The Beaman Oak *The Great Elm* *Five Corners* *The Rowlandson Pine*

TOWN OF LANCASTER
HAZARD MITIGATION PLAN

DRAFT - April 2022

Prepared by:
Montachusett Regional Planning Commission

Town of Lancaster, MA

Hazard Mitigation Plan

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Prepared for:

Town of Lancaster, MA

Prepared by:

Montachusett Regional Planning Commission
established 1968
Commonwealth of Massachusetts

Lancaster Hazard Mitigation Plan

Section 1

Section 1: Introduction

A community cannot prevent all hazards from occurring. The effect of a natural disaster or other hazard can be devastating to a community without proper planning to mitigate the impacts. Communities must take all necessary steps to properly plan for such mitigation to reduce the loss of life and physical assets and to lessen the overall effects of any disaster on a particular facility and the community.

This plan establishes a baseline community profile, identifies hazards, acknowledges the effects of climatic changes on natural hazards and extreme weather events; identifies risks and vulnerabilities and establishes a comprehensive, strategic, and functional process for implementing a prioritized mitigation action plan efficiently and effectively. The plan was created with the assistance and input of the public, relevant stakeholders, and a Hazard Mitigation Planning Working Group of qualified town officials. It is designed as an iterative, working plan that will be informed by its own implementation and hence, capable of evolving and adapting to changing needs and circumstances. As such, the overall intent of Lancaster's Hazard Mitigation Plan is to reduce current hazard risks, and address existing vulnerabilities so that they may, in turn, become strengths and examples of adaptive resiliency in future versions of the plan and the form and function of the town's infrastructure, environment, and society.

This section provides a general introduction to the Town of Lancaster's Hazard Mitigation Plan. It consists of the following subsections:

1.1. Background
1.2. Purpose
1.3. Scope and Authority
1.4. Plan Organization

Figure 1-1. *Prevent, Mitigate, Prepare, Respond, Recover – The 5 Phases of Emergency Management.*

1.1 Background

The Town of Lancaster contracted with the Montachusett Regional Planning Commission (MRPC) to draft the 2021-2022 update to their 2016 hazard mitigation plan. In 2015-2016, MRPC drafted a multi-jurisdiction (MJ) Hazard Mitigation Plan (HMP) for Lancaster and 22 additional communities in MRPC's region. The MJ-HMP evaluated the 23 communities together, as a region, for past and potential future occurrences of hazards, then evaluated each community, individually, to identify vulnerable facilities and potential risks. The 2021-2022 HMP for the Town of Lancaster, presented here, serves to update the 2016 plan for the jurisdictional area of the Town of Lancaster; in doing so, the previous MJ-HMP, for the area of Lancaster, will be replaced by a single-jurisdiction (SJ) Hazard Mitigation Plan, including only the Lancaster, and will act as the new Hazard Mitigation plan for the Town moving forward.

1.2 Purpose

As established and affirmed during the Town's first Hazard Mitigation Planning Working Group meeting, the primary purpose of this plan is three-fold:

1. To help Lancaster become better prepared and more resilient to potential emergencies and disasters;
2. To identify and assess the community's natural hazard risks and determine how to best minimize and manage those risks over time; and
3. To make Lancaster eligible and better positioned to receive federal grant funding for mitigation projects and other types of non-emergency disaster assistance.

1.3 Scope and Authority

The Hazard Mitigation Plan will be updated and maintained to continually address those natural hazards determined to be of primary concern to the Town of Lancaster as documented in the hazard analysis and vulnerability, or risk assessment (Section 4). Such hazards include but are not comprehensive of or limited to specific hazards identified in the Massachusetts State Hazard Mitigation Plan (2015) and Massachusetts State Hazard and Climate Action Mitigation Plan (2018). Other hazards that pose a low risk or are otherwise not included in this plan will continue to be evaluated during future updates, but they may not be fully addressed unless or until they are determined to be of primary concern to the Town.

The geographic scope (i.e., the "planning area") for the plan includes all areas within Lancaster's jurisdictional town limits. Some areas outside of Lancaster's jurisdictional town limits were evaluated relative to weather, precipitation, and streamflow patterns and conditions affecting the contributing "upstream" volumes of water, or streamflow within the Nashua River and North Nashua River. Upstream conditions can affect local instream volumes of water within Lancaster and are related to potential associated flood risks and vulnerabilities. This plan has been adopted by the Town of Lancaster in accordance with the authority and powers granted to local governments by the Commonwealth of Massachusetts. A copy of the resolution to adopt the plan is included as a cover page to this document [INSERT – WORDING FOR PENDING/FINAL FEMA APPROVAL AND TOWN SELECT BOARD ADOPTION].

This plan was developed in accordance with current Federal rules and regulations governing local hazard mitigation plans. The HMP shall be monitored and updated on a routine basis (as identified in Section 6) to maintain compliance with the following legislation:

- Section 322, Mitigation Planning, of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as enacted by Section 104 of the Disaster Mitigation Act of 2000 (Public Law 106-390), and;
- FEMA's Interim Final Rule published in the Federal Register on February 26, 2002, at 44 CFR Part 201.

1.4 Plan Organization

This plan is organized into six (6) sections that make up the main body of the plan along with five (5) appendices as described below:

Section 1: Introduction Section 1 serves as a general introduction to the Town of Lancaster's Hazard Mitigation Plan, including some brief background on hazard mitigation and hazard mitigation planning, as well as the purpose, authority, scope, and organization of the plan document.

Section 2: Planning Process Section 2 provides a summary of the process used to develop the plan, including how it was prepared and who was involved. It also describes the public engagement strategy used to involve the public and other community stakeholders, and it summarizes the review and incorporation of existing plans, studies, reports, and technical information.

Section 3: Community Profile Section 3 provides some background and a general overview of the entire planning area, including information on Lancaster's *location & history*, *geography & climate*, *population & community demographics*, *land use & development trends*, *natural resources & environment*, and *infrastructure & critical facilities*.

Section 4: Hazard Identification & Vulnerability Assessment Section 4 identifies the hazards posing the greatest risk to the community and provides an assessment of the ways in which the town is at risk or vulnerable to those hazards. An evaluation of likelihood of occurrences, impacts, and overall Community Risk and Vulnerability Assessment is then assessed for all hazards and a detailed risk and vulnerabilities analysis is provided. Two additional hazards, wildfire, and infectious disease & pandemic, not previously identified or included in prior plans, were included as part of this plan and their associated risks were assessed and considered within the mitigation strategy. Additionally, the potential influence or impact of climate change is evaluated and considered throughout.

Section 5: Mitigation Strategy Section 5 provides a strategic plan or map for the Town of Lancaster to follow to address vulnerabilities and mitigate risks to the impacts of the hazards identified and evaluated within this plan. Mitigation goals, strategies, and actions are based on the consensus of the Hazard Mitigation Planning Working Group (HMPWG), Community Resilience Building Workshop (2020), stakeholder and public input, and an evaluation survey data collected from the HMPWG, stakeholders, and public. Additionally, evaluation of comprehensive Hazard Analysis, including a summarization of past hazard events, and specific Vulnerability Assessments for each hazard, and finally, review of the Capability Assessment conducted for the town were taken into consideration.

An overall mission statement along with a series of mitigation goal statements designed to encompass the needs of the community guided the process. The result are specific mitigation actions that are intended to help Lancaster successfully achieve its mitigation goals over time. Several of these proposed mitigation actions are demonstrated as a series of "results chains". Results chains were created to guide the process of addressing several vulnerabilities believed to be most vulnerable to or influenced or impacted by factors associated with climate change. These specific needs or actions were identified within Lancaster's 2020 Community Resilience Building Risk Matrix. The results chains provide a visual representation of the strategic process for achieving those goals with performance-oriented results. The were included here with the intent of

demonstrating compatibility and cooperative, co-dependency between the town's climate resiliency efforts and hazard mitigation efforts.

Section 6: Plan Maintenance Section 6 describes Lancaster's formal plan maintenance process to ensure that the plan remains an active and relevant document that guides hazard mitigation actions over time. As conditions change, new information becomes available, or actions progress over the life of the plan, plan adjustments may be necessary to maintain its relevance. To this end, the plan, and its proposed strategies and actions, provide an iterative, results-based approach allowing for the use of the plan as a tool to accomplish goals. This characteristic and methodology results in a plan that can evolve as actions are implemented to reduce known risk or as new risks arise over time. Such a plan encourages adaptation and leads to future resiliency. In general, the plan maintenance section identifies procedures for monitoring, evaluating, and updating the plan and provides a clear path for implementing the plan through existing planning mechanisms. Most importantly, it stresses the importance of public involvement and coordination between town officials and interested stakeholders to maintain a successful, impactful, working plan. Finally, it recognized the need for ongoing, concurrent, implementation and continued planning, assuring the evolution of the plan to meet the needs of the community in the face of changes over time.

Appendices:

Appendix 1 – Capabilities Assessment

Appendix 2 – Maps

Appendix 3 – Mitigation Action Cards

Appendix 4 – Nashua River Basin Future Climate Projections

Appendix 5 – Covid-19 Mitigation Measures

Lancaster Hazard Mitigation Plan

Section 2

Section 2: Planning Process

This section provides a summary of the process used to develop the plan, including how it was prepared and who was involved. It also describes the public engagement strategy used to involve the public and other community stakeholders, and it summarizes the review and incorporation of existing plans, studies, reports, and technical information. It consists of the following subsections:

2.1. Hazard Mitigation Planning Working Group
2.2. Public and Stakeholder Engagement
2.3. Review of Existing Plans, Reports, and Other Relevant Information

Figure 2-1. The Four Core Steps of the Hazard Mitigation Planning Process (FEMA.gov)

2.1 Hazard Mitigation Planning Working Group

The Town of Lancaster formed a Hazard Mitigation Planning Working Group (HMPWG) comprised of town staff and board members (**Table 2-1**) to assist MRPC staff in gathering data, important documents, and all relevant information necessary to develop the HMP. The HMPWG guided and informed the planning process, supported public outreach and engagement efforts, and collaborated with MRPC in drafting the plan. The primary responsibilities for HMPWG members included attending meetings (virtually), providing input on hazards, risks, vulnerabilities, and mitigation goals, reviewing draft sections, and providing input and feedback on town capabilities and capacity to implement the recommended actions.

Table 2-1. Town of Lancaster Hazard Mitigation Planning Working Group (HMPWG) members.

Name	Title	Department, Board, or Commission
Michael Hanson	Fire Chief, Emergency Management Director	Lancaster Fire Department
Everett L. Moody	Acting Police Chief	Lancaster Police Department
Jasmin Farinacci	Community Development & Planning Director	Lancaster Community Development & Planning Department
Kevin A. Bartlett	DPW Superintendent	Lancaster Department of Public Works
John A. Farnsworth	BoH Member	Lancaster Board of Health

2.2 Public Stakeholder Engagement

The Town hosted multiple public outreach sessions and hosted a public survey to solicit input and feedback from community members. These outreach meetings occurred during the COVID-19 pandemic and were held as virtual meetings to accommodate safety precautions. MRPC staff presented project materials using different virtual meeting features like screen-sharing, chat messaging, meeting audio options, and a project presentation to allow for different public participation methods. A public survey was posted on the town website, including posting on a newly created Hazard Mitigation webpage to garner community opinions and input. The Town Hazard Mitigation webpage was created as part of this planning process to provide a landing and launching page for the sharing of hazard related information, notices, and outreach materials, including a public survey and the review and future access of this plan.

MRPC shared the meeting invitation web-links, agendas, presentations, and relevant documents prior to the virtual meetings and meeting invitations included an option for calling in by telephone. This allowed participants to join the meeting by computer or telephone to accommodate and make the meetings accessible to as many people as possible. This approach allowed participants to follow along using their own computer, view the host's shared screen, or listen and interact by audio using a telephone. MRPC staff shared email addresses with meeting participants to allow for follow-up engagement. Public meetings were posted as required by open meeting law and following existing town protocols including posting on the Town website, announced to the Board of Selectmen during their meetings, and circulated to all other boards and commissions. MRPC also conducted interviews with several relevant stakeholders including: Massachusetts Department of Conservation and Recreation, Division of Water

Supply Protection (MA DCR DWSP); Massachusetts Water Resources Authority (MWRA); Lancaster Sewer Commission; Clinton Advanced Wastewater Treatment Plant; and Massachusetts Department of Transportation – Highway District 3.

2.3 Review of Existing Plans, Reports, and Other Relevant Information

As part of the development of this plan, many existing plans, studies, reports, and other technical information were reviewed and incorporated as appropriate. This review supported an overall evaluation of community needs and goals, past hazard-related studies or reports, disaster damage data, natural area plans, and other relevant documents that provided helpful information for plan development. This included specific data and information used in the completion of the hazard analysis and risk assessment and capability assessment as well as the use of other information to support the development of the mitigation strategy.

MRPC staff review the following local plans in preparation of the 2021 Hazard Mitigation Plan update:

- 2007 Master Plan, Town of Lancaster
- 2015 Economic Development Plan, Town of Lancaster, prepared by Montachusett Regional Planning Commission
- 2015 Massachusetts State Hazard Mitigation Plan, Commonwealth of Massachusetts, EOEEA
- 2017 Open Space and Recreation Plan, Town of Lancaster
- 2016 Multi-Jurisdiction Hazard Mitigation Plan, Montachusett Regional Planning Commission
- 2018 Massachusetts State Hazard Mitigation and Climate Adaptation Plan, Commonwealth of Massachusetts, EOEEA
- 2020 Community Resilience Building (CRB)/Municipal Vulnerability Preparedness (MVP) Report, Town of Lancaster
- 2021 Emergency Dispensing Site Plan (EDS), Working Plan, Town of Lancaster
- Regional Homeland Security Plan
- Housing Production Plan
- Zoning Bylaws

The maps generated for this plan are comprised of information and data from the Town of Lancaster's Assessors department, Inspectional Services Department, Public Works Department, Lancaster interactive GIS map (CAI AxisGIS), Commonwealth of Massachusett's MassGIS MassMapper application & Climate Change Vulnerability Map, MRPC Mr.Mapper application, and using ESRI ArcGIS. Additionally, the maps relied upon data layers from the Commonwealth of Massachusetts' Bureau of Geographic Information (MassGIS), FEMA Flood Insurance Rate Maps (FIRM), Massachusetts Department of Transportation (MassDOT), US Census Bureau, and the American Community Survey (ACS).

Hazard related information and historical weather and storm event data were also referenced as part of the planning process and have been documented throughout the plan. Primary sources for such information included, but were not limited to, Massachusetts Executive Office of Energy and Environmental Affairs (EOEEA), Massachusetts Department of Conservation and Recreation (DCR), Massachusetts Emergency Management Agency (MEMA), U.S. Federal Emergency Management Agency (FEMA), and U.S. National Oceanic and Atmospheric Administration (NOAA).

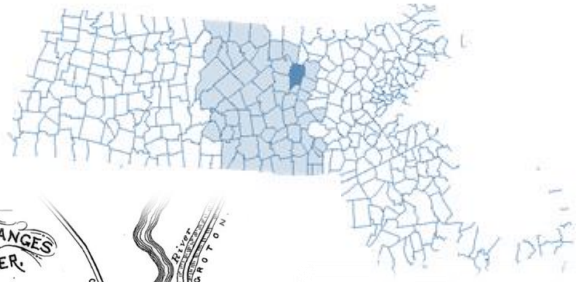
Lancaster Hazard Mitigation Plan

Section 3

Section 3: Community Profile

Effective, meaningful Hazard Mitigation Planning is dependent upon a thorough investigation and inventory of the social, cultural, environmental, and physical resources possessed by the town. Establishing this baseline setting, or **Community Profile**, is one of the critical first steps in the development of any Hazard Mitigation Plan (HMP). This section establishes a baseline setting, or Community Profile for the town. Essentially, it provides an inventory of the town's assets and a general overview of the entire planning area. It consists of the following subsections:

3.1. Location & History
3.2. Geography & Climate
3.3. Population & Community Demographics
3.4. Land Use & Development Trends
3.5. Natural Resources & Environment
3.6. Infrastructure & Critical Facilities



3.1 Location & History

The Town of Lancaster is located within northern Worcester County in the North Central Region of Massachusetts. It is bordered by Lunenburg and Shirley on the north, Harvard and Bolton on the east, Clinton on the south, and Sterling and Leominster on the west. Lancaster is about 36 miles west of Boston, 18 miles north of Worcester, 192 miles from New York City. The town, like several of its neighboring towns, has managed to preserve its rural character and natural landscapes despite its location within a region that has seen considerable urbanization in places like Worcester, Fitchburg, Leominster, and the nearby suburban towns of Boston's metro-west region. Lancaster is comprised of several distinct villages or districts, namely Ebanville, Deershorn, South Lancaster, and Five Corners in the southern parts of town, and Lancaster (Town Center), North Village, and Ponakin Mill in the central and northern parts of town. The town cherishes its heritage of farmland, woods, open space, and rivers and ponds and aims to preserve its rural and historic character while, at the same time, placing a value on education, business and job opportunities, and the overall well-being of its residents (Lancaster Master Plan, 2007, Lancaster OSRP, 2017).

Lancaster is known as the official "mothertown" of many of the surrounding east-central Massachusetts settlements that followed. Towns such as Harvard, Stow, Bolton, Hudson, Marlborough, Leominster, Clinton, Berlin, and Boylston were all once part of the original Lancaster settlement land grant. The town seal reads "Lancaster on the Nashua", and the Nashua River forms much of the eastern boundary of the town; the river, and its tributaries not only define many of the Town's boundaries, but they also define much of the community's character. Ironically, the Nashua River is and always has been one of Lancaster's greatest assets while, at the same time it is also one of the town's greatest hazards.

The area was first settled by the Nashawogg or Nashaway people, a band of the Nipmuc tribe of Native American Algonquian. English interest in the area began in 1641 or 1642 when the local Nashaway Sachem called Nashawhonan or Showanon, better known today as Sholan, travelled by foot to the falls, or head of tidewater on the Charles River, at present day Watertown (Pequossette) and Newton (Nonantum). The area, formerly inhabited by the Native American Nonantum and Pequossette people, was located near present-day Squibnocket Park just upstream from the modern cities of Boston and Cambridge (or the vicinities formerly known as Shamut, Toant, Mishawum, and Menetomy). At this location Sachem Sholan met with an English fur trader, Thomas King, with whom he traded the fur pelts he had carried from his home on the shores of Waushacum Pond. Sholan, whether out kindness and trust, or, more likely, out of an interest in establishing more convenient and profitable trade for the benefit of his people, invited King to visit Nashawogg and then to establish a fur trading post on Nashaway land in what is now present-day Lancaster. King, along with an associate, Henry Symonds would establish a trading post near the base of George Hill at a spot where several Indian trails intersected. Sachem Sholan agreed to sell King and Symonds an area of land ten miles in length and eight miles wide in that area with the only caveat being that they not "molest" the established hunting, fishing, and planting places of the Nashaway people. At around that same time, in 1643, a group of enterprising Englishman were granted the right to explore the area for iron ore by the Massachusetts General Court. While no iron ore was found and that venture was forgotten, the settlement persevered and eventually took its name, Nashaway Plantation, from the local, Native American band of Nashaway Nipmucs, led by Sholan (Marvin, 1879; Norse, 1889; Lancaster Historical Society, website, Accessed February 9, 2022).

At that time the Nipmucs were comprised of several localized bands generally inhabiting the region among the hills, valleys, and rivers of their historic territory, Nippenet, "the freshwater pond place", within the

area of present-day central Massachusetts and nearby portions of what is now Rhode Island and Connecticut. The historic homeland of the Nashaway was the area near the confluences of the North Nashua and Nashua Rivers (Lancaster), the land around Waushacum Ponds (Sterling), and the land along Monoosnoc Brook and at its confluence with the North Nashua River (Leominster) (**See Figure 3-1**). In addition to likely settlements at those locations, the Nashaway are generally believed to have lived and hunted among the land of the Nashua River watershed draining to those points, including the whereabouts of Waushakum Ponds (Sterling) and Mount Wachusett (Princeton). The Nashaway likely inhabited many small villages or family dwellings throughout the area that today includes portions of the towns of Leominster, Fitchburg, Westminster, Princeton, Sterling, and Lancaster. In 1653, Nashaway Plantation was officially incorporated as a town and renamed "Lancaster", making it the oldest town in Worcester County (Marvin, 1879).

Figure 3-1. Territory of Nashaway and major tribes of southern New England

During the earliest years of English settlement, relationships between the first settlers and the Nashaway people were peaceable, likely due to trust built through initially established relations and fair dealings between Sholan and the two original fur-trader Englishmen, and the respect earned by John Prescott for his bravery and hard work. It is likely that, in the beginning, the original fur-trading enterprise created mutual benefits to both the Englishmen and the local Nashaway people involved. However, by 1675, more than fifty English families were settled in Nashaway expanding the footprint and impact of the settlement. By then, the revered Sachem Sholan was deceased (died October 1654) and relationships between the English and the native tribes of the region had deteriorated. In August of 1675, a group of Nashaway, people of the Nipmuc tribe, led by Sholan's successor, Sachem Monoco (known to the English as "One-eyed John"), raided and attacked the town of Lancaster. Seven English settlers died in the ensuing encounter that summer day (Marvin, 1879; Nourse, 1889). At that time tension was also developing between the English and Native Wampanoag people in nearby Plymouth Plantation. The Wampanoag Sachem Metacom, known by the English as King Philip, the son of Massasoit (the former Wampanoag Sachem who was a friend and savior to the Pilgrims), had steadfastly expressed a list of grievances against the English. His concerns were based upon the treatment of the local Native people by the English with respect to "*cheating, discrimination, and pressures* [directed toward the native people] *to sell land, submit to Plymouth colony's authority, convert to Christianity, and consume alcohol*", as summarized from an account provided by John Eaton in his narrative, *A Relation of the Indian War, by Easton*, 1675.

In the months following the August 1675 attack on Lancaster, rumors of another attack were circulating among both English and Native people throughout the region. The rumors proved to be true and on February 10, 1676, another raid on Lancaster occurred. This attack seemed to have even greater

significance and purpose than the first attack six months earlier. Unlike the first raid, this encounter was not planned and executed by only a small number of Nashaway Nipmucs. Rather, it was carried out by a confederation of the region's Native Americans led by the Wampanoag Sachem Metacom and encompassing the combined strength and unified purpose of over 1,500 Wampanoag, Nipmuc, and Narragansett people (Marvin, 1879).

The 1675 and 1676 events, both violent and destructive, would become known as two of the initial actions of Metacomet's Rebellion, or "King Philips War". Several people died and others, including Mary Rowlandson (the minister's wife), were captured, and removed as prisoners. Her story provides a clear account of her experiences as a captor and provided an understanding of both native American and Puritan culture, beliefs, and behaviors during this time-period. It is considered an important and formative piece of American literature, the archetype captor narrative, and Americas first "best-seller". While violence, grievances, mistreatment, and misgivings were accused, claimed, perpetrated, or professed by both sides, one thing is clear, Lancaster, or Nashaway, is and always has been a place cherished by its people, both English and Algonquin, alike; a place worthy of their efforts, despite any hardships and hazards it posed (Lancaster OSRP; Rowlandson, 1682).

Mitigating hazards has been a concern of the people living in this place since its earliest days. Lancaster was built on the backs of its earliest settlers, like the blacksmith John Prescott, considered to be the town's founder. Its heritage was shaped by the strife and struggles faced by its early English and Nashaway inhabitants. Perhaps the struggles of Lancaster's early settlers was best surmised and praised by Henry S. Nourse in *The Military Annals of Lancaster, Massachusetts, 1740-1865*, where it was said of John Prescott that, "…he went out into the wilderness with his family to found a home, and for forty years thought, fought and wrought to make that home the centre of a prosperous community." (Nourse, p. 339) Norse, continued to praise Prescott by explaining that, of all of the original partners of the primary settlement land acquisition, Prescott was the only one who did not quit on the proposition and, instead, lived until his death in Nashaway Plantation, earning the respect of the Nashaway and his title as the founding father of Lancaster. Other settlers were either too discouraged, or worse, defeated (sometimes by death) in their attempts to settle the frontier land, which had so much to offer in agricultural and pastoral potential, but that which was equally hampered by as much danger to overcome. It is ironic that a landscape could have been so fertile and forbearing, and yet so futile and foreboding at the same time (Nourse, 1889).


Three Sisters

Despite the overwhelming, life-threatening challenges faced by Prescott and other early settlers, including the Nashaway people, their toils were rewarded by the fertility of the land and the bounty of its yields. As such, the settlement continued to grow, and eventually thrive among the fields along the shores of the two branches of the Nashua River (**Figure 3-2**). Agriculture was most important to the community during its earliest days of English settlement, and it is almost certain that the native Nashaway people had grown their corn, squash, and beans (known as the "three sisters") on the fertile lands between the banks of the North and South branches of the Nashua River for many generations prior. If not for that fertile crescent of land between the two branches of the Nashua River, known as "the neck", the settlement may have failed like many other early "frontier" settlements.

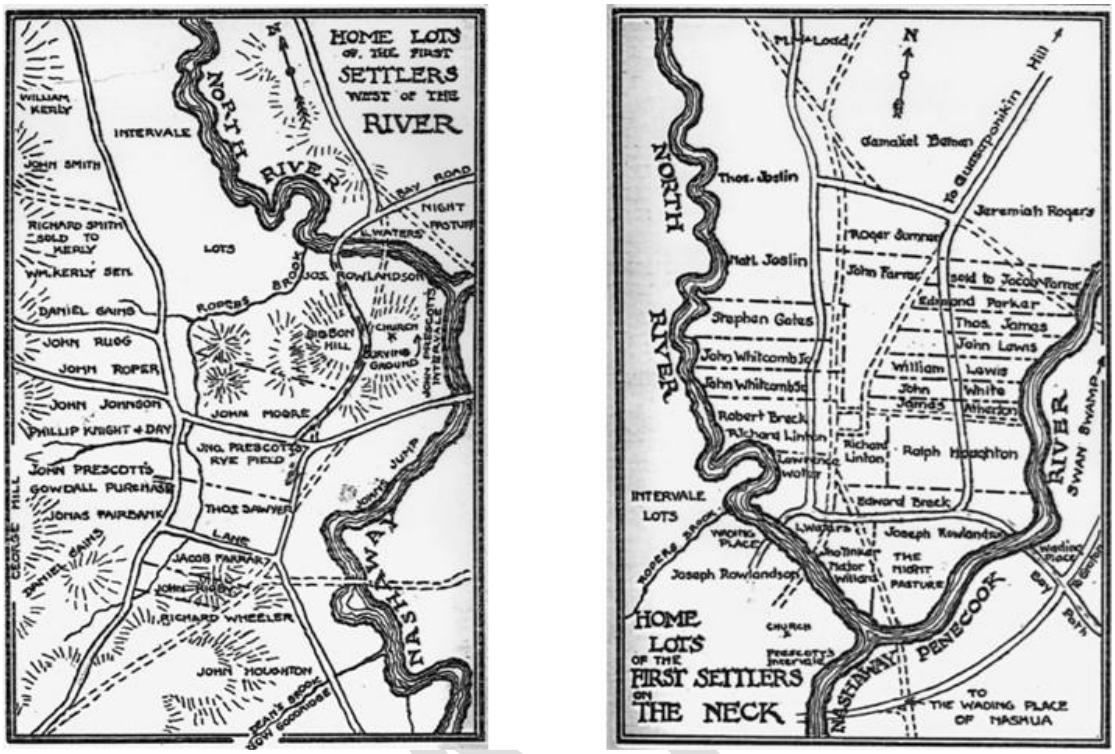


Figure 3-2. Maps of the 'home lots' of the early settlers of Nashaway Plantation (Lancaster, MA).

Not only did the Nashua River provide the fertile soils so important for growing crops, but it also provided settlers with a reliable source of energy which could be harnessed to operate a sawmill and gristmill. People from surrounding towns as far away as Sudbury travelled to Lancaster to acquire sawn lumber and have their corn ground. The first sawmill and gristmill, in addition to the original town garrison and bridge crossing the Nashua River, contributed greatly to the towns establishment and are two early examples of "critical infrastructure".

While agriculture was long-since established as the dominant livelihood in Lancaster, by 1771 the town's economy and industry also included commercial shops, and over seventeen mills for such endeavors as cider pressing and distilling, hat making, potash production, cast holloware, textiles, leather boards, shoe shanks, and brickmaking. Lancaster's former slate mine, the remnants of which can be found at Slate Rock Pond, produced the slate for the roof of John Hancock's home and the Old State House, two of colonial Boston's most prominent and prestigious buildings. Despite the successful mills, agriculture and horticulture remained an important part of the town's economy and way of life for over 200 years, well into the 19th and early 20th Centuries. Renowned horticulturist, Luther Burbank, founder of the "Burbank Potato" used for McDonald's famous French fries, was born in Lancaster in 1849. He was a pioneer in agricultural sciences who developed over 800 strains and varieties of plants. The town's agricultural and horticultural heritage is still evident in several small working farms, orchards, horse stables, farm markets, and tree nurseries (Lancaster Historical Society, website, Accessed Feb. 9, 2022).

In the early 19th century, an evolution occurred from a farming town to a popular summer getaway for wealthy Bostonians. During this era many ornate residences and sprawling gardens and manicured landscapes were developed by some of the most elite families from Boston. These mansions were places for these wealthy families to escape to for respite from the hustle and bustle of city life, work, and politics and were referred to as "summer cottages", by their affluent owners. By 1849 the Worcester and Nashua Railroad had come to Lancaster and contributed to an influx of commercial activity in the town. It was perhaps this growth, and the increase in mills and manufacturing in the southern part of town, where the best sites for waterpower along the Nashua River were located, that led to Clinton being separated from Lancaster and incorporated as its own town in 1850 (Lancaster OSRP). One example of a such a mill was the Lancaster Mills (**Figure 3-3**), an innovative and successful textile mill, which produced some of the first and finest gingham materials in the country. The mill, which was formerly located in Lancaster before the town of Clinton's separation, went on to prosper for years in Clinton after the new town was formed around it. Today, it has become luxury loft apartments with riverfront views.

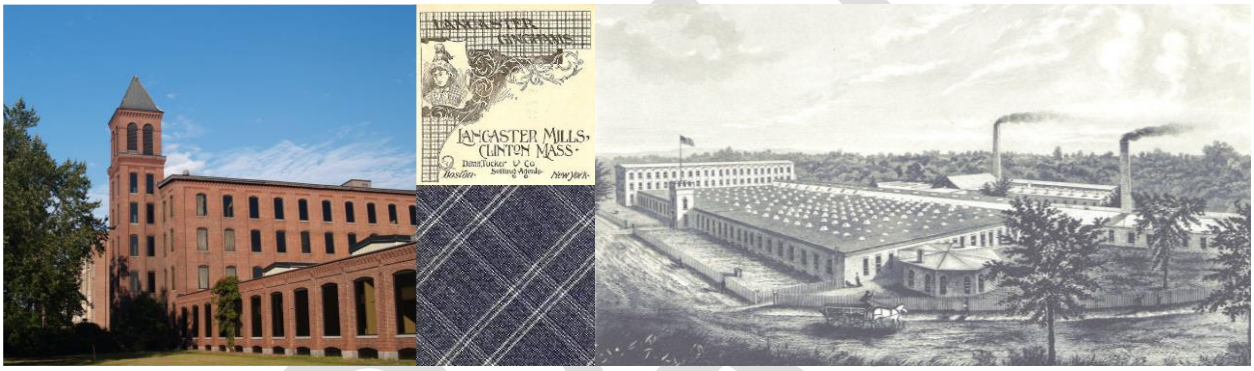


Figure 3-3. The Lancaster Mills complex in Clinton (formerly Lancaster), Massachusetts. Present day (left); artist's (Lossing, 1876, public domain) rendering (right); Gingham fabric swatch (center, inset).

With the incorporation and sudden growth of its daughter town of Clinton, Lancaster's agricultural production and profits grew substantially, more than doubling in value between 1849 and 1899. Dairy, hay, and fodder products increased the most. The growth of the new town to the south and the boon created by the railroad, and its connection to Boston, brought led to further increases in the production and markets of vegetables, eggs, poultry, hay, fodder, milk, beef, pork, and veal. Just as Lancaster had provided much of the sawn lumber and slate for the roofs of colonial Boston and the surrounding region in the 1700's, it also supplied the important agricultural food and resources that supported the region's growth during the industrial revolution of the 1800's. Sawn lumber had not become an industry of the past, in fact it too was growing, and in 1855 harvesting and processing of forest products accounted for nearly one third of Lancaster's manufacturing (Lancaster OSRP, Lancaster Historical Society).

Lancaster's agricultural heritage and dependence on the land and rivers for sustenance may help explain the value its residents have always placed on preserving its landscape and growing the town in a way that preserves landscapes and honors the legacy of the land. Education and recreation were two natural paths to pursue for the development of a town which valued such things as nature, agriculture, horticulture, wildlife, and outdoor recreation, or a so-called connection to nature. Naturally, through the 1800's the Thayer family and other benevolent benefactors contributed to building nature-like cemeteries, wildlife preserves, bridle paths, exotic plant greenhouses, natural history and ornithological museums, arboretum, a golf course, and later even a ski hill. For a town that had so much, Lancaster was not immune

to economic and natural hazards. The "Golden Age" of Lancaster's history lasted into the late 1920's when the Great Depression (1929-1939) and two devastating natural disasters occurred (1936 and 1938).

Perhaps few other towns with similar means, both in financial wealth and natural resources, were hit as hard as Lancaster by the trifecta impact of the "Great Depression", "Flood of 1936", and "Great Hurricane of 1938". What remained after many of the wealthy residents lost their fortunes in 1929, and the depression years that followed, were the valuable and beautiful landscapes they had preserved and nurtured for so many generations. Unfortunately, that too changed in 1936 and 1938 when Mother Nature's unforgiving winds and unrelenting rains ravaged the landscape in The Hurricane of 1936, then again in the Great Flood of '38. Some of the town's most important resources, its trees and bridges were hit the hardest. What the stock market took from the town's elite in financial investments between 1929 and 1939, nature took the same or more from the town's common resources – its trees, bridges, pastures, and roads during those two events in 1936 and 1938. To say Lancaster was devastated and isolated, both figuratively and literally could not have been truer. Only a single route into or out of town remained after the Hurricane induced flooding of 1936. Worse yet, that last remaining bridge was lost two years later, along with what repairs had been made to the others, following the Flood of '36. Without a way into town, Lancaster was cut-off from the surrounding region, regardless, there were probably more reasons for the town's residents to want to leave Lancaster over that route than any desire for others to come from it. As in its earliest days following the burning of the town in 1676, Lancaster was again a community shaped, sworn, and strengthened by the hazards it faced and was forced to overcome.

Lancaster's early agricultural heritage combined with its legacy of sprawling landscapes of "golden age" estates, and the philanthropic spirit of public giving, have helped to shape the town you see today. The town's aesthetic beauty and the communities' persistent sense of place stem from the roots of its rich history of land use and landscape appreciation, or what can be described as a strong connection to the land. Today, considerable value is given to the preservation of open space lands for conservation, recreation, natural resources protection, education, and tourism. Yesterday's legacy is today's heritage in the landscape of Lancaster; a town up of open, rolling, landscapes, historical architecture, public spaces, and picturesque fields, hills, rivers, streams, and ponds.

3.2 Geography & Climate

Lancaster lies in the *Southern New England Coastal Plains and Hills* ecoregion of Massachusetts (U.S. EPA). The ecoregion landscape is comprised of plains with a few low hills. Forests tree species area predominantly central hardwoods with some transition hardwoods and some elm-ash-red maple communities interspersed with red and white pine. Many major rivers drain this ecoregion. Lancaster, falls entirely within the major drainage basin of the Nashua River Watershed Basin.

The North Branch of the Nashua River, or North Nashua, enters Lancaster from the northwest and flows in a south-to-south-easterly direction to where it meets the main branch of the Nashua River at the southwestern border of the Bolton Flats Wildlife Management Area. The Nashua River, flowing south to north, then forms much of the eastern boundary of the town, where significant, protected open space areas, including important protected floodzones, lie along the Oxbow National Wildlife Refuge and on Bolton Flats (Lancaster OSRP, 2017; Mass Mapper Climate Change Vulnerability Map). Lancaster also includes several small ponds, including Fort Pond, Spectacle Pond, Oak Hill Pond, and White Pond. The remaining landscape is a diverse mix of vast floodplain intervals consisting of wet meadows, emergent

wetlands and shrub swamps, red maple swamps, forested wetlands, springs, small streams and brooks, isolated wetlands, open fields, shrublands, and low, rolling hills of open and forested landcover.

The geology of the area consists of underlying bedrock, primarily a low-grade metomorphic composition consistent with the Nashua belt and Worcester formations. There is evidence of glaciation in both the composition of the soils and geomorphology of the landscape. Glacial till covers approximately 30% of Lancaster's land area, while glacial outwash alluvial sediments of sand, silt, or clay can be found along the banks and floodplains of the lower-lying, low-gradient landscapes along the two branches of the Nashua River. Other glacial evidence such as drumlins, kettle hole ponds, and features consistent with the basin of a large glacial meltwater lake, Glacial Lake Nashua, are also evident throughout Lancaster (OSRP, 2017).

There are five major soil types occurring within Lancaster (Hinkley-Merrimac-Windsor, Paxton-Woodbridge-Canton, Chatfield-Hollis Series, Quonset Series, and Winooski-Limerick-Sacco). While Lancaster has a rich agricultural heritage and is known for its fertile soils along the low-lying areas associated with the Nashua Rivers, Prime Agricultural Soils (as defined by the United States Department of Agriculture (USDA)), are shown to be limited in recent USDA maps (2017) produced for Northeast Worcester County. Further, Lancaster's OSRP (2017) noted that recent development trends show loss of Prime Agricultural Soils to recent residential, commercial, and industrial development within Lancaster. The OSRP (2017) also noted that several areas of "Primary Forest Soils", or historically untilled areas may also exist throughout Lancaster. Such areas have important biological, and biodiversity qualities that give them some value for consideration as conservation priorities. Finally, the OSRP (2017) recommends careful consideration and wise decision-making relative to development and the long-term preservation of Prime Agricultural Soils and potential primary forest soils to protect critical soil resources for their future benefits. The identification and protection of unique or productive soils can be important to future hazard mitigation with respect to drought, severe storms, extreme temperatures, and increased precipitation, all of which are recognized as factors affected by a changing climate and forecast to increase in frequency, duration, and intensity in future years (EOEEA, 2018).

Massachusetts experiences a humid continental climate, with maritime influences which are greatest in the southeast part of the state and decrease in magnitude as you move away from that point in a northwesterly directional course across the state. The Lancaster area, represented by National Weather Service Data from nearby Worcester experiences monthly mean temperatures ranging from a low of 24.4°F in January to a monthly mean high of 71°F in July. Annual-average precipitation is above the national average at 49.15-inches annually (it should be noted that the upper portions of the North Nashua River basin, which drains to Lancaster, receive even greater amounts of annual precipitation), including 78-inches of annual snowfall. With a temperate climate and location of only 32-miles of approximate distance from the Atlantic Ocean, as the crow flies, Lancaster, and its surrounding region are subject to a wide variety of climatic conditions and weather patterns, including the occurrence of sever weather, such as hurricanes, nor'easters, thunderstorms, high winds, blizzards, and ice storms. As described above, the geography of the town, includes the confluence of the North Branch and South Branch of the Nashua Rivers forming the main stem of the Nashua River at a place, close to the center of town, known as the "Meeting of the Waters". This occurrence, and the nature of the climate at this location, particularly the occurrences of severe storms and above average precipitation rates, can result in the occurrence of flooding and other weather-related hazards.

Changing climatic conditions statewide in Massachusetts include an increase in annual temperature of 2.9°F since 1895, an increase in the growing season by approximately 15-days since 1950, coastal sea-level rise of approximately 11-inces since 1922 (as measured in Boston), and an increase in heavy precipitation by approximately 55% since 1958. Climate projections for the Nashua River Basin in Massachusetts, including Lancaster, forecast an increase in the number of days above 90°F from 5-days to as many as 12- to 31-days by 2050 and increase by as many as 10- to 63-days by 2090. Conversely, days below 32°F, currently at 146-days per-year, are expected to decrease by 19- to 40 days annually by 2050 and by more than 24- to 64-days by 2090. Annual average precipitation is expected to increase between 0.9 to as many as 6-inches by 2050, that amount would be in excess of the average of 47-inches, calculated between 1971-2000. Average annual precipitation predictions for 2090 are even greater ranging exceeding the presented average by as many as 1.2 to 7.3-inches. Under such forecasts, Lancaster could see as many as 54.3-inches of rain annually by 2090 (Lancaster CRB, 2020).

Over the past several years the town of Lancaster has seen an increasing number of documented impacts that may be related to the increasing frequency, duration, and intensity of weather-related natural hazards. Local evidence of these impacts, specific to Lancaster, is provided in the following section (*Section 4. Hazard Identification & Vulnerability Assessment*) of this plan and was documented within the Lancaster Community Resilience Building Report (2020). Recent local impacts of such occurrences include extreme flooding in 2010, which inundated roadways, forcing closures, and a series of severe storms, including several high wind-events, throughout 2016 which led to flooding, tree damage, utility line damage and power outages throughout town. The influence of changing climatic conditions has also been seen in the increased frequency and intensity of severe winter storms, including the region's most impactful ice-storm (2008), unseasonal occurrences of heavy snow including, tree-damaging October snowstorms (2011), late-spring snowstorms (April 1997, 2016, 2018, 2021), and flood-inducing, early, or sudden, spring-thaw snowmelt rain-events (2010 & 2017). These occurrences have resulted severe impacts to trees, agriculture, especially local fruit orchards, hard and soft infrastructure, including critical infrastructure. These impacts have affected all segments of the community, particularly at-risk populations of people, such as the very young, very old, those living alone, and families affected by poverty.

3.3 Population & Community Demographics

Lancaster covers a total area of 28.2 square miles with a resident population of 8,441 according to the 2020 US Census, an increase of 4.8% from 2010. This population growth is notably slower than that of both Worcester County (8.1%) and Massachusetts as a whole (7.4%) from 2010 to 2020. The population of Lancaster remains largely White, although that proportion has decreased over the last ten years, from 86.4% (6,959) in 2010 to 77.1% (6,510). This change can primarily be attributed to the growth of the multiracial population over the same period of time from 1.6% (126) in 2010 to 10.9% (923) in 2020.

Lancaster has also shown an increase in the total number of housing units in the town, having 2,788 units as of 2020, an increase of 6.7%, or 174 additional units since 2010, which is reflected in the development trends over the last decade.

3.4 Land Use & Development Trends

Lancaster was one of the earliest settlements in colonial Massachusetts and the first town in central Massachusetts. Lancaster is well known for its architecturally and historically significant structures and contains three distinct Historic Districts, North Village, Center Village, and Ponakin Mill Village. Both North

Village and Center Village are designated National Historical Districts. As a town, it was laid out and developed as a compact, linear village surrounded by agricultural fields. This heritage is still evident in the towns landscape and geographic spatial layout today. For a very short time the first settlers established a fur trading outpost, then as that endeavor passed, a successful sawmill was established and much of forest was cleared to produce firewood and sawn lumber for Boston and other early towns. At the same time a gristmill was established to grind grain and corn for consumption by people and their livestock. Lancaster's sawmill and gristmill were utilized by farmers and settlers throughout the region. These mills were both built alongside the Nashua River and their success was due to the dependable power produced by its flow. The Nashua River was an important source of power in those days but also a hazard for flooding – it provided the power that ran the mills and flooded the fields each spring with moisture and fertile sediments and minerals needed for successful agriculture, however, it also dictated where homes could and could not be built along its course throughout the town. The Nashua River is still a defining characteristic and determining factor of the town's land use and development trends today.

From the time of the town's incorporation, and for at least 150-years following, the primary use of the land was agricultural. Even after agriculture slowed, it remained as one of the town's more important land uses and that heritage and the landscape it created are still evident and a part of the town's character today. By the early 1800's Lancaster had become known for the development of large elitist estates, sprawling designed gardens and manicured landscapes, and architecturally beautiful buildings. One example is the town's Fifth Meetinghouse, an "American Masterpiece" of architecture erected in 1816 and designed by Charles Bulfinch of Boston. Other examples include Herbert D. Hale's Center School, Georgian Colonial styled Town Hall designed by A.W. Longfellow, Memorial Hall Library – a gift from Nathaniel Thayer II, and many notable homes and estates such as the Iver Johnson estate, the George Parker Estate, the Old Brick Tavern. By the turn of the century Lancaster was arguably an equal to Newport Rhode Island for its opulent estates and elite residents. Perhaps most notable of this era are the Victorian villas and mansions of the Thayer's, an elite family of Boston Brahmins and one of Lancaster's most philanthropic benefactors. Their legacy can be seen in their former estates and the beautiful public buildings they so graciously gifted to the town they loved (OSRP, 2017, Lancaster Historical Society).

Lancaster's age of opulence, or "Golden Age" lasted until 1929 when the Great Depression struck. The Country's worst financial disaster was then followed by two of the worst natural disasters Lancaster and the New England region had ever seen – The Great Flood of 1936, and The Great New England Hurricane of 1938. Lancaster's roadways, bridges, and natural landscapes were severely damaged or lost completely. The town had to rebuild much of its critical infrastructure during a time of severe public and private financial hardship.

Following a difficult decade of financial and natural disasters between 1929 and 1938, additional land use challenges continued to challenge Lancaster in the form of an uncompensated loss of a large area of valuable lands. Approximately 4,000-acres, 30% of the towns total land area, and some of the town's most valuable forest and meadows were taken, without compensation, by the Federal Government. Between 1938 and 1947, the land would become part of Devens South Post Training Area, property of the United States Army. Despite seeing one-third of the town lost without compensation, the town and its residents continued to place value on public land uses such as education and recreation for large areas of land such as the donation of Blood Town Forest by the Blood family in 1946, Bartlett Pond Recreation Area, Spectacle Pond and Fort Pond recreation areas and swimming beaches, and the Young Men's Christian Association (YMCA) Camp Lowe on Fort Pond, and the aforementioned ski jump on George Hill

at Goss Lane, which attracted national professionals and local amateurs and talented, and ambitious youth for winter competitions (OSRP, 2017).

While the 1930's saw financial and natural disasters, and the 1940's saw an increase in land use protection and development for natural resource protection and recreational opportunities and purposes, the 1950s brought increased suburbanization throughout the region. During this time Lancaster experienced the subdivisions of lands on multiple large, old farm tracts for housing developments such as George Hill Park in the Whitcomb Drive area of South Lancaster. Single story ranch, raised ranch, and split-level homes, common to the 1950's subdivision era of the post-war baby boom, were built throughout town in subdivisions and along cookie-cutter frontage lots along Lancaster's formerly undeveloped rural roads. The 1954 Lancaster Town Report noted the significance of the changing times by noting that "old order changeth" (OSRP, 2017).

This period of community landscape subdivision and regional suburbanization coincided with the construction of Massachusetts' Route 495 between the towns of Foxboro in the south and the Salisbury in the north between 1958 and 1975 (an additional southern extension south from Foxboro (I-95) to Whareham was added in 1985). Immediately following the completion of the construction of Route 495, the construction of Route 190 between Leominster and Worcester began in 1975 and was completed in 1983 (Interstate-Guide.com, website, Accessed, Mar. 30, 2022). Both highways affected Lancaster due to their proximity to town and because of the Route 117 corridor creating a connection between Route 190 and Route 495 directly through Lancaster. These major highways and the Route 117 connection greatly contributed to the land use development trend of local land subdivision and regional suburbanization experienced by Lancaster and the Montachusett Region during that time. The highways also increased commuter traffic through the town and decreased the time of travel between Lancaster and urban areas like Worcester and Lowell, affecting Lancaster's disposition but not completely changing its rural character.

The 1960's and '70's saw the centralization and regionalization of schools and many, then all, of Lancaster's outlying schoolhouses closed and were centralized, culminating in the closure of Lancaster High School in 1960 (students would now attend Nashoba Regional High School) and the building of Lancaster Middle School in 1973. Sand and gravel from the Pine Hill area was in such high demand during the post-war construction years and into the home-development-boom of the 1980's that an area of once rolling hills of pine and sand were completely levelled for use of the valuable material (OSRP, 2017).

During the building boom of the early 2000's, the rolling hills and open spaces of Lancaster continued to change in their physical character and aesthetic appearance. With the development of so many new housing subdivisions such as Eagle Ridge, Devonshire Estates, Blue Heron Pond, Shaker Village, Turner Woods, Turner Heights, Lancaster Woods and Runaway Brook but with little growth of commercial, industrial, or agricultural resources and enterprises, Lancaster was becoming more and more of a bedroom community.

In the years since the construction or Routes 190 and 495, the town has indeed (in spite of its own wishes) become known as a bedroom community. It's location, access to major local highways, and commutable proximity to more urban-industrial and commercial areas, including Worcester, Leominster, Fitchburg, Lowell, and Boston make it a desirable and convenient place to live and commute to work from. However, with recent trends toward working remotely, or tele-commuting brought about through enhancements in telecommunications technologies and in response to the impacts of the Covid-19 pandemic, many

individuals, families, employers, and communities are re-imagining and re-creating the way we all understand, experience, and rationalize previous norms related to work, life, and daily commuting. In addition, Lancaster has recently experienced some small growths in industry and commerce and has worked to redefine itself in a way that embraces both its historical heritage and future potential (Lancaster MP, 2007).

Despite the historical and recent changes in land use and development trends that Lancaster has experienced, the town still values and preserves some of its agricultural heritage. According to the town's most recent Open Space and Recreation Plan (2017), a limited number of farms and orchards still operate today, including: DiMeco's Farmstand on Chace Hill Road, Bob's Turkey Farm on Old Common Road, George Hill Orchards on George Hill Road, Liberty Hill Farm on George Hill Road, Harper Farm on Main Street, Manny's Dairy Farm on Brockelman Road which is now a beef and cattle farm, and the Flats Mentor Farm on the flood plain off of Seven Bridge Road near Bolton which produces numerous agricultural products.

In general, today's composition of Land Uses in Lancaster is comprised of approximately 25% Forest, Agricultural, Open-Land, and Water; 27% Residential; 28% Recreational and Institutional lands; 13% Commercial/Industrial/Mixed-use, other; and 7% Right-of-Way (**Table 3-1**).

Table 3-1. Lancaster Land Use Classification Type (2015) acreage

Land Use Class	Acres	Percent of Total
Devens South	4,702	n/a*
Recreation/Institutional	3,737	28%
Single Family Residential	2,965	22%
Open land	2,064	16%
Right-of-way	926	7%
Industrial	610	5%
Commercial	523	4%
Agriculture	503	4%
Mixed use, other	499	4%
Multi-family Residential	451	3%
Water	337	3%
Forest	301	2%
Mixed Use – Primarily Residential	265	2%
Unknown	26	0.1%
Total:	**17,909**	**100%**

*Acreage for Devens was not used to calculate Land Use proportions

Recent development trends in Lancaster have shown some growth with a development rate of 3.8 acres per square-mile between 2012 and 2017 (**Table 3-2**). Lancaster can presently be described as a bedroom community whose residents mostly commute daily to work in the more urbanized towns of Metro-west, Boston, Worcester, or the likes. However, Lancaster's 2007 Master Plan made it clear that the community envisions itself as more than that and does not solely define the town's current state-of -being, or limit its future potential, to that of only a "bedroom community".

Table 3-2. Summary of Land Use and Development Trends in Lancaster – 2012 to 2017		
Statistic	*Value*	*Rank in state*
Size of town in acres	17,917 acres	94
Size of town in square miles	28.0 square miles	94
Total area of development	2,483 acres	170
Total area of natural land	11,484 acres	120
Total area of open land	3,656 acres	20
Percent developed land	14%	217
Percent natural land	64%	185
Percent open land	20%	13
Total area of newly developed land from 2012 to 2017	106 acres	71
Total area of newly developed land from 2012 to 2017, standardized by town size (acres per square mile)	3.8 acres per square mile	111

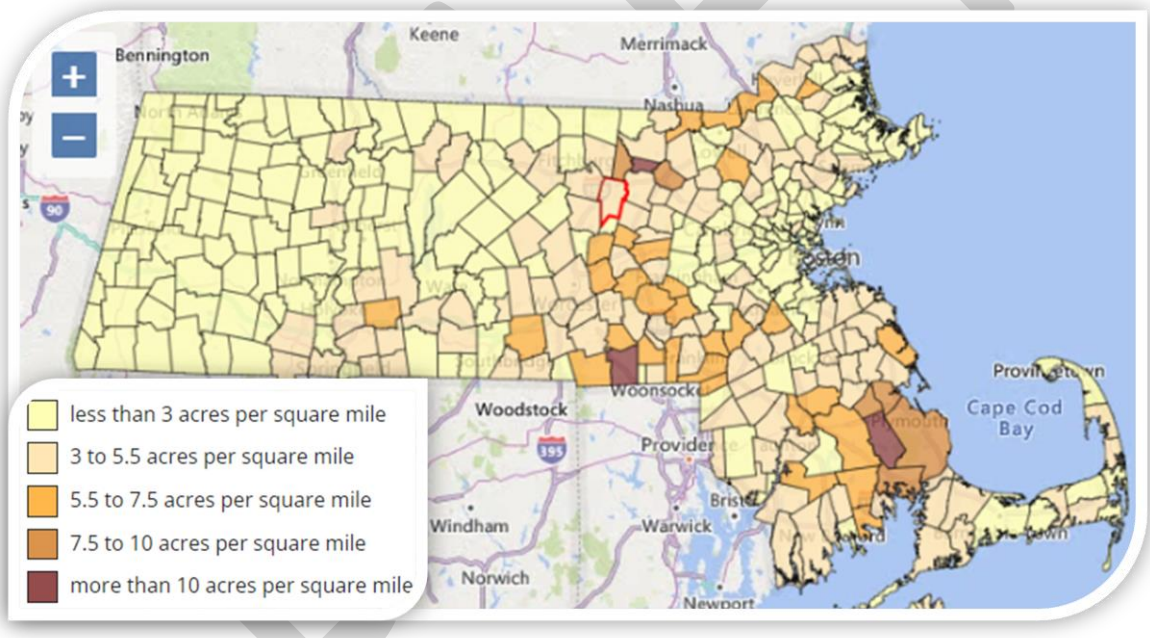
Source: Mass Audubon. "Losing Ground: Nature's Value In A Changing Climate reports on the pace and patterns of land development and land protection in Massachusetts between 2012 and 2017". Sixth Edition, Published February 2020, Accessed Feb. 16, 2022

In the Master Plan (2007), members of the community provided a description of their vision for the town they live in. The introductory section of the plan was titled "The Town We Want" and it identified several important values and ideas and listed goals and objectives for enacting the community's vision. Of those values and ideas, the things that the members of the community cherished most about Lancaster included "its heritage, its farmlands, woods, and open space, its beautiful rives and ponds, education, and its people". They desired "to preserve its rural, historic character", while at the same time, wanting to increase "business and job opportunities for local residents". They also expressed an interest in providing "affordable opportunities" to purchase a home so that younger community members could afford to buy a home and "continue living in the town in which they grew up". They envisioned a more walkable and bikeable community; A community that continued to value and preserve its most treasured historical, cultural, and natural resources and that promoted those resources, and welcomed visitors and tourists to enjoy and "admire its beautiful, historic buildings, its traditional New England [town common], to canoe and kayak on the lovely Nashua River; and to pick apples and buy fresh produce from local farms". Finally, they looked forward to future where sound planning, coordinated land-use decision making, smart-growth development strategies, and technological advances may mitigate and decrease commuter traffic

passing through the town and reduce or eliminate the need for its residents to travel such long distances to work (Lancaster MP, 2007).

QUICK FACT: *Between 2012 and 2017 Lancaster's changes in land use included 106-acres of newly developed land. During that time the town experienced d development rate of 3.8-acres per square mile.*

Losing Ground 2020: Statistics – Town of Lancaster		
Statistic	***Value***	***Rank in state***
Total area of newly developed land from 2012 to 2017	106 acres	71
Total area of newly developed land from 2012 to 2017, standardized by town size (acres per square mile)	3.8 acres per square mile	111



Source: Mass Audubon. "Losing Ground: Nature's Value In A Changing Climate reports on the pace and patterns of land development and land protection in Massachusetts between 2012 and 2017". Sixth Edition, Published February 2020, Accessed Feb. 16, 2022

In the fifteen years since the 2007 Master Plan was written, Lancaster has worked toward that vision and those land use and development ideals. This Hazard Mitigation Plan is another step in that direction, a step toward improving the safety and well-being of the town's residents both now, and in the future.

3.5 Natural Resources & Environment

Lancaster contains several important areas of ***Water Resources***, ***Forest & Conservation Open Space Lands***, and ***Protected Wildlife Habitat***; these natural resources provide outstanding outdoor recreation opportunities, aesthetic values, financial and economic benefits, community services, and many other intangible community benefits and values. Specifically, the town possesses a substantial amount of state, local, and Federal, protected open space and wildlife habitat lands, including the vast wetlands and floodplains of the Bolton Flats Wildlife Management Area and borders the Oxbow National Wildlife Refuge along the Nashua River. The town is made up of a vast landscape of natural areas and resources and it includes many acres of conserved lands, recreational fields, farms, green infrastructure, important wildlife habitat, critical landscapes, and protected climate resilient lands (**Table 3-3**). These resources are not only an important part of the towns history, character, and vision, but they provide specific and valuable services such as flood control and pollution prevention and are important to the community's overall mitigation of hazards. In addition to providing these critical hazard mitigation functions, these areas also serve as important wildlife habitat and offer great aesthetics and recreational value, especially the Nashua River and its tributaries, floodplains, and wetlands.

For a brief and general description of Lancaster's ***Water Resources***, ***Forest & Conservation Open Space Lands***, and ***Protected Wildlife Habitat*** areas see the following paragraphs. For a more in-depth description of these assets and resources the reader may refer to the Lancaster Open Space & Recreation Plan (2017).

Table 3-3. Protected Open Space and Natural Resource Land-Area Statistics in Lancaster

Statistic	*Value*	*Rank in state*
Size of town in acres	17,917 acres	94
Size of town in square miles	28.0 square miles	94
Total area of permanently conserved land	2,081 acres	218
Overall percentage of permanently conserved land	12%	283
Total area of newly conserved land from 2012 to 2019	511 acres	130
Total area of newly conserved BioMap2 Core Habitat	310 acres	51
Total area of newly conserved BioMap2 Critical Natural Landscape	218 acres	114
Total area of newly conserved land classified by The Nature Conservancy as resilient to climate change	8	192
Total area of newly conserved Green Infrastructure Network	511 acres	130

Source: Mass Audubon. "Losing Ground: Nature's Value In A Changing Climate reports on the pace and patterns of land development and land protection in Massachusetts between 2012 and 2017". Sixth Edition, Published February 2020, Accessed Feb. 16, 2022

The Town of Lancaster possesses many important, high quality **Water Resources** including rivers, streams, wetlands, and ponds. The town's main rivers are the North Branch Nashua River, Mainstem Nashua River, and Still River. The North Branch of the Nashua River joins the Mainstem of the Nashua River at "the Meeting of the Waters" just above the Center Bridge Road bridge. The Still River enters South Lancaster from Bolton and crosses Route 110 then runs north along the east side of Bolton Flats crossing back into Bolton near Route 117 then eventually into Harvard where it then joins the mainstem Nashua River where it forms the boundary between Lancaster and Harvard within Bolton Flats Wildlife Management Area just south of the Oxbow National Wildlife Refuge. There are several small brooks and streams draining to the two branches of the Nashua River and to Still River. These small tributaries include McGovern Brook, Spectacle Brook, White Pond Brook, Bow Brook, Wekepeke Brook, Ropers Brook, Goodridge Brook, Ponakin Brook, and many other unnamed tributaries and channels draining wetland area (Lancaster OSRP, 2017; MassGIS).

The towns primary ponds include Spectacle Pond, Little Spectacle Pond, Turner Pond, Fort Pond, White Pond, Shirley Road Pond, Oak Hill Pond, Slate Rock Pond, Cranberry Pond, and South Meadow Pond West.

In his *History of the Town of Lancaster, Massachusetts: from the first settlement to the present time, 1643-1878*, published by the Town of Lancaster in 1879, Reverend Abijah P. Marvin described Lancaster's northern ponds and the Nashua River in this eloquent way:

> *If these ponds are jewels on the bosom of Lancaster, the Nashua is a silver girdle, reaching from shoulder to shoulder and circling her waist. The north branch rushes from the hills of Ashburnham and Westminster, through Fitchburg, between high banks and over a rocky channel. In Leominster the valley spreads into a long intervale, and this feature is preserved as the stream rolls on to the meeting of the waters, where the south branch comes in and makes the main river, and thence to the northern boundary. But the rush and momentum of the branches in their upper channels, crowd the river along the lower and smoother level with a steady force.*
>
> *(Abijah P. Marvin, p. 29)*

Several small impoundments also exist along several of Lancaster's streams. These small, impounded wetland ponds are either natural, beaver influenced, or the result of small, unregulated dams like the two impoundment ponds along Goodridge Brook in South Lancaster. Bartlett Pond, a former small dam impoundment also existed prior to the removal of Bartlett Pond Dam in 2016. The former pond is now a meadow in succession along the banks of Wekepeke Brook (Lancaster OSRP, 2017; MassGIS).

Six of Lancaster's ponds are designated by the Commonwealth of Massachusetts as "Great Ponds". A great pond is defined as any pond or lake that is greater than 10-acres in size in its natural state or which once were that size. Great Ponds are considered a common, public resource and as such public access to great ponds is provided. Lancaster's Great Ponds with public access are Fort Pond, Spectacle Pond, Little Spectacle Pond, Turner Pond, Whites Pond, and South Meadow Pond (partially within Clinton).

Several of Lancaster's streams and brooks have been designated by the Commonwealth of Massachusetts as Cold-water Fish Resources. They are listed below along within the description of other designated, protected wildlife habitats.

Lancaster's public water supply is served from two municipal groundwater wells supplying untreated water to approximately 75% of the town's population. The quality and quantity of water pumped from these wells are dependent upon the protection of groundwater aquifers. There are three medium-yield aquifers and three high-yield aquifers within the Town boundaries. Protection of these aquifers is always of critical importance to the public welfare and any potential impacts should be evaluated relative to their short-term and long-term consequences (Lancaster OSRP, 2017, MassGIS).

The Town of Lancaster, though it's Conservation Commission, Department of Public Works, and the previous generosity and thoughtful consideration of several residents or their family members or beneficiaries possess a considerable amount of ***Conservation and Open Space Lands***. These Open Space Lands include forests, flood plains, wetlands, fields, rivers, hills, and other important natural features that provide important, and in many cases, unique habitat and migratory corridors for a variety of mammals, birds, insects, fish, reptiles, and amphibians. In addition, they provide important community services, and hazard mitigation benefits and values, such as flood control, pollution control, and microclimate stabilization. Large areas of protected open space, particularly those of unique or critical habitats likely promote climate resiliency, offer potential wildlife climate refugia, provide crucial habitat-specific breeding and rearing features, and increase ecological and biological diversity and species richness.

Lancaster's protected Open Space Lands include: Cook Conservation Area, Lunenburg Road Conservation Area, Bolton Flats WMA, Oxbow National Wildlife Refuge, Bartlett Pond Conservation Area & Robert Frommer Park, Dexter Drumlin Reservation, Parker Property, Eagle Ridge Estates Conservation Area, Atherton Bridge Conservation Area, Cosimi Conservation Area (Main Street Canoe Launch), Lancaster Water Supply Land (Mill Street Extension/Bolton Station Road), Mill Street Conservation Area, Nashua River Greenway CR (off Mill Street), Shar CR, Ballard Hill Conservation Area, Rota CR, Ballard Hill North Conservation Area, Runaway Brook Conservation Area. In addition, the town has several protected forests for the purpose of sustainable forestry and forest management. These ***Forest Lands*** include Lancaster State Forest (bordering Cook CA on N. Nashua), Lancaster-Blood Town Forest, Thayer Forest, and Confarm Forest (Lancaster OSRP, 2017; MassGIS).

Lancaster has several ***protected wildlife habitat*** areas as designated by the Commonwealth of Massachusetts Department of Fisheries and Wildlife, Natural Heritage and Endangered Species Program. These protected ***Natural Heritage and Endangered Species Habitat Areas*** include a designated area of Critical Environmental Concern, the **Central Nashua River Valley, Area of Critical Environmental Concern**, three designated areas of **Estimated Habitats of Rare Wildlife** (**EH 1113**; **EH 1072**; **EH 992**), and three designated areas of **Priority Habitats of Rare Species** (**PH 1643**; **PH 1561**; **PH 1390**) (MassGIS).

In addition to those protected wildlife habitat areas, Lancaster also includes several water resources which are state-designated ***Cold-water Fish Resource Areas***. These waterbodies include Bow Brook, Wekepeke Brook, Spectacle Brook, Unnamed Tributary to Slaterock Brook, Slaterock Brook, Ponakin Brook, Still River, Goodridge Brook. These areas are classified as capable of providing habitat necessary to support the presence and reproduction of cold-water fish species, including brook trout. Cold-water habitats and the species of fishes they support are a sensitive and threatened resource within Massachusetts (MassGIS).

3.6 Infrastructure & Critical Facilities

Infrastructure, in its most literal sense, is the underpinnings, or foundation, upon which a community and its economy and livelihood are built and sustained. The term first appeared in common usage in the late 1880's and is derived from the French words *infra-* meaning below and *structure* meaning building. In

more general terms, according to Jeffrey Fulmer (2009), infrastructure can be considered "the physical components of interrelated systems providing commodities and services essential to enable, sustain, or enhance societal living conditions" of the built and natural environment (Fulmer, Jeffrey (2009). "What in the world is infrastructure?". *PEI Infrastructure Investor* (July/August): 30–32.). The makeup of a town's infrastructure consists of *soft infrastructure*, *hard infrastructure*, and *critical infrastructure*.

Soft infrastructure includes institutions that help maintain the economy, health, and civic functions of a community. Examples of such institutions may include a community's healthcare, governmental and social services, law enforcement, financial, and educational systems.

Hard Infrastructure includes the serviceable physical assets and systematic structures that provide the necessary mechanics, utility, and operability required for a community to function in a methodical, industrious, and utilitarian manner. Examples of such physical assets and systematic structures include a community's roadways, highways, bridges, culverts, public works equipment, waste management, public transit, and capital and assets required for their ensured maintenance, function, and operation.

Critical Infrastructure includes a combination of soft and hard infrastructure components and systems that are essential to a community's ability to provide for public health and safety and to allocate, implement, distribute, and dispense necessary resources and services which are critical to hazard prevention, mitigation, preparedness, response, and recovery efforts before, during, and following emergencies, severe weather conditions, and natural disasters, such as floods, drought, hurricanes, and tornadoes.

A complete list of Lancaster's critical facilities & infrastructure as identified by the HMPWG is provided below as **Table 3-4**:

Table 3-4. The Town of Lancaster's Critical Facilities & Infrastructure

Feature Type	Name	Address
Town Hall	Prescott Building	701 Main Street
Library	Thayer Memorial Library	717 Main Street
Community Center	Lancaster Community Center	695 Main St Suite 7
DPW	Lancaster Highway Department	432 Center Bridge Road
	Lancaster DPW Office	392 Mill Street Extension
Emergency Operations Centers	Lancaster Police Station	1053 Main Street
	Lancaster Fire Station	1055 Main Street
Fire	Lancaster Fire Station	1055 Main Street
	South Lancaster Fire Station	283 South Main Street

Police	Lancaster Police Station	1053 Main Street
EMS	Lancaster EMS Department	1055 Main Street
Water	Lancaster Water Department	392 Mill Street Extension
Recycling	Recycling Center – Lancaster DPW Barn	435 Center Bridge Road
Public Water Supply*	Dambrosio Eye Care, Inc.	479 Old Union Turnpike
	Gp Well # 1	
	U.S. Army Devens (South Post)	
	Out Water LLC	Old Union Turnpike
	Gp Well # 2	
	Norm Wagner Toyota	700 Old Union Turnpike
	Gp Well # 1	
	Gp Well # 2	
	YMCA Camp Lowe	Fort Pond Inn Road
	Lancaster Golf and Learning Center	438 Old Union Turnpike
	Horn Packaging	580 Fort Pond Road
	Kimball Farm at Oakridge	1543 Lunenburg Road
Public Sewer	Massachusetts Water Resources Authority (MWRA) – Clinton Wastewater Treatment Facility	677 High Street, Clinton, MA
Public Schools	Luther Burbank Middle School (Grades 6-8, Public)	1 Hollywood Drive
	Mary Rowlandson Elementary School (Grades PK-5, Public)	103 Hollywood Drive
Prisons	Souza-Baranowski Correctional Center	Shaker Road
Other Facilities		
Feature Type	**Name**	**Address**
Transmission Lines	Tennessee Gas Pipeline	
	Powerline Corridor (Rt 190 to White Pond Rd. to Lunenburg Rd.)	
	Powerline Corridor (Route 190 to Chisolm Trail – Shirley)	
	Distribution Transmission Lines	

Early Education Childcare Facilities	Nashoba Montessori School, Inc.	725 Main Street
	Child Development Center at RFK	25 Creamery Rd
	Discovery Program-Day Care (South Lancaster Academy/Browning Elementary PreK-12)	180 George Hill Road
Elderly Housing	Bigelow Gardens	449 Main Street
HazMat Sites	Best Way of New England	840 Sterling Road
	Cumberland Farms #0177	110/Five Corners
	Cumberland Farms #2147	114 Main Street
	US Govt. South Post	Rt. 2
Hospitals or Medical Offices	Physical Therapy Plus @ Orchard Hill	100 Duval Road Ground Floor
Long Term Care Facility	Davis Manor	200 Harvard Road
	River Terrace Health Care (Kindred)	1675 North Main Street
Other Critical Facilities	YMCA Camp Lowe	Fort Pond
	Mass Youth Soccer	512 Old Union Turnpike
	Sterling Manufacturing Co.	640 Sterling Street
	Thayer Conservatory	438 Main Street
	Railroad Overpass	Rail Line & Bolton Road
	Railroad Overpass	Rail Line & Main Street
	Railroad Overpass	Rail Line & Nashua River
	Railroad Overpass	Rail Line & Nashua River
	College Church (former Atlantic Union College)	337 Main Street
	First Church of Christ Unitarian	725 Main Street
Residential Program Facilities	Perkins School--Crisis Unit	60 Pinfeather Lane
	Perkins--Manor House	971 Main Street
	Perkins School--Weymouth Program	850 Main Street

	RFK-Residence Hall	120 Old Common Road
	Perkins School--White Hall	1006 Main Street
	Perkins School--Friends Hall	40 Pin Feather Lane
	Perkins School--Duplex	60 Pinfeather Lane
	Perkins School--Curtis Hall	868 Main Street
Private Schools	Dr. Franklin Perkins School (Grades K-12, Special Ed., Residential, Private)	971 Main Street
	Trivium School (Grades 7-12, Private)	471 Langen Road
	Don Watson Academy – RFK Children's Action Corps (Grades K-12, Special Ed., Residential, Private)	220 Old Common Road
	Browning Elementary School (at South Lancaster Academy)	198 George Hill Road
	South Lancaster Academy (Grades PK-12, Private)	162 George Hill Road

In addition to the list of critical infrastructure above, the town of Lancaster Department of Public Works is responsible for maintaining approximately 85 miles of roadway. Major highways within the town's jurisdictional boundaries, including Route 2 and Interstate 190, are maintained by the Massachusetts Department of Transportation, Mass Highway Division.

Major roadway infrastructure in Lancaster includes several major Interstate Highways and primary state-designated highway routes, including Route 2, Route 190, Route 70, Route 117, Route 110, and Route 62 which are all important to the area's regional transportation network. A detailed description of these major highways and other significant, or commonly used transit routes are provided below.

Interstate 495, which loops around Boston from the "Head of Buzzards Bay" to the "Mouth of the Merrimack", eventually connecting back to Interstate 95 near Newburyport, is located just west of Lancaster in neighboring Bolton. While I-495 is not located within Lancaster, it is important to, and influences the traffic and transportation networks within Lancaster as a result of its proximity and connections to other roadways within the jurisdictional boundaries of the town.

Route 2 runs east-to-west through the northern part of town connecting west to Leominster and eventually Albany, New York, and east to Harvard and beyond to the City of Boston.

Interstate 190 runs along a portion of the town's western border and connects two of the region's urban centers, Leominster and Worcester. I-190 provides a connection between Route 2, in the north at Leominster, and Interstate 290, in the south at Worcester.

State Route 117 bisects Lancaster in an east-west direction between I-190 and I-495 in the neighboring town of Bolton.

State Route 110 (Clinton to Bolton) and State Route 62 (Sterling to Clinton) are less heavily traveled but still serve as critical local and regional transportation infrastructure.

State Route 70 intersects with Route 2 in the northwestern part of town and runs south crossing Route 117 at North Village near the center of Lancaster and continues to the southern border with Clinton and eventually beyond into the City of Worcester.

State Route 62 passes through the southwestern corner of town, in the areas known as Ebanville and Deershorn, entering from Clinton and traversing to the Sterling border and continuing westward to Barre center.

Since the building of Routes 495 (1958 to 1975) and 190 (1975 to 1983) traffic on Route 117 in Lancaster has increased dramatically as the roadway is often used during peak commute times as a connecting corridor between those major interstate routes (Interstate-Guide.com, website, Accessed, Mar. 30, 2022).

In addition to these major highways, several important **major collector roads** and **minor arterial roads** also exist. Lunenburg Road in the northwest, acts a major collector road between the intersection of Route 2 and Route 70 and Leominster Shirley Road to the north in Lunenburg. Shirley Road in the north, acts as a major collector from Route 2 north to Route 2A in Shirley. Fort Pond Road runs parallel Route 2 and provides a major collector road between Shirley Road and Lunenburg Road. In the south, Center Bridge Road is an important collector road between Route 70 (Main Street) and Route 110 (High Street Extension) through the Bolton Flats near the junction of the Nashua and North Nashua Rivers.

Some other local roads provide important connections between these major roadways and local neighborhoods and historic villages. For instance, Langen Road and Goss Lane as well as Sterling Road and Deershorn Road in addition to George Hill and Hilltop/Flanagan Hill Roads, and Brockelmen Road are used to transit or connect areas south of Route 117 and west of Route 70 in South Lancaster and the Ebanville area; Bolton Road, Old Common Road, Mill Street/Mill Street Extension, Bolton Station Road, and Center Bridge Road are the primary local roads in the Southeast corner of town between Route 70 and Route 110 and east of Route 110 to the Bolton border. (This area is known as Five Corners from the place where Old Common Road, Route 110, Center Bridge Road, and Bolton Road meet.); Harvard Road, Neck Road, Packard Street, Pine Feather Drive and Perkins Drive provide transit routes and access to the homes, farm fields, and areas located in the northeast part of Lancaster.

Several of Lancaster's major also function as local and regional evacuation routes (See Figure 3-4 below; Map prepared by MRPC for the Massachusetts Central Region Homeland Security Advisory Council (CRHSAC) using various GIS data sources).

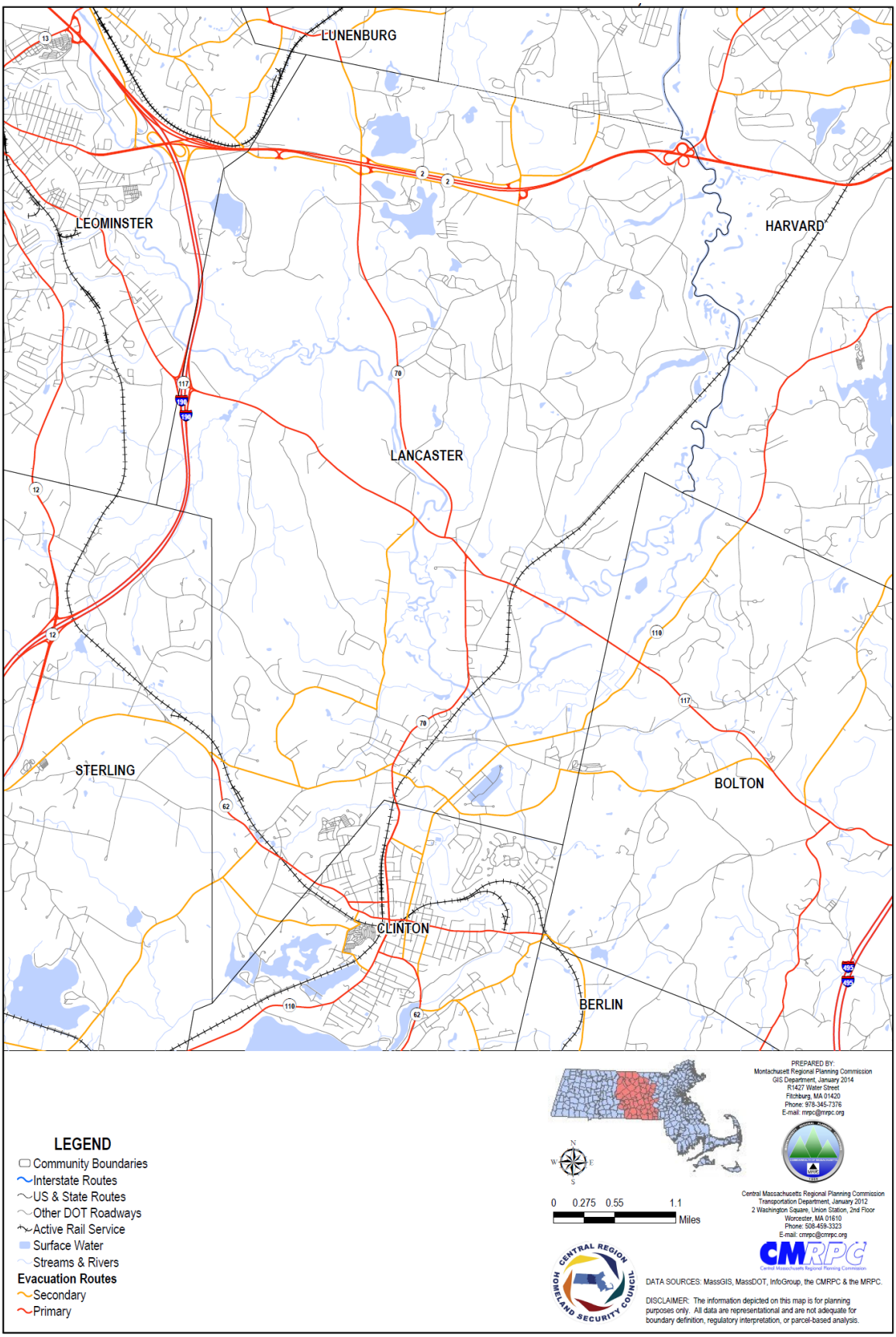


Figure 3-4. Regional Evacuation Routes for Lancaster and Central Massachusetts (2014)

In addition to the network of roads and highways, Lancaster's transportation systems also include public transit services administered by the *Montachusett Regional Transit Authority (MART)*. The local transit bus service is the most prominent method of public transportation in the region and is available in Fitchburg, Leominster, and Gardner. The MART has one fixed stop in Lancaster along Route 8, which is at D'Ambrosio Eye Care. MART's Route 8 is primarily in Leominster and provides service to Monument Square to the Mall at Whitney Field, Crossroads Office Park (Mechanic Street, Leominster), D'Ambrosio Eye Cre Center (Lancaster), Orchard Hill Park (Target and Kohl's), and the Leominster Senior Center. (mrta.us/schedule-map/route-8/, Accessed Feb. 17, 2022)

The Massachusetts Bay Transportation Authority (MBTA) commuter rail line (known regionally as the "T") runs just outside the towns northern border along a portion of the town's border with Leominster and Lunenburg. Passenger service is available at station stops in the adjacent neighboring towns of Leominster and Shirley, making Lancaster an "*MBTA Community*". (MBTA Communities are those towns that are either directly served or abutting a town that is directly served by the MBTA.)

Railroad freight transportation networks also exist within Lancaster. The Springfield Rail Terminal Railway, which bisects the southeast corner of Lancaster, operates a line that offers freight rail service through town, but it does not stop in Lancaster or directly serve any of its businesses. CSX Transportation, also operates one line running through Lancaster from Fitchburg to Clinton. That line runs through the westerly side of Lancaster (OSRP, 2017; MassGIS).

Airline transportation is also readily accessible from Lancaster with several regional, national, and international airports located within a conveniently commutable distance. Major commercial flights are available at Boston Logan International Airport in Boston, Rhode Island T.F. Green International Airport in Providence, Rhode Island, Manchester-Boston Regional Airport in Manchester, New Hampshire, Bradley International Airport in Bradley Field, Connecticut. A limited number of commercial airlines serving a small number of locations are available locally at Worcester Regional Airport in Worcester.

Along with the soft, hard, and critical infrastructural assets listed and described above, soft infrastructure also includes waste disposal services, such as garbage pickup and local dumps and certain administrative functions, or public programs and services, which are often covered by local town government or nonprofit organizations. In addition to education and health care facilities, public health programs, services, and information are also be included, along with certain essential or highly beneficial scientific, research and development, investigative, training, and industrial disciplines which directly support or enable necessary infrastructure functions and services.

Natural hazards affect each of these infrastructure categories and facilities (or services) to varying degrees depending on relationships between certain circumstances of the particular hazard and infrastructure or service with regard to location, extent, occurrence, impact, and vulnerability. A full evaluation of those circumstances is provided in the following section.

Lancaster Hazard Mitigation Plan

Section 4

Section 4: Hazard Identification and Vulnerability Assessment

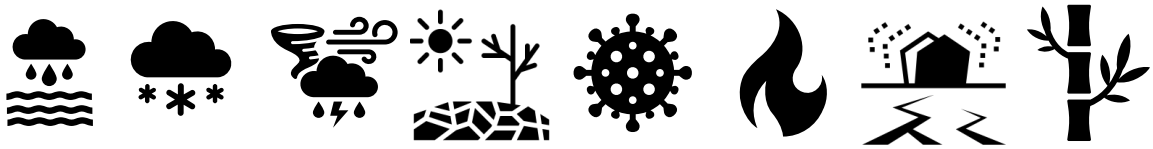
FEMA defines a hazard as an act or phenomenon that has the potential to cause harm or produce other undesirable consequences to a person or thing. Lancaster, like all towns, and particularly those of central Massachusetts, is vulnerable to a broad range of natural hazards. The purpose of the development and maintenance of this plan is to mitigate the potential harm or undesirable consequences of the hazards faced by the town. To identify and evaluate these hazards the Town of Lancaster HMPCWG reviewed the full range of hazards identified in the 2018 Massachusetts State Hazard Mitigation and Climate Adaptation Plan (SHMCAP), 2015 Massachusetts State Hazard Mitigation Plan, and the information gathered and documented in the 2020 Lancaster Community Resilience Building (CRB) Workshop and Report. While priority of hazard relevance was given to the most recent Massachusetts SHMCAP (2018) and Lancaster CRB Report (2020), a review of the 2015 State Hazard Mitigation Plan was conducted for reference.

The following section provides a summary of hazards which have occurred within Lancaster and those which were identified to have the greatest likelihood to occur in the future and most potential to cause impacts to the town of Lancaster. An evaluation of each specific hazard relative to the **Type, Location, Extent, Previous Occurrences, Probability of Future Events, Impact, and Vulnerability** is given for each identified hazard. An assessment of the potential effect that climate change may have on individual hazard types was considered and described for each hazard. Hazards believed to be most affected by climate change in Lancaster were previously identified as priorities in the town's 2020 Community Resilience Report. Those explicit hazards and their climate-influenced vulnerabilities were identified and addressed separately in section 4.4 and integrated throughout the summarization of general hazard evaluations and vulnerability assessments of sections 4.2, 4.4, and 4.5.

Finally, a comprehensive, overall risk assessment, or assessment of vulnerabilities is given relative to each hazard type and the jurisdiction area. These vulnerabilities are summarized as a vulnerability, or risk matrix in section 4.5. Consideration is given to known historical hazard events and recently observed changes in climatic conditions relative to location, extent, probability of future events, impacts, and vulnerabilities. The content, structure, format, and methodology of this section is consistent with the guidelines of the FEMA Regulation 44 CFR 201.6, Local Mitigation Plans.

This section includes the following subsections:

4.1. Summary of Historical Hazard Events
4.2. Hazard Identification
4.3. Climate Change Vulnerability Assessment
4.4. Hazard Vulnerability Assessment
4.5. Summary of Vulnerabilities, Risk Matrices



4.1 Summary of Historical Hazard Events

A profile summary of historical hazard events which have occurred within Lancaster is provided here as an introductory overview to establish an understanding of what, when, how, and where past hazards have affected the people, economy, infrastructure, and natural resources of Lancaster (see pictographic timeline on the proceeding pages). A list of Emergency Declarations (Table 4-1) since 2011 (FEMA; MEMA) and a summary of severe weather events (Table 4-2) occurring in Worcester County since the last update of the plan (2015) are provided below (NOAA-NWS Storm Events Database, accessed March 17, 2022).

Table 4-1. Recent major State of Emergency & Disaster Declarations affecting Worcester County.

Year	Declaration Period	Disaster	State or Federal
2020	January 20 to Present	Covid-19 Pandemic	Both
2020	January 20 to Present	Covid-19	Both
2018	March 13 to March 14	Severe Winter Storm/Snowstorm	Federal
2018	March 3 to March 6	Coastal Storm	State
2015	February 9 to February 25	Severe Winter Storm/Snowstorm	State
2015	January 26 to January 28	Severe Winter Storm/Snowstorm & Flooding	Both
2013	February 8 to February 13	Severe Winter Storm/Snowstorm & Flooding	Both
2012	October 27 to November 8	Hurricane Sandy	Both
2011	October 29 to November 7	Severe Winter Storm/Snowstorm (Nor'easter)	Both
2011	August 26 to September 6	Hurricane Irene	Both
2011	June 1 to June 11 & 19	Severe Storms and Tornadoes	Both
2011	January 12 to January 13	Severe Winter Storm/Snowstorm	State

Sources: Commonwealth of Massachusetts, MEMA – State of Emergency Information; U.S. Dept. of Homeland Security, Federal Emergency Management Agency, FEMA.gov – Disaster Declarations

Table 4-2. Severe weather events affecting Worcester County between Jan. 1, 2015, and Dec. 31, 2021.

County	Event Type (NWS Directive 10-1605)	Number of Days with Event	Number of Days with Death	Number of Days with Injury	Number of Days with Property Damage
Worcester	Blizzard	1	0	0	0
Worcester	Drought	10-months	0	0	0
Worcester	Extreme Cold/Wind Chill	5	0	0	0
Worcester	Flash Flood	12	0	0	7
Worcester	Flood	34	0	0	18
Worcester	Hail	19	0	0	0
Worcester	Heavy Snow	20	0	0	3
Worcester	High Wind	19	1	1	17
Worcester	Lightning	11	0	0	11
Worcester	Strong Wind	65	0	0	64
Worcester	Thunderstorm Wind	57	0	1	57
Worcester	Tornado	6	0	1	5
Worcester	Tropical Storm	3	0	1	3
Worcester	Winter Storm	12	0	0	2
Worcester	Winter Weather	18	0	0	9

Source: NOAA – National Weather Service, Storm Events Database (for more information please refer to *Database Details*)

Below is a historical timeline summarizing many of the most severe storms and impactful hazard events which have occurred within the Town of Lancaster over its documented history of habitation:

Earthquakes of 1638 & 1663

Two documented earthquakes occurred in 1638 and 1663 in Concord, NH and Quebec with 6.5 and 7.5 magnitudes were felt in Massachusetts.

The Great September Gale of 1815

In 1815 a great gale (the term hurricaine was not yet in current use then) struck New England. According to Marvin's *History of Lancaster*, the storm likely had an impact on Lancaster's roads and bridges, and certainly its trees. In his history he stated that…"[1815] is memorable for the "September Gale" when thousands of trees were thrown down." (Marvin, 1879; p. 447)

Flood of 1936

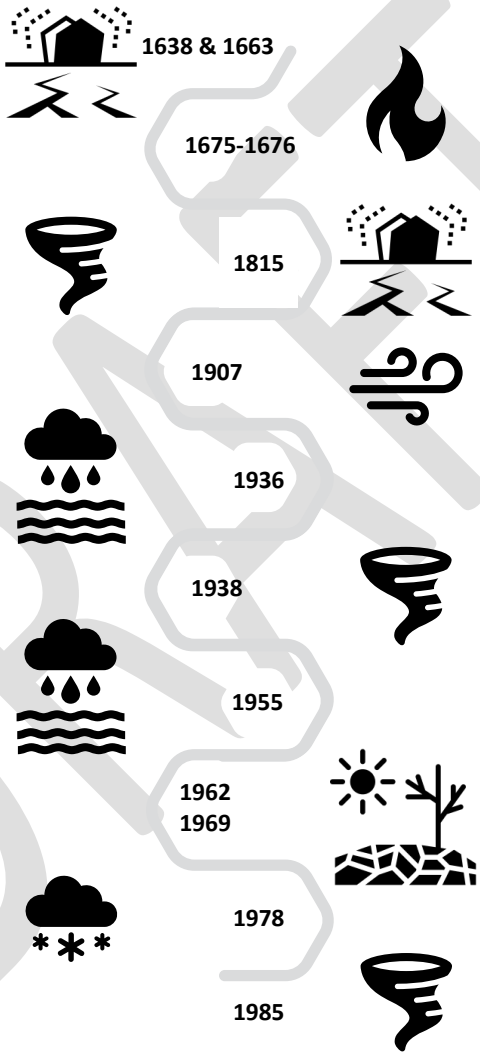
The Great Flood of 1936 was one of the worst floods in Massachusetts history. Several factors, including extreme cold winter temperatures which led to ice buildup in rivers, heavy snowpack, and an abrupt March thaw and rain event, led to some of the worst flooding on record.

Floods of Connie & Diane

The Hurricaines of Connie and Diane travelled up the east cost only 1-week apart in August of 1955. After receiving 4-6 inches of rain from Connie, rivers were swollen, and the ground was saturated. Then, Diane hit Southern New England and brought up to 20 inches of rain over a 2-day period. The rainfall and flooding were record-breaking in many areas. Hurricane Diane led to the Federal Flood Insurance Act of 1956. **Emergency Declaration**.

Blizzard of 1978

One of the most severe Nor'easter's of all time. Up to 3-feet of snow accumulated blocking roads and trapping people in their homes for days. The Commonwealth's first ever statewide road closure was issued. **Emergency Declaration**.



Town & Bridges Burned

As two of the first actions of King Phillip's War the town of Lancaster was raided in August of 1675 and February of 1676, and the town's homes, bridges, and fields were burned.

Earthquakes of 1727, 1744, 1761, & 1755

Massachusetts experienced several earthquakes with estimated magnitudes between 4.6 and 6.2.

Severe Storm Wind Event

Lancaster's renowned "Great Elm" was lost to a blow down during a severe summer storm event. Downed trees and other related stormdamage occur frequently in Lancaster and many of its "great" trees, have been lost to wind and time, including the Beaman Oak (1989) and the Rowlandson Pine (2002).

Hurricaine of 1938

The Great New England Hurricaine of '38 made landfall at the astronomical high tide and was one of the most destructive and powerful storms of all time. The storm caused severe damage to trees, buildings, homes, and caused significant flooding. Only two years after the Great Flood of '36, all the town's bridges were washed out. Street trees and forests were severely impacted, and the storm scarred and changed the landscape. Signs of it can still be seen today.

Severe, Long-term Statewide Drought

A long-term, 7-year multistate drought was one of the worst on record in Massachusetts and resulted in water-supply shortages in many areas.

Hurricaine Gloria

September 28, 1985, Hurricaine Gloria affected southern New England. 500,000 Massachusetts residents lost power and high wind and substantial rain caused severe tree damage and flooding statewide. **Emergency Declaration**.

Flooding of 1987

Over 6-inches of rain fell in early April within the upper Nashua River basin. The rain and snowmelt caused a dam to fail in Fitchburg washing out Bemis Road Bridge and causing downstream flooding through Leominster and into Lancaster. **Emergency Declaration**.

Statewide Level-II Drought, 2001 - 2003

Statewide period of drought from December of 2001 until January of 2003. Level-II, "Significant Drought" was reached for several months.

2008 Wildfire

April 2008, a large wildfire burned 100's of acres of the Devens, South Post Training Area following a period of region-wide drought.

Flooding of 2010

A series of several precipitation events over a 5-week period in March following a recent snow storm and a winter of heavy snowpack, resulted in major flooding throughout Massachusetts. The Nashua River was hit especially hard. Parts of Clinton and Lancaster were underwater for days and residents were seen kayaking down Bolton Road in Lancaster. **Emergency Declaration**.

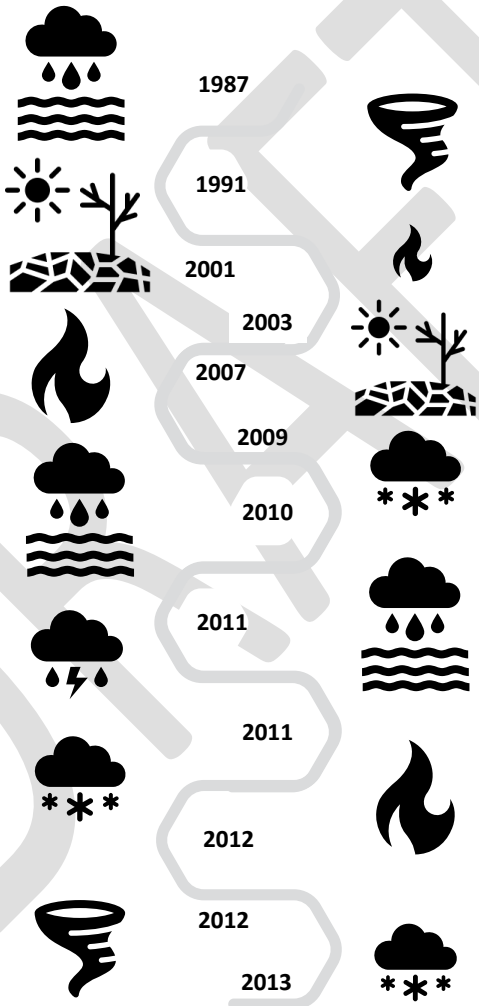
Severe Storms – A June 1, 2011, storm resulted in hail, tornadoes, and high winds causing damage throughout Massachusetts. **Emergency Declaration**.

October Nor'easter

October 29, 2011, snowstorm brought 24" to 32" of snow to towns throughout Massachusetts with wind gusts of up to 69mph. Known as the Halloween Nor'easter, or Snowtober, it was the 14th multi-billion-dollar weather-related disaster of 2011. It resulted in over 400,000 power outages and 6 deaths in Massachusetts. **Emergency Declaration**.

Hurricane Sandy

October 27th to November 28th, 2012. Hurricane Sandy affected 24 states, including the entire east coast from Florida to Maine, and inflicted $65 Billion in damage. **Emergency Declaration**.



Hurricaine Bob

On August 19, 1991, Hurricane Bob hit the New England Coast making landfall at Block Island and Newport Rhode Island. It was one of the costliest hurricaines in Massachusetts history accounting for $1 Billlion of the total $1.4 Billion in damages to U.S. states and Canadien provinces. **Emergency Declaration**.

2002 Wildfire – August 14, 2002, a wildfire burned a large area of the Devens, South Post Training Area in Lancaster.

Regional Level-I Drought, 2007 - 2008

An unusual period of drought occurred between October 2007 to March 2008.

Ice Storm of 2008

One of the region's worst ever ice storms. Power outages statewide for weeks and severe tree damage statewide. **Emergency Declaration**.

Hurriane Irene Flooding

August 27th to 29th 2011, Hurrucaine Irene hit the Mid-Atlantic and Northeast U.S. resulting in $13.5 Billion in damages including substantial flooding in Massachusetts and throughout New England. **Emergency Declaration**.

Wildfires of 2012

Unseasonably dry conditions led to at least 4 brush fires in different parts of Worcester County on April 18, 2012. In Lancaster, a brushfire occurred off South Meadow Road. Firefighters were able to contain and extinguish the blaze quickly, but it posed a real risk of spreading if it had not been reported or responded to so quickly. Brush fires which occurred in Leicester/Paxton, Northbridge, Petersham, were considerably larger and more resource intensive.

Winter Storm Nemo – Feb. 8th & 9th 2013. Nor'Easter caused heavy snow and coastal flooding throughout Massachusetts. The February 2013 North American Blizzard, or the Blizzard of 2013, produced up to 2-feet of snow and 30-50 mph winds. **Emergency Declaration**.

2013 Wildfire

October 2013, a large brushfire, scorched a large wooded area off Hilltop Road and required assistance from Harvard and Groton to control. Chiansaws were used to clear a path for a brush truck to get water to the area.

Strong Winds of 2016

No less than 9 Strong Wind events occurred in Northern Worcester County between March and December 2016. High wind and several heavy rain events caused downed trees, downed power lines, flooding, and power outages in Lancaster.

Flooding of 2017

Flooding conditions were experienced on the Nashua River between April 4-7, 2017. Several roadways, including Route 117, were closed in Lancaster due to the flooding.

Covid-19 Pandemic

Global outbreak of the novel coronavirus (SARS-CoV-2). Covid-19 resulted in over 1.69 million total cases and 20,029 deaths in Massachusetts between March of 2020 and March of 2022. 191k of those cases and 2,559 deaths occurred within Worcester County. **Emergency Declaration**.

2013

2016

2017

2018

2020

2030

2040

2050

2060

January 2015 Blizzard

January 26 - 27, 2015, an historic winter storm with 34 to 36-inches of snow reported in nearby Acton and Hudson. Blizzard conditions were reported for several hours throughout the region. **Emergency Declaration**.

Statewide Level III Drought

July 2016 to April 2018. Statewide drought conditions led to instances of wildfire, water bans, and a gypsy moth outbreak. Usually, early season rain events cause a fungus that controlss gypsy moth populations. However, without any moisture, populations grew out of control which decimated tree foliage in most of Southern New England.

Wildfire 2018

A brush fire burned about 3-acres near the railroad tracks off Pine Hill Road. Multiple Fire Departments responded to the 2-alarm wildfire.

Sources:

Costliest U.S. Tropical Cyclones Table Updated, Natonial Oceanic & Atmospheric Administration – NHC. Accessed 14 Mar 2022

Hurricane Sandy Situation Report #6" (PDF). United States Department of Energy Office of Electricity Delivery & Energy Reliability. October 31, 2012. Archived from the original (PDF) on March 2, 2013. Retrieved March 13, 2022.

Storm Events Database, National Oceanic & Atmospheric Administration – National Weather Service. Accessed 17 March 2022.

Lancaster Community Resilience Building Report, 2020. Town of Lancaster, Prepared by BETA Group, Inc. Municipal Vulnerability Preparedness Program, Massachusetts EOEEA.

Online Archives of Local Contemporary Newspapers, News Media Outlets and Wikipedia Online Encyclopedia. Accessed February and March 2022.

FEMA Declared Disasters Search Tool, Federal Emergency Management Agency. Accessed March 17 & 24, 2022.

Recent years, between 2001 to present, have resulted in an increase in the frequency, duration, and intensity of many types of severe storms and weather patterns. During this time the town of Lancaster has experienced long lasting drought, multiple wildfires, several floods, an increasing number of severe storms and natural disasters, including early- and late-season winter storms, a major ice storm, and storm-related wind events that have resulted in numerous, costly, and live-threatening storm-related damages. The increase in the severity and occurrences of severe storm events, and the elevated degree of their impact, may be attributable to climatic changes on a regional and global scale. Recent severe weather hazards experienced by the town of Lancaster, including drought, severe winter storms, high winds, heavy snow, unseasonably, early, or late winter storms, early spring thaws, and intense rain may be a result of changing climatic conditions. The impacts of these changes are becoming more apparent with each event, especially along the two branches of the Nashua River where instances of late-winter or early-spring flooding and periodic flash flooding are occurring more frequently than usual.

During that 20-year period, between January 1, 2001 and December 31, 2021, within Worcester County, there have been no less than 42 months of drought, and at least 671 days with recorded storm related hazard events including 4 days of above normal or excessive heat and high humidity, 5 days of extreme cold/wind chill, 1 day of frost/freeze, 82 days with hail, 47 days with recorded lightening, 281 days with recorded high (46), strong (81), or thunderstorm winds (154), 11 days with a recorded tornado (two of them in towns abutting Lancaster – Bolton and Clinton), 4 days of tropical storms, 2 days with heavy rain, 142 days with severe winter weather including, 4 ice storms, 2 days with blizzards, 42 days with winter storms, 31 days with winter weather, 63 days with heavy snow, and, finally, 92 days with recorded flooding, including 28 flash floods (NOAA-NWS Storm Events Database, Accessed March 17, 2022). During that same 20-year period there have been 22 Federal emergency declarations affecting Worcester County. Since 1953 there have only been a total of 55 Federal emergency declarations state-wide (FEMA.gov Declared Disasters, Accessed March 22, 2022).

4.2 Hazard Identification

The following sub-sections provides an evaluation of each hazard type identified relative to documented occurrences of past events and the likelihood of future occurrences within Worcester County and the town of Lancaster. Two additional hazards, *Wildfire*, and *Infectious Disease and Pandemic*, not previously identified or included in prior plans, were included as part of this plan. their associated risks were assessed and considered within the mitigation strategy.

Lancaster has identified the following eight (8) hazards:

1.) Flooding
2.) Severe Winter Storm
3.) Other Severe Weather
4.) Drought & Extreme Temperature
5.) Earthquake
6.) Infectious Disease & Pandemic
7.) Wildfire
8.) Invasive Species

These eight (8) hazards, as they pertain to Lancaster, are evaluated, and described below within subsections 4.2.1 to 4.2.8.

Each hazard was assess based on **Location, Extent, Previous Occurrences, Probability of Future Events, Impacts, and Vulnerability (See FEMA Worksheet 5.1)**

4.2.1 Flooding Hazard:

Lancaster, as a town, and its inhabitants have been susceptible to flood-related impacts for as long as the area has been inhabited. Flooding along the Nashua Rivers, as a seasonal occurrence, and worse, as the result of extreme storm events, or cold, snowy winters followed by sudden, or early spring-thaw snowmelt and intense, or prolonged rainfall has impacted the native Nashaway people, early English settlers, and current-day residents of Lancaster throughout the area's history. The name 'Ponakin' in Ponakin Mill, a village of Lancaster, adjacent to the North Nashua River, is short for the Native Nashaway word *Quasaponakin*, which is said to mean, "entirely full of water". Over the course of its history, seasonal weather patterns and storms have often presented a flood hazard to the town. Many of these floods have resulted in severe impacts, particularly those associated with late-winter or early-spring thaws, like the Great Flood of 1936, or the floods of March 2010. The disposition of the town's landscape – rivers, broad intervals, low-lying floodplains, and perennial wetlands – combined with its geographic location at the "meeting of waters" of the higher-gradient, swift moving, North Nashua, and the low-lying, broad, meandering (South) Nashua River make this place an area of natural inundation. (Lennon, 2005)

In the period since Lancaster's last HMP (2015) there have been 46 different days of a reported flood event (34 Flood events, and 12 Flash Flood events) within Worcester County (NOAA-NWS, Storm Events Database). Flooding is known to occur throughout Lancaster but specifically, and most frequently within areas located along the two branches of the Nashua River and their tributaries. Specific areas or infrastructure affected by flooding, and their associated impacts are discussed in greater detail in the Assessment of Vulnerabilities section below. In addition to recent documented flood events, past historic flood events, some of which were documented in the introductory summary above, have been known to occur. Specific instances of such events include, the Great Flood of 1936, the flooding associated with the Hurricane of 1938, the Floods of Hurricanes Connie & Diane (1955), the spring floods of 1987 and 2010, and Hurricane Irene Flooding (2011).

The SHMCAP (2018) lists Flooding as a natural hazard related to the primary climate change interaction of Changes in Precipitation.

4.2.2 Severe Winter Storm Hazard:

Severe winter storms are documented to occur historically in Lancaster (Section 4.1 above) and have been shown to be increasing in severity in recent years. The SHMCAP (2018) documented Severe Winter Storm/Ice Storm hazards as one of the top hazards with a high vulnerability score affecting physical/non-physical assets based on several critical items. **Table 4-3** below is a summary of severe winter weather events affecting the Northeast corridor and the Town of Lancaster.

The SHMCAP (2018) lists Severe Winter Storm/Nor'easter as a natural hazard related to the primary climate change interaction of Extreme Weather.

Table 4-3. Extent and previous occurrences of major snowstorms affecting the Northeast urban corridor since 1956, having resulted in greater than 4-inches of snowfall, relative to Lancaster, Massachusetts.

Lancaster, MA	Storm Duration		NESIS Classifications			NOAA Snowfall Accumulation
Snowfall (In)	Start	End	Value	Category	Description	Storm Maps (Hypertext-Links)
10 - 20"	2021-01-30	2021-02-03	4.93	3	Major	ncdc.noaa.gov/snow-and-ice/rsi/nesis
4 - 10"	2020-12-14	2020-12-18	3.21	2	Significant	ncdc.noaa.gov/snow-and-ice/rsi/nesis
10 - 20"	2018-03-11	2018-03-15	3.16	2	Significant	ncdc.noaa.gov/snow-and-ice/rsi/nesis
10 - 20"	2018-03-05	2018-03-08	3.45	2	Significant	ncdc.noaa.gov/snow-and-ice/rsi/nesis
10 - 20"	2018-01-03	2018-01-05	2.27	1	Notable	ncdc.noaa.gov/snow-and-ice/rsi/nesis
10 - 20"	2017-03-12	2017-03-15	5.03	3	Major	ncdc.noaa.gov/snow-and-ice/rsi/nesis
10 - 20"	2015-02-08	2015-02-10	1.32	1	Notable	ncdc.noaa.gov/snow-and-ice/rsi/nesis
10 - 20"	2015-01-29	2015-02-03	5.42	3	Major	ncdc.noaa.gov/snow-and-ice/rsi/nesis
30" +	2015-01-25	2015-01-28	2.62	2	Significant	ncdc.noaa.gov/snow-and-ice/rsi/nesis
4 - 10"	2014-11-26	2014-11-28	1.56	1	Notable	ncdc.noaa.gov/snow-and-ice/rsi/nesis
10 - 20"	2014-02-11	2014-02-14	5.28	3	Major	ncdc.noaa.gov/snow-and-ice/rsi/nesis
10 - 20"	2013-03-04	2013-03-09	3.05	2	Significant	ncdc.noaa.gov/snow-and-ice/rsi/nesis
20 - 30"	2013-02-07	2013-02-10	4.35	3	Major	ncdc.noaa.gov/snow-and-ice/rsi/nesis
10 - 20"	2011-10-29	2011-10-30	1.75	1	Notable	ncdc.noaa.gov/snow-and-ice/rsi/nesis
10 - 20"	2011-02-01	2011-02-03	5.3	3	Major	ncdc.noaa.gov/snow-and-ice/rsi/nesis
10 - 20"	2011-01-26	2011-01-27	2.17	1	Notable	ncdc.noaa.gov/snow-and-ice/rsi/nesis
10 - 20"	2011-01-09	2011-01-13	5.31	3	Major	ncdc.noaa.gov/snow-and-ice/rsi/nesis
4 - 10"	2010-12-24	2010-12-28	4.92	3	Major	ncdc.noaa.gov/snow-and-ice/rsi/nesis
4 - 10"	2010-02-23	2010-02-28	5.46	3	Major	ncdc.noaa.gov/snow-and-ice/rsi/nesis
4 - 10"	2009-12-18	2009-12-21	3.99	2	Significant	ncdc.noaa.gov/snow-and-ice/rsi/nesis
4 - 10"	2009-03-01	2009-03-03	1.59	1	Notable	ncdc.noaa.gov/snow-and-ice/rsi/nesis
4 - 10"	2007-03-15	2007-03-18	2.54	2	Significant	ncdc.noaa.gov/snow-and-ice/rsi/nesis
4 - 10"	2007-02-12	2007-02-15	5.63	3	Major	ncdc.noaa.gov/snow-and-ice/rsi/nesis
10 - 20"	2006-02-12	2006-02-13	4.1	3	Major	ncdc.noaa.gov/snow-and-ice/rsi/nesis
10 - 20"	2005-01-21	2005-01-24	6.8	4	Crippling	ncdc.noaa.gov/snow-and-ice/rsi/nesis
10 - 20"	2003-02-15	2003-02-18	7.5	4	Crippling	ncdc.noaa.gov/snow-and-ice/rsi/nesis
4 - 10"	2000-12-30	2000-12-31	2.37	1	Notable	ncdc.noaa.gov/snow-and-ice/rsi/nesis
4 - 10"	2000-01-24	2000-01-26	2.52	2	Significant	ncdc.noaa.gov/snow-and-ice/rsi/nesis
20 - 30"	1997-03-31	1997-04-01	2.29	1	Notable	ncdc.noaa.gov/snow-and-ice/rsi/nesis
4 - 10"	1996-01-06	1996-01-08	11.78	5	Extreme	ncdc.noaa.gov/snow-and-ice/rsi/nesis
10 - 20"	1995-02-02	1995-02-04	1.43	1	Notable	ncdc.noaa.gov/snow-and-ice/rsi/nesis
10 - 20"	1994-02-08	1994-02-12	5.39	3	Major	ncdc.noaa.gov/snow-and-ice/rsi/nesis
10 - 20"	1993-03-12	1993-03-14	13.2	5	Extreme	ncdc.noaa.gov/snow-and-ice/rsi/nesis
4 - 10"	1987-01-21	1987-01-23	5.4	3	Major	ncdc.noaa.gov/snow-and-ice/rsi/nesis

10 - 20"	1983-02-10	1983-02-12	6.25	4	Crippling	ncdc.noaa.gov/snow-and-ice/rsi/nesis
10 - 20"	1982-04-06	1982-04-07	3.35	2	Significant	ncdc.noaa.gov/snow-and-ice/rsi/nesis
20 - 30"	1978-02-05	1978-02-07	5.78	3	Major	ncdc.noaa.gov/snow-and-ice/rsi/nesis
10 - 20"	1978-01-19	1978-01-21	6.53	4	Crippling	ncdc.noaa.gov/snow-and-ice/rsi/nesis
10 - 20"	1972-02-18	1972-02-20	4.77	3	Major	ncdc.noaa.gov/snow-and-ice/rsi/nesis
4 - 10"	1969-12-25	1969-12-28	6.29	4	Crippling	ncdc.noaa.gov/snow-and-ice/rsi/nesis
20 - 30"	1969-02-22	1969-02-28	4.29	3	Major	ncdc.noaa.gov/snow-and-ice/rsi/nesis
10 - 20"	1969-02-08	1969-02-10	3.51	2	Significant	ncdc.noaa.gov/snow-and-ice/rsi/nesis
10 - 20"	1967-02-05	1967-02-08	3.5	2	Significant	ncdc.noaa.gov/snow-and-ice/rsi/nesis
4 - 10"	1966-12-23	1966-12-25	3.81	2	Significant	ncdc.noaa.gov/snow-and-ice/rsi/nesis
4 - 10"	1966-01-29	1966-01-31	5.93	3	Major	ncdc.noaa.gov/snow-and-ice/rsi/nesis
4 - 10"	1964-01-11	1964-01-14	6.91	4	Crippling	ncdc.noaa.gov/snow-and-ice/rsi/nesis
10 - 20"	1961-02-02	1961-02-05	7.06	4	Crippling	ncdc.noaa.gov/snow-and-ice/rsi/nesis
10 - 20"	1961-01-18	1961-01-21	4.04	3	Major	ncdc.noaa.gov/snow-and-ice/rsi/nesis
10 - 20"	1960-12-11	1960-12-13	4.53	3	Major	ncdc.noaa.gov/snow-and-ice/rsi/nesis
20 - 30"	1960-03-02	1960-03-05	8.77	4	Crippling	ncdc.noaa.gov/snow-and-ice/rsi/nesis
4 - 10"	1958-03-18	1958-03-21	3.51	2	Significant	ncdc.noaa.gov/snow-and-ice/rsi/nesis
10 - 20"	1958-02-14	1958-02-17	6.25	4	Crippling	ncdc.noaa.gov/snow-and-ice/rsi/nesis
4 - 10"	1956-03-18	1956-03-19	1.87	1	Notable	ncdc.noaa.gov/snow-and-ice/rsi/nesis

Source: NOAA, NCEI - NESIS (http://www.ncdc.noaa.gov/snow-and-ice/rsi/nesis), Accessed, April 20 & 21, 2022.

4.2.3 Other Severe Weather Hazard:

Other Severe Weather including hurricanes, rain events, wind events, severe thunderstorms, hail, and tropical storms have been documented to impact Lancaster. In particular, Lancaster seems to be particularly disposed to the impacts of high and strong winds related to severe weather. Also, the impacts of sudden, intense, and prolonged rain, and sudden melting of snow combined with rain, occurrences which are often associated with severe weather, can result in a serious risk of flooding throughout several areas of Lancaster, mostly associated with the two branches of the Nashua River. Examples of these particular instances have been documented in section 4.1 above.

The SHMCAP (2018) lists Other Severe Weather as a natural hazard related to the primary climate-change interaction of Extreme Weather. Hurricanes/Tropical Storms, Severe Winter Storms/Nor'easters, Tornadoes, and Other Severe Weather are also included under the Extreme Weather climate-change interaction category.

Table 4-4 below includes recent examples of severe weather events, other than severe winter storms, which have caused documented impacts that have specifically affected the Town of Lancaster.

Table 4-4. Severe weather events which have directly impacted the Town of Lancaster.

Location	County/Zone	St.	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
NORTHERN WORCESTER (ZONE)	NORTHERN WORCESTER (ZONE)	MA	10/20/2006	16:15	EST-5	High Wind	50 kts. EG	0	0	85.00K	0.00K
NORTH LEOMINSTER	WORCESTER CO.	MA	03/14/2010	09:03	EST-5	Flood		0	0	2.700M	0.00K
SOUTHBRIDGE	WORCESTER CO.	MA	03/29/2010	17:34	EST-5	Flood		0	0	4.050M	0.00K
SOUTHBRIDGE	WORCESTER CO.	MA	04/01/2010	00:00	EST-5	Flood		0	0	0.00K	0.00K
LANCASTER	WORCESTER CO.	MA	07/19/2010	18:55	EST-5	Funnel Cloud		0	0	0.00K	0.00K
HARDWICK	WORCESTER CO.	MA	03/07/2011	02:03	EST-5	Flood		0	0	25.00K	0.00K
NORTHERN WORCESTER (ZONE)	NORTHERN WORCESTER (ZONE)	MA	11/24/2013	12:28	EST-5	High Wind	50 kts. EG	0	0	15.00K	0.00K
FITCHBURG	WORCESTER CO.	MA	10/21/2016	17:58	EST-5	Flash Flood		0	0	75.00K	0.00K

Source: NOAA – National Weather Service, Storm Events Database (for more information please refer to *Database Details*)

4.2.4 Drought & Extreme Temperature Hazard:

Instances of statewide and localized drought have been common in recent years. In just the past twenty years, since 2001, the Lancaster and the Nashua River Watershed have experienced six instances of reportable Level 1 (Mild Drought), Level 2 (Significant Drought), and Level 3 (Critical Drought) drought conditions (**Table 4-5**). In the entire period of time between 1879 and the year 2000, a duration of 142-years, only 10 other instances of similar drought occurred state-wide (2019 Mass Drought Management Plan).

Table 4-5. Droughts in Massachusetts Based on Instrumental Records. This table has been adapted to include drought periods affecting the Nashua River Watershed and town of Lancaster in recent years.

Date Period	Region or Watershed Basin Affected	Drought Level	Reference
Dec 2001 – Jan 2003	Statewide	Level 2 drought was reached for several months	DCR 2017 - 2022
Oct 2007 – March 2008	Statewide except Western and Cape & Island Regions	Level 1 drought	DCR 2017 - 2022
Aug 2010 – Nov 2010	Connecticut River Valley, Central, and Northeast Regions	Level 1 drought	DCR 2017 - 2022
Jul 2016 – Apr 2017	Statewide	Level 3 drought	DCR 2017 - 2022
May 2020 – Nov 2020	Statewide with unique drought status for Nashua River Basin	Level 2 drought	DCR 2017 - 2022
Mar 2021 – Apr 2021	Western, Connecticut River Valley, Central, Cape Cod Regions	Level 1 drought	DCR 2017 - 2022

Source: Adapted from Massachusetts Drought Management Plan (2019), MA, Executive Office of Energy and Environmental Affairs.

The SHMCAP (2018) lists Drought as a natural hazard related to the primary climate change interaction of Changes in Precipitation.

Instances of extreme heat…

The SHMCAP (2018) lists Extreme Heat as a natural hazard related to the primary climate change interaction of…

4.2.5 Earthquake Hazard:

Over the full period of the recorded history of Massachusetts since colonial settlement, there have been over 400 earthquakes which have impacted or been felt within the state and over 2,000 affecting the northeast region north of New Jersey (**Table 4-6**). These events were documented between the first recorded earthquake which occurred on December 19, 1668, and 2016. Of all the known occurrences, it is believed that the epicenter of the majority of those earthquakes was located within the northeastern part of the state. Additionally, a large number of Massachusetts' earthquakes have occurred in the southeast along the south-coast and Cape Cod regions, and a considerable number have also occurred in the central part of the state (History of Earthquakes in Massachusetts, Northeast States Emergency Consortium (NESEC), accessed March 17, 2022).

According to *History of Earthquakes in Massachusetts*:

> The most storied earthquake in the history of the northeastern U.S. is the one that occurred about 4:30 a.m. on November 18, 1755. This earthquake had an epicenter probably about 30 miles east of Cape Ann, MA, and based on its felt area from Halifax, Nova Scotia to Winyah, SC and to the northwestern end of Lake Champlain, its estimated magnitude is 6.2. In Boston the Cape Ann earthquake damaged or destroyed about one third of the chimneys, bent a number of church steeples, and damaged several brick walls. Some streets in Boston were so covered with bricks that they were

> all but impassible. Damage to chimneys and brick walls was reported at several towns in northeastern Massachusetts, at Portsmouth, NH and at Portland, ME. The 1755 earthquake followed an earlier strong shock that was centered near Newburyport, MA on October 29, 1727 on the Julian calendar. This shock had an estimated magnitude of 5.6, and it damaged chimneys, caved in some cellar walls, and threw down stone fences in the Newburyport area. The 1727 earthquake was felt as far away as Philadelphia, PA and Penobscot Bay, ME. It was followed by over one hundred local aftershocks that were felt by residents in the Newburyport area. Northeastern Massachusetts experienced frightening shaking but with no reported damaged due to earthquakes on June 3, 1744 on the Julian calendar (estimated magnitude 4.7) and on March 12, 1761 (estimated magnitude 4.6).
>
> (NESEC, in consultation with Professor John E. Ebel)

Throughout the 19th and 20th centuries there were several moderate earthquakes documented within northeastern and southeastern Massachusetts including events in the years, 1817, 1847, 1852, 1854, 1876, and 1880, and 1903 (a), 1903 (b), 1907, 1925 (a), 1925 (b), 1963, and 1965, respectively. In addition to those events, with epicenters believed to be within Massachusetts, several earthquakes believed to have epicenters originating outside of Massachusetts also occurred and were either felt or caused damages within the state. Most notable among those were the events of: 1638 – Concord, NH (estimated magnitude 6.5); 1663 – Quebec, Canada (estimated magnitude 7.5); 1925 – Charlevoix, Quebec (magnitude 6.2); 1935 – western Quebec, Canada (magnitude 6.2); 1940 – Ossipee Mountains, NH (estimated magnitude 5.6); 1944 – Massena, NY (magnitude 5.9); 1982 – New Brunswick, Canada (magnitudes 5.8 & 5.5); 1988 – Quebec City, Quebec (magnitude 5.9); 2011 – Mineral, VA (magnitude 5.8). (NESEC)

Table 4-6. Number of earthquakes occurring in the Northeastern United States with force substantial enough to have been felt.

Number of Felt Earthquakes in the Northeast States			
State	**Years of Earthquake Record**	**Number of Felt Earthquakes**	**Years with Damaging Earthquakes**
Connecticut	1678-2016	115	1791
Maine	1766-2016	454	1973, 1904
Massachusetts	1668-2016	408	1727, 1755
New Hampshire	1638-2016	320	1638, 1940
New Jersey	1738-2016	98	1884
New York	1737-2016	551	1737, 1929, 1944, 1983, 2002
Rhode Island	1766-2016	34	
Vermont	1843-2016	50	
Total Number of Felt Earthquakes		2030	

Source: NESEC, History of Earthquakes in Massachusetts, https://nesec.org/massachusetts-earthquakes/, accessed March 17, 2022

The SHMCAP (2018) lists Earthquakes as a hazard which is not related to weather or influenced by any climate change interactions.

4.2.6 Infectious Disease and Pandemic Hazard

Pandemics or other public health emergency declarations have been identified as a hazard to the Town of Lancaster. An Emergency Declaration was made in March of 2020, related to the Covid-19 Pandemic, a global outbreak of a novel coronavirus (SARS-CoV-2), covering the period between January 2020 and the present time (March 2022, as of the preparation of this report). This global pandemic has affected people of all ages around the entire world. In Massachusetts alone, as many as 1,738,231 people tested positive for Covid-19 and 20,222 people died from the disease at the time of this statement (April 28, 2022) during the writing of this plan. Nationally, 80,984,914 people tested positive for Covid-19 and 991,254 people died of the disease as of this same date in time (April 28, 2022) (Johns Hopkins University, April 2022).

The Covid-19 pandemic which began only months prior to the beginning of the planning phase of this HMP, and, which continued to spread and infect global populations throughout the planning process and preparation of this plan, is a recent example of the potential hazard and associated vulnerabilities, risks, and impacts of infectious disease and pandemic.

Locally, in Lancaster, the Covid-19 pandemic required steps to be taken including the passage of a face covering (i.e., mask) mandate by the Board of Health on September 8, 2021 (rescinded February 24, 2022). The pandemic also resulted in many other changes to normal social activities

including social distancing measures, remote and hybrid models of work and school, interruptions to athletic programs, and many other impacts on the way people work, live, play, and otherwise interact.

Other instances of increasing concern related to infectious disease and pandemic are vector-borne viruses, specifically those carried and transmitted by insects such as mosquitos and ticks. Increasing temperatures and rainfall associated with climate change have the potential to increase populations of such insects and the likelihood of transmission of the diseases they carry. Examples of such concerns are evident in the increases in confirmed cases of West Nile Virus (WNV) and Eastern Equine Encephalitis (EEE or "Triple E") documented in both people and mosquitos by the Massachusetts Department of Public Health (Massachusetts Department of Public Health, Mosquito-borne Diseases, webpage Accessed, April 28, 2022). Similarly, increasing documentation of tick-borne diseases such as Lyme Disease, Babesiosis, and Anaplasmosis documented in both people and ticks are concerning, especially given the increasing abundance of ticks observed in recent years (Massachusetts Department of Public Health, Tick-borne Diseases, Webpage accessed April 28, 2022; TickReport, Tick-borne Diseases Passive Surveillance Database, Webpage accessed April 28, 2022).

The SHMCAP (2018) lists Infectious Diseases and increased seasonal and geographic distributions of vectors and vector-borne diseases as a natural hazard related influenced by climate-change interactions and having the potential to impact several segments of the population including, young, elderly, people living in poverty, people of color, the homeless, people with limited English proficiency, and individuals with disabilities or chronic diseases (SHMCAP, 2018). At-risk populations are described in greater detail in Section 4.3 below.

4.2.7 Wildfire Hazard

According to the office of the state fire marshal, the Massachusetts Department of Conservation & Recreation estimates that in 2021, there were more than 1,100 Wildland fires on non-federal land in Massachusetts, accounting for over 1,600-acres of burnt land (Clinton Item, Article, April 8, 2022). That same source estimated that 98% of all wildland fires in Massachusetts are caused by human activity. For instance, on March 21 and 22, 2022, on the Fort Devens South Post in Lancaster, a wildfire, believed to have been started by live munitions during a military training exercise, burned an estimated 341-acres of land (The Boston Globe, Article, March 23, 2022; Clinton Item, Article, April 8, 2022). In addition to the most recent April 2022 wildfire at Devens, similar instances of wildland fire have occurred at that location, and others in Lancaster in 2002, 2008, 2012, 2013, and 2018.

The natural conditions of the undeveloped northern part of north Lancaster, including the Devens South Post training area, combined with the human activity of that area, result in a greater wildfire likelihood than other communities within Worcester County, the Commonwealth of Massachusetts, and nationwide. Similarly, the natural conditions of the populated area of South Lancaster also result in a greater likelihood of occurrence of wildfire than other communities, in the county, state and nation. South Lancaster is unique in that while it is heavily populated with many homes, the landscape surrounding the populated area and homes exists in an otherwise

relatively undeveloped, natural state. As a result, South Lancaster's higher density of residential homes and higher relative exposure to direct and indirect sources of wildfire, results in a high risk to homes and people within that area (*Wildfire Risk to Communities. https://wildfirerisk.org*, Accessed March 9, 2022). Statistics and figures related to the associated risks of wildfire are provided below in section 4.4.7, *Wildfire Vulnerabilities*.

The 2019 Devens Integrated Natural Resources Management Plan (INRMP) recognized the risks of wildland fire at the Devens South Post training area and the potential benefits of vegetation and controlled burns to reduce that risk and improve habitat for wildlife. The Devens INRMP (2019) recommended the development of a Wildland Fire Management Plan by FY2021 and coordination with local and state agencies including fire departments and emergency management entities. Coordination between the Town of Lancaster, including the Lancaster Fire Department, Emergency Management Director, and multi-town regional dispatch center, and the U.S. Army's Devens Reserve Force Training Area (DRFTA), as proposed by the Devens INRMP (2019) is also strongly recommended by this HMP for the purpose of preparing, mitigating, and responding to wildfire hazards within the Devens South Post training area, an area within the Town of Lancaster but outside of its jurisdictional oversight.

The SHMCAP (2018) lists Wildfires as a natural hazard related to the primary climate-change interaction of Rising Temperatures. Periods of prolonged, frequent, or intense drought could also factor into risks associated with wildfire hazard relative to climate-change interactions.

4.2.8 Invasive Species Hazard

Invasive plant species typically have few (if any) natural animal or insect herbivory predators. This means that there is little to no ecological pressure or competition on the plant in its introduced environment. This gives non-native, introduced plants an advantage over native or endemic, non-invasive plants. If non-native plants can exclusively outcompete native plants in an ecosystem, the native animal or insect species which depend upon that plant for food or habitat are unable to access the resources that they depend on from the native plant. Unfortunately, the non-native invasive plant often cannot provide the same resource and the wildlife or insect species declines or becomes locally extirpated from the habitat area or ecosystem. Best management practices for invasive plants are dependent upon the species of plant, the level of infestation, and other factors such as adjacent habitats, plants, or resource areas such as wetlands. Some options for managing or eradicating invasive plants include, herbicides, burning, hand cutting or pulling, non-herbicidal chemical treatments, the controlled (and approved) introduction of competing species or herbivory predators, and other methods (MDAR). Additional information on the prevention and control of invasive plants can be found through the Massachusetts Department of Agricultural Resources Prohibited Plant List, Massachusetts Invasive Plant Advisory Group (MIPAG), U.S. Department of Agriculture (USDA) Federal Noxious Weed List, and Massachusetts Audubon's Invasive Plant program.

Invasive species were a primary concern in Lancaster given the importance of agricultural lands and town forest and conservation lands and the threat that invasive plats poses to those resources. Areas of Critical Environmental Concern, and Estimated and Priority Habitat of Endangered Species, and otherwise important and ecologically sensitive habitats such as

wetlands, rivers, and floodplain forests, are another major concern for the potential impacts of invasive species in Lancaster. The MDAR currently maintains a list of plant species prohibited in Massachusetts. MIPAG currently (Accessed, April 11, 2022) lists 72 species of plants as either "Invasive" (36), "Likely Invasive" (33), or "Potentially Invasive" (3).

The Devens Integrated Natural Resources Management Plan lists several plant species as invasive species of concern within the U.S. Army's South Post jurisdictional area of Lancaster. The plan lists potential management techniques of herbicidal treatment or controlled burning but lists concerns for competing native plants or adjacent wetland resource areas as limiting factors to control and eradication management efforts. The abutting town of Harvard's Emergency Management Director also noted that invasive plant species were a concern of their public works and emergency management efforts and commented that the problem, and effort needed to manage it, appeared to be increasing in recent years (Rick Sicard, Personal Communication, March 17, 2022).

In addition to invasive plants, invasive insects also pose a threat to forest health in Lancaster and throughout Massachusetts. The Massachusetts Department of Conservation and Recreation, Forest Health Program lists nine current forest health threats in Massachusetts. Six of those current threats (e.g., gypsy moth, winter moth, hemlock woolly adelgid, emerald ash borer, and Asian longhorned beetle) are the result of the introduction and spread of non-native, invasive insect species and pose a risk to Lancaster.

The SHMCAP (2018) lists Invasive Species as a natural hazard related to the primary climate-change interaction of Rising Temperatures.

4.3 Climate Change Vulnerability Assessment

The Massachusetts Executive Office of Environmental Affairs, the Commonwealth's state-wide interagency Resilient MA Action Team, Resilient MA Climate Change Clearing House, and Massachusetts Wildlife Climate Action Tool provide a comprehensive set of data, tools, and resources for assessing, analyzing, and forecasting climate-related information, data, projections, and scenarios. These resources were reviewed as part of the planning process for the development of Lancaster's HMP and consideration of climate change impacts and adaptation needs were considered throughout. The implementation of this plan should consider potential climate change impacts and adaptation needs to improve the town's resiliency to a changing climate, now and in the future. The aforementioned data, tools, resources, and agencies should be utilized as a resource, not only for the implementation of this plan and it's recommended strategies and actions, but also for the update and revision of future versions of Lancaster's HMP to improve the town's resiliency and adaptive capabilities in the face of a changing climate and associated hazardous weather events.

A proactive approach, like the one recommended here, is made with deliberate purpose over the alternative, reactive, or responsive approaches. Being proactive, is not only the preferred approach to Hazard Mitigation, but also a fundamental part of its step-wise methodology – Planning, Prevention, Mitigation, and Preparedness before Response or Recovery, and throughout it all, continued, ongoing Planning.

In 2020, as part of Municipal Vulnerability Preparedness (MVP) planning efforts, the Town of Lancaster held a Community Resiliency Building (CRB) Workshop. The workshop identified several vulnerabilities related to climate change interactions. As part of that process, the following climate-related hazards were identified as being of the greatest risk to the Town of Lancaster:

1. Inland Flooding
2. Severe Winter Storms
3. Other Severe Weather (Inclusive of Drought, Tornados, Hurricanes/Tropical Storms)
4. Invasive Species

The hazards identified in that process were the focus of the resulting CRB Report prepared by Beta Group, Inc. for the Town of Lancaster. They are consistent with hazards identified within this section of Lancaster's Hazard Mitigation Plan (HMP) and specific hazards susceptible to climate-change interactions identified and described in the SHMCAP (EOEEA, 2018). The following Vulnerability Assessment within this section takes Lancaster's 2020 CRB Report's documented hazards into account and follows the example and methodology of the 2018 SHMCAP by taking climate-change interactions into consideration for each identified hazard (Lancaster, 2020; EOEEA, 2018). Section 5 of this plan, *Mitigation Strategy*, also considers Lancaster's CRB efforts and EOEEA's statewide documented climate-change interactions and provides specific mitigation strategies aimed at improving resiliency to the impacts of a changing climate. Further, this plan takes into consideration people or populations within the community that are most at-risk (Figure 4-1) to the effects of changing climatic conditions and associated hazards such as flooding, severe storms, extreme temperatures, heatwaves, and drought.

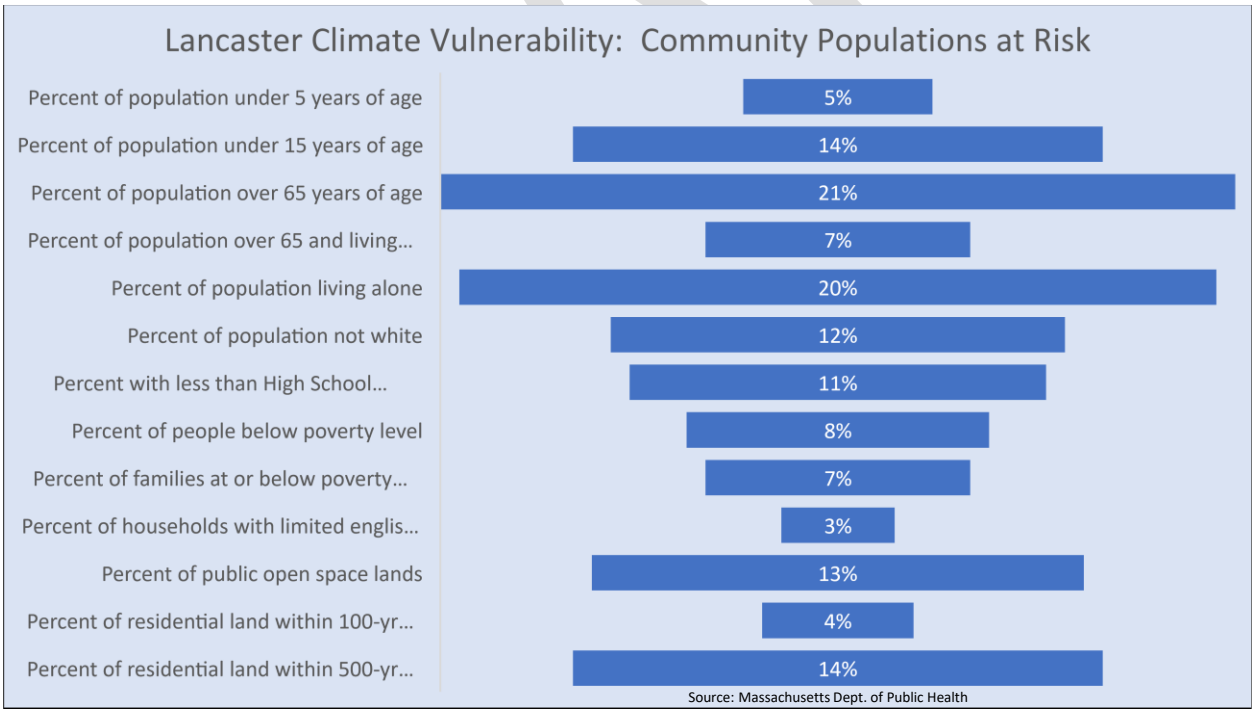


Figure 4-1. Lancaster's at-risk populations most vulnerable to climate change and severe weather.

As part of Lancaster's CRB Workshops, held in 2019, the Core Team identified the top natural hazards susceptible to the influence of climate change: **Inland Flooding**; **Severe Winter Storms**; **Invasive Species**; and **Other Severe Weather**. The influence of climate-change on hazards, relative to community

risks, were also considered and evaluated as part of this HMP and are presented throughout the following section, Section 4.4. The three categorical sectors of community governance function that are most affected by the influence of climate change on certain climate-related hazards, 1. ***Infrastructural***, 2. ***Societal***, and 3. ***Environmental***, were evaluated as part of the CRB process, and again as part of this HMP process. Community assets or infrastructure that were deemed to be susceptible to the potential impacts of climate-change influenced hazards were evaluated and categorized by sector to better understand and demonstrate the potential risks relative to their impacted sector of governance or community assets (**Table 4-7**). The ability of specific mitigation strategies and actions (identified later in Section 5 of this plan) to respond to the impacts of climate-influence hazards on one or more of these three community governance sectors was evaluated and the corresponding sector was noted for each action identified within Section 5.5. This designation will help to evolve future iterations of this plan into a full Hazard Mitigation *and* Climate Action Plan, consistent with the SHMCAP (2018) and capable of fully incorporating the intended outcomes of the Lancaster CRB Workshop and Report (2020).

Appendix X of Lancaster's HMP includes a summary of forecasted climate change projections for the Nashua River Basin of north-central Massachusetts, including Lancaster and the surrounding towns of, Ashburnham, Ashby, Ayer, Bolton, Boylston, Clinton, Dunstable, Fitchburg, Gardner, Groton, Harvard, Holden, Hubbardston, Leominster, Lunenburg, Paxton, Pepperell, Princeton, Rutland, Shirley, Sterling, Townsend, West Boylston, Westminster, and Worcester.

Table 4-7. Public services & assets within three sectors of community governance most affected by influence of climate-change

	Infrastructural	Societal	Environmental
Community Services & Assets	Culverts	Low-Income Population	Nashua River
	Bridges	Elderly Population	Town Forest
	Sewer Pump Stations	Code Red Emergency Notification System	Open Space Lands
	Highway Department	Town Communications	Still River
	Major Roads	Evacuation Plan	Waterbodies
	Wells & Storage Tanks	Regional Emergency Communications Center	Wetlands
	Long-term Emergency Shelter	River Terrace Rehabilitation & Healthcare Center	Drinking Water Protection Area
	Railroad Crossings	Housing Authority	Cooks Conservation Area
	Municipal Buildings	Schools	Lunenburg Road Conservation Area
	Energy & Utility Networks	Agricultural Properties/Production	Soils

Source: Lancaster Community Resilience Building Workshop, Summary of Findings Report, 2019, Municipal Vulnerability Program, MA EOEEA

4.4 Hazard Vulnerability Assessment

Within this subsection, Community Risk, or Vulnerability is assessed for a variety of known and potential impacts of the hazards specified above. A detailed risk and vulnerabilities analysis is provided. The following section addresses several vulnerabilities related to:

1. Flooding
2. Severe Winter Storms
3. Other Severe Weather
4. Drought & Extreme Temperatures
5. Invasive Species
6. Earthquakes
7. Infectious Disease & Pandemic
8. Wildfire

4.4.1 Assessment of Flooding Vulnerability:

An analysis of the FIRM flood hazard area maps indicates that there is a total of approximately 3,247 acres of 100-year floodplain within Lancaster. This amounts to 18.13% of the total town. Based on additional analysis, 87.35 acres (2.69%) of the floodplain are developed. Currently there are 146 structures located within the floodplain which is about 3.8% of the total structures in the community. When the structures within the floodplain are multiplied by their building values, as determined by the Massachusetts Department of Revenue, a potential loss of up to $503,168,400 can be equated for those buildings due to their vulnerability to damage and loss associated with the risk of flooding.

Several important features listed as critical infrastructure are at risk of flooding, particularly DPW facilities, roadways, culverts, dams, and bridges. A list of critical infrastructure that is at risk of flooding, or located within a designated flood zone, is provided in **Table 4-8** below. A map of Lancaster's critical facilities located within FEMA designated flood zones is also provided within Appendix X of this plan.

Table 4-8. Lancaster's Critical Infrastructure within the 100-year or 500-year Flood Zone

Feature Type	***Name***	***Address***
DPW Facilities	Lancaster Highway Department	432 Center Bridge Road
DPW Salt Storage	Lancaster Highway Department	432 Center Bridge Road
Other Critical Facilities	Railroad Overpass	Rail Line & North Nashua River
Other Critical Facilities	Railroad Overpass	Rail Line & Nashua River
Other Government Buildings	Lancaster Highway Department	432 Center Bridge Road
Highway Overpass	I-190 Overpasses	Interstate 190
Utility Transmission Lines	Electric powerline corridor	Northwest Lancaster
Utility Transmission Lines	Electric powerline corridor	Southwest-Northeast Lancaster
Utility Transmission Lines	Tennessee Gas Pipeline	Northwest-Southeast Lancaster
School*	Mary Rowlandson Elementary School	103 Hollywood Drive
Commercial/Fuel*	Cumberland Farms #0177	460 High Street Ext. (Route 110)

Wastewater Treatment Facility**	Clinton Wastewater Treatment Plant	677 High Street, Clinton, MA
* Feature located within the 500-year Flood Zone but outside of the 100-year Flood Zone. ** Feature located outside of the jurisdictional boundaries of the town of Lancaster.		

Floodplain Management and Compliance with the National Flood Insurance Program (NFIP):
The current total NFIP premium for Lancaster is $24,716 and the total coverage is $5,824,100. Since the initiation of the National Flood Insurance Program (NFIP), 34 flood insurance claims in the Town of Lancaster have been made totaling $327,168.99 in payments. There are five repetitive loss properties in Lancaster totaling $230,261.59 in claims. Statistics from the FEMA Community Information System (CIS) indicate that there are 21 flood insurance policies in force within Lancaster. (FEMA HMP Worksheet 4.3)

In an effort to meet compliance of the NFIP, and reduce flood hazard risks and impacts, the town supports, upholds, and administers certain floodplain management activities, regulations, laws, and policies. These efforts include:

- Implementing the MA Wetlands Protection Act and the town's Wetland's Protection Bylaw regulating development and activity within the wetlands buffer zone and regulating stormwater and other point source discharge.
- Implementing the Town Flood Plain District Bylaw (May 2, 2011) regulating development in the floodplain district.
- Continued maintenance of municipal stormwater drainage system which includes regular cleaning of catch basins, storm drains and culverts.
- Continued maintenance of public waterways to reduce flooding caused by erosion and water displacement.
- Enforcement of Stormwater Control Bylaw regulating land alterations, disturbances and construction activities that may impact stormwater flow and/or result in or unduly cause flooding events.
- Enforcement of the Flexible Development Bylaw which mitigates possible flooding events by designating protected open space within a development which in turn treats stormwater runoff through the means of natural infiltration.

A map entitled Critical Infrastructure & FEMA Q3 Flood Zones depicts the 100- and 500-year flood zones in the community relative to critical infrastructure and is included within the appendices of this report.

Flooding of the Nashua River Branches and its Tributaries:
The flooding potential of the North Nashua, and Nashua Rivers poses real hazard risk and vulnerability to the Town of Lancaster. That risk and vulnerability is increased because of the town's location at the confluence of these two rivers. According to the National Weather Service's Advanced Hydrologic Prediction Service, Northeast River Prediction Service, significant flooding occurs along low-lying portions of the North Nashua River. Flooding affects several areas of Fitchburg and Leominster, including the Whitney Field Mall at the river's confluence with Monoosnoc Brook where overtopping of the dike along Commercial Road in Leominster may occur, in Lancaster where flooding of Center Bridge Road and Main Street (Route 117) in Lancaster is known to occur (NWS-NOAA).

To understand and describe the potential for and vulnerability of flooding in Lancaster, we can observe the hydrographic responses of the two rivers in the vicinity of Lancaster during a typical late-winter sudden thaw (snowmelt) and rainfall event. One such event occurred during the preparation of this report, providing an example of flooding risks and vulnerabilities faced by Lancaster's infrastructure network of roads, bridges, and culverts. To monitor and document the event, the hydrographs for both rivers were monitored in real-time during this occurrence and representative figures were captured as part of the preparation of this plan. A site visit to several locations of known vulnerability (i.e., flood-prone culverts) was also conducted to and illustrative images were captured. This provided an opportunity to observe and demonstrate actual conditions associated with flood risks and vulnerabilities faced by the town during a typical February late-winter thaw and rain event. See the following description and **Example 4-1** below.

As illustrated by the example, the lower gradient and large storage area of the Wachusett Reservoir and South Branch of the Nashua River upstream of Lancaster has a considerable effect towards mitigating flood risks downstream compared to the higher-gradient geomorphology and watershed-landscape of the North Nashua River. In general, the Nashua River (South Branch) showed a hydrograph pattern that was far less dramatic, or less "flashy", than the North Nashua, exhibiting a lower maximum volume of water (peak), and more gradual rise over time. A large reservoir, in this case the Wachusett Reservoir has the capability of mitigating flood risks and vulnerabilities to downstream infrastructure and communities. However, the flashy, or fast rising hydrograph of the North Nashua River, combined with the quick rising volume of water created by spring-thaw rain events and the compounding effects of the conjoining volumes of water, created by the confluence of both branches of the Nashua River occurring in Lancaster, result in a high risk of flooding to roadway infrastructure at several locations in Lancaster, including areas along Main Street/Route 117, Sterling Road, Deershorn Road, Center Bridge Road, Bolton Road, and the general vicinity of the "meeting of the waters", or the confluence of the North Nashua and Nashua Rivers. These locations were observed, and high flows conditions were observed and documented by MRPC on the evening of February 18th, 2022 (**Example 4-1**).

Example 4-1.

A late-winter thaw snowmelt and rainfall event and the associated risk of flooding, February 17th and 18th, 2022, Lancaster, Massachusetts:

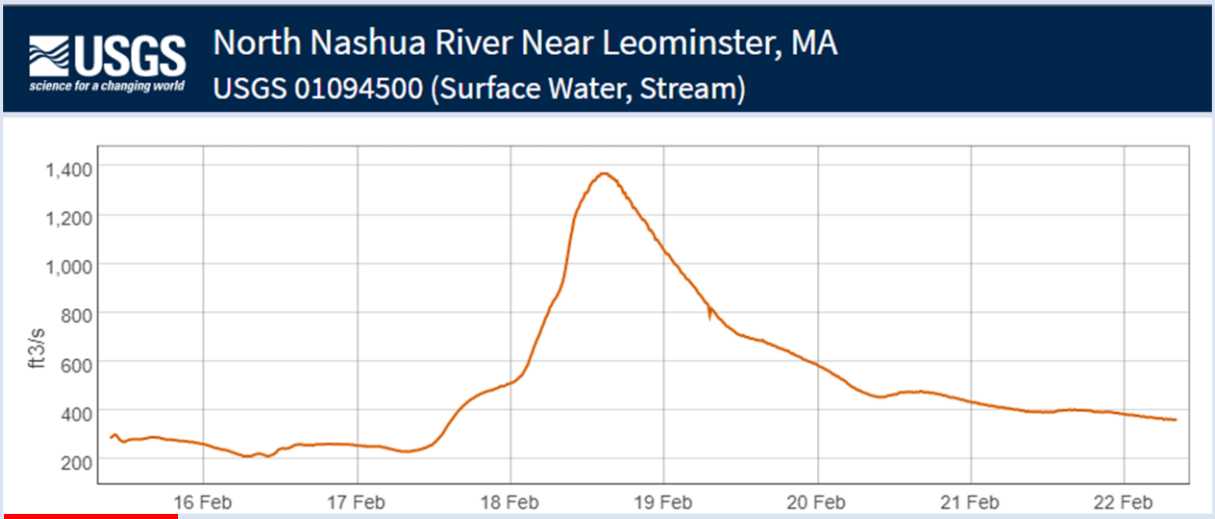
A weather event occurred on February 17th and 18th, 2022. The event included a sudden thaw as temperatures peaked at 59-60 degrees on February 17th causing a sudden melt of approximately 6 to 10-inches of snowpack during the day. Following the warm temperatures and sunny conditions during the daytime hours, a heavy rain- and wind-event occurred in the evening and continued sporadically throughout the night and into the morning of February 18th. The precipitation event resulted in approximately 1 to 1.5-inches of rain over a 12-hour period and melted much, or all the remaining snow-cover in the regional vicinity of the upper branches of the Nashua River. Despite the warm temperatures during that day, the ground remained mostly frozen from the typical cold winter conditions which were predominant over the previous two months. As a result, there was little chance of infiltration and heavy runoff was directed overland and through existing stormwater conveyance infrastructure at a high rate and volume filling Lancaster's rivers and streams. While this event was considerable, it was not an extreme circumstance, yet it still resulted in a **risk of flooding**.

The region of the upper **North Nashua River** and its tributary watershed received approximately 1.5-inches of rainfall between the evening of February 17th and the morning of the 18th. In just two days, the amount of water entering Lancaster from the North Nashua River went from only 213 cubic-feet per second (ft^3/s) on February 16th, to 1,200 cubic-feet per second, and was still rising on February 18th. The volume of water in the North Nashua eventually peaked at 1,370 ft^3/s (**Example 4-1(a)**) between 2:00 PM and 3:30 PM in the afternoon of the 18th before steadily dropping over the next several days and beginning to level out at around 400 ft^3/s mid-day on February 21st. The **water level** of the North Nashua at the Leominster-Lancaster town line **rose 4-feet** to a height of 7.04-feet between 8:00 AM on February 17th and 3:00 PM on the 18th.

Continued next page…

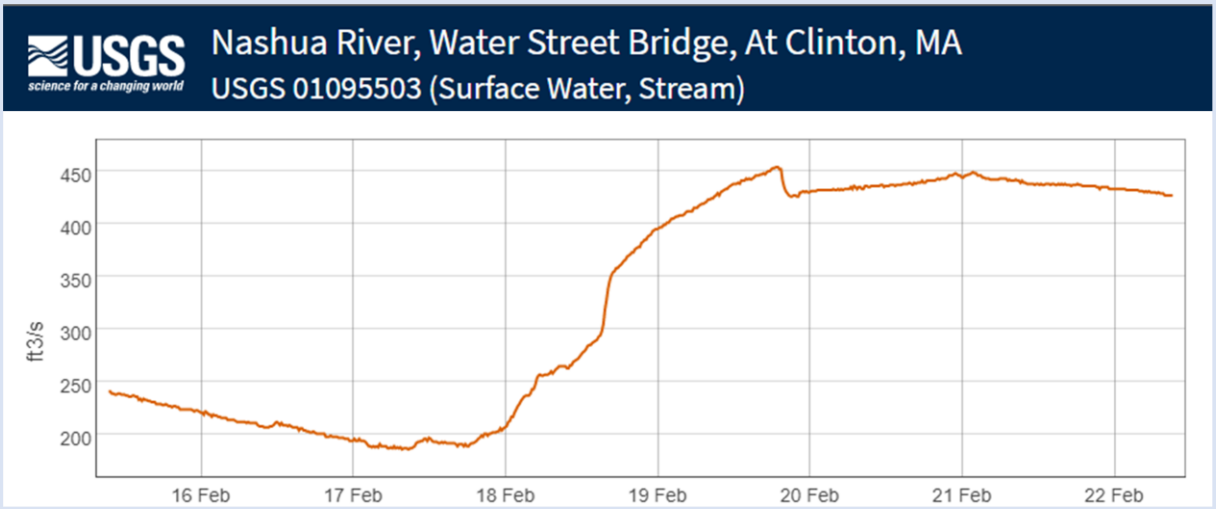
Insert pictures from Friday, February 18th, Route 117 – Nashua and North Nashua River Crossings

Example 4-1. (Cont.)



Example 4-1(a). Hydrograph of the North Nashua River near Leominster, MA (Lancaster-Leominster town line at Route 190) during a typical late-winter thaw and rainfall event. (*Source: USGS*)

The area of the Wachusett Reservoir and the upper tributaries of the **Nashua River (South Branch)** received approximately 0.75 to 1.2-inches of rainfall between the evening of February 17th and the morning of the 18th. The Nashua River (South Branch) enters Lancaster from Clinton downstream (north) of the Wachusett Reservoir. The hydrograph showed a small response to snowmelt during the late morning of February 17th with a volume of water increasing by approximately 10 ft^3/s. Between Noon on February 17th and Noon on the 18th, the South Nashua River rose another 79 ft^3/s (197 – 276 ft^3/s). Then, from Noon until mid-night on the 18th, a period of twelve hours, the hydrograph rose from 276 ft^3/s to 395 ft^3/s, a rise of 119 ft^3/s. Overall, the volume of water continued to rise into the following morning and throughout the next day eventually peaking at 454 ft^3/s at 7:00 PM on February 19th (**Example 4-1(b)**). During that period, between 8:00 AM on February 17th and 7:00 PM on the 19th, the **water level** of the Nashua River (South Branch) downstream of the Wachusett Reservoir, just south of Lancaster, **rose** from 2.5 to 4.65-feet, a difference of **2.5-feet**.



Example **4-1(b)**. **Hydrograph of the Nashua River (South Branch) upstream of Lancaster at Clinton, MA during a typical late-winter thaw and rainfall event. (*Source: USGS*)**

Roadway, Culvert, and Bridge Flooding Vulnerabilities:
The Town of Lancaster network of roadway infrastructure intersects and parallels many rivers, streams, wetlands, and flood zones. As demonstrated in the example above, any of the town's roadways are at risk of flooding due to old, undersized culverts, beaver activity, and the increased frequency, duration, and intensity of severe storms and precipitation events occurring within the region. The risk posed by increasing floodwaters is compounded by the fact that Lancaster's network of roads were not designed and constructed as part of a pre-planned, grided system. Instead, Lancaster's first roads, many of which are still in use today, were located and built based on convenience, relative to the lay of the land or the fastest, most direct route. These roads likely followed existing Native American walking paths or the paths created by the first settler's livestock moving from daytime feeding pastures to protected night pastures. As such, the location and disposition of the town's roads often followed the low, flat areas following the course of rivers and streams. These original paths, which became today's roads, were probably suitable, or at least acceptable to the feet, hooves, sleigh runners, and wagon wheels they were required to pass in those days – wet, muddy, shoes and hooves notwithstanding. However, today's roads and bridges must be able to safely pass all modes of modern transit, including cars, trucks, motorcycles, buses, pedestrians, and bicycles.

Currently, many of Lancaster's roads, culverts, and bridges, due to their location, elevation, and general disposition (i.e, size, shape, material) are at risk of overtopping, damage, or catastrophic failure during storm-related flood events.

Roadway infrastructure vulnerabilities pose a public safety and emergency

***Transportation vulnerability includes three primary factors*:**

1. **Risk of Failure**: A road-stream crossing can fail due to structural deficiencies or storm damage, or inability to pass enough water during storms because of improper sizing. The magnitude of such failures can range from inconvenience to catastrophic failure, including complete loss of a crossing, downstream property damage, and loss of life.
2. **Criticality**: Crossing failures during flooding events can impede critical routes and severely disrupt access to important infrastructure needed to provide critical emergency services. Impassable roads can prevent emergency workers from reaching the people and places they need to serve and can prevent access to hospitals, water treatment plants, power plants, electrical substations, and emergency shelters. Criticality is a measure of how important a crossing is to the transportation network and the delivery of critical services.
3. **Climate change resilience**: Climate change models are forecasting storms of increasing frequency and severity. It is important to take future changes into account when assessing the vulnerability of road-stream crossings to flooding.

(Source: North Atlantic Aquatic Connectivity Collaborative (NAACC), "Transportation infrastructure and public safety". Accessed Feb. 17, 2022.)

response hazard. Critical infrastructure like bridges, culverts, and roads must be passable at all times, and under all conditions, especially during periods of severe flooding. This is especially critical for emergency response, evacuation, and transport of goods or services at times when they are needed most.

Several of Lancaster's roadways and culverts are vulnerable to flooding and the town must plan accordingly to mitigate the risks and potential impacts. Flood prone roadway infrastructure documented, in part by the Storm Event Database of the National Climatic Data Center within the National Oceanic Atmospheric Administration (NCDC-NOAA), and confirmed by the Town of Lancaster's Department of Public Works is prone to the impacts of flooding at multiple locations under various, reoccurring conditions associated with sudden winter or spring thaw snow-melt events, intense or prolonged precipitation events, a combination of snow melt and precipitation, multiple, repeated precipitation events occurring frequently over a period of days or weeks under certain conditions, and intense rain events, usually associated with severe thunderstorms, during periods of prolonged drought or under dry, summer conditions. Lancaster's most vulnerable and flood prone roadway infrastructure include portions of roadways associated with culverts on: Sterling Road, Deershorn Road, Main Street/Route 117, Center Bridge Road, Bolton Road, and the general vicinity of the "meeting of the waters", or the confluence of the North Nashua and Nashua Rivers (K. Bartlett, Personal Communication, Feb. 23, 2022).

Addressing the vulnerability of roadway flooding and associated risks to roadway, bridge, and culvert infrastructure is a critical need for the Town of Lancaster and will be further addressed within this plan in *Section 5. Hazard Mitigation Strategies*.

Lancaster does not have any bridges over water that are classified by MassDOT as "structurally deficient".

QUICK FACT: *Undersized, unmaintained, or degraded culverts at road-stream crossings can be a major hazard and infrastructural vulnerability during severe storms, floods, and other natural disasters. Plan ahead- identify, maintain, repair, or replace damaged, blocked or undersized culverts!*

Photo credit: UMass Extension, RiverSmart Communities program, Accessed, Feb. 17, 2022

Flooding vulnerability along the Nashua River could be compounded by situations when the Wachusett Reservoir reaches full capacity and the additional storage of water within the reservoir

is not possible. To control for and mitigate such instances, managed water releases, or pass-through of flow from the Wachusett Reservoir at the Wachusett Dam to the Nashua River are operated and maintained by the Massachusetts Water Resources Authority (MWRA) following specific protocols (John Gregoire, MWRA, Personal Communication, March 3rd & 9th, 2022). The protocols for dam release and streamflow management include careful coordination between the Massachusetts Department of Conservation and Recreation – Division of Water Supply Protection (Mass DCR-WSP), MWRA, and communication with downstream municipal Emergency Management Directors. Such protocols are designed to mitigate downstream flooding risks and vulnerabilities through the monitoring and reporting of snowfall/snowpack and precipitation data throughout the contributing watersheds (Quabbin Reservoir, Ware River, Wachusett Reservoir) by Mass DCR who then report the information to MWRA so that they can manage reservoir water-levels and dam releases in a controlled and coordinated manner that accounts for current water levels and predicted contributions of inflow (runoff and streamflow, with consideration given to existing snowpack, frozen ground conditions, and ice cover), to maintain an acceptable water level and downstream flow conditions (Mass DCR-DWSP; MWRA).

In general, MWRA maintains an operating band of set elevations to support water supply withdrawals to serve the greater Boston area, as well as support transfers from Quabbin Reservoir. Their operational management procedures balance inflow (two rivers and several streams and their Quabbin transfer) with outflows (demand to their service area, statutory releases to the Nashua River, and elevation and flood control). Outlet structures in the Wachusett Dam and spillway are managed for elevation control and flood control operations. MWRA is very cognizant of downstream conditions at all times, particularly during wet weather events. They support a USGS gaging station on the Nashua River at Water St in Clinton (among others across the system) to monitor river discharge down stream of Wachusett Reservoir. Additionally, they have downstream locations in Clinton along the Nashua that are monitored during high flow periods to ensure that calculated outflows are compatible with actual downstream conditions. If necessary, they can increase or decrease releases depending on river conditions (John Gregoire, MWRA, Personal Communication, March 3rd & 9th, 2022).

Dam Vulnerabilities and Risk of Dam Failure:
The Commonwealth of Massachusetts, Department of Conservation and Recreation (DCR), Office of Dam Safety regulates all jurisdictional dams located in Massachusetts. DCR lists four (4) dams in the Town of Lancaster (Table 4-9). All four dams are privately owned and non-jurisdictional, or below the threshold for volume of water impounded and/or dam-height, therefore they are not regulated by the Office of Dam Safety.[1]

Table 4-9. List of known dams located within the town of Lancaster.

Town	Dam Name	Ownership/Responsibility	Hazard Code
Lancaster	Fort Pond Dam	Private	N/A
Lancaster	Old Ice Pond Dam	Private	N/A
Lancaster	Spectacle Pond Dam	Private	N/A
Lancaster	Four Ponds Dam	Private	N/A

[1] Non-jurisdictional dams are under 6-feet in height, and/or impound less than 15 acre-feet of water-storage; As such they do not require dam-safety regulation or an assigned 'Hazard Code'.

Bartlett Pond Dam, previously located at the outfall of Bartlett Pond on Wekepeke Brook within the Town of Lancaster and under its ownership, was removed in June of 2014. Prior to its removal, it was classified as a 'Significant Hazard' potential dam by the Massachusetts DCR Office of Dam Safety. When the dam was removed by the Town of Lancaster in 2014, that hazard was eliminated. While the town's, remaining dams are non-jurisdictional and therefore not required to be classified, the town should still be cognizant of the potential vulnerability to flooding associated with privately owned dams and take steps to mitigate any potential risks to downstream infrastructure.

QUICK FACT: *In June 2014, the Town of Lancaster removed the Bartlett Pond Dam and completed site improvements to the surrounding Robert Frommer Conservation Area. The dam was located on the Wekepeke Brook, a cold-water stream with native brook trout, rare species habitat, and exemplary natural communities. Removal of the Bartlett Pond Dam eliminated a significant hazard and opened 18-miles of upstream habitat from Wekepeke Brook's confluence with the Nashua River.*

Left to Right: Dam before removal; dam at the start of removal; and Wekepeke Brook after removal.

Source: Massachusetts Division of Ecological Restoration (DER). "Bartlett Pond Dam Removal & Wekepeke Brook Restoration", Accessed Feb. 15, 2022.

One major dam located outside of Lancaster's jurisdictional boundaries, upstream of the towns of Lancaster and Clinton along the Nashua River, is Wachusett Dam, the outfall to the Wachusett Reservoir. The reservoir, and its conjoining watershed and water-supply system, including Quabbin Reservoir and portions of the Ware River, supplies drinking water for communities in the metropolitan Boston area and in several other Massachusetts towns located between Boston and Quabbin Reservoir. Holding back approximately 56 billion gallons of water, and potentially up to 65 billion gallons, the Wachusett Dam, North Dike and South Dike are the three impounding structures for

Wachusett Reservoir. All three structures are classified as 'Large' size and 'High Hazard' potential dams by the Massachusetts DCR Office of Dam Safety's dam classification system.[2] Two of those structures, North Dike and Wachusett Reservoir would pose a risk to Lancaster in the event of a dam failure. MWRA follows the dam safety regulations and has an independent inspection of these structures every 2 years. The 2020 inspection of Wachusett Reservoir's impoundment structures found them to be in Satisfactory condition (Montachusett Region HMP, 2016; MVP/CRB Report, Clinton, MA, 2019; John Gregoire, MWRA, Personal Communication, March 3rd & 9th, 2022).

Climate Change Implications for Flooding Vulnerabilities:
The impacts of changing climatic conditions on weather patterns, the frequency, duration, and intensity of major storm events, and the impacts of natural hazards on critical community assets & infrastructure across the three primary sectors of functional governance have been well documented within this plan, Lancaster's CRB Report, and the 2018 SHMCAP. A primary implication of increased intensity and duration of precipitation associated climate-change is the risk of increased flooding. This risk is particularly substantial along the Nashua River, and particularly in Lancaster. Considering the focus of documenting the potential implications of Climate Change on potential hazards identified within this plan, it is noteworthy to mention that aside from the Hurricane of 1938, which accounted for the highest ever recorded gauge height (14.57-feet) on the North Nashua River at the Leominster-Lancaster town line, twelve of the next twenty highest recorded gauge heights have occurred in only the last 15-years since 2008 (USGS). In fact, three out of the last four years have accounted for some of the highest annual precipitation totals ever recorded in the Upper Nashua River basin over the past 37-years of recorded precipitation history at the Wachusett Reservoir (MWRA, Mass DCR).

Given the predicted future climatic weather patterns of higher temperatures, and prolonged periods of increased drought conditions, it is important to consider another aspect of potential flood risk and vulnerability that may not be anticipated, obvious, or apparent but which is supported by historical evidence, ***Flash Flooding***. This risk or vulnerability, which could be influenced by predicted climate change models, is the potential risk of flood during times of severe drought when sudden, intense precipitation occurs. During periods of prolonged drought, a sudden, intense precipitation event could pose a substantial a risk and vulnerability of flash flooding. The natural "flashy" nature of the North Nashua River hydrograph due to the geologic and geographic conditions of the landscape combined with the fact that such a large portion of its contributing watershed is comprised of the highly urbanized, impervious landscapes of the region's twin cities, Leominster and Fitchburg, make the North Nashua River, and its confluence with the Nashua River in Lancaster, highly susceptible flooding if an intense or prolonged precipitation event were to occur during a period of severe or prolonged drought. Periods of drought create hard, dry land surfaces preventing infiltration, soil saturation, and vegetative water uptake. These conditions mean there is no opportunity for infiltration and soil saturation resulting in little or no resistance (or roughness) factor of the landscape creating a situation that would mirror complete imperviousness in a hydrologic model. Hard, dry ground with poor infiltration and absorption capabilities combined with drought-related stress responses of trees, grasses, and plants, which include summer dormancy would result in overland surface runoff occurring at a fast and complete rate during precipitation events; water that falls on the land will

[2] Under the Massachusetts DCR Office of Dam Safety's dam classification system, "Hazard potential" refers to the potential consequence of failure to downstream loss of life and infrastructure, not the condition of the dam.

make its way directly to streams with little to no uptake, infiltration, or resistance. This condition can be equated to the conditions which occur during a sudden spring snow-thaw and rain event with frozen ground. While at first it may seem hard to rationalize a risk of flooding during drought, the dry conditions associated with drought create a situation not unlike frozen ground conditions often associated with New England late-winter/early-spring thaw flood events (EOEEA, 2018), or near complete imperviousness associated with heavily urbanized areas.

A specific instance of such a flash-flood event can be found when you cross-reference drought data (Mass DCR, 2019) with hydrographic data (USGS) for the North Nashua River, and regional hazard storm data (NCDC-NOAA). On June 25, 1944, a precipitation event occurred during a documented period of severe prolonged drought (Mass DCR, 2019) which resulted in the highest recorded streamflow of 1944 in the North Nashua River at the Leominster-Lancaster town line. The event accounted for the fourth highest recorded stream flow ever recorded at that location (USGS). The height of the river during that event, was 12.2-feet, comparable to such flood events as the Hurricane of 1938 and the March 2010 flood emergency declaration. Another example of high stream flow stage-height indicative of the potential for flash flooding during a period of severe statewide drought occurred on June 6, 1982. Flash flooding during periods of drought or extreme heat or other factors leading to extreme dry landscape conditions is a substantial risk to Lancaster and the Nashua River basin.

QUICK FACT: *Rivers and streams, like transportation networks, are widely spread across the landscape providing many opportunities for intersections with roads. These crossings are points of potential vulnerability for transportation infrastructure. Road-stream crossings are a critical, and sometimes vulnerable, component of the transportation system. Flooding and erosion associated with severe storms can disrupt transportation networks and thus the ability to provide essential services. Crossing failures can be more than an inconvenience; they can threaten public safety and result in significant economic impacts. Planning can mitigate future disaster.*

Recent severe storms in the Northeast have raised concerns about the vulnerability of transportation networks due to flood damage at road-stream crossings. With climate change models forecasting storms of increasing severity and greater frequency, communities and state departments of transportation are beginning to take the issue more seriously. The time to plan for the future is now.

Source*: North Atlantic Aquatic Connectivity Collaborative. "Transportation infrastructure and public safety – Road-Stream Crossings & Culverts", Accessed Feb. 16, 2022*

Public Works Infrastructure Vulnerabilities to Flooding:
The DPW Highway facility including buildings, outbuildings and grounds are located within the 100-year Flood Zone and are vulnerable to flooding. Lancaster's roadways, which are vulnerable to flooding, lack "flood-prone area" warning signs. These vulnerabilities could impact the Town's ability to properly maintain, or repair critical infrastructure, provide warning, or respond to or access areas to conduct necessary maintenance or repairs, or otherwise conduct their duties and serve the public during flood events.

4.4.2 Severe Winter Storm Vulnerabilities:

Severe winter storms have been increasing in recent years with more frequent, intense, and early and late season snowstorms. Such events have been associated with tree and powerline damage in Lancaster, often resulting in power outages. Given this, Lancaster has a need for reliable back-up power, communication tools and technology, and emergency shelter facilities to serve the public. These assets have been identified as lacking, unavailable, or outdated. Technology improvements, emergency response equipment, and emergency shelter supply inventories are in need of replacement and acquisition. In particular, emergency backup power generators are needed at multiple town facilities, including critical infrastructure locations.

4.4.3 Other Severe Weather Vulnerabilities:

The Town of Lancaster is vulnerable to the impacts of severe weather. In particular, precipitation associated with severe storms, hurricanes, tropical storms, and sudden, intense thunderstorms can lead to flooding throughout town. The vulnerabilities of Lancaster's roadway infrastructure to flooding have been well documented in section 4.4.1. Lancaster's Department of Public Works Highway Facility is located within the 100-year Flood Zone and, as such is also at risk of flooding during instances of severe weather. Powerline and tree damage caused by severe weather can result in power outages, road closures, damage to homes, damage to government buildings and service interruptions. Lancaster is vulnerable to such interruptions as its back-up power, shelter, and emergency communications systems have been identified as outdated or in need of improvements. Addressing these vulnerabilities is a critical concern and focus of the following section (Section 5 – Mitigation Strategy) of this plan.

4.4.4 Drought Vulnerabilities:

Instances of prolonged drought can lead to flash flooding due to overland runoff caused by hard, dry soils that are unable to infiltrate water. For an example of flash flooding in Lancaster, see the storm event data from October 21, 2016, documented within Table 4-4 above (NOAA-NWS). Flooding occurred which closed Main Street/Route 117 because it was impassable. Flash floods were, in this case likely due to runoff and inability of stormwater infrastructure to keep up and/or lack of green infrastructure storage within low-lying, flood prone areas or areas where stormwater capacity issues generally exist.

Periods of drought, extreme heat, and prolonged periods of high summer temperatures and humidity are common and increasing in Lancaster and the region. The Town of Lancaster is lacking adequate cooling shelters to service segments of the population in need of such services during those times. In particular, the very young, very old, and other vulnerable populations identified in section 4.3 above may be at an elevated risk and disadvantaged relative to access to cooling. Securing back-up power and reliable, energy efficient, air conditioning for public facilities, critical infrastructure, and shelter locations to mitigate such risks is a critical need in Lancaster.

4.4.5 Earthquake Vulnerabilities:

Many of Lancaster's historical properties were constructed of brick long before modern-day building codes and advances in structural engineering. As such, many of these unreinforced masonry structures may be vulnerable to the impacts of an earthquake. However, the likelihood of occurrence of an earthquake of a certain magnitude capable of causing substantial impacts in Lancaster is of low probability based on past occurrences as documented in Section 4.2.5, above. As such, the town of Lancaster is vulnerable to the potential impacts of earthquake given that they have occurred and may occur again, and since much of the town's infrastructure, including many public buildings including, critical infrastructure, are of unreinforced masonry (brick) construction. While this poses a vulnerability, the low probability of occurrence of a high-magnitude earthquake at this location places a low risk on the vulnerability posed by such a hazard.

Regardless, given the nature of earthquakes, it is essential to consider the potential for impacts and plan for them accordingly.

4.4.6 Infectious Disease and Pandemic Vulnerabilities:

Lancaster Board of Health (BOH) administers an up-to-date Emergency Dispensing Site (EDS) Plan which is a working plan in a perpetual planning phase except during times when an EDS response, recovery, or mitigation action is in progress. The BOH follows the Incident Command System (ICS) standards and procedures of the National Incident Management Systems (NIMS) and the EDS Plan describes how ICS is applied to Lancaster's EDS approach. Lancaster's EDS provides a protocol for quickly establishing the resources and site accommodations necessary to establish an emergency site for administering vaccinations or dispensing of medication and for emergency treatment during the declaration of a State-declared health emergency.

An EDS is a location where medications or vaccines intended to prevent disease may be given quickly to a large number of people in the event of a public health emergency. A public health emergency that may use an EDS as a control tool consists of situations where:

- Many people have been exposed to an infection that may make them sick.
- Spread of the infection is imminent and dangerous.
- Further spread of the infection may be prevented by antibiotics or a vaccine.
- Antibiotics or a vaccine that is capable of fighting the specific strain of the source of infection exists and is available.

The recent Covid-19 pandemic, which included a global outbreak of the novel Coronavirus (SARS-CoV-2) in 2020 and lasted through the entire preparation of this plan through April of 2022 and beyond, is an example of such a case where an EDS is vital to a community's governmental services and public health infrastructure. Noting the existence of Lancaster's EDS plan, administered by the Board of Health, within this HMP is done to increase awareness and interdepartmental coordination between municipal officials

responsible for Emergency Management within the town of Lancaster – it is part of the mitigation strategy for addressing pandemics and public health emergency hazards.

The Lancaster school system, as part of the Nashoba Regional School District, took a proactive approach to the early stages of the Covid-19 pandemic to anticipate and plan for appropriate actions related to initial cases and exposure. Those preparative steps proved to be critical in successfully responding to their first case and their early coordination with Mass Department of Public Health helped to mitigate risks throughout the later stages of the pandemic. In those first days and weeks, the School District's Draft Pandemic Plan (which was in preparation prior to the Covid-19 outbreak) was finalized and steps identified within the plan were implemented as important actionable preparation, mitigation, preparedness, and response steps (Lesa Gulbicki, Coordinator of Health, Guidance, & Wellness, Nashoba Regional School District, Personal Communication, April 29, 2022).

Even with proper planning and a proactive approach, the Covid-19 pandemic resulted in the need for the school department to implement remote learning models and alternative modes of education. In addition to hybrid and remote learning, the Nashoba Regional School Districted implemented an in-person summer teaching and learning program for students in need of in-person teacher interactions, experiential learning opportunities, or individual educational programs. Such at-risk students were disadvantaged by alternative, remote or hybrid learning modes and the summer programming was a direct response to mitigate those risks.

One critical vulnerability that the Covid-19 pandemic exposed in Lancaster and throughout the state and nation, is that the recovery process is a critical component to the mitigation of this and other pandemics, especially among school-aged children and essential workers, like teachers. The added stress and emotional strain of such a drastic and life-altering event can have both short- and long-term impacts of physical and mental well-being and identifying and addressing those impacts is a critical response need of Lancaster and all communities and, as such, should be recognized as part of the Hazard Mitigation Planning process.

Preventing, mitigating, preparing for, responding to, and recovering from the effects of public health emergencies such as infectious disease and pandemic is a critical component of a municipality's emergency preparedness and hazard mitigation planning responsibilities. The lessons learned from the Covid-19 pandemic can be applied to other instances of viral transmission and vector-borne infection, disease, and illness. Awareness, proper preparative and preventative planning, and ongoing, adaptive response planning were implemented by the town of Lancaster's Board of Health and the Nashoba Regional School Department in the early stages of the Covid-19 pandemic and throughout the ongoing pandemic. Learning from the strengths and weaknesses of that process will be a critical step for improving the Town's ability to mitigate future pandemics and other ongoing public health concerns including other infectious diseases.

Developing enhanced response capabilities based on new, experiential knowledge should be a high priority to address any risks and vulnerabilities exposed by recent experiences.

4.4.7 Wildfire Vulnerabilities:

Lancaster, throughout its entire jurisdictional area, and the non-jurisdictional area of the Devens South Post Training area, possesses a higher community-wide likelihood of wildfire than most other communities regionally (county-wide), state-wide, and nation-wide (*Wildfire Risk to Communities. https://wildfirerisk.org*, Accessed March 9, 2022). The area of the Devens South Post Reserve Forces Training Area, due to its use as a military training area where live ammunition is used, is at even greater risk of wildfire than other areas of Lancaster. Several wildland fires, some several hundred acres in size, have occurred within Devens South Post Training Area throughout the course of its documented history.

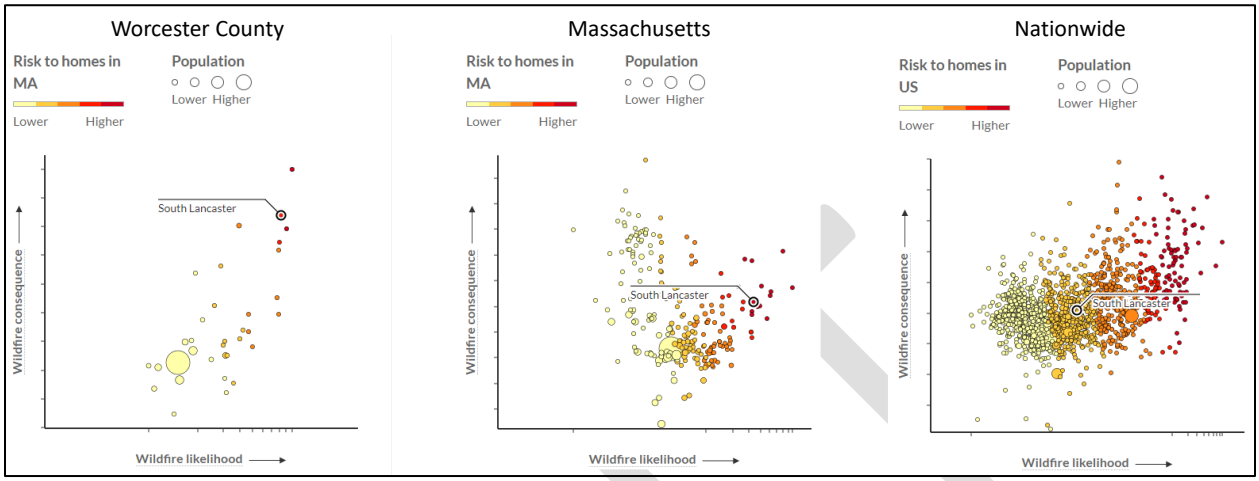
To mitigate the wildfire risks and vulnerabilities associated with all areas of Lancaster, given that the vulnerable area includes both town jurisdictional and non-jurisdictional land areas within Lancaster, it is critical that communication and coordination exists between the following entities: Town of Lancaster's emergency management departments, agencies, and managers; the U.S. Army; Devens Fire Department; Massachusetts Department of Conservation & Recreation's Bureau of Forest Fire Control & Forestry; Regional Emergency Dispatch Cooperative; and other relevant state, Federal, and any other relevant stakeholders or local emergency management directors, agencies, and entities. The Devens Integrated Natural Resources Management Plan (2019) recommended such coordination and the development of a Wildland Fire Management Plan by FY2021.

Coordination between the U.S. Army, Devens Fire Department, the Town of Lancaster, and other relevant local and state agencies including fire departments and emergency management entities is critical to successful mitigation of this risk. Ensuring that a complete and current Wildland Fire Management Plan is established and that it includes clear protocols and that the plan, or its relevant contents, has been made available and is familiar to Lancaster's Fire Chief/Emergency Management Director is an imperative recommendation of this HMP. Full, current knowledge and understanding of means of access via roadways, trails, and paths, and egress through locked gates or closed roadways should be established, known, and understood by all parties. Changes should be incorporated into all relevant plans and any maps, descriptions, codes, or other pertinent information should be appended to such plans or protocols should be put in place to assure that the information is available and known to all responsible parties and their support staff or designees.

The area of South Lancaster has, on average, a greater likelihood of the occurrence of wildfire, possesses a greater risk to homes, and is exposed to a greater amount of direct and indirect sources of wildfire than most communities, locally, regionally, statewide, and nationwide. South Lancaster possesses a risk and vulnerability to wildfire to a degree greater than most other populated areas in Worcester County and Massachusetts. The likelihood of wildfire in South Lancaster is greater than more than half of all communities, nationwide (*Wildfire Risk to Communities. https://wildfirerisk.org*, Accessed March 9, 2022).

Populated areas of **South Lancaster** have, on average, **greater risk to homes** from wildfire than **60%** of communities in the **United States**. Compared to all **Massachusetts** communities, statewide, populated areas of **South Lancaster** have, on average, a **96%** greater risk to homes

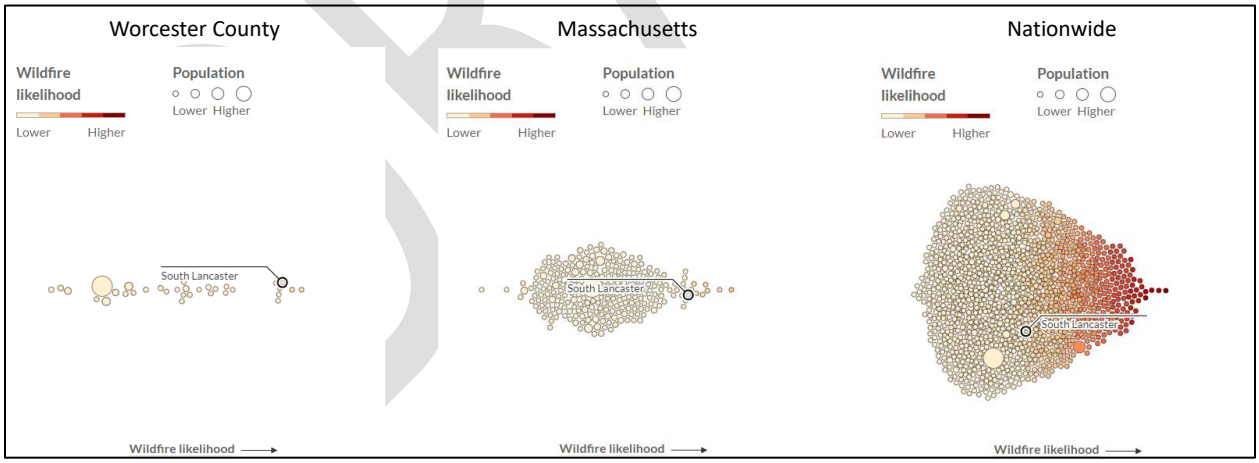
from wildfire. Similarly, populated areas of **South Lancaster** have, on average, greater risk to homes from wildfire than **94%** of communities in **Worcester County** (*Wildfire Risk to Communities.* https://wildfirerisk.org, Accessed March 9, 2022).



Source: Wildfire Risk to Communities. https://wildfirerisk.org, Accessed March 9, 2022

Figure 4-X. Wildfire risk to homes in the populated areas of South Lancaster relative to other populated areas of Worcester County, Statewide, and the Nation.

Populated areas of **South Lancaster** have, on average, **greater wildfire likelihood** than **71%** of communities in the **United States**. In fact, those areas have, on average, a greater wildfire likelihood than **94%** of communities in **Worcester County**, and a greater likelihood than **97%** of communities statewide in all of **Massachusetts (Figure 4-X)** (*Wildfire Risk to Communities.* https://wildfirerisk.org, Accessed March 9, 2022).

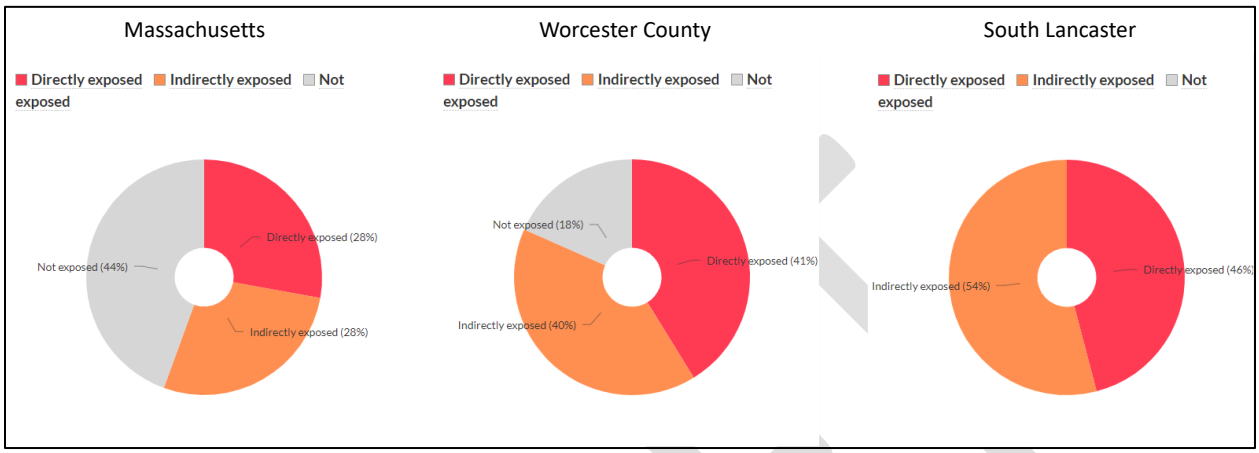


Source: Wildfire Risk to Communities. https://wildfirerisk.org, Accessed March 9, 2022

Figure 4-X. Wildfire likelihood of populated areas of South Lancaster relative to other populated areas of Worcester County, Statewide, and the Nation.

The most populated area of Lancaster, South Lancaster has a considerably greater risk of exposure to wildfire than most other communities throughout Massachusetts and across the state **(Figure 4-X)**. In fact, **100%** of the populated areas of South Lancaster are exposed to wildfire risk, either directly, or indirectly. **Indirect sources of wildfire** include sources such as embers from nearby

direct sources or home-to-home ignition. **Direct sources of wildfire** include flammable vegetation, duff, and leaf litter within populated areas or directly adjacent. **54%** of the populated areas of South Lancaster are exposed to **indirect** sources of wildfire, while the remaining **46%** of populated area are exposed to **direct** sources of wildfire (*Wildfire Risk to Communities. https://wildfirerisk.org*, Accessed March 9, 2022).



Source: Wildfire Risk to Communities. https://wildfirerisk.org, Accessed March 9, 2022

Figure 4-X. Wildfire risk exposure type for populated areas of South Lancaster.

Land areas of Lancaster, outside of South Lancaster, while not populated at a high enough density to show specific statistics relative to homes and other communities, still show a risk and high likelihood of wildfire, according to *Wildfire Risk to Communities* maps of data for all lands. The map areas of less populated lands in the northern portions of town show a high risk to homes, high density of areas of exposure to direct sources of wildfire, and high likelihood of wildfire, similar to populated areas of South Lancaster (*Wildfire Risk to Communities. https://wildfirerisk.org*, Accessed March 9, 2022).

4.4.8 Invasive Species Vulnerabilities:

Invasive species pose a real threat to Lancaster's agricultural lands, town forest lands, conservation lands, protected designated wildlife habitats (e.g., Central Nashua River Valley Area of Critical Environmental Concern, Estimated and Priority Habitats of Rare and Endangered Species, Cold-water Fish Resources), and other generally sensitive habitats like wetlands and floodplain forests. Climate change forecasts for the Nashua River basin project that average annual temperatures are predicted to increase, and extreme high temperatures are predicted to rise. These changes could result in increased occurrences and rates of spread of invasive plants, and increased survival and productivity of invasive insect pests because of the prolonged growing season and unfavorable conditions for native species (EOEEA, 2018). The forecasted future increases in average temperatures in Lancaster and subsequent predicted increase in presence and abundances of invasive plants and insects, lends further credence to the level of concern.

The Devens INRMP (U.S. Army, 2019) covering the South Post Training Area of Lancaster listed purple loosestrife (*Lythrum salicaria*), Japanese knotweed (*Fallopia japonica*), spotted knapweed (*Centaurea stoebe*), autumn olive (*Elleagnus umbellate*), black locust (*Robinia pseudoacacia*),

common reed – phragmites spp. (*Phragmites australis*), and buckthorn spp. (*Rhamnus cathartica*; *Frangula alnus*; *Rhamnus frangula)* as primary invasive plant concerns within the Devens South Post Training Area. Treatments considered within the INRMP include herbicides, controlled burns, and the promotion and planting of native species.

4.5 Summary of Hazard Vulnerabilities & Risk Matrices

Based on the hazards identified and evaluated within this plan, the plans previous iteration (2016), and the 2020 Lancaster CRB Workshops & Report, and an in-depth assessment of the vulnerabilities and risks posed by those hazards to the Town of Lancaster, the Town considers itself to be at a **high risk** for flooding caused by intense, prolonged rain, Spring flooding associated with early thaws or rain events associated with heavy snow-pack & sudden snow-melt, flash flooding during sudden, high-intensity rainfall occurring during a period of severe Drought or extreme summer heat, and roadway & culvert flooding associated with undersized culverts & beaver activity; **moderate risk** for high winds, hurricanes, tornados, nor'easters, severe thunderstorms, heavy snow, ice storms, blizzard, major urban fires, wildland fire, drought, extreme temperatures, earthquakes, invasive plants and insects, infectious disease & pandemic, and flooding associated with snow melt, dam failure, & ice jams; and **low risk** for landslides (HMP 2016; CRB 2020). The classification of vulnerabilities and risks was obtained following a review and selection of hazards by participants of the Lancaster Local Hazard Mitigation Planning Working Group (HMPWG) Meeting held on March 15, 2022, consideration of previous related plans and reports (e.g., Lancater's 2016 HMP and 2020 CRB Report), public input gathered at the September 15, 2021 public meeting, and analysis of survey results gathered from HMPWG members, relevant local stakeholders, Emergency Management Directors of abutting towns, and the public.

Another recent assessment of hazard risks, **Community Resilience Building (CRB) Risk Matrix,** identifying specific climate change resilience vulnerabilities and strengths was developed by the town in 2020, with community participation, as part of Lancaster's planning process under the Massachusetts Executive Office of Energy and Environmental Affairs (EOEEA), Municipal Vulnerability Preparedness (MVP) program. That recent, existing matrix helped inform the qualitative assessment of risks conducted for this plan. A full summary of findings and more detailed description of that process can be found in the full Lancaster Community Resilience Building Report which can be downloaded from Mass EOEEA at: https://www.mass.gov/doc/lancaster-report/download.

Final determination of risks and vulnerabilities, or levels of risk were made upon expert review of the available information by the HMPWG. A summary table of Lancaster's **2022 Community Vulnerability & Risk Matrix** is included below (**Table 4-9**).

This HMP is intended to be a compliment to the 2020 Lancaster MVP CRB Report and Risk Matrix and incorporated many of its findings and recommendations as part of the planning process and resulting plan presented here.

Table 4-9. [INSERT RISK MATRICES HERE OR AS APPENDIX]

Lancaster Hazard Mitigation Plan

Section 5

Section 5: Mitigation Strategy

The Mitigation Strategy section provides a blueprint, or map, for the Town of Lancaster to follow to become less vulnerable to the negative effects of the hazards identified and addressed in this plan. It is based on the consensus of the Hazard Mitigation Planning Working Group (HMPWG) and the findings and conclusions of the Hazard Analysis & Risk Assessment and Capability Assessment (APPENDIX B?), in addition to the input and feedback generated through the Town's public engagement efforts and Community Resilience Building Workshop (2020).

The strategy development was guided by a mission statement and an established set of goals and objectives. The mitigation strategy consisted of one general overall goal and eight hazard-specific goals and incorporated a series of general hazard mitigation measures across five mitigation categories. Each goal and associated mitigation measures took climatic change adaptation and resiliency into consideration relative to the potential effects of climate-influenced hazards on three key sectors of functional governance: infrastructural, societal, and environmental. The development and prioritization of mitigation goals and strategies involved a comprehensive evaluation of existing capabilities, extensive stakeholder engagement and community input, and thoughtful assessment and evaluation by the Town's Hazard Mitigation Planning Working Group. The intent of the Mitigation Strategy is to provide the town of Lancaster with a robust vision that will assist and strengthen the Town's ability to mitigate risks and address vulnerabilities in the short- and long-term.

Section 5 consists of the following subsections:

5.1. Mission & Overview
5.2. Mitigation Goals
5.3. Identification & Analysis of Potential Mitigation Measures
5.4. Selection and Prioritization of Mitigation Actions
5.5. Mitigation Action Plan (MAP)
5.6. Mitigation Result Chain Diagrams

5.1. Mission & Overview

The following Mitigation Strategy developed for the Town of Lancaster is intended to provide a clear a vision and set of strategic, practical, goals that are effective, adaptable, and attainable. These goals are intended to encompass the wide-ranging and evolving needs of the community in a changing world and climate and to serve as a guide for the implementation of mitigation actions, evolution and adaptation of the current and future working plan, and an established standard for measuring its success.

In providing ***a clear vision***, and establishing a set of ***strategic***, ***practical goals***, the Mitigation Strategy included a thorough review of all hazards and identified mitigation measures intended to, not only reduce the future impacts of high-risk hazards, but also to help the Town of Lancaster achieve compatible infrastructural, societal, and environmental goals.

In being ***effective***, each proposed mitigation action is linked to established priorities and presented as part of a summary *Mitigation Action Plan* (*MAP*) and as an individual *Mitigation Action Card* where the MAP acts as an overall index or key to all of the actions and the individual cards provide specific details related to the classification, description, and implementation of each action. Action Cards can be used as a cue card for identifying or applying to funding sources or as a work ticket for responsible staff or departments.

In being ***adaptable***, the development of the Mitigation Strategy is based on five categorical themes which encompass a variety of potential mitigation measures capable of achieving specific goals or objectives. This general approach allows for the strategic evaluation of goals and objectives in a way that allows for the development of future goals and objectives in response to evolving needs resulting from both implementation of the plan and new, unforeseen, or changing hazards.

In being ***attainable***, each proposed action responds to specified hazards and vulnerabilities and provides a clear description of the problem and a suggested path to the solution. Detailed action titles and descriptions include key words which are based on the specific topics, themes, or requirements of potential programs or funding sources under which the work may be eligible.

Changing climatic conditions and the recent trend of increased frequency, intensity, and duration of severe storm events is forecasted to continue and amplify in future years. This Mitigation Strategy was informed by Lancaster's recent Community Resilience Building report (2020) with the intention of providing climate-focused strategies to improve resiliency and mitigate the risks and vulnerabilities associated with the hazards of a changing climate. Similarly, this plan and mitigation strategy followed the example of the *2018 Massachusetts State Hazard Mitigation and Climate Adaptation Plan*, taking into consideration projected climate changes including changes in precipitation, rising temperatures, and severe weather to develop an integrative, strategic plan for Hazard Mitigation and Climate Adaptation. The deliberate intention to account for and address climate change interactions in an integrative approach as part of the overall mission of this plan and its mitigation strategy, is expressed in the overall ***Mission Statement*** adopted by the HMPWG.

The mission of any strategic plan should represent the goals and envisioned outcomes of those who created it and the needs of those whom it is intended to serve. The final mission statement adopted by the Town of Lancaster HMPWG is as follows:

MISSION STATEMENT: ***REDUCE THE IMPACT OF NATURAL HAZARDS AND A CHANGING CLIMATE ON LANCASTER'S RESIDENTS, BUSINESSES, FACILITIES, AND SERVICES THROUGH SOUND PLANNING, WISE LAND-USE DEVELOPMENT & DECISION MAKING, AND IMPROVED PREPAREDNESS, RISK REDUCTION, AND MITIGATION STRATEGIES AND ACTIONS.***

In addition to developing a mission statement that represented the envisioned outcomes of the plan, the HMPWG established an overall Hazard Mitigation Strategy goal and a series of hazard specific **mitigation goals**. The established mitigation goals represent comprehensive ideas that are reflective of community needs and area intended to address and mitigate known vulnerabilities and risks through the implementation of more specific objectives and mitigation actions.

Following the identification of mitigation goals and objectives, the process included the identification, consideration, and analysis of available **mitigation measures, or categories** to help achieve the identified mitigation goals. The identification of mitigation measures is a long-term, continuous process that should be sustained through the current development, long-term implementation, and ongoing, continuous maintenance of this plan. Alternative mitigation measures will continue to be considered by the Town of Lancaster as future mitigation opportunities are identified, as data and technology improve, as mitigation funding becomes available, and as the plan is implemented and maintained over time.

The outcome of the identification, evaluation, analysis, and establishment of a **Mitigation Mission, Goals**, **Objectives**, and **Measures** is the **Mitigation Strategy,** a set of specific, strategic **Mitigation Actions** expressed as a **Mitigation Action Plan**. The **Mitigation Action Plan (MAP)** reflects the specific needs, concerns, and problems identified during the planning process and represents a clear and functional plan of action toward their mitigation. It is considered the primary and essential outcome of the mitigation planning process.

The MAP includes a prioritized listing of proposed hazard mitigation actions for the Town of Lancaster. Each action has accompanying information, such as those departments or individuals most likely to lead or participate in the responsibility of implementation, potential funding sources, and an estimated target date or timeline for completion. The MAP provides the departments or individuals responsible for implementing mitigation actions with a clear roadmap that also serves as an important tool for monitoring and measuring success or progress over time. The cohesive collection of actions listed in the MAP can also serve as an easily understood menu of mitigation policies and projects

for local decision makers who want to quickly review the recommendations and proposed actions of the Town's Hazard Mitigation Plan. To assist with providing greater detail to those charged with the responsibility of implementing certain action items, an "Action Card" or ticket was developed for each action item identified within the MAP.

In preparing the Mitigation Action Plan, the HMPWG considered the overall hazard risk and capability to mitigate the effects of hazards as identified through the risk and capability assessment process, in addition to meeting the adopted mission statement and mitigation goals. Prioritization of the proposed mitigation actions was based on the process outlined in subsection 5.4.

5.2. Mitigation Goals

The primary mission of all local governments is to promote the public health, safety, and welfare of its citizens. In keeping with this standard, the Town of Lancaster developed an **overall Strategic Hazard Mitigation Goal statement** and **eight (8) individual, hazard-specific goal statements**, one for each of the selected priority hazards. In addition, several primary objectives were developed for each goal. The goals were established as general parameters to guide future strategic planning and implementation and the objectives were established as specific targets to aid in the development of individual strategic actions to be incorporated into a meaningful and attainable Mitigation Action Plan (MAP). In developing these goals and objectives, careful consideration was given to the wide range of strategies, goals, and actions from other community plans, Lancaster's CRB Report, and the influence of climate change on selected natural hazards to ensure consistency, cross-integration, adaptability, and resiliency. Lancaster's **Hazard Mitigation Goals and Objectives** are presented in a numerical tabulated format below:

α Overall Mitigation Strategy Goal Statement: To reduce the loss of life, property, infrastructure, and cultural resources throughout the town of Lancaster from natural disasters through a multi-dimensional hazard mitigation program that involves enhanced, strategic coordination, planning, education, decision-making, and capital improvements.

1. **Objective:** To organize and prepare to provide adequate shelter, water, food, and basic first aid to displaced residents in the event of a natural disaster, and to provide adequate notification and information regarding evacuation procedures, *etc.*, to residents in the event of a natural disaster.
2. **Objective:** To inventory supplies at existing shelters and develop a needs list and storage requirements; and to establish arrangements with local or neighboring vendors for supplying shelters with food and first aid supplies in the event of a natural disaster.
3. **Objective:** To have the Emergency Management Director (EMD) lead an effort to increase coordination between inter-departments in pre-disaster planning and implementation of hazard mitigation projects.

4. **Objective:** Increase awareness of hazard mitigation among town officials, private organizations, businesses, and the general public through the creation of a Hazard Mitigation webpage and enhanced other public outreach.
5. **Objective:** To utilize the Code Red emergency notification system to notify the public about emergency situations or events.
6. **Objective:** To collect, periodically update, and disseminate information on Hazard Mitigation and Emergency Preparedness, including, notification of which local radio stations provide emergency information, what to include in a "home survival kit, how to prepare homes and other structures to withstand flooding and high winds, where to find state or Federal emergency notifications or disaster declarations and associated information, and the proper evacuation procedures and routes to follow during a natural disaster.

I. Goal Statement for Flooding: To prepare public works department, emergency staff, and volunteers in order to minimize the loss of life, damage to property, and the disruption of governmental services and general business activities due to flooding.

1. **Objective:** To continue to participate in the National Flood Insurance Program and to have the flood maps periodically updated.
2. **Objective:** Seek funding to conduct a survey and develop recommendations and a plan exploring possible measures to mitigate flooding and prevent road closures during flood events along the Bolton Flats section of Route 117.
3. **Objective*:*** To Develop a priority list and seek funding through the Hazard Mitigation Grant Program (HMGP), Mass Division of Ecological Services, Culvert Replacement Municipal Assistance Program, or other relevant funding sources for the replacement of undersized culverts throughout Town.
4. **Objective:** Support local town departments to continue present methods to prevent beaver caused flooding and seek guidance and assistance from beaver management professionals, including consultants and trappers.
5. **Objective:** Develop beaver management and culvert maintenance plan(s) in coordination with a beaver management professional, Department of Public Works, and Conservation Commission.
6. **Objective:** Secure beaver and culvert maintenance Order of Conditions from Conservation Commission and other necessary permitting from Board of Health and/or Mass Wildlife to efficiently maintain culverts and install beaver management flow control devices where appropriate.
7. **Objective:** Support town departments and continue to enforce existing local, state, and Federal regulations to prevent development within designated flood zones.

8. **Objective:** Explore options to relocate critical infrastructure outside of the floodzone in cases where such instances occur and investigate corrective actions or measures that can be taken to mitigate the potential impacts of flooding in their current situation.

II. Goal Statement for Severe Winter Storms: To minimize the loss of life, damage to property, and disruption of governmental services and general business activities due to severe snow and ice storms.

1. **Objective:** To develop a plan for providing access to water, information, shelter, and food stores to people in remote locations in Lancaster in the event of a severe winter storm.
2. **Objective:** To use the Code-Red notification system to notify the public of impending hazards and provide information related to emergency preparedness, shelter, evacuation, and response.
3. **Objective:** To conduct an assessment of the Code-Red participation rate and increase outreach and notification to ensure that the highest rates of registration are achieved; particular emphasis being placed on ensuring that vulnerable portions of the population are represented to the fullest extent possible.

III. Goal Statement for Other Severe Weather (Including Hurricanes and Tornadoes): To minimize the loss of life, damage to property, and the disruption of governmental services and general business activities due to lightning, hail, and high winds associated with severe storms, hurricanes, and tornadoes. (The objectives listed above, under flooding, address the flooding that can result from a hurricane or severe storm.)

1. **Objective:** To educate residents and volunteers regarding the safe methods and actions necessary to deal with Severe Storms, Hurricanes, and Tornados.
2. **Objective:** To inventory, assess, and prepare emergency shelters and supplies.
3. **Objective:** To seek funding for the location and development of an emergency shelter capable of supporting community needs including the needs of portions of the population that are particularly vulnerable to the impacts of changing climatic conditions and weather-related hazards.
4. **Objective:** To Inventory, assess, and seek funding for alternative and back-up power supply options for critical infrastructure, emergency shelters, and emergency dispensing sites.

5. **Objective:** To use the Code-Red notification system to notify the public of impending hazards and provide information related to emergency preparedness, shelter, evacuation, and response.

IV. Goal Statement for Drought: To educate staff, residents and volunteers about the potential for drought and increased temperatures and to provide knowledge and awareness of the increasing likelihood of such occurrences and their potential impacts associated with changing climatic conditions and to encourage and promote strategies, and to be prepared to minimize the loss of life, damage to property, the disruption of governmental services and general business activities due to periods of prolonged drought and high temperatures.

1. **Objective:** To conduct an assessment of the condition, capacity, and capabilities of groundwater wells and aquifers and to evaluate their ability to meet water supply demands during periods of prolonged drought and under predicted future climate scenarios and to explore conservation and technology methods to maximize efficiency, efficacy, and capacity to provide necessary services now and in the future.
2. **Objective:** To consider and evaluate impacts of drought on streamflow conditions at road-stream crossings (culverts and bridges) and ensure that extreme low-flows are considered in addition to extreme high-flows when maintaining, repairing, and replacing culverts.
3. **Objective:** To seek funding for the location and development, including cooling and water storage capabilities, of an emergency shelter capable of supporting community needs including the needs of portions of the population that are particularly vulnerable to the impacts of changing climatic conditions and extreme heat and drought-related hazards.
4. **Objective:** To use the Code-Red notification system to notify the public of drought or extreme heat and provide information related to water conservation, adequate drinking water supply and access, emergency preparedness, shelter, evacuation, and response.

V. Goal Statement for Earthquake: To educate staff, residents, and volunteers about the potential for earthquakes and strategies to minimize the loss of life, damage to property, the disruption of governmental services and general business activities due to earthquakes.

1. **Objective:** To educate and encourage homeowners and developers to rehab and build using methods to minimize the effects of earthquakes and other disasters.
2. **Objective**: To ensure that all identified shelters have sufficient back-up utility service in the event of primary power failure.

VI. Goal Statement for Infectious Disease & Pandemic: To educate, train, and prepare staff, residents and volunteers about the risk of infectious diseases and potential for pandemic and strategies to respond to outbreaks, and minimize the exposure to infection, spread of disease, impacts

to mental and physical health and wellbeing, loss of life, the disruption of social and cultural activities, the disruption of governmental services and general business activities due to exposure, infection, and spread of virus and disease.

1. **Objective:** To Inventory, assess, and seek funding for equipment, supplies, and necessary devises and furnishings for Emergency Dispensing Sites.
2. **Objective:** To use the Code-Red notification system to notify the public of viral outbreaks of infectious disease and provide information related to general public health information, required or recommended mitigation actions (such as social distancing and masks), limiting and preventing exposure, vaccinations, emergency preparedness, emergency dispensing site information, shelter, evacuation, and emergency response.
3. **Objective:** To compile knowledge and learn from experiences related to the recent Covid-19 pandemic to better prepare for and mitigate future viral outbreaks of infectious disease and better respond to associated community public health needs, and most importantly, recover from pandemic and non-pandemic related public health emergencies.

VII. Goal Statement for Wildfire: To educate, train, and prepare staff, residents, and volunteers about the risk of Wildfire and to increase awareness to mitigate the risk of exposure or accidental ignition and to encourage the prevention of wildfire to avoid the loss of life, impacts to health, damage to property and the environment, destruction of natural resources, and the disruption of governmental services and general business activities.

1. **Objective:** To seek funding to conduct an assessment of access to town forests, conservation lands, and other open space and recreation lands to evaluate fire prevention and emergency response capabilities and risk of wildfire spread, including the identification and location of natural and man-made fire breaks and off-grid sources of water.
2. **Objective:** Improve access and response capabilities to areas susceptible to wildfire through coordinated planning, including the development of maps (with corresponding site signage, coding, or other location wayfinding markings), maintenance of existing paths, cart-roads, and/or fire roads, and coordinated access agreements or accommodations with private landowners, utility companies, and railroad companies.
3. **Objective:** Conduct regular training with Town Fire Department Staff, Volunteers, Mass DCR Bureau of Forest Fire Control, and abutting town Departments, and implement controlled burns as part of the training exercises to manage and prevent the accumulation of combustible organic fuels in high-risk, fire-prone areas.

4. **Objective:** Increase public awareness of wildfire risks and prevention measures through education, demonstrations, outreach campaigns and materials, web-postings, and code-red notifications during times of high wildfire danger.

VIII. Goal Statement for Invasive Species/Plants: To educate, train, and prepare staff, residents, and volunteers about the risk of the introduction and spread of Invasive, non-endemic wildlife species and plants and their ability to invade, crowd, suppress, outcompete, and eradicate local native plants and disrupt natural environments, habitats, and systems, including food-chains, predator-prey interactions, and co-dependent, symbiotic, communal, or host-species relationships.

1. **Objective:** To conduct a town-wide inventory of invasive plants and trees along roadways, and within Town Conservation, Forest, Cemetery, Parks, and at other public facilities, including public waterbodies.
2. **Objective:** To seek funding to develop an invasive species management plan, train relevant Town staff on best-management-practices and techniques of removal and control, and to remove and prevent invasive plants on public lands, waterbodies, and facility grounds.
3. **Objective:** To coordinate with relevant town departments, state agencies, organizations, and local businesses (including farms, nurseries, and lawn and garden centers) to raise public awareness and prevent the introduction, spread, and invasion of invasive species.

These mitigation goals were developed based on a review of the goals and objectives identified for the Town of Lancaster within the previous MJHMP (2016) and a review of the findings and recommended actions of the Town of Lancaster's Community Resilience Building Workshop Report (2020). The information brought forward from those sources were then assessed, relative to strengths, assets, and vulnerabilities, associated with selected hazards and the influence of climate-change, to identify appropriate and effective strategies and actions with regard to mitigating societal, environmental, and infrastructural impacts. The selected goals and objectives were then reviewed and finalized by the HMPWG at the third and Fourth HMPWG meetings. Each goal, intentionally general, is intended to broadly encompass the range of community needs associated with identified hazards, risks, and vulnerabilities and serves to establish the minimal parameters necessary to define achievable mitigation actions and to aid in formulating new ones as the plan evolves throughout its implementation phase.

5.3. Identification and Analysis of Potential Mitigation Measures

In developing the ***Mitigation Strategy***, a wide range of activities or measures (themes) were considered to help establish targeted mitigation strategies and actions capable of addressing specific hazard and vulnerability concerns. These actions were established based on a review of the information and actions identified within the Town of Lancaster's Community Resilience Building Workshop and Report (2020), additional review and discussion by the HMPWG at multiple meetings, and information garnered from public and stakeholder engagement efforts, including

interviews, meetings, and surveys. This systematic review of a wide range of activities was completed to ensure that all possible mitigation measures were explored and that the selected actions were appropriate and attainable.

In general, all activities considered by the HMPWG may be classified under one of the following five (5) mitigation strategy categories: **1. Local Plans and Regulations**; **2. Structure and Infrastructure Projects**; **3. Natural Systems Protection**; **4. Education and Awareness Programs**; and **5. Emergency Communications, Shelter, Evacuation, and Power**. All five categories are briefly described below with examples of general types of responsive mitigation measures that may be used to guide the current and future development of mitigation actions for currently identified hazards and vulnerabilities or future hazards or vulnerabilities which may arise during the implementation and maintenance of this plan and its future iterations.

Local Plans and Regulations
Mitigation measures that fall under this category include government authorities, policies, or codes that influence the way land and buildings are developed and built. Some examples pertinent to Lancaster include:

- Floodplain regulations
- Wetlands Protection bylaw
- Community Preservation Act
- Master plans or HMP-related Plans (e.g., MVP/CRB)
- Land use and Zoning bylaws
    - Enterprise Zoning District
    - Integrated Planning Overlay District
    - Flexible Development Bylaw
    - Floodplain Overlay District
    - Water Resource Bylaw
    - Environmental Controls Bylaw

Structure and Infrastructure Projects
Mitigation measures that fall under this category include repair and replacement of undersized culverts, roadway improvements, roadway drainage and flood control, utility service and back-up power maintenance and improvements, etc. Some examples pertinent to Lancaster include:

- Replace or repair Sterling Road Culvert
- Drainage improvements on South Main St.
- Develop general maintenance Order of Conditions with Conservation Commission for DPW

- General Town-wide Culvert Assessment, Maintenance, Planning, and Management
    - Town-wide culvert mapping and assessments
    - Acquire funds to repair undersized, damaged, or failed culverts
    - Develop a road-stream crossing beaver management plan
    - Maintain culverts through staffing increase and management plan
- Evaluate municipal buildings' need for generators or alternative power and ability to function as shelter
- Evaluate electric vehicle charging infrastructure capacity, need, and potential

Natural Systems Protections

Mitigation measures that fall under this category include acquisition and stewardship of open space lands, wildlife habitat protections, water resources protections, natural resource inventories and management plans, pollution control programs, forest management for stand improvement, habitat enhancements, or wildfire reduction, etc. Some examples pertinent to Lancaster include:

- Improve flow conditions and fish & wildlife passage at culverts & bridges under high and low flow conditions
- Identify priority Open Space land acquisitions for connections between existing open space and unique habitats
- Maintain and expand current open space areas in flood zones for flood control and habitat protection
- Identify and preserve areas of Prime Forest on municipal open space lands which have not been previously tilled
- Identify and preserve areas of Prime Agricultural Soils
- Identify and reduce wildfire risks to natural areas

Education and Awareness Programs

Mitigation measures that fall under this category include public information and outreach campaigns related to hazard mitigation, hazard response, emergency coordination and planning, sustainable development principals, individual water conservation and pollution prevention practices, public health campaigns, tic and mosquito education and awareness, emergency preparedness at home, etc. Some examples pertinent to Lancaster include:

- Increase outreach to low income and elderly populations and other vulnerable portions of the population
- Increase public awareness on risks and prevention of wildfire
- Increase public awareness on risks and prevention of mosquito and tic borne illnesses and testing for both people and insects/wildlife
- Develop a Hazard Mitigation public outreach and informational webpage
    - Lancaster Hazard Mitigation Plan and Related Information
    - https://www.ready.gov/
    - Code-Red Registration
    - Local Disaster and Emergency Notifications and Information

- State and Federal Disaster and Emergency Notifications and Information

Emergency Communications, Shelter, Evacuation, and Power
Mitigation measures that fall under this category include emergency communication equipment maintenance and improvements, emergency evacuation notification, signage, and wayfinding improvements, back-up power and utility improvements.
Some examples pertinent to Lancaster include:

- Assess schools as shelters and conduct long-term feasibility study of shelter options
- Find a location in town to serve as an Emergency Shelter and install back-up power generator(s) as necessary
- Backup power generator(s) for town-owned buildings
- Upgrade and maintain communication radios for Town Emergency Response and Public Works Departments
- Secure reliable back-up power and cooling for housing authority and municipal infrastructure serving vulnerable populations
- Assess flooding, erosion, and backup power for essential services infrastructure such as water & sewer distribution networks, wells, pumps, and storage tanks
- Investigate traffic flow improvements at critical intersections along evacuation routes and main roadways

Within each of the five mitigation measure categories demonstrated above, measures, or themes, were generally determined to have the potential to address or respond to hazards affecting three (3) primary, functional sectors of community governance: **1. Infrastructural**; **2. Societal**; and **3. Environmental**. These three sectors were identified in the Lancaster CRB Workshops (2020) as the primary community systems or functional elements most susceptible to the impacts of climate-influenced hazards. For this reason, we evaluated the relationship between the examples within all five mitigation measure categories and the three functional sectors of community governance affected by the impacts of hazards influenced by climate-change. These relationships were taken into consideration when selecting and prioritizing the following mitigation actions.

5.4. Selection and Prioritization of Mitigation Actions

The above mitigation measures were evaluated and developed relative to the ***community profile*** and specific ***hazards and vulnerabilities*** established for the town of Lancaster in Section 3 (Community Profile), and Section 4 (Hazard Identification & Vulnerability Assessment). The mitigation goals and objectives (and subsequent actions of the proceeding section) were identified and prioritized by the town of Lancaster as part of a public process during the Community Resilience Building Workshops conducted in 2020. They were then presented to the HMPWG for their review and confirmation for the purpose of selection and prioritization of appropriate and necessary mitigation actions. The final set of proposed actions includes the actions identified within the Lancaster CRB Workshop & Report (2020), relevant goals from the previous HMP (2016), and new goals identified by the HMPWG relative to hazards and vulnerabilities identified as part of the current planning process.

Prior to moving forward with action selection, an interactive exercise was held (during the third HMPWG meeting. STAPPLEE Exercise or other method?) in which the mitigation categories were generally **prioritized** as follows:

1. Education and Awareness
2. Local Plans and Regulations
3. Structure and Infrastructure Projects
4. Natural Systems Protection

In addition, each of the above categories for mitigation actions were introduced and described as part of the Public Opinion Survey. While responses indicate that all categories are important for the Town of Lancaster to consider, the results indicated the following **priority rankings** (slightly different from those prioritized by the HMPWG as shown above):

1. Local Plans and Regulations
2. Natural Systems Protection
3. Structure and Infrastructure Projects
4. Education and Awareness

The identification, evaluation, and selection of specific mitigation actions for the Mitigation Action Plan were carefully considered and discussed through multiple means including multiple HMPWG and open public meetings, the Public Opinion Survey, and individual discussions with and feedback from Town staff.

5.5. Mitigation Action Plan (MAP)

This Mitigation Action Plan (MAP) lists all mitigation actions proposed by the Town of Lancaster for implementation during the 2022-2027 hazard mitigation planning cycle. The MAP has been designed to address the established goals of this Hazard Mitigation Plan (Section 5.2), and they are focused on those hazards and vulnerabilities presenting the highest potential threats to the Town as determined through the Hazard Analysis and Risk Assessment (Appendix A). Mitigation actions are also based on the Town's existing local capability as described in the Capability Assessment (Appendix B).

The MAP (See Table 5-1 below) is a summary of all 30 Action Items recommended by the plan and will be maintained on a regular basis according to the plan maintenance procedures established in Section 6. The MAP can be used as a reference key to individual mitigation "Action Cards" developed for each action (Appendix X). The Mitigation Action Cards provide additional details and descriptions for each proposed action relative to the attribute information categories included in the MAP and described below:

- **Action #** – A unique identifier assigned to each action.

- **Action Title** – Provides a brief summary of the proposed action.
- **Action Description** – Describes the action in more detail, with some background on the issue or problem it will address.
- **Mitigation Goal** – Identifies the specific mitigation goal(s) the action is intended to help achieve as established in Section 5.2.
- **Mitigation Category** – Identifies the category for mitigation measure techniques the action falls under as established in Section 5.3.
- **Hazard(s) Addressed** – Indicates the specific hazard(s) the action will attempt to mitigate.
- **Climate Action Functional Sector** – Identifies the functional sector of community government that is affected by the climate-influenced hazard intended to be mitigated as described in Section 5.3.
- **Estimated Cost** – Provides a general cost estimate, if applicable, or indicates other resources required for implementation (e.g., "Town staff time").
- **Potential Funding Source** – Identifies potential funding sources, if applicable.
- **Lead or Responsible Department** – Indicates the department or agency with primary responsibility to carry the action out.
- **Implementation Schedule** – Indicates the general schedule or anticipated date of completion.
- **Priority –** Classifies the action as a High, Moderate, or Low Priority based on the criteria established in Section 5.4.

Table 5-1. Summary of hazard mitigation actions identified for the Town of Lancaster as part of a comprehensive hazard mitigation strategy.

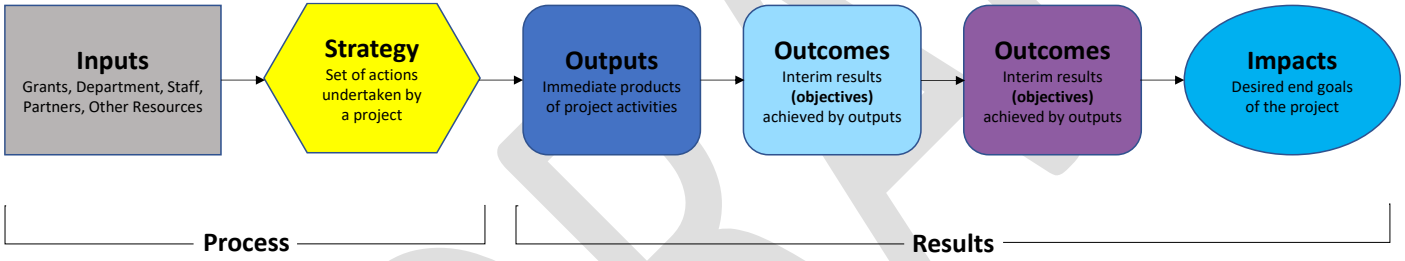
Lancaster Mitigation Action Plan (MAP) Summary									
#	**Action Title**	**Mitigation Goal**	**Mitigation Category**	**Hazard(s) Addressed**	**Estimated Cost**	**Potential Funding Source**	**Lead Dept.**	**Implementation Schedule**	**Priority**
1	Community-Wide Culvert Assessment and Improvement Plan	G1, O3; G4, O2	SIP, NSP	H1, H4		Fed BIP	CDP; CC; DPW		High
2	Replace/Upsize Culvert on Routes 110 & 117	G1, O3; G4, 02	SIP, NSP	H1, H4		MA MVP; MA CRMAP	DPW; CDP		High
3	Repair Sterling Road Culvert	G1, O3; G4, O2	SIP, NSP	H1, H4		MA MVP; MA CRMAP; Fed BIP; RAISE; Fed CRRRP;	DPW; CDP		High
4	Improve major roadways resistance to flooding	G1, O2	SIP	H1		MA TIP	DPW; CDP		High

5	Locate shelter facilities	G3, O2 & O3	ECSEP	All natural hazards		FEMA EFSP	CDP		High
6	Evaluate backup power	G3, O4; G5, O2	ECSEP	All natural hazards		FEMA PDM	DPW; CDP		High
7	Improve town communication	G7, O4	ECSEP	All natural hazards			DPW; FD; PD; CDP		High
8	Emergency Dispensing Sites	G6, O1	LPR, EAP	H6			EMD		High
9	Vulnerable populations	G4, O3	ECSEP, EAP	All natural hazards			HA; CDP		High
10	Update/Upgrade evacuation plans		ECSEP	All natural hazards			EMD; DPW; CDP; FD; PD		High
11	Code-Red notification system	G2, O3; G3, O5; G4, O4; G6, O2 & O3	EAP	All natural hazards			EMD		High
12	Relocate salt shed out of flood zone	G1, O8	SIP	H1			DPW		Medium
13	Evaluate town managed areas for risk of wildfire spread	G7, O1	NSP	H7			FD		Medium
14	Improve access and response capabilities to areas susceptible to wildfires	G7, O2	LPR	H7			DPW; FD		Medium
15	Relocate Highway Department	G1, O8	SIP	H1			DPW		Medium
16	Assess and upgrade current water system	G4, O1	LPR, SIP	H4			WD; CDP		Medium

17	Wetland protection	G4, O1	LPR	H1		Lancaster WPA fees	CC		Medium
18	Educate residents and volunteers	G3, O1; G5, O1; G7, O4	EAP	All natural hazards			CDP; FD		Medium
19	Mitigate flood impacts along rivers	G1, O7 & O8	LPR, SIP	H1		MA MVP; Lancaster WPA fees	CDP; CC		Medium
20	Evaluate and repair/replace bridges	G4, O2	LPR, SIP	All natural hazards		Fed BIP	DPW		Medium
21	Improve communication with rail companies	G1; G3; G5; G7	ECSEP	All natural hazards			EMD		Medium
22	Maintain Open Space and Town Forest	G7, O1; G8, O1	LPR	All natural hazards		MA LAND; MA PARC; MA MVP; U.S. LWFC; U.S. FSFLP	CC		Medium
23	Update and enforce drinking water related restrictions and regulations		LPR	All natural hazards			WD		Medium
24	Use recent Covid-19 pandemic to better prepare for and mitigate future viral outbreaks*	G6, O3	EAP	H6			EMD		Medium
25	Conduct regular wildfire control training with relevant departments	G7, O3	EAP	H7			FD		Medium
26	Create an invasive species management plan	G8 O1 & O2 & O3	LPR	H8			CC		Low
27	Work with Regional Emergency	G1; G2; G3; G4; G5; G6; G7	ECSEP	All natural hazards (except H8)		MA MVP; MA S&I	EMD		Low

	Communications Center								
28	Assess agricultural properties		LPR	All natural hazards		MA CSAP	AC		Low
29	Evaluate brooks and ponds	G8, O1 & O2	NSP	H8		U.S. F&W	CC		Low
30	Evaluate Conservation area adjacent to Rt. 70	G1	NSP	H1			CC		Low

5.6 Mitigation Result Chain Diagrams



Lancaster Hazard Mitigation Plan

Section 6

Section 6: Plan Maintenance

The Plan Maintenance section outlines how the plan will be implemented, monitored, evaluated, and enhanced over time. This section also discusses how the public will continue to be involved in the hazard mitigation planning process. It consists of the following three subsections:

6.1. Plan Implementation and Integration
6.2. Monitoring, Evaluation, and Enhancement
6.3. Continued Public Involvement

6.1 Plan Implementation and Integration

The Town of Lancaster is responsible for implementing specific mitigation actions as identified in the Mitigation Action Plan in Section 5 (Mitigation Strategy). While the overall responsibility for plan implementation remains with the Community Development and Planning Department in coordination with the Emergency Management Director, each proposed action has been assigned to a specific Town department with overall responsibility and accountability for carrying the action out. In most cases, subsequent departments or town boards or commissions are also listed as partners or supporters in responsibility. In addition, a proposed implementation schedule and estimated cost has been assigned to each mitigation action by the HMPWG to help drive progress toward completion and to assess whether actions are being implemented in a timely and cost-effective fashion.

Plan implementation will be accomplished by adhering to the schedules identified for each action. In some cases, the completion of an action may be contingent on the Town obtaining outside funding or other resources, and when applicable, potential funding sources have also been identified. The Town's Community Development and Planning Department, in coordination with representatives from applicable lead departments, will monitor funding opportunities that could be leveraged to implement some of the costlier actions. It will be the responsibility of each lead department to determine additional implementation measures beyond those listed within their Mitigation Action Plan (MAP). This includes integrating mitigation actions into other local planning documents, processes, or mechanisms as deemed appropriate and most effective.

The Hazard Mitigation Planning Working Group (HMPWG) will remain tasked with ensuring that the goals and strategies of new and updated local planning documents are consistent with the goals and actions of the hazard mitigation plan and will not contribute to increased hazard vulnerability in Lancaster. Opportunities to integrate the requirements of this Plan into other local planning mechanisms shall continue to be identified through future meetings of the HMPWG and through the five-year review process described in this section. Other local planning mechanisms include but are not limited to other Town plans, policies, procedures, projects, and other routine Town government activities such as capital improvement planning and the Town's annual budget process.

Although it is recognized that there are many possible benefits to integrating components of this plan into other local planning mechanisms, the development and maintenance of this stand-alone plan is currently considered by the Town to be the most effective and appropriate method to implement local hazard mitigation actions.

6.2 Monitoring, Evaluation, and Enhancement

Monitoring, evaluating, and enhancing the Town's Hazard Mitigation Plan are important steps in maintaining an effective document. Periodic revisions and updates of the plan may be required to ensure that the goals of the plan are kept current, considering potential changes in hazard vulnerability and mitigation priorities. In addition, revisions may be necessary to ensure that the plan is within full compliance with applicable federal, state, and local regulations. Periodic evaluation of the Plan will also ensure that specific mitigation actions are being reviewed and carried out according to the Mitigation Action Plan included in Section 5. As such, the Town adopts the following specific procedures to support routine plan maintenance and updates:

• The town department with the overall responsibility for monitoring the implementation and effectiveness of the plan is the Town of Lancaster's Community Development and Planning Department in coordination with the Emergency Management Director and Hazard Mitigation Planning Working Group. To assist in this process, the Department will routinely review and update the status of each mitigation action by reviewing the Mitigation Action Plan (MAP) and Mitigation Action Cards and documenting progress or achievements using a MS Excel-based ***Mitigation Action Tracker*** developed as part of this plan. Progress and achievement monitoring within the Mitigation Action Tracker will be done in coordination with other Town staff, and specifically those representatives from agencies identified as the lead or participating department for mitigation actions within each Mitigation Action Card. The Mitigation Action Tracker will help facilitate the routine submission, review, and discussion of status updates on each action on regular and recurring basis (recommended biannually at a minimum, or more frequently as needed). Through this on-going, adaptive, monitoring approach the re-prioritization of actions, or the addition of newly identified actions, and removal of completed actions will naturally evolve over the life of the plan and can be seamlessly and cooperatively integrated into the current plan and will consequently accommodate the development of new goals and actions for the iteration of the planning process of the next revision of the plan.

• The HMPWG will be the primary advisory body for plan implementation and will reconvene at least once per year for an **annual plan review meeting**. The HMPWG will also reconvene following any disaster events warranting a re-examination of the mitigation actions being implemented or proposed as new activities. Such a review, or ***Post-Disaster Plan Review and Update***, is essential to the evolution and effectiveness of the HMP and on-going planning process or cycle. This will ensure that the plan is continuously updated to reflect changing conditions and needs within Lancaster, specifically those changing conditions or needs associated with the occurrence and impacts of actual hazards, regardless of whether they were specified within this plan. The annual plan review meeting should take place in the fall of each year so that sufficient time is available to assess the status of any mitigation actions relevant to the annual season of severe winter storms, spring flooding, and well in advance of the end (June 31st) or beginning (July 1st) of the annual fiscal year and associated grant cycles.

• If determined to be appropriate or as requested, an **annual progress report** on the plan will be developed and will be included as a section the annual report or presented to the Board of Selectmen, at their discretion, to report on the status and advancement of actions identified in the plan and to provide information on any updates to relevant legislative requirements or community needs. The report may also highlight any proposed additions, amendments, or improvements required for the plan to increase its overall effectiveness. The preparation of the annual progress report should be closely aligned with the annual plan review meeting and should be coordinated in tandem with annual reporting requirements of the Federal Emergency Management Agency (FEMA), Community Rating System (CRS), once the Town if and when the Town decides to become an active participant in the

program. CRS is a voluntary incentive program that recognizes and encourages floodplain management practices that exceed the minimum requirements of the National Flood Insurance Program (NFIP).

As part of this monitoring, evaluation and enhancement process, Town staff will continue to attend any relevant meetings and/or training workshops sponsored by the Massachusetts Emergency Management Agency (MEMA), FEMA, or others as appropriate to keep up to date with any changing guidance or requirements for hazard mitigation plans.

At a minimum, the plan will undergo a comprehensive ***Five-Year Plan Review and Update.*** Review, update, and re-adoption every five years is required by federal regulations and per the current planning guidance from MEMA and FEMA. The on-going, adaptive monitoring, evaluation, and enhancement approach outlined here will accommodate and facilitate that process, increasing preparedness and ensuring its efficiency and efficacy.

6.3 Continued Public Involvement

Public participation is an integral component of the mitigation planning process and will continue to be essential as this plan evolves and is updated over time.

The most appropriate and meaningful opportunities for the public to be involved in the maintenance and implementation of the Town of Lancaster's Hazard Mitigation Plan is during the five-year plan review process as described earlier in this section. Public engagement in the plan review and update process will be solicited through multiple means and as similarly done for the initial development of the plan (this includes a formal public meeting in addition to other potential engagement activities). As demonstrated in Section 2, the Town has been active in seeking widespread public and stakeholder involvement during the plan development process through multiple methods. As part of this plan, a Hazard Mitigation Planning webpage was created on the town of Lancaster's website. This addition will benefit community and enhance the Town's hazard mitigation preparedness, education, and public outreach and information efforts. Benefits to the Town and Community will not only occur during the HMP planning and implementation processes but also during all times, particularly before, during, and after hazard storm-related events. While the five-year plan review process represents the greatest opportunity for such involvement, other efforts to involve the public in the maintenance, evaluation, and enhancement process will continue to be made as necessary. These efforts may include but are not limited to the following:

- Advertising meetings of the HMPWG in the local newspaper, public bulletin boards, social media outlets, Cable Access TV, and/or Town office buildings.
- Designating willing citizens and private sector representatives as official members of the HMPWG.
- Working with children through existing school programs and other appropriate means to engage children, parents, and other adults.
- Utilizing local media to update the public of any maintenance and/or periodic review activities taking place.
- Utilizing Town websites to advertise any maintenance and/or periodic review activities taking place.
- Maintaining copies of the plan in Town Hall, Thayer Memorial Library and/or other appropriate venues.
- Posting annual progress reports on the plan to the Town website.

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