Dear Swaathi Joseph:

Attached please find a revised Article 22 Special Permit submission for the **36-64 Whittemore Avenue Project**. This package has been updated based on our discussion with your team on April 2, 2021 at which some questions were raised. This package supersedes the original package submitted March 15, 2021.

Following we have outlined the requested changes and updates. They include narrative updates within this cover letter as well as updates to the sections in the attached compiled report.

Summary of changes/Updated information:

1. **Net Zero Energy Assessment**: We have revised the NZE assessment to evaluate the feasibility of a future all-electric system option. This includes a full LCCA to assess cost, impact and feasibility of the non-fossil fuel system. The proposed system leverages structural capacity and other infrastructure improvements incorporated into the current design to replace conventional boilers with an air-water chilled/hot water heat pump plant. Gas storage service hot water heaters are also replaced with similar heat pump equipment. It is anticipated that heat pump condensing units will use the vast majority of available roof area (including possible green roof area) under this scenario.

   As a result of the assessment, and as a reflection of the shared commitment to decarbonizing buildings, the proponent has committed to upgrading the structural design to be capable to carry the additional equipment of the identified all-electric solution.

2. **On-Site PV assessment / Green Roof**: The team continues to explore options and feasibility of future on-site solar PV on campus. Based on ongoing study and analysis, the Proponent and Project team have determined that there is a solar array opportunity of approximately **16,000 SF** on the prototypical building 3 mechanical penthouse roof. The remaining rooftop area is under high demand for building equipment and future tenant equipment, however additional space on the lower roof areas has been earmarked for the installation of green roofs since the solar availability makes them less favorable for solar production.

   Additionally, the team is studying solar PV canopies over the existing parking lot east of building three. The current scheme shows this ground mounted solar array includes approximately **14,000SF** of panel areas that would offset electrical use on campus. See more in the updated NZE assessment and Section E for preliminary plans of the rooftop and ground mounted options.

3. **Water Capture and Reuse**: The current design includes a stormwater capture and reuse system that will be used for irrigation on site. Additionally, the team is exploring the option to expand this system to capture condensate and greywater from lavatories and shower to be treated and reused for toilet flushing. Initial findings suggest this strategy could have a significant impact on the reduction of municipal water use. The team is continuing to explore the feasibility of this option.

4. **Optimize Energy Performance Points Targeted:** Based on our current energy modeling effort we believe the eight (8) points shown is appropriate at this time. The team recognizes the importance of energy efficiency and will continue to evaluate opportunities to reduce energy use and increase points. The project will comfortably exceed the updated stretch energy code requirements.

5. **Life Cycle Assessment of Structure and Enclosure**: The team is in the process of conducting an analysis of the structure and enclosure in accordance with the LEED v4.1 Building Life-Cycle Impact Reduction credit, Option 4, requirements and working to refine the design. The goal is to demonstrate a minimum 5% impact reduction compared to a baseline building in at least 3 of the 6 impact categories.

6. **Third Party Certifications**: The projects are committed to pursue formal LEED-CSv4 Gold certification and Fitwel certification for Buildings 3-5.

Cambridge Article 22 Special Permit Package

Project: 36-64 Whittemore Avenue

Section A: Green Building Project Checklist	p3-4
Section B: Green Building Report (Including prototypical LEED-CS v4 checklist)	p5-21
Section C: Green Building Professional Affidavit	p22-23
Section D: Net Zero Energy Narrative	p24-35
Section E: Initial Prototypical Rooftop and Parking Canopy PV plans	p36

(sections are bookmarked)

Green Building Project Checklist

Green Building
Project Location: 36-64 Whittemore Avenue

Applicant

Name: Chris Schaffner
Address: 23 Bradford Street, First Floor, Concord, MA 01742
Contact Information
Email Address: chris@greenengineer.com
Telephone #: 978-369-8978

Project Information (select all that apply):

- [x] New Construction – GFA: 551,294 GFA
- [ ] Addition – GFA of Addition:
- [x] Rehabilitation of Existing Building – GFA of Rehabilitated Area: 184,200 GFA (Buildings 1, 2 & 28)
  - [x] Existing Use(s) of Rehabilitated Area: office, research
  - [x] Proposed Use(s) of Rehabilitated Area: office, research
- [x] Requires Planning Board Special Permit approval
- [x] Subject to Section 19.50 Building and Site Plan Requirements
- [ ] Site was previously subject to Green Building Requirements

Green Building Rating Program/System:

- [x] Leadership in Energy and Environmental Design (LEED) – Version: v4
  - [x] Building Design + Construction (BD+C) – Subcategory: Core & Shell
  - [ ] Residential BD+C – Subcategory:
  - [ ] Interior Design + Construction (ID+C) – Subcategory:
  - [ ] Other:
- [ ] Passive House – Version:
  - [ ] PHIUS+
  - [ ] Passivhaus Institut (PHI)
  - [ ] Other:
- [ ] Enterprise Green Communities – Version:

Project Phase

☒ **SPECIAL PERMIT**

Before applying for a building permit, submit this documentation to CDD for review and approval.

Required Submissions

All rating programs:

- ☒ Rating system checklist
- ☒ Rating system narrative
- ☒ Net zero narrative (see example template for guidance)
- ☒ Affidavit signed by Green Building Professional with attached credentials – use City form provided (Special Permit)

Cambridge Article 22: Green Building Report
Special Permit

Project: 36-64 Whittemore Avenue

Issued: April 23, 2021

Image courtesy of Gensler

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III. LEEDv4 Checklist Summary Page 6

IV. LEED Credit Compliance Narrative Page 8

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B. Location and Transportation
C. Sustainable Sites
D. Water Efficiency
E. Energy and Atmosphere
F. Materials and Resources
G. Indoor Environmental Quality
H. Innovation in Design
I. Regional Priority Credits

Section I. PROJECT DESCRIPTION

This is an application for the 36-64 Whittemore Avenue redevelopment in the Alewife neighborhood of Cambridge, MA (the "Project"). IQHQ, Inc. (the "Applicant") is proposing to redevelop this 27-acre site, which extends from Whittemore Avenue and along Alewife Brook Parkway to Rindge Avenue (the "Project Site"). The goal for the Project is to create a vibrant, resilient, highly connected, and inclusive community in this North Cambridge neighborhood. The site is directly adjacent to the MBTA Red Line's Alewife Station in one of the most sought-after life science and technology destinations.

The 36-64 Whittemore Avenue project includes the demolition of certain existing buildings, structures, and elements and the construction of a new life science campus. The project includes the new construction of three (3) lab/office buildings at a ratio of 60/40 lab/office. See the table below for project areas. Additionally, a 121,000 GFA parking structure with 362 stalls is proposed. 319 surface spaces are also included for a total parking capacity of 681. Significant site and landscaping improvements are included in the development.

Use	Proposed Size[2]/Quantity	Height (feet/stories)
Office/Lab/Lobby		
Building 1[1] (office, R&D)	91,150 GFA	
Building 2[1] (research)	100,000 GFA	
Building 28[1] (office)	2,344 GFA	
Building 3 (life science)	147,500 GFA	48'/3 stories
Building 4 (life science)	130,000 GFA	48'/3 stories
Building 5 (life science)	140,000 GFA	48'/3 stories
Retail	3,500 GFA	
Parking Garage	121,000 GFA	34'/3 stories
	Total Proposed: 735,494 GFA	
	Total Existing to Remain: 184,200 GFA	
	Total Existing to Be Demolished: 197,800 GFA	
	Net New Total: 353,494 GFA	
Parking Spaces: Garage	362 spaces[3]	
Surface	319 spaces	
	Total Proposed: 681 spaces	
	Total Existing: 681 spaces	
	Net New Total: 0 spaces	

The current prototypical design of the new 36-64 Whittemore Avenue buildings includes an improved envelope, high-efficiency HVAC systems and LED lighting. Detailed information is included in the attached Net Zero Energy narrative.

Each new building will demonstrate Article 22 compliance following the LEED for Core and Shell (LEED-CS) version 4 rating system. For this application we have presented a prototypical LEED checklist and compliance strategy since the design and compliance approach will be the same for all new buildings.

The team has committed to pursue formal LEED certification for the development. Additionally, because all portions of the project will be built as a campus with combined site and infrastructure elements the team will pursue a LEED Master Site. This will allow the project to show compliance with various LEED elements from a “campus approach”.

Additionally, all buildings will participate in the MassSave energy-efficiency utility incentive program. A kickoff with the utilities was conducted on March 15, 2021.

Note that improvements to the existing buildings to remain have not been included in this Article 22 assessment.

Section II. AFFIDAVIT

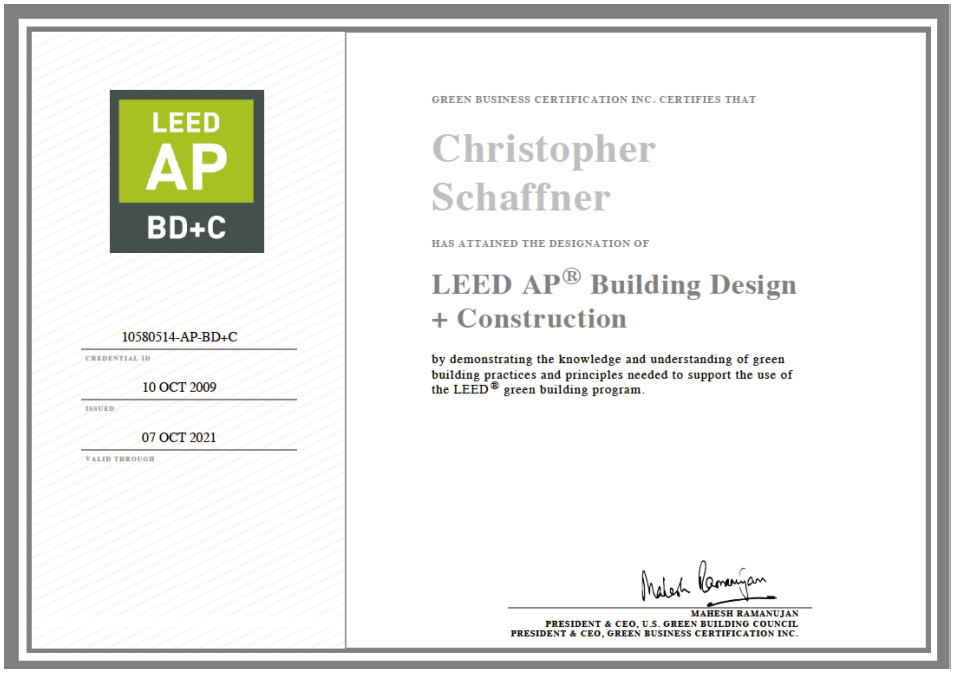
I, Christopher Schaffner, do hereby affirm that I have thoroughly reviewed the supporting documents for the LEEDv4 for Core & Shell rating system and confirm that the 36-64 Whittemore Avenue new construction prototypical project is targeted to meet the requirement for Gold Certifiability with **61** points as 'Yes' and 29 possible ('maybe') points. The 36-64 Whittemore Avenue new construction projects, located in Cambridge, MA will be designed to meet the green building requirement under Article 22.20 of the Cambridge Zoning Ordinance.

Chris Schaffner, PE, LEED Fellow is founder and CEO of The Green Engineer, Inc. a sustainable design consulting firm located in Concord, MA. Chris has 33 years of experience in the design of building systems with a focus on energy efficiency and sustainability. He holds a B.S. in Mechanical Engineering from M.I.T., and is a registered professional engineer in Massachusetts, California and Vermont.

A long-time promoter of sustainable design, Chris was a charter member of the US Green Building Council's (USGBC) LEED Faculty (TM), training more than 10,000 building industry professionals in the use of the LEED Rating System since 2001. He recently completed his term on the LEED Steering Committee, where he served as 2019 LSC Chair. He previously served on the USGBC Board of Directors, the USGBC Advisory Council, as Chair of the Energy and Atmosphere Technical Advisory Group (TAG) and LEED Advisory Committee, and as a member of the Indoor Environmental Quality TAG, among other volunteer roles with the USGBC.

An executed Cambridge Affidavit has been provided.

Christopher Schaffner, PE, LEED Fellow
Massachusetts PE Registration #37211
The Green Engineer, Inc.
LEED Administrator and Sustainability Consultant


LEED AP BD+C

GREEN BUSINESS CERTIFICATION INC. CERTIFIES THAT

Christopher Schaffner

HAS ATTAINED THE DESIGNATION OF

LEED AP® Building Design + Construction

by demonstrating the knowledge and understanding of green building practices and principles needed to support the use of the LEED® green building program.

10580514-AP-BD+C
CREDENTIAL ID

10 OCT 2009
ISSUED

07 OCT 2021
VALID THROUGH

MAHESH RAMANUJAN
PRESIDENT & CEO, U.S. GREEN BUILDING COUNCIL
PRESIDENT & CEO, GREEN BUSINESS CERTIFICATION INC.

Section III. LEEDv4 CHECKLIST SUMMARY

For this application we have presented a prototypical LEED checklist and compliance strategy since the design and compliance approach will be the same for all new buildings. This protype project (the "Project") was reviewed for compliance using the USGBC's LEED for Core & Shell (LEED-CS), version 4 rating system. The project is targeting 61 out of a possible 110 credit points with an additional 29 credit points still undergoing evaluation to determine feasibility of achievement. By targeting 61 credit points, the project anticipates meeting the City of Cambridge requirement to be LEED v4 Gold 'certifiable'. In addition to the City of Cambridge requirements, the projects will be registered under the LEED-CS v4 rating system and will be pursuing formal certification with the USGBC.

The team will continue to evaluate design options against LEED requirements with the goal to design and construct a building which minimize its impact on the environment, create an engaging and healthy space for occupants and reduce operating costs. Several credits remain designated as 'Maybe' due to the uncertainty of future design decisions, which is common at this phase of the Project. The team will continue to evaluate LEED credits to pursue to ensure enough of a "point cushion" to ensure the LEED Gold requirement is met.

The USGBC recently released the beta version of the LEEDv4.1 rating system which is intended to serve as an update to (and improvement upon) LEEDv4. Recent guidance issued by the USGBC allows LEEDv4 projects to substitute any prerequisite or targeted credit for the LEEDv4.1 equivalent. Credits this project intends to pursue using the LEED v4.1 criteria have been denoted with (LEEDv4.1) adjacent to the credit name within the scorecard below and ensuing credit narratives.

Y	M	N			
1	0	0	**Integrative Process**		1
1			Credit 1	Integrative Process	1

18	0	2	**Location and Transportation**		20
		N	Credit 1	LEED for Neighborhood Development Location	
2			Credit 2	Sensitive Land Protection	2
3			Credit 3	High Priority Site	3
4		2	Credit 4 (LEEDv4.1)	Surrounding Density and Diverse Uses	6
6			Credit 5 (LEEDv4.1)	Access to Quality Transit	6
1			Credit 6 (LEEDv4.1)	Bicycle Facilities	1
1			Credit 7 (LEEDv4.1)	Reduced Parking Footprint	1
1			Credit 8 (LEEDv4.1)	Green Vehicles	1

4	6	1	**Sustainable Sites**		11
Y			Prereq 1	Construction Activity Pollution Prevention	Required
1			Credit 1	Site Assessment	1
	1	1	Credit 2	Site Development - Protect or Restore Habitat	2
1			Credit 3	Open Space	1
	3		Credit 4 (LEEDv4.1)	Rainwater Management	3
	2		Credit 5	Heat Island Reduction	2
1			Credit 6	Light Pollution Reduction	1
1			Credit 7	Tenant Design and Construction Guidelines	1

4	2	5	Water Efficiency		11
Y			Prereq 1	Outdoor Water Use Reduction	Required
Y			Prereq 2	Indoor Water Use Reduction	Required
Y			Prereq 3	Building-Level Water Metering	Required
1	1		Credit 1	Outdoor Water Use Reduction	2
2	1	3	Credit 2	Indoor Water Use Reduction	6
		2	Credit 3	Cooling Tower Water Use	2
1			Credit 4	Water Metering	1

14	12	7	Energy and Atmosphere		33
Y			Prereq 1	Fundamental Commissioning and Verification	Required
Y			Prereq 2	Minimum Energy Performance	Required
Y			Prereq 3	Building-Level Energy Metering	Required
Y			Prereq 4	Fundamental Refrigerant Management	Required
5	1		Credit 1	Enhanced Commissioning	6
8	4	6	Credit 2	Optimize Energy Performance	18
	1		Credit 3	Advanced Energy Metering	1
	2		Credit 4 (LEEDv4.1)	Demand Response	2
	2	1	Credit 5	Renewable Energy Production	3
1			Credit 6	Enhanced Refrigerant Management	1
	2		Credit 7	Green Power and Carbon Offsets	2

6	3	5	Materials and Resources		14
Y			Prereq 1	Storage and Collection of Recyclables	Required
Y			Prereq 2	Construction and Demolition Waste Management Planning	Required
2	1	3	Credit 1 (LEEDv4.1)	Building Life-Cycle Impact Reduction	6
1		1	Credit 2 (LEEDv4.1)	BPDO – EPD	2
	1	1	Credit 3 (LEEDv4.1)	BPDO - Sourcing of Raw Materials	2
1	1		Credit 4 (LEEDv4.1)	BPDO – Material Ingredients	2
2			Credit 5 (LEEDv4.1)	Construction and Demolition Waste Management	2

5	5	0	Indoor Environmental Quality		10
Y			Prereq 1	Minimum Indoor Air Quality Performance	Required
Y			Prereq 2 (LEEDv4.1)	Environmental Tobacco Smoke Control	Required
Y			Prereq 3	Minimum Acoustic Performance	Required
1	1		Credit 1	Enhanced Indoor Air Quality Strategies	2
2	1		Credit 2 (LEEDv4.1)	Low-Emitting Materials	3
1			Credit 3	Construction Indoor Air Quality Management Plan	1
	3		Credit 4 (LEEDv4.1)	Daylight	3
1			Credit 5	Quality Views	1

6	0	0	Innovation		6
1			Credit 1	Innovation: Purchasing - Lamps	1
1			Credit 2	Innovation: O&M Starter Kit	1
1			Credit 3	Innovation in Design: TBD	1

1			Credit 4	Innovation in Design: TBD	1
1			Credit 5	Pilot Credit: Integrative Analysis of Building Materials	1
1			Credit 6	LEED Accredited Professional	1

3	1	0	**Regional Priority (earn up to 4 points)**		4
1			Credit 1	Regional Priority Credit: LTc3 High Priority Site (2 points)	1
	x		Credit 2	Regional Priority Credit: SSc4 Rainwater Mngnmt (2 points)	1
		x	Credit 3	Regional Priority Credit: WEc2 Int. H2O Reduction (4 points)	1
1			Credit 4	Regional Priority Credit: EAc2 Opt. Eng. 20% (8 points)	1
	1		Credit 5	Regional Priority Credit: EAc5 Renewables (2 ponits)	1
1			Credit 6	Regional Priority Credit: MRc1 Bldg LCA (2 points)	1

61	29	20	**TOTALS**	**Possible Points: 110**

Section IV. LEED CREDIT NARRATIVE

As detailed below, the Project meets the LEEDv4 Cores & Shell Minimum Program Requirements and each of the required Prerequisites. Additionally, the following credits are being targeted.

A. Integrative Process (IP)

IP Credit 1 Integrative Process — 1 credit point

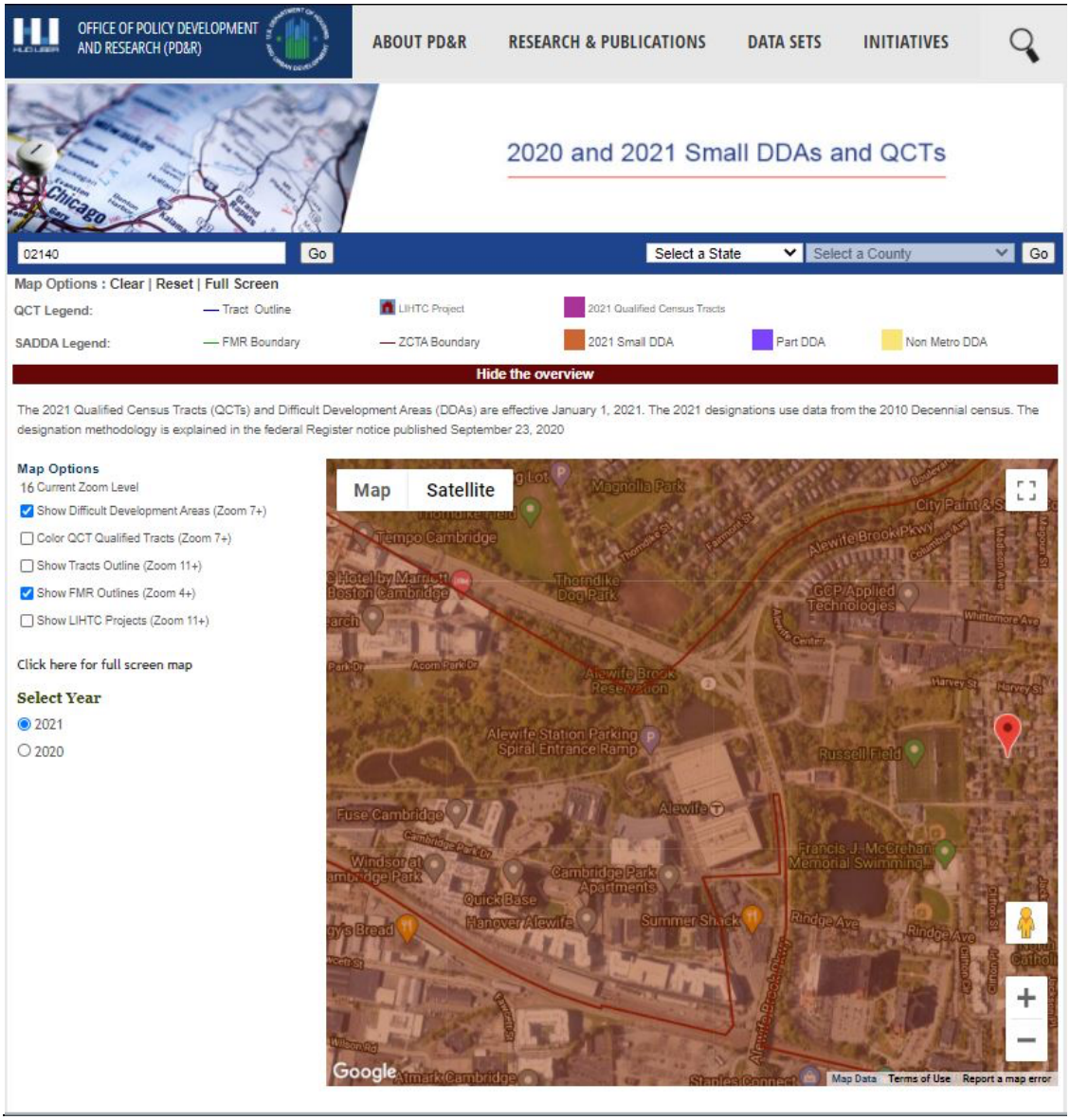
The Project has met the intent of this credit through identification of cross discipline opportunities to design a sustainable building project. Sustainable design focused meetings have been conducted in early design to assist the team in establishing shared sustainable design and energy / water efficiency goals for the project. Early design phase energy modeling has been conducted to review systems synergies and assess areas where energy loads may be significantly reduced. A water use analysis will be conducted to aid in establishing water use reduction targets.

The Project has conducted interdisciplinary early meetings focusing on sustainability. These meetings have included the ownership group, architect, MEP engineer, energy analyst, and sustainability expert. An initial workshop was conducted in January 2021. Early energy modeling will be performed to provide real feedback on decision-making. Additionally, the Project will be linked into the MassSave energy-efficiency incentive program. This early work will push the design to optimize the performance of the envelope and HVAC systems and explore additional opportunities for decreasing water use within the project.

B. Location and Transportation (LT)

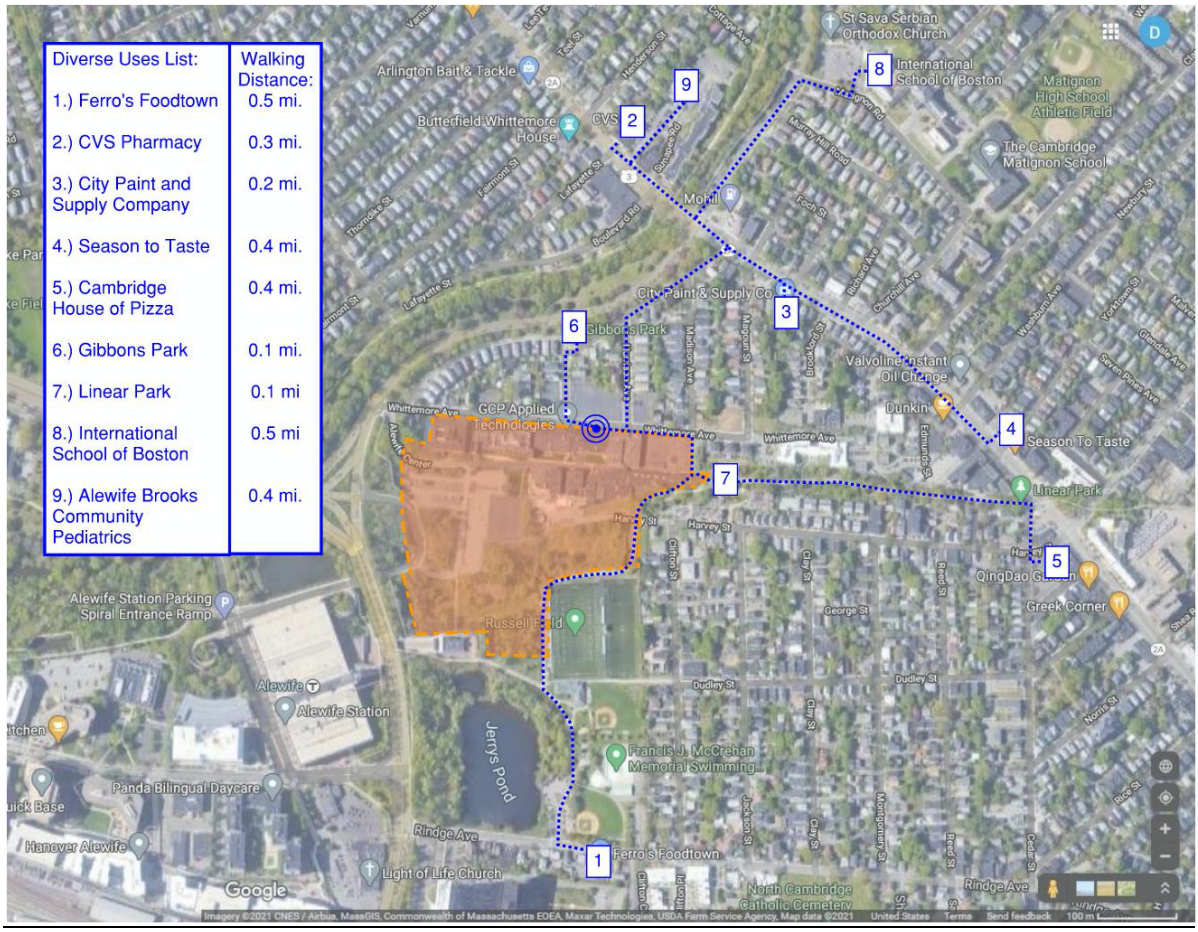
LT Credit 3 High Priority Site — 3 credit point

The Project will meet Option 2 requirements by being located on a site in a U.S. Department of Housing and Urban Development's Difficult Development Area as shown in the map below. The Project will meet Option 3 requirements for Brownfield remediation. The Project is listed MassDEP as a Disposal Site under the MA Contingency Plan (MCP) (RTN 3-0277) and will require contaminated soil removal.



LT Credit 4 Surrounding Density and Diverse Uses (LEEDv4.1) 4 credit points

The Project will meet Option 1 for Surrounding Density by being located in an area with an average density greater than 35,000 sf/acre. The Project will meet Option 2 for Diverse Uses by being located within ½ mile walking distance of at least 9 publicly available diverse uses in at least three separate use categories.



The Project are located within ½ mile of the following 9 diverse uses:

Category	Use Type	# of Diverse uses	Business Name	Distance (mi.)
Food Retail	Grocery Store	1	Ferro's Foodtown	0.5 mi.
Community Serving Retail	Pharmacy	2	CVS Pharmacy	0.3 mi.
	Hardware Store	3	City Paint & Supply Company	0.2 mi.
Services	Restaurant	4	Season to Taste	0.4 mi.
	Cafe	5	Cambridge House of Pizza	0.4 mi.
Civic and Community Facilities	Public Park	6	Gibbons Park	0.1 mi.
	Public Park	7	Linear Park	0.1 mi.
	Educational Facility	8	International School of Boston	0.4 mi.
	Medical Clinic or Office that treats patients	9	Alewife Brooks Community Pediatrics	0.4 mi.

LT Credit 5 Access to Quality Transit (LEEDv4.1) 6 credit points

LEEDv4.1: The Project is located within ½ mile walking distance of the Alewife station servicing the Red Line and 67 Bus line. The project is also located within ¼ mile walking distance of the Massachusetts Ave. Bus Stop @ Lafayette, and ½ mile walking distance of the Rindge Ave Bus Stop @ Rindge Ave opp Clifton St. (See table below for total trips)

	Total Rides Per Day		Percent of Total Rides Per Line	
	Weekday	Weekend	Weekday	Weekend
Red Line - Alewife, Braintree	208	169	21%	26%
Red Line - Alewife, Ashmont	206	169	21%	26%
Red Line - Ashmont, Mattapan	326	153	33%	24%
Bus 77 @ Lafayette St.	116	104	12%	16%
Bus 79 @ Lafayette St.	22	0	2%	0%
Bus 350 @ Lafayette St.	34	17	3%	3%
Bus 83 @ Rindge Ave opp Clifton St.	41	36	4%	6%
Bus 67 @ Alewife	23	0	2%	0%
Total:	976	647		

LT Credit 6 Bicycle Facilities (LEEDv4.1) 1 credit point
A minimum of 25 exterior short-term and 95 covered long-term bicycle storage is planned for visitors and regular occupants of the Project. Additionally, shower and changing facilities will be provided for use by building occupants. The immediate neighborhood provides a direct connection to a local bicycle network that links to a variety of services with pedestrian and cyclist access. The Project will meet City of Cambridge requirements for bike storage.

LT Credit 7 Reduced Parking Footprint (LEEDv4.1) 1 credit point
A new, four-level parking garage and a redesigned surface lot are proposed to provide on-site parking for employees and visitors. The new parking garage will provide 352 parking spaces with an additional 330 surface spaces, which is an 45% reduction to the baseline number of parking spaces calculated from the ratios set forth in the LEED reference guide.

LT Credit 8 Green Vehicles (LEEDv4.1) 1 credit point
The Building Owner has committed to provide EV charging stations to satisfy the LEED credit by providing EV charging stations for 5% of the total parking capacity. There are 682 parking spaces that will be provide. Of those spaces, 5% will be outfitted as electric vehicle charging stations, which will require a total of 35 EV charging stations.

C. Sustainable Sites (SS)

SS Prerequisite 1: Construction Activity Pollution Prevention Required
The construction manager will be required to submit and implement an appropriate SWPPP/Erosion and Sedimentation Control (ESC) Plan for construction activities related to the construction of the Project. The ESC Plan will conform to the erosion and sedimentation requirements of the applicable NPDES regulations and specific municipal requirements for the City of Cambridge. Additionally, the ESC Plan will address management and containment of dust and particulate matter generated by on site demolition and construction activities.

SS Credit 1: Site Assessment 1 credit point
A comprehensive site assessment will be completed as part of the Project. The site assessment will include topography, hydrology, climate, vegetation, soils, human use, and human health effects and was used to inform the design.

SS Credit 3: Open Space 1 credit point
The project design will provide outdoor space that is physically accessible and will be equal to or greater than 30% of the total site area. Current design shows >51% of the site is compliant.

SS Credit 6 Light Pollution Reduction 1 credit point
The Project will meet uplight and light trespass requirements by complying with the LEED v4 BUG Rating method. To meet credit requirements, the site lighting will not exceed the

LEEDv4 allowable luminaire backlight, uplight and glare ratings for the project's Lighting Zone.

SS Credit 7 Tenant Design and Construction Guidelines 1 credit point
Tenant Design and Construction Guidelines will be developed outlining the sustainable design and energy efficiency measures in the core and shell phases and providing detailed guidance for the office/lab tenants to design and build in alignment with the project sustainability goals. Information will also be included to assist tenants in pursuing LEED certification for their spaces. The team will encourage tenants to pursue LEED and/or WELL certification as part of their build out.

D. Water Efficiency (WE)

WE Prerequisite 1 Outdoor Water Use Reduction, 30% Required
The Project will meet the minimum requirement of 30% reduction. The will include permanent irrigation that will use efficient technology such that water use will show a minimum 50% reduction against a LEED baseline.

WE Prerequisite 2 Indoor Water Use Reduction, 20% Reduction Required
Through the specification of low flush and flow and high efficiency plumbing fixtures, The Project will reduce potable water consumption by at least 20% over the baseline calculated for the building (not including irrigation) after meeting Energy Policy Act of 1992 fixture performance requirements.

WE Prerequisite 3 Building Level Water Metering Required
The Project will meet the requirements of this prerequisite by installing permanent water meters that measure the total potable water use of the building and associated grounds. In addition to installing the meters, the Project will commit to sharing water usage data with the USGBC for a five-year period beginning on the date the Project accepts LEED certification or typical occupancy, whichever comes first.

WE Credit 1 Outdoor Water Use Reduction (LEEDv4.1) 1 credit point, 1 *maybe*
The project will achieve a 50% reduction in landscaping water demand through plant selection, and water efficient irrigation delivery and weather sensors. The design will include permanent irrigation that will use efficient technology such that water use will show a minimum 50% reduction against a LEED baseline.

WE Credit 2 Indoor Water Use Reduction 2 credit points, 1 *maybe points*
Through the specification of low flow and high efficiency plumbing fixtures, the Project will implement water use reduction strategies that at a minimum result in a 30% reduction in potable water use annually when compared to EPA baseline fixtures for the building (not including irrigation) after meeting Energy Policy Act of 1992 fixture performance requirements.

WE Credit 4 Water Metering 1 credit point
To support water management and identify opportunities for additional water savings, the Project will include permanent water meters for a minimum of two water subsystems.

E. Energy and Atmosphere (EA)

EA Prerequisite 1 Fundamental Commissioning and Verification Required
A commissioning agent has been engaged by the Building Owner for purposes of providing fundamental commissioning services for the building energy related. The commissioning

agent will perform the scope of work required to comply with the prerequisite in accordance with ASHRAE Guideline 0-2005 and ASHRAE Guideline 1.1-2007 for HVAC & R systems.

The commissioning agent (CxA) is independent of the project's design and construction management teams. The commissioning agent will report findings to the Building Owner. The Owner's Project Requirements and the Basis of Design documents will be provided to the CxA for review.

The following systems will be included in the Commissioning scope of work:

- Heating, ventilating, air conditioning and refrigeration (HVAC&R) systems
- HVAC controls
- Lighting controls
- Electrical systems
- Domestic hot water systems
- Plumbing and pumps
- Building Automation System
- PV (if applicable)

EA Prerequisite 2 Minimum Energy Performance — Required

To meet the prerequisite, the Project's building performance will demonstrate a minimum of 5% improvement in energy use by cost when compared to a baseline building performance as calculated using the rating method in Appendix G of ANSI/ASHRAE/IESNA Standard 90.1-2010. The Project is also required to meet the MA Stretch Energy Code requirements.

This project will achieve these savings through inclusion of the following ECMs:

1. Improved envelope assemblies
2. Reduced LPD in core/shell scope areas
3. Chilled beams in office areas
4. SAT Reset to minimize reheat loads
5. High-efficiency heat recovery chilled water plant and condensing hot water plants
6. Low-flow domestic hot water fixtures

Comprehensive, iterative energy modeling will be used to explore design options to meet all Code requirements and to provide substantiation for the LEED application. Energy performance goals were established during the Schematic Design for the Project phase. The team recognizes the importance of energy efficiency and will continue to evaluate opportunities to reduce energy use and increase points.

EA Prerequisite 3 Building Level Energy Metering — Required

To meet the requirements of this prerequisite, the Project will install whole building energy meters for gas and electricity. In addition to installing the meters, the Project will commit to sharing energy usage data with the USGBC for a five-year period beginning on the date each accepts LEED certification or typical occupancy, whichever comes first. It is understood that at a minimum, the Project will be subject to the Building Energy Use Disclosure Ordinance and will annually report and disclose energy performance in terms of energy usage.

EA Prerequisite 4 Fundamental Refrigerant Management — Required

CFC based refrigerants will not be used in the Project's HVAC & R systems.

EA Credit 1 Enhanced Commissioning — 5 credit points, 1 *maybe points*

In addition to EApr1 Fundamental Commissioning and Verification requirements, Option 1 Path 1 Enhanced Commissioning and Option 2 Building Envelope Commissioning will be pursued by the Project. The Building Owner has engaged BR+A as MEP commissioning

agent and SGH as BECxA to review the proposed design and verify the building systems meet the Owner's expectations and requirements.

The following commissioning process activities in addition to those required under EA Prerequisite Fundamental Commissioning and Verification will be completed by the commissioning agent, in accordance with ASHRAE Guideline 0–2005 and ASHRAE Guideline 1.1–2007 for HVAC&R systems, as they relate to energy, water, indoor environmental quality, and durability:

- Review contractor submittals.
- Verify inclusion of systems manual requirements in construction documents.
- Verify inclusion of operator and occupant training requirements in construction documents.
- Verify systems manual updates and delivery.
- Verify operator and occupant training delivery and effectiveness.
- Verify seasonal testing.
- Review building operations 10 months after substantial completion.
- Develop an on-going commissioning plan.

In addition to the commissioning of mechanical and electrical systems, the Building Owner is considering engaging the commissioning agent to perform monitoring-based commissioning activities as they relate to the operations and maintenance of the building once it has been occupied.

Requirements for enhanced and monitoring-based commissioning will be included in the OPR and BOD.

EA Credit 2 Optimize Energy Performance 8 credit points, *4 maybe points*
The project is designed to meet IECC 2015/ASHRAE 90.1-2013 energy efficiency requirements to comply with the requirements of the Massachusetts Stretch Energy Code. Based on preliminary modeling, it is expected that the project will achieve at least eight points following EApc95, which is equivalent to 17% improvement against a LEED baseline.

The team recognizes the importance of energy efficiency and will continue to evaluate opportunities reduce energy use and increase points within the Energy & Atmosphere category, specifically within the Optimize Energy Performance credit.

EA Credit 6 Enhanced Refrigerant Management 1 credit point
The HVAC equipment installed in the base building uses low-impact refrigerants that have low global warming and ozone depletion potential.

F. Materials and Resources (MR)

MR Prerequisite 1 Storage and Collection of Recyclables Required
Storage of collected recyclables will be accommodated in a designated recycling area within the loading dock area. Recyclable materials collected will include mixed paper, corrugated cardboard, glass, plastics, and metals, and the disposal of batteries and electronic waste. A contracted waste management company will collect the recyclables on a regular basis.

MR Prerequisite 2 Construction and Demolition Waste Management Planning Required
The Project will meet the requirements of this prerequisite by including a Construction Waste Management section in Division 1 of the project manual. The specification will include direction for the construction manager to submit and implement a compliant waste management plan for the duration of construction. Waste diversion goals for the project will include at least five materials targeted for diversion.

MR Credit 1 Building Life-Cycle Impact Reduction (LEEDv4.1) 2 credit points, 1 *maybe point*
The Building Owner will engage the team to conduct a whole-building life-cycle assessment for The Project and refine the design accordingly such that it demonstrates that the structure and enclosure achieves at least a 5% reduction in a minimum of three of the six impact categories when compared to a baseline building. One of the impact categories must be global warming potential. The remaining impact categories that would be assessed are depletion of the stratospheric ozone layer, acidification, eutrophication, formation of tropospheric ozone and depletion of nonrenewable energy resources.

MR Credit 2 Building Product Disclosure & Optimization (BPDO): EPDs (LEEDv4.1)
1 credit point,
The Project will achieve this credit via Option 1. The technical specifications will include direction for the construction manager and their sub-contractors to provide and submit materials and products Environmental Product Declarations that conform to ISO 14025, 14040, 14044, and EN 15804 or ISO 21930 and have at least a cradle to gate scope. The team will work to provide documentation for 20 different permanently installed products sourced from at least 3 different manufacturers.

MR Credit 4 BPDO: Material Ingredients (LEEDv4.1) 1 credit points, 1 *maybe points*
The Project will pursue Option 1 and Option 2 for product and material disclosure, and by selecting products and materials with third party confirmation of reduced hazardous substances. The project manual will include the information and direction for the construction manager and their sub-contractors to provide and submit materials and products documentation identifying the chemical make-up. The documentation may be Health Product Declarations, Cradle-to-Cradle or Declare certification. The team will provide documentation for 20 different permanently installed products sourced from at least 3 different manufacturers.

MR Credit 5 Construction & Demolition Waste Management (LEEDv4.1) 2 credit points
The Project will meet the requirements of this credit by including a Construction Waste Management section in Division 1 of the project manual. The specification will include direction for the construction manager to attempt to divert a minimum of 75% of the demolition and construction waste generated on site from area landfills. The construction waste management plan will include tracking five waste streams. Diverted material reported will include at least three different material streams. Demolition waste will be separated on site as part of the strategy to meet this credit.

G. Indoor Environmental Quality (IEQ)

IEQ Prerequisite 1 Minimum IAQ Performance Required
The Project's mechanical systems are designed to exceed the requirements of ASHRAE Standard 62.1-2010 sections 4 through 7. The mechanical engineer will complete a ventilation rate procedure (VRP) calculator to verify compliance for the Project. Outdoor airflow monitors are included in the project.

IEQ Prerequisite 2 Environmental Tobacco Smoke Control (LEEDv4.1) Required
Smoking will be prohibited in The Project and within 25' of the building. Signage will be posted within 10' of all building entrances to indicate the interior and exterior no-smoking policy.

IEQ Credit 1 Enhanced Indoor Air Quality Strategies 1 credit points,
1 *maybe point*
The Project is being designed to incorporate permanent entryway systems, properly enclosed and ventilated chemical use/storage areas, and compliant filtration media (MERV 13+).

Additionally, the Project is exploring the feasibility of Option 2, which will require providing a CO2 sensor in all densely occupied spaces or increasing ventilation.

IEQ Credit 2 Low Emitting Materials 2 credit points, 1 *maybe point*
The Project will achieve this credit through meeting the compliance criteria for the following compliant categories: interior paints and coatings, adhesives and sealants, flooring, ceilings, insulation, and composite wood. Intending to achieve at least 4 categories for 3 points.

IEQ Credit 3 Construction Indoor Air Quality Management Plan 1 credit point
The project manuals for the Project will include direction for the construction manager to develop and implement an Indoor Air Quality Management plan in compliance with applicable control measures as stated in the SMACNA IAQ Guidelines for Occupied Buildings under construction 2nd Edition, 2007 ANSI/SMACNA 008-2008 Chapter 3. Additional measures will be implemented to ensure absorptive materials will be protected from moisture damage.

IEQ Credit 8 Quality Views 1 credit point
A direct line of sight to the outdoors and/or atrium will be provided for 75% of the regularly occupied floor area of the Project. 75% of the regularly occupied floor area will also have quality views to the outdoors which will include multiple lines of sight; unobstructed views; views to landscaped areas, sky, pedestrian walkways, and streetscapes.

H. Innovation (IN)

Inc1 Innovation: Purchasing - Lamps 1 credit point
The Project will achieve one innovation point by complying with LEED Innovation Credit: Purchasing – Lamps, which requires that the calculated average mercury content for the Project be below 35 picograms of Hg per lumen hour. The project will be 100% LED.

Inc2 Innovation, O & M Starter Kit 1 credit point
The Project will develop and implement compliant Green Cleaning and Integrated Pest Management policies that will ensure reduce the use of chemical inputs and provide increased human health and wellbeing during operation.

Inc3-4 Innovation, TBD 2 credit points
The Project is exploring options to achieve this Innovation credit and is confident that a path will be found to earn all innovation credits. Options include, but are not limited to, exemplary performance in an existing credit, Green Building Education, Occupant Comfort Survey, Social Equity within the Project team, Safety First policies, or Beauty and Design WELL feature compliance.

INc5 Pilot: Integrative Analysis of Building Materials 1 credit point
The Project will specify, purchase, and install three different permanently installed products that have a documented qualitative analysis of potential health, safety, and environmental impacts of the product over its life cycle.

INc6 LEED Accredited Professional 1 credit point
Many members of the team are LEED Accredited Professionals (APs).

I. Regional Priority (RP)

Regional Priority Credits (RPCs) are established by the USGBC to have priority for a particular area of the country. When a project team achieves one of the designated RPCs, an additional credit is awarded to the project. LEEDv4 RPCs applicable to the Cambridge area include: LTc3 High Priority Site (2 points), SSc4 Rainwater Management (2 points), WEc2

Indoor Water Use Reduction (4 points), EAc2 Optimize Energy Performance (17%/8 points), EAc5 Renewable Energy Production (3%/2 points), and MRc1 Building Life-Cycle Impact Reduction (2 points).

The Project is currently tracking the following RPCs:

LTc3 High Priority Site	1 credit point
SSc4 Rainwater Management	1 *maybe point*
EAc2 Optimize Energy Performance	1 credit point
EAc5 Renewable Energy Production	*1 maybe point*
MRc1 Building Life-Cycle Impact Reduction	1 credit point

--- End of Report ---

Affidavit Form for Green Building Professional
Special Permit

Green Building
Project Location: 36-64 Whittemore Avenue Cambridge, MA

Green Building Professional

Name: Christopher Schaffner

☐ Architect
☒ Engineer

License Number: Massachusetts PE Registration #37211
Company: The Green Engineer, Inc
Address: 23 Bradford Street, First Floor, Concord, MA 01742
Contact Information
Email Address: chris@greenengineer.com
Telephone Number: 978-369-8978

I, Christopher Schaffner, as the Green Building Professional for this Green Building Project, have reviewed all relevant documents for this project and confirm to the best of my knowledge that those documents indicate that the project is being designed to achieve the requirements of Section 22.24 under Article 22.20 of the Cambridge Zoning Ordinance.

(Signature) *(Date)* 2/19/2021

Attach either:

☒ Credential from the applicable Green Building Rating Program indicating advanced knowledge and experience in environmentally sustainable development in general as well as the applicable Green Building Rating System for this Green Building Project.

☐ If the Green Building Rating Program does not offer such a credential, evidence of experience as a project architect or engineer, or as a consultant providing third-party review, on at least three (3) projects that have been certified using the applicable Green Building Rating Program.

LEED AP BD+C

10580514-AP-BD+C

CREDENTIAL ID

10 OCT 2009

ISSUED

07 OCT 2021

VALID THROUGH

GREEN BUSINESS CERTIFICATION INC. CERTIFIES THAT

Christopher Schaffner

HAS ATTAINED THE DESIGNATION OF

LEED AP® Building Design + Construction

by demonstrating the knowledge and understanding of green building practices and principles needed to support the use of the LEED® green building program.

Mahesh Ramanujam

Project Name: 36-64 Whittemore Ave
Submitted By: The Green Engineer, Inc.
Date of Submission: April 23, 2021

Green Building Requirements
Net Zero Narrative

Project Profile

Development Characteristics

Lot Area (sq.ft.):	784,926 SF
Existing Land Use(s) and Gross Floor Area (sq.ft.), by Use:	Office/Laboratory/storage/retail; 382,000 sf. Ft. (60%/40% lab/office + small retail)
Proposed Land Use(s) and Gross Floor Area (sq.ft.), by Use:	Bldgs. 1-5 + Garage: [(Total for all buildings 735,494 GFA): (Lab - 354,000) (Office - 238,344) (Lobby/BOH Total 18,650) (Retail - 3,500) (Garage - 121,000)]
Proposed Building Height(s) (ft. and stories):	Building heights New Construction Buildings 3-5 (3 stories), 48'-0". Building 1 (4 stories), existing height; Building 2 (3 stories), existing height; Parking Garage (4 levels), 34'-0"
Proposed Dwelling Units:	N/A
Proposed Open Space (sq.ft.):	Goal is to achieve 20% of open space, likely closer to 50%
Proposed Parking Spaces:	681 cars (319 surface, 362 in structured parking)
Proposed Bicycle Parking Spaces (Long-Term and Short-Term):	Building 3 (prototypical): Long term = 34 bikes per building Short term = 12 bikes Showers = 6.

Green Building Rating System

Choose the Rating System selected for this project:

LEED-Leadership in Energy & Environmental Design (U.S. Green Building Council)			
Rating System & Version:	LEED v4 Core and Shell	**Seeking Certification?***	Yes
Rating Level:	LEED Gold	**# of Points:**	(60-79 points)
Enterprise Green Communities			
Rating System & Version:	n/a	**Seeking Certification?***	No
Rating Level:	n/a	**# of Points:**	n/a
Passive House Institute US (PHIUS) or Passivhaus Institut (PHI)			
Rating System &	n/a	**Seeking Certification?***	No

Project Name: 36-64 Whittemore Ave
Submitted By: The Green Engineer, Inc.
Date of Submission: April 23, 2021

Proposed Project Design Characteristics

Building Envelope

Assembly Descriptions:

(Note that we have presented a prototypical assessment based on building 3 parameters. Design and compliance approaches will be the same for all new buildings.)

Roof:	TPO: R-30 min
Foundation:	Slab on grade R-15 for 24"
Exterior Walls:	Typical assembly: 5" continuous mineral wool, R-21.5
Windows:	Typical vision assembly: U-0.38, SHGC-0.38, VLT-0.54
Window-to-Wall Ratio:	31%
Other Components:	N/A

	Proposed		Baseline	
	Area (sf)	U-value	Area (sf)	U-Value
Window	17,668	0.38	17,237	0.38
Wall	39,790	0.04	40,221	0.064
Roof	50,450	0.032	50,450	0.032

Envelope Commissioning Process:

Option 2 Building Envelope Commissioning will be pursued by the Project. The Building Owner has engaged SGH as BECxA to review the proposed design and verify the building systems meet the Owner's expectations and requirements.

Project Name: 36-64 Whittemore Ave
Submitted By: The Green Engineer, Inc.
Date of Submission: April 23, 2021

Building Mechanical Systems

Systems Descriptions:

Space Heating:	BOD: Central condensing boiler plant, 4 x 6000 mbh, 96.8% Eff. HRC chiller 2.9 COP The hot water loop is designed with 140'F supply with a 30'F temperature drop.
Space Cooling:	BOD: Central air-cooled chiller plant, 3 x 400T Maglev IPLV 1.2 kW/ton, 100T HRC scroll IPLV 1.2 kW/ton Alternate: Evaporative air-cooled chiller plant, 3 x 400T, IPLV 0.76 kW/ton
Heat Rejection:	BOD: N/A, Alternate: Evaporative
Pumps & Auxiliary:	BOD: CHW Loop: Primary only 120 FtHd HW Loop: Primary 120 FtHd, Secondary 80 FtHd Glycol Loop: 80 FtHd
Ventilation:	Lab: 10.5 ACH occupied/ 5.3 ACH unoccupied Office: 0.6 cfm/sf
Domestic Hot Water:	Condensing gas storage type: 2 x 600 mbh, 97% Eff, 130 gal (ea)
Interior Lighting:	The project will comply with C406.3 and achieve a10% lighting power density reduction beyond (MA amended) code requirements.
Exterior Lighting:	20% better than code
Other Equipment:	Lab: 6 w/sf process loads Office: 1.2 w/sf

Systems Commissioning Process:

A commissioning agent has been engaged by the Building Owner for purposes of providing fundamental commissioning services for the building energy related. In addition to EApr1 Fundamental Commissioning and Verification requirements, Option 1 Path 1 Enhanced Commissioning and Option 2 Building Envelope Commissioning will be pursued by the Project. The Building Owner has engaged BR+A as MEP commissioning agent and SGH as BECxA to review the proposed design and verify the building systems meet the Owner's expectations and requirements. In addition to the commissioning of mechanical and electrical systems, the Building Owner is considering engaging the commissioning agent to perform monitoring-based commissioning activities as they relate to the operations and maintenance of the building once it has been occupied. Requirements for enhanced and monitoring-based commissioning will be included in the OPR and BOD.

Project Name: 36-64 Whittemore Ave
Submitted By: The Green Engineer, Inc.
Date of Submission: April 23, 2021

Building Energy Performance Measures

Overview

The project is utilizing integrative design methodology, and is incorporating early energy modeling for whole building analysis at multiple stages of design to advise the appropriate thermal properties of specific building envelope assemblies, and to further explore opportunities for energy reduction on mechanical systems, improve energy efficiency, and reduce greenhouse gas emissions.

Land Uses:	Sited on previously developed land, which is also classified as U.S. Department of Housing and Urban Development's Difficult Development Area
Building Orientation and Massing:	The project is on a previously developed urban site. New buildings have been located over previously developed portions of the site to minimize impact to open space, and in upland areas to minimize impact on the flood plain. These factors along with the orientation of perimeter roadways have oriented the buildings in an east-west orientation, with the long faces of the building facing south and north. Fenestration area is optimized for the project to minimize thermal losses and to bring in sufficient daylight into the spaces.
Envelope Systems:	High performing envelope which meets the new code envelope backstop criteria has been designed for the project. It includes continuous insulation on walls and roofs, high performing glazing assemblies and optimized window wall ratio. The typical wall assembly u-value is 27% lower than code, which in combination with the low WWR precludes the need for triple glazing.
Mechanical Systems:	High efficiency equipment like variable flow dedicated outdoor air systems (DOAS), energy/heat recovery equipment, chilled beams, high efficiency chillers, heat recovery chillers and condensing boiler plants are being used for the project.
Renewable Energy Systems:	Solar PV will be incorporated on the mechanical penthouse roof on day one. A solar PV parking canopy is also being developed and a pro-rated portion of it's capacity has been allocated to each building. Due to the nature of the project part of the roof will be occupied by large mechanical systems. This limits the amount of solar PV or green roof area that can be incorporated within the available footprint. The optimum solar PV and green roof approach is still being studied.
District-Wide Energy Systems:	There is no existing feasible district steam connection (Vicinity) in close proximity to the site. No small-scale district energy solution is feasible given site soil conditions.
Other Systems:	EV charging stations to be provided for 5% of the total parking capacity for the project.

Project Name: 36-64 Whittemore Ave
Submitted By: The Green Engineer, Inc.
Date of Submission: April 23, 2021

Integrative Design Process

The project team has collaborated on a number of design solutions to identify a cost effective basis of design that significantly exceeds current energy code requirements. Sustainable design focused meetings have been conducted in early design to assist the team in establishing shared sustainable design and energy / water efficiency goals for the project. Early design phase energy modeling has been conducted to review systems synergies and assess areas where energy loads may be significantly reduced. The Project has conducted interdisciplinary early meetings focusing on sustainability. An initial workshop was conducted in January 2021. Early energy modeling will be performed to provide real feedback on decision-making.

Green Building Incentive Program Assistance

The Project is participating in the MassSave Large Building Incentives program through Eversource - the main utility provider for the project. As part of the program, the Project has facilitated an energy charrette with Eversource to identify energy conservation measures that can be incorporated in the MassSave program's incentive study. The Project is currently finalizing energy modeling requirements and next steps for the program.

Project Name: 36-64 Whittemore Ave
Submitted By: The Green Engineer, Inc.
Date of Submission: April 23, 2021

Net Zero Scenario Transition

Several opportunities for future improvement of the Project have been identified that may be implemented for a Net Zero Option scenario. To achieve net zero would required a de-carbonization of the ISO New England electrical gid and deployment of technologies that can take advantage of grid improvements.

	Net Zero Condition:	Transition Process:
Building Envelope:	Possible options include potential for future air-sealing and retro Cx of envelope.	The proposed envelope is considered high performance and significantly exceeds minimum code requirements, including the newly adopted "envelope backstop" requirement. No upgrades would be necessary to achieve NZE.
HVAC Systems:	Future NZE scenario assumes some sort of air source heat pump technology would be used. In this option the boilers and chillers would be replaced with modular air-cooled heat pumps that could provide chilled and hot water as needed.	We have carried out a review of the replacement of the gas fired boilers with air cooled heat pump units. A hybrid heat pump + electric boiler approach was discussed with the expectation that it would reduce capital costs. However, the team preferred to outline a 100% heat pump alternative with the understanding that continued reasearch and development will yield cost feasible solutions in the future. Please find outlined below the comments we would have with respect to this change: 1. The estimated cooling load for the air source heat pumps units would be 4,000 Tons while currently the building would only have a load of 1,200 Tons due to the sizing of equipment based on peak heating loads. 2. The electrical service to the building would need to be increased by approximately 3 times its current size to provide the required power for the heat pump units. 3. There would be a requirement for approximately 5,000 Sq. Ft. of roof space for the required heat pump units (plus additional space for their minimum clearances). 4. The estimated additional weight on the roof for the required equipment would be approximately 40,000 Lb. While not currently economically feasible, the Project could eventually be converted to all electric service. We would expect this to occur at the end of life of the original HVAC systems. There are a few options available. The actual methodology will depend on innovations in technology over the next several decades. Potential additional difficulties include the hot water temperatures that the heat pumps can generate. The current technology struggles to heat beyond the 130˚F. It is possible that future heat pump technology may be able to generate higher temperatures, but it should also be noted that the proposed HVAC systems will use lower temperatures to maximize boiler efficiency.

Net Zero Scenario Transition (CONTINUED)

Several opportunities for future improvement of the Project have been identified that may be implemented for a Net Zero Option scenario. To achieve net zero would required a de-carbonization of the ISO New England electrical gid and deployment of technologies that can take advantage of grid improvements.

	Net Zero Condition:	Transition Process:
Domestic Hot Water:	To lower energy use in the future, domestic hot water heating source can be a heat pump type water heater	At the end of life of the original equipment it is possible to easily convert the existing system to a high efficient heat pump system for domestic hot water system.
Lighting:	In a Core and Shell project, lighting design is driven by the tenant. Although beyond the Applicant's scope of work, it is assumed that the tenants will design their spaces at least 20% below the new code allowable lighting power density (LPD).	It is important to acknowledge that the new Massachusetts Building Energy Code has stringent LPD thresholds and the Applicant will be engaging in dialogue with the tenants to go beyond the code thresholds. This LPD reduction in tenant spaces may be required through tenant lease and sale agreement.
Renewable Energy Systems:	The project is exploring the options for a PV installations on day one on both the individual buildings and the surface lot east of bldg 3. At a minimum all buildings will be solar ready to accommodate future PV if feasible.	Due to high energy use intensities for laboratory type buildings, offsite renewable energy sources are likely required to balance site energy sources. A number of options exist, including solar, wind, purchase power agreements and green power purchases.
Other Strategies:	N/A	N/A

Project Name: 36-64 Whittemore Ave
Submitted By: The Green Engineer, Inc.
Date of Submission: April 23, 2021

Energy Systems Comparison

Overview

The Net Zero / Zero Carbon cost feasibility assessment includes the following energy conservation measures:
- Triple glazed window assemblies
- High efficiency air-water heat pumps for chilled and hot water
- High efficiency air-water heat pumps for Service/Process hot water

The total cost premium of the cited measures is approximately $22,262,852. Switching fuels from relatively inexpensive gas to a more expensive electric fuel source results in increased annual energy costs. Therefore, there is no financial payback for this approach, in spite of source energy savings on the order of 10% and greenhouse gas emissions savings of 34%. Although the environmental benefits are clear, a combination of declining equipment and inflating natural gas costs are necessary to make zero carbon laboratories cost effective.

Most of the energy and cost savings are associated with ventilation energy recovery (not required by code) and the conversion from gas boilers to high efficiency heat pumps for both space heating and service hot water. As a result of this exercise, a number of improvements have been incorporated into the design, including the commitment to solar PV, and more importantly, the addition of structural capacity to accommodate future electrification.

Assumptions

The building is in early design and is a Core and Shell speculative laboratory building typology (60/40 laboratory/office split) with ground floor retail. The project is incorporating early energy modeling for whole building analysis at multiple stages of design to explore opportunities for energy reduction on mechanical systems, improve energy efficiency, and reduce greenhouse gas emissions.

	Included in analysis?		**Describe the systems for which this was analyzed or explain why it was not included in the analysis:**
	Yes	**No**	
Solar Photovoltaics:	**x**		The project is exploring the options for a PV installation on day one on both the individual buildings and the surface lot east of building 3. Based on ongoing study and analysis, the Proponent and Project team have determined that there is a solar array opportunity of up to approximately 14,000 SF of panel area on the prototypical building 3 mechanical penthouse roof. This solar array has the potential to produce up to 260,000kWh/yr, or 5.6% of the basis of design energy consumption. The remaining rooftop area is under high demand for building equipment and future tenant equipment such as laboratory exhaust fans, however additional space on the lower roof areas has been earmarked for the installation of green roofs since the solar availability makes them less favorable for solar production. Additionally, the team is studying solar PV canopies over the existing parking lot South of Whittemore Ave. The current scheme shows this approximately 14,000SF ground-mounted solar array has the potential to produce up to an additional 260,000 kWh/yr, that would offset electrical use on campus. Details are still under development.

Solar Hot Water:		x	There is limited available roof area on the project. Any available area has been evaluated for PVs rather than solar hot water due to the larger impact per available area.
Ground-Source Heat Pumps (Geothermal):		x	Historic soil contamination makes GSHP wells not feasible
Water-Source Heat Pumps:		x	Water source heat pumps typically use a conventional boiler plant as the primary heat source. Furthermore, this system type is not typically used for laboratory applications. While the may be used in office applications, it would require additional base building equipment (e.g. cooling tower, condenser loop piping, etc.) that reduces cost feasibility. Additionally, air-source solutions tyically fare better due to the lack of boiler requirements.
Air-Source Heat Pumps:	x		The basis of design is a hydronic system that uses an air source heat recovery chiller to offset a portion of the annual heating loads.
Non-Carbon-Fuel District Energy:		x	There is no existing feasible district steam connection (Vicinity) in close proximity to the site. No small-scale district energy solution is feasible given site soil conditions
Other Non-Carbon-Fuel Systems:		x	n/a

Non-Carbon-Fuel Scenario

Zero carbon laboratories in dense urban areas have low feasibility due to high capital costs associated air-source or ground source equipment infrastructure. An air-source system consumes the majority of available structural roof area to accommodate the condensing units necessary to meet the capacities anticipated by laboratory processes. Similarly, ground source systems would take a correspondingly large amount of ground area that is not accessible on the site. Additionally, high capacity deep bore systems do not have significant market penetration for laboratory applications and their feasibility is considered low due to associated capital costs, installation uncertainties and long term thermal performance of the ground heat exchanger. As a result, the zero carbon option described below is not cost feasible at this time, however structural capacity is being incoporated into the design to allow air source heat pump equipment at a future date.

Project Name: 36-64 Whittemore Ave
Submitted By: The Green Engineer, Inc.
Date of Submission: April 23, 2021

Solar-Ready Roof Assessment

Total Roof Area (sq. ft.):	30,250 SF See roof sketch at the end of this report for details. Due to shading, mechanical and maintenance equipment appurtenances, only the mechanical penthouse (MPH) roof area is suitable for PV production.
Unshaded Roof Area (sq. ft.):	Approximately 14,000 SF or 80% of penthouse roof area to allow for setbacks and accessways
Structural Support:	As required to support potential PV capacity.
Electrical Infrastructure:	As required to support potential PV capacity.
Other Roof Appurtenances:	Accounted for in the available roof area sketch.
Solar-Ready Roof Area (sq. ft.):	16,121 SF as indicated on mechanical penthouse sketch. Plus approximately 14,100SF on lower roof areas
Capacity of Solar Array:	200 kW installed capacity (Plus additional 67 kW prorated parking canopy capacity) 260,000 kWh year typical production $42,900 annual electric cost offset
Financial Incentives:	The state solar SMART program will be solicited to determine the applicable incentive tier available at the time of enrollment. It's understood that the projects utility rate class, incentive tier and potential "rate adders" have a significant impact on overall cost feasibility.
Cost Feasibility:	Based on typical costs of recent installations, the simple payback without incentives is on the order of 14 years. Depending on SMART incentives available at the time of enrollment, the projected payback could be as low as 7 years. The payback may be reduced further as PV manufacturing costs continue to decline and technological advancements are made.

Results

	Proposed Design		Net Zero Scenario	
	Installation Cost	Maintenance Cost	Installation Cost	Maintenance Cost
Structural	$ 125,954		$ 419,995	
Envelope			$ 596,721	
HVAC Systems			$ 16,083,384	
Domestic Hot			$ 2,236,823	
Electrical			$ 3,985,216	
Other (Solar PV)	$ 933,333			
(Financial Incentives)			TBD - recently initiated the utility incentive process.	
Total Building Energy System Cost			$ 22,262,852	

The proposed design costs reflect added structural capacity to accommodate future retrofit of an air source solution, which is still being considered. The net zero costs are an estimate of retrofit costs (including applicable demolition and repair) to the zero carbon configuration using present day dollars. Detailed cost estimates (with the exception of solar PV) were developed by Siena Construction.

Project Name: 36-64 Whittemore Ave
Submitted By: The Green Engineer, Inc.
Date of Submission: April 23, 2021

Anticipated Energy Loads and Greenhouse Gas Emissions

Assumptions

The building is in early design and is a Core and Shell speculative laboratory building typology (60/40 laboratory/office split) with ground floor retail. The project is incorporating early energy modeling for whole building analysis at multiple stages of design to explore opportunities for energy reduction on mechanical systems, improve energy efficiency, and reduce greenhouse gas emissions.

Annual Projected Energy Consumption and Greenhouse Gas (GHG) Emissions

	Baseline Building		Proposed Design		Future Net Zero Scenario		Non-Carbon-Fuel Scenario	
	MMBTU	% of Total	MMBTU	% of Total	MMBTU	% of Total	MMBTU	% of Total
Lights	1,362	4%	1,164	5%	1,164	6%	See Future Net Zero Option	
Misc. Equip	4,789	14%	4,789	22%	4,789	26%		
Space Heating	15,680	47%	1,296	6%	1,071	6%		
Space Cooling	2,000	6%	1,907	9%	2,113	11%		
Heat Rejection	-	0%	-	0%	-	0%		
Pumps & Aux	23	0%	418	2%	413	2%		
Vent Fans	4,588	14%	7,178	34%	7,127	38%		
DHW	4,229	13%	4,229	20%	1,731	9%		
Ext Ltg	613	2%	329	2%	329	2%		
	$US, kBTU, kBTU/SF		$US, kBTU, kBTU/SF	% Reduction from Baseline	$US, kBTU, kBTU/SF	% Reduction from Baseline	$US, kBTU, kBTU/SF	% Reduction from Baseline
Site EUI	227		145	36%	128	44%	See Future Net Zero Option	
Source EUI	398		354	11%	357	10%		
Total Energy Use	33,284		21,310	36%	18,737	44%		
Total Energy Cost	$ 2,463,607		2,025,543	18%				
	MMBTU	% Total Energy	MMBTU	% Total Energy	MMBTU	% Total Energy	MMBTU	% Total Energy
On-Site Renewable Energy Generation	-	-	1183	5.6%	1183	6.3%	See Future Net Zero Option	
Off-Site Renewable Energy Generation	-	-	-		17,554	94%		
	Tons CO_2 [/SF]		Tons CO_2 [/SF]	% Reduction				
GHG Emissions	1995		1419	29%				
GHG Emissions per SF	0.014		0.0096	29%				

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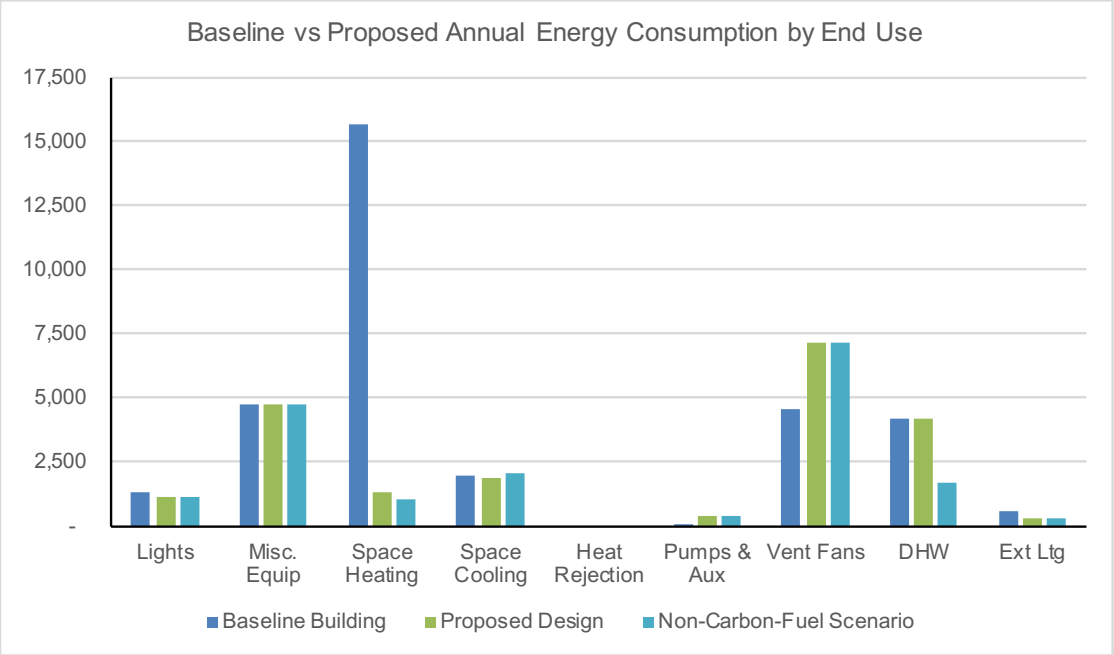
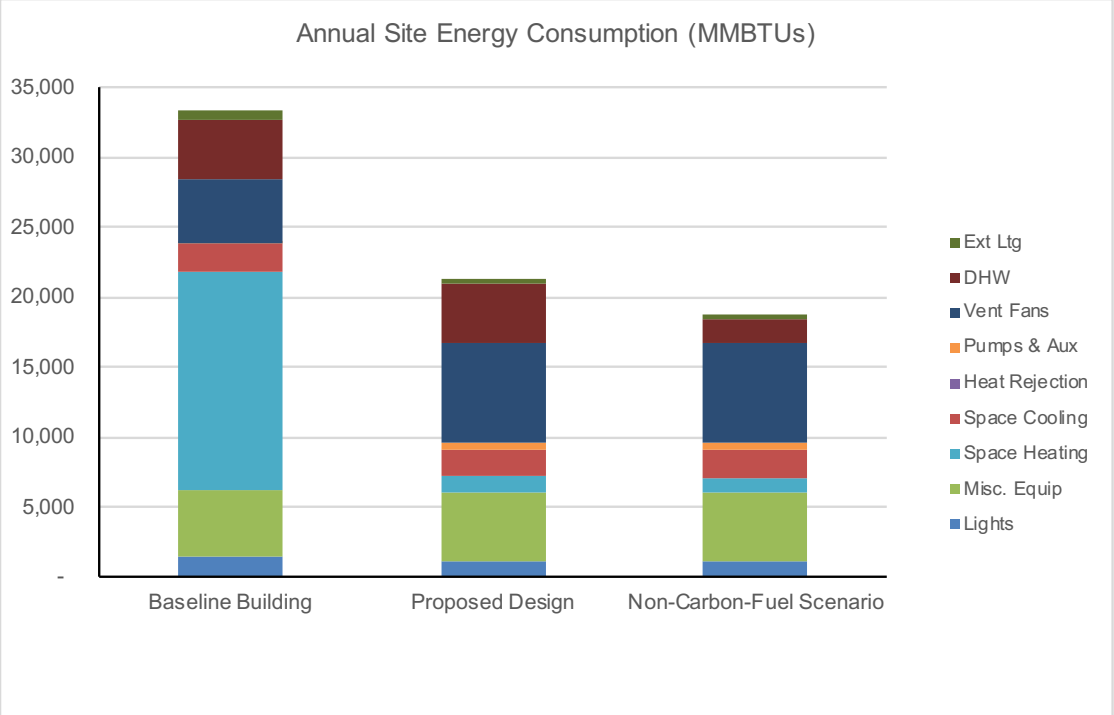
Submitted By: The Green Engineer, Inc.
Date of Submission: April 23, 2021

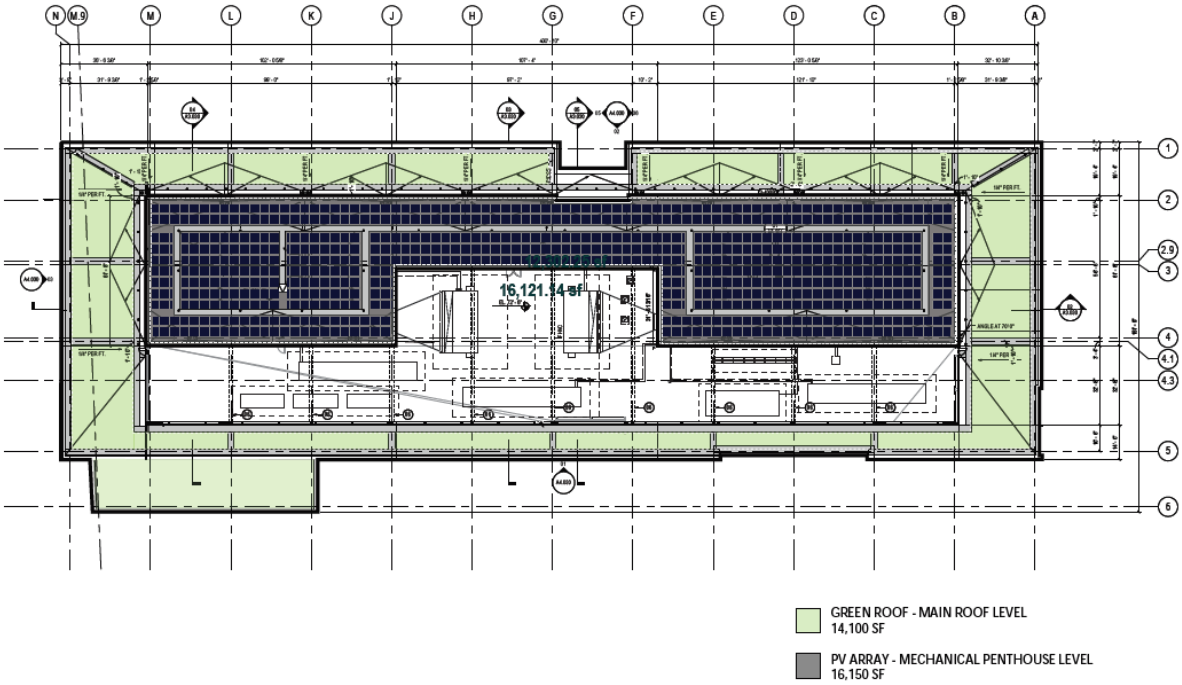




Section E: Initial Prototypical Rootop and Parking Canopy PV plans

Building 3 Rooftop

ROOF PLAN - BUILDING 3, TYPICAL GREEN ROOF/SOLAR

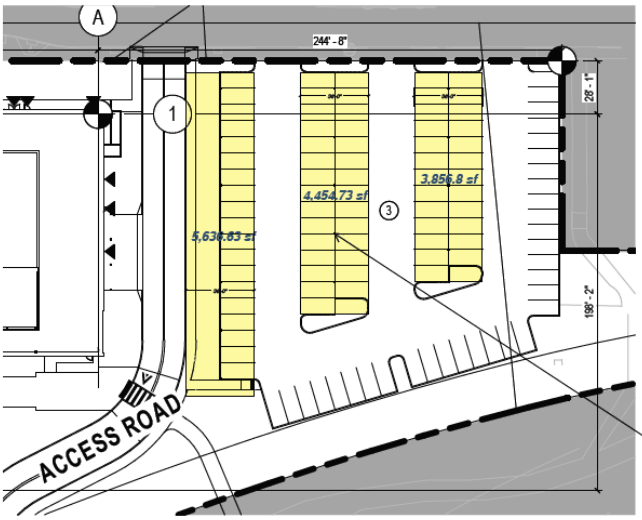


Gensler

IOHO

Surface Lot PV Canopy

SURFACE PARKING LOT PV ARRAY



SURFACE LOT PV ARRAY LAYOUT - APPROXIMATEL 14,000 SF ARRAY

EXAMPLE ARRAY

Gensler

IOHO

04.05.21

Cambridge Article 22 Special Permit Package

Project: One Alewife Center (Building 1)

Section A: Green Building Project Checklist

Section B: Green Building Report (Including LEED-CS v4 checklist)

Section C: Green Building Professional Affidavit

Section D: Net Zero Energy Narrative with PV Analysis

(sections are bookmarked)

Green Building Project Checklist

Green Building Project Location: 36-64 Whittemore Avenue*

Applicant

Name: Christopher Schaffner

Address: 23 Bradford St., 1st Floor, Concord, MA 01742

Contact Information

Email Address: chris@greenengineer.com

Telephone #: 978-369-8978

Project Information (select all that apply):

- ☐ New Construction – GFA: 551,500 GFA
- ☐ Addition – GFA of Addition: _____
- ☐ Rehabilitation of Existing Building – GFA of Rehabilitated Area: 184,000 GFA**
  - ☐ Existing Use(s) of Rehabilitated Area: Office, research
  - ☐ Proposed Use(s) of Rehabilitated Area: Office, research
- ☒ Requires Planning Board Special Permit approval
- ☒ Subject to Section 19.50 Building and Site Plan Requirements
- ☐ Site was previously subject to Green Building Requirements

Green Building Rating Program/System:

- ☒ Leadership in Energy and Environmental Design (LEED) – Version: v4
  - ☒ Building Design + Construction (BD+C) – Subcategory: Core & Shell
  - ☐ Residential BD+C – Subcategory: _____
  - ☐ Interior Design + Construction (ID+C) – Subcategory: _____
  - ☐ Other: _____
- ☐ Passive House – Version: _____
  - ☐ PHIUS+
  - ☐ Passivhaus Institut (PHI)
  - ☐ Other: _____
- ☐ Enterprise Green Communities – Version: _____

** The full address of the property is 36-64, 53-59, 73, 91-99 & 115 Whittemore Avenue, 1R-3R Alewife Brook Parkway.*

*** One Alewife and Building 29 will remain and will be improved as part of the Project's proposed Buildings 1 and 2.*

Project Phase

☒ **SPECIAL PERMIT**

Before applying for a building permit, submit this documentation to CDD for review and approval.

Required Submissions

All rating programs:

- ☒ Rating system checklist
- ☒ Rating system narrative
- ☒ Net zero narrative (see example template for guidance)
- ☒ Affidavit signed by Green Building Professional with attached credentials – use City form provided (Special Permit)

Cambridge Article 22: Green Building Report
Special Permit

Project: One Alewife Center (Building 1)

Issued: October 22, 2021

Image courtesy of studioTROIKA

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D. Water Efficiency
E. Energy and Atmosphere
F. Materials and Resources
G. Indoor Environmental Quality
H. Innovation in Design
I. Regional Priority Credits

Section I. PROJECT DESCRIPTION

The Alewife Park Project consists of the reuse of two existing buildings (Building 1 and Building 2), demolition of several existing structures and the new construction of three buildings and a structured parking garage, presenting a mix of office and life science laboratory uses as well as a small retail space, totaling approximately 735,500 square feet ("sf") of Gross Floor Area ("GFA"). The Project will provide approximately 653 parking spaces, including 350 parking garage spaces and 303 surface spaces. The Project will result in a net reduction in the number of registered parking spaces serving the Project Site of 69 parking spaces down from the current existing registered parking count of 722 spaces.

Building 1, located at One Alewife Center, is an existing four-story building with a brick and punched window façade. The existing building has a gross floor area of 91,000 square feet, the height to the roof of the building is approximately 52'-6", and the building has a floor-to-floor height of 13'-0" on each floor. The mechanical equipment at the roof level is behind a 14'-0" high screen wall. The building's primary use is office and is proposed to be converted to 60% lab and 40% office. The initial scope of the project included limited interior renovations and MEP improvements. However, the scope is being expanded to ensure the project includes sufficient measures to meet the Article 22 requirements of LEED-CS v4 Gold Certifiability.

The design of the One Alewife Center renovation includes high-efficiency HVAC systems and LED lighting. Detailed information is included in the attached Net Zero Energy narrative.

The Project will demonstrate Article 22 compliance following the LEED for Core and Shell (LEED-CS) version 4 rating system. For this application we have presented a LEED checklist and compliance strategy for the Project.

Since all portions of the project will be built as a campus with combined site and infrastructure elements the team will utilize a LEED Master Site strategy. This will allow the project to show compliance with various LEED elements from a "campus approach".

Additionally, all buildings will participate in the MassSave energy-efficiency utility incentive program. A kickoff meeting with all of the applicable utility providers for One Alewife Center is being scheduled.

Section II. AFFIDAVIT

I, Christopher Schaffner, do hereby affirm that I have thoroughly reviewed the supporting documents for the LEEDv4 for Core & Shell rating system and confirm that the One Alewife Center project is targeted to meet the requirement for Gold Certifiability with **61** points as 'Yes' and 21 possible 'Maybe' points. The One Alewife Center project located in Cambridge, MA will be designed to meet the green building requirement under Article 22.20 of the Cambridge Zoning Ordinance.

Chris Schaffner, PE, LEED Fellow is founder and CEO of The Green Engineer, Inc. a sustainable design consulting firm located in Concord, MA. Chris has 33 years of experience in the design of building systems with a focus on energy efficiency and sustainability. He holds a B.S. in Mechanical Engineering from M.I.T., and is a registered professional engineer in Massachusetts, California and Vermont.

A long-time promoter of sustainable design, Chris was a charter member of the US Green Building Council's (USGBC) LEED Faculty (TM), training more than 10,000 building industry professionals in the use of the LEED Rating System since 2001. He recently completed his term on the LEED Steering Committee, where he served as 2019 LSC Chair. He previously served on the USGBC Board of Directors, the USGBC Advisory Council, as Chair of the Energy and Atmosphere Technical Advisory Group (TAG) and LEED Advisory Committee, and as a member of the Indoor Environmental Quality TAG, among other volunteer roles with the USGBC.

An executed Cambridge Affidavit has been provided.

Christopher Schaffner, PE, LEED Fellow
Massachusetts PE Registration #37211
The Green Engineer, Inc.
LEED Administrator and Sustainability Consultant

Section III. LEEDv4 CHECKLIST SUMMARY

The One Alewife Center project (the "Project") was reviewed for compliance using the USGBC's LEED for Core & Shell (LEED-CS), version 4 rating system. The Project is targeting 61 out of a possible 110 credit points with an additional 21 credit points still undergoing evaluation to determine feasibility of achievement. By targeting 61 credit points, the Project anticipates meeting the City of Cambridge requirement to be LEED v4 Gold 'certifiable'. In addition to the City of Cambridge requirements, the Project will be registered under the LEED-CS v4 rating system and will be pursuing formal certification with the USGBC.

The team will continue to evaluate design options against LEED requirements with the goal being to design and renovate a building that minimizes its impact on the environment, creates an engaging and healthy space for occupants, and reduces operating costs. Several credits remain designated as 'Maybe' due to the uncertainty of future design decisions, which is common at this phase of a project. The team will continue to evaluate LEED credits to pursue enough of a "point cushion" to ensure the Project meets the LEED Gold requirement.

The USGBC recently released the beta version of the LEEDv4.1 rating system which is intended to serve as an update to (and improvement upon) LEEDv4. Recent guidance issued by the USGBC allows LEEDv4 projects to substitute any prerequisite or targeted credit for the LEEDv4.1 equivalent. Each of the credits that this Project intends to pursue using the LEED v4.1 criteria has been denoted with (LEEDv4.1) adjacent to the credit name within the scorecard below and ensuing credit narratives.

Y	M	N			
1	0	0	**Integrative Process**		1
1			Credit 1	Integrative Process	1

18	0	2	**Location and Transportation**		20
		N	Credit 1	LEED for Neighborhood Development Location	
2			Credit 2	Sensitive Land Protection	2
3			Credit 3	High Priority Site	3
4		2	Credit 4 (LEEDv4.1)	Surrounding Density and Diverse Uses	6
6			Credit 5 (LEEDv4.1)	Access to Quality Transit	6
1			Credit 6 (LEEDv4.1)	Bicycle Facilities	1
1			Credit 7 (LEEDv4.1)	Reduced Parking Footprint	1
1			Credit 8 (LEEDv4.1)	Green Vehicles	1

4	6	1	**Sustainable Sites**		11
Y			Prereq 1	Construction Activity Pollution Prevention	Required
1			Credit 1	Site Assessment	1
	1	1	Credit 2	Site Development - Protect or Restore Habitat	2
1			Credit 3	Open Space	1
	3		Credit 4 (LEEDv4.1)	Rainwater Management	3
	2		Credit 5	Heat Island Reduction	2
1			Credit 6	Light Pollution Reduction	1
1			Credit 7	Tenant Design and Construction Guidelines	1

4	1	6	**Water Efficiency**		11
Y			Prereq 1	Outdoor Water Use Reduction	Required

Y			Prereq 2	Indoor Water Use Reduction	Required
Y			Prereq 3	Building-Level Water Metering	Required
2			Credit 1	Outdoor Water Use Reduction	2
2		4	Credit 2	Indoor Water Use Reduction	6
		2	Credit 3	Cooling Tower Water Use	2
	1		Credit 4	Water Metering	1

12	8	13	**Energy and Atmosphere**		33
Y			Prereq 1	Fundamental Commissioning and Verification	Required
Y			Prereq 2	Minimum Energy Performance	Required
Y			Prereq 3	Building-Level Energy Metering	Required
Y			Prereq 4	Fundamental Refrigerant Management	Required
3	1	2	Credit 1	Enhanced Commissioning	6
8	4	6	Credit 2	Optimize Energy Performance	18
		1	Credit 3	Advanced Energy Metering	1
		2	Credit 4 (LEEDv4.1)	Demand Response	2
	1	2	Credit 5	Renewable Energy Production	3
1			Credit 6	Enhanced Refrigerant Management	1
	2		Credit 7	Green Power and Carbon Offsets	2

8	4	2	**Materials and Resources**		14
Y			Prereq 1	Storage and Collection of Recyclables	Required
Y			Prereq 2	Construction and Demolition Waste Management Planning	Required
4	2		Credit 1 (LEEDv4.1)	Building Life-Cycle Impact Reduction	6
1		1	Credit 2 (LEEDv4.1)	BPDO – EPD	2
	1	1	Credit 3 (LEEDv4.1)	BPDO - Sourcing of Raw Materials	2
1	1		Credit 4 (LEEDv4.1)	BPDO – Material Ingredients	2
2			Credit 5 (LEEDv4.1)	Construction and Demolition Waste Management	2

5	1	4	**Indoor Environmental Quality**		10
Y			Prereq 1	Minimum Indoor Air Quality Performance	Required
Y			Prereq 2 (LEEDv4.1)	Environmental Tobacco Smoke Control	Required
Y			Prereq 3	Minimum Acoustic Performance	Required
1		1	Credit 1	Enhanced Indoor Air Quality Strategies	2
2	1		Credit 2 (LEEDv4.1)	Low-Emitting Materials	3
1			Credit 3	Construction Indoor Air Quality Management Plan	1
		3	Credit 4 (LEEDv4.1)	Daylight	3
1			Credit 5	Quality Views	1

6	0	0	**Innovation**		6
1			Credit 1	Innovation: Purchasing - Lamps	1
1			Credit 2	Innovation: O&M Starter Kit	1
1			Credit 3	Innovation in Design: TBD	1
1			Credit 4	Innovation in Design: TBD	1
1			Credit 5	Pilot Credit: Integrative Analysis of Building Materials	1
1			Credit 6	LEED Accredited Professional	1

2	2	0	**Regional Priority (earn up to 4 points)**		4
1			Credit 1	Regional Priority Credit: LTc3 High Priority Site (2 points)	1
	x		Credit 2	Regional Priority Credit: SSc4 Rainwater Mgmt (2 points)	x
		x	Credit 3	Regional Priority Credit: WEc2 Int. H2O Reduction (4 points)	x
1			Credit 4	Regional Priority Credit: EAc2 Opt. Eng. 17% (8 points)	1
	1		Credit 5	Regional Priority Credit: EAc5 Renewables (2 points)	1
1			Credit 6	Regional Priority Credit: MRc1 Bldg LCA (2 points)	1

61	21	28	**TOTALS**	**Possible Points:**	**110**

Section IV. LEED CREDIT NARRATIVE

As detailed below, the Project meets the LEED for Core & Shell Minimum Program Requirements and each of the required Prerequisites. Additionally, the following credits are being targeted.

** - Denotes credits pursued as part of LEED Master Site strategy*

A. Integrative Process (IP)

IP Credit 1 Integrative Process — 1 credit point

The Project has met the intent of this credit through identification of cross discipline opportunities to design a sustainable building project. Sustainable design focused meetings have been conducted in early design to assist the team in establishing shared sustainable design and energy / water efficiency goals for the project. Early design phase energy modeling has been conducted to review systems synergies and assess areas where energy loads may be significantly reduced. A water use analysis will be conducted to aid in establishing water use reduction targets.

The Project has conducted interdisciplinary early meetings focusing on sustainability. These meetings have included the ownership group, architect, MEP engineer, energy analyst, and sustainability expert. An initial workshop was conducted in September 2021. Early energy modeling will be performed to provide real feedback on decision-making. Additionally, the Project will be linked into the MassSave energy-efficiency incentive program. This early work will push the design to optimize the performance of the envelope and HVAC systems and explore additional opportunities for decreasing water use within the project.

B. Location and Transportation (LT)

LT Credit 2 Sensitive Land Protection — 2 credit points

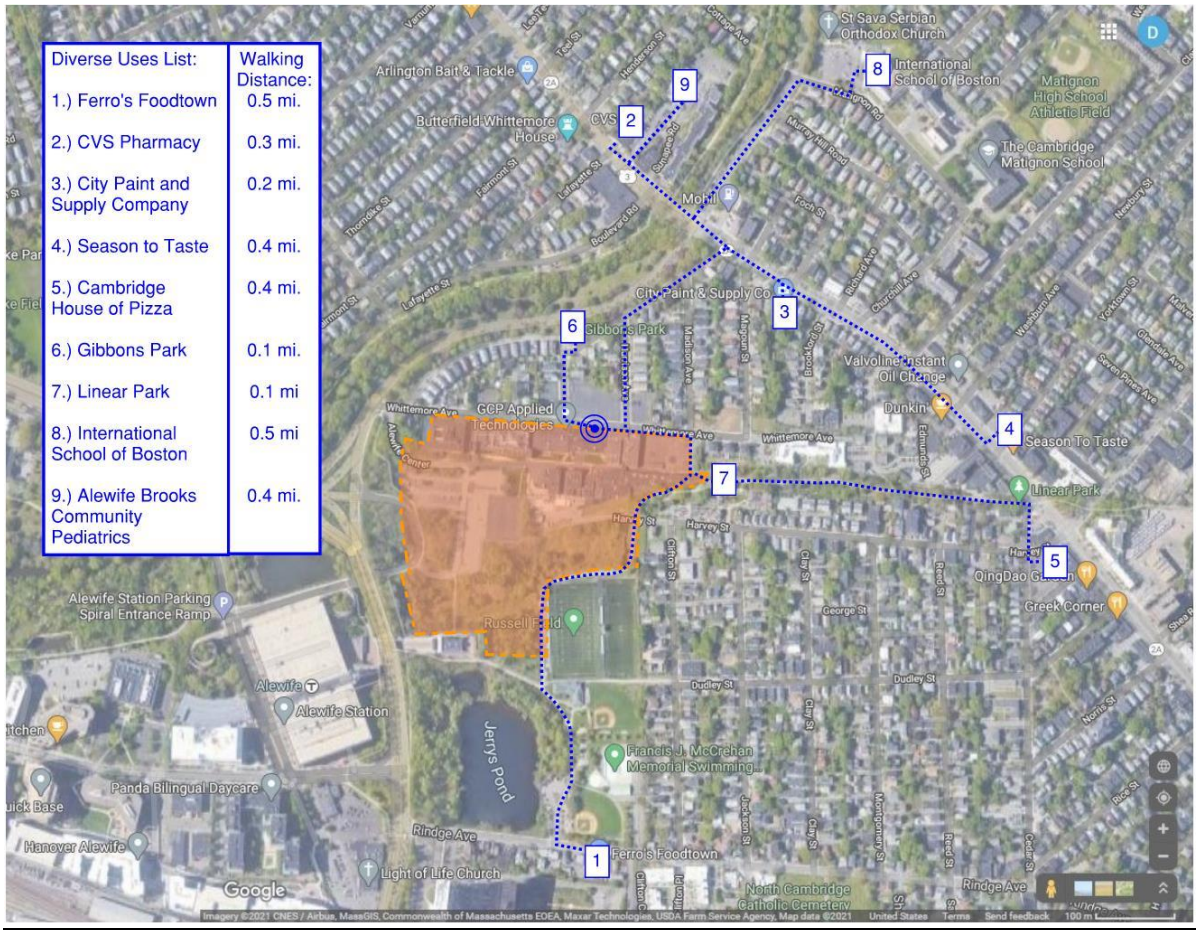
The Project will meet Option 1 requirements as it is located on a previously developed site.

*LT Credit 3 High Priority Site — 3 credit points

The Project site will meet Option 3 requirements for Brownfield remediation. The Project site is listed MassDEP as a Disposal Site under the MA Contingency Plan (MCP) (RTN 3-0277) and will require contaminated soil removal.

*LT Credit 4 Surrounding Density and Diverse Uses (LEEDv4.1) — 4 credit points

The Project will meet Option 1 for Surrounding Density by being located in an area with an average density greater than 35,000 sf/acre. The Project will meet Option 2 for Diverse Uses by being located within ½ mile walking distance of at least 9 publicly available diverse uses in at least three separate use categories.



The Project are located within ½ mile of the following 9 diverse uses:

Category	Use Type	# of Diverse uses	Business Name	Distance (mi.)
Food Retail	Grocery Store	1	Ferro's Foodtown	0.5 mi.
Community Serving Retail	Pharmacy	2	CVS Pharmacy	0.3 mi.
	Hardware Store	3	City Paint & Supply Company	0.2 mi.
Services	Restaurant	4	Season to Taste	0.4 mi.
	Cafe	5	Cambridge House of Pizza	0.4 mi.
Civic and Community Facilities	Public Park	6	Gibbons Park	0.1 mi.
	Public Park	7	Linear Park	0.1 mi.
	Educational Facility	8	International School of Boston	0.4 mi.
	Medical Clinic or Office that treats patients	9	Alewife Brooks Community Pediatrics	0.4 mi.

*LT Credit 5 Access to Quality Transit (LEEDv4.1) 6 credit points
LEEDv4.1: The Project is located within ½ mile walking distance of the Alewife station servicing the Red Line and 67 Bus line. The Project is also located within ¼ mile walking distance of the Massachusetts Ave. Bus Stop @ Lafayette and ½ mile walking distance of the Rindge Ave Bus Stop @ Rindge Ave opp Clifton St. (See table below for total trips)

	Total Rides Per Day		Percent of Total Rides Per Line	
	Weekday	Weekend	Weekday	Weekend
Red Line - Alewife, Braintree	208	169	21%	26%
Red Line - Alewife, Ashmont	206	169	21%	26%
Red Line - Ashmont, Mattapan	326	153	33%	24%
Bus 77 @ Lafayette St.	116	104	12%	16%
Bus 79 @ Lafayette St.	22	0	2%	0%
Bus 350 @ Lafayette St.	34	17	3%	3%
Bus 83 @ Rindge Ave opp Clifton St.	41	36	4%	6%
Bus 67 @ Alewife	23	0	2%	0%
Total:	976	647		

LT Credit 6 Bicycle Facilities (LEEDv4.1) 1 credit point
A minimum of 4 exterior short-term and 14 covered long-term bicycle storage is planned for visitors and regular occupants of the Project. Additionally, shower and changing facilities will be provided for use by building occupants. The immediate neighborhood provides a direct connection to a local bicycle network that links to a variety of services with pedestrian and cyclist access. The Project will meet City of Cambridge requirements for bike storage.

*LT Credit 7 Reduced Parking Footprint (LEEDv4.1) 1 credit point
A new, four-level parking garage and a redesigned surface lot are proposed to provide on-site parking for employees and visitors. The new parking garage will provide 350 parking spaces with an additional 303 surface spaces, which is an 53% reduction to the baseline number of parking spaces calculated from the ratios set forth in the LEED reference guide.

*LT Credit 8 Green Vehicles (LEEDv4.1) 1 credit point
The applicant has committed to providing EV charging stations to satisfy the LEED credit by providing EV charging stations for 5% of the total parking capacity. There are 653 parking spaces that will be provide. Of those spaces, 5% will be outfitted as electric vehicle charging stations, which will require a total of 35 EV charging stations.

C. Sustainable Sites (SS)

*SS Prerequisite 1: Construction Activity Pollution Prevention Required
The construction manager will be required to submit and implement an appropriate SWPPP/Erosion and Sedimentation Control (ESC) Plan for construction activities related to the construction of the Project. The ESC Plan will conform to the erosion and sedimentation requirements of the applicable NPDES regulations and specific municipal requirements for the City of Cambridge. Additionally, the ESC Plan will address management and containment of dust and particulate matter generated by on site demolition and construction activities.

SS Credit 1: Site Assessment 1 credit point
A comprehensive site assessment will be completed as part of the Project. The site assessment will include topography, hydrology, climate, vegetation, soils, human use, and human health effects and was used to inform the design.*SS Credit 3: Open Space 1 credit point
The Project site design will provide outdoor space that is physically accessible and will be equal to or greater than 30% of the total site area. Current design shows >51% of the site is outdoor space that is physically accessible.

SS Credit 6 Light Pollution Reduction 1 credit point
The Project will meet uplight and light trespass requirements by complying with the LEED v4 BUG Rating method. To meet credit requirements, the site lighting will not exceed the LEEDv4 allowable luminaire backlight, uplight and glare ratings for the project's Lighting Zone.

SS Credit 7 Tenant Design and Construction Guidelines 1 credit point
Tenant Design and Construction Guidelines will be developed outlining the sustainable design and energy efficiency measures in the core and shell phases and providing detailed guidance for tenants to design and build in alignment with the project sustainability goals. Information will also be included to assist tenants in pursuing LEED certification for their spaces. The team will encourage tenants to pursue LEED certification as part of their build-out.

D. Water Efficiency (WE)

WE Prerequisite 1 Outdoor Water Use Reduction, 30% Required
The Project will meet the minimum requirement of 30% reduction. The Project site will include permanent irrigation that will use efficient technology and reclaimed rainwater such that no potable water use will be required.

WE Prerequisite 2 Indoor Water Use Reduction, 20% Reduction Required
Through the specification of low flush and flow and high efficiency plumbing fixtures, the Project will reduce potable water consumption by at least 20% over the baseline calculated for the building (not including irrigation) after meeting Energy Policy Act of 1992 fixture performance requirements.

WE Prerequisite 3 Building Level Water Metering Required
The Project will meet the requirements of this prerequisite by installing permanent water meters that measure the total potable water use of the building and associated grounds. In addition to installing the meters, the Project will commit to sharing water usage data with the USGBC for a five-year period beginning on the date the Project accepts LEED certification or typical occupancy, whichever comes first.

*WE Credit 1 Outdoor Water Use Reduction, 100% (LEEDv4.1) 2 credit points
The Project site will achieve a 50% reduction in landscaping water demand through plant selection, and water efficient irrigation delivery and weather sensors. The Project site will include permanent irrigation that will use efficient technology and captured rainwater such that no potable water use will be required.

WE Credit 2 Indoor Water Use Reduction 2 credit points
Through the specification of low flow and high efficiency plumbing fixtures, the Project will implement water use reduction strategies that at a minimum result in a 30% reduction in potable water use annually when compared to EPA baseline fixtures for the building (not including irrigation) after meeting Energy Policy Act of 1992 fixture performance requirements.

E. Energy and Atmosphere (EA)

EA Prerequisite 1 Fundamental Commissioning and Verification Required

A commissioning agent has been engaged by the Building Owner for purposes of providing fundamental commissioning services for the building energy related. The commissioning agent will perform the scope of work required to comply with the prerequisite in accordance with ASHRAE Guideline 0-2005 and ASHRAE Guideline 1.1-2007 for HVAC & R systems.

The commissioning agent (CxA) is independent of the project's design and construction management teams. The commissioning agent will report findings to the Building Owner. The Owner's Project Requirements and the Basis of Design documents will be provided to the CxA for review.

The following systems will be included in the Commissioning scope of work:

- Heating, ventilating, air conditioning and refrigeration (HVAC&R) systems
- HVAC controls
- Lighting controls
- Electrical systems
- Domestic hot water systems
- Plumbing and pumps
- Building Automation System

EA Prerequisite 2 Minimum Energy Performance Required

To meet the prerequisite, the Project's building performance will demonstrate a minimum of 5% improvement in energy use by cost when compared to a baseline building performance as calculated using the rating method in Appendix G of ANSI/ASHRAE/IESNA Standard 90.1-2010. The Project is also required to meet the MA Stretch Energy Code requirements.

This Project will achieve these savings through inclusion of the following ECMs:

1. Improved envelope efficiency
2. Reduced LPD in core/shell scope areas
3. Reduced ACH rate capability during unoccupied hours
4. SAT Reset to minimize reheat loads
5. High-efficiency heat recovery chilled water plant and hot water plants
6. Low-flow domestic hot water fixtures

Comprehensive, iterative energy modeling will be used to explore design options to meet all Code requirements and to provide substantiation for the LEED application. Energy performance goals were established during the Schematic Design phase of the Project. The Project team recognizes the importance of energy efficiency and will continue to evaluate opportunities to reduce energy use and increase points.

EA Prerequisite 3 Building Level Energy Metering Required

To meet the requirements of this prerequisite, the Project will install whole building energy meters for gas and electricity. In addition to installing the meters, the Project will commit to sharing energy usage data with the USGBC for a five-year period beginning on the date each accepts LEED certification or typical occupancy, whichever comes first. It is understood that at a minimum, the Project will be subject to the Building Energy Use Disclosure Ordinance and will annually report and disclose energy performance in terms of energy usage.

EA Prerequisite 4 Fundamental Refrigerant Management Required

CFC based refrigerants will not be used in the Project's HVAC & R systems. Any existing refrigerant-containing systems will be maintained as part of the existing building renovation will be evaluated to determine whether phase-out requirements are applicable.

EA Credit 1 Enhanced Commissioning 3 credit points

In addition to EApr1 Fundamental Commissioning and Verification requirements, Option 1 Path 1 Enhanced Commissioning will be pursued by the Project. The Building Owner has engaged BR+A as MEP commissioning agent to review the proposed design and verify the building systems meet the Owner's expectations and requirements.

The following commissioning process activities in addition to those required under EA Prerequisite Fundamental Commissioning and Verification will be completed by the commissioning agent, in accordance with ASHRAE Guideline 0–2005 and ASHRAE Guideline 1.1–2007 for HVAC&R systems, as they relate to energy, water, indoor environmental quality, and durability:

- Review contractor submittals.
- Verify inclusion of systems manual requirements in construction documents.
- Verify inclusion of operator and occupant training requirements in construction documents.
- Verify systems manual updates and delivery.
- Verify operator and occupant training delivery and effectiveness.
- Verify seasonal testing.
- Review building operations 10 months after substantial completion.
- Develop an on-going commissioning plan.

Requirements for enhanced commissioning will be included in the OPR and BOD.

EA Credit 2 Optimize Energy Performance 8 credit points

The project is designed to meet IECC 2015/ASHRAE 90.1-2013 energy efficiency requirements to comply with the requirements of the Massachusetts Stretch Energy Code. Based on preliminary modeling, it is expected that the project will achieve at least eight points following EApc95, which is equivalent to 17% improvement against a LEED baseline.

The team recognizes the importance of energy efficiency and will continue to evaluate opportunities reduce energy use and increase points within the Energy & Atmosphere category, specifically within the Optimize Energy Performance credit.

EA Credit 6 Enhanced Refrigerant Management 1 credit point

The HVAC equipment installed in the base building uses low-impact refrigerants that have low global warming and ozone depletion potential.

F. Materials and Resources (MR)

MR Prerequisite 1 Storage and Collection of Recyclables Required

The Project will meet this requirement. Storage of collected recyclables will be accommodated in a designated area within the back of house area on level 1. Recyclable materials collected will include mixed paper, corrugated cardboard, glass, plastics, and metals, and the disposal of batteries and electronic waste. A contracted waste management company will collect the recyclables on a regular basis.

MR Prerequisite 2 Construction and Demolition Waste Management Planning Required

The Project will meet the requirements of this prerequisite by including a Construction Waste Management section in Division 1 of the project manual. The specification will include direction for the construction manager to submit and implement a compliant waste management plan for the duration of construction. Waste diversion goals for the project will include at least five materials targeted for diversion.

MR Credit 1 Building Life-Cycle Impact Reduction (LEEDv4.1) 4 credit points
The Project is targeting 45% reuse of existing structural elements within the building. This includes 45% reuse of existing structural elements (floors, roofs, envelope) for 4 points using the LEED v4.1 requirements.

MR Credit 2 Bldg. Product Disclosure & Optimization: EPDs (LEEDv4.1) 1 credit point
The Project will achieve this credit via Option 1. The technical specifications will include direction for the construction manager and their sub-contractors to provide and submit materials and products Environmental Product Declarations that conform to ISO 14025, 14040, 14044, and EN 15804 or ISO 21930 and have at least a cradle to gate scope. The team will work to provide documentation for 20 different permanently installed products sourced from at least 5 different manufacturers.

MR Credit 4 BPDO: Material Ingredients (LEEDv4.1) 1 credit point
The Project will pursue Option 1 for product and material disclosure, and by selecting products and materials with third party confirmation of reduced hazardous substances. The project manual will include the information and direction for the construction manager and their sub-contractors to provide and submit materials and products documentation identifying the chemical make-up. The documentation may be Health Product Declarations, Cradle-to-Cradle or Declare certification. The team will provide documentation for 20 different permanently installed products sourced from at least 5 different manufacturers.

MR Credit 5 Construction & Demolition Waste Management (LEEDv4.1) 2 credit points
The Project will meet the requirements of this credit by including a Construction Waste Management section in Division 1 of the project manual. The specification will include direction for the construction manager to attempt to divert a minimum of 75% of the demolition and construction waste generated on site from area landfills. The construction waste management plan will include tracking five waste streams. Diverted material reported will include at least three different material streams. Demolition waste will be separated on site as part of the strategy to meet this credit.

G. Indoor Environmental Quality (IEQ)

IEQ Prerequisite 1 Minimum IAQ Performance Required
The Project's mechanical systems are designed to exceed the requirements of ASHRAE Standard 62.1-2010 sections 4 through 7. The mechanical engineer will complete a ventilation rate procedure (VRP) calculator to verify compliance for the Project. Outdoor airflow monitors are included in the project.

IEQ Prerequisite 2 Environmental Tobacco Smoke Control (LEEDv4.1) Required
Smoking will be prohibited in The Project and within 25' of the building. Signage will be posted within 10' of all building entrances to indicate the interior and exterior no-smoking policy.

IEQ Credit 1 Enhanced Indoor Air Quality Strategies 1 credit point
The Project is being designed to incorporate permanent entryway systems, properly enclosed and ventilated chemical use/storage areas, and compliant filtration media (MERV 13+).

IEQ Credit 2 Low Emitting Materials 2 credit points
The Project will achieve this credit through meeting the compliance criteria for at least three of the following product categories: interior paints and coatings, interior adhesives and sealants, flooring, ceilings, insulation, and composite wood. Three compliant categories on the Project will achieve 2 points.

IEQ Credit 3 Construction Indoor Air Quality Management Plan 1 credit point

The project manuals for the Project will include direction for the construction manager to develop and implement an Indoor Air Quality Management plan in compliance with applicable control measures as stated in the SMACNA IAQ Guidelines for Occupied Buildings under construction 2nd Edition, 2007 ANSI/SMACNA 008-2008 Chapter 3. Additional measures will be implemented to ensure absorptive materials will be protected from moisture damage.

IEQ Credit 8 Quality Views 1 credit point

A direct line of sight to the outdoors and/or atrium will be provided for 75% of the regularly occupied floor area of the Project. 75% of the regularly occupied floor area will also have quality views to the outdoors which will include multiple lines of sight; unobstructed views; views to landscaped areas, sky, pedestrian walkways, and streetscapes.

H. Innovation (IN)

Inc1 Innovation: Purchasing - Lamps 1 credit point

The Project will achieve one innovation point by complying with LEED Innovation Credit: Purchasing – Lamps, which requires that the calculated average mercury content for the Project be below 35 picograms of Hg per lumen hour. The project will be 100% LED.

Inc2 Innovation, O & M Starter Kit 1 credit point

The Project will develop and implement compliant Green Cleaning and Integrated Pest Management policies that will ensure reduce the use of chemical inputs and provide increased human health and wellbeing during operation.

Inc3-4 Innovation, TBD 2 credit points

The Project is exploring options to achieve this Innovation credit and is confident that a path will be found to earn all innovation credits. Options include, but are not limited to, Green Building Education, Occupant Comfort Survey, Social Equity within the Project team, Safety First policies, or Beauty and Design WELL feature compliance.

INc5 Pilot: Integrative Analysis of Building Materials 1 credit point

The Project will specify, purchase, and install three different permanently installed products that have a documented qualitative analysis of potential health, safety, and environmental impacts of the product over its life cycle.

INc6 LEED Accredited Professional 1 credit point

Many members of the team are LEED Accredited Professionals (APs).

I. Regional Priority (RP)

Regional Priority Credits (RPCs) are established by the USGBC to have priority for a particular area of the country. When a project team achieves one of the designated RPCs, an additional credit is awarded to the project. LEEDv4 RPCs applicable to the Cambridge area include: LTc3 High Priority Site (2 points), SSc4 Rainwater Management (2 points), WEc2 Indoor Water Use Reduction (4 points), EAc2 Optimize Energy Performance (17%/8 points), EAc5 Renewable Energy Production (3%/2 points), and MRc1 Building Life-Cycle Impact Reduction (2 points).

The Project is currently tracking the following RPCs:

LTc3 High Priority Site	1 credit point
EAc2 Optimize Energy Performance	1 credit point
MRc1 Building Life-Cycle Impact Reduction	1 credit point

--- End of Report ---

Affidavit Form for Green Building Professional
Special Permit

Green Building
Project Location: 36-64 Whittemore Avenue Cambridge, MA

Green Building Professional

Name: Christopher Schaffner

☐ Architect
☒ Engineer

License Number: Massachusetts PE Registration #37211
Company: The Green Engineer, Inc
Address: 23 Bradford Street, First Floor, Concord, MA 01742
Contact Information
Email Address: chris@greenengineer.com
Telephone Number: 978-369-8978

I, Christopher Schaffner, as the Green Building Professional for this Green Building Project, have reviewed all relevant documents for this project and confirm to the best of my knowledge that those documents indicate that the project is being designed to achieve the requirements of Section 22.24 under Article 22.20 of the Cambridge Zoning Ordinance.

(Signature) *(Date)* 2/19/2021

Attach either:

☒ Credential from the applicable Green Building Rating Program indicating advanced knowledge and experience in environmentally sustainable development in general as well as the applicable Green Building Rating System for this Green Building Project.

☐ If the Green Building Rating Program does not offer such a credential, evidence of experience as a project architect or engineer, or as a consultant providing third-party review, on at least three (3) projects that have been certified using the applicable Green Building Rating Program.

GREEN BUSINESS CERTIFICATION INC. CERTIFIES THAT

Christopher Schaffner

HAS ATTAINED THE DESIGNATION OF

LEED AP® Building Design + Construction

by demonstrating the knowledge and understanding of green building practices and principles needed to support the use of the LEED® green building program.

10580514-AP-BD+C

CREDENTIAL ID

10 OCT 2009

ISSUED

07 OCT 2023

VALID THROUGH

Mahesh Ramanujam

MAHESH RAMANUJAM
PRESIDENT & CEO, U.S. GREEN BUILDING COUNCIL
PRESIDENT & CEO, GREEN BUSINESS CERTIFICATION INC.

Green Building Requirements
Net Zero Narrative

PROJECT:

Project Profile

Development Characteristics

Lot Area (sq.ft.):	1.04 acres
Existing Land Use(s) and Gross Floor Area (sq.ft.), by Use:	Office, 89,875 sq ft
Proposed Land Use(s) and Gross Floor Area (sq.ft.), by Use:	Office, 89,875 sq ft
Proposed Building Height(s) (ft. and stories):	4-story
Proposed Dwelling Units:	0
Proposed Open Space (sq.ft.):	Goal is achieve 20% open space, likely closer to 50%
Proposed Parking Spaces:	653 Cars (303 surface, 350 in structured parking)
Proposed Bicycle Parking Spaces (Long-Term and Short-Term):	14 Long term interior, 4 short term exterior, 4 showers

Green Building Rating System

Choose the Rating System selected for this project:

LEED-Leadership in Energy & Environmental Design (U.S. Green Building Council)			
Rating System & Version:	LEED v4 Core and Shell	**Seeking Certification?***	Yes
Rating Level:	LEED Gold	**# of Points:**	(60-79 points)
Enterprise Green Communities			
Rating System & Version:	n/a	**Seeking Certification?***	No
Rating Level:	n/a	**# of Points:**	n/a
Passive House Institute US (PHIUS) or Passivhaus Institut (PHI)			
Rating System & Version:	n/a	**Seeking Certification?***	No

Proposed Project Design Characteristics

Building Envelope

Assembly Descriptions:

Roof:	3 in of insulation on top of concrete with water proofing membrane
Foundation:	Slab on grade
Exterior Walls:	Brick masory vaneer with pre-cast concrete spandrel and column cover panels
Windows:	double pane fixed IGU in anodized aluminum frams
Window-to-Wall Ratio:	43%
Other Components:	n/a

	Proposed		Baseline	
	Area (sf)	U-value	Area (sf)	U-Value
Window	13,592	0.55	12,761	0.55
Wall	31,902	0.102	31,902	0.064
Roof	15,332	0.078	15,332	0.048

Envelope Commissioning Process:

Building Mechanical Systems

Systems Descriptions:

Space Heating:	Hot water coils supplied by a central condensing boiler plant. 3x6,000 mbh, 96% eff
Space Cooling:	chilled water coils supplied by central plant air cooled chillers. Central plant consists of 3x450 T air cooled chillers, EER 9.046, IPLV 19.46. The chilled water will be provided to 5 AHUs AHU-1
Heat Rejection:	Heat rejection will be provided via air cooled chillers
Pumps & Auxiliary:	CHW Pumps: 3x850 gpm HW Pumps: 3x600 gpm Energy Recovery: 3x70 gpm
Ventilation:	Lab: 100% OA Office: 0.6 cfm/sf
Domestic Hot Water:	100 gal gas fired hot water heater
Interior Lighting:	Project will comply with current code
Exterior Lighting:	n/a
Other Equipment:	Lab: 1w/sf Office: 1.5 w/sf

Systems Commissioning Process:

A commissioning agent has been engaged by the Building Owner for purposes of providing fundamental commissioning services for the building energy related. In addition to EApr1 Fundamental Commissioning and Verification requirements, Option 1 Path 1 Enhanced Commissioning and Option 2 Building Envelope Commissioning will be pursued by the Project. The Building Owner has engaged BR+A as MEP commissioning agent to review the proposed design and verify the building systems meet the Owner's expectations and requirements. In addition to the commissioning of mechanical and electrical systems, the Building Owner is considering engaging the commissioning agent to perform monitoring-based commissioning activities as they relate to the operations and maintenance of the building once it has been occupied. Requirements for enhanced and monitoring-based commissioning will be included in the OPR and BOD.

Building Energy Performance Measures

Overview

The project is utilizing integrative design methodology, and is incorporating early energy modeling for whole building analysis at multiple stages of design to advise the appropriate thermal properties of specific building envelope assemblies, and to further explore opportunities for energy reduction on mechanical systems, improve energy efficiency, and reduce greenhouse gas emissions.

Land Uses:	Sited on previously developed land, which is also classified as U.S. Department of Housing and Urban Development's Difficult Development Area
Building Orientation and Massing:	The project is a renovation of an existing building
Envelope Systems:	The envelope is not within the scope of the project
Mechanical Systems:	High efficiency air cooled chillers and high efficiency boilers have been selected for this project. Energy recovery is included on the 100% OA lab units
Renewable Energy Systems:	Due to the nature of the project, a significant part of the roof will be occupied by large mechanical systems. The existing structure cannot structurally support additional solar PV or green roof loads
District-Wide Energy Systems:	There is no existing feasible district steam connection (Vicinity) in close proximity to the site. No small-scale district energy solution is feasible given site soil conditions.
Other Systems:	EV charging stations to be provided for 5% of the total parking capacity for the project.

Integrative Design Process

The project team has collaborated on a number of design solutions to identify a cost effective basis of design that significantly exceeds current energy code requirements. Sustainable design focused meetings have been conducted in early design to assist the team in establishing shared sustainable design and energy / water efficiency goals for the project. Early design phase energy modeling has been conducted to review systems synergies and assess areas where energy loads may be significantly reduced. The Project has conducted interdisciplinary early meetings focusing on sustainability. An initial workshop was conducted in September 2021. Early energy modeling will be performed to provide real feedback on decision-making.

Green Building Incentive Program Assistance

The Project is will engage in the MassSave Large Building Incentives program at a future date through Eversource - the main utility provider for the project. As part of the program, the Project plans to facilitate an energy charrette with Eversource to identify energy conservation measures that can be incorporated in the MassSave program's incentive study.

Net Zero Scenario Transition

Several opportunities for future improvement of the Project have been identified that may be implemented for a Net Zero Option scenario. To achieve net zero would required a de-carbonization of the ISO New England electrical gid and deployment of technologies that can take advantage of grid improvements.

	Net Zero Condition:	Transition Process:
Building Envelope:	Provide addional insulation, air sealing, and improved windows	The proposed envelope will need to be upgraded in the future.
HVAC Systems:	6 (N+1) 200 Ton Heat pumps would provide chilled water for the AHUs located within the building. During the winter the heat pumps would provide hot water with 2x 6,000 mbh elec boilers as back up providing hot water for the hot water loop during peak/times of extreme cold. The heat pumps will provide chilled water for cooling	We are propsing a hybrid heat pump and electrical boiler apporach. Based off the increase demand during winter the building will need to increase its electrical demand. The NZE is proposed as a Day 1 solution.

Net Zero Scenario Transition (CONTINUED)

Several opportunities for future improvement of the Project have been identified that may be implemented for a Net Zero Option scenario. To achieve net zero would required a de-carbonization of the ISO New England electrical gid and deployment of technologies that can take advantage of grid improvements.

	Net Zero Condition:	Transition Process:
Domestic Hot Water:	To lower energy use in the future, domestic hot water heating source can be a heat pump type water heater	At the end of life of the original equipment it is possible to easily convert the existing system to a high efficient heat pump system for domestic hot water system.
Lighting:	In a Core and Shell project, lighting design is driven by the tenant. Although beyond the Applicant's scope of work, it is assumed that the tenants will design their spaces at least 20% below the new code allowable lighting power density (LPD).	It is important to acknowledge that the new Massachusetts Building Energy Code has stringent LPD thresholds and the Applicant will be engaging in dialogue with the tenants to go beyond the code thresholds. This LPD reduction in tenant spaces may be required through tenant lease and sale agreement.
Renewable Energy Systems:	The project does not have the structural capacity to support rooftop PV installations. At a minimum the building will be solar-ready to accommodate future PV if structurally feasible.	Due to high energy use intensities for laboratory type buildings, offsite renewable energy sources are likely required to balance site energy sources. A number of options exist, including solar, wind, purchase power agreements and green power purchases.
Other Strategies:	N/A	N/A

Energy Systems Comparison

Overview

The Net Zero/Zero Carbon feasibility assessment includes the following energy conservation measures:
-High Efficiency air to water heat pumps with for chilled and hot water utilizing elec boiler back up for hot water
-Heat Pump DHW

Assumptions

The building is in early design and is a Core and Shell speculative laboratory building typology (60/40 laboratory/office split). The project is incorporating early energy modeling for whole building analysis at multiple stages of design to explore opportunities for energy reduction on mechanical systems, improve energy efficiency, and reduce greenhouse gas emissions.

	Included in analysis?		Describe the systems for which this was analyzed or explain why it was not included in the analysis:
	Yes	No	
Solar Photovoltaics:	x		We have estimated the theoretical capacity of rooftop PV panels for the project, but structure will not accommodate additional roof loads

Solar Hot Water:		x	There is limited available roof area on the project. Any available area has been evaluated for PVs rather than solar hot water due to the larger impact per available area.
Ground-Source Heat Pumps (Geothermal):		x	Historic soil contamination and the lack of available lot area makes GSHP wells not feasible
Water-Source Heat Pumps:		x	Water source heat pumps typically use a conventional boiler plant as the primary heat source. Furthermore, this system type is not typically used for laboratory applications. While they may be used in office applications, it would require additional base building equipment (e.g. cooling tower, condenser loop piping, etc.) that reduces cost feasibility. Additionally,air-source solutions typically fare better due to the lack of boiler requirements.
Air-Source Heat Pumps:	x		The basis of design is a hydronic system that uses an air source heat recovery chiller to offset a portion of the annual heating loads.
Non-Carbon-Fuel District Energy:		x	There is no existing feasible district steam connection (Vicinity) in close proximity to the site. No small-scale district energy solution is feasible given site soil conditions
Other Non-Carbon-Fuel Systems:		x	n/a

Non-Carbon-Fuel Scenario

Zero carbon laboratories in dense urban areas have low feasibility due to the lack of area available to accommodate associated air-source or ground source equipment infrastructure. An air-source system would likely take all available roof area, plus additional (otherwise leaseable) mid elevation floors to house the condensing units necessary to meet the capacities anticipated by laboratory processes. Similarly, ground source systems would take a correspondingly large amount of ground area that is not accessible on the site. Additionally, high capacity deep bore systems do not have significant market penetration for laboratory applications and their feasibility is considered low due to associated capital costs, installation uncertainties and long term thermal performance of the ground heat exchanger. As a result, the net zero option described below is considered feasible using readily available technology, without the uncertainties inherent to the zero carbon option.

Solar-Ready Roof Assessment

Total Roof Area (sq. ft.):	15332
Unshaded Roof Area (sq. ft.):	5,300
Structural Support:	As required to support potential PV capacity.
Electrical Infrastructure:	As required to support potential PV capacity.
Other Roof Appurtenances:	Accounted for in the available roof area sketch.
Solar-Ready Roof Area (sq. ft.):	5,300
Capacity of Solar Array:	100 kW installed capacity 120,000 kWh year typical production $21,140 annual electric cost offset
Financial Incentives:	The state solar SMART program will be solicited to determine the applicable incentive tier available at the time of enrollment. It's understood that the projects utility rate class, incentive tier and potential "rate adders" have a significant impact on overall cost feasibility.
Cost Feasibility:	Based on typical costs of recent installations, the simple payback without incentives is on the order of 14 years. Depending on SMART incentives available at the time of enrollment, the projected payback could be as low as 7 years. The payback may be reduced further as PV manufacturing costs continue to decline and technological advancements are made.

Results

	Proposed Design		Net Zero Scenario	
	Installation Cost	Maintenance Cost	Installation Cost	Maintenance Cost
Envelope				
HVAC Systems			$ 6,969,990	
Domestic Hot Water			$ 192,802	
Electrical Infrastructure			$ 2,530,846	
Other (Structural)			$ 268,360	
(Financial Incentives)			TBD - recently initiated the utility incentive process.	
Total Building Energy System Cost			$ 9,961,998	

See the overview from the (previous) energy systems comparison. The cited costs are limited to the additional cost (i.e. cost delta) beyond the basis of design. The proposed solutions are not expected to incur any significant maintenance cost penalties.

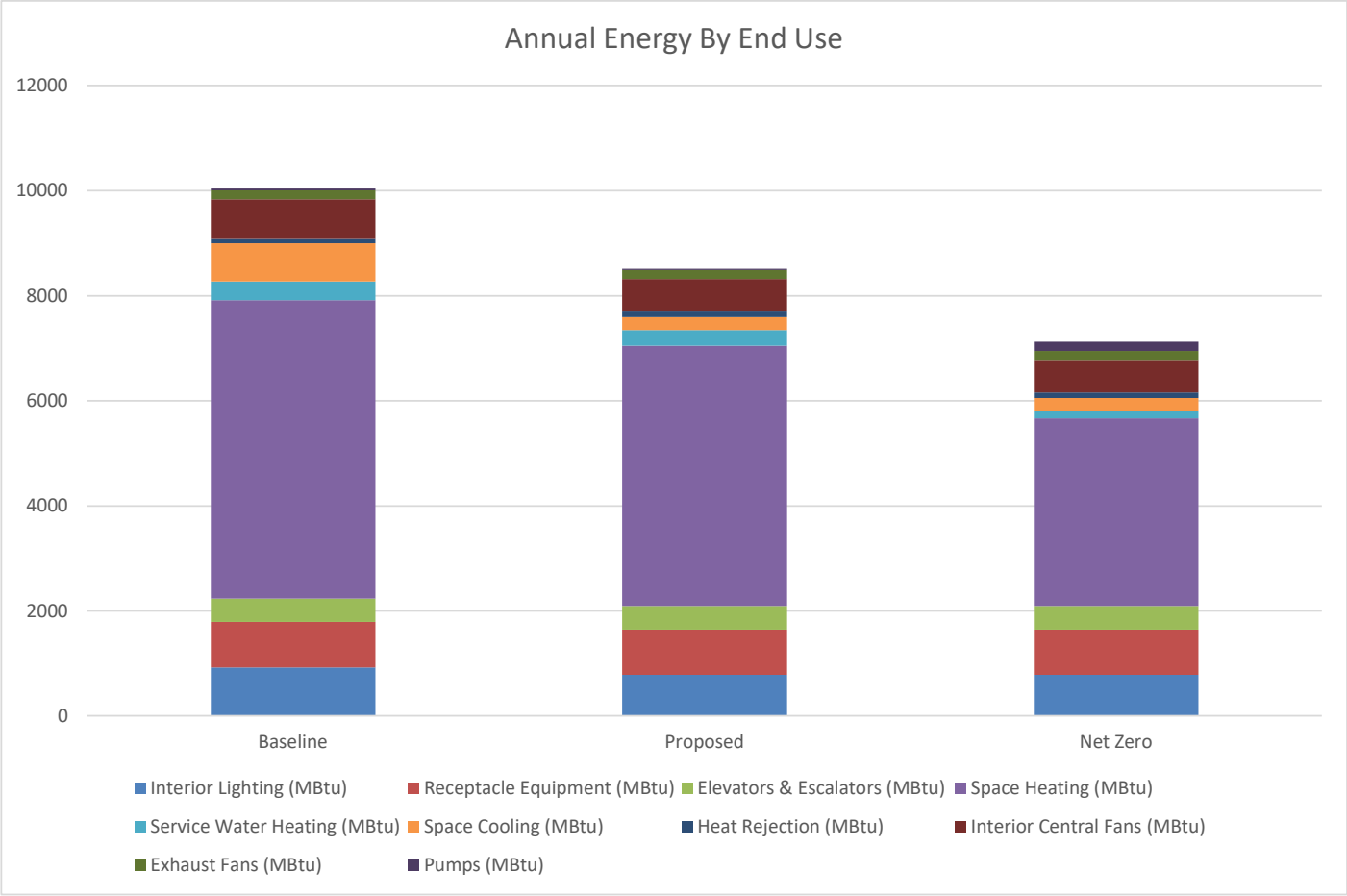
Anticipated Energy Loads and Greenhouse Gas Emissions

Assumptions

The building is in early design and is a Core and Shell speculative laboratory building typology (60/40 laboratory/office split). The project is incorporating early energy modeling for whole building analysis at multiple stages of design to explore opportunities for energy reduction on mechanical systems, improve energy efficiency, and reduce greenhouse gas emissions.

Annual Projected Energy Consumption and Greenhouse Gas (GHG) Emissions

	Baseline Building		Proposed Design		Future Net Zero Scenario		Non-Carbon-Fuel Scenario	
	MMBTU	% of Total	MMBTU	% of Total	MMBTU	% of Total	MMBTU	% of Total
Lights	928	9%	787	9%	787	11%	See Future Net Zero Option	
Misc. Equip	1,285	13%	1,309	16%	1,309	18%		
Space Heating	5,679	57%	4,954	59%	3,649	51%		
Space Cooling	726	7%	245	3%	240	3%		
Heat Rejection	83	1%	105	1%	108	1%		
Pumps & Aux	32	0%	25	0%	174	2%		
Vent Fans	929	9%	624	7%	792	11%		
DHW	353	4%	298	4%	144	2%		
Ext Ltg	-	0%	-	0%	-	0%		
	$US, kBTU, kBTU/SF		$US, kBTU, kBTU/SF	% Reduction from Baseline	$US, kBTU, kBTU/SF	% Reduction from Baseline	$US, kBTU, kBTU/SF	% Reduction from Baseline
Site EUI	117		99	15%	80	32%	See Future Net Zero Option	
Source EUI	204		171	16%	224	-10%		
Total Energy Use	10,014,447		8,514,796	15%	6,833,377	32%		
Total Energy Cost	$ 2,463,607		2,025,543	18%				
	MMBTU	% Total Energy	MMBTU	% Total Energy	MMBTU	% Total Energy	MMBTU	% Total Energy
On-Site Renewable Energy Generation	-	-	-		409	0%	See Future Net Zero Option	
Off-Site Renewable Energy Generation	-	-	-		6,832,968	100%		
	Tons CO_2 [/SF]		Tons CO_2 [/SF]	% Reduction				
GHG Emissions	582		493	15%				
GHG Emissions per SF	0.007		0.0058	15%				


Annual Energy By End Use
12000
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4000
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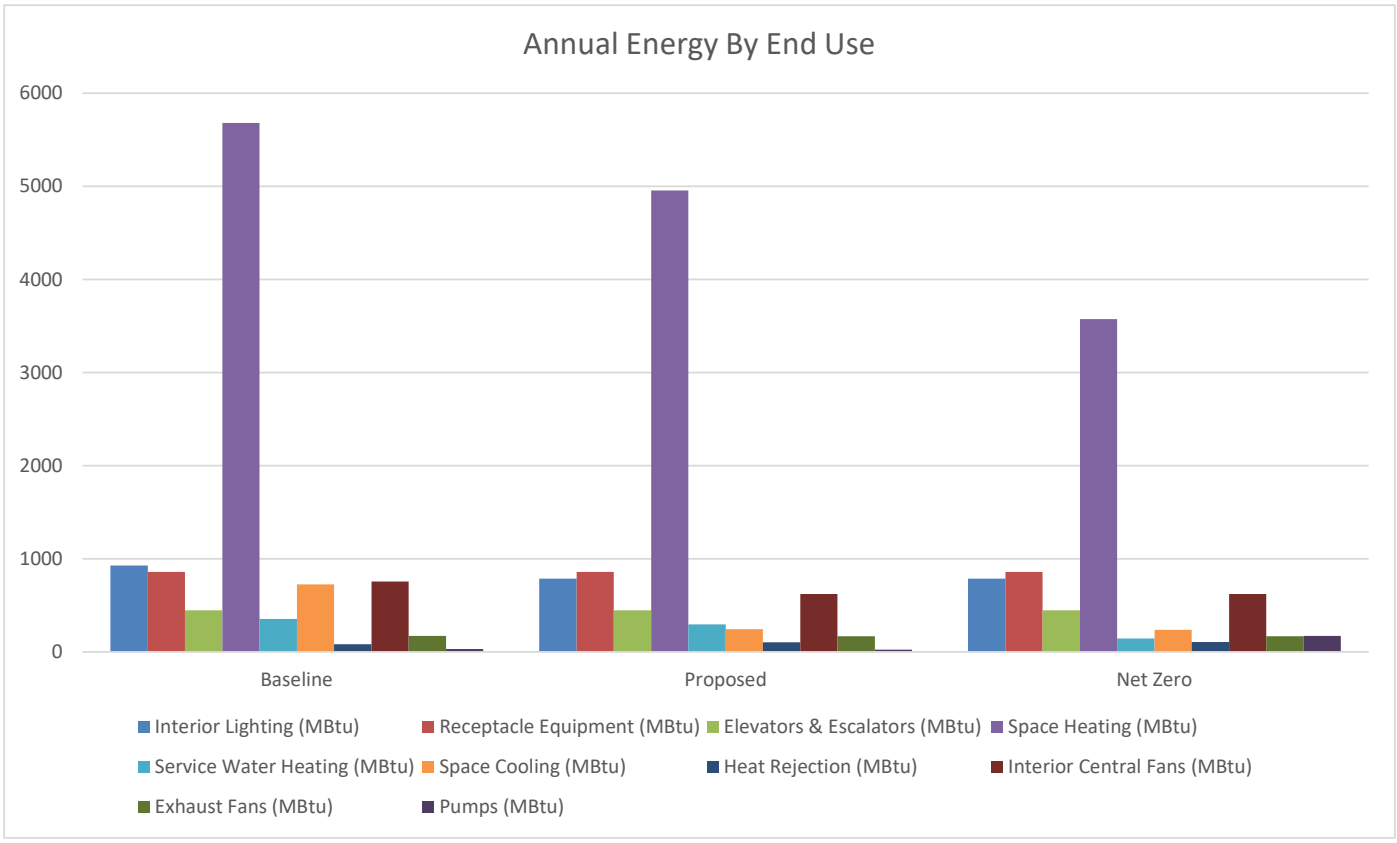
Baseline
Proposed
Net Zero
Interior Lighting (MBtu)
Receptacle Equipment (MBtu)
Elevators & Escalators (MBtu)
Space Heating (MBtu)
Service Water Heating (MBtu)
Space Cooling (MBtu)
Heat Rejection (MBtu)
Interior Central Fans (MBtu)
Exhaust Fans (MBtu)
Pumps (MBtu)


Annual Energy By End Use
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Baseline
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Net Zero
Interior Lighting (MBtu)
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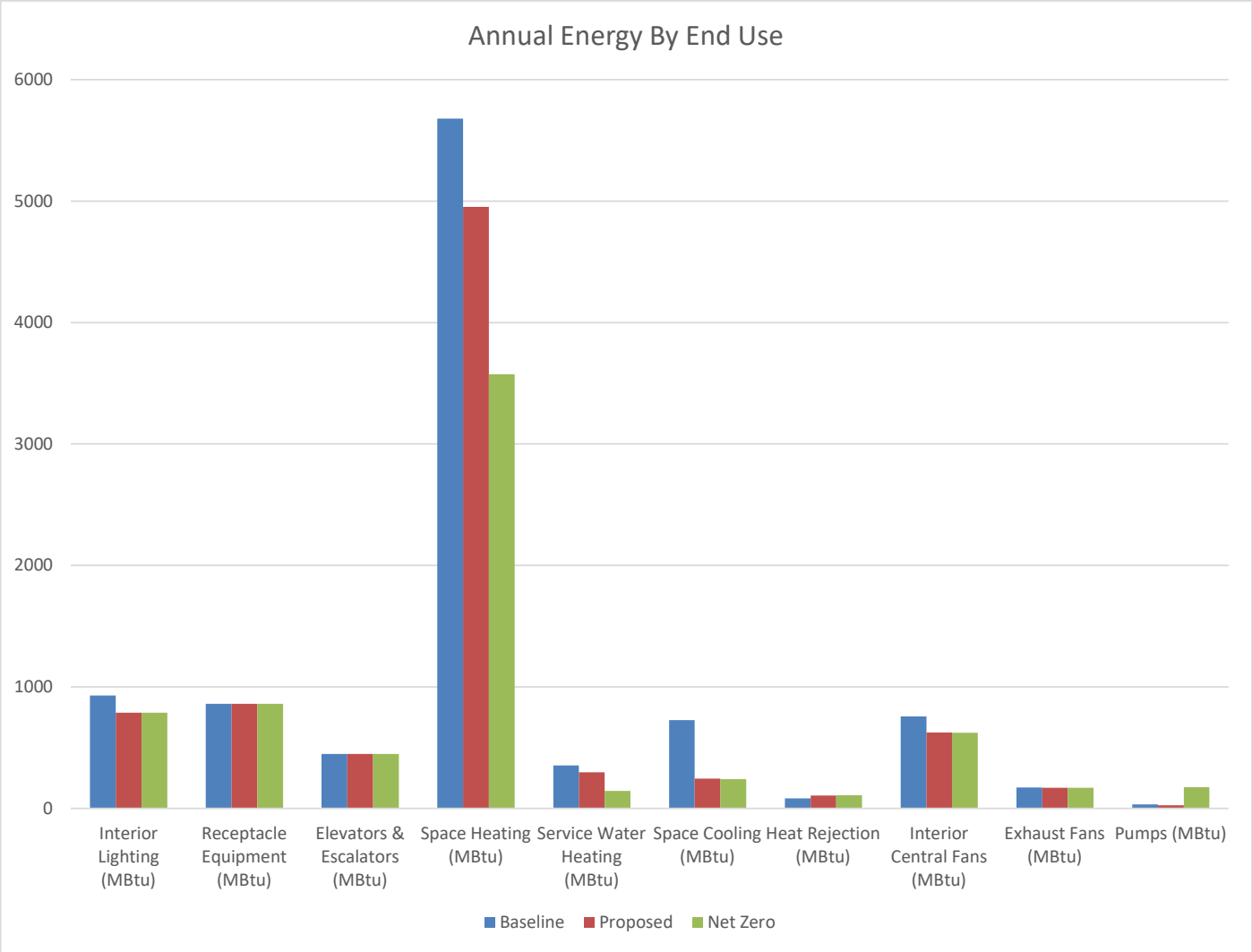
Pumps (MBtu)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0
Interior Lighting (MBtu)
Receptacle Equipment (MBtu)
Elevators & Escalators (MBtu)
Space Heating (MBtu)
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Space Cooling (MBtu)
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Exhaust Fans (MBtu)
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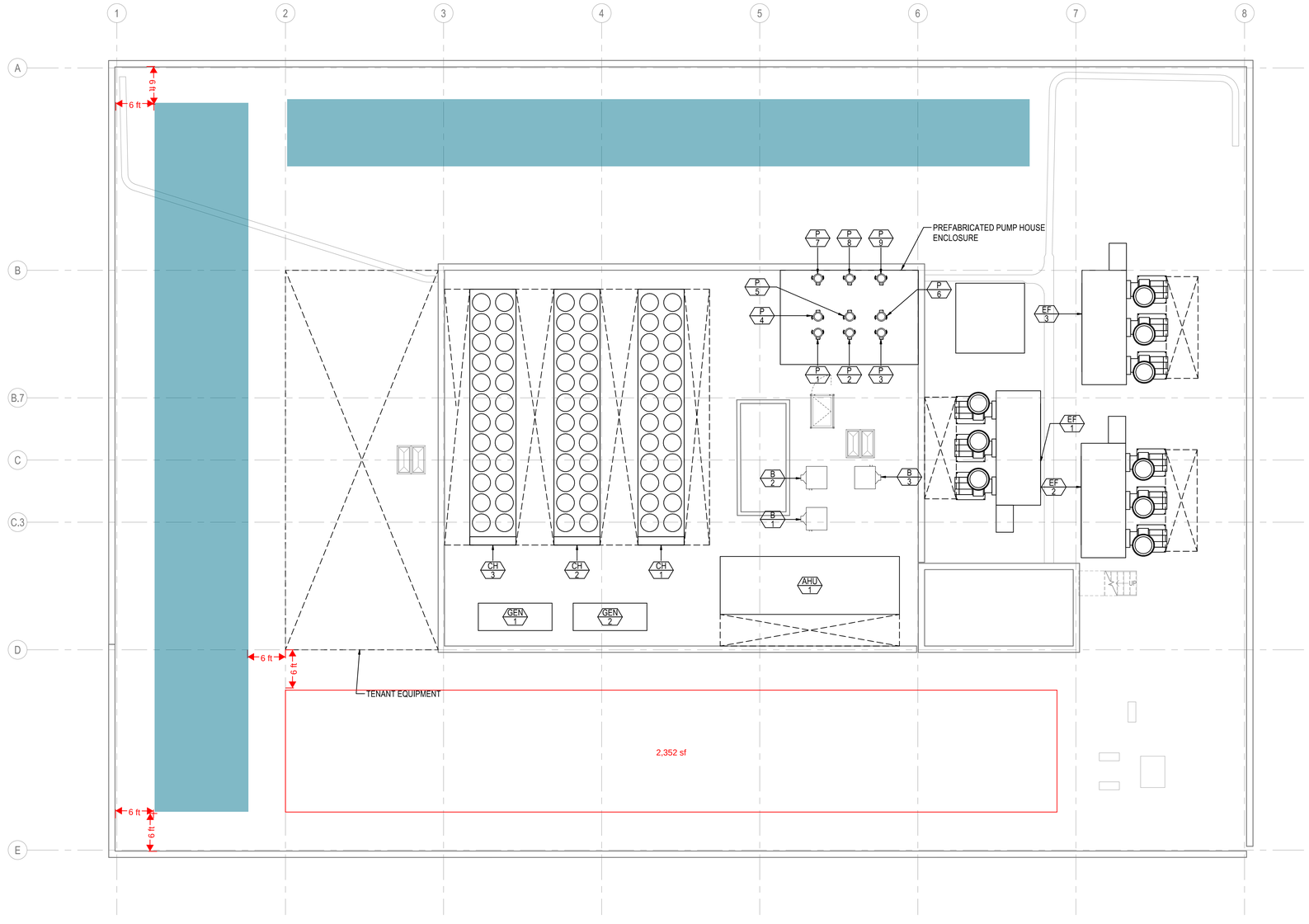
Baseline
Proposed
Net Zero



1 ROOF - MECHANICAL PLAN
SCALE: 1/8" = 1'-0"

TROIKA
STUDIOTROIKA.COM
15 Channel Center Street
Boston, MA 02210
p. 857.991.1021

IQHQ

CONSULTANTS

SYSKA HENNESSY GROUP (MEP/FP)
10 POST OFFICE SQUARE #725
BOSTON, MA 02109
617.577.9900

THORNTON TOMASETTI (STRUCTURAL)
27 WORMWOOD STREET SUITE 200
BOSTON, MA 02210
617.250.4110

STAMP

NOT FOR CONSTRUCTION

REVISIONS

#	DESCRIPTION	DATE
	100% SD Set	2021.10-07

NOTES

PROJECT TITLE
IQHQ

ONE ALEWIFE CENTER,
CAMBRIDGE, MA

PHASE
SCHEMATIC DESIGN

DRAWING TITLE
MECHANICAL FLOOR PLAN - ROOF

PROJECT NUMBER	21-003711
DATE	10.07.2021
DRAWN BY:	KO
CHECKED BY:	NF

M-205

SCALE 1/8" = 1'-0"

Cambridge Article 22 Special Permit Package

Project: Building 2 at Alewife Park

Section A: Green Building Project Checklist

Section B: Green Building Report (Including LEED-CS v4 checklist)

Section C: Green Building Professional Affidavit

Section D: Net Zero Energy Narrative with PV Analysis

(sections are bookmarked)

Green Building Project Checklist

Green Building Project Location: 36-64 Whittemore Avenue*

Applicant

Name: Christopher Schaffner

Address: 23 Bradford St., 1st Floor, Concord, MA 01742

Contact Information

Email Address: chris@greenengineer.com

Telephone #: 978-369-8978

Project Information (select all that apply):

- ☐ New Construction – GFA: 551,500 GFA
- ☐ Addition – GFA of Addition: _____
- ☐ Rehabilitation of Existing Building – GFA of Rehabilitated Area: 184,000 GFA**
  - ☐ Existing Use(s) of Rehabilitated Area: Office, research
  - ☐ Proposed Use(s) of Rehabilitated Area: Office, research
- ☒ Requires Planning Board Special Permit approval
- ☒ Subject to Section 19.50 Building and Site Plan Requirements
- ☐ Site was previously subject to Green Building Requirements

Green Building Rating Program/System:

- ☒ Leadership in Energy and Environmental Design (LEED) – Version: v4
  - ☒ Building Design + Construction (BD+C) – Subcategory: Core & Shell
  - ☐ Residential BD+C – Subcategory: _____
  - ☐ Interior Design + Construction (ID+C) – Subcategory: _____
  - ☐ Other: _____
- ☐ Passive House – Version: _____
  - ☐ PHIUS+
  - ☐ Passivhaus Institut (PHI)
  - ☐ Other: _____
- ☐ Enterprise Green Communities – Version: _____

** The full address of the property is 36-64, 53-59, 73, 91-99 & 115 Whittemore Avenue, 1R-3R Alewife Brook Parkway.*

*** One Alewife and Building 29 will remain and will be improved as part of the Project's proposed Buildings 1 and 2.*

Project Phase

☒ **SPECIAL PERMIT**

Before applying for a building permit, submit this documentation to CDD for review and approval.

Required Submissions

All rating programs:

- ☒ Rating system checklist
- ☒ Rating system narrative
- ☒ Net zero narrative (see example template for guidance)
- ☒ Affidavit signed by Green Building Professional with attached credentials – use City form provided (Special Permit)

Cambridge Article 22: Green Building Report
Special Permit

Project: Building 2 at Alewife Park

Issued: October 22, 2021

Image courtesy of Gensler

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III. LEEDv4 Checklist Summary Page 5

IV. LEED Credit Compliance Narrative Page 7

A. Integrative Process
B. Location and Transportation
C. Sustainable Sites
D. Water Efficiency
E. Energy and Atmosphere
F. Materials and Resources
G. Indoor Environmental Quality
H. Innovation in Design
I. Regional Priority Credits

Section I. PROJECT DESCRIPTION

The Alewife Park Project consists of the reuse of two existing buildings (Building 1 and Building 2), demolition of several existing structures and the new construction of three buildings and a structured parking garage, presenting a mix of office and life science laboratory uses as well as a small retail space, totaling approximately 735,500 square feet ("sf") of Gross Floor Area ("GFA"). The Project will provide approximately 653 parking spaces, including 350 parking garage spaces and 303 surface spaces. The Project will result in a net reduction in the number of registered parking spaces serving the Project Site of 69 parking spaces down from the current existing registered parking count of 722 spaces.

Specifically, Building 2 (formerly known as Building 29) located at 62 Whittemore Avenue, is an existing three-story building with a brick, punched window and curtain wall façade. The building contains a basement level and two levels above grade. The existing building has a gross floor area of 100,000 square feet, the height to the uppermost roof of the building is approximately 40'-6" and the building has a floor-to-floor height of 10'-2" at the basement level, 17'-1/2" at the first level and 14'-0" at the second level. There are two small penthouses at the southeast and southwest corners of the building that are approximately 20'-4" above the roof level. Mechanical equipment at the roof level will be screened by a new proposed 20'-0" high screen wall. Building 2 improvements include a full reclad of the building's exterior to greatly improve the building's thermal performance.

The building's primary uses are office and laboratory. The initial scope of the project included full exterior reclad of the building's elevations, limited interior renovations and MEP improvements. However, the scope is being expanded to ensure the project includes sufficient measures to meet the Article 22 requirements of LEED-CS v4 Gold Certifiability.

Detailed information on energy conservation measures is included in the attached Net Zero Energy narrative.

The Project will demonstrate Article 22 compliance following the LEED for Core and Shell (LEED-CS) version 4 rating system. For this application we have presented a LEED checklist and compliance strategy for the Project.

The team has committed to pursue formal LEED certification for the development. Additionally, since all portions of the project will be built as a campus with combined site and infrastructure elements the team will utilize a LEED Master Site strategy. This will allow the project to show compliance with various LEED elements from a "campus approach".

Additionally, all buildings will participate in the MassSave energy-efficiency utility incentive program. A kickoff meeting with all of the applicable utility providers is being scheduled for Building 2.

Section II. AFFIDAVIT

I, Christopher Schaffner, do hereby affirm that I have thoroughly reviewed the supporting documents for the LEEDv4 for Core & Shell rating system and confirm that the Building 2 renovation project is targeted to meet the requirement for Gold Certifiability with **61** points as 'Yes' and 17 possible 'Maybe' points. The Two Alewife project located in Cambridge, MA will be designed to meet the green building requirement under Article 22.20 of the Cambridge Zoning Ordinance.

Chris Schaffner, PE, LEED Fellow is founder and CEO of The Green Engineer, Inc. a sustainable design consulting firm located in Concord, MA. Chris has 33 years of experience in the design of building systems with a focus on energy efficiency and sustainability. He holds a B.S. in Mechanical Engineering from M.I.T., and is a registered professional engineer in Massachusetts, California and Vermont.

A long-time promoter of sustainable design, Chris was a charter member of the US Green Building Council's (USGBC) LEED Faculty (TM), training more than 10,000 building industry professionals in the use of the LEED Rating System since 2001. He recently completed his term on the LEED Steering Committee, where he served as 2019 LSC Chair. He previously served on the USGBC Board of Directors, the USGBC Advisory Council, as Chair of the Energy and Atmosphere Technical Advisory Group (TAG) and LEED Advisory Committee, and as a member of the Indoor Environmental Quality TAG, among other volunteer roles with the USGBC.

An executed Cambridge Affidavit has been provided.

Christopher Schaffner, PE, LEED Fellow
Massachusetts PE Registration #37211
The Green Engineer, Inc.
LEED Administrator and Sustainability Consultant


LEED AP BD+C

GREEN BUSINESS CERTIFICATION INC. CERTIFIES THAT

Christopher Schaffner

HAS ATTAINED THE DESIGNATION OF

LEED AP® Building Design + Construction

by demonstrating the knowledge and understanding of green building practices and principles needed to support the use of the LEED® green building program.

10580514-AP-BD+C
CREDENTIAL ID

10 OCT 2009
ISSUED

07 OCT 2023
VALID THROUGH

Mahesh Ramanujam

MAHESH RAMANUJAN
PRESIDENT & CEO, U.S. GREEN BUILDING COUNCIL
PRESIDENT & CEO, GREEN BUSINESS CERTIFICATION INC.

Section III. LEEDv4 CHECKLIST SUMMARY

Building 2 at Alewife Park (the "Project") was reviewed for compliance using the USGBC's LEED for Core & Shell (LEED-CS), version 4 rating system. The Project is targeting 61 out of a possible 110 credit points with an additional 17 credit points still undergoing evaluation to determine feasibility of achievement. By targeting 61 credit points, the Project anticipates meeting the City of Cambridge requirement to be LEED v4 Gold 'certifiable'. In addition to the City of Cambridge requirements, the Project will be registered under the LEED-CS v4 rating system and will be pursuing formal certification with the USGBC.

The team will continue to evaluate design options against LEED requirements with the goal being to design and renovate a building that minimizes its impact on the environment, creates an engaging and healthy space for occupants and reduces operating costs. Several credits remain designated as 'Maybe' due to the uncertainty of future design decisions, which is common at this phase of a project. The team will continue to evaluate LEED credits to pursue enough of a "point cushion" to ensure the Project meets the LEED Gold requirement

The USGBC recently released the beta version of the LEEDv4.1 rating system which is intended to serve as an update to (and improvement upon) LEEDv4. Recent guidance issued by the USGBC allows LEEDv4 projects to substitute any prerequisite or targeted credit for the LEEDv4.1 equivalent. Each of the credits that this Project intends to pursue using the LEED v4.1 criteria has been denoted with (LEEDv4.1) adjacent to the credit name within the scorecard below and ensuing credit narratives.

Y	M	N			
1	0	0	**Integrative Process**		1
1			Credit 1	Integrative Process	1

18	0	2	**Location and Transportation**		20
		N	Credit 1	LEED for Neighborhood Development Location	
2			Credit 2	Sensitive Land Protection	2
3			Credit 3	High Priority Site	3
4		2	Credit 4 (LEEDv4.1)	Surrounding Density and Diverse Uses	6
6			Credit 5 (LEEDv4.1)	Access to Quality Transit	6
1			Credit 6 (LEEDv4.1)	Bicycle Facilities	1
1			Credit 7 (LEEDv4.1)	Reduced Parking Footprint	1
1			Credit 8 (LEEDv4.1)	Green Vehicles	1

4	4	3	**Sustainable Sites**		11
Y			Prereq 1	Construction Activity Pollution Prevention	Required
1			Credit 1	Site Assessment	1
	1	1	Credit 2	Site Development - Protect or Restore Habitat	2
1			Credit 3	Open Space	1
	3		Credit 4 (LEEDv4.1)	Rainwater Management	3
		2	Credit 5	Heat Island Reduction	2
1			Credit 6	Light Pollution Reduction	1
1			Credit 7	Tenant Design and Construction Guidelines	1

2	1	8	Water Efficiency		11
Y			Prereq 1	Outdoor Water Use Reduction	Required
Y			Prereq 2	Indoor Water Use Reduction	Required
Y			Prereq 3	Building-Level Water Metering	Required
2			Credit 1	Outdoor Water Use Reduction	2
		6	Credit 2	Indoor Water Use Reduction	6
		2	Credit 3	Cooling Tower Water Use	2
	1		Credit 4	Water Metering	1

13	7	13	Energy and Atmosphere		33
Y			Prereq 1	Fundamental Commissioning and Verification	Required
Y			Prereq 2	Minimum Energy Performance	Required
Y			Prereq 3	Building-Level Energy Metering	Required
Y			Prereq 4	Fundamental Refrigerant Management	Required
5	1		Credit 1	Enhanced Commissioning	6
8	2	8	Credit 2	Optimize Energy Performance	18
		1	Credit 3	Advanced Energy Metering	1
		2	Credit 4 (LEEDv4.1)	Demand Response	2
	1	2	Credit 5	Renewable Energy Production	3
	1		Credit 6	Enhanced Refrigerant Management	1
	2		Credit 7	Green Power and Carbon Offsets	2

10	2	2	Materials and Resources		14
Y			Prereq 1	Storage and Collection of Recyclables	Required
Y			Prereq 2	Construction and Demolition Waste Management Planning	Required
6			Credit 1 (LEEDv4.1)	Building Life-Cycle Impact Reduction	6
1		1	Credit 2 (LEEDv4.1)	BPDO – EPD	2
	1	1	Credit 3 (LEEDv4.1)	BPDO - Sourcing of Raw Materials	2
1	1		Credit 4 (LEEDv4.1)	BPDO – Material Ingredients	2
2			Credit 5 (LEEDv4.1)	Construction and Demolition Waste Management	2

4	2	4	Indoor Environmental Quality		10
Y			Prereq 1	Minimum Indoor Air Quality Performance	Required
Y			Prereq 2 (LEEDv4.1)	Environmental Tobacco Smoke Control	Required
Y			Prereq 3	Minimum Acoustic Performance	Required
1		1	Credit 1	Enhanced Indoor Air Quality Strategies	2
2	1		Credit 2 (LEEDv4.1)	Low-Emitting Materials	3
1			Credit 3	Construction Indoor Air Quality Management Plan	1
		3	Credit 4 (LEEDv4.1)	Daylight	3
	1		Credit 5	Quality Views	1

6	0	0	Innovation		6
1			Credit 1	Innovation: Purchasing - Lamps	1
1			Credit 2	Innovation: O&M Starter Kit	1
1			Credit 3	Innovation in Design: TBD	1
1			Credit 4	Innovation in Design: TBD	1

1			Credit 5	Pilot Credit: Integrative Analysis of Building Materials	1
1			Credit 6	LEED Accredited Professional	1

3	1	0	**Regional Priority (earn up to 4 points)**		4
1			Credit 1	Regional Priority Credit: LTc3 High Priority Site (2 points)	1
	x		Credit 2	Regional Priority Credit: SSc4 Rainwater Mgmt (2 points)	x
		x	Credit 3	Regional Priority Credit: WEc2 Int. H2O Reduction (4 points)	x
1			Credit 4	Regional Priority Credit: EAc2 Opt. Eng. 20% (8 points)	1
	1		Credit 5	Regional Priority Credit: EAc5 Renewables (2 points)	1
1			Credit 6	Regional Priority Credit: MRc1 Bldg LCA (2 points)	1

61	17	32	**TOTALS**	**Possible Points:**	110

Section IV. LEED CREDIT NARRATIVE

As detailed below, the Project meets the LEED for Core & Shell Minimum Program Requirements and each of the required Prerequisites. Additionally, the following credits are being targeted.

** - Denotes credits pursued as part of LEED Master Site strategy*

A. Integrative Process (IP)

IP Credit 1 Integrative Process — 1 credit point

The Project has met the intent of this credit through identification of cross discipline opportunities to design a sustainable building project. Sustainable design focused meetings have been conducted in early design to assist the team in establishing shared sustainable design and energy / water efficiency goals for the project. Early design phase energy modeling has been conducted to review systems synergies and assess areas where energy loads may be significantly reduced. A water use analysis will be conducted to aid in establishing water use reduction targets.

The Project has conducted interdisciplinary early meetings focusing on sustainability. These meetings have included the ownership group, architect, MEP engineer, energy analyst, and sustainability expert. An initial workshop was conducted in February 2021. Early energy modeling will be performed to provide real feedback on decision-making. Additionally, the Project will be linked into the MassSave energy-efficiency incentive program. This early work will push the design to optimize the performance of the envelope and HVAC systems and explore additional opportunities for decreasing water use within the project.

B. Location and Transportation (LT)

LT Credit 2 Sensitive Land Protection — 2 credit points

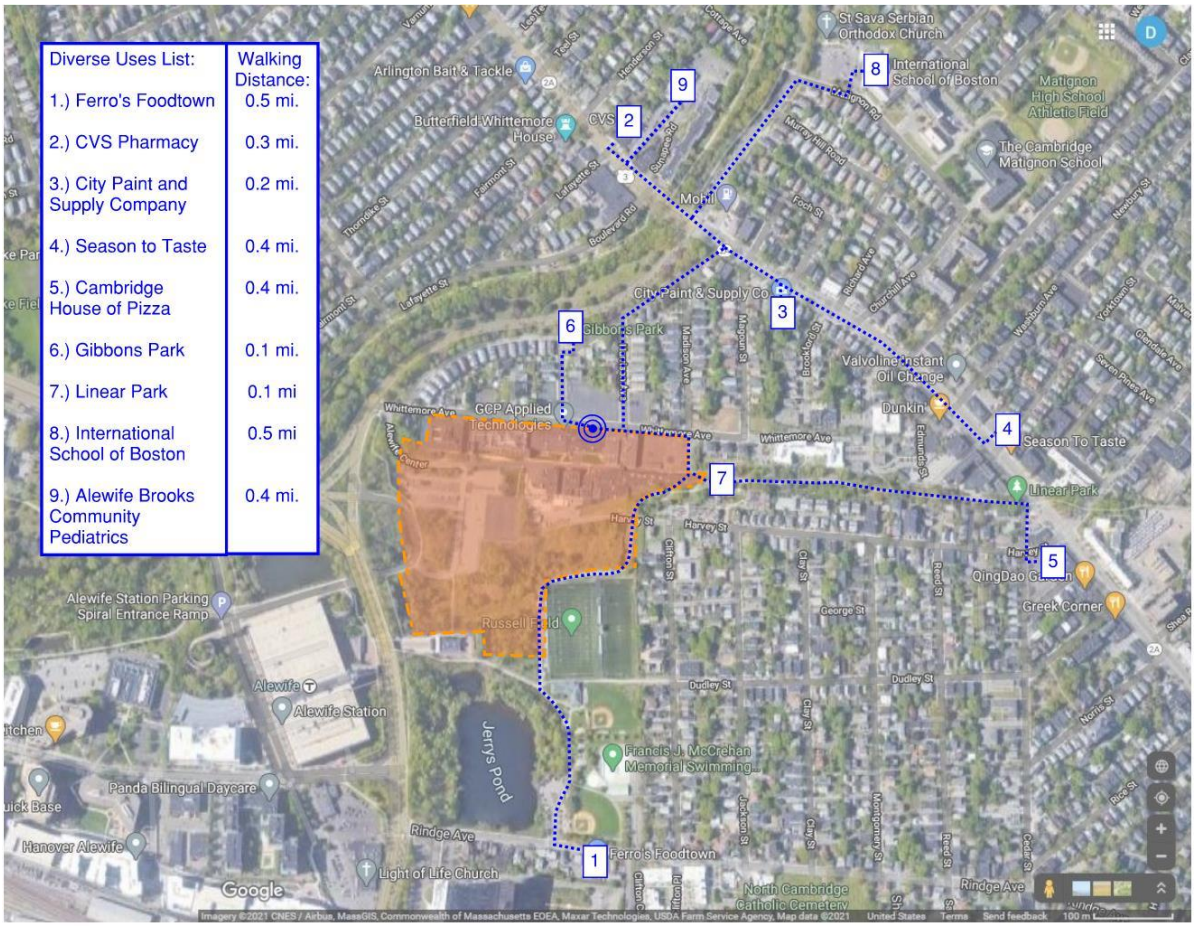
The Project will meet Option 1 requirements because it is located on a previously developed site.

*LT Credit 3 High Priority Site — 3 credit points

The Project site will meet Option 3 requirements for Brownfield remediation. The Project site is listed MassDEP as a Disposal Site under the MA Contingency Plan (MCP) (RTN 3-0277) and will require contaminated soil removal.

*LT Credit 4 Surrounding Density and Diverse Uses (LEEDv4.1) 4 credit points

The Project will meet Option 1 for Surrounding Density by being located in an area with an average density greater than 35,000 sf/acre. The Project will meet Option 2 for Diverse Uses by being located within ½ mile walking distance of at least 9 publicly available diverse uses in at least three separate use categories.



The development is located within ½ mile of the following 9 diverse uses:

Category	Use Type	# of Diverse uses	Business Name	Distance (mi.)
Food Retail	Grocery Store	1	Ferro's Foodtown	0.5 mi.
Community Serving Retail	Pharmacy	2	CVS Pharmacy	0.3 mi.
	Hardware Store	3	City Paint & Supply Company	0.2 mi.
Services	Restaurant	4	Season to Taste	0.4 mi.
	Cafe	5	Cambridge House of Pizza	0.4 mi.
Civic and Community Facilities	Public Park	6	Gibbons Park	0.1 mi.
	Public Park	7	Linear Park	0.1 mi.
	Educational Facility	8	International School of Boston	0.4 mi.
	Medical Clinic or Office that treats patients	9	Alewife Brooks Community Pediatrics	0.4 mi.

*LT Credit 5 Access to Quality Transit (LEEDv4.1) 6 credit points

LEEDv4.1: The Project is located within ½ mile walking distance of the Alewife station servicing the Red Line and 67 Bus line. The Project is also located within ¼ mile walking distance of the Massachusetts Ave. Bus Stop @ Lafayette and ½ mile walking distance of the Rindge Ave Bus Stop @ Rindge Ave opp Clifton St. (See table below for total trips)

	Total Rides Per Day		Percent of Total Rides Per Line	
	Weekday	Weekend	Weekday	Weekend
Red Line - Alewife, Braintree	208	169	21%	26%
Red Line - Alewife, Ashmont	206	169	21%	26%
Red Line - Ashmont, Mattapan	326	153	33%	24%
Bus 77 @ Lafayette St.	116	104	12%	16%
Bus 79 @ Lafayette St.	22	0	2%	0%
Bus 350 @ Lafayette St.	34	17	3%	3%
Bus 83 @ Rindge Ave opp Clifton St.	41	36	4%	6%
Bus 67 @ Alewife	23	0	2%	0%
Total:	976	647		

LT Credit 6 Bicycle Facilities (LEEDv4.1) 1 credit point

A minimum of 4 exterior short-term and 16 covered long-term bicycle storage is planned for visitors and regular occupants of the Project. Additionally, shower and changing facilities will be provided for use by building occupants. The immediate neighborhood provides a direct connection to a local bicycle network that links to a variety of services with pedestrian and cyclist access. The Project will meet City of Cambridge requirements for bike storage.

*LT Credit 7 Reduced Parking Footprint (LEEDv4.1) 1 credit point

A new, four-level parking garage and a redesigned surface lot are proposed to provide on-site parking for employees and visitors. The new parking garage will provide 350 parking spaces with an additional 303 surface spaces, which is an 53% reduction to the baseline number of parking spaces calculated from the ratios set forth in the LEED reference guide.

LT Credit 8 Green Vehicles (LEEDv4.1) 1 credit point

The applicant has committed to providing EV charging stations to satisfy the LEED credit by providing EV charging stations for 5% of the total parking capacity. There are 653 parking spaces that will be provide. Of those spaces, 5% will be outfitted as electric vehicle charging stations, which will require a total of 35 EV charging stations.

C. Sustainable Sites (SS)

SS Prerequisite 1: Construction Activity Pollution Prevention Required

The construction manager will be required to submit and implement an appropriate SWPPP/Erosion and Sedimentation Control (ESC) Plan for construction activities related to the construction of the Project. The ESC Plan will conform to the erosion and sedimentation requirements of the applicable NPDES regulations and specific municipal requirements for the City of Cambridge. Additionally, the ESC Plan will address management and containment of dust and particulate matter generated by on site demolition and construction activities.

SS Credit 1: Site Assessment 1 credit point

A comprehensive site assessment will be completed as part of the Project. The site assessment will include topography, hydrology, climate, vegetation, soils, human use, and human health effects and was used to inform the design.

*SS Credit 3: Open Space 1 credit point
The Project site design will provide outdoor space that is physically accessible and will be equal to or greater than 30% of the total site area. Current design shows >51% of the site is outdoor space that is physically accessible.

SS Credit 6 Light Pollution Reduction 1 credit point
The Project will meet uplight and light trespass requirements by complying with the LEED v4 BUG Rating method. To meet credit requirements, the site lighting will not exceed the LEEDv4 allowable luminaire backlight, uplight and glare ratings for the project's Lighting Zone.

SS Credit 7 Tenant Design and Construction Guidelines 1 credit point
Tenant Design and Construction Guidelines will be developed outlining the sustainable design and energy efficiency measures in the core and shell phases and providing detailed guidance for the office/lab tenants to design and build in alignment with the project sustainability goals. Information will also be included to assist tenants in pursuing LEED certification for their spaces. The team will encourage tenants to pursue LEED and/or WELL certification as part of their build out.

D. Water Efficiency (WE)

WE Prerequisite 1 Outdoor Water Use Reduction, 30% Required
The Project will meet the minimum requirement of 30% reduction. The Project site will include permanent irrigation that will use efficient technology and reclaimed rainwater such that no potable water use will be required.

WE Prerequisite 2 Indoor Water Use Reduction, 20% Reduction Required
Through the specification of low flush and flow and high efficiency plumbing fixtures, the Project will reduce potable water consumption by at least 20% over the baseline calculated for the building (not including irrigation) after meeting Energy Policy Act of 1992 fixture performance requirements.

WE Prerequisite 3 Building Level Water Metering Required
The Project will meet the requirements of this prerequisite by installing permanent water meters that measure the total potable water use of the building and associated grounds. In addition to installing the meters, the Project will commit to sharing water usage data with the USGBC for a five-year period beginning on the date the Project accepts LEED certification or typical occupancy, whichever comes first.

*WE Credit 1 Outdoor Water Use Reduction – 100% (LEEDv4.1) 2 credit points
The Project will achieve a 50% reduction in landscaping water demand through plant selection, and water efficient irrigation delivery and weather sensors. The Project site will include permanent irrigation that will use efficient technology and captured rainwater such that no potable water use will be required.

E. Energy and Atmosphere (EA)

EA Prerequisite 1 Fundamental Commissioning and Verification Required

A commissioning agent has been engaged by the Building Owner for purposes of providing fundamental commissioning services for the building energy related. The commissioning agent will perform the scope of work required to comply with the prerequisite in accordance with ASHRAE Guideline 0-2005 and ASHRAE Guideline 1.1-2007 for HVAC & R systems.

The commissioning agent (CxA) is independent of the project's design and construction management teams. The commissioning agent will report findings to the Building Owner. The Owner's Project Requirements and the Basis of Design documents will be provided to the CxA for review.

The following systems will be included in the Commissioning scope of work:

- Heating, ventilating, air conditioning and refrigeration (HVAC&R) systems
- HVAC controls
- Lighting controls
- Electrical systems
- Domestic hot water systems
- Plumbing and pumps
- Building Automation System

EA Prerequisite 2 Minimum Energy Performance Required

To meet the prerequisite, the Project's building performance will demonstrate a minimum of 5% improvement in energy use by cost when compared to a baseline building performance as calculated using the rating method in Appendix G of ANSI/ASHRAE/IESNA Standard 90.1-2010. The Project is also required to meet the MA Stretch Energy Code requirements.

This Project will achieve these savings through inclusion of the following ECMs:

1. Improved envelope performance
2. Reduced LPD in core/shell scope areas
3. Reduced ACH rate capability during unoccupied hours
4. High-efficiency heat recovery chilled water plant and hot water plants
5. Low-flow domestic hot water fixtures

Comprehensive, iterative energy modeling will be used to explore design options to meet all Code requirements and to provide substantiation for the LEED application. Energy performance goals were established during the Schematic Design phase of the Project. The Project team recognizes the importance of energy efficiency and will continue to evaluate opportunities to reduce energy use and increase points.

EA Prerequisite 3 Building Level Energy Metering Required

To meet the requirements of this prerequisite, the Project will install whole building energy meters for gas and electricity. In addition to installing the meters, the Project will commit to sharing energy usage data with the USGBC for a five-year period beginning on the date each accepts LEED certification or typical occupancy, whichever comes first. It is understood that at a minimum, the Project will be subject to the Building Energy Use Disclosure Ordinance and will annually report and disclose energy performance in terms of energy usage.

EA Prerequisite 4 Fundamental Refrigerant Management Required

CFC based refrigerants will not be used in the Project's HVAC & R systems. Any existing refrigerant-containing systems that are to be maintained as part of the existing building renovation will be evaluated to determine whether phase-out requirements are applicable.

EA Credit 1 Enhanced Commissioning 5 credit points

In addition to EApr1 Fundamental Commissioning and Verification requirements, Option 1 Path 1 Enhanced Commissioning and Option 2 Building Envelope Commissioning will be pursued by the Project. The Building Owner has engaged BR+A as MEP commissioning agent and SGH as BECxA to review the proposed design and verify the building systems meet the Owner's expectations and requirements.

The following commissioning process activities in addition to those required under EA Prerequisite Fundamental Commissioning and Verification will be completed by the commissioning agent, in accordance with ASHRAE Guideline 0–2005 and ASHRAE Guideline 1.1–2007 for HVAC&R systems, as they relate to energy, water, indoor environmental quality, and durability:

- Review contractor submittals.
- Verify inclusion of systems manual requirements in construction documents.
- Verify inclusion of operator and occupant training requirements in construction documents.
- Verify systems manual updates and delivery.
- Verify operator and occupant training delivery and effectiveness.
- Verify seasonal testing.
- Review building operations 10 months after substantial completion.
- Develop an on-going commissioning plan.

Requirements for enhanced commissioning will be included in the OPR and BOD.

EA Credit 2 Optimize Energy Performance 8 credit points

The project is designed to meet IECC 2015/ASHRAE 90.1-2013 energy efficiency requirements to comply with the requirements of the Massachusetts Stretch Energy Code. Based on preliminary modeling, it is expected that the project will achieve at least eight points following EApc95, which is equivalent to 17% improvement against a LEED baseline.

The team recognizes the importance of energy efficiency and will continue to evaluate opportunities reduce energy use and increase points within the Energy & Atmosphere category, specifically within the Optimize Energy Performance credit.

F. Materials and Resources (MR)

MR Prerequisite 1 Storage and Collection of Recyclables Required

The Project will meet this requirement. Storage of collected recyclables will be accommodated in a designated recycling area within the loading dock area. Recyclable materials collected will include mixed paper, corrugated cardboard, glass, plastics, and metals, and the disposal of batteries and electronic waste. A contracted waste management company will collect the recyclables on a regular basis.

MR Prerequisite 2 Construction and Demolition Waste Management Planning Required

The Project will meet the requirements of this prerequisite by including a Construction Waste Management section in Division 1 of the project manual. The specification will include direction for the construction manager to submit and implement a compliant waste management plan for the duration of construction. Waste diversion goals for the project will include at least five materials targeted for diversion.

MR Credit 1 Building Life-Cycle Impact Reduction (LEEDv4.1) 6 credit points

The Project will target 30% building reuse of existing building. This includes 30% reuse of existing structural elements (floors, roofs, envelope) for 5 points and 60% reuse of existing

non-structural elements (interior walls, doors, floor coverings and ceiling systems) for 1 additional point.

MR Credit 2 Bldg. Product Disclosure & Optimization: EPDs (LEEDv4.1) 1 credit point
The Project will achieve this credit via Option 1. The technical specifications will include direction for the construction manager and their sub-contractors to provide and submit materials and products Environmental Product Declarations that conform to ISO 14025, 14040, 14044, and EN 15804 or ISO 21930 and have at least a cradle to gate scope. The team will work to provide documentation for 20 different permanently installed products sourced from at least 5 different manufacturers.

MR Credit 4 BPDO: Material Ingredients (LEEDv4.1) 1 credit point
The Project will pursue Option 1 and Option 2 for product and material disclosure, and by selecting products and materials with third party confirmation of reduced hazardous substances. The project manual will include the information and direction for the construction manager and their sub-contractors to provide and submit materials and products documentation identifying the chemical make-up. The documentation may be Health Product Declarations, Cradle-to-Cradle or Declare certification. The team will provide documentation for 20 different permanently installed products sourced from at least 5 different manufacturers.

MR Credit 5 Construction & Demolition Waste Management (LEEDv4.1) 2 credit points
The Project will meet the requirements of this credit by including a Construction Waste Management section in Division 1 of the project manual. The specification will include direction for the construction manager to attempt to divert a minimum of 75% of the demolition and construction waste generated on site from area landfills. The construction waste management plan will include tracking five waste streams. Diverted material reported will include at least three different material streams. Demolition waste will be separated on site as part of the strategy to meet this credit.

G. Indoor Environmental Quality (IEQ)

IEQ Prerequisite 1 Minimum IAQ Performance Required
The Project's mechanical systems are designed to exceed the requirements of ASHRAE Standard 62.1-2010 sections 4 through 7. The mechanical engineer will complete a ventilation rate procedure (VRP) calculator to verify compliance for the Project. Outdoor airflow monitors are included in the project.

IEQ Prerequisite 2 Environmental Tobacco Smoke Control (LEEDv4.1) Required
Smoking will be prohibited in The Project and within 25' of the building. Signage will be posted within 10' of all building entrances to indicate the interior and exterior no-smoking policy.

IEQ Credit 1 Enhanced Indoor Air Quality Strategies 1 credit point
The Project is being designed to incorporate permanent entryway systems, properly enclosed and ventilated chemical use/storage areas, and compliant filtration media (MERV 13+).

IEQ Credit 2 Low Emitting Materials 2 credit points
The Project will achieve this credit through meeting the compliance criteria for at least three of the following product categories: interior paints and coatings, interior adhesives and sealants, flooring, ceilings, insulation, and composite wood. Three compliant categories on the Project will achieve 2 points.

IEQ Credit 3 Construction Indoor Air Quality Management Plan 1 credit point

The project manuals for the Project will include direction for the construction manager to develop and implement an Indoor Air Quality Management plan in compliance with applicable control measures as stated in the SMACNA IAQ Guidelines for Occupied Buildings under construction 2nd Edition, 2007 ANSI/SMACNA 008-2008 Chapter 3. Additional measures will be implemented to ensure absorptive materials will be protected from moisture damage.

H. Innovation (IN)

Inc1 Innovation: Purchasing - Lamps 1 credit point

The Project will achieve one innovation point by complying with LEED Innovation Credit: Purchasing – Lamps, which requires that the calculated average mercury content for the Project be below 35 picograms of Hg per lumen hour. The project will be 100% LED.

Inc2 Innovation, O & M Starter Kit 1 credit point

The Project will develop and implement compliant Green Cleaning and Integrated Pest Management policies that will ensure reduce the use of chemical inputs and provide increased human health and wellbeing during operation.

Inc3-4 Innovation, TBD 2 credit points

The Project is exploring options to achieve this Innovation credit and is confident that a path will be found to earn all innovation credits. Options include, but are not limited to, exemplary performance in an existing credit, Green Building Education, Occupant Comfort Survey, Social Equity within the Project team, Safety First policies, or Beauty and Design WELL feature compliance.

INc5 Pilot: Integrative Analysis of Building Materials 1 credit point

The Project will specify, purchase, and install three different permanently installed products that have a documented qualitative analysis of potential health, safety, and environmental impacts of the product over its life cycle.

INc6 LEED Accredited Professional 1 credit point

Many members of the team are LEED Accredited Professionals (APs).

I. Regional Priority (RP)

Regional Priority Credits (RPCs) are established by the USGBC to have priority for a particular area of the country. When a project team achieves one of the designated RPCs, an additional credit is awarded to the project. LEEDv4 RPCs applicable to the Cambridge area include: LTc3 High Priority Site (2 points), SSc4 Rainwater Management (2 points), WEc2 Indoor Water Use Reduction (4 points), EAc2 Optimize Energy Performance (17%/8 points), EAc5 Renewable Energy Production (3%/2 points), and MRc1 Building Life-Cycle Impact Reduction (2 points).

The Project is currently tracking the following RPCs:

LTc3 High Priority Site	1 credit point
EAc2 Optimize Energy Performance	1 credit point
MRc1 Building Life-Cycle Impact Reduction	1 credit point

--- End of Report ---

Affidavit Form for Green Building Professional
Special Permit

Green Building
Project Location: 36-64 Whittemore Avenue Cambridge, MA

Green Building Professional

Name: Christopher Schaffner

☐ Architect
☒ Engineer

License Number: Massachusetts PE Registration #37211
Company: The Green Engineer, Inc
Address: 23 Bradford Street, First Floor, Concord, MA 01742
Contact Information
Email Address: chris@greenengineer.com
Telephone Number: 978-369-8978

I, Christopher Schaffner, as the Green Building Professional for this Green Building Project, have reviewed all relevant documents for this project and confirm to the best of my knowledge that those documents indicate that the project is being designed to achieve the requirements of Section 22.24 under Article 22.20 of the Cambridge Zoning Ordinance.

(Signature) *(Date)* 2/19/2021

Attach either:

☒ Credential from the applicable Green Building Rating Program indicating advanced knowledge and experience in environmentally sustainable development in general as well as the applicable Green Building Rating System for this Green Building Project.

☐ If the Green Building Rating Program does not offer such a credential, evidence of experience as a project architect or engineer, or as a consultant providing third-party review, on at least three (3) projects that have been certified using the applicable Green Building Rating Program.

GREEN BUSINESS CERTIFICATION INC. CERTIFIES THAT

Christopher Schaffner

HAS ATTAINED THE DESIGNATION OF

LEED AP® Building Design + Construction

by demonstrating the knowledge and understanding of green building practices and principles needed to support the use of the LEED® green building program.

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VALID THROUGH

Mahesh Ramanujam

MAHESH RAMANUJAM
PRESIDENT & CEO, U.S. GREEN BUILDING COUNCIL
PRESIDENT & CEO, GREEN BUSINESS CERTIFICATION INC.

Green Building Requirements
Net Zero Narrative

Project Profile

Development Characteristics

Lot Area (sq.ft.):	784,926 SF
Existing Land Use(s) and Gross Floor Area (sq.ft.), by Use:	Office/Laboratory/storage; 393,684 sf. Ft. (60%/40% lab/office)
Proposed Land Use(s) and Gross Floor Area (sq.ft.), by Use:	Unchanged from existing use type
Proposed Building Height(s) (ft. and stories):	Building 2 (3 stories), existing height
Proposed Dwelling Units:	N/A
Proposed Open Space (sq.ft.):	Goal is to achieve 20% of open space, likely closer to 50%
Proposed Parking Spaces:	653 cars (303 surface, 350 in structured parking)
Proposed Bicycle Parking Spaces (Long-Term and Short-Term):	Building 2: Long term = 34 bikes per building; Short term = 6 bikes; Showers = 4.

Green Building Rating System

Choose the Rating System selected for this project:

LEED-Leadership in Energy & Environmental Design (U.S. Green Building Council)			
Rating System & Version:	LEED v4 Core and Shell	**Seeking**	Yes
Rating Level:	LEED Gold	**# of Points:**	(60-78 points)
Enterprise Green Communities			
Rating System & Version:	n/a	**Seeking**	No
Rating Level:	n/a	**# of Points:**	n/a
Passive House Institute US (PHIUS) or Passivhaus Institut (PHI)			
Rating System &	n/a	**Seeking**	No

Proposed Project Design Characteristics

Building Envelope

Assembly Descriptions:

Roof:	Existing to remain; Assume R-20
Foundation:	Existing to remain; Slab on grade
Exterior Walls:	Typical assembly: 5" continuous mineral wool, R-21.5
Windows:	Typical vision assembly: U-0.38, SHGC-0.38, VLT-0.54
Window-to-Wall Ratio:	22%
Other Components:	N/A

	Proposed		Baseline	
	Area (sf)	U-value	Area (sf)	U-Value
Window	7,525 SF	0.38	7,525 SF	0.38
Wall	21,285 SF	0.048	21,285 SF	0.064
Roof	35,105 SF	0.032	35,105 SF	0.032

Envelope Commissioning Process:

Option 2 Building Envelope Commissioning will be pursued by the Project. The Building Owner has engaged SGH as BECxA to review the proposed design and verify the building systems meet the Owner's expectations and requirements.

Building Mechanical Systems

Systems Descriptions:

Space Heating:	Central condensing boiler plant, 3 x 6000 mbh, 90% Eff. Water-cooled HRC chiller: 1 x 100 tons, 2.8 COP The hot water loop is designed with 143'F supply with a 30'F temperature drop.
Space Cooling:	Air Cooled Chiller (100%)= 1.108 KW/ TON. Unit provided with free cooling. Water Cooled Chiller CLG COP: 1.84
Heat Rejection:	
Pumps & Auxiliary:	CHW Loop: Primary only 80 Ft.Hd. HW Loop: Primary 120 FtHd, Secondary 80 Ft. Hd. Glycol Loop: 80 Ft. Hd.
Ventilation:	Lab: 100,000 CFM OA Office: 12,500 CFM OA
Domestic Hot Water:	Service hot water: condensing gas storage type: 2 x 600 mbh, 97% Eff, 130 gal (ea) Future Tenant Laboratory process hot water: Electric
Interior Lighting:	The project will comply with C406.3 and achieve a 10% lighting power density reduction beyond (MA amended) code requirements.
Exterior Lighting:	N/A
Other Equipment:	Lab: 6 w/sf process loads Office: 1.2 w/sf

Systems Commissioning Process:

A commissioning agent has been engaged by the Building Owner for purposes of providing fundamental commissioning services for the building energy related. In addition to EApr1 Fundamental Commissioning and Verification requirements, Option 1 Path 1 Enhanced Commissioning and Option 2 Building Envelope Commissioning will be pursued by the Project. The Building Owner has engaged BR+A as MEP commissioning agent and SGH as BECxA to review the proposed design and verify the building systems meet the Owner's expectations and requirements. In addition to the commissioning of mechanical and electrical systems, the Building Owner is considering engaging the commissioning agent to perform monitoring-based commissioning activities as they relate to the operations and maintenance of the building once it has been occupied. Requirements for enhanced and monitoring-based commissioning will be included in the OPR and BOD.

Building Energy Performance Measures

Overview

The project is utilizing integrative design methodology, and is incorporating early energy modeling for whole building analysis at multiple stages of design to advise the appropriate thermal properties of specific building envelope assemblies, and to further explore opportunities for energy reduction on mechanical systems, improve energy efficiency, and reduce greenhouse gas emissions.

Land Uses:	Sited on previously developed land, which is also classified as U.S. Department of Housing and Urban Development's Difficult Development Area
Building Orientation and Massing:	The project is a renovation of an existing building
Envelope Systems:	High performing envelope which meets the new code envelope backstop criteria has been designed for the project. It includes 5 inches of continuous insulation on walls and roofs, high performing glazing assemblies and an optimized window to wall ratio.
Mechanical Systems:	High efficiency equipment like variable flow RTUs, energy/heat recovery equipment, and high efficiency chiller and boiler plants with a heat recovery chiller are being used for the project.
Renewable Energy Systems:	Due to the nature of the project, a significant part of the roof will be occupied by large mechanical systems. The existing structure cannot structurally support additional solar PV or green roof loads. Although the existing structure cannot support additional green roof or PV systems, a roof PV assessment has been provided for reference.
District-Wide Energy Systems:	There is no existing feasible district steam connection (Vicinity) in close proximity to the site. No small-scale district energy solution is feasible given site soil conditions.
Other Systems:	EV charging stations to be provided for 5% of the total parking capacity for the project.

Integrative Design Process

The project team has collaborated on a number of design solutions to identify a cost effective basis of design that significantly exceeds current energy code requirements. Sustainable design focused meetings have been conducted in early design to assist the team in establishing shared sustainable design and energy / water efficiency goals for the project. Early design phase energy modeling has been conducted to review systems synergies and assess areas where energy loads may be significantly reduced. The Project has conducted interdisciplinary early meetings focusing on sustainability. An initial workshop was conducted in October 2021. Early energy modeling will be performed to provide real feedback on decision-making.

Green Building Incentive Program Assistance

The Project is will engage in the MassSave Large Building Incentives program at a future date through Eversource - the main utility provider for the project. As part of the program, the Project plans to facilitate an energy charrette with Eversource to identify energy conservation measures that can be incorporated in the MassSave program's incentive study.

Net Zero Scenario Transition

Several opportunities for future improvement of the Project have been identified that may be implemented for a Net Zero Option scenario. To achieve net zero would required a de-carbonization of the ISO New England electrical gid and deployment of technologies that can take advantage of grid improvements.

	Net Zero Condition:	Transition Process:
Building Envelope:	Possible options include provision of triple pane glazing	The proposed envelope is considered high performance and significantly exceeds minimum code requirements, including the newly adopted "envelope backstop" requirement. No upgrades would be necessary to achieve ZNE. Design alternate vision assembly: U-0.24, SHGC-0.35, VLT-0.5
HVAC Systems:	Future ZNE scenario assumes some sort of air source heat pump technology would be used. In this option the boilers and chillers would be replaced with modular air-cooled heat pumps that could provide chilled and hot water as needed.	We have carried out a review of the replacement of the gas fired boilers with air cooled heat pump units. The proposed changes to the building systems shall be as follows: 1. Replace the existing building air cooled chillers with heat pump units where their heating and cooling can be utilized. 2. The existing building heating load consists of 3 of 6000 MBH gas boilers. 3. The existing building cooling load is 800 Tons (consisting of 2 of 400 Ton air cooled chillers). 4. It is proposed to replace the air cooled chillers with 4 of 200 Ton Heat pump chiller units (each consisting of 8 modules ganged together). This arrangement shall maintain the existing building estimated chilled water requirements. Each chiller arrangement (4 of) would have an estimated weight of 22,400 lbs. 5. These heat pump units will also provide a total heating output of 6,060 MBH (1,515 MBH each Heat pump unit (4 of)). 6. In order to maintain the existing heating required then 2 of 6,005 MBH electric boilers shall be still required to supplement the heat pump heating output. This would require the additional provision of 2 of Precision boilers model number: HW36-176D. Each of these boilers would require 2,119 AMPs at 480/3/60 electrical power and would be 3,720 Lbs. Comments with respect to the proposed systems change: 1. The electrical service to the building would need to be increased by approximately 2 times its current size to provide the required power for the heat pump units and the electrical boilers. 2. There would be a requirement for approximately 5,937 Sq. Ft. of roof space for the required heat pump units (space for their minimum clearances) with additional 232 Sq. Ft. of the electrical boilers. 3. The estimated additional weight on the roof for the required equipment would be approximately 89,600 Lb. for the heat pump units and an additional 7,500 LB. for the electrical boilers. While not currently economically feasible, the Project could eventually be converted to all electric service. We would expect this to occur at the end of life of the original HVAC systems. There are a few options available. The actual methodology will depend on innovations in technology over the next several decades. Potential additional difficulties include the hot water temperatures that the heat pumps can generate. The current technology struggles to heat beyond the 130˚F. It is possible that future heat pump technology may be able to generate higher temperatures, but it should also be noted that the proposed HVAC systems will use lower temperatures to maximize boiler efficiency.

Net Zero Scenario Transition (CONTINUED)

Several opportunities for future improvement of the Project have been identified that may be implemented for a Net Zero Option scenario. To achieve net zero would required a de-carbonization of the ISO New England electrical gid and deployment of technologies that can take advantage of grid improvements.

	Net Zero Condition:	Transition Process:
Domestic Hot Water:	To lower energy use in the future, domestic hot water heating source can be a heat pump type water heater	At the end of life of the original equipment it is possible to easily convert the existing system to a high efficient heat pump system for domestic hot water system. The analysis assumes that electric resistance boilers will be retained for lab process hot water loads.
Lighting:	In a Core and Shell project, lighting design is driven by the tenant. Although beyond the Applicant's scope of work, it is assumed that the tenants will design their spaces at least 20% below the new code allowable lighting power density (LPD).	It is important to acknowledge that the new Massachusetts Building Energy Code has stringent LPD thresholds and the Applicant will be engaging in dialogue with the tenants to go beyond the code thresholds. This LPD reduction in tenant spaces may be required through tenant lease and sale agreement.
Renewable Energy Systems:	The project does not have the structural capacity to support rooftop PV installations. At a minimum the building will be solar-ready to accommodate future PV if structurally feasible.	Due to high energy use intensities for laboratory type buildings, offsite renewable energy sources are likely required to balance site energy sources. A number of options exist, including solar, wind, purchase power agreements and green power purchases.
Other Strategies:	N/A	N/A

Energy Systems Comparison

Overview

The Net Zero cost feasibility assessment includes the following energy conservation measures:
- Triple glazed window assemblies
- Air to water heat pump with supplemental electric hot water boilers
- 33 kW of rooftop solar PV

The total cost premium of the cited measures is approximately $7,551,427. Annual energy cost savings are not realized due to the higher cost of electricity when compared with natural gas. Based on this analysis, the NZE design option is not feasible when compared to the basis of design.

Most of the energy and cost savings are associated with the reduced ventilation rates specified to accommodate the active chilled beam system. This option significantly reduces the types of research that can be conducted, effectively limiting it to biology research. At this time, the developer has prioritzed future tenant flexibility to maximize utilization of the available space.

Assumptions

The building is in early design and is a Core and Shell speculative laboratory building typology (60/40 laboratory/office split) with ground floor retail. The project is incorporating early energy modeling for whole building analysis at multiple stages of design to explore opportunities for energy reduction on mechanical systems, improve energy efficiency, and reduce greenhouse gas emissions.

	Included in analysis?		**Describe the systems for which this was analyzed or explain why it was not included in the analysis:**
	Yes	**No**	
Solar Photovoltaics:	**X**		The building structure will not accommodate additional roof loads. For a theoretical estimate, TGE has estimated the theoretical capacity of rooftop PV panels for the project.

Solar Hot Water:		X	There is limited available roof area on the project. Any available area has been evaluated for PVs rather than solar hot water due to the larger impact per available area.
Ground-Source Heat Pumps (Geothermal):		X	Historic soil contamination and the lack of available lot area makes GSHP wells not feasible
Water-Source Heat Pumps:		X	Water source heat pumps typically use a conventional boiler plant as the primary heat source. Furthermore, this system type is not typically used for laboratory applications. While they may be used in office applications, it would require additional base building equipment (e.g. cooling tower, condenser loop piping, etc.) that reduces cost feasibility. Additionally,air-source solutions typically fare better due to the lack of boiler requirements.
Air-Source Heat Pumps:	X		The basis of design is a hydronic system that uses an water cooled heat recovery chiller to offset a portion of the annual heating loads.
Non-Carbon-Fuel District Energy:		X	There is no existing feasible district steam connection (Vicinity) in close proximity to the site. No small-scale district energy solution is feasible given site soil conditions
Other Non-Carbon-Fuel Systems:		X	n/a

Non-Carbon-Fuel Scenario

Zero carbon laboratories in dense urban areas have low feasibility due to the lack of area available to accommodate associated air-source or ground source equipment infrastructure. An air-source system would likely take all available roof area, plus additional (otherwise leaseable) mid elevation floors to house the condensing units necessary to meet the capacities anticipated by laboratory processes. Similarly, ground source systems would take a correspondingly large amount of ground area that is not accessible on the site. Additionally, high capacity deep bore systems do not have significant market penetration for laboratory applications and their feasibility is considered low due to associated capital costs, installation uncertainties and long term thermal performance of the ground heat exchanger. As a result, the net zero option described below is considered feasible using readily available technology, without the uncertainties inherent to the zero carbon option.

Solar-Ready Roof Assessment

Total Roof Area (sq. ft.):	28,760 SF See roof sketch at the end of this report for details. Due to mechanical and maintenance equipment appurtenances, only the mechanical penthouse roof area would be suitable for PV production.
Unshaded Roof Area (sq. ft.):	28,760 SF - no shading from adjacent structures
Structural Support:	As required to support potential PV capacity. The project does not currently have the structural capacity to support PV
Electrical Infrastructure:	As required to support potential PV capacity.
Other Roof Appurtenances:	Accounted for in the available roof area sketch.
Solar-Ready Roof Area (sq. ft.):	2,160 SF as indicated on the provided sketch.
Capacity of Solar Array:	33 kW installed capacity 42,000 kWh year typical production $5,800 annual electric cost offset
Financial Incentives:	The state solar SMART program will be solicited to determine the applicable incentive tier available at the time of enrollment. It's understood that the projects utility rate class, incentive tier and potential "rate adders" have a significant impact on overall cost feasibility.
Cost Feasibility:	Based on typical costs of recent installations, the simple payback without incentives is on the order of 17 years. Depending on SMART incentives available at the time of enrollment, the projected payback could be as low as 10 years. The payback may be reduced further as PV manufacturing costs continue to decline and technological advancements are made.

Results

	Proposed Design		Net Zero Scenario	
	Installation Cost	Maintenance Cost	Installation	Maintenance Cost
Envelope			$ 1,402,476	
HVAC Systems			$ 4,429,230	
Domestic Hot Water			$ 128,535	
On-site Renewable Energy (Solar PV)			$ 99,692	
Structural			$ 324,397	
Electrical			$ 1,167,097	
(Financial Incentives)			TBD - recently initiated the utility incentive process.	
Total Building Energy System Cost			$ 7,551,427	

See the overview from the (previous) energy systems comparison. The cited costs are limited to the additional cost (i.e. cost delta) beyond the basis of design. The proposed solutions are not expected to incur any significant maintenance cost penalties.

Anticipated Energy Loads and Greenhouse Gas Emissions

Assumptions

The building is in early design and is a Core and Shell speculative laboratory building typology (60/40 laboratory/office split) with ground floor retail. The project is incorporating early energy modeling for whole building analysis at multiple stages of design to explore opportunities for energy reduction on mechanical systems, improve energy efficiency, and reduce greenhouse gas emissions.

Annual Projected Energy Consumption and Greenhouse Gas (GHG) Emissions

	Baseline Building		Proposed Design		Future Net Zero	Non-Carbon-Fuel Scenario	
	MMBTU	% of Total	MMBTU	% of Total	MMBTU	MMBTU	% of Total
Lights	1,381	5%	1,176	6%	1,176	See Future Net Zero Option	
Misc. Equip	4,789	17%	4,789	25%	4,789		
Space Heating	11,010	40%	867	5%	735		
Space Cooling	1,717	6%	867	5%	1,564		
Heat Rejection		0%	141	1%	-		
Pumps & Aux	322	1%	291	2%	242		
Vent Fans	3,959	14%	7,009	37%	7,002		
DHW	4,191	15%	3,875	20%	3,875		
Ext Ltg	194	1%	97	1%	97		
	$US, kBTU, kBTU/SF		$US, kBTU, kBTU/SF	% Reduction from Baseline	$US, kBTU, kBTU/SF	$US, kBTU, kBTU/SF	% Reduction from Baseline
Site EUI	249		177	29%	175	See Future Net Zero Option	
Source EUI	550		533	3%	482		
Total Energy Use	27,563		19,014	31%	19,480		
Total Energy Cost	$ 883,366		922,830	-4%			
	MMBTU	% Total Energy	MMBTU	% Total Energy	MMBTU	MMBTU	% Total Energy
On-Site Renewable Energy Generation		-	-	-	141.8	See Future Net Zero Option	
Off-Site Renewable Energy Generation	-	-	-	-	19,338		
	Tons CO_2 [/SF]		Tons CO_2 [/SF]	% Reduction from Baseline			
GHG Emissions	1660		1283.5	23%			
GHG Emissions per SF	0.016		0.0127	23%			

Project Name: Building Two at Alewife Park
Submitted By: The Green Engineer, Inc.
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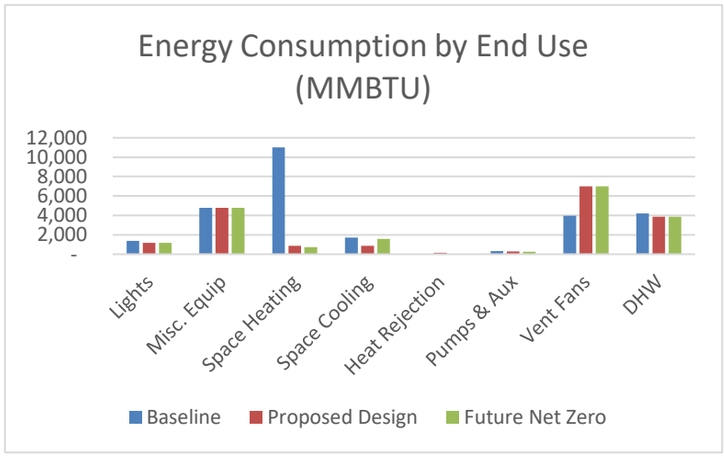

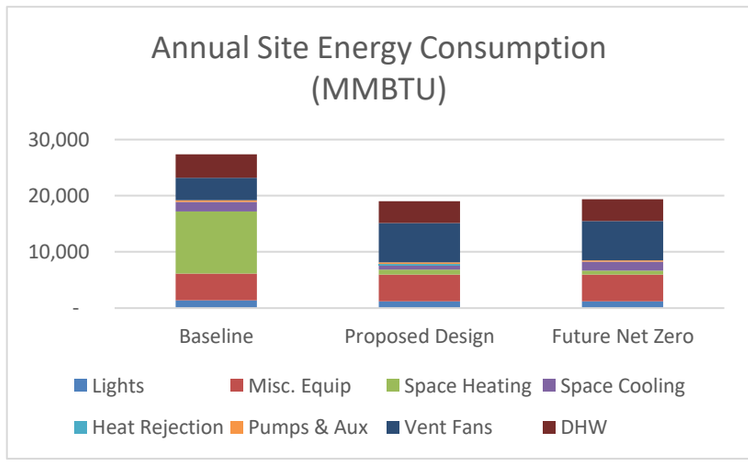

Portion of roof assessed for Solar Ready analysis