City of Claremont
New Hampshire

HAZARD MITIGATION PLAN

Update 2016

Foisy Hill Road, June 2013

Prepared by the
City of Claremont Hazard Mitigation Committee and
Upper Valley Lake Sunapee Regional Planning Commission

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I. INTRODUCTION

A. BACKGROUND

The New Hampshire Division of Homeland Security and Emergency Management (NH HSEM) has a goal for all communities within the State of New Hampshire to establish local hazard mitigation plans as a means to reduce future losses from natural or man-made hazard events before they occur. The NH HSEM has provided funding to the City of Claremont, to update their local Hazard Mitigation Plan. UVLSRPC wrote the first Claremont Hazard Mitigation Plan that was approved in 2004, and then a 2011 update. The *Claremont Hazard Mitigation Plan Update 2016* serves as a strategic planning tool for use by the City of Claremont in its efforts to reduce future losses from natural and/or man-made hazard events before they occur. This *Plan* does *not* constitute a section of the Master Plan.

In the previous plan of 2011, much of the focus was on emergency management though this is a hazard mitigation plan. Due to greater focus on hazard mitigation, the update 2016 plan includes an inventory of emergency management improvements, but the heart of the plan is now hazard mitigation. Changes to the City have been made since 2011 as will be noted in the *Development Trends* section of Chapter II.

The Claremont Hazard Mitigation Committee updated the *Claremont Hazard Mitigation Plan* with the assistance and professional services of the Upper Valley Lake Sunapee Regional Planning Commission (UVLSRPC). After a public meeting held in the Claremont City Offices, the Claremont City Council adopted the updated plan on DATE as shown in Appendix F.

B. PURPOSE

The Claremont Hazard Mitigation Plan is a planning tool for use by the City of Claremont in its efforts to reduce future losses from natural and/or man-made hazards. This plan does not constitute a section of the City Master Plan, nor is it adopted as part of the Zoning Ordinance.

C. HISTORY

On October 30, 2000, President Clinton signed into law the Disaster Mitigation Act of 2000 (DMA 2000). The ultimate purpose of DMA 2000 is to:

- Establish a national disaster mitigation program that will reduce loss of life and property, human suffering, economic disruption, and disaster assistance costs resulting from disasters, and
- Provide a source of pre-disaster mitigation funding that will assist States and local governments in accomplishing that purpose.

DMA 2000 amends the Robert T. Stafford Disaster Relief and Emergency Assistance Act by, among other things, adding a new section: 322 – Mitigation Planning. This places new emphasis on local mitigation planning. It requires local governments to prepare and adopt jurisdiction-wide hazard mitigation plans as a condition to receiving any hazard mitigation grants. Local governments must review and update their plans at least every five years to continue program eligibility.

Why develop a Mitigation Plan?
Planning ahead to lessen or prevent a disaster will reduce the human, economic, and environmental costs. The State of NH is vulnerable to many types of hazards, including, but not limited to, floods, hurricanes, winter storms, wildfires, wind events, and earthquakes. All of these types of events can have significant economic, environmental, and social impacts. The full cost of the damage resulting from the impact of natural hazards – personal suffering, loss of lives, disruption of the economy, and loss of tax base – is difficult to quantify and measure.

D. SCOPE OF THE PLAN

The scope of the *Claremont Hazard Mitigation Plan* includes the identification of natural hazards affecting the City, as identified by the Claremont Hazard Mitigation Committee. The hazards were reviewed under the following categories as outlined in the State of New Hampshire Hazard Mitigation Plan:

- Dam Failure
- Flooding
- Hurricane
- Tornado & Downburst
- Thunderstorm/Lightning/Hail
- Severe Winter Weather
- Earthquake
- Drought
- Extreme Heat
- Erosion
- Wildfire
- Natural Contaminants
- Hazardous Materials Spill
- Terrorism

E. METHODOLOGY

Using the *Local Mitigation Planning Handbook by FEMA (2013*), the Claremont Hazard Mitigation Committee, in conjunction with the UVLSRPC, developed the content of the *Claremont Hazard Mitigation Plan Update 2016* by tailoring the nine-task process set

forth in the handbook appropriate for the City of Claremont. Many FEMA resources and multiple State and Federal websites were also used as well. The Committee held two posted meetings in 2016. The meeting was posted inviting the general public and notices were sent to the city Offices of neighboring towns to invite town officials. A public notice was placed in two places in the City of Claremont and the city web site to invite the public to attend. An e-mail was sent to all surrounding municipalities to also invite them to the meeting or to request a copy of the draft plan. These notices are provided in Appendix C. No members of the public attended the meetings. Special invitations to the large employers of the City were sent out and two companies attended the second meeting as noted in Appendix C. They did not feel it was beneficial to attend the meeting.

The Claremont City Council held a public meeting and adopted the Plan after FEMA conditional approval on DATE as shown in Appendix F. Prior to the City of Claremont adopting the updated Plan, a public meeting was held to gain additional input from the citizens of Claremont and to raise awareness of the ongoing hazard mitigation planning process.

To complete this updated Plan, the Hazard Mitigation Committee followed the planning tasks below to re-evaluate the plan sections of the existing 2011 plan and to update it to reflect current information and issues:

Task 1: Determine the Planning Area and Resources (June 2016)
Claremont is a rural city and chose to continue their planning as process as a single municipality. The City chose to work with the Upper Valley Lake Sunapee Regional Planning Commission to provide technical support.

Task 2: Build the Planning Team (June 2016)
Members of the Committee included all relevant personnel. This included the Town Manager, the Fire Chief/EMD, a Police Chief, the Planning & Zoning Administrator, the Finance Director, and the Public Works Director.

Task 3: Create an Outreach Strategy (June 2016)
The Committee chose to provide public notices to the public to encourage participation at the public meetings. They also put a notice on the city website. Notices were also sent to each of the neighboring municipalities to invite them to participate in the meetings, send comments, or request a final plan. The final plan will also be available for public review prior to City adoption.

Task 4: Review Community Capabilities (June 2016)
Committee members identified facilities that were considered to be of value to the City for emergency management purposes, for provision of utilities and services, and for historic, cultural and social value. A GIS-generated map was prepared to show critical facilities identified by the Claremont Hazard Mitigation Committee. A summary listing of “Critical Facilities” is presented in Chapter IV. Costs were determined for losses for each type of hazard. Using information and activities in the handbook, the Committee and

UVLSRPC staff identified existing mitigation strategies which are already implemented in the City related to relevant hazards. A summary chart and the results of this activity are presented in Chapter VI.

Task 5: Conduct a Risk Assessment (June-July 2016):
The Committee determined natural and human-made hazards affecting the City and updated a description, location, and extent of those previous and potential hazards. Existing and future assets were updated to determine vulnerability to potential hazard events. Critical facilities needed during an emergency were identified and given values based on tax data. It was also determined if these facilities are in a hazard zone or not. Other facilities identified are those needed to continue the daily operation of the municipality and those that have dense populations or valued historical structures and vulnerable natural areas.

Task 6: Develop a Mitigation Strategy (June-July 2016):
The Committee evaluated the goals in the previous plan and determined they were still appropriate with minor revisions for clarification. They then determined actions that they could take to meet those goals to reduce their risk to hazard events. They discussed existing regulations, ordinances, and the Master Plan and how they could continue to incorporate hazard mitigation strategies into these documents to include hazard mitigation in land use planning. Committee members agreed to pursue this integration with appropriate municipal boards.

Task 7: Keep the Plan Current:
The plan will be reviewed after every major event to evaluate the effectiveness of the plan. It will also be updated at least every five years as required. This includes review of goals, existing and proposed actions, and prioritizing those actions. Updates of other City documents and regulations and ordinances will be part of this updating process.

Task 8: Review and Adopt the Plan:
The Committee will incorporate any feedback from Committee members, municipal officials, residents, businesses and institutions, and neighboring communities. The plan will be assessed by using FEMA's Local Mitigation Plan Review Tool prior to sending to NH Homeland Security and Emergency Management for preliminary review. If HSEM considers the plan to meet the requirements, they will forward the draft plan to FEMA for their review. Once FEMA determines the plan meets requirements, the municipality will hold a public meeting to obtain further comments and review the final draft. If there are no major suggested changes, the municipal government will adopt the plan and the adoption form will be sent to HSEM and then to FEMA to receive a final approval of the plan.

Task 9: Create a Safe and Resilient Community:
The municipality will implement the plan by committing to task accomplishment as indicated in the plan. The municipality will take advantage of available funding opportunities such as FEMA's mitigation grant programs. The process for monitoring and updating the Plan can be found in Chapter IX.

UVLSRPC staff compiled the results of tasks one through nine in a draft document, as well as helpful and informative materials from the *State of New Hampshire Multi-Natural Hazard Mitigation Plan Update 2013*, which served as a resource for the *Claremont Hazard Mitigation Plan Update 2016*.

F. HAZARD MITIGATION GOALS

The Claremont Hazard Mitigation Committee reviewed the hazard mitigation goals set forth in the previous Hazard Mitigation Plan and revised them as follows:

1. To identify, introduce and implement cost effective Hazard Mitigation measures so as to accomplish the City's goals and to raise awareness and acceptance of hazard mitigation opportunities generally.

2. To improve upon the protection of the general population, the citizens, and visitors of the City of Claremont from natural and human-made hazards.

3. To reduce the potential impact of natural and human-made disasters to:
   - the City of Claremont's Critical Support Services,
   - Critical Facilities in the City of Claremont,
   - the City of Claremont's infrastructure,
   - private property,
   - the City's economy,
   - the City's natural environment, and
   - the City's specific historic treasures and interests.

4. To improve the City's disaster response and recovery capability as a hazard mitigation strategy to be prepared for emergencies and reduce their impact.

G. ACKNOWLEDGEMENTS

The following people participated in developing the update of this plan as the Hazard Mitigation Committee:

- Rick Bergeron, Emergency Management Director and Fire Chief, City of Claremont
- Mark Brislin, Director Parks & Recreation, City of Claremont
- Steve Coombs, Building Inspector, City of Claremont
- Sean Glasscock, Building Inspector, City of Claremont
- Nancy Merrill, Planning and Development Director, City of Claremont
- Dorée Russell, Executive Assistant, City of Claremont
- Victor St. Pierre, Assistant Public Works Director, City of Claremont
- Alexander Scott, Police Chief, City of Claremont
- Scott Sweet, Public Works Director, City of Claremont
- Jane Taylor, City Solicitor, City of Claremont
- Mary Walter, Finance Director, City of Claremont

- Shawna-Leigh Morton, Field Representative, NH Homeland Security and Emergency Management
- Victoria Davis, Planner, Upper Valley Lake Sunapee Regional Planning Commission

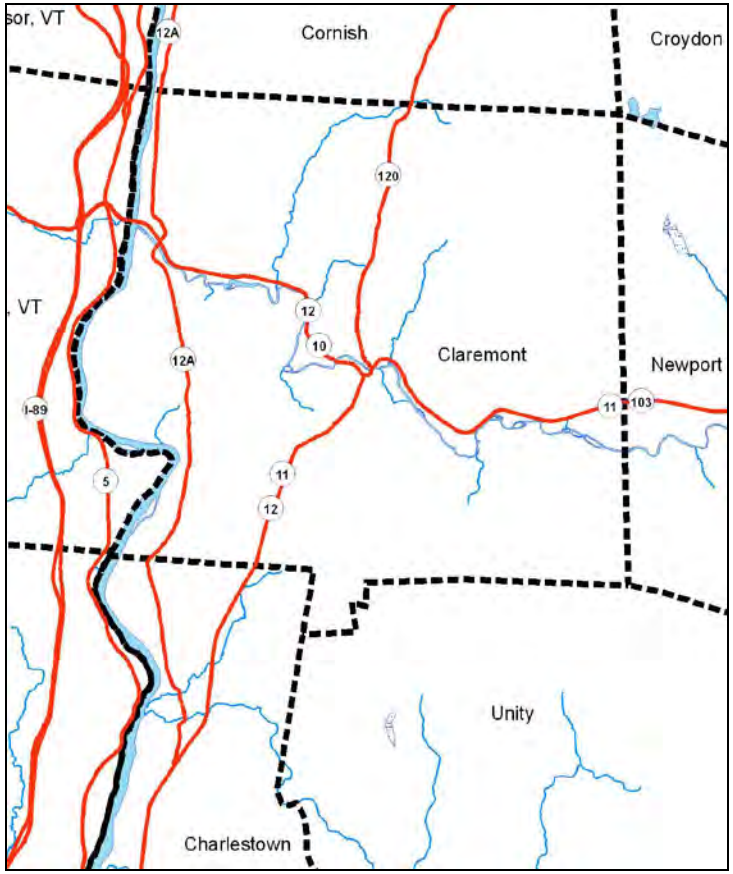
The Hazard Mitigation Committee was composed of local officials, many of whom are citizens of Claremont and a staff representative of the UVLSPRC for meeting facilitation and plan development. All abutting communities were invited to participate in the public meeting, submit comments, and request copies of the final plan. The general public and local businesses and industry were invited to attend the meetings by public postings at the city office and on the city website. See Appendix C. These were posted 10 days prior to the public meeting. Specific invitations were sent to area industry and major employees prior to the second meeting. Canam Group and Preferred Building representatives attended the meeting. They had no comments except they saw no value in their attendance. No city residents quired about the update process or attended the meeting.

Historical information, relevant data and potential future mitigation strategies were contributed by all parties involved in the planning process. For a record of all meeting topics see Appendix C: Meeting Documentation. The staff representative of the UVLSRPC gathered all information from local officials, agency representatives and public input and compiled the information to develop the Plan.

II. COMMUNITY PROFILE

A. INTRODUCTION[1]

Situated along the Connecticut River, Claremont is located in the New England upland region. Most of Claremont is composed of rolling topography where the highest points are between 1500 and 2000 feet above sea level. The highest point is Green Mountain at approximately 2000 feet. The lowest point in Claremont is at the banks of the Connecticut River at approximately 90 feet. Topography is an important factor in assessing development suitability. Due to the sensitivity of these areas, development should either be discouraged or carefully managed to maintain visual quality and minimize erosion concerns. Alternatively, low lying areas are typically associated with water resources such as river corridors and may be prone to flooding, and/or contain deposits of sand and gravel or rich farmland soils.



The City has a well developed distribution system for water and sewer services. The present total capacity of the City's water reservoirs is 245 million gallons per day. The backup water supply is the Sugar River, which is used several times each year. There are 70 miles of water distribution piping, two storage tanks, three reservoirs, and three dams. The system can supply about 4 million gallons of water per day with an excess capacity for a current demand that ranges from 0.9 to 1.5 million gallons per day. Waste water or sewer services also contain excess capacity. The systems can treat a total of 3.2 million gallons per day. Usage typically does not exceed 1.4 million gals/day, leaving the system with significant excess capacity. The City maintains about 50 miles of sewer collection pipe and six pump stations.

[1] City of Claremont Master Plan (2011)

Once slopes exceed 15 to 20% slope, there is greater chance for environmental impact and increased development costs. Most of these areas are found in the north of the Sugar River especially in the Cathole Road and Foisy Hill Road section of the community. There are approximately 4184 acres of slopes 20% and greater in Claremont *(Upper Valley Lake Sunapee RPC, 2007).*

Claremont is relatively rich in water resources—making up approximately 3,300 acres *(Upper Valley Lake Sunapee RPC, 2007).* Two of the region's major rivers flow through the community as well a number of smaller brooks. There are no major lakes, although there are several small ponds and manmade reservoirs such as the Rice and Dole Reservoirs north of the Sugar River. Regulatory measures such as shoreline set backs and conservation districts can help preserve the health of water resources.

Much of the transportation activity within the City is automobile-oriented. The City's existing 144 mile road system was initially developed to serve agricultural transactions between the City center and rural farms. Since the City's transportation system was designed to facilitate travel to the City center, many of Claremont's main arterial roads (including NH Routes 11, 12, and 103) intersect at what is now Opera House Square in the center of Claremont's downtown area. This convergence of major roadways provides good access to the City, but also has resulted in heavy traffic in the downtown area. Over the past 60 years, development has responded to the use of the automobile as the main means of transportation, resulting in dispersed land uses, varied travel demands, and a more complex transportation network. Claremont also has an important rail system, reflecting the City's early industrial prominence. The system is primarily oriented towards freight traffic, with limited passenger service to destinations between New York and Essex Junction, Vermont provided by Amtrak that uses a north-south trunk line of about seven miles connects Claremont to other northeastern destinations. A short two mile segment of rail spur extends into the City center parallel with Tylor Street and is operated by a private railroad company. This infrastructure has been used infrequently in recent years. Passenger service is also limited. Pedestrian travel is accommodated by a thirty-five mile sidewalk system in the core of the City. However, new development, for example will require the City to consider expanding the system.

The single most extensive land use in Claremont is forest land which covers over 55% of the City's area. The largest contiguous concentration of this land cover is in the north east quadrant of the City. It occupies more than twice the area of the next highest category of use which is low density residential which occupies 22% of the City's land area. This activity is located on the periphery of the downtown area with the highest concentration located north of the Sugar River. Open fields and agriculture represent 8% of the land area. High density residential occupies approximately 4% of the City's land area while both medium-density residential and industrial make up 2.08 % and 2.58%, respectively. The remaining uses are all under 2%.

B. DEVELOPMENT TRENDS

With the current water and wastewater systems in place, Claremont could handle the demands from a population of about 20,000. Within the system's service area there is a considerable amount of land available for development. This suggests that expanding the extent of the existing system would be inefficient because it would make land available for development which may not be needed in the immediate future. Supporting a water and sewer system to serve a decentralized or thinly settled land use pattern would be more expensive for the City to maintain due to the increased amount of water and sewer lines. It is likely that an expansion of the service will be necessary in the future to support additional growth; however, at this time it would be most effective to expand the system by filling in unserved areas within the boundary of the existing system.

Other potential growth areas include along Route 12A/River Road and Grissom Lane. There is an industrial park on Grissom Lane near where the waste incinerator is located.

Claremont has adopted zoning and subdivision and site plan regulations to manage building activity and growth. At present, there are fourteen (14) zoning districts that control the types and density of uses. These generally fall into residential, business and industrial zones with separate zones for healthcare and mill use. There are also five (5) overlay districts including: Historic, Floodplain, Floodway, Streambank, and Airport Approach. Each of these provides additional standards beyond the underlying district.

Table II-1: PERMITS FOR NEW STRUCTURES

Year of Permit	New Homes	New Mobile Homes	New Commercial	Floodplain?
2015	0	2	2	None
2014	0	0	1	None
2013	3	5	0	None
2012	2	1	1	None
2011	2	3	5	1 mobile home

The City does not feel that it is more vulnerable to hazards than it was five years ago as most of the new development in the hazard areas are replacements to previously existing buildings. Although a proposed development on Washington Street will partially be in the dam inundation area, the buildings will be outside this hazard.

Table II-2: AREA POPULATION TRENDS

Area	1970	1980	1990	2000	2010
Claremont	**14,221**	**14,557**	**13,902**	**13,151**	**13,336**
Newport	5,899	6,229	6,110	6,269	6,507
Unity	709	1,092	1,341	1,530	1,671
Croydon	396	457	627	661	764
Cornish	1,268	1,390	1,659	1,661	1,640
Charlestown	3,274	4,417	4,630	4,749	5,114
Sullivan County	30,949	36,063	38,592	40,458	43,713
New Hampshire	737,578	920,475	1,109,252	1,235,786	1,327,000

Source: US Census

Table II-3: POPULATION GROWTH IN CLAREMONT

	1970	1980	1990	2000	2010
Population	**14,221**	**14,557**	**13,902**	**13,151**	**13,336**
Decade Change in Population		2.4%	-4.5%	-5.4%	1.4%

Source: US Census

Table II-4: POPULATION PROJECTIONS FOR CLAREMONT

Area	2015	2020	2025	2030	2035	2040
Claremont	**13,150**	**12,991**	**13,322**	**13,662**	**13,914**	**14,064**
Change in Population in 5 yrs.	-1.4%	-1.2%	2.5%	2.6%	1.8%	1.1%
Change in Population in 10 yrs		-2.6%		5.2%		2.9%

Source: State of New Hampshire, Regional Planning Commissions, Office of Energy and Planning - Municipal Population Projections, 2013

Despite an increase in the population in the earlier decades, Claremont remains a small city surrounded by rural communities. The rate of growth was moderate in the 1970's and 1980's, but has slowed significantly since then. In 2010, the total population was 13,336 persons. Population projections show Claremont to continue to grow at a very slow rate. See the population projections table.

III. HAZARD IDENTIFICATION

The Claremont Hazard Mitigation Committee reviewed the list of hazards provided in the *State of New Hampshire Hazard Mitigation Plan*, and some hazard history for the State of New Hampshire and Sullivan County in particular. A list of past hazard events in Claremont, Sullivan County, and the State of New Hampshire can be found in the following discussion and tables. After reviewing this information and the Emergency Operations Plan, the Committee conducted a Risk Assessment. The resulting risk designations are provided in the heading of each hazard table below as well as a more detailed discussion further into this chapter.

A. WHAT ARE THE HAZARDS IN CLAREMONT?

Claremont is prone to a variety of natural and human-made hazards. The hazards that Claremont is most vulnerable to were determined through gathering historical knowledge of long-time residents and city officials; research into the CRREL Ice Jam Database, FEMA and NOAA documented disasters, and local land use restrictions; and from the input of representatives from state agencies (NH HSEM). The hazards potentially affecting the City of Claremont are dam failure, flooding, hurricane, tornado & downburst, thunderstorm (including lightning and hail), severe winter weather, earthquake, drought, extreme heat, erosion/landslide, wild and structure fire, natural contaminants, hazardous materials spills, and terrorism. Each of these hazards and the past occurrences of these hazards are described in the following sections. Hazards that were eliminated from assessment are those that have not had a direct impact on the City of Claremont and are not anticipated to have an impact as determined by the Hazard Mitigation Planning Committee, representatives from state agencies and citizens of the City of Claremont. Eliminated hazards include Land Subsidence, Landslides, Expansive Soils, and Snow Avalanches.

B. DESCRIPTIONS OF HAZARDS

An assessment of each hazard relevant to Claremont is provided below. An inventory of previous and potential hazards is provided. Past events are shown in the following tables and the potential for future events is then discussed. The “risk” designation for each hazard was determined after evaluations discussed later in this chapter.

- Dam Failure
- Flooding
- Hurricane
- Tornado & Downburst
- Thunderstorm/Lightning/Hail
- Severe Winter Weather
- Earthquake
- Drought
- Extreme Heat
- Erosion
- Wildfire
- Natural Contaminants
- Hazardous Materials Spill
- Terrorism

Dam Failure

Dam failure results in rapid loss of water that is normally held by the dam. These kinds of floods pose a significant threat to both life and property. The map in Appendix D shows the location of active dams in Claremont.

NH DES assigns a hazard designation to each dam in the state depending upon the potential damage it would cause if the dam failed:

- A "high hazard potential" is indicated if the dam is in a location and of a size that failure or mis-operation of the dam would result in the following: major economic loss to structures or property; structural damage to roads; major environmental; or public health losses; and probable loss of human life.

- A "significant hazard potential" would mean the dam is in a location and of a size that failure or mis-operation of the dam would result in any of the following: major economic loss to structures or property; structural damage to roads; major environmental or public health losses.

- A "low" hazard dam failure could cause some structural damage to buildings and roads.

- A "non-menace" dam failure would not cause any significant damage.

"High" and Significant" hazard potential dam owners must provide NH DES with maps of the potential inundation area if the dam were to fail. It should be noted that there are some exemptions from this requirement such as lagoons.

Past Dam Failure Events

There have been no dam failures within the City of Claremont or outside the City that would have affected the City.

Table III-1 - DAMS

Dam #	Class	Dam Name	Water Body	Owner (Now or Formerly)	Status	Type	Impound-ment Area in Acres	Height of Dam (Ft)	Drainage Area in Acres
047.30	H	Whitewater Brook Dam	Whitewater Brook	City of Claremont	active	C	20.000	95.00	4.20
047.11	-	Whitewater Brook Dam	Whitewater Brook	City of Claremont	removed	C	0.000	13.00	4.00
047.12	-	Red Water Brook Dam	Red Water Brook	George Hubbard	breached	C/S	0.250	14.00	7.70
047.50	NM	West Dam	Unnamed stream	John West	active	E	0.480	6.00	0.00
047.18	-	Red Water Upper Dam	Red Water Brook	Gaffney Lumber Co.	ruins	T/S	0.000	15.00	0.00
047.38	NM	Farm Pond	Stevens Brook	Jack McKenzie	active	E	0.900	11.00	0.00
047.31	NM	Water Supply	Natural swale	Leonard Aiken	active	E	0.140	8.00	0.00
047.16	-	Fitch Reservoir Dam	Grandy Brook	City of Claremont	removed	E	3.000	40.00	0.80
047.15	-	McQuade Reservoir Dam	Grandy Brook	City of Claremont	removed	E	1.000	17.00	0.98
047.36	NM	Wildlife pond	Natural swale	M&M Sclafani	active	E	0.130	8.00	0.00
047.46	NM	Recreation pond	Natural swale	Robert Sicard	active	E	0.250	7.00	0.03
047.10	S	Sweetwater Hydro Dam	Sugar River	ENEL North America, Inc.	active	C	46.000	44.00	270.00
047.56	NM	Dole Reservoir Dike	Dole Reservoir	City of Claremont	active	C	9.000	8.00	0.01
047.28	L	Claremont Treatment Road Dam	Jarvis Hill Brook	City of Claremont	active	E	0.900	20.00	0.50
047.17	H	Dole Reservoir Dam	Trib. Stevens Brook	City of Claremont	active	E	9.200	43.00	0.05
047.20	NM	Stevens Brook	Stevens Brook	Edward Wagner	removed	C	0.500	8.00	0.00
047.13	-	Straw Reservoir	Trib. Grandy Brook	City of Claremont	removed	C	1.500	25.00	0.20
047.21	-	Grandy Brook Ice Pond Dam	Grandy Brook	Jack McKenzie	ruins	E	0.000	12.00	2.20
047.22	L	Grandy Pond Recreation Pond Dam	Grandy Brook	Roger Chicoine	active	E	1.500	12.00	2.40
047.39	NM	Wildlife pond	Natural swale	Cindy Coupal	active	E	0.400	10.00	0.04
047.45	NM	Wildlife pond	Natural swale	Elsie Schneider	active	E	0.200	18.00	0.02
047.41	NM	Farm pond	Natural swale	Doris Pederson	active	E	0.420	8.00	0.00
047.43	-	Recreation pond dam	Natural swale	August Allhen	not built	E	0.200	18.00	0.00
047.24	-	Grandy Brook Lumber Co. Dam	Grandy Brook	Elliott Rose Co.	breached	C	0.250	16.00	2.80
047.04	-	Sullivan Machinery Co. Dam	Sugar River	John Bourdon	ruins	-	0.000	1.20	250.00
047.05	-	Claremont Flock Corp. Dam	Sugar River	Claremont Flock Corp.	removed	T/S	0.000	15.00	250.00
047.08	-	Lower Village Dam	Sugar River	Family Homestead Ind.	ruins	T/S	1.000	15.00	251.00
047.03	NM	Sugar River Foundry Dam	Sugar River	City of Claremont	active	C	1.500	15.00	250.00
047.07	L	Lower Village Dam	Sugar River	Lower Village Dam	active	-	1.100	14.00	252.00
047.06	S	Lower Valley Hydro	Sugar River	ENEL North America Inc.	active	C	8.000	34.00	252.00
047.02	-	Monadnock Mills Hydro Dam	Sugar River	Monadnock Mills Co.	ruins	T/S	0.000	16.50	250.00
047.01	NM	Sugar River	Sugar River	City of Claremont	active	C	2.000	8.00	250.00

Dam #	Class	Dam Name	Water Body	Owner (Now or Formerly)	Status	Type	Impound-ment Area in Acres	Height of Dam (Ft)	Drainage Area in Acres
047.09	-	Dartmouth Woolen Mills Dam	Sugar River	Dartmouth Woolen Mills	breached	T	0.000	13.00	251.00
047.47	NM	Roy Recreation Pond	Natural swale	Leo Roy	active	E	0.150	18.00	0.01
047.26	NM	Farm pond	Natural swale	Doris Pederson	active	E	0.660	5.00	0.00
047.40	L	Hood Trout Pond Dam	Trib. to Sugar River	David & Kathleen Hood	active	E	0.400	10.00	0.05
047.51	-	Fletcher Recreation Pond	NA	Winterhawk Land Development	not built	E	0.670	6.20	0.16
047.37	NM	Wildlife pond	Gully Brook	Brian Dutile	active	E	0.100	10.00	0.00
047.29	NM	Recreation pond	Natural swale	Claremont Country Club	active	E	0.500	9.00	0.00
047.49	NM	Fleury Dam	Natural swale	Dennis Fleury	active	E	0.500	13.00	0.00
047.33	NM	Water supply	Trib. Sugar River	Shugah Vale, Inc.	active	E	0.330	16.00	0.00
047.54	NM	Fleury Stock Pond	NA	Dennis Fleury	active	E	1.100	5.60	0.11
047.23	NM	Lane Farm Pond Dam	Natural swale	M&M Gader	active	E	0.700	4.00	0.00
047.19	-	Tyler Pond Dam	Bible Hill Brook	Dr. Rowland Freeland	ruins	T/S	0.000	20.00	1.50
047.27	NM	Farm pond	Natural swale	Rosinski Builders	active	E	0.100	9.00	0.00
047.25	NM	Farm pond	Natural swale	Freeport Development Inc.	active	E	0.440	13.00	0.00
047.42	NM	Recreation pond	Natural swale	Nathan Ainsworth	active	E	0.220	9.00	0.00
047.32	NM	Fire pond	Natural swale	Betty Rich	active	E	0.100	8.00	0.01
047.34	NM	Wildlife pond	Natural swale	Rober Easter	active	E	0.220	8.00	0.00
047.35	NM	Wildlife pond	Natural swale	Sydney Lorendeau	active	E	0.300	14.00	0.00
047.58	NM	Messina Pond	Sugar River trib.	Richard Messina	active	C	1.300	10.00	0.61
047.52	-	Ascutney View Manure Dam	runoff	Norman & Mary Jane Van Ord	exempt	C	0.900	8.00	0.00
047.53	L	Leskiewicz Recreation Pond	Unnamed stream	Ed Leskiewicz, Jr.	active	E	1.300	10.00	0.03
047.44	S	McGary Fletcher Dam	Trib. to Sugar River	Winterhawk Land Development	active	E	2.100	18.00	0.15
047.14	H	Rice Reservoir Dam	Stevens Brook	City of Claremont	active	E	11.000	48.00	0.15
047.48	NM	Bellevance Recreation Pond	Natural swale	Lillian M. Corp	active	E	0.150	18.00	0.00
047.55	NM	Sugar River	Sugar River	George Lagassa	active	C	0.250	5.00	0.00
047.57	NM	Claremont County Club Pond	Unnamed stream	Claremont Country Club	active	E	0.270	13.00	0.04
047.59	NM	Claremont Landfill Sediment Pond	runoff	City of Claremont	active	E	0.250	18.00	0.04

Class of potential hazard: NM – non-menace; L-low; S-significant; H-high
Material: T-timber; S-stone; E-earth; C-concrete

Source: NH DES
**The Committee believed the status to be incorrect and has changed them.*

Potential Future Dam Failure Damage

Although there are 59 dams in Claremont (14 are ruins, removed, or breached), there are only three "high" hazard dams: Whitewater Brook Dam, Dole Reservoir Dam, and Rice Reservoir Dam; three "significant" hazard dams: Sweetwater Hydro Dam, Lower Valley Hydro Dam, and McGary Fletcher Dam; and five "low" hazard dams: Claremont Treatment Road Dam, Grandy Pond Recreation Pond Dam, Lower Village Dam, Hood Trout Pond Dam, and Leskiewicz Recreation Pond Dam. Emergency action plans are required for dams of high or significant hazard to delineate inundation areas—with the exception of lagoons.

There are three other "high" hazard dams which could impact the City of Claremont which are located outside the city: the Gunnison Lake Site D2 Dam located in Goshen (Dam ID Number 95.25), the Wilder Dam in Lebanon on the Connecticut River (Dam ID Number 134.15), and the North Hartland Dam at the Connecticut River.

The Gunnison Lake Site D2 Dam could impact a substantial portion of Claremont along the Sugar River South Branch to the Sugar River flowing toward Vermont. The other two "out-of-city" dams are on the Connecticut River and could cause substantial damage.

The map of critical facilities and hazard areas (Appendix D) includes the dam inundation areas for the high and significant dams. The following table provides the number and value of structures within each of the dam inundation area. This provides the City with information about vulnerability in case of a particular dam failure. It should be noted that some dam inundation areas overlap each other. This is shown on the map in appendix D. The Committee determined that dam failure is a medium/high risk in Claremont.

Table III-2: STRUCTURE ASSESSED VALUES IN DAM INUNDATION AREAS BY PROPERTY TYPE – 2016 (average values)

Dam Inundation Area	Houses		Mobile Homes		Non-Residential & Apartment Buildings		Total	
	#	Value	#	Value	#	Value	#	Value
Dole Reservoir Dam	28	$3,247,188	1	$13,027	9	$1,390,329	38	$4,650,544
Gunnison Lake Dam	111	12,872,781	4	52,108	57	10,589,336	171	23,514,225
Lower Valley Hydro Dam	10	1,159,710	5	65,135	12	1,853,772	27	3,078,617
McGary Fletcher Dam	2	231,942	0	0	0	0	2	231,942
Rice Reservoir Dam	15	1,739,565	3	39,081	5	772,405	23	2,551,051
Sweetwater Dam	1	115,971	2	26,054	0	0	3	142,025
Whitewater Brook Dam	61	6,030,492	4	52,108	7	1,081,367	72	7,163,967
CT River Dams (2)	26	3,015,246	0	0	12	1,853,772	38	4,869,018
TOTALS	254	$23,010,510	19	$1,251,835	101	$16,185,372	374	$52,022,145

Source: Claremont Aerial Imagery, 2014 and Tax Assessment Information, 2016

Flooding

Flooding is the temporary overflow of water onto lands that are not normally covered by water. Flooding results from the overflow of major rivers and tributaries, storm surges, and inadequate local drainage. Floods can cause loss of life, property damage, crop/livestock damage, and water supply contamination, and can disrupt travel routes on roads and bridges.

Floods in the Claremont area are most likely to occur in the spring due to the increase in rainfall, snowmelt and ice flow; however, floods can occur at any time of the year. A sudden winter thaw or a major summer downpour can cause flooding. Floodplains indicate areas potentially affected by flooding. There are several types of flooding.

Special Flood Hazard Areas Formerly called "100-year flood" zones, these areas have a one percent chance of a flood in any given year. These areas were mapped for all towns in New Hampshire by FEMA. Appendix D displays the "Special Flood Hazards Areas."
River Ice Jams Ice forming in riverbeds and against structures presents significant hazardous conditions storm waters encounter these ice formations which may create temporary dams. These dams may create flooding conditions where none previously existed (i.e., as a consequence of elevation in relation to normal floodplains). Additionally, there is the impact of the ice itself on structures such as highway and railroad bridges. Large masses of ice may push on structures laterally and/or may lift structures not designed for such impacts.

Rapid Snow Pack Melt Warm temperatures and heavy rains cause rapid snowmelt. Quickly melting snow coupled with moderate to heavy rains are prime conditions for flooding.

Severe Storms Flooding associated with severe storms can inflict heavy damage to property. Heavy rains during severe storms are a common cause of inland flooding.

Beaver Dams and Lodging Flooding associated with beaver dams and lodging can cause road flooding or damage to property.

Bank Erosion and Failure As development increases, changes occur that increase the rate and volume of runoff, and accelerate the natural geologic erosion process. Erosion typically occurs at the outside of river bends and sediment deposits in low velocity areas at the insides of bends. Resistance to erosion is dependent on the riverbank's protective cover, such as vegetation or rock riprap, or its soils and stability. Roads and bridges are also susceptible to erosion.

Past Flooding Events

The Committee determined there are no other flood areas in the city other than the FEMA designated flood zones. Appendix D shows the Flood Insurance Rate Map of Special Flood Hazard Areas. The following tables provide a list of floods in the State, County, and Claremont. Other flooding issues are listed in the Erosion section—primarily for roads.

Table III-3: FLOODING

FLOODING				
Hazard	**Date**	**Location**	**Description of Areas Impacted**	**Damages**
Flood	1927, 34, 36, 38, 50, 53, 73, 76	Claremont	Per Claremont Flood Insurance Study, FEMA, February 15, 1984	Unknown
Flood (Ice Jam in Claremont)	March 11-21, 1936	NH State including Sugar River, W. Claremont	Damage to Road Network. Flooding caused by simultaneous heavy snowfall totals, heavy rains and warm weather. Run-off from melting snow with rain overflowed the rivers; ice jam on Sugar River below Red Water Brook (CRREL)	Unknown
Flood (Ice Jam)	January 22, 1959	Sugar River, West Claremont	Backwater from ice (CRREL)	Unknown
Flood (Ice Jam)	March 19, 1968	Sugar River, West Claremont	Ice jam. (CRREL)	Unknown
Flood (Ice Jam)	February 11, 1970	Sugar River, West Claremont	Ice jam. (CRREL)	Unknown
Flood (Ice Jam)	January 8, 1976	Sugar River, West Claremont	Ice jam. (CRREL)	Unknown
Flood (Ice Jam)	January 1, 1978	Sugar River, Claremont	Highest stage from ice in 1978; 3' lower than in 1936 (CRREL)	Unknown
Flood (Ice Jam)	January 26, 1978	Sugar River, West Claremont	Ice jam. (CRREL)	Unknown
Flood (Ice Jam)	March 7, 1979	Sugar River, West Claremont	Ice jam. (CRREL)	Unknown
Flood (Ice Jam)	January 1, 1981	Sugar River, Claremont	From Valley News: heavy flood damage in Beauregard Village; one woman died in the flood; the city received a federal grant to relocate residents of the trailer park. (CRREL)	Woman killed
Flood (Ice Jam)	February 12, 1981	Sugar River, West Claremont	Ice jam. (CRREL)	Unknown
Flood (Ice	February 4, 1983	Sugar River, West	Ice jam. (CRREL)	Unknown

FLOODING				
Hazard	**Date**	**Location**	**Description of Areas Impacted**	**Damages**
Jam)		Claremont		
Flood (Ice Jam)	February 1, 1984	Sugar River, Claremont	River flooded Route 12A in front of D'Amane's store. A wall of ice came over the Dartmouth Woolen Mill Dam plunging a dozen cars into the river. The cars had been in the mill parking lot; eight other cars were damaged. Water seeped into boiler room, causing plant to be evacuated. Evacuated several mobile homes in Beauregard Village, Cote's Motel, and homes along river. Police closed several roads and monitored river levels. (CRREL)	Estimated $1 million in Claremont
Flood (Ice Jam)	February 16, 1984	Sugar River, West Claremont	Ice jam (CRREL)	Unknown
Flood (Ice Jam)	January 26, 1986	Claremont, Sugar River	Jam formed on Coy Paper Company Mill pool finally breaking loose; 14 homes evacuated (CRREL)	Unknown
Flood / Severe Storm	April 16, 1987	Cheshire, Carroll, Grafton, Hillsborough, Merrimack, Rockingham, & Sullivan Counties	FEMA Disaster Declaration # 789- DR (Presidentially Declared Disaster). Flooding of low-lying areas along river caused by snowmelt and intense rain.	$4,888,889 in damage in State.
Flood (Ice Jam)	January 26, 1990	Sugar River, Claremont	Ice jam (CRREL)	Unknown
Flood	August 7-11, 1990	Belknap, Carroll, Cheshire, Coos, Grafton, Hillsborough, Merrimack & Sullivan Counties, NH	FEMA Disaster Declaration # 876. Flooding caused by a series of storm events with moderate to heavy rains.	$2,297,777 in damage in State.
Flood (Ice Jam)	March 11, 1992	Sugar River, Claremont	Ice jam at bend near Main Street Bridge caused residential and road flooding, and disruption to electrical and gas utilities. A crane was used to break up the jam. The first jam was at a dam at Coy Paper in W. Claremont. Later, another jam formed upstream at a sharp bend in the river causing water to spill over the south bank and head for a group of homes near Cote's Motel. Several residents were evacuated. (CRREL)	Home and road flooding; Unknown cost
Flood (Ice Jam)	March 27, 1992	Sugar River, West Claremont	Ice jam (CRREL)	No damage recorded

FLOODING				
Hazard	**Date**	**Location**	**Description of Areas Impacted**	**Damages**
Flood (Ice Jam)	March 9, 1995	Sugar River, West Claremont	Ice jam downstream from Red Water Brook (CRREL)	No damage recorded
Flood (Ice Jam)	January 19, 1996	Sugar River, Claremont	Ice jam reported on right bank below Red Water Brook (CRREL)	No damage recorded
Flood	October 29, 1996	Grafton, Hillsborough, Merrimack, Rockingham, Strafford & Sullivan Counties, NH	FEMA Disaster Declaration # 1144- DR. Flooding caused by heavy rains.	$2,341,273 in damage in State.
Flooding	1998	Half Mile Road	Drainage into undersized culvert under railroad trestle of very active railroad line; if this trestle is damaged, a 90-mile detour will be required	No damage recorded
Flood (Ice Jam)	January 25, 1999	Sugar River, West Claremont	Ice jam; water discharge estimated at 3700 cubic feet per second (CRREL)	No damage recorded
Flood (Ice Jam)	December 28, 2000	Sugar River, West Claremont	Peak annual stage at 8.31' due to ice jam (CRREL)	No damage recorded
Flood	October 7-18, 2005	Cheshire, Grafton, Merrimack, Sullivan, and Hillsborough Counties, NH	FEMA Disaster Declaration # 1610. Severe storms and flooding.	$3,000,000 in damages in NH.
Flood	October-November 2005	Grafton, Hillsborough, Merrimack, Rockingham, Strafford & Sullivan counties	FEMA Disaster Declaration # DR-1144- NH	No damage recorded in Claremont
Flood	April 16, 2007	All counties, NH	FEMA Disaster Declaration # 1695. Severe storms and flooding; 2,005 home owners and renters applied for assistance in NH.	$27,000,000 in damages in NH
Storms, Tornado, and Flooding	July 24, 2008	Central and Southern NH; Counties Declared: Belknap, Carroll, Merrimack, Rockingham, and Strafford	FEMA DR 1782	No damage in Claremont
Flood	August 14, 2008	Central Northern NH; Counties Declared: Belknap, Carroll, Coos, and Grafton	FEMA Disaster Declaration #1787	$3 million in public assistance; primary damage to roads; no damage in Claremont
Flood (Ice Jam)	December 12, 2008	Sugar River, Claremont	Possible ice jam in W. Claremont likely cause for river levels to be fluctuating (CRREL)	No damage recorded

FLOODING				
Hazard	**Date**	**Location**	**Description of Areas Impacted**	**Damages**
Flood (Ice Jam)	December 18, 2008	Sugar River, West Claremont	Ice jams apparent causing river to go above flood stage (CRREL)	No damage recorded
Flood (Ice Jam)	December 19, 2008	Sugar River, West Claremont	Maximum peak state due to ice jam. (CRREL)	No damage recorded
Flood (Ice Jam)	January 26, 2010	Sugar River, West Claremont	Preliminary information on 2/3/2010; can't access database 6/1/10	No damage recorded
Flood	March 14-31, 2010	Statewide	FEMA DR-1913; severe storms & flooding; Declared Counties: Hillsborough and Rockingham	No damage in Claremont
Flood/ Tropical Storm	August 28 – September 2, 2011	Coos, Grafton, Carroll, Sullivan, Merrimack, Belknap, and Strafford Counties	FEMA DR-4026; Tropical Storm Irene; localized flooding including Cat Hole Road and Roberts Hill; Sugar River Drive in Claremont and Chandlers Mill Road in Newport	Received $95,500 from FEMA for flood damages; received $48,788 for damage to Sugar River Cone Valve during event; received $81,660 in 2014 for Sugar River Bank Stabilization
Flood	June 26-July 3, 2013	Grafton, Sullivan and Cheshire Counties	FEMA DR-4139; severe storms, flash flooding, and landslides; lightning strike at City Hall; Cat Hole Road, Foisey Hill Road and Washington Street	Received $308,000 from FEMA for damages
Flood (within 100 yr zone)/ Ice Jams	Almost every year	Sugar River	In Beauregard Village area; Claremont Center parking area on Washington Street; HUD grant purchased properties in Beauregard Village	Cost varies each year and some would be encumbered by local businesses
Local Flooding Outside the FEMA determined A & AE Flood Zones:				
Flooding & Erosion	Once or twice a year	Sugar River Drive; Alden Road, and Case Hill Road	Logging and clear cut in southeast corner of city increased drainage to culvert on Sugar River Drive; must replace shoulder gravel each time	Standing water; low level flooding; high water table (Hitchcock Aquifer)
Flooding	Every 4-5 years	67 Tyler Street (Desilets)	Storm drainage pipes go under building-inaccessible for proper maintenance, angle in pipes causing choke point under building; cannot move the building	Water from Tyler Brook plugs up under building and backs up
Flooding	Every 4-5 years usually in spring/ summer	East Street (beginning of Tyler Brook corridor)	Undersized culvert plugs up and backs up water into nearby beaver bog which flood homes; road has been closed, backyards damaged, and people moved out to safety	Home damage and city sewer back up into street
Flooding	2-3 times a year	Beauregard Street	Floods over low point of Route 12/103 (Main Street); damaged motel	Motel damage; home basements flood; mobile homes at end of Beauregard Street become isolated by road flooding

Claremont became a participating member of the National Flood Insurance Program on April 17, 1978. Updated maps (DFIRMS) and flood insurance studies for all municipalities within Sullivan County were finalized May 23, 2006. In January 2016, there are currently 61 policies in the city with $18.2 million of insurance: 34 are single-family homes, one 2-4 family home, one "other residential," and 22 non-residential properties. However, flood insurance purchase is not a reflection of the number of structures within the flood plain. Six of the 61 policies are not in the designated flood plain. Seventeen loss claims have been paid. One single family home is not insured but has received flood loss funds in 1981, 1984, and 1986 totally over $17,000. This is the only repetitive loss property. All claims totaled $109,592. Claremont's 1% (formerly 100-Year) Special Flood Areas are located within the A Zone, with no base flood elevations determined and the AE Zone where base flood elevations have been determined. See Appendix D for a map showing all Special Flood Hazard Areas.

As an NFIP participant, the City of Claremont has a floodplain ordinance which restricts building within the special floodplains to protect the flow of flood waters and not increase the needed land area for those waters. The City adopted the model ordinance provided by the NH Floodplain Management Office. This ordinance is reflected in the zoning ordinance, subdivision regulations, and site plan review regulations.

Potential Future Flooding Events

Future flooding is likely as noted in the above table based upon local knowledge of past flood events. According to the State's Mitigation Plan, Sullivan County has a high hazard risk for flooding. The Committee determined flooding is a High risk in Claremont.

Table III-3: STRUCTURE VALUES IN FLOOD HAZARD AREAS BY TYPE – 2016 (average values)

Flood Zone	Houses		Mobile Homes		Nonresidential & Apt. Buildings		Total	
	#	Value	#	Value	#	Value	#	Value
FEMA flood plain	95	$11,017,245	5	$65,135	52	$8,033.012	152	$19,115,392
Locally determined flood	61	7,074,231	30	390,810	66	10,195,746	157	17,660,787
TOTALS	156	$18,091,476	35	$455,945	27	$18,228,758	309	$36,776,179

Sources: FEMA floodplain map, HazMit Committee, Claremont Aerial Imagery 2014, and 2016 Tax Assessment values

Hurricane

A hurricane is an intense tropical weather system with a well-defined circulation and maximum sustained winds of 74 mph (64 knots) or higher. Hurricane winds blow in a large spiral around a relative calm center known as the "eye." The "eye" is generally 20 to 30

miles wide, and the storm may extend outward 400 miles. As a hurricane nears land, it can bring torrential rains, high winds, and storm surges. A single hurricane can last for more than 2 weeks over open waters and can run a path across the entire length of the eastern seaboard. August and September are peak months during the hurricane season that lasts from June 1 through November 30. Damage resulting from winds of this force can be substantial, especially considering the duration of the event, which may last for many hours (*NH Hazard Mitigation Plan*; FEMA website).

The Saffir-Simpson Hurricane Wind Scale provides categories of sustained winds by miles per hour: 1 – 74-95 mph; 2 – 96-110 mph; 3 – 111-129 mph; 4 – 130 – 156 mph; and 5 – 157 mph or higher. Categories 3 -5 are considered to be major wind events that can cause devastating to catastrophic damage.

Past Hurricane Events

There have been several hurricanes over the years which have impacted New England and New Hampshire. These are listed below.

Table III-4: HURRICANES & TROPICAL STORMS

HURRICANES AND TROPICAL STORMS				
Hazard	**Date**	**Location**	**Description of Areas Impacted**	**Damages**
Hurricane	August, 1635	n/a	Unknown	None recorded in Claremont
Hurricane	October 18-19, 1778	n/a	Winds 40-75 mph	None recorded in Claremont
Hurricane	October 9, 1804	n/a	Unknown	None recorded in Claremont
Gale	September 23, 1815	n/a	Winds > 50mph	None recorded in Claremont
Hurricane	September 8, 1869	n/a	Unknown	None recorded in Claremont
Hurricane	September 21, 1938	Southern New England	Flooding caused damage to road network and structures. 13 deaths, 494 injured throughout NH. Disruption of electric and telephone services for weeks. 2 Billion feet of marketable lumber blown down. Total storm losses of $12,337,643 (1938 dollars). 186 mph maximum winds.	None recorded in Claremont
Hurricane (Carol)	August 31, 1954	Southern New England	Category 3, winds 111-130 mph. Extensive tree and crop damage in NH, localized flooding	None recorded in Claremont

HURRICANES AND TROPICAL STORMS				
Hazard	**Date**	**Location**	**Description of Areas Impacted**	**Damages**
Hurricane (Edna)	September 11, 1954	Southern New England	Category 3 in Massachusetts. This Hurricane moved off shore but still cost 21 lives and $40.5 million in damages throughout New England. Following so close to Carol it made recovery difficult for some areas. Heavy rain in NH	None recorded in Claremont
Hurricane (Donna)	September 12, 1960	Southern and Central NH	Category 3 (Category 1 in NH). Heavy flooding in some parts of the State.	No damage in Claremont
Tropical Storm (Daisy)	October 7, 1962	Coastal NH	Heavy swell and flooding along the coast	No damage in Claremont
Tropical Storm (Doria)	August 28, 1971	New Hampshire	Center passed over NH resulting in heavy rain and damaging winds	No damage in Claremont
Hurricane (Belle)	August 10, 1976	Southern New England	Primarily rain with resulting flooding in New Hampshire. Category 1	No damage in Claremont
Hurricane (Gloria)	September, 1985	Southern New England	Category 2, winds 96-110 mph. Electric structures damaged; tree damages. This Hurricane fell apart upon striking Long Island with heavy rains, localized flooding, and minor wind damage in NH	No damage in Claremont
Hurricane (Bob)	August 19, 1991	Southern New England	Structural and electrical damage in region from fallen trees. 3 persons were killed and $2.5 million in damages were suffered along coastal New Hampshire. Federal Disaster FEMA-917-DR	No damage in Claremont
Hurricane (Edouard)	September 1, 1996	Southern New England	Winds in NH up to 38 mph and 1 inch of rain along the coast. Roads and electrical lines damaged	No damage in Claremont
Tropical Storm (Floyd)	September 16-18, 1999	Southern New England	FEMA DR-1305-NH. Heavy Rains	No damage in Claremont
Hurricane (Katrina)	August 29, 2005	East Coast of US and more	FEMA-3258-EM. Heavy rains and flooding devastating SE US	No damage in Claremont
Tropical Storm (Tammy)	October 5-13, 2005	East Coast of US	Remnants of Tammy contributed to the October 2005 floods which dropped 20 inches of rain in some places in NH.	No damage in Claremont

HURRICANES AND TROPICAL STORMS				
Hazard	**Date**	**Location**	**Description of Areas Impacted**	**Damages**
Tropical Storm (Irene)	August 26 – September 6, 2011	East Coast of US	FEMA-4026-DR for Coos, Carroll, Grafton, Strafford, Belknap, Merrimack and Sullivan Counties; EM-3333 Hillsboro, Rockingham, and Cheshire Counties	Claremont received $226,000 from FEMA for flood damages in 2011 and 2014; see flooding table
Hurricane (Sandy)	October 26 – November 8, 2012	East Coast of US	FEMA-4095-DR-NH for Belknap, Carroll, Coos, Grafton and Sullivan Counties.	Claremont received $8,815 from FEMA for damages, debris cleanup and emergency response

Potential Future Hurricane Damage

Hurricane events will affect the entire city. It is impossible to predict into the future what damage will occur in the city. According to the State's mitigation plan, Sullivan County has a medium/high risk for hurricanes. The Committee determined the hurricane risk to be medium Claremont.

Tornado & Downburst

"A tornado is a violent windstorm characterized by a twisting, funnel shaped cloud. These events are spawned by thunderstorms and, occasionally by hurricanes, and may occur singularly or in multiples. They develop when cool air overrides a layer of warm air, causing the warm air to rise rapidly. Most vortices remain suspended in the atmosphere. Should they touch down, they become a force of destruction." (*NH Hazard Mitigation Plan*). The Enhanced Fujita Scale is the standard scale for rating the severity of a tornado as measured by the damage it causes. Most tornadoes are in the EF0 to EF2 Class. Building to modern wind standards provides significant property protection from these hazard events. New Hampshire is located within Zone 2 for Design Wind Speed for Community Shelters, which suggests that buildings should be built to withstand 160 mph winds.

Significantly high winds occur especially during tornadoes, hurricanes, winter storms, and thunderstorms. Falling objects and downed power lines are dangerous risks associated with high winds. In addition, property damage and downed trees are common during severe wind occurrences. A downburst is a severe, localized wind blasting down from a thunderstorm. These "straight line" winds are distinguishable from tornadic activity by the pattern of destruction and debris. Downbursts fall into two categories: 1. Microburst, which covers an area less than 2.5 miles in diameter, and 2. Macroburst, which covers an area at least 2.5 miles in diameter. Most downbursts occur with thunderstorms, but they can be associated with showers too weak to produce thunder.

Past Tornado & Downburst Events

The following table displays tornadoes occurring in Sullivan County between 1950 and 1995. The committee did not recall any tornadoes or downburst in which the city was impacted. The Committee recalled that around 2006, a severe microburst knocked down stands of trees in neighboring municipalities, but it missed Claremont. In 2015, there was a severe straight-line wind event (downburst) which greatly impacted Claremont.

Table III-5: TORNADOES IN OR NEAR SULLIVAN COUNTY

TORNADOES & DOWNBURSTS – MEDIUM RISK			
	Date	**Scale**	**Damages**
Tornado	September 9, 1821	Most intense in NH	Killed 6 people; crossed Lake Sunapee
Tornado	July 14, 1963	F1	No deaths or injuries; costs unknown; no damage in Claremont
Tornado	June 27, 1964	F0	No deaths or injuries; costs unknown; no damage in Claremont
Tornado	August 11, 1966	F2	No deaths or injuries; costs unknown; no damage in Claremont
Tornado	August 25, 1969	F1	No deaths or injuries; costs unknown; no damage in Claremont
Tornado	May 31, 1972	F1	No deaths or injuries; costs unknown (Merrimack County); no damage in Claremont
Tornado	July 21, 1972	F1	No deaths or injuries; costs unknown; no damage in Claremont
Tornado	May 11, 1973	F2	No deaths or injuries; costs unknown; no damage in Claremont
Tornado	June 11, 1973	F0	No deaths or injuries; costs unknown; no damage in Claremont
Tornado	August 15, 1976	F1	No deaths; 5 injuries; costs unknown (Merrimack County); no damage in Claremont
Tornado	August 13, 1999	F1	No deaths or injuries; costs unknown; no damage in Claremont
Tornado	July 6, 1999	F2	No deaths or injuries; costs unknown (Merrimack County); in New London two roofs blown off structures; power outages,; downed trees, utility pole, and wires; no damage in Claremont
Tornado	Summer 2006	NA	Began in Barnet, VT and moved to Monroe, NH; trees knocked down in Claremont
Tornado	April 15, 2007	NA	Numerous trees were knocked down in Enfield, NH; no damage in Claremont
Tornado	July 24, 2008	(EF 2)	DR 1799: Numerous trees and utility poles down; damage to many houses; 1 fatality; $2.5 million from FEMA; no damage in Claremont
Downburst	July 19, 2015	NA	Heavy rains and powerful winds knocked down trees and power lines in Claremont; electricity out for several days in places; damaged cars and houses; took over 3 weeks of cleanup; one person killed by tree falling on his car in Claremont; damage also in nearby towns

Source: www.tornadoproject.com; NH Natural Hazard Mitigation Plan; Committee

Table III-6 ENHANCED FUJITA SCALE

FUJITA SCALE (old model)			OPERATIONAL EF SCALE	
F Number	**Fastest ¼-mile (mph)**	**3 second gust (mph)**	**EF Number**	**3 second gust (mph)**
F0	40-72	45-78	EF0	65-85
F1	73-112	79-117	EF1	86-110
F2	113-157	118-161	EF2	111-135
F3	158-207	162-209	EF3	136-165
F4	208-260	210-261	EF4	166-200
F5	261-318	262-317	EF5	Over 200

Source: http://www.spc.noaa.gov/faq/tornado/ef-scale.html

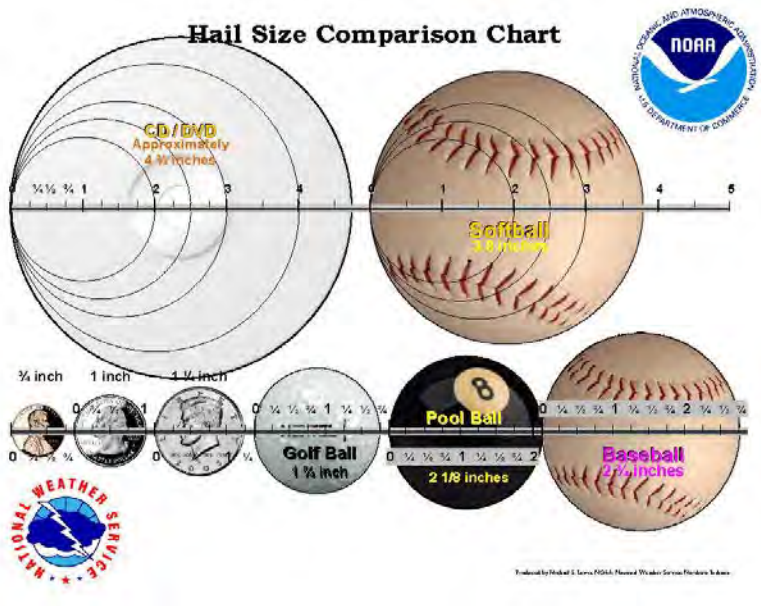
Potential Future Tornado and Downburst Damage

It is impossible to predict where a tornado or downburst will occur or what damage it will inflict. A tornado or downburst could happen anywhere in the city. The Claremont Committee does not recall tornadoes or downburst Claremont, but a severe straight winds event occurred in 2015 as noted in the above table. The FEMA website places the State of NH in the Zone II Wind Zone which provides that a community shelter should be built to a 160 mph "design wind speed." According to the State's mitigation plan, Sullivan County has a medium risk for tornadoes. The Committee determined there is a medium risk for tornadoes and downbursts in Claremont.

Thunderstorms/Lightning/Hail

A thunderstorm is a rain shower during which you hear thunder. Since thunder comes from lightning, all thunderstorms have lightning. A thunderstorm is classified as "severe" when it contains one or more of the following: hail three-quarter inch or greater, winds gusting in excess of 50 knots (57.5 mph), tornado. Hail is a form of precipitation that occurs when updrafts in thunderstorms carry raindrops upward into extremely cold areas of the atmosphere where they freeze into ice. When the hail particle becomes heavy enough to resist the updraft, it falls to the ground. The resulting wind and hail can cause death, injury, and property damage. Below is a comparison chart for the various sizes of hail.

Figure III-1: HAIL SIZE COMPARISON CHART



An average thunderstorm is 15 miles in diameter and lasts an average of 30 minutes. Winter thunderstorms are rare because the air is more stable, strong updrafts cannot form because the surface temperatures during the winter are colder.

Lightning is a giant spark of electricity that occurs within the atmosphere or between the atmosphere and the ground. As lightning passes through the air, it heats the air to a temperature of about 50,000 degrees Fahrenheit, considerably hotter than the surface of the sun. Fires are a likely result of lightning strikes, and lightning strikes can cause death, injury, and property damage. It is impossible to predict where lightning will strike.

A lightning activity level has been developed by the National Weather Service and is shown below:

Table III-7: LIGHTNING ACTIVITY LEVEL

Lightning Activity Level	Description
1	No thunderstorms
2	Isolated thunderstorms: Light rain will occasionally reach the ground. Lightning is very infrequent, 1 to 5 cloud to ground strikes in a five minute period.
3	Widely scattered thunderstorms. Light to moderate rain will reach the ground. Lightning is infrequent, 6 to 10 cloud to ground strikes in a 5 minute period.
4	Scattered thunderstorms. Moderate rain is commonly produced. Lightning is frequent, 11 to 15 cloud to ground strikes in a 5 minute period.
5	Numerous thunderstorms. Rainfall is moderate to heavy. Lightning is frequent and intense, greater than 15 cloud to ground strikes in a 5 minute period.
6	Dry lightning (same as LAL3, but without rain). This type of lightning has the potential for extreme fire activity and is normally highlighted in fire weather forecasts with a Red Flag Warning.

Source: http://graphical.weather.gov/definitions/defineLAL.html

Past Thunderstorm Events

There have been lightning strikes in Claremont including strikes to the communication towers on Green Mountain and to some municipal facilities damaging equipment: traffic lights, airport lights and beacons, municipal alarm systems, phone systems, and computers. Mitigation efforts have been made to reduce damage there. Some vulnerable equipment surfaces have been double and triple wrapped to prevent further damage.

Other occasional strikes have caused minor damage to businesses in the downtown. A thunderstorm with lightning or hail could impact the entire city, although lightning is more likely in isolated areas.

Potential Future Thunderstorm Damage

It is inevitable that thunderstorms will occur in Claremont's future. Lightning, hail, or wind from a thunderstorm could impact anywhere in the city. It is not possible to estimate potential damage. According to the State's mitigation plan, Sullivan County has a medium risk of a lightning hazard. The risk for future thunderstorm damage was determined by the Committee to be medium risk in Claremont

Table III-8: THUNDERSTORMS/LIGHTNING, HAIL

Thunderstorms/Lightning/Hail				
Hazard	**Date**	**Location**	**Description of Areas Impacted**	**Damages**
Hail	June 16, 2007	SW NH	A severe thunderstorm produced large hail (.75 in) in southwestern New Hampshire.	No damage in Claremont
Hail	August 3, 2007	Sullivan County	An isolated thunderstorm produced large hail in Sullivan County.	No damage in Claremont
Lightning	July 2, 2013	Claremont	At end of flooding period, severe thunderstorm	Hit transformer on Mulberry Street and hit City Hall blowing out emergency services communications; shut down City Hall; other City facilities also impacted; started a house fire on Mulberry Street

Severe Winter Weather

Ice and snow events typically occur during the winter months and can cause loss of life, property damage, and tree damage.

Heavy Snow Storms A heavy snowstorm is generally considered to be one which deposits four or more inches of snow in a twelve-hour period. A blizzard is a sustained wind or frequent gusts greater than or equal to 35 miles per hour accompanied by falling and/or blowing snow, frequently reducing visibility to less than ¼ mile for three hours or more (NOAA National Weather Service). Therefore, intense Nor'easters, which occur in the winter months, are often referred to as blizzards. The definition includes the conditions under which dry snow, which has previously fallen, is whipped into the air and diminishes visual range. Such conditions, when extreme enough, are called "white outs."

Ice Storms Freezing rain occurs when snowflakes descend into a warmer layer of air and melt completely. When these liquid water drops fall through another thin layer of freezing air just above the surface, they don't have enough time to refreeze before reaching the ground. Because they are "supercooled," they instantly refreeze upon contact with anything that is at or below O degrees C, creating a glaze of ice on the ground, trees, power lines, or other objects. A significant accumulation of freezing rain lasting several hours or more is called an ice storm. This condition may strain branches of trees, power lines and even transmission towers to the breaking point and often creates treacherous conditions for highway travel and aviation. Debris impacted roads make emergency access, repair and cleanup extremely difficult.

The National Weather Service has developed a Scaled Predictive Ice Storm Aftermath (SPIA) Index. The potential impacts are scaled from 0 to 5 and suggest potential electrical outage coverage and duration. Current ice storm warnings are based on forecast of ice accumulation only. SPIA reports on the combined effects of the predicted ice and wind. Below is a chart of the SPIA index levels.

Table III-9: SCALED PREDICTIVE ICE STORM AFTERMATH INDEX

Ice & Wind: Average Ice in Inches and Wind in Miles per hour	**<15 mph**	**15-25 mph**	**25-35 mph**	**≥35 mph**
0.10 – 0.25 inches	0	1	2	3
0.25 – 0.50 inches	1	2	3	4
0.50 – 0.75 inches	2	3	4	5
0.75 – 1.00 inches	3	4	5	5
1.00 – 1.50 inches	4	5	5	5
>1.50 inches	5	5	5	5

"Nor'easters" Nor'easters can occur in the eastern United States any time between October and April, when moisture and cold air are plentiful. They are known for dumping heavy amounts of rain and snow, producing hurricane-force winds, and creating high surfs that cause severe beach erosion and coastal flooding. A Nor'easter is named for the winds that blow in from the northeast and drive the storm up the east coast along the Gulf Stream, a band of warm water that lies off the Atlantic coast.

There are two main components to a Nor'easter: Gulf Stream low-pressure system (counter-clockwise winds) generate off the coast of Florida. The air above the Gulf Stream warms and spawns a low-pressure system. This low circulates off the southeastern U.S. coast, gathering warm air and moisture from the Atlantic. Strong northeasterly winds at the leading edge of the storm pull it up the east coast. As the strong northeasterly winds pull the storm up the east coast, it meets with cold Arctic high-pressure system (clockwise winds) blowing down from Canada. When the two systems collide, the moisture and cold air produce a mix of precipitation.

Winter conditions make Nor'easters a normal occurrence, but only a handful actually gather the force and power to cause problems inland. The resulting precipitation depends on how close you are to the converging point of the two storms. Nor'easter events which occur toward the end of a winter season may exacerbate the spring flooding conditions by depositing significant snow pack at a time of the season when spring rains are poised to initiate rapid snow pack melting.

Past Extreme Winter Weather Events

The following table provides a list of past extreme winter weather events in New Hampshire and Claremont.

Table III-10: SEVERE WINTER WEATHER

SEVERE WINTER WEATHER/ICE STORMS				
Hazard	**Date**	**Location**	**Description of Areas Impacted**	**Damages**
Ice Storm	December 17-20, 1929	New Hampshire	Unprecedented disruption and damage to telephone, telegraph and power system. Comparable to 1998 Ice Storm (see below)	No damage in Claremont recorded
Blizzard	February 14-17, 1958	New Hampshire	20-30 inches of snow in parts of New Hampshire	No damage in Claremont recorded
Snow Storm	March 18-21, 1958	New Hampshire	Up to 22 inches of snow in south central NH	No damage in Claremont recorded
Snow Storm	December 10-13, 1960	New Hampshire	Up to 17 inches of snow in southern NH	No damage in Claremont
Snow Storm	January 18-20, 1961	New Hampshire	Up to 25 inches of snow in southern NH	No damage in Claremont
Snow Storm	February 2-5, 1961	New Hampshire	Up to 18 inches of snow in southern NH	No damage in Claremont
Snow Storm	January 11-16, 1964	New Hampshire	Up to 12 inches of snow in southern NH	No damage in Claremont
Blizzard	January 29-31, 1966	New Hampshire	Third and most severe storm of 3 that occurred over a 10-day period. Up to 10 inches of snow across central NH	No damage in Claremont
Snow Storm	December 26-28, 1969	New Hampshire	Up to 41 inches of snow in west central NH	No damage in Claremont
Snow Storm	February 18-20, 1972	New Hampshire	Up to 19 inches of snow in southern NH	No damage in Claremont
Snow Storm	January 19-21, 1978	New Hampshire	Up to 16 inches of snow in southern NH	No damage in Claremont
Blizzard	February 5-7, 1978	New Hampshire	New England-wide. Up to 25 inches of snow in central NH	No damage in Claremont
Snow Storm	February, 1979	New Hampshire	President's Day storm	No damage in Claremont
Ice Storm	January 8-25, 1979	New Hampshire	Major disruptions to power and transportation	No damage in Claremont

SEVERE WINTER WEATHER/ICE STORMS				
Hazard	**Date**	**Location**	**Description of Areas Impacted**	**Damages**
Snow Storm	April 5-7, 1982	New Hampshire	Up to 18 inches of snow in southern NH	No damage in Claremont
Ice Storm	February 14, 1986	New Hampshire	Fiercest ice storm in 30 yrs. in the higher elevations in the Monadnock region. It covered a swath about 10 miles wide from the MA border to New London NH	No damage in Claremont
Extreme Cold	November-December, 1988	New Hampshire	Temperature was below 0 degrees F for a month	No damage in Claremont
Ice Storm	March 3-6, 1991	New Hampshire	Numerous outages from ice-laden power lines in southern NH	No damage in Claremont
Snow Storm	1996	Regional	Two major storms with five feet of snow in a week	No damage in Claremont
Snow Storm	1997	New Hampshire	Power outages throughout region due to heavy snowfall	No damage in Claremont
Ice Storm	January 15, 1998	New Hampshire; Substantial power in NH	Federal disaster declaration DR-1199-NH, 20 major road closures, 67,586 without electricity, 2,310 without phone service, $17+ million in damages to Public Service of NH alone	No damage in Claremont
Snow Storm	2000	Regional	Heavy snow	No damage in Claremont
Snow Storm	March 5-7, 2001	New Hampshire	Heavy snow.	No damage in Claremont
Snow Storm	December 6-7, 2003	New Hampshire	Heavy snow. Federal Disaster Declaration FEMA-3193-NH	Claremont received funds from FEMA for damages; no City records at DPW for this event
Ice Storm	2004	Regional	Ice storm resulted in many trees down and loss of power.	No damage in Claremont
Snow Storm	January 22-23, 2005	New Hampshire	Snow damage; FEMA EM-3207	FEMA paid $7 million in damages;
Snow Storm	February 10-12, 2005	New Hampshire	Heavy snow. Federal Disaster Declaration FEMA-3208-NH	Claremont received funds for damages from FEMA; no city records at DPW
Ice Storm	December 2008	New Hampshire	Debris removal. FEMA DR-1812; power outages in region for up to 10 days; downed trees blocked roads and damaged utility lines	FEMA paid $15 Million in damages in New Hampshire;

SEVERE WINTER WEATHER/ICE STORMS				
Hazard	**Date**	**Location**	**Description of Areas Impacted**	**Damages**
Wind Storm	February 23 – March 3, 2010	New Hampshire	FEMA DR-1892; Federal funding to Grafton, Hillsborough, Merrimack, Rockingham, Strafford, and Sullivan Counties; power loss; trees & limbs down	Claremont received $16,600 in federal funding for snow & ice clean-up
Snow Storm	October 29-30, 2011	Statewide	EM-3344; FEMA-4049 Hillsborough & Rockingham Counties	No damage in Claremont
Ice Storm	January 27, 2012	Region	Isolated power outages in region; several limbs down	No damage in Claremont
Snow Storm	February 8-10, 2013	New Hampshire	Heavy Snow (NEMO event). FEMA DR-4105	Claremont received $23,473 from FEMA primarily for snow removal and tree clean-up
Snowstorm	January 26-28, 2015	Hillsborough, Rockingham, and Strafford Counties, NH	Severe Winter Storm and Snowstorm DR-4209	No damage in Claremont

Potential Future Severe Winter Damage:

There is the potential for severe winter damage every year. An event would affect the entire city. The Committee determined there is no specific area in the City which is more vulnerable. According to the State's mitigation plan, Sullivan County has a high risk for severe winter weather. The Committee determined severe winter weather to be a High risk in Claremont.

Earthquake

Earthquakes are characterized by a sudden and rapid shaking of the ground caused by the shifting of rock beneath the ground. The damage caused by an earthquake can be severe, causing the collapse and destruction of buildings, bridges, roads and other critical infrastructure. As a result, there can be many other hazards that occur, such has gas leaks, fires, electrical outages, landslides, etc. The magnitude and intensity of an earthquake can be rated on a scale such as the Richter or Mercalli, which are both illustrated below.

The following is a list of earthquakes which have impacted New England, New Hampshire, and potentially Claremont.

Table III-11: EARTHQUAKES

EARTHQUAKES			
Date	**Location**	**Magnitude**	**Damage**
1638	Central NH	6.5-7	
October 29, 1727	Off NH/MA coast	NA	Widespread damage Massachusetts to Maine: cost unknown
December 29, 1727	Off NH/MA coast	NA	Widespread damage Massachusetts to Maine: cost unknown
November 18, 1755	Cape Ann, MA	6.0	Much damage: cost unknown
1800s	Statewide	83 felt earthquake in NH	No damage recorded in Claremont
1900s	Statewide	200 felt earthquake in NH	No damage recorded in Claremont
March 18, 1926	Manchester, NH	Felt in Hillsborough Co	No damage recorded in Claremont
Dec 20, 1940	Ossipee, NH	Both earthquakes 5.5	Damage to homes, water main rupture: cost unknown; no damage in Claremont
December 24, 1940	Ossipee, NH	NA	No damage in Claremont
December 28, 1947	Dover-Foxcroft, ME	4.5	No damage in Claremont
June 10, 1951	Kingston, RI	4.6	No damage in Claremont
April 26, 1957	Portland, ME	4.7	No damage in Claremont
April 10, 1962	Middlebury, VT	4.2	No damage in Claremont
June 15, 1973	Near Quebec Border	4.8	No damage in Claremont
Summer 1977-1978*	Centered in Franklin	NA	No damage in Claremont
January 19, 1982	West of Laconia	4.5	Structure damage 15 miles away in Concord: no damage in Claremont
October 20, 1988	Near Berlin, NH	4	No damage in Claremont
September 26, 2010	New Hampshire	3.4	Centered in Boscawen, NH, The Committee recalls feeling the earthquake; no damage in Claremont
August 23, 2011	Central Virginia, East Coast	5.8	Felt in region; no damage in Claremont
September 18, 2012	Concord, NH	1.2	Epicenter was Concord, NH and the quake was felt in the capital region of NH; No damage in Claremont
October 16, 2012	Southern Maine	4.0	The earthquake was located southern Maine and felt throughout the area and into southern NH; No damage in Claremont

Source: earthquake.usgs.gov/earthquakes/states/new_hampshire/history.php for earthquakes through 1964. NH Multi-Hazard Mitigation Plan, 2010 for 1973-1982; earthquake.usgs.gov/earthquakes (12/13/11)
**Committee recollection*

Table III-12 RICHTER SCALE AND MERCALLI INTENSITY

Richter Scale and Mercalli Intensity		
Richter Scale	**Modified Mercalli Intensity**	**Average Earthquake Effects**
1.0-3.0	I	**I** – Not felt except by a very few under especially favorable conditions.
3.0-3.9	II-III	**II** – Felt only by a few persons at rest, especially on upper floors of buildings. **III** – Felt quite noticeably by persons indoors. Standing motor cars may rock slightly.
4.0-4.9	IV-V	**IV** – Felt indoors by many, outdoors by few during the day. Dishes, windows, doors disturbed; walls make cracking sound. V – Felt by nearly everyone; many awakened. Some dishes, windows broken.
5.0-5.9	VI-VII	**VI** – Felt by all. Some heavy furniture moved; a few instances of fallen plaster. **VII** – Damage negligible in buildings of good design and construction, considerable damage in poorly built or badly designed structures; some chimneys broken.
6.0-6.9	VII-IX	**IX** – Damage considerable in specially designed structures; damage great is substantial buildings, with partial collapse.
7.0 and higher	VIII or higher	**VIII** and higher: damage slight in specially designed structures. Fall of chimneys, factory stacks, columns, monuments, walls. **X** – Some well-built wooden structures destroyed, most masonry and frame structures destroyed with foundations. **XI** – Few if any masonry structures remain standing. Bridges destroyed. **XII** – Total damage. Lines of sight and level are distorted. Objects thrown in air.

Potential Future Earthquake Damage:

A United States Geographic Survey mapping tool on the web (geohazards.cr.usgs.gov/ projects) projects a 5 – 6 peak ground acceleration (pga) with 10% probability of exceedance in 50 years for the City of Claremont. This pga rating is equivalent to a Modified Mercalli Intensity of "V" with moderate perceived shaking and very light potential damage. An earthquake event would impact the entire city. According to the State's mitigation plan, Sullivan County has a medium risk for earthquakes. The Committee determined the risk to be low/medium in Claremont.

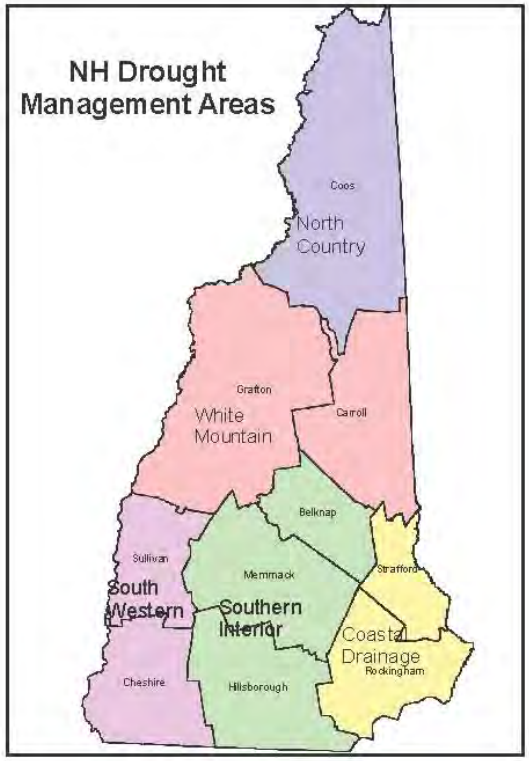
Drought

Droughts or abnormally low precipitation are generally not as damaging or disruptive as floods, but are more difficult to define. A drought is a natural hazard that evolves over months or even years and can last as long as several years or only a few months. Fortunately, droughts are rare in New Hampshire. The severity of the water deficit if gauged by the degree of moisture deficiency, its duration, and the size of the area affected. The effects of drought are indicated through measurements of soil moisture, groundwater levels and stream flow; however, not all of these indicators will be low during a drought. Not all of these indicators will be minimal during a particular drought. For example, frequent minor rainstorms can replenish the soil moisture without raising ground water levels or increasing stream flow.

Low stream flow correlates with low ground water level because it is ground water discharge to streams and rivers that maintain stream flow during extended dry periods. Low stream flow and low ground water levels commonly cause diminished water supply.

New Hampshire breaks the State into five Drought Management Areas, with one in the north, one across the central region, and three along the southern portion of the State. The National Oceanic and Atmospheric Administration (NOAA) and the US government use the Palmer Drought Survey Index for conditions of the nation. The Palmer Drought Management areas divide the State into two areas and use the Palmer Drought Severity Index which is based on rainfall, temperature, and historic data. The City of Claremont is in Area 2. The NH Drought Management Team, coordinated by the NH Department of Environmental Services Dam Bureau, uses these maps to help determine which areas are hardest hit.

Figure III-2: DROUGHT MAPS



Past Drought Events

Around 2001-2002, Claremont and other nearby towns had drought issues. This occurred again in 2010. In July 2016, southern NH was in the midst of a severe drought while central and northern NH were in either a moderate drought or abnormally dry.

Table III-13: DROUGHT

Date	Location	Description	Damages
1929-1936	Statewide	Regional. Recurrence Interval 10 to > 25 years	No damage recorded in Claremont
1939-1944	Statewide	Severe in southeast and moderate elsewhere. Recurrence Interval 10 to > 25 years	No damage recorded in Claremont
1947-1950	Statewide	Moderate. Recurrence Interval 10 to > 25 years	No damage recorded in Claremont
1960-1969	Statewide	Regional longest recorded continuous spell of less than normal precipitation. Encompassed most of the Northeastern US. Recurrence Interval > 25 years	No impact in Claremont recalled
2001-2002	Statewide	Affected residential wells and agricultural water sources; third worst drought on record, exceeded only by the drought of 1956-1966 and 1941-1942; recurrence level not determined yet	Minor impact in Claremont
2010	Mostly southern counties	Affected dug wells and those in hillsides.	No known impact in Claremont
2015	Southern & Central NH	Concord currently 5.17" below the average precipitation from March 1 to May 21, 2015; considered a "moderate drought" by the US Dept. of Agriculture	Minor impact in Claremont with a couple wells drying up
July 2016	Statewide	Southern NH in severe drought while areas in central (including Sullivan County) were in a moderate drought	Minor impact in Claremont

Source: NH DES through 2002; Concord Monitor August 22, 2010; WMUR.com May 21, 2015 and July 7, 2016

Potential Future Drought Damage

Drought will affect the entire city. The damage will depend upon the crops being grown at the time of the drought. No cost has been assigned to residential wells going dry though new wells may have to be dug or drilled. According to the State's mitigation plan, Sullivan County has a medium risk for drought. The Committee determined that drought is a low/medium risk in Claremont.

Extreme Heat

Extreme heat is characterized by abnormally high temperatures and/or longer than average time periods of high temperatures. These event conditions may impact the health of both humans and livestock. The National Weather Service developed a heat index based upon temperature and relative humidity. This is shown below.

Table III-14: HEAT INDEX

NOAA's National Weather Service

Heat Index

Temperature (°F)

Relative Humidity (%)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	128	136					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

Caution | Extreme Caution | Danger | Extreme Danger

Past Extreme Heat Events

In the summer of 2008, Rescue personnel assisted several residents having breathing difficulties due to extreme heat. The following table lists the extreme heat events in the past which included the Northeast and New Hampshire.

Table III-15: EXTREME HEAT

Date	Location	Description	Damage
July, 1911	New England	11-day heat wave in New Hampshire	No impact recorded in Claremont
Late June to September, 1936	North America	Temps to mid 90s in the northeast	No impact recorded in Claremont
June - August, 1999	Northeast	Mean temperatures well above long-term average	No impact recorded in Claremont
Early August, 2001	New Hampshire	Mid 90s and high humidity	No impact in Claremont
August 2-4, 2006	New Hampshire	Regional heat wave and severe storms	No impact in Claremont
2008	Claremont	Committee recollection of assisting several residents with breathing difficulties	Breathing difficulties of several residents
July 2010	Northeast	Regional heat wave	Noticed residents about where to go for cooling station; minimal impact
July 2015	New Hampshire	Regional heat wave	Claremont cooling station not opened; minimal impact

Source: Union Leader July 30, 2015

Potential Future Extreme Heat Events

Extreme heat would impact the entire city though those with air conditioning in their homes would have less impact. The costs of extreme heat are most likely to be in human life. The elderly are especially susceptible to extreme heat. The State did not develop a county risk factor for extreme heat in its *NH Hazard Mitigation Plan*. The Committee determined extreme heat to be a low risk in Claremont.

Erosion

Soil erosion is the process of removal and transportation of soil by wind or water to a new location.

Soil erosion, although a natural process, can be greatly accelerated by improper construction practices. Because of the climate in New Hampshire and the general nature of our topography, eroded soils can be quickly transported to a wetland, stream, or lake. The New Hampshire Department of Environmental Services (DES) regulates major construction activities to minimize impacts upon these resources. A properly conducted construction project should not cause significant soil erosion.

Soil becomes vulnerable to erosion when construction activity removes or disturbs the vegetative cover. Vegetative cover and its root system play an extremely important role in preventing erosion by: (1) Shielding the soil surface from the impact of falling rain drops; (2) Reducing the velocity of runoff; (3) Maintaining the soil's capacity to absorb water, and (4) Holding soil particles in place.

Because of the vegetation's ability to minimize erosion, limiting its removal can significantly reduce soil erosion. In addition, decreasing the area and duration of exposure of disturbed soils is also effective in limiting soil erosion. The designer must give special consideration to the phasing of a project so that only those areas actively under construction have exposed soils. Other factors influencing soil erosion are: (1) Soil types, (2) Land slope, (3) Amount of water flow from up-slope, and (4) Season of disturbance.

Past Erosion Events

There have been several erosion events in Claremont. There are about 90-100 miles of paved roads and 20 miles of gravel roads in Claremont. The area north of Maple Avenue to “the Bluff” has sandy soils and roads with adequate drainage and road subsurface. The remainder of the city has silt/clay-based soils and subsurface more susceptible to erosion.

Table III-16: EROSION AREAS

Location/Hazard	Problem
Sugar River Drive/Flooding & Erosion	Logging and clear cut in southeast corner of city increased drainage to culvert on Sugar River Drive; now floods road once or twice a year; must replace shoulder gravel each time
72 Sugar River Drive/Erosion	Slope failure into Sugar River; have done some engineering and design work, but inadequate to mitigate hazard
South of Beauregard Village at Route 12/103 (Main Street)/ Erosion	Main artery 100' from Sugar River and road embankment slumping toward river
Whitewater Brook/Flooding & Erosion	The only access to the main reservoir for drinking water floods every spring and the road washes; one house and mostly woods
Cat Hole Road/Flooding & Erosion	Severe erosion off Foisey Hill, water from Green Mountain; drains down into Cat Hole Road, Foisey Hill Road, and Skyline Drive
Ledgewood Road development/ flooding and erosion	The Ledgewood Road development area drains to Charlestown Road to Buena Vista Road to Tyler Brook; undersized culverts cause water to bubble out of catch basins and wash edges of roads
Tyler Brook Corridor:	
A. **APC Building**, 129 Sullivan Street	Tyler Brook flows underneath building and is damaging the building structure and support
B. **Desilets Building**, 67 Tyler Street	Storm drainage pipes go under building-inaccessible for proper maintenance, angle in pipes causing choke point under building; cannot move the building; floods area every 4-5 years
C. **Myrtle Street**	Culvert is too small to contain water
D. **Mulberry Street Crossing**	Culvert is too small to contain water
E. **RR Crossing south of Prospect Street**	Culvert is too small to contain water and erosion is threatening the supports of the railroad trestle above; this is a heavily used trestle
F. **Pleasant Street**	Culvert is too small to contain water
G. **East Street**	Undersized culvert plugs up and backs up water into nearby beaver bog which flood homes; road is closed every 4-5 years usually in spring; road has been closed, backyards damaged, and people moved out to safety

Potential Erosion Events

Due to the topography of the city, there is always potential for erosion. As properties are developed there will be less vegetative buffer to protect the city from erosion during rainstorms. Several roads need improvement as shown above to mitigate erosion from future rainstorms. The Committee determined that erosion is a low/medium risk in Claremont. In 2015, the NH Department of Environmental Services did a study on fluvial erosion of the Sugar River in Claremont. This information is provided in Appendix E.

Wildfire

Wildfire is defined as any unwanted and unplanned fire burning in the forest, shrub or grass. Wildfires are frequently referred to as forest fires, shrub fires or grass fires, depending on their location. They often occur during drought and when woody debris on the forest floor is readily available to fuel the fire. The threat of wildfires is greatest where vegetation patterns have been altered by past unsafe land-use practices, fire suppression and fire exclusion. Vegetation buildup can lead to more severe wildfires.

Increased severity over recent years has decreased capability to extinguish wildfires. Wildfires are unpredictable and usually destructive, causing both personal property damage and damage to community infrastructure, cultural and economic resources. Negative short term effects of wildfires include destruction of timber, forage, wildlife habitats, scenic vistas and watersheds. Some long term effects include erosion and lowered water quality.

There are many types and causes of fires. Wildfires, arson, accidental fires and others all pose a unique danger to communities and individuals. Since 1985, approximately 9,000 homes have been lost to urban/wild land interface fires across the United States (Northeast States Emergency Consortium: www.nesec.org). The majority of wildfires usually occur in April and May, when home owners are cleaning up from the winter months, and when the majority of vegetation is void of any appreciable moisture making them highly flammable.

The threat of wildfires for people living near wildland areas or using recreational facilities in wilderness areas is real. Dry conditions at various times of the year and in various parts of the United States greatly increase the potential for wildfires. Advance planning and knowing how to protect buildings in these areas can lessen the devastation of a wildfire. To reduce the risk to wildfire, it is necessary to consider the fire resistance of structures, the topography of property and the nature of the vegetation in the area.

According to the National Wildfire Coordination Group, there are categories of wildfire based upon size: Class A - one-fourth acre or less; Class B - more than one-fourth acre, but less than 10 acres; Class C - 10 acres or more, but less than 100 acres; Class D - 100 acres or more, but less than 300 acres; Class E - 300 acres or more, but less than 1,000 acres; Class F - 1,000 acres or more, but less than 5,000 acres; Class G - 5,000 acres or more.

Past Wildfire Events

There have been few wildfire events in Claremont except the occasional brush fire.

Potential Future Wildfire Events

There are many large, contiguous forest tracts in Claremont. Where development interfaces with the forested areas is called the "urban interface." These are the areas where structures could be impacted by a wildfire; these areas are scattered throughout the city. The most likely areas for wildfire are where ice storm impact downs trees and branches providing fuel for a fire. During drought conditions, many areas may be at risk for wildfire. According to the State's mitigation plan, Sullivan County has substantial debris to fuel a wildfire remaining from the ice storm of 1998 and 2008 and heavy forest cover. In April 2016, there was a wildland fire on a ridge between Hanover and Winter Streets. It is assumed this was vandalism. It took two days to extinguish. There is typically a similar fire each year. The State plan gives the county a high risk of wildfire. The Committee determined that the risk of wild and structure fire risk in Claremont is low.

Natural Water & Air Contaminants

Radium, radon and uranium are grouped together because they are radionuclides, unstable elements that emit ionizing radiation. These three particular substances are a health risk only if taken into the body by ingestion or inhalation. They occur naturally in the environment, uranium and radium as solids in rock while radon exists as a gas. Radionuclides are undetectable by taste, odor, or color, so only analytical testing can determine if they are present in water. Because they are associated with rock, wells drilled into bedrock are more likely to contain elevated levels of radionuclides than shallow or dug wells.

Radon gas can also be found in the soil. Openings between the soil and buildings, such as foundation cracks and where pipes enter, provide conduits for radon to move into structures. The difference in air pressure, caused by heated indoor air moving up and out of buildings, results in a flow of soil gas toward the indoors, allowing radon to potentially accumulate in structures. Air quality in a home can also be tested for radon. Following is a map of New Hampshire by the U.S. EPA to show radon zones.

There are many other natural contaminants which can render drinking water unsafe such as arsenic. The Drinking Water and Groundwater Bureau of the NH Department of Environmental Services has several fact sheets available to address these natural materials and suggests which materials to be included in testing. See their list of fact sheets at http://www.des.state.nh.us/dwg.htm.

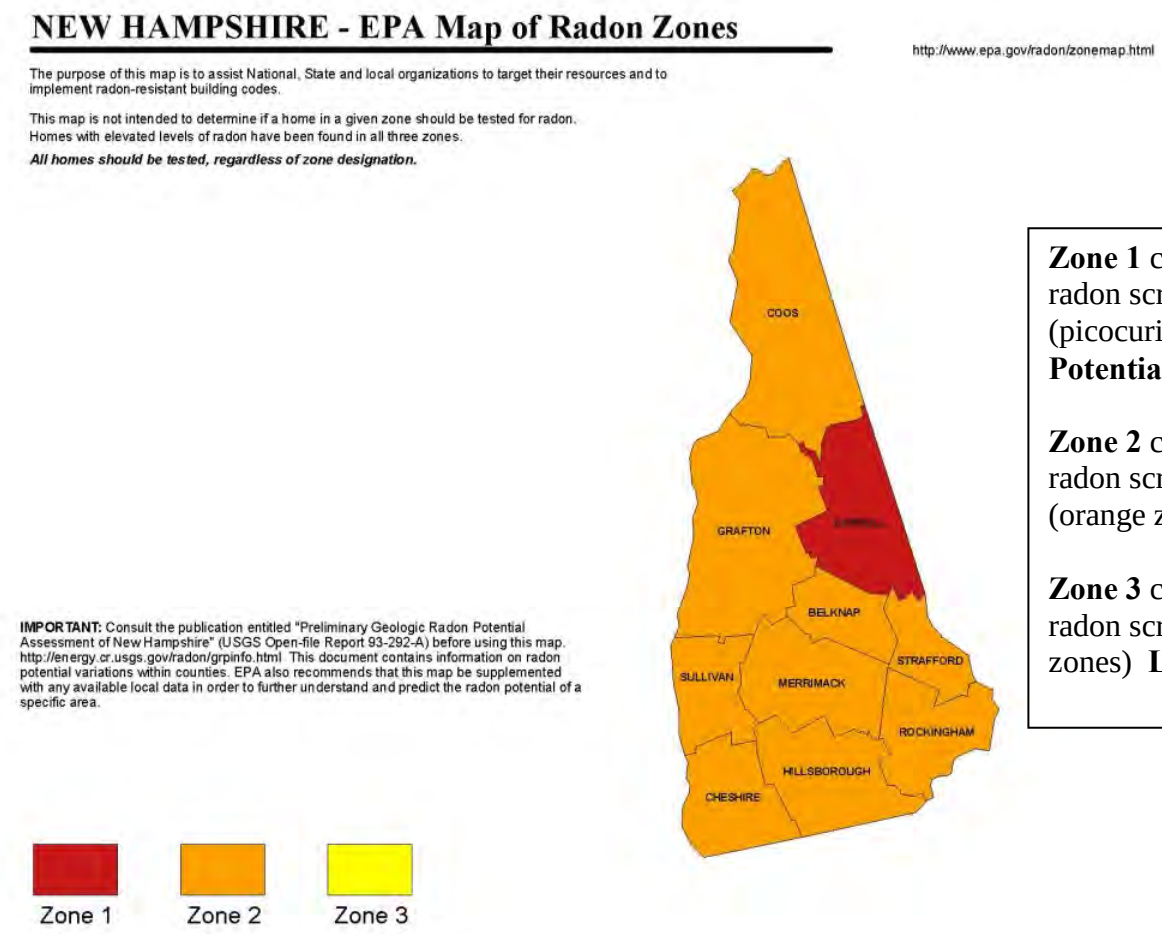
Past Natural Water & Air Contaminant Events

There have been no known events related to natural water and air contamination in Claremont. However, although the Hazard Mitigation Committee is not aware of radon contamination incidents in Claremont, it is likely that some homes are affected by radon given that we are in the "Granite State." Also, uranium was found when constructing I-89 which runs near Claremont.

Table III-17: RADON – LOW/MEDIUM RISK

RADON					
Summary Table of Short-term Indoor Radon Test Results in NH's Radon Database 11/04/2003)					
County	**# Tests**	**G. Mean**	**Maximum**	**% > 4.0 pCi/l**	**% > 12.0 pCi/l**
Belknap	744	1.3	22.3	14.4	1.3
Carroll	1042	3.5	478.9	45.4	18
Cheshire	964	1.3	131.2	15.6	2.3
Coos	1072	3.2	261.5	41	17
Grafton	1286	2.0	174.3	23.2	5.2
Hillsborough	2741	2.1	202.3	29.6	6.8
Merrimack	1961	2.0	152.8	25.2	6
Rockingham	3909	3.0	155.3	40	9.5
Strafford	1645	3.4	122.8	44	13
Sullivan	**466**	**1.4**	**29.4**	**15.7**	**2.1**
STATEWIDE	**15860**	**2.4 pCi/L**	**478.9 pCi/L**	**32.4**	**8.6**

Figure III-3: MAP OF RADON ZONES



Zone 1 counties have a predicted average indoor radon screening level greater than 4 pCI/L (picocuries per liter) (red zones) **Highest Potential**

Zone 2 counties have a predicted average indoor radon screening level between 2 and 4 pCi/L (orange zones) **Moderate Potential**

Zone 3 counties have a predicted average indoor radon screening level less than 2 pCi/L (yellow zones) **Low Potential**

Potential Future Natural Air & Water Contaminant Damage:

Although there are no known records of illness that can be attributed to radium, radon, or uranium or other contaminants in Claremont, residents should be aware that they are present. Houses with granite and dirt cellars are at increased risk to radon gas

infiltration. According to the table above, Sullivan County radon levels are below average for the State. According to the State's mitigation plan, Sullivan County has a medium probability of a radon related hazard.

In addition radium, radon, and uranium as well as other natural materials can be present in drinking water. Residents, especially with bedrock wells, should be aware of the possibility of water contamination and the availability of testing and remediation. The Committee determined that the risk of natural contaminants is low.

Hazardous Materials Spills

Hazardous materials spills or releases can cause loss of life and damage to property. Short or long-term evacuation of local residents and businesses may be required, depending on the nature and extent of the incident. In Claremont, there are about 130 hazardous waste generators listed on the NH Department of Environmental Services (DES) "one-stop" list. Most of these are inactive and probably only produce small amounts of hazardous waste. However, there are also some larger producers. There are also large tanks for fuel such as propane, oil, and gas to service the various businesses and industries in city. Fourteen commercial entities have licensed tanks with NH DES. The City of Claremont is an active member of the Midwestern NH Regional Hazardous Materials Response Team.

Past Hazardous Waste Spill Events

No known recent and significant spills have occurred in Claremont, and there are currently close to 300 hazardous waste generators listed in the NH Department of Environmental Services database. This includes large and small quantity generators as well as facilities that may never generate hazardous waste again. However, the sheer volume of entries indicates that there is substantial hazardous waste generation in the City of Claremont.

Several minor spills have occurred in the past. Over the past five years, the Claremont Fire Department has responded to 109 hazardous spills. Of these, only one is listed as being reportable. That incident took place in February 2016. It was determined to have been caused by a ruptured heating oil tank in the basement of a home on Veteran's Park Road. The oil migrated outdoors and into a nearby brook. The fire department controlled the oil they could and the State was called in to complete the cleanup.

Potential Future Hazardous Waste Spill Damage

There conceivably could be spills near any home in Claremont due to home heating fuel delivery. The property owner is responsible for clean-up. The State oversees these reported spills. Larger spills are possible from non-residential fuel tanks as

shown above in Claremont. The cost for clean-up would be assigned to the transporter. However, there should be an emergency plan to immediately respond to the site to minimize water and ground contamination. Major routes through the city include Routes 11/103, 11/12, 12A, and 120.

The State did not determine county risk for hazardous waste spills in the *NH Hazard Mitigation Plan*. The Committee determined a hazardous waste spill is a low/medium risk.

Terrorism

Terrorism has been defined in many ways. The word terrorism is derived from the Latin term "terrere" which means to frighten. Section 802 of the USA Patriot Act expanded the definition of terrorism to cover "domestic," as opposed to international terrorism. A person engages in domestic terrorism if they do an act "dangerous to human life" that is a violation of the criminal laws of a state or the United States, if the act appears to be intended to: (i) to intimidate or coerce a civilian population; (ii) to influence the policy of a government by intimidation or coercion; or (iii) to affect the conduct of a government by mass destruction, assassination, or kidnapping; and (C) occur primarily within the territorial jurisdiction of the United States."

Past Terrorism Events

There have been no terrorism events within Claremont in the past. In October 2015, the Planned Parenthood clinic vandalized and caused significant damage. In the spring of 2015, the Saint Mary's Church was vandalized the building causing significant damage.

Future Terrorism Events

Terrorism is not considered a major risk, although vandalism is an occasional problem. The Committee determined that the risk of terrorism is a low/medium risk in Claremont.

C. HAZARD RISK RATINGS

The City of Claremont Hazard Mitigation Committee reviewed each potential hazard and rated the probability of occurrence and vulnerability (cost if the hazard actually occurs) to come up with an overall risk rating. The ratings were based on past occurrences of hazards affecting the State of New Hampshire, Sullivan County, and the City of Claremont. These ratings were reevaluated for change in 2015. Although severe winter and erosion/landslide hazards were determined to fall in the medium/high risk range, flooding is considered a high risk.

Assessing Probability

The process involved assigning a number to each hazard type based on its potential of occurring determined using the committee's knowledge of past events:

1 – Low: 0-33% chance of occurrence during a 10-year period
2 – Medium: 33-66% chance of occurrence during a 10 year-period
3 – High: 66-100% chance of occurrence during a 10-year period

An n/a score was given if there was insufficient evidence to make a decision. To ensure some balance with a more scientific measurement, the plan also identifies the probability of occurrence from the State Hazard Plan as shown in Table III-18. For comparative purposes the Low rating was given a designation of "1," the Medium rating a designation of "2," and the High rating a designation of "3." These figures are shown in Table III-19 and III-20.

Table III-18: PROBABILITY OF HAZARD FOR SULLIVAN COUNTRY FROM STATE PLAN

Flood	Dam Failure	Drought	Wildfire	Earth-quake	Radon	Tornado	Hurricane	Lightning	Severe Winter
H	L	M	H	M	M	M	M	M	H

Assessing Vulnerability

A relative scale of 1 to 3 was used to determine the impact and cost for human death and injury, property losses and damages, and business/agricultural impact: 1 – limited damage and cost; 2 - moderate amount of damage and cost, and 3 – high damage and cost.

Table III-19: VULNERABILITY OF EXISTING DEVELOPED AREAS

Committee Assessment of Vulnerability	Human Impact	Property Impact	Economic Impact	Vulnerability
	Probability of death or injury	Physical losses and damages	Cottage businesses & agriculture	Avg. of human/ property/ business impact
Dam Failure	3	3	3	3.00
Flooding	2	3	2	2.67
Hurricane	2	2	2	2.00
Tornado & Downburst	2	2	2	2.00
Thunderstorm/Lightning/Hail	1	2	2	1.67
Severe Winter/Ice Storms	2	3	3	2.67
Earthquake	1	3	3	2.33
Drought	1	2	1	1.33
Extreme Heat	2	1	1	1.33
Erosion	1	2	2	1.67
Wildfire	1	2	2	1.67
Natural Contaminants	1	2	2	1.67
HazMat Spills	1	2	2	1.67
Terrorism	2	2	2	2.00

Assessing Risk

The averages of each vulnerability and probability were multiplied to arrive at the overall risk the hazard has on the community. The overall risk or threat posed by a hazard over the next 25 years was determined to be high, medium, or low.

HIGH**:** There is strong potential for a disaster of major proportions during the next 25 years; or (2) history suggests the occurrence of multiple disasters of moderate proportions during the next 25 years. The threat is significant enough to warrant major program effort to prepare for, respond to, recover from, and mitigate against this hazard. This hazard should be a major focus of the city emergency management training and exercise program.

MEDIUM/HIGH: There is strong potential for a disaster of significant proportions during the next 25 years. The threat is significant enough to warrant major program effort to prepare for, respond to, recover from, and mitigate against this hazard. This hazard should be a major focus of the city's emergency management training and exercise program.

MEDIUM: There is moderate potential for a disaster of less than major proportions during the next 25 years. The threat is great enough to warrant modest effort to prepare for, respond to, recover from, and mitigate this hazard. This hazard should be included in the city's emergency management training and exercise program.

LOW/MEDIUM: There is slight potential for disaster in the in the next 25 years. The modest threat warrants modest effort to prepare for, respond to, recover from, and mitigate this hazard. This hazard should be included in the city's emergency management training and exercise program.

LOW: There is little potential for a disaster during the next 25 years. The threat is such as to warrant no special effort to prepare for, respond to, recover from, or mitigate this hazard. This hazard need not be specifically addressed in the city's emergency management training and exercise program except as generally dealt with during hazard awareness training.

Table III-13: RISK ASSESSMENT

Risk Assessment 0-1.9 Low 2-3.9 Low/Med 4-5.9 Med 6-7.9 Med-High 8-9 High				
Hazards	**Probability based on Committee Review**	**Vulnerability based on Committee Review**	**Risk Rating (Probability x Vulnerability)**	**Risk**
Dam Failure	2	3.00	6.00	Medium/High
Flooding	3	2.67	8.01	High
Hurricane	2	2.00	4.00	Medium
Tornado & Downburst	2	2.00	4.00	Medium
Thunderstorm/Lightning/Hail	3	1.67	5.01	Medium
Severe Winter	3	2.67	8.01	High
Earthquake	1	2.33	2.33	Low/Medium
Drought	2	1.33	2.66	Low/Medium
Extreme Heat	1	1.33	1.33	Low
Erosion	2	1.67	3.34	Low/Medium
Wildfire	1	1.67	1.67	Low
Natural Contaminants	1	1.67	1.67	Low
HazMat	2	1.67	3.34	Low/Medium
Terrorism	1	2.00	2.00	Low/Medium

IV. CRITICAL FACILITIES/LOCATIONS

The Critical Facilities list, identified by the Claremont Hazard Mitigation Committee, is divided into three categories. The first category contains facilities needed for emergency response in the event of a disaster. The second category contains non-emergency response facilities that are not required in an event, but that are considered essential for the everyday operation of the City of Claremont. The third category contains facilities/populations that the Committee wishes to protect in the event of a disaster. Values were retrieved from the city assessor's office in June 2016.

Table IV-1: EMERGENCY RESPONSE FACILITIES, SERVICES & STRUCTURES

Map #	Critical Facility	Tax Map & Lot #	Hazard Vulnerability	Value
1	Emergency Operations Center/Police Station/Courthouse/City Hall (one building)	120/50	Hurricane; Tornado & Downburst; Lightning & Hail; Earthquake; Hazardous Materials Spills	$2,636,500
2	Fire Station	120/161	Hurricane; Tornado & Downburst; Lightning & Hail; Earthquake; Hazardous Materials Spills	763,400
3	Golden Cross Ambulance building	108/64	Hurricane; Tornado & Downburst; Lightning & Hail; Earthquake; Hazardous Materials Spills	351,200
4	Stevens High School (secondary shelter)	132/5	Hurricane; Tornado & Downburst; Lightning & Hail; Earthquake; Hazardous Materials Spills	6,785,000
5	Claremont Savings Bank Community Center (primary shelter)	132/173	Hurricane; Tornado & Downburst; Lightning & Hail; Earthquake; Hazardous Materials Spills	5,772,500
6	Maple Avenue School (secondary shelter)	129/117	Hurricane; Tornado & Downburst; Lightning & Hail; Earthquake; Hazardous Materials Spills	2,353,600
7	Bluff School (secondary shelter)	119/224	Hurricane; Tornado & Downburst; Lightning & Hail; Earthquake; Hazardous Materials Spills	1,822,900
8	Claremont Middle School (secondary shelter)	132/175	Hurricane; Tornado & Downburst; Lightning & Hail; Earthquake; Hazardous Materials Spills	9,745,000
9	Disnard School (secondary shelter)	95/114	Hurricane; Tornado & Downburst; Lightning & Hail; Earthquake; Hazardous Materials Spills	1,930,000
10	Valley Regional Hospital (private)	95/97	Hurricane; Tornado & Downburst; Lightning & Hail; Earthquake; Hazardous Materials Spills	13,537,400
11-15	Water Treatment Facility, tanks, and pump stations	84/18 Facility only	Hurricane; Tornado & Downburst; Lightning & Hail; Earthquake; Hazardous Materials Spills;	1,938,400
16-24	Sewer Plant and pump stations	80/4 Plant only	Hurricane; Tornado & Downburst; Lightning & Hail; Earthquake; Hazardous	5,763,300

Map #	Critical Facility	Tax Map & Lot #	Hazard Vulnerability	Value
			Materials Spills; Flooding (sewer pumps); Dam Inundation	
25	Communication Towers – Green Mountain (City, County and Towns of Cornish, Unity, and Lempster)	75/1	Hurricane; Tornado & Downburst; Lightning & Hail; Earthquake	Unknown
26	Department of Public Works Facility	95/28	Hurricane; Tornado & Downburst; Lightning & Hail; Earthquake; Hazardous Materials Spills	279,500
NA	Evacuation Routes (major roads & bridges)	NA	Dam Failure; Flooding; Severe Winter Weather; Earthquake; Landslide; Erosion; Hazardous Materials Spills	Unknown

Sources: FEMA floodplain map, Dam Inundation Maps, HazMit Committee, Claremont Aerial Imagery 2014, and 2015 Tax Assessment average values

Table IV-2: NON-EMERGENCY RESPONSE FACILITIES & STRUCTURES

Critical Facility	Map & Lot #	Hazard Vulnerability	Value
Fiske Free Library	120/155	Hurricane; Tornado & Downburst; Lightning & Hail; Earthquake; Hazardous Materials Spills	$515,500
Claremont Planning & Development Office	108/1	All Hazards	340,600
Food stores	NA	All Hazards	Unknown
Gas Stations	NA	All Hazards	Unknown
Banks	NA	All Hazards	Unknown

Sources: FEMA floodplain map, HazMit Committee, Claremont Aerial Imagery 2014, and 2016 Tax Assessment values

Table IV-3: FACILITIES & POPULATIONS TO PROTECT

Critical Facility	Map & Lot #	Hazard Vulnerability	Value
National Historic Register Districts (some buildings listed individually)	NA	Hurricane; Tornado & Downburst; Lightning & Hail; Earthquake; Hazardous Materials Spills	Unknown
River Valley Community College	60/12	Hurricane; Tornado & Downburst; Lightning & Hail; Earthquake; Hazardous Materials Spills	$5,502,300
Churches	NA	Hurricane; Tornado & Downburst; Lightning & Hail; Earthquake; Hazardous Materials Spills	Unknown
Washington Street commercial district	NA	Hurricane; Tornado & Downburst; Lightning & Hail; Earthquake; Hazardous Materials Spills	Unknown
Elm Wood Center (68 beds)	72/22	Hurricane; Tornado & Downburst; Lightning & Hail; Earthquake; Hazardous Materials Spills	1,637,000
Silver Maples (10 beds)	108/106	Hurricane; Tornado & Downburst; Lightning & Hail; Earthquake; Hazardous Materials Spills	236,600
Earl Bourdon	143/1	Hurricane; Tornado & Downburst; Lightning & Hail; Earthquake; Hazardous Materials Spills	2,620,700

Critical Facility	Map & Lot #	Hazard Vulnerability	Value
Apartments (80 units)			
Hillside Terrace (79 units)	108/56 108/63	Hurricane; Tornado & Downburst; Lightning & Hail; Earthquake; Hazardous Materials Spills	3,220,300 658,200
Marion Phillips Apartments (100 units)	132/51	Hurricane; Tornado & Downburst; Lightning & Hail; Earthquake; Hazardous Materials Spills	2,439,100
Sugar River Mills (123 + 39 units)	107/23	Hurricane; Tornado & Downburst; Lightning & Hail; Earthquake; Hazardous Materials Spills	6,745,600
Claremont Manor (90 units)	130/59	Hurricane; Tornado & Downburst; Lightning & Hail; Earthquake; Hazardous Materials Spills	3,076,400
Claremont Village Apartments (67 unites)	130/49	Hurricane; Tornado & Downburst; Lightning & Hail; Earthquake; Hazardous Materials Spills	2,478,700
Claremont Christian Academy	130/74	Hurricane; Tornado & Downburst; Lightning & Hail; Earthquake; Hazardous Materials Spills	557,300
New England Classical Academy	119/349	Hurricane; Tornado & Downburst; Lightning & Hail; Earthquake; Hazardous Materials Spills	1,389,900
Green Mountain Daycare	154/69	Hurricane; Tornado & Downburst; Lightning & Hail; Earthquake; Hazardous Materials Spills	123,400
Ready Set Grow Childcare	107/199	Hurricane; Tornado & Downburst; Lightning & Hail; Earthquake; Hazardous Materials Spills	277,700
Mobile Home Parks	NA	Hurricane; Tornado & Downburst; Lightning & Hail; Earthquake	Unknown

Sources: FEMA floodplain map, HazMit Committee, Claremont Aerial Imagery 2014, and 2016 Tax Assessment values

V. DETERMINING HOW MUCH WILL BE AFFECTED

A. IDENTIFYING VULNERABLE FACILITIES

It is important to determine which critical facilities and other structures are the most vulnerable and to estimate potential losses. The first step is to identify the facilities most likely to be damaged in a hazard event. To do this, the locations of critical facilities were compared to the location of past and potential hazard events. Facilities and structures located in federally and locally determined flood areas, dam inundation areas, etc. were identified and included in the analysis. Values for houses (3,518) and mobile homes (441) were generated as average values from the total values by structure type for houses and manufactured housing from City tax assessment records for 2015. The values for non-residential and apartment buildings were generated as average values from the total value of "commercial/industrial" 2015 assessed valuation. There are currently 543 apartment building sites, 354 commercial sites, and 80 industrial sites. There is neither large land areas slated for potential development nor large development projects in the works, so vulnerability of undeveloped land was not analyzed except to note logical future development areas.

Table V-1: VULNERABILITY OF EXISTING DEVELOPED AREAS

Area	Hazard	Critical Facilities	Buildings (residential & non-residential)	Infrastructure	Natural Resources	Total Known Building Value
Dole Dam Inundation Area	Dam Failure	Evacuation routes	28 houses; 1 mobile home; 5 commercial; 4 industrial	Roads	Vegetation	$5Million
Gunnison Dam Inundation Area	Dam Failure	Wastewater Treatment Plant and sewer pump stations; evacuation routes	111 houses; 4 mobile homes; 57 non-residential and apartment buildings	Roads, bridges, other dams, railroad	River vegetated buffers; agricultural lands	$24 Million
McGary Fletcher Dam Inundation Area	Dam Failure	Evacuation Route	2 houses	Roads, railroad	Vegetation	$232,000
Rice Dam Inundation Area	Dam Failure	Sewer Pump Station (289 Elm St.)	15 houses; 3 mobile homes; 5 nonresidential and apartment buildings	Roads, other dam, railroad	Vegetation	$2.6 Million
Sweetwater Dam Inundation Area	Dam Failure	Evacuation Route	1 house and 2 mobile homes	Roads, other dam, railroad	River vegetated buffers	$142,000
Whitewater	Dam Failure	Evacuation	61 houses; 4 mobile homes; 7 non-residential	Roads, bridges,	Brook vegetated	$7.2 Million

Area	Hazard	Critical Facilities	Buildings (residential & non-residential)	Infrastructure	Natural Resources	Total Known Building Value
Brook Dam		Routes	and apartment buildings	railroad	buffer; agricultural lands	
Connecticut River Dams: Wilder, North Hartland	Dam Failure	None	26 residential, 12 non-residential and apartment buildings	Roads	Vegetated buffers and agricultural lands	$5 Million
FEMA Flood Zones	Flooding	Evacuation Routes	95 houses, five mobile homes, and 52 nonresidential and apartment buildings	Roads, bridges, railroad	Vegetated buffers of CT River, Sugar R, and Redwater Brook, agricultural lands along Connecticut River	$19 Million
Locally Determined Flood Areas	Flooding	None	61 houses, 30 mobile homes, and 66 nonresidential and apartment buildings	Roads, bridges, railroad	Vegetated buffer of Tyler Brook	$18 Million

Table V-2: VULNERABILITY OF POTENTIAL DEVELOPMENT

Area	Hazard	Critical Facilities	Projected Buildings	Projected Infrastructure	Projected Value
City infrastructure in-fill; industrial park on Grissom; Route 12A/River Road	All Hazards	None	Unknown	Built in city center areas	Unknown

B. IDENTIFYING VULNERABLE SPECIAL POPULATIONS

There are many centers of special populations in city including several schools, nursing homes, day care centers, senior center, churches, and senior housing. The elderly and physically or mentally impaired residents are also residing throughout the city in their homes. A list of known people with special needs is kept by elderly housing complexes, nursing homes, and home health services. The City does not maintain a list.

C. POTENTIAL LOSS ESTIMATES

This section identifies areas in city that are most vulnerable to hazard events and estimates potential losses from these events. It is difficult to ascertain the amount of damage caused by a natural hazard because the damage will depend on the hazard's extent and severity, making each hazard event quite unique. In addition, human loss of life was not included in the potential loss estimates, but could be expected to occur. FEMA's *Understanding Your Risks: Identifying Hazards and Estimating Losses* (August 2001) was used in estimating loss evaluations. The value of structures was determined by using city records. The city's tax maps were used to determine number of units within each hazard area. These 2015 values are assessed tax values. In 2010, the "cost new" values were used. The land damage cost, structure content loss costs, and function loss cost were not determined.

Dam Failure – Medium/High Risk - $15.5 Million Estimated Cost (not including roads, bridges, railroad)
Nine dams are designated as "significant" or "high" hazard potential either within Claremont or areas upstream in a position to impact Claremont in the event of dam failure: Dole Reservoir, Gunnison Dam (in Goshen), Lower Valley Hydro Dam, McGary Fletcher Dam, Rice Reservoir, Sweetwater Dam, Whitewater Dam, Wilder Dam (Connecticut River, Wilder, VT), and the North Hartland Dam (North Hartland, VT at Connecticut River). If any of these dams failed, major economic loss to structures or property, structural damage roads, major environmental or public health losses would likely occur. It is estimated that there are 254 houses, 19 mobile homes and 101 non-residential and apartment buildings within these dam inundation areas—most within the Gunnison Dam inundation area. The total value of the buildings is approximately $51 million. Assuming a 28% structural damage to the buildings, the building damage would be over $14.3 million. There are also about 19 mobile homes within the dam failure inundation areas at a total value of about $1.2 million. Assuming a 78% structural damage to the mobile homes, the damage would be about $1 million. The nonresidential portion includes the sewage treatment facility which is also within dam failure inundation areas. These structures are valued at $6 million (replacement value would be substantially higher than the assessed value for these facilities). In addition, there are about 10 bridges within the dam inundation areas and several city and state roads, as well as portions of the railroad. No value estimate has been done for these structures. Since there are six dams classified as "high hazard" that could impact Claremont, there is also the probability that people could be killed if the dams fail.

Flooding – High Risk - $10.5 Million Estimated Cost (not including roads, bridges, railroad)
There are approximately 156 houses, 15 commercial structures and 27 nonresidential and apartment buildings within the FEMA and locally designated Special Flood Hazard areas. The total value of the buildings is about $36 million. Assuming a 28 % structural damage to the buildings, the damage would total close to $10 million. There are about 35 mobile homes with a value of $455,945 in the flood zones which would receive more substantial damage than buildings. Assuming an estimated 78% structural damage to the mobile homes, there could be as much as $356,000 in damage. There are 11 bridges and several sections of road and railroad in these flood areas. No value estimate has been done for these structures.

Hurricane – Medium Risk – $6.6 Million Estimated Cost
Damage caused by hurricanes can be severe and expensive. Claremont has been impacted in the past by both wind and flooding damage as a result of hurricanes. According to the 2015 MS1 form, the total assessed value of all structures within Claremont is approximately $658 million. It is random which structures would be impacted and how much. There is no standard loss estimation available and no record of past costs. If 10% of the buildings received 10% damage, the damage cost would be about $6.6 million. A hurricane could damage or demolish buildings; knock down utility lines causing breaks in water, sewer, and electricity service; cause heavy rain and flooding; and kill livestock and people.

Tornado & Downburst – Medium Risk – No Recorded or Estimated Cost
Tornadoes, downbursts, and microbursts are relatively uncommon natural hazards in New Hampshire. On average, about two tornado events strike each year in New Hampshire. In the State, the average annual cost of tornadoes between 1950 and 1994 was $9 million (NOAA's Storm Prediction Center) in adjusted US dollars. These wind events occur in specific areas, so calculating potential city-wide losses is difficult. There is no standard loss estimation model available for tornadoes due to their random nature although it is likely that there could be severe damage to buildings, utilities, crops, livestock, and trees as well as potential for human fatalities.

Although more recent information was not found for New Hampshire, a July 2008 tornado which touched down in Deerfield, NH where it resulted in one fatality and damaged nearly 100 homes and completely destroyed two homes. The 52 mile long damage path was the longest damage path for any tornado in NH and extended from several other NH counties before crossing into Maine. Twisted trees still remained in some towns five years later, as property owners could not afford to clear them. No cost estimate for this disaster was found, but FEMA provided about $2.5 million in assistance to affected NH communities.

Thunderstorm/Lightning/Hail – Medium Risk – No Recorded or Estimated Cost
According to the Federal Alliance for Safe Homes, in an average year, hail causes more than $1.6 billion worth of damage to residential roofs in the United States, making it, year in and year out, one of the most costly natural disasters. Lightning is one of the most underrated severe weather hazards, yet it ranks as the second-leading weather killer in the United States. More deadly than hurricanes or tornadoes, lightning strikes in America each year killing an average of 73 people and injuring 300 others, according to the National Weather Service. There is no cost estimation model for thunderstorms due to their random nature. Lightning strikes can start fires in buildings and forests causing great loss of property and natural resources. Lightning can also cause power outages costing significantly in repairs to utilities, not to mention great inconvenience to homeowners and businesses.

Severe Winter Weather – High Risk – No Recorded or Estimated Cost
Ice storms often cause widespread power outages by downing power lines, and these storms can also cause severe damage to trees. New England usually experiences at least one or two severe snowstorms, with varying degrees of severity, each year. All of these

impacts are a risk to the community and put all residents, especially the elderly, at risk. Municipal costs rise in severe winters as towns attempt to keep ice and snow off the roads. The purchase of salt and sand can greatly increase if the severity of winter weather is greater than anticipated.

According to a study done for the Institute for Catastrophic Loss Reduction (Canada) and the Institute for Business and Home Safety (U.S.), the 1998 Ice Storm inflicted $1.2 billion (U.S.) worth of damage in the U.S. and Canada. In New Hampshire alone, over 67,000 people were without power (http://www.meteo.mcgill.ca/extreme/Research_Paper_No_1.pdf). U.S. average insurance claim was $1,325 for personal property, $1,980 for commercial property, and $1,371 for automobiles. In a 2014 study by the Insurance Information Institute, winter-related disasters totaled $3.7 billion nationwide. The organization further reported that severe winter weather caused 15% of all insured auto, home, and business catastrophe losses in the US in 2014.

Earthquake – Low/Medium Risk - $6.6 million Estimated Cost if All Buildings Impacted

Earthquakes can cause buildings and bridges to collapse, disrupt gas, electric and phone lines, and precipitate landslide and flash flood events. Four earthquakes in NH between 1924 and 1989 had a magnitude of 4.2 or more. Two of these occurred in Ossipee, one west of Laconia, and one near the Quebec border. Buildings have not been subject to any seismic design level requirement for construction and would be susceptible to structural damage. The dams, bridges, and roads would be vulnerable to a sizable earthquake event. Building practices can make a difference in the deaths during and earthquake. Even a moderate rupture beneath a city with structures unprepared for shaking can produce many casualties. Although Claremont has building regulations to address these occurrences, there are many older buildings in the City which were not built to this specification.

FEMA's *Understanding Your Risks: Identifying Hazards and Estimating Costs*, August 2001 provides that an earthquake with a 5% peak ground acceleration (as determined by the US Geologic Survey for the area) could cause damage to single family residences by around 10% of the structural value. According to the 2015 MS1 form, the total assessed value of all structures within Claremont is approximately $658 million. It is random which structures would be impacted and how much. There is no standard loss estimation available and no record of past costs. If 10% of the buildings received 10% damage, the damage cost would be about $6.6 million.

Drought – Low/Medium Risk – No Recorded or Estimated Cost

A long drought would cause damage to crops and dry up wells. There is no cost estimate for this hazard in Claremont as no drought has significantly affected Claremont in the past. If any farms are impacted, the crop loss could be devastating, but it depends upon the length of the drought. Drought can also require the development of new and deeper wells for residential use. Fires can occur during a drought especially if combined with a lightning strike and dry tinder.

Extreme Heat – Low Risk – No Recorded or Estimated Cost
Excessive heat kills more people in the U.S. than tornadoes, hurricanes, floods, and lightning combined. The elderly, very young, obese and those who work outdoors or have substance abuse problems are most at risk from succumbing to heat. Additionally, people in urban areas are more susceptible as asphalt and cement tend to hold in heat throughout the night (Federal Alliance of Safe Homes website). The costs for this hazard are in terms of human suffering. It is not anticipated that there would be any structural or infrastructure costs.

Erosion – Low/Medium Risk – No Recorded or Estimated Cost
Development on steep slopes can cause substantial erosion in the adjacent area. This can impact the adjacent roads in the area by making them more susceptible to erosion and washout. Construction itself can cause erosion if best management practices are not used to control run-off from disturbed soils, and the rooftops of buildings displace water which would have gone into the ground. This is then exacerbated by the steep slopes where the run-off moves more quickly and can cause more damage**.** Severe erosion has occurred along several roads in Claremont.

Wildfire– Low Risk – $3.3 Million Estimated Cost
The risk of fire is difficult to predict based on location. Forest fires are more likely to occur during drought years. In addition, areas and structures that are surrounded by dry vegetation that has not been suitably cleared are at high risk. Fire danger is generally universal, however, and can occur practically at any time. Dollar damage would depend on the extent of the fire and the number and type of buildings burned. Some of the developed area of Claremont interfaces with forest, where structures are potentially vulnerable to wildfire. The estimated value of all structures in the city is approximately $658 million. If 1% of the structures received 50% damage, the total estimated cost would be about $3.3 million.

According to the Sullivan County Forester, big wildfires are uncommon in Sullivan County as the weather here is generally not favorable for a high probability of ignition and rapid spread. Additionally, there are enough roads and people in the county that fires are generally spotted and addressed before they are too large.

Natural Contaminants – Low Risk – No Recorded or Estimated Cost

The cost of a radon hazard would be the health of individuals exposed to radon. No cost estimate is provided for this hazard as often people do not even know they have radon in their home interior air or water. The impact to their health may never be known as they may not realize the source of their illness if it is related to radon which can cause cancer. The Centers for Disease Control and Prevention, the American Lung Association and the American Medical Association agree with estimates that radon causes thousands of preventable lung cancer deaths every year. (US EPA)

Hazardous Material Spills –Low/Medium Risk – No Recorded or Estimated Cost

The cost of a hazardous material spill would depend upon the extent of the spill, the location of the spill in relation to population, structures, infrastructure, and natural resources, as well as the type of hazardous material. The cost of any clean-up would be imposed upon the owner of the material. However, other less tangible costs such as loss of water quality might be borne by the community. No cost estimate has been provided for this possible hazard. There are no significant hazardous waste generators in Claremont—so any spills would likely be from heating fuel delivery or transport of materials through the city on Routes 120, 12A, 103, and 11.

Many critical facilities are located in areas especially susceptible to hazardous waste spills as they are located on major routes.

Terrorism – Low/Medium Risk – No Recorded or Estimated Cost

The cost of any terrorism event is unpredictable and not estimated in this document. The intent of terrorism is typically to cause deaths and destroy infrastructure. The Committee does not feel that terrorism is a substantial threat in Claremont.

VI. EXISTING MITIGATION ACTIONS

A. EXISTING HAZARD MITIGATION PROGRAMS

The following table provides the existing mitigation actions in Claremont. The fourth or "Effectiveness" column ranks each program as one of the following: "high" – the existing program works as intended and meets its goals; "average" – the existing program works though there is room for improvement; and "low" – the existing program does not work as intended or falls short of its goals. The fifth column lists if there were recommendations for improvement in the previous hazard mitigation plan and if those recommendations were put into action or not and if not, why not. The final column provides either an update of the mitigation action or proposed improvements that are currently being recommended for the future. Any proposed actions or actions to be continued will be shown again in future tables for evaluation, prioritization, and scheduling for implementation.

Table VI-1: EXISTING MITIGATION ACTIONS

Existing Mitigation Action & Description	Hazard Type/Service Area	Responsible Local Agent	Effectiveness (Low, Average, High)	Recommendations in Previous Hazard Mitigation Plan/Actions Taken to Meet Recommendations or Not Met	Proposed Improvements
City Master Plan - Most recent version is 2011 (currently being updated)	All Hazards/Entire City	Planning Board	Average	Reference HazMit Plan and importance of hazard mitigation in appropriate Master Plan sections/ NOT COMPLETED due to lack of communication	Add reference to Hazard Mitigation Plan and Emergency Operations Plan to Master Plan
Claremont Municipal Airport Master Plan – Plans for future use of airport; 10-year plan adopted by FAA and Bureau of Aeronautics	All Hazards/Airport	Airport Manager	Average	No recommendations in past plan	None (Limited capacity due to small size.)
Emergency Power – Provide emergency power at all shelters.	All Hazards/Entire City	EMD	Average	Provide emergency power at Stevens High School/COMPLETED in Claremont Savings Bank Community Center (primary shelter) instead of Stevens High School	Enhance Stevens High school with emergency power
HazMat Truck Route – Route trucks around center of city	HazMat/ Downtown	City Traffic Advisory Committee	Low	Establish route/Study completed in August 2009 with four alternative truck routes/INCOMPLETE due to opposition & difficulty in rerouting	Continue to evaluate options with State DOT

Existing Mitigation Action & Description	Hazard Type/Service Area	Responsible Local Agent	Effectiveness (Low, Average, High)	Recommendations in Previous Hazard Mitigation Plan/Actions Taken to Meet Recommendations or Not Met	Proposed Improvements
National Flood Insurance Program - Provides insurance program for homes in or near the FEMA determined flood zones	Flooding/Entire City	City Council	High	Provide public awareness of NFIP/On-going education	Continue to provide public awareness; add link for hazard mitigation education to City web site; provide a map of the floodplains on the City web site.
Water Department Emergency Plan – Standard operating procedures to prevent and correct malfunctions	All Hazards/Portion of City with services	Water & Sewer Superintendant	Average	No recommendations in past plan	None
Dam emergency plans and maintenance - NH DES inspects dams; dam owners maintain to prevent failure; City maintains records of plans and DES inspections	Dam Failure/Dam Inundation Areas (See map in Appendix D & E)	State and individual property owners of dam sites	Average	No recommendations in past plan	None
City Dam maintenance – Maintain existing city dams as required by State law	Dam Failure/Dam Inundation Areas	Public Works Director	Average	No recommendations in past plan	Rice and Whitewater Dams being evaluated for repairs now
Conservation Commission – Advises City Boards about conservation concerns; reviews State wetlands applications	All Hazards/Entire City	CC Chair	Average	No recommendations in past plan	None
Zoning Ordinance – Regulates land use; regulates floodplain, floodway, and stream banks	Flooding, Erosion/Entire City	Planning Board; City Council	Average	Update ordinance/INCOMPLETE due to lack of communication	Amend Zoning Ordinance to include restrictions on steep slopes and wetland buffers
Subdivision Regulations – Regulates division of land	All Hazards/Entire City	Planning Board, City Council	Average	Update and reference Best Management Practices/INCOMPLETE due to lack of communication	Amend Subdivision Regulations to add the use of "Best Management Practices" in development
Driveway Regulations – Regulates driveway access on city roads.	Erosion/Entire City	Planning Board	Average	Update and reference Best Management Practices/ INCOMPLETE due to lack of communication	Add requirement for "Best Management Practices" in driveway construction
Building Codes – Regulates building structures and	All Hazards/Entire	Planning & Developmen	Average	Revisions needed/Adopted State-adopted codes and property	None

Existing Mitigation Action & Description	Hazard Type/Service Area	Responsible Local Agent	Effectiveness (Low, Average, High)	Recommendations in Previous Hazard Mitigation Plan/Actions Taken to Meet Recommendations or Not Met	Proposed Improvements
reference Best Management Practices	City	t Office; Fire Chief		maintenance codes	
Site Plan Review Regulations – regulates non-residential and multi-family development	All Hazards/Entire City	Planning Board; City Council	Average	Update and reference Best Management Practices/ INCOMPLETE due to lack of communication	Amend to require "Best Management Practices" in development
Capital Improvements Program – Plans for future major purchases	All Hazards/Entire City	Planning Board; City Council	Average	No recommendations in past plan	None; continual updates
Water Ordinance – Defines system design/construction if connections to public system	All Hazards/ Public water service areas	Public Works Director	High	No recommendations in past plan	None
Sewer Ordinance - Defines system design/construction if connected to public system	All Hazards/Entire City	Public Works Director	High	No recommendations in past plan	None
Hazard tree trimming - Program for cutting hazardous branches and trees as necessary;	All Hazards/Entire city	DPW (road rights of way); Airport Man; Parks & Rec Dir	Low	Identify hazardous trees and develop action strategies/ON-GOING	Continue program
Winter Parking Ordinance – ordinance to prevent blocking emergency parking	Severe Winter/Entire city	DPW Director	Average	No recommendations in previous plan	None
Road Improvements - Mitigate problem areas to prevent substantial future damage from natural hazards	Flooding, Erosion, Dam Inundation/ Entire city	DPW Director	High	Culvert and revetment work - see list of proposed improvements in following table	See Table VI-2
Water & Sewage Treatment Systems Improvement - Mitigate problem areas to prevent failure of systems from natural hazards	Flooding, Erosion, Terrorism/Entire city	Water & Sewer Superintendent	High	Complete eng and design work to complete satisfactory mitigation of revetment work for sewage valve building at 72 Sugar River Drive which handles County facilities in Unity (river eroding bank and threatening to undermine bldg)/ COMPLETED in 2015	No known mitigation improvements at this time other than those referenced in Table VI-2 for sewer and water through undersized culverts

Table VI-2: ROAD IMPROVEMENTS PROGRAM – PROPOSED IMPROVEMENTS

Location/Hazard	Problem	Mitigation Action/Status of Action
Sugar River Drive/Flooding & Erosion	Logging and clear cut in southeast corner of city increased drainage to culvert on Sugar River Drive; now floods road once or twice a year; must replace shoulder gravel each time	Upgrade culvert with appropriately sized culvert for increase in receiving runoff/NOT COMPLETED due to lack of resources
72 Sugar River Drive/Erosion	Slope failure into Sugar River; have done some engineering and design work, but inadequate to mitigate hazard	Complete eng and design work to complete satisfactory mitigation of revetment work for sewage valve building which handles County facilities in Unity (river eroding bank and threatening to undermine bldg)/COMPLETED 2015
Beaureguard Village/Flooding & Ice Jams	Floods over Route 12/103 (Main Street) 2-3 times a year in residential area (HUD paid homeowners for homes but some have stayed and are not allowed to improve homes); damaged motel	Identify options to mitigate damage to or relocate existing sanitary sewer trunk line on Beauregard Street/NOT COMPLETED due to lack of resources
South of Beauregard Village at Route 12/103 (Main Street)/ Erosion	Main artery 100' from Sugar River and road embankment slumping toward river	Reinforce embankment which is eroding into river/NOT COMPLETED due to lack of resources
Half Mile Road/Flooding	Drainage into undersized culvert under railroad trestle of very active railroad line which is compromising trestle supports; if this trestle is damaged, a 90-mile detour will be required	Upgrade culvert to handle water/NOT COMPLETED due to lack of resources
B**ible Hill Road**/Flooding	Undersized culvert with water and sewer lines inside; floods every spring as located at bottom of hill; floods driveways and yards; if lines fail, many homes will be without water and sewer	Upgrade culvert with appropriately sized culvert/NEW to plan/NEW to plan
Washington Street/Flooding	Twin culverts jam with debris and flood the area after every major rain event; impacts business strip and box stores; 2nd busiest street in the State	Upgrade twin culverts with a box culvert/NEW to plan
Whitewater Brook/Flooding & Erosion	The only access to the main reservoir for drinking water floods every spring and the road washes; one house and mostly woods	Upgrade culvert with appropriately sized culvert/NEW to plan
Girard Avenue at Lonesdale/ Flooding	Floods road and a couple houses every spring due to an undersized culvert	Upgrade culvert with appropriately sized culvert/NEW to plan
Cat Hole Road/Flooding & Erosion	Severe erosion off Foisey Hill, water from Green Mountain; drains down into Cat Hole Road, Foisey Hill Road, and Skyline Drive	Upgrade culvert with appropriately sized culvert/NEW to plan
Ledgewood Road development/ flooding and erosion	The Ledgewood Road development area drains to Charlestown Road to Buena Vista Road to Tyler Brook; undersized culverts cause water to bubble out of catch basins and wash edges of roads	Enlarge enclosed stone drainage system/NEW to plan

Location/Hazard	Problem	Mitigation Action/Status of Action
Tyler Brook Corridor: (flooding and erosion)		
A. **APC Building**, 129 Sullivan Street	Tyler Brook flows underneath building and is damaging the building structure and support	Consider re-routing the brook around the building/NEW to plan
B. **Desilets Building**, 67 Tyler Street	Storm drainage pipes go under building-inaccessible for proper maintenance, angle in pipes causing choke point under building; cannot move the building; floods area every 4-5 years	Consider re-routing the brook around the building/NOT COMPLETED due to lack of resources
C. **Myrtle Street**	Culvert is too small to contain water	Upgrade culvert with appropriately sized culvert/NEW to plan
D. **Mulberry Street Crossing**	Culvert is too small to contain water	Upgrade culvert with appropriately sized culvert/NEW to plan
E. **RR Crossing south of Prospect Street**	Culvert is too small to contain water is damaging the supports of the railroad trestle above; this is a heavily used trestle	Upgrade culvert with appropriately sized culvert/NEW to plan
F. **Pleasant Street**	Culvert is too small to contain water	Upgrade culvert with appropriately sized culvert/NEW to plan
G. **East Street**	Undersized culvert plugs up and backs up water into nearby beaver bog which flood homes; road is closed every 4-5 years usually in spring; road has been closed, backyards damaged, and people moved out to safety	Upgrade culvert with appropriately sized culvert; dredge beaver wetland/NOT COMPLETED due to lack of resources

The City of Claremont will provide a public education and outreach program by using brochures and the city website to reach their citizens. There will also be one-on-one outreach as appropriate. Below is a table showing the potential topics and outreach methods. Dam failure is not included as this is performed by the State Dam Bureau in their assessment of all dams in the State.

Table VI-3: PUBLIC EDUCATION AND OUTREACH TOPICS

Natural Hazard	Educational Topics	Outreach Methods
Multi-Hazard	Shelters; evacuation routes; proper evacuation procedures; emergency kits and family plans	City web site; City flyer in City Offices; Community TV; City e-News
Flooding	National Flood Insurance Program participation; building in a floodplain; stormwater runoff; driving on flooded roads; protecting natural systems which provide flood mitigation; securing property items such as propane tanks prior to a flood	City web site; building inspection; brochures
Wind Events (Hurricane, Tornado, Downburst)	Wind retrofits such as shutters, hurricane clips; school and city official sheltering basics; resident and business sheltering basics; window coverings	City web site
Severe Winter Weather	Installation of carbon monoxide monitor and alarms; ventilation of fuel-burning equipment; protecting water pipes	City web site
Thunderstorms/Lightning/Hail	Taking cover; staying inside when it thunders	City web site
Earthquake	Structural and non-structural home retrofitting; securing furnishings	City web site; building codes
Drought	Water-saving measures; crop insurance; soil and water conservation practices by farmers	City web site
Extreme Heat	Preparing for extreme heat; air conditioning; cooling shelters	City web site
Erosion	High risk areas; stormwater management; bank stabilization; water body buffers	City web site
Wildfire	Most vulnerable areas; reducing fuel for fires such as dry brush	City web site; Fire Department and Fire Warden interactions
Natural Contaminants	Testing for contaminants in air and water	City web site
Hazardous Materials Spills	What to do if there's a fuel delivery spill	City web site

B. NEW MITIGATION PROGRAMS

The Committee evaluated the existing programs and proposed improvements to determine if they were addressing all the hazards they felt could impact the city. Table VII-4 summarizes this evaluation and notes where new programs could be implemented to address all hazards.

Table VI-4: COMMITTEE ASSESSMENT FOR NEW HAZARD MITIGATION ACTIONS

Hazard	Committee Ideas and Assessment
Dam Failure	The committee felt that overall they did not have the ability to mitigate dam failures. They noted that NH DES keeps record of dam inspections. The committee felt that any actions that could be taken regarding private dam failure were beyond the scope of their jurisdiction. The City assesses their reservoirs on a regular basis.
Drought	The Committee determined that the City will follow State recommendations and put out notices to the public to be careful during drought events.
Earthquake & Severe Wind	For earthquake and major wind events, the City already has building codes which take these events into account. The Committee did not feel they should adopt more stringent requirements since these events are rare and the available actions to take were outside the capacity and resources of the City. The City does plan to continue its tree trimming by the highway department to reduce damage by severe wind.
Erosion	Road maintenance and upgrades; Site Plan Review Regulations address stormwater; Driveway Regulations assure proper culvert size.
Extreme Temperatures	Open shelter for extreme weather events.
Flood	The city is an NFIP member and has adopted a floodplain ordinance; the highway department will continue to evaluate culverts and bridges for flooding impacts.
Thunderstorms, Lightning and Hail	The Committee discussed the hazards, but did not feel a particular area of city is more prone to lightning strikes, and there are no feasible mitigation strategies at this point. The City has completed mitigation strategies for the City buildings to minimize electrical damage.
Severe Winter Weather	The City does its best to maintain the roads in the winter to keep them clear of snow and ice. The City already adopted the State's International Building Code, International Residential Code, and Life Safety Code which are enforced by the Building Inspector and Fire Code Inspector. The City provides shelter during prolonged major storms and power outages.
Earthquake	The Committee felt the risk of a destructive earthquake was not sufficient enough to warrant expensive mitigation strategies. The building codes provide a standard to meet the risk of earthquakes in city.

Hazard	Committee Ideas and Assessment
Wildfire	The City requires fire permits to reduce unsafe fire practices. The Committee did not feel there were other strategies they should adopt. Constant outreach to reduce risks.
Natural Contaminants	The Committee discussed the different natural contaminants and noted that radon is always a risk living in a region on granite bedrock. They did not feel it appropriate for the city to take action other than educating its residents about the danger and how to test for radon.
Hazardous Materials	The Committee felt the most suitable strategies for hazardous materials are to continue their mutual aid agreements regarding HazMat spills. They recognize this is considered a preparedness item, but the committee feels it is the best action for the city to take and did not feel they could take on any other measures at this time.
Terrorism	While the City is small surrounded by rural communities and terrorism is a low risk, City emergency departments continue to attend training for terrorism response and share that training with the business community.

Table VI-5 provides a list of proposed new mitigation actions including ones that had been proposed in the previous plan. If these actions had not been accomplished since the last plan, then there is an explanation, however, all mitigation actions are new.

Table VI-5: PROPOSED NEW MITIGATION ACTIONS

Proposed New Mitigation Action Description	Hazard Type/Service Area	Responsible Local Agent	If Recommended in Previous Plan, why was it not put into place?
Drainage Infrastructure Map – Inventory and locate components of drainage infrastructure	Flooding/Entire city	DPW Director	Not enough staff time to pursue
Sewer & Water Infrastructure – Evaluate and assess existing infrastructure for condition and priority for repair or replacement	Hazardous Materials/Entire city	DPW Director & Public Health Inspector	Not in previous plan
Public Education Program – Multi-media program to educate public about emergency shelters, how to prepare for storms, NFIP….	All Hazards/Entire city	EMD	Not assigned to particular person

C. CRITICAL EVALUATION FOR IMPROVEMENTS TO EXISTING PROGRAMS AND NEW PROGRAMS

The Claremont Hazard Mitigation Committee reviewed each of the proposed improvements to existing programs and proposed new programs identified for existing mitigation programs using the following factors:

- Does it reduce disaster damage?
- Does it contribute to community objectives?
- Does it meet existing regulations?
- Can it be quickly implemented?
- Is it socially acceptable?
- Is it technically feasible?
- Is it administratively possible?
- Does the action offer reasonable benefits compared to cost of implementation?

Each mitigation strategy was evaluated and assigned a score (High – 3; Average – 2; and Low – 1) based on the criteria.

The Claremont Hazard Mitigation Committee assigned the following scores to each strategy for its effectiveness related to the critical evaluation factors listed above, and actions had the following scores, with the highest scores suggesting the highest priority. These scores are re-evaluated during each update process for new and existing strategies.

Table VI-6 examines the proposed improvements and evaluates them as 1: Low; 2: Average; and 3: High for effectiveness looking at several criteria as shown in the table. The totals are then ranked to prioritize the improvements to help the Committee focus on the most effective strategy improvements.

Old or deferred actions have been reprioritized with new actions.

Table VI-6: PRIORITIZING EXISTING & NEW MITIGATION STRATEGY IMPROVEMENTS

Rank	Strategy Improvement	Reduce Damage	Community Objectives	Existing Regulations	Quickly Implemented	Socially Acceptable	Technically Feasible	Administration Possible	Benefit - Cost	TOTAL SCORE	Mitigate Existing or New Development or Both
4	**National Flood Insurance Program** - Continue to provide public awareness; add link for hazard mitigation education to City web site	1	3	3	2	3	3	3	3	21	Both
5	**Emergency Shelter** - Enhance Stevens High school with emergency power; obtain written agreement with Claremont Housing Authority to use Marion Phillips Apartments as a secondary shelter	1	3	3	1	3	3	3	3	20	Both
6	**City Master Plan –** Reference hazard mitigation plan and importance	1	2	3	1	2	3	3	3	18	Both
6	**Subdivision Regulations** – Add the use of "Best Management Practices" in development	2	3	3	1	2	2	3	2	18	New
6	**Driveway Regulations –** Add the use of "Best Management Practices" in development	2	3	3	1	2	2	3	2	18	New
6	**Site Plan Review Regulations –** Add the use of "Best Management Practices" in development	2	3	3	1	2	2	3	2	18	New
7	**Zoning Ordinance Update –** Include restrictions on steep slopes and wetland buffers; add language for NFIP	2	2	3	1	2	2	3	2	17	Both
7	**Drainage Infrastructure Map –** Inventory and locate components of drainage infrastructure	2	2	3	1	3	2	2	2	17	Both
8	**Truck Route** – Evaluate options to designate route for trucks to avoid city center	3	3	1	1	2	1	2	2	15	Both
5	**Sugar River Drive** - Replace culvert with appropriately sized culvert for increase in receiving runoff	2	3	3	3	2	3	2	2	20	Both
5	**Beauregard Village** - Identify options to mitigate damage to or relocate existing sanitary sewer trunk line on Beauregard Street	2	3	3	3	2	3	2	2	20	Both
5	**South of Beauregard Village at Route 12/103 (Main Street) -** Reinforce embankment which is eroding into river	2	3	3	3	2	3	2	2	20	Both
8	**Half Mile Road** - Install appropriately sized culvert to handle water	2	1	3	3	1	2	2	1	15	Both
1	**Bible Hill Road** - Replace culvert with appropriately sized culvert	3	3	3	3	3	3	3	3	24	Both
1	**Washington Street** – Replace twin culverts with box culvert	3	3	3	3	3	3	3	3	24	Both
2	**Whitewater Brook** – Replace existing culvert w/larger box culvert	3	3	3	3	3	3	2	3	23	Both
6	**Girard Avenue at Lonesdale** – Replace culvert with larger culvert	1	2	3	2	2	3	3	2	18	Both
1	**Cat Hole Road** – Replace culvert with appropriately sized culvert	3	3	3	3	3	3	3	3	24	Both
3	**Ledgewood Road Development** – Enlarge enclosed stone drain system	3	3	3	3	3	3	1	3	22	Both
5	**APC Building (Tyler Brook)** – Consider re-routing brook around building	3	3	3	1	3	3	1	3	20	Both

Rank	Strategy Improvement	Reduce Damage	Community Objectives	Existing Regulations	Quickly Implemented	Socially Acceptable	Technically Feasible	Administration Possible	Benefit - Cost	TOTAL SCORE	Mitigate Existing or New Development or Both
5	**Desilets Building (Tyler Brook)** – Consider re-routing brook around building	3	3	3	1	3	3	1	3	20	Both
4	**Myrtle Street (Tyler Brook)** – Replace culvert with larger culvert	3	3	3	2	3	3	1	3	21	Both
4	**Mulberry Street Crossing (Tyler Brook)** – Replace culvert with larger culvert	3	3	3	2	3	3	1	3	21	Both
5	**RR Crossing S of Prospect Street (Tyler Brook)** – Replace culvert with larger culvert	3	3	3	1	3	3	1	3	20	Both
5	**Pleasant Street (Tyler Brook)** – Replace culvert with larger culvert	3	3	3	1	3	3	1	3	20	Both
4	**East Street (Tyler Brook)** – Replace culvert with larger culvert; dredge beaver wetland	3	3	3	2	3	3	1	3	21	Both
3	**Drainage Infrastructure Map** – Inventory and locate components of drainage infrastructure	3	3	3	3	3	3	1	3	22	Both
3	**Sewer & Water Infrastructure** – Evaluate and assess existing infrastructure for condition and priority for repair or replacement	1	3	3	3	3	3	3	3	22	Both
1	**Public Education –** Provide hazard mitigation strategies to the public	3	3	3	3	3	3	3	3	24	Both

D. EMERGENCY PREPAREDNESS ACTIONS

Although this is a hazard mitigation plan, the Committee felt it was important to address new and proposed emergency preparedness actions. It is sometimes difficult to distinguish between hazard mitigation and emergency preparedness. Essentially, emergency preparedness is the preparation to act once a hazard has occurred. And as has been discussed previously, hazard mitigation includes actions to eliminate or reduce hazards before they happen. Table VI-7 below is a list of the emergency preparedness actions that the Committee felt should be addressed and included in this plan.

Table VI-7: EMERGENCY PREPAREDNESS ACTIONS

Existing Emergency Preparedness Action & Description	Type/Service Area	Responsible Local Agent	Effectiveness (Low, Average, High)	Recommendations in Previous Hazard Mitigation Plan/*Actions Taken to Meet Recommendations or Not Met*	Update/Future Proposed Improvements
Emergency Operations Plan - Describes the preparation and response necessary for the City to address emergency situations	All Hazards/Entire City	EMD & EM Committee	Average	Needs periodic updating; add hazardous materials section for rail line; coordinate with Valley Regional Hospital/COMPLETED - Updated plan in 2015 including above concerns	None
Emergency Communication – emergency dispatch serves the City, County, and the Towns of Cornish, Unity and Lempster	All Hazards/Entire city	Police Chief	Average	Update the technology (dispatch consoles and radios) in the communication center (included in CIP)/ INCOMPLETE due to lack of resources	Update the dispatch consoles and radios in the communication center
School Emergency Plan – Addresses hazards, deficiencies, evacuation, relocation, lockdown	All Hazards/ public schools	School Superintendent	High	Provide emergency power/NOT COMPLETED as cost prohibitive	None (Will update as needed.)
Emergency Shelter – Provide shelter to the public in the event of an emergency. Have agreement with the Upper Valley Humane Society for pet sheltering and assistance with large animal sheltering.	All Hazards/Entire City	EMD	Average	Provide emergency power/PARTIALLY DONE and shown in existing mitigation actions Table VI-1	Obtain written agreement with Claremont Housing Authority to use Marion Phillips Apartments as a secondary shelter

Existing Emergency Preparedness Action & Description	Type/Service Area	Responsible Local Agent	Effectiveness (Low, Average, High)	Recommendations in Previous Hazard Mitigation Plan/*Actions Taken to Meet Recommendations or Not Met*	Update/Future Proposed Improvements
Haz/Mat Program – Provides emergency response to hazardous materials spills	HazMat Spills/Entire City	Fire Chief	Average	No recommendations in past plan	None
Mutual Aid – Police - Agreements for assistance with surrounding towns in Sullivan County per RSAs	All hazards/Entire city	Police Chief	High	No recommendations in past plan	None (will maintain consistency with State requirements)
Mutual Aid – Fire – Agreements with Southwest Fire Mutual Aid; CT River Valley FMA; and Upper Valley Emergency Services Organization	All hazards/ Entire city	Fire Chief	High	No recommendations in past plan	None
911 Numbering - City has ordinance to post 911 numbers at building	All Hazards/Entire city	Assessor's Office	Average	Continue encouraging people to post numbers/COMPLETED as most are posted.	Continue encouraging people to post and re-post numbers.
Emergency Equipment & Training -	All Hazards/Entire city	Fire and Police Chiefs	Average	Additional Fire & Police Departments training needed/COMPLETED as have continuous trainings	None (Maintain certifications)

VII. PRIORITIZED IMPLEMENTATION SCHEDULE

The Claremont Hazard Mitigation Committee created the following action plan for implementation of priority mitigation strategies. Actions ranked in Table VI:5 are provided here in the order they were ranked in priority.

Table VII-1: PRIORITIZED IMPLEMENTATION SCHEDULE FOR EXISTING AND NEW PROGRAMS

Rank	Evaluation Score	Problem Statement	Mitigation Action	Hazard Addressed	Responsible Party	Anticipated Cost	Potential Funding Source	Timeframe
1	24	**Public Education** – Outreach to teach public about hazard mitigation strategies	Provide information on the web site, public TV and other appropriate media	All Hazards	EMD	$0	NA	1-2 years to provide and then ongoing*
1	24	**Bible Hill Road** – undersized culvert with water & sewer lines inside	Replace existing culvert with larger culvert	Flooding	Department of Public Works	$175,000	Grants & Taxes	1-2 years
1	24	**Washington Street** – twin culverts jam with debris and cause flooding in busy area	Replace twin culverts with a box culvert	Flooding	Department of Public Works	$300,000	Grants & Taxes	3-4 years
1	24	**Cat Hole Road** – extreme runoff from Foisey Hill impacting several roads	Replace existing culvert with larger culvert	Flooding & Erosion	Department of Public Works	$175,000	Grants & Taxes	3-4 years
2	23	**Whitewater Brook** – road to reservoir washed out every spring	Replace existing culvert with larger box culvert	Flooding	Department of Public Works	$435,000	Grants & Taxes	2-3 years
3	22	**Ledgewood Road development** – water bubbling up from catch basins and washing road edges	Enlarge enclosed stone drainage system	Flooding & Erosion	Department of Public Works	$600,000	Grants & Taxes	3-4 years
3	22	**Drainage Infrastructure Map**	Inventory and locate components of drainage infrastructure	Flooding & Erosion	Department of Public Works	$50,000	Grants & Taxes	2-3 years

Rank	Evaluation Score	Problem Statement	Mitigation Action	Hazard Addressed	Responsible Party	Anticipated Cost	Potential Funding Source	Timeframe
3	22	**Sewer & Water Infrastructure**	Assess problem areas for repair and replacement to prevent flooding and contamination	Flooding; Haz Mat	Department of Public Works	$50,000	Grants & Taxes	1-3 years
4	21	**National Flood Insurance Program** – Some people unaware of program and possibility to use if not in flood zone	Continue to provide public awareness; add link for hazard mitigation education to City web site	Flooding	Emergency Management Director	$0	NA	Ongoing*
4	21	**Myrtle Street (Tyler Brook)** – flooding across street	Replace existing culvert with larger culvert	Flooding & Erosion	Department of Public Works	$202,500	Grants & Taxes	3-4 years
4	21	**Mulberry Street Crossing (Tyler Brook)** – flooding across street	Replace existing culvert with larger culvert	Flooding & Erosion	Department of Public Works	$450,900	Grants & Taxes	2-3 years
4	21	**East Street (Tyler Brook)** – culvert plugs up and backs up water into nearby beaver bog which floods homes; road closed every few years	Replace existing culvert with larger culvert and dredge bog	Flooding & Erosion	Department of Public Works	$227,400	Grants & Taxes	1-2 years
5	20	**Emergency Shelter** – Need additional options	Enhance Stevens High school with emergency power	All Hazards	Emergency Management Director	$225,000	Taxes and Grants	4-5 years
5	20	**Beauregard Village** – flooding area where sanitary sewer trunk line runs	Identify options for mitigation or relocate sewer line	Flooding and Ice Jams	Department of Public Works	$45,000	Grants & Taxes	3-4 years
5	20	**South of Beauregard Village at Main Street** – road slumping toward Sugar River	Reinforce embankment	Erosion	Department of Public Works	$300,000	Grants & Taxes	4-5 years

Rank	Evaluation Score	Problem Statement	Mitigation Action	Hazard Addressed	Responsible Party	Anticipated Cost	Potential Funding Source	Timeframe
5	20	**APC Building (Tyler Brook)** – brook runs under building damaging structure	Re-route brook around building	Flooding & Erosion	Department of Public Works	$823,500	Grants & Taxes	4-5 years
5	20	**Desilets Building (Tyler Brook)** – brook runs under building with choke point; no access for maintenance	Re-route brook around building	Flooding & Erosion	Department of Public Works	$491,000	Grants & Taxes	4-5 years
5	20	**RR Crossing south of Prospect Street (Tyler Brook)** – damage to trestle supports from below	Replace existing culvert with larger culvert	Flooding & Erosion	Department of Public Works	$326,700	Grants & Taxes	1-2 years
5	20	**Pleasant Street (Tyler Brook)** – flooding across street	Replace existing culvert with larger culvert	Flooding & Erosion	Department of Public Works	$432,000	Grants & Taxes	4-5 years
6	18	**City Master Plan** – Lack of reference to hazard mitigation and emergency management	Add reference to Hazard Mitigation Plan and Emergency Operations Plan to Master Plan	All Hazards	Planning & Development Department	$0	NA	1-2 years
6	18	**Subdivision Regulations** – Does not entirely address quality of development	Amend Subdivision Regulations to add the use of "Best Management Practices" in development	Erosion and Flooding	Planning Department and Planning Board	$0	NA	2-3 years
6	18	**Site Plan Review Regulations** – Does not entirely address quality of development	Amend Site Plan Review Regulations to add the use of "Best Management Practices" in development	Erosion and Flooding	Planning & Development Department and Planning Board	$0	NA	2-3 years
6	18	**Sugar River Drive** – flooding at culvert	Replace existing culvert with larger culvert	Flooding and Erosion	Department of Public Works	$45,000	Grants & Taxes	3-4 years
6	18	**Girard Avenue at Lonesdale** – floods every spring	Replace existing culvert with larger culvert	Flooding	Department of Public Works	$335,000	Grants & Taxes	3-4 years

Rank	Evaluation Score	Problem Statement	Mitigation Action	Hazard Addressed	Responsible Party	Anticipated Cost	Potential Funding Source	Timeframe
7	17	**Zoning Ordinance** – Does not address steep slopes or wetland buffer development	Amend Zoning Ordinance to include restrictions on steep slopes and wetland buffers	Erosion and Flooding	Planning & Development Department and Planning Board	$0	NA	2-3 years
8	15	**HazMat Truck Route** – Trucks currently going through City center	Continue to evaluate options with State DOT for rerouting	Hazardous Materials Spills	City Council	$0	Taxes and Grants	4-5 years
8	15	**Half Mile Road** – compromising RR trestle supports	Replace existing culvert with larger culvert	Flooding & Erosion	Department of Public Works	$57,000	Grants & Taxes	4-5 years

*This action will be completed on an ongoing basis throughout the life of the plan.

VIII. ADOPTION & IMPLEMENTATION OF THE PLAN

A good plan needs to provide for periodic monitoring and evaluation of its successes and challenges, and to allow for updates of the Plan where necessary. In order to track progress and update the Mitigation Strategies identified in the Plan, the City of Claremont will revisit the Hazard Mitigation Plan *annually, or after a hazard event*. The Claremont Emergency Management Director will initiate this review and should consult with the Hazard Mitigation Committee. Changes will be made to the plan to accommodate for projects that have failed, or that are not considered feasible after a review for their consistency with the evaluation criteria, the timeframe, the community's priorities, and funding resources. Priorities that were not ranked highest, but that were identified as potential mitigation strategies, will be reviewed as well during the monitoring and update of this plan, to determine feasibility for future implementation. The plan will be updated and submitted for FEMA approval at a minimum every five years as required by the Disaster Mitigation Act 2000.

A. IMPLEMENTATION THROUGH EXISTING PROGRAMS

Many municipalities have web sites where they can share information about hazard mitigation and emergency management. The use of the web site by its citizens is often dictated by the availability of broadband service to easily access the web. The City of Claremont has provided a link to the Regional Planning Commission's web page, "A Citizen's Guide to Hazard Mitigation and Emergency Management" as well as other more city-specific information.

Municipalities have documents to convey city goals and objectives that are used to guide future programs. They can be used to promote and implement hazard mitigation. A Municipal Master Plan outlines how the community wants to grow and develop. It includes overall goals and objectives of the community and recommendations for ordinances and regulations to accomplish those goals. A zoning ordinance is a common vehicle to implement goals of the master plan and regulates land use. It can be used to restrict development in flood zones, steep sloped areas, buffer zones around wetlands and water bodies, drinking water recharge areas, hillsides, and ridgelines. These areas may be "overlay districts" mapped out for protection. A zoning ordinance can also require best management practices in forestry and timber harvesting and stormwater management to prevent erosion. A floodplain management plan is part of the zoning ordinance and has typically followed a format recommended by the NH Flood Management Program.

Other municipal documents include regulations such as Curb Cut or Driveway Regulations, Excavation Regulations, Subdivision Regulations and Site Plan Review Regulations. Curb Cut Regulations are used to make sure the culverts at the intersection of driveways and roads are adequate to handle runoff water or stream flow. Excavation Regulations are used to restrict the removal of earth including distance to seasonal high water table and the requirements to restore the site once the excavation is completed. This is

essential to make sure the area is graded and re-vegetated to reduce the chances of erosion. Subdivision Regulations determine how lots are to be laid out in a subdivision. This might include requirements for fire protection, stormwater runoff management, vegetated buffers, and reference back to the zoning ordinance. Site Plan Review Regulations are for multi-family housing and commercial development. Again, these regulations refer back to the zoning ordinance. The regulations can determine site specific development requirements such as parking, open space, vegetated buffers, and traffic flow.

Subdivision Regulations and Site Plan Review Regulations typically refer back to the Zoning Ordinance, so it may be more effective to amend the zoning ordinance to address hazard mitigation through specific restrictions though this can vary by municipality.

Another important municipal document is the Capital Improvements Program which is a "budget of the future" to consider potential capital expenditures such as new roads, major road improvements, equipment, schools, parks. This allows a systematic evaluation of potential projects. Any capital expenditures related to hazard mitigation will be incorporated into this document.

There are other regulations and ordinances that municipalities may adopt such as to regulate water use during a drought or restrict development in areas around drinking water sources. This all varies by municipality.

It should also be noted that many municipalities do not update these documents very often, and some towns do not have them at all. However, where they exist, they offer the potential to include hazard mitigation and emergency management topics.

B. CONTINUED PUBLIC INVOLVEMENT

The public will continue to be invited to participate in the hazard mitigation planning process. In future years, a public meeting will be held (separate from the adoption hearing) to inform and educate members of the public. It is hoped that a separate meeting discussing hazard mitigation and emergency management will create more interest in the process. Additionally, a press release to local newspapers (to be published at their discretion) will be distributed and information will be posted on the city website as well as the city office, library, and post office.

Copies of the Hazard Mitigation Plan have been or will be shared with to the following parties for review for reference:

- Select Board Offices in neighboring towns
- NH Homeland Security & Emergency Management
- Claremont City Council, Conservation Commission, and Planning Board
- Upper Valley Lake Sunapee Regional Planning Commission

RESOURCES USED IN THE PREPARATION OF THIS PLAN

FEMA *Multi-Hazard Mitigation Planning Guidance Under the Disaster Mitigation Act of 2000*, March 2004, Last Revised June 2007

FEMA 386-1 *Getting Started: Building Support for Mitigation Planning*, September 2002

FEMA 386-2 *Understanding Your Risks: Identifying Hazards and Estimating Costs*, August 2001

FEMA 386-3 *Developing the Mitigation Plan: Identifying Mitigation Actions and Implementation Strategies*, April 2003

Ice Storm '98 by Eugene L. Lecomte et al for the Institute for Catastrophic Loss Reduction (Canada) and the Institute for Business & Home Safety (U.S.), December 1998

City of Claremont Emergency Operations Plan, 2015

City of Claremont Master Plan, 2011

NH HSEM's *State of New Hampshire Multi-Hazard Mitigation Plan*, Update 2013

www.fema.gov/disasters: Website for FEMA's Disaster List

http://www.ncdc.noaa.gov/: Website for National Oceanic & Atmospheric Administration Disaster List

www.tornadoproject.com: Website for The Tornado Project

http://www.erdc.usace.army.mil/Locations/CRREL.aspx: Website for Cold Regions Research and Engineering Laboratory Website

www.nesec.org: Website for Northeast States Emergency Consortium

http://earthquake.usgs.gov/earthquakes/states/new_hampshire/history.php: Website for area earthquake information

APPENDICES

Appendix A: **Technical Resources**

Appendix B: **Hazard Mitigation Assistance Grants**

Appendix C: **Meeting Documentation**

Appendix D: **Maps of Hazard Areas and Critical Facilities**

Appendix E: **Fluvial Erosion Study**

Appendix F: **City Adoption & FEMA Approvals of Hazard Mitigation Plan**

APPENDIX A:

Technical Resources

APPENDIX A: TECHNICAL RESOURCES

1) Agencies

New Hampshire Homeland Security and Emergency Management
Hazard Mitigation Section 271-2231
Federal Emergency Management Agency ..... (617) 223-4175
NH Regional Planning Commissions:
Upper Valley Lake Sunapee Regional Planning Commission 448-1680
NH Executive Department:
Governor's Office of Energy and Community Services 271-2611
New Hampshire Office of State Planning 271-2155
NH Department of Cultural Affairs: 271-2540
Division of Historical Resources 271-3483
NH Department of Environmental Services: 271-3503
Air Resources 271-1370
Waste Management 271-2900
Water Resources 271-3406
Water Supply and Pollution Control 271-3504
Rivers Management and Protection Program 271-1152
NH Office of Energy and Planning 271-2155
NH Municipal Association 224-7447
NH Fish and Game Department 271-3421
NH Department of Resources and Economic Development: 271-2411
Natural Heritage Inventory 271-3623
Division of Forests and Lands 271-2214
Division of Parks and Recreation 271-3255
NH Department of Transportation 271-3734
Northeast States Emergency Consortium, Inc. (NESEC) ..... (781) 224-9876
US Department of Commerce:
National Oceanic and Atmospheric Administration:
National Weather Service; Gray, Maine 207-688-3216

US Department of the Interior:
US Fish and Wildlife Service 225-1411
US Geological Survey 225-4681
US Army Corps of Engineers ..... (978) 318-8087
US Department of Agriculture:
Natural Resource Conservation Service 868-7581

2) Mitigation Funding Resources

404 Hazard Mitigation Grant Program (HMGP) ..... NH Homeland Security and Emergency Management
406 Public Assistance and Hazard Mitigation ..... NH Homeland Security and Emergency Management
Community Development Block Grant (CDBG) ..... NH HSEM, NH OEP, also refer to RPC
Dam Safety Program ..... NH Department of Environmental Services
Disaster Preparedness Improvement Grant (DPIG) ..... NH Homeland Security and Emergency Management
Emergency Generators Program by NESEC‡ ..... NH Homeland Security and Emergency Management
Emergency Watershed Protection (EWP) Program ..... USDA, Natural Resources Conservation Service
Flood Mitigation Assistance Program (FMAP) ..... NH Homeland Security and Emergency Management
Flood Plain Management Services (FPMS) ..... US Army Corps of Engineers
Mitigation Assistance Planning (MAP) ..... NH Homeland Security and Emergency Management
Mutual Aid for Public Works ..... NH Municipal Association
National Flood Insurance Program (NFIP) † ..... NH Office of Energy and Planning
Power of Prevention Grant by NESEC‡ ..... NH Homeland Security and Emergency Management
Project Impact ..... NH Homeland Security and Emergency Management
Roadway Repair & Maintenance Program(s) ..... NH Department of Transportation
Section 14 Emergency Stream Bank Erosion & Shoreline Protection ..... US Army Corps of Engineers
Section 103 Beach Erosion ..... US Army Corps of Engineers
Section 205 Flood Damage Reduction ..... US Army Corps of Engineers
Section 208 Snagging and Clearing ..... US Army Corps of Engineers
Shoreland Protection Program ..... NH Department of Environmental Services
Various Forest and Lands Program(s) ..... NH Department of Resources and Economic Development
Wetlands Programs ..... NH Department of Environmental Services

‡NESEC – Northeast States Emergency Consortium, Inc. is a 501(c)(3), not-for-profit natural disaster, multi-hazard mitigation and emergency management organization located in Wakefield, Massachusetts. Please, contact NH HSEM for more information.

† Note regarding National Flood Insurance Program (NFIP) and Community Rating System (CRS):
The National Flood Insurance Program has developed suggested floodplain management activities for those communities who wish to more thoroughly manage or reduce the impact of flooding in their jurisdiction. Through use of a rating system (CRS rating), a community's floodplain management efforts can be evaluated for effectiveness. The rating, which indicates an above average floodplain management effort, is then factored into the premium cost for flood insurance policies sold in the community. The higher the rating achieved in that community, the greater the reduction in flood insurance premium costs for local property owners. The NH Office of State Planning can provide additional information regarding participation in the NFIP-CRS Program.

3) Websites

Sponsor	Internet Address	Summary of Contents
Natural Hazards Research Center, U. of Colorado	http://www.colorado.edu/litbase/hazards/	Searchable database of references and links to many disaster-related websites.
Atlantic Hurricane Tracking Data by Year	http://wxp.eas.purdue.edu/hurricane	Hurricane track maps for each year, 1886 – 1996
National Emergency Management Association	http://nemaweb.org	Association of state emergency management directors; list of mitigation projects.
NASA – Goddard Space Flight Center "Disaster Finder:	http://www.gsfc.nasa.gov/ndrd/disaster/	Searchable database of sites that encompass a wide range of natural disasters.
NASA Natural Disaster Reference Database	http://ltpwww.gsfc.nasa.gov/ndrd/main/html	Searchable database of worldwide natural disasters.
U.S. State & Local Gateway	http://www.statelocal.gov/	General information through the federal-state partnership.
National Weather Service	http://nws.noaa.gov/	Central page for National Weather Warnings, updated every 60 seconds.
USGS Real Time Hydrologic Data	http://h20.usgs.gov/public/realtime.html	Provisional hydrological data
Dartmouth Flood Observatory	http://www.dartmouth.edu/artsci/geog/floods/	Observations of flooding situations.
FEMA, National Flood Insurance Program, Community Status Book	http://www.fema.gov/fema/csb.htm	Searchable site for access of Community Status Books
Florida State University Atlantic Hurricane Site	http://www.met.fsu.edu/explores/tropical.html	Tracking and NWS warnings for Atlantic Hurricanes and other links

Sponsor	Internet Address	Summary of Contents
National Lightning Safety Institute	http://lightningsafety.com/	Information and listing of appropriate publications regarding lightning safety.
NASA Optical Transient Detector	http://www.ghcc.msfc.nasa.gov/otd.html	Space-based sensor of lightning strikes
LLNL Geologic & Atmospheric Hazards	http://wwwep.es.llnl.gov/wwwep/ghp.html	General hazard information developed for the Dept. of Energy.
The Tornado Project Online	http://www.tornadoroject.com/	Information on tornadoes, including details of recent impacts.
National Severe Storms Laboratory	http://www.nssl.uoknor.edu/	Information about and tracking of severe storms.
Independent Insurance Agents of America IIAA Natural Disaster Risk Map	http://www.iiaa.iix.com/ndcmap.htm	A multi-disaster risk map.
Earth Satellite Corporation	http://www.earthsat.com/	Flood risk maps searchable by state.
USDA Forest Service Web	http://www.fs.fed.us/land	Information on forest fires and land management.

APPENDIX B:

Hazard Mitigation Assistance Grants

APPENDIX B:
HAZARD MITIGATION ASSISTANCE GRANTS

Hazard Mitigation Assistance (HMA) grant programs of the Department of Homeland Security (DHS) Federal Emergency Management Agency (FEMA), presents a critical opportunity to protect individuals and property from natural hazards while simultaneously reducing reliance on Federal disaster funds. The HMA programs provide pre-disaster mitigation grants annually to local communities. The statutory origins of the programs differ, but all share the common goal of reducing the loss of life and property due to natural hazards. Eligible applicants include State-level agencies including State institutions; Federally recognized Indian Tribal governments; Public or Tribal colleges or universities (PDM only); and Local jurisdictions.

All sub-applicants for Flood Mitigation Assistance Program (FMA) must currently be participating in the National Flood Insurance Program (NFIP) to be eligible to apply for this grant. Hazard Mitigation Grant Program (HMGP) and Pre-Disaster Mitigation (PDM) mitigation project sub-applications for projects sited within a special flood hazard area are eligible only if the jurisdiction in which the project is located is participating in the NFIP. There is no NFIP participation requirement for HMGP and PDM project sub-applications located outside the special flood hazard area. Properties included in a project sub-application for FMA funding must be NFIP-insured at the time of the application submittal. Flood insurance must be maintained at least through completion of the mitigation activity.

The HMA grant assistance includes three programs:

1. *Hazard Mitigation Grant Program (HMGP*): This program assists in the implementation of long-term hazard mitigation measures following a major disaster.

2. *The Pre-Disaster Mitigation (PDM) program*: This provides funds for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event. Funding these plans and projects reduces overall risks to the population and structures, while also reducing reliance on funding from actual disaster declarations. PDM grants are awarded on a competitive basis.

3. *The Flood Mitigation Assistance (FMA) program*: This provides funds so that cost-effective measures can be taken to reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insured under the NFIP. The long-term goal of FMA is to reduce or eliminate claims under the NFIP through mitigation activities.

Potential eligible projects are shown in the following table by grant program. For further information on these programs visit the following FEMA websites:

HMGP - http://www.fema.gov/hazard-mitigation-grant-program

PDM – www.fema.gov/government/grant/pdm/

FMA – www.fema.gov/government/grant/fma

Mitigation Project:	HMPG	PDM	FMA
1. Mitigation Projects	**X**	**X**	**X**
Property Acquisition and Structure Demolition	**X**	**X**	**X**
Property Acquisition and Structure Relocation	**X**	**X**	**X**
Structure Elevation	**X**	**X**	**X**
Mitigation Reconstruction	**X**	**X**	**X**
Dry Floodproofing of Historic Residential Structures	**X**	**X**	**X**
Dry Floodproofing of Non-residential Structures	**X**	**X**	**X**
Generators	**X**	**X**	
Localized Flood Reduction Projects	**X**	**X**	**X**
Non-Localized Flood Reduction Projects	**X**	**X**	
Structural Retrofitting of Existing Buildings	**X**	**X**	**X**
Non-structural Retrofitting of Existing Buildings and Facilities	**X**	**X**	**X**
Safe Room Construction	**X**	**X**	
Wind Retrofit for One- and Two-Family Residences	**X**	**X**	
Infrastructure Retrofit	**X**	**X**	**X**
Soil Stabilization	**X**	**X**	**X**
Wildfire Mitigation	**X**	**X**	
Post-Disaster Code Enforcement	**X**		
Advance Assistance	**X**		
5% Initiative Projects	**X**		
Misc. Other	**X**	**X**	**X**
2. Hazard Mitigation Planning	**X**	**X**	**X**
Planning Related Activities	**X**		
3. Technical Assistance			**X**
4. Management Costs	**X**	**X**	**X**

OTHER HAZARD MITIGATION ASSISTANCE FUNDING

Environmental Protection Agency

The EPA makes available funds for water management and wetlands protection programs that help mitigate against future costs associated with hazard damage.

Mitigation Funding Sources Program	Details	Notes
Clean Water Act Section 319 Grants	Grants for water source management programs including technical assistance, financial assistance, education, training, technology transfer, demonstration projects, and regulation. http://www.epa.gov/OWOW/NPS/cwact.html	Funds are provided only to designated state and tribal agencies
Clean Water State Revolving Funds	State grants to capitalize loan funds. States make loans to communities, individuals, and others for high-priority water-quality activities. http://www.epa.gov/owow/wetlands/initiative/srf.html	States and Puerto Rico
Wetland Program Development Grants	Funds for projects that promote research, investigations, experiments, training, demonstrations, surveys, and studies relating to the causes, effects, extent, prevention, reduction, and elimination of water pollution. http://www.epa.gov/owow/wetlands/initiative/#financial	See website

National Oceanic and Atmosphere Administration (NOAA)

NOAA is the major source for mitigation funding related to coastal zone management and other coastal protection projects.

Mitigation Funding Sources Program	Details	Notes
Coastal Services Center Cooperative Agreements	Funds for coastal wetlands management and protection, natural hazards management, public access improvement, reduction of marine debris, special area management planning, and ocean resource planning. http://www.csc.noaa.gov/funding/	May only be used to implement and enhance the states' approved Coastal Zone Management programs
Coastal Services Center Grant Opportunities	Formula and program enhancement grants for implementing and enhancing Coastal Zone Management programs that have been approved by the Secretary of Commerce. http://www.csc.noaa.gov/funding/	Formula grants require non-federal match
Coastal Zone Management Program	The Office of Ocean and Coastal Resource Management (OCRM) provides federal funding and technical assistance to better manage our coastal resources. http://coastalmanagement.noaa.gov/funding/welcome.html	Funding is reserved for the nation's 34 state and territory Coastal Zone Management Programs
Marine and Coastal Habitat Restoration	Funding for habitat restoration, including wetland restoration and dam removal. http://www.nmfs.noaa.gov/habitat/recovery/	Funding available for state, local and tribal governments and for- and non-profit organizations.

Floodplain, Wetland and Watershed Protection Programs

USACE and the U.S. Fish and Wildlife Service offer funding and technical support for programs designed to protect floodplains, wetlands, and watersheds.

Funding and Technical Assistance for Wetlands and Floodplains Program	Details	Notes
USACE Planning Assistance to States (PAS)	Fund plans for the development and conservation of water resources, dam safety, flood damage reduction and floodplain management. http://www.lre.usace.army.mil/planning/assist.html	50 percent non-federal match
USACE Flood Plain Management Services (FPMS)	Technical support for effective floodplain management. http://www.lrl.usace.army.mil/p3md-o/article.asp?id=9&MyCategory=126	See website
USACE Environmental Laboratory	Guidance for implementing environmental programs such as ecosystem restoration and reuse of dredged materials. http://el.erdc.usace.army.mil/index.cfm	See website
U.S. Fish & Wildlife Service Coastal Wetlands Conservation Grant Program	Matching grants to states for acquisition, restoration, management or enhancement of coastal wetlands. http://ecos.fws.gov/coastal_grants/viewContent.do?viewPage=home	States only. 50 percent federal share
U.S. Fish & Wildlife Service Partners for Fish and Wildlife Program	Program that provides financial and technical assistance to private landowners interested in restoring degraded wildlife habitat. http://ecos.fws.gov/partners/viewContent.do?viewPage=home	Funding for volunteer-based programs

Housing and Urban Development

The Community Development Block Grants (CDBG) administered by HUD can be used to fund hazard mitigation projects.

Mitigation Funding Sources Program	Details	Notes
Community Development Block Grants (CDBG)	Grants to develop viable communities, principally for low and moderate income persons. CDBG funds available through Disaster Recovery Initiative. http://www.hud.gov/offices/cpd/communitydevelopment/programs/	Disaster funds contingent upon Presidential disaster declaration
Disaster Recovery Assistance	Disaster relief and recovery assistance in the form of special mortgage financing for rehabilitation of impacted homes. http://www.hud.gov/offices/cpd/communitydevelopment/programs/dri/assistance.cfm	Individuals
Neighborhood Stabilization Program	Funding for the purchase and rehabilitation of foreclosed and vacant property in order to renew neighborhoods devastated by the economic crisis. http://www.hud.gov/offices/cpd/communitydevelopment/programs/neighborhoodspg/	State and local governments and non-profits

Bureau of Land Management

The Bureau of Land Management (BLM) has two technical assistance programs focused on fire mitigation strategies at the community level.

Mitigation Funding Sources Program	Details	Notes
Community Assistance and Protection Program	Focuses on mitigation/prevention, education, and outreach. National Fire Prevention and Education teams are sent to areas across the country at-risk for wildland fire to work with local residents. http://www.blm.gov/nifc/st/en/prog/fire/community_assistance.html	See website
Firewise Communities Program	Effort to involve homeowners, community leaders, planners, developers, and others in the effort to protect people, property, and natural resources from the risk of wildland fire before a fire starts. http://www.firewise.org/	See website

U.S. Department of Agriculture

There are multiple mitigation funding and technical assistance opportunities available from the USDA and its various sub-agencies: the Farm Service Agency, Forest Service, and Natural Resources Conservation Service.

Mitigation Funding Sources Agency Program	Details	Notes
USDA Smith-Lever Special Needs Funding	Grants to State Extension Services at 1862 Land-Grant Institutions to support education-based approaches to addressing emergency preparedness and disasters. http://www.csrees.usda.gov/funding/rfas/smith_lever.html	Population under 20,000
USDA Community Facilities Guaranteed Loan Program	This program provides an incentive for commercial lending that will develop essential community facilities, such as fire stations, police stations, and other public buildings. http://www.rurdev.usda.gov/rhs/cf/cp.htm	Population under 20,000
USDA Community Facilities Direct Loans	Loans for essential community facilities. http://www.rurdev.usda.gov/rhs/cf/cp.htm	Population of less than 20,000
USDA Community Facilities Direct Grants	Grants to develop essential community facilities. http://www.rurdev.usda.gov/rhs/cf/cp.htm	Population of less than 20,000
USDA Farm Service Agency Disaster Assistance Programs	Emergency funding and technical assistance for farmers and ranchers to rehabilitate farmland and livestock damaged by natural disasters. http://www.fsa.usda.gov/	Farmers and ranchers
USDA Forest Service National Fire Plan	Funding for organizing, training, and equipping fire districts through Volunteer, State and Rural Fire Assistance programs. Technical assistance for fire related mitigation. http://www.forestsandrangelands.gov/	See website
USDA Forest Service Economic Action Program	Funds for preparation of Fire Safe plans to reduce fire hazards and utilize byproducts of fuels management activities in a value-added fashion. http://www.fs.fed.us/spf/coop/programs/eap/	80% of total cost of project may be covered
USDA Natural Resources Conservation Service Emergency Watershed Protection Support	Funds for implementing emergency measures in watersheds in order to relieve imminent hazards to life and property created by a natural disaster. http://www.nrcs.usda.gov/programs/ewp/	See website

Mitigation Funding Sources Agency Program	Details	Notes
Services		
USDA Natural Resources Conservation Service Watershed Protection and Flood Prevention	Funds for soil conservation; flood prevention; conservation, development, utilization and disposal of water; and conservation and proper utilization of land. http://www.nrcs.usda.gov/programs/watershed/index.html	See website

Health and Economic Agencies

Alternative mitigation programs can be found through health and economic agencies that provide loans and grants aimed primarily at disaster relief.

Federal Loans and Grants for Disaster Relief Agency Program	Details	Notes
Department of Health & Human Services Disaster Assistance for State Units on Aging (SUAs)	Provide disaster relief funds to those SUAs and tribal organizations who are currently receiving a grant under Title VI of the Older Americans Act. http://www.aoa.gov/doingbus/fundopp/fundopp.asp	Areas designated in a Disaster Declaration issued by the President
Economic Development Administration (EDA) Economic Development Administration Investment Programs	Grants that support public works, economic adjustment assistance, and planning. Certain funds allocated for locations recently hit by major disasters. http://www.eda.gov/AboutEDA/Programs.xml	The maximum investment rate shall not exceed 50 percent of the project cost
U.S. Small Business Administration Small Business Administration Loan Program	Low-interest, fixed rate loans to small businesses for the purpose of implementing mitigation measures. Also available for disaster damaged property. http://www.sba.gov/services/financialassistance/index.html	Must meet SBA approved credit rating

Research Agencies

The United States Geological Survey (USGS) and the National Science Foundation (NSF) provide grant money for hazard mitigation-related research efforts.

Hazard Mitigation Research Grants Agency Program	Details	Notes
National Science Foundation (NSF) Decision, Risk, and Management Sciences Program (DRMS)	Grants for small-scale, exploratory, high-risk research having a severe urgency with regard to natural or anthropogenic disasters and similar unanticipated events. http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5423&org=SES	See website
U.S. Geological Survey (USGS) National Earthquake Hazards Reduction Program	The purpose of NEHRP is to provide products for earthquake loss reduction to the public and private sectors by carrying out research on earthquake occurrence and effects. http://www.usgs.gov/contracts/nehrp/	Community with a population under 20,000

APPENDIX C:

Meeting Documentation

Vickie Davis

From: Vickie Davis
Sent: Wednesday, June 08, 2016 3:05 PM
To: Mary Curtis (townbos@comcast.net); Town of Croydon (croydon@myfairpoint.net); Shane O'Keefe (sokeefe@newportnh.net); Tracy Decker (tydunityplanningboard@gmail.com); dedkins@charlestown-nh.gov
Cc: Rick Bergeron (firechief@claremontnh.com)
Subject: Claremont Hazard Mitigation Plan Update Meeting

Greetings,

The City of Claremont will begin the update process of their 2011 hazard mitigation plan on Monday, June 13, 2016 at 11:00 am at the city offices.

Interested officials from neighboring towns are invited to attend. Natural hazards know no boundaries, so if there is an issue you would like to share, this is the time.

If you are unable to attend, feel free to send me a message to be shared at the meeting. I would also be glad to forward the draft plan to you.

Thank you.

Vickie

Victoria Davis
Upper Valley Lake Sunapee Regional Planning Commission
10 Water Street, Suite 225
Lebanon, NH 03766
603-448-1680
603-448-0170 fax

Visit our Household Hazardous Waste web site at http://hhw.uvlsrpc.org
Visit our Waste web site at http://waste.uvlsrpc.org
Visit the Healthy Home Facebook Page at www.Facebook.com/HealthyHomeProgram

Join our Mailing List

Find us on facebook

Please consider the environment before printing this e-mail.

Public Meeting Notice

For Work Session on Claremont Hazard Mitigation Plan Update

When: Monday, June 13, 2016 from 11:00 am – 1:00 pm

Where: Claremont City Offices

Why: Update plan for hazard mitigation from natural hazards (flooding, hurricane…) and human-made hazards (hazardous waste spills…). This is a five-year plan that is required by the State of NH to obtain hazard mitigation grants.

CITY OF CLAREMONT

EVENTS

<	June 2016					>
Sun	Mon	Tue	Wed	Thu	Fri	Sat
29	30	31	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	1	2
3	4	5	6	7	8	9

June 13 2016

All Events

Search All Events

UPCOMING EVENTS

Jun 13 **HAZARD MITIGATION PLAN UPDATE**
11:00AM - Hazard Mitigation Plan Update - Council Chambers
DETAILS

Jun 13 **CLAREMONT PLANNING BOARD**
7:00PM - June 13th meeting
DETAILS

Jun 13 **PARKS AND RECREATION COMMISSION**
6:00PM - June 13th meeting
DETAILS

Jun 14 **TRANSFER STATION AD HOC COMMITTEE MEETING - COUNCIL CHAMBERS**
5:00PM - Transfer Station Ad Hoc Committee Meeting - Council Chambers
DETAILS

June 13, 2014
Claremont Hazard Mitigation Plan

Rick Bergeron	Fire Chief
Tim Hennon	Supt of Parks
Scott Swett	Dir. of Public Works
Dorée Russell	City Manager's Office
Alexander Scott	Police Chief
Jane Taylor	City Solicitor
Shawna-Leigh Morton	Field Rep - HSEM
Nancy Merrill	Planning + Development
Mary Waite	Finance Director
Guy Santagate	City Manager

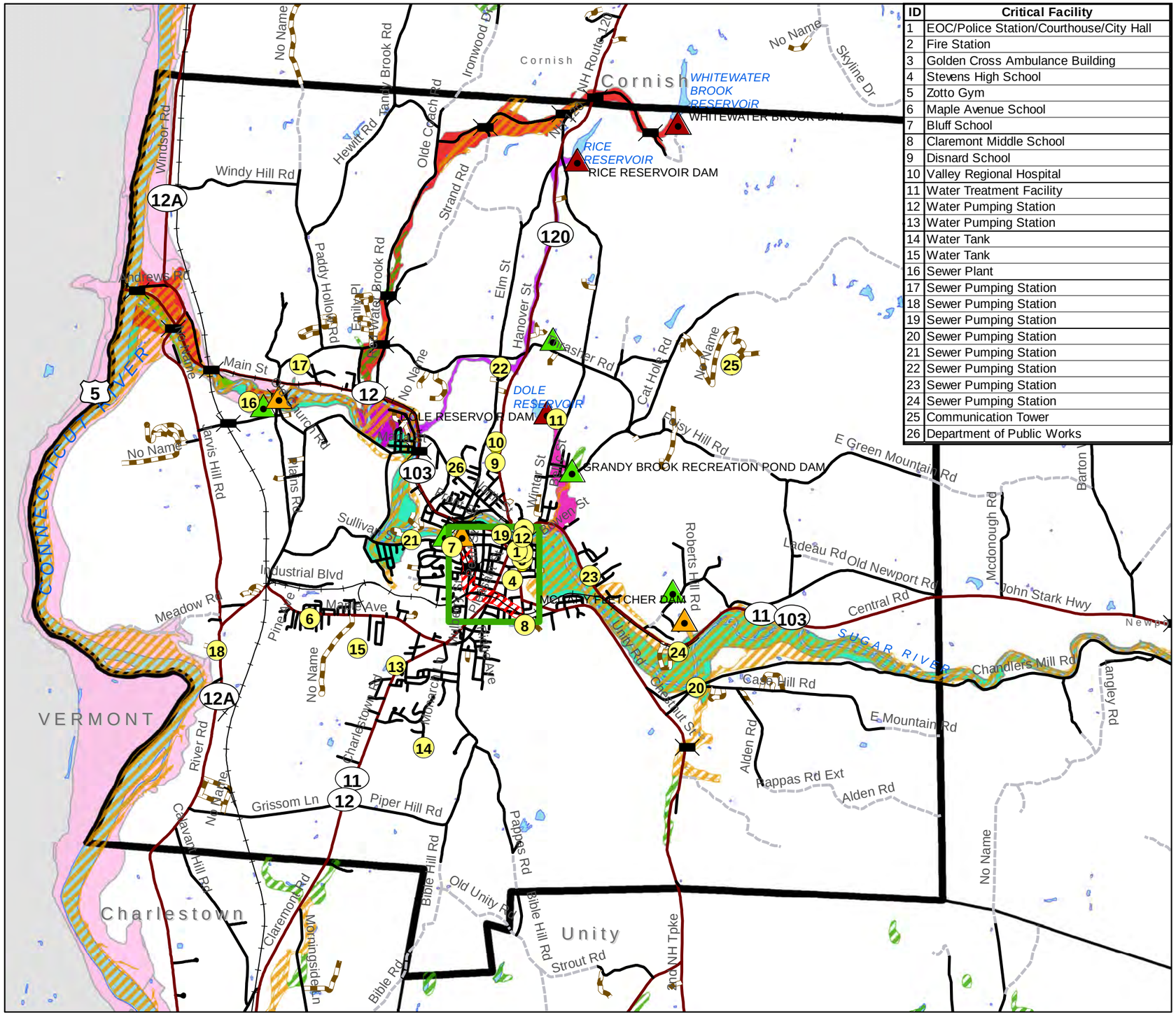
PLEASE SIGN IN –City of Claremont Hazardous Mitigation Plan Update Meeting – July 25, 2016

	Name (please print clearly)	Title	Mailing Address	Telephone	E-mail
1	Randy Williams	Ops Manager			rwilliams@preferredbuildings.com
2	Bryant Huot	Vice President			bhuot@preferredbuildings.com
3	Sean Glassock	Building Inspector			SGlassock@claremontnh.com
4	Erin Gallagher	Safety Coord.			erin.gallagher@canamgroupinc.com
5	Cody Fitzgerald	Safety Intern			cody.fitz@canamgroupinc.com
6	Mary Walker	Finance Director			mwalker@claremont.nh.com
7	Dorée Russell	Exec. Asst. City			drussell@claremontnh.com
8	VICTOR ST. PIERRE	ASS. PWD			VSTPIERRE@CLAREMONTNH.COM
9	Mark Brislin	Rec Dir			Mbrislin@claremontnh.com
10	SCOTT SWEET	DPW DIRECTOR			SSWEET@CLAREMONTNH.COM
11	Alex Scott	Police Chief			ascott@claremontnh.com
12	NORMA LIMOGES	DPW			NLIMOGES@CLAREMONTNH.COM
13	Nancy Merrill	P+D			nmerrill@claremontnh.com
14	RICK BOUCHERON	FIRE CHIEF			firechief@claremontnh.com

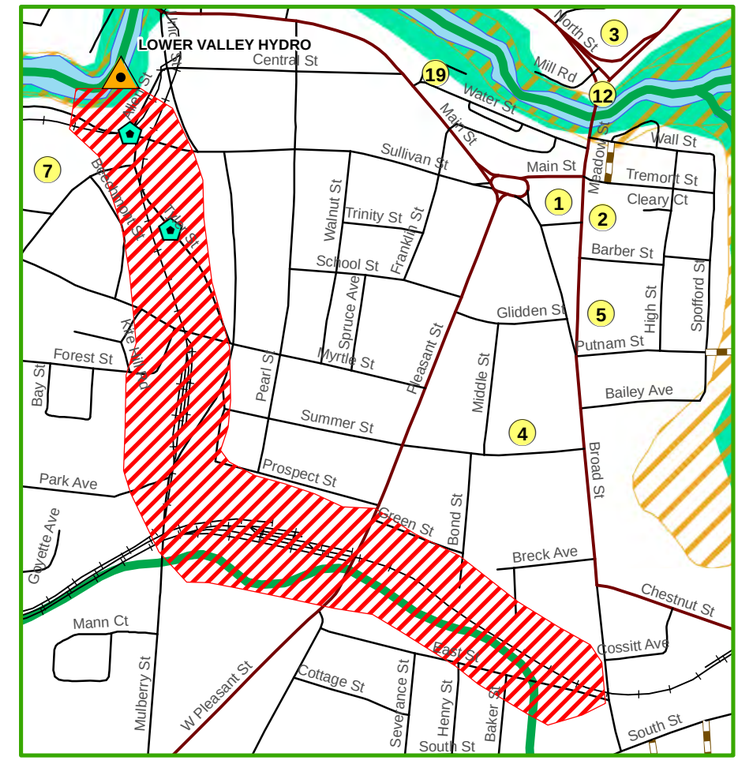
APPENDIX D:

Maps of Hazard Areas and Critical Facilities

Hazard Areas & Critical Facilities Map
Claremont, NH



ID	Critical Facility
1	EOC/Police Station/Courthouse/City Hall
2	Fire Station
3	Golden Cross Ambulance Building
4	Stevens High School
5	Zotto Gym
6	Maple Avenue School
7	Bluff School
8	Claremont Middle School
9	Disnard School
10	Valley Regional Hospital
11	Water Treatment Facility
12	Water Pumping Station
13	Water Pumping Station
14	Water Tank
15	Water Tank
16	Sewer Plant
17	Sewer Pumping Station
18	Sewer Pumping Station
19	Sewer Pumping Station
20	Sewer Pumping Station
21	Sewer Pumping Station
22	Sewer Pumping Station
23	Sewer Pumping Station
24	Sewer Pumping Station
25	Communication Tower
26	Department of Public Works



Legend

- Critical Facilities
- Tyler Brook Hazard Area
- Tyler Brook Hazard Buildings

Dams by Hazard Class

- High hazard potential
- Significant hazard potential
- Low hazard potential
- Bridges

Roads

- State
- Local
- Not Maintained
- Private

FEMA Floodplains

- A
- AE
- Waterbodies

Dam Inundation Areas

- Dole Reservoir Dam Breach Area
- Rice Reservoir Dam Breach Area
- Sweetwater Hydro Dam Breach Area
- McGary Fletcher Dam Breach Area
- Whitewater Brook Dam Breach Area
- Gunnison Dam Breach Flood Area
- Connecticut River Dams

N W E S

0 0.275 0.55 1.1 1.65 2.2 Miles

MAP PREPARED BY UVLSRPC FOR CLAREMONT HAZARD MITIGATION PLAN JUNE 2016.

UPPER VALLEY LAKE SUNAPEE REGIONAL PLANNING COMMISSION

Data Source: Dam hazard class and inundation data from NH DES Dam Bureau. FEMA floodplain data. Critical Facilities and Flood Prone Areas data developed by UVLSRPC with the Claremont Hazard Mitigation Committee. Roads and Bridges data NH DOT 2016.

Map created May 2016 by UVLSRPC. THIS MAP IS INTENDED FOR PLANNING PURPOSES ONLY.

APPENDIX E:

Fluvial Erosion Study

City of Claremont, NH

Fluvial Erosion Hazard Data

Addendum to Hazard Mitigation Plan – September 2015

Introduction

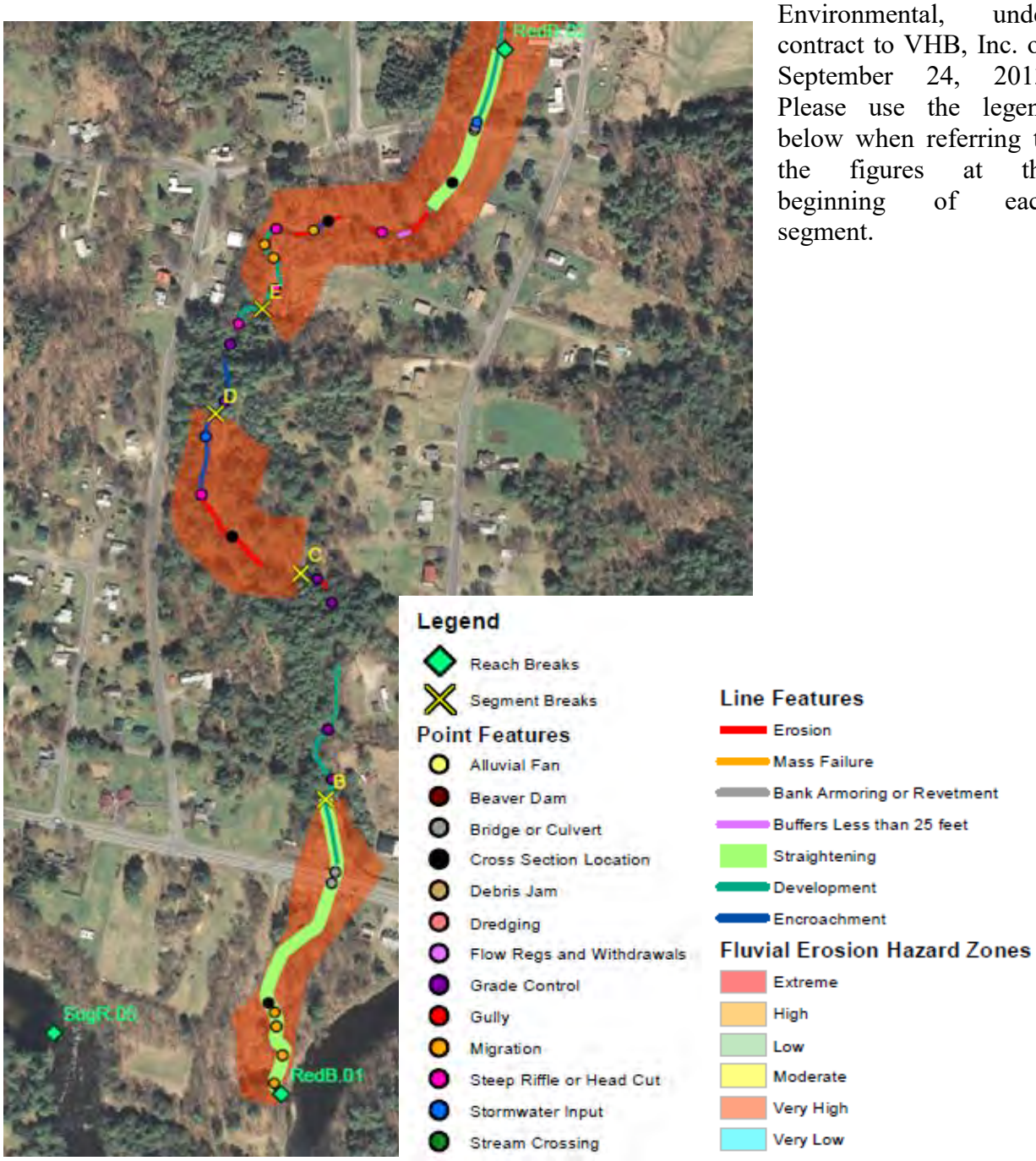
During the summer of 2013 the NH Department of Environmental Services hired a contractor to assess the conditions and attributes of many reaches of river and stream throughout the Sugar River Watershed. The results of that data provided the towns with information regarding vulnerabilities to erosion, or Fluvial Erosion Hazard (FEH) Sensitivity Rating, and the conditions that contribute to the rating. In Claremont there were three reaches in the Sugar River Watershed that were assessed. The Sugar River itself was assessed in the area adjacent to Sugar River Drive. Additionally, Grandy Brook was assessed from where it meets the Sugar River to approximately 1.6 miles north, Redwater Brook was assessed from the Sugar River north to the Cornish town line. The reaches on Redwater Brook were not continuous for the entire distance, they maps attached depict the specific study area.

Results

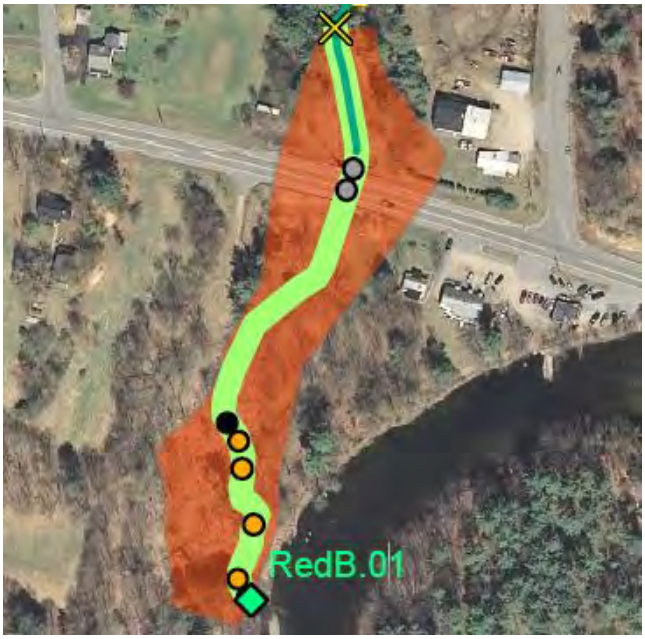
The following summaries of the results for Redwater Brook and Grandy Brook were prepared by the New Hampshire Department of Environmental Services.

Summary of Geomorphological Information
Redwater Brook, Claremont
Reach 1; Segments A, B, C, D, E
March, 2015

This document provides a narrative summary of the river geomorphology data that was collected on Redwater Brook, identified Reach 1, segments A through E, within the Town of Claremont, New Hampshire. Reach 1 of Redwater Brook extends for a length of 3,931 feet from the confluence with Sugar River (approximately 600 ft. south of Central Rd) to approximately 250 north of Thrasher Rd. This reach is broken down into 5 sub-segments. Segments A through E shown here. Redwater Brook, Reach 1 was surveyed by personnel from Bear Creek Environmental, under contract to VHB, Inc. on September 24, 2013. Please use the legend below when referring to the figures at the beginning of each segment.



Segment A: 923 feet



Valley and River Corridor
The average measured width of the valley that contains Redwater Brook though this reach is 242 ft. As can be seen in picture to the right, the channel has been historically straightened and is attempting to regain sinuosity. This section of the river has good access to the floodplain, therefore incision is not a concern. Development, extending 181 feet is encroaching upon the east bank of the river. The west bank is free of developmental impacts. Corridor slopes on the east side of the channel were flat with grades ranging from 0-3%. The west bank was steeper with slopes ranging from 9-15%.

Stream Channel
Based on a cross-section collected at a location that is representative of the reach overall, the channel width is 48 feet, with a maximum bankfull depth is 3.2 feet. The mean bankfull depth is 1.91 feet. The floodprone width, which is the width of the active floodplain at the floodplain elevation, is 177 feet. The floodprone width includes the active stream channel, and the floodplain on either side of the channel. This segment contains only two riffles (an area of shallow stream, over which the water flows swiftly with a wavy surface; viewed as an important component with pools for supporting good habitat), that are spaced an average of 171 feet apart.

With the representative cross-section information, this reach types out as a C4 stream in the Rosgen Stream Classification system (Rosgen, 1996). Typically, C4 streams have gravel beds (this reach has a bed dominated by gravel, based on the pebble count) with riffles, and that meanders through a mature floodplain. Streambanks in this segment are typically composed of non-cohesive material (boulder-cobble, sand). Consequently, these streams are often susceptible to increased bank erosion, which is present in some areas of the reach, as discussed in the next section.

Riparian banks, Buffers and Corridors
Bank slopes in Segment A are typically steep, and the channel canopy is open, meaning that the stream is not extensively shaded by trees adjoining the channel. Streambanks are comprised of a non-cohesive and unconsolidated sand mixture on both sides of the channel. On the east bank, the total length of bank erosion observed is 290 feet with average heights of 2 feet. The west bank has 300 feet of erosion, which are 3 feet in height. Streambanks are armored, with total lengths of 255 feet on the east, and 273 feet on the west.

Buffer widths are more than 100 feet on both sides of the channel and consist mostly of deciduous forest cover with some invasive Japanese knotweed. The riparian corridor is dominated by forest and secondarily by residential development.

Flow Modifiers

There are minimal flow modifiers in Segment A, meaning there are no stormwater inputs, beaver dams, flow regulations, or debris jams. There are a minimal amount of springs, seeps and tributaries that affect flow.

Channel Bed and Planform Changes

There are 4 flood chutes within Segment A. Flood chutes are side channels that cross the inside of a meander bend where flood waters will bypass the main channel, taking a shorter route through the chute. The presence of multiple sediment bars increases this segment's sensitivity scores. The following are the number of bars (depositional features) recorded in the reach:

Bar Type	Number Present
Mid-channel	1
Point	0
Side	6
Diagonal	2
Delta	0
Island	0

A total of 921 feet, or 99%, of the Segment A is identified as having been straightened in the past. The figure below shows an example of the historic straightening that has occurred in Segment A of Reach 1.

Stream Crossing
There is a 53 foot concrete bridge with abutments crossing the reach at Central Rd. At the time of assessment, there was no upstream bank erosion and the upstream bank armoring was intact. There is "low" bank erosion on the downstream side of the bridge. Field notes indicate that the downstream armoring is failing. There is evidence of aggradation (sediment accumulation) both upstream and downstream of the bridge. Sediment accumulations are occurring in the mid-channel on the upstream side of the bridge and on the side of the channel, downstream of Central Rd.

Stream Channel Condition
Segment A was given a score based on the data collected on the current channel condition. The condition of segment was considered to be Fair (the second lowest of a four condition scale). This was mostly due to the major channel widening that is evident with bank erosion on both sides and the 4 flood chutes. Field notes also indicate that major planform adjustment (meandering) is occurring which is likely a result of the historic straightening of this segment. The Central Rd. bridge is causing sediment to accumulate upstream and downstream of the abutments, which is probably accelerating the widening and planform changes. The condition score combined with the stream type translated into a sensitivity score of the reach. The score results placed this segment into the Very High sensitivity category (the second most sensitive of six categories of stream sensitivity).

Segment B: 731 feet

Valley and River Corridor
The average measured width of the valley that contains Redwater Brook though this reach is 68 feet and is narrowly confined. The corridor slopes are considered to be very steep (16-25%). Development, extending 417 feet is encroaching upon the east bank of the river. The west bank is free of developmental impacts.

Stream Channel
This segment of the reach has a low sinuosity value of 1.04, meaning that there are few bends. Field notes indicate that there is bedrock along the banks and cobble covering the in-channel bedrock, creating stable channel conditions.

Riparian banks, Buffers and Corridors
Bank slopes in the reach are typically steep, and the channel canopy is closed, meaning that the stream is shaded by trees adjoining the channel. Bedrock forms the base of the streambanks. Some non-cohesive sandy, unconsolidated material is found on top of the bedrock in the upper section of this segment. Total lengths of bank erosion observed are 148 feet on the east bank, and 21 feet on the west bank, with average heights of bank erosion of 5 feet on the both sides of the channel. There is no bank revetment on either bank of this segment.

On the east bank, buffer widths are more than 100 feet, consisting mostly of the coniferous tree species. The invasive, Japanese knotweed is also present. The riparian corridor on the east bank is dominated by residential land use and secondarily by forest. On the west bank is dominated by forest. Coniferous vegetation is dominant near the bank. Mixed trees, shrubs and sapling make up the 100 foot buffer.

Flow Modifiers

There are minimal flow modifiers in Segment B, meaning there are no stormwater inputs, beaver dams, flow regulations, or debris jams. There are a minimal amount of springs, seeps and tributaries at affect flow.

Channel Bed and Planform Changes

Field notes indicate bed form type is step-pool. There are no signs of channel alternations or migrations in Segment B. Sediments are not accumulating on the channel bed or being scoured from the bed to alter streambed elevations.

The picture above shows and example of a step-pool in Segment B of Reach 1.

The following are the number of bars (depositional features) recorded in the reach:

Bar Type	Number Present
Mid-channel	0
Point	0
Side	2
Diagonal	0
Delta	0
Island	0

Stream Channel Condition
Data from Segment B suggest that this section of the river is stable. However, 168 feet of the total length of the segment (731 feet), are showing signs of erosion. Development is present but it appears as though there are no human-caused disturbances in the channel or adjacent land. The segment was not assigned a sensitivity score because of its stable nature, as the reach is dominated by bedrock and is not likely to adjust laterally or vertically on time scales of concern to us.

Segment C: 654 feet

Valley and River Corridor
The average measured width of the valley that contains Redwater Brook though this reach is 294 feet and is broadly confined. Approximately 255 feet of Clay Hill Rd parallels the west bank of this segment. The corridor slope is mild and considered hilly with grades of 4-8 percent.

Stream Channel
Based on a cross-section collected at a location that is representative of the segment overall, the channel width is 44 feet, with a maximum bankfull depth is 3.05 feet. The mean bankfull depth (from each point on the cross-section) is 2.23 feet. The floodprone width, which is the width of the active floodplain at the floodplain elevation, is 113 feet. The reach contains does not contain riffles or steps.

With the representative cross-section information, this reach types out as a C4 stream in the Rosgen Stream Classification system. Typically, C4 streams have gravel beds (this reach has a bed dominated by gravel, based on the pebble count) with riffles, and that meanders through a mature floodplain. Streambanks are typically composed of unconsolidated and non-cohesive material that is finer than the bed material, which accurately characterizes the banks in this reach. Consequently, these streams are often susceptible to increased bank erosion, which is present in 70% of the segment.

Riparian banks, Buffers and Corridors
Bank slopes in the reach are typically steep, and the channel canopy is closed, meaning that the stream is extensively shaded by trees adjoining the channel. Streambanks are comprised of unconsolidated materials including boulder, cobbles, coarse gravel and sand on both sides of the channel. On the east bank the total length of bank erosion observed is 107 feet, with average heights of 2 feet. Erosion on the west bank is 453 feet in length with an average of 4 feet in height. There is no bank revetment in this segment.

Buffer widths on both sides of the channel are more than 100 feet, consisting mostly of the deciduous vegetation types, including the invasive, Japanese knotweed. The riparian corridor is dominated by forest on both sides of the channel.

Flow Modifiers
There are no beaver dams, flow regulations, or debris jams impacting flow in this segment. One road ditch (approximately 1300 feet north of the Central Rd and Clay Hill Rd junction) is contributing stormwater flow to the reach.

Channel Bed and Planform Changes
This segment of the reach falls into the category of a "plane" bedform, meaning that it has no distinct sequence of bed features. The following are the number of bars (depositional features) recorded in the reach:

Bar Type	Number Present
Mid-channel	0
Point	0
Side	2
Diagonal	2
Delta	0
Island	0

There has been no historic straightening or channel alterations within this segment of Reach 1.

Stream Channel Condition
Segment C was given a score based on the data collected on the current channel condition. The condition of segment was considered to be Fair, (the second lowest of a four condition scale). Factors that contributed to the Fair conditions of this reach included the bank erosion present throughout the segment. Bear Creek Environmental staff noted in their comments that "major to extreme" channel widening was occurring due to the bank erosion. Field notes also indicate that the streambed is also beginning to erode, causing a deepening of the channel. This score was combined with the stream type, to translate a sensitivity score of the reach. The score results placed this segment into the Very High sensitivity category (the second most sensitive of six categories of stream sensitivity).

The picture to the left shows an example of the erosion and stream widening that is occurring at Segment C of Reach 1.

Segment D: 367 feet

Valley and River Corridor
The average measured width of the valley that contains Redwater Brook though this reach is 119 feet and is broadly confined. Approximately 157 feet of Clay Hill Rd and 101 feet of development are encroaching upon the west bank of this segment. The east bank is free of encroachment. The corridor slope is very steep with grades of 16-25 percent.

Stream Channel
This segment of the reach has a sinuosity value of 1.13, meaning that there are few bends. Bedrock dominates the bed and banks in this segment, creating stable channel conditions.

Riparian banks, Buffers and Corridors
Bank slopes in the reach are typically steep, and the channel canopy is open, meaning that the stream is not extensively shaded by trees adjoining the channel. Streambanks are comprised of a non-cohesive and unconsolidated sand mixture on both sides of the channel. There is no evidence of erosion or bank revetment on either side of the channel.

Buffer widths are more than 100 feet on both sides of the channel. Vegetation is predominantly coniferous with some shrubs and saplings. The riparian corridor is dominated by forest on both sides of the channel.

Flow Modifiers
There are minimal flow modifiers in Segment A, meaning there are no stormwater inputs, beaver dams, flow regulations, or debris jams. There are a minimal amount of springs, seeps and tributaries that affect flow.

Channel Bed and Planform Changes
Field notes indicate that this segment of the river is a step-pool bedform. The following are the number of bars (depositional features) recorded in the reach:

Bar Type	Number Present
Mid-channel	0
Point	1
Side	0
Diagonal	1
Delta	0
Island	0

There has been no historic straightening or channel alterations within this segment of Reach 1. Given that the brook through this segment flows through a bedrock gorge, indicating channel integrity on time scales of concern, no cross-sections were collected.

Stream Channel Condition
This segment of the stream was not assigned a sensitivity score, given that it flows through a bedrock gorge, with no mapped bank erosion and no flow modifiers.

Segment E: 1256 feet

Valley and River Corridor
The average measured width of the valley that contains Redwater Brook though this reach is 592 feet, which is considered to be very broad and has good floodplain access. As can be seen in the figure to the right, about 39% of the segment length (490 feet) has been historically straightened. Corridor encroachments on the east bank include a berm, extending 63 feet in length and 7 feet in height as well as development, which extends 479 feet in length adjacent to the brook. The east side of the bank is flat with 0-3%

grades. The west bank also has development adjacent to the brook, extending 243 feet in length and is slightly steeper than the east bank with 4-8% grades.

Stream Channel
Based on a cross-section collected at a location that is representative of the segment overall, the channel is 78 feet, with a maximum bankfull depth is 2.8 feet. The mean bankfull depth (from each point on the cross-section) is 1.06 feet. The floodprone width, which is the width of the active floodplain at the floodplain elevation, is 175 feet. The reach contains riffles, that are spaced an average of 90 feet apart.

With the representative cross-section information, this reach types out as a C4 stream. Typically, C4 streams have gravel beds (this reach has a bed dominated by gravel, based on the pebble count) with riffles, and that meanders through a mature floodplain. Streambanks in this segment are typically composed of non-cohesive material (boulder, cobble, sand). Consequently, these streams are often susceptible to increased bank erosion, which is present in the reach, as discussed in the next section.

Riparian banks, Buffers and Corridors
Bank slopes in the reach are typically steep, and the channel canopy is open, meaning that the stream is not extensively shaded by trees adjoining the channel. Streambanks are comprised of a non-cohesive and unconsolidated sand mixture on both sides of the channel. Total length of bank erosion observed on the east bank is 408 feet with average heights of 3.5 feet. Erosion on the west bank is 125 feet in length and 3 feet in height. Streambank revetment has been installed on both the east bank (286 feet in length) and west banks (82 feet in length).

The buffer to the east of the stream is less than 25 feet and is a "residential" riparian corridor with some herbaceous vegetation, with deciduous vegetation present, though less dominant. Near bank vegetation is predominately comprised of invasive species on both sides of the channel. The west bank has a buffer greater than 100 feet in width, with deciduous forest dominating, though some residences are present within the corridor.

Flow Modifiers
There is 1 overland flow stormwater input in this segment. Springs, seeps and/or tributaries are abundant. There are no flow regulation impacts, debris jams or beaver dams.

Channel Bed and Planform Changes
This segment of Reach 1 falls into the "riffle-pool" bedform category. The following are the number of bars (depositional features) recorded in the reach:

Bar Type	Number Present
Mid-channel	1
Point	3
Side	5
Diagonal	0
Delta	0

Island	0

The presence of multiple sediment bars increases this segment's sensitivity scores. A total of 488 feet, or 39%, of this segment is identified as having been straightened in the past. There are a total of 3 flood chutes and 3 steep riffles present in this segment, which also increase the reach's sensitivity.

Stream Crossing

There is a 20 foot concrete bridge with abutments crossing the reach at Thrasher Rd. At the time of assessment, there was no upstream or downstream bank erosion and the armoring on both sides of the bridge was intact. There is no evidence of sediment accumulation on either side the bridge.

Stream Channel Condition

Segment E was given a score based on the data collected on the current channel condition. The condition of segment was considered to be Fair, (the second lowest of a four condition scale). Factors that contributed to the condition rating for the segment included the presence of channel straightening, erosion and flood chutes. This segment has multiple deposition features (sediment accumulation), with multiple diagonal bars and steep riffles present. Additionally, the segment is undergoing adjustment (as evidenced by the presence of the flood chutes and bars) as the river tries to regain sinuosity (meanders) in response to its historic straightening. The condition score was combined with the stream type, and translated into a sensitivity score of the reach. The score results placed this segment into the Very High sensitivity category (the second most sensitive of six categories of stream sensitivity).

Summary of Geomorphological Information
Grandy Brook, Claremont
Reach 1; Segments A, B, C
March, 2015

This document provides a narrative summary of the river geomorphology data that was collected on Grandy Brook, identified Reach 1, segments A through C, within the Town of Claremont, New Hampshire. Reach 1 of Grandy Brook extends for a length of 2703 feet from the confluence with the Sugar River (approximately 375 ft. south of Washington St/Route 103) to approximately 150 feet north of Veteran's Park Rd. This reach is divided into 3 segments, A through C shown here. Grandy Brook, Reach 1 was surveyed by personnel from Bear Creek Environmental, under contract to VHB, Inc. on September 10 and 14, 2013. For more detailed descriptions of the fluvial geomorphic terms, please see the attached document: Descriptions of Fluvial Geomorphology Data.

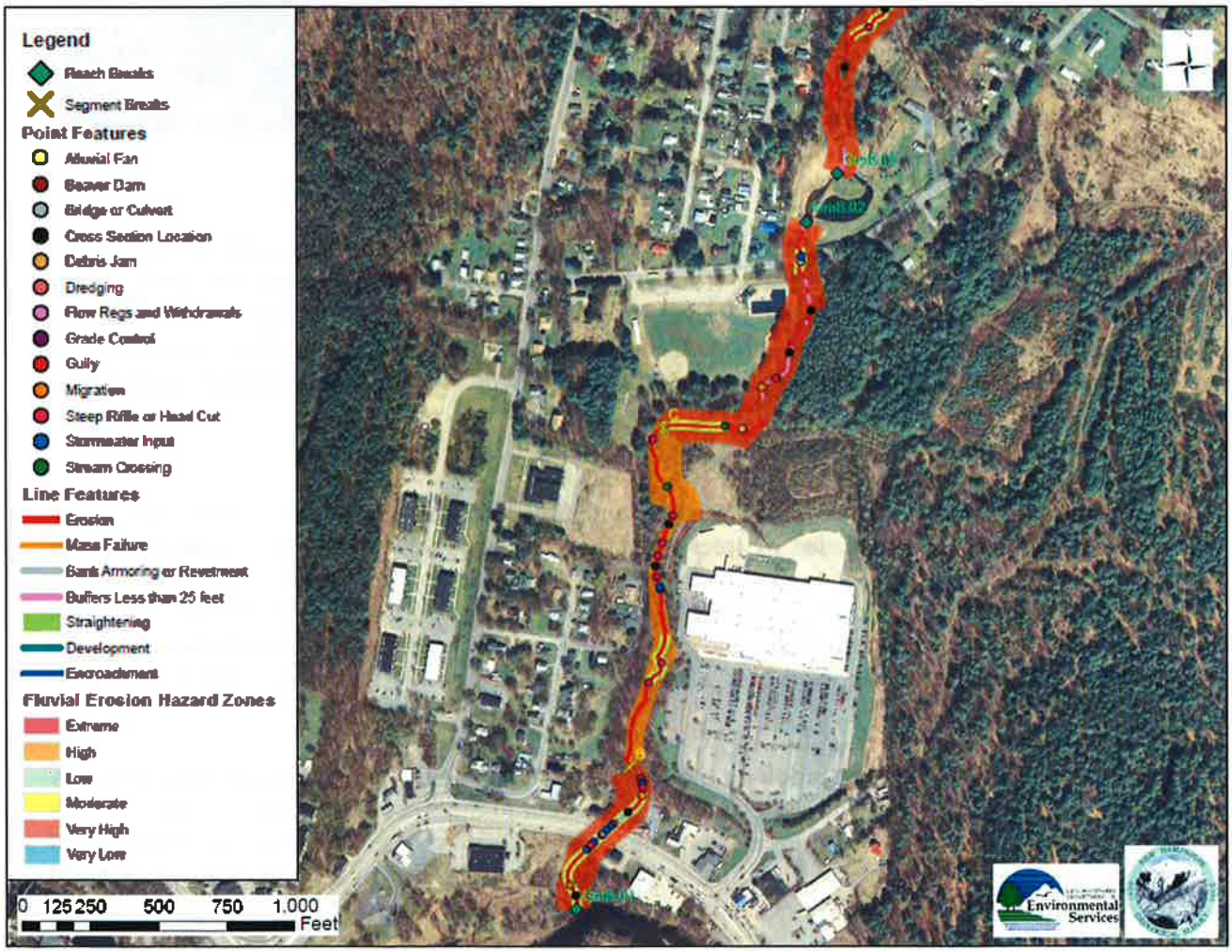
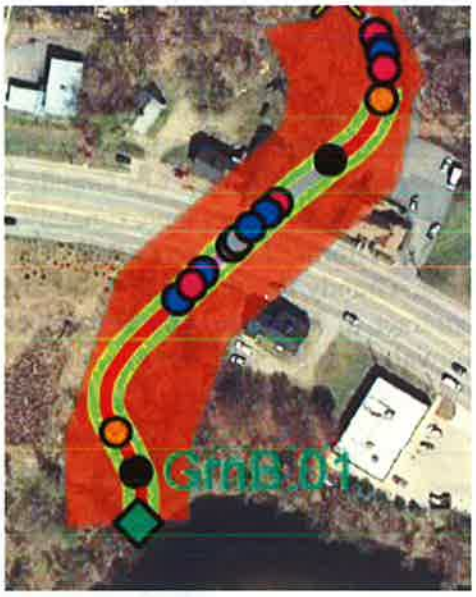


Figure 1 Reach 1 of Grandy Brook, including segments A, B and C, Claremont, NH.

Segment A: 671 feet

Valley and River Corridor

The average measured width of the valley that contains Grandy Brook though this reach is 448 feet and is considered to be very broad. As can be seen in the figure to the right, the channel has been historically straightened and is attempting to regain sinuosity. Development, extending 95 feet, is encroaching upon the east bank of the river. Development on the west bank extends for 162 feet in this segment. Land adjacent to the channel is hilly with slopes ranging from 4-8%.



Stream Channel

Based on a cross-section collected at a location that is representative of the reach overall, the channel width is 21 feet, with a maximum bankfull depth of 3.05 feet. The mean bankfull depth is 2.28 feet. The floodprone width, which is the width of the active floodplain is 160 feet. This segment contains four steep riffles, that are spaced an average of 100 feet apart.

With the representative cross-section information, this reach types out as a C4 stream in the Rosgen Stream Classification system (Rosgen, 1996). Typically, C4 streams have gravel beds (this reach has a bed dominated by gravel, based on the pebble count) with riffles, and that meanders through a mature floodplain. Consequently, these streams are often susceptible to increased bank erosion, which is present in some areas of the reach, as discussed in the next section.

Riparian banks, Buffers and Corridors

Bank slopes in Segment A are typically steep, and the channel canopy is open, meaning that the stream is not extensively shaded by trees adjoining the channel. Streambanks are comprised of non-cohesive materials, such as sand and gravel on both sides of the channel. On the east bank, the total length of bank erosion observed is 374 feet with average heights of 3.5 feet. The west bank has 313 feet of erosion, with an average of 2.5 feet in height. Field notes indicate that rip rap and hard-bank armoring have been installed, which extend 391 feet on the east bank and 95 feet on the west bank.

Buffer widths adjacent to the brook on the east bank are generally 26-50 feet and predominantly consist of shrubs, saplings and invasives. Land adjacent to the west bank has more than 100 feet of buffer, also consisting of shrubs and saplings. The vegetation near both banks is comprised of shrubs, saplings and invasives. The riparian corridor on both sides of the channel is dominated by residential development.

Flow Modifiers
There are several flow modifiers in Segment A. There is one road ditch and four urban stormwater inputs. At the time of the assessment, there was one debris jam. There are a minimal amount of springs, seeps, and tributaries and wetlands that affect flow. There is a dam upstream, in Reach 2.

Channel Bed and Planform Changes
There are two flood chutes within Segment A. The presence of multiple sediment bars increases this segment's sensitivity scores. The following are the number of bars (depositional features) recorded in the reach:

Bar Type	Number Present
Mid-channel	3
Point	0
Side	4
Diagonal	1
Delta	1
Island	0

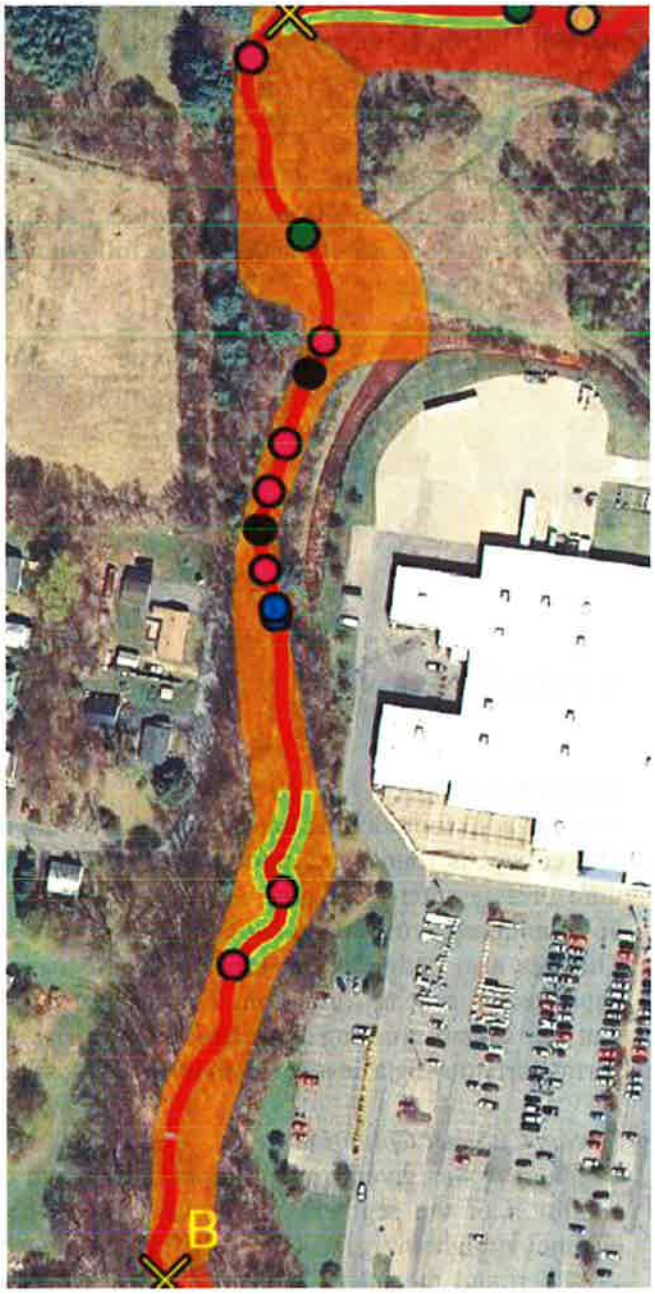
A total of 557 feet, or 83%, of Segment A is identified as having been straightened in the past.

Stream Crossing
There is a 90 foot, double barrel culvert crossing under Washington St, next to Coldwell Banker. The culvert is round and made out of concrete headwalls with corrugated steel barrels. At the time of assessment, the upstream and downstream bank armoring was intact. There is "High" upstream bank erosion and evidence of aggradation (sediment accumulation) in the mid-channel. There is also "High" bank erosion downstream of the culvert, in which sediments are being deposited in a delta formation. This culvert is considered to be "fully incompatible," meaning that the stream crossing is at an increased risk of being unable to adequately pass river flow, particularly during a severe storm event. Redesign and replacement are recommended.

Stream Channel Condition
Segment A was given a score based on the data collected on the current channel condition. The condition of the segment was considered to be Fair. This was mostly due to the extensive channel straightening which caused historic deepening of the channel. The channel is beginning to widen and meander. There is significant deposition present where the valley has widened. There is also significant deposition at the Washington St. culvert, which is identified to be fully incompatible. There is high bank erosion throughout the segment, as evidenced by the island and the steep riffles. The condition score was combined with the stream type (C4), and translated into a sensitivity score of the reach. The score results placed this segment into the Very High sensitivity category (the second most sensitive of six categories of stream sensitivity).

Segment B: 1375 feet

Valley and River Corridor
The average measured width of the valley that contains Grandy Brook though this reach is 80 feet and is considered to be semi-confined. As can be seen in the figure to the right, a subset of the reach has been historically straightened and is attempting to regain sinuosity. Development, extending 712 feet, is encroaching upon the east bank of the river. Walmart's perimeter road is also encroaching upon the east bank, extending 199 feet. Development adjacent to the west bank extends for 149 feet in this segment. Land adjacent to the river is very steep with grades ranging from 16-25% on the both sides of the channel. There is exposed glacial till on the bed and valley walls.



Stream Channel
Based on a cross-section collected at a location that is representative of the reach overall, the channel width is 16 feet, with a maximum bankfull depth is 2.9 feet. The mean bankfull depth is 1.95 feet. The floodprone width is 23 feet. The riffles and steps in this segment are eroded and are generally spaced an average of 150 feet apart.

With the representative cross-section information, this reach types out as a B4 stream in the Rosgen Stream Classification system (Rosgen, 1996). B4 streams have gravel beds (this reach has a bed dominated by gravel, based on the pebble count) with step-pool and/or plane-bed and/or pool-riffle bedforms. Typically, A B4 stream is not susceptible to erosion but this segment is an exception because of historic activity in and near the channel, potentially combined with the presence of the dam upstream, at the start of Reach 2.

Riparian banks, Buffers and Corridors

Bank slopes in Segment B are typically steep, and the channel canopy is open. The east streambank is comprised of silt and clay, overlain by sand. The west bank is entirely comprised of silt. On the east bank, the total length of bank erosion is 1133 feet with an average height of 4.5 feet. The west bank has a total of 985 feet of erosion, with an average height of 3.5 feet. There are also multiple mass failures which indicate that the channel is widening. Additional riprap extends 229 feet on the east bank, with none on the west bank.

Figure 2 This picture shows an example of a mass failure in Segment B of Reach 1 of Grandy Brook in Claremont NH.

Buffer widths on both banks are generally 26-50 feet and predominantly consist of invasives and other herbaceous vegetation cover. The vegetation near the bank is comprised of invasives, with some shrubs and saplings. In some areas, there is no vegetation. The east riparian corridor is dominated by commercial and industrial development. The west riparian corridor is dominated by residential development.

Flow Modifiers

There is one urban stormwater input within this segment. There are a minimal amount of springs, seeps, and tributaries, with no adjacent wetlands or beaver dams. There is a dam upstream, in Reach 2.

Channel Bed and Planform Changes
Field notes indicate that this segment of the reach has a "plane" bedform, meaning that it has no distinct sequence of bed feature. There are no flood chutes within Segment B. The presence of multiple sediment bars increases this segment's sensitivity scores. The following are the number of bars (depositional features) recorded in the reach:

Bar Type	Number Present
Mid-channel	3
Point	1
Side	12
Diagonal	3
Delta	0
Island	1

In addition to the many depositional features, there are also three steep riffles and four head cuts in this segment of the reach. A total of 204 feet, or 15%, of the segment is identified as having been straightened in the past.

Stream Channel Condition
Segment B was given a score based on the data collected on the current channel condition. The condition of the segment was considered to be Fair, (the second lowest of a four condition scale). Other factors that contributed to the condition rating for the segment included the presence of channel straightening and road encroachment. This segment has multiple deposition features (sediment accumulation), with multiple diagonal and side bars and steep riffles present. The sensitivity score of the reach was calculated as Very High but field notes indicate that the sensitivity could be increased to Extreme due to the extensive erosion, mass failures, and active head cuts.

Segment C: 1253 feet

Valley and River Corridor
The average measured width of the valley that contains Grandy Brook though this reach is 795 feet and is considered to be very broad. As can be seen in the picture to the right, the channel has been historically straightened and is attempting to regain sinuosity. Development, extending 348 feet is encroaching upon the east bank of the river. Land adjacent to the east side of the river has slopes that range from 16-25% and are considered to be very steep. The land adjacent to the west has more gentle slopes and range from 9-15%. There is no development adjacent to the west bank.

Stream Channel
Based on a cross-section collected at a location that is representative of the reach overall, the channel width is 26 feet, with a maximum bankfull depth of 2 feet. The mean bankfull depth is 1.25 feet. The floodprone width is 88.5 feet. This segment contains four steep riffles, that are spaced an average of 112 feet apart.

With the representative cross-section information, this reach types out as a C4 stream in the Rosgen Stream Classification system (Rosgen, 1996). C4 streams are often susceptible to increased bank erosion, which is present in the reach, as discussed in the next section.

Riparian banks, Buffers and Corridors
Bank slopes in Segment C are steep, and the channel canopy is open. Streambanks are comprised of non-cohesive materials, such as sand and gravel on both sides of the channel. On the east bank, the total length of bank erosion observed is 584 feet with average heights of 2 feet. There is approximately 43 feet of hard bank armoring on the east bank. The west bank has 420 feet of erosion, which are 2 feet in height. The west bank also has 61 feet of bank armoring.

Figure 3 This picture shows the hard bank armoring that is present in Segment C of Reach 1 of Grandy Brook, Claremont, NH.

Buffer widths adjacent to the east bank are generally more than 100 feet in width and predominantly consist of mixed trees, shrubs and saplings. The buffer width adjacent to the west bank is 26-50 feet and consists of mixed and herbaceous vegetation. The riparian corridor adjacent to the east bank is dominated by forest and secondarily by residential development. The

riparian corridor adjacent to the west bank is dominated by residential development and secondarily by forest. The near bank vegetation on the east bank consists of coniferous and deciduous vegetation with a forest riparian corridor. Vegetation near the west bank is dominated by deciduous, shrubs and saplings.

Flow Modifiers
There is one stormwater input, which is located adjacent to Veteran's Park Rd. There is a minimal amount of springs, seeps, and tributaries and no beaver dams. At the time of the assessment, there was one debris jam. There are minimal wetlands present. There is a dam upstream, in Reach 2.

Channel Bed and Planform Changes
There is one flood chute within Segment C. The presence of multiple sediment bars increases this segment's sensitivity scores. The following are the number of bars (depositional features) recorded in the reach:

Bar Type	Number Present
Mid-channel	2
Point	3
Side	12
Diagonal	2
Delta	1
Island	1

A total of 320 feet, or 26%, of the segment is identified as having been straightened in the past. This straightened section has a plane bedform and large bars. The upstream section of this segment is becoming entrenched.

Stream Crossing
There is a 45 foot concrete, box culvert crossing under Veteran's Park Rd, just below the dam and adjacent to the Veteran's Park. At the time of assessment, both the upstream and downstream bank armoring was failing. There is "Low" upstream bank erosion and evidence of aggradation (sediment accumulation) along the side of the channel. There is "High" bank erosion downstream of the culvert, in which sediments are being deposited along the side of the channel.

Stream Channel Condition
Segment C was given a score based on the data collected on the current channel condition. The condition of segment was considered to be Fair. This was mostly due to the major historic degradation. The channel appears to be filled with sediment downstream of the pool at Veteran's Park. Sediment accumulations have also created a flood chute. There is high bank erosion throughout the segment, as evidenced by the island and the steep riffles. This is especially evident below the dam. The condition score was combined with the stream type (C4), and translated into a sensitivity score of the reach. The score results placed this segment into the Very High sensitivity category (the second most sensitive of six categories of stream sensitivity).

Results continued,

The segment in the main branch of the Sugar River that was assessed begins approximately 1,000 feet west of the intersection of Unity Road and Sugar River Drive and runs east about 1.3 miles, continuing adjacent to Sugar River Drive. This reach was broken into two segments with the wester segment being given a Fluvial Erosion Hazard (FEH) Zone sensitivity rating of "very high" and the eastern portion being rated "high". In the "very high" section, a migrating flood chute was noted in three located. A head cut was also noted as impact at the boundary of where the segment rating changes to "high". The segment rated as high also saw a migrating flood chute as a contributing impact in four spots along the reach, additionally, storm water input from a roadside ditch and a field ditch created impacts to the river.

Mitigation Actions

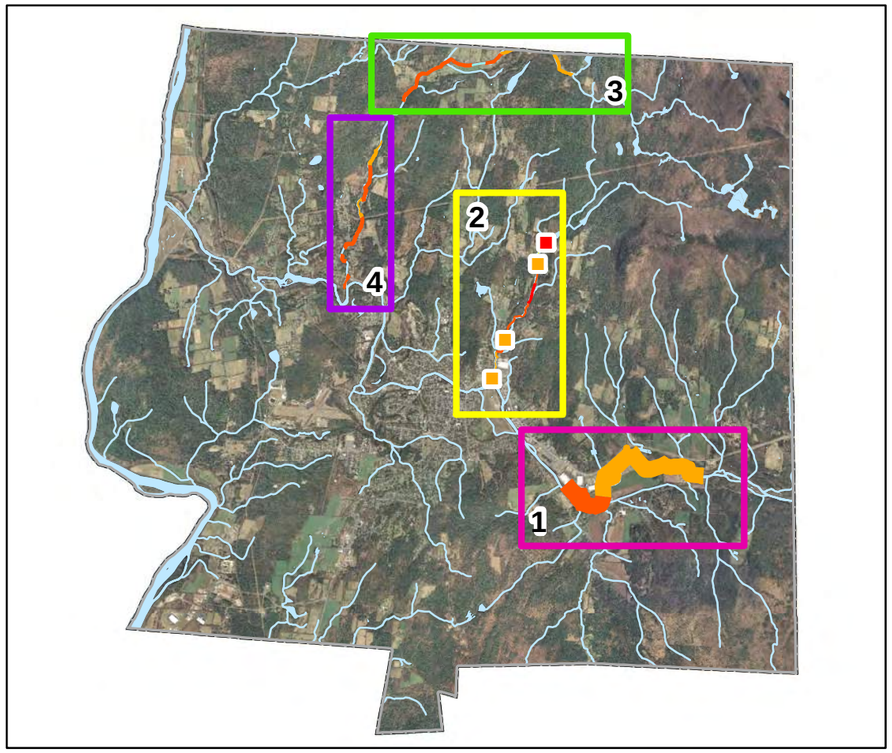
The City of Claremont felt that the most pressing mitigation action that needed to be taken from the results of this study was the upsizing of the culvert beneath Washington Street at the outflow of Grandy Brook into the Sugar River. Though this culvert is under a state road, the city is concerned that the undersized culvert could create substantial damage to the infrastructure should it fail during a storm event. Failure of the culvert that caused the road to be closed would cut off downtown Claremont to the main retail corridor and also severely impact east west travel on NH Route 11, which is the primary trucking/commercial route in the region. The City would like to replace the 90 foot twin culverts with a single span culvert of appropriate size to accommodate the flows on the brook.

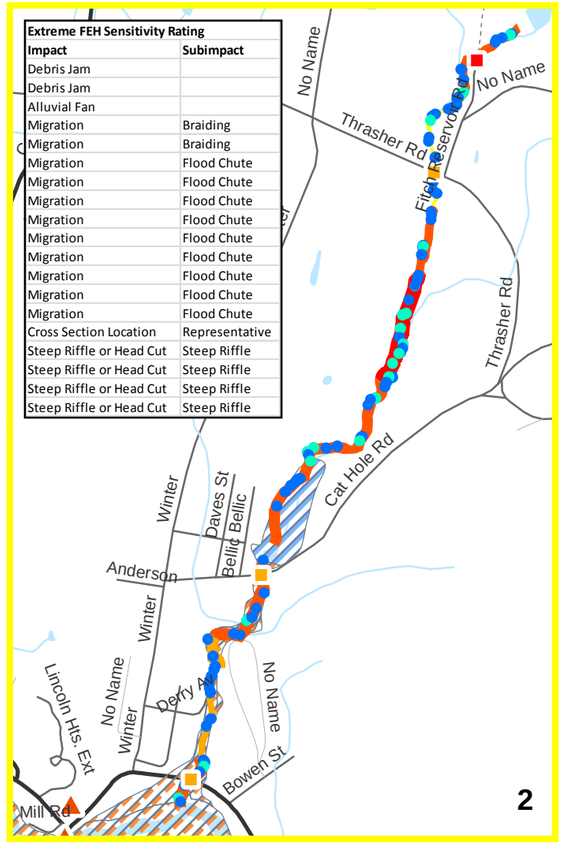
Rank	Strategy Improvement	Reduce Damage	Community Objectives	Existing Regulations	Quickly Implemented	Socially Acceptable	Technically Feasible	Administration Possible	Benefit - Cost	TOTAL SCORE	Mitigate Existing or New Development or Both
1	**Washington Street/Grandy Brook Culvert:** Replace the current undersized twin culvert with upgraded single span culvert with increased capacity.	3	3	3	2	2	3	3	2	21	New

Rank	Evaluation Score	Problem Statement	Mitigation Action	Responsible Party	Timeframe	Potential Funding Source	Anticipated Cost
1	21	The currently undersized culvert can not accommodate the capacity of water that it needs to and	**Washington Street/Grandy Brook Culvert:** Replace the current undersized twin culvert with upgraded single span culvert	Claremont DPW & NH DES	Long Term	HMGP/PDM	$100,000

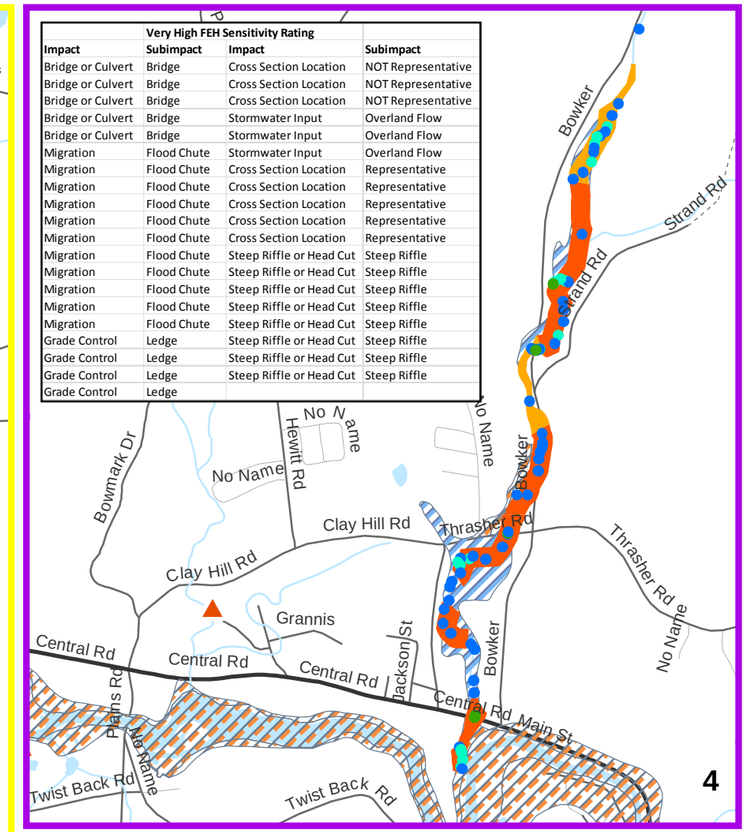
Rank	Evaluation Score	Problem Statement	Mitigation Action	Responsible Party	Timeframe	Potential Funding Source	Anticipated Cost
		is causing significant erosion and impacting the stream health and is a danger to infrastructure.	with increased capacity.				

Fluvial Geomorphic Study - City of Claremont, Sugar River Watershed (HUC 10)





Extreme FEH Sensitivity Rating	
Impact	Subimpact
Debris Jam	
Debris Jam	
Alluvial Fan	
Migration	Braiding
Migration	Braiding
Migration	Flood Chute
Migration	Flood Chute
Migration	Flood Chute
Migration	Flood Chute
Migration	Flood Chute
Migration	Flood Chute
Migration	Flood Chute
Migration	Flood Chute
Migration	Flood Chute
Cross Section Location	Representative
Steep Riffle or Head Cut	Steep Riffle
Steep Riffle or Head Cut	Steep Riffle
Steep Riffle or Head Cut	Steep Riffle
Steep Riffle or Head Cut	Steep Riffle



Very High FEH Sensitivity Rating			
Impact	Subimpact	Impact	Subimpact
Bridge or Culvert	Bridge	Cross Section Location	NOT Representative
Bridge or Culvert	Bridge	Cross Section Location	NOT Representative
Bridge or Culvert	Bridge	Cross Section Location	NOT Representative
Bridge or Culvert	Bridge	Stormwater Input	Overland Flow
Bridge or Culvert	Bridge	Stormwater Input	Overland Flow
Migration	Flood Chute	Stormwater Input	Overland Flow
Migration	Flood Chute	Cross Section Location	Representative
Migration	Flood Chute	Cross Section Location	Representative
Migration	Flood Chute	Cross Section Location	Representative
Migration	Flood Chute	Cross Section Location	Representative
Migration	Flood Chute	Cross Section Location	Representative
Migration	Flood Chute	Steep Riffle or Head Cut	Steep Riffle
Migration	Flood Chute	Steep Riffle or Head Cut	Steep Riffle
Migration	Flood Chute	Steep Riffle or Head Cut	Steep Riffle
Migration	Flood Chute	Steep Riffle or Head Cut	Steep Riffle
Migration	Flood Chute	Steep Riffle or Head Cut	Steep Riffle
Grade Control	Ledge	Steep Riffle or Head Cut	Steep Riffle
Grade Control	Ledge	Steep Riffle or Head Cut	Steep Riffle
Grade Control	Ledge	Steep Riffle or Head Cut	Steep Riffle
Grade Control	Ledge		

Map Features

- Critical Facilities
- Data Collection Sites

Subimpact

- Bridge
- Culvert
- Migration

FEMA 100 Year Flood Zone

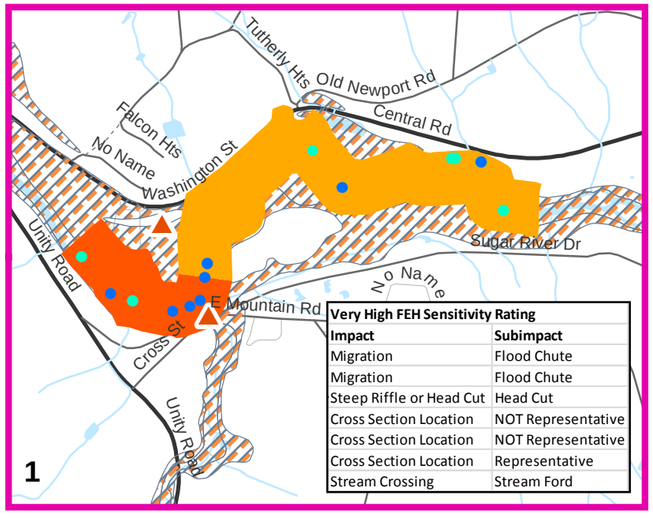
- 100-Yr Flood - A
- 100-Yr Flood - AE

FEH Sensitivity Rating

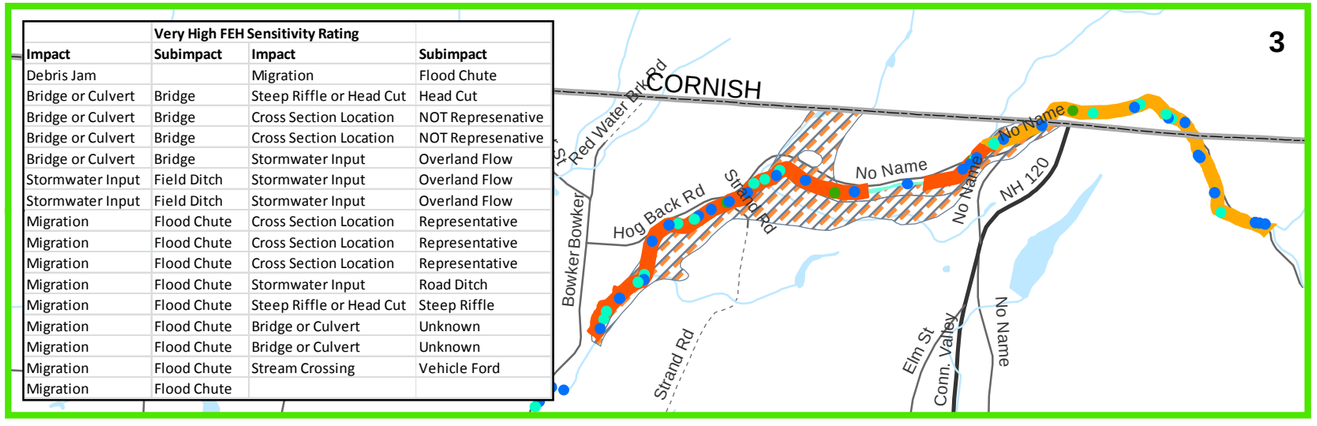
- Extreme
- Very High
- High
- Moderate
- Very Low

Geomorphic Compatability

- Fully Incompatible
- Mostly Incompatible
- Mostly Compatible
- Partially Compatible



Very High FEH Sensitivity Rating	
Impact	Subimpact
Migration	Flood Chute
Migration	Flood Chute
Steep Riffle or Head Cut	Head Cut
Cross Section Location	NOT Representative
Cross Section Location	NOT Representative
Cross Section Location	Representative
Stream Crossing	Stream Ford



Very High FEH Sensitivity Rating			
Impact	Subimpact	Impact	Subimpact
Debris Jam		Migration	Flood Chute
Bridge or Culvert	Bridge	Steep Riffle or Head Cut	Head Cut
Bridge or Culvert	Bridge	Cross Section Location	NOT Represenative
Bridge or Culvert	Bridge	Cross Section Location	NOT Represenative
Bridge or Culvert	Bridge	Stormwater Input	Overland Flow
Stormwater Input	Field Ditch	Stormwater Input	Overland Flow
Stormwater Input	Field Ditch	Stormwater Input	Overland Flow
Migration	Flood Chute	Cross Section Location	Representative
Migration	Flood Chute	Cross Section Location	Representative
Migration	Flood Chute	Cross Section Location	Representative
Migration	Flood Chute	Stormwater Input	Road Ditch
Migration	Flood Chute	Steep Riffle or Head Cut	Steep Riffle
Migration	Flood Chute	Bridge or Culvert	Unknown
Migration	Flood Chute	Bridge or Culvert	Unknown
Migration	Flood Chute	Stream Crossing	Vehicle Ford
Migration	Flood Chute		

N W E S

Data Sources: Data drawn from info provided by the NH DES as results from the Sugar River Watershed fluvial geomorphic study. Other data was provided by: NH GRANIT, the state's GIS clearinghouse, and represents the best available data. Critical Facilities developed by UVLSRPC with the Hazard Mitigation Committe.

Data Source Disclaimer: Digital data in NH GRANIT represent the efforts of the contributing agencies to record information from the cited source materials. Complex Systems Research Center (CSRC), under contract to the Office of Energy and Planning (OEP), and in consultation with cooperating agencies, maintains a continuing program to identify and correct errors in these data. OEP, CSRC, and the cooperating agencies make no claim as to the validity or reliability or to any implied uses of these data.

Fluvial Erosion Hazard Zone Sensitivity Rating

This inforamtion is based on data collected for the Sugar River Watershed Area by the NH Geological Survey & the NH Department of Environmental Services. The Fluvial Erosion Hazard Zone (FEH), or meander belt, is provided for river reaches that have been assessed for this study. Sensitivity ratings are based on 6 categories of condition, ranging from Very Low to Extreme. Sensitivity is defined as the potential of a river to respond to flood events, through bank erosion and lateral migration (across the floodplain) processes.

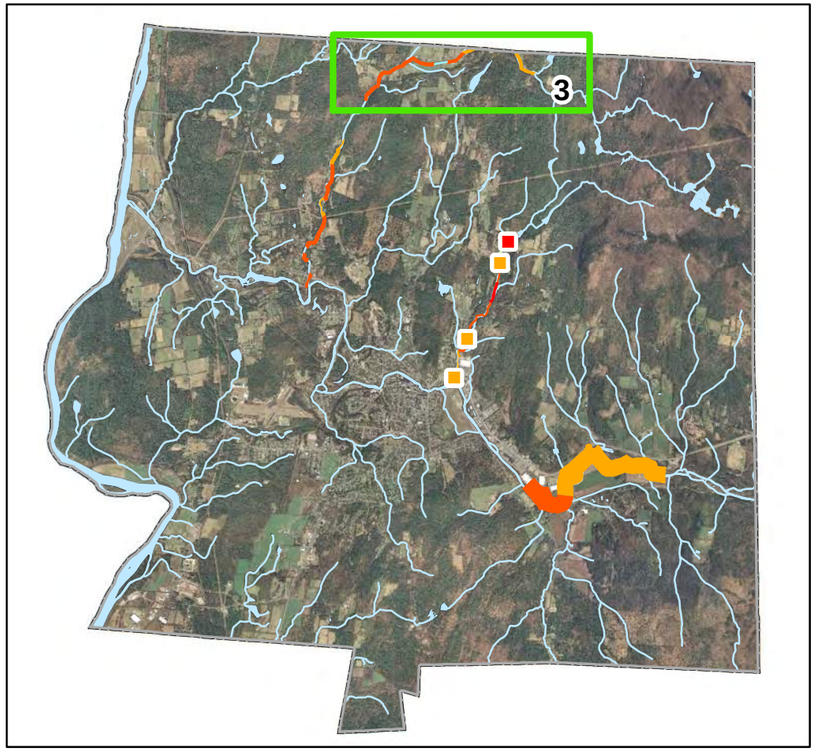
Culvert Compatability

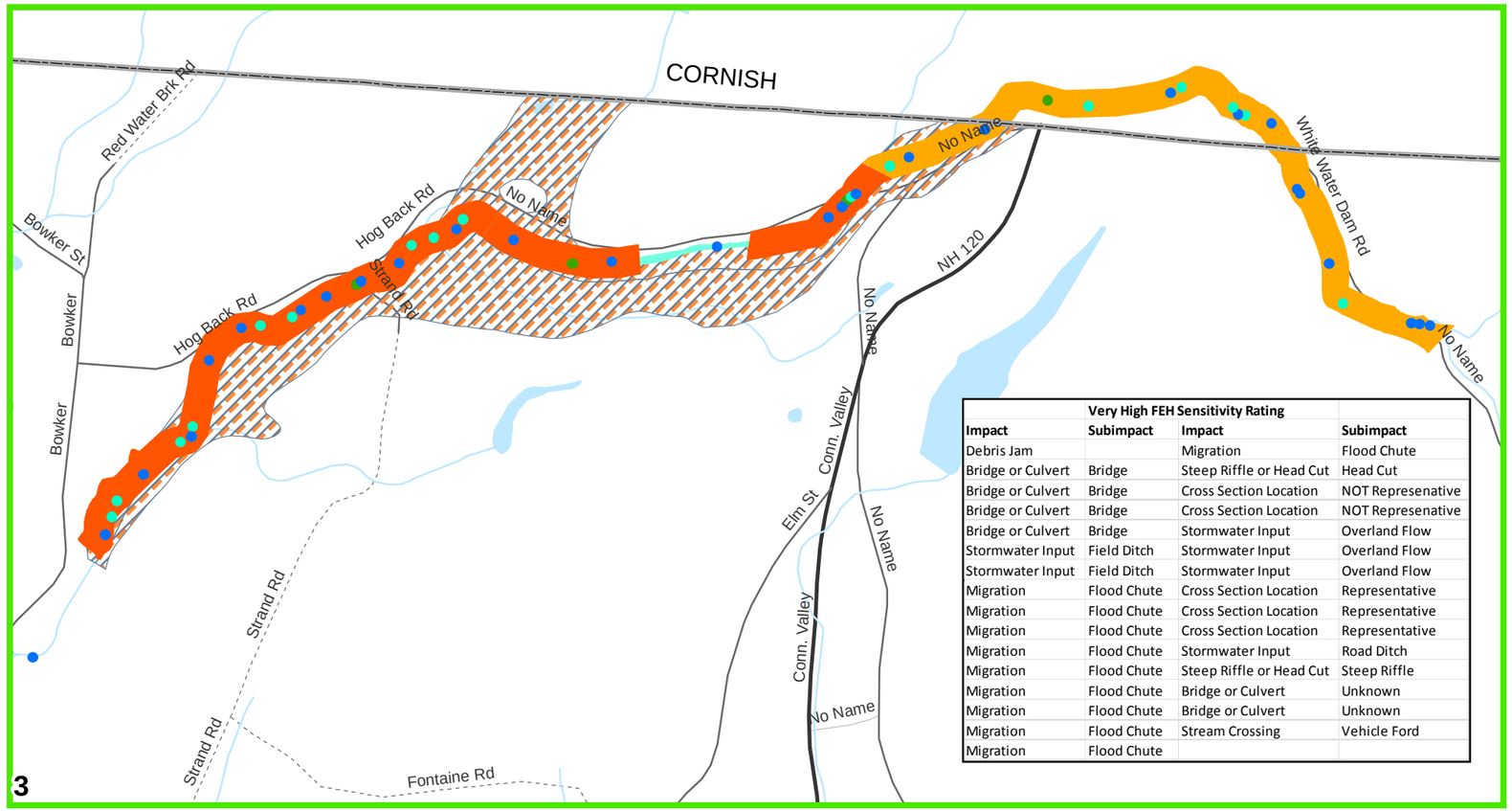
This data was rated and scored based on how the culvert will influence specific features that impact the compatability of a culvert with river/stream geomorphic processes, in general, the information provides guidance on what each rank tells us about the long-term compatability of a culvert with flow and sediment transport processes. The tables on each map indicate culvert data for the points in the selected area.

UVLSRPC NHDES

Map created by UVLSRPC January 2015.

Fluvial Geomorphic Study - City of Claremont, Sugar River Watershed (HUC 10) - Redwater Brook





	Very High FEH Sensitivity Rating		
Impact	**Subimpact**	**Impact**	**Subimpact**
Debris Jam		Migration	Flood Chute
Bridge or Culvert	Bridge	Steep Riffle or Head Cut	Head Cut
Bridge or Culvert	Bridge	Cross Section Location	NOT Represenative
Bridge or Culvert	Bridge	Cross Section Location	NOT Represenative
Bridge or Culvert	Bridge	Stormwater Input	Overland Flow
Stormwater Input	Field Ditch	Stormwater Input	Overland Flow
Stormwater Input	Field Ditch	Stormwater Input	Overland Flow
Migration	Flood Chute	Cross Section Location	Representative
Migration	Flood Chute	Cross Section Location	Representative
Migration	Flood Chute	Cross Section Location	Representative
Migration	Flood Chute	Stormwater Input	Road Ditch
Migration	Flood Chute	Steep Riffle or Head Cut	Steep Riffle
Migration	Flood Chute	Bridge or Culvert	Unknown
Migration	Flood Chute	Bridge or Culvert	Unknown
Migration	Flood Chute	Stream Crossing	Vehicle Ford
Migration	Flood Chute		

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Culvert Compatability
This data was rated and scored based on how the culvert will influence specific features that impact the compatability of a culvert with river/stream geomorphic processes, in general, the information provides guidance on what each rank tells us about the long-term compatability of a culvert with flow and sediment transport processes. The tables on each map indicate culvert data for the points in the selected area.

Fluvial Erosion Hazard Zone Sensitivity Rating
This inforamtion is based on data collected for the Sugar River Watershed Area by the NH Geological Survey & the NH Department of Environmental Services. The Fluvial Erosion Hazard Zone (FEH), or meander belt, is provided for river reaches that have been assessed for this study. Sensitivity ratings are based on 6 categories of condition, ranging from Very Low to Extreme. Sensitivity is defined as the potential of a river to respond to flood events, through bank erosion and lateral migration (across the floodplain) processes.

Map Features

- Critical Facilities
- Data Collection Sites

Subimpact

- Bridge
- Culvert
- Migration

FEMA 100 Year Flood Zone

- 100-Yr Flood - A
- 100-Yr Flood - AE

FEH Sensitivity Rating

- Extreme
- Very High
- High
- Moderate
- Very Low

Geomorphic Compatability

- Fully Incompatible
- Mostly Incompatible
- Mostly Compatible
- Partially Compatible

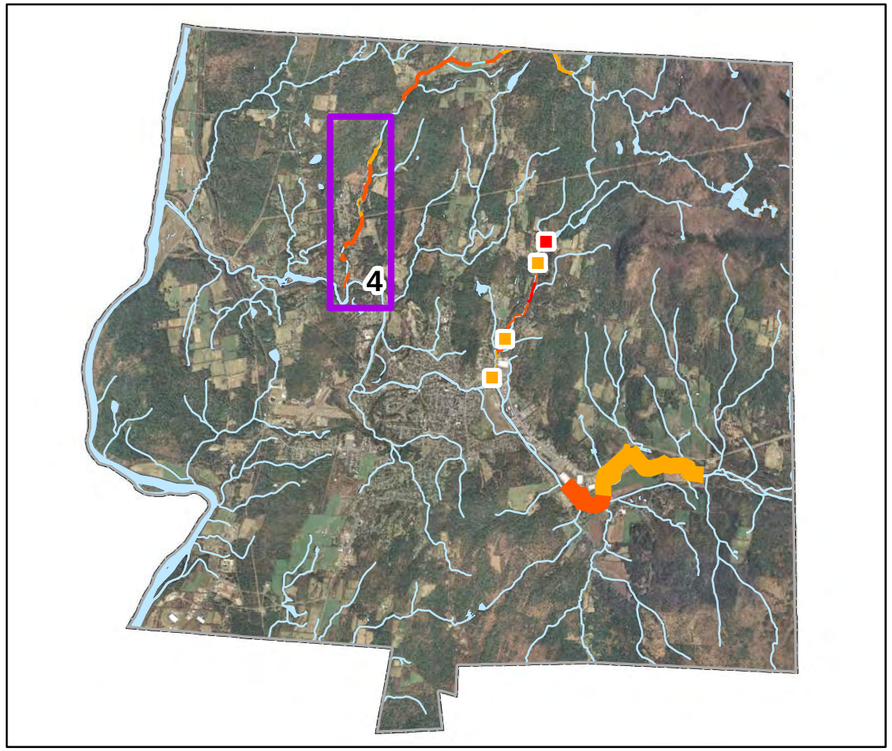
Data Sources: Data drawn from info provided by the NH DES as results from the Sugar River Watershed fluvial geomorphic study. Other data was provided by: NH GRANIT, the state's GIS clearinghouse, and represents the best available data. Critical Facilities developed by UVLSRPC with the Hazard Mitigation Committe.

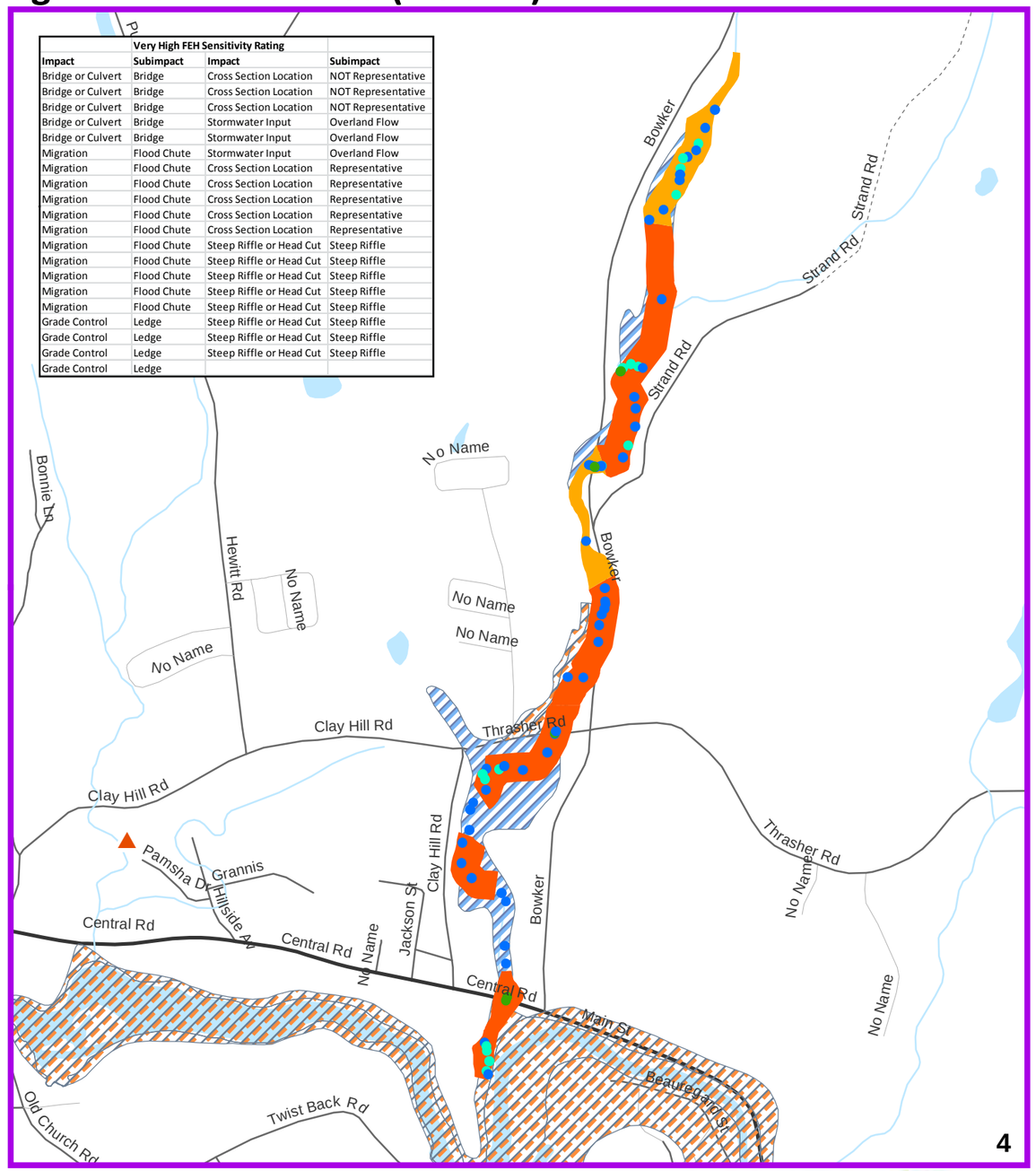
Data Source Disclaimer: Digital data in NH GRANIT represent the efforts of the contributing agencies to record information from the cited source materials. Complex Systems Research Center (CSRC), under contract to the Office of Energy and Planning (OEP), and in consultation with cooperating agencies, maintains a continuing program to identify and correct errors in these data. OEP, CSRC, and the cooperating agencies make no claim as to the validity or reliability or to any implied uses of these data.

UVLSRPC NHDES

Map created by UVLSRPC January 2015.

Fluvial Geomorphic Study - City of Claremont, Sugar River Watershed (HUC 10) - Redwater Brook





	Very High FEH Sensitivity Rating		
Impact	Subimpact	Impact	Subimpact
Bridge or Culvert	Bridge	Cross Section Location	NOT Representative
Bridge or Culvert	Bridge	Cross Section Location	NOT Representative
Bridge or Culvert	Bridge	Cross Section Location	NOT Representative
Bridge or Culvert	Bridge	Stormwater Input	Overland Flow
Bridge or Culvert	Bridge	Stormwater Input	Overland Flow
Migration	Flood Chute	Stormwater Input	Overland Flow
Migration	Flood Chute	Cross Section Location	Representative
Migration	Flood Chute	Cross Section Location	Representative
Migration	Flood Chute	Cross Section Location	Representative
Migration	Flood Chute	Cross Section Location	Representative
Migration	Flood Chute	Cross Section Location	Representative
Migration	Flood Chute	Steep Riffle or Head Cut	Steep Riffle
Migration	Flood Chute	Steep Riffle or Head Cut	Steep Riffle
Migration	Flood Chute	Steep Riffle or Head Cut	Steep Riffle
Migration	Flood Chute	Steep Riffle or Head Cut	Steep Riffle
Migration	Flood Chute	Steep Riffle or Head Cut	Steep Riffle
Grade Control	Ledge	Steep Riffle or Head Cut	Steep Riffle
Grade Control	Ledge	Steep Riffle or Head Cut	Steep Riffle
Grade Control	Ledge	Steep Riffle or Head Cut	Steep Riffle
Grade Control	Ledge		

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Culvert Compatability
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Fluvial Erosion Hazard Zone Sensitivity Rating
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Map created by UVLSRPC January 2015.

Map Features

- Critical Facilities
- Data Collection Sites

Subimpact

- Bridge
- Culvert
- Migration

FEMA 100 Year Flood Zones

- 100-Yr Flood - A
- 100-Yr Flood - AE

Geomorphic Compatability

- Fully Incompatible
- Mostly Incompatible
- Mostly Compatible
- Partially Compatible

FEH Sensitivity Rating

- Extreme
- Very High
- High
- Moderate
- Very Low

Data Sources: Data drawn from info provided by the NH DES as results from the Sugar River Watershed fluvial geomorphic study. Other data was provided by: NH GRANIT, the state's GIS clearinghouse, and represents the best available data. Critical Facilities developed by UVLSRPC with the Hazard Mitigation Committe.

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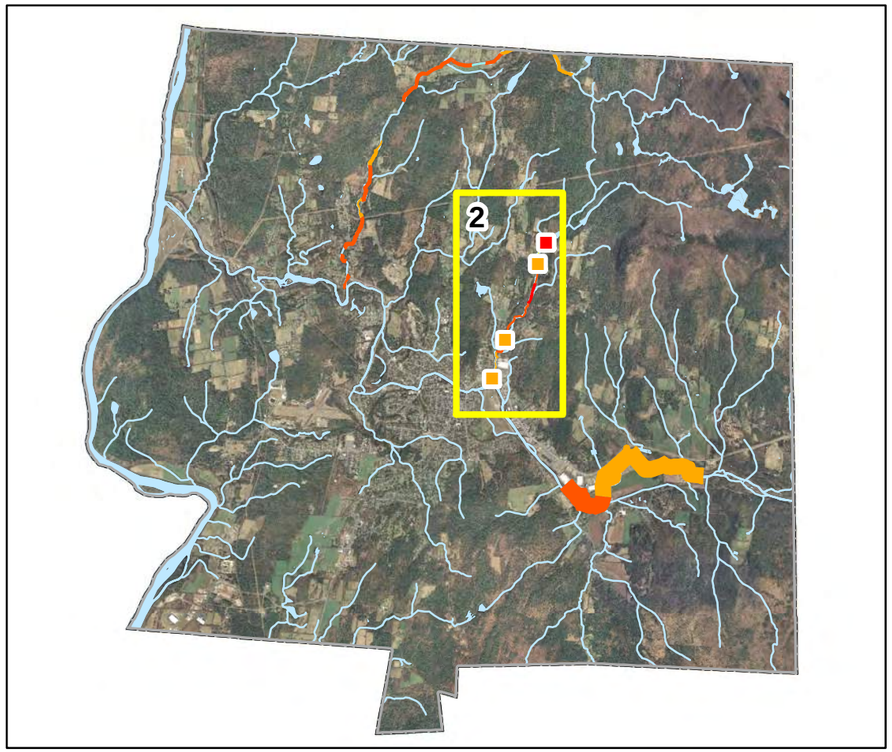
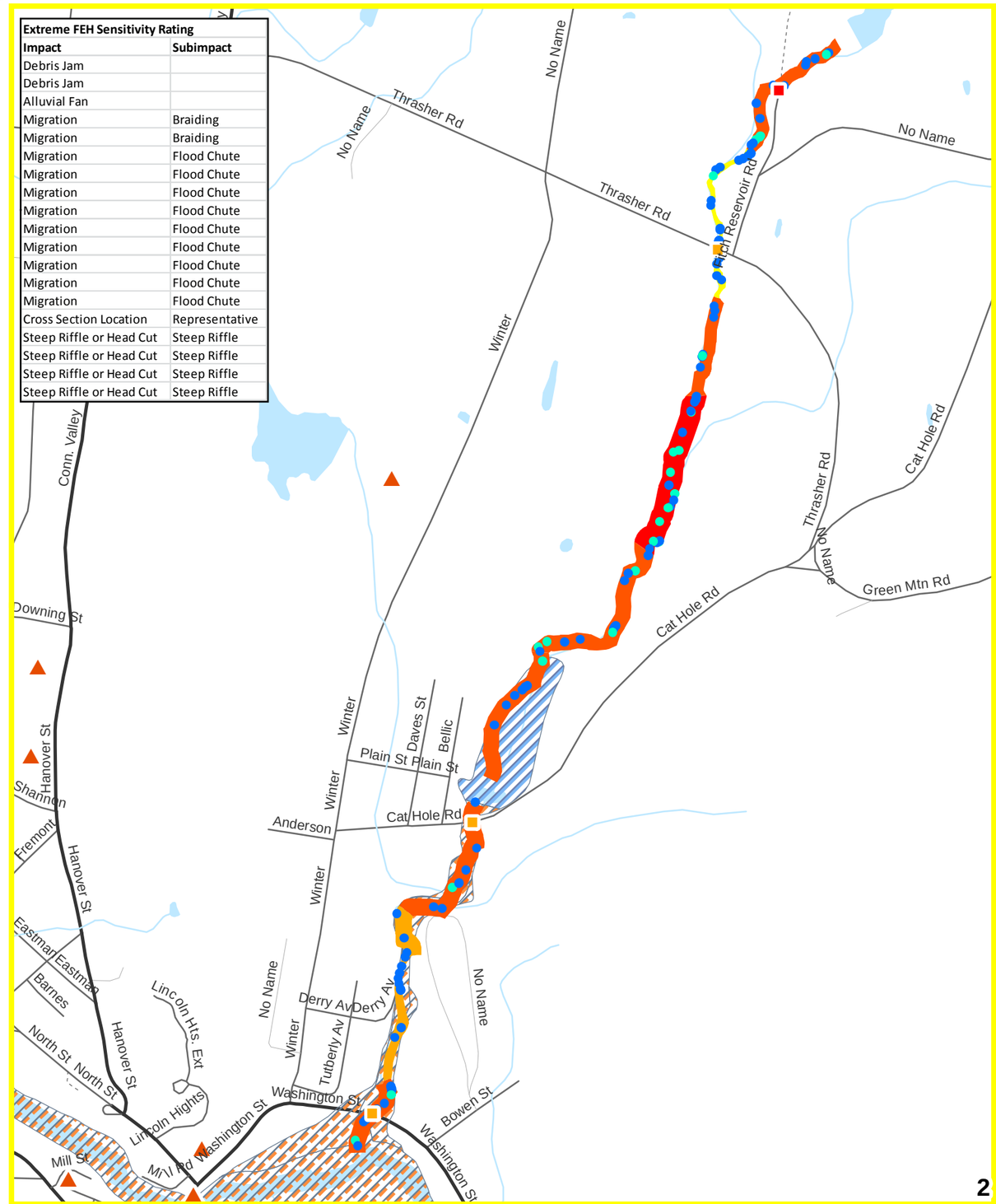
Fluvial Geomorphic Study - City of Claremont, Sugar River Watershed (HUC 10) - Grandy Brook



Extreme FEH Sensitivity Rating	
Impact	**Subimpact**
Debris Jam	
Debris Jam	
Alluvial Fan	
Migration	Braiding
Migration	Braiding
Migration	Flood Chute
Migration	Flood Chute
Migration	Flood Chute
Migration	Flood Chute
Migration	Flood Chute
Migration	Flood Chute
Migration	Flood Chute
Migration	Flood Chute
Migration	Flood Chute
Cross Section Location	Representative
Steep Riffle or Head Cut	Steep Riffle
Steep Riffle or Head Cut	Steep Riffle
Steep Riffle or Head Cut	Steep Riffle
Steep Riffle or Head Cut	Steep Riffle



Map Features

- Critical Facilities
- Data Collection Sites

Subimpact

- Bridge
- Culvert
- Migration

FEMA 100 Year Flood Zone

- 100-Yr Flood - A
- 100-Yr Flood - AE

FEH Sensitivity Rating

- Extreme
- Very High
- High
- Moderate
- Very Low

Geomorphic Compatability

- Fully Incompatible
- Mostly Incompatible
- Mostly Compatible
- Partially Compatible

Culvert Compatability
This data was rated and scored based on how the culvert will influence specific features that impact the compatability of a culvert with river/stream geomorphic processes, in general, the information provides guidance on what each rank tells us about the long-term compatability of a culvert with flow and sediment transport processes. The tables on each map indicate culvert data for the points in the selected area.

Fluvial Erosion Hazard Zone Sensitivity Rating
This inforamtion is based on data collected for the Sugar River Watershed Area by the NH Geological Survey & the NH Department of Environmental Services. The Fluvial Erosion Hazard Zone (FEH), or meander belt, is provided for river reaches that have been assessed for this study. Sensitivity ratings are based on 6 categories of condition, ranging from Very Low to Extreme. Sensitivity is defined as the potential of a river to respond to flood events, through bank erosion and lateral migration (across the floodplain) processes.

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UVLSRPC NHDES

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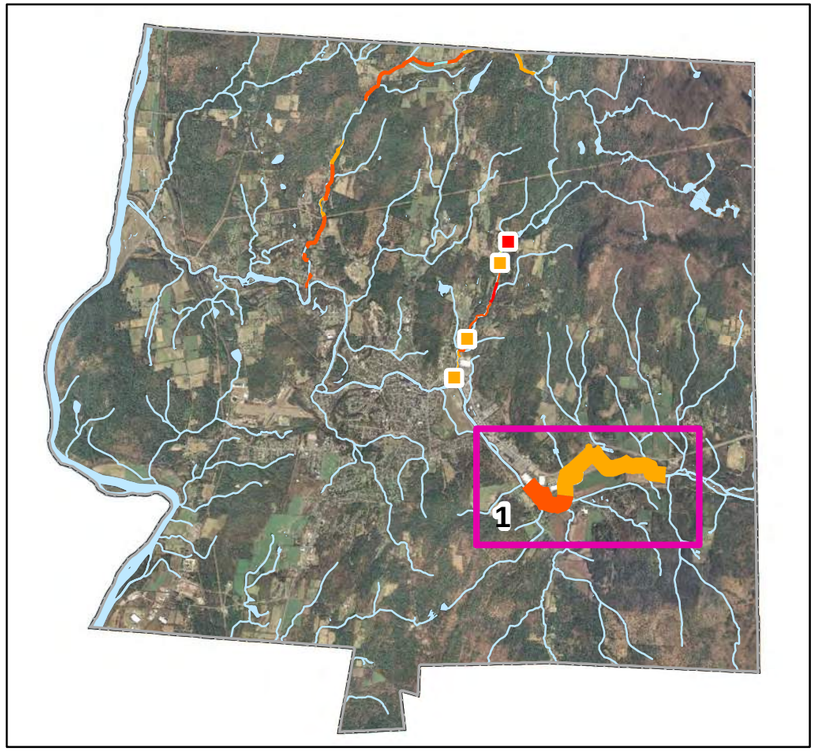
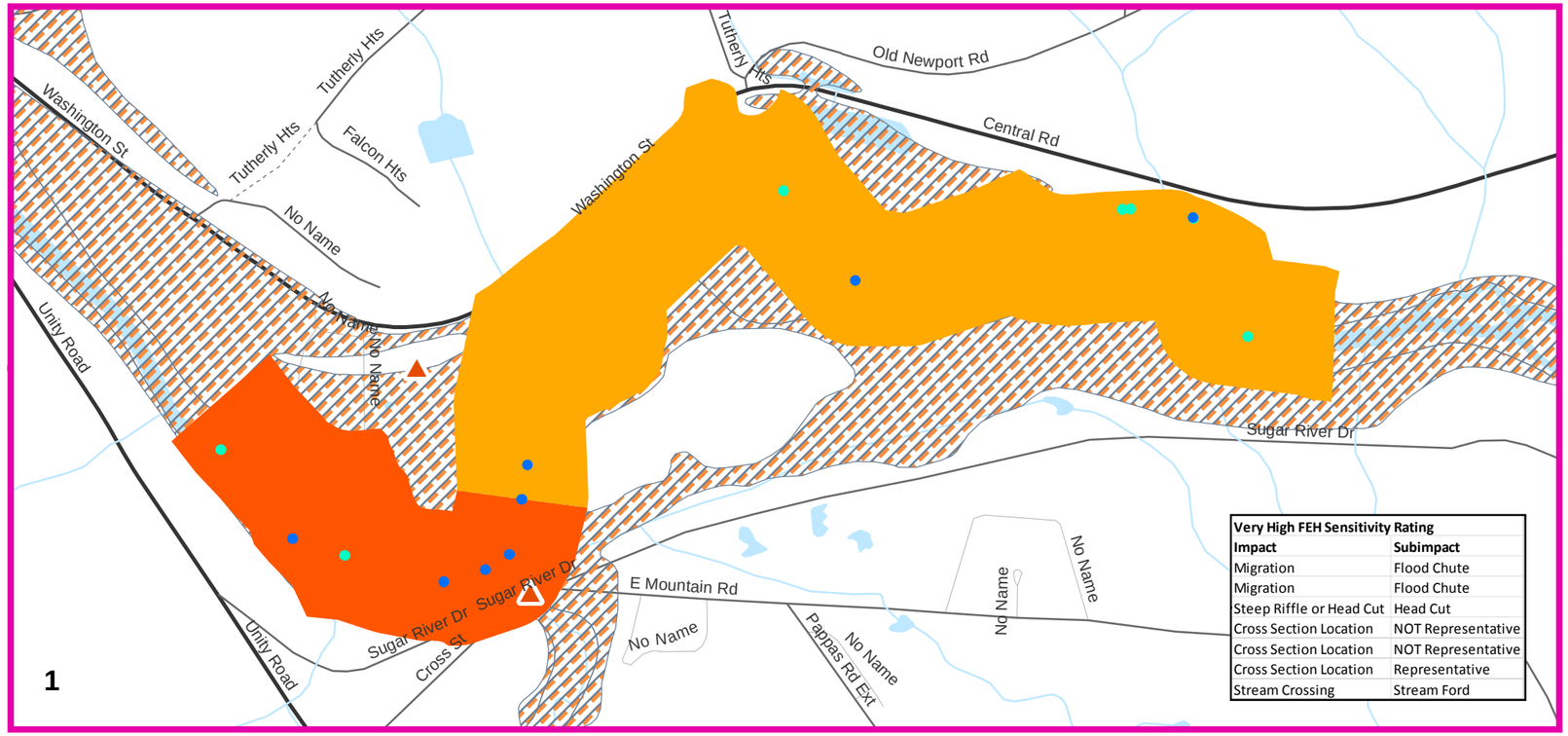
Map created by UVLSRPC January 2015.

Fluvial Geomorphic Study - City of Claremont, Sugar River Watershed (HUC 10) - Sugar River





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Culvert Compatability
This data was rated and scored based on how the culvert will influence specific features that impact the compatability of a culvert with river/stream geomorphic processes, in general, the information provides guidance on what each rank tells us about the long-term compatability of a culvert with flow and sediment transport processes. The tables on each map indicate culvert data for the points in the selected area.

Fluvial Erosion Hazard Zone Sensitivity Rating
This inforamtion is based on data collected for the Sugar River Watershed Area by the NH Geological Survey & the NH Department of Environmental Services. The Fluvial Erosion Hazard Zone (FEH), or meander belt, is provided for river reaches that have been assessed for this study. Sensitivity ratings are based on 6 categories of condition, ranging from Very Low to Extreme. Sensitivity is defined as the potential of a river to respond to flood events, through bank erosion and lateral migration (across the floodplain) processes.

Map Features

- Critical Facilities
- Data Collection Sites

Subimpact

- Bridge
- Culvert
- Migration

FEMA 100 Year Flood Zone

- 100-Yr Flood - A
- 100-Yr Flood - AE

FEH Sensitivity Rating

- Extreme
- Very High
- High
- Moderate
- Very Low

Geomorphic Compatability

- Fully Incompatible
- Mostly Incompatible
- Mostly Compatible
- Partially Compatible

Data Sources: Data drawn from info provided by the NH DES as results from the Sugar River Watershed fluvial geomorphic study. Other data was provided by: NH GRANIT, the state's GIS clearinghouse, and represents the best available data. Critical Facilities developed by UVLSRPC with the Hazard Mitigation Committe.

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UVLSRPC NHDES

Map created by UVLSRPC January 2015.

APPENDIX F:

FEMA Approvals and City Adoption of Hazard Mitigation Plan

City of Claremont, New Hampshire
City Council
A Resolution Adopting the Claremont Hazard Mitigation Plan Update 2016

WHEREAS, the City of Claremont received assistance from the Upper Valley Lake Sunapee Regional Planning Commission through funding from the NH Homeland Security and Emergency Management to prepare a hazard mitigation updated plan; and WHEREAS, several planning meetings to develop the hazard mitigation plan update were held in ___ 2016 and then presented to the City Council for review and discussion on _____, 2016; and WHEREAS, the Claremont Hazard Mitigation Plan Update 2016 contains several potential future projects to mitigate the hazard damage in the City of Claremont; and WHEREAS, the City Council held a public meeting on _____, 2016 to formally approve and adopt the Claremont Hazard Mitigation Plan Update 2016.

RESOLVED by the City of Claremont City Council:

1. The Plan is hereby adopted as an official plan of the City of Claremont;
2. The respective officials identified in the mitigation strategy 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 a part of this resolution for a period of five (5) years from the date of this resolution.
4. An annual report on the progress of the implementation elements of the Plan shall be presented to the City Council by the Emergency Management Director.

IN WITNESS WHEREOF, the undersigned has affixed his/her signature and the corporate seal of the City this ___ day of _____, 2016: City of Claremont City Council

_____	_____	_____
Charlene Lovett, Mayor	Scott Pope, Councilor, Ward II	Keith Raymond, Councilor, At Large
_____	_____	_____
Victor Bergeron, Assistant Mayor	Nicholas Koloski, Councilor, Ward III	John Simonds, Councilor, At Large
_____	_____	_____
Carolyn Towle, Councilor, Ward I	Allen Damren, Councilor, At Large	Bruce Temple, Councilor, At Large

_____
Attests to Signatures