

Massachusetts Institute of Technology
East Campus Urban Design Study: Appendix A
Sustainability Report

2014.03.14

Mack Scogin Merrill Elam Architects | MICHAEL VAN VALKENBURGH ASSOCIATES INC | atelier ten



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Preface

This document, East Campus Urban Design Study Final Report: Appendix A-Sustainability Report, provides a vision for a sustainable East Campus for the Massachusetts Institute of Technology (MIT). It contains sustainability analysis of the East Campus site on matters such as water conservation and management, reducing energy and emissions, and material management.

Atelier Ten was commissioned to serve as a sustainability consultant for the East Campus Urban Design Study and consistently provided valuable input to the designers throughout the process. Ultimately, as the urban campus planning schemes changed and developed, Atelier Ten's role evolved to providing visions and aspirations of the sustainable aspect of the MIT's future East Campus.

This Sustainability Report was prepared by Atelier Ten and is a part of the East Campus Urban Design Study Final Report by Mack Scogin Merrill Elam Architects in association with Michael Van Valkenburgh Associates, Landscape Architects. The Final Report, Appendix B: Financial Analysis which was prepared by HR&A Advisors, Inc. and Appendix C: Process Notes by Mack Scogin Merrill Elam Architects and Michael Van Valkenburgh Associates are included under separate covers.



Vision for a Sustainable East Campus

7031 MIT East Campus
March 14, 2014

Sustainability in the East Campus area is an integral part of the growth and improvement of Kendall Square and its relationship to MIT's campus. The growth of the East Campus embraces sustainability by furthering existing and emerging Institute and Cambridge sustainability goals. It will improve MIT's connection to the community, enhance open space, manage and conserve water, reduce energy and emissions, manage material streams responsibly, and connect social sustainability and community to provide a sustainable urban ecosystem.

A framework for the East Campus area has been developed that will create an exemplary sustainable urban neighborhood, integrating private and public spaces, vibrant streets with advanced research and technology hubs, and energy efficient buildings. Pedestrians will experience a streetscape that incorporates seating, bike parking, vegetation, and ground-level public spaces and services, while providing pedestrian comfort, natural habitat, stormwater management, and showcases of sustainability research advancements. Below the streetscape, service corridors will facilitate energy distribution, utilities, and waste handling. Opportunities will be explored for scalable, on-site district energy systems.

The East Campus vision includes a layered approach that embraces sustainability from the district scale down to the individual building. It will enhance the way students, faculty, staff, visitors, local researchers, and commercial users will engage with the MIT campus, the local Kendall Square culture, and the connections to greater Cambridge, Boston and Somerville communities. As advancements in strategies and technologies are developed, this vision will be continually revisited and re-evaluated in order to be at the forefront of adopting environmental principles.



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Embracing Sustainability: MIT & Cambridge

MIT

MIT is strongly committed to sustainability. The Institute is building academic programs that specifically target sustainable design and new technologies. It is a leader in cutting-edge energy technology and policy research, as well as other related fields. The Institute has an extensive framework for implementing sustainability on campus, including:

- Office of Sustainability
- Environment, Health and Safety Office Policies
- Campus Energy Program¹
- Green Design requirements in MIT Facilities Building Systems Design Handbook²
- MIT 2030³
- Department of Facilities Sustainability Efforts
- Signatory to Sustainable Campus Charter⁴

These programs have directly resulted in numerous high-performance buildings on campus that are achieving significant energy use reductions, carbon emission reductions, materials conservation, water reuse and conservation, and healthy indoor environments. Many buildings – including dormitory, academic and laboratory uses – have earned LEED Certification. Currently, six buildings have earned LEED Gold Ratings and one project is in design to achieve a LEED Gold Rating. One building has earned a LEED Silver Rating while three additional projects are in design and anticipating LEED Silver Ratings.

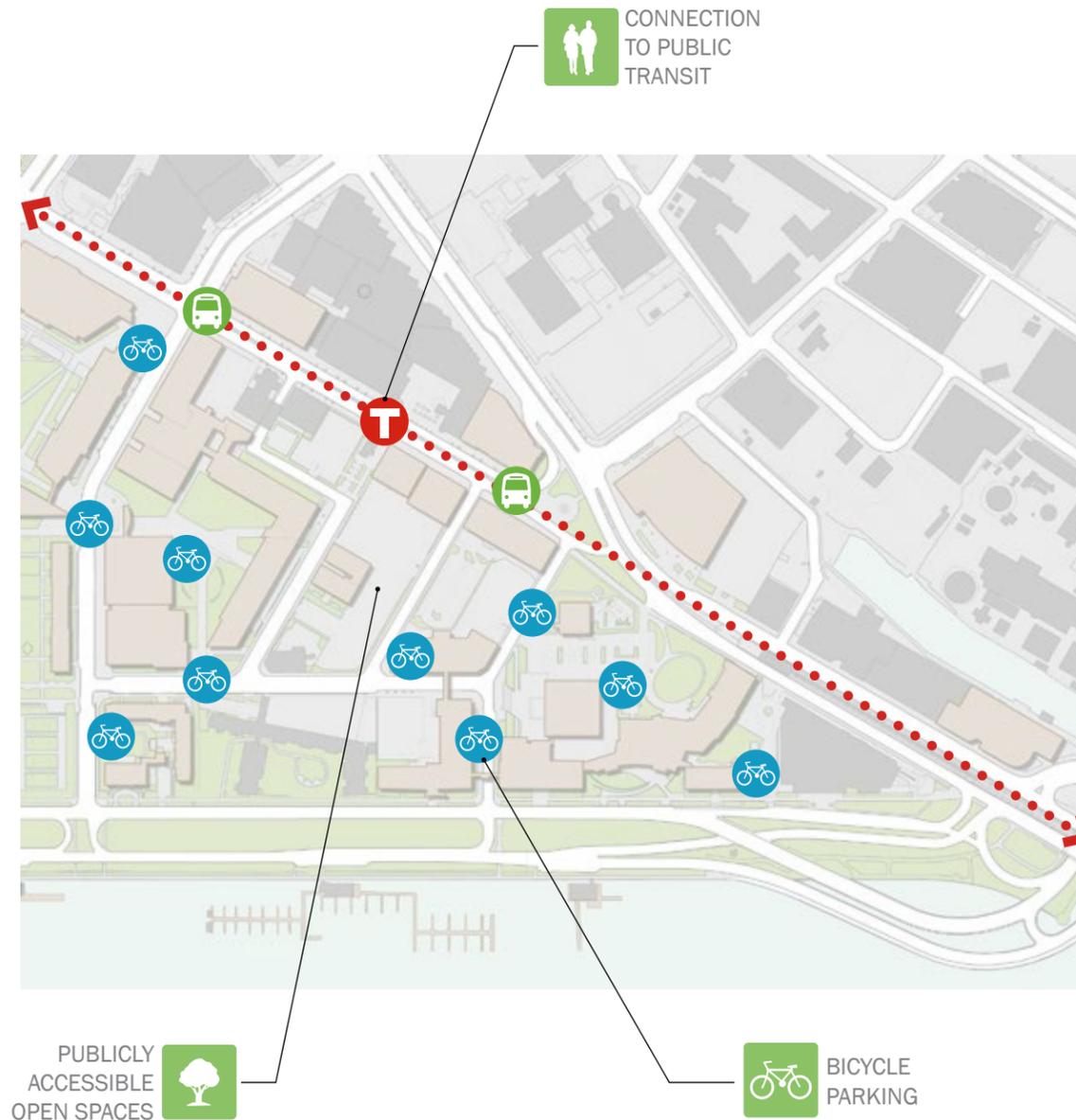
While the Institute has made strides elsewhere on campus, much more is possible to improve campus sustainability. The East Campus area will build on these extensive initiatives, notably contributing to further reducing energy use and greenhouse gas emissions. East Campus buildings will achieve LEED Gold certification, the minimum requirement for new buildings in the PUD-5 District. This exceeds the current Institute baseline requirement of LEED Silver certification.



Cambridge

The city has several initiatives to advance sustainable development. It has adopted the optional Massachusetts Stretch Energy Code⁵, requiring new buildings to reduce energy by at least 20% over the state energy code. Furthermore, the city has developed zoning amendments requiring LEED for projects, rules to encourage passive energy strategies and green roofs, and guidelines for solar and wind energy installations. The Eastern Cambridge Kendall Square Open Space Planning Study (ECKOS)⁶ is developing a plan for improving and expanding public open spaces in the neighborhood adjacent to the East Campus area.

The Institute actively partners with the city through its engagement in the Compact for a Sustainable Future⁷. Planning for the East Campus will incorporate and improve on local requirements by integrating sustainability into a comprehensive design approach.



Connecting MIT to the Community

Site design and transportation connections are critical to integrating the East Campus with the rest of MIT's campus, the Kendall Square neighborhood, and Cambridge. The East Campus strategy will encourage multimodal transportation and provide infrastructure for cyclists and alternative energy vehicles.

- MIT has a comprehensive transportation plan to address connectivity within the campus and connections to the city, encouraging bicycle commuting, public transportation, and carpools. MIT has a system of low-emission shuttle vehicles that connect the campus to the local community. These initiatives reduce the dependence on individual vehicles for transportation, leading to a reduction in emissions.
- East Campus is located on the Red Line, with the Kendall stop at the north edge of the campus, providing direct access to downtown Boston, Cambridge, and Somerville for students, faculty, staff, and commercial commuters. The plan envisions improvements to the MBTA headhouse to improve the passenger experience and encourage use of the Red Line.
- The extensive existing network of bike paths, bike parking, and changing facilities will be expanded further to promote an active lifestyle, reducing cars on the road and alleviating a crowded public transit system.
- Where parking is provided, spaces will be reserved for low-emission vehicles and carpools.

Enhancing Open Space

The vision for the East Campus area carefully balances programmatic needs with the desire for functional open space and vegetated areas. The open space design is a critical component of both the experience and the environmental performance of the East Campus.

- Open space will be provided to balance the building footprints, ensuring a connection to vegetation and daylight for pedestrians.
- Green areas will be provided with native and adapted planting to provide natural habitat for animals, as well as reduce water used for irrigation.
- Light-colored materials incorporated in the landscape will mitigate urban heat island effects. Likewise, vegetated areas or open-grid paving will help reduce the impact of solar radiation on site surfaces to create a more comfortable pedestrian zone.
- Site materials and landscape design can provide mitigation alternatives for flood hazards and coastal storm vulnerability by allowing for capturing of stormwater and slowed release of runoff to the sewer systems and Charles River in significant storm events. Landscape features can also provide protection from the elements and hold back or direct water away from buildings and into the river during storm events.

Managing and Conserving Water

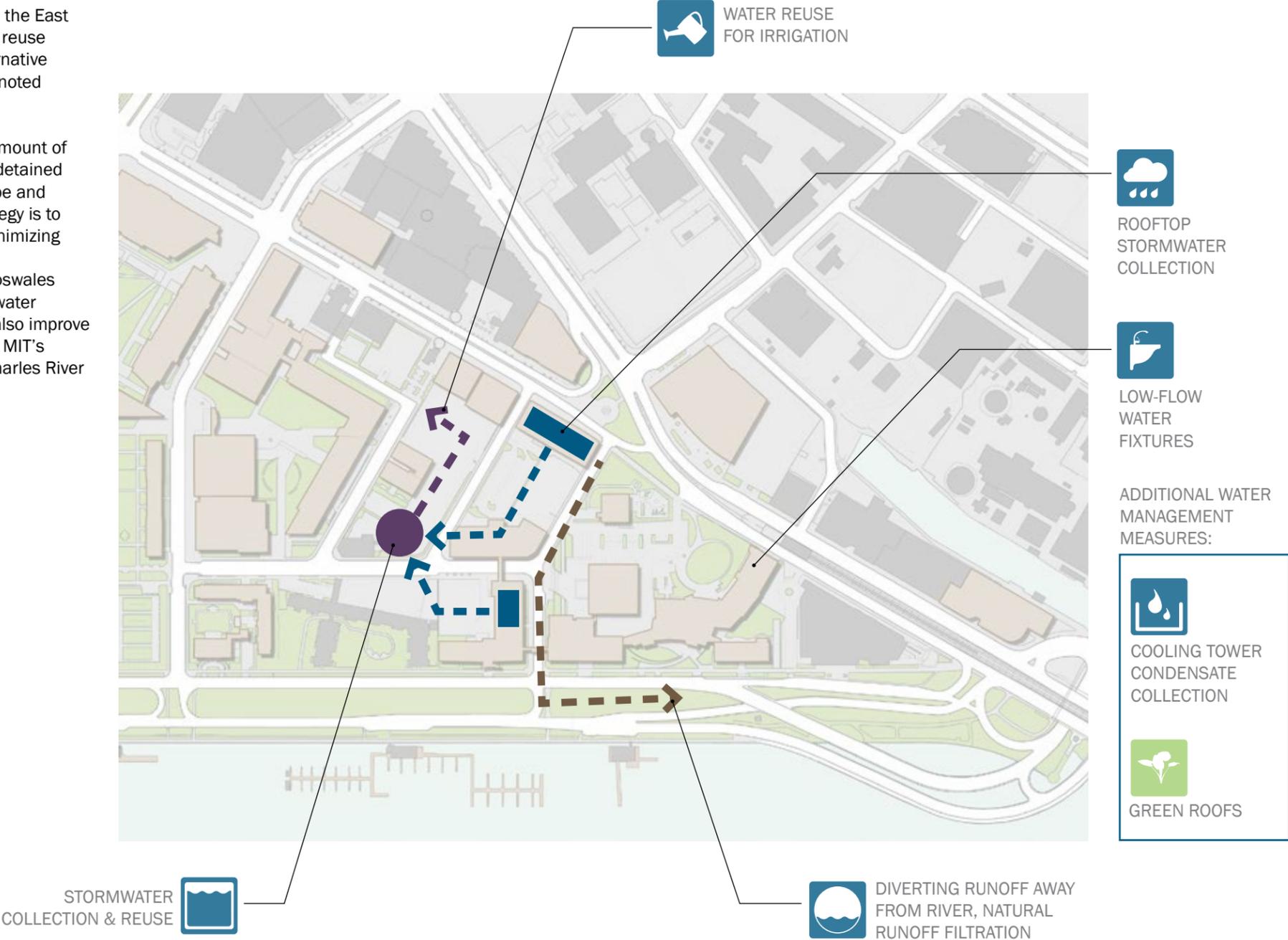
MIT is committed to reducing potable water consumption on campus. Some buildings have incorporated stormwater reuse for toilet flushing, and other buildings have utilized low-flow and low-flush fixtures to minimize the potable water consumed.

Indoor water use from toilets, urinals, and sink faucets will be reduced through the selection of efficient, low-flow water fixtures. Such strategies will reduce the amount of potable water that needs to be pulled from the city's resources, as well as reduce the amount of water that leaves the site for sewage conveyance.

- Low-flow and low-flush fixtures will target a water use reduction of at least 35%.
- The reuse of non-potable sources such as air handling unit condensate, stormwater and greywater from flow fixtures will be explored on the East Campus to meet non-potable water demands. Stormwater could be collected, stored, and reused for irrigation, toilet flushing or cooling tower use. Depending on availability and efficiency, non-potable water will be used to maximize water savings and achieve an overall water savings of over 50%.

It is important to manage stormwater in the East Campus area, independent of potential reuse applications. The area will explore alternative stormwater management strategies as noted below.

- The East Campus will explore the amount of stormwater that can be infiltrated, detained or collected from both the landscape and rooftops. To achieve this, one strategy is to maximize pervious paving while minimizing impervious hardscape.
- Where feasible, biofiltration and bioswales will be included as a natural stormwater management strategy. Bioswales also improve runoff water quality, contributing to MIT's phosphorus reduction goals and Charles River water quality goals.



EFFICIENT BUILDING SYSTEMS

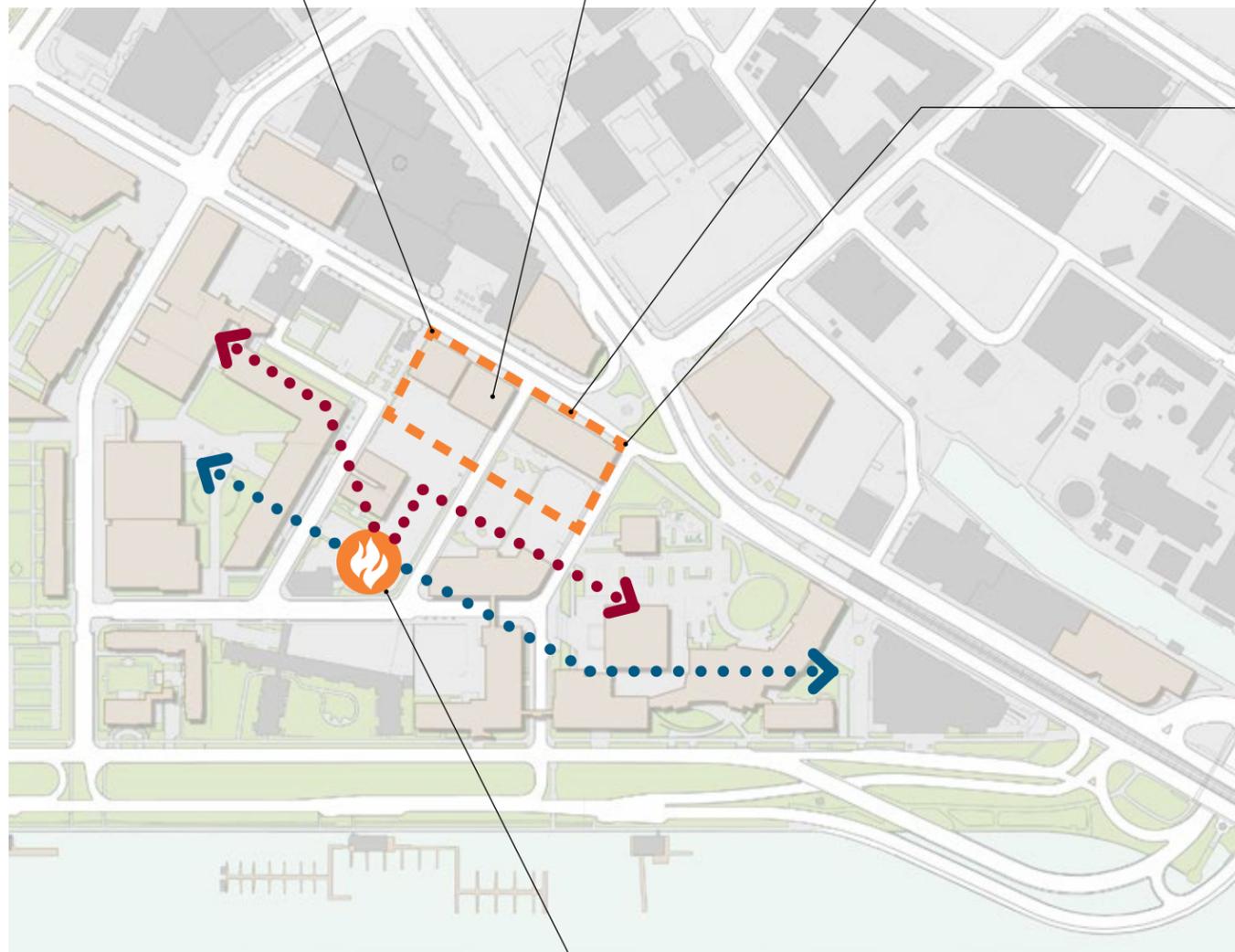


REFLECTIVE & GREEN ROOFS



HIGH-PERFORMANCE GLAZING & BUILDING ENVELOPES

SHARED ENERGY OPPORTUNITIES



ADDITIONAL ENERGY-SAVING MEASURES:



REDUCED LIGHTING ENERGY



BUILDING METERING



CENTRAL ENERGY & UTILITY NETWORK, CENTRAL PLANT & COGENERATION

Reducing Energy and Emissions

The East Campus area will expand MIT's existing local district energy strategy to maximize energy savings through its central energy plant and provide heating and cooling to academic buildings. This allows the campus to deliver hot and chilled water more efficiently, while eliminating unsightly cooling towers from building rooftops and greatly reducing greenhouse gas emissions. The rooftops can then be used as active, occupiable spaces, potentially with green roof vegetation. Commercial projects should evaluate the potential of on-site cogeneration and the potential efficiencies of shared systems. The below-grade infrastructure might provide opportunities to deploy such shared systems more efficiently.

Building Systems

- The buildings planned for the East Campus area will pursue numerous energy efficiency strategies to exceed local code and LEED requirements.
- Innovative building systems will contribute to meeting these goals. Strategies include high-efficiency variable air volume systems, heat recovery, chilled beams, high-efficiency lighting, advanced controls and high-performance building envelopes.
- These strategies will not only reduce energy usage and cost, but will also improve occupant thermal comfort.

Energy Systems

- The East Campus will extend MIT's existing steam and chilled water loops and benefit from the highly efficient central plant infrastructure MIT has developed over the years.
- Future improvements to the central plant and distribution systems will ensure further reductions in greenhouse gas emissions.
- The East Campus will explore the opportunity to share energy between different buildings, such as recovering waste heat for domestic hot water generation or heating.
- Waste heat could also be used to heat sidewalks during winter, maintaining safe, ice-free surfaces for pedestrians and minimizing maintenance requirements.
- Combining strategies for a local central energy plant could provide energy savings when compared to stand-alone building systems. This will be explored as buildings are developed further.
- Alternative energy strategies, such as photovoltaics or solar hot water, will be explored and incorporated where appropriate to reduce the energy footprint of the East Campus.

Managing Material Content Responsibly

MIT has a proven material waste handling program that addresses a wide variety of materials for either recycling or proper, safe disposal. MIT contributes to Cambridge's single-stream recycling efforts. The East Campus area will expand these efforts and will explore a central waste hub and central service corridors. A centralized compost or food waste facility is also an option.

Material Selection

- Best practices for selecting materials, such as low- or no-VOC materials, will ensure a high level of indoor air quality. This has a direct impact on the health of building occupants.
- The East Campus will target reclaimed or reused materials to reduce the volume of new construction materials.
- MIT's previous building projects have selected recycled and regionally sourced materials. The East Campus will target these materials as well.
- Opportunities will be explored to incorporate rapidly renewable materials in the sourcing of construction materials.



Construction

Construction in the East Campus area will be guided by sustainability considerations, with various measures to minimize the environmental impact of building practices.

- Construction and demolition waste will be diverted from landfills for recycling or salvage.
- Excavation materials will be reused to form landscape elements. If contamination is discovered, then the materials will be treated and disposed of responsibly.
- A comprehensive clean-construction commitment will include elements such as low-sulfur fuel, equipment washdowns before leaving a construction site, recycled water stations, and a stringent erosion and sedimentation control plan to limit disturbance beyond the boundaries of construction.

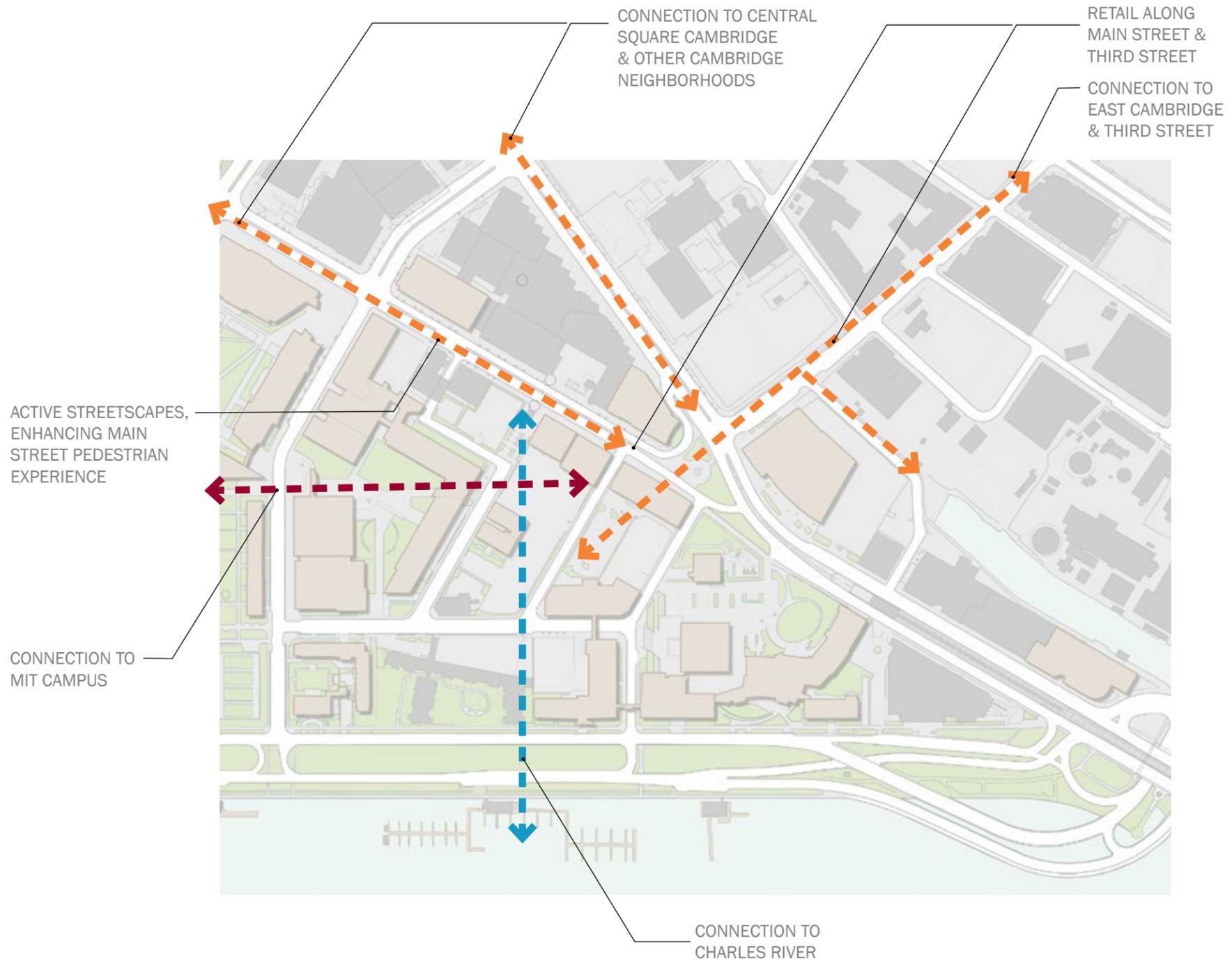
Connecting Social Sustainability & Community

Active streetscape and pedestrian activity are key aspects of the East Campus vision. They will encourage a healthy lifestyle, vibrant streets, and provide benefits for the entire community. Significant portions of the street-level program will be used for active uses, such as food services, retail, exhibition and museum space, and other publicly accessible community resources. This will contribute to an active streetscape and enhance the neighborhood with diverse destinations and services.

- The Infinite Corridor will be extended to enhance the connection between the East Campus and other MIT buildings.
- The East Campus area will directly connect to the T and Kendall Square, linking it to its surrounding neighborhood.
- This will be enhanced by extending the greenscape provided at Kendall Square straight to the riverfront and locating programs and services at the pedestrian level to draw in the community.

An active streetscape along Main Street, Third Street, and Broad Canal Way will include:

- Connected pathways
- Ground-floor active space uses
- Outdoor amenity spaces
- Planting
- Benches
- Public transportation access



Implementing a Sustainability Vision

In the East Campus area, MIT has the ability to embrace a holistic campus vision to advance sustainability initiatives already underway at the Institute. Environmental stewardship is a critical element of the growth and improvement of Kendall Square and its relationship to MIT's campus.

The vision for sustainability in the East Campus area is an approach that encompasses district strategies down to individual building performance. Implementing this vision will reinforce MIT's connection to the community, enhance open space, manage water responsibly, reduce energy and emissions, utilize materials and waste streams efficiently, and provide a more tangible social connection between the community and the Institute within a world class sustainable urban ecosystem.

References

Background research for campus and local sustainability initiatives has included the references below, in the order of appearance in the document:

- ¹Campus Energy Program, including the Campus Energy Initiative (MITEI)
<<https://mitei.mit.edu/campus-energy>>
- ²Green Design requirements in MIT Facilities Building Systems Design Handbook. 2001
<http://web.mit.edu/facilities/maps/MIT_bldg_design_handbook.pdf>
- ³MIT 2030
<<http://web.mit.edu/mit2030/>>
- ⁴Signatory to Sustainable Campus Charter, January 2011
<<http://web.mit.edu/newsoffice/2011/gulf-charter-report-0518.html>>
<http://ehs.mit.edu/site/sites/default/files/files/MIT2010_ISCN-GULF_Charter_Report_Final.pdf>
- ⁵Massachusetts Stretch Energy Code
<<http://www.mass.gov/eopss/consumer-prot-and-bus-lic/license-type/csl/stretch-energy-code-information.html>>
- ⁶Eastern Cambridge Kendall Square Open Space Planning Study (ECKOS)
<<http://www.cambridgema.gov/CDD/Projects/Parks/ecambkendallparks.aspx>>
- ⁷Cambridge Compact for a Sustainable Future
<<https://www.cambridgema.gov/mayor/cambridgecommunitycompact.aspx>>