Zoning & Planning Committee
Agenda

City of Newton
In City Council

Monday, December 10, 2018

7:00PM
City Council Chamber

Items Scheduled for Discussion:

Referred to Zoning & Planning and Finance Committees

#576-18 **Discussion of a visioning process for land surrounding Riverside MBTA station**
COUNCILORS KRINTZMAN, GENTILE, MARKIEWICZ, LAREDO AND AUCHINCLOSS requesting a discussion with the Director of Planning on conducting a vision process for the potential development of the land around the Riverside MBTA station.

Public Hearing will be held on #572-18:

#572-18 **Zoning Amendment to delay effective date of garage ordinance**
DIRECTOR OF PLANNING proposing to further amend Chapter 30, Section 3.4.4 of the Revised Ordinances, as amended by Ordinance B-6, to implement a deferred effective date for the Ordinance of December 31, 2019 or such other appropriate date, for the purpose of allowing the Planning Department to complete a comprehensive study thereof.

Public Hearing will be held on #488-18:

#488-18 **Adoption of the Climate Change Vulnerability Assessment and Action Plan**
DIRECTOR OF PLANNING & DEVELOPMENT requesting discussion and adoption of the Climate Change Vulnerability Assessment and Action Plan as an amendment to the 2007 Newton Comprehensive Plan.

Public Hearing continued on #187-18:

#187-18 **Zoning Amendment for Inclusionary Zoning**
DIRECTOR OF PLANNING requesting amendments to the Inclusionary Housing provisions of Chapter 30, Newton Zoning Ordinance, to increase the required percentage of affordable units; to require that some affordable units be designated for middle income households; to create a new formula for calculating payments in

---

lieu of affordable units; and to clarify and improve the ordinance with other changes as necessary.

#518-18 **Discussion and review relative to the draft Zoning Ordinance**
DIRECTOR OF PLANNING requesting review, discussion, and direction relative to the draft Zoning Ordinance.

Respectfully Submitted,

Susan S. Albright, Chair

Ruthanne Fuller
Mayor

City of Newton, Massachusetts
Department of Planning and Development
1000 Commonwealth Avenue Newton, Massachusetts 02459

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Barney S. Heath
Director

MEMORANDUM

DATE: December 7, 2018

TO: Councilor Susan Albright, Chair, Zoning and Planning Committee
Members of the Zoning and Planning Committee

FROM: Barney Heath, Director, Department of Planning and Development
James Freas, Deputy Director of Planning
Rachel Nadkarni, Long Range Planner
Lily Canan Reynolds, Community Engagement Manager

RE: **#576-18** **Discussion of a visioning process for land surrounding Riverside MBTA station**

MEETING: December 10, 2018

CC: City Council
Planning and Development Board
Jonathan Yeo, Chief Administrative Officer
Alissa O. Giuliani, City Solicitor

With our recent experience in developing vision plans for the Needham Street Area (completed) and Washington Street (in process), out department is fully cognizant of the time and resources required to produce such a plan. Given our current workload (Zoning Redesign, Washington Street Vision Plan, Northland Special Permit, Climate Action Plan), we are very constrained on the capacity side of the equation.

That said, we are committed to gaining a better understanding of the Lower Falls and Auburndale neighborhood residents' vision for their neighborhoods, especially as to how they relate to the MBTA Riverside parcel. Toward that end, our department recently attended a two-hour listening session with the Lower Falls Improvement Association.

While the City Council Land Use process is the formal review of any major development application, there are advantages to undertaking planning analysis in advance of a formal development application. One of the main advantages is an opportunity to proactively understand key issues, concerns, and opportunities from the perspectives of different stakeholders. We have identified two potential

options that could be used to substantively engage with residents about their neighborhoods and the relationship to the Riverside property:

1. Mediated Community Dialogue
   This approach would involve hiring a professional mediation team, experienced in land use and community planning, to facilitate a dialogue between key stakeholders, mainly the neighborhood residents and the development team for Riverside. This expert team would facilitate a mediated communication process, an analysis of stakeholders' key issues and concerns, and an exchange of information, all with the goal to modify the project proposal to better respond to neighborhood concerns prior to a formal submission to the City Council's Land Use Committee. Anticipated timeframe would be approximately three months and could begin as soon as a procurement process could be completed.

2. Expanded Peer Review
   An alternative approach would be to engage in an "expanded peer review" process. Starting in 2018 the Planning Department secured the services of a number of "on-call" consultants to assist in our review of specific elements of proposed development projects, including the Northland application on Needham Street, which is currently underway. These consultant teams bring significant expertise in the following subject areas:

   Site Design
   Open Space
   Sustainability
   Engineering
   Transportation
   Housing
   Fiscal and Economic Impacts

   Using this second approach, the Planning Department would look to build upon our current peer review process by engaging our consultant team in an early community listening and scoping session with neighborhood stakeholders to hear first-hand about the issues and wishes of the community prior to the formal initiation of the City Council Land Use process. This option would likely consist of a single meeting and occur early in the new year.

We look forward to a full discussion of these potential options.

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Ruthanne Fuller
Mayor

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Barney S. Heath
Director

PUBLIC HEARING MEMORANDUM

DATE: December 7, 2018

TO: Councilor Susan Albright, Chairman
Members of the Zoning and Planning Committee

FROM: Barney Heath, Director, Department of Planning and Development
James Freas, Deputy Director of Planning
Rachel Blatt, Long Range Planner

RE: **#572-18 Zoning amendment to delay effective date of garage ordinance**
DIRECTOR OF PLANNING proposing to further amend Chapter 30, Section 3.4.4 of the Revised Ordinances as amended by Ordinance B-6, to implement a deferred effective date for the ordinance of December 31, 2019 or such other appropriate date, for the purpose of allowing the Planning Department to complete a comprehensive study thereof.

MEETING: December 10, 2018

CC: Planning & Development Board
Alissa O. Giuliani., City Solicitor
Commissioner John Lojek, Inspectional Services Department

Many in the design community raised concerns about the content of the garage ordinance, suggesting that it may have gone too far in addressing the issues associated with garages dominating the streetscape.

In October 2016 and again in March 2018, the Council passed deferrals of implementation of the ordinance in order to allow time for further discussion.

At this time, the Planning Department is seeking a deferral of the effective date until the end of the current Council term, December 31, 2019, so that it can be studied and discussed further in the context of Zoning Redesign.

Ruthanne Fuller
Mayor

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Barney S. Heath
Director

M E M O R A N D U M

DATE: December 4, 2018

TO: Councilor Albright, Chair of the Zoning and Planning Committee
Members of the Zoning and Planning Committee
Peter Doeringer, Vice Chair of the Planning and Development Board
Members of the Planning and Development Board

FROM: Barney Heath, Director of Planning and Development
Jennifer Steel, Chief Environmental Planner

RE:# # Joint Public Hearing/Public Meeting and Public Listening Session

Request: Vote to recommend adoption of the Climate Change Vulnerability Assessment and Action Plan as an amendment to the 2007 Newton Comprehensive Plan

MEETING DATE: December 10, 2018

CC: City Council
Alissa Giuliani, City Solicitor
Jonathan Yeo, Chief Operating Officer

Background: Newton has made a commitment to become a climate conscious community. To that end, the City has undertaken a Climate Change Vulnerability Assessment (CCVA) and developed an Action Plan focused on resiliency. By creating a plan that meets the requirements of the State Executive Office of Energy and Environmental Affairs' (EOEEA) Municipal Vulnerabilities Preparedness (MVP) Program, Newton will be eligible for grant funding from a variety of sources. We believe the current draft is ready for ZAP's approval and, ultimately, approval of the full City Council as an amendment to the City's Comprehensive Plan to provide

Newton with a clear picture of the steps needed to prepare our community for the ongoing impacts of climate change.

History: In 2016 Newton began engaging City staff, stakeholders, and interested citizens to create a CCVA under the direction of the Metropolitan Area Planning Council (MAPC). In April 2018, the City submitted a well-documented and detailed draft CCVA with Action Plan to the State in hopes of meeting the qualifications for the MVP Program. In response to EOEEA's request for more public engagement, in May of 2018 City staff applied for and received a grant of $48,000 to engage in a robust community discussion and finalize the CCVA. With MAPC's assistance, we held a very well-attended public workshop on October 29, received and responded to feedback from ZAP, and augmented the draft CCVA in response to that input.

Current Draft: The current draft is dated December 2018 and is being provided only as an electronic pdf attachment. Changes to the plan since it was last reviewed by ZAP on October 22, 2018 included:

- Addressing the comments of the ZAP committee members
- Adding a summary of the public comments and recommendations from the 10/29 public workshop
- Making the Action chapter clear and actionable

Request: The Planning Department respectfully suggests that ZAP invite MAPC to provide a brief review of the CCVA and a more detailed review of the recommended actions, followed by committee and public input. Staff is prepared to incorporate any changes requested by ZAP prior to submission to the full City Council.

Attachment: *Climate Change Vulnerability Assessment and Action Plan - Final Draft, December 2018 (electronic copy only).*

#488-18

City of Newton
Climate Change Vulnerability Assessment and Action Plan

Final Draft, December 2018

Prepared for
City of Newton
1000 Commonwealth Avenue
Newton, Massachusetts 02459
www.newtonma.gov
Ruthanne Fuller, Mayor

Prepared by
Metropolitan Area Planning Council
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ACKNOWLEDGEMENTS

The project was conducted by the Metropolitan Area Planning Council (MAPC) with funding from MAPC's Planning for MetroFuture Technical Assistance program, the Barr Foundation, the Commonwealth of Massachusetts Community Compact and Municipal Vulnerability Preparedness programs, and the City of Newton.

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INTRODUCTION

The greater Boston regions is already experiencing warmer temperatures, increased precipitation, and rising seas. Precipitation in the Boston area has increased by 10% in the past fifty years. Recently released design storm figures (NOAA 14) for the 10-year, 24-hour storm are 15% higher than those issued in 1961. Climate projections for this century include increased frequency and intensity of rain storms, and more frequent days with extreme heat. The devastating effects of Hurricanes Harvey, Irma, and Maria highlight the imperative to plan now for future storms.

In Newton Massachusetts, the March 2010 rains caused millions of dollars in damages and disrupted service on the Green Line. Twenty-five of the City's seventy-eight facilities flooded. As rainfall amounts increase, rain events similar to 2010 will become more frequent. A one-thousand-year event would nearly double the rainfall experienced over three days in March 2010. As is evident from Hurricane Harvey, damage and suffering from such an extreme event is severe. Indeed, flooding or extreme heat, and the resultant potential for power outages can have devastating and cascading effects during far lesser storms than a one-in-one-thousand-year occurrence.

Yet we can take steps to increase Newton's resilience and limit future damages. Many of today's investments and decisions in the City of Newton have long legacies that will influence future vulnerabilities. Of particular concern are the impacts on vulnerable populations in Newton including seniors, individuals living alone, people with a disability, young children, people who are socially isolated, and people with limited English language proficiency. Advance planning can save money, while inaction, or actions that don't anticipate future conditions, may lead to higher costs in the future. An example of effective planning comes from the reports that Florida properties experienced much less damage from Hurricane Irma in 2017 than from Hurricane Andrew in 1992. This is attributed to critical improvements made to the building code because of lessons learned from Hurricane Andrew.

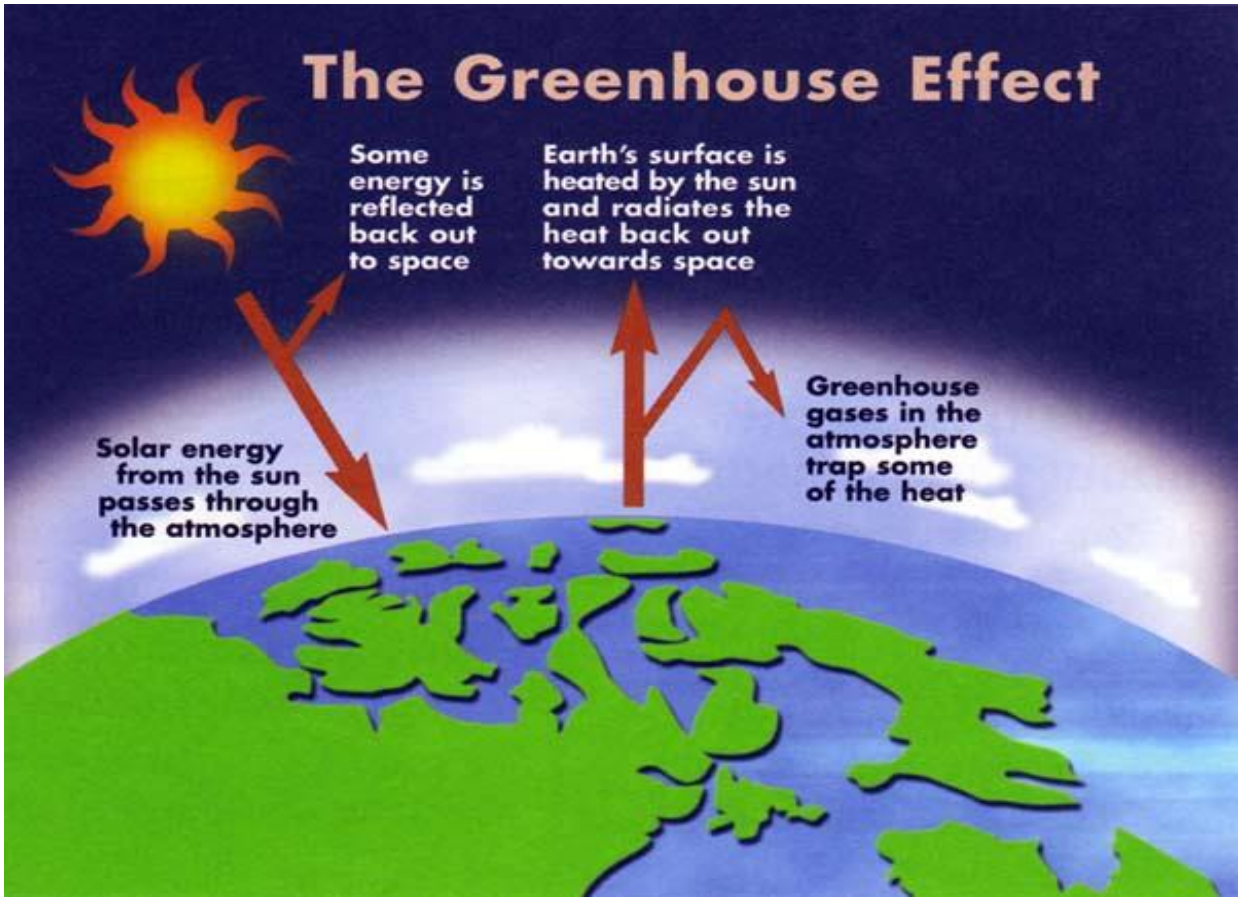
This report identifies future climate vulnerabilities and suggests strategies for the City of Newton that can reduce the risk of harm to people, properties, and natural resources and help speed recovery when inevitable future storms occur. The recommendations span many areas and range from easy and quick to difficult and expensive. They include such areas as:

- Communicating with and supporting vulnerable populations
- Improving stormwater systems and restoring natural drainage
- Planting more trees
- Continuing and improving emergency preparedness
- Investing in critical infrastructure (e.g. bridges and culverts)
- Incorporating green infrastructure and stormwater management into the zoning ordinances as they are revised.

CLIMATE CHANGE BACKGROUND

Climate Change Processes

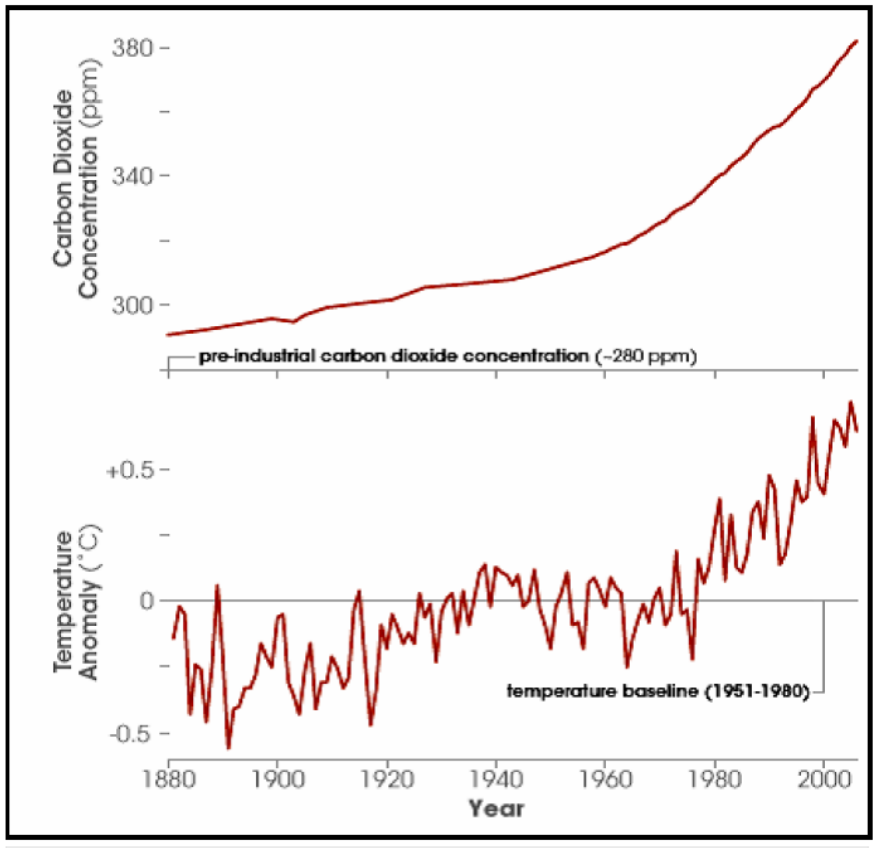
Our climate has always been regulated by gases, including carbon dioxide, methane, and nitrous oxide, that blanket the earth. These gases trap heat that would otherwise be reflected out to space; without them our planet would be too cold to support life. We refer to these gases as "greenhouse gases" (GHGs) for their heat trapping capacity. Changes in GHG concentrations occur naturally, due to such events as volcanic eruptions, and variations in solar energy entering the atmosphere.



In the past century, human activity associated with industrialization has contributed to a growing concentration of GHGs in our atmosphere. The combustion of fossil fuels, our primary energy source in the age of industrialization, releases GHGs into the atmosphere. As shown in Figure 1, there is a correlation between increases in carbon dioxide concentrations and global temperature. There is by now widespread consensus among scientists regarding the warming of our climate and its causes. As stated in the Third United States Climate Report (2014): "Global climate is changing and this change is apparent across a wide range of observations. The global warming of the past 50 years is primarily due to human activities." (Chapter 2, page 12)

The following sections will review climate changes that have been observed to date, and projections of future changes. Climate change impacts are not evenly distributed across the globe. The focus of this report is on impacts relevant to Newton. We utilize data for the Northeast United States and, where possible, the Boston region. For those interested in more background on climate science, the U. S. National Climate Assessment 2014 provides a very readable review. It can be downloaded at: http://nca2014.globalchange.gov/downloads.

Figure 1. Global Temperature and CO_2 Trends



Source: MA Climate Change Adaptation Report 2011

Climate Change: Observations, Projections, Impacts

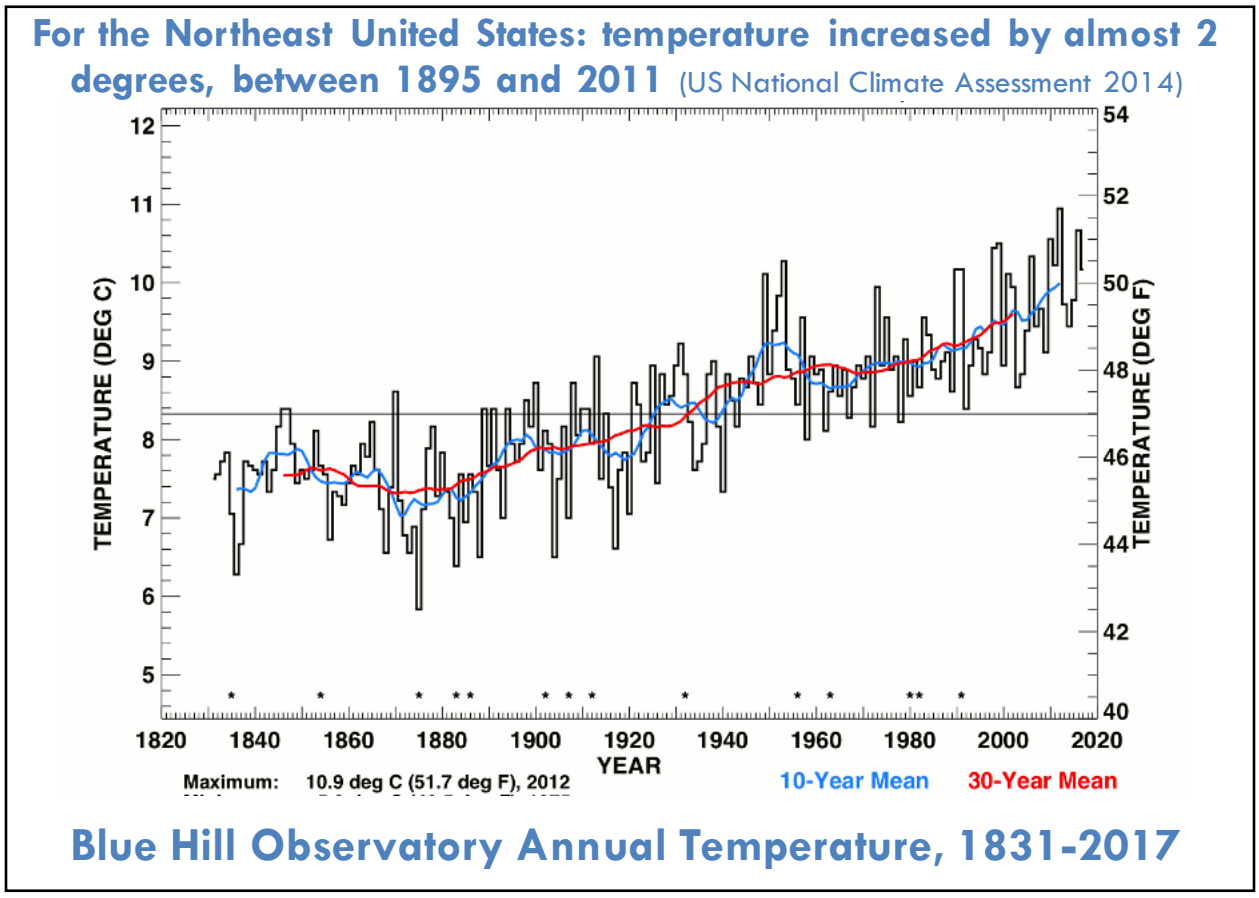
Climate change observations come from a variety of data sources that have measured and recorded changes in recent decades and centuries. Climate change projections, however, predict future climate impacts and by their nature cannot be observed or measured. As a result of the inherent uncertainty in predicting future conditions, climate projections are generally expressed as a range of possible impacts. There are two primary sources of uncertainty. Scientists project future impacts by developing models; the range of projected impacts will be smaller or larger depending on the level of confidence in a given climate model. The other source of uncertainty is that our future GHG emission levels are unknown. GHG levels reflect global emissions. While the international community is investing substantial efforts in reducing GHG emissions, it is not possible to predict future emissions levels with any certainty. As a result, climate projections often include

multiple scenarios, or a range of results, reflecting a range of future GHG levels in the atmosphere.

Temperature

Temperature has been increasing along with GHG concentrations in the past century. According to the US National Climate Assessment 2014, temperatures in the Northeast United States have increased by almost two degrees Fahrenheit between 1895 and 2011. Data from the Blue Hill Observatory in Milton (Figure 2) located less than ten miles from Newton, reflects this trend.

Figure 2. Observed Temperature Change



Future temperature projections for the Charles River Basin, (Figure 3) are shown below. The projections show an increase in average temperatures and an increasing likelihood of heat waves, as indicated by the increased number of days over 90 and 100 degrees each year. Increasing temperatures will have important impacts on human health. Heat is the number one cause of U.S. weather fatalities over the past decade (EPA/NOAA). Heat waves are often accompanied by poor air quality, exacerbating chronic respiratory and cardiovascular conditions.

Rising temperatures will impact natural systems; expected impacts include changes in species and the composition of forest and wetland habitats, an increase in invasive species and pests, and a

longer growing season. Rising temperatures also drive other impacts including changes in precipitation patterns, and sea level rise.

Figure 3. Projected Temperature Change for the Charles River Basin.

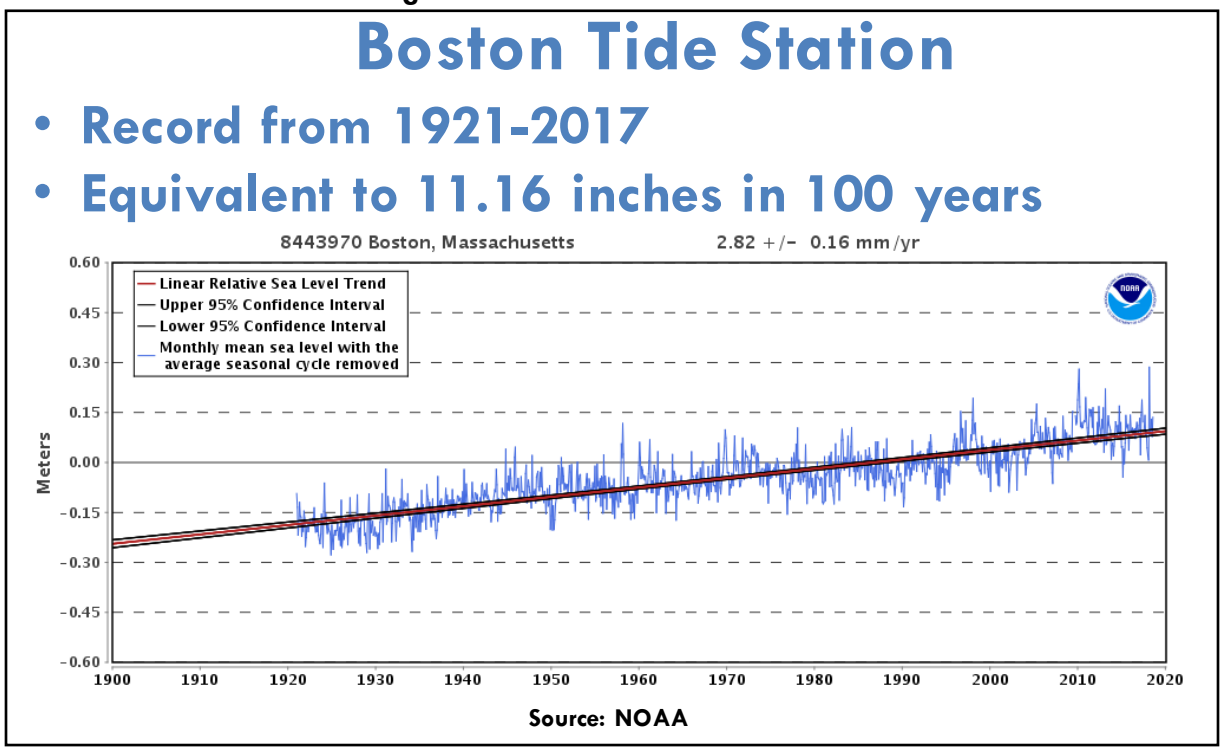
Parameter (Temperature F°)	Observed Baseline (1971-2000)	Predicted 2020-2049	Predicted 2040-2069	Predicted 2060-2089	Predicted 2080-2099
Annual temperature	49°	51-53°	52-55°	52-58°	52-60°
Winter temperature	29°	31-33°	32-35°	32-37°	33-39°
Spring Temperature	47°	48-50°	49-52°	49-55°	50-60°
Summer temperature	70°	72-74°	73-77°	73-80°	74-83°
Fall Temperature	52°	54-57°	56-58°	55-61°	56-64°
Days over 90 (days/year)	9	16-29	19-44	22-66	24-85
Days over 100 (days/year)	0.05	.29-2	.45-5	.58-11	.84-21

Source: Northeast Climate Science Center, UMass-Amherst, 2017

Sea Level Rise

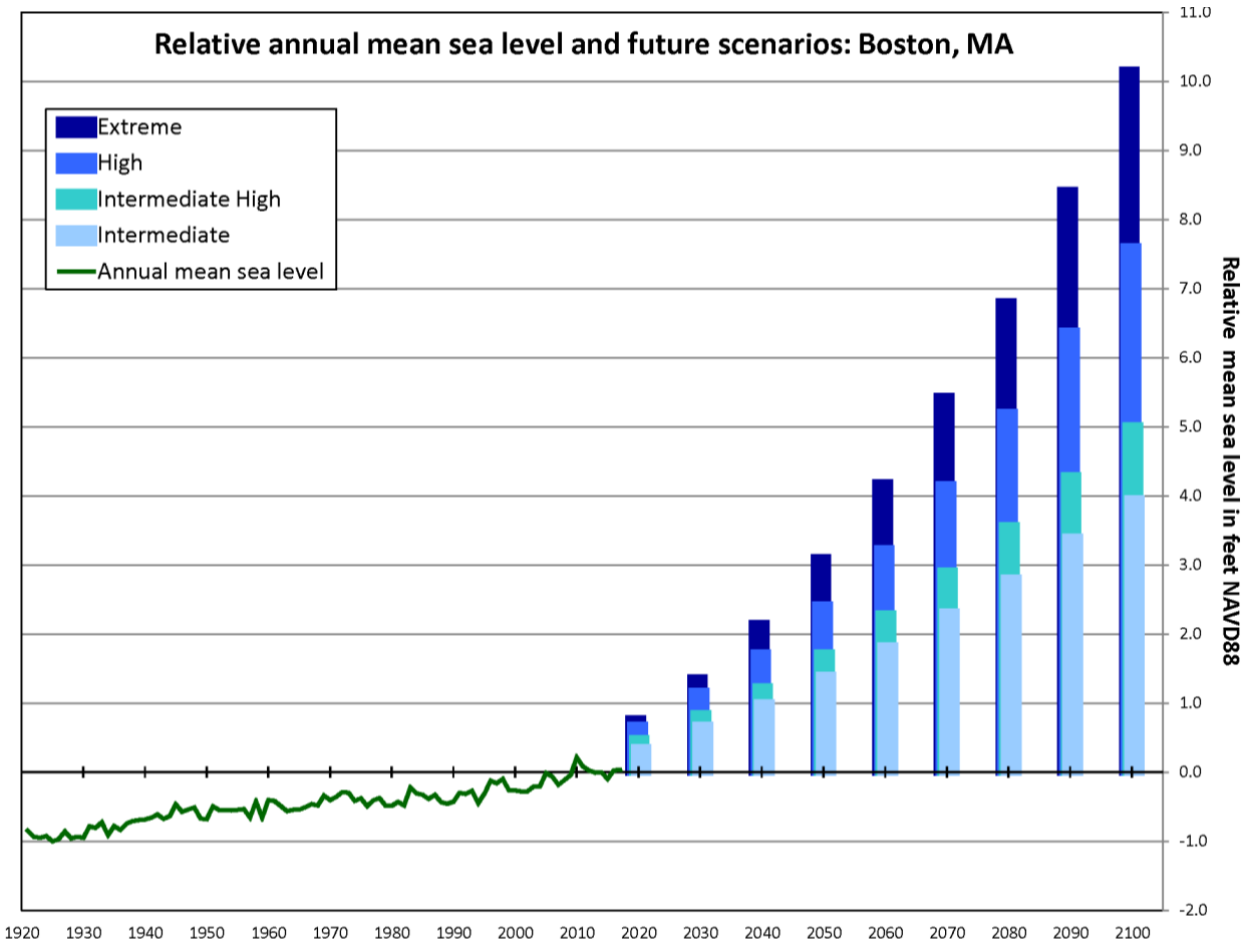
Records from the Boston Tide Station show nearly one foot of sea level rise in the past century (Figure 4). Warming temperatures contribute to sea level rise in two ways. First, warm water expands to take up more space. Second, rising temperatures are melting land-based ice which enters the oceans as meltwater. The third, quite minor, contributor to sea level rise in New England is not related to climate change. New England is still experiencing a small amount of land subsidence (drop in elevation) in response to the last glacial period.

Figure 4. Observed Sea Level Rise



The Commonwealth of Massachusetts released revised sea level rise projections in 2018. As is evident in Figure 5, the range of projections for the future is quite wide, particularly approaching the end of this century. The projections reflect upper bounds of likelihood for planning purposes. For example, they indicate that sea level rise is unlikely (83% probability) to exceed the intermediate projections assuming high levels of future greenhouse gas emissions. Although Newton has no coastal shoreline, modeling utilized in this study projects that later in the century, storm surge could travel up the Charles River and impact the Newton shoreline.

Figure 5. Projected Sea Level Rise



Source: Sea Level Rise: Resilient MA 2018

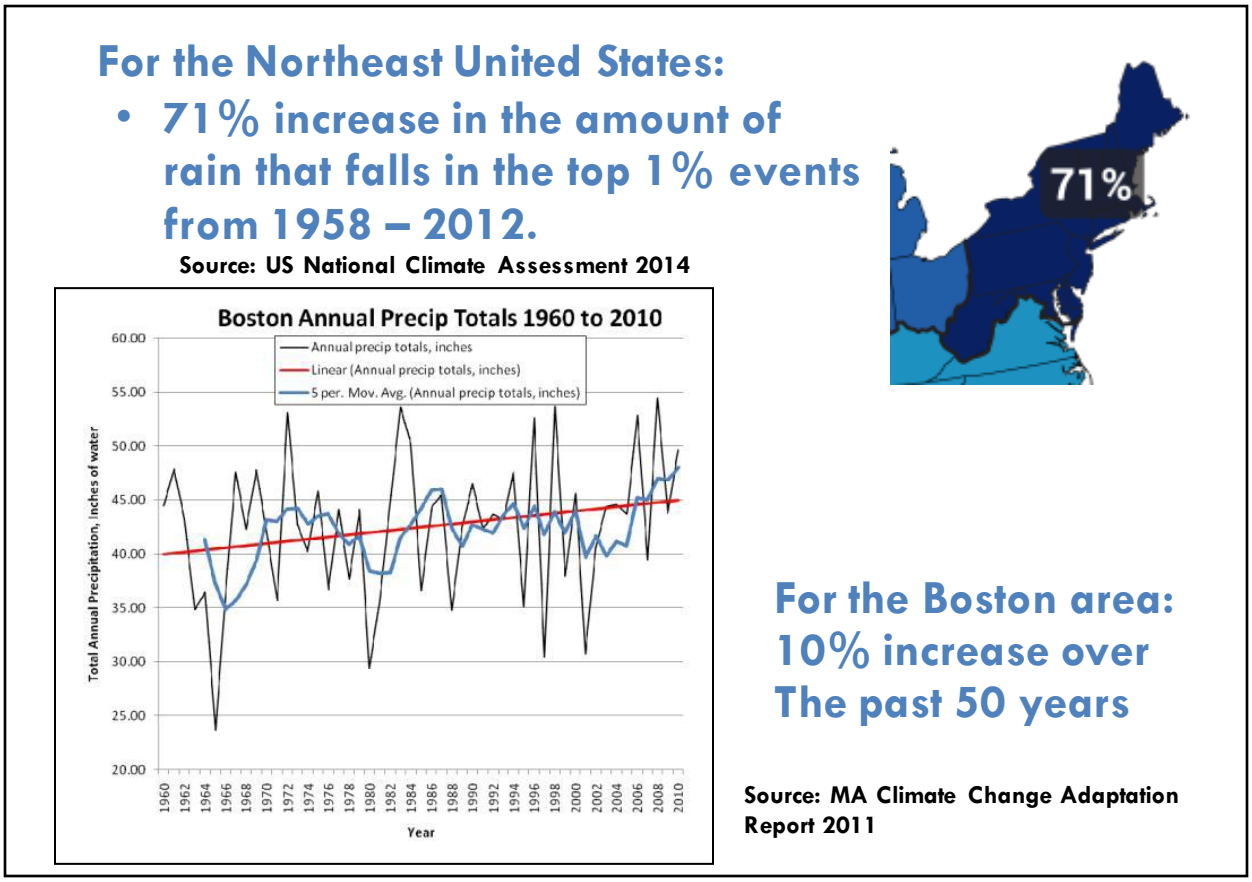
Precipitation

Precipitation in Massachusetts has increased by approximately 10% in the fifty-year period from 1960 to 2010 (Figure 6). Moreover, for the Northeast US, according to the US National Climate Assessment, 2014, in the past fifty years there has been a 71% increase in the amount of rain that falls in the top 1% of storm events. As the atmosphere warms, it can hold more water; this leads to an increase in large rainfall events.

Projections for future precipitation suggest an increase in total precipitation, but also changes in precipitation patterns. Rain amounts are projected to increase in the winter and spring but decrease in the summer (Figure 7). As a result, despite overall increasing precipitation levels, summer droughts may be a consequence of climate change. In addition, as noted, it is expected that we will experience a greater number of large rain events. Another potential source of uncommon, but significant, rain events is hurricanes. According to the National Oceanic and Atmospheric Administration (NOAA), hurricanes may become but more intense with a projected 10-15% increase in rainfall by the end of the century.

As we experienced in 2016, drought can strain water supplies and stress plant and aquatic communities. Increasing winter/spring precipitation, along with warmer weather resulting in more rain rather than snow, is expected to create additional flooding early in the year, and low-flow in rivers and streams in the summer.

Figure 6. Observed Precipitation Change



The observed changes in precipitation are also reflected in changing precipitation frequency estimates. Precipitation frequency estimates, used to derive design storm standards, were published in 1961 by the U.S. Commerce Department in a document known as TP-40 (Technical Paper 40). The National Oceanic and Atmospheric Administration (NOAA Atlas 14) and the Northeast Regional Climate Center (NRCC) at Cornell University have recently published updated estimates. The TP-40 100-year storm calculated in 1961 is now approximately equal to a 30-year storm as calculated by NRCC and NOAA Atlas 14 (MWRA). TP-40 figures are less precise, reflecting data available at the time. The NOAA 14 and NRCC figures are specific to Newton.

Table 1. Design Storm Estimates

Newton	TP-40	NRCC
10-year, 24-hour storm	4.5”	5.13”
100-year, 24-hour storm	6.5”	8.88”

Figure 7. Projected Precipitation Change

Parameter	Current Conditions (1961-1990)	Predicted Change by 2050		Predicted Change by 2100	
		Low	High	Low	High
Annual precipitation	41 inches	+ 5%	+ 8%	+ 7%	+ 14%
Winter precipitation	8 inches	+ 6%	+ 16%	+ 12%	+ 30%
Summer precipitation	11 inches	- 3%	-1%	0%	-1%

Source: MA Climate Adaptation Report 2011

The cities of Boston and Cambridge projected future conditions for the 10-year, 24-hour design storm as part of their climate vulnerability assessments. Their projections for increased precipitation are shown in Table 2.

Table 2. 10-year 24-hour Design Storm Projections

Boston Water and Sewer Commission	Baseline (1948-2012)	Precipitation (inches)		
		2035	2060	2100
Medium emission scenario	5.24”	5.55”	5.76”	6.08”
High emission scenario		5.6”	6.03”	6.65”
Cambridge	**(1971-2000)**	**2015-2044**	**2055-2084**	
	4.9”	5.6”	6.4”	

Source: Climate Ready Boston, Boston Research Advisory Group Report, 2016

WHY UNDERTAKE A CLIMATE VULNERABILITY ASSESSMENT FOR NEWTON?

This climate vulnerability assessment is an effort to determine which Newton community assets – people, natural resources, and physical infrastructure – may be susceptible to harm from climate change. Climate vulnerability assessments generally consider:

- Exposure – whether climate changes will have a negative effect on various assets in the community.
- Sensitivity – if affected by climate change, how much damage, or loss of function will occur.

- Adaptive Capacity – sensitivity will be lessened, or heightened, by the degree to which there may be ways for the community asset to cope, compensate, or be modified, to adjust to climate changes.

Once vulnerabilities are identified, they can be prioritized according to the perceived risk they present. Generally, this involves considering the probability of damage to an asset and the consequences of damage. As an example, flooding to a sewer pump station and open space might be equally likely, but the pump station would presumably have higher priority as the consequence of failure is more severe. This strategy for considering risk is shown in Figure 8.

Figure 8. Risk Analysis

		Probability		
		Low	Medium	High
Consequence	Low	Least Risk	M-L	M
	Medium	M-L	Medium Risk	M-H
	High	M	M-H	Greatest Risk

For the most part, projected climate impacts do not create brand new concerns, rather they are an intensification, increased frequency, or geographic expansion, of existing challenges including flooding, heat waves and drought. As a result, Newton already has significant experience and expertise to bring to these challenges. Further, many initiatives to address climate impacts provide benefits to the City (tree planting, open space preservation), can help address City obligations (MS4 permit compliance), or combat already identified problems (flooding). Although disruptive storms may occur at any time, most of the predicted climate changes are happening relatively slowly over time. Identifying future vulnerabilities now gives the City of Newton time to plan for and enact projects and policy changes that will make for a more resilient community in the future.

SOCIOECONOMIC VULNERABILITY

Just as some locations in Newton will be more vulnerable to climate impacts than others, it is also the case that climate change will not affect all residents of Newton equally. In the context of climate change, vulnerable populations include those who may be more susceptible to climate impacts, and those who will have more difficulty adapting to, preparing for, and recovering from extreme weather events. Our demographic analysis indicates that a number of identified vulnerable populations have been growing or are projected to grow over time. These include seniors, individuals living alone, people of color, young children, and people with limited English proficiency. Socioeconomic vulnerability influences susceptibility to illness or injury and capacity to meet one's basic needs following extreme weather. Individuals can simultaneously experience

multiple socioeconomic vulnerabilities that can magnify the extent to which they are affected by climate change.

Socioeconomic vulnerability refers to socioeconomic characteristics, such as income and race/ethnicity that influence vulnerability to climate change. Low-income communities often have limited access to healthcare services and have higher rates of uninsured people. Low-income people are often more susceptible to financial shocks, which can occur after extreme weather, and which can have long-lasting impacts on financial security and the ability to secure safe shelter and meet medical needs. Furthermore, people who lack financial resources may have limited access to transportation. This can impair their ability to relocate to emergency shelters or away from areas susceptible to climate impacts. Social isolation can also influence vulnerability, as it limits access to critical information, municipal resources, and social support systems that can bolster emergency response. People at the most risk for social isolation include those living alone, people of color, and people with limited English language proficiency. People of color and undocumented immigrants may also experience social isolation due to historically strained or tenuous relationships with government officials and first responders.

Environmental conditions can also exacerbate the impact of severe weather. Neighborhood environmental quality has been found to be strongly associated with socioeconomic composition. Environmental justice communities – neighborhoods with a high concentration of low-income people, people of color, and people with limited English language proficiency – are often more vulnerable to climate impacts. This is because of the higher prevalence of environmental burdens (i.e., noxious and industrial land uses), which lead to worsened environmental quality and higher incidence of chronic diseases. Housing conditions are also an important facet of environmental vulnerability. Not only are low-income people more likely to live in substandard housing, it is more financially challenging for them to make their homes more resilient to climate change and to fix damage caused by extreme weather.

Newton has many programs that provide services and connect to vulnerable populations. It will be a challenge to catalogue current efforts and identify gaps in services. Outreach to vulnerable populations will provide valuable feedback regarding concerns and needs. Social connectedness helps communities prepare for, respond to, and recover from natural disasters. Communities with stronger networks have reacted faster to meet needs and begin recovery efforts. A growing body of evidence indicates that social cohesion is a protective health factor as those with stronger connections typically experience healthier outcomes.

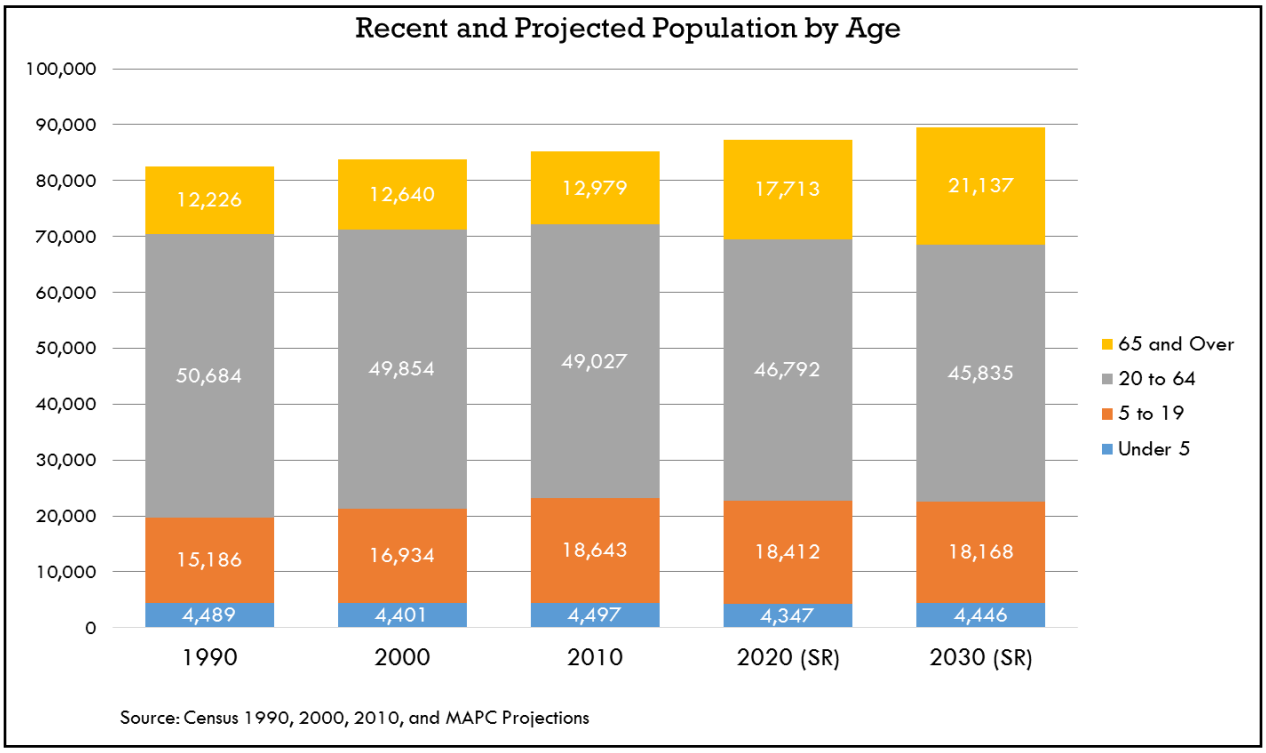
SOCIOECONOMIC CONDITIONS IN NEWTON

Demographic information helps identify populations that may be particularly affected by climate change. It can also provide opportunities to build upon existing strengths in order to enhance resiliency. Understanding a community's character, socioeconomic makeup, and environmental features is important to fully understanding the implications of climate impacts on the cities' population.

Age

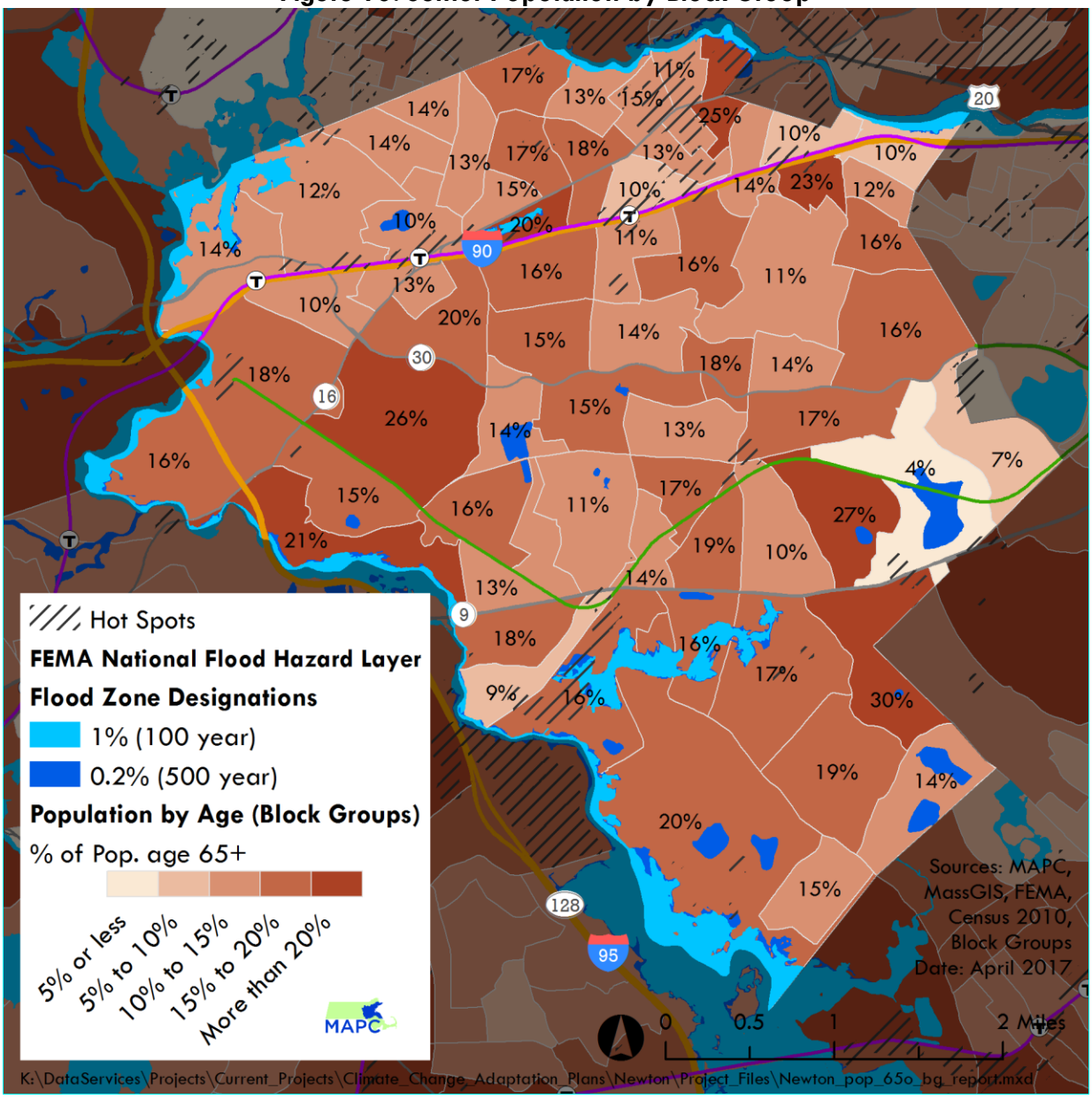
Newton's population has been growing since 1990 and will continue to grow over the coming decades. In 2010, Newton's population was just over 85,000, with approximately 5% children below the age of five, and 15% of residents over 65 years of age (Census 2010). The villages of Thompsonville, Waban, Nonantum, and Newton Corner contain block groups with over 30% seniors. According to the MAPC "Stronger Region" scenario, in which Metro Boston will retain a vibrant economy even as baby boomers retire, MAPC projects that by 2030, Newton's total population will grow modestly by 5% to over 89,000 people. Over the same period, Newton's population will age. MAPC projects that by 2030, the senior population will increase by 63% (Figure 9).

Figure 9. Current Population and Projections



As of 2010, 26% of Newton's households consisted of people living alone (Census 2010). People 65 years of age and older were disproportionately represented in this population, accounting for more than 51% ± 3% of residents living alone (ACS 2011-2015). Currently, several block groups in Newton have more than 25% of their population over the age of 65. These areas are in the Chestnut Hill Village and Waban neighborhoods (Figure 10). Two block groups nearest to Boston College have the lowest percentage of population over the age of 65.

Figure 10. Senior Population by Block Group



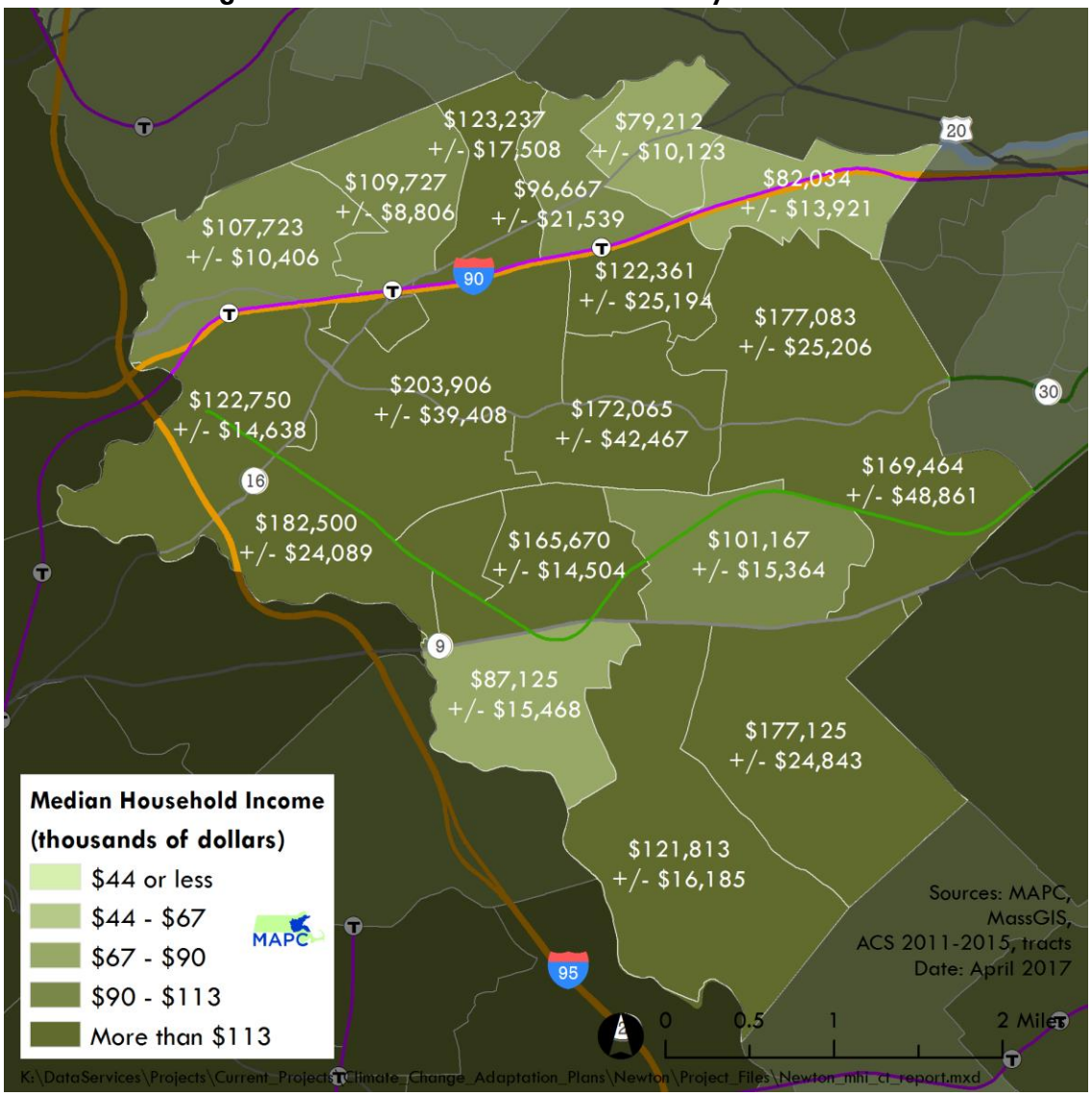
Income

The median household income in Newton is $122,080 +/- $4,102 as compared with $75,389 +/- $428 for Metro Boston (ACS 2011-2015). While Newton as a whole is wealthier than Metro Boston, segments of the population still struggle to meet their basic needs. According to the US Census (2015), a household income of $24,257 or less for a family of four is considered living in poverty. According to the ACS, 6% (±1%) of Newton households are living in poverty. In Newton, Black residents are more likely to live in poverty than White residents (23% ± 14%, and 4% ± 1%, respectively, ACS 2011-2015). Differences in poverty rates between residents of other races are not statistically significant. A household income for a family of $78,150 is

considered low-income. According to ACS 25% (+/- 1.7%) of households in Newton are low-income.

It is not reliable to map poverty at the census tract or block group level due to high margins of error, but it is possible to identify areas where income is lower than the city average. As shown in Figure 11, relatively lower income areas of the city include Nonantum, Newton Corner, and Newton Upper Falls.

Figure 11. Median Household Income by Census Tract

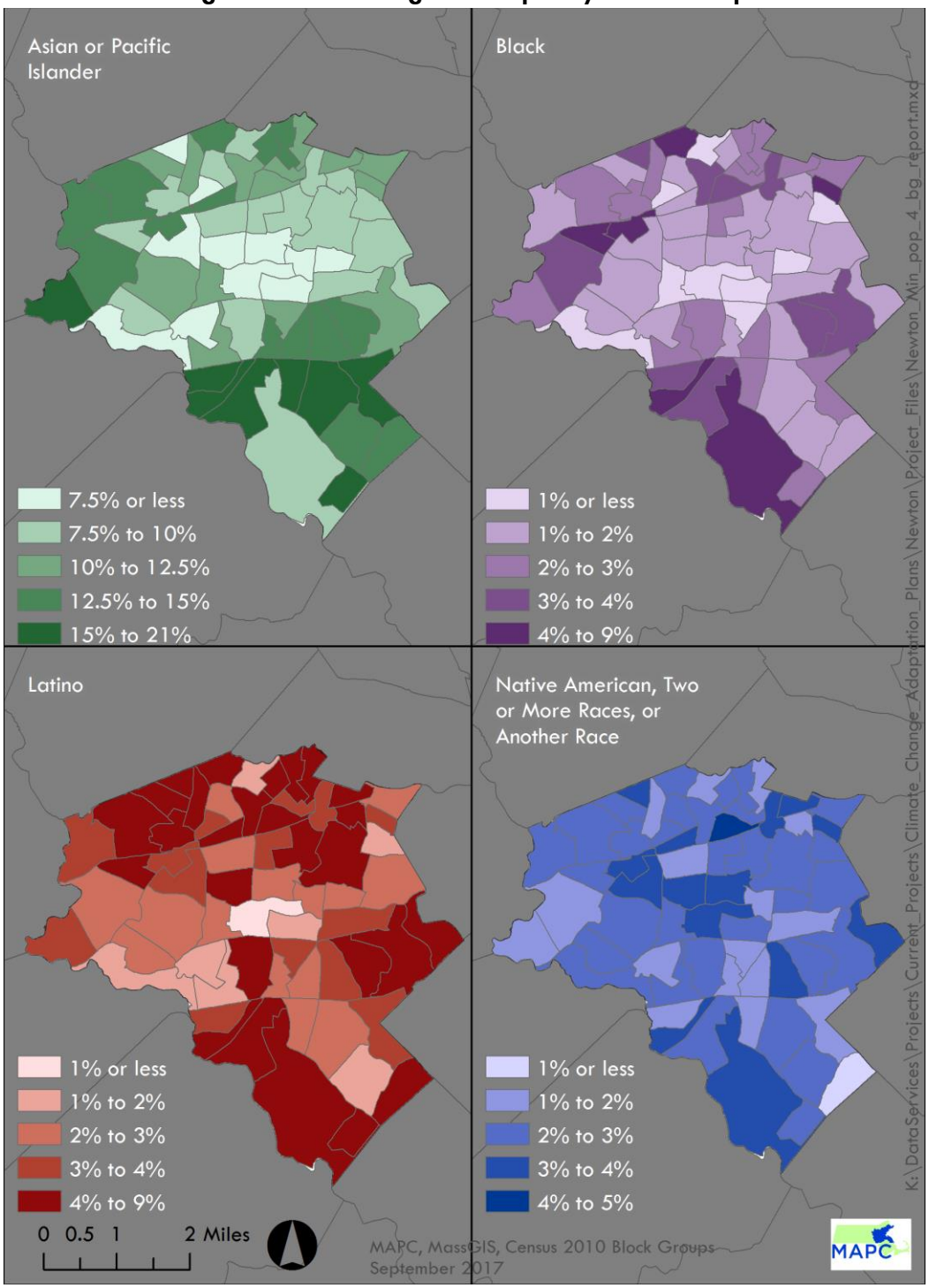


Race and Ethnicity

Newton is becoming more diverse. In 2000, people of color were 14% of the total population. By 2010, that number had grown to 20%. The percentage of Asian residents increased the most, going from 8% to 12%. In 2010, 4% of the population was Latino, 2% percent was Black, and the remaining 2% was Native American, multi-racial, or other races. Figure 12 shows the

percentage of people of color by 2010 census block group. Figure 13 displays the country of origin for residents from Asia (US Census 2010).

Figure 12. Percentage of People by Block Group



Language and Linguistic Isolation

The percentage of Newton households that speak a language other than English in the home has increased over time. According to the 2000 Census, 23% of households spoke a language other than English; by 2011-2015 (ACS) that proportion increased to 31% (+/- 3%). As the percent of households speaking another language at home has increased, the proportion of limited English-speaking households has increased as well. "Limited English-speaking households," formerly known as "Linguistically isolated households", have no household members age 14 or older who speak English very well. Other languages spoken at home include: Chinese languages (5,470 ± 660), Spanish or Spanish Creole (3,153 ± 245), Russian (2,963 +/- 493), and Korean (1,193 +/-219). In Newton, Asian and Latino residents are much less likely to speak English very well than residents of any other race (29% ± 3% and 14% ± 4% respectively, ACS 2011-2015). City records for households with flood damage in 2010 indicated that 2.5% of respondents of Asian background and 2.5% of respondents of Russian background had difficulty communicating in English. Reliable data regarding geographic distribution of residents based on language and linguistic isolation are not available.

Figure 12. Country of Origin for Asian Residents

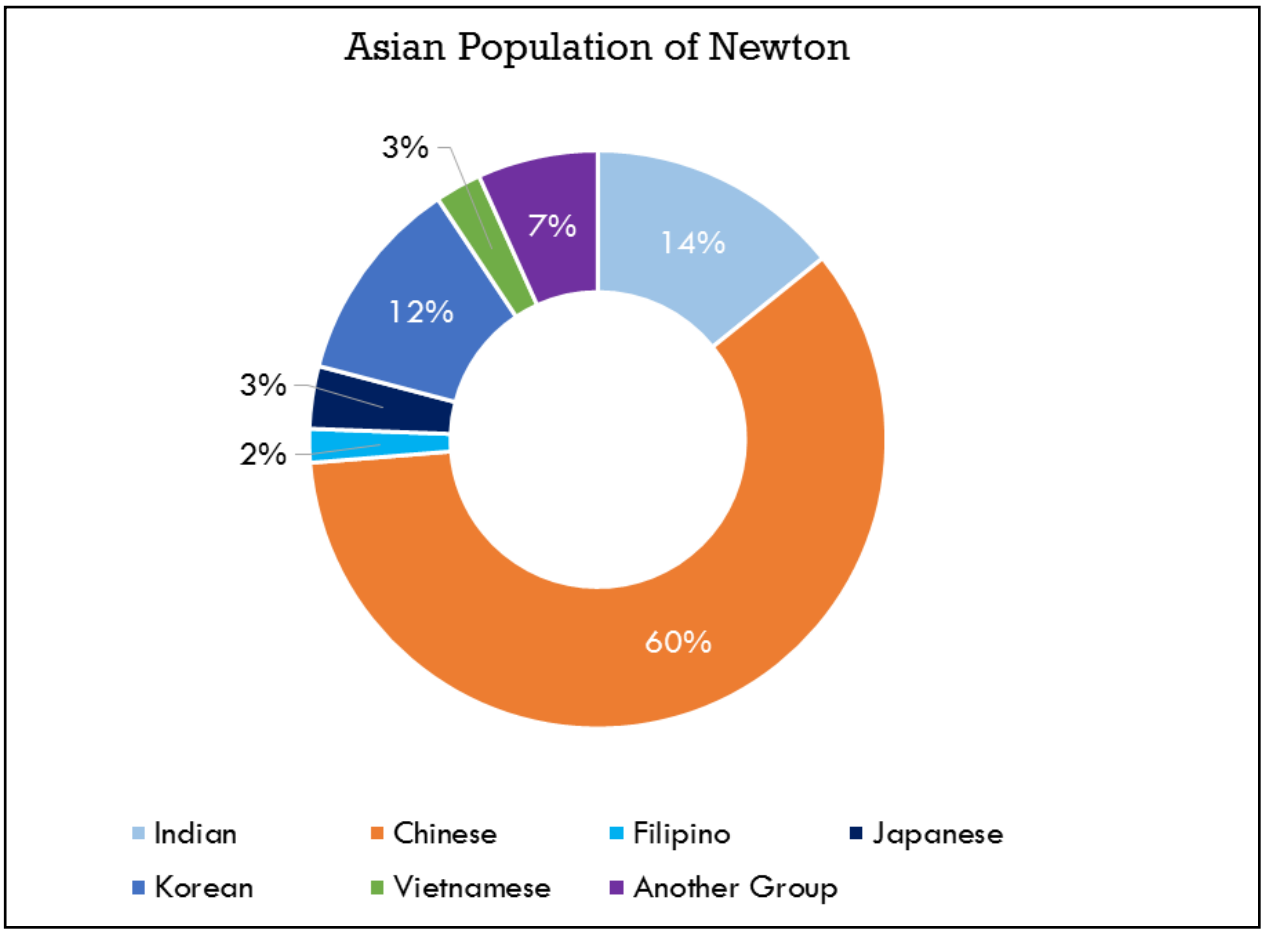
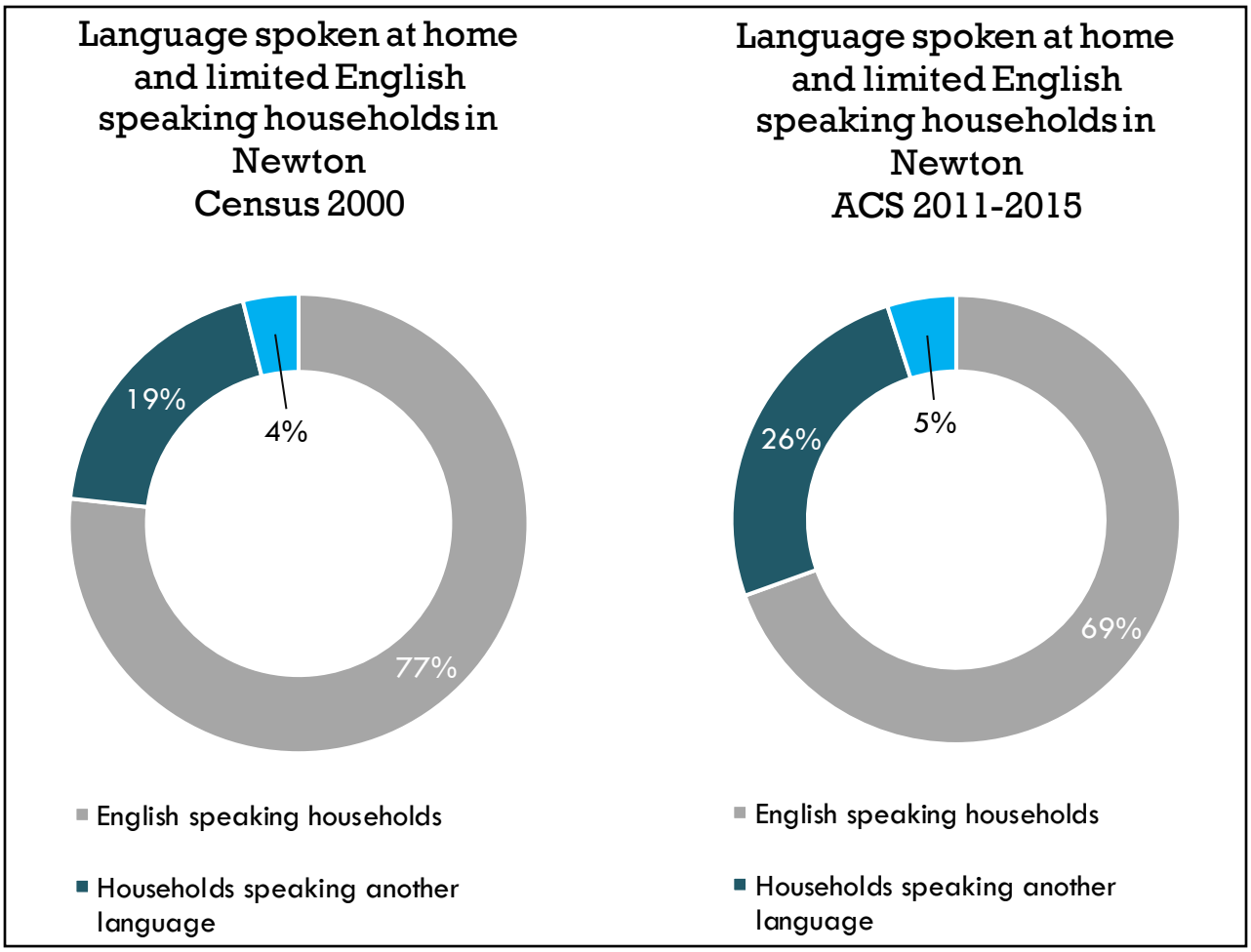


Figure 13. Language and Linguistic Isolation



The demographic analysis provides indications of where higher concentrations of vulnerable residents may be located. Yet it is important to recognize that residents with heightened vulnerability to climate impacts reside throughout the City.

CLIMATE IMPACTS ON PUBLIC HEALTH

Climate change is expected to have an impact on public health across socioeconomic status and geography. Extreme weather events can increase stress, which can worsen or cause new physical and mental health conditions. An individual's vulnerability to the public health impacts of climate change is influenced by personal behaviors, environmental quality, housing quality, social connectivity, and access to resources. Socioeconomic characteristics may limit access to information, medical equipment, and healthcare. Low-income people and linguistically-isolated households are most vulnerable to this threat.

Seniors, young children, people with disabilities, and people with pre-existing health conditions, are most physically vulnerable to the health impacts of climate change. Individuals with physical mobility constraints, such as people with disabilities and seniors, may need additional assistance

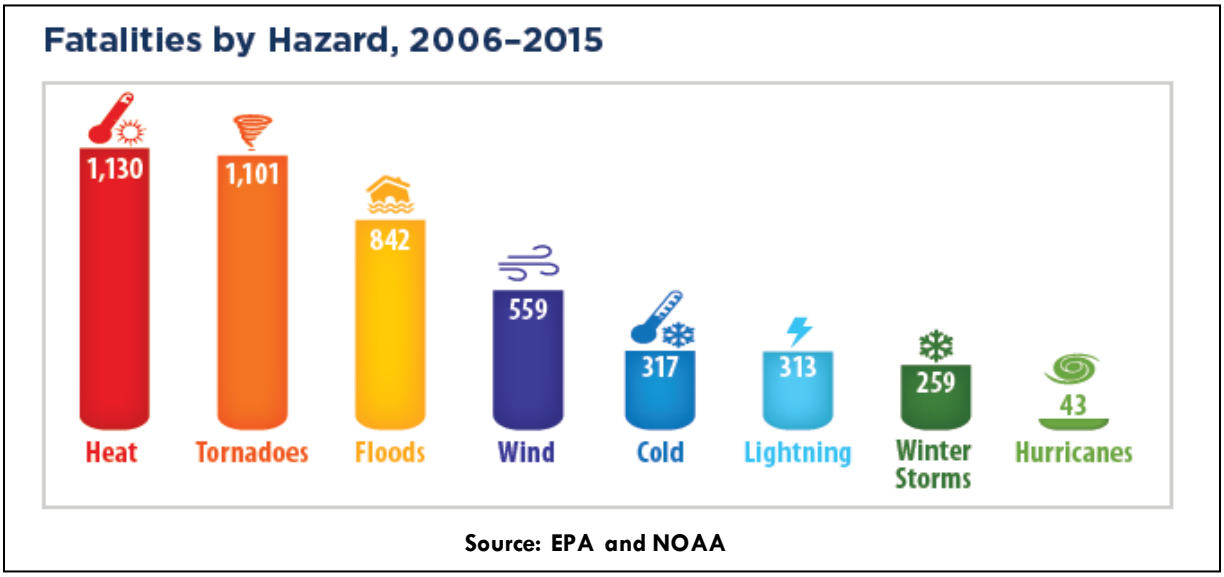
with emergency response. In Newton, approximately 8% ± 1% of the civilian non-institutionalized population has a disability (ACS 2011-2015). As the population in Newton ages, it is likely that the percentage of the population with a disability will rise. In Massachusetts, over 20% of the age 65 to 74 population has a disability, that figure jumps to nearly 50% for those 75 and older. By comparison, just over 10% of adults aged 35 to 64 have a disability. Reliable data regarding the geographic distribution of residents with disabilities is not available.

Prolonged periods of higher temperatures will occur all over the City and will be magnified by "heat islands", heavily paved and densely built areas, usually in village centers. Those living in those areas, and those without air-conditioners will be disproportionately affected. Exposure to mold and vector-borne illnesses are additional climate-related concerns. Public health strategies overlap significantly with those designed to address social vulnerability and strategies for improved heat and flood protection included in the *Built Environment* section.

Extreme Heat

The projected increase in extreme heat and heat waves is the source of one of the key health concerns related to climate change. Heat was the leading cause of weather fatalities in the United States over the past decade (Figure 15). As noted earlier, the Northeast Climate Science Center projects 24 to 85 days over 90°F, and .84 to 21 days over 100°F annually, by the end of this century.

Figure 14. United States Weather Fatalities



Prolonged exposure to high temperatures can cause heat-related illnesses, such as heat cramps, heat exhaustion, heat stroke, and death. Heat exhaustion is the most common heat-related illness and if untreated, it may progress to heat stroke. People who perform manual labor, particularly those who work outdoors, are at increased risk for heat-related illnesses. Prolonged heat exposure can also exacerbate pre-existing conditions, including respiratory illnesses, cardiovascular disease, and mental illnesses. The senior population is often at elevated risk due to

a high prevalence of pre-existing and chronic conditions. People who live in older housing stock (as is often the case with public housing), and in housing without air conditioning have increased vulnerability to heat-related illnesses. Power failures are more likely to occur during heat waves, affecting the ability of residents to remain cool during extreme heat. Individuals with pre-existing conditions and those who require electric medical equipment may be at increased risk during a power outage. Loss of refrigeration can result in food-borne illnesses if contaminated food is ingested.

Extreme heat can contribute to greater levels of ground level air pollution and allergens. The poor air quality and high humidity that often accompany heat waves can aggravate asthma and other pre-existing cardiovascular conditions. Anyone who does outdoor physical activity during hot days with poor air quality is at increased risk for respiratory illness. Low-income people and people of color may also be at increased risk because these populations have a higher prevalence of chronic disease. While Newton residents are hospitalized for asthma at a lower rate than are Massachusetts residents as a whole, hospitalizations for Black and Latino residents are higher than for White and Asian/Pacific Islanders in Newton (Figure 16). Data for Native Americans, two or more races, and other races were not available. Similarly, Newton residents have a lower rate of hypertension hospitalization than the Massachusetts average, but residents of color are hospitalized for hypertension at a higher rate than white residents (Figure 17). Data for hypertension hospitalization rates for Latinos, Native Americans, two or more races, or other races were not available.

Figure 15. Asthma Hospitalization

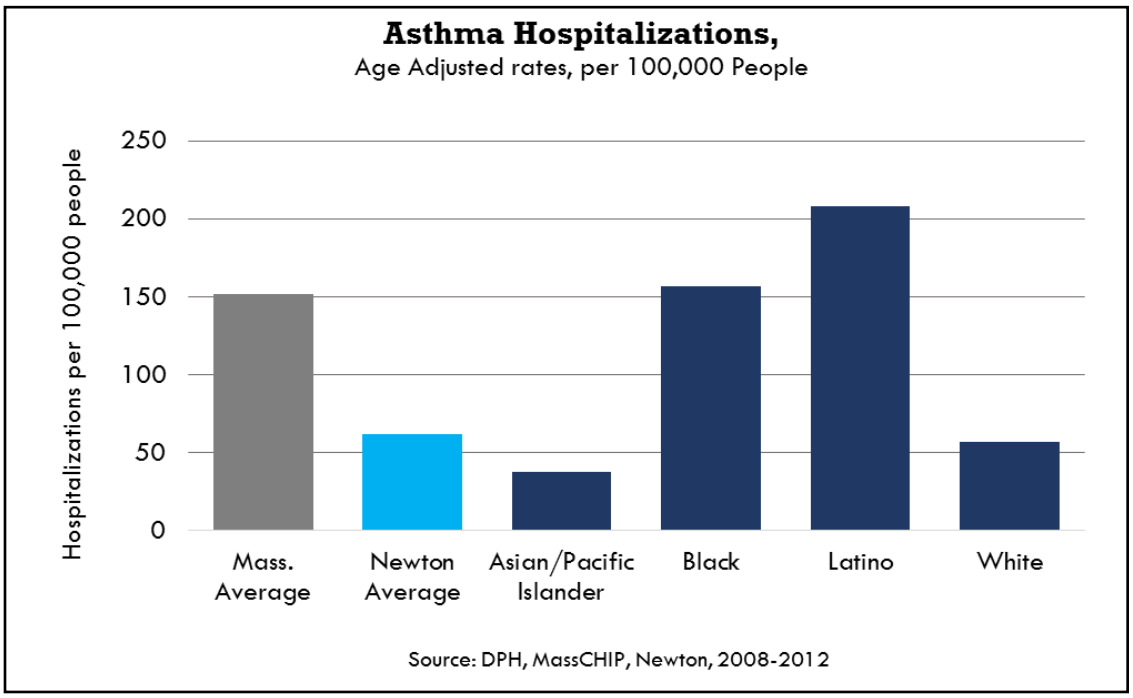
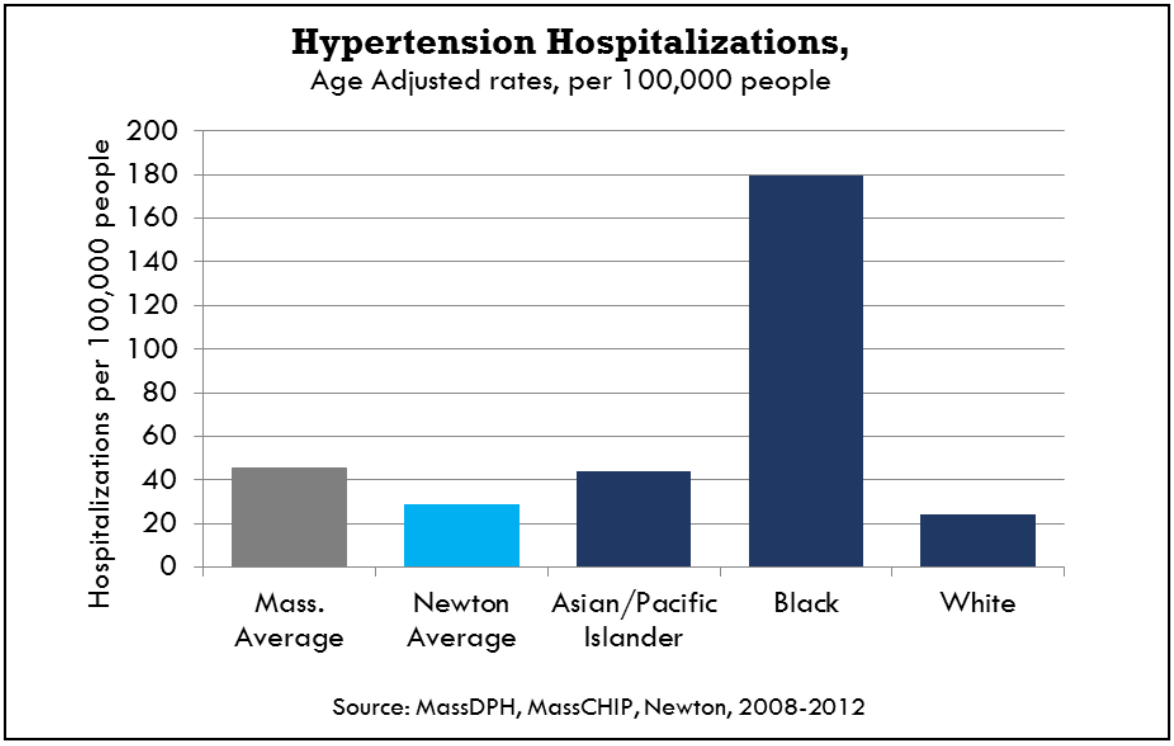


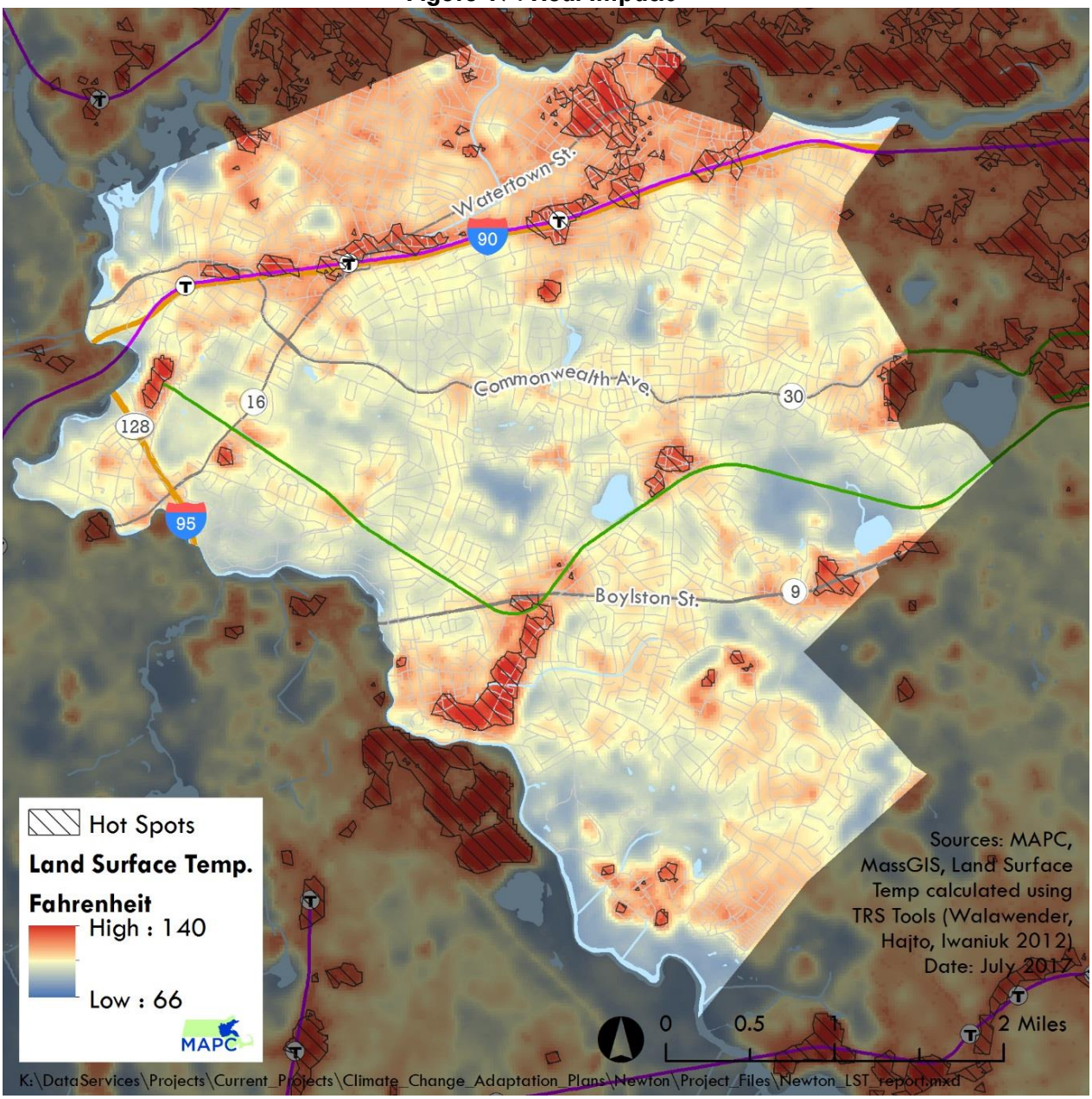
Figure 16. Hypertension Hospitalization



Due to what is termed the "heat island effect," areas with less shade and more dark surfaces (pavement and roofs) will experience even hotter temperatures: these surfaces absorb heat during the day and release it in the evening, keeping nighttime temperatures warmer as well. Figure 18 displays land surface temperature derived from satellite imagery on July 13, 2016, when the high temperature at Logan Airport was 92°F. It is important to note that air temperature just several feet above the ground differs from ground temperature. The range of land surface temperatures is much greater than that of air temperatures. Black pavements can attain temperatures far higher than the air temperature several feet above the ground. In contrast, vegetation or water can be much cooler than air temperatures. Thus, the air temperature people experience will not be as hot as the hottest temperatures shown, nor as cool as the coolest areas shown.

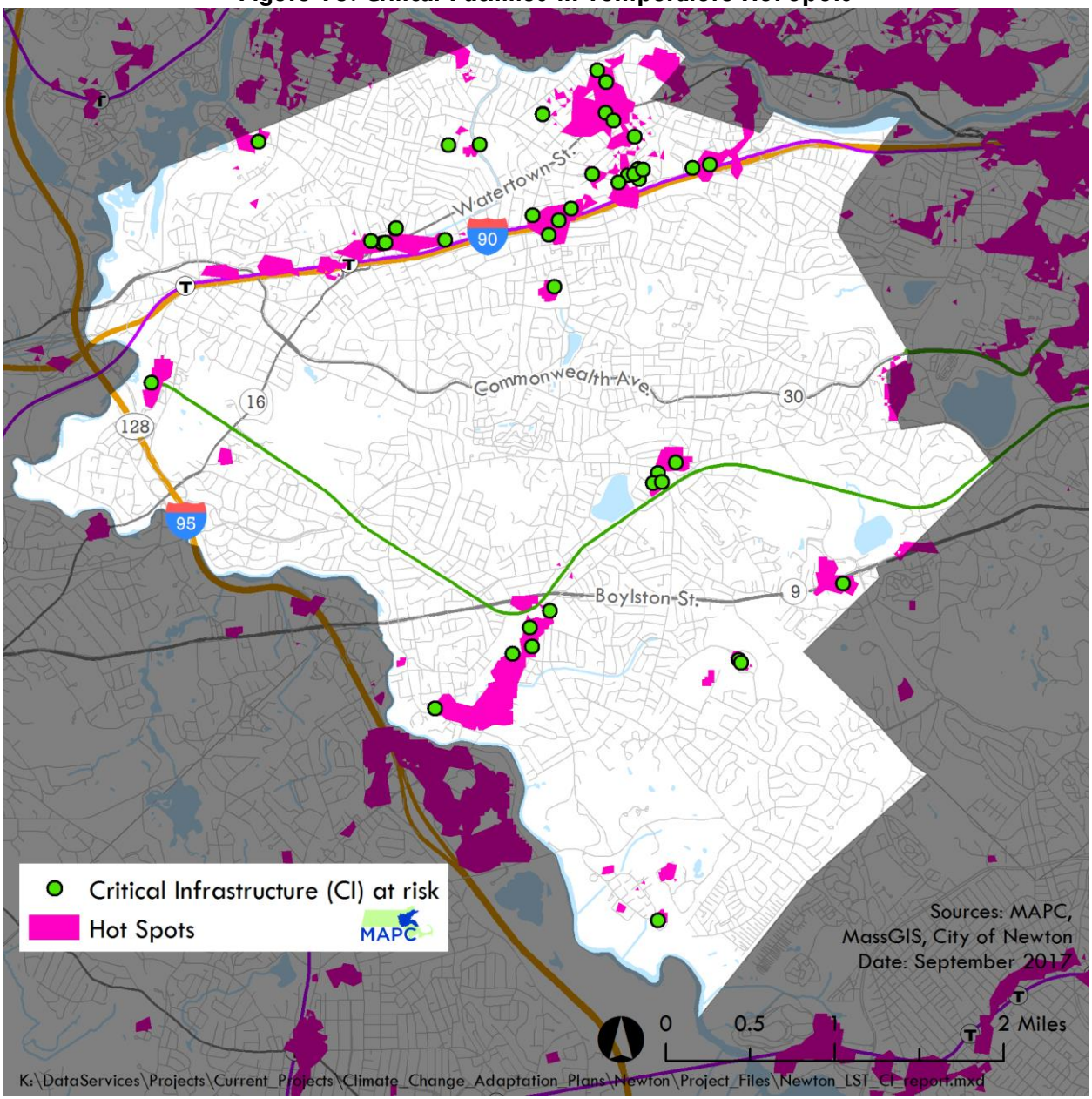
The temperature display reveals that the hottest areas in Newton coincide, for the most part, with locations that are zoned for commercial and industrial use. Given the generally suburban nature of the residential areas in Newton, this is not surprising. There are, however, some residential locations, particularly the multi-residence-zoned areas in Nonantum that are identified as "hot spots": part of the hottest 5% of land area in the MAPC region. Residential locations adjacent to business or industrial areas along the Mass Pike and elsewhere are included in the identified hot spots. Figure 19 and the accompanying Table 3 identify critical facilities in hot spot locations.

Figure 17. Heat Impacts



Land Surface Temperature on July 13th, 2016, when high temperature at Logan Airport was 92 degrees Fahrenheit.

Figure 18. Critical Facilities in Temperature Hot Spots



Hot spots identify the hottest 5% of land area in the MAPC region.

Table 3. Critical Facilities in Temperature Hot Spots

Facility	Location	Type
Avalon at Upper Falls	99 Needham Street	Affordable Housing
Avalon at Chestnut Hill	160 Boylston Street	Affordable Housing
Chestnut Street	1202 Chestnut Street	Affordable Housing
West Street	19 West Street	Affordable Housing
Newton Homebuyer Assistance Program	12 Green Court	Affordable Housing
Scattered Sites	457 Washington Street	Affordable Housing
Genesis House (Genesis II)	295 Adams Street	Affordable Housing
Army National Guard Armory	1137 Washington Street	Armory
Activity Academy Inc./ West Newton School	25 Lenglen Road	Child Care
Close to Home Children's Center, Inc.	144 Bridge Street	Child Care
Little Red Wagon Playschool	56 Winchester Street	Child Care
Newton Community Service Centers	492 Waltham Street	Child Care
Golden Days Children's Center	66 Needham Street	Child Care
The Evan Baptist Church	23 Chapel Street	Church
Italian Pentecostal Christian Church	150 Lowell Avenue	Church
First Baptist Church in Newton	1299 Centre Street	Church
Sacred Heart Church	1321 Centre Street	Church
Lutheran Church of the Newtons	1310 Centre Street	Church
Verizon Telephone Building	787 Washington Street	Communication Tower
NEW TV	23 Needham Street	Communication Tower
Newtonville MBTA stop		Commuter Rail Station
Newton Center Municipal Lot	797 Beacon Street	Distribution Site
Austin Street Municipal Lot	34 Austin Street	Distribution Site
Our Lady Parish Parking Lot	573 Washington Street	Distribution Site
Newton Police Headquarters	1321 Washington Street	Emergency Operations Center
Rumford Avenue Recycling Center	125 Rumford Avenue	Hazardous Material Site
Silent Spring Information Center	29 Crafts Street	Library
Newton History Museum Library	527 Washington Street	Library
Higher Education Center Library	55 Chapel Street	Library
Crafts Street DPW Yard	90 Crafts Street	Municipal
Newton District Court	1309 Washington St	Municipal
Albemarle Field House	250 Albermarle Road	Municipal Facilities
Newton Community Service Center	492 Waltham Street	Municipal Facilities
Carr School	225 Nevada Street	Municipal Facilities
MBTA Riverside Line Electric Station 1	389 Grove Street	Power Substation
Burr School	171 Pine Street	School
EDCO Collaborative - N.E.W. Academy	429 Cherry Street	School
Fessenden School	246 Waltham Street	School
Trinity Catholic High School	575 Washington Street	School
Newton South High School	140 Brandeis Road	School/Shelter
Solomon Schecter Upper School	125 Wells Avenue	School
Jewish Community Day School	25 Lenglen Road	School
Angier Elementary School	225 Nevada Street	School
Newton North High School	457 Walnut Street	School

*Items shown in bold are also listed in Table 6 as potential flooding locations.

Increased Precipitation & Flooding

As previously noted, climate change is expected to bring increased precipitation and changing precipitation patterns to Massachusetts. Heavier winter and spring storms can cause localized flooding and water damage to buildings – and the formation of mold. Chronic mold is an existing problem in Newton, particularly in public housing, senior housing, and in buildings built before the 1980s. Mold triggers allergies and respiratory illnesses, such as asthma. Some strains of mold release airborne toxins, called mycotoxins, which can cause mold toxicity. Mold toxicity can influence the function of internal organs, the nervous system, and the immune system.
Heavy precipitation and flooding can also lead to health-threatening water contamination, including bacteria, viruses, and chemicals that cause gastrointestinal diseases, dermatological conditions, toxicity/poisoning, and other illnesses. Heavy precipitation can cause pollutants to be washed into water bodies and can also overwhelm infrastructure, leading to sewage back-ups and overflows. Often people come into contact with contaminated water when it floods onto their property, but contact with contaminated water through recreation can be dangerous too. In recent years, Crystal Lake has experienced closures due to high E. coli and cyanobacteria levels. If water damage results in a loss of power, residents could be disconnected from telecommunications during a medical emergency, putting at risk residents reliant on electric medical equipment.

Vector Borne-Illnesses

Vector-borne illnesses are those that stem from contact with vectors such as mosquitos and ticks. The spread of vector-borne illnesses is influenced by vector type, weather conditions, built environment conditions, and human behavioral factors. The two most common mosquito-borne illnesses in Massachusetts are eastern equine encephalitis (EEE) and West Nile virus (WNV). Mosquito species present in Newton have been found to carry WNV. As climate change is expected to bring heavy precipitation events (which increase areas of standing water) and warmer temperatures, it is expected that mosquito populations will grow and that the transmission season will extend beyond its traditional late spring through early fall. Warmer temperatures also accelerate a mosquito's lifecycle and increase their biting rates.

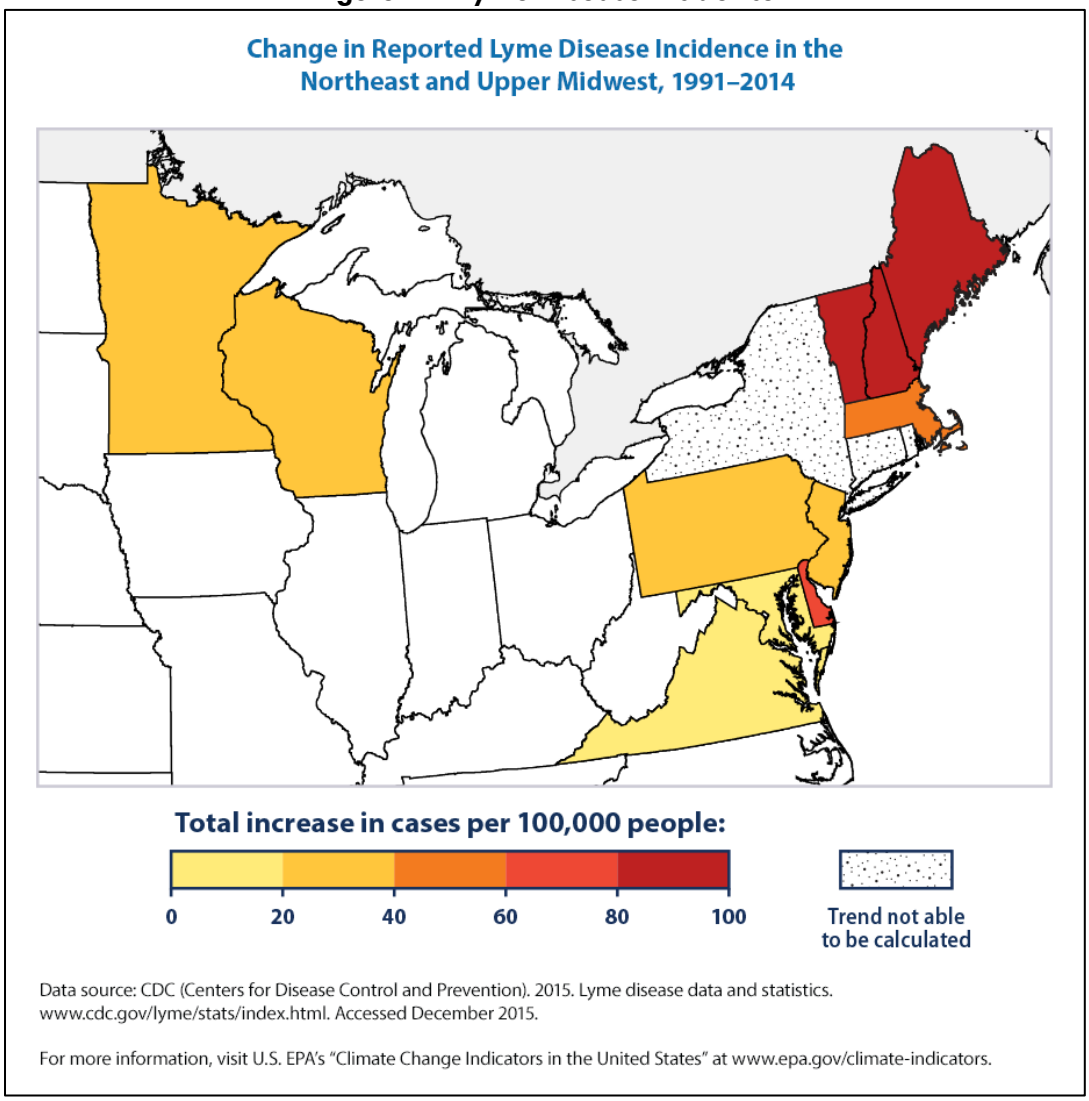
Tick-borne illnesses, particularly Lyme disease, babesiosis, and anaplasmosis have been on the rise in Massachusetts. From 1991-2014, there has been an average increase of 59 cases of Lyme disease per 100,000 people (Figure 20). Winter frost plays an important role in limiting tick populations; warmer winter may lead to more nymphs surviving into the spring months. As with mosquitos, warmer temperatures can lead to longer transmission seasons as ticks begin to seek hosts earlier in the season. Tick populations thrive with increased precipitation and humidity and may be more susceptible to annual fluctuations in precipitation than mosquitos. The Massachusetts State Hazard Mitigation and Climate Adaptation Plan notes that toxins in the invasive zebra mussel could have health impacts if eaten by humans. In addition, they note that the invasive Tree of Heaven can cause allergic reactions in humans.

Forecasting the spread of vector-borne illnesses and estimating risk due to climate change is very challenging, due to multiple factors at play. For example, research suggests that heavy

precipitation in urbanized areas could actually reduce mosquito populations by flushing underground breeding habitat. Further, vector populations' size and range are dependent on the size and range of their host species (i.e., migratory birds, mice, and deer), which may shift as the climate changes. As the climate gets warmer, tropical vector species may expand their ranges north, which could bring with them vector-borne illnesses not typically found in the Northeast (i.e., dengue fever or chikungunya). As vector-borne disease outbreaks occur globally, residents may import vector-borne illnesses acquired during trips to other countries.

People who spend a lot of time outdoors, or live close to vector habitats, are at greatest risk of exposure to vector-borne illnesses. The ability to protect oneself from mosquito-borne illnesses has been associated with socioeconomic status via housing conditions. Households that can afford air-conditioning and maintenance of windows/screens are less likely to come into contact with mosquitos in their home. Those most likely to experience severe vector-borne illnesses are children, people over the age of 50, and people with compromised immune systems.

Figure 19. Lyme Disease Incidence



NATURAL RESOURCES AND CLIMATE RESILIENCE

Newton's natural resources lessen climate impacts by absorbing and storing carbon dioxide and by serving vital protective functions. Many natural resources will be challenged by heat, droughts, and storms. Forests, open space, wetlands, rivers, and streams serve important functions, from providing clean drinking water, to flood control, to giving relief from extreme heat. Healthy ecosystems will be more resistant to stresses a changing climate may bring, including disease, invasive plants, and storm damage. Healthy ecosystems will also be better able to protect against heat and flooding. Natural resource conservation and preservation can provide economic benefits, for individuals and the City, by reducing the costs associated with addressing damage from climate impacts. As an example, utilizing natural areas to absorb stormwater can reduce the need for costly pollution abatement and for stormwater infrastructure.

Mitigation

Climate mitigation refers to efforts to reduce or prevent the emission of GHGs. Newton's forested areas and trees provide significant mitigation. Trees help reduce the amount of carbon dioxide in the atmosphere because they absorb carbon dioxide from the air and convert it into carbon that is stored in their trunks, roots, and foliage. In 2005, forests throughout Massachusetts were estimated to sequester nearly 85 million metric tons of carbon, or about 13.3% of all carbon emissions in the region. Trees also reduce energy demand from air conditioners when they directly shade buildings.

Protection

Heat

Our natural resources provide protection from climate threats in a wide variety of ways. Trees are important in mitigating the impact of heat waves. According to the EPA, suburban areas with mature trees are 4-6 degrees cooler than new suburbs without trees. Shaded surfaces can be 25-40 degrees cooler than the peak temperatures of unshaded surfaces. Vegetated surfaces of all types are cooler than pavement and rooftops.

Flooding

As will be detailed in following sections, flooding is already a significant issue in Newton, and one that is projected to worsen with climate change. Existing wetlands, as well as forests and other open lands, soak up and store rain waters, reducing flooding to streets and homes. Maintaining open space in floodplains allows the land to absorb the brunt of flooding without impact to homes and infrastructure.

Trees also absorb remarkable quantities of precipitation. Research has shown that a typical medium-sized tree can intercept as much as 2,380 gallons of rain per year (USDA Forest Service). Intercepted rainfall lands on tree leaves and is stored or evaporated back into the atmosphere. This reduces the stormwater runoff and flooding.

CLIMATE IMPACTS ON NATURAL RESOURCES

Natural resources can be adversely affected by climate change, and changes in natural resources can compound effects of climate change. One key concern in Newton is the continued loss of trees to development and the loss of street trees to disease and gas leaks. Trees play a critical role in mitigating climate change and cooling local areas. Compromised water quality, extremes of water quantity, and resulting impacts on aquatic life are also of concern. The critical role of natural resources in climate change mitigation and climate adaptation cannot be overstated and is addressed throughout the report.

Aquatic and Wetland Resources

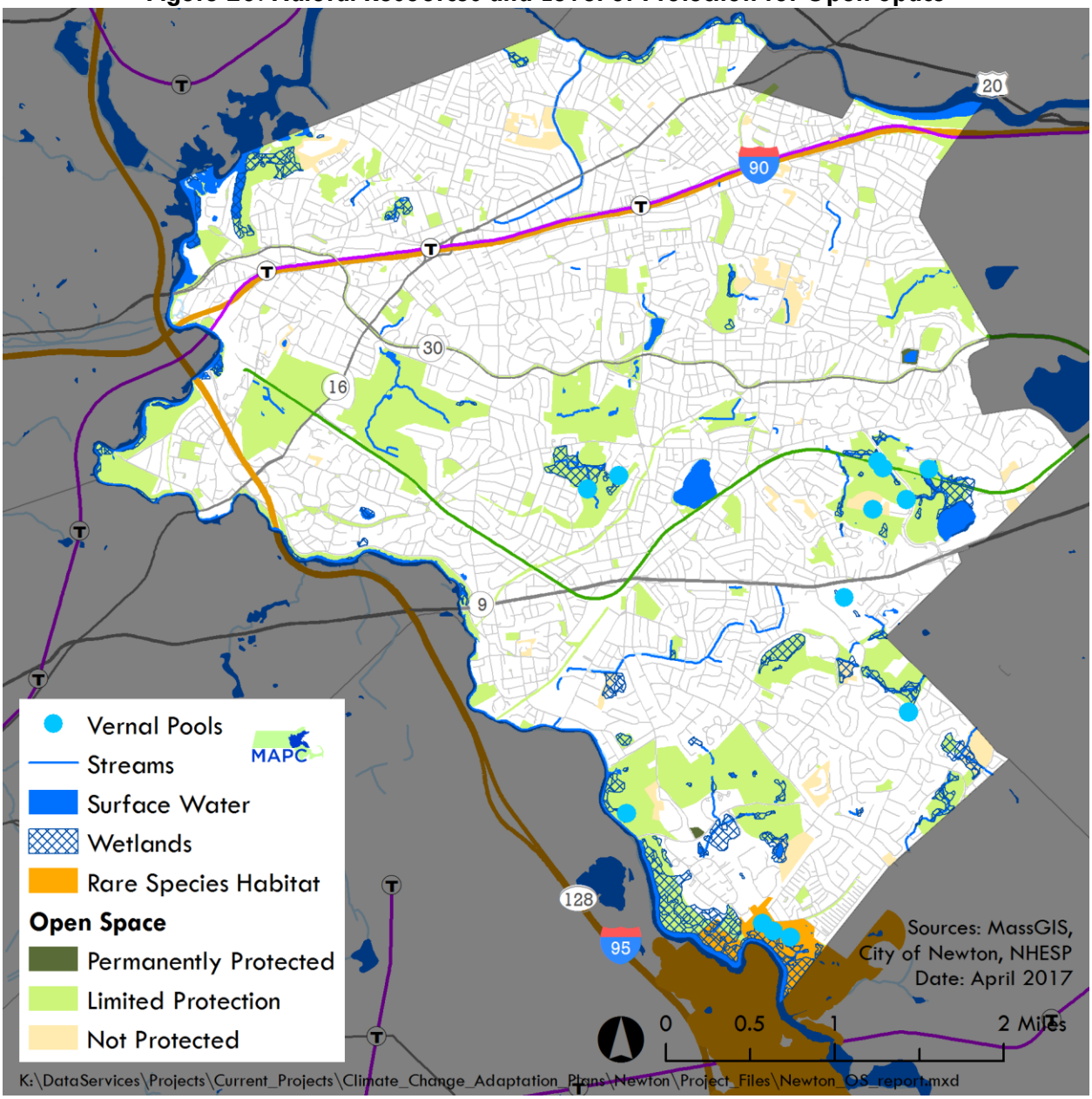
Aquatic resources will be affected by warmer temperatures and by changes in the timing and amount of precipitation. Rain has a negative effect on water quality, because it flushes ground pollutants – everything from dog waste, to oils on the road, to sand – into rivers, streams, and ponds. Large rain events can also cause sewage overflow into waterways when sewer systems become inundated with rainwater and unable to handle the flow. Finally, large rain events can increase erosion and scour stream beds.

The combined effects of washing nutrients into lakes and ponds and warmer summer temperatures may lead to an increase in the growth of aquatic vegetation. Such growth can deplete dissolved oxygen and lead to die-offs of aquatic animals. Additionally, excessive aquatic vegetation can make water bodies unpleasant for recreational use. Algae blooms can also lead to growth in toxic bacteria that makes water bodies unsafe for use by humans and pets.

An increase in summer heat and drought, combined with earlier spring run-off due to warmer temperatures and a shift from snow to rain, can lead to warmer waters and seasonal low-flow or no-flow events in rivers and streams. Shallower waters and warmer temperatures also lead to low levels of dissolved oxygen, with negative effects on fish species. If dry conditions persist, wetlands could shrink in area or lose some of their absorptive capacity and be more prone to runoff and erosion.

According to the Open Space and Recreation Plan, Newton's aquatic resources include 14 lakes and ponds, 22 streams and brooks, and the Charles River, amounting to 276 acres or 2.4% of Newton's total area. Wetlands total 258 acres for an additional 2.3% of Newton's land area. These resources have been heavily affected by development. Wetland acreage has been reduced to less than 20% of the approximately 1,470 acres existing in 1897, and water quality has been compromised by stormwater runoff.

Figure 20. Natural Resources and Level of Protection for Open Space



As part of compliance with the federal Clean Water Act, Massachusetts must evaluate whether water bodies meet water quality standards. As shown in Table 4, in the 2014 "Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act," most of the assessed water bodies in Newton do not meet water quality standards for E. coli, phosphorous, and other impairments. Hammond Pond has not been assessed for all uses, but was identified as attaining uses including: Aesthetic, Fish Aquatic and Wildlife, and Secondary Contact Recreation. Crystal Lake was not assessed. Newton's other streams and ponds are not included in the assessment.

Many of these impairments may be further exacerbated by climate changes. Newton has made significant investments in water quality. In particular, through elimination of illicit and indirect connections, the City estimates it has reduced 4,500 gallons per day of sewage that previously entered storm drains. Wetlands and their buffer areas are protected under the Wetland Protection Act as well as by City ordinance. Approximately 77 acres of wetlands are located in protected open space.

Table 4. Water Quality Impairments

Waterbody	Impairment
Cheese Cake Brook	dissolved oxygen saturation, E. coli, phosphorous, excess algal growth
South Meadow Brook	dissolved oxygen, E. coli, phosphorous, turbidity
Bullough's Pond	excess algal growth, nutrient/eutrophication
Sawmill Brook	dissolved oxygen, E. coli, organic enrichment (sewage), phosphorous, chloride, turbidity
Charles River	E. coli, nutrient/eutrophication, phosphorous, DDT, PCB in fish tissue,

Forests and Trees

Warming temperatures are expected to change the composition of forests as trees adapted to more northern climates decline and those adapted to warmer climates increase in abundance. As an example, maples are expected to decline, while oaks become more abundant. Increasing intensity and frequency of weather events, including ice storms, drought and wildfire, can weaken and damage trees. Forests may also be subject to new pests and diseases brought by warmer climates.

The City estimates that approximately 20% of its land is Open Space. This includes protected and unprotected private and public land (Figure 21). The Open Space and Recreation Plan (OSRP) identifies larger wooded areas, including the Webster Conservation, Hammond Woods and Temple Mishkan Tefila land in Chestnut Hill; East and West Kessler Woods, the Saw Mill Brook Conservation Area and Bald Pate Meadows in Oak Hill; Auburndale Park and Flowed Meadow in Auburndale; and Dolan Pond Conservation Area in West Newton. These larger and connected areas are valuable as they provide greater resilience and protection for plant and animal species impacted by climate changes.

The OSRP indicates that there are approximately 1,200 acres of forested land but notes that this acreage has declined by over 20% in the last 25 years. The OSRP cites an even steeper decline in street trees, down 35% to approximately 26,000 trees from 40,000 in the early 1970s. City officials estimate Newton is currently losing street trees at the rate of 800 per year.

Using tree canopy data create by the University of Vermont based on remote sensing data, we estimate that tree canopy covers 48% of total land in Newton (Figure 22). Table 5 provides tree canopy data by land use category.

The USDA Forest Service has created a peer-reviewed web-based software tool called i-Tree that quantifies the value of ecological services trees provide. The i-Tree software estimates the value of carbon storage, air pollution removal, and stormwater runoff reduction provided by trees. Their estimates underscore the value and importance of forests and street trees in providing climate mitigation and resilience. The estimated value of carbon storage in Newton's tree canopy exceeds $22 million, while the estimated value of annual carbon sequestration (tree growth minus loss due to decomposition and mortality) is over $600,000. Estimates of annual air pollution removal include 2,848 pounds of carbon monoxide, 73,467 pounds of nitrogen dioxide, 208,445 pounds of ozone, 15,158 pounds of sulfur dioxide, and 36,881 pounds of particulate matter. For stormwater runoff i-Tree estimates that 90 million gallons per year is avoided due to transpiration and interception of rainfall. The value of the reduced runoff is estimated at over $800,000 annually. Information on the methodology for these estimates is available at https://landscape.itreetools.org/references/.

Figure 21. Tree Canopy

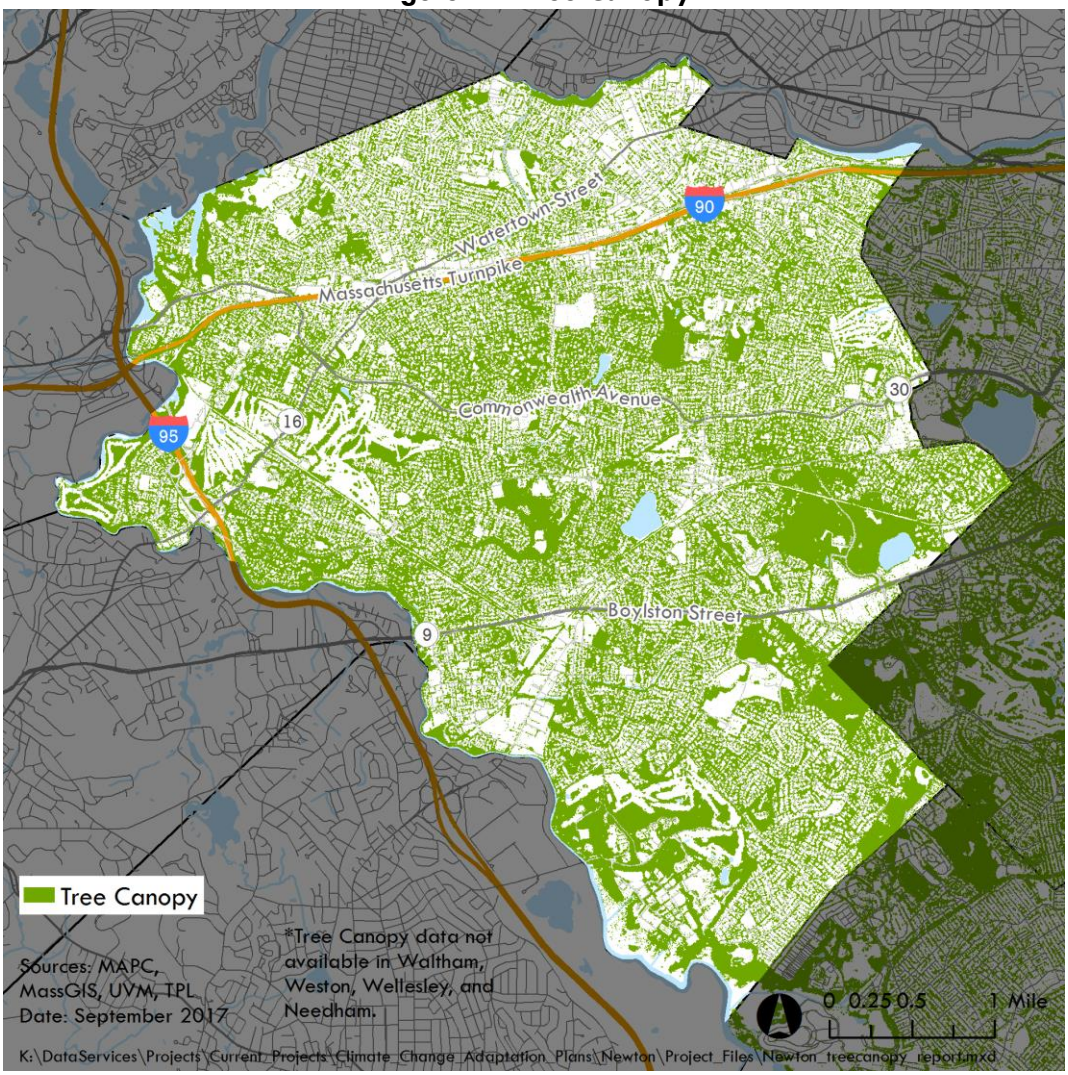


Table 5. Tree Canopy and Land Use

Land Use	Sq. Miles	% of Total Tree Canopy	Land Use %
RESIDENTIAL	4.8	55.5%	51%
OPEN SPACE	1.8	20.6%	17%
RIGHT OF WAY	1.2	14.0%	16%
INSTITUTIONAL	0.3	3.1%	4%
COMMERCIAL	0.2	2.4%	5%
GOVERNMENT	0.2	2.1%	3%
INDUSTRIAL	0.1	0.8%	1%
TOTAL	8.7	100%	100%

Source: MAPC and Trust for Public Land with the U. Vermont Spatial Analysis Laboratory

CLIMATE IMPACTS ON THE BUILT ENVIRONMENT

Flooding and the Built Environment

In many instances, potential impacts of a warming climate do not prompt entirely new challenges, but rather, exacerbate existing concerns. This is certainly the case regarding the projection that significant rain events will increase in intensity and frequency over the next century. Flooding and stormwater management are already key concerns to which the City devotes considerable resources. The 2013 Newton Hazard Mitigation Plan identifies nine locations of special flooding concern. Newton's Stormwater Infrastructure Improvement Plan 2015 is a comprehensive review of Newton's 320 miles of drainage infrastructure. The Plan identifies seven additional localized flooding areas and prioritizes 32 culvert and 16 stream improvement projects. Many of the locations are along surface waterways, including the Charles River, the Sawmill, Cheesecake, South Meadow, Cold Spring and Hammond Brooks, and Bullough's Pond, but they also include many areas of poor drainage not associated with flood zones or visible waterways.

Rainstorms that occurred in March 2010 provide recent data for considering flood impacts in Newton. Figure 23 shows the United States Geological Survey gage record for March and early April 2010 on the Charles River in Wellesley, just upstream of Route 9 and the Metropolitan Circular Dam. The river peaked at 5.87 feet on April 3, 2010.

Flooding from the 2010 storm was significant: the last time gage heights exceeded the 2010 record was thirty years ago in 1987. This long gap between flooding incidents may give the impression that a storm the magnitude of 2010 is exceedingly rare. Yet gage records from 1960 to the present reveal that peak flow has exceeded the 2010 record four times. That is, Charles River flow the magnitude of 2010 or larger has happened, on average, every 11 years since 1960. This matches fairly closely the FEMA Flood Insurance Study for Norfolk County (2015) calculation that the 10% chance flood will yield a flow of 1,965 cubic feet per second (cfs). The flow recorded at the USGS gage on April 3, 2010 was 2,170 cfs, or slightly higher than FEMA's calculation for the 10% chance flood.

Flooding from the 2010 storm was significant: the last time gage heights exceeded the 2010 record was thirty years ago in 1987. This long gap between flooding incidents may give the impression that a storm the magnitude of 2010 is exceedingly rare. Yet gage records from 1960 to the present reveal that peak flow has exceeded the 2010 record four times. That is, Charles River flow the magnitude of 2010 or larger has happened, on average, every 11 years since 1960. This matches fairly closely the FEMA Flood Insurance Study for Norfolk County (2015) calculation that the 10% chance flood will yield a flow of 1,965 cubic feet per second (cfs). The flow recorded at the USGS gage on April 3, 2010 was 2,170 cfs, or slightly higher than FEMA's calculation for the 10% chance flood.

What is a "100-year" flood?

The term "100-year flood" is shorthand for a flood that has a 1% chance of happening in a given year. In reality, a 100-year flood could occur two years in a row, or not at all for 100 years. But each year, there is a 1% chance it will occur.

The .2% chance flood = 500 year flood
The 1% chance flood = 100 year flood
The 2% chance flood = 50 year flood
The 10% chance flood = 10 year flood

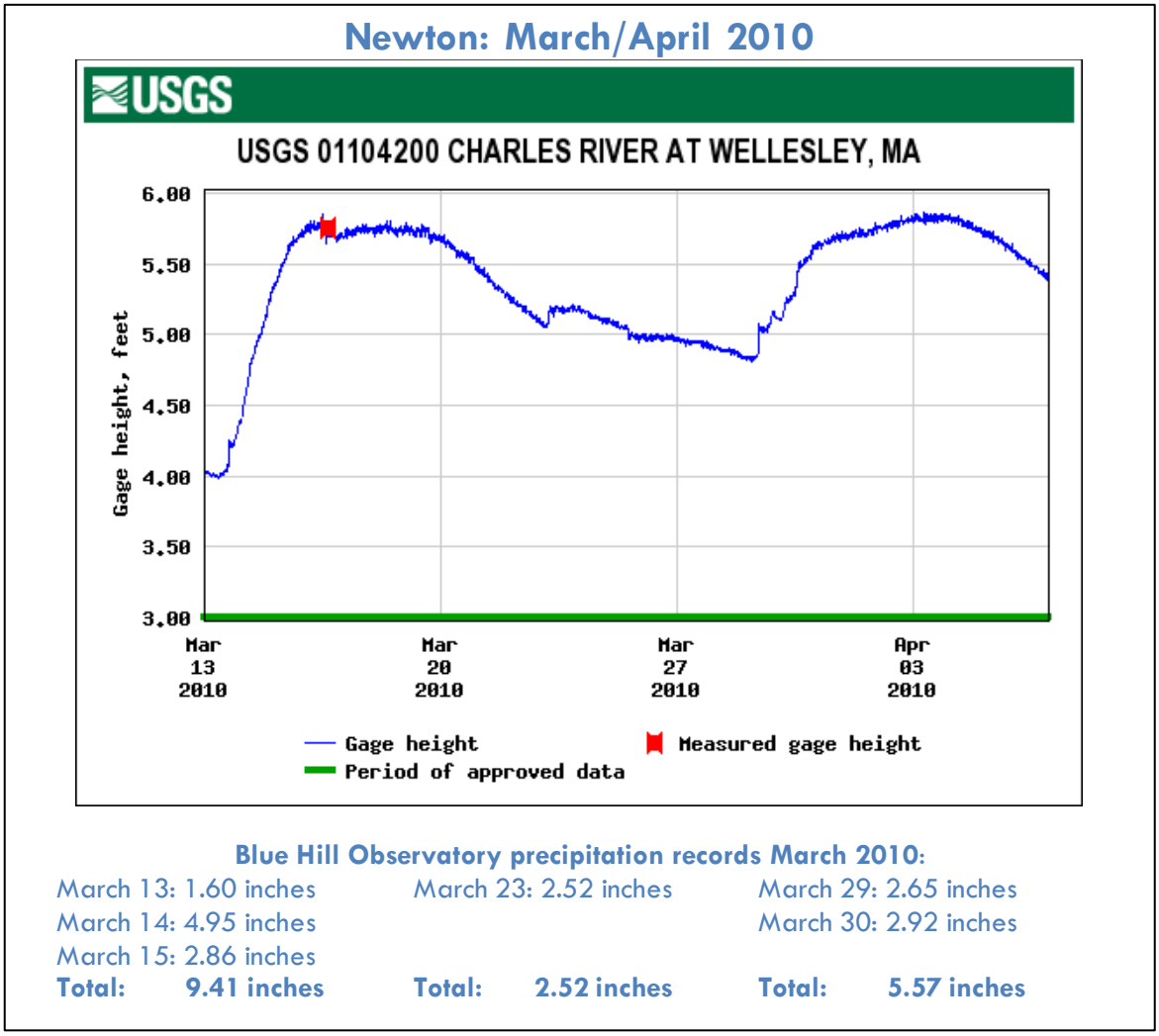
The 100-year flood zone is the location where there is a 1% chance of flooding each year. In the 500-year flood zone there is a .2% chance of flooding each year.

Four additional rain events between 1982 and 2001 did not increase flow in the Charles River as significantly but did result in the payment of 24 to 52 flood insurance claims in Newton. The Charles River has a large watershed and tends to rise slowly during longer-term flooding events. However, flooding in Newton neighborhoods will also occur during shorter duration high intensity storms. The four rain events ranged from a little over 4 inches in two days (24 claims in 2001) to almost 8.5 inches in two days (52 claims in 1996). Rainfall records are from the Blue Hill Observatory in Milton.

While the 2010 rains were significant, they did not approach the magnitude of rainfall produced by Hurricane Diane in August 1955. Rainfall from Diane, recorded at the Blue Hill Observatory, totaled 13.76 inches – 9.93 inches of which fell in 24 hours. The Wellesley stream gage did not exist in 1955, but records from the USGS gage on the Charles River in Dover give an indication of the impact of Hurricane Diane relative to the 2010 storm.

At that location, flow was 15% higher (2,790 cfs in 2010 vs. 3,220 cfs in 1955). The flood gage height was more than a foot higher (8.05 feet in 2010 vs. 9.24 feet in 1955). Clearly a storm the size of Hurricane Diane would cause damage far exceeding that experienced in 2010. As will be discussed in following sections, a storm the magnitude of Hurricane Diane would also likely produce greater flooding and damage today than it did in 1955, due to the amount of development that has taken place in the past sixty years. This may be less true along the Charles River, where Army Corps of Engineers land purchases in the 1970s and 80s have preserved natural storage.

Figure 22. March 2010 USGS Charles River Gage



As shown in Figure 25, the FEMA flood insurance claims from March 2010 account for more than twenty percent of the total number of paid insurance claims, and more than one-third the value of claims paid since 1978. Yet insurance claims represent only a fraction of actual damages. According to storm records in the NOAA Storm Events Database, more than 700 homes and 25 City buildings were damaged by flooding. City officials suggest that the number of homes affected by flooding may have been closer to 2,000. Because the 2010 storm was a federally declared disaster, property owners without flood insurance were eligible for limited reimbursement for damages. Uninsured property owners filed nearly three times the number of claims as those with flood insurance. It should also be noted that FEMA did not fully reimburse the uninsured property owners. City damage estimates, which were available for roughly 85% of the uninsured owners, totaled over $3 million, or nearly ten times the amount reimbursed by FEMA. City officials also estimate that damages to businesses were well over $1 million.

Figure 23. Selwyn Road, Hurricane Diane 1955

Source: Jackson Homestead and Museum

Figure 24. Newton Flood Damage Claims

The Cost of Flood Damage

- **Total claims: 1978 through January 2017** FEMA flood insurance paid 275 claims - $1.7 million in damages
- **One stormy month: March 2010** FEMA flood insurance paid 70 claims - $672,843 in damages
- **Plus…** FEMA reimbursed 209 uninsured property owners $338,527 in damages, City of Newton was reimbursed $364,723 for damages (75% of request)

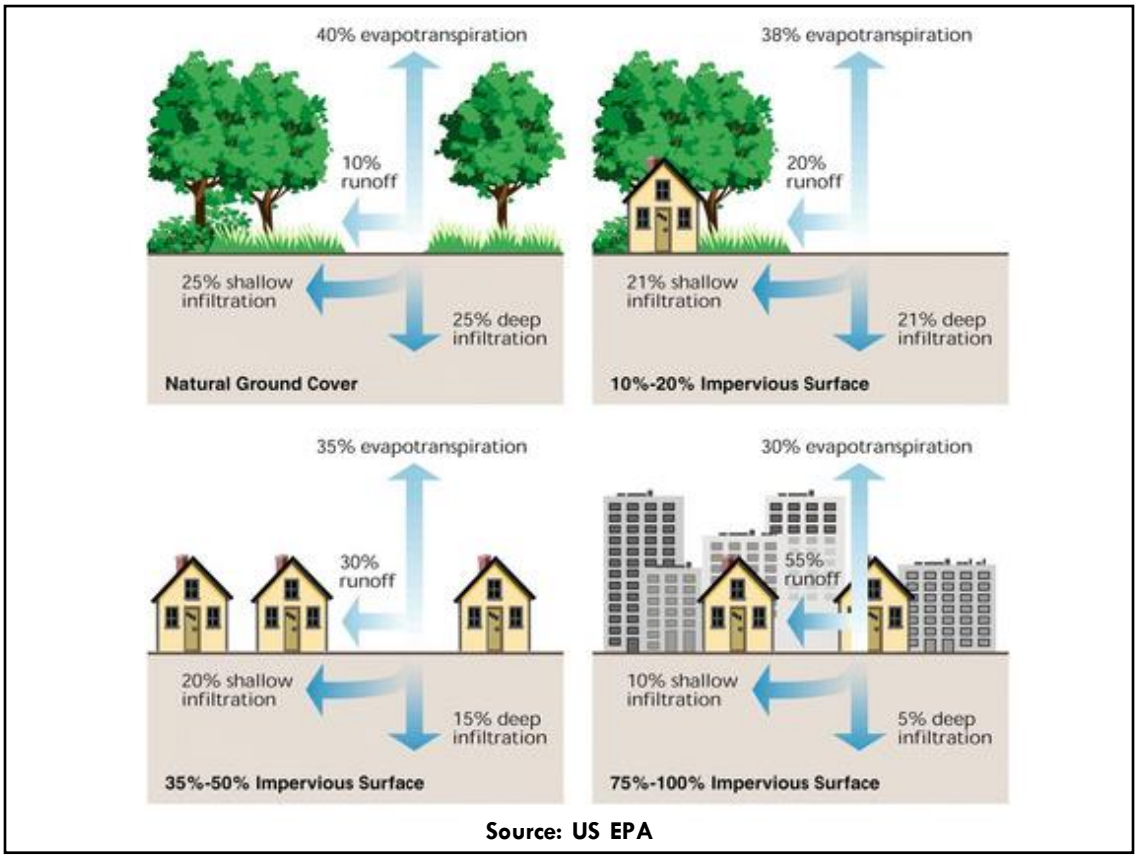
Lyons Field, Auburndale, March 15: Source Gail Spector

City officials also note that short duration high intensity storms have caused flooding in the past. City staff report that this type of storm tends to cause flooding at choke points caused by stormwater drainage facilities that are unable to handle the volume of rain over a short period of time.

Flooding and Development Patterns

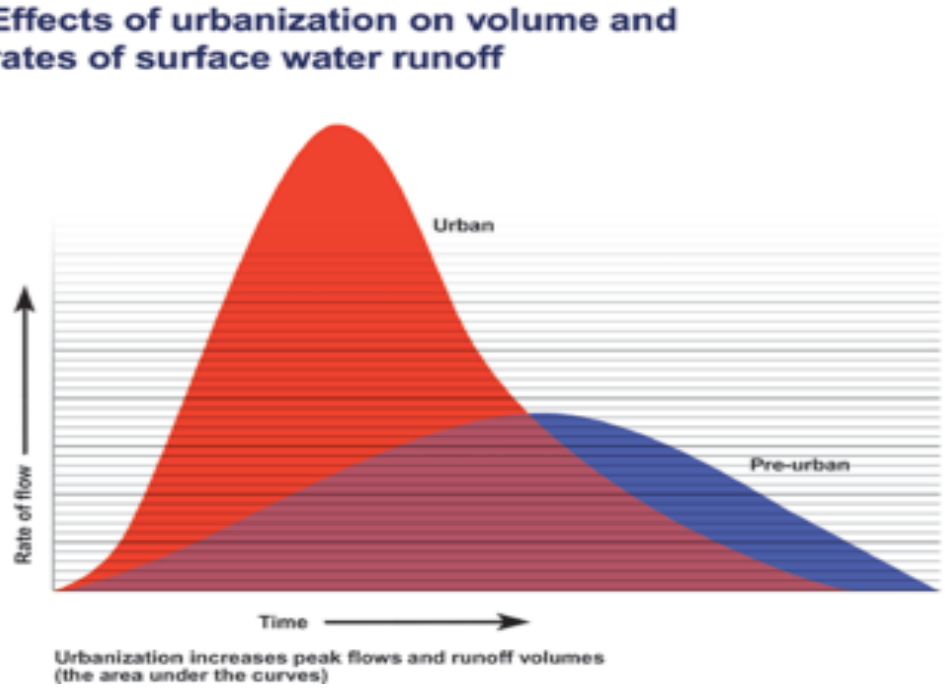
Newton faces significant challenges in addressing flooding. These challenges are commonplace in cities and towns where, over time, development has changed watershed drainage characteristics, re-rerouted or placed brooks and streams in culverts, and filled natural floodplains. As shown in Figure 26, with development comes an increase in impervious surfaces. As a result, the watershed hydrology is changed. Less rainfall reaches streams and rivers through groundwater infiltration, but instead reaches waterways through overland runoff. Runoff is directed to storm drains and reaches waterways much more quickly, causing an increase in flooding as shown in Figure 27.

Figure 25. Development and Rainfall



Source: US EPA

Figure 26. Development and Stormwater

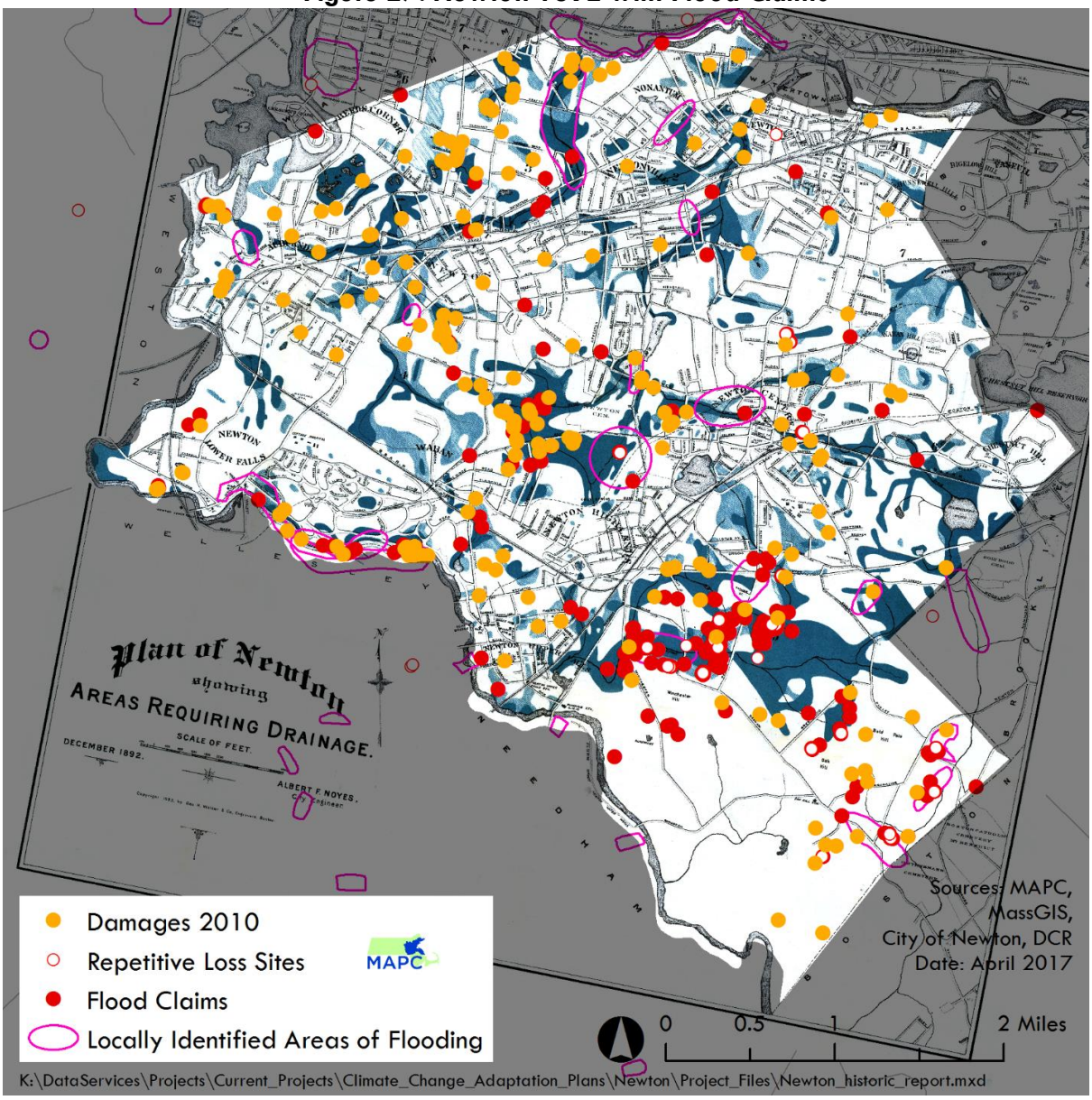


Source: Adapted from Drainage Manual, Roads and Transportation Association of Canada, 1982

Historic Development in Newton

An 1892 map of Newton (Figure 28) identifies "areas requiring drainage," including ponds, streams and wetland areas. In striking contrast, Figure 29 depicts today's surface waters and wetlands; the vast majority of the 1892 wetlands and waterways are no longer visible. As described in the Open Space and Recreation Plan (OSRP), many of Newton's wetlands and ponds have been drained and filled, and streams culverted. All of the 22 brooks and streams have been at least partially culverted or altered. Wetland acreage has been reduced to less than 20% of the approximately 1,470 acres that existed in 1897. As noted in the OSRP, much of the alteration of water resources took place under development pressures or for perceived health reasons. One

Figure 27. Newton 1892 with Flood Claims

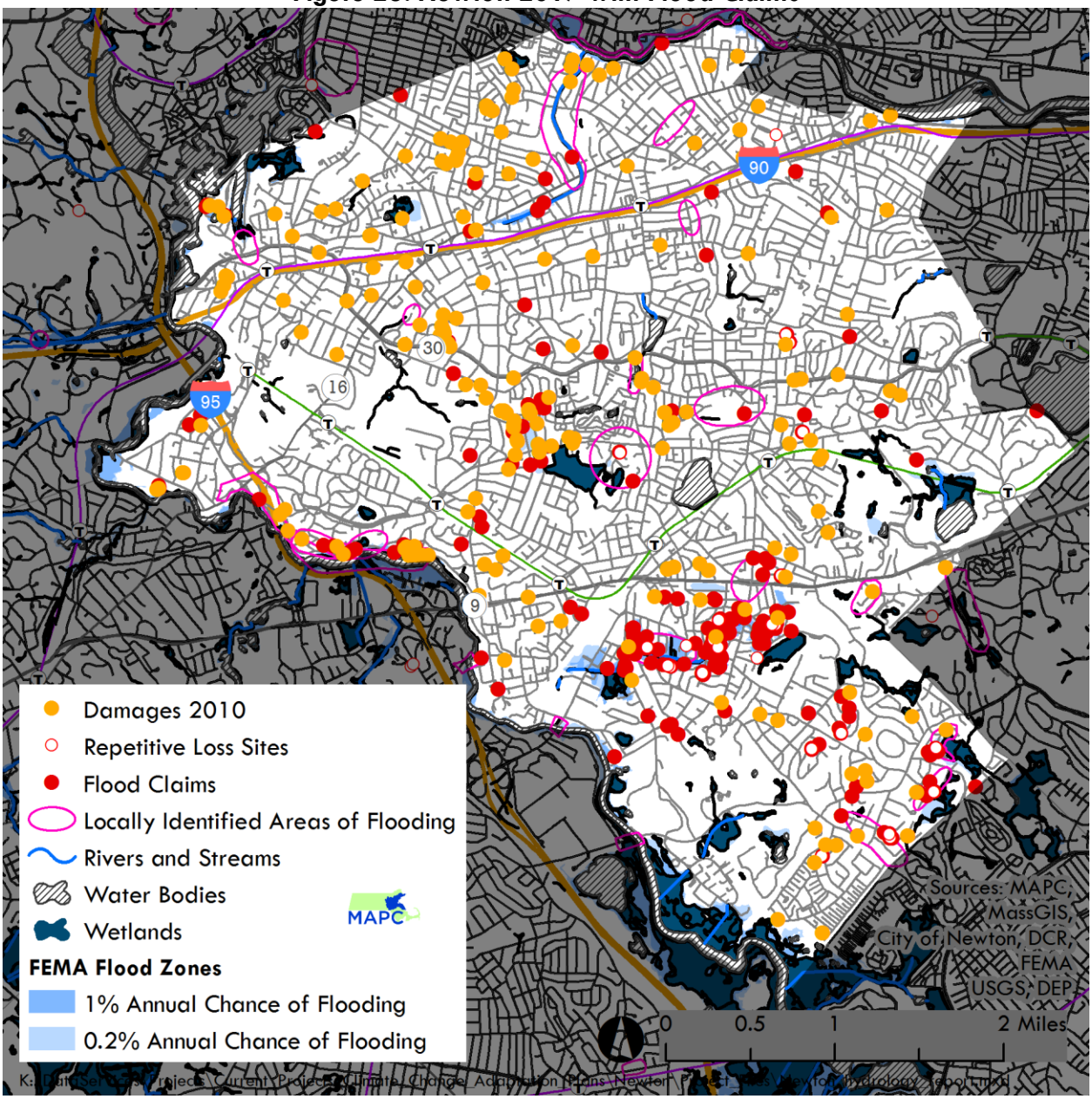


The flood claim locations are enlarged to comply with federal privacy requirements.

measure of these alterations is the 17 miles of underdrains that were constructed to facilitate the installation of sewer lines during the 1800s. The underdrains were installed in low-lying areas to lower groundwater in order to install the sewer lines on dry soil.

The 1892 map and the current map have been amended to identify locations of 1) FEMA flood insurance claims, 2) FEMA claims paid in 2010, and 3) localized flooding areas identified by the City. Placement of the flooding locations on the 1892 map reveals that nearly all of these locations are close to former wetlands or culverted streams.

Figure 28. Newton 2017 with Flood Claims



The flood claim locations are enlarged to comply with federal privacy requirements.

While flooding does occur in FEMA flood areas, there are many more flood damage locations outside of mapped flood areas. As demonstrated by the 1892 map, many of these locations may be related to flood sources that, although no longer visible, are still revealed by their impact. This has important implications for understanding and addressing flooding. In locations outside of flood zones, residents and officials are not necessarily forewarned of the potential for flooding. Regulations that would protect against flood damage do not apply. As an example, buildings in flood zones must comply with building code requirements that preclude basements.

An additional challenge to identifying potential flooding locations, is the 320 miles of Newton drainage infrastructure, the vast majority of which is buried underground. As noted previously, the City is making a significant investment in evaluating and improving its stormwater infrastructure. 100,000 linear feet of the most critical infrastructure has been prioritized for evaluation to identify potential emergencies and plan improvements. Yet, the condition of most of the drainage network is unknown. As a result, there is the potential for flooding in unexpected locations due to aging, or potentially failing, infrastructure. Flooding along the MBTA Riverside line in 2010, described in the MBTA section, is an example of damage due to unexpected drainage failure.

Flooding and Critical Facilities

In this report, we utilize models to project where future sea level rise may change flood locations and depths. To date, however, no similar mapping of potential future inland flood zones is available. There are particular challenges to projecting future inland flooding and damages, including varying impacts when rain falls on dry, frozen, or saturated land; and varying impacts between long and short-duration rain events. Flooding associated with storm drainage infrastructure is also particularly difficult to predict.

Yet there are ways to assess and consider future vulnerabilities that might result from increases in precipitation. Reviewing extreme events that may become more frequent, such as the 2010 storm, is valuable for identifying where damage occurred and where it might have extended had rainfall amounts been greater. FEMA mapped 500-year flood zones, and relatively flat land adjacent to flood zones can be reviewed for vulnerability. Understanding the condition and location of culverts and storm drains is important, because of their potential for blockages and failure. Further, as discussed above, the location of former wetlands is an important indicator of potential flooding locations.

According to Newton officials, 25 of 78 City facilities flooded in 2010. In a number of the locations flooding was minor, either because protective steps had been taken previously, or because water depths were limited. Nevertheless, Newton calculates damage to its facilities totaled over $650,000. As previously discussed, officials estimate that damages to homes and businesses exceeded $4 million from the 2010 storm alone.

Figure 30 and the accompanying Table 6 identify critical facilities in locations that may be subject to flooding. These include 1) flood zones, 2) City-identified flooding areas, 3) in proximity to previous flood claims, and 4) facilities that coincide with “areas requiring drainage” identified in the 1892 map of Newton. These categories serve as proxies for identifying locations that may be subject to flooding now, or in the future as a result of larger storms. We do not have the capacity to predict more precisely where future flooding may occur. Only 30% of the listed facilities are in current FEMA flood zones. 55% are listed solely because they are in historic wetland areas. Facilities shown in bold are also located in temperature “hot spots” (see Figure 19 and Table 3).

Figure 29. Critical Facilities, Flood Zones, Identified Flooding Areas, and Historic Wetlands

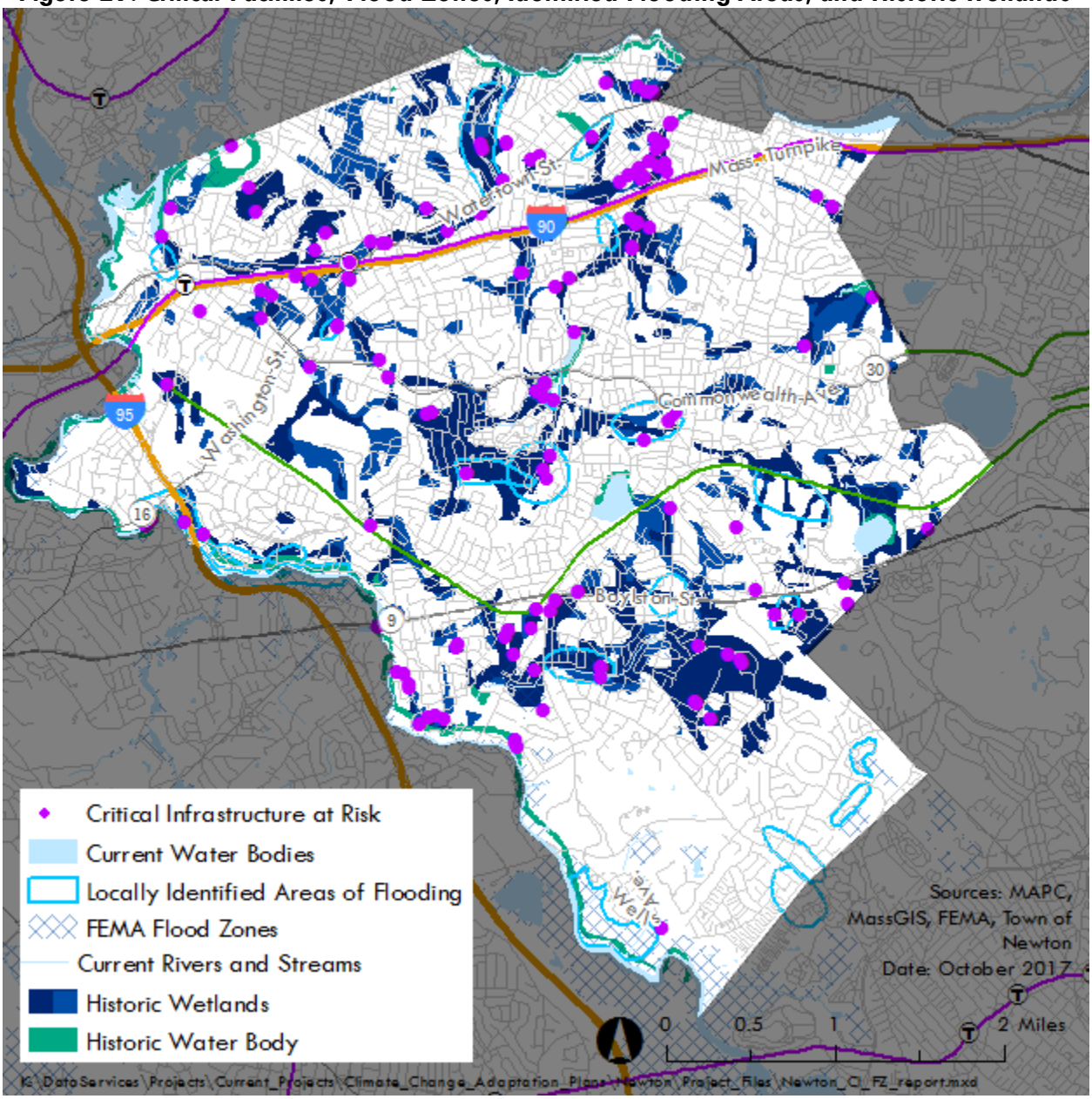


Table 6. Critical Facilities and Potential Flooding Indicators

Critical Facility	Location	Type	Flood Zone	City-Identified Flooding	Proximity to a Flood Claim	Overlap with Historic Wetlands
	831 Boylston Street	Affordable Housing				X
73 Walnut St #3	73 Walnut St	Affordable Housing				X
Albermarle Road	470 Albermarle Road	Affordable Housing				X
Avalon at Chestnut Hill	160 Boylston Street	Affordable Housing				X
Avalon at Upper Falls	99 Needham Street	Affordable Housing				X
Beacon Street	1115 Beacon Street	Affordable Housing		X		X

Critical Facility	Location	Type	Flood Zone	City-Identified Flooding	Proximity to a Flood Claim	Overlap with Historic Wetlands
Beaconwood Apartments	14 Wilson St	Affordable Housing		X		X
Beaconwood Apartments	36 Hargrave Cir	Affordable Housing		X		
Boylston Street Condos	340 Boylston St.	Affordable Housing		X		
Cabot Park Village	280 Newtonville Ave	Affordable Housing				X
Chatham Park	197 Westwood	Affordable Housing				X
Chestnut Street	1175 Chestnut Street	Affordable Housing				X
Coyne Road Group Home	18 Coyne Road	Affordable Housing				X
Echo Ridge	76 Thurston Road	Affordable Housing				X
Forte House & Townhouses	76 Webster Park	Affordable Housing	X		X	
Grove Street--NWW	87 Grove Street	Affordable Housing			X	
Hampton Place	77 Florence Street	Affordable Housing				X
Highland Glen Condos	92 Christina Street	Affordable Housing				X
Jackson Gardens	111 Kennedy Circle	Affordable Housing				X
Jackson Road	163 Jackson Rd	Affordable Housing				X
Jackson Terrace	15 Jackson Terrace	Affordable Housing				X
Kayla A. Rosenberg House	90 Christina St	Affordable Housing				X
Millhouse Commons	1093 Chestnut St	Affordable Housing				X
Millhouse Commons	1101 Chestnut St	Affordable Housing				X
New Falls Apartments	2281 Washington St.	Affordable Housing		X		
Newton Homebuyer Assist Program	368 Elliot St	Affordable Housing			X	
Nonantum Village	239 Watertown Street	Affordable Housing				X
Nonantum Village Place	241 Watertown	Affordable Housing				X
Orchard Avenue	40 Orchard Avenue	Affordable Housing				X
Parkview Homes	192 Lexington Street	Affordable Housing				X
Riverview Avenue	209 Riverview Avenue	Affordable Housing	X		X	
Tremont Street House	173 Tremont Street	Affordable Housing				X
Wiltshire Road	13 Wiltshire	Affordable Housing				X
Wyman Street	52 Wyman	Affordable Housing				X
Coyne Road Apartments	29 Coyne Rd	Affordable Housing/Assist Living				X
Falls at Cordingly	2300 Washington Street	Assisted Living	X			X
Bowen Cooperative Nursery School	96 OTIS STREET	Child Care				X
Brookline Infant Toddler Center	1900 Commonwealth Ave	Child Care				X
Gan Yeladim Day Care Center	125 WELLS AVENUE	Child Care	X			
Happy Child Preschool/Day Care	1191 CHESTNUT STREET	Child Care				X
Little Red Wagon Playschool	56 WINCHESTER STREET	Child Care				X
Morning Play Program	652 HAMMOND ST	Child Care				X

Critical Facility	Location	Type	Flood Zone	City-Identified Flooding	Proximity to a Flood Claim	Overlap with Historic Wetlands
Newton Creative Start	573B WASHINGTON STREET	Child Care				X
Plowshares at Lincoln Eliot	191 PEARL STREET	Child Care				X
The Preschool Experience, Inc.	1091 CENTRE STREET	Child Care		X		
The Teddy Bear Club, Inc.	1466 Commonwealth Ave	Child Care				X
Ward After School Program	10 Dolphin Road	Child Care				X
Beth Menachem Chabad	229 DEDHAM ST	Church	X	X	X	X
Church of the Messiah	161 AUBURN ST	Church				X
Congregation Mishkan Tefila	128 OLDE FIELD RD	Church	X			X
Greek Evangelical Church of Boston	1115 CENTRE ST	Church		X		
Myrtle Baptist Church	21 CURVE ST	Church				X
St. John's Church	297 LOWELL AVE	Church				X
Trinity Church	1097 CENTRE ST	Church		X		
United Methodist Church of Newton	430 WALNUT ST	Church				X
Lincoln Park Baptist Church	1450 WASHINGTON ST	Church/Child Care				X
TEMPLE SHALOM	175 TEMPLE ST	Church/Child Care		X		
Lasell College	1844 Commonwealth Av	College or University				X
NEW TV	23 Needham St	Communication Tower				X
WEST NEWTON		Commuter Rail Station				X
Our Lady's Parish Parking Lot	573 Washington Street	Distribution Site				X
The Rashi School	15 Walnut Park	Distribution Site				X
Newton Police Headquarters	1321 Washington Street	Emergency Operations Center				X
Higher Education Center Library	55 Chapel Street	Library			X	
Silent Spring Information Center	29 Crafts Street	Library				X
Newton Free Library	330 Homer Street	Library/Distribution Site		X		
Riverside		MBTA Station				X
Elliot Street DPW Yard	82 Elliot Street	Municipal				X
Newton City Hall	1000 Commonwealth Ave	Municipal				X
Newton District Court	1309 Washington St	Municipal			X	X
Albemarle Field House		Municipal Facilities		X		X
Auburndale Park Shed		Municipal Facilities				X
Cabot Park Field House		Municipal Facilities				X

Critical Facility	Location	Type	Flood Zone	City-Identified Flooding	Proximity to a Flood Claim	Overlap with Historic Wetlands
Clubhouse		Municipal Facilities				X
Gath Pool		Municipal Facilities		X		X
Jackson Homestead		Municipal Facilities				X
Newton Centre Field House		Municipal Facilities		X		
Newton Highlands Park Bldg.		Municipal Facilities				X
Parks & Rec Admin Bldg.		Municipal Facilities				X
Pellegrini Park Building		Municipal Facilities		X		
Pulsifers Cove Bath House		Municipal Facilities	X			
Stearns Park Building		Municipal Facilities				X
Golden Living Center - West Newton	25 Armory St.	Nursing Home				X
Heathwood Nursing & Rehab Center	188 Florence St.	Nursing Home				X
Waban Health & Rehabilitation	20 Kinmonth St.	Nursing Home				X
MBTA Riverside Line Electric Station	55 Winchester St	Power Substation				X
NSTAR Electric Station 17	334 Homer St	Power Substation				X
Langley Rd Sewer Pump Station	Langley Road	Sewer Pump Station			X	
EDCO Collaborative /N.E.W. Academy	429 Cherry Street	School				X
Integrated Learning Academy	109 Oak Street	School				X
Jackson School	200 Jackson Road	School				X
Newton North High School	457 Walnut Street	School				X
The Education Cooperative (TEC)	675 Watertown Street	School		X		
Trinity Catholic High School	575 Washington Street	School				X
Jewish Community Day School	25 LENGLEN RD	School/Child Care				X
Newton South High School	140 Brandeis Rd	School/Distribution Site/Shelter				X
Burr Elementary School		School/Shelter				X
Cabot School	229 Cabot Street	School/Shelter				X
Countryside School	191 Dedham Street	School/Shelter	X	X		X
Day Middle School	21 Minot Place	School/Shelter				X
Horace Mann School	687 Watertown Street	School/Shelter		X		X
Lincoln-Eliot School	191 Pearl Street	School/Shelter				X
Oak Hill Middle School	130 Wheeler Road	School/Shelter				X
Zervas School	30 Beethoven Avenue	School/Shelter		X		X
Elliot Street Sewer Pump Station	385 Elliot St	Sewer Pump Station			X	

Critical Facility	Location	Type	Flood Zone	City-Identified Flooding	Proximity to a Flood Claim	Overlap with Historic Wetlands
Quinobequin Rd Sewer Pump Station	136 Quinobequin Rd	Sewer Pump Station				X
Brown Middle School	125 Meadow Brook	School/Shelter				X
Echo Ridge Apts - Elder Housing	64 Thurston St.	Special Needs			X	
Newton Education Center	100 Walnut St.	Special Needs				X
Parker House	21 Parker St.	Special Needs				X

*Items shown in bold are also located in hot spots (Table 3).

The Massachusetts Climate Adaptation Report suggests that existing and capped landfills could be vulnerable, saying: "More rainstorms and associated runoff could cause structural damage, increased release of leachate, or even exposure of waste at landfills located in historic wetlands and other sensitive locations." MAPC did not investigate the status of the closed Rumford Avenue landfill. As it is adjacent to mapped wetlands and the Charles River, the City may want to review whether there are any current or future concerns.

Dams

The Massachusetts Climate Adaptation Report notes that increased intensity of precipitation is the primary concern for dams, as they were most likely designed based on historic weather patterns. The Department of Conservation and Recreation (DCR) Office of Dam Safety monitors the condition of the state's dams. A potential effect of increased significant rain events is the failure and/or overtopping of existing dams. There are twelve dams with potential impacts on Newton, including two upstream dams in Wellesley and one in Weston. Their ownership, and their condition as of 2009 are shown in Table 7. DCR potential hazard ratings are high, significant, and low; conditions were rated good, satisfactory, fair, poor, or unsafe. The State Hazard Mitigation Plan uses the term "High Hazard Potential" for dams located where failure will likely cause loss of life and serious damage to homes, industrial or commercial facilities, important public utilities, main highways, or railroads. A "Significant Hazard Potential" dam is one located where failure may cause loss of life and damage homes, industrial or commercial facilities, secondary highways, or railroads; or cause interruption of use or service of relatively important facilities. "Low Hazard Potential" dams are located where failure may cause minimal property damage to others, and loss of life is not expected.

Table 7. Dam Status

DAM	OWNERSHIP	DCR RATING 2009
Waban Hill Reservoir Dam	MA DCR	High hazard/Fair
Newton Lower Falls Dam – Finley	MA DCR	Significant hazard/Satisfactory
Cordingly Dam	MA DCR	Significant hazard/Fair
Silk Mill Dam	MA DCR	Low hazard/Not Rated
Metropolitan Circular Dam (Wellesley)	MA DCR	Significant hazard/Poor

Met Circular Dam, Hemlock Gorge Spillway (Wellesley)	MA DCR	Significant hazard/Poor *the Spillway has been rebuilt since this designation of Poor condition
Brae Burn Dam		Not listed
Nonantum Dam	MA DCR	Not listed
Bullough's Pond Dam	City of Newton	Not listed *
Carlisle St. Dam	Private	Not listed
Stoney Brook Reservoir Dam (Weston)	City of Cambridge	High hazard/Fair
Watertown Dam	MA DCR	Significant hazard/Fair

*City staff note that Bullough's Pond Dam is a significant hazard as it is currently non-compliant with DCR earthen dam safety regulations.

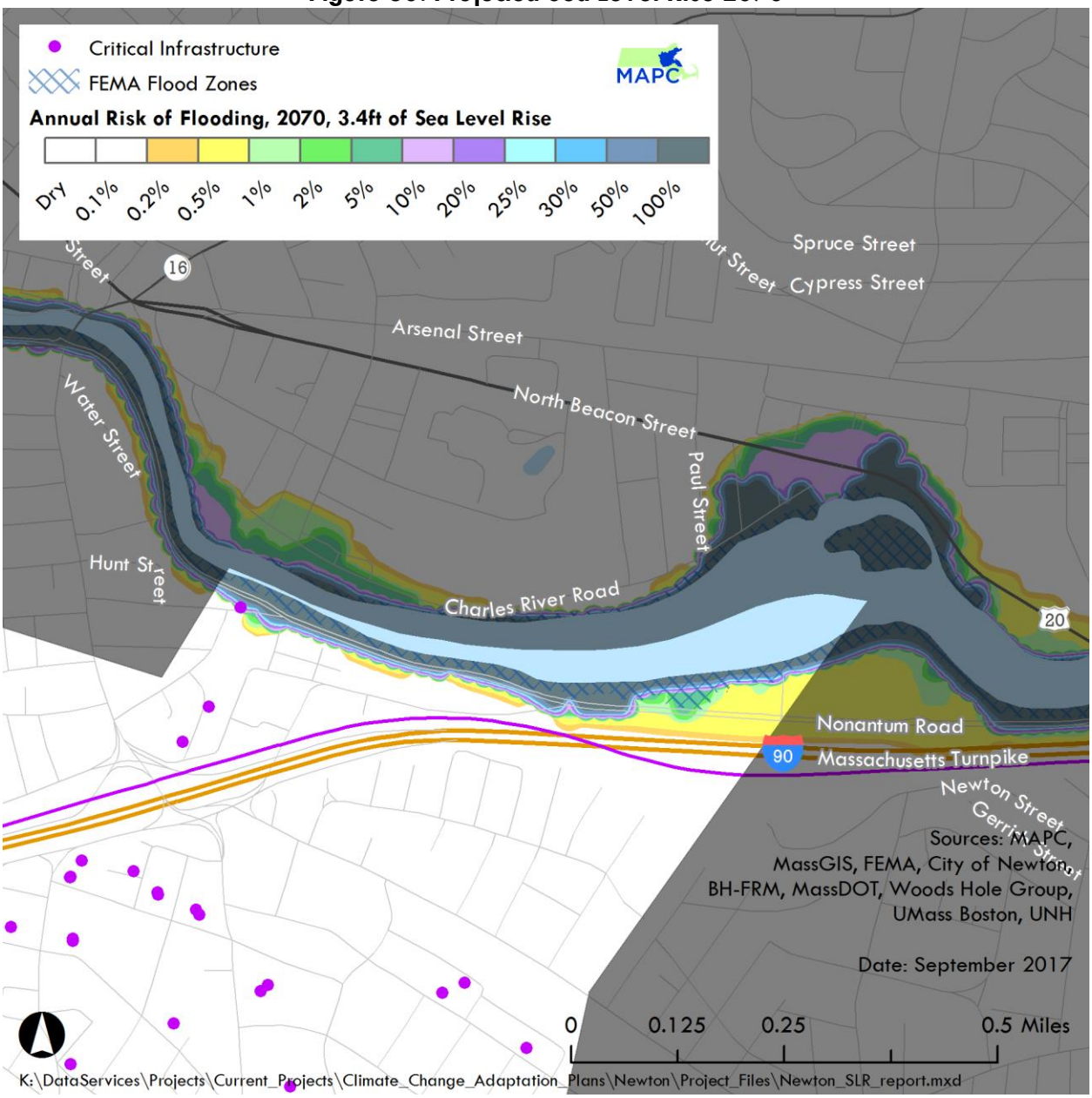
Sea Level Rise and the Built Environment

MAPC used Version 3 of the Boston Harbor Flood Risk Model (BH-FRM) developed by the Woods Hole Group (WHG) to provide projections for flooding probabilities and depths in 2030 and 2070. The BH-FRM was originally developed for Mass DOT and the Federal Highway Administration to evaluate the vulnerability of the central artery tunnel system. WHG has provided data for MAPC Metro Mayor communities.

BH-FRM models both risk of flooding and depth of flooding on the basis of sea level rise projections and projected changes in intense storm patterns. Unlike previous models of sea level rise, the BH-FRM takes into account a variety of variables, such as storm surge and wave run up. The model bases projections on .68 feet of sea level rise by 2030 and 3.4 feet of sea level rise by 2070, relative to sea level in 2013. These figures are comparable to the "high" scenario for sea level rise shown in Figure 5. While this is a conservative scenario, observed rates of sea level rise have been trending toward the high scenario in recent years.

Caution should be used in interpreting the projections. There are inherent mapping inaccuracies due to the need to interpolate between calculation nodes. The maps are not applicable at a fine-grained level to assess individual buildings. Rather the sea level rise map below is provided as general guidance for future flooding analysis. The projections are not related to FEMA flood insurance maps and cannot be used for boundary resolution or location. Details on the BH-FRM can be downloaded at:
https://www.massdot.state.ma.us/Portals/8/docs/environmental/SustainabilityEMS/Pilot_Project_Report_MassDOT_FHWA.pdf
The mapping shows no impact to Newton from sea level rise in 2013 and 2030. In 2070, the model projects that Newton could be affected by flooding along the Charles River (Figure 31). This is based on projections that, in their current configurations, the Charles River and Amelia Earhart Dams in Boston would be overtopped or flanked in low probability storms. As this scenario would have far greater impact on Boston and Cambridge, we consider it likely that steps will be taken to reconfigure the dams to address future sea level rise.

Figure 30. Projected Sea Level Rise 2070



Temperature and the Built Environment

Buildings, roads, and railways can be stressed by extreme temperatures. Heat can cause damage to expansion joints on bridges and highways and may cause roadways to deteriorate more rapidly. Extreme heat will increase demand for cooling. According to the Massachusetts Climate Adaptation Report, 2011, there is a potential for significantly increased household energy consumption as the climate warms. The report notes that because higher temperatures reduce the efficiency of electric generation, it could be difficult to meet peak electricity demands. Power outages have significant impact on public health, communications, transportation, and the economy in general.

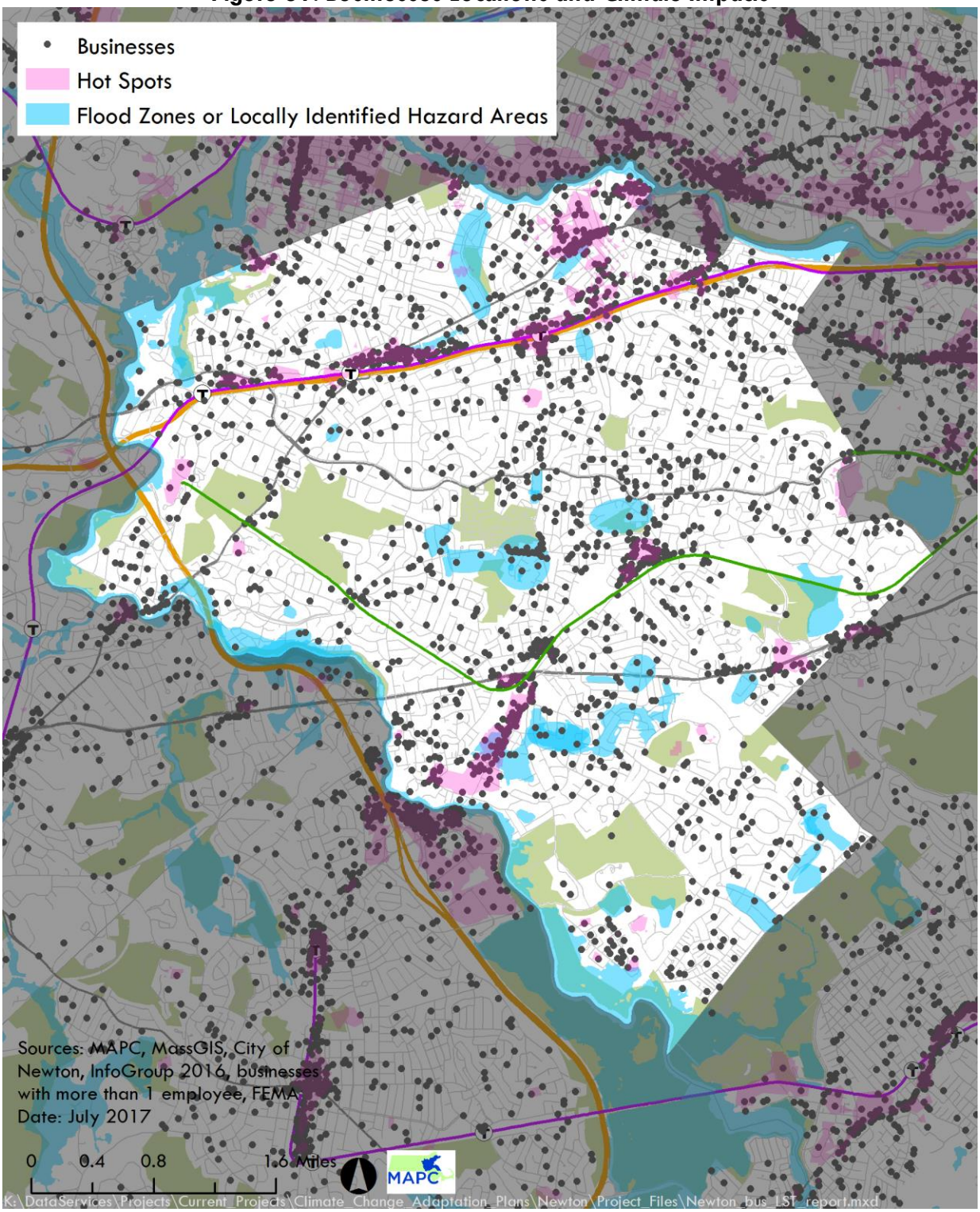
CLIMATE IMPACTS ON THE LOCAL ECONOMY

Businesses, employees, residents, and the municipality could experience financial shocks from business disruption, property damage, and property loss caused by extreme weather. Severe climate effects that result in property damage and financial stress can cause commercial and residential displacement, if the cost of repair, hardening infrastructure, and increased utility or insurance costs become too great for property owners. Job disruption during an extreme weather, such as a Nor'easter or heatwave could result in delayed projects, forced business closures, job loss, and reduced spending.

Approximately 40% of Newton's businesses are in areas with particularly high land surface temperatures (InfoGroup 2016) (Figure 32). Hot days can cause unhealthy work conditions for people who work outside, and Newton has approximately 1,800 workers who are employed in industries that have a large portion of people who work outside (InfoGroup 2016). Excessive heat can cause unsafe and uncomfortable indoor conditions as well, for both employees and patrons. Massachusetts's OSHA regulations do not currently regulate indoor temperatures or air conditioning, but employees can file complaints to the Newton Board of Health or OSHA if workplace conditions are unbearable.

In Newton, a relatively small number of businesses (6%) are located in flood zones and City-identified areas of flooding. This figure may underestimate flooding vulnerability, as it does not include additional locations, identified in this report, where flood claims have been paid. The majority (85%) of employed Newton residents commute outside of the City for work, making a functional transportation system critical for the livelihoods of residents (LEHD, 2014). Because roughly 34% of Newton's residents work in the City of Boston, mostly in Downtown Boston and the Longwood Medical area, they may be affected by flooding on critical transit corridors in Brookline and Boston, such as along the Riverway, Storrow Drive, and the Green line (LEHD, 2014). Flooding along these corridors may result in business disruption and reduced activity if employees and customers experience barriers when trying reach Newton during floods.

Figure 31. Businesses Locations and Climate Impacts



CLIMATE IMPACTS ON STATE-OWNED INFRASTRUCTURE

Massachusetts Bay Transportation Authority

The MBTA provides critical transportation services to Newton residents and businesses. Data from the MBTA Ridership and Services Statistics 2014 Report record over 21,000 daily boardings on MBTA services in Newton. While these figures include passengers from communities other than Newton (particularly the Riverside Station and Bus 57, which together account for over 7,000 boardings), reliance on the MBTA is clear.

MBTA services in Newton include the Riverside Green Line, the Framingham/Worcester commuter rail line, 13 bus lines, and The Ride (ADA compliant service). The MBTA data show that weekday ridership includes nearly 9,500 boardings at Newton Green Line Stations, and 900 at Newton commuter rail stops. An average of 253 trips per day on The Ride originated in Newton in FY 2013. Over 11,000 boardings were recorded on buses that serve Newton. Nine of 13 bus routes provide express service to Boston via the Mass Pike: they primarily provide service to Newton neighborhoods north of the Mass Pike. Daily boardings on those routes totaled nearly 4,500 passengers. The four other bus routes totaled nearly 6,800 daily boardings. They include two that provide north/south service across Newton.

MBTA climate concerns include potential damage and disruption from flooding. Extreme heat can cause buckled rails, overheated equipment, regional power failures, wear and tear on paved surfaces, and health and safety issues for workers and passengers when temperatures exceed 85 degrees. Warmer temperatures could lead to more damage from ice storms if temperatures hover around freezing.

The MBTA is taking steps to address climate resiliency. Requests for Proposals (RFPs) for architectural and engineering plans must now address historic and future vulnerabilities by the 30% design stage. Capital plan requests need to indicate whether projects will improve resiliency; they receive greater priority if they address resilience. A pilot resiliency evaluation has been conducted for the Blue Line, and an RFP is being developed for a system-wide analysis. Specific climate resiliency projects in Charlestown and Kenmore Square are already planned or underway.

Newton has already experienced a significant instance of MBTA service interruption from flooding. In the March 2010 flood, as described in the NOAA Storm Events Database, a forty-foot section of rail bed was washed out after a sinkhole – twelve feet deep and fifty feet in diameter – opened. This took place at Glen Avenue on the Riverside line, requiring bus service between the Newton Highlands and Reservoir stations. According to City officials, this caused over $1 million in damages to the MBTA and had an impact on businesses. In addition to vulnerabilities that may exist for rail lines, surface transportation could be affected if buses travel through flooded streets. Street flooding could also affect trips on The Ride.

Massachusetts Water Resources Authority

The MWRA provides drinking water and sewage treatment to the City of Newton. The MWRA has been analyzing the climate vulnerability of its systems and is working to increase resiliency in identified priority locations. The MWRA is confident that its drinking water infrastructure is not threatened by more intense storms. Pump stations and storage tanks are above flooding elevations; spillways have been improved to handle the .01% storm (1 in 1,000 years). They have reviewed the status of their dams and report no current issues. They report no concerns with the Commonwealth Avenue and Dudley Road pumping stations in Newton.

The MWRA does not anticipate issues with water supply. The Authority's safe yield of 300 million gallons per day (gpd) took into account the 1960s drought, which was characterized as a 400-year event. Current usage is 200 million gpd. The MWRA has very large reservoirs relative to the size of the watershed. Because of this capacity, and because of significant success in water conservation efforts over the past 35 years, even if a drought extends several years, the MWRA can supply all existing communities and provide assistance to neighboring communities as needed.

The MWRA has conducted an analysis of its sewer infrastructure, considering potential impacts based on modeling the 1% chance FEMA flood elevation, plus an additional 2.5 feet of elevation. Newton is not affected by the coastal pump stations that are vulnerable to storm surge. City officials note that the capacity of the sewage system has been exceeded during heavy rain events. This has resulted in the release of untreated sewage, and sewage backflow into streets and basements. According to the MWRA, capacity issues are generally caused by groundwater infiltration and inflow from storm drains, roof leaders, and sump pumps that should not be connected to the sewer treatment system.

Department of Transportation

Mass DOT is currently working with a consultant to develop a model to project the future 100-year floodplain for the 24-hour storm, using future precipitation projections. It is not yet known when the model, now in a test phase, will be available statewide, but MassDOT hopes to be able to use it to identify priority flooding locations. State roadways in Newton include Routes 9, 16, 30, and 128 (I-95), as well as the Massachusetts Turnpike.

Department of Conservation and Recreation

The Department of Conservation and Recreation (DCR) owns eight dams discussed earlier. The DCR also owns several roadways, including Hammond Pond Parkway, Quinobequin Road, and Nonantum and Charlesbank Roads.

CLIMATE IMPACTS ON UTILITIES

Electricity

Eversource is the energy utility company that services Newton. Of the five identified Eversource substations, one is located in a potential flooding area, and none are located in temperature "hot spots." Energy infrastructure is vulnerable to extreme weather, in particular winter storms, heat

waves, and floods. Ice storms, freeze/thaw cycles, and flooding can cause severe damage to infrastructure. Winter storms and hurricanes can increase loads on utility infrastructure, especially power lines and utility poles, because of increased weight from precipitation and wind. Additionally, over 90% of power outages are caused by fallen trees and limbs during storms. Heat waves are also damaging to infrastructure, because of disruptions to core components within transformers, which are already overburdened during times of increased demand on the electric grid. Flooding can corrode critical infrastructure and prevent electronic components from functioning. Eversource is currently implementing initiatives to bolster the resiliency of their critical assets. These initiatives include emergency preparedness trainings for staff, flood-proofing vulnerable substations, and updating design standards for increased precipitation and flooding.

Natural Gas

Newton's natural gas infrastructure is serviced by National Grid. There are approximately 306 miles of gas distribution lines in the City. Critical gas infrastructure includes pipelines, compressor stations, storage facilities, and control stations. This infrastructure is necessary to transport, store, and distribute natural gas.

Flooding from heavy precipitation poses a threat to underground gas infrastructure. Gas pipes rely on internal pressure to keep natural gas flowing. Water intrusion can disturb this internal pressure and result in service disruption. Gas pipes within low pressure distribution systems are the most vulnerable to flooding, because they do not have the hydrostatic pressure necessary to keep water out. Above ground infrastructure, such as compressor stations, metering stations, and control stations are also vulnerable to flooding. Freeze/thaw events can cause gas mains to break. Older cast iron pipes are the most vulnerable to freeze/thaw events. Extreme heat does not pose significant threats to gas infrastructure.

National Grid has initiated a Yearly Improvement Program targeted at enhancing resiliency in areas that have suffered repeat flood outages. The utility company has also undergone an in-depth climate vulnerability assessment of their assets to identify high risk areas. Within these areas, they will be upgrading low pressure distribution systems to high pressure distribution systems and flood-proofing aboveground infrastructure that may be affected by flooding. National Grid has verified that Newton is not within any of their high-risk distribution clusters.

Massachusetts has a gas leaks problem that adds complexity to addressing future climate impacts. The natural gas system is one of the oldest in the country. Non-protected steel and cast-iron pipes are particularly leak-prone; they constitute 3,172 miles, or 44% of the 7,215 miles of pipe main in National Grid's Boston Gas distribution system, which includes Newton. Cast iron pipes are susceptible to breaks from frost heaves, ground movement, and construction. Unprotected steel pipes are subject to corrosion.

Gas leaks release methane, the most powerful greenhouse gas, into the soil and the air. Gas leaks carry serious environmental and health risks, including suffocating the root systems of trees and forming ground-level ozone (an asthma trigger). In 2014, the Massachusetts legislature passed a law that requires gas companies to accelerate the replacement of leak-prone pipes.

Gas companies are required to submit annual Gas Safety Enhancement Plans (GSEP). In their 2017 plan, submitted in October 2016, National Grid indicated that they intend to replace 105 miles of leak-prone pipes in 2017 and complete replacement of all leak-prone pipes by 2035.

Newton has 305.6 miles of gas mains. Just over 80%, or 246 miles, are leak-prone, including 62% cast iron, and 18% non-protected steel. Most recent figures from National Grid show there are eight Grade 2 leaks and 582 Grade 3 leaks in Newton. National Grid defines Grade 2 leaks as non-hazardous to persons or property, but justifying repair based on probable future hazard. Grade 3 leaks are characterized as non-hazardous and expected to remain non-hazardous. A Grade 1 leak is an existing or probable hazard that requires immediate attention.

The 2017 National Grid GSEP includes plans for eight projects in Newton, replacing 3.38 miles of mostly low-pressure cast iron pipe. From 2018 through 2021, National Grid plans 98 projects, replacing 11.7 miles of low-pressure cast iron pipe. If implemented, this would reduce leak-prone mains 6% by 2022, leaving 231.5 miles of leak-prone gas mains. The City of Newton is working aggressively with National Grid to facilitate repair and replacement of leak-prone pipes. Efforts to identify and quickly address large leaks known as "super-emitters" are a high priority.

Telecommunications

Telecommunications infrastructure is the technology that transmits information electronically. Telecommunications systems include phone and computer networks, and the internet. This infrastructure plays a critical role in emergency response and recovery. Telecommunications infrastructure is vulnerable to extreme heat, precipitation, and storms. Most heat-related service disruptions are caused by power outages resulting from increased demand on the electric grid. Extreme heat can also cause critical infrastructure to overheat or malfunction, leading to equipment failure and reduced lifespan. Corrosion and erosion that can be caused by flooding from heavy precipitation, sea level rise, and storm surges are primary concerns for underground infrastructure and critical facilities. Heavy ice formation and snow accumulation can increase the load on telecommunication lines and infrastructure, resulting in damage. Heavy precipitation and increased humidity can interfere with the signal transmission that wireless systems rely on.

Aboveground infrastructure is vulnerable to strong winds and lightning. Wired infrastructure and utility poles are particularly vulnerable to damage from falling trees and limbs. Many providers utilize shared fiber networks that reduce redundancy and increase vulnerability to systems disruption during extreme weather.

Some service providers, such as Verizon, are taking steps to protect their infrastructure from the impact of climate change. They are creating backup power capability on critical sites, implementing emergency fuel plans for generators, hardening buildings and structures to withstand flooding and precipitation, deploying mobile communications units to heavily affected communities, and training staff to respond to emergencies. Specific data on the location of telecommunications infrastructure and networks is not publicly available. MAPC Metro Mayors

communities have the option to purchase proprietary information about telecommunications infrastructure for their communities.

VULNERABILITY ASSESSMENT SUMMARY

The key projected impacts from a warming climate include:

- Increased winter/spring precipitation and large rainfall events, resulting in flooding damage to built infrastructure and negative water quality impacts
- Increased summer drought, compromising water quality and quantity and putting stress on natural resources
- Increasing temperatures, particularly an increase in the number of days over 90°F and 100°F, affecting public health, infrastructure, and natural resources
- Rising sea level, resulting in potential flooding and habitat loss along the Charles River late in the century (if no action is taken to increase the capacity of the downstream Charles River dams)

Socioeconomic Vulnerabilities

Vulnerable populations include those who may be more susceptible to climate impacts, and those who will have more difficulty adapting to, preparing for, and recovering from, extreme weather events. Vulnerable populations that are growing, or projected to grow, include seniors, individuals living alone, people of color, and people with limited English proficiency. In Newton, residents who speak Asian languages are more likely to be linguistically isolated than those who speak other non-English languages at home. Other vulnerable populations include low-income residents, young children, and individuals with a disability or pre-existing health conditions. Social isolation increases vulnerability, as it limits access to critical information, municipal resources, and social support systems valuable in emergencies.

Recent Newton demographics, summarized from the assessment, include:

- Seniors 16%,
- People living alone..... 26% (51% of whom are seniors)
- People of color..... 20%
- Limited English-speaking households..... 5%
- Households below the federal poverty level..... 6%
- Young children (under age 5)..... 6%
- People with a disability 8%

Public Health Vulnerabilities

The health impact of increases in extreme heat and heat waves are a primary concern. Heat is the leading cause of weather fatalities, and exposure to high temperatures can cause a variety of heat-related illnesses. Young children and seniors are more physically vulnerable to heat than other age groups. Those who work outdoors or participate in outdoor physical activity increase their susceptibility to heat-related illness, as do those in older housing stock, or those without

access to air conditioning. People who require electric medical equipment may be at increased risk during loss of power. Extreme heat is often accompanied by high humidity and poor air quality. These conditions can aggravate or trigger cardiovascular and respiratory illnesses. Low-income individuals and people of color may be at increased risk of such illnesses due to a higher prevalence of these chronic diseases. Areas with less shade and a higher percentage of dark surfaces will experience the highest temperatures, known as the "heat island effect".

Health-related problems from flooding can include diseases from mold in flooded homes and from contact with contaminated water. Such contact can happen in the home because of sewage back-ups and overflows, or in polluted recreational waters. A changing climate may cause an increase in mosquitos and ticks, as well as the illnesses they spread, such as eastern equine encephalitis, West Nile virus, and Lyme disease. Forecasting change in vector-borne illnesses, however, is complicated by a variety of climate and non-climate factors that may have conflicting effects. Those who spend significant time outdoors and/or live close to vector habitats are most vulnerable to vector-borne diseases. Substandard housing may increase contact with mosquitoes in the home.

Natural Resources Vulnerabilities

Newton's existing natural resources lessen climate impacts. Trees confer many benefits, including carbon absorption and storage, air pollution removal, and stormwater interception. Tree-shade provides relief from heat and reduces energy demand from air conditioners. Wetlands, forests, and other open lands soak up and store rainwater, reducing flooding and protecting water quality. Maintaining open space in floodplains allows the land to absorb the brunt of flooding without impact to homes and infrastructure.

Aquatic resources will be affected by warmer temperatures and by changes in the timing and amount of precipitation. Stormwater from rain washes pollutants into waterways and may cause erosion. In large rain events, waterways may be affected by sewage overflows. Warmer summer temperatures may lead to an increase in aquatic vegetation, which can deplete dissolved oxygen and may have negative effects on aquatic animals and recreational use of waterbodies. Warmer waters, seasonal low-flow or no-flow events, and low levels of dissolved oxygen in the water, may result from a shift in precipitation patterns toward earlier spring runoff and more frequent summer droughts. The report details existing water quality impairments identified in relation to the Clean Water Act. While Newton has made significant investments to improve water quality, many of the identified impairments may be exacerbated by climate impacts.

Trees will be affected by warming temperatures. Trees adapted to warmer climates are predicted become more abundant, while those that grow well in more northern climates will decline. Trees may also be subject to new pests and diseases that can thrive in a warming climate. Drought and wildfire, as well as ice storms, can weaken and damage trees. The Open Space Plan indicates that forested acreage has declined by 20% in the past 25 years, while street trees have decreased by 25% since the early 1970s. Street trees can be damaged by gas leaks.

Built Environment Vulnerabilities

Flooding

Flooding due to rain is already a significant problem in Newton. This report documents the severity and frequency of damaging floods over the past 60 years. An increasing frequency and intensity of storms will exacerbate future flooding. A key finding is that more than 75% of identified flood claims are for properties located outside of FEMA flood zones. This is likely related to overburdened storm drain systems and/or to filled or buried historic wetlands and waterways: a preponderance of the claims outside flood zones align with "areas requiring drainage" shown on an 1892 map of Newton.

Properties outside of FEMA flood zones are not subject to floodplain regulations, and property owners are not formally warned of their flood risk. Future development that increases impervious surfaces or further alters natural drainage will exacerbate flooding problems. This report identifies critical facilities in flood zones, in City-identified flood prone areas, in proximity to previous flood claims, and overlapping historic wetlands identified in the 1892 map of Newton. These categories serve as proxies to identify areas that may be subject to increased flooding in the future.

Sea level rise

The Woods Hole Group model projects that by 2070, flooding along the Charles River due to storm surge will overtop or flank the downstream Charles River dams. As this scenario would have great impact on Boston and Cambridge, it is likely that steps will be taken to reconfigure these dams, thereby protecting Newton from any direct impacts of sea level rise.

Temperature

Heat can cause bridges, roadways, and railways to deteriorate more rapidly. The report identifies land projected to be in the hottest 5% in the MAPC region. As the climate warms, increased demand for cooling combined with the decreased efficiency of electric generation at high temperatures may make it difficult to meet peak energy demands. Power outages have significant effects on public health, communications, transportation, and the economy in general.

Local Economic Vulnerabilities

Approximately 40% of businesses are located in hot-spots. A relatively small number (6%) are located in flood zones and identified flooding areas. This figure does not, however, include those that are located in former wetlands. Approximately 85% of employed Newton residents work outside of Newton. The largest concentrations work in Downtown Boston, the Longwood Medical area and the Back Bay. Transportation to these areas may be subject to interruption from flooding.

State-Owned Infrastructure Vulnerabilities

MBTA

As of 2014, ridership across all MBTA services in Newton exceeded 21,000 daily boardings. MBTA climate concerns include damage from flooding as well as from heat. Flooding in 2010 caused significant damage on the Riverside "D" line in Newton. Health of passengers and workers is a concern at times of high heat. The MBTA is also concerned that warmer temperatures in the winter could result in more damage from ice storms. The MBTA is proceeding with plans for a system-wide climate vulnerability analysis.

Massachusetts Water Resources Authority

The MWRA provides water and sewer service to Newton. The MWRA has analyzed the vulnerability of its systems. Drinking-water infrastructure is not threatened, even by more intense storms; and the MWRA's analysis is that even if a drought extends for several years, the Authority can supply drinking water to all its communities. Newton's sewage treatment is not vulnerable to coastal storm surges. The capacity of the sewer system has, however, been exceeded during heavy rain. This has resulted in the release of untreated sewage and backflow into streets and basements.

Department of Transportation

State roadways in Newton include Routes 9, 16, 30, and 128 and the Massachusetts Turnpike. MassDOT is currently working to develop a model to project the future 100-year floodplain for the 24-hour storm, based on future precipitation projections. The model is in a test phase; it is not known when it will be available statewide.

Department of Conservation and Recreation

The DCR owns eight dams and inspects an additional one located in, or potentially affecting Newton. Increased precipitation intensity is the primary concern as it could affect dams that were likely designed for historic weather patterns.

Utilities Vulnerabilities

Electricity

Eversource is the energy utility company servicing Newton. Eversource's climate concerns include winter storms, heat waves, and floods. Ice storms, freeze/thaw events, and flooding can cause severe damage to infrastructure. Power outages result from downed lines due to falling trees or ice, and from increased demand and equipment failures during extreme heat. Of the five Eversource substations in Newton, one is located in historic wetlands and one is located in a "hot spot." Eversource's resiliency initiatives include flood-proofing vulnerable substations, updating design standards for future flooding, and emergency preparedness training for staff.

Natural Gas

National Grid is the natural gas provider for Newton. Gas pipes and infrastructure are vulnerable to corrosion and damage from flooding. Freeze/thaw events may cause gas mains to

rupture. Gas leaks release methane into the soil and air, contributing to greenhouse gases in the atmosphere and threatening public health and safety. The leaks damage trees by suffocating root systems, and form ground-level ozone, which is an asthma trigger. Due to the damaging impacts and high risk of leaks, the state has required gas companies to accelerate replacement of leak-prone pipes.

In their 2017 plan, National Grid indicated that 80% of Newton's gas mains are leak-prone. Most recent figures reflected nearly 600 gas leaks in Newton. The National Grid plan projects that they will complete replacement of all of their leak-prone pipes by 2035. If successful, climate vulnerability should decline. The City of Newton is working aggressively with National Grid to facilitate repair and replacement of leak-prone pipes. Newton is a leader in efforts to identify and quickly address large leaks known as "super-emitters".

Telecommunications

Telecommunications systems include phone and computer networks and the internet. This infrastructure plays a critical role in emergency response and recovery. Vulnerabilities essentially mirror those described above in the *Electricity* section. Specific data on the location of telecommunications infrastructure and networks is not publicly available. A key concern is that many providers utilize shared fiber networks. This reduces redundancy and increases vulnerability to disruption during extreme weather.

ADAPTATION AND RESILIENCY ACTION PLAN

Introduction

In developing and adopting this plan, the City of Newton joins a small but growing group of municipalities taking action to address future climate risks. The field of climate resilience is relatively new and climate projections are regularly updated. As such, this plan should be considered a living document, subject to updates and improvement. A key recommendation is that the City reconvene and expand its original Steering Committee. The committee should meet regularly to ensure proposed actions are being evaluated and implemented. A first task of the committee will be to review recently received public feedback (see below) for inclusion in the plan. Action items span all municipal departments, so coordination and communication will be critical. It will also be important to coordinate efforts as Newton develops its Climate Action Plan, as many actions will support both climate mitigation and future resilience.

On-Going Efforts

The City of Newton has already taken numerous steps to improve its resilience to extreme weather. Flooding, heat waves, and drought are projected to become more frequent and severe over the course of this century, but they are not new concerns. Thus, while planning for climate resilience is a relatively new endeavor, Newton starts with a firm foundation to support its future efforts.

The City has instituted many specific adaptation strategies, including:

- Funding of a Sustainability Office to coordinate climate efforts

- Creating a stormwater utility with incentives for stormwater infiltration
- Incorporating updated 10-year, 24-hour rainfall rates into DPW stormwater requirements
- Adopting a stretch code for energy conservation and resilience to heat events
- Investing in stormwater analysis and improvements, including green infrastructure projects
- Establishing strong emergency planning
- Administering public health and wellness programs
- Conducting senior outreach and support activities
- Including green infrastructure in the Complete Streets policy
- Opening of cooling centers during heat waves

While this plan focuses on adapting to climate change, it is critical to continue efforts to reduce greenhouse gas emissions through mitigation efforts. The City of Newton, its residents, and its businesses, have already taken many steps to promote energy conservation and the use of renewable energy.

- Initiating Newton Power Choice (community aggregation program)
- Newton's Community Solar Share Initiative.
- Coordinating with National Grid to repair gas leaks
- Starting a Home Energy Savings program
- Starting a Business Energy Savers program
- Creating a transportation strategy that encourages alternatives to car use
- Providing home weatherization and solar credits for low-income households

Many items listed above, and many of the recommendations that follow, will both reduce greenhouse gas emissions and improve City resilience to future extreme weather.

New Recommendations

This plan recommends actions that should be undertaken even in the absence of climate change, as they are likely to generate economic, environmental, and social benefits. The use of green infrastructure and low impact development techniques, for example, reduces stormwater runoff and cooling costs and it provides recharge to groundwater aquifers, supports local ecosystems, and provides residents with additional green space. This plan recommends strategies that span planning, policy, design, community outreach, and more. Many require additional analysis and planning and/or financial resources. Recommendations address ongoing implementation as well as every category of vulnerability discussed in this analysis. Many recommendations address multiple vulnerabilities and concerns.

A. Implementation Recommendations

Climate change modeling has inherent uncertainties and will be affected by unknown levels of future greenhouse gas emissions. Newton will also change over time, as will technologies and other means of climate mitigation and adaptation. Expanded and coordinated participation across City departments will strengthen City efforts. Evaluation and implementation of action items will require on-going coordination, monitoring, and leadership from the City, a Steering

Committee, or other successor group to ensure that climate resilience is incorporated into all City planning documents and activities.

Climate related issues should be incorporated into City planning including capital planning, operations budgets, zoning, the Complete Streets policy, the master plan, the open space plan, the hazard mitigation plan and emergency planning. It is especially important that climate change be considered in the capital planning process. Large capital projects present opportunities to make significant improvements in climate resilience that might otherwise be cost-prohibitive. Climate considerations are also appropriate for smaller capital projects. As an example, road reconstruction provides an opportunity to reduce road width and incorporate green infrastructure.

B. Socio-Economic Recommendations

Newton has many programs that provide services and connect to vulnerable populations. Newton should continue to catalogue current efforts and identify gaps in services. Priorities include outreach to linguistically isolated households, heat and flooding retrofit support for low-income households, and assessing the preparedness of facilities in Newton that serve vulnerable populations. Outreach will provide valuable feedback regarding resident concerns and needs. Social connectedness helps communities prepare for, respond to, and recover from natural disasters. Communities with stronger ties and networks have reacted faster to meet needs and begin recovery efforts. A growing body of evidence indicates that social cohesion is a protective health factor as those with stronger connections typically experience healthier outcomes.

C. Public Health Recommendations

Prolonged periods of higher temperatures will occur all over the City and will be magnified by "heat islands", heavily paved and densely built areas, usually in village centers. Those living in such areas, and those without air-conditioners will be disproportionately affected. Exposure to mold and vector-borne illnesses are additional climate-related concerns. Public health strategies overlap significantly with social vulnerability efforts and strategies for improved heat and flood protection included under "*Built Environment*" and include efforts such as addressing the health impacts of extreme heat and education about increased tick and mosquito risks.

D. Natural Resources Recommendations

Natural resources can be adversely affected by climate change, and changes in natural resources can compound effects of climate change. One key concern in Newton is the continued loss of trees to development and the loss of street trees to disease and gas leaks. Trees play a critical role in mitigating climate change and cooling local areas. Compromised water quality and extremes of water quantity, and resulting impacts on aquatic life are also of concern. The critical role of natural resources in climate change mitigation and climate adaptation cannot be overstated and is addressed throughout the report. Natural Resource recommendations focus on the protection and enhancement of green space and using green infrastructure and low impact development to provide protection from flooding and heat impacts and water quality degradation.

Green Infrastructure and Low Impact Development should be maximized. Green Infrastructure (GI) is an approach to infrastructure and natural resource management that incorporates natural features, such as forests and wetlands, as well as engineered landscapes that mimic natural processes. Green infrastructure practices include preservation and restoration of natural landscapes, along with the use of rain gardens, porous pavements, green roofs, infiltration planters, trees and tree boxes, and rainwater harvesting systems. GI is a cost-effective, resilient approach to managing wet weather impacts. Low Impact Development (LID) is a development process that begins with smart growth-based best site planning practices to identify critical natural resource areas for preservation and uses Green Infrastructure to maintain natural drainage flow paths and reduce impervious surfaces.

Recommendations include: 1) protecting large and/or connected green spaces to foster ecological resilience and biodiversity; 2) removing asphalt, planting trees, and installing green or white roofs to cool "hot spots"; 3) maintaining and creating open space buffers to protect water quality and provide flood protection; 4) identifying locations where soil will support stormwater infiltration, and increasing tree planting to address net losses and increase tree canopy.

E. Built Environment

Flood Recommendations

Periodic flooding is natural, but man-made impervious surfaces in densely developed areas makes it worse. In Newton, as elsewhere, flood damage is exacerbated by development that has encroached into natural floodplains and re-engineering of wetlands and streams. The City is devoting significant resources to stormwater infrastructure improvements that will reduce flooding. Recommended actions include incorporating Green Infrastructure and Low Impact Development in zoning and guidelines, strategies to address flooding that occurs outside of FEMA flood zones, retrofitting city facilities, and outreach to residents in chronic flooding locations.

Heat Recommendations

Recommended actions focus on improving buildings for the health and comfort of occupants, and on reducing heat and heat island impacts. Many Green Infrastructure/Low Impact Development strategies in the flooding section will also reduce heat impacts by reducing paving and expanding green space. Recommendations include green building and landscaping requirements, use of permeable and reflective pavement, and reduced use of paving in general.

Flood and Heat Recommendations

Recommended actions such as use of microgrids, district energy, and battery storage, and prioritizing retrofits of City facilities vulnerable to flooding and heat impacts, promote resilience in the event of power outages caused by heat, flood, and other extreme weather. Other recommendations focus on public outreach regarding flooding and high heat locations, and retrofit strategies.

F. Economic Recommendations

Many actions relevant to the business community are addressed under *Built Environment*. Newton/Needham Chamber of Commerce members expressed particular concern about the impacts of power outages. This plan recommends assisting local businesses to develop emergency preparedness plans.

G. State-owned Infrastructure Recommendations

State agencies own, or are responsible for, significant critical infrastructure in Newton. The City has an interest in ensuring that these facilities are prepared for climate change. The City should also make sure that state agency activities (for example vegetation management) do not adversely impact other climate goals. State agencies are in various stages of developing climate resilience analysis and plans. As a result of Governor Baker's Executive Order 569, all will be required to identify adaptation options for their assets. This plan recommends establishing close relationships with state agency staff responsible for climate resilience.

H. Utilities Recommendations

As with state-owned infrastructure, the City has an interest in climate resilience and in limiting adverse impacts of the utilities that serve Newton. The City is already working closely with National Grid to address natural gas leaks. Recommended actions focus on improved coordination and increased redundancy. Telecommunications present challenges, as there are multiple providers and specific information on infrastructure is not publicly available.

Public Feedback

The draft plan was reviewed in two forums. In November 2017 the plan was presented at an event sponsored by the Newton/Needham Chamber of Commerce. In October 2018 the plan was reviewed in a workshop funded by a grant from the state Municipal Vulnerability Preparedness program. Most participants in the November 2017 presentation were members of the business community. Participants in the October 2018 workshop included city councilors, city board and commission members, and representatives of community organizations and neighborhood councils.

Priority Recommendations

In each forum participants prioritized the recommendations in the draft report. The top five priorities were the same for both groups. In order of the strength of support, they are:

1) Ensure that the current zoning/ordinance review incorporates climate resilience. This included support for Green Infrastructure, Low-Impact Development, and Green Building and Landscaping requirements that would reduce paving, and address stormwater and heat-island impacts. Workshop participants included recommendations for mandatory standards (rather than guidelines), no net loss of permeable surfaces, and tax incentives to minimize runoff.

2) Increase tree planting. Participants emphasized the importance of reversing the decline of street trees and utilizing trees to manage heat islands and stormwater. Workshop participants highlighted the need to fix gas leaks as part of protecting street trees.

3) Incorporate climate resilience in open space planning.

4) Improve emergency communications and support to vulnerable populations including the linguistically isolated, low income, and those unable to evacuate.

5) Establish relationships with state agency staff responsible for climate resilience (DCR, DOT, MBTA, MWRA). Communicate City concerns and priorities, and stay abreast of agency planning. Workshop participants emphasized working cooperatively with state agency representatives.

Business owners at the Chamber of Commerce forum indicated that power outages are their primary climate concern. They added another priority from among the recommendations:

6) Encourage use of microgrids, district energy, and battery storage for critical facilities.

Additional Recommendations

Workshop participants also offered valuable new recommendations for the City to consider. They include:

7) Incorporating lifetime cost/benefit analysis in budget discussions (e.g., considering the lifetime benefits of trees as well the planting and maintenance costs), and

8) Two new areas of focus: Education and Transportation.

Education

Incorporate climate change in the school curriculum.
Develop a public communication strategy for climate change and sustainability.
Educate the public about green infrastructure, adaptation, and vulnerability.
Educate the public about invasive species.
Train local officials on green infrastructure. Develop staff capacity on climate issues across all departments.
Encourage families to develop a climate vulnerability plan.

Transportation

Develop Green and resilient transportation infrastructure.
Create a low-stress multi-modal transportation system.
Lower or eliminate parking minimums in zoning.
Create safe bike lanes and pedestrian walkways, and walkable village centers.

Socio-Economic

Develop neighborhood social networks to support vulnerable populations (Brookline Buddies program that partners older adults with volunteers, as an example).
Create a list of vulnerable populations.
Plan for potential climate related in-migration from other communities.
Include community centers in disaster planning.
Encourage block parties for climate change awareness and social cohesion.
Develop kits of emergency supplies to distribute, set up distribution centers, and consider bulk purchase.

Natural Resources

Promote local agriculture and food production.
Develop a food waste reduction program for the schools.
Increase protected open space.
Support ecological restoration to ensure ecosystem function.
Develop a reuse plan for golf courses.
Ban toxic lawn chemicals and encourage natural landscaping.
Ban plastic bags and reduce plastic waste/Styrofoam.
Plant trees on lawns.
Identify places where water can be stored (increase capacity in advance of storms).

Infrastructure

Prioritize implementation of the Stormwater Improvement Plan.
Address flood mitigation in high risk areas with new development through zoning.
Assess fees for heat island impacts.
Move utilities underground.
Upgrade electric distribution system (for EV's, heat pumps, etc.).
Install heat pumps in schools and municipal buildings.
Electrify the grid and new building development.
Develop waste management systems that create energy.
Solarize: encourage power purchase agreements for local businesses.
Fix gas leaks.
Get rid of gas pipelines – plan for future transformation.
Direct the City's pension funds out of fossil fuels.

Summary of Recommendations

The report recommendations have been organized in the matrix below, noting the most relevant planning process that would "house" the initiative, the lead department(s), and possible timelines for each action. Each action is listed by category and number to facilitate identification. Categories include: A) Implementation; B) Socio-Economic; C) Public Health; D) Natural Resources; E) Built Environment; F) Economic; G) State-owned Infrastructure; and H) Utilities. "Emergency

Management" in the Lead Department column refers to the Mayor/Executive Office, Police Chief, Fire Chief, and the Health and Human Services Department.

Appropriate Plan/Process	Recommended Action	Lead Department(s)	Possible Timing	Category and Action #
• ALL	The Steering Committee, or a successor group, should continue to meet to establish priorities, incorporate new information, and monitor progress on climate goals. The City should expand the Steering Committee to include additional relevant departments, such as Senior Services, Inspectional Services, and Urban Forestry.	• Steering Committee	FY18-19 on	A3
• ALL	Establish relationships with state agency staff responsible for climate resilience. Communicate City concerns and priorities and stay abreast of agency planning (e.g. DCR and MWRA).	• Sustainability • Executive Office	On-going	G1
• Annual Departmental Budgets	Provide training to empower City staff to implement cutting edge techniques for green practices. [i]	• ALL	FY18-19 on	E2
• Capital Improvement Plan (**CIP**)	Place signage at popular park and recreation areas to inform residents about tick/mosquito protection measures.	• Parks and Rec • Planning • HHS	FY19	C3
• Capital Improvement Plan (**CIP**)	Assess municipal properties for opportunities for LID/GI retrofits. [ii]	• Public Facilities	On-going	E5
• Capital Improvement Plan (**CIP**)	Prioritize retrofits and emergency planning for City facilities vulnerable to flooding and heat impacts.	• Public Facilities	On-going	E15
• Capital Improvement Plan (**CIP**)	Target affordable housing sites and low-income residents for flood and heat protection upgrades.	• Planning	FY20	B3
• Capital Improvement Plan (**CIP**)	Prioritize public health education programs that address the illnesses and conditions forecast to be exacerbated by climate change (e.g., extreme heat). [iii] [iv]	• HHS	FY20	C1
• Capital Improvement Plan (**CIP**)	Publicize hot spot and potential flooding areas to current residents, businesses, and to permit applicants. Direct them to educational materials.	• Planning • ISD	FY22	E14
• Capital Improvement Plan (**CIP**)	Develop and distribute education and outreach materials on climate related technologies and practices including, for example, elevating utilities, preventing backflow, protecting basements, and weatherization. Consider targeting flooding areas outside of flood zones, including areas with older housing stock, and properties with chronic mold issues. [v]	• ISD	FY20	E13
• Capital Improvement Plan (**CIP**) • Stormwater Infrastructure Improvement Plan (**SIIP**)	Prioritize energy efficiency and stormwater management in capital planning.	• Sustainability • DPW • Executive Office	FY18-19 on	E8
• Stormwater Infrastructure Improvement Plan (**SIIP**)	Utilize flood claim (losses) mapping to target stormwater improvements.	• DPW	On-going	E7
• Stormwater Infrastructure Improvement Plan (**SIIP**)	Look for stream daylighting or re-naturalizing opportunities to restore natural habitat as part of stormwater or other infrastructure projects. [vi]	• DPW • Planning	As needed	D3

Appropriate Plan/Process	Recommended Action	Lead Department(s)	Possible Timing	Category and Action #
• Stormwater Infrastructure Improvement Plan (**SIIP**)	Reach out to property owners in a specific catchment area (as a pilot project) about ways to improve conditions through Green Infrastructure and stormwater projects. Locations could include an area prone to chronic flooding or an important resource area such as the Crystal Lake watershed.	• DPW • Planning	FY20	E6
• Comprehensive Emergency Management Plan (**CEMP**)	Identify gaps in services to vulnerable populations and prioritize: developing strategies to address gaps, coordinating with community partners to strengthen relations, and considering staff/Medical Reserve Corps involvement in emergency plans.	• Emergency Management • Steering Committee	On-going	B1
• Comprehensive Emergency Management Plan (**CEMP**)	Update the Comprehensive Emergency Management Plan to incorporate changes in emergency situations and response activities that may result from climate impacts.	• Emergency Management	At next cycle	C4
• Comprehensive Emergency Management Plan (**CEMP**)	Develop advance shelter-in-place and communication strategies for residents who may not be able to evacuate during emergencies.	• Emergency Management	On-going	B6
• Comprehensive Emergency Management Plan (**CEMP**)	Assist local businesses in developing emergency preparedness plans. [vii]	• Sustainability • Planning	On-going	F1
• Comprehensive Emergency Management Plan (**CEMP**)	Identify and support vulnerable households most in need of air conditioning. Encourage use of efficient air conditioning.	• HHS	FY20	C5
• Comprehensive Emergency Management Plan (**CEMP**)	Ensure redundancy in the City's emergency communications infrastructure.	• Emergency Management	On-going	H2
• Comprehensive Emergency Management Plan (**CEMP**) • Hazard Mitigation Plan (**HMP**) • Emergency Support Functions (**ESF**) Model	Review climate projections and revise and update climate resilience priorities every five years.	• Sustainability	FY23	A1
• Comprehensive Emergency Management Plan (**CEMP**) • Hazard Mitigation Plan (**HMP**)	Communicate emergency preparedness information to linguistically isolated households.	• Emergency Management	On-going	B4
• Comprehensive Emergency Management Plan (**CEMP**) • Hazard Mitigation Plan (**HMP**)	Incorporate and prioritize climate resilience and energy efficiency, stormwater management into all City planning documents and activities.	• Executive Office • Planning	On-going	A4
• Comprehensive Emergency Management Plan (**CEMP**) • Hazard Mitigation Plan (**HMP**)	City departments should review the projections and reevaluate climate vulnerabilities relevant to their assets and mission and identify potential and current activities that bolster resilience.	• All	FY18-19	A2
• Hazard Mitigation Plan (**HMP**)	Explore joint procurement opportunities with MAPC to purchase emergency generators and pumps.	• Facilities • Emergency Management	As needed	E12

Appropriate Plan/Process	Recommended Action	Lead Department(s)	Possible Timing	Category and Action #
• Hazard Mitigation Plan (**HMP**)	Evaluate readiness of facilities that serve vulnerable populations (e.g. group homes). Assess retrofit needs and evacuation plans. Assess air conditioning and back-up generators. Encourage sign-up for the emergency notification system.	• Emergency Management	On-going	B2
• Hazard Mitigation Plan (**HMP**)	Work with local health providers to provide emergency preparedness information to clients with physical and mental disabilities.	• Health and Human Services	On-going	B5
• Street Tree Planting Plan (**STPP**)	Increase funding for increased street-tree planting and landscaping at public facilities in "hot spot" areas. Continue to increase tree diversity and consider trees well-adapted to warming temperatures to boost climate resilience. [viii]	• Parks and Rec/Forestry	On-going	C2
• Zoning Redesign	Ensure that the zoning ordinance requires Green Infrastructure/Low Impact Development/Renewable Energy through, e.g., green buildings, creative approaches to parking, driveways, street width, stormwater, and site plan review in all development and redevelopment. Include incentives to increase green landscaping, reflective pavements, and cool or green roofs to lessen heat island impacts. [ix] [x]	• Planning	FY18-19	E1
• Zoning Ordinance	Establish green building requirements. [xi]	• Planning • ISD	FY19-20	E9
• Floodplain Ordinance	Expand the floodplain ordinance to include documented areas of flooding. [xii]	• Planning	FY21	E3
• Floodplain Ordinance	Develop plans to address flooding outside of FEMA flood zones (e.g., expand wetlands protection jurisdiction, restrict basements, or require flood proofing for basements).	• Planning • ISD	FY20	5E4
• Open Space and Recreation Plan (**OSRP**) • Conservation Restrictions (**CR**s)	In open space planning include: 1) protecting large, connected or buffering green spaces to foster ecological resilience and biodiversity; 2) removing asphalt; 3) planting trees; and 4) identifying locations where soil will support stormwater infiltration. .[xiii]	• Planning	FY18-19 (plan due in 2020)	D1
• DPW evaluation of specific bridge and culvert projects	Ensure that bridge and culvert repairs take into account future precipitation projections. [xiv]	• DPW	As needed	D2
• DPW review of special permits, administrative site plans, and proposed subdivisions. • Zoning Ordinance or LID Ordinance. • Complete Streets Policy	Incorporate depaving permeable concrete, and GI/LID stormwater management guidelines into street design for construction and reconstruction. Use GIS to prioritize areas where such activities will address flooding.	• DPW • Planning	FY20	E10
• DPW monthly meetings with Eversource (electrical distribution), National Grid (gas distribution), and Verizon (communication distribution).	Work with Eversource to address vulnerabilities and coordinate work, including capital improvements and vegetation management, to ensure protection of Newton assets.	• Sustainability • DPW	On-going	H1
• Newton North High School microgrid plan. • Newton Wellesley Hospital microgrid plan.	Encourage use of microgrids, district energy, and battery storage to keep critical facilities functioning in the event of power loss. [xv]	• Sustainability	FY19-20	E11

[i] The University of New Hampshire Stormwater Center conducts research and offers technical training on innovative stormwater treatments.

[ii] Possible project with MAPC.

[iii] The Bureau of Environmental Health of the Massachusetts Department of Public Health has online resources, including a conceptual pathways matrix that identifies hazards, exposures, vulnerable groups, and health risks https://matracking.ehs.state.ma.us/Climate-Change/conceptual-pathways.html.

[iv] Center for Disease Control Extreme heat guidebook: https://www.cdc.gov/climateandhealth/pubs/extreme-heat-guidebook.pdf MAPC's Keep Cool App. MAPC's Keep Cool App.

[v] Example: Basement protection materials from Kingston, Ontario, Canada (https://utilitieskingston.com/Wastewater/BasementFlooding/Protect).

[vi] Example: The Muddy River project in Brookline and Boston has restored natural habitat and reduced flooding risk.

[vii] Example: The City of Cambridge and MAPC partnered in providing workshops to small business owners. The City of Cambridge maintains a Business Emergency Preparedness website: https://www.cambridgema.gov/CDD/econdev/resourcesforbusinesses/smallbusiness/emergencypreparednessforbusinesses

[viii] The U.S. Forest Service has developed a comprehensive manual, "Forest Adaptation Resources: Climate Tools and Approaches for Land Managers," available at https://www.fs.fed.us/nrs/pubs/gtr/gtr_nrs87-2.pdf.

[ix] MAPC Low Impact Development Toolkit, ex. Town of Littleton Low Impact Development Manual.

[x] Examples: Seattle Green Factor establishes green landscaping requirements for projects of a certain size. Sacramento Parking Lot Shading Requirement mitigates urban heat island impacts.

[xi] The Boston Planning and Development Agency has a climate resiliency checklist that could be modified for use in Newton. LEED resources include climate resilience screening tools. Example: The City of Cambridge has developed sustainable building requirements.

[xii] The Town of Braintree floodplain by-law includes documented areas of flooding outside FEMA flood zones.

[xiii] The Metro Mayors Climate-Smart Region (CSR) Decision Support Tool is a new GIS-based program developed to prioritize locations for green infrastructure. The CSR program analyzes spatial data in four climate strategies: Connect (carbon-free transportation links), Cool (shade areas to reduce heat), Absorb (innovative stormwater management), and Protect (natural land buffers for sea level rise). MAPC can provide training on use of the tool.

[xiv] Massachusetts Stream Crossing Handbook: http://www.mass.gov/eea/docs/dfg/der/pdf/stream-crossings-handbook.pdf and State grant program for replacement of high ecological value culverts.

[xv] The state's Advancing Commonwealth Energy Storage (ACES) program, and the Mass Clean Energy Center Community Micro grids program. Examples: The City of Northampton is building a microgrid to power its DPW, emergency shelter, and local hospital.

#187-18

Ruthanne Fuller
Mayor

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Barney S. Heath
Director

M E M O R A N D U M

DATE: December 7, 2018

TO: Councilor Albright, Chair
Members of the Zoning and Planning Committee

FROM: Barney S. Heath, Director of Planning and Development
James Freas, Deputy Director of Planning and Development
Amanda Berman, Director of Housing & Community Development
Jennifer Caira, Chief Planner

RE: **#187-18** DIRECTOR OF PLANNING requesting amendments to the Inclusionary Housing provisions of Chapter 30, Newton Zoning Ordinance, to increase the required percentage of affordable units; to require that some affordable units be designated for middle income households; to create a new formula for calculating payments in lieu of affordable units; and to clarify and improve the ordinance with other changes as necessary.

MEETING DATE: December 10, 2018

CC: Jonathan Yeo, Chief Operating Officer
Jonah Temple, Assistant City Solicitor
Planning & Development Board
City Council

Over the past year and a half, the Planning Department has greatly appreciated your committee's interest in working with us to craft an amended Inclusionary Zoning ordinance that more effectively meets the diverse housing needs of today's Newton. Your comments and questions, as well as those from the public, helped us focus in on specific areas in need of improvement and greater research. The productive back and forth during this time has led to what we believe is a very strong ordinance that works to accomplish multiple goals and maximize public benefit.

As you know, staff has carefully examined every section of our proposal, testing our ideas with urban planners across the region, as well as economic development consultants and local developers. Throughout our process we have tweaked the many provisions of the ordinance based on feedback from City Councilors, stakeholders, and housing development experts. Utilizing RKG's Financial Feasibility Model, developed specifically to test our inclusionary zoning proposal and assumptions, we have run hundreds of scenarios to identify percentage requirements that extract the greatest number of affordable units from a project while not rendering a project financially infeasible.

While we are sensitive and appreciative to the fact that our proposed ordinance does not meet all of Newton's affordable housing goals, particularly as they relate to extremely low-income households, our department is prepared to continue the hard work of developing additional policies and projects to serve this vulnerable population. Additionally, we are also aware of the importance of continuing to strengthen the Elder Housing with Services section of the Inclusionary Zoning ordinance. While we believe that the updated ordinance does a much better job of considering the complexities of these types of projects, we know there is more research and work to be done on this section, and on the issue of affordable housing overall.

With that in mind, once the updated ordinance passes, the Planning Department will docket the following items related to the Inclusionary Zoning ordinance:

- An alternative compliance option for those rental projects that set aside a percentage of their total units for households with annual incomes at or below 30% AMI (extremely low-income individuals and households).
- A more detailed and specific inclusionary housing requirement for Elder Housing with Services projects – a provision that is more tailored to the nuances of these types of projects and the strong differences that exist between them and other mixed-income housing developments.

While staff work is only at the beginning stage of research and development, the alternative compliance option would allow a project to greatly reduce its overall inclusionary zoning requirement if at least 2.5% of its total units are designated for extremely low-income households. Additionally, the developer would be required to partner with a City-approved agency that specializes in providing supportive services for individuals and families in this income bracket. Tenant selection and on-site case management would be provided by this agency.

In closing, we truly appreciate the insight you all have provided during this process. We hope to be able to start the new year under these updated inclusionary requirements and look forward to tracking the successes and challenges of the new ordinance as we work with it on future development projects. We fully expect to evaluate the effectiveness of this ordinance on a regular basis. While there is a five-year reevaluation requirement included in the amended ordinance, staff is prepared to recommend changes to the ordinance more frequently if need be.

Additionally, the following pages detail a handful of questions that were raised at the November 14th Public Hearing. Staff has provided concise answers to these questions and we are happy to discuss these issues further at the meeting on Monday night.

Digital Attachments / Additional Documents:

- Proposed Inclusionary Zoning Ordinance text (clean version), November 9, 2018: http://www.newtonma.gov/civicax/filebank/documents/92905
- Proposed Inclusionary Zoning Ordinance Guidebook (November 9, 2018): http://www.newtonma.gov/civicax/filebank/documents/93001
- City of Newton Inclusionary Zoning: Financial Feasibility Analysis, prepared by RKG Associates, Inc., March 2018 (not attached, but can be found on the City's IZ website: http://www.newtonma.gov/civicax/filebank/documents/91410)
- Further detail and additional memos and supporting documents can be found on the City's Inclusionary Zoning website: http://www.newtonma.gov/gov/planning/lrplan/inclusionary_zoning.asp

1.) What were the guiding objectives that staff utilized to develop the updated Inclusionary Zoning ordinance?

While the housing needs in Newton and throughout the Boston metro region are vast, inclusionary zoning should not be seen as the sole solution to our housing affordability challenges. Inclusionary zoning has become an increasingly popular tool across the country for local governments to leverage private development for the creation of affordable housing[1]; however, inclusionary zoning is **market-driven,** and a successful policy must carefully consider the intricacies of housing development and finance in order to strike a careful balance between achieving a municipality's affordable housing goals, while not suppressing residential development altogether. Further, affordable housing is one of many community benefits and requirements placed on development.

Keeping in mind that inclusionary zoning is only one of the resources in the City's suite of affordable housing tools, staff developed a set of guiding objectives to help us focus the development of this important ordinance. Also critical to defining the objectives of the new ordinance were the key findings identified in the Housing Strategy's Needs Assessment, including Newton's shrinking middle-class, its declining population of younger adults and increasing population of seniors, and its lack of affordable housing options for smaller households and residents seeking to downsize.

As such, the guiding objectives that staff utilized to develop the updated Inclusionary Zoning ordinance include the following:

- To more effectively leverage private development for the creation of affordable housing throughout Newton.
- To increase the required percentage of inclusionary units from 15% up to 20%.[2]

[1] According to the Lincoln Institute of Land Policy's report "Inclusionary Housing: Creating and Maintaining Equitable Communities", "Inclusionary housing programs tend to serve low- and moderate-income households (those that earn between 60 and 120 percent of the local median income)." Page 25, https://ihiusa.org/wp-content/uploads/Inclusionary-Housing-Report-2015-Rick-Jacobas.pdf

[2] Defined as a Priority Action in the City of Newton's 2016 Housing Strategy.

- To put forth an ordinance that considers the financial feasibility of residential development in Newton and strikes a careful balance between the City's need for affordable housing and the nuanced economics of housing development.
- To clarify confusion and multiple interpretations around the current ordinance language.
- To introduce a tiered system of affordability requirements, including units designated for middle-income households earning between 81% - 110% AMI, to more specifically target and balance the need for affordable housing across the City's diverse spectrum of income levels (units for low, moderate, and middle-income households).

2.) <u>What are the trade-offs associated with increasing the percentage requirements for Tier 1 units (units affordable to households at or below 50% AMI)?</u>

At your September 12th meeting, we explored this question and the policy decision associated with this topic. As discussed, to accomplish the goal of favoring Tier 1 units and providing a deeper level of affordability for a project, the overall number of required inclusionary units would be greatly reduced across all three tiers of affordability, and may present a number of scenarios where projects of a certain size and type are not financially feasible.

The following Policy Decision was laid out for the committee, and the committee unanimously decided to move forward with <u>Option 2.</u>

<u>Policy Decision for ZAP:</u>

<u>Option 1:</u> Favor Tier 1 units
- Results in fewer overall affordable units in a project
- But a deeper level of affordability for the required inclusionary units (units affordable for low-income to moderate-income households)
- Tier 1 units tend to be the hardest to produce, as they require the deepest level of subsidy

<u>Option 2:</u> Provide for a balance amongst all three tiers of affordability
- As demonstrated in staff's current proposal (units for low, moderate, and middle-income households)

<u>Option 3:</u> Favor Tier 3 and Tier 2 units
- Provides for a greater number of required affordable units in a project, but at a higher level of affordability (moderate to middle-income versus low-income)

3.) <u>Why do the Tier 1 and Tier 2 percentage requirements decrease when you jump from a 34-unit project to a 35-unit project?</u>

The short answer is that at 35+ units, the RKG model assumes that stick over podium construction ($205/sq. ft.) would be utilized, as well as underground parking. Both of these assumptions greatly

increase the costs of projects in the 35-64 units category. The percentage requirements begin to increase again at 65+ units, as the economies of scale come back into play.

Number of Inclusionary Units Required (2018 Staff Proposal)												
Tier Level	7-9 units		10-20 units		21-34 units		35-64 units		65-100 units		101+ units	
	Rental	Owner	Rental	Owner	Rental	Owner	Rental	Owner	Rental	Owner	Rental	Owner
Tier 1, up to 50% AMI	0.0%	0.0%	0.0%	0.0%	5.0%	0.0%	0.0%	0.0%	2.5%	0.0%	2.5%	0.0%
Tier 2, 51%-80% AMI	15.0%	15.0%	17.5%	5.0%	7.5%	10.0%	2.5%	7.5%	10.0%	10.0%	12.5%	12.5%
Tier 3, 81%-110% AMI	0.0%	0.0%	0.0%	10.0%	5.0%	7.5%	15.0%	10.0%	5.0%	7.5%	2.5%	5.0%
Total	***15.0%***	***15.0%***	***17.5%***	***15.0%***	***17.5%***	***17.5%***	***17.5%***	***17.5%***	***17.5%***	***17.5%***	***17.5%***	***17.5%***

As discussed in previous memos, staff contracted with RKG Associates in early 2018 to determine the financial impact resulting from the proposed changes to the City's existing Inclusionary Zoning ordinance. To perform the analysis, RKG created a financial feasibility model based on traditional pro forma analysis standards for real estate development. The model focuses on Internal Rate of Return (IRR) calculations to determine financial feasibility. This measure is a standard approach to understanding the potential performance of a real estate investment. Boston area development industry minimum standards for a desired IRR are currently 20% for new construction ownership residential and 12% for rental residential projects. Generally, projects that do not achieve this IRR are not able to get financing.

Pro forma development modeling requires substantial market data to generate the model assumptions needed to calculate financial performance. The three primary data categories include: construction/development data; revenue/expenditure data; and finance/investment data. RKG used several tools to gather both local and regional data, including interviews with several for-profit and non-profit residential developers and commercial lending bank professionals, the City Assessors database, current rent rates and sales prices throughout Newton, and nationally-recognized secondary data sources, such as Marshall & Swift Valuation Services.

The financial model calculated the basic go/no-go decision a developer must make about a potential project, which usually comes down to overall financial return and risk exposure. If there is confidence that the desired returns will be reached, then the project will be pursued, otherwise the project will not be undertaken.

Within the model, the appropriate construction cost is applied to the development based on its type and average size. Four-unit developments are assigned townhome construction costs ($192/sq. ft.), greater than four units but less than 35 are deemed stick construction ($176/sq. ft.), and greater than 35 units are classified as stick over podium construction[3] ($205/sq. ft.). Additionally, within the model, three types of parking costs were included: surface, structured above ground, and underground. The types of parking have dramatically different cost estimates: $8,000 per stall for surface, $25,000 per stall for aboveground, and $40,000 per stall for underground parking. The parking calculations in the model are based on the number of parking spaces required for the development scenario based on the total number of residential units.

[3] Wood-framed construction over a concrete substructure.

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Section 5.11. Inclusionary Zoning

5.11.1. Purposes

The purposes of this Section 5.11 are to:

A. Promote the public health, safety, and welfare by encouraging a diversity of housing opportunities for people of different income levels in the City;
B. Provide for a full range of housing choices throughout the City for households of all incomes, ages, and sizes;
C. Increase the production of affordable housing units to meet existing and anticipated housing needs within the City; and
D. Work to overcome economic segregation regionally as well as within Newton, allowing the City to be a community of opportunity in which low- and moderate-income households have the opportunity to advance economically.

5.11.2. Definitions

A. "Area Median Income (AMI)" means the median income for households within the designated statistical area that includes the City of Newton, as reported annually and adjusted for household size by HUD.

B. "Deed-Restricted Affordable Unit(s)" means any Inclusionary Unit that meets the provisions of 5.11.4 and holds a legal use restriction that runs with the land, is recorded at the Registry of Deeds, provides for affordability in perpetuity, identifies the Subsidizing Agency and monitoring agent, if applicable, and restricts occupancy to income eligible households, as defined by the provisions of Section 5.11.4.

C. "Eligible Household" means a household whose gross annual income does not exceed the amounts set forth in Section 5.11.4.

D. "Household Income Limit" means at any given percentage of the area median income (AMI), the income limit adjusted by household size at that percentage as published annually by the U.S. Department of Housing and Urban Development (HUD) for the designated statistical area that includes the City of Newton or, for percentage levels not published by HUD, as calculated annually by the City based on the HUD AMI calculation.

E. "Inclusionary Housing Project" means any residential development project that meets the provisions of 5.11.3.A.

F. "Inclusionary Unit(s)" means any finished dwelling unit that meets the provisions of 5.11.4.

    1. "Tier 1 Unit(s)" means any Inclusionary Unit that is affordable to a household whose gross annual income is less than or equal to 50% of AMI.

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2. "Tier 2 Unit(s)" means any Inclusionary Unit that is affordable to a household whose gross annual income is greater than 50% of AMI, but at or below 80% of AMI.

3. "Tier 3 Unit(s)," also known as "Middle-Income Unit(s)," means any Inclusionary Unit that is affordable to a household whose gross annual income is greater than 80% of AMI, but at or below 110% of AMI.

5.11.3. Application of Inclusionary Zoning Requirements

A. These inclusionary zoning provisions apply to any proposed residential or mixed-use development, including a conventional subdivision of land under M.G.L. Chapter 41, Sections 81K-81GG, in any zoning district that includes the construction or substantial reconstruction of seven or more residential dwelling units on any parcel or contiguous parcels comprising a proposed development site. The inclusionary zoning requirements apply to the total number of such residential units regardless of the existing residential units proposed to be demolished.

B. This Section 5.11 does not apply to accessory units.

C. No Segmentation. The inclusionary zoning provisions of this section apply to projects at one site or two or more adjoining sites in common ownership or under common control within a period of five years from the first date of application for any special or building permit for construction on the lot or lots, or for the 12 months immediately preceding the date of application for any special permit or building permit. An applicant for residential development shall not segment or divide or subdivide or establish surrogate or subsidiary entities to avoid the requirements of Section 5.11.11. Where the City Council determines that this provision has been violated, a special permit will be denied. However, nothing in Section 5.11 prohibits phased development of a property.

D. 100% Deed-Restricted Affordable Developments. Any proposed residential or mixed-use development that consists of 100% deed-restricted affordable units up to 110% of AMI is not subject to Section 5.11.4.B; however, projects of this type are subject to all other applicable sections of this ordinance.

E. Qualification of Tier 1 and Tier 2 Units as Local Action Units. All Inclusionary Units affordable to households at or below 80% of AMI must be qualified as 'Local Action Units' pursuant to the requirements of the Comprehensive Permit Guidelines of the Massachusetts Department of Housing and Community Development (DHCD), Section VI.C "Local Action Units," as in effect June 1, 2009 as the same may be amended from time to time, unless:

1. The unit is exempted from this requirement by another provision of this Section 5.11; or

2. The unit is exempted from this requirement by a provision included in a special permit authorizing the development, based on special circumstances applicable to that development, or based on changes in the DHCD regulations or guidelines.

F. Tier 3 Units as Consistent with Local Action Units requirements. All Inclusionary Units affordable to households earning greater than 80% but less than or equal to 110% of AMI must be consistent with the requirements of 'Local Action Units' pursuant to the requirements of the Comprehensive Permit

Guidelines of DHCD, Section VI.C "Local Action Units," as in effect June 1, 2009 as the same may be amended from time to time, unless:

1. The unit is exempted from this requirement by another provision of this Section 5.11; or

2. The unit is exempted from this requirement by a provision included in a special permit authorizing the development, based on special circumstances applicable to that development, or based on changes in the DHCD regulations or guidelines.

5.11.4. Mandatory Provision of Inclusionary Units

A. Inclusionary Unit Tiers. Inclusionary Units are divided into three tiers based on their level of affordability. Tier 1 represents units affordable to households at or below 50% of AMI; Tier 2 represents units affordable to households greater than 50% of AMI, but at or below 80% of AMI; and Tier 3 represents units affordable to households greater than 80% of AMI, but at or below 110% of AMI.

B. Number of Inclusionary Units Required. The percentage of required Inclusionary Units in a proposed development is based on the total number of new units proposed on any parcel or contiguous parcels comprising a proposed development site, and whether the units are rental or ownership.

1. Where the inclusionary zoning requirement results in a fraction of a unit greater than or equal to 0.5, the development must provide one Inclusionary Unit to capture that fraction.

2. Where the inclusionary zoning requirement results in a fraction of a unit less than 0.5, the development may choose to provide one Inclusionary Unit to capture that fraction or contribute a fractional cash payment to the City to cover the fraction of that Inclusionary Unit requirement. Fractional cash payment amounts are calculated based on the provisions of Section 5.11.5.

3. All fractions are rounded to the nearest tenth.

The percentage requirement for applicable developments is based on the following table:

Tier Level	7-9 units		10-20 units		21-34 units		35-64 units		65-100 units		101+ units	
	Rental	Owner	Rental	Owner	Rental	Owner	Rental	Owner	Rental	Owner	Rental	Owner
Tier 1, up to 50% AMI	0.0%	0.0%	0.0%	0.0%	5.0%	0.0%	0.0%	0.0%	2.5%	0.0%	2.5%	0.0%
Tier 2, 51%-80% AMI	15.0%	15.0%	17.5%	5.0%	7.5%	10.0%	2.5%	7.5%	10.0%	10.0%	12.5%	12.5%
Tier 3, 81%-110% AMI	0.0%	0.0%	0.0%	10.0%	5.0%	7.5%	15.0%	10.0%	5.0%	7.5%	2.5%	5.0%

Illustrations:

- **31-unit rental development**
  The required number of Inclusionary Units that must be provided on-site would be as follows:
  - 5% at Tier 1 = 1.55; a total of *2 units at Tier 1*

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- 7.5% at Tier 2 = 2.325; a total of *2 units at Tier 2* *(plus a fractional cash payment – see Section 5.11.5.C.)*
- 5% at Tier 3 = 1.55; a total of *2 units at Tier 3*
- Total IZ Units Required On-Site: *6 inclusionary units on-site*

➢ **16-unit ownership development**

The required number of Inclusionary Units that must be provided on-site would be as follows:

- 0% at Tier 1 = 0; a total of *0 units at Tier 1*
- 5% at Tier 2 = 0.8; a total of *1 unit at Tier 2*
- 10% at Tier 3 = 1.6; a total of *2 units at Tier 3*
- Total IZ Units Required On-Site: *3 inclusionary units on-site*

C. For phased developments, each phase of the project must include a proportional number of the required Inclusionary Units.

D. Incentives for Additional Inclusionary Units. An Inclusionary Housing Project that includes more than the required number of Inclusionary Units shall be awarded bonus market-rate units at a ratio of 2 to 1. For every additional Inclusionary Unit the applicant agrees to provide, the development will be awarded 2 additional market-rate units. The additional Inclusionary Units must be affordable to households at or below 80% AMI (Tier 2 units), and the total number of additional units proposed by an applicant must not exceed 20% of the number of units otherwise permissible on the lot under lot area per dwelling unit requirements.

Illustration:

➢ **31-unit rental development**

Total IZ Units required to be built on-site: 6 inclusionary units (25 market-rate units and 6 inclusionary units):

- 5% at Tier 1 = 1.55; a total of *2 units at Tier 1*
- 7.5% at Tier 2 = 2.325; a total of *2 units at Tier 2 (plus a fractional cash payment)*
- 5% at Tier 3 = 1.55; a total of *2 units at Tier 3*

The developer then chooses to provide 2 additional Inclusionary Tier 2 units, which provides the project with 4 additional market-rate units, for a total of 6 additional units.

The project now includes 37 total new units (29 market-rate units and 8 inclusionary units):

- 2 units at Tier 1
- 4 units at Tier 2
- 2 units at Tier 3
- = *8 total Inclusionary Units* (out of 37 total units)

Note: the total number of additional units allowed for a project originally consisting of 31 units is 6; 20% X 31 = 6.2; for a total of no more than 37 total new units, as the example demonstrates.

E. Maximum Monthly Housing Costs, Sale Prices and Rents. Maximum sale price or rent for Inclusionary Units is calculated as affordable to a household with a number of household members

equal to the number of bedrooms in a unit plus one, regardless of the actual number of persons occupying the unit.

1. Rental. Monthly housing costs, inclusive of rent, utility costs for heat, water, hot water, and electricity, 1 parking space, and including access to all amenities that are typically offered to a tenant in the building, such as access to an onsite gymnasium, and other such amenities, must not exceed 30% of the monthly income for the applicable eligible household, adjusted for household size. If the utilities are separately metered, they may be paid by the tenant and the maximum allowable rent will be reduced to reflect the tenants' payment of utilities, based on the area's utility allowance for the specific unit size and type, to be secured from the Newton Housing Authority. For a household with a Section 8 voucher, the rent and income are to be established by the Newton Housing Authority with the approval of HUD.

2. Homeownership. Monthly housing costs, inclusive of mortgage principal and interest, private mortgage insurance, property taxes, condominium and/or homeowner's association fees, hazard insurance, and 1 parking space, must not exceed 30% of the monthly income for the applicable eligible household, adjusted for household size.

a. Maximum Sale Prices. Maximum sale prices of Inclusionary Units shall be set so that a household earning 10 percentage points lower than the household income limit for that unit would not expend more than 30% of their monthly income for the cost of purchasing the housing.

b. Down Payment. Down payment must be at least 3% of the purchase price.

c. Mortgage Loan. Mortgage loan must be a 30-year fully amortizing mortgage for not more than 97% of the purchase price with a fixed interest rate that is not more than 2 percentage points above the current MassHousing interest rate.

d. Buyers will be eligible so long as their total housing cost including the services identified above do not exceed 38% of their income.

F. Notwithstanding the requirements of this Section 5.11.4, an Inclusionary Housing Project may set the price or rental rate for Inclusionary Units lower than what is required herein.

5.11.5. Cash Payment Option

As an alternative to the requirements of Section 5.11.4., an applicant may contribute a cash payment to the City's Inclusionary Housing Fund, in lieu of providing Inclusionary Units.

A. Eligibility. There are three circumstances in which the Inclusionary Unit requirements of Section 5.11.4 may be met through a cash payment instead of providing Inclusionary Units:

1. For Inclusionary Housing Projects that include the construction or substantial reconstruction of 7 to 9 dwelling units; or

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2. By special permit from the City Council where the Council makes specific findings that there will be an unusual net benefit to achieving the City's housing objectives as a result of allowing a cash payment rather than requiring the development of Inclusionary Units. The findings must include consideration of the appropriateness of the development site location for income-eligible households, including proximity to and quality of public transportation, schools, and other services; the current balance of the Inclusionary Housing Fund; and the purposes of this Section 5.11.

3. For Inclusionary Housing Projects where the inclusionary zoning requirement results in a fraction of a unit less than 0.5, the applicant may contribute a fractional cash payment to the City to cover the fraction of that Inclusionary Unit requirement.

B. Cash Payment Amount. The cash payment as an alternative to each required Inclusionary Unit, or fraction thereof, is based on a formula that utilizes the current Massachusetts Department of Housing and Community Development Index for "Total Residential Development Cost Limits" for Production Projects within Metro Boston. This index is updated annually through DHCD's Qualified Allocation Plan (QAP) and serves as a maximum subsidy amount per unit for affordable housing projects seeking Federal Low-Income Housing Tax Credits (LIHTC) throughout the state.

1. For Inclusionary Housing Projects containing 10 or more units that receive a Special Permit to make such a payment, the total cash payment is determined by utilizing the following calculation:

Inclusionary Zoning Cash Payment Calculation:	
A = # of dwelling units in proposed project X Total IZ Percentage Requirement for project (Section 5.11.4.B.	A
Multiplied by	
B = average of "Small Units" QAP index and "Large Units" QAP index for Production Projects in Newton	B
Total Cash Payment Due for Project	***Equals A X B***
note: QAP = DHCD's Qualified Allocation Plan, as updated annually by DHCD	

Illustrations:

Note: *$389,000* = the average of the "Small Units" index ($379,000) and "Large Units" index ($399,000) for Production Projects in Newton for 2018-2019, which falls within the Urban Area of Metro Boston category of the QAP

- **18-unit rental development**
  - 17.5% Total IZ percentage requirement: 0.175 X 18 units = 3.15
  - 3.15 X $389,000
  - = *$1,225,350 total cash payment*

- **36-unit ownership project**
  - 17.5% Total IZ percentage requirement: 0.175 X 36 units = 6.3
  - 6.3 X $389,000 = *$2,450,700 total cash payment*

2. For Inclusionary Housing Projects with 7-9 units, the total cash payment is determined by utilizing the average of the "Small Units" index and "Large Units" index for Production

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Projects in Newton, as updated annually by DHCD, as the basis for the calculation (defined as B in the calculation presented in Section 5.11.5.B.1.); and the payment is then adjusted for the number of new units in the project, at a decreasing percentage.

a. Total cash payment for a 7-unit project: 70% *multiplied by* the average of the "Small Units" index and "Large Units" index for Production Projects in Newton, as updated annually by DHCD (defined as B in the calculation presented in Section 5.11.5.B.1.)

b. Total cash payment for an 8-unit project: 80% *multiplied by* B

c. Total cash payment for a 9-unit project: 90% *multiplied by* B

Illustrations:

- **7-unit project**: 70% of $389,000
  = *$272,300 total cash payment*

- **8-unit project**: 80% of $389,000 = *$311,200 total cash payment*

- **9-unit project**: 90% of $389,000 = *$350,100 total cash payment*

C. Fractional Cash Payment Amount. For Inclusionary Housing Projects that choose to make a fractional cash payment per Section 5.11.4.B.2., the fractional cash payment is equal to 5% of the average of the "Small Units" index and "Large Units" index for Production Projects in Newton, as updated annually by DHCD's Qualified Allocation Plan, per decimal point of the resulting fraction (rounded to the nearest tenth), per Inclusionary Unit Tier, up to a maximum fractional cash payment per project of $160,000.

Illustrations:

Note: *5% X $389,000 = $19,450*

- **48-unit rental development**
  The Total Inclusionary Zoning / Fractional Cash Payment requirement would be calculated as follows:

  Tier 1: 48 X 0% = 0
  Tier 2: 48 X 2.5% = 1.2, so the fractional requirement would be 0.2 (2 X $19,450 = $38,900)
  Tier 3: 48 X 15% = 7.2, so the fractional requirement would be 0.2 (2 X $19,450 = $38,900

= Total IZ / Fractional Cash Payment Requirement for Project =
Tier 1: 0 Inclusionary Units
Tier 2: 1 Inclusionary Unit *plus* a Cash Payment of $38,900
Tier 3: 7 Inclusionary Units *plus* a Cash Payment of $38,900

Which equals a total of 8 Inclusionary Units required on-site plus a total Fractional Cash Payment of $77,800

D. Payment Deadline. Any Inclusionary Unit cash payment must be paid in full to the City prior to the granting of any Certificate of Occupancy.

E. Cash Payment Recipient. The cash payment is made to the City's Inclusionary Zoning Fund, to be distributed equally between the Newton Housing Authority and the City of Newton. These funds are to be targeted for the restoration, creation, and preservation of deed-restricted units affordable to households with annual gross income at or below 80% of AMI, to the extent practical. Appropriation of these funds for use by the City or the Newton Housing Authority shall first be approved by the Mayor and then the City Council. The Newton Housing Authority and the City must each maintain an ongoing record of payments to the fund on their behalf and the use of the proceeds for the purposes stated in this Section 5.11.

5.11.6. Off-Site Development

A. Eligibility. Off-site Inclusionary Units are generally discouraged. The Inclusionary Unit requirements of Section 5.11.4 may be met through the off-site development of the required Inclusionary Units only by special permit from the City Council where the Council makes specific findings that there will be an unusual net benefit to achieving the City's housing objectives as a result of allowing the units to be built off-site. The findings must include consideration of the appropriateness of the development site location for income-eligible households, including proximity to and quality of public transportation, schools, and other services; consideration relative to the concentration of affordable units in the City; and consideration of the purposes of this section of the Ordinance, found in Section 5.11.1.

B. Non-Profit Housing Developer Partnership. Any Inclusionary Housing Project that includes off-site Inclusionary Units must form a development agreement with a non-profit housing developer for the development of the off-site units.

C. The applicant must submit a development plan for off-site development for review and comment by the Planning and Development Department prior to submission to the City Council. The plan must include, at a minimum, demonstration of site control, necessary financing in place to complete the off-site development or rehabilitation, an architect's conceptual site plan with unit designs and architectural elevations, and agreement that the off-site units will comply with Section 5.11.7.

D. The off-site Inclusionary Units must have an equivalent level of accessibility as what would have been provided if the required units were to remain on-site.

E. All off-site Inclusionary Units allowed by Special Permit must be completed and occupied no later than completion and occupancy of the applicant's market rate units. If the off-site Inclusionary Units are not completed as required within that time, temporary and final occupancy permits may not be granted for the number of market rate units equal to the number of off-site Inclusionary Units which have not been completed. Where the Council determines that completion of off-site inclusionary units has been delayed for extraordinary reasons beyond the reasonable control of the applicant and non-profit housing developer, the City Council may, in its discretion, permit the applicant to

post a monetary bond and release one or more market rate units. The amount of the bond must be sufficient in the determination of the Planning and Development Department to assure completion of the off-site Inclusionary Units.

5.11.7. Design and Construction

In all cases, Inclusionary Units must be fully built out and finished dwelling units and comply with the requirements set out in in the Comprehensive Permit Guidelines of DHCD, Section VI.B.4. "Design and Construction Standards," as in effect June 1, 2009 as the same may be amended from time to time. Additionally, the following requirements shall apply to all Inclusionary Units:

A. Inclusionary Units provided on site must be dispersed throughout the Inclusionary Housing Project and be sited in no less desirable locations than the market-rate units.

B. Inclusionary Units must have exteriors that are indistinguishable in design and of equivalent materials to the exteriors of the market-rate units in the project.

C. The bedroom mix of Inclusionary Units must be equal to the bedroom mix of the market-rate units in the Inclusionary Housing Project.

D. The materials used and the quality of construction for inclusionary units, including heating, ventilation, and air conditioning systems, must be equal to that of the market-rate units in the Inclusionary Housing Project, as reviewed by the Planning and Development Department; provided that amenities such as designer or high-end appliances and fixtures need not be provided for Inclusionary Units.

E. At a minimum, the Inclusionary Units must have an equivalent level of accessibility as that of the market-rate units.

5.11.8. Inclusionary Housing Plans and Covenants

The applicant shall submit an Inclusionary Housing Plan for review and approval by the Director of Planning and Development prior to the issuance of any building permit for the project. The plan must include the following provisions:

A. A description of the proposed project and Inclusionary Units including, at a minimum, a breakdown of the total number of residential units in the project, including the number of market-rate units, Inclusionary Units, and accessible and adaptable units; floor plans indicating the location of the Inclusionary Units and accessible and adaptable units; the number of bedrooms and bathrooms per unit for all units in the development; the square footage of each unit in the development; the amenities to be provided to all units; the projected sales prices or rent levels for all units in the development; and an outline of construction specifications certified by the applicant.

B. An Affirmative Fair Housing Marketing and Resident Selection Plan (AFHMP) that, at a minimum, meets the requirements set out in in the Comprehensive Permit Guidelines of the DHCD, Section III., Affirmative Fair Housing Marketing and Resident Selection Plan, as in effect June 1, 2009 as the same may be amended from time to time and:

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1. To the extent permitted by law, such plan must provide for a local preference for up to 70% of the Inclusionary Units in a project.

2. Where a project results in the displacement of individuals who qualify for a unit in terms of household size and income, first preference must be given to those displaced applicants, unless such preference would be unallowable under the rules of any source of funding for the project.

3. Where a project includes units that are fully accessible, or units that have adaptive features, for occupancy by persons with mobility impairments or hearing, vision or other sensory impairments, first preference (regardless of applicant pool) for those units must be given to persons with disabilities who need such units, including single person households, in conformity with state and federal civil rights law, per DHCD's Comprehensive Permit Guidelines, Section III., Affirmative Fair Housing Marketing and Resident Selection Plan, as in effect June 1, 2009 as the same may be amended from time to time.

4. Prior to the marketing or otherwise making available for rental or sale any of the units in the development, the applicant must obtain the City's and DHCD's approval of the AFHMP for the Inclusionary Units.

C. Agreement by the applicant that resident selection shall be conducted and implemented in accordance with the approved marketing and resident selection plan and Comprehensive Permit Guidelines of the DHCD, Section III., Affirmative Fair Housing Marketing and Resident Selection Plan.

D. Agreement by the applicant that all Tier 1 and Tier 2 Units must be qualified as and all Tier 3 Units must be consistent with the requirements of 'Local Action Units' pursuant to the requirements of the Comprehensive Permit Guidelines of the DHCD, Section VI.C "Local Action Units," as in effect June 1, 2009 as the same may be amended from time to time, unless:

1. The unit is exempted from this requirement by another provision of this Section 5.11; or

2. The unit is exempted from this requirement by a provision included in the special permit authorizing the development, based on special circumstances applicable to that development, or based on changes in the DHCD regulations or guidelines.

E. Agreement by the applicant that all Inclusionary Units, including those affordable to households earning greater than 80% but less than or equal to 110% of AMI, must comply with the Use Restrictions requirements set out in in the Comprehensive Permit Guidelines of the DHCD, Section II.A.1.e. "Use Restriction," and Section VI.B.9. "Regulatory Agreement and Use Restrictions," and that the applicant shall execute and record an affordable covenant in the Registry of Deeds for the Southern District of Middlesex County or the Land Court Registry of Deeds for the Southern District of Middlesex County as the senior interest in title for each Inclusionary Unit and which shall endure for the life of the residential development, as follows:

For purchase units, a covenant to be filed at the time of conveyance and running in favor of the City of Newton, in a form approved by the City Solicitor, which limits initial sale and subsequent re-sales of Inclusionary Units to eligible households in accordance with provisions reviewed and

approved by the Director of the Planning and Development Department which incorporate the provisions of this Section; and

For rental units, a covenant to be filed prior to the issuance of an occupancy permit and running in favor of the City of Newton, in a form approved by the City Solicitor, which limits rental of Inclusionary Units to eligible households in accordance with provisions reviewed and approved by the Director of the Planning and Development Department which incorporate the provisions of this Section.

F. At the discretion of the applicant and with the agreement of the Newton Housing Authority, an agreement, in a form approved by the City Solicitor, to convey rental units to the Newton Housing Authority for sale or rental to eligible households.

G. In the case of rental housing, an agreement by the applicant to submit an annual compliance report to the Director of Planning and Development, in a form approved by the City Solicitor, certifying compliance with the provisions of this Section 5.11.

5.11.9. Public Funding Limitation

An applicant may not use public development funds to construct Inclusionary Units required under Section 5.11. Public development funds means funds for housing construction or rehabilitation if provided through a program eligible to serve as a 'subsidy' under 760 CMR 56.00 Comprehensive Permit: Low or Moderate Income Housing. However, the applicant may use public development funds to construct Inclusionary Units that are found by the Director of Planning and Development to be consistent with the following:

A. Those that represent a greater number of Inclusionary Units than are otherwise required by this subsection, and not receiving bonus market rate units according to Section 5.11.4.D;

B. Those that are lower than the maximum eligible income limit for some or all Inclusionary Units by at least 10 percentage points below that stipulated in Section 5.11.2; and

C. Those that exceed regulatory requirements in providing for persons having disabilities.

5.11.10. Elder Housing with Services

In order to provide affordable elder housing with services on-site, this section applies to all housing with services designed primarily for elders, such as residential care, continuing care retirement communities, assisted living, independent living, and congregate care. The base services to be provided must be an integral part of the annual housing costs, rent or occupancy related fee, must be comparable to the base services offered to all residents regardless of income status, and may include in substantial measure long-term health care, as well as nursing, home health care, personal care, meals, transportation, convenience services, and social, cultural, and education programs. This Section 5.11.11 does not apply to a nursing facility subject to certificate of need programs regulated by the Commonwealth of Massachusetts Department of Public Health or to developments funded under a state or federal program which requires a greater number of elder units or nursing beds than required here.

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A. Definition of Elderly Households. For all such projects, an elderly household is defined as a single person who is 62 years of age or older at the time of initial occupancy; or two persons living together, where at least one of whom is 62 years of age or more at the time of initial occupancy.

B. Number of Inclusionary Beds Required. For all such projects, 5% of beds provided on-site must be Inclusionary Beds designated affordable to elderly households with annual gross incomes up to 80% of AMI. Inclusionary Beds may be located in single-occupancy rooms, or in shared rooms. The Inclusionary Beds must be proportionately distributed throughout the site and must be indistinguishable from the market-rate beds.

C. Monthly Housing and Service Costs. Total monthly housing costs, inclusive of rent or monthly occupancy fees and base services, may not exceed 80% of the eligible household's annual gross income. The services provided to these households must be comparable to the base services offered to all residents, regardless of income status, and must include long-term health care, nursing care, home health care, personal care, meals, transportation, convenience services, social, cultural, and educational programming, and the like.

D. Use Restrictions. For all such projects, all Inclusionary Beds must be subject to an affordable covenant approved by the City Solicitor, executed by the City and the developer, and recorded at the Registry of Deeds for the Southern District of Middlesex County or the Land Court Registry of Deeds for the Southern District of Middlesex County.

E. Tenant Selection. For all such projects, all Inclusionary Beds must be subject to an Affirmative Fair Housing Marketing and Resident Selection Plan to be approved by the Director of the Planning Department. To the extent permitted by law, such plan must provide for a local preference for up to 70% of the Inclusionary Beds in a project.

F. Fractional Units. Where the inclusionary zoning requirement results in a fraction of a bed greater than or equal to 0.5, the development must provide one Inclusionary Bed to capture that fraction.

G. Alternative Compliance. The applicant may choose to comply with their Inclusionary Zoning requirements through a cash payment to the City, without receiving a Special Permit granting permission to do so. The total cash payment for projects of this type is determined by utilizing DHCD's current Qualified Allocation Plan Index for "Single Room Occupancy / Group Homes / Assisted Living / Small Unit Supportive Housing", coupled with the calculation of 5% of the total number of beds provided in the project.

Illustrations:

- **115-bed assisted living project**
  - 5% requirement X 115 = 5.75; therefore, *6 inclusionary beds are required on-site*
  - If this project were to choose to provide the City with a cash payment, rather than provide the beds on-site, the total cash payment would equal:
    - 5.75 X $259,000 (DHCD's 2018 QAP Index for projects of this type) = *$1,489,250 total cash payment*

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- **85-bed continuing care retirement community**
  - 5% requirement X 85 = 4.25; therefore, *4 inclusionary beds are required on-site*
  - If this project were to choose to provide the City with a cash payment, rather than provide the beds on-site, the total cash payment would equal:
    - 4.25 X $259,000 = *$1,100,750 total cash payment*

5.11.11. No Effect on Prior or Existing Obligations

The requirements of Section 5.11 have no effect on any prior or currently effective special permit, obligation, contract, agreement, covenant or arrangement of any kind, executed or required to be executed, which provides for dwelling units to be made available for sale or rental to or by the City, the Newton Housing Authority, or other appropriate municipal agency, or any cash payment so required for affordable housing purposes, all resulting from a special permit under Section 5.11 granted prior to the effective date of this amendment.

5.11.12. Inclusionary Housing Program Reevaluation Requirement

The City shall initiate a reevaluation of the Inclusionary Housing Requirement at an interval of no more than 5 years from the time the Inclusionary Housing Requirement was last amended and every 5 years thereafter. Such reevaluation must include a report provided to the City Council reviewing factors such as changes in demographic characteristics and residential development activity, housing trends measured in terms of, but not limited to, vacancy rates, production statistics, prices for dwelling units, and affordability, and the relationship between Inclusionary Housing Projects and all housing in Newton. The Department of Planning and Development must also conduct an annual review and report on the Inclusionary Housing Program.

5.11.13. Effective Date

The requirements of Section 5.11 do not apply to any special permit (or in the event that a special permit is not required, any building permit) issued prior to the effective date of this amendment [*insert date (which shall mean a specified date after the amended ordinance is adopted by the City Council and signed by the Mayor)].*

City of Newton
Inclusionary Zoning Ordinance Guidebook
(as of staff's most current updated proposal – 11/9/18)

1) What is Inclusionary Zoning?

Inclusionary Zoning is a popular tool used by local governments across the country to leverage private development for the creation of affordable housing. While ordinances take many forms, a common structure is to require a percentage of units in a private development be rented or sold at affordable levels to low- and moderate-income households (usually households at or below 80% of the Area Median Income, AMI).

2) When is a project subject to the Inclusionary Zoning ordinance provisions?

All residential and mixed-use developments that contain the construction or substantial reconstruction of 7 or more residential units are subject to the City's IZ provisions, regardless of the necessary approval process for that project. Existing residential units that are proposed to be demolished as part of a development are not considered in the inclusionary zoning requirement calculation.

Examples:

- A developer proposes to build a large multifamily development on two contiguous parcels. The project contains the construction of 20 new units, in four different buildings. There is an existing four-family building on one of the parcels, which the developer plans to demolish. This proposed development would be subject to the Inclusionary Zoning ordinance, based off a total of 20 units.

- A developer proposes to build a small multifamily development, containing the construction of 7 units in two different buildings. There is an existing two-family building on site, which the developer plans to demolish. This proposed development would be subject to the Inclusionary Zoning ordinance, based off a total of 7 units.

3) What is the Inclusionary Zoning requirement for projects subject to this ordinance?

The Inclusionary Zoning requirement is based on the total number of units proposed for a development and whether it is a rental or ownership project. The percentage of required inclusionary units to be built on site is divided into three affordability tiers: Tier 1 are units affordable to

households with annual gross incomes at or below 50% of the area median income (AMI); Tier 2 are units affordable to households with annual gross incomes greater than 50% AMI, but at or below 80% AMI; and Tier 3 are units affordable to households with annual gross incomes greater than 80% AMI, but at or below 110% AMI (middle-income units).

Where the IZ requirement results in a fraction of a unit greater than or equal to 0.5, the developer must build one inclusionary unit to capture that fraction.

Where the inclusionary zoning requirement results in a fraction of a unit less than 0.5, the developer may choose to provide one inclusionary unit to capture that fraction. Alternatively, the developer may contribute a fractional cash payment to the City to cover the fraction of that inclusionary unit requirement.

Tier 1 and Tier 2 inclusionary units must be qualified as 'Local Action Units' pursuant to the requirements of the Comprehensive Permit Guidelines of the DHCD and, therefore, must be SHI-eligible units. All projects subject to the Inclusionary Zoning requirements must enter in an affordable housing deed restriction with the City, and in most cases, a Regulatory Agreement between the City, DHCD (or relevant Subsidizing Agency) and the developer. These affordable housing covenants must be recorded in the Registry of Deeds and will endure for the life of the residential development.

The percentage requirement for applicable developments is based on the following table:

Number of Inclusionary Units Required												
Tier Level	7-9 units		10-20 units		21-34 units		35-64 units		65-100 units		101+ units	
	Rental	Owner	Rental	Owner	Rental	Owner	Rental	Owner	Rental	Owner	Rental	Owner
Tier 1, up to 50% AMI	0.0%	0.0%	0.0%	0.0%	5.0%	0.0%	0.0%	0.0%	2.5%	0.0%	2.5%	0.0%
Tier 2, 51%-80% AMI	15.0%	15.0%	17.5%	5.0%	7.5%	10.0%	2.5%	7.5%	10.0%	10.0%	12.5%	12.5%
Tier 3, 81%-110% AMI	0.0%	0.0%	0.0%	10.0%	5.0%	7.5%	15.0%	10.0%	5.0%	7.5%	2.5%	5.0%

Number of Inclusionary Units Required: Project Examples												
Tier Level	7 units		16 units		24 units		47 units		78 units		225 units	
	Rental	Owner	Rental	Owner	Rental	Owner	Rental	Owner	Rental	Owner	Rental	Owner
Tier 1, up to 50% AMI	0	0	0	0	1	0	0	0	2	0	6	0
Tier 2, 51%-80% AMI	1	1	3	1	2	2	1	4	8	8	28	28
Tier 3, 81%-110% AMI	0	0	0	2	1	2	7	5	4	6	6	11
Total	***1***	***1***	***3***	***3***	***4***	***4***	***8***	***9***	***14***	***14***	***40***	***39***

Examples:

- **31-unit rental development**
  The required number of Inclusionary Units that must be provided on-site would be as follows:
  - 5% at Tier 1 = 1.55; a total of *2 units at Tier 1*
  - 7.5% at Tier 2 = 2.325; a total of *2 units at Tier 2* *(plus a fractional cash payment)*
  - 5% at Tier 3 = 1.55; a total of *2 units at Tier 3*
  - Total IZ Units Required On-Site: *6 inclusionary units on-site*

- **16-unit ownership development**
  The required number of Inclusionary Units that must be provided on-site would be as follows:

- 0% at Tier 1 = 0; a total of *0 units at Tier 1*
- 5% at Tier 2 = 0.8; a total of *1 unit at Tier 2*
- 10% at Tier 3 = 1.6; a total of *2 units at Tier 3*
- Total IZ Units Required On-Site: *3 inclusionary units on-site*

4) What is the "Area Median Income" in Newton and what does 50% AMI, 80% AMI, and 110% AMI mean?

Area Median Income, or ***"AMI"*** as it is referred to regularly, is the median family income, adjusted for household size, within a given metropolitan or non-metropolitan area, updated annually by the U.S. Department of Housing and Urban Development (HUD) and used to determine eligibility for most housing assistance programs.

For Newton, the HUD Area Median Family Income (HAMFI) is based on the Boston-Cambridge-Quincy, MA-NH HUD Metro FMR (Fair Market Rent) Area Median income:

- ***$107,800,*** or 100% AMI for a family or household of 4 persons, as detailed below in the FY 2018 Income Limits Summary Table for Newton, MA[1]

50% AMI refers to a Low-Income Household whose annual gross income is at or below 50% of the area median income. In Newton, a household with 3 persons with an annual gross income at or below $48,550 would be eligible for a housing unit designated at 50% AMI, as detailed in the table below.

80% AMI refers to a Moderate-Income Household whose annual gross income is greater than 50% AMI, but at or below 80% of the area median income (also referred to as 51%-80% AMI). In Newton, a household with 5 persons with an annual gross income at or below $87,600 would be eligible for a housing unit designated at 80% AMI.

110% AMI refers to a Middle-Income Household whose annual gross income is greater than 80% AMI, but at or below 110% of the area median income (also referred to as 81%-110% AMI). In Newton, a household with 4 persons with an annual gross income at or below $118,580 would be eligible for a housing unit designated at 110% AMI.

At times, these middle-income units are also referred to as Workforce Housing. HUD defines Workforce Housing as housing affordable to households earning between 80% and 120% AMI. The Massachusetts Housing Finance Agency (MassHousing), however, defines Workforce Housing as units affordable to households with incomes greater than 60% AMI and up to 120% AMI.

[1] FY 2018 Income Limits Documentation System, Newton City FY 2018 Income Limits Summary: https://www.huduser.gov/portal/datasets/il/il2018/2018summary.odn

FY 2018 Income Limits Summary - Newton, MA						
Income Level	Household Size					
	1	2	3	4	5	6
50% AMI	$37,750	$43,150	$48,550	$53,900	$58,250	$62,550
80% AMI	$56,800	$64,900	$73,000	$81,100	$87,600	$94,100
100% AMI	$75,500	$86,300	$97,100	$107,800	$116,500	$125,100
110% AMI	$83,050	$94,930	$106,810	$118,580	$128,150	$137,610

5) When is a project that is subject to the Inclusionary Zoning ordinance allowed to make a cash payment to the City in lieu of building inclusionary units on site?

Developments with 7-9 units may choose to make a cash payment to the City in lieu of building the inclusionary units on site, without receiving permission from the City Council through the Special Permit process.

For projects that fall outside of the 7-9 units category, payments-in-lieu are only allowed through the Special Permit process where the City Council makes specific findings to an "unusual net benefit to allowing a fee rather than the inclusionary units."

For projects where the inclusionary zoning requirement results in a fraction of a unit less than 0.5, the developer may contribute a fractional cash payment to the City to cover the fraction of that inclusionary unit requirement, without receiving permission from the City Council through the Special Permit process.

6) How are cash payments determined for projects that are allowed or receive permission to make such payments to the City?

The total cash payment is determined by utilizing the most current Massachusetts Department of Housing and Community Development's (DHCD) Qualified Allocation Plan's (QAP) "Total Residential Development Cost Limits" Index:[2]

- ***$389,000*** (2018-2019 QAP): the average of the "Small Units" index ($379,000) and "Large Units" index ($399,000) for Production Projects in Newton, which falls within the Urban Area of Metro Boston category of the QAP

These Total Residential Development Cost Limits are published annually through the Commonwealth of Massachusetts Department of Housing and Community Development's Low Income Housing Tax Credit Program Qualified Allocation Plan.[3] The cost limits reflect project type and location and are based on the Massachusetts Housing Partnership's (MHP) extensive research on behalf of DHCD.[4]

[2] From the Commonwealth of Massachusetts Department of Housing and Community Development's Low Income Housing Tax Credit Program 2018-2019 Qualified Allocation Plan, Appendix C, https://www.mass.gov/files/documents/2018/04/26/20182019QAP.pdf

[3] DHCD is the Massachusetts allocating agency for the Low Income Housing Tax Credit (LIHTC) program, which has helped support the production or preservation of over 67,000 affordable multifamily rental units since the program's beginnings

For projects with 7-9 new units, the total cash payment is determined by utilizing $389,000 as the basis for the calculation. The payment is then adjusted for the number of new units in the project, at a decreasing percentage.

Examples:

- 7-unit project: 70% of $389,000 = *$272,300 total cash payment*
- 8-unit project: 80% of $389,000 = *$311,200 total cash payment*
- 9-unit project: 90% of $389,000 = *$350,100 total cash payment*

For projects with 10 or more new units, which have received permission from the City Council to make a cash payment to the City in lieu of building the inclusionary units requirement on site, the total cash payment is determined by utilizing $389,000 per unit as the basis for the calculation. The payment is then adjusted based on the total percentage requirement for a project of that size and type (rental versus ownership), as detailed in the following calculation:

Inclusionary Zoning Cash Payment Calculation:	
A = # of dwelling units in proposed project X Total IZ Percentage Requirement for project (Section 5.11.4.B.	A
Multiplied by	
B = average of "Small Units" QAP index and "Large Units" QAP index for Production Projects in Newton	B
Total Cash Payment Due for Project	***Equals A X B***
note: QAP = DHCD's Qualified Allocation Plan, as updated annually by DHCD	

Examples:

- 18-unit rental project
  - 17.5% total IZ percentage requirement: 0.175 X 18 units = 3.15
  - 3.15 X $389,000 = *$1,225,350 total cash payment*

- 36-unit ownership project
  - 17.5% total IZ percentage requirement: 0.175 X 36 units = 6.3
  - 6.3 X $389,000 = *$2,450,700 total cash payment*

- 88-unit rental project
  - 17.5% IZ requirement: 0.175 X 88 units = 15.4
  - 15.4 X $389,000 = *$5,990,600 total cash payment*

For projects that choose to make a fractional cash payment, the fractional cash payment is equal to 5% of $389,000, per decimal point of the resulting fraction (rounded to the nearest tenth), per Inclusionary Unit Tier, up to a maximum fractional cash payment per project of $160,000.

in 1987. Each year, the state allocating agency for the Low Income Housing Tax Credit is required to publish a plan describing how it intends to award the credit, including selection criteria for projects receiving tax credit allocations.
[4] To develop these cost limits, MHP researched the costs of hundreds of rental projects over a four-year timeframe in DHCD's and MHP's portfolio, and assessed multiple variables, including the cost of production versus preservation; family housing versus senior housing or special needs housing; regional variations in cost; and variations based on construction type. The cost limits, first introduced into DHCD's 2017 tax credit QAP, apply to all rental housing funded by the Massachusetts public lenders. The cost limits are to be reviewed annually and will be part of the Massachusetts public lenders' ongoing efforts to manage costs.

Example:
Note: 5% X $389,000 = $19,450

- 48-unit rental development
  The Total Inclusionary Zoning / Fractional Cash Payment requirement would be calculated as follows:
  - Tier 1: 48 X 0% = 0
  - Tier 2: 48 X 2.5% = 1.2, so the fractional requirement would be 0.2 (2 X $19,450 = $38,900)
  - Tier 3: 48 X 15% = 7.2, so the fractional requirement would be 0.2 (2 X $19,450 = $38,900

  = Total IZ / Fractional Cash Payment Requirement for Project =
  Tier 1: 0 Inclusionary Units
  Tier 2: 1 Inclusionary Unit *plus* a Cash Payment of $38,900
  Tier 3: 7 Inclusionary Units *plus* a Cash Payment of $38,900
  Which equals a total of 8 Inclusionary Units required on-site plus a total Fractional Cash Payment of $77,800

7) Are projects that consist of 100% deed-restricted affordable units subject to the Inclusionary Zoning ordinance provisions?

The short answer is no. Such projects are not required to comply with the prescribed percentage requirements per income level, as detailed in Section 5.11.4.B. of the ordinance – "Number of Inclusionary Units Required." However, projects that are 100% deed-restricted affordable are still subject to all other sections of the ordinance. For instance, such projects are required to submit an Inclusionary Housing Plan and an Affirmative Fair Housing Marketing and Resident Selection Plan for review and approval by the Director of Planning and Development, and are subject to a Regulatory Agreement and Use Restrictions, which shall endure for the life of the development, and shall be recorded at the Registry of Deeds.

Examples:

- 24-unit rental project at 100% Tier 3 (81%-110% AMI)
  - This project would not be required to provide any units at Tier 1 or Tier 2

- 78-unit rental project at 85% Tier 3 and 15% Tier 2
  - This project would not be required to provide any units at Tier 1

8) Are "Elder Housing with Services" projects subject to the Inclusionary Zoning ordinance provisions?

Yes. However, such projects fall slightly outside of the Inclusionary Zoning requirements associated with all other residential and mixed-used developments that are subject to the provisions of the IZ ordinance.

The Inclusionary Zoning ordinance defines this type of project as housing with services designed primarily for elders, such as residential care, continuing care retirement communities, assisted living,

independent living, and congregate care. The ordinance does not apply to nursing homes subject to regulations by the state of Massachusetts Department of Public Health. Nor does the ordinance apply to Elder Housing with Services projects that are 100% deed-restricted, affordable.

Under the Inclusionary Zoning ordinance, 5% of the total number of beds provided as part of an Elder Housing with Services project must be affordable for seniors age 62 or older whose annual gross incomes are at or below 80% AMI. Where the IZ requirement results in a fraction of a unit greater than or equal to 0.5, the developer must provide one inclusionary bed to capture that fraction.

Inclusionary beds may be located in single-occupancy rooms or in shared rooms; must be proportionately distributed throughout a project; and must be indistinguishable from the market-rate beds.

The total monthly housing costs, inclusive of base services, must not exceed 80% of the eligible senior's annual gross income. The services provided to these residents must be comparable to the base services offered to all residents, regardless of income status, and may include long-term health care, nursing care, home health care, personal care, meals, transportation, convenience services, and social, cultural and educational programs.

Alternatively, Elder Housing with Services projects may choose to meet their Inclusionary Zoning requirement through a payment-in-lieu, without receiving permission from the City Council through the Special Permit process. The total cash payment for projects of this type is determined by utilizing DHCD's Qualified Allocation Plan Index for "Single Room Occupancy / Group Homes / Assisted Living / Small Unit Supportive Housing" of $259,000, coupled with the calculation of 5% of the total number of beds provided in the project.

Examples:

- 115-bed assisted living project:
  - 5% requirement X 115 = 5.75; therefore, *6 inclusionary beds are required on site*
  - If this project were to choose to provide the City with a cash payment, rather than provide the beds on site, the total cash payment would equal:
    - 5.75 X $259,000 = *$1,489,250 total cash payment*

- 85-bed continuing care retirement community:
  - 5% requirement X 85 = 4.25; therefore, *4 inclusionary beds are required on site*
  - If this project were to choose to provide the City with a cash payment, rather than provide the beds on site, the total cash payment would equal:
    - 4.25 X $259,000 = *$1,100,750 total cash payment*

9) What happens to the cash payments made to the City's Inclusionary Zoning Fund? How are these funds used, and by whom?

These cash payments are deposited into the City's Inclusionary Zoning Fund, which is distributed equally between the Newton Housing Authority (NHA) and the City of Newton. These funds are to be targeted for the restoration, creation, and preservation of deed-restricted units affordable to households with annual gross incomes at or below 80% AMI.

Appropriation of the funds for use by the City or the Newton Housing Authority must first be approved by the Mayor and then the City Council.

10) Does the City provide an incentive to developers that provide more affordable units than what is required by the Inclusionary Zoning ordinance?

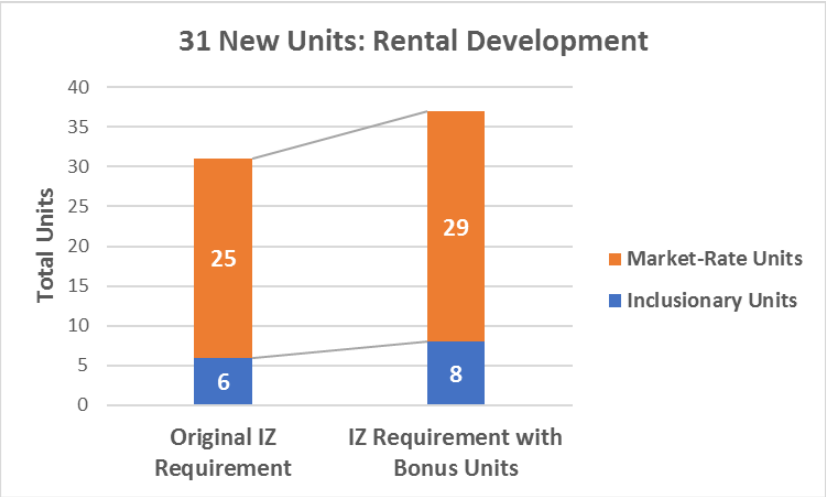
Yes. If a project that is subject to the Inclusionary Zoning provisions includes more than its required number of inclusionary units, a bonus of additional market-rate units will be offered to the project at a ratio of 2 to 1: for every additional affordable unit proposed, the project will be allowed to include 2 additional market-rate units. The additional affordable units must be set at no more than 80% AMI (Tier 2 units), and the number of additional units shall not exceed 20% of the number of units otherwise allowed on the lot under lot area per dwelling unit requirements.

Examples:

- A developer proposes to build a multifamily rental development, containing a total of 31 units; therefore, the total IZ requirement for the development would be 6 inclusionary units: 25 market-rate units and 6 inclusionary units:
  - 5% at Tier 1 = 1.55; a total of *2 units at Tier 1*
  - 7.5% at Tier 2 = 2.325; a total of *2 units at Tier 2 (plus a fractional cash payment)*
  - 5% at Tier 3 = 1.55; a total of *2 units at Tier 3*

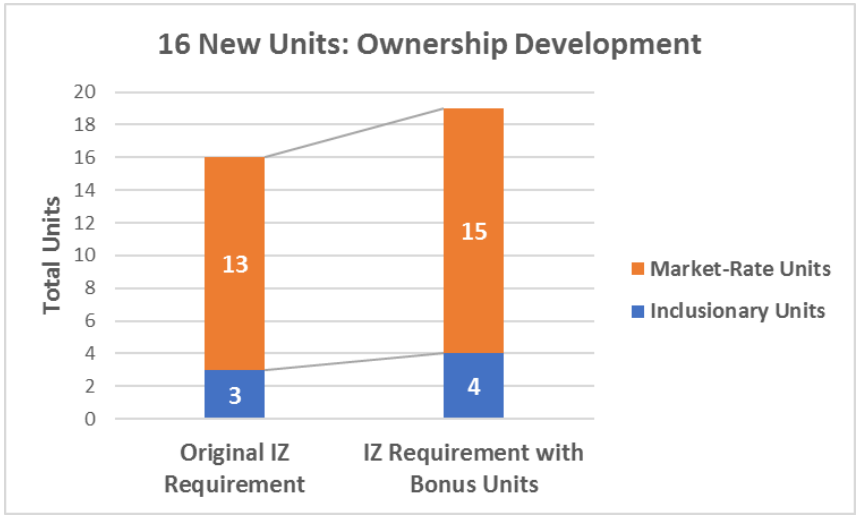
  The developer then chooses to provide 2 additional affordable Tier 2 units, which provides the project with 4 additional market-rate units, for a total of 6 additional units. The project now includes 37 total units: 29 market-rate units and 8 inclusionary units:
  - 2 units at Tier 1
  - 4 units at Tier 2
  - 2 units at Tier 3
  - = *8 total inclusionary units* (out of 37 total units; for a project that is now 21.6% affordable)

  Note: the total number of additional units allowed for a project originally consisting of 31 new units is 6; 20% X 31 = 6.2; for a total of no more than 37 total new units, as the example demonstrates.



- A developer proposes to build a multifamily ownership development, containing a total of 16 units; therefore, the total IZ requirement for the development would 3 inclusionary units: 13 market-rate units and 3 inclusionary units:
  - 0% at Tier 1 = 0; a total of *0 units at Tier 1*
  - 5% at Tier 2 = 0.8; a total of *1 unit at Tier 2*
  - 10% at Tier 3 = 1.6; a total of *2 units at Tier 3*

  The developer then chooses to provide 1 additional affordable Tier 2 units, which provides the project with 2 additional market-rate units, for a total of 3 additional units. The project now includes 19 total units: 15 market-rate units and 4 inclusionary units:
  - 0 units at Tier 1
  - 2 units at Tier 2
  - 2 units at Tier 3
  - = *4 total inclusionary units* (out of 19 total units; for a project that is now 21% affordable)



11) How do the inclusionary units in a development differ from the market-rate units in terms of design, construction, location, accessibility, and amenities?

The inclusionary units in a development must be indistinguishable from the market-rate units as viewed from the exterior, and the inclusionary units must contain complete living facilities, including a stove, kitchen cabinets, plumbing fixtures, a refrigerator, a microwave, and access to laundry facilities. The materials used and the quality of construction for the inclusionary units, including heating, ventilation, and air conditioning systems, must be equal to that of the market-rate units.

The bedroom mix of the inclusionary units must be equal to that of the market-rate units. The inclusionary units must be equivalent in size to that of the market-rate units, and the inclusionary units must meet the following minimum square footage and bathroom requirements, as required by DHCD's most current Comprehensive Permit Guidelines:

- 1 bedroom – 700 square feet / 1 bath
- 2 bedrooms – 900 square feet / 1 bath
- 3 bedrooms – 1200 square feet / 1 bath + 1 half bath
- 4 bedrooms – 1400 square feet / 2 baths

The inclusionary units, and their associated parking spaces, must be proportionately distributed throughout a project and must not be located in less desirable locations than the market-rate units.

At a minimum, the inclusionary units must have an equivalent level of accessibility to that of the market-rate units.

The inclusionary units must have equal access to all amenities that are offered to the market-rate units in a project, such as parking, onsite fitness center, laundry facilities, and community rooms.

12) How are the rents and sale prices for the inclusionary units in a project determined?

The total monthly housing costs associated with an inclusionary unit must not exceed 30% of the gross monthly income for the eligible household living in that unit.

Total monthly housing costs for rental units include rent, utility costs for heat, water, hot water, and electricity, one parking space, and access to all amenities that are typically offered to a tenant in the development, such as access to an onsite fitness center, laundry facilities, etc.

Total monthly housing costs for ownership units include the mortgage principal and interest, private mortgage insurance, property taxes, condo and/or homeowner's association fees, hazard insurance, and one parking space.

Step One:
The first step in calculating an inclusionary unit's maximum affordable rent or sale price is to identify the number of bedrooms in that unit. The rent or sale price is based on the number of household

members equal to the number of bedrooms in a unit plus one, regardless of the actual number of persons that end up occupying the unit.

Example:

- A 2-bedroom apartment's maximum affordable rent is based on a household size of 3 persons
  - 2 bedrooms + 1 = *3 person household*

Step Two:

Secondly, the appropriate gross annual Income Limit for that unit, adjusted for the associated household size, must be identified. HUD publishes these limits on an annual basis, and the FY 2018 Income Limits Summary Table for Newton, MA[5] is provided below.

FY 2018 Income Limits Summary - Newton, MA						
Income Level	Household Size					
	1	2	3	4	5	6
50% AMI	$37,750	$43,150	$48,550	$53,900	$58,250	$62,550
80% AMI	$56,800	$64,900	$73,000	$81,100	$87,600	$94,100
100% AMI	$75,500	$86,300	$97,100	$107,800	$116,500	$125,100
110% AMI	$83,050	$94,930	$106,810	$118,580	$128,150	$137,610

Examples:

- The income limit for a 2-bedroom apartment set at 50% AMI (3 person household size) is $48,550.
  - This means that only those households with annual gross incomes at or below this limit would be eligible for this housing unit

- The income limit for a 3-bedroom apartment set at 110% AMI (4 person household size) is $118,580.
  - This means that only those households with annual gross incomes at or below this limit would be eligible for this housing unit

Step Three – Rental Units:

Once the gross annual Income Limit associated with an inclusionary rental unit is determined, the maximum affordable annual rent can be easily determined by calculating 30% of that Income Limit and dividing by 12 to determine the maximum affordable monthly rent for an eligible household.

The table below demonstrates how the maximum gross rent for a 50% AMI unit is calculated.

[5] FY 2018 Income Limits Documentation System, Newton City FY 2018 Income Limits Summary: https://www.huduser.gov/portal/datasets/il/il2018/2018summary.odn

2018 Calculation of Maximum Affordable Rent - 50% AMI (all utilities included in rent)				
Unit Type	**Household Size (# of BR + 1)**	**50% of Adjusted Median Family Income***	**Monthly Income**	**Maximum Gross Rent (30% of income)**
Studio	1	$ 37,750.00	$ 3,145.83	$ 943.75
1 BR Unit	2	$ 43,150.00	$ 3,595.83	$ 1,078.75
2 BR Unit	3	$ 48,550.00	$ 4,045.83	$ 1,213.75
3 BR Unit	4	$ 53,900.00	$ 4,491.67	$ 1,347.50
4 BR Unit	5	$ 58,250.00	$ 4,854.17	$ 1,456.25
5 BR Unit	6	$ 62,550.00	$ 5,212.50	$ 1,563.75

The following table is a summary of the 2018 Maximum Affordable Rents for the City of Newton, broken out by Unit Type and AMI level.

2018 Maximum Affordable Rents, City of Newton (all utilities included in rent)				
Unit Type	**Household Size (# of BR + 1)**	**50% AMI**	**80% AMI**	**110% AMI**
Studio	1	$ 943.75	$ 1,420.00	$ 2,076.25
1 BR Unit	2	$ 1,078.75	$ 1,622.50	$ 2,373.25
2 BR Unit	3	$ 1,213.75	$ 1,825.00	$ 2,670.25
3 BR Unit	4	$ 1,347.50	$ 2,027.50	$ 2,964.50
4 BR Unit	5	$ 1,456.25	$ 2,190.00	$ 3,203.75

Step Three – Ownership Units:

Once the gross annual Income Limit associated with an inclusionary ownership unit is determined, the maximum affordable sale price must be set so that a household earning 10 percentage points lower than the identified Income Limit for that unit would not spend more than 30% of its annual income on housing costs. For example, if an inclusionary unit is set at 80% AMI, the maximum sale price for that unit must affordable for a household with an annual gross income of less than or equal to 70% AMI.

The down payment for the unit must be at least 3% of the purchase price. The mortgage loan must be a 30-year fully amortizing mortgage for not more than 97% of the purchase price with a fixed interest rate that is not more than 2 percentage points above the current MassHousing interest rate.

Below is an example of a maximum affordable sale price calculation for a 2-bedroom condo unit set at 80% AMI (for a 3 person household). The max sale price for this inclusionary unit would be $222,000.

2018 Max Affordable Sale Price Calculator		
Ex: 2-bedroom affordable condo set at 80% AMI		
	80% AMI Limit	**70% AMI Limit**
Sales Price	**$253,000**	**$222,000**
5% Down payment	$12,650	$11,100
Mortgage	$240,350	$210,900
Interest rate	**4.83%**	**4.83%**
Amortization	30	30
Monthly P&I Payments	$1,265.40	$1,110.35
Tax Rate	**$10.82**	**$10.82**
monthly property tax	$228	$200
Hazard insurance	**$84**	**$74**
PMI	$156	$137
Condo/HOA fees (if applicable)	**$84**	**$74**
Monthly Housing Cost	**$1,818**	**$1,596**
Necessary Income:	$72,736	$63,824
Household Income:		
# of Bedrooms	2	2
Sample Household size	3	3
110% AMI Limit	$100,375	$100,375
Target Housing Cost (110% AMI)	**$2,509**	**$2,509**
10% Window	$91,250	$91,250
Target Housing Cost (100% AMI)	**$2,281**	**$2,281**
80% AMI/"Low-Income" Limit	$73,000	$73,000
Target Housing Cost (80%AMI)	**$1,825**	**$1,825**
10% Window	$63,875	$63,875
Target Housing Cost (70%AMI)	**$1,597**	**$1,597**

The following table is a summary of the 2018 Maximum Affordable Sale Prices for the City of Newton, broken out by Unit Type and AMI level.

2018 Maximum Affordable Sales Prices, City of Newton					
Unit Type	**Household Size (# of BR + 1)**	**70% AMI**	**80% AMI**	**100% AMI**	**110% AMI**
Studio	1	$ 172,000	$ 197,000	$ 247,000	$ 271,000
1 BR Unit	2	$ 197,000	$ 225,000	$ 282,000	$ 310,000
2 BR Unit	3	$ 222,000	$ 253,000	$ 315,000	$ 349,000
3 BR Unit	4	$ 246,000	$ 282,000	$ 352,000	$ 387,000
4 BR Unit	5	$ 266,000	$ 304,000	$ 374,000	$ 418,000

13) When is a project that is subject to the Inclusionary Zoning ordinance allowed to provide its inclusionary units requirement off site, at an alternative project site?

Off-site inclusionary units are generally discouraged by this ordinance, and are only allowed through the Special Permit process where the City Council makes specific findings to an "unusual net benefit to achieving the City's housing objectives as a result of allowing the required units to be built off-site."

Projects that receive such permission from the Council must form a development agreement with a non-profit housing developer for the development of the off-site affordable units. Off-site units must be completed and occupied no later than the project's market-rate units and must provide an equivalent level of accessibility as what would have been provided if the required IZ units were to remain on-site.

14) What happens after an Inclusionary Housing project receives approval to move forward?

Prior to receiving a Building Permit from the City, the developer must submit a draft Inclusionary Housing Plan for review and final approval by the Director of Planning and Development. The plan must include, among other elements, a description of the proposed project, the total number of market-rate and inclusionary units, floor plans indicating the location, size and number of bedrooms and bathrooms per unit for all the units in the project, and the projected rent levels and sale prices for all the units.

Additionally, the developer must also submit a draft Affirmative Fair Housing Marketing and Resident Selection Plan for review and final approval by the Director of Planning and Development. At a minimum, this plan must meet the requirements set out in the Comprehensive Permit Guidelines of the DHCD, and provide for a Newton local preference for up to 70% of the inclusionary units in a project.

15) How are inclusionary units marketed and occupied?

The inclusionary units must be marketed and occupied consistent with the City and DHCD (or the relevant Subsidizing Agency) approved Affirmative Fair Housing Marketing and Resident Selection Plan. Marketing may not take place for ***any*** units in the project until the City and DHCD have approved this plan.

The developer is responsible for carrying out this plan, and must contract with an entity that has substantial and successful prior experience in each component of the Affirmative Fair Housing Marketing and Resident Selection Plan.

To avoid discriminatory effects in violation of fair housing laws, resident selection for the inclusionary units must comply with DHCD's approved lottery process for both the local preference and non-local preference units. The lottery process usually commences about six months prior to expected occupancy of the units.

The inclusionary units and market-rate units of a project must be occupied at the same time.

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Ruthanne Fuller
Mayor

City of Newton, Massachusetts
Department of Planning and Development
1000 Commonwealth Avenue Newton, Massachusetts 02459

Barney S. Heath
Director

MEMORANDUM

DATE: December 7, 2018

TO: Councilor Susan Albright, Chair, Zoning and Planning Committee
Members of the Zoning and Planning Committee

FROM: Barney Heath, Director, Department of Planning and Development
James Freas, Deputy Director of Planning
Rachel Nadkarni, Long Range Planner
Lily Canan Reynolds, Community Engagement Manager

RE: **#518-18 Discussion and review relative to the draft Zoning Ordinance**
DIRECTOR OF PLANNING requesting review, discussion, and direction relative to the draft Zoning Ordinance.

MEETING: December 10, 2018

CC: Planning and Development Board
John Lojek, Commissioner of Inspectional Services
Marie Lawlor and Jonah Temple, Law Department

Attached is a meeting summary of the discussion on residential districts from the November 26th meeting. Staff will be creating a meeting summary like this for each topic regarding the First Draft Zoning Ordinance to track work flow, next steps, and to digitize the notes taken during the discussion.

At the December 10th meeting, staff will briefly present the meeting summary, and take note of any additional thoughts that the Committee has reflecting back on the previous discussion.

Zoning Redesign Meeting Summary

Topic: Residential Districts Date: November 26, 2018

Part 1: Staff Summary (Points of General Agreement)

During the discussion of residential districts, staff introduced several topics related to the development of, and modifications to, properties in the residential districts. Staff have attempted to summarize additional points of general agreement with the understanding that details on these topics still need further discussion. These notes will be used to direct work flow over the next months and do not represent any decision of the Committee members.

Lot Standards

- The definition of lot coverage – there seemed to be general agreement that the clear division of what could be built upon and what had to be left as landscaped area was a positive change.
- Setbacks – there seemed to be general agreement that setbacks are an important mechanism in the zoning ordinance. Staff would like more feedback on the proposed list of setback encroachments in Sec. 2.3.5. and the Committee asked for more research with regard to encroachments and freestanding structures in the front setback.
- Contextual Front Setback – there seemed to be general agreement that the contextual front setback is a tool to keep in the zoning ordinance.
- Effective Minimum Lot Size – As analyses proceed, staff will explore what the effective minimum lot size is in each district based on the setbacks and lot coverage.

Building Types

- Footprint – there seemed to be general agreement that footprints may need adjustment after the buildout analysis is discussed.
- Proximity Rule – there seemed to be general agreement that the proximity rules for building types, particularly in the R3 district, merit further thinking on the part of both staff and the Committee.

Topics needing more discussion

- Height – How to measure? Standards? Reducing incentives for flat roofs and “podium” grade changes around buildings? There are many questions on height, and staff will review the schedule for an appropriate deep dive into all things height-related.

- Multi-unit housing – The discussion of Village Districts on January 14th will include topics related to multi-unit housing and mixed-use projects that may be applicable in the Neighborhood General and Residence 3 districts as well.
- Rear Lots – Staff has slides on a rear lot case study that we will include in a future presentation. A rear lot has a different relationship with the private backyards of its neighbors than a typical home fronting on a street. Some of the standards for rear lots are made stricter to address impacts to neighboring properties, most significantly a rear lot is limited to the House C building type. The House C type is smaller in footprint and lower in profile at 1.5 stories than other house types, limiting views into neighboring backyards. Landscaped screening and building orientation standards are also used to clearly separate the semi-public space of the driveway and front entry of the house on the rear lot from its neighbors' private backyard spaces. Staff would like feedback on the clarity and strength of the proposed limits on rear lots.

Part 2: Meeting Facilitation Notes Documented

Below is the Zoning Redesign Notes Matrix from the Residential Districts Discussion at the Zoning and Planning Committee Meeting on November 26th.

Recorded Zoning Redesign Facilitated Discussion Matrix

Points of Agreement

- Great Presentation

Proposed Modifications

- Consider differences in R3 District – potential need for a new district (as buildout analysis moves forward, consider if two patterns emerge)

Points to Discuss Next Time

- Differences in current and first draft proposed zoning map
- Mixed Use and Villages – come back to the Neighborhood General and how the transitions are handled at village edges
- R3 – come back to more discussion on the proximity rule for certain building types
- Tear-down vulnerability is important analysis
- Rear lots – easier or harder to do under the proposed? (show the case study at future meeting)

Points that need Staff Research

- Front setbacks and components in the front setback – things like pergolas – make sure there's incentives to allow full use of front yard for home/community connection
- House D – footprints may need to be reduced – will benefit from buildout analysis

Ideas to Come Back to

- What lots are currently unbuildable that become buildable (A question for the build out analysis)
- Review items that were moved from Phase 1 to Phase 2 discussions back in 2015, see how they are handled in the First Draft
- More discussion on height, retaining walls, basements, and attics
- Exploring prevention of groundwater flow between properties