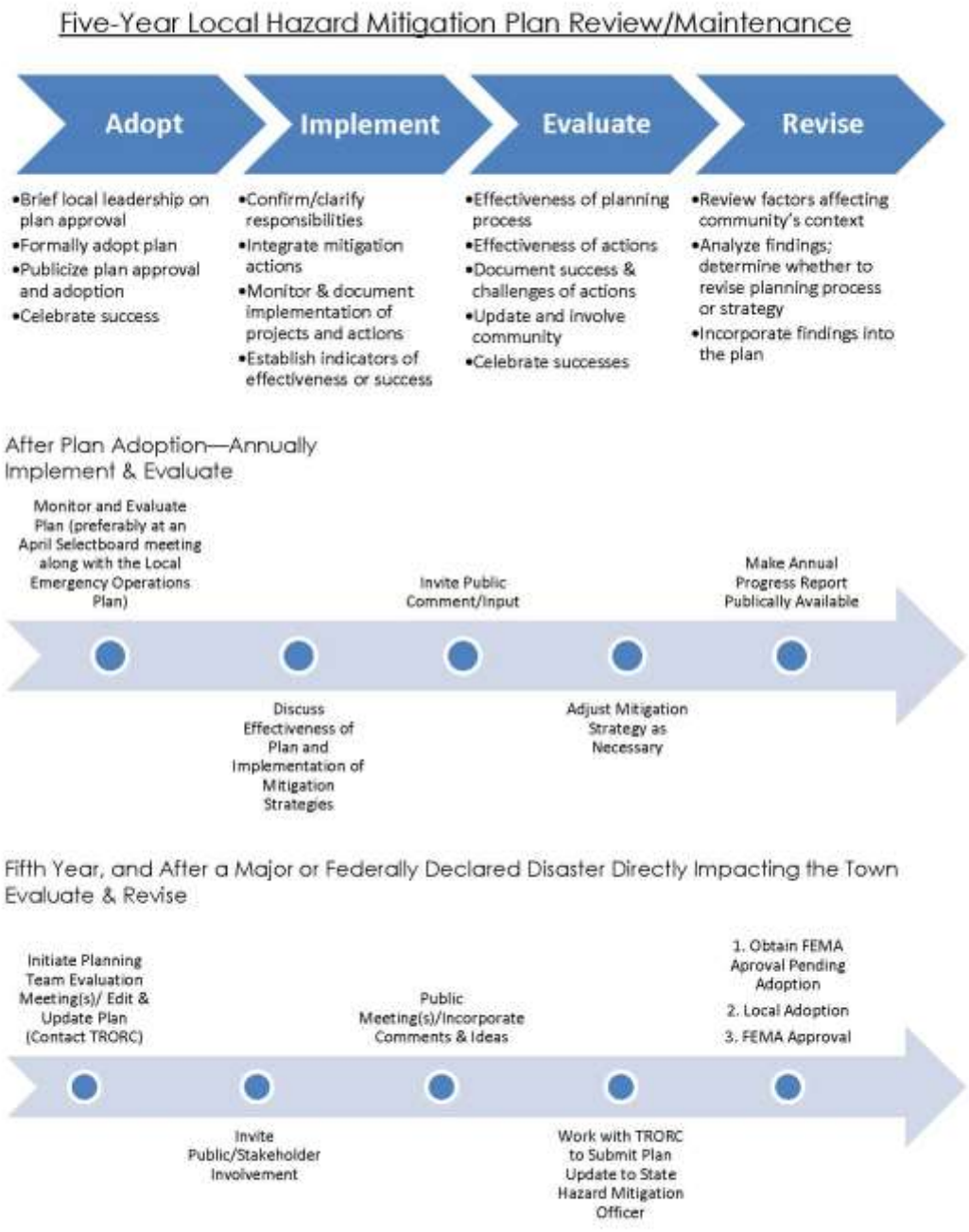
Critical crossings group one includes stream crossing structures on town highways that cross third order streams or larger. Headwater streams generally include first through third order. Third order was included as these headwater streams will have larger drainage areas and may have larger structures that are more difficult to replace and have a larger impact on the road network. Most of these are bridges.

Critical crossings group two includes significantly undersized structures, usually culverts, were identified from the ANR-DEC stream geomorphic assessment survey with openness ratios less than 50%. This measure refers to when structure's width is less than half of the stream bankfull width. Several of these structures may have been damaged during TS Irene or other events and may have been replaced. The town, at some point, should look at these sites and assess their status and need for repair/upgrades.

bankfull_w	n_hwy_cd	local_id	location	latitude	longitude	inv_date	Road Name	cul_type	cul_matl	
CULVERTS										
0		01	156	44.08723622600	-72.26932932700	6/16/2003	FELCH RD	30	10	
0		03	19	44.09759181900	-72.29057270800	6/16/2003	HONEY CORNERS RD	30	10	
0		06	37	44.09953352600	-72.29060748400	6/16/2003	HONEY CORNERS RD	30	10	
0		01	10	44.09603267800	-72.29037030400	6/16/2003	HONEY CORNERS RD	30	9	
0		01	5	44.08635496400	-72.29169537700	6/16/2003	PIKE HILL RD E	30	9	
0		02	47	44.08999194300	-72.26926717900	6/16/2003	WATSON HILL RD	30	10	
0		09	362	44.12786825700	-72.25436393700	6/12/2003	WILLEY HILL RD	30	10	
SMALL BRIDGES										
3	38			44.12824063500	-72.25559587800	5/22/2013	BEN DEXTER RD	B34	99	
13	29			44.13225124600	-72.24283761400	5/22/2013	CURRIER RD	B29	99	
24	40			44.12134287600	-72.23102479600	5/22/2013	HARTS RD	B27	99	
20	1			44.18020270900	-72.22689058100	5/22/2013	POWDER SPRING RD	B3	99	
10	1			44.15068610500	-72.23310367600	5/22/2013	POWDER SPRING RD	B5	99	
23	2			44.10270726400	-72.21186787700	5/22/2013	SWAMP RD	B4	99	
9	1			44.09725867800	-72.22340933100	5/22/2013	TOPSHAM CORINTH RD	B1	99	
5	1			44.11617567700	-72.23298344400	5/22/2013	TOPSHAM CORINTH RD	B9	99	
25	4			44.12877567300	-72.25735864200	5/22/2013	WILLEY HILL RD	B37	99	
BIG BRIDGES										
BridgeType	FeaturesIr	StructureI	YearBuilt	Latitude	Longitude	YearRecon	Location	TownNam	RouteLogBr	Notes
CONCRETE SLAB	TABOR BR	20019301(	1999	44071657	072140093	0000	5.0 MI N JCT. VT.25	TOPSHAM	0010T	07/20/2016 - Bridge is in good shape. ~ MJ/SP 7/16/14 Good shape. MJK SMP 07/25/12 Detached guardrail abut 2 upstream end needs repairs, ~MJK , JM
CONCRETE T-BEAM	TABOR BR	200193001	1940	44072668	072141950	0000	5.3 MI N JCT. VT.25	TOPSHAM	00011	07/20/2016 - This T beam bridge is in good shape, but could use some concrete repair work to correct heavy scaling along the deck fascia and abutment footings. The deck drains should be filled with concrete as well; to stop all leakage thru them that is
CONCRETE SLAB	LEVI BROC	100912000	1995	44064377	072114372	0000	1.26 MI TO JCT W C3 TH5	TOPSHAM	00006	10/6/15 Radius end upstream end needs repairs and approaches should be shimmed. MJK SP 10/25/13 Good shape, radius beam abutment 2 upstream end needs to be attached to post. MJK FE 06/13/11 Good condition, approaches should be shimmed. MJK & JG
PRESTRESS CONC C-BM	TABOR BR	100912001	1963	44042369	072132501	0000	0.1 MI JCT TH 65 + TH 1	TOPSHAM	00012	10/6/15 Guardrail system needs to be upgraded and has been mentioned before with no repairs made. MJK SP 10/25/13 Approach & bridge guardrail system needs repairs heavy damage. MJK FE 06/13/11 Good condition. however guardrail need repairs and upgr
I BM W TIMBER DK	WAITS RIV	100912002	1974	44055836	072181776	0000	0.05 MI JCT TH 49 + VT25	TOPSHAM	00022	10/6/15 Adequate rail system needs to be installed and timber curb has heavy rot. Beams need to be cleaned & painted, abutment 2 lower stem should be cleaned & patched. Added anti scour protection needs to be put in place along abutment 2. MJK SP 10/2
PRESTRESS CONC C-BM	TABOR BR	100912002	1964	44072738	072144875	0000	0.3 MI JCT TH 1 + TH 4	TOPSHAM	00023	10/6/15 Guardrail system needs to be upgraded, deck needs to be stripped and membrane project done. Gaps between panels. MJK SP 10/25/13 Pavement along deck has worn off to top of panel, heavy leakage is getting through causing deterioration along c
PRESTRESS SLAB	TABOR BR	100912002	1960	44055589	072132903	2012	0.05 MI JCT TH 63 + TH 1	TOPSHAM	00025	10/6/15 Relatively good shape. No changes in abutment & wings settlement in years now. MJK SP 10/25/13 Recent recon with new prestress slab good improvement, recent chinking along abutment facing. Town should fill in voids along wing areas. MJK FE
PRESTRESSED SLAB	TABOR BR	100912002	1920	44044042	072132997	2010	0.1 MI JCT TH 64 + TH 1	TOPSHAM	00026	10/6/15 Abutments need to be grouted or chinked as moderate to larger voids are present, large void abutment 2 downstream ends outer end of concrete cap needs to be filled in. MJK SP 10/25/13 Abutment voids need to be filled in with grout or chinking.
RLD BM W TIMBER DK	WAITS RIV	100912003	1919	44052061	072170122	1994	0.1 MI JCT TH 57 + VT 25	TOPSHAM	00038	10/6/15 Timber approach and bridge rail needs repairs, voids in abutment1 laid in place stone need to be mortared or chinked. Scour along abutment 2 needs to be filled in. A588 Beams need to be cleaned & painted along with greasing as they have areas of
CONCRETE SLAB	TABOR BR	100912003	1985	44062521	072140314	0000	0.1 MI JCT TH 51 + TH 1	TOPSHAM	00039	10/6/15 Good shape. MJK SP 10/25/13 Good shape. MJK FE 06/14/11 Good condition. MJK & JG 04/30/2009 - MLJ/DAS

Bankfull Width Percentage	CompatablitlySum	IceDebrisJam	OpennesssRatio	AOPCourseScreen	RetrofitPotential	StructureType	Town	Location	Latitude	Longitude	GisRoadName	StreamName	ChannelWidth	StructureLength	StructureHeight	StructureWidth
12.2	4	1	4%	Red	LLL	Culvert	Topsham	DS end of pond at 29 James Downing Rd	44.13601	-72.18928		Scott Brook	8.2	25	1	1
38.5	5	1	6%		Missing Data	Bridge	Topsham	At Town Line	44.08766	-72.30496	PIKE HILL RD W	Trib to Waits River	5.2	22	0.7	2
31.7	3	1	8%	Gray	LLL	Culvert	Topsham	Near Driveway # 52	44.08245	-72.22874	STRYKER RD	Trib to Tabor Branch	6.3	53	2	2
20	4	1	11%	Red	LLL	Culvert	Topsham	Bend to the east 2/10 mile from Harris Driveway	44.11235	-72.19915	SWAMP RD	Trib to Levi Brook	10	36	2	2
31.7	2	1	13%	Red	MLL	Culvert	Topsham	Elevation 1640'	44.15538	-72.21137	FISKE RD	Trib to Tabor Branch	6.3	31	2	2
23.5	4	1	13%	Red	LLL	Culvert	Topsham	.4 Mi N Meadow Ln	44.14473	-72.19344	EMERSON RD	Unnamed	8.5	30	2	2
28.4	3	1	13%	Red	LLL	Culvert	Topsham	Fields on both sides, sand driveway 50' to the north and next to telephone poll # 76	44.09246	-72.22226	TOPSHAM-CORINTH RD	Trib to Tabor Branch	7.4	28	1.8	2.1
12.5	4	1	15%	Gray	LLL	Culvert	Topsham	Just W Powder Springs Rd.	44.1792	-72.22837	KEENAN POND RD	Unnamed	12	20	2	1.5
26.7	5	1	17%	Orange	LLL	Culvert	Topsham	Driveway off to the right	44.0748	-72.21036	THOMPSON RD TOPSHAM	Trib to Hedgehog Brook	7.5	24	2	2
20	4	1	18%	Red	LLL	Culvert	Topsham	Elevation - 1720'	44.15759	-72.26314	KASSON RD	Trib to Tabor Branch	7.5	12.5	1.5	1.5
34.5	3	1	18%	Red	LLL	Culvert	Topsham	Between Sugarhouse Road & Emma Jane Road	44.13677	-72.27261	WILLEY HILL RD	Trib to Tabor Branch	8.7	50	3	3
87.2	3	1	19%	Red	HHM	Culvert	Topsham	Elevation - 1725'. 1/10 mile above BM 1720	44.16906	-72.30397	US RTE 302	Trib to Waits River	4.7	90	4.1	4.1
38.7	4	1	19%	Red	MLL	Culvert	Topsham	.3 Mi N Caldwell rd.	44.18318	-72.22525	POWDER SPRING RD	Unnamed	8	50	3.1	3.1
16.7	4	1	20%	Gray	LLL	Culvert	Topsham	1 Mi N Clarks XRD	44.1767	-72.20684	GALUSHA HILL RD	East Brook	12	20	2	2
29.1	1	1	22%	Red	LLL	Culvert	Topsham	3/10 mile above intersection with Downing Hill Road	44.13016	-72.25955	WILLEY HILL RD	Trib to Tabor Branch	10.3	41	3	3
30.6	2	1	23%	Orange	MLL	Culvert	Topsham	Juction with Watson Hill Road	44.0998	-72.26864	PHELPS RD	Shit Brook	9.8	39	3	3
20.6	3	1	23%		Missing Data	Bridge	Topsham	1.4 miles from intersection with Spooner Road	44.11677	-72.25709	BEN DEXTER RD	Trib to Tabor Branch	10.7	17	1.8	2.2
31.5	1	1	25%	Red	MLL	Culvert	Topsham	1/10 mile east from intersection with TH-1	44.09914	-72.22193	SWAMP RD	Trib to Tabor Branch	9.2	36	3.1	2.9
32.6	0	1	25%	Red	MLL	Culvert	Topsham	1/10 mile south of swamp road intersection	44.0978	-72.2236	TOPSHAM-CORINTH RD	Trib to Tabor Branch	9.2	36	3	3
35.3	4	1	25%	Red	MLL	Culvert	Topsham	100' south of BM - 1673	44.1495	-72.26135	DOWNING RD	Trib to Tabor Branch	8.5	36	3	3
28	3	1	28%	Gray	LLL	Culvert	Topsham	Elevation 1015'	44.11201	-72.23936	WELCH RD	Trib to Tabor Branch	10.7	32	3	3
31.5	3	1	29%	Red	MLL	Culvert	Topsham	Just above intersection with Crossroad	44.14431	-72.31014	US RTE 302	Tribto Waits River	12.7	56	4.1	4
27.7	5	1	30%	Gray	LLL	Culvert	Topsham	1/2 mile upstream from Route 25	44.08689	-72.29089	PIKE HILL RD	Trib to Waits River	13.7	54	4.2	3.8
116.7	3	0	30%	Gray	HHH	Culvert	Topsham	1/10th mile east of Topsham / Orange Town line	44.09616	-72.32879	E ORANGE RD	Trib to East Orange Branch	3	41	3.5	3.5
40.5	1	1	30%	Red	LLL	Culvert	Topsham	Elevation 1550'	44.15209	-72.21163	JOHN WHITE RD	Trib to Tabor Branch	7.4	30	3	3
64.9	3	1	30%	Red	MLL	Culvert	Topsham	Near Driveway # 170	44.16133	-72.30714	US RTE 302	Trib to Waits River	7.7	84	5.1	5
70.2	5	1	31%	Red	MML	Culvert	Topsham	3/10 mile NE on route 302 above BM1831. Elevation 1820'	44.17855	-72.29881	US RTE 302	Trib to Waits River	5.7	53	4.1	4
42.9	2	1	31%	Red	MLL	Culvert	Topsham	Jct with Ben Dexter Road	44.10011	-72.26394	SPOONER RD	Trib to Waits	7	29	3	3
32.6	4	1	38%	Red	MLL	Culvert	Topsham	1/10 mile above intersection with TH-1	44.09894	-72.22191		Trib to Tabor Branch	9.2	24	3	3
46.3	1	1	40%	Gray	LLL	Culvert	Topsham	Jct of Phelps Road & Zion Hill Road	44.11211	-72.28344	PHELPS RD	Trib to Waits	8	39	4.2	3.7
36.9	1	1	41%	Red	MLL	Culvert	Topsham	Below Juction with phelps road	44.09864	-72.26828	WATSON HILL RD	Trib to Waits River	10.3	38	4.1	3.8
44.1	4	1	43%	Red	MLL	Culvert	Topsham	Unnumbered structure - Structure upstream is # 70003301589012x	44.15001	-72.20709	JOHN WHITE RD	Trib to Tabor Branch	6.8	21	3	3
32.7	2	1	43%	Gray	MLL	Culvert	Topsham	1st structure on road above East Topsham Village	44.12599	-72.22782	GALUSHA HILL RD	Trib to Tabor Branch	11	34	4.1	3.6
30.9	5	1	45%	Gray	MLL	Culvert	Topsham	elevation - 1615	44.15322	-72.27843	TERRITORY RD	Trib to Tabor Branch	9.7	20	3	3
32.3	0	1	45%	Red	MLL	Culvert	Topsham	200' from Willey Hill Road	44.14389	-72.2797	TERRITORY RD	Trib to Tabor Branch	9.3	20	3	3

Appendix C: Five-Year Review and Maintenance Plan



Attachments

Attachment A: Map of the Town of Topsham