



CITY OF DOVER, NEW HAMPSHIRE MASTER PLAN

2016 Stewardship of Resources

Preparing for Tomorrow

Preparing for Tomorrow

Department of Planning and Community Development

City of Dover, New Hampshire

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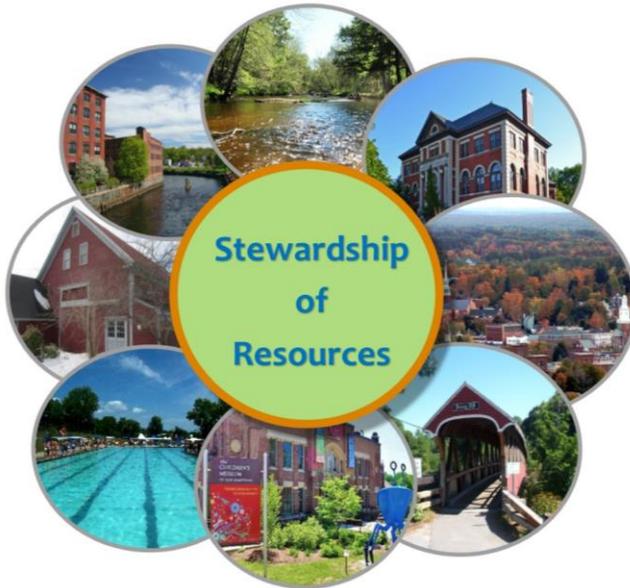
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Our Shared Resources

This section describes the many resources that make the City of Dover a unique place and emphasizes the importance of thoughtful stewardship.



Dover’s creation of this Chapter of the Master Plan is intended to illustrate how the network of resources within the City are interconnected. Traditionally, these resources and the issues related to them have been inventoried and presented in individual chapters. By integrating them in one chapter, a systems approach is taken to better understand many ways our resources affect each other, identify potential stewardship actions that have implications for several resources, and recommend cost-effective initiatives that will preserve Dover’s unique character. This integrated approach also presents an opportunity to explore how these diverse resources and related issues contribute to the Vision of Dover as a dynamic community with an outstanding quality of life.

Introduction

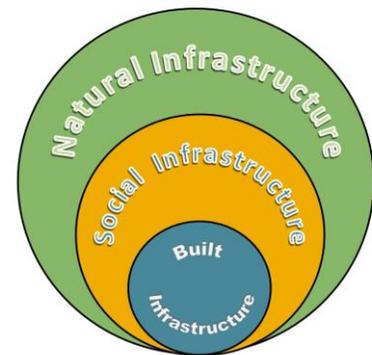


Dover’s rich history is reflected in the City’s built environment and pattern of development. With a mix of rural and urban landscapes, Dover stands out in New Hampshire’s Seacoast Region. The dense Downtown with parks, public gathering spaces, and distinctive architecture is surrounded by lower density development, agriculture, and conservation lands. All three elements contribute to the character of this coastal city.

As land uses change and the City develops, we risk losing Dover’s unique resources if efforts are not made to acknowledge the value of—and threats to—these resources, and, where necessary, protect them. As a coastal community influenced by tidal rivers within the Great Bay watershed, Dover is also influenced by the unique dynamics of the land-sea interface, and therefore must be prepared for a greater diversity of natural hazards—flooding, coastal storms, and winter weather events.

As the City strives to become more resilient over time it must also address the energy related needs of the population while preserving the history and culture of the past. Taking a systems approach: inventorying and understanding the dynamic relationships among these resources will help citizens plan for a range of eventualities and build-in resiliency to meet them. The goal is for residents, business owners, workers, and visitors continue to find Dover a rewarding community. Taking a systems perspective also allows us anticipate outcomes and take stewardship actions to best address future needs.

This Chapter inventories these critical resources and related issues that will inform policy decisions within the City. The recommended strategies and clear implementation actions identified in this Chapter will provide a roadmap for Dover’s citizens, elected officials, and staff as they work toward fulfilling the 2023 Vision for Dover. These physical sites and structures, ecological resources and functions, and emerging issues are all related to past and future human actions and the web of relationships within and beyond the City boundaries. In order to undertake the work that needs to be accomplished to reach the 2023 Vision, preserve Dover’s unique character, and become more resilient, the City must tap into



existing social capital within the community, but also build social capital for the future.

ICON KEY

- 📁 Planning Department Documents and Reports
 - 📖 Vision Chapter
 - 📎 Appendix
-

To increase the usability of this plan, the “icon key” at left was produced. The icons will appear throughout the chapter to help readers identify concepts and ideas that will be used and explained. The folder icon represents information available in the [Dover Planning Department’s Documents and Reports webpage](#), the pencil icon represents information gathered during the visioning sessions, and the page icon represents material available in the chapter appendix that served as the basis of Chapter content.

Resources and Related Issues

In earlier master planning efforts in Dover, the resources and related issues addressed in this Chapter were inventoried and analyzed separately and presented in individual chapters. While this approach is typical in community planning, it makes it difficult to understand the interconnections among elements, and to strategically plan implementation actions using a whole systems perspective. Nonetheless, as we explore the interplay among these topics we must also define and inventory them individually to understand their context within the City of Dover and the greater region. Here are short definitions of the topics addressed in this Chapter:

Natural Resources: soils, surface and groundwater, air, forests, farmland, material deposits, and many related ecosystem elements.

Historic and Cultural Resources: the physical structures and properties, sites, transportation corridors, archaeological sites, heritage areas and business corridors, landscapes and viewsapes, as well as the cultural institutions, events, books, history, and identity that have emerged in this unique context.

Energy Resources: current energy use and sources of energy, emerging energy sources and issues, and the related energy infrastructure.

Natural Hazards: naturally occurring events, which can be geophysical (earthquakes and landslides), hydrological (floods), climatological (extreme temperatures, drought and wildfires), meteorological (winter storm events and wave surges) or biological (disease epidemics and insect/animal plagues).

Coastal Management: policies and actions related to managing coastal areas (tidal rivers, bays, and their associated watersheds) to balance environmental health, human health, and social and economic activities.

Social Capital: the identified value of existing social networks and the ongoing creation of personal relationships stemming from the shared experience of Dover life to build networks of trust and mutual responsibility.

These are the topics that this Stewardship Chapter will address. Subsequent sections of this Chapter will examine each topic, inventory related resources, forecast potential threats or issues, and explore how each individual topic is related to the other topics and to other Master Plan Chapters. With this task in mind, it is important to clarify what we mean by stewardship. We define stewardship as:

In the context of Dover, this means the thoughtful and responsible management of the numerous and interconnected resources that have been entrusted to us and that we wish to ensure for future generations. To

The activity or activities associated with protecting and being responsible for something.

Source: Merriam-Webster's Learner's Dictionary

accomplish this Dover should undertake city-wide education programs to inform Dover citizens about the importance of protecting and managing the City's resources. This will serve as a way of engaging the public in the process of active stewardship.

Dover's Vision and Master Plan

In 2012, the City completed a Vision Chapter for the Master Plan. This Vision for Dover in 2023 has informed the development of this new Stewardship of Resources Chapter. Specific details from the Vision have also guided the action items proposed to ensure appropriate stewardship of Dover's resources through regulatory and non-regulatory means. Below is an excerpt from the Vision.

The Dover 2023 Vision:

When Dover celebrates its 400th anniversary in 2023 it will be a dynamic community with an outstanding quality of life because it has achieved the following interconnected characteristics:

- Residents celebrate safe, family friendly neighborhoods, a strong sense of community and an excellent school system.
- The historic downtown is alive with a wide variety of retail, dining, entertainment, cultural opportunities and a mix of housing choices that make it the vibrant focal point of the community.
- Municipal government and schools are run effectively and efficiently with full transparency, resulting in high quality services, well maintained buildings and infrastructure, a great recreation system and a competitive property tax burden.
- The community is fully served by public transportation and is very accessible for walking, bicycling and persons with disabilities.
- Vehicular traffic volumes and speeds are well managed.
- Dover attracts and retains stable, well-paying employers because it is business friendly and has a high quality of life.
- Rural character is preserved and well-designed development is encouraged in and around the downtown core and waterfront.
- Enhanced environmental quality and sustainability are actively pursued and inherent in all the city's activities.

This Vision, along with other chapters included in the Master Plan, and the new Regional Plan have all provided context and direction for this new Stewardship of Resources Chapter.

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Natural Resources

Section

2

This section describes the natural features that contribute to Dover’s unique sense of place, the resources available for human use, and options for balancing future development with the conservation and protection of these resources for future generations.

Dover’s natural resources have shaped the land use and development patterns throughout the City’s history. From the Abenaki people living along the Piscataqua, Cochecho and Bellamy Rivers in pre-colonial days, to the first European settlements taking advantage of the Great Bay’s fishing and water transportation opportunities and favorable farming soils, to our current community, the beauty, economic, and recreational opportunities in this area have drawn people to adopt—and adapt. Like many New Hampshire Great Bay communities, Dover developed around the rivers and ocean access, using these natural resources to power industry and transport goods and people.



Cochecho River in Downtown Dover

Natural resources are a critical consideration in establishing a sustainable and resilient land use management plan for Dover. Environmental factors such as slope, soils, vegetation, wildlife, and water resources have shaped Dover’s development history and character and should continue to inform and guide future development. These natural resources and open spaces support the integrity of the local ecosystem and provide residents with a healthy and enjoyable environment in which to live. They are critical to the future resiliency of the community.

These natural systems provide both opportunities and constraints for growth. Steep slopes and wetlands, for example, are less suitable for development, while better drained, flatter areas are more suitable. On the other hand, these well-drained areas may be associated with groundwater recharge areas and prime agricultural soils that require protection. Ensuring that Dover can meet the environmental challenges of the future and remain resilient in the face of climate change and population demands will require a carefully considered effort to protect its natural resources.

Survey Results

Many respondents of the 2016 Survey identified water resources such as the Cochecho and Bellamy Rivers, conservation areas, trails, open space, and parks as Dover’s most significant natural resources. The responses reflect the value of the riverfront and Great Bay environments to the community. Many responses mentioned the importance of conserving open space, natural areas, and farmland.

Dover sits at the confluence of rivers and ocean, where the Piscataqua River Basin Watershed drains to the Atlantic Ocean. This estuarine ecosystem is vibrant, diverse and at the same time fragile. In economic terms, these resources provide natural buffers, such as wetlands to absorb flood waters that defer possible property destruction, and essential elements such as clean water. Protecting the Dover estuarine ecosystem services is essential to the health and future of the community and the region. This section seeks to understand the resource thresholds of irreversible impacts and predicts trends in future threats.



Great Bay

Development Trends

The Development Trends map on the following page shows the development change in Dover between 2005 and 2015: 2005 development is orange and new development between 2005 and 2015 is yellow. The map suggests that overall changes and impacts in the last 10 years have been minor. However, on further analysis, there are concerns:

- Crowding of development in the NH Department of Environmental Services Designated River Corridor (1/4 mile buffer) has resulted in 25% of this resource area being developed.
- Some 20% of the unique habitat types (as identified in the NH Wildlife Action Plan) were lost during this ten year period. In addition, the development model used for this mapping does not account for fragmentation and degradation of particular habitat features by roads and buildings, thus the impact is likely to be more significant than it appears.
- More than 100 acres of land considered “Above Average” for climate change resiliency was developed during this ten year period. This land also correlates strongly with the better wildlife habitat.
- Dover has ample prime agricultural soils; however, some 290 acres have been removed from potential production in ten years.
- At least 150 acres of hydric soils has also been developed over the last ten years.

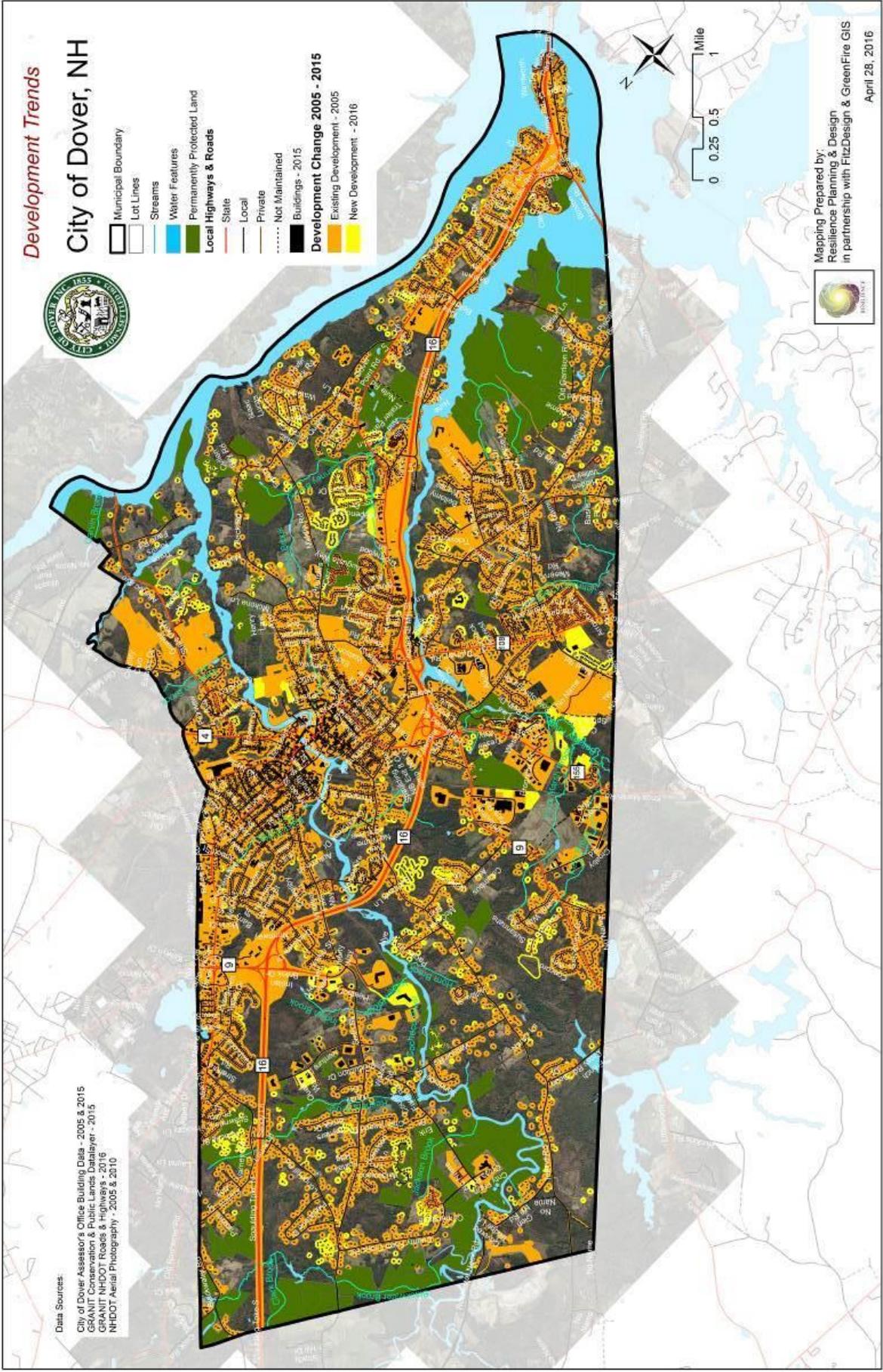
Development Trends

City of Dover, NH



- Municipal Boundary
- Lot Lines
- Streams
- Water Features
- Permanently Protected Land
- Local Highways & Roads
- State
- Local
- Private
- Not Maintained
- Buildings - 2015
- Development Change 2005 - 2015
 - Existing Development - 2005
 - New Development - 2016

Data Sources:
City of Dover Assessor's Office Building Data - 2005 & 2015
GRANIT Corporation & Public Lands, Datalayer - 2015
GRANIT NHDOT Roads & Highways - 2016
NHDOT Aerial Photography - 2005 & 2010



Mapping Prepared by:
Resilience Planning & Design
in partnership with FitzDesign & GreenFire GIS
April 28, 2016



Table 1 2015 Natural Resource Data 

Natural Resource Feature	Total Land Area	Percent Dover Land Area	Area Developed 2015	Percent Resource Developed	Area Conserved	Percent Resource Conserved
High Yield Aquifer (Ground Water)	585	3.4%	365	62.4%	2	0.3%
Floodplain	1,266	7.4%	179	14.2%	402	31.8%
Hydric Soils (Wetlands)	4,192	24.5%	1,064	25.4%	722	17.2%
Riparian Corridor (CWS Stream Order)	679	4.0%	111	16.3%	192	28.2%
NHDES Designated River Corridor (1/4 mile)	2,759	16.1%	701	25.4%	372	13.5%
NHDES Wellhead Protection Areas	3,530	20.7%	1,778	50.4%	233	6.6%
NHDES Source Water Protection Areas	890	5.2%	252	28.3%	0	0.0%
NHDES SWQPA 250 buffer	1,864	10.9%	484	26.0%	370	19.9%
Prime Agricultural Soils	5,400	31.6%	2,558	47.4%	775	14.4%
NHWAP Habitat Quality						
<i>Tier 1: Best in NH</i>	1,782	10.4%	409	22.9%	808	45.4%
<i>Tier 2: Best in Bio-region</i>	879	5.1%	134	15.2%	164	18.6%
<i>Tier 3: Supporting Landscape</i>	1,489	8.7%	698	46.9%	550	36.9%
NHWAP Habitat Types (Uncommon)	2,661	15.6%	333	12.5%	517	19.4%
<i>Temperate Swamp</i>	809	4.7%	79	9.8%	125	15.4%
<i>Wet Meadow/shrub Wetland</i>	706	4.1%	58	8.2%	168	23.8%
<i>Salt Marsh</i>	240	1.4%	29	12.1%	65	27.0%
<i>Floodplain Forest</i>	220	1.3%	15	6.6%	92	42.0%
<i>Peatland</i>	215	1.3%	25	11.5%	3	1.6%
<i>Rocky Ridge</i>	3	0.0%	0	0.0%	0	0.0%
<i>Hemlock/Hardwood/Pine Forest</i>	469	2.7%	126	27.0%	64	13.6%
Climate Change Resilience	1,882	11.0%	405	21.5%	295	15.7%
<i>Above Average</i>	1,835	10.7%	400	21.8%	291	15.8%
<i>Far Above Average</i>	46	0.3%	5	11.1%	4	8.5%

The development trends mapping data for 2015 shown on the Development Trends map has been translated into Table 1 above. This table illustrates the status of many natural resources, including surface waters, ground water (aquifers), habitat, prime agricultural soils, as well as conservation trends and depletion trends related to development pressures. The data from the [NH Wildlife Action Plan](#) (NHWAP) was released in 2015. A complete comparison of Dover’s 2005 and 2015 natural resource data is available in an expanded table in the Appendix.

Resources that were more than 30% depleted or conserved are circled above. It is noteworthy that nearly two-thirds (62.4%) of the high-yield aquifer resource has been developed, and half (50.4%) of wellhead protection areas have been developed. Water quality issues hang in the balance. Similarly, nearly half of the prime agricultural soils (47.4%) have been developed. On a more positive note, nearly more than two fifths of the high-quality habitat (45.5%), and floodplain forest (42.0%) have been protected. Nearly a third (31.8%) of floodplain has been protected and will continue to serve as a flood buffer, and more than a third (36.9%) of Tier 3 habitat has been protected (although nearly half (46.9%) have been developed. Nearly a quarter (21.8%) of land considered above average in terms of resilience to climate change effects has been developed just under 16% (15.8) has been conserved.

The Interplay Among Topics

This topic is the first to be addressed in this Chapter because Dover's natural resources, also referred to as Ecosystem Services, are the foundation of all other built and social resources. The loss of natural resources impacts the character of a community and opportunities to meet resident's needs locally, and lost resources can be expensive to restore or replace. The fact that Dover developed as a center of commerce and industry is directly related to its location and the ecosystem resources – waterways for power, forests for building materials, coastal regions for transportation, and agricultural soils for food production.

As natural resources are lost or damaged by development Dover's historic/cultural landscape experiences may diminish as well. Changes wrought by development may leave the community more susceptible to natural hazards. For example, the loss of wetland areas that provide flood storage and protection, clean stormwater, and provide habitat and recreational opportunities means fewer ecosystem services in clean water, flood protection, and habitat. Predicted outcomes of a changing climate and coastline suggest that over time storm surges and high tides may push water further inland and ultimately reduce coastal habitat. More can also be done within developed portions of the community to mitigate stormwater and other impacts. This could be encouraged through the creation of a stormwater utility and associated programs. Such an effort could encourage people to remove unnecessary pavement to increase infiltration, create rain gardens, and implement other site level solutions.

To address these challenges and become more resilient, Dover must look for opportunities to protect and regenerate its natural resources while enabling continued development, including new uses for existing structures. Thoughtful development has the potential to preserve and restore ecosystem services that would fulfill and achieve Dover's stated vision of "enhanced environmental quality and sustainability." Enhancing the quality of Dover's natural environment by "ensuring long-term protection, conservation and resiliency of its ecological and water resources, shorelines, open space, and wildlife" will also meet goals stated in the Master Plan's Land Use Chapter. This could include developing guidelines or a management plan to ensure that prime agricultural land is protected and used wisely in Dover. Collaboration with organizations like the New Hampshire Farms Network will provide new opportunities for Dover. Restoring ecosystem services to developed areas of the City could also include requirements for trees and/or green roofs. There are also opportunities for the City to lead by example by creating an "urban tree plan" that provides tree planting and removal guidelines. Such a plan should also include requirements to keep trees in the more developed areas of Dover and restrictions on removing trees during development.

Stewardship efforts should seek to preserve Dover's distinct historic and cultural character; protect the community's ability to withstand natural hazards such as a rising sea level; and also preserve space for residents to gather for celebrations, events, and recreational opportunities that strengthen the social capital. Developing metrics

for healthy ecosystem services, that also accomplish these other needs, and publicizing these goals and accomplishments will engage residents and businesses in voluntary efforts on their own properties.

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Historic & Cultural Resources

Section

3

This section describes the historical structures and cultural amenities that Dover are important to the culture and identity of Dover.

The first recorded European settlement in what is now Dover took place in 1623 by sailor David Thompson on behalf of a British property owner John Mason. Mason had received a “patent” from the Council of New England for all the territory lying between the [Merrimack](#) and [Kennebec](#) rivers. Thompson arrived at what is now known as Hilton Point (Dover Neck). Previous to Europeans, Dover and southern New Hampshire were settled by native people who began occupying the area some 12,000 years ago, after the last ice sheet retreated. The native [Penacook tribe](#) of the Abenaki people had no written language and the history of how they lived and used the land is scant¹. As a result, our understanding of these original inhabitants comes primarily

from archeology and in some cases legends passed through native peoples and European settlers. For this reason, Dover’s historic and cultural resources are seen as following the arrival of David Thompson and other European immigrants—a fairly recent period beginning about 400 years ago.

Shortly after the initial European settlement, a small village was established on nearby high ground known as Meeting House Hill (on Dover Point Road). This “plantation” was under the jurisdiction of Massachusetts for the next 100 years. During that period farming, fishing, and logging enterprises were established. Then a saw mill was constructed at the falls of the Cochecho River about four miles north. This waterfall became a valuable energy source and during the latter half of the 1600’s the center of settlement shifted north from the hill at Dover Neck and a new meeting house was built at Pine Hill in 1712. By 1758 the center again shifted to the north again to present-day Tuttle Square, where the First Parish built a



Historic Native American Trials in Dover and Southeast New Hampshire

● Ancient Cochecho Village Site

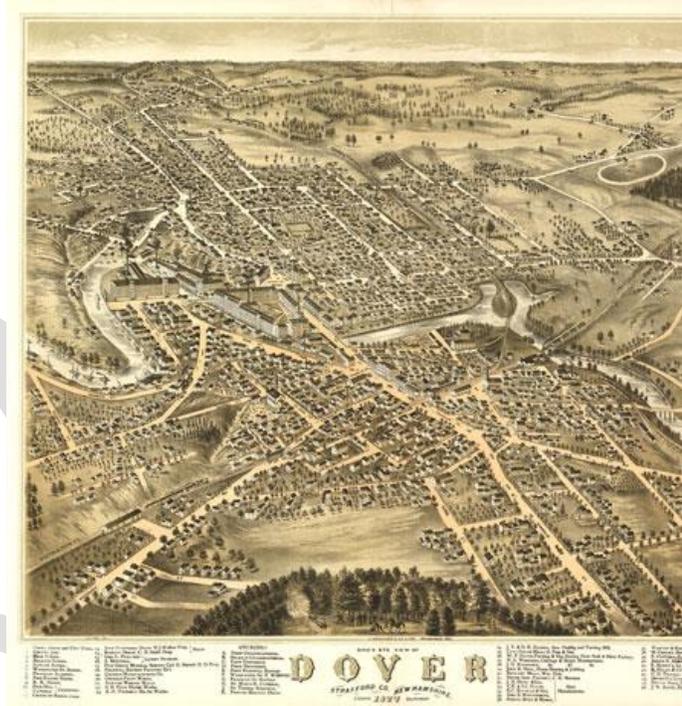
■ Trading Post

(From Map titled: [Historic Indian Trials of New Hampshire](#), Chester B. Price, New Durham, NH, New Hampshire Archeological Society 1958)

wooden church at the site of the current brick church building.

By the late 1700's and early 1800's, Dover had become an industrial community based on the Cochecho waterfall. The original grist and saw mills gave way to cotton textile mills. For almost 100 years, Dover Manufacturing Company (incorporated in 1827) became the major industry in the community. Sawyer Woolen Mills, established in 1824 on the Bellamy River, flourished through the end of World War II. During this period, Dover experienced a successive influx of immigrant groups including Irish, French-Canadians, and Greeks. These cultures are represented in the churches each group built within Dover, place names throughout the community, and events and festivals that continue to this day.

At this point in Dover's history, the City contains a diverse and historically significant set of sites, monuments, and buildings. A number of these buildings and places have been placed on the National Register of Historic Places, and all of them contribute to the character and appeal of the community. Although Dover is fortunate to have retained many historic resources, there have been periods when numerous structures have been razed for new development— such as during the period of Urban Renewal in the early 1970's. The belated recognition of the destroyed buildings—their historic character and how they shaped public space—should serve as caution against letting popular trends overwhelm aesthetics.



Dover's cultural landscape includes many of the remaining historic sites and structures mentioned above. It, too, has been shaped by the generations of residents that have called Dover home. The community's cultural resources add a dimension to the story that historic resources alone cannot reveal. Dover's cultural resources include memorials to historic events and institutions that hold the City's history, such as the Public Library, the Woodman Museum, and historic walking tours as well as current events and entertainment that draw people together and enable the kinds of relationships that build to social capital, an important element of the City's resilience and ability to overcome challenges. For the purpose of this section of the Master Plan the focus will be on place-based cultural resources, including the many parks and shared spaces that make public events possible.

The historic resources inventory developed in 1988 and updated in the 2000 Master Plan appears in the Appendix for this chapter. This inventory relied heavily on historical research and a “windshield” survey to identify historic structures and places. The cultural resources identified in this chapter include Dover’s parks and shared open spaces that make cultural events possible. The organizations responsible and annual events will be included in the Social Capital section of this chapter.

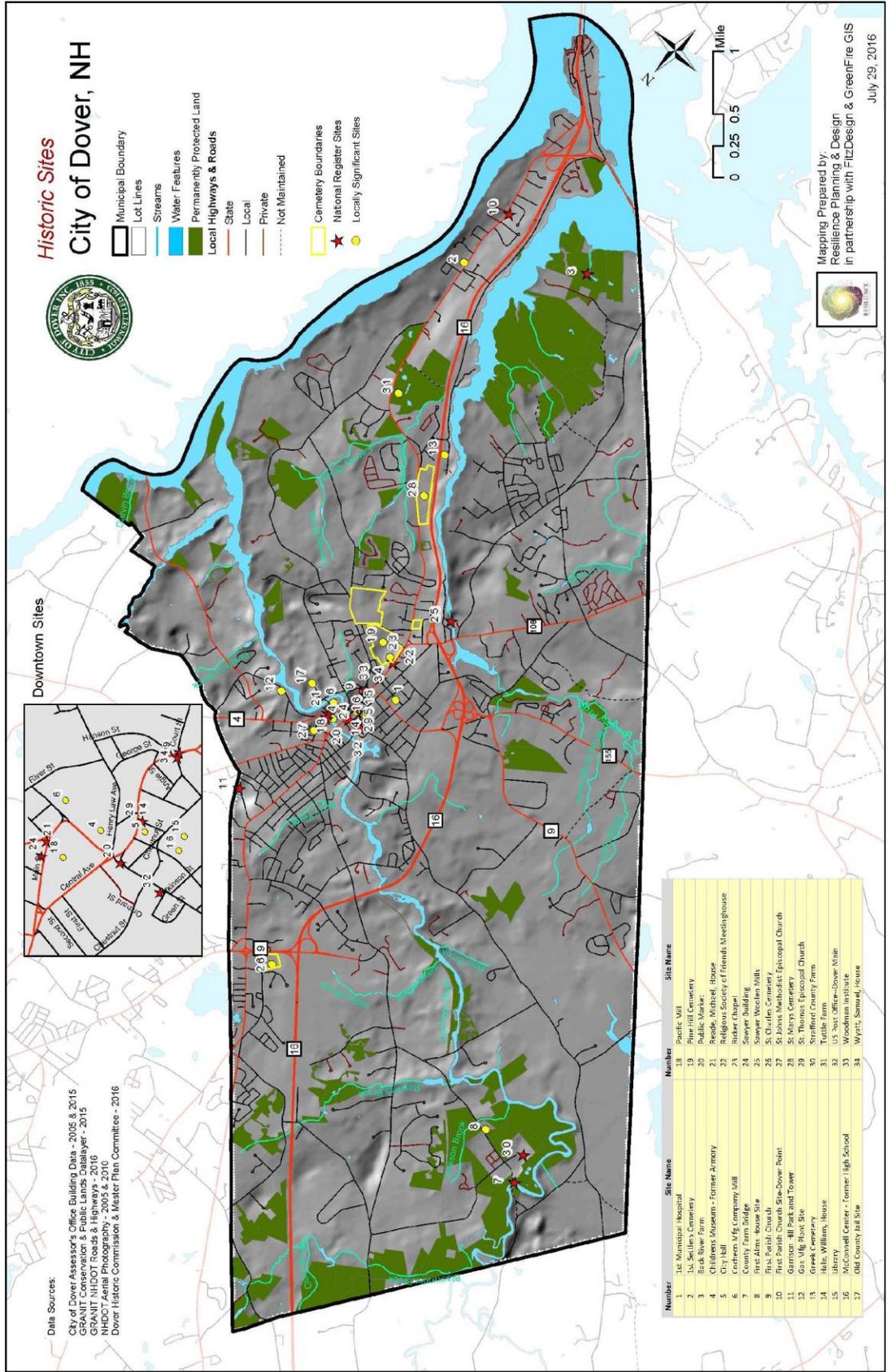


Masonic Temple (1890) Rebuilt in 1907 after fire.



Parade on Central Avenue, Early 1890's

Below is a map of existing historic sites in Dover, intended to show the distribution and variety of resources within the City; it does not include all known historic sites or structures in Dover.



Cultural Resources

For a city like Dover, cultural resources are often difficult to isolate from the historical resources because one is often part of the other. Henry Law Park and Downtown Dover's streets and squares provide spaces for outdoor



gatherings and cultural events. The McConnell Community Center, City Hall, churches, and the Library also provide space and services that support cultural events in the City. The McConnell Center alone houses a large number of community organizations in a collaborative atmosphere while offering space for meetings, events, and recreational activities. Other significant sites that contribute to Dover's cultural landscape include the Woodman Museum, the One Washington Street mills, the Community Trail, and the Strand Theatre.



Projected Demands and Potential Issues

The recently completed [Regional Plan](#) by the Strafford Regional Planning Commission calls for creating: “A World Class Place to Live and Work.” This vision recognizes that tourism opportunities tied to historical and cultural sites and events are important economic drivers. Promoting economic development in a region rich with history, recreational opportunities, and natural beauty is a major focus of the Regional Plan. Dover’s natural beauty and scenic character are central aspects of the regional economy, and it is important to recognize that development in the county has resulted in loss of agricultural lands, natural resources, and historic structures over time. Looking ahead, it is important for citizens to recognize that historic and cultural resources are critical components of Dover’s identity and character. One of the biggest challenges for the City as we look to 2023 and beyond is to find ways to protect and enhance its valuable historic and cultural resources while guiding new growth and redevelopment activity. Future development should enhance, and complement existing structures and resources



The City of Dover is fortunate to have access to the [NH Division of Historical Resources](#) (DHR) and the [NH Department of Cultural Resources](#) as it commits to stewardship of these shared resources. Both agencies inventory significant resources, track related issues, and create guidance and programming for New Hampshire communities. The New Hampshire Historic Preservation Plan is an example of this work and can inform future land uses to fulfill Dover’s Vision. Every five years the State Historic Preservation Office of the NHDHR facilitates the preparation of the statewide historic preservation plan. The latest plan can be found at: https://www.nh.gov/nhdhr/programs/documents/presplan2015_2020.pdf.

Protection of the cultural landscape that defines the City of Dover, the region, and the state is also imperative. The National Park Service defines a cultural landscape as "a geographic area, including both cultural and natural resources and the wildlife or domestic animals therein, associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values" and defines four basic types of cultural landscape:

- historic sites,
- historic designed landscapes,
- historic vernacular landscapes, and
- ethnographic landscapes.

Historic sites and historic designed landscapes, which may include gardens and parks, are easily defined. Vernacular and ethnographic landscapes allow for a broader consideration of human impacts on and interactions with the world around us. However, this focus on physical landscapes leaves out other important cultural aspects of Dover including the art, stories, and events that draw people together, build relationships and social capital, and attract visitors. As Dover works to balance the often competing objectives of economic growth and preservation, we must recognize that these objectives are interdependent. A resilient and culturally intact City with a distinct character that sets it apart from neighboring town is more likely to be economically successful.

The Interplay Among Topics

Some of Dover’s unique historic and cultural resources buildings and properties rely on adjacent natural resources and open spaces to tell their story. Many of Dover’s historic and cultural properties include indoor and outdoor spaces that also create opportunities for residents to meet, collaborate, and build relationships that make us more resilient. Early in the development of Dover, residents were restricted by the natural resources and technologies available. This created a local economy and a level of resilience that has been lost over time. In many ways, we are returning to that earlier reality of living within our resources as the City strives to be resilient in an ever-changing world.

Unpredictable natural hazards, a changing coastline, and continued development activity all present challenges. Efforts to protect natural resources and guide future land use will create opportunities to preserve elements of Dover’s history, protect cultural resources, and build solidarity through education. Goals to increase energy efficiency and renewable energy use can be accomplished while achieving historic preservation objectives. The resource document [“Energy Efficiency, Renewable Energy, and Historic Preservation”](#) completed by Clean Air Cool Planet and others in 2009, is a place to start. Dover must continue to protect, share, and celebrate its history and culture while “ensuring the historic downtown is alive with a wide variety of retail, dining, entertainment, cultural opportunities, and a mix of housing choices that make it the vibrant focal point of the community” (2023 Vision Statement).

Elements of this vision can be fulfilled by reinforcing actions identified in the Land Use Chapter, such as “the adoption of regulations including architectural and landscape design standards to ensure quality, historically appropriate building design.” Celebrating Dover’s history is a way of promoting economic development opportunities. Highlighting the interplay between place and history may also stimulate thoughtful building and corridor designs that enable social connections. For example, designs might encourage the use of public transportation, bring people to “street level” interactions such as retail shops, and create new public spaces for residents and tourists alike. Walkability objectives can also be accomplished while protecting land for hazard mitigation and for other natural resource values.

At a larger scale incentives, voluntary measures, or a citizen nomination process should be created for roads, or road segments, that have trees and/or high quality views that include historical agricultural landscapes, including stone walls consistent with the intent of RSA 231.57. Moving forward as a community there also will be opportunities to look to the past to inform our understanding of how to re-localize Dover and become more resilient.

Energy Resources

Section

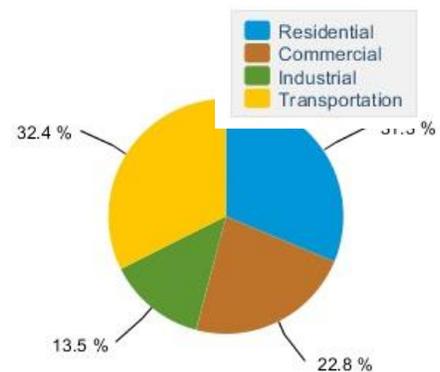
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The purpose of this section is to examine our current energy use in Dover and identify energy efficiency initiatives and new energy sources that will better serve the local population.

Establishing best management practices and policies that promote the adoption of new energy technologies in building maintenance, renovation, and future construction is important to both Dover's economic sustainability and its long-term resilience. Fortunately, the City has a demonstrated commitment to energy related issues. An example is the creation of the Energy Committee in 2007 to advise on energy plans and sustainable practices such as energy conservation, energy efficiency, energy generation, and zoning practices. The renamed Energy Commission has been recently been working to assess the efficiency of municipal buildings, and the possibilities for future energy conservation and production initiatives. The City has also committed to transportation policies that support transit and non-motorized transportation options.

Over the coming decades, energy will play an increasingly important role in Dover. The decisions we make about how much and what types of energy we use will have major ramifications on the quality of life we and future citizens may enjoy. Primarily, Dover and other New Hampshire communities are consuming fossil fuels for the vast majority of their energy needs. This includes energy production, home heating, transportation, food production, and other sectors of our lives. According to the New Hampshire Office of Energy and Planning, New Hampshire is currently importing 57% of the fuels used for energy production. Because New Hampshire has no in-state sources of fossil fuels (e.g., coal, natural gas, oil) or nuclear material, the state imports a large portion of its energy for this sector alone and exports almost \$5 billion dollars annually from the economy to pay for our energy. As Figure 1 indicates, the majority of our energy use in New Hampshire is for the transportation and residential sectors.

Figure 1

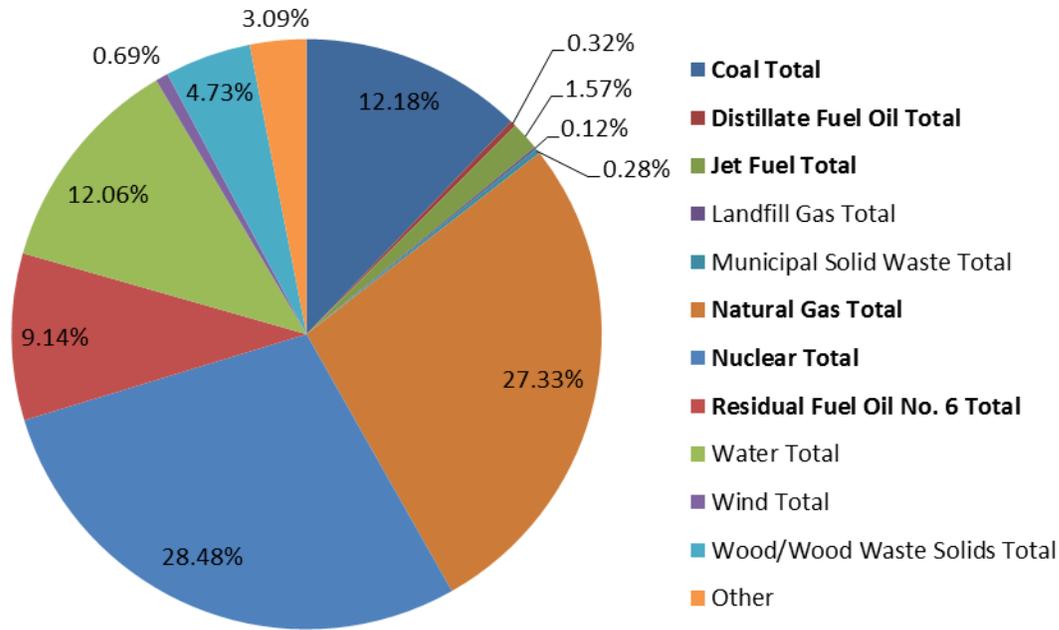


Source: Energy Information Administration, State Energy Data System

Primarily, Dover and other New Hampshire communities are consuming fossil fuels for the majority of their energy needs. Although New Hampshire burns virtually no oil for purposes of electricity generation, its per capita petroleum consumption is one of the highest in the United States. In fact, the state's many uses for petroleum combined for 46.6% of energy consumption in 2013, more than any other primary energy source (<http://large.stanford.edu/courses/2015/ph240/gray2/>). This includes energy production, home heating, transportation, food production, and other sectors of our lives. According to the New Hampshire Business and Industry Association for Energy and telecommunications, a member of the ISO-NE, New Hampshire is currently importing approximately 79% of the fuels used for energy production. Because New Hampshire has no in-state sources of fossil fuels (e.g., coal, natural gas, oil) or nuclear material, the state imports a large portion of its energy for this sector alone and exports almost \$7 billion dollars annually from the economy to

pay for our energy. As Figure 1 indicates, the majority of our energy use in New Hampshire is for the transportation and residential sectors.

Figure 2



Source: ISO-New England

Two severe problems have arisen out of this dependence on burning fossil fuels as our primary source of energy. First, burning fossil fuels is a primary contributor to global climate change: it moves carbon from the Earth and releases it into the atmosphere as carbon dioxide, trapping solar warmth in what is known as the “greenhouse effect.” The long-term consequences include severe climate disruptions and related social disruptions. Second, the rate of production of fossil fuels has peaked and begun to decline (an event known as “peak oil”). Approximately half of all global oil reserves have been consumed. Our electrical system is also experiencing some of the most fundamental changes since it was created. As we shift away from outdated energy sources with high emissions and import costs, new technologies of energy generation and management may add to our supply of electrical power. This provides an opportunity to reduce the environmental and economic impact of our energy use, and Dover can be a leader and play an important role in this transition.

The State of New Hampshire’s [10-Year State Energy Strategy](#) calls for modernizing the electrical grid to support this new energy economy. This will require increasing investment in energy efficiency initiatives and diversifying the fuel supply away from imported fossil fuels and incorporating more local fuel sources which could include hydroelectricity. Implementation of this 10-year energy strategy and [New Hampshire’s Climate Action Plan](#) present Dover opportunities such as spurring economic growth by investing in our local energy infrastructure while reducing the environmental, economic, and health costs of burning fossil fuel. City of Dover’s policies and practices can support these initiatives while encouraging distributed energy initiatives, increased transportation options, local food production, and other efforts that will build resiliency over time.

investment in training by the Commission and City Staff.

Overall, the City's energy costs were \$1.476 million in FY 2004 and grew to \$1.789 million in FY 2015. To slow increasing energy expenditures, the City entered into a performance contract with Johnson Controls. Through the last reporting period (11/14 – 10/15) the City had saved \$354,849 through Facility Improvement Measures (FIMs) to 14 City owned buildings and facilities. These improvement measures are financed by guaranteed reductions in the City's energy use and related costs. Looking at the data gathered from the Finance Department on the city's energy use, the greatest expenditures of energy as measured by KWH's from both FY 2013 and 2014 were in ranked order (2013/2014):

1. Water Treatment Plant (Mast Rd and Middle Road)	2,646,800
2. Ice Arena	4,426,400
3. McConnell Center	846,700
4. City Street Lighting	809,103

The City has completed LED lighting conversion programs at the Ice Arena, the Indoor Pool and at the McConnell Center. The City started with the Ice Arena which is scheduled to save \$27,000/yr and have a 4.5 year payback. Next the City together with Eversource Energy addressed the Indoor Pool where is anticipated to save \$5,000/year and will have a 5.5 year payback, and Dover just completed the McConnell Center project and is projecting \$18,000/year savings and a 6.6 year payback.



Commercial Solar Power in Dover

Looking beyond the municipal sector, energy is also being imported to power residential, commercial, and residential properties. Some property owners have started installing renewable energy systems and completing energy conservation upgrades. The transportation sector in Dover is heavily reliant on fossil fuel use, but the City is fortunate to be on an active rail line with Amtrak service and to have bus service available through COAST and Wildcat. The City has also been working to expand pedestrian and bicycle facilities that will support higher levels of service for non-motorized transportation.

Material goods and food are generally imported and require large amounts of energy not often calculated as part of Dover's annual energy use. Some material goods could be produced more locally in time, but opportunities to grow a larger percentage of Dover's food supply are diminishing as development activity continues to absorb area farmland. The Natural Resources Section of this Chapter includes information on existing agricultural activity and the remaining agricultural soils.

Projected Demands and Potential Issues

Dover has the potential to step forward as a regional leader in energy generation, conservation, and efficiency. It is important to frame energy use as having broader obvious uses such as lighting and heating to include energy calculations in the production and transportation of food and other goods. The energy landscape (cost and supply) is uncertain, and the impacts contributing to climate change are becoming more apparent. It is in Dover's best interest to make energy use a local issue, and to work on distributed generation efforts that result in more sustainable energy sources locally. It is also important that the City work to keep energy cost low for our residents.

There are regulatory and non-regulatory paths toward this goal. On the non-regulatory front, Dover can continue to identify opportunities for increased energy conservation and efficiencies in City-owned structures, operations, and fleets. Establishing a renewable energy infrastructure to help power City-owned facilities and fleets should also be explored. Currently, several market-driven initiatives are underway in Dover; they include looking at LED conversion of streetlights and installing solar electric panels on city-owned buildings. Adopting purchasing policies that encourage the use of local suppliers and purchasing alternative energy will minimize fuel costs and pollution while promoting local job creation. The City can also assist with outreach to property owners to encourage personal actions and implementation. This could include information about available energy efficiency and renewable energy programs and funding. Another strategy to consider would be to utilize the Solarize campaign model that provides targeted outreach and education to increase the number of solar energy installations within Dover, or to increase energy conservation efforts on private property. City officials may want to consider a revolving credit source for homeowners wishing to install solar or other renewable energy sources; in such a system, a homeowner would repay the loan from the City through a separate charge on property tax bills.

As Dover looks to create a positive energy environment for commercial businesses the City should consider supporting the efforts of organizations like the Jordan Institute's C-PACE (Property Assessed Clean Energy for Commercial properties) to help commercial business afford the costs of energy efficiency improvements. Municipalities can voluntarily adopt RSA 53-F that allows them to establish special assessment districts where commercial building owners may finance cash-positive energy-efficiency and renewable-energy projects and tie the financing to the property through a voluntary special assessment/lien. This effectively ties the repayment to the building, not the borrower, and has many unique benefits.

From a regulatory perspective, the City should continue to recognize the role that land use and transportation policies have on energy use and how regulations can create additional barriers or costs that may slow energy conservation, efficiency, or renewable energy projects. The City should work to remove any barriers to the creation of a local, renewable energy infrastructure. With emerging solar, wind, biomass, tidal and hydroelectric options available, Dover should ensure that the regulatory process is clear and that any potential conflicts are identified and addressed.

In 2015, the Office of Energy and Planning released the [New Hampshire Guide to Residential Rooftop Solar PV Permitting, Zoning and Interconnection](#). This guide explains current laws and regulations impacting residential solar systems specifically, and offers recommendations for permitting and zoning. While it does have a solar-specific focus, many of the takeaways would hold for all renewable energy systems. The guide advocates for a clear regulatory process, a single point of contact, and a reasonable fee structure. Related tools provided in the Guide's Appendices include a Sample Solar PV Project Checklist, a Sample Solar PV Permit Application, Sample Structural Review Worksheet, and a Simplified Guide to Utility Interconnection Requirements. The Renewable Energy Property Tax Exemption should also be adopted as it permits cities and towns to offer exemptions from local property taxes for renewable energy systems. Dover's land use regulations could also require new commercial

development to provide a percentage of its energy usage (i.e.: heating, lighting, etc.) from alternative fuel sources (solar, wind, etc.).

The Nashua Regional Planning Commission is currently developing a renewable energy “toolbelt” that will help communities like Dover navigate the process of selecting and enacting appropriate energy solutions including fuel source and associated infrastructure needs. The City should also support the creation of a regional task force for exploring and making recommendations for low carbon electrical generation opportunities in cooperation with other communities in the region. This would provide an opportunity to explore tidal power and other solutions.

The Interplay Among Topics

As the City works to be more sustainable environmentally and economically, energy issues are central. Food production, the shipping of consumer goods, transportation, construction, heating and cooling, and generating electricity all require the consumption of energy in various forms. Fortunately, there are opportunities for moving away from the harmful fuel sources and inefficient energy transmission systems of the past while fulfilling Dover’s vision for the future.

Dover must continue to pursue energy conservation measures in all sectors, create opportunities to produce energy from renewable sources, increase opportunities for producing food and material goods locally, and continue to expand transportation options. These actions will help the City become more resilient over time while providing economic opportunities and environmental, health, and social benefits. These actions also reinforce the actions identified in the Land Use Chapter by “building a sustainable community for current and future generations of Dover residents.”

Efforts to address energy issues in Dover also provide opportunities to meet natural resource goals by encouraging the protection and active use of agricultural soils. For example incentivizing the creation of local agricultural operations that support local food production systems would reduce the amount of energy required to ship food to Dover, and the associated impacts of emissions. Promoting non-motorized and public transit-related infrastructure as articulated in the Transportation Chapter will also address Dover’s energy issues.

Recognizing that new buildings have energy consequences, including not only energy costs associated with materials and construction in addition to ongoing maintenance, requiring solar siting and other passive energy design practices through improved building code and land use requirements will promote energy conservation and production. Lastly, specific initiatives such as encouraging the creation of makerspaces and community gardens will increase the social capital in the community while providing the infrastructure and training for producing and repairing goods locally.

Natural Hazards

Section

5

This section addresses the natural hazards risks facing Dover and mitigation alternatives that could protect people, property, and Dover's unique environment.

Natural hazards are the risks of any naturally occurring event that could harm people, property, and/or the environment. Hazards are known threats, such as flooding, that can become disasters when they actually occur. These risks can be geophysical, such as weather-related events or earthquakes, or biological, such as diseases and infestations. Many of these hazards are interrelated and, when they co-occur, can trigger other disasters. Assessing the risks of these hazards and preparing to mitigate damage and manage recovery is critical to the resiliency of a community that is faced with natural disasters.

In 2012, the City updated the [Multi-Hazard Mitigation Plan](#) with assistance from Strafford Regional Planning. This plan aims to “reduce the loss of life and property, human suffering, economic disruption, and disaster assistance costs.” The Plan articulates specific implementation actions for the City's mitigation efforts over time.



This collaborative effort identified the most likely geophysical hazards to impact Dover as:

- Flood (heavy rains),
- Winter Storms (ice storms),
- Nor'easters,
- Hurricanes,
- Severe Wind Storms, and
- Severe Thunderstorms and Lightning.

The immediate threat these storms pose are:

1. Loss of electrical power
2. Disruption of transportation systems
3. Damage to land and buildings
4. Damage to water quality
5. Loss of animal and human life.

- **Hurricanes:** Twenty-six hurricane classified storms have been recorded in New since 1930, and many more tropical storms that produced equal amounts of damage. Threats associated with these storms are primarily coastal storm surges and flooding due to precipitation. Dover, with its many waterways and coastal geography, is at higher risk for this hazard than other communities.
- **Tornadoes and Severe Winds:** New Hampshire experiences one or two tornadoes per year. The flatter, southwestern portion of the state is in a higher risk category for these types of disasters, which are typically associated with severe thunderstorms. However, the worst tornado recorded in the state touched down in 2008 in the towns of Epsom and Northwood, less than 30 miles from Dover.
- **Severe Winter Storms:** New Hampshire sees several large winter storms per winter, but the Seacoast communities average the least snowfall in the state. However, with the emerging wetter, local milder climate, snows can be heavy and wetter causing more damage and hazardous conditions. Rapidly melting snows have also contributed to flooding events in the Dover area.
- **Ice Storms:** Ice storms happen when warm air collides with arctic air fronts. In 2008 the largest Ice storm recorded hit the New England area. The Seacoast communities were among the hardest hit in New Hampshire and the inconvenience was compounded by the recovery costs.
- **Thunderstorms:** The primary danger associated with thunderstorms is lightning, which can cause fires and knock down trees or power lines. These storms typically occur in the summer.
- **Earthquakes:** New Hampshire is considered to be in the moderate risk category for earthquakes in the U.S.. The state experiences many small earthquakes a year and the probability of a major earthquake (magnitude over 5.0) within the next 50 years is low. However, the overall earthquake risk to the state is high.
- **Extreme Heat:** An outcome of climate change has been the increase in the number of days of extreme heat (temperatures above 90 degrees); these increases in maximum temperatures are predicted to continue. The most vulnerable members of the community include elderly, very young children, and the economically disadvantaged.

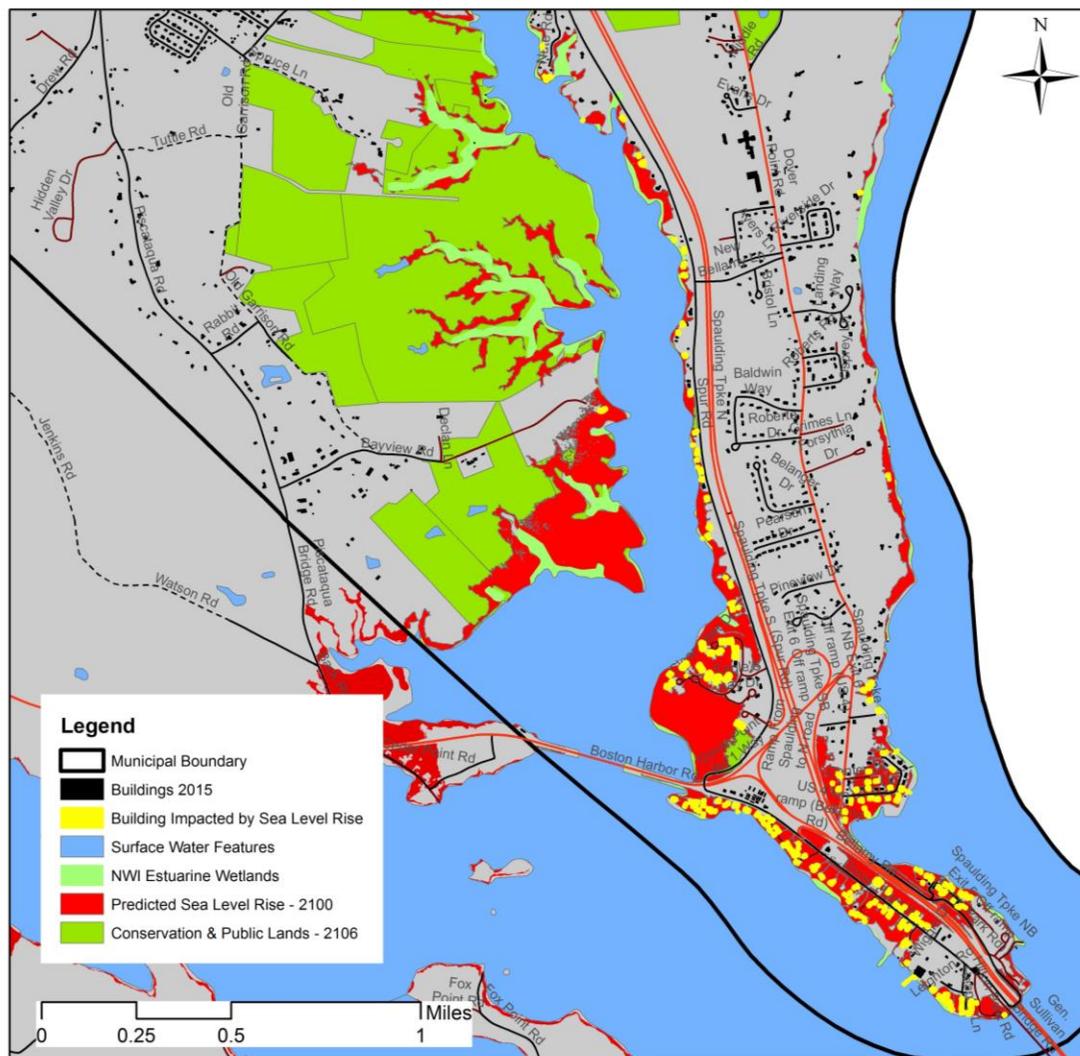
Risk Assessment

Based on historical data and analyses of future trends, the natural hazards most likely to affect Dover are climate, or weather related. Climate change is the primary force driving potential risks from natural hazards. Natural systems are complex and changes to one aspect will affect others.

As is the case across New England, Southern New Hampshire has been getting warmer over the past 100 years. The rate of temperature change has in fact increased over the last forty years. According to a report prepared by the Sustainability Institute at UNH, [Climate Change in Southern New Hampshire](#), the Dover area has also been getting increasingly wetter, with more frequent extreme precipitation events. These changes are already affecting the climate norms, and are predicted to escalate, further impacting the environment.

Higher temperatures will be a fact of living in Dover and the rest of the region over the next century. The climate models show an increase in winter temperatures and more extreme heat days during the summer. In fact, Southern New Hampshire's USDA Hardiness zones were recently reclassified into higher zone categories due to warming temperatures and lengthening of the growing season. The consequences of this temperature change will be far-reaching, disrupting weather patterns, jeopardizing the health of susceptible and compromised populations, impeding energy generation and distribution, and damaging natural ecosystems and food production.

The development history and patterns of Dover, along and within the floodplains of rivers and the Great Bay Estuary, significantly increased flood risks. Flooding is the most common disaster event in Dover. Its causes may be many: increased precipitation that saturates the ground and reduces infiltration capacity, extreme rainfall events, rapid snow melt, and increased areas of impervious surfaces. As development increases, the capacity of the land to absorb storm waters decreases and the risk rises. The City recently adopted the updated Federal Emergency Management Agency (FEMA) floodplain maps to inform the development review process and future planning efforts.



Map Source: The Nature Conservancy

Sea level rise and its impact on tidal flooding will also affect floodplains and flood risks in Dover. Numerous recent studies have projected sea level rises by 2100; the predictions range from 3 feet to 6 feet depending on the scenario, but even the more conservative estimate, a rise of three feet, predicts that twice as much land will be affected during tidal storm surges and 100-year flood events—the last such event in Dover was in 2007.

According to a 2016 study by The Nature Conservancy, 356 acres of land in Dover will be affected by a 2-meter (6.6 feet) sea level rise. When these areas are compared with data from the Dover Department of Public Works, it appears that a total of 224 buildings would be affected. Some structures upstream from Great Bay are accessory buildings (boat houses, cottages, etc.), but locations on Dover Point are potentially at risk. The potential for actual impact also depends on site-specific elevation data for the structures, which is not available. The image below features the most potentially affected areas in Dover. With this in mind, future predictions and the known consequences of land use should shape City decision-making to prepare for hazard mitigation.

According to [The Summary Climate Change Risk Assessment for Dover](#), completed by the Massachusetts Institute of Technology Science Impact Collaborative, the potential risks associated with higher temperatures, increased precipitation, and sea level rise will affect many aspects of ecosystem services: long-range challenges to water quality, food availability, disease control, ecosystem health, and emergency management should be expected.

Risks Associated with Higher Temperatures:

- **Health** – increase in heat strokes, respiratory illnesses due to air pollution, vector-borne diseases, northward migration of pests.
- **Infrastructure** – demand on power, damage to roads, bridges, water supply and sewer treatment systems.
- **Water Supply & Quality** – more precipitation and runoff pollution, longer drought conditions, and less winter snow pack as water storage.
- **Agriculture** – non-native plant and insect invasions, decreased winter dormancy period for native crops, unpredictability, longer growing season.
- **Ecosystem Stress** – habitat migration from south to north, species decline, ecosystem collapse.

Risks Associated with Increased Precipitation:

- **Flooding** – flooding of Cochecho and Bellamy Rivers in densely populated urban areas.
- **Erosion** – extreme rain events can erode embankments, undermine infrastructure, and deplete productive soils.
- **Water Quality** - increased stormwater runoff carrying pollutants, and contributing to flooding.
- **Vector-Borne Diseases** – increased water-borne diseases and pests that carry disease.

Risks Associated with Sea Level Rise

- **Daily Tidal Inundation** – increased tidal impact or influence on land and riverine environments.
- **Groundwater** – sea level rise may increase freshwater salinity and damage infrastructure and coastal property.

[The Summary Climate Change Risk Assessment for Dover](#), prepared in collaboration with the Massachusetts Institute of Technology, identifies community vulnerabilities including neighborhoods in floodplains, response facilities such as police and fire stations, hospitals, schools, transportation and communication networks, and City Hall. Vulnerabilities also include necessary resources such as commercial areas, hazardous materials facilities, and historic buildings. These areas and resources were determined to be at particularly high risk in case of disasters or emergencies. Some community vulnerabilities such as critical facilities are critical to management operations during emergencies and should be protected. The Assessment recognizes populations that would be particularly vulnerable such as those with decreased mobility, immunity, and available income.

Mitigation and Adaptation

In such cases the options are two: mitigate and adapt. Mitigation (prevention) is preferable—avoiding building on floodplains, or lower fossil fuel consumption, for example—although many elements of climate change are beyond the control of local communities. Adaptation, or coping with natural changes may be necessary. Dover’s ability to adapt to future climate change will be increasingly critical to the quality of life in the community. The integral connection between the natural ecosystems and community resiliency should be at the forefront of the future planning decisions. Increasing community resiliency will require forward-thinking land use and development policies. Reducing human-induced stress on vital natural resources will be an important strategy in hazard mitigation as well as the quality of everyday life in Dover. The City is about to begin a new adaptation planning initiative that will explore these issues further.

The Interplay Among Topics

Natural hazards can result in the loss of life and property, forever altering a community. Generally, they are isolated but potentially re-occurring events, and with climate change, some of these hazards are becoming more intense and having larger impacts. Dover must continue to prepare for these events through hazard mitigation and adaptation efforts. This Stewardship of Resources Chapter highlights the need for natural hazards planning and mitigation to also be considered during related planning and conservation efforts in Dover. Conservation land, buildings and infrastructure, and social capital all contribute to the community’s hazard preparedness and resiliency. Completing a study of repetitive loss areas in the community to better understand which areas are being impacted by flooding and other hazards will inform land use regulations and conservation efforts. Such a study may also identify areas with high flood storage capacities that can reduce downstream flooding and guide the preservation of natural areas that can accommodate sea level rise and salt marsh migration.

As Dover addresses the hazards discussed in this section there will be opportunities to achieve the City’s stated vision of “enhanced environmental quality and sustainability being actively pursued and inherent in all the City’s activities while residents celebrate safe, family friendly neighborhoods and a strong sense of community.” Planning for hazards will also reinforce actions identified in the Land Use Chapter by “building a sustainable community for current and future generations of Dover residents, and ensuring long-term protection, conservation and resiliency of its ecological resources.” Because natural hazards are closely related to natural resources it is easy to see the need to reduce ecosystem stresses resulting from heat island effects, cycles of flooding and drought, sea level rise, and all of the related social impacts. Taking appropriate action will require creative solutions and a broad coalition of stakeholders.

Coastal Management

Section

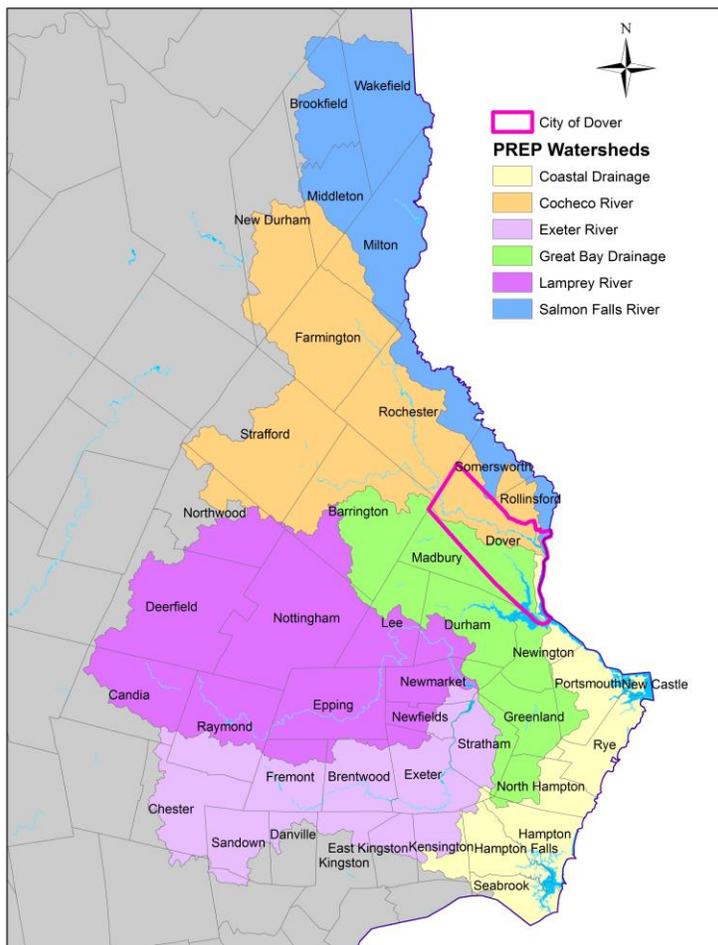
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This section will address the issues facing this ecosystem and how Dover's stewardship can preserve this valuable resource.

The City of Dover is part of the Piscataqua Region Watershed that feeds the Great Bay Estuary. Dover's Cochecho and Bellamy Rivers drain into the northern part of the Great Bay called Little Bay. This unique and diverse ecosystem operates at the confluence of rivers, land, and sea. The Great Bay provides critical wildlife habitat, seafood production, buffering from coastal flooding, and recreational opportunities.

The Great Bay is an exceptional natural area, and has been protected through the Great Bay National Estuarine Reserve since 1989. The reserve includes 20,172 acres of open water, wetlands, uplands, and tidal areas. The seven river systems that feed into the estuary, together with tidal waters from the Gulf of Maine that travel inland 15 miles through the Piscataqua River into Little Bay, create ecosystems and habitats which support over 18% of the state's rare species. At high tide the surface waters of Great Bay cover 8.9 square miles, and at low tide over 50% of the area is exposed mud flats. The reserve is managed through a

partnership between the National Oceanic and Atmospheric Administration (NOAA) and the New Hampshire Fish and Game Department.



This area, with its abundant and diverse wildlife, has been home to human settlements for over 12,000 years. From the mill era to present day development, land use changes have put stress on the coastal ecosystems, contributing to pollution of waterways, soils, and air and the loss and fragmentation of habitats. While development in the Piscataqua Region Watershed is likely to continue, it is critical to plan developments with minimal impacts on habitats and water quality. Fifty-two communities in the watershed, including those in New Hampshire, Massachusetts and Maine, share this concern and responsibility. The Piscataqua Region Estuaries Partnership (PREP), part of the U.S. Environmental Protection Agency's

Summary of Threats

Dover falls within three sub-watersheds: the Cochecho River, the Bellamy River and the Oyster River, with some areas along the eastern boundary draining directly into the Piscataqua River. Urban development and human activity in Dover principally affect the Cochecho and Bellamy sub-watersheds. The 2015 Piscataqua Region Environmental Planning Assessment (PREPA) evaluated the threats and regulation efforts for the Piscataqua Region Watershed (<http://preestuaries.org/prepa/>) found that threats to Dover's coastal resources revolve around water quality including pollutants from run-off, wastewater discharge, impervious surface cover such as paved areas and building roofs, and climate change.

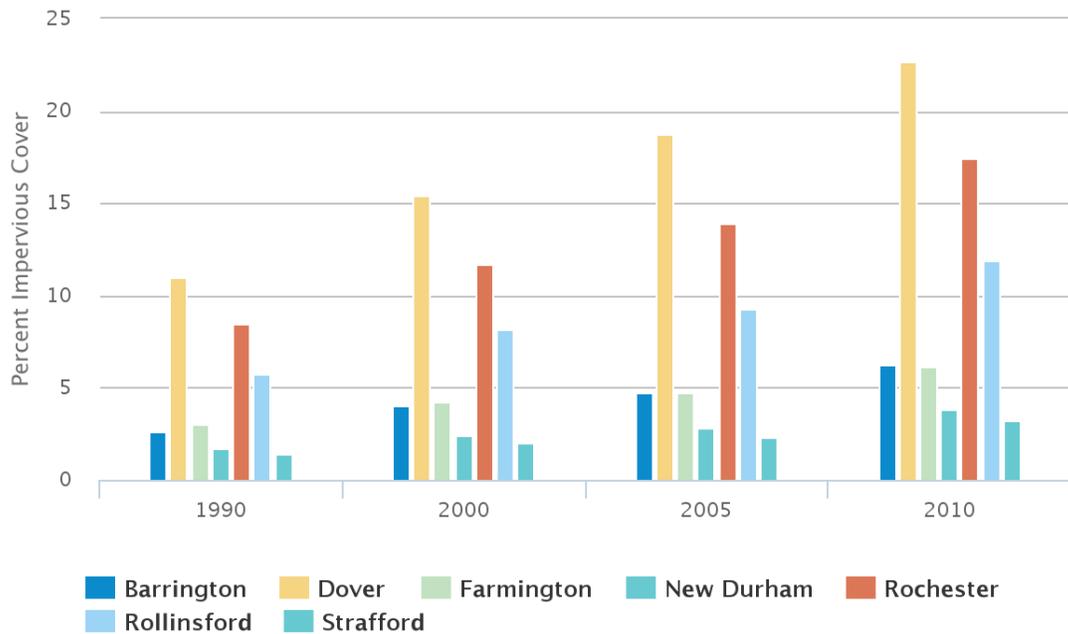
Development and Impervious Surface

Land use changes such as converting farmland and open space into residential and commercial development result in fewer areas of porous soils that absorb rainwater and more impervious surfaces that cause runoff. Impervious surfaces include paved parking lots, roadways, and roofs. Stormwater runoff can have several adverse effects on the landscape and estuary including: 1) increased risk of flooding by adding large amounts of stormwater to rivers and streams that would otherwise infiltrate into the soils, 2) decreased groundwater recharge by diverting rainwater that would otherwise infiltrate, and 3) continued movement of pollutants and nutrients to rivers that flow into the Great Bay.

Any amount of impervious surface within a watershed can adversely impact its hydrology and ecology and diminish water quality and species survival. Impervious cover becomes concerning when the impervious surface cover in a watershed reaches five percent. Research has shown that water quality becomes impacted when impervious surface cover exceeds 10%, and surface waters can lose many aquatic species when the cover reaches 25 percent or more. NHDES recommends no more than 10 % impervious surface for communities in the watershed.

Since 1990, impervious cover has increased dramatically in the Piscataqua Region Watershed. Recent estimates show 120% increase between 1990 and 2010. Within the Cochecho River Watershed, Dover has seen a doubling of the amount of impervious surface in the last 20 years. Clearly, Dover is increasing impervious cover, and reducing porous land surfaces at a rate faster than neighboring communities. At greater than 20% impervious surface cover, the City can anticipate impaired water quality and the threatened loss of aquatic species. Dover has been working hard as a community to reverse this trend and has now adopted stormwater management regulations that will apply to future development and redevelopment efforts. These regulations require infiltration and treatment of stormwater to protect surface waters.

Impervious Cover Rates in the Cochecho River Watershed



Highcharts.com

Climate Change

As described in the previous section on Natural Hazards, research suggests that the region will experience a wetter, hotter climate due to climate change. Increased rainfall, rising sea levels, more severe storms, warmer temperatures, and lower snowfall amounts threaten to modify the estuary habitat due to changing salinity of the waters, river and stream flows, higher water temperatures, and changing inundation patterns. Changes in saltmarsh and wetland footprints within the estuary due to sea level rise and increased rainfall will alter habitats and species populations.

Within the developed areas of the watershed, particularly those bordering the Great Bay, climate-induced sea level rises will increase the susceptibility to flooding and saltwater intrusion into fresh groundwater aquifers. Water quality and availability, along with protection of property and public safety, will be critical areas of focus. According to the New Hampshire Coastal Risk and Hazards Commission, in the report [Preparing New Hampshire for Projected Storm Surge, Sea-Level Rise, and Extreme Precipitation](#), Great Bay will see real change in the next few decades. Using mean sea level in 1992 as a starting point, New Hampshire sea levels are expected to rise between 0.6 and 2.0 feet by 2050 and between 1.6 and 6.6 feet by 2100. Today's extreme storm surge events will have a significantly greater inundation extent and destructive impact due to higher sea levels.

Land Conservation Priorities

The 2016 Nature Conservancy report on [Land Conservation Priorities for the Protection of Coastal Water Resources](#) identifies the link between development and declining water quality through by a range of pathways including:

- The loss of lands under natural cover;
- An increase in pollutant loads to surface waters, stormwater runoff, and flood risk to downstream areas;

- An increase in public and private infrastructure that both relies on and often degrades key ecosystem services such as clean water.

Sea Level Rise and Flood Risk Mitigation

The following Sea Level Rise and Flood Risk Mitigation map is based on data from the 2016 Nature Conservancy study. This map identifies *Tier 1: Critical Flood Storage* areas and *Tier 2: Important Flood Storage* areas in Dover.

Tier 1 flood storage zones are in the top 30% by land area in the coastal watersheds and are upstream from “valuable infrastructure” such as densely populated areas and major transportation systems. Tier 1 areas also include conservation priorities such as salt marsh potential considering the potential of up to 2 meters of sea level rise by year 2100.

Tier 2 areas include the top scoring flood storage areas in each sub-watershed that didn’t include a Tier 1 focus area. Although these areas meet the top 30 % threshold used for Tier 1, they are not upstream of valuable infrastructure.

The pending waterfront development in Dover will take this predicted rise into account and will include an elevated natural area along the water’s edge. This zone will provide storm protection, habitat value, and recreation area for the public.



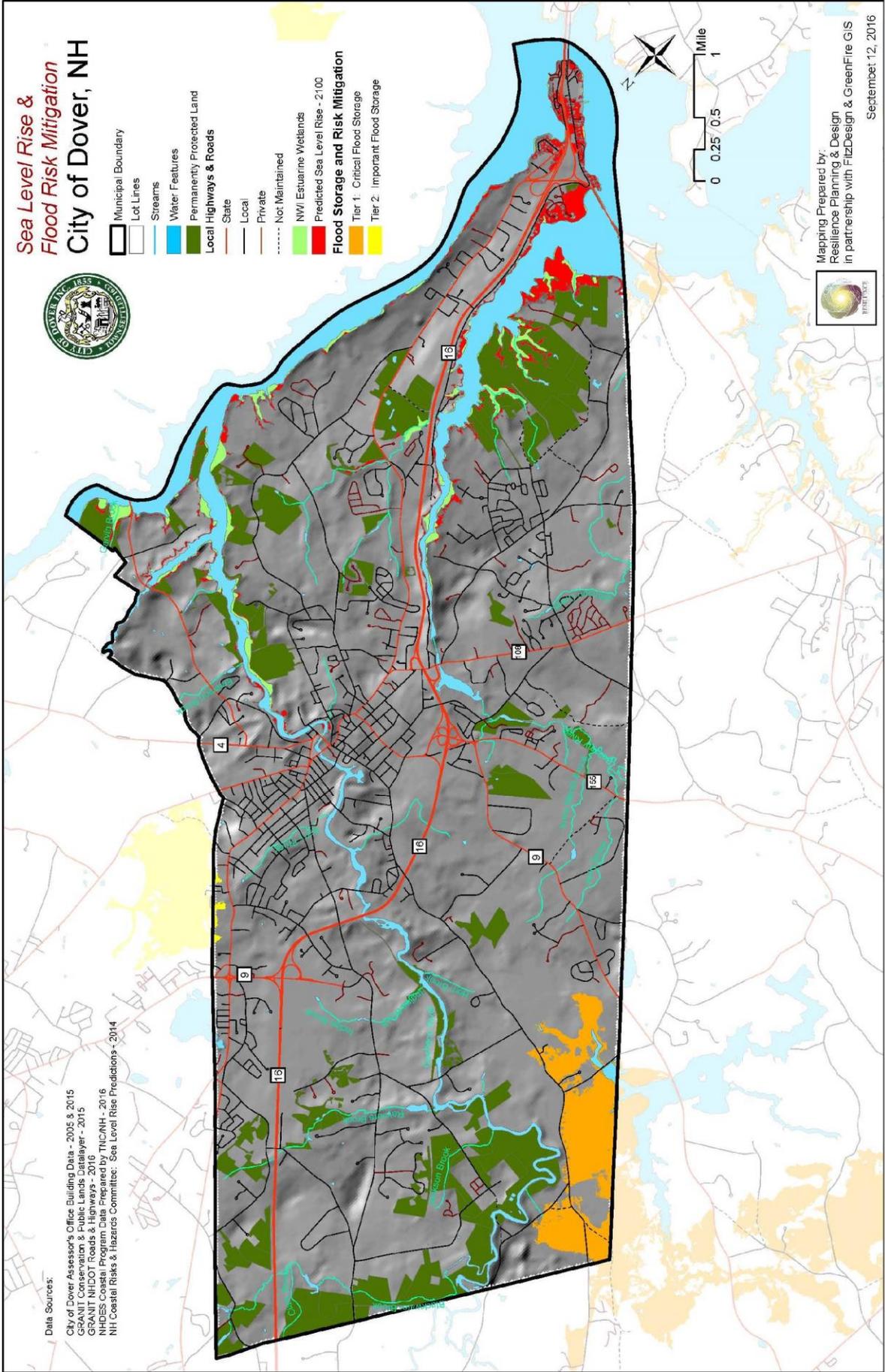
Hilton Point, Dover, NH

Sea Level Rise & Flood Risk Mitigation City of Dover, NH



- Municipal Boundary
- Lot Lines
- Streams
- Water Features
- Permanently Protected Land
- Local Highways & Roads**
- State
- Local
- Private
- Not Maintained
- NWI Estuarine Wetlands
- Predicted Sea Level Rise - 2100
- Flood Storage and Risk Mitigation**
- Tier 1 - Critical Flood Storage
- Tier 2 - Important Flood Storage

Data Sources:
 City of Dover Assessor's Office Building Data - 2005 & 2015
 City of Dover Assessor's Office Public Lands & Hillshade - 2015
 GRANIT MIDCOAST Regional Planning & Hillshade - 2015
 NHDES Coastal Program Data Prepared by THIC/NH - 2016
 NH Coastal Risks & Hazards Committee, Sea Level Rise Predictions - 2014



Mapping Prepared by:
 Resilience Planning & Design
 In partnership with FitzDesign & GreenFire GIS
 September 12, 2016

The Interplay Among Topics

Dover's coastal resources are closely linked to all other systems in the community. As additional population growth and development occur across the coastal watershed, and sea level rise continues, the threats and pressures on water resources will be exacerbated even further. Given the magnitude of these challenges, it is critical to capitalize on existing natural infrastructure to maintain and improve water quality and reduce risks to Dover and other communities in the coastal watershed. Protecting critical lands is an important strategy to meet this need.

As a community founded because of its coastal location, Dover must protect its natural and cultural resources. This will require recognition of an increase in the frequency and intensity of natural hazards and efforts to design and implement mitigation and adaptation strategies. More specifically, prioritizing and protecting riparian buffers, flood storage areas, and groundwater resources for their functions related to stormwater management, flood control, and other critical ecosystem services is a near-term priority. Emphasizing Dover's historic and cultural connection to the coastal zone and continuing efforts to deepen, preserve, and share this history may raise awareness and support for these efforts.

DRAFT

Social Capital

Section

7

This section will address the issues that affect the social networks and opportunities for social interaction in Dover.

The central premise of social capital is that social networks have value. Strong networks are essential in building healthy communities, and planning policies have the power to affect social capital positively or negatively. Planning outcomes can be improved by tapping these networks and incorporating local knowledge of issues, generating creative alternatives, and enriching the overall policy discussion.

When a group of neighbors informally keeps an eye on one another's homes, that is social capital in action. Coming together as a community after a storm, that's social capital in action. Serving on local boards and committees is social capital in action, and so, too, are e-mail exchanges among members of local schools or support groups. Social capital can be found in friendship networks, neighborhoods, churches, schools, bridge clubs, civic associations, and even local coffee shops. The importance of building social capital is that it strengthens community ties, enables positive change, and makes community resilience possible.

“Social capital refers to the collective value of all "social networks" [who people know] and the inclinations that arise from these networks to do things for each other ["norms of reciprocity"].”

The Saguaro Seminar, Harvard University

Dover is fortunate to be a City with a high level of social capital. The evidence for this is in the large number of volunteers participating in local boards and committees, in the school system, youth sports, and local non-profits. The annual Apple Harvest Day event, Dover Pride Clean-Up Day, and the Cochecho Arts Festival are all examples of large events organized by volunteers and which attract thousands of participants.



These established relationships create a level of caring within the community such that people do things for each other (norms of reciprocity). This creation of a broader identity and sense of solidarity are encouraged by social networks that help translate an "I" mentality into a "We" mentality. Some of the diverse groups in Dover that contribute to the City's social capital include:

- Creative Networks (Open Air Art Space, Wrong Brain, Arts Commission, dance studios, etc.)
- School networks (sports, teachers & faculty, students in person and online, etc.)
- City networks (employees, boards & committee members, recreation opportunities and Library, etc.)
- Industry networks (Chamber, individual businesses such as Wentworth Douglass Hospital, Federal Savings Bank, and Liberty Mutual, etc.)
- Civic Networks (Dover Main Street, Dover Rotary, Seacoast Local, Dover Housing, etc.)
- Community networks (neighborhoods, faith groups, scouting, Transparent Dover, online groups, etc.)
- Fitness and recreational networks (fitness classes, parent groups, wellness classes, 603 Running Club, beer mug clubs, etc.)

The walkable downtown, parks, and adjacent neighborhoods in Dover provide important infrastructure for these social interactions. These built environments draw people together regularly and provide spaces for planned and impromptu exchanges. Dover's playgrounds, school properties, recreation trails, and conserved open spaces serve a similar function. These areas benefit the community by hosting regular events, providing locations for informal gatherings and interactions, and even special events that reinforce existing personal connections and create new ones. As an example, the Jenny Thompson Pool and Ice Arena host regular sporting events that draw large numbers of participants and spectators together. The Downtown area is also host to road races, the Dover Dines event, and many other special events. Some additional examples of established events include:

- *Apple Harvest Day* - A day-long family event spearheaded by the Greater Dover Chamber of Commerce. The event features 400 crafters, great food, live entertainment, and more. The event was first held in 1985 and now draws more than 50,000 people to the City of Dover's downtown, making it one of the most popular regional festivals.
- *The Cochecho Arts Festival* - Produced by the Greater Dover Chamber of Commerce, this Festival began in 1987. The summer-long Festival showcases both internationally and nationally recognized acts as well as top local Seacoast entertainers.
- *Dover Pride Clean Up Day* - This annual event starts with a pancake breakfast served by the Kiwanis Club in the Cochecho Mill Courtyard. From there, hundreds of volunteers, with help from the City of Dover's Community Services Department, rake, prune, sweep, mulch, weed, paint, and plant their way through multiple sites in the downtown area.
- *Ethnic Festivals* - The Irish Festival, Greek Festival, and similar events reflect and celebrate the diversity of cultures in the region.

Projected Demands and Potential Issues

According to the New Hampshire Charitable Foundation, land use policies have the potential to harm human networks, trust, and engagement in ways that undermine important outcomes, such as health, safety, and prosperity. Planning decisions have the potential to affect social capital in four main ways:

- **Dispersing Human Populations:** Projects that destroy neighborhoods or disperse communities offer the clearest cases of negative social capital impacts. They uproot individuals and shred networks by ending the geographic proximity that enabled social support. The classic example of projects that harmed the social fabric by dislocating communities is the urban renewal projects of the post-World War II era.
- **Disrupting Community Institutions:** Projects that disrupt or destroy community institutions also can be harmful. If individuals in a small city gather only at the local park, the loss of this functional gathering place would diminish opportunities for the casual contact that builds trust and reciprocity.
- **Diminishing Opportunities for Engagement:** In addition to these clear-cut cases of social capital impact, some projects include components that decrease opportunities for engagement in the community. Policies and projects that result in phenomena associated with lower social capital – sprawl, commuting, residential mobility, increased television and internet viewing, longer working hours, and income inequality have the potential to undermine local networks, participation, and trust.
- **Denying Opportunities to Build Social Capital:** Finally, when we do not pay attention to social capital in planning and policymaking decisions, we may miss out on important opportunities to build social capital. For instance, attention to social capital might ensure the creation of crucial community gathering places and public meeting rooms when a new library, school, or civic structure is built.

According to the Carsey Institute at the University of New Hampshire, walkability is an increasingly important feature of healthy communities for many reasons including increased human interactions(see [report](#)). Similarly, recent work by the Urban Land Institute found that even in the suburbs, residents want more walkable spaces, higher density development, and better transit. The millennial generation in their 20s and early 30s is seeking this type of walkable and higher density, nucleated development, in both cities and suburbs, and the aging Baby Boomers want communities that allow them to age in place. Dover is actively working to create this type of development pattern and integrated transportation network. Communities such as Dover with safe sidewalks, good lighting, and well designed, compact development with easy access to shops, parks, schools, and dining—walkable in other words—are linked to greater health benefits, higher home values, reduced energy use for transportation, and better mental health. Walkable communities are associated with higher social capital, a key ingredient in vibrant, connected communities and in the kinds of social networks that make life healthier and more enjoyable.

Walkable communities by definition are denser and thus more easily served by public transit, thereby reducing parking needs and preserving porous surfaces to mitigate flooding and water quality damage.

Other aspects of the community that enable higher rates of social capital include:

- Prompt, reliable emergency services,
- Public spaces that attract frequent use,

- Public memorials that affirm the City’s history,
- Public campaigns, for example, to help households reduce energy consumption through efficiency measure, reduce the City’s carbon footprint overall, and provide an educational focus on the community itself—that is, students involved in tracking environmental quality, identifying historic buildings and stories, oral history projects, community photography projects. etc.
- Adequate housing options,
- Access to transportation,
- Access to affordable food,
- Community gardens,
- Equitable educational opportunities,
- Low crime/ high social supports, and
- A singular beauty of social capital is that it creates positive feedback loops—that is, the more people that trust and take care of one another, the stronger the social bonds become.

Creating the infrastructure for social capital might include designating informal community gathering places in proposed developments and incorporating public meeting rooms when city-owned structures are constructed.

The Interplay Among Topics

Dover’s citizens, institutions, buildings, natural areas, and infrastructure all support the cultivation of social capital. The relationships formed in the City’s neighborhoods, parks, businesses, and meeting rooms make the community more resilient and contribute to the quality of life for all involved. As a small city, Dover should protect these resources and foster a sense of belonging to increase social capital as part of “creating a community where residents celebrate safe, family friendly neighborhoods, a strong sense of community and an excellent school system.” This vision also calls for an historic downtown that is “alive with a wide variety of retail, dining, entertainment, cultural opportunities and a mix of housing choices that make it the vibrant focal point of the community.”

The Land Use Chapter also calls for “creating a sustainable community for current and future generations of Dover residents that allows for modest growth of residential, commercial and industrial development compatible with Dover’s historic urban and rural character.” Continued protection and stewardship of open space and recreational trails can play an important role in building social capital. It is also important that residents and business owners recognize the historic and cultural resources that provide the spaces for gathering in Dover and support many of the City’s events and institutions. These resources do more than just create a visual character; they also create opportunities for developing social capital. Furthermore, this philosophy matches the intent of the Transportation Chapter, which is to increase the walkability of the community to create opportunities for positive social interactions while reducing energy consumption and emissions. Although social capital is often overlooked, it is a component of community resilience and will be essential to success adaptation to future change.

Creating outreach and education opportunities that focus on Dover can also assist with reaching these goals. This could include getting students involved in tracking environmental quality, identifying historic buildings and stories, capturing oral histories, completing community photography projects. etc.

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Implementation Strategy and Recommendations

Section

8

The following implementation strategy and recommendation provide a work plan for Dover over the coming years. Implementation of these or similar actions can ensure that Dover retains and improves the resources that currently define and support it. Recognizing that the City itself is a dynamic system and does not operate in isolation, is extremely important. Over time, this Chapter and these actions may need to be revisited as new information becomes available.

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Section 8 - Stewardship of Resources: Actions

	Stewardship of Resources Related Actions	Priority	Responsibility	Chapter Page #
	Outreach and Education			
1	Develop an information sharing program focused on the importance of Dover’s shared resources. (NR, HC, NH, CM, E, SC)			6
2	Create opportunities for identifying and voluntarily protecting viewsheds and scenic road segments. (NR, HC)			23
3	Incentivize the conversion of impervious surfaces and implementation of low impact development stormwater management strategies through property owner action. (NR, HC, NH, CM, E, SC)			15
4	Develop metrics for healthy ecosystem services. Set specific quality goals for water, air, soil, carbon sequestration, and other natural resources and support voluntary resident and business engagement. (NR, NH, CM, E, SC)			15
5	Provide education opportunities and assistance for property owners interested in placing their properties on the National Register of Historic Places or who want to protect and enhance their historic properties. (HC, SC)			15
6	Consider providing education, outreach, and incentives to encourage developers and homeowners to pursue energy conservation measures on their properties. (NR, E)			15, 29
7	Review opportunities for an outreach and education campaign to increase awareness of how to protect against losses during severe weather events. (NR, NH, CM, SC)			15
8	Explore opportunities for citizen feedback for some public meetings, particularly that are televised, using an online platform or other technology.(SC)			49
9	Create a platform that identifies existing and new initiatives that build social capital. (SC)			49

10	Develop and support opportunities for K-12 and secondary education students to engage in Dover oriented projects. (NR, HC, SC)			46
	Studies and Initiatives			
11	Investigate Class B dams with NH Water Resources Board and produce an assessment and report identifying policy actions needed. (NR, HC, NH, CM, E, SC)			26, 30
12	Create a Strategic Conservation Plan for Dover that uses multiple objectives such as natural resource protection, hazard mitigation, historic and cultural resources, social capital potential, sustainability and resilience. (NR, HC, NH, CM, E, SC)			15
13	Implement the use of tools that improve analysis and reporting of data gathered from energy audits and assessments for all municipal buildings, operations, and vehicles. (NR, E, SC)			27
14	Identify and adopt a carbon limit and specific reduction strategies for City buildings and vehicles. Encourage similar actions by residents and businesses. (NR, E, SC)			48
15	Support creation of a regional task force for exploring and making recommendations for harnessing tidal power for low carbon electrical generation. (NR, NH, E)			28
16	Create opportunities that promote best use of prime agricultural land. (NR, NH, E, SC)			15
17	Support the continued collection and presentation of Dover's pre and post settlement history and culture through varied platforms such as memorials, walking tours and digital mediums. (HC)			18, 24
18	Continue support for programs such as Historic Byways or American Heritage Rivers. (NR, HC, NH, CM)			24
19	Promote opportunities for public, public/private and intergovernmental renewable energy generation. (NR, HC, NH, E)			29
20	Strengthen regulations to protect wetlands in critical areas to buffer Dover from flooding, improve water quality, and support biodiversity. (NR, HC, NH)			35

21	Create and adopt a climate resilience Master Plan chapter. (NR, HC, NH, E, CM, SC)			36
22	Support activities that reduce inland flood risks and potential infrastructure damage across the City. (NR, NH, CM)			35
23	Support continued water quality monitoring for all fresh and saltwater bodies. (NR, NH, CM)			39
24	Support neighborhood improvement initiatives and incentives that promote social capital and community resilience. (NR, E, SC)			47
25	Complete the Berry Brook Project and use as a model for similar projects throughout the City. (NR, NH)			36
26	Support efforts to assess the health and well-being of the citizens of Dover to assure continued provision of appropriate support services. (SC)			49
27	Encourage arts engagement and increased social capital through promotion of public art in both public and private spaces and through the creation of creative spaces such as makerspaces, community studio/education spaces, affordable artist housing, co-working spaces and shared kitchen spaces. (HC, SC)			49
28	Support the development of a social capital working group that provides technical guidance to community based efforts and initiatives. (SC)			49
	Regulatory Changes			
29	Enhance existing stormwater management requirements to also create habitat and potential food production, reduce the heat island effect, improve air quality, meet recreational needs, supports opportunities for education, etc. (NR, NH, CM, E)			15, 27
30	Develop regulations for an environmental and wildlife impact analysis for large development. (NR, NH, CM)			15
31	Create development guidelines for the gateways into the City to protect their historic character and ensure that new development is consistent with this character. (HC, E, SC)			23, 24

32	Review, and update where necessary, regulations to ensure environmental quality and historically appropriate building design. (NR, HC, NH, E)			15
33	Using nationally recognized codes and standards such as ICC and NFPA codes, explore the adoption of regulations and policies that achieve improved energy efficiency for buildings and developments. (HC, E)			29
34	Explore the creation of an ordinance to encourage use of renewable sources of energy. (NR, NH, E)			29
35	Identify opportunities to reduce regulatory and financial barriers to the implementation of renewable and alternative energy sources in all sectors of the community. (NR, E)			29
36	Review and consider policies that promote the use of passive energy building practices and active solar orientation in new or renovated buildings. (NR, E)			28
37	Explore regulations that establish special assessment districts that allow commercial building owners to finance cash-positive energy-efficiency and renewable-energy projects. (NR, E, SC)			28
38	Explore the promotion of renewable energy system tax incentives. (NR, E)			28
39	Explore and consider creating regulatory language that guides the integration of landscaping, stormwater management, and other site elements in the site plan and subdivision regulations. (NR, NH)			15, 32
40	Review existing land use regulations, and develop as appropriate, methods to reduce heat-island effects. (NR, NH, CM, E)			15
41	Investigate the creation of a Stormwater Utility to fund the retrofitting of existing properties with low-impact development strategies that will address stormwater and flooding related issues. (NR, NH, CM)			15
42	Review existing regulatory requirements and practices to determine if required riparian buffers are providing adequate protection from runoff and are maintaining sufficient natural cover adjacent to surface waters and wetlands, flood storage areas, and groundwater resources. (NR, NH, CM)			15, 32
43	Create development standards that require the inclusion of opportunities for social or civic engagement within new development. (HC, SC)			47

44	Create development review standards that address energy conservation. (NR, HC, E)			29
City Operations, Policies and Procedures				
45	Maintain an accurate inventory of City trees and develop an “urban tree plan” that provides tree planting and removal guidelines. (NR, HC, NH, E, SC)			15
46	Create more extensions of the community trail into natural environments. (NR, E, SC)			46, 48
47	Promote sustainable municipal operations and development practices through the implementation of strategies that support energy efficiency and the use of recycled or sustainable materials and products. (NR, E, SC)			29
48	Update the vehicle replacement program to include strategies for a city vehicle fleet powered by alternative energy sources and considers public/private partnerships for develop of fueling/support facilities. (NR, NH, E)			29
49	Investigate the use of off-grid or hybrid renewable energy systems for safety service agencies and emergency shelter locations. (NR, NH, E, SC)			29
50	Increase the dedicated funding source for land conservation and resilience related projects. (NR, NH, CM, E)			15
51	Periodically review the City’s culvert sizing and clearing policies to assure that they account for anticipated climate change related impacts. (NR, NH, CM)			32, 35
52	Explore the use of CDBG funding to address Federal and State climate resilience objectives. (NR, HC, NH)			36
53	Consider sea level rise predictions and other climate change related impacts when planning infrastructure investments in Dover’s Capital Improvement Program. (NR, HC, NH, CM)			35
54	Continue efforts to identify new drinking water sources and to protect both existing and potential sources. (NR, NH, CM)			15, 40

55	Revisit Dover's non-metered water usage by residents/businesses and the possibility of creating a fee associated with this water usage that could be placed in a capital reserve for addressing stormwater management concerns. (NR, CM)			15
56	Investigate participation in the Community Rating System (CRS). (NR, NH, CM)			32, 34

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