GREEN SENSOR HACKING LABORATORY

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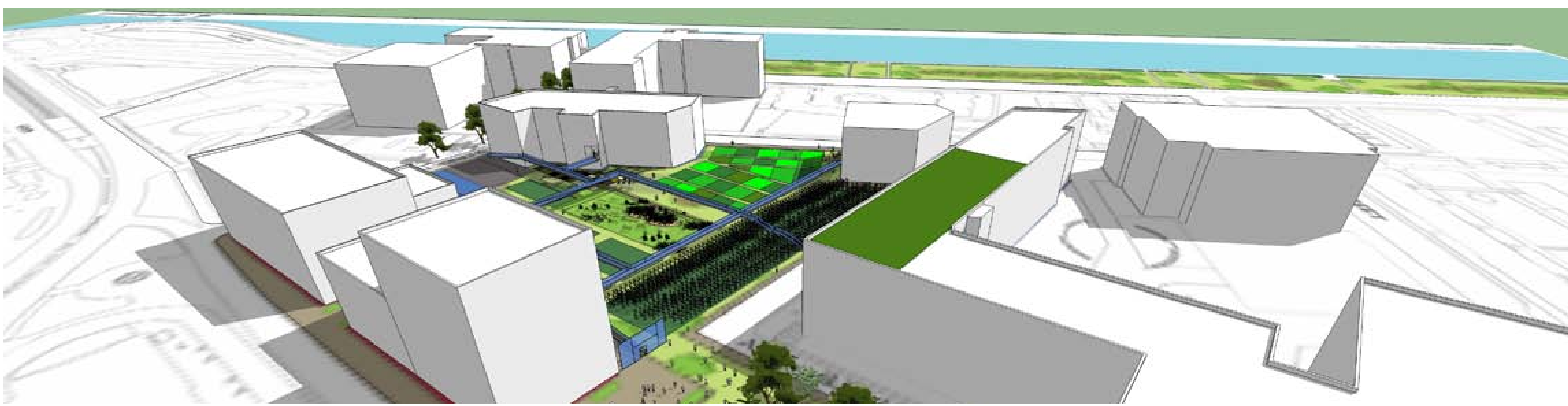
A core aspect of MIT's identity is experimentation and innovation in and outside of academia. On campus, students regularly execute hacks—unexpected projects that demonstrate technical expertise that play off of our interactions with the environment. In fact, MIT's mascot, the beaver, is a symbol of the ingenuity and industriousness that goes into altering the landscape. Testing and redesigning spaces is an essential part of the MIT ethos.

MIT's campus, however, currently lacks space for ecological innovation. Despite growing concerns regarding climate change, the need for climate adaptive technologies, and an increasing trend toward sustainable development practices, MIT does not have a space for students and faculty to experiment with ecological technologies and design strategies.

The Kendall Square redevelopment area offers the unique opportunity to provide MIT community members with flexible space to use as a living laboratory in a location which can act as a connecting hub for media/data analysis, business, international studies, biotech companies, and living/retail spaces.

The Living Laboratory will provide a flexible and experimental space for students and faculty across campus to test designs, water management strategies, and other landscape-based projects.



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PRECEDENTS

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The practice of using the physical campus space as an educational tool and testing ground for new ideas is not new to MIT and many existing spaces served as precedents to our concept. We looked to a few key existing and historical precedents to inform our planning process.

Buiding 20

Building 20, a post-WWII building that was torn down to make room for the Stata Center, served as a hub for experimentation. Because of the building's deterioration, students were able to tear down walls and conduct many types of experiments, and in fact, many MIT start-ups were launched as a result of students carrying out ideas there. We wanted our Living Lab space to capture the spirit of entrepreneurship and limitless experimentation that Building 20 encompassed. At the same time, we wanted the Living Lab to be open to encourage more public engagement and visibility of process, rather than a closed building with all the activities happening in the interior.

State Center Bioswale

On the environmental and ecological front, the Stata bioswale illustrates how innovative water technologies can be directly integrated into campus infrastructure. As one of the first stormwater capture systems incorporated with greywater infrastructure, it is emblematic of the type of innovative thinking born out of MIT and deployed to many other locations. Yet, there are a few areas in which it falls short. First, it lacks a mechanism for evaluation of its performance in terms of water capture or cost savings. Second, it is not an inviting physical locatino for people to spend time. With the objective of placemaking through design and programming, we wanted the Living Lab to be differentiated from this by making it a hub of activity and a destination where people would want to spend time.

Media Lab

One of the most architecturally striking buildings on campus, the Media Lab houses several laboratory groups that take an unorthodox approach to creative technological research. From developing new prototypes for prosthetics to data visualization, the Media Lab fosters a culture of interdisciplinary research, understanding, and innovation through testing. We looked to the Media Lab for inspiration on making MIT research visible and inviting to the public, as well as creating a space that fosters cross-fertilization of disciplines and ideas.

Co-Generation Plant

Lastly, the Co-Generation facility on Vassar Street highlights the importance of revealing infrastructure and processes to encourage learning on campus. The facility's glass windows reveal the complex infrastructure required for co-generation. Classes focused on energy across campus are invited to take tours of the plant to better understand how the systems work mehcanically. We conceived of the Living Laboratory as the analogous go-to place for MIT and Cambridge community to understand the technical aspects of stormwater management and the impact of human activities on the watershed.

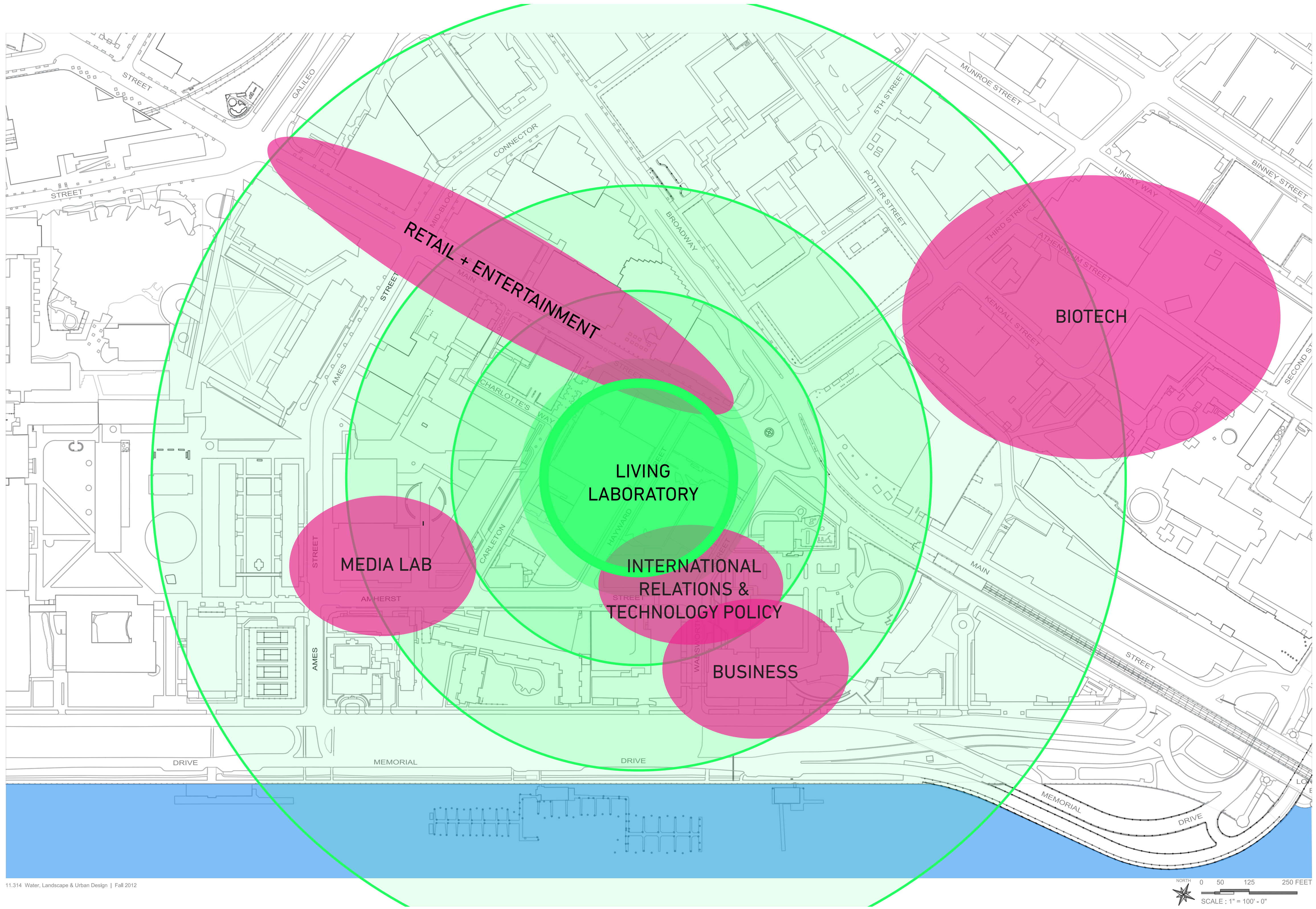
Understanding the strengths and weaknesses of each of these four precedents helped to shape our site proposal for a Living Laboratory.

CONNECTING THE NEIGHBORHOOD

The area around Kendall Square includes a very diverse set of buildings and uses. First, it is a main connector between MIT and Canbridge where campus meets the city. The proposed site is located right at the convergence of these two worlds at the doorstep of MIT, but does not provide a sense of place or identity for either MIT or the Kendall Square area. The retail corridor along Main Street and the cluster of biotech laboratories and companies nearby feel wholly disjointed from the rest of Kendall Square and campus.

Within the campus boundaries, the site is surrounded by a number of distinct and well-known departments on campus, including the Media Lab, the Center for International Studies, the Technology Policy Program, the Sloan Business School, and the MIT Medical Center. Despite their close proximity, these departments currently do not have strong relationships with each other.

We envision this as a space that could serve as a neighborhood hub, connecting the many actors in the vicinity. Providing them a physical space to interact, as well as a theme of water management to cooperate around, the Living Lab has the potential to truly bring a sense of identity to the neighborhood.



DESIGN PRINCIPLES

1. EXPERIMENTATION
This is a space for failure, learning, testing; currently MIT has no wet lab for ecological research.

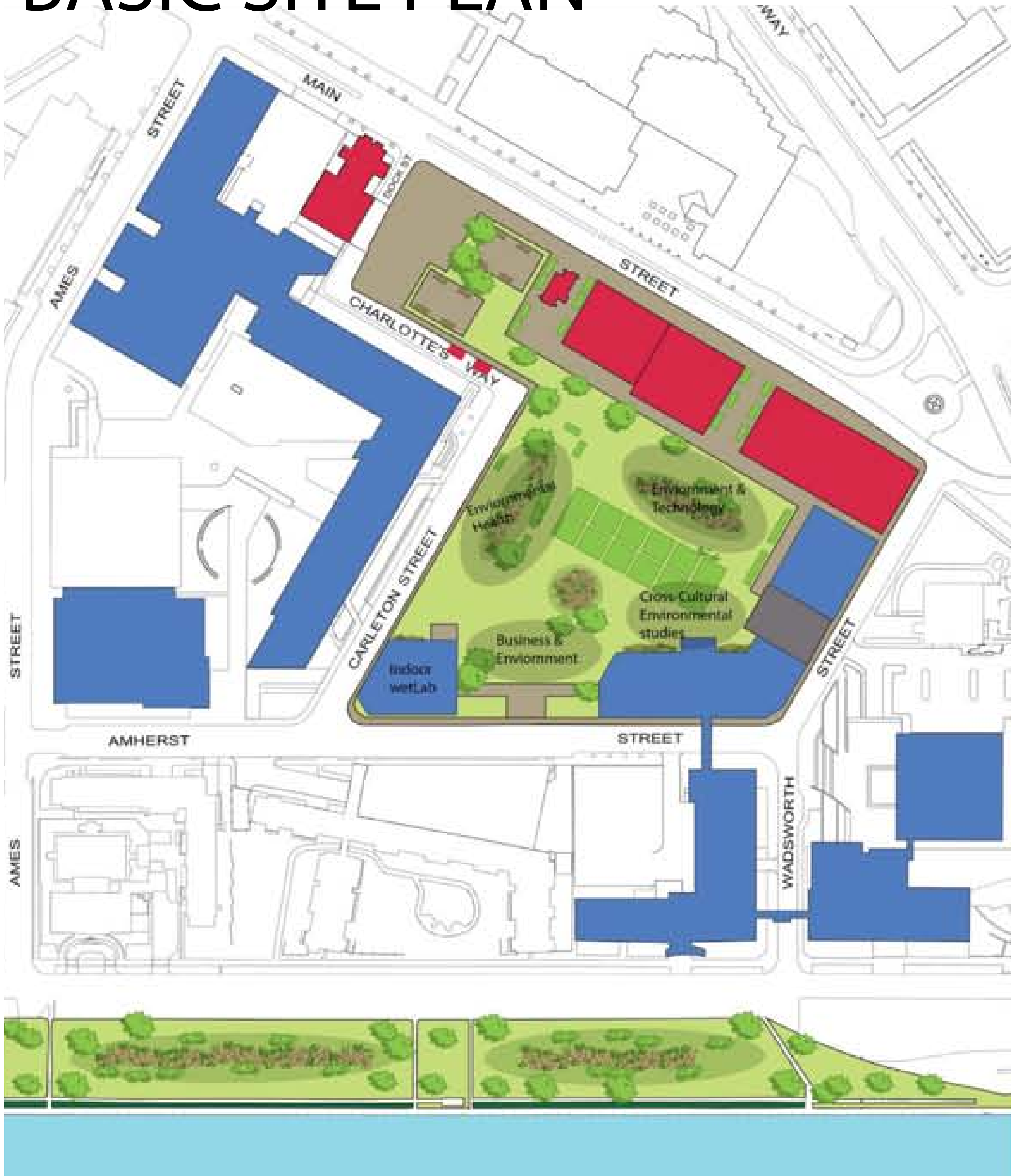
2. MONITORING AND VERIFICATION
The laboratory will promote consciousness about how we alter environments. It will encourage understanding how well our technologies and practices are functioning by establishing a unified monitoring system that can be scaled across campus/Cambridge.

3. DIFFUSION
The laboratory will enable experimentation, developing practical applications, and deploying of innovations around campus/Cambridge.

4. CONNECTIVITY
The site will act as a place of convergence for many different groups around Kendall that currently have no space/forum for interaction (Media lab, Sloan, Center for Int'l Studies, biotech industry, commercial/retail).

5. PUBLIC PARTICIPATION
On site visualization will make processes and data visible to the public. An open data platform and dashboard will allow students and other interested groups to utilize collected data and help to crowdsource stormwater management solutions.

BASIC SITE PLAN



The Living Laboratory will provide a flexible and experimental space for students and faculty across campus to test desigs, water management strategies, and other landscape-based projects. By removing Hayward Street, we created a megablock that is broken down into different zones of activities. In addition, we moved the two-direction lanes of Memorial Drive together to create a larger green space along the river, rather than having a sizable, but unused median that remains sandwiched between high-speed traffic.

First, the space itself would serve as a stormwater management space by expanding the area of pervious surface through the green lab area, as well as through pervious paving for the surrounding sidewalks. The green space along Memorial Drive will be a significant buffer to catch runoff directly before it enters the Charles River. A proposed green street along Wadsworth can also capture the water as it flows south toward the River.

The outdoor lab space is intended for MIT researchers to be able to reserve and develop environmental experiments. Despite the many environmental and sustainability-focused programs across Boston-area campuses, the region lacks such a research space for outdoor ecological testing and fieldwork. Projects may last for different lengths of time, require different amounts of space, and have different landscaping needs. This means the site will constantly be in flux. While public access spaces will remain stable, experimentation areas will be claimed by different departments, students, and faculty at different times. The spaces will be reshaped and reformed to meet the needs of these different users. To provide some structure for the laboratory activities, the space can be programmed to fulfill some broad functions based upon the various actors in the area, such as: research on ecology and human health, cross-cultural water management practices, pavement and materials testing for water infiltration, or toxicity and urban agriculture. Some examples of different types of on-site programming that we envision will be elaborated upon later in this chapter.

Anchoring the outdoor space is the indoor laboratory that will house state-of-the-art laboratory facilities and equipment to allow for physical, chemical, and biological testing of samples and materials. The indoor lab will also serve as MIT's main building for environmental work across campus. Many departments currently offer courses relating to the environment and sustainability, including urban planning; earth, atmospheric, and planetary sciences; civil engineering; architecture, materials science and engineering; biology; health sciences; and biological engineering. To encourage interdepartmental cooperation and research, this space can bring researchers together to tackle issues relating to water and resource management in innovative and collaborative ways.

The indoor lab space will also be the central location for the sensor network. The data collected through the sensor system will be routed back to the lab, where it can then be aggregated in a centralized database and opened up to people within and outside of MIT to view and download, opening up the ecological workings of Kendall Square to a variety of users. Organizations, such as the Charles River Watershed Association, the City of Cambridge Department of Public Works, or neighborhood associations, who might be interested in accessing or contributing to this data collection would also have access to the data platform to make for a more robust dataset and a more engaged public.

Most importantly, the lab will be a space that fosters cross-fertilization of ideas from departments around campus interested in environmental design, from architecture and planning to civil engineering and hydrology. The projects on the site will respond to and be informed by other prominent clusters around campus who work on environmental issues.

OPEN DATA PLATFORM

With an eye toward evaluating how we are altering the landscape, the Living Laboratory will implement an extensive sensor network on the site that can be scaled to the rest campus and throughout the neighborhood to verify the performance of the new technologies and track water and climate data for the school and community. Public access to this data will be facilitated through a real-time online dashboard and an outdoor display visible at the Media Lab.

In establishing the Living laboratory, we also aim to deploy technologies developed there in the surrounding areas. MIT can use this space as a test bed for materials it then uses in other campus construction projects. Water interventions can be implemented at other departments. And, new strategies can be rolled out in the surrounding Kendall Square neighborhood. One of the principal components of our project is an open data platform that will be designed to aggregate all existing and potential water sensing technologies across campus and pool their data streams into a centralized, publicly accessible hub.

An open data as a platform can help achieve both objectives of performance evaluation and diffusion of ideas to the greater community. We refer to this as a platform rather than a portal because a platform provides an environment that allows applications to be developed and operated. Not just a portal or point of access.

The open data platofrm will help to:

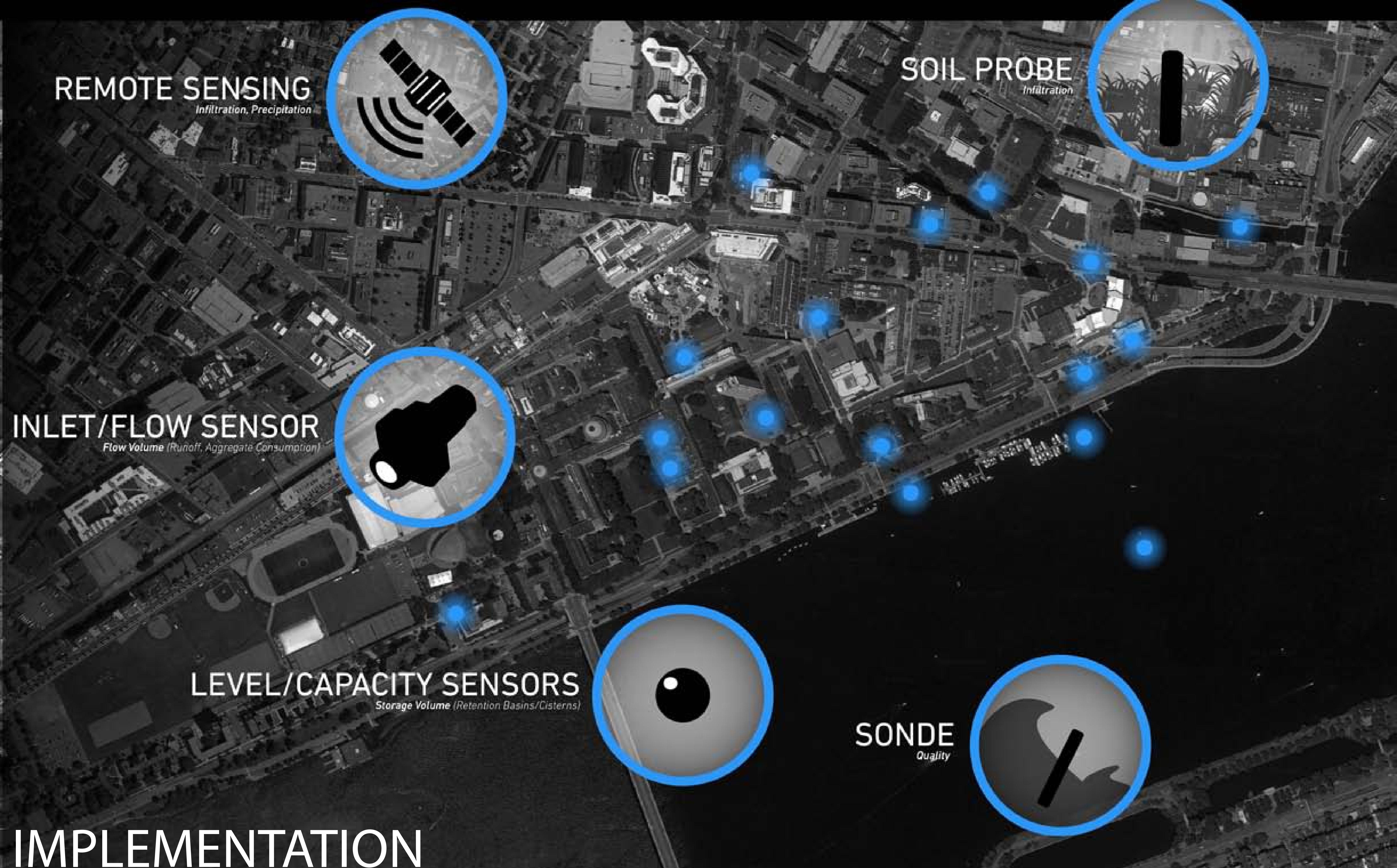
- Reveal hidden dynamics of MIT's hydrologic system, including
  - Dynamics of use
  - How to better distribute services/interventions
- Monitor the performance of experimental technologies and policies
- Enable transparent regulatory processes
- Create and test a model for water monitoring and management that could be scaled to an entire city

Sensor Types

The sensor network will rely upon several types of sensors to collect a range of information. Remote sensing provides large-scale information about soil moisture through satellite imagery. Soil probes can also collect information about soil moisture and infiltration rates in a more localized and source-specific way. Inlet/flow sensors can measure quality of stormwater and runoff entering the pipes. Level and capacity sensors can be installed to measure the volume and flow of stormwater and runoff, which will be increasingly helpful with the expected increase of extreme weather events due to climate change.

All data will be made available to public in real time. The open data platform privileges access and ease of use for a range of different audiences including the public, the scientific research community, policymakers, and professionals. The technology platform functions as the glue between distributed technologies, analysis, and sense-making apparatus, while the real-time data in communication systems suitable for all dimensions of use.

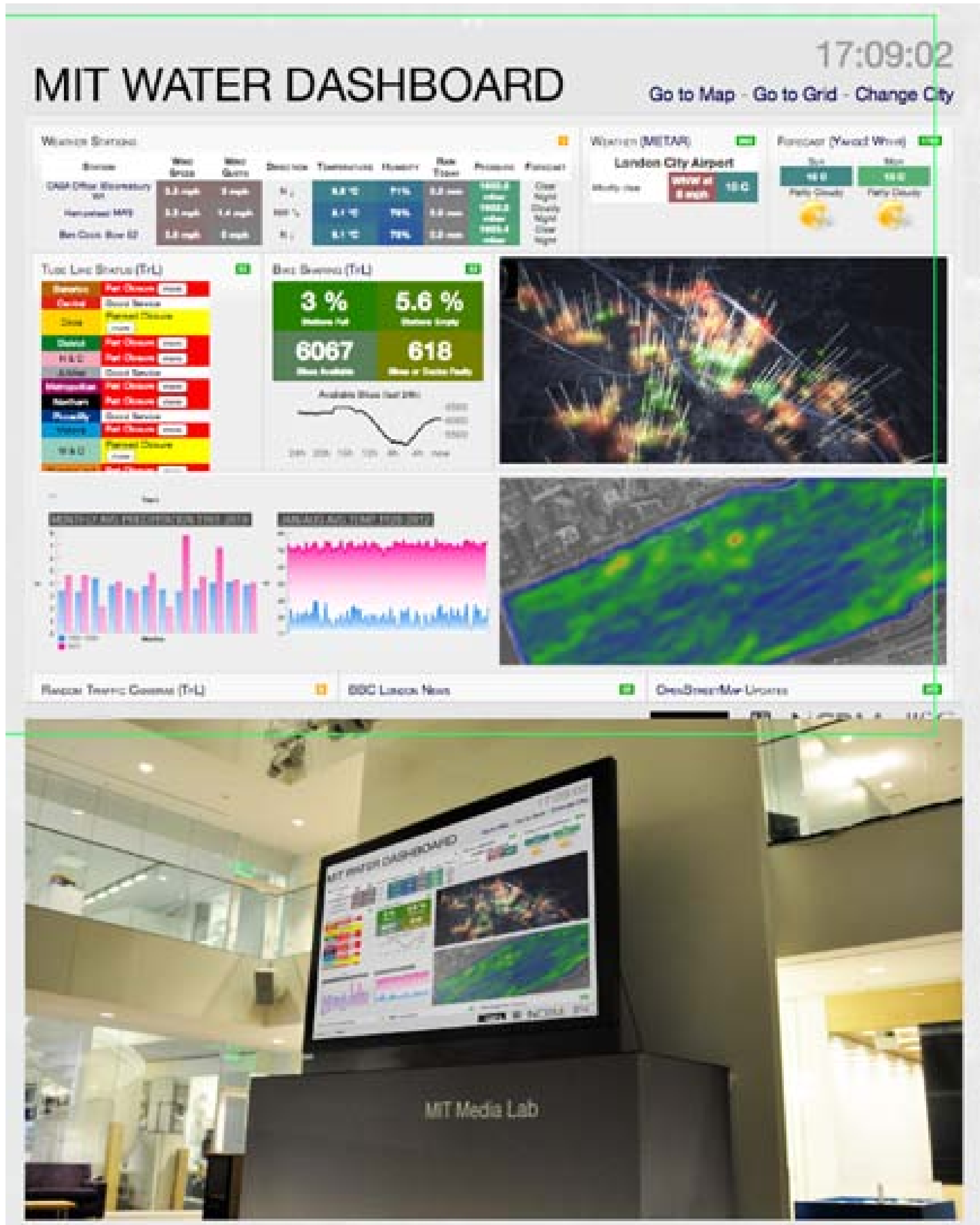
By making completely accessible real time data on a site's ecological performance, the open data platform can revolutionize how stormwater and environmental management can be done. We propose housing the system here so that it can be first piloted and refined at MIT before being expanded elsewhere.



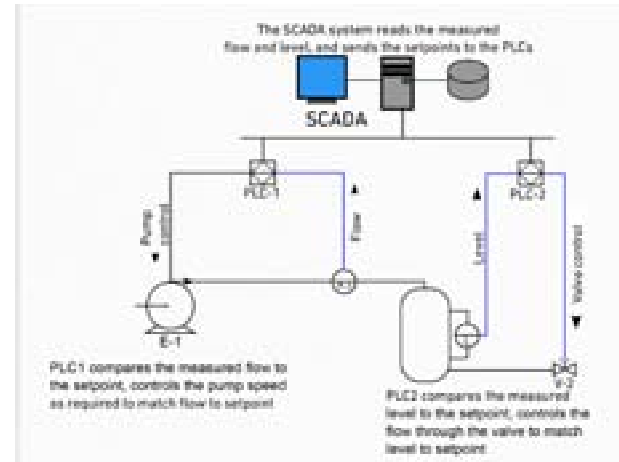
IMPLEMENTATION

Install and network a wide array of water sensing technologies across

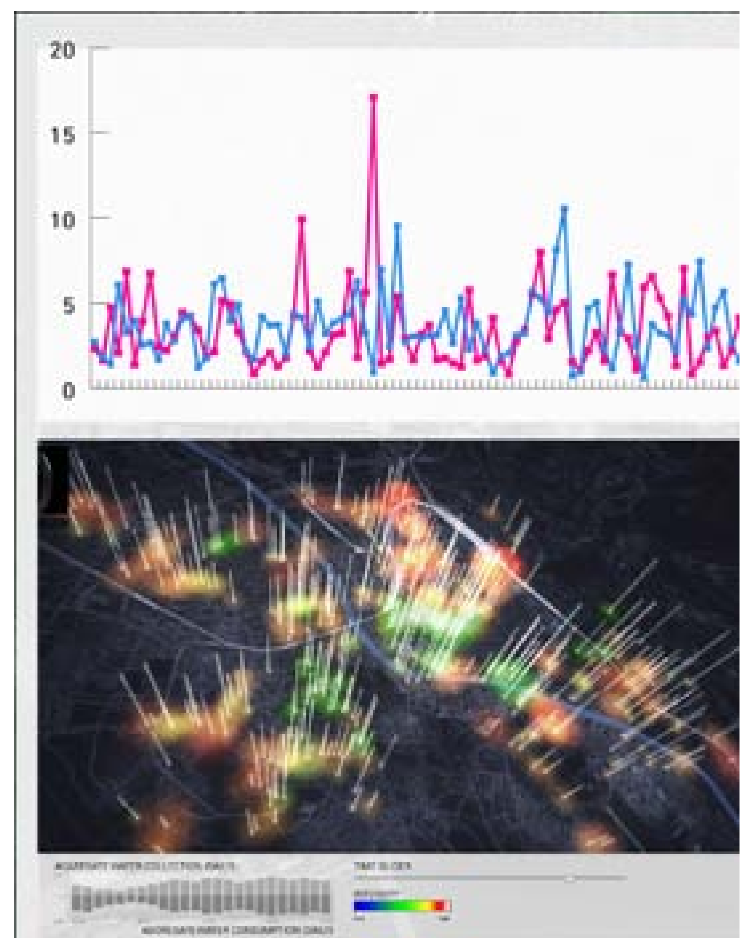
EXAMPLES OF DATA DISPLAYS FOR DIFFERENT AUDIENCES



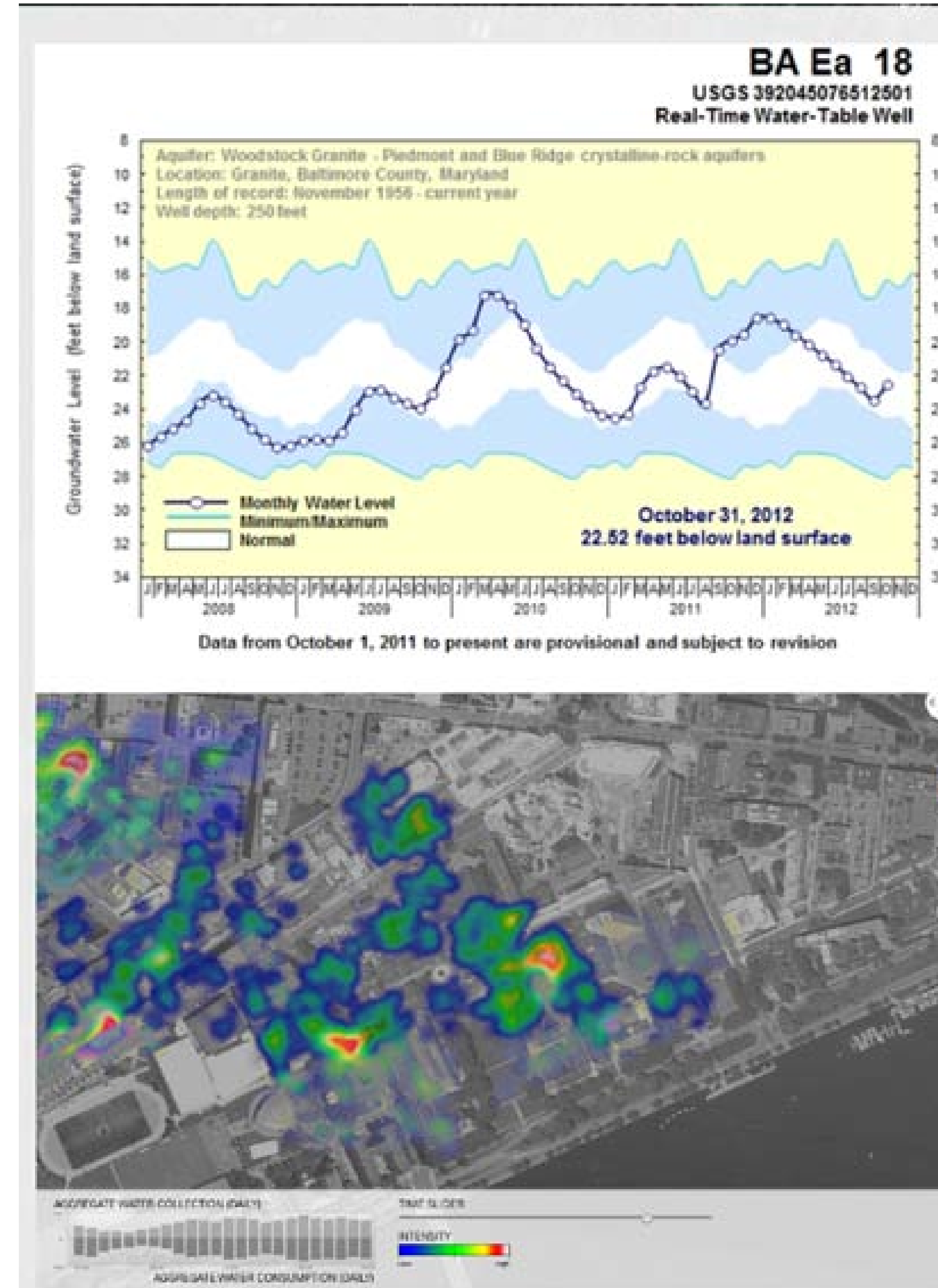
PUBLIC



PROFESSIONALS



RESEARCHERS



POLICYMAKERS

REDUCE THE RUNOFF:

CAMBRIDGE STORMWATER BANKING AND MANAGEMENT PROGRAM

In addition to the open data platform as way to make the Living Lab useful and relevant to the community beyond MIT's borders, we also conceived of an accompanying policy proposal that empowers the Cambridge residents to get involved in stormwater management.

Building upon the Living Lab as an asset and a central hub for the technologies and best management practices that inform effective and sound policymaking, the City of Cambridge can further increase its impact on stormwater management by adopting a stormwater banking system.

The goal of this program is to empower public participation in citywide stormwater management through the development of a distributed green infrastructure network. Building off of the sensor sytem explained above, this program uses real-time data to allow users to better control their individual contributions to water quality.

The program entails four components: a citywide stormwater capture goal, a distributed green infrastructure network, a mechanism by which to measure and understand the performance of the green infrastructure network, and a banking system to incentive participation.

1 Set Cambridge Capture Goal

2 Implement Green Infrastructure

3 Understand Performance

4 Establish Stormwater Bank

CONTEXT
CURRENT CAMBRIDGE STORMWATER MANAGEMENT EFFORTS

Reduction of CSO discharge into Charles

Separation of sewer systems

Cambridge Stormwater Management Plan addresses stormwater management through six minimum control measures as specified through EPA NPDES and MS4 program:

(1) public education and outreach,
(2) public participation and involvement,
(3) illicit discharge detection and elimination,
(4) construction site runoff control,
(5) post-construction site runoff control, and
(6) pollution prevention and good housekeeping at municipal operations.

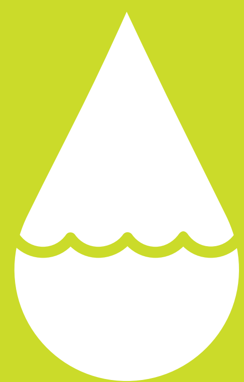
Department of Public Works Rain Garden

Examples of Municipal Action

Demonstration sites: DPW Rain Garden (opened in spring 2010), rain barrel promotion displays at DPW, City Hall, Water Department
Capital improvement projects: create wetlands (such as Alewife wetland) and stormwater storage and drainage infrastructure
Public participation: FAR Summer Ecology Camp, community meetings, GoGreen Awards, Fresh Pond Volunteering Program
Inspection: Inspection of discharge and construction sites; removal of illicit discharge sites; post-construction BMP inspections
Data Collection: Maintain database for private BMP facilties
Preventative measures: catch basin cleaning, street sweeping, urban forestry

Stormwater Capture Goal

1



Set Cambridge Capture Goal

Creates an overarching target that the entire city can work toward

Establishes a framework for action

Encourages cooperation between government and public on stormwater management, as well as among Cambridge residents

Relies upon positive incentives as opposed to regulatory compliance and penalization

PRECEDENTS FOR CONSIDERATION

Philadelphia: Manage first inch of all rainfall from all directly connected impervious surfaces

Chicago: Manage 0.5 inch runoff from all impervious surfaces OR reduce imperviousness by 15%

San Jose: Control 85% of 24-storm OR 10% of 50-year peak flow rate

Distributed Green Infrastructure & Sensor Network

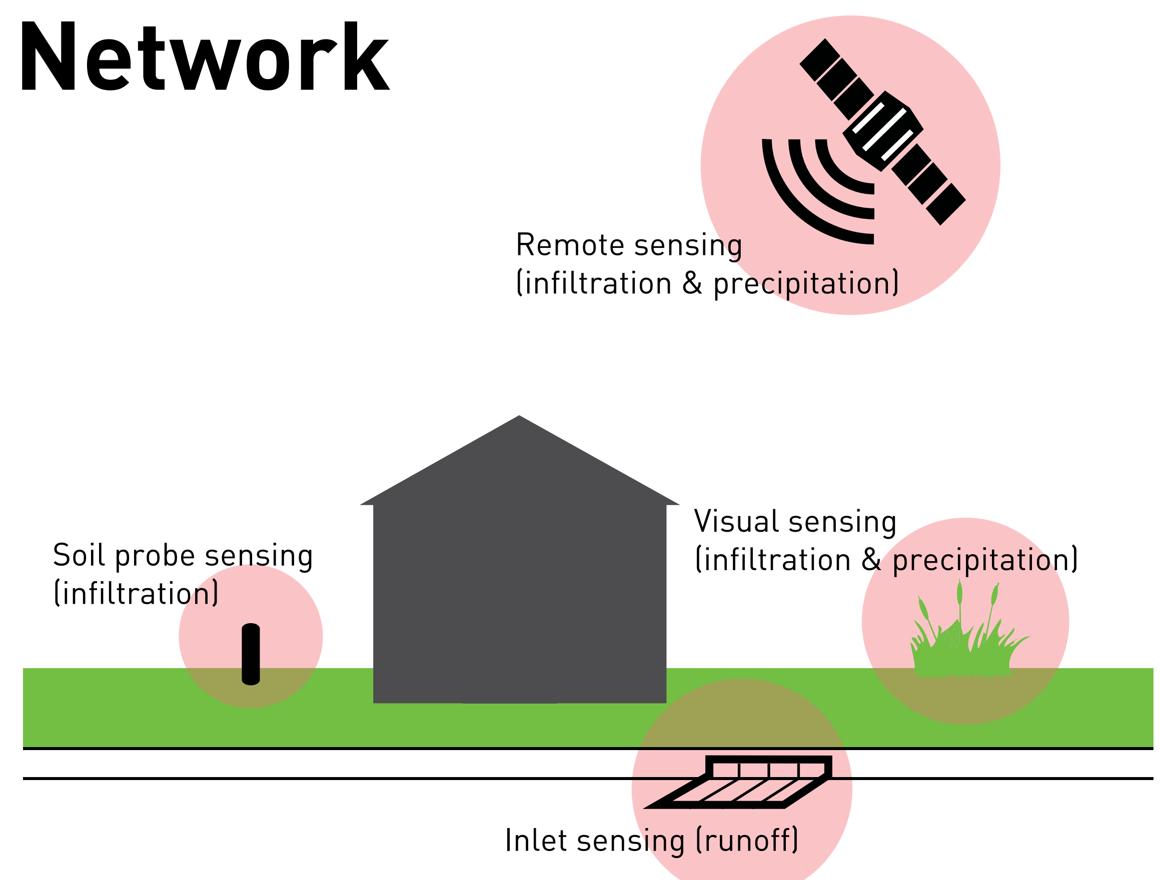
2

Implement Green Infrastructure

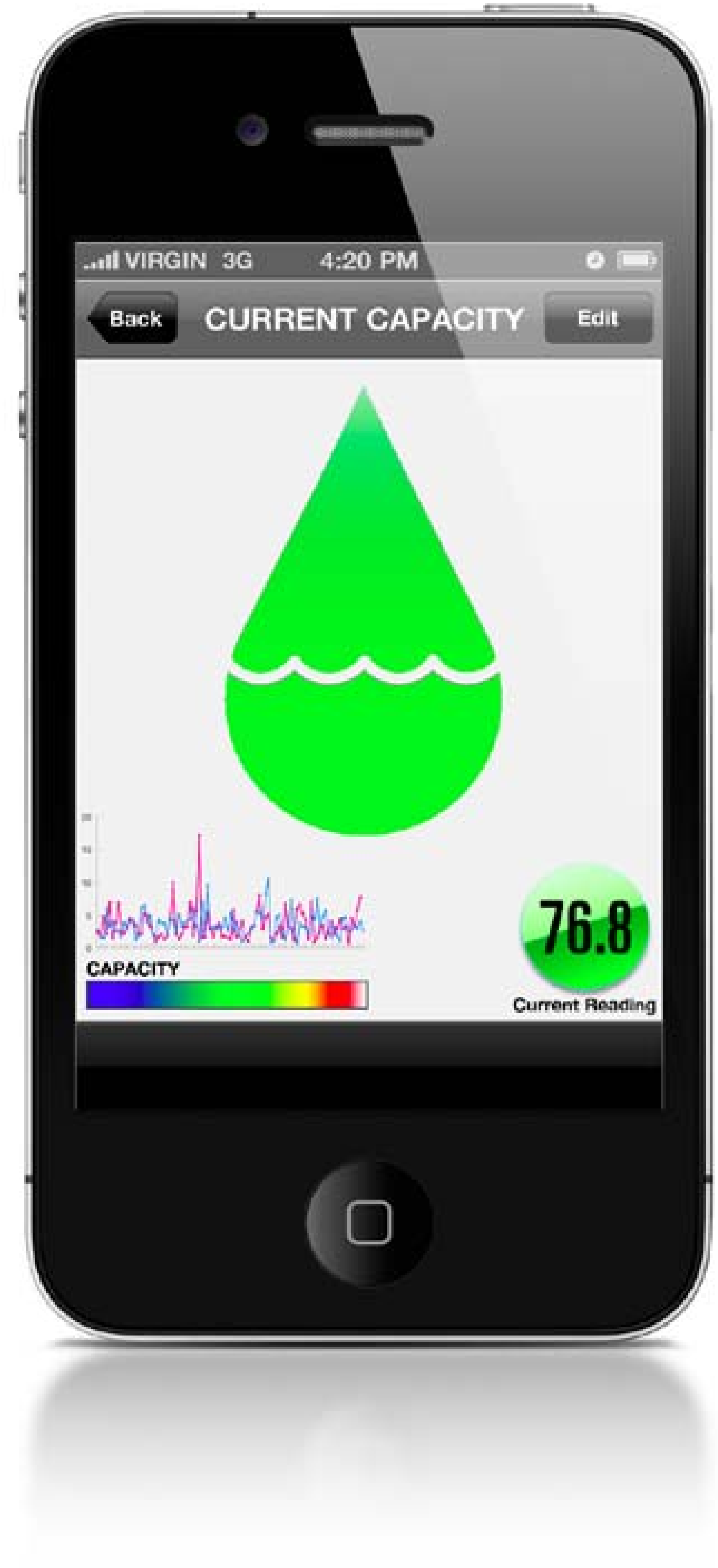
Allows for identification of target areas for intervention through sensor network

Helps property owners and managers to best understand the type of green infrastructure that will best suit the stormwater need on site

Uses City of Cambridge outreach program to educate property owners, property managers, and landscape architects on stormwater green infrastructure best management practices



Performance Evaluation & Public Engagement



3

Understand Performance

Aggregates the effect of collective decentralized efforts

Integrates types of sensing to provide comprehensive evaluation of entire water cycle from precipitation to infiltration to runoff

Translates technical sensor data into accessible and easy-to-understand personal dashboard, promoting increased public understanding of stormwater management

Shows how individual actions contribute to greater effort, creating a community around stormwater management

Stormwater Banking & Savings Incentivization

4

Establish Stormwater Bank

Provides discounts to water and sewer bill, creating a strong economic incentive for participation

Encourages long-term participation since the more you capture, the more discounts you receive

Spearheading Efforts at MIT

MIT has long been a community leader in stormwater management, making it a logical starting point as pilot project of Reduce the Runoff. In fact, MIT was recipient of 5 City of Cambridge's 2011 GoGreen Awards, including one for stormwater management.

From its innovative Stata Center Bioswale greywater system to its programs in planning and landscape design to its expertise in real time sensor and data collection at the Senseable Cities Lab, the campus houses the necessary technical capacity, space, and know-how to develop and test the initial roll-out of the Reduce the Runoff program.

This collaboration would allow MIT to both apply its vast array of technical expertise and ability to benefit the greater Cambridge community and better support the City of Cambridge in this initiative.

MIT receives the City of Cambridge GoGreen Award

SITE PLAN DETAILS AND PROGRAMMING

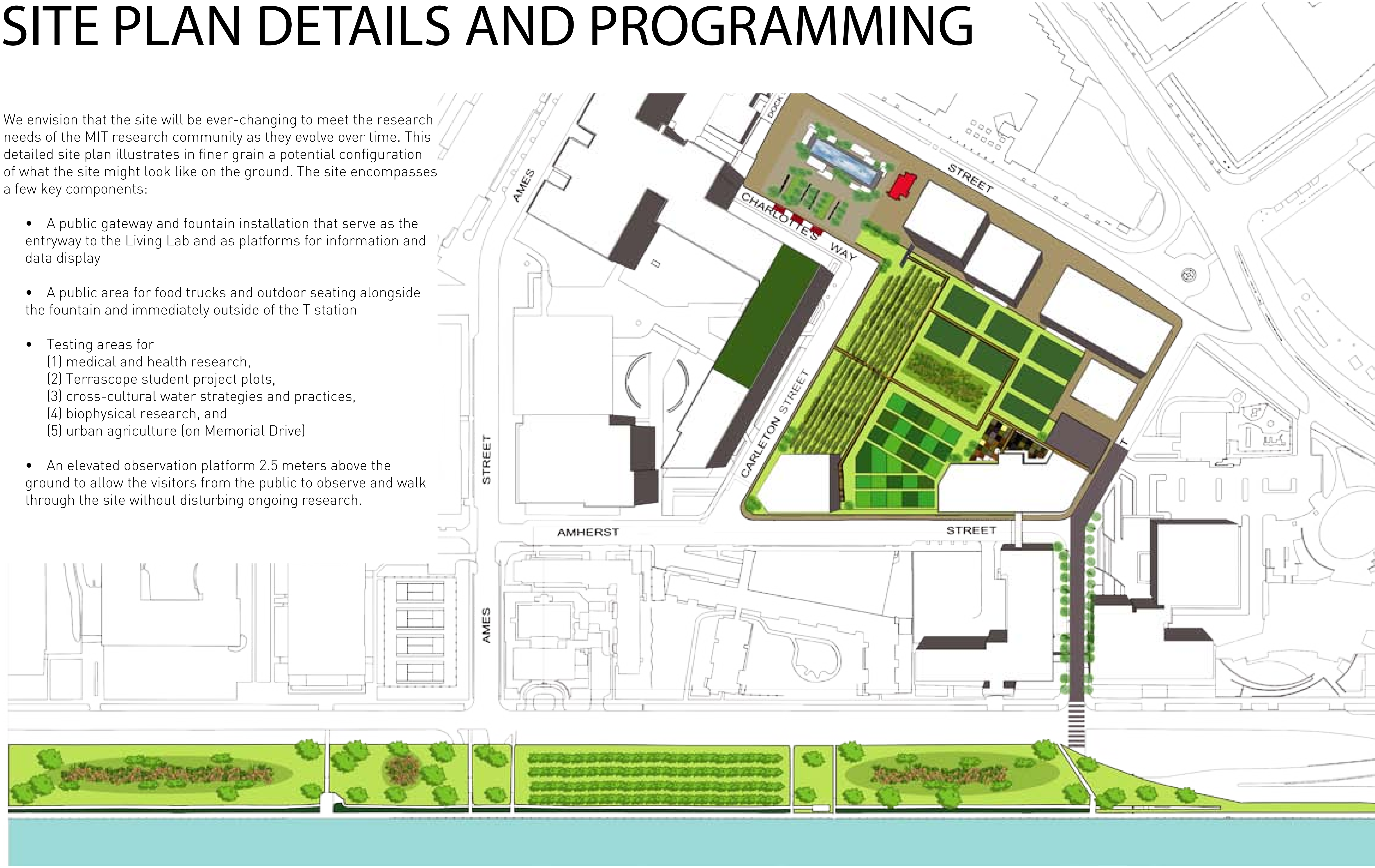
We envision that the site will be ever-changing to meet the research needs of the MIT research community as they evolve over time. This detailed site plan illustrates in finer grain a potential configuration of what the site might look like on the ground. The site encompasses a few key components:

- A public gateway and fountain installation that serve as the entryway to the Living Lab and as platforms for information and data display

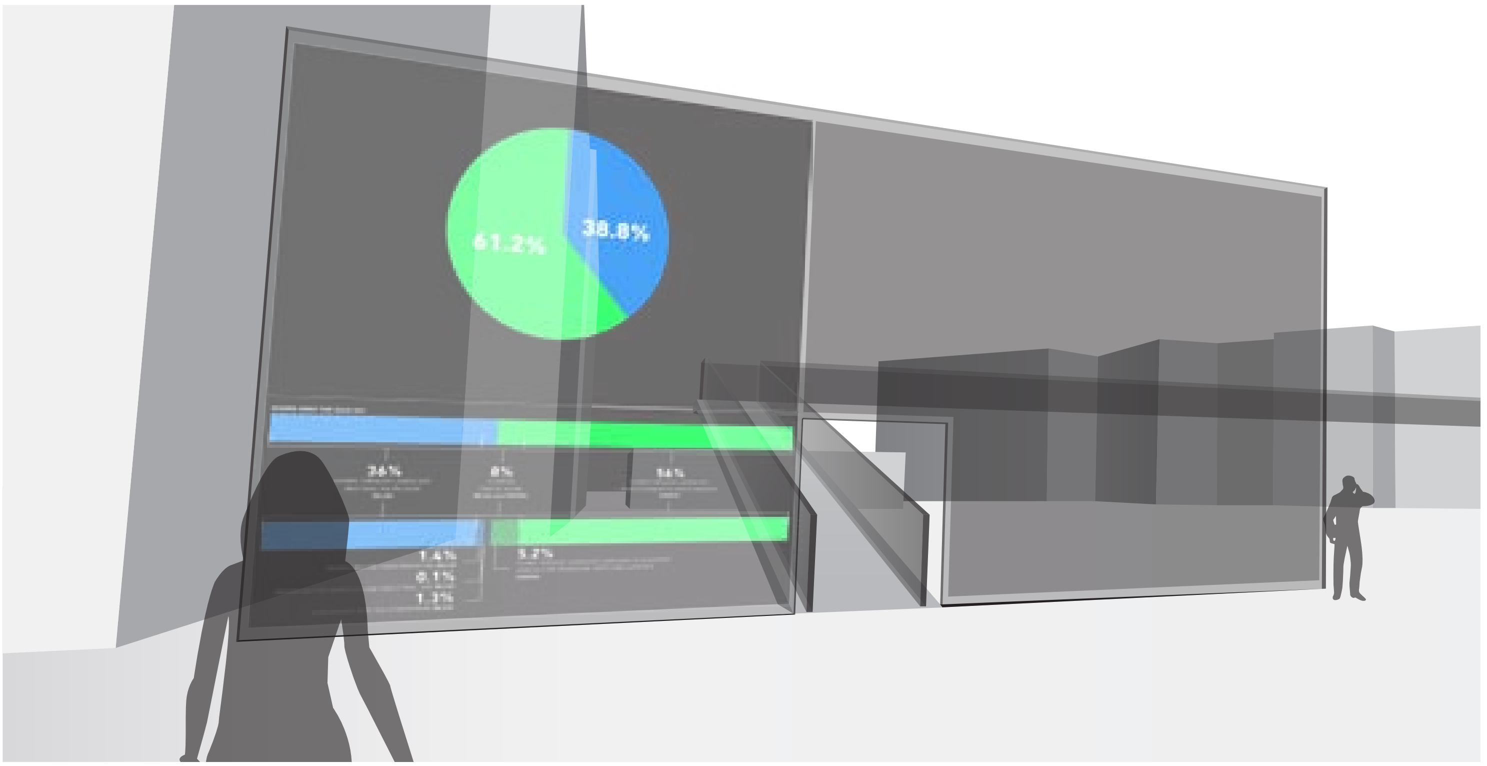
- A public area for food trucks and outdoor seating alongside the fountain and immediately outside of the T station

- Testing areas for
  (1) medical and health research,
  (2) Terrascope student project plots,
  (3) cross-cultural water strategies and practices,
  (4) biophysical research, and
  (5) urban agriculture (on Memorial Drive)

- An elevated observation platform 2.5 meters above the ground to allow the visitors from the public to observe and walk through the site without disturbing ongoing research.



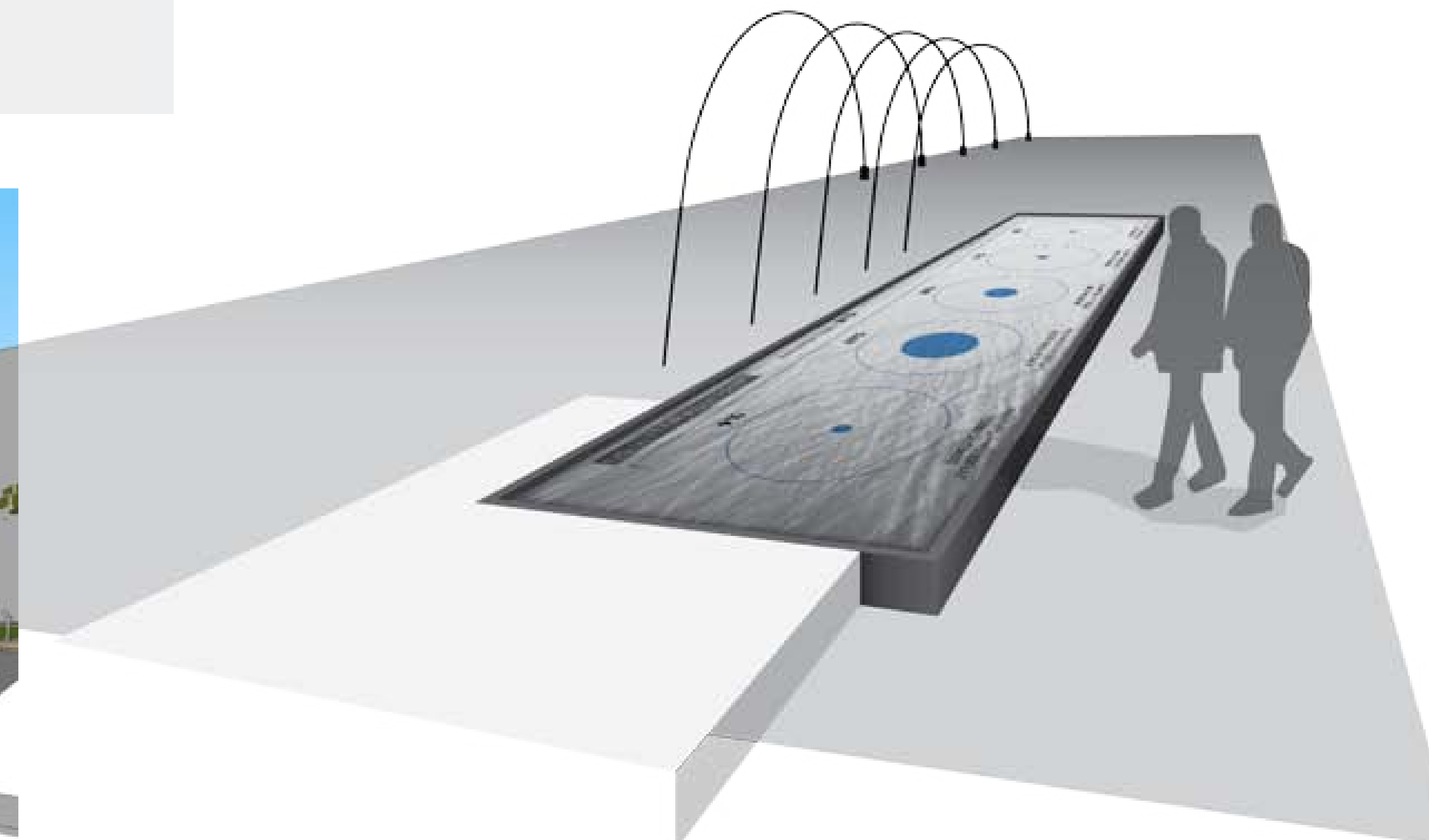
GATEWAY DISPLAY & REFLECTION POOL



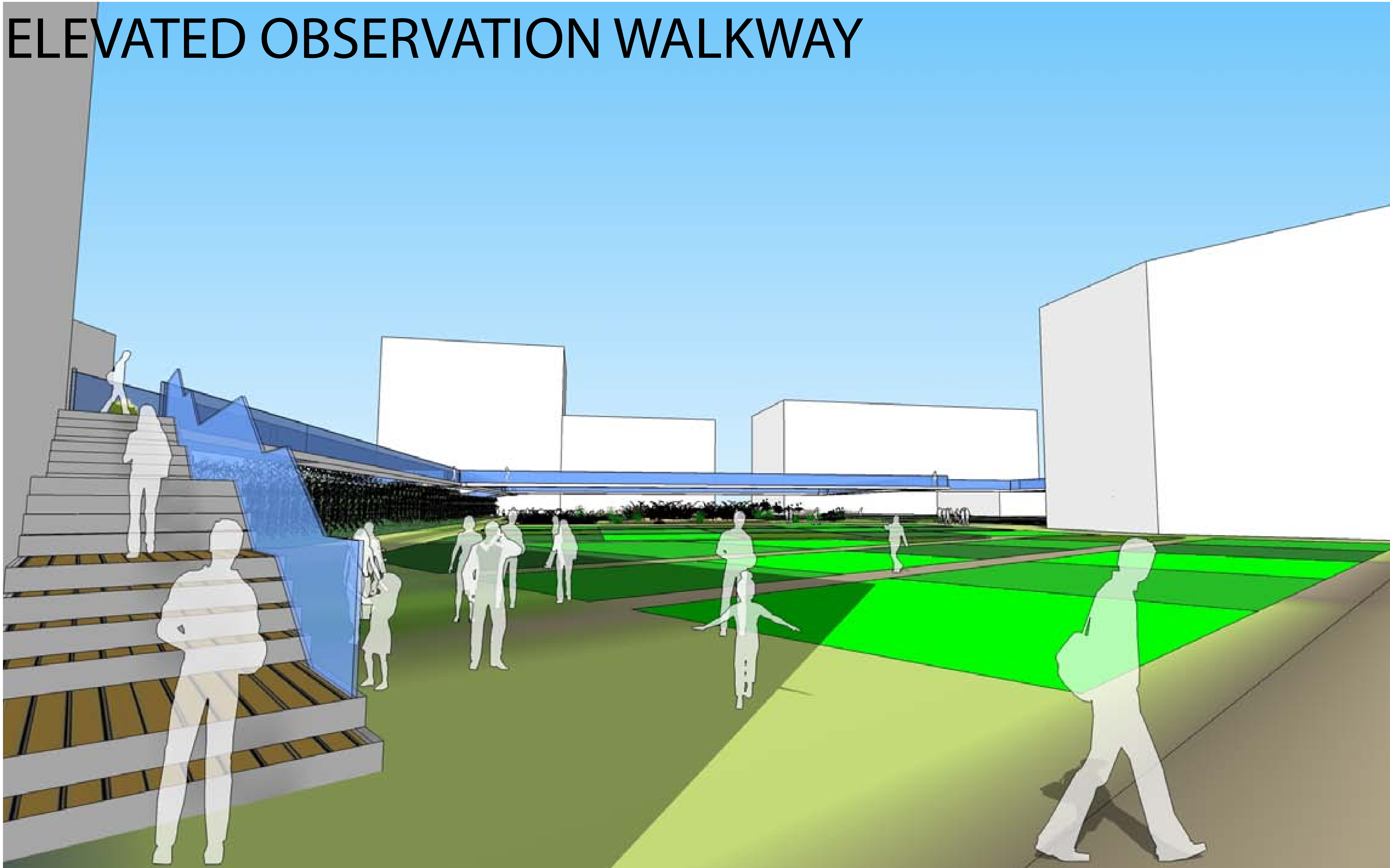
While it is important to understand how the Living Lab could impact the greater community, the strength of its impact depends on having a well-programmed and well-designed site. These renderings help illustrate how the site will function and perform as a place for MIT students and faculty, Cambridge neighborhood residents, and visitors or other members of the public coming to the space for the first time.

After emerging from the Kendall Square T stop, a visitor to the site will first be greeted by a striking reflection pool installation where a display of information about water quality, consumption, and management in Cambridge is projected onto the water surface. The reflection pool invites interaction with water and also serves as the first indication that this is a place that integrates technology and the natural world.

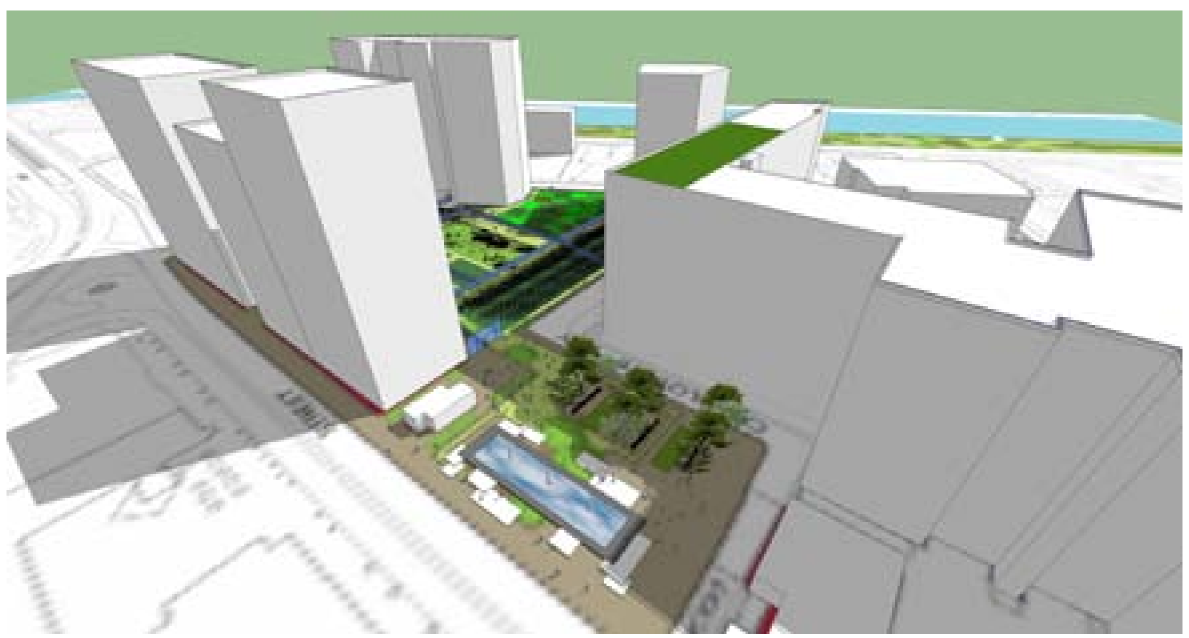
At the entrance to the Living Lab, visitors will see a large semi-transparent gateway with a visual display of information of the research happening on the site and invite them to meander along the elevated observation platform to see the work in progress.



ELEVATED OBSERVATION WALKWAY



FLEXIBLE BUILDING HEIGHTS



To address concerns from MITIMCO or others worried about the site's revenue-generating capacity, we propose a scale of building heights to create more opportunities for commercial development. The first graphic shows the site with current building heights (at about 4-5 stories), while the second graphic to the right illustrates how the site would look if the building heights were to be extended for more vertical use. The latter provides more of a sense of enclosure of the space without being too out of place in the area relative to East Gate, the Marriott Hotel, and the Microsoft building in Kendall Square.

CIRCULATION

The site features two levels of pedestrian circulation due to the elevated observation pathway and the laboratory grounds below. There are access points near the T stop, across from the Medical Center on Carleton Street, at the indoor lab space along Amherst Street, and at Wadsworth Street across from Dewey Library.

These paths provide more efficient navigability across the site in both north-south and east-west directions to guide people to and from the T to other parts of Kendall Square and MIT.

Moreover, they provide a sense of security and privacy for researchers to be able to carry out their work undisturbed. Like other labs at MIT give a sense of openness combined with a level of security with glass walls, the outdoor space needs a physical differentiation between the spaces for public and research realms. The height of the elevated platform will still allow for conversation and some engagement with the landscape itself, without disturbing any experiments or work sessions in place.

SENSORS ON DISPLAY

Through the sensor network, the site offers many levels of engagement for different audiences that enter the area.

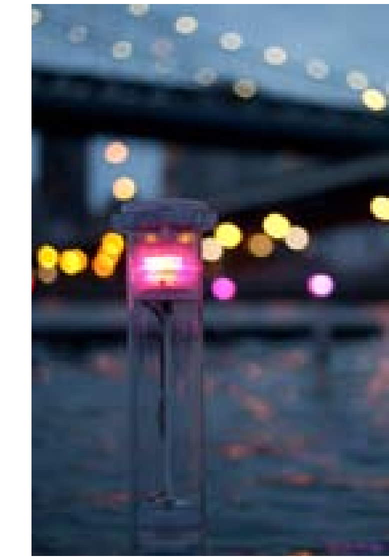
To bring the sensor network into a highly visible public arena, we propose to integrate the sensors with LED lights that can blink, pulse, or display different colors depending on the metrics they are tracking. For example, for plots testing soil moisture could display blue lights when the soil has heavy moisture and yellow when it is dry. Another type of sensor dedicated to reading nutrient levels in the water might pulse red when nutrient levels are high.

The explanations of the light colors or patterns can be explained on the gateway or through signposts near the plots, but the idea will be to give passers-by an impression of how the environment is functioning and that experiments are taking place. We can also imagine ticker tape readings that actually display numerical readings of the data collected in real time.

Functionally, the sensors will also be an integral aspect for the researchers using the test plots. They will be able to monitor their experiment sites around the clock. The data will automatically be downloaded to a central server housed in the indoor lab for manipulation and analysis.

The ambient lighting that this sensor display creates will also create a distinct feeling this place that connects technological innovation with the natural environment in a space designated for learning and exploration. The sensors will also help to light the space at night, making for a unique outdoor park experience that draws visitors to the site as they emerge from the T station or walk along Main Street.

From the raw data collection for researchers to the playful and inviting light displays for the general public to the packaged data for people who want to learn more about the hydrological and ecological performance of Kendall Square, the sensors help convey many types of information through different channels.



ENRICHING HANDS-ON EDUCATION AT MIT

While at first glance, the Living Laboratory is not the most lucrative idea, it should be considered a long-term investment into add research and monetary value to the education and culture of MIT. First and foremost, by providing MIT with a unique space that no other campus in the Boston area offers, the Lab would draw more talented researchers, grant money, and student applications to MIT from those who would otherwise not have a space to conduct ecological tests that is also paired with state of the art indoor research facilities. Moreover, the Lab has enormous potential to enrich student life. We provide two examples that walk through how MIT's course offerings could concretely benefit from having the Living Lab space. We provide some ideas for how the spaces can be integrated into research experiments that engage several departments across campus

Health Medical Testing Area:

Establish three different test plots to compare different environments, these could be on the roof of medical center, a plot in the main living laboratory space, and a segment of memorial drive.

Test for plants at each site for consumption safety evaluating different toxin levels and examining which species handle pollution best.

Test the impact of grow conditions and evaluate whether the three different plots exhibit different growth rates, fruiting rates, or other characteristics.

Biotech Enzyme Research:

Companies in the biotech district may want to create new or different enzymes to use in the production processes. They could research using plant enzymes or test the enzymes performance in outdoor conditions.

Importing and Testing International Water Technologies:

Import different pavement materials from other countries and test them on site and monitor their behavior and response.

Conduct workshops for international students to test their water management ideas and strategies on site.

Importing different species of plants and test their water management capabilities on site.

TERRASCOPE STUDENT PLOTS

Terrascope is a unique program for MIT freshman that offers hands on systems thinking about natural resources and the environment. With a mission to encourage students to "approach and solve problems that require interdisciplinary and innovative solutions," the Terrascope courses could be greatly enhanced by adding an ecological Living Lab aspect to the curriculum. The year in Terrascope encompasses a fall course on complex problem solving, which is currently structured around guest lecturers; a scattering of IAP courses to do field research on flora, fauna, and ecosystems in Everglades or water use and conservation techniques in Mexico; and a spring course on communicating and developing solutions to complex environmental issues.

With the added benefit of a Living Lab at home, Terrascope could first give students exposure to hands on ecological spaces and understand complex ecological systems on a micro level at MIT/Kendall Square. Cross-disciplinary experiments that allow students to understand in a more interactive way than guest lectures, for example, the how types of pollutants in the stormwater affect plant species here in the Cambridge area, would create complementary activities and lessons to the guest lecture sessions about pressing environmental issues. Moreover, as the Living Lab space becomes increasingly used by other departments, faculty, and students at MIT, this could also serve as a way to showcase emerging environmental research at the Institute and expose freshman to the types of ideas and uses this lab could have for them in their later years at MIT.

When Terrascope students return from field-based projects over IAP, the Living Lab student plots could also serve as a way to bring their site-based knowledge back home. From taking a further look at ecosystem biodiversity to testing out water conservation and purification practices that they learned in other contexts, the Living Lab student plots would provide an ideal space for students in the spring term to really explore how to implement practices of restoration, conservation, and environmental improvement in a project of their own designing. This could be a semester-long group or individual project, or a class project, that builds the skills for students to understand how to design and carry out environmental experiments that rounds out the Terrascope curriculum. Most importantly, it shows that fieldwork is not only relevant to exotic locations, but can be very beneficial and educational at MIT's front door.

URBAN AGRICULTURE & FOOD SYSTEMS

This fall, Professor Judy Layzer at DUSP taught a course on Food Systems. The course topics covered the relationship of food production to the natural environment; pesticides, herbicides, fertilizers, and monoculturing; irrigation and aquatic ecosystems; climate change and food; industrial agriculture; genetically modified food and organics; food policy and the Farm Bill; local food markets; and composting. In its current state, the course relied upon traditional articles, class discussions, and writing assignments.

If paired with the urban agricultural plots that we propose along Memorial Drive, this course could be greatly enhanced by actually allowing students to understand how agricultural practices work on the ground. Most of the units discussed in the course could integrate some physical, observational, or testing element. For example, the readings on pesticides and organics could be paired with looking at actual data comparing water, plant, and soil quality of organic plots vs. pesticide-treated plots to understand the tangible differences to the environment that each of these practices can bring.

The unit on irrigation and aquatic ecosystems could definitely be enhanced by having tangible testing areas right on Memorial Drive. Instead of only reading articles about challenges to irrigation and the water cycle as it relates to agricultural production, the class could offer an on-the-ground look at the irrigation requirements for agriculture in Cambridge, and how that affects the groundwater supply, and is affected by runoff.

INDOOR LABORATORY SPACE

METRICS FOR EVALUATION

The Living Lab concept inherently entails a high degree of metrics collection through the sensor network that can detect and evaluate on-site performance of stormwater management practices. The sensors will help to evaluate traditional water quality indicators, such as phosphorous, nutrient levels, or bacteria count of stormwater runoff, as well as water volume and flow during weather events. In designing our evaluation metrics, we wanted to go beyond these traditional indicators to look more broadly at how the site performs on a holistic scale. In order to do this, we created a set of metrics based upon the planning principles we hoped to achieve. Our hope is that the site can not only benefit stormwater management at MIT, Cambridge, and beyond, but also become a vibrant destination that ties together Kendall Square and bridges the campus to the rest of the surrounding neighborhood.

Planning Principle	**Metric**
Experimentation	• Observing use of space • Work/reports/studies that come out of experimentation space • Diversity of users • Active and continued use of space by students, faculty, and staff
Monitoring & Evaluation	• Verify fully functioning data platform • Implementing and verifying that sensors are monitoring water levels, moisture, phosphorous, nitrogen, etc.
Diffision	• Number of projects spawned on campus and elsewhere in Cambridge • Accessibility of online data platforms (who are they? how are they using it?)
Connectivity	• Cross-departmental classes and experiments • Connectivity of data to institutions/processes, internal and external to MIT
Public Engagement	• Use of online data platforms • Sensors count onsite visitors

CONCLUSION: HACKING KENDALL SQUARE

Hacking is a significant part of MIT culture. Hacks are playful pranks that demonstrate ingenuity, innovation, and experimentation by transforming a physical space. In coming up with the idea for the Living Lab, we wanted to explore what it would mean to "hack" the Kendall Square space. In the end, our proposal can be seen as a series of hacks.

1. **Complete impervious to complete pervious hack**: The current site consists of two large parking lots, covered by impervious pavement and contributing to significant runoff into the Charles River. Our first hack is transforming the parking lots into a high performing space for developing innovative best practices in stormwater management.

2. **Green footprint hack**: At the moment, this area is being discussed for redevelopment. In the proposal on the table, the floor area is almost entirely covered by building footprints. In contrast to maximizing commercial profit from this high revenue site, we propose an entirely green space. While it may seem ludicrous not to include any new commercial real estate here, we argue that the Living Lab will enrich the campus and the community in a much more holistic way.

3. **Environmental performance sensor hack**: At a place like MIT that seeks to reveal processes and understand the world around us, the sensor system that allows for complete and around-the-clock collection of many aspects of land performance.

4. **Night club hack**: The ambience from the sensor lights can create a unique nighttime space that would be perfect for an outdoor nightclub.

5. **Rooftop hack**: Even if the site is not seen as feasible to implement and the entire site gets built up, the ultimate hack is that all of the space can be transformed to the rooftops, creating a Living Sky Lab.