Longwood Medical and Academic Area

Open Space and Resilience Framework

October 2025

Longwood collective

Acknowledgements

Longwood Sustainability Committee

Colette Baker, Sustainability Manager, Harvard Medical School
Susan Bottino, Sustainability Manager, Harvard T.H. Chan School of Public Health
Melissa Cantarow, Sustainability Program Manager, Boston Children's Hospital
Mike Copponi, Manager of Environmental Compliance & Sustainability, Dana-Farber Cancer Institute
Vithal Deshpande, Director of EHS & Sustainability, Massachusetts College of Art and Design
Russell Kinkade, Associate Director of Engineering, Merck Research Laboratories
Kate Lewandowski, Director of Sustainability, Boston Children's Hospital
Avery Palardy, Sustainability Director, Beth Israel Deaconess Medical Center
Debra Shepard, Principal, Riverstone Sustainability on behalf of Wentworth Institute of Technology
Lisa Tornatore, Sustainability Director, Boston University

Longwood Sustainability Committee Vision
A partnership between Longwood Collective and member institutions where institutions feel supported in having a collaborative space to share and advance progress toward shared sustainability goals, collect tools and resources to benefit from collective action, and have a network of peers to help build success.

Peer review provided by FUSS&O'NEILL

Longwood Collective Member Institutions

The Baker Center for Children and Families, Boston Children's Hospital (BCH), Beth Israel Deaconess Medical Center (BIDMC), Brigham and Women's Hospital (BWH), Dana Farber Cancer Institute (DFCI), Emmanuel College, Harvard University, Isabella Stewart Gardner Museum, Joslin Diabetes Center, Massachusetts College of Art and Design (MassArt), Massachusetts College of Pharmacy and Health Sciences (MCPHS), Massachusetts Mental Health Center, Simmons University, Temple Israel, Wentworth Institute of Technology (WIT), The Winsor School

Associate Members
Boston University Wheelock College of Education and Human Development (BU Wheelock), Fenway Community Health Center, Massachusetts Eye and Ear Infirmary (MEEI), Merck Research Laboratories

Longwood Collective's Mission
To drive collaborative solutions enabling Longwood to be an innovative hub of healthcare, research, and education.

About Longwood Collective
Rapid growth and congestion fifty years ago led to the creation of a non-profit now known as the Longwood Collective to serve as the convening organization for the institutions in Longwood and to address shared challenges, such as land use, transportation and congestion.

Today, Longwood Collective serves as the preeminent organization planning and advocating for the people served by Longwood's institutions, providing transportation services and collaborating with our members and the City of Boston and others on shared land use, sustainability and transportation goals.

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Executive Summary

The Open Space and Resilience Framework provides a guide and prioritization tool for advancing projects to address climate and community resilience risks in Longwood, a dense hub of healthcare, research, and higher education, located in the City of Boston.

For decades Longwood Collective (LC), as stewards of Longwood, has partnered with our member institutions and the public sector to advance district tree planting, beautification, flood control, and other programs. These existing programs and new initiatives are essential to tackle Longwood's climate and open space needs.

This document highlights existing conditions and challenges, analyzes risks, and identifies existing and new initiatives and opportunities for collaboration with public agencies, community organizations, and Longwood member institutions. We recommend six (6) Focus Areas and associated projects addressing heat, flooding, and access to open space.

This document addresses climate solutions for Longwood's public and publicly-accessible spaces including sidewalks, plazas, parks and open areas. Longwood's hospitals, colleges, cultural institutions and research institutes also address climate goals through individual campus plans such as the Health Sector Climate Pledge (2022).

Introduction

Planning for climate change is crucial to ensure the long-term economic vitality of Longwood. The City of Boston identifies Longwood as among the most at-risk neighborhoods for extreme heat and stormwater flooding*. This plan charts a path toward climate readiness, highlighting opportunities to work across sectors to turn challenges into shared solutions.

Boston's Longwood Medical and Academic Area, also known as Boston's city-within-a-city, is located three miles southwest of downtown Boston, adjacent to the Fenway, Mission Hill, and Audubon Circle neighborhoods, and the Town of Brookline. "Longwood", is a 213-acre campus that is home to 22 prominent institutions, including three Harvard-affiliated teaching hospitals, three Harvard graduate schools, three research or research treatment centers, six historic colleges and universities, a private secondary school, an art museum, one public high school, a state mental health center, a religious institution, and an international pharmaceutical research company. It contains over 22 million square feet of floor area and employs 73,000 people, receives over 3 million patients annually, and receives 134,000 daily visitors. It is an economic powerhouse, and a world leading hub of healthcare, research and education.

Proactive climate planning is essential to safeguard Longwood's long-term economic vitality and global competitiveness. By preparing for flooding, we can ensure reliable access for essential workers and protect the critical transit systems they depend on. Addressing extreme heat will strengthen community health while reinforcing the energy systems that sustain life-saving care. Preserving open spaces and improving air quality will help Longwood remain a world-leading hub that continues to attract top talent. At the same time, enhancing our pocket parks and green spaces will equip them to better withstand future climate events while providing vital respite for the district's people and wildlife.

This document provides a roadmap for better climate resiliency and community accessibility of existing open spaces, exploring opportunities for retrofitting impervious areas with green infrastructure, and protecting and enhancing the health of existing open spaces. It presents an analysis of existing conditions, climate risks, challenges and opportunities and presents six (6) Focus Areas and potential projects with an assessment of costs and benefits.

For over 100 years, with support from partners in the public sector, and local community, Longwood institutions have been healing, teaching, strengthening, curing, and inspiring the world. Today, addressing the impacts of climate change offers a powerful new opportunity to apply that same spirit of innovation and collaboration to safeguard our future.

Serving Vulnerable Populations

Mitigating the impacts of climate change is essential to protecting the many vulnerable populations Longwood serves, including patients with compromised immunity, mobility impairments and other health challenges. Longwood also hosts three or half of Boston's Level 1 trauma centers.

From the City of Boston alone, roughly 60,000 people including patients and employees come to Longwood from neighborhoods meeting at least 2 of the Commonwealth's Environmental Justice (EJ) criteria (minority population, income, and English isolation).

*City of Boston, Open Space and Recreation Plan, 2023

Legacy Programs and Recent Successes

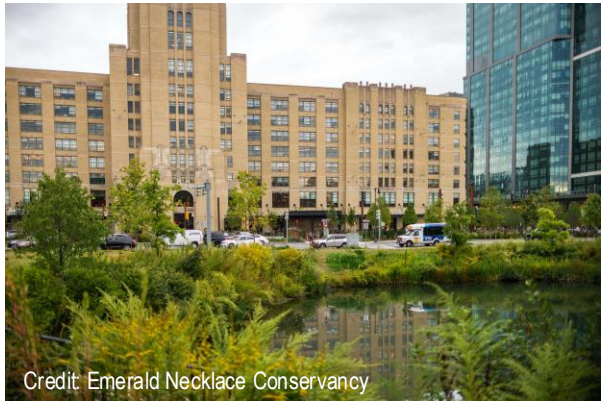
Well-established programs and ongoing projects provide a foundation to tackle Longwood's climate and open space needs. These programs form the basis of the strategies contained in this Open Space and Resilience Framework.

For 15 years, LC has been caring for street trees on Huntington Avenue to enhance district gateways and reduce the urban heat island effect.

Every year, LC and our members install 172 hanging flower baskets each spring and maintain 92 planters through our district-wide beautification program.

In 2025, with a grant from **the City's Browne Fund**, LC is constructing a bioswale as stormwater and tree planting pilot project located at Avenue Louis Pasteur and The Fenway and is the subject of an MOU between LC and **BWSC**.

LC worked with the Army Corps of Engineers on the **Muddy River Restoration Project** to dredge sediment and daylight Justine Mee Liff Park, a stretch that had been buried due to urbanization. This work reduced flood risk and reflects Olmsted's original vision for an urban greenspace.



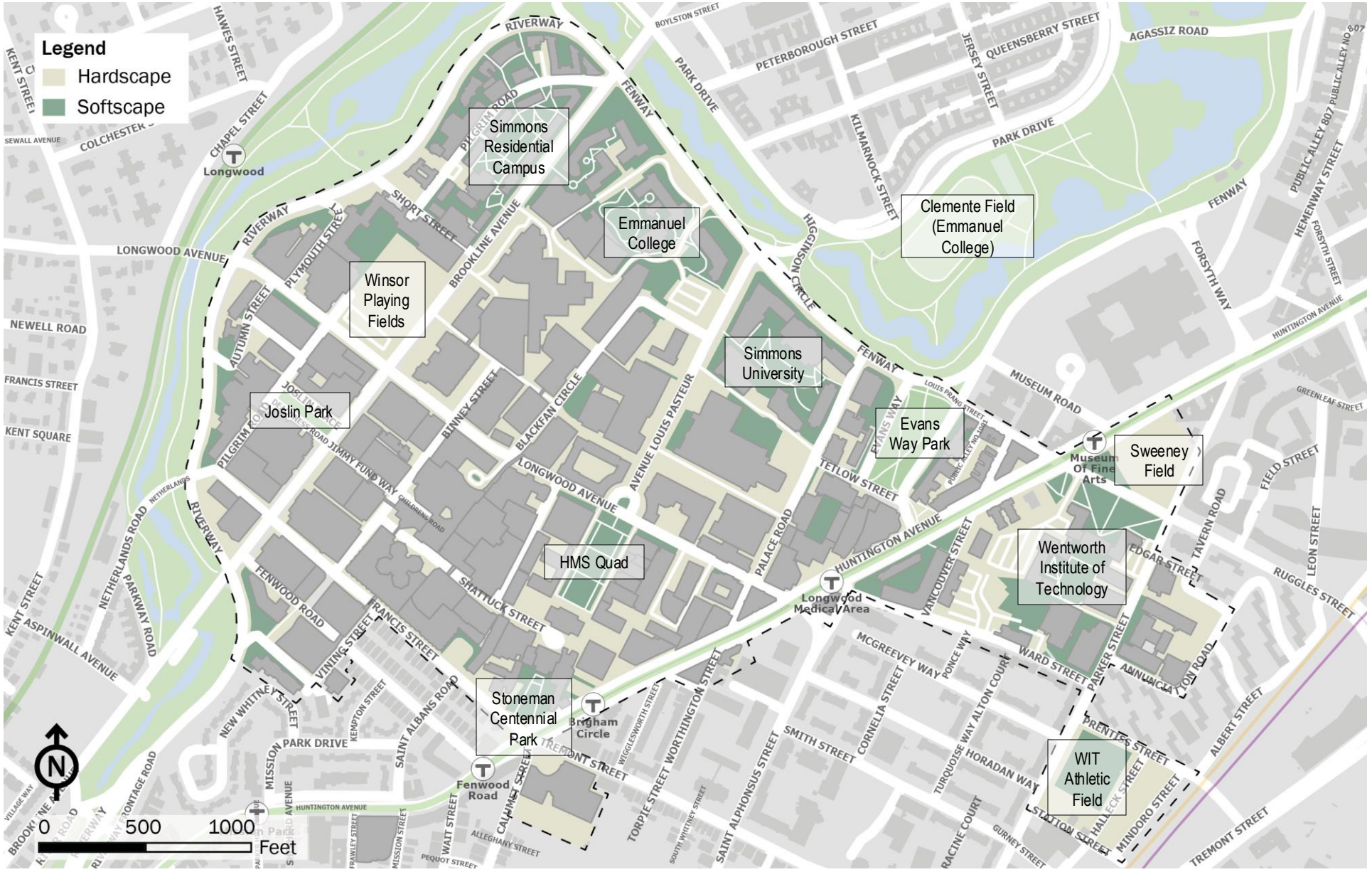
The planned **Longwood Place development project** will add 2.8 acres of open space, permeable areas, parks and trees, and the **1 Joslin Place Hospital project** will upgrade its much-loved city park namesake.

Between 2012-2020, **BWSC** replaced 13,000 linear feet of water mains and sewer, upgrading 100-year-old pipes to improve district's stormwater management.

For 7 years, the Outside// Placemaking program, sponsored by LC, four hospitals, and a private property owner, has been bringing the culture of care outside across 12 locations with umbrellas, seating, games, and music.

Figure 1: Open Space in the Longwood Medical and Academic Area

For the purposes of this Framework, open spaces include all areas that are not building footprints or roads. This includes pu blic and private parks, plazas, lawns, fields, sidewalks, landscaped edges, surface parking, driveways and circulation areas– all Hardscapes and Softscapes denoted in the map.



Longwood's open space accounts for almost half of the district acreage at 99 acres of the total 213 acres. 46% of the area is pervious, 54% is impervious.

Roof areas, including those that are suitable for constructing a green, blue, or reflective roof, or space for installing solar panels or heat pumps in the transition to renewable energy sources to decarbonize are not included in this total, however are included as opportunities for future projects.

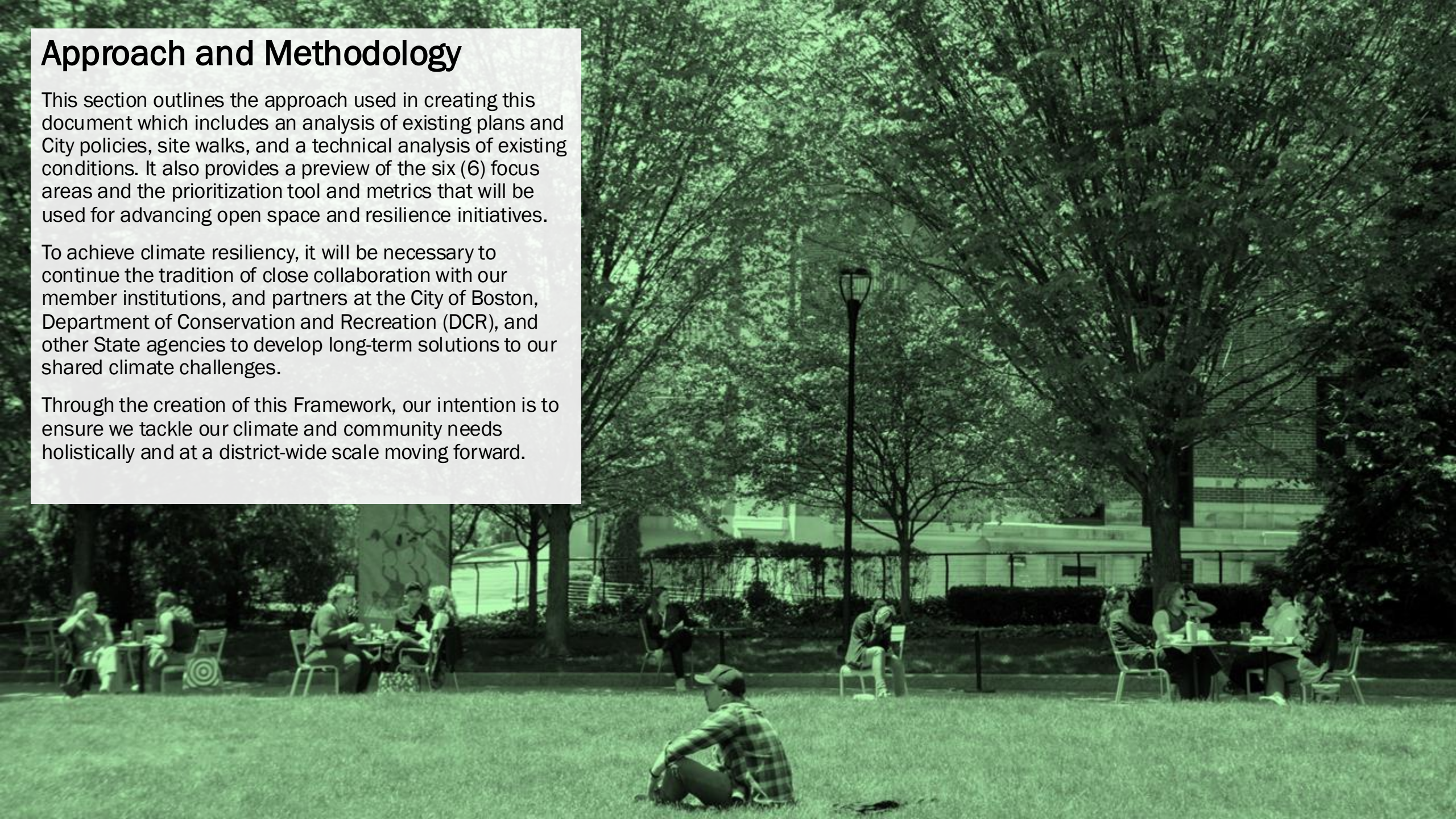
Roadways are not in scope as technologies are still evolving, but strategies will be researched in Phase 3 (outlined on Page 30)

Approach and Methodology

This section outlines the approach used in creating this document which includes an analysis of existing plans and City policies, site walks, and a technical analysis of existing conditions. It also provides a preview of the six (6) focus areas and the prioritization tool and metrics that will be used for advancing open space and resilience initiatives.

To achieve climate resiliency, it will be necessary to continue the tradition of close collaboration with our member institutions, and partners at the City of Boston, Department of Conservation and Recreation (DCR), and other State agencies to develop long-term solutions to our shared climate challenges.

Through the creation of this Framework, our intention is to ensure we tackle our climate and community needs holistically and at a district-wide scale moving forward.



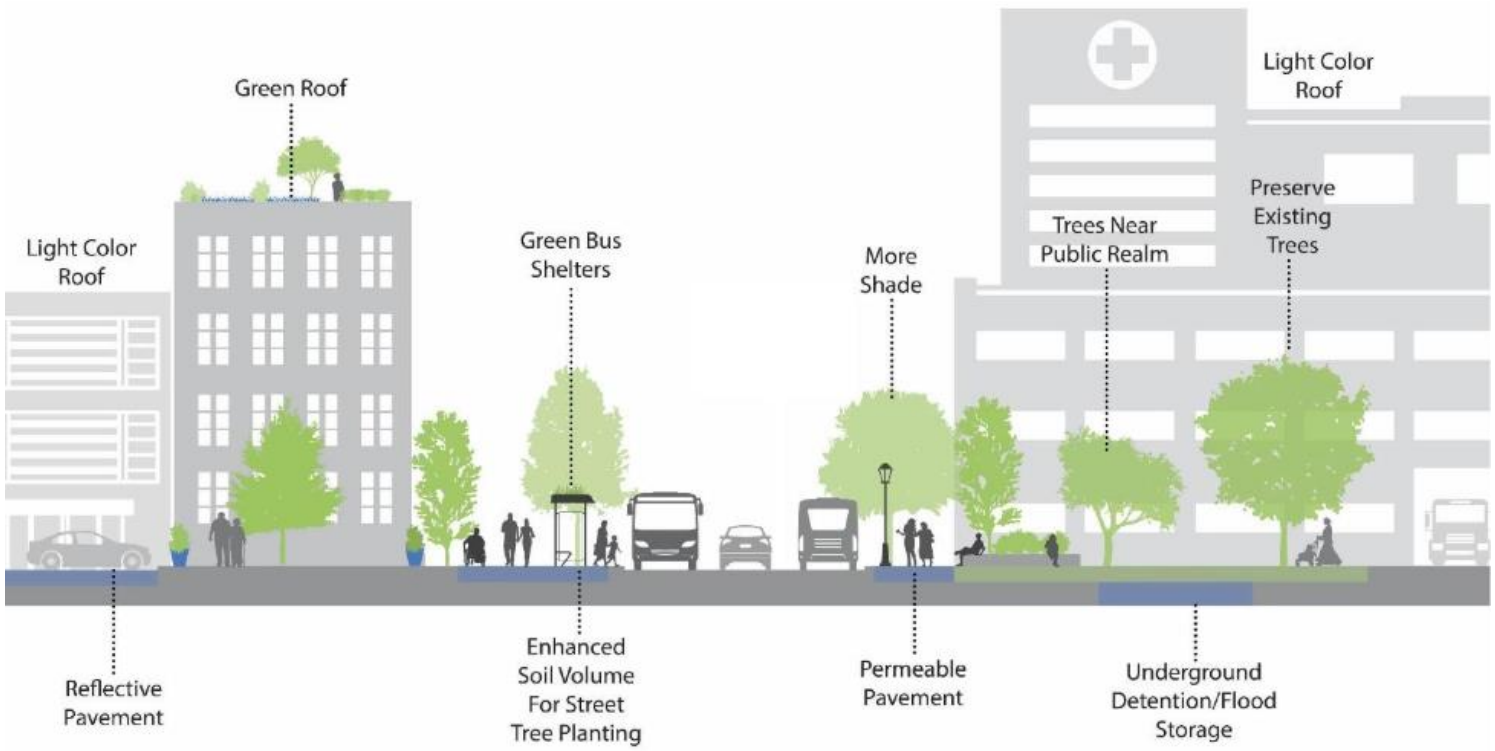
The Vision

A resilient Longwood adapts to the inevitable extreme weather, and mitigates the environmental, economic, and community impacts of climate change.

It's a hot summer day in 2035, and Lucas is receiving in-patient care at a Longwood Hospital. His mom and sister Lily come to visit, and after his procedure they decide to step outside for some fresh air. From the lobby, they are directed to the district's Outside// Placemaking program that offers seating and shade, and includes **misting fans**, petting dogs under the shade of **healthy, drought and disease-resistant trees**, boosting their spirits. Lucas uses a wheelchair, and even though there was significant rainfall in the days before, **the permeable pavers** and **bioswale** in the plaza mean there are no deep puddles or mud to navigate around.

When visiting hours are over in the afternoon, the temperature has risen to over 100°F. Mom and Lily leave the hospital and are relieved that the **reflective pavement**, **lush tree canopy**, and bus shelter **green roof** make the local temperature 15 degrees cooler. On the way to the bus, they see a Soofa sign directing them to a **cooling center in their neighborhood**. They stop there for an hour before returning home.

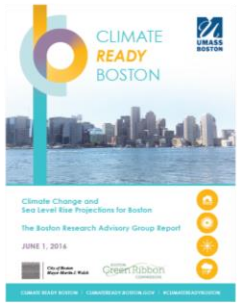
Meanwhile, Lucas's nurse, Louis, is able to find respite for 10 minutes on the **hospital's rooftop garden**. He counts on those quick and accessible breaks outdoors for his mental health to ensure he can provide high quality care. The garden also **reduces the hospital's energy usage** and **filters the runoff** that flows into the Muddy River. All these permeable surfaces reduced the flood inundation from yesterday's storm. No patients or ambulances were redirected, and Louis was able to walk home that evening. He had a late patient case, so it was dark when he left, but he spotted a new **wayfinding** sign connecting him to the Emerald Necklace and the pathway lighting made it a safe and inviting option.

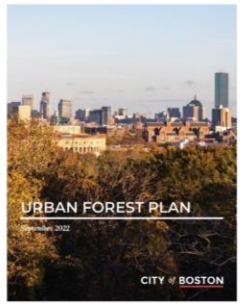


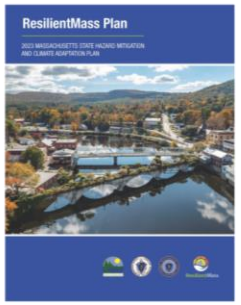
Framework Methodology

Our methodology for developing this Open Space and Resilience Framework includes:

1. A Comprehensive Review and Analysis of Several City and State Plans, Policies and Climate Models, including the City of Boston Office of Climate Resilience's Heat Resilience Solutions Report, Urban Forest Plan, and Open Space and Recreation Plan, Climate Ready Boston Flood Map, and the ResilientMass Hazard Mitigation and Climate Adaptation Plan.







2. Technical Analysis of the Area's Existing Conditions. LC technical staff used Google Earth and physical site walks to identify open space in the district to define our scope. Using Geographic Information Systems (GIS) spatial analysis tool, staff pinpointed our priority areas with the greatest opportunity for green projects and programs based on a relative level of impact on flooding and extreme heat. These surfaces were then further sub-classified by land type (pervious vs impervious) ownership (public vs private), and land use (parking, turf fields, pedestrian circulation) to indicate collaboration and partnership opportunities, and which potential Framework Focus Areas and projects are best to continue prioritizing or deploy in each area.

3. The Development of Six (6) Focus Areas to Guide Decision Making and a Project Matrix. The 6 Focus Areas serve to categorize initiatives that support resilience and open space development. Page 25 shows existing initiatives currently underway and funded with example projects and strategies and characteristics (i.e. benefit, implementation timeline, leading entity). Page 26 shows planned and aspirational initiatives.

6 Framework Focus Areas

- **Construct Green Infrastructure**
- **Advance Sustainable Development**
- **Build & Maintain Tree Canopy**
- **Expand Beautification Program**
- **Connect Open Space Network**
- **Reduce Fossil Fuel Dependence**

Existing Conditions: Climate Impacts on Longwood

Heavy rainfall, flooding, and extreme heat are the biggest climate threats facing Longwood. Flooding impacts roadways and hospital operations, obstructing access to ambulance bays, overwhelming stormwater systems and flooding basements. Extreme heat places a strain on the power supply, a heightened risk for hospitals that require a high demand for 24/7 uninterrupted power, and is uncomfortable and dangerous for vulnerable populations that must travel to Longwood for essential services.

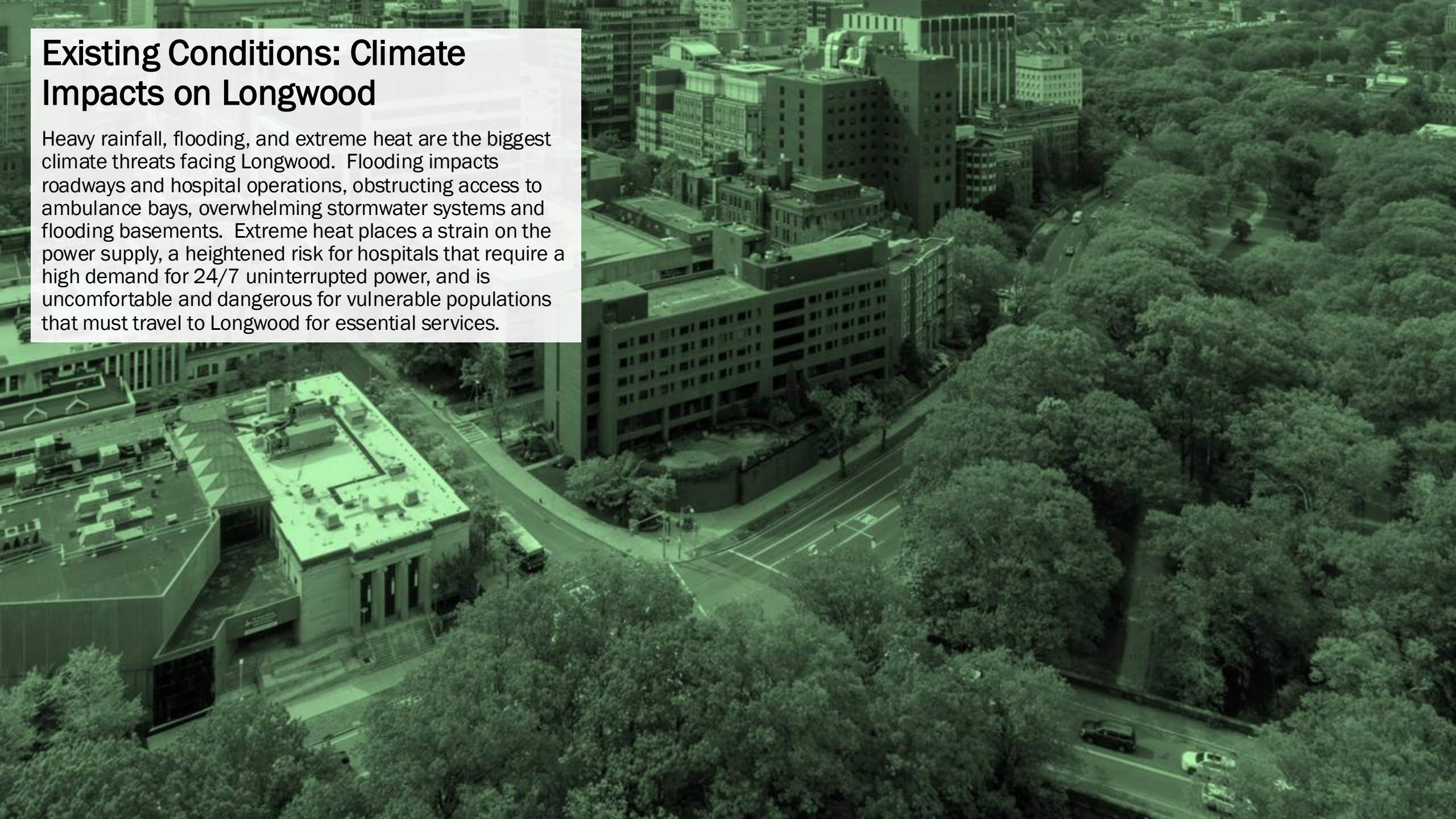


Figure 1: Stormwater Flooding

The potential economic losses from business interruptions in Longwood are higher* as it is harder for anchor institutions such as hospitals, colleges, and cultural institutions to rapidly shift to remote operations or relocate operations in the event of a storm and could be catastrophic for the region.

Since the Muddy River was dredged, flooding such as this event in 2014, has been mitigated.

Flooded bike lane on Brookline Ave

Climate Ready Boston's Near-Term Stormwater Flood Map shows flooding in portions of Simmons University, Emmanuel College, Avenue Louis Pasteur, WIT, BIDMC East Campus, and Stoneman Park .

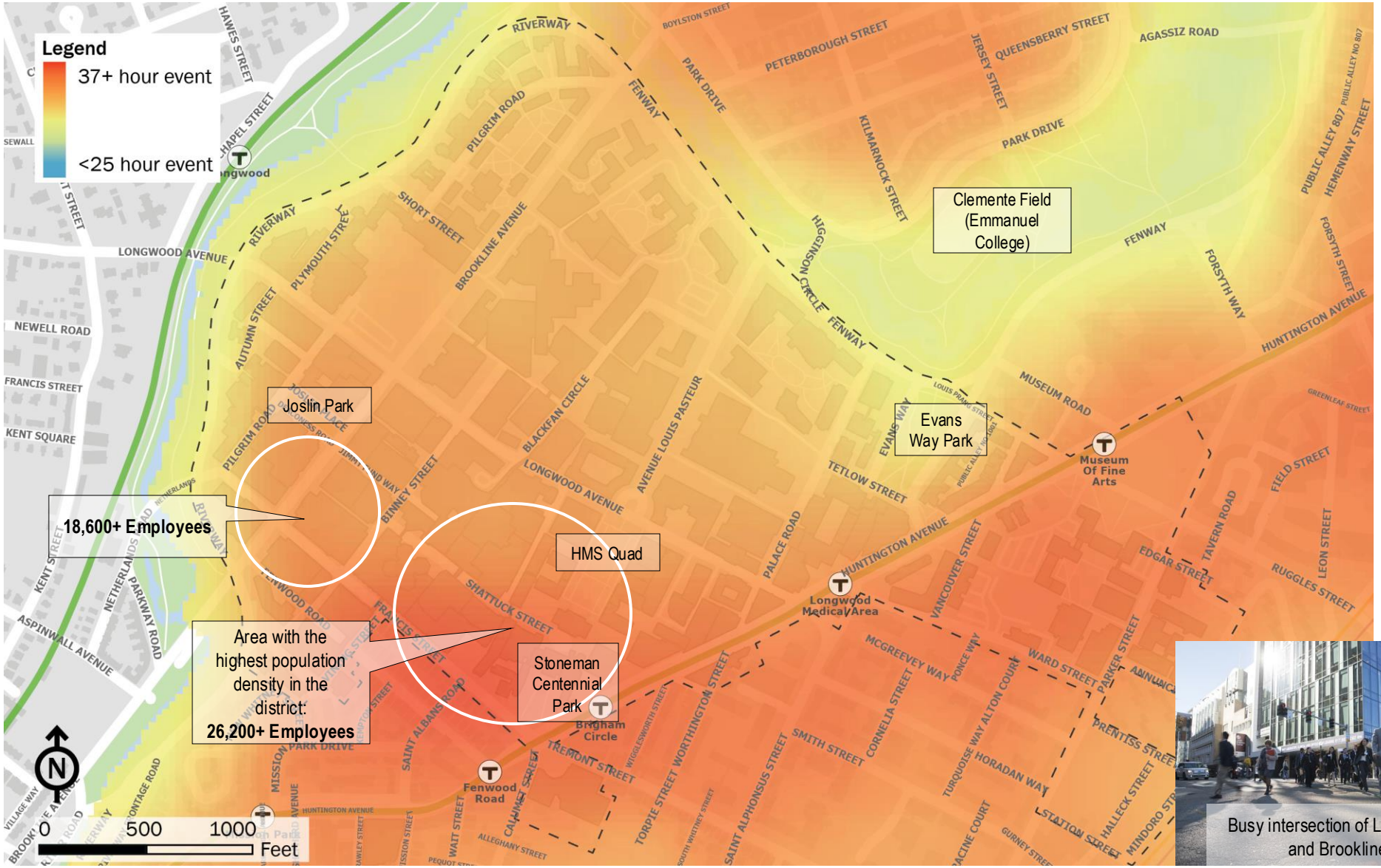
Other precipitation events like blizzards and Nor'easters also cause inland flooding. Both BWSC and the City of Boston have recognized the need for better inland stormwater flood models and visualizations of real stormwater flooding events in Boston. Through field analysis, LC has mapped some of the real flood events from recent rainstorms over the last few years that emphasize this difference and the risk to hospital operations if climate-driven storms continue to intensify.

Boston's Office of Green Infrastructure's Community-Based Flood Resilience and Green Infrastructure Planning Project is harnessing community engagement to inventory and track real inland flooding occurrences to effectively build a strategy to address the potential impacts based on real data. BWSC is planning a study to characterize inland flooding.

*Climate Ready Boston, 2016

Figure 2: Heat Event Duration

The cooling effects of the Emerald Necklace and the Colleges of the Fenway path and greensward are evident in the data, but the lack of parklands and tree canopy in the south and southeast area of the district contributes to the intense heat lingering for longer.



Based on the **City of Boston's Heat Resilience Study**, Longwood has high Heat Event Duration - the number of hours exceeding 95°F during the day or 75°F at night - with the southern portion of the district remaining in this range for >37 hours. Along Huntington Avenue, the concentration of surface parking, high traffic areas, poor growing conditions, and Green Line MTBA line create high thermal load and temperatures reaching over 105°F + during heatwaves. Conditions for those on foot can be uncomfortable: sidewalks are narrow, crowded and many intersections are heat- exposed and congested with delivery trucks, buses, ambulances and other large vehicles emitting heat.

Brigham and Women's Hospital, Mission Hill – an EJ neighborhood, and Huntington Avenue, densely populated with students, are areas where the community is at risk for heat-related medical issues due to long heat events. The hottest area is also where the most people in the district work.

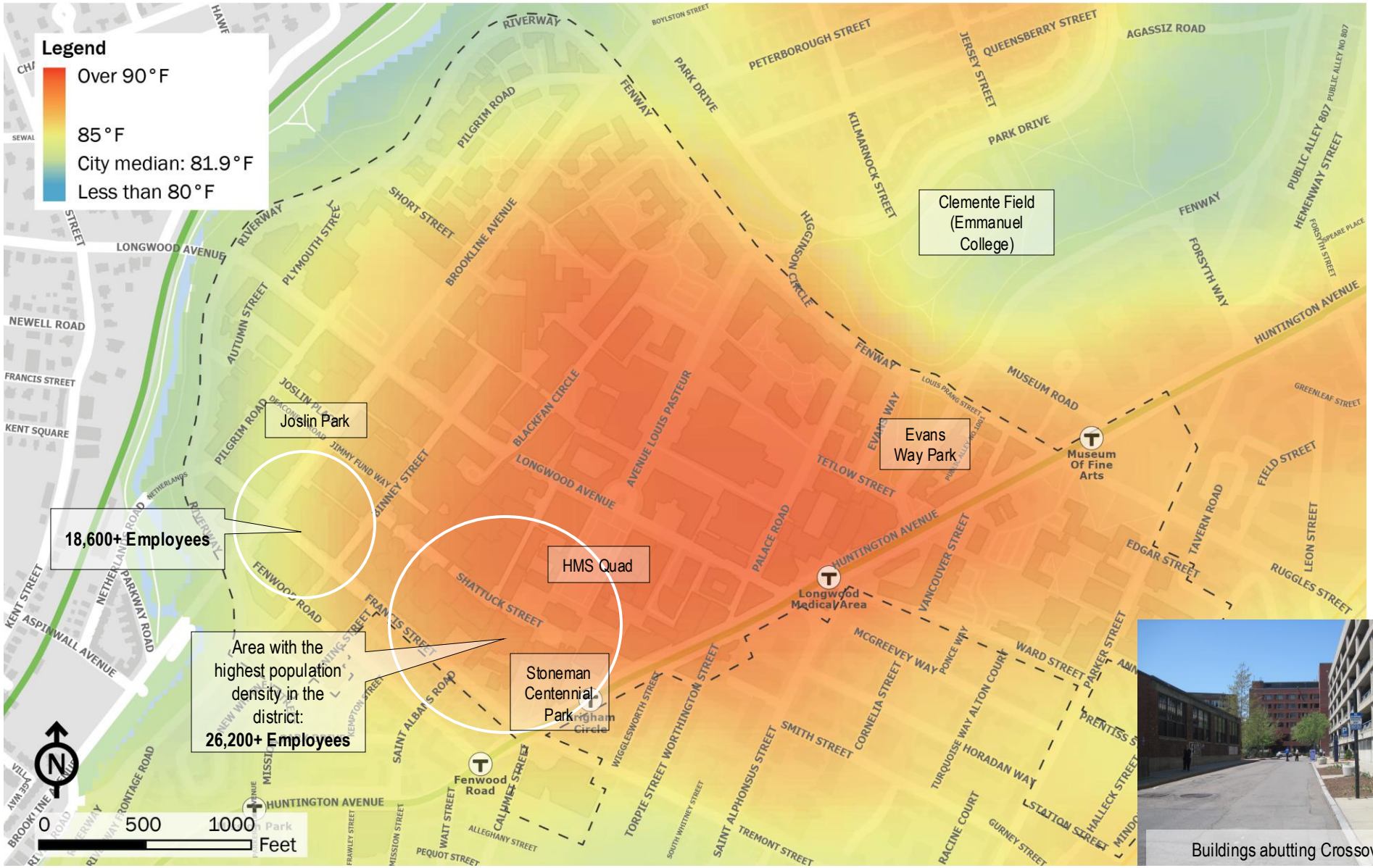
Busy intersection of Longwood Ave and Brookline Ave

Traffic on Longwood Ave

City of Boston Heat Map Explorer, 2022

Figure 3: Nighttime Air Temperatures (3AM)

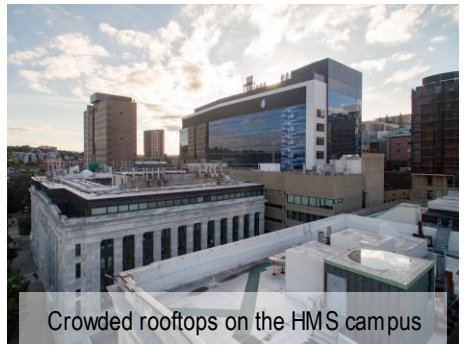
A challenge inherent in any medical district like Longwood is the 24/7 operations required to sustain specialty care, a unique consideration for Longwood compared to other economic hubs in Boston.



Longwood has some of the highest Nighttime Air Temperatures during heatwaves (>90°F), compared to the rest of the City. Longwood campuses are often built to the property lines. The ability to add rooftop gardens or solar panels is also constrained by extensive rooftop mechanicals.

The cooling impacts of the Emerald Necklace are noticeable. The surrounding areas are generally more residential or marked by commercial uses that are closed overnight.

Buildings abutting Crossover St



Crowded rooftops on the HMS campus

City of Boston Heat Map Explorer, 2022

Figure 4: Energy Intensive Needs

The City of Boston aims to achieve carbon-neutrality by 2050 with Net-Zero Carbon Zoning regulations requiring new hospitals and labs to be net-zero operational carbon emissions by 2045 and 2035 respectively.

Geothermal wells under the ISG Museum
Credit: SAK Environmental

WIT's cogeneration steam plant

MATEP

The district's energy infrastructure includes the Medical Area Total Energy Plant, or MATEP, serving major institutions including BIDMC, BCH, BWH, DFCI, Harvard Medical School, and Harvard School of Public Health, all of whom are in a contract with the plant through 2051. MATEP is a privately-owned co-generation plant that generates electricity and thermal energy, steam and chilled water for heating and cooling, via the combustion of a single fuel, natural gas. MATEP supplies much of the district's continuous energy needs. However, reliance on fossil fuels complicates decarbonization efforts for the institutions it serves. WIT has its own cogeneration steam power plant, producing nearly one-third of campus power, recovering waste heat to produce heating for buildings, and ISG has 8 geothermal wells to heat and cool the New Wing.

Building Emissions Reduction and Disclosure Ordinance (BERDO) also sets requirements on large buildings to reduce greenhouse gas emissions over time with the goal to reach net-zero emissions by 2050 – regulations most buildings in Longwood are subject to.

Other buildings not served by MATEP use electricity from Eversource and onsite use steam boilers for heating cooling or have gas-powered generators to offset the demand in these large buildings under continuous operation.

Open Space Assessment

As we examine the current state of open space in Longwood, these maps help us identify areas of opportunity and where to prioritize efforts for potential new projects.

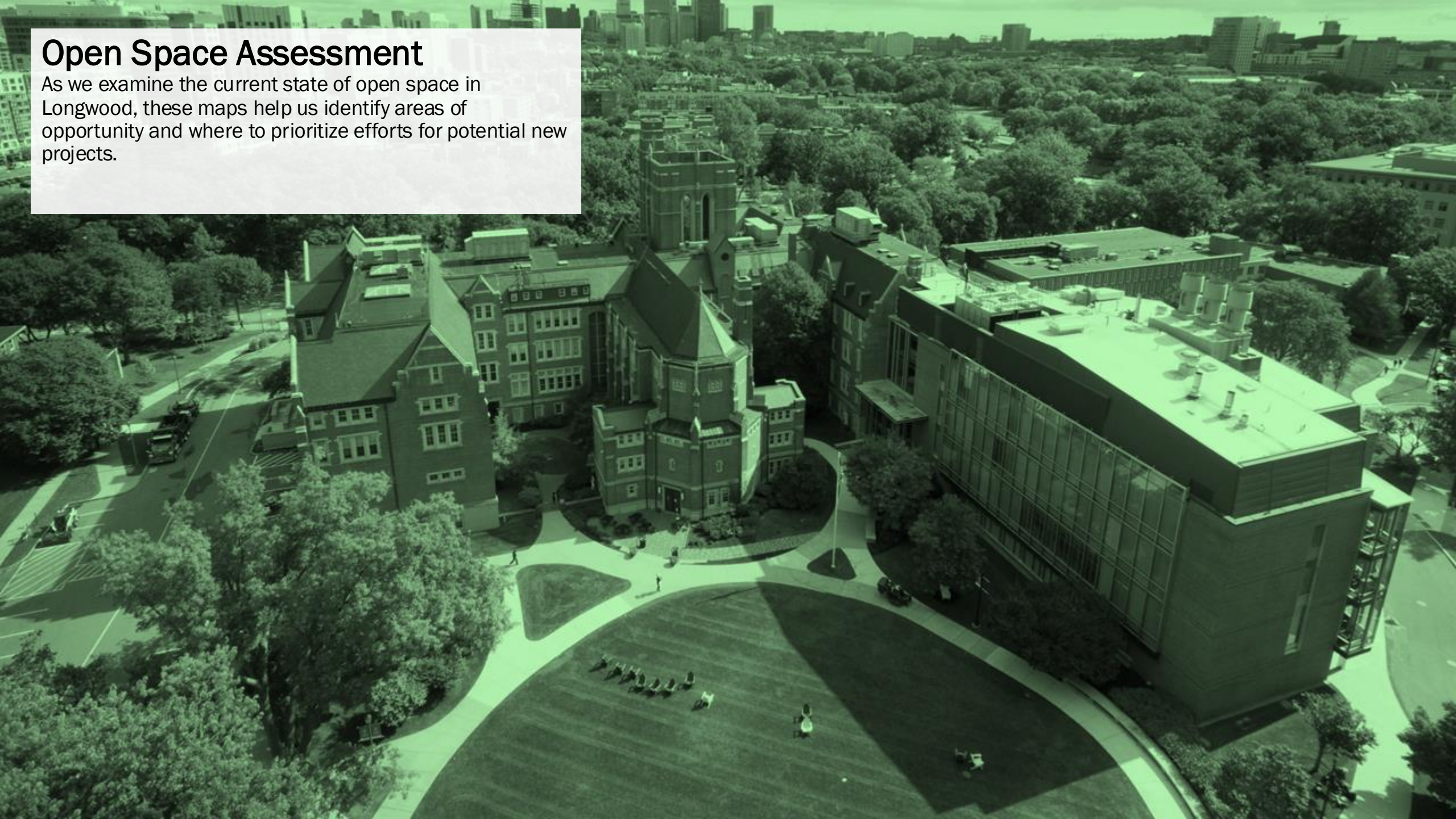
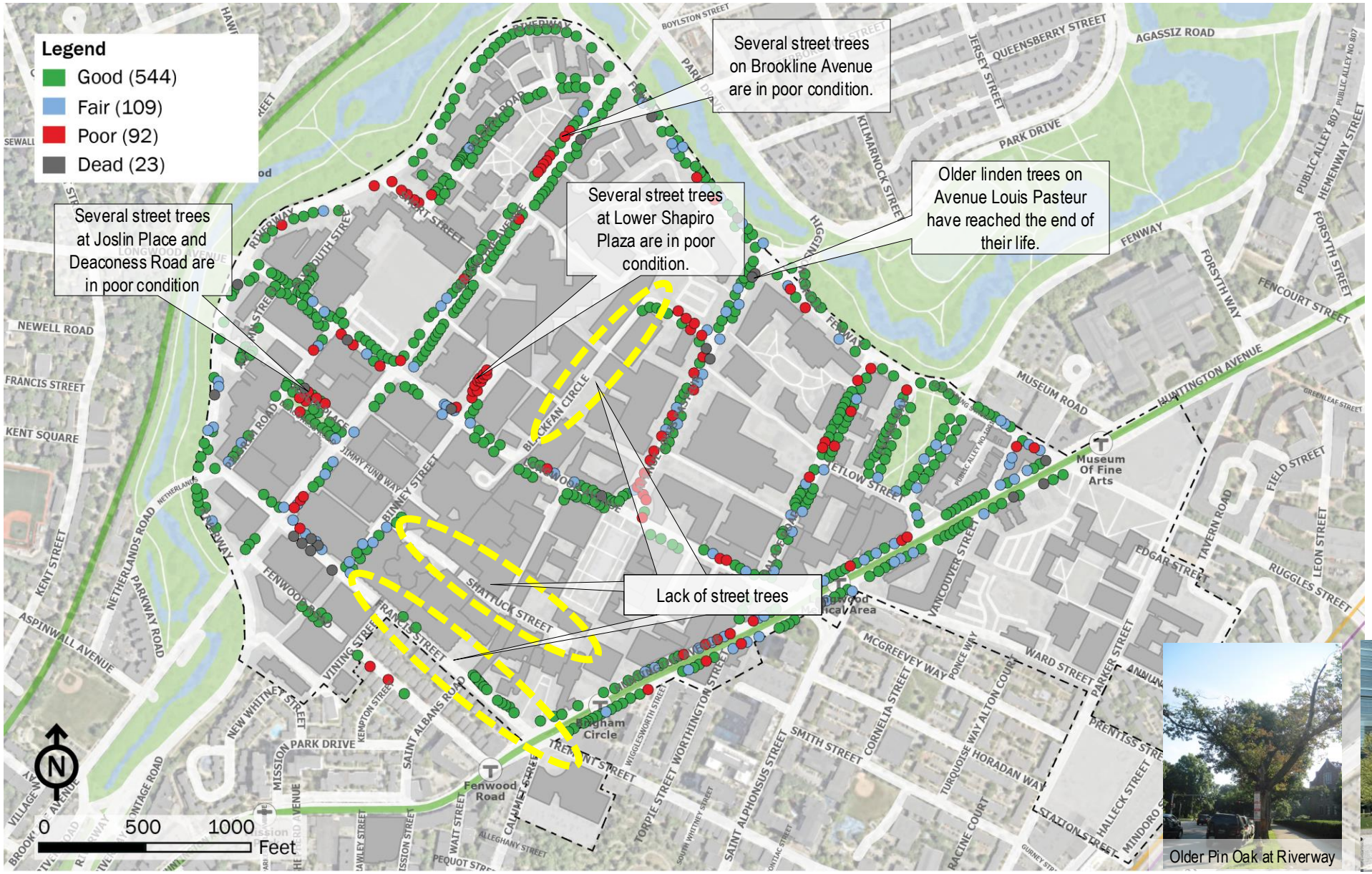


Figure 5: Street Tree Condition

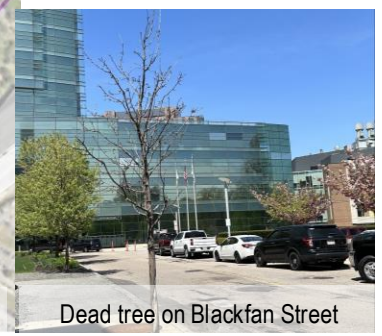
Longwood's tree canopy is ~10%, well below the City average 27%*. We can develop a district-wide street tree strategy and plan with local partners, the City Arborist, and Urban Forest Division in support of the City's Urban Forest Plan.

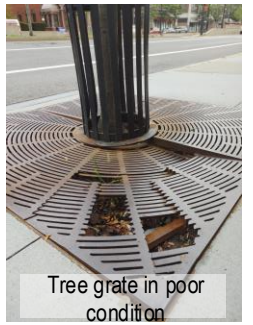


Trees help to combat the urban heat island effect, slow and filter runoff of stormwater, remove pollutants from the air and soil, sequester carbon, and improve health outcomes. Street trees are generally owned by the City and Department of Conservation and Recreation (DCR), except for the trees in the Huntington Avenue median which LC is responsible for maintenance and replacement.

In 2022, Longwood Collective conducted a comprehensive survey of street trees. Based on the findings, 70% of street trees are in good condition. However, the remaining 30% or ~220 trees are in only fair or poor condition, strained by the summer heat or are dead. Tree pit infrastructure conditions also vary, with tree grates causing safety hazards, collecting trash, or digging into trunks, and soil pits are compacted. Opportunities for planting street trees are also limited due to the presence of subsurface conduits carrying utilities.

Older Pin Oak at Riverway


Dead tree on Blackfan Street


Tree grate in poor condition

*City of Boston Urban Forest Plan, 2022

Figure 6: Ownership of Longwood's Green Spaces

Longwood's existing green space network will require maintenance and enhancement over time. Preservation and access strategies and approaches differ between public and private spaces depending on funding, management, and oversight.

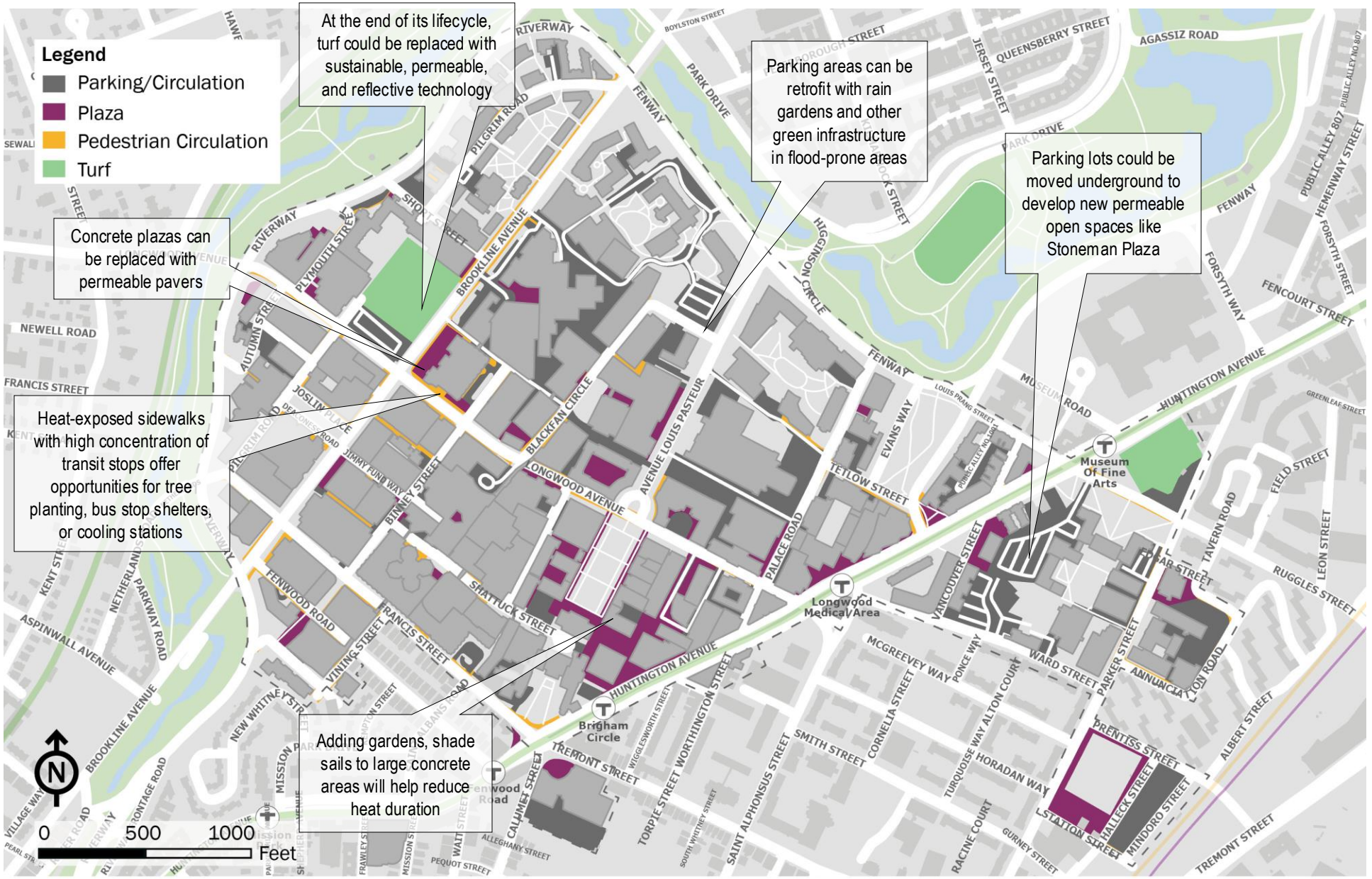
There is a nearly continuous system of privately-owned green spaces including tree-lined parks and quads between BU's Wheelock campus and WIT, forming an effective permeable greensward across the north half of Longwood, most prone to flooding.

The rest of the district's green spaces are public parklands, like Evan's Way Park, or planted areas adjacent to the public right of way. Avenue Louis Pasteur, a historic, tree-lined boulevard provides a visual and physical connection between the Emerald Necklace and the Harvard Medical School Quad.

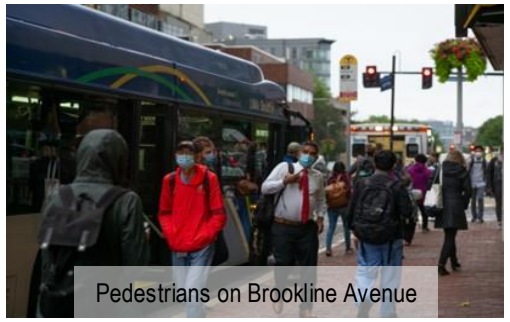
Only 28% of green space is publicly accessible, highlighting the need to protect and enhance the connection between these spaces and the Emerald Necklace.

Figure 7: Plazas, Parking Lots, Loading, and Circulation

Similarly, the approaches to greening the network of impervious spaces depends on land use. While pedestrian circulation are as account for a small percentage (7%) of open space, they have high foot traffic - 100,000 people daily, where the greatest felt impacts of extreme heat and flooding may occur.



Impervious surfaces include sidewalks, surface parking lots, and plazas. There are ~11 miles of pedestrian circulation (impervious sidewalks and alleys), subjected to heat, much of it being along Longwood and Brookline Avenues where there are also some of the highest concentrations of shuttle and MBTA bus stops where people are waiting outside. In other areas, sidewalks are too narrow to accommodate a bus stop shelter or tree pit (See Figure 10 Transit Stop Map). The few remaining surface parking lots in the district are approved for re-development for buildings and open areas.

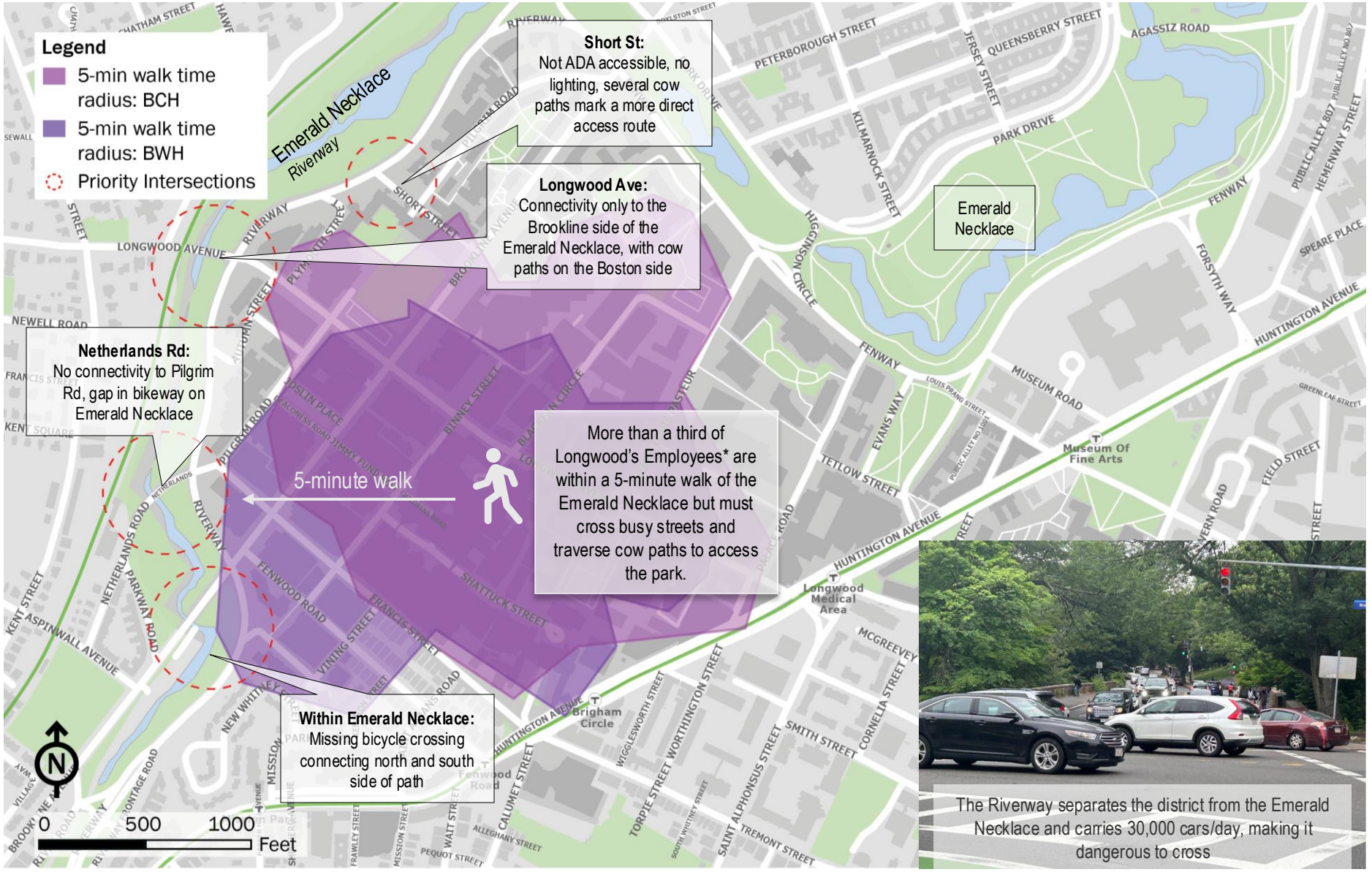


Pedestrians on Brookline Avenue

Shapiro Plaza at BIDMC

Figure 8: Connectivity to Green Space

The Emerald Necklace offers clean air, cooling shade, and respite for community well-being as climate impacts worsen, but is difficult and uncomfortable to access due to a lack of ADA accessible paths, limited lighting, and barriers presented by traffic-filled arterials.

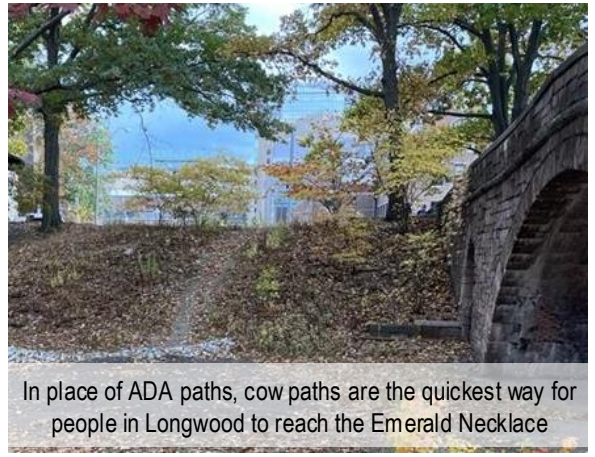


Olmsted's Emerald Necklace park system and the Muddy River, adjacent to Longwood is a cherished, historic resource. It mitigates the impacts of extreme heat and flooding by providing cooler air and natural stormwater management.

However, even though only a short walk for many thousands of employees, patients, and visitors, the Riverway section is difficult and uncomfortable to access. Additional pedestrian infrastructure would make the park more usable as intended - an oasis and respite from increased urbanization. It can function as a community benefit to better Longwood's vitality as an attractive and resilient hub of innovation.

*5-minute walkshed is measured from Longwood's two largest employers: BCH and BWH

The Riverway separates the district from the Emerald Necklace and carries 30,000 cars/day, making it dangerous to cross



In place of ADA paths, cow paths are the quickest way for people in Longwood to reach the Emerald Necklace

Districtwide Recommendations to Advance Open Space and Resilience Goals

The following recommendations are based on the preceding analysis of existing climate conditions, and the assessment of open space in Longwood. There are six (6) priority areas including: Green Infrastructure, Tree Canopy, Open Space, Sustainable Development, Beautification and Energy.

Specific projects fall under each of these priority areas and include both existing initiatives such as district tree planting and maintenance, and new initiatives. Projects are prioritized based on their ability to mitigate heat, flooding, and/or access to open space. Prioritization also considers relative costs, timeline, ownership and management responsibilities of Longwood Collective, our members and local partners.

The project list is intended to evolve over time based on the availability of funding, new innovations and other factors.

The Framework: 6 Focus Areas

The Framework provides a district-wide approach to support existing projects and identify gaps, areas needing project expansion, and new initiatives that can be harnessed to mitigate against the more challenging effects of climate change.

Construct Green Infrastructure: This infrastructure dramatically increases flood water management through the increase of permeable spaces and reduces heat absorption and the public health risks of the urban heat island effect and support thriving natural ecosystems.

Build & Maintain Tree Canopy: The urban forest plays a crucial role in climate resiliency. New plantings and maintenance of the existing canopy can be analyzed and prioritized differently through the district based on cost, infrastructure, logistics, and informed by the City's Urban Forest Plan.

Connect Open Space Network: This strategy focuses on connecting the community to open spaces and parklands for physical and mental health benefits. It also includes community building initiatives like the Outside// placemaking program.

Advance Sustainable Development: Large scale developments will add green space and provide environmental mitigation funds while continuing to add density. This strategy also includes TMA and bus stop capital investments.

Expand Beautification Program: The installation and upkeep of hanging baskets, planters, and raised beds provide community benefits by creating an inviting and natural outdoor environment.

Reduce Fossil Fuel Dependence: At a large scale, district microgrids, clean renewable energy sources like geothermal, and electrification help to reduce greenhouse gas emissions that are worsening the impacts of climate change.

Our Framework, 6 Focus Areas, and example projects encompassed in a matrix, represents a comprehensive and holistic vision of recommendations and identified initiatives that we can envision could create a resilient district requiring shared ownership, responsibility, and collective action from all Longwood stakeholders, City and State partners and public funding to support. It helps bring broader City initiatives to life in Longwood and emphasizes nuances, providing direction and highlighting priorities that will help shape our roadmap and inspire local partners to help achieve the vision.

The Project Matrix is based on three prioritization metrics and are relative to the other projects in the matrix, the individual projects' primary functions, and co-benefits:

1. **Climate and Community Impact**: the level of benefit the project or initiative has on addressing one or more of the main risks to Longwood's open spaces: extreme heat, stormwater flooding, and access to ample and thriving open spaces

2. **Implementation Timeframe:** both the time needed for the physical construction, and projects that would intentionally not be prioritized for many years, like turf replacement, to avoid unnecessary waste and emissions. Factors include the potential complexity of approvals and permitting required, the number of entities involved in implementation, and potential disruptions to the community.

3. **Project Cost:** funding will need to be acquired through LC's capital funds, grant opportunities, member sponsorship, and other investments.

Current Projects and Initiative Matrix

We can visualize the collective impact our current initiatives have on the district by their alignment with City plans and goals, the number of stakeholders managing these projects, and the range of scopes and scales.

Focus Area	Project ✓ In Progress	Level of Benefit	Implementation Timeframe	Cost	Project Lead
Construct Green Infrastructure	✓ Community-Based Flood Mapping		→	$	City, Member Institutions
	✓ Bioswale Construction		→	$ $	City, Member Institutions
	✓ Green/Blue Roofs		⟶	$ $ $	Member Institutions
Build & Maintain Tree Canopy	✓ Huntington Ave Street Tree Maintenance		→	$ $	City
	✓ Tree Planting		⟶	$ $	City, Member Institutions
	✓ Emerald Necklace Ecological Maintenance		→	$ $ $ $	State, City, Local Stakeholders
Connect Open Space Network	✓ Maintain and Expand Placemaking		→	$ $	Member Institutions
	✓ Expanded Digital Signage/ Public Service Announcements		→	$	Longwood Collective
	✓ Wayfinding System Modernization		→	$ $	Longwood Collective
Advance Sustainable Development	✓ Bus Stop Shelter Upgrades		→	$ $	City, Member Institutions
Expand Beautification Program	✓ Add Locations		→	$	Longwood Collective
	✓ District-wide Planters		→	$ $	City, Member Institutions
Reduce Fossil Fuel Dependence	✓ EV and Micro-mobility Infrastructure		⟶	$ $ $ $	City, Member Institutions

Prioritization Criteria	
Level of Benefit	
Beneficial	Heat Mitigation
More Beneficial	Flood Management
Most Beneficial	Open Space Access
Implementation Timeframe	
Short: 1-5 years	→
Medium: 5-10 years	→
Long: 10+ years	⟶
Cost	
Low cost: >$100K	$
Medium cost: $200K-$500K	$ $
High cost: $500K-$1M	$ $ $
Highest cost: $1M+	$ $ $ $

Implementation Timeframe reflects both the level of effort and timeframe to expand the current scope district-wide.

New Project Matrix

Developing this Framework provided an opportunity for us to identify gaps, priority areas and recommendations where project expansion, net new initiatives, and more research are needed. Longwood Collective and partners have already prioritized several projects in FY26.

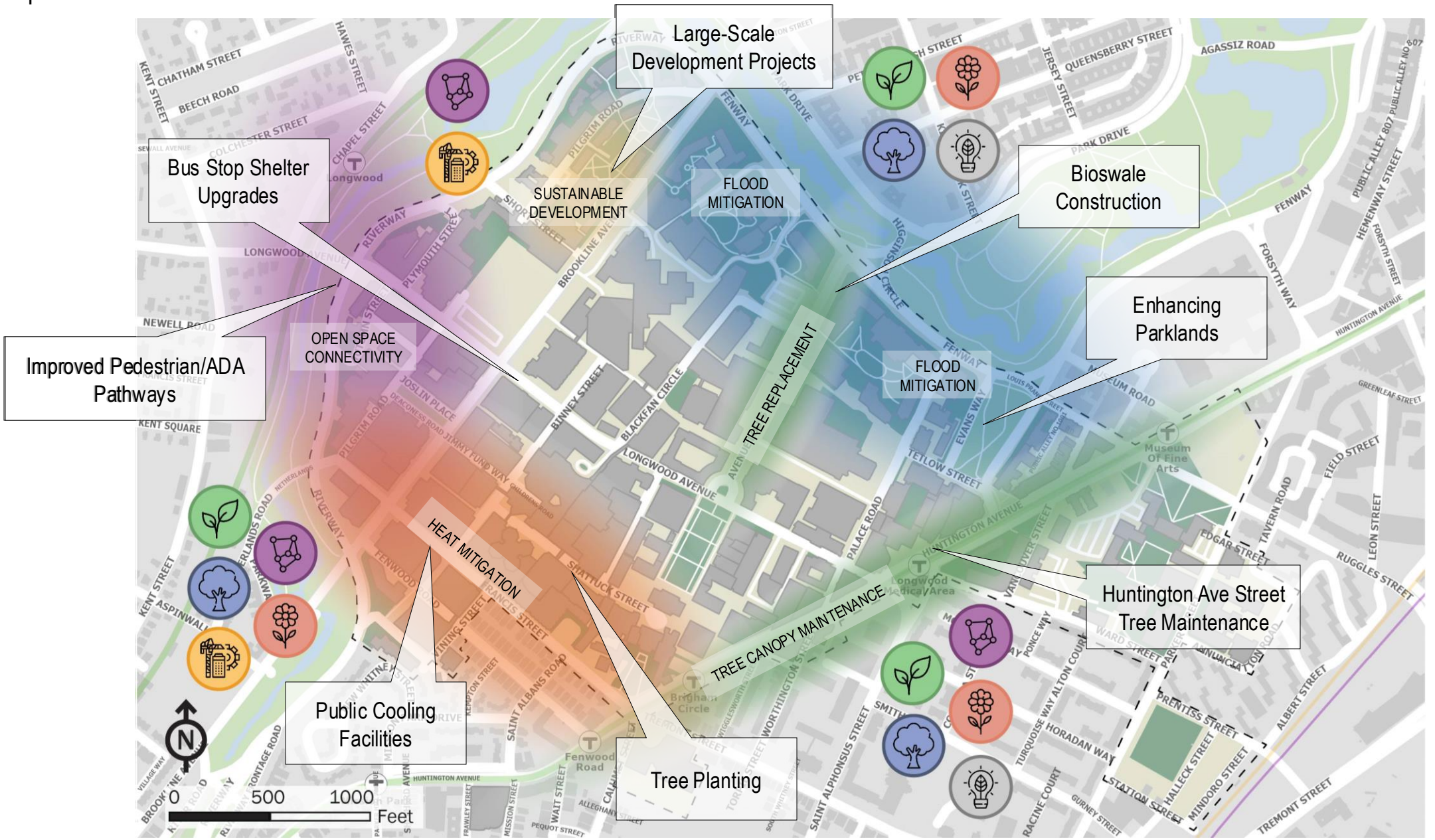
Focus Area	Project ✓ Priority	Level of Benefit	Implementation Timeframe	Cost	Project Lead
Construct Green Infrastructure	Surface Parking Interventions			$ $	Member Institutions
	Turf Replacement/Redesign			$ $	Member Institutions
Build & Maintain Tree Canopy	✓ District Tree Canopy Maintenance			$ $	City
Connect Open Space Network	✓ Improved Pedestrian/ADA Pathways			$ $	State, City
	✓ Emerald Necklace Lighting Pilot			$ $ $	City, Local Stakeholders
Advance Sustainable Development	✓ Public Cooling Facilities			$	City
	✓ Large-Scale Development Projects			$ $ $ $	City
	Reflective/Pervious Road Surfaces			$ $ $ $	City
	Enhancing Parklands			$ $ $ $	State, City
	White/Reflective Roofs			$ $ $	Member Institutions
Expand Beautification Program	Soil Volume and Quality/Irrigation System			$ $ $	City
Reduce Fossil Fuel Dependence	Battery Energy Storage			$ $ $ $	City, Member Institutions
	Networked Geothermal Systems			$ $ $ $	Member Institutions

Prioritization Criteria	
Level of Benefit	
Beneficial	Heat Mitigation
More Beneficial	Flood Management
Most Beneficial	Open Space Access
Implementation Timeframe	
Short: 1-5 years	
Medium: 5-10 years	
Long: 10+ years	
Cost	
Low cost: >$100K	$
Medium cost: $200K-$500K	$ $
High cost: $500K-$1M	$ $ $
Highest cost: $1M+	$ $ $ $

Implementation Timeframe reflects both the level of effort and timeframe to expand the current scope district-wide.

District-wide Mitigation Recommendations

Based on our analysis and greatest opportunity areas, this visual represents how the 6 focus areas can be deployed together to address flooding, heat, and open space access.



Case Studies

The following section spotlights current and previous projects that provide a blueprint for future initiatives. These include tree planting, flood control, green roofs, and sustainable energy projects.

Each project showcases collaborations between Longwood institutions, the City and others. This includes larger projects such as the Muddy River restoration and smaller projects such as tree planting and beautification.

Case Studies

Avenue Louis Pasteur Bioswale

In 2025, with a City of Boston grant, LC is constructing a bioswale as part of a 3-year pilot to assess the effectiveness of each stormwater filtration system in reducing polluted runoff into the Muddy River using soil and water testing conducted by Simmons University, Northeastern University and the Charles River Watershed Association.

There are opportunities to replicate this project in the planting strips on Avenue Louis Pasteur and potentially at locations throughout the district.

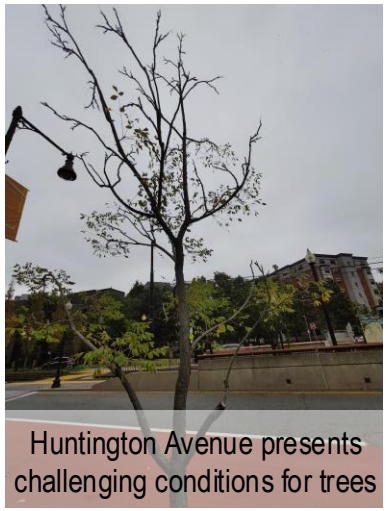
Rendering of Avenue Louis Pasteur bioswale

Huntington Ave Tree Care

For many years, LC and WIT have been maintaining, replacing, watering, and pruning the street trees along Huntington Ave and the MBTA median on behalf of the City.

In recent years, street trees have struggled with a lack of healthy soil, air pollution, and heat exposure.

An actionable tree replacement and maintenance plan is needed to mitigate high temperatures, provide shade and beautify Boston's Avenue of the Arts.



Huntington Avenue presents challenging conditions for trees

Muddy River Restoration Project

The Muddy River Restoration Project (2014-2024) highlights the success of a long-term partnership between several organizations including the Restoration Project's Maintenance and Management Oversight Committee (MMOC), Army Corps of Engineers, City of Boston, Emerald Necklace Conservancy, and Longwood Collective.

In 2025, the MMOC is focused on wildlife and habitat improvement, landscaping maintenance and offers additional opportunities for LC to collaborate on ecological preservation, bridge restoration, and pedestrian infrastructure connecting people to vibrant parks.

Phase 2 of the Muddy River Restoration dredging
Credit: Emerald Necklace Conservancy

Case Studies

Boston's Green Roof Bus Shelter Pilot

In 2024, the City of Boston announced the installation of green roofs on 30 bus shelters along one of the City's highest ridership corridors where communities are also disproportionately impacted by extreme heat as part of a demonstration project. These shelter roofs now have drought-resistant plantings that provide shade, improve air quality, increase stormwater retention, add new green space, and attract pollinators to support biodiversity.

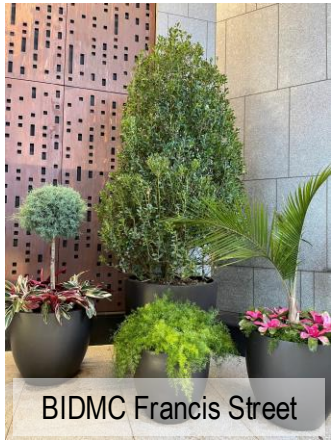
This project advances strategies in Boston's Heat Plan. We are following the project's successes and learnings to understand the feasibility of adopting a similar model and scaling it to similar high ridership and high heat risk corridors within Longwood.

2024 Boston Green Roof pilot
Credit: Social Impact Collective

Planter Pots as In-Ground Planting Alternatives

LC has worked with our members and landscape architects to design, implement, and maintain our highly successful district-wide beautification program. We recently added a winter component to replace summer annuals with evergreens.

With many parcels built out to the property lines, narrow sidewalks, and subsurface utility structures, there is often insufficient space to plant traditional trees. As an alternative, working with sponsoring members, LC has planted and managed several trees in large pots. To replace dying street trees in poor growing conditions, and increase the district's tree canopy, it may be necessary to expand this program and prioritize hearty and resilient shrubs with more sequestration capacity.



BIDMC Francis Street

Isabella Stewart Gardner Museum Geothermal Wells

The Museum installed (eight) 8 geothermal wells beneath Evans Way during construction of the New Wing that help support the equipment that heats and cools the building.

This alternative energy system enables the Museum to reduce its reliance on fossil fuel-burning systems and replace them with efficient electric methods. Due to the energy required to maintain the temperature and humidity specifications for the preservation of art, geothermal heat pumps are a cost-effective way to reduce their carbon footprint and can be explored as an option for other development projects.

Isabella Stewart Gardner Museum
Credit: Nitsch Engineering

Next Steps and Suggested Implementation

This Framework is a 2–20-year plan. We can continue to build consensus and implement pilot projects, while continuing to revise our strategies as technology and the climate impacts change. Illustrative success metrics show how we will determine what is working, and what we need to adapt.

Implementing the Framework: A Phased Approach

We recognize that climate projections, technology, and needs are always changing, and it is important to have flexibility when looking to implement these initiatives. The scope of this work is large, and success will not be possible without collaboration. We value our longstanding partnerships with our members, local organizations, and city and state agencies where we can provide support for each other in realizing our shared goals.

Phase 1
Framework and Vision

- Assess Longwood's climate risks and define our vision that aligns with the City's goals
- Analyze existing conditions
- Assemble and assess ongoing resiliency initiatives
- Identify opportunity areas
- Develop Framework, project matrix and metrics

The publishing of this Framework document completes Phase 1

Phase 2
Short-term Implementation (Starting FY26)

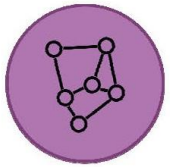
- Identify early action items, partners and costs
- Explore funding sources
- Pilot and implement
- Support initiatives such as:
  - *Boston's community-driven inland flood mapping initiative*
  - *Boston's 2030 Climate Action Plan*
  - *Longwood's development projects*

Phase 3
Learn and Adapt (continuous work)

- Measure performance based on metrics
- Adapt to changing climate projections and technologies, revising our Framework regularly
- Conduct feasibility studies to fine tune our approach
  - Ex. Renewable energy sources, permeable & reflective roadways
- Continue working with the City and our other partners to advance policies that support large-scale sustainable development

Measuring Success of the Framework: 2-3 Year Illustrative Success Indicators

These indicators will evolve, be re-visited and expanded during the implementation phase.

Focus Area	2-3 Year Illustrative Success Indicators
 **Construct Green Infrastructure**	-Complete mapping /dataset of district flood events -Complete bioswale data gathering & pilot
 **Build & Maintain Tree Canopy**	-Complete urban forestry plan for Longwood -Reduce % of Fair/Poor/Dead street trees
 **Connect Open Space Network**	-Increase signage to green spaces and Placemaking locations -Develop consensus for better lighting/access to Emerald Necklace with Stakeholders
 **Advance Sustainable Development**	-Install at least 1 cooling facility or bus shelter -Advance 1-2 initiatives with Skanska/1 Joslin Place
 **Expand Beautification Program**	-Increase number of planters and hanging baskets -Identify new sponsors
 **Reduce Fossil Fuel Dependence**	-Advance district understanding of Net Zero buildings -Increase participation in TMA micromobility programs

Appendix

Glossary

Matrix Project Descriptions

Figure 9: Rooftop Gardens, Green Roofs, Subsurface Parking

Figure 10: Transit Stops

Glossary

Beautification – adding visual, nature-centered enhancements to an urban area, such as hanging baskets, landscaped beds, and planters, as well as removing litter and fixing broken pavement to foster community well-being

Green Infrastructure – stormwater management features that use plants and soil, mimicking natural filtration processes to remove pollutants and enable water to absorb into the ground

Hardscape – open spaces constructed with human-made elements such as brick, concrete, asphalt, including paved pathways, plazas, parking lots

Impervious Surfaces – hard, solid human-made surfaces, like hardscapes, but do not allow water to penetrate the ground, risking flooding or runoff that may contaminate water bodies and degrade ecosystems

Pervious Surfaces – surfaces that allow water to penetrate the ground, often marked by natural materials like grass, soil, or vegetation, that promote filtration, though porous pavement or similar man-made materials are also included

Softscape – open spaces made of living or natural elements like trees, soil, vegetation, including parks, lawns, dirt or gravel pathways, planted beds

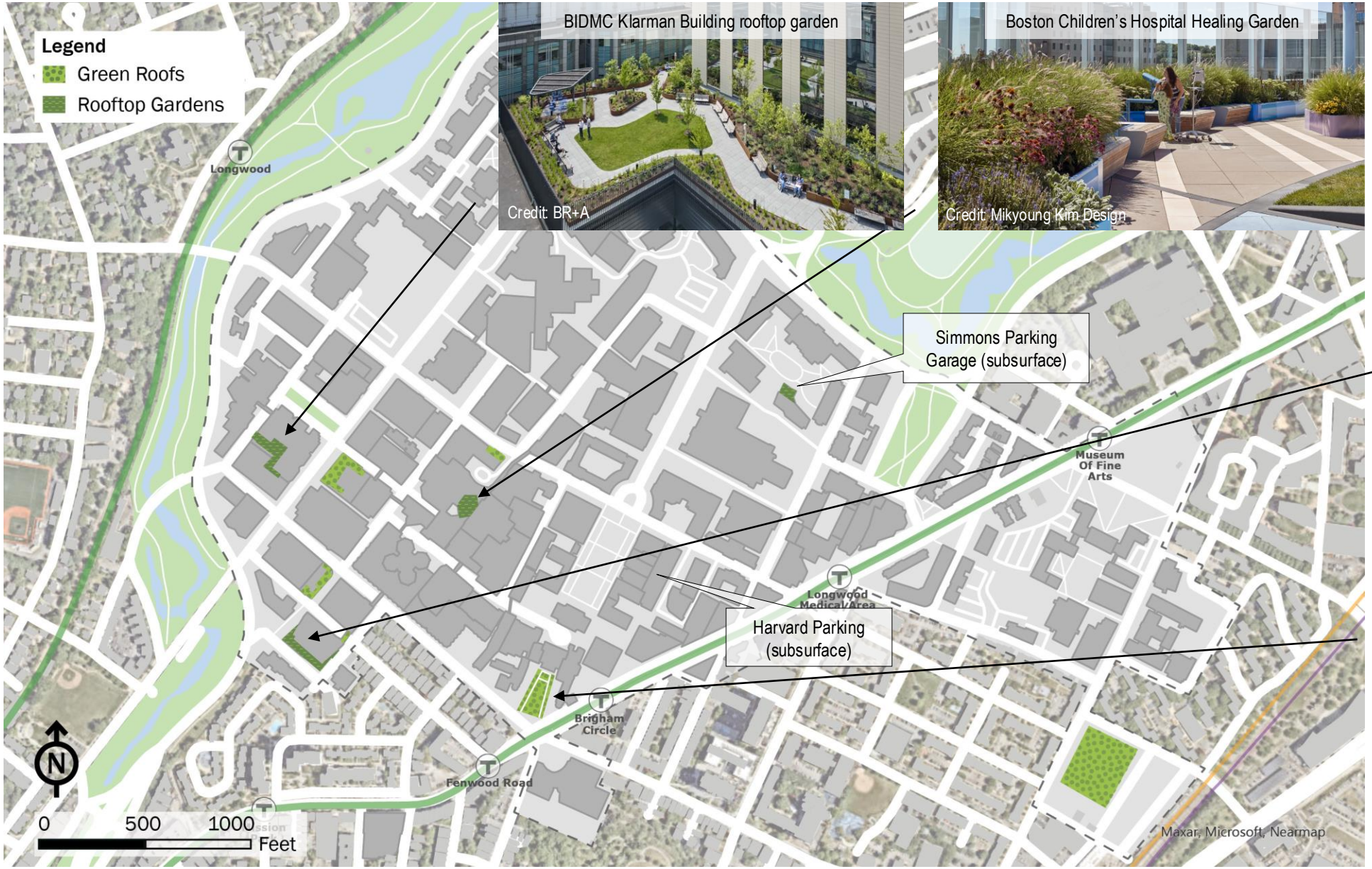
Matrix Project Descriptions

Current Projects	Description
Add Beautification Locations	Identify additional locations for the beautification program including hanging flower baskets, planter beds, and planter pots
Bioswale Construction	Construction of a bioswale as part of a 3-year pilot project to assess above-and below-grade systems at filtering runoff into the Muddy River and to determine best practices for scaling this type of infrastructure throughout the district
Bus Stop Shelter Upgrades	Invest in bus stops to add comfort amenities like shelter, green roofs, seating, and signage to all MBTA and shuttle stops to attract ridership.
Community-Based Flood Mapping	Log flood occurrences and impacts for the City's Green Infrastructure Planning Project to collect much-needed information about inland flooding to better model inland flooding
District-wide Planters	Continued maintenance of rose beds in Evan's Way Park, Oscar Tugo Circle, plus new improvements to enlarge tree pits, increase the health of the tree understory, maintain 3,500 perennial plants, and add new plantings, and enhance pedestrian pathways.
Emerald Necklace Ecological Maintenance	Collaboration and collective action to preserve the Emerald Necklace ecosystems through clean ups, tree pruning, wildlife care to promote a thriving natural environment
EV and Micromobility Infrastructure	Managing operations and promoting active and alternative transportation commuter benefits to reduce air pollution, as well as expanding offerings and increasing participation
Expanded Digital Signage/Public Service Announcements	Use smart city technology to inform the public about community resources and events like cooling centers, placemaking activities, directions to hospitals, or green spaces
Green/Blue Roofs	Add cooling gardens and stormwater filtration to eligible rooftops throughout the district. Green roofs have vegetation that offer cooling, stormwater management, and improves air quality. Blue roofs are non-vegetated roof infrastructure that store stormwater and control runoff to reduce flooding and water pollution. Wentworth's new Sweeney Field on the corner of Prentiss St. and Parker St and 1 Joslin Place's planned management system with a rainwater storage tank for re-use throughout the building are examples of blue roofs.
Huntington Ave Street Tree Maintenance	Continued watering, maintenance, and end of life replacement of 225 city sidewalk trees, and the intentional redirection of focus away from trees in the MBTA median due to the harsh and unsuccessful growing conditions due to poor soil, trains and trucks hitting them, air pollution from exhaust and roadway heat
Maintain and Expand Placemaking	Year-round placemaking programming, improving the quality of life for the community by bringing the culture of care outside with food trucks, ice sculptures, music performances, dog petting, games, and more to support health and wellness. Activation of additional open spaces, and collaborations with the City of Boston to bring programming to Evans Way Park, or with Colleges of the Fenway to bring student-targeted events to campus lawns
Tree Planting	Increasing the canopy coverage long-term by planting new street trees in high density, low coverage areas. Consider tree planters along sidewalk areas that are either too narrow for tree pits or where underground utilities prevent the ability to dig pits that support robust root systems. Significant opportunity along Avenue Louis Pasteur where there are large areas with good soil to plant and maintain samplings
Wayfinding System Modernization	Filling location and content gaps and replacing the district's wayfinding system with unified branding, expanding the system with additional modes of transportation to better connect and direct the community

Planned or New Projects	Description
Battery Energy Storage	Explore opportunities for long-term battery storage of clean and renewable energy to deploy during peak demand to offset reliance on the main energy grid
District Tree Canopy Maintenance	Pruning, watering, and end of life replacement for district street trees to maintain the health and vitality of the established tree canopy
Emerald Necklace Lighting Pilot	Emerald Necklace Conservancy pilot project to install temporary lighting along major pedestrian routes for increased safety and access while continuing to prioritize historic preservation
Enhancing Parklands	Collaboration with local and city agencies to green our open spaces, increasing accessible parkland in and around the district, enhancing the existing parklands through cleaning up pollution, establish thriving ecosystems
Improved Pedestrian/ADA Pathways	Conduct analysis of the main pedestrian commuter arteries and optimal walking and biking routes that connect open spaces and parks, and strategically green these pathways through beautification, tree planting wayfinding, pervious surfaces, and Outside// programming to increase comfort and promote health and wellness through welcoming access to the outdoors.
Large-Scale Development Projects	Several planned development projects throughout the district including Joslin Place a DFCI project adding 300 beds, covered pedestrian ways, and expanding Joslin Park. Longwood Place, a Skanska and Simmons development project for lab, retail, and residential space with landscaping and public realm improvements as well as mitigation funding for Emerald Necklace enhancements. 500 Huntington Ave, a WIT project to remove an artificial turf field, surface parking lot, and smaller buildings replaced by multi-use buildings and 1.5 acres of open-space and pedestrian and bike-friendly connectivity across from the Museum of Fine Arts
Networked Geothermal Systems	Learn from Eversource's Networked Geothermal Pilot in Framingham and other college campus systems to explore feasibility and opportunities for networked geothermal systems on college campuses in Longwood
Public Cooling Facilities	Opportunity to invest in cooling centers (tents, fans, drinking water) throughout the district in some of the major pedestrian commuter routes and high-volume bus stops
Refelctive/Pervious RoadSurfaces	Conduct a feasibility study on the effectiveness and feasibility of retrofitting roads with pervious cover or painting or adding a reflective coating to the roadways in Boston's climate and level of density in the district. Continue researching new cooling technologies for roadways.
Soil Volume and Quality / Irrigation System	Increasing the soil volume and quality, and install an irrigation system to water trees and beds currently existing in poor growing conditions enhancing the heath of the canopy, and enable more vegetation to thrive throughout the district
Surface Parking Interventions	Reduce the acreage of surface parking, replace the surface with pervious material and green infrastructure for stormwater management, and beautify the space. This will be necessary under the EPA's Residual Designation Authority requiring institutions with at least 1 acre of impervious space to filter stormwater and reduce pollution of stormwater runoff.
Turf Replacement/Redesign	When Winsor School's and Emmanual College's turf fields reach their end of life stage and are due for replacement, replace and redesign fields using athletic field permeable and cooling technologies.
White/Reflective Roofs	Conduct a feasibility study on the effectiveness of white or reflective roofs in this climate

Figure 9: Rooftop Gardens, Green Roofs, Subsurface Parking

New buildings have added rooftop gardens and cherished healing spaces. These innovative, sky-high spaces must compete for roof space with helipads and mechanical penthouses. Parking has also been buried underground and covered with new and restored open spaces and parks.



Over time, surface parking lots have been replaced with buildings and new open spaces. The Stoneman Centennial Park re-established the historic main entrance to the original Peter Bent Brigham Hospital, restoring the landscape of a century ago (see bottom photo). Beneath the park are 400 parking spaces contained in four levels.

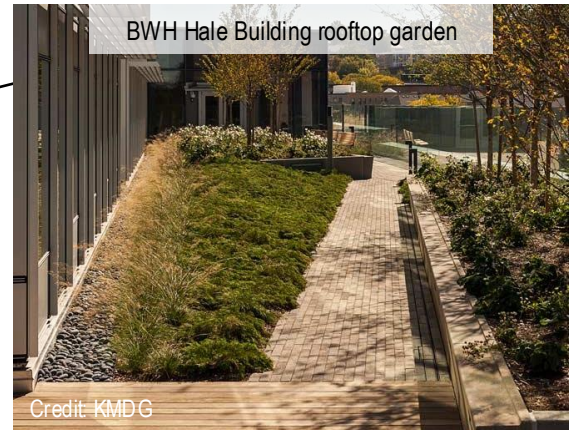
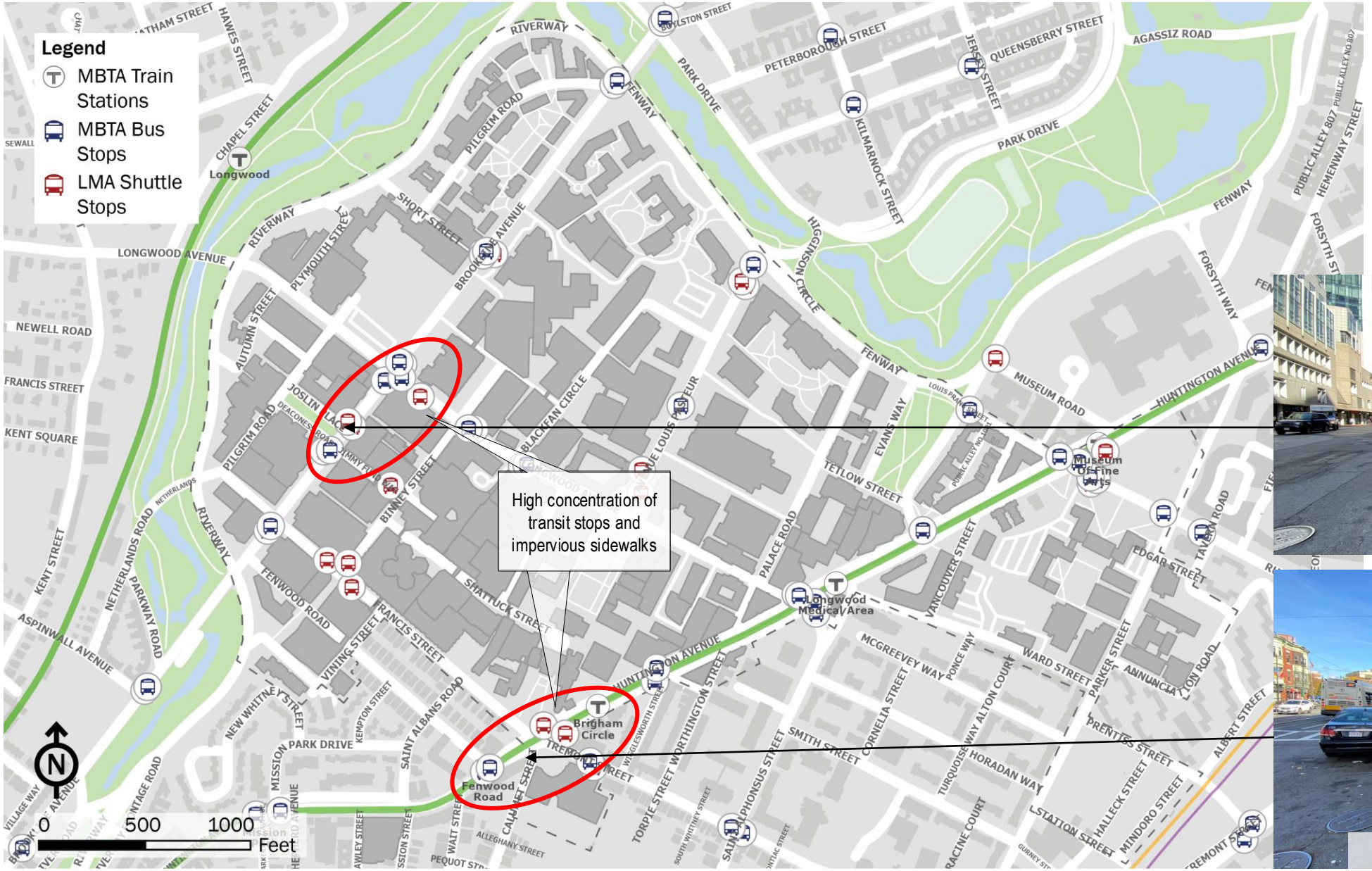


Figure 10: Transit Stops

MBTA Train, Bus, and LMA Shuttle stops with high volume ridership can be prioritized for creative shade and cooling structures where trees cannot be planted due to sidewalk widths or subsurface conduits



Brookline Ave and Deaconess Rd Bus Stop

Huntington Ave at Fenwood Rd Bus Stop