3. ENVIRONMENTAL IMPACTS

3.1 PEDESTRIAN WIND ASSESSMENT

FINAL REPORT

135 BROADWAY

CAMBRIDGE, MA

PEDESTRIAN WIND STUDY
RWDI # 2200459
October 22, 2021

SUBMITTED TO

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EXECUTIVE SUMMARY

RWDI was retained to conduct a pedestrian wind assessment for the proposed 135 Broadway development in Cambridge, MA (Image 1).

The following document summarizes the findings and results from our analyses. Wind comfort and safety conditions resulting from the study are shown on site plans in Figures 1 through 3. The associated wind speeds are listed in Table 1.

These results can be summarized as follows:

Wind Safety:

- Wind speeds that meet the RWDI wind safety criterion are predicted at all but one assessed location at grade-level. One location above grade (at the Level 38 rooftop terrace of the residential building) also failed to meet the safety target.

Wind Comfort:

- Wind speeds at all areas during the summer, and at most areas during the winter, are anticipated to be suitable for the intended use at all assessed locations on and around the site of the proposed development. During the winter, higher-than-desired wind speeds are anticipated at a few localized areas around the proposed office buildings.
- At the Level 6 podium terrace of the residential building, calm winds suitable for passive usage are anticipated at most areas during the summer. However, higher-than-desired wind speeds are anticipated at the south side of the Level 6 podium terrace and also at all assessed locations on the Level 38 rooftop terrace.
- Wind control measures that can be used to achieve the desired wind speeds at all grade and above-grade areas are described within the report.

3.1 PEDESTRIAN WIND ASSESSMENT

INTRODUCTION

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1 INTRODUCTION

RWDI was retained to conduct a pedestrian wind assessment for the proposed 135 Broadway development in Cambridge, MA. The project (site shown in Image 1) involves the construction of two 400,000 SF/289 ft tall office buildings and one 400,000 SF/430 ft tall residential tower on a land parcel located at the intersection of Binney Street and Galileo Way. The existing site features a multi-level parking garage and a two-story office building.

The objective of the study was to assess the effect of the proposed development on local pedestrian wind conditions and to provide recommendations for minimizing adverse effects, if needed. The assessment focused on critical pedestrian areas, including public sidewalks and building terraces.

This report presents the project objectives, approach and the main results from RWDI's assessment and provides conceptual wind control measures, where necessary.

Image 1: Aerial View of Site and Surroundings (Photo Courtesy of Google™ Earth)

2 BACKGROUND AND APPROACH

2.1 Generalized Wind Flows

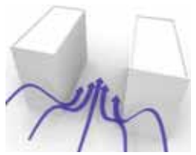
In our discussion of wind conditions, reference may be made to the following generalized wind flows (Image 2):

DOWNWASHING

Tall buildings tend to intercept the stronger winds at higher elevations and redirect them to the ground level. This is often the main cause for wind accelerations around large buildings at the pedestrian level.

CORNER ACCELERATION

When winds approach at an oblique angle to a tall façade and are deflected down, a localized increase in the wind activity or corner acceleration can be expected around the exposed building corners at pedestrian level.



CHANNELING EFFECT

When two buildings are situated side by side, wind flow tends to accelerate through the space between the buildings due to channeling effect caused by the narrow gap.

Image 2: Generalized Wind Flows

If these building/wind combinations occur for prevailing winds, there is a greater potential for increased wind activity. Design details such as; setting back a tall tower from the edges of a podium, deep canopies close to ground level, wind screens, tall trees with dense landscaping, etc. (Image 3) can help reduce wind speeds. The choice and effectiveness of these measures would depend on the exposure and orientation of the site with respect to the prevailing wind directions and the size and massing of the proposed buildings.

Podium/tower setback, canopy, landscaping and wind screens (left to right)

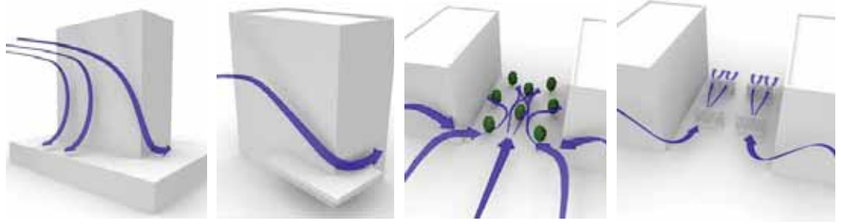


Image 3: Common Wind Control Measures

2.2 Physical Modeling

To assess the wind environment around the proposed project, a 1:300 scale model of the site and surroundings was constructed. The model reflected the proposed development in the context of surrounding existing buildings (Image 4). The wind tunnel model included all relevant surrounding buildings and topography within an approximately 1200 ft radius of the study site. The wind and turbulence profiles in the atmospheric boundary layer beyond the modelled area were also simulated in RWDI's wind tunnel.

The wind tunnel model was instrumented with 142 specially designed wind speed sensors to measure mean and gust speeds at a full-scale height of approximately 5 ft above local grade in pedestrian areas throughout the study site. Wind speeds were measured for 36 directions in a 10-degree increments. The measurements at each sensor location were recorded in the form of ratios of local mean and gust speeds to the mean wind speed at a reference height above the model. The placement of wind measurement locations was based on our experience and understanding of the pedestrian usage for this site.

3.1 PEDESTRIAN WIND ASSESSMENT

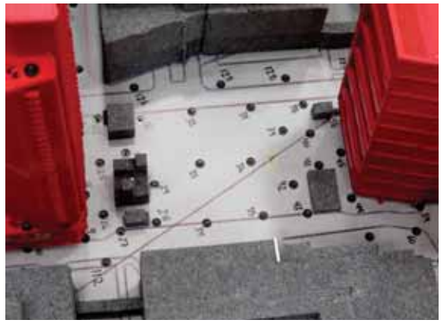


Image 4: Wind Tunnel Study Model – Proposed Configuration

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2.3 Meteorological Data

Wind statistics recorded at Boston Logan International Airport between 1990 and 2019, inclusively, were analyzed for the Summer (May through October) and Winter (November through April) seasons. Image 5 graphically depicts the directional distributions of wind frequencies and speeds for these two seasons. The most common wind directions are those between south-southwest and north-northwest. Winds from the east-northeast to the east-southeast are also strong but less frequent. In the case of strong winds, west-northwest, northwest, west and northeast are the dominant wind directions. Strong winds of a mean speed greater than 20 mph measured at the airport (at an anemometer height of 30 ft) occur for 3.9% and 11% of the time during the summer and winter seasons, respectively, and they are primarily from the southwest through northeast directions.

Wind statistics were combined with wind tunnel data to predict the frequency of occurrence of full-scale wind speeds, which were then compared with the wind criteria for pedestrian comfort and safety.

Summer (May – October) Winter (November – April)

Wind Speed (mph)	Probability (%) Summer	Winter
Calm	2.7	2.3
1-5	8.3	6.1
6-10	36.1	27.7
11-15	36.2	34.2
16-20	12.8	18.7
>20	3.9	11.0

Image 5: Directional Distribution of Winds Approaching Boston Logan International Airport between 1990 and 2019

3.1 PEDESTRIAN WIND ASSESSMENT

2.4 Wind Criteria

The RWDI pedestrian wind criteria, which have been developed by RWDI through research and consulting practice since 1974, are used in the current study. These criteria have been widely accepted by municipal authorities as well as by the building design and city planning community. Regional differences in wind climate and thermal conditions as well as variations in age, health, clothing, etc. can affect a person's perception of the wind climate. Therefore, comparisons of wind speeds for the existing and proposed building configurations are the most objective way in assessing local pedestrian wind conditions. In general, the combined effect of mean and gust speeds on pedestrian comfort can be quantified by a Gust Equivalent Mean (GEM).

Comfort Category	GEM Speed (mph)	Description
Sitting	≤ 6	Calm or light breezes desired for outdoor restaurants and seating areas where one can read a paper without having it blown away
Standing	≤ 8	Gentle breezes suitable for main building entrances, bus stops, and other places where pedestrians may linger
Strolling	≤ 10	Moderate winds that would be appropriate for window shopping and strolling along a downtown street, plaza or park
Walking	≤ 12	Relatively high speeds that can be tolerated if one's objective is to walk, run or cycle without lingering
Uncomfortable	> 12	Strong winds of this magnitude are considered a nuisance for all pedestrian activities, and wind mitigation is typically recommended

Notes:
(1) GEM Speed = max (Mean Speed, Gust Speed/1.85) and Gust Speed = Mean Speed + 3*RMS Speed;
(2) Wind conditions are considered to be comfortable if the predicted GEM speeds are within the respective thresholds for at least 80% of the time between 6:00 and 23:00. Nightly hours between 0:00 and 5:00 are excluded from the wind analysis for comfort since limited usage of outdoor spaces is anticipated; and,
(3) Instead of standard four seasons, two periods of summer (May to October) and winter (November to April) are adopted in the wind analysis, because in a cold climate such as that found in Cambridge, there are distinct differences in pedestrian outdoor behaviors between these two-time periods.

Safety Criterion	Gust Speed (mph)	Description
Exceeded	> 56	Excessive gust speeds that can adversely affect a pedestrian's balance and footing. Wind mitigation is typically required.

Notes:
(1) Based on an annual exceedance of 9 hours or 0.1% of the time for 24 hours a day; and,
(2) Only gust speeds need to be considered in the wind safety criterion. These are usually rare events, but deserve special attention in city planning and building design due to their potential safety impact on pedestrians.

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3 RESULTS AND DISCUSSION

The predicted wind conditions are shown on site plans in Figures 1 through 3 located in the "Figures" section of this report. These conditions and the associated wind speeds are also represented in Table 1, located in the "Tables" section. The following is a detailed discussion of the suitability of the predicted wind conditions for the anticipated pedestrian use of each area of interest.

Wind conditions comfortable for walking or strolling are appropriate for sidewalks and walkways as pedestrians will be active and less likely to remain in one area for prolonged periods of time. Lower wind speeds conducive to standing are preferred at main entrances where pedestrians are apt to linger. It is generally desirable for wind conditions on areas intended for passive activities, such as terraces and plaza areas, to be comfortable for sitting or standing for more than 80% of the time in the summer. During the winter, the area would not be used frequently and increased wind activity would be considered appropriate.

3.1 Pedestrian Safety

Wind speeds that meet the RWDI wind safety criterion are predicted at all but one grade-level location, namely at the northwest corner of the 250 Binney Street West office tower (Location 49 in Figure 3). One above-grade location was also identified as exceeding the safety criterion (i.e., Location 141 at the Level 38 rooftop terrace in Figure 3).

Mitigation measures involving landscaping, wind screens and/or deep canopies should be considered for these areas, as illustrated in Images 6 and 7.

3.2 Pedestrian Comfort

3.2.1 Grade Level (Locations 1 through 131)

Wind speeds on and around the site of the proposed development are anticipated to be comfortable for walking, standing or sitting during the summer (Figure 1), which is suitable for the intended use. During the winter, wind speeds around the residential building are anticipated to remain comfortable for the intended use. Uncomfortable wind speeds are however anticipated at a few locations around the western corners of the 250 Binney Street West building and in the gap between the two office buildings (Figure 2). These conditions are due to a combination of: 1) downwashing and corner acceleration of the prevailing westerly and northwesterly winds around the western corners of the 250 Binney Street West building, and 2) channeling of prevailing winds between the two office buildings, as shown schematically in Image 2. Examples of mitigation solutions that could be pursued to improve conditions are illustrated in Image 6.

3.1 PEDESTRIAN WIND ASSESSMENT

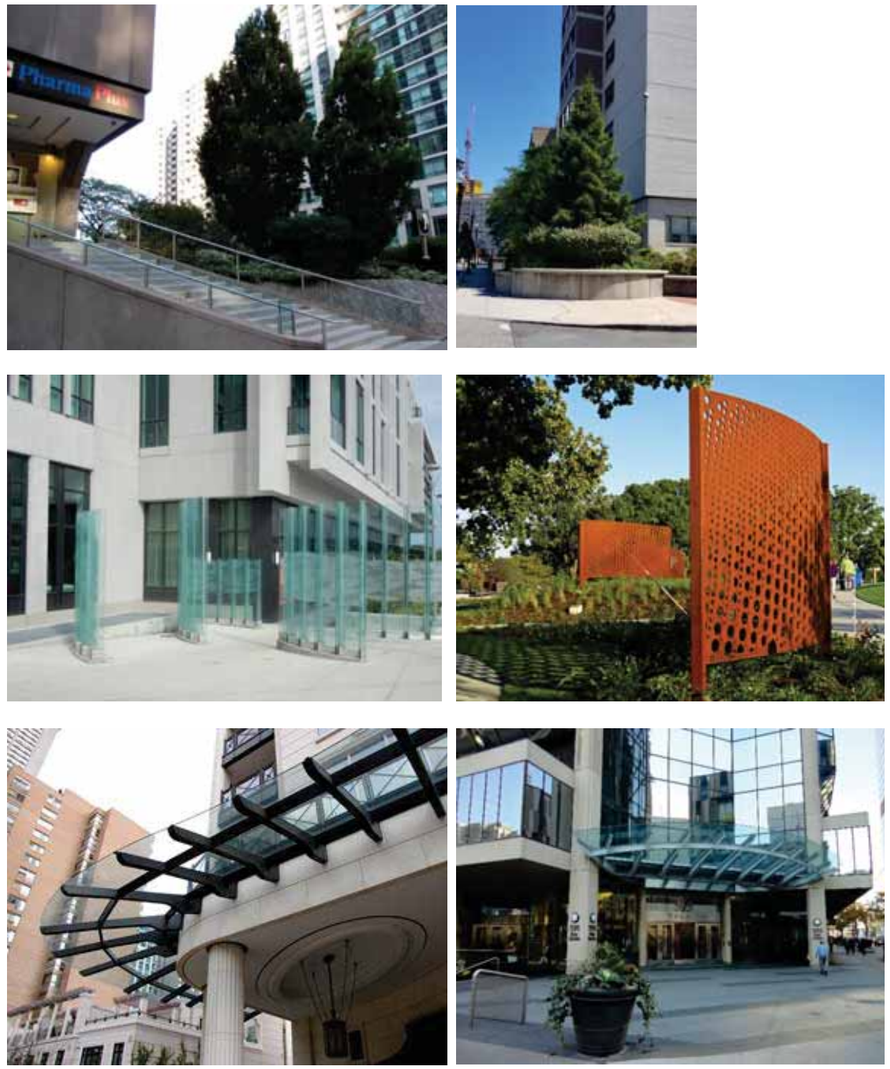

Image 6: Example Images of Recommended Wind Control Measures at the Grade Level such as Landscaping, Wind Screens and Canopies

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3.2.2 Terraces (Locations 132 through 142)

During the summer, calm wind speeds suitable for standing are anticipated at most areas of the Level 6 podium terrace of the residential building (Figure 1). However, higher-than-desired wind speeds suitable for strolling or walking are anticipated at the south side of the Level 6 podium terrace (Locations 133 and 134 in Figure 1) and at the Level 38 rooftop terrace (Locations 139 through 142 in Figure 1).

During the winter, generally higher wind speeds are anticipated on the terraces, some of which are anticipated to be uncomfortable (i.e., at the southwest corner of Level 6 podium terrace). These conditions may however be considered acceptable by the project team if limited use of the terraces is anticipated during the colder months.

General wind control measures to achieve lower wind speeds at the terraces include tall guardrails, wrap-around canopies, trellises, wind screens and/or landscaping, example images of which are shown in Image 7.

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Image 7: Example Images of Recommended Wind Control Measures on the Terraces such as Landscaping, Trellises, Wind Screen and Tall Guardrails

REFERENCES

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4 REFERENCES

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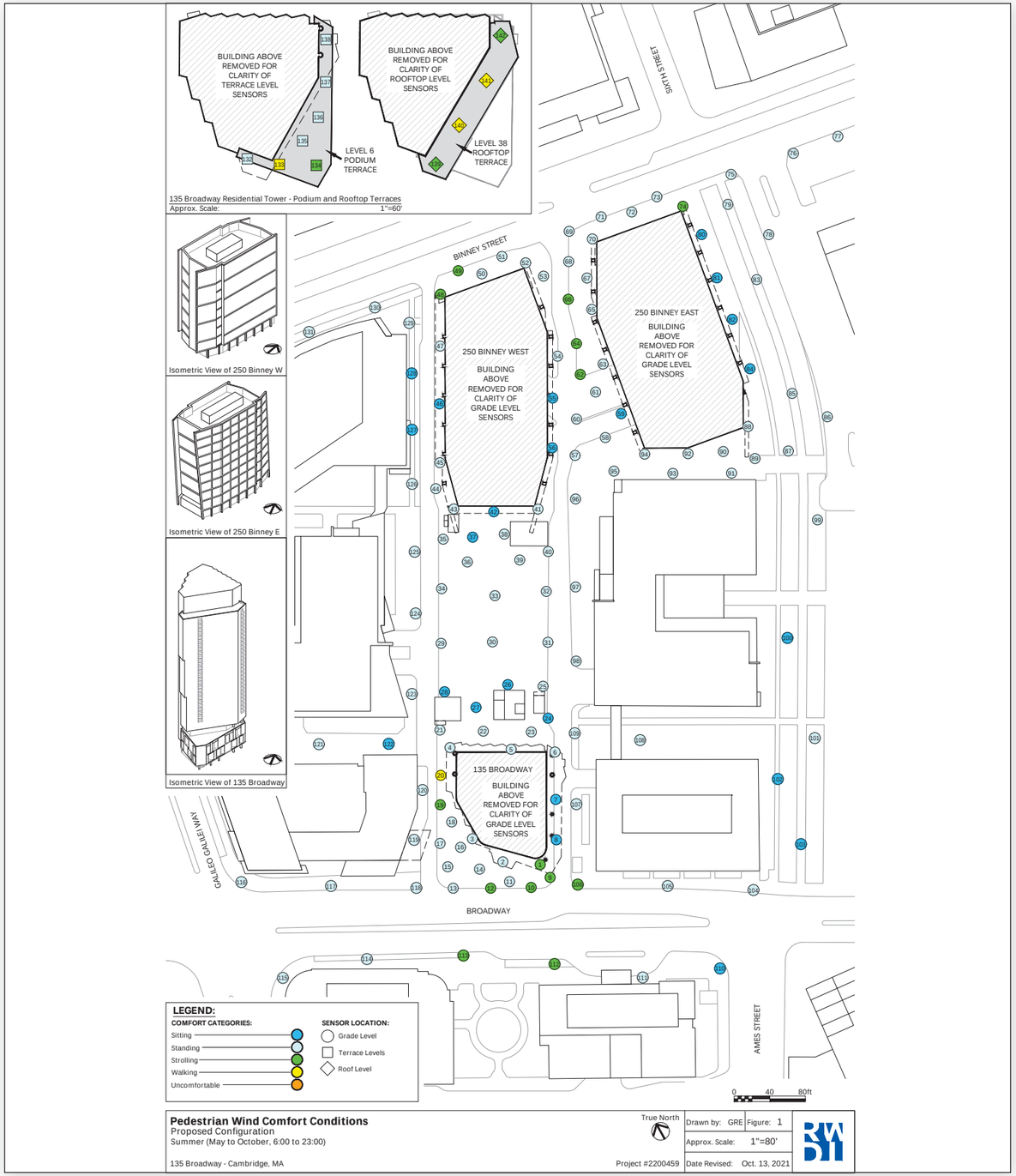
3.1 PEDESTRIAN WIND ASSESSMENT

FIGURES

FIGURES



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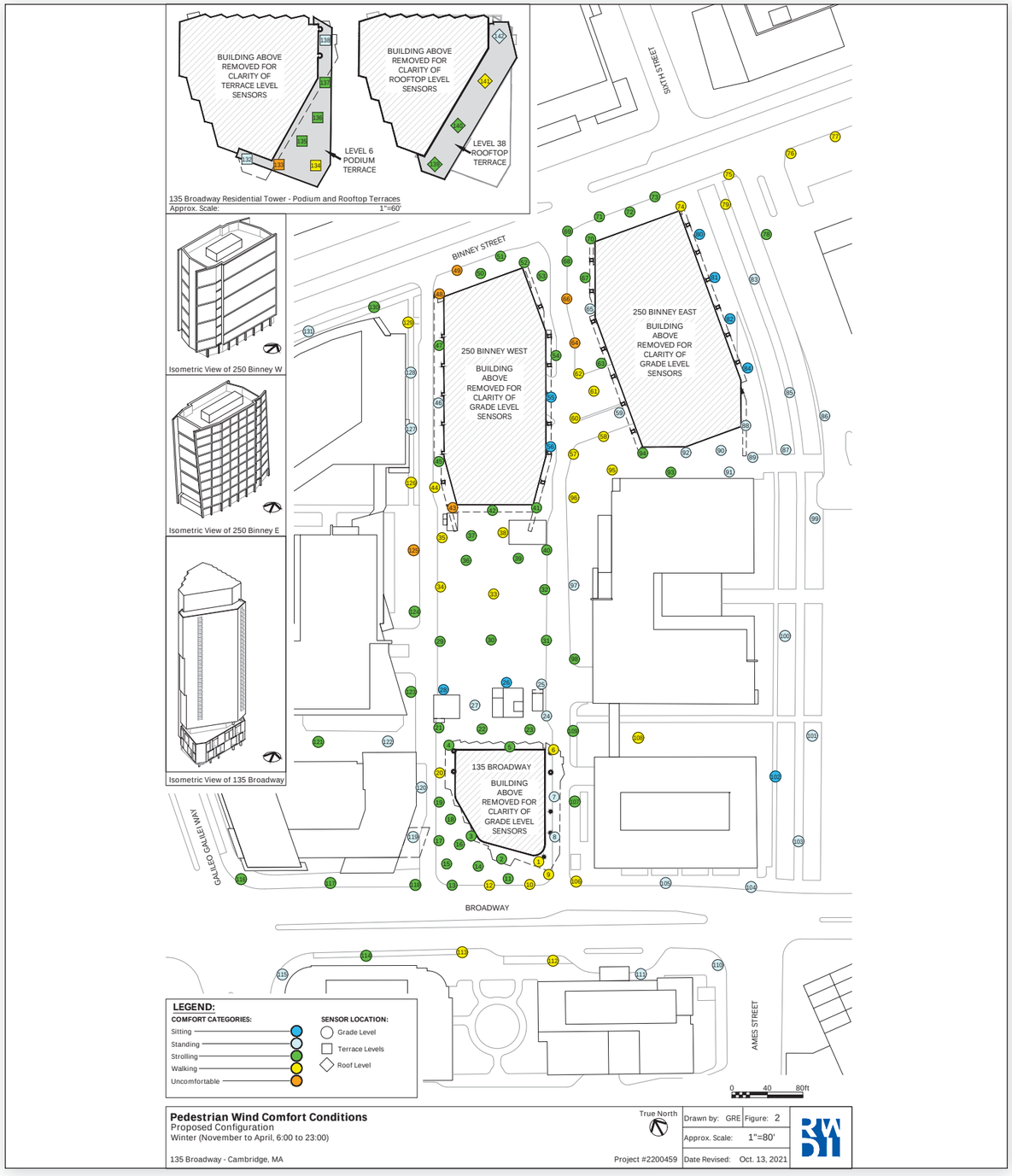

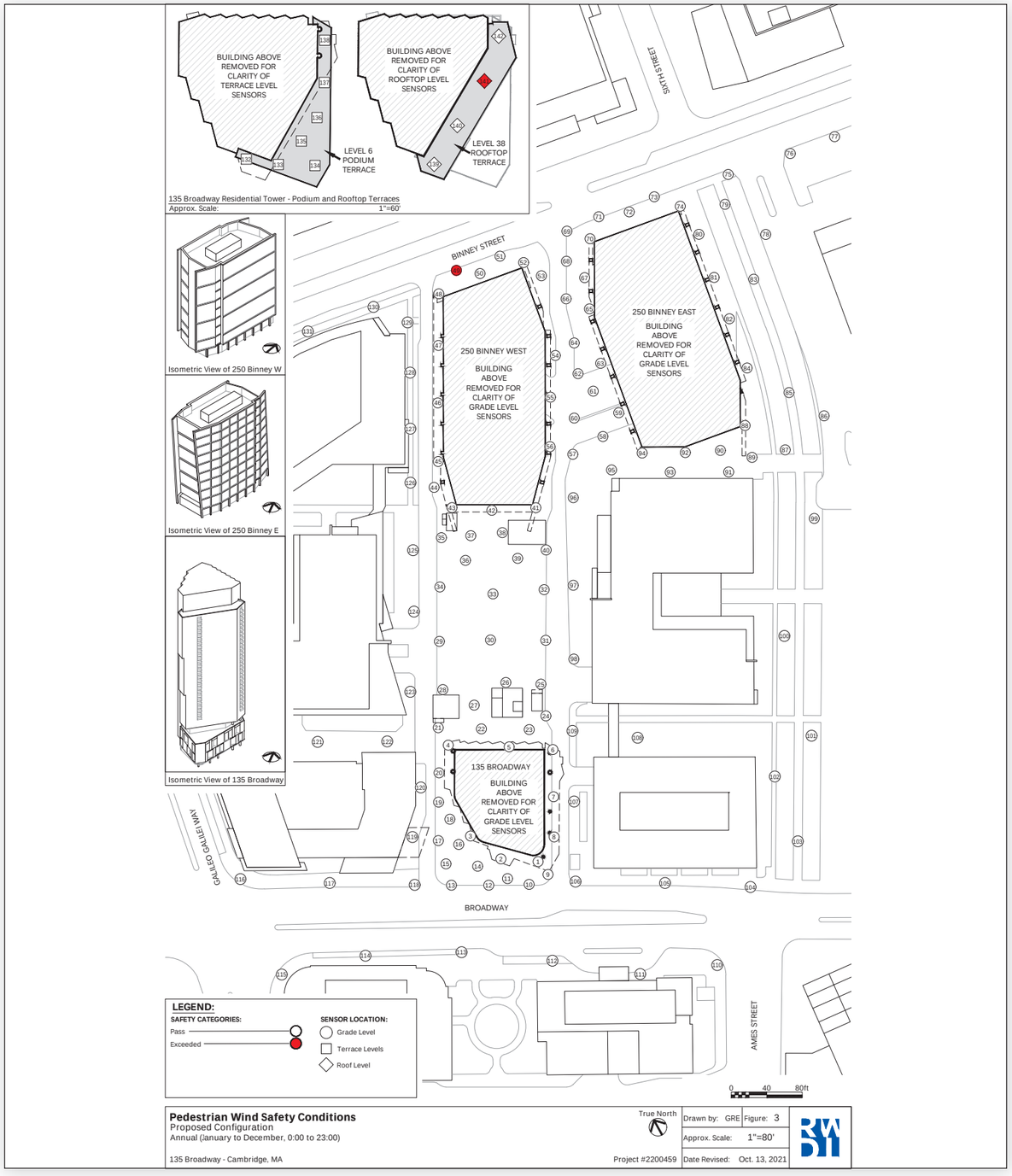

3.1 PEDESTRIAN WIND ASSESSMENT

TABLES

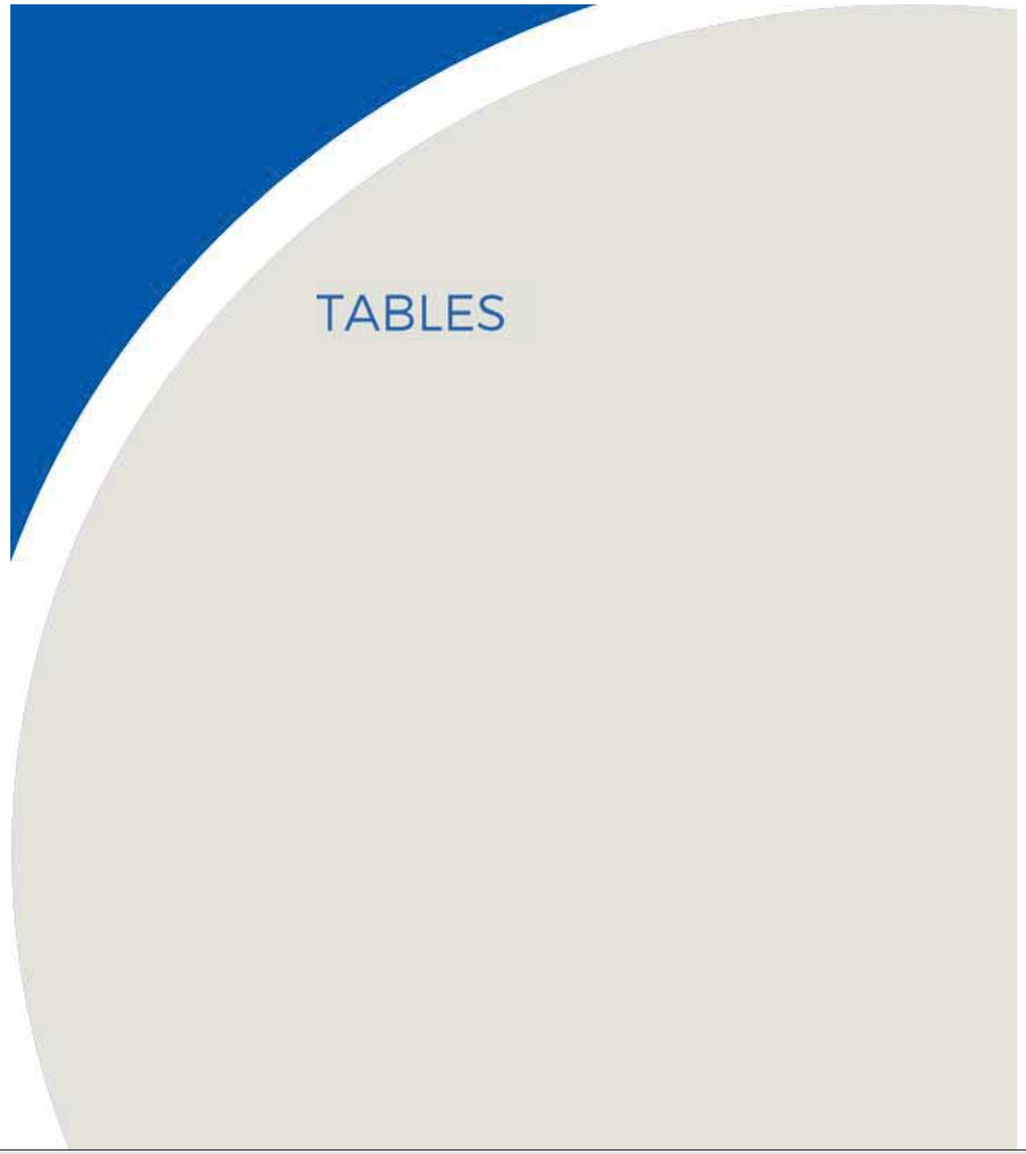

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (mph)	Rating	Speed (mph)	Rating	Speed (mph)	Rating
1	Proposed	10	Strolling	12	Walking	43	Pass
2	Proposed	8	Standing	9	Strolling	35	Pass
3	Proposed	7	Standing	9	Strolling	42	Pass
4	Proposed	8	Standing	10	Strolling	40	Pass
5	Proposed	7	Standing	9	Strolling	35	Pass
6	Proposed	8	Standing	11	Walking	44	Pass
7	Proposed	6	Sitting	7	Standing	26	Pass
8	Proposed	6	Sitting	7	Standing	29	Pass
9	Proposed	10	Strolling	12	Walking	43	Pass
10	Proposed	9	Strolling	11	Walking	39	Pass
11	Proposed	8	Standing	10	Strolling	38	Pass
12	Proposed	9	Strolling	11	Walking	40	Pass
13	Proposed	8	Standing	10	Strolling	39	Pass
14	Proposed	7	Standing	9	Strolling	36	Pass
15	Proposed	8	Standing	9	Strolling	38	Pass
16	Proposed	7	Standing	9	Strolling	41	Pass
17	Proposed	8	Standing	9	Strolling	39	Pass
18	Proposed	8	Standing	10	Strolling	42	Pass
19	Proposed	9	Strolling	10	Strolling	43	Pass
20	Proposed	11	Walking	12	Walking	47	Pass
21	Proposed	7	Standing	9	Strolling	38	Pass
22	Proposed	8	Standing	10	Strolling	39	Pass
23	Proposed	7	Standing	9	Strolling	37	Pass
24	Proposed	6	Sitting	7	Standing	34	Pass
25	Proposed	7	Standing	8	Standing	30	Pass
26	Proposed	5	Sitting	6	Sitting	24	Pass
27	Proposed	6	Sitting	8	Standing	31	Pass

3.1 PEDESTRIAN WIND ASSESSMENT

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (mph)	Rating	Speed (mph)	Rating	Speed (mph)	Rating
28	Proposed	5	Sitting	6	Sitting	24	Pass
29	Proposed	8	Standing	10	Strolling	43	Pass
30	Proposed	7	Standing	10	Strolling	43	Pass
31	Proposed	7	Standing	9	Strolling	38	Pass
32	Proposed	7	Standing	9	Strolling	40	Pass
33	Proposed	8	Standing	11	Walking	47	Pass
34	Proposed	8	Standing	11	Walking	43	Pass
35	Proposed	7	Standing	11	Walking	40	Pass
36	Proposed	7	Standing	10	Strolling	40	Pass
37	Proposed	6	Sitting	9	Strolling	35	Pass
38	Proposed	7	Standing	11	Walking	45	Pass
39	Proposed	7	Standing	10	Strolling	43	Pass
40	Proposed	7	Standing	10	Strolling	43	Pass
41	Proposed	7	Standing	10	Strolling	39	Pass
42	Proposed	6	Sitting	9	Strolling	37	Pass
43	Proposed	8	Standing	13	Uncomfortable	48	Pass
44	Proposed	8	Standing	11	Walking	43	Pass
45	Proposed	7	Standing	10	Strolling	40	Pass
46	Proposed	6	Sitting	8	Standing	35	Pass
47	Proposed	7	Standing	9	Strolling	36	Pass
48	Proposed	10	Strolling	14	Uncomfortable	53	Pass
49	Proposed	10	Strolling	14	Uncomfortable	57	Exceeded
50	Proposed	7	Standing	10	Strolling	42	Pass
51	Proposed	7	Standing	10	Strolling	42	Pass
52	Proposed	7	Standing	9	Strolling	38	Pass
53	Proposed	8	Standing	10	Strolling	51	Pass
54	Proposed	7	Standing	9	Strolling	41	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (mph)	Rating	Speed (mph)	Rating	Speed (mph)	Rating
55	Proposed	5	Sitting	6	Sitting	24	Pass
56	Proposed	4	Sitting	6	Sitting	22	Pass
57	Proposed	8	Standing	12	Walking	47	Pass
58	Proposed	8	Standing	11	Walking	43	Pass
59	Proposed	6	Sitting	7	Standing	31	Pass
60	Proposed	8	Standing	11	Walking	43	Pass
61	Proposed	8	Standing	12	Walking	45	Pass
62	Proposed	9	Strolling	12	Walking	47	Pass
63	Proposed	7	Standing	9	Strolling	37	Pass
64	Proposed	10	Strolling	13	Uncomfortable	52	Pass
65	Proposed	7	Standing	8	Standing	40	Pass
66	Proposed	10	Strolling	13	Uncomfortable	51	Pass
67	Proposed	7	Standing	9	Strolling	42	Pass
68	Proposed	7	Standing	9	Strolling	39	Pass
69	Proposed	8	Standing	10	Strolling	39	Pass
70	Proposed	8	Standing	10	Strolling	42	Pass
71	Proposed	8	Standing	10	Strolling	42	Pass
72	Proposed	7	Standing	10	Strolling	40	Pass
73	Proposed	8	Standing	10	Strolling	42	Pass
74	Proposed	9	Strolling	12	Walking	44	Pass
75	Proposed	8	Standing	12	Walking	42	Pass
76	Proposed	8	Standing	11	Walking	45	Pass
77	Proposed	8	Standing	11	Walking	44	Pass
78	Proposed	8	Standing	10	Strolling	48	Pass
79	Proposed	8	Standing	12	Walking	46	Pass
80	Proposed	5	Sitting	5	Sitting	37	Pass
81	Proposed	6	Sitting	6	Sitting	32	Pass

3.1 PEDESTRIAN WIND ASSESSMENT

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (mph)	Rating	Speed (mph)	Rating	Speed (mph)	Rating
82	Proposed	6	Sitting	6	Sitting	32	Pass
83	Proposed	8	Standing	8	Standing	45	Pass
84	Proposed	6	Sitting	6	Sitting	41	Pass
85	Proposed	7	Standing	8	Standing	43	Pass
86	Proposed	7	Standing	8	Standing	44	Pass
87	Proposed	7	Standing	8	Standing	40	Pass
88	Proposed	7	Standing	7	Standing	36	Pass
89	Proposed	7	Standing	8	Standing	35	Pass
90	Proposed	8	Standing	8	Standing	37	Pass
91	Proposed	8	Standing	8	Standing	39	Pass
92	Proposed	7	Standing	8	Standing	40	Pass
93	Proposed	8	Standing	10	Strolling	43	Pass
94	Proposed	8	Standing	10	Strolling	43	Pass
95	Proposed	8	Standing	11	Walking	45	Pass
96	Proposed	8	Standing	12	Walking	49	Pass
97	Proposed	7	Standing	8	Standing	37	Pass
98	Proposed	7	Standing	9	Strolling	39	Pass
99	Proposed	7	Standing	7	Standing	38	Pass
100	Proposed	6	Sitting	7	Standing	35	Pass
101	Proposed	7	Standing	8	Standing	34	Pass
102	Proposed	6	Sitting	6	Sitting	31	Pass
103	Proposed	6	Sitting	7	Standing	30	Pass
104	Proposed	7	Standing	8	Standing	34	Pass
105	Proposed	7	Standing	8	Standing	35	Pass
106	Proposed	10	Strolling	12	Walking	42	Pass
107	Proposed	7	Standing	9	Strolling	40	Pass
108	Proposed	8	Standing	12	Walking	43	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (mph)	Rating	Speed (mph)	Rating	Speed (mph)	Rating
109	Proposed	8	Standing	10	Strolling	40	Pass
110	Proposed	6	Sitting	8	Standing	30	Pass
111	Proposed	7	Standing	8	Standing	30	Pass
112	Proposed	9	Strolling	12	Walking	40	Pass
113	Proposed	10	Strolling	11	Walking	42	Pass
114	Proposed	7	Standing	9	Strolling	39	Pass
115	Proposed	7	Standing	8	Standing	35	Pass
116	Proposed	8	Standing	10	Strolling	37	Pass
117	Proposed	7	Standing	9	Strolling	35	Pass
118	Proposed	8	Standing	10	Strolling	38	Pass
119	Proposed	7	Standing	8	Standing	36	Pass
120	Proposed	8	Standing	8	Standing	35	Pass
121	Proposed	7	Standing	10	Strolling	48	Pass
122	Proposed	6	Sitting	8	Standing	38	Pass
123	Proposed	8	Standing	9	Strolling	45	Pass
124	Proposed	8	Standing	10	Strolling	43	Pass
125	Proposed	8	Standing	14	Uncomfortable	48	Pass
126	Proposed	8	Standing	12	Walking	42	Pass
127	Proposed	6	Sitting	8	Standing	37	Pass
128	Proposed	6	Sitting	7	Standing	37	Pass
129	Proposed	8	Standing	12	Walking	45	Pass
130	Proposed	7	Standing	9	Strolling	36	Pass
131	Proposed	7	Standing	8	Standing	40	Pass
132	Proposed	7	Standing	8	Standing	35	Pass
133	Proposed	11	Walking	13	Uncomfortable	50	Pass
134	Proposed	9	Strolling	11	Walking	45	Pass
135	Proposed	8	Standing	10	Strolling	42	Pass

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Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (mph)	Rating	Speed (mph)	Rating	Speed (mph)	Rating
136	Proposed	8	Standing	10	Strolling	41	Pass
137	Proposed	8	Standing	9	Strolling	41	Pass
138	Proposed	7	Standing	7	Standing	35	Pass
139	Proposed	10	Strolling	9	Strolling	49	Pass
140	Proposed	11	Walking	10	Strolling	51	Pass
141	Proposed	12	Walking	11	Walking	57	Exceeded
142	Proposed	10	Strolling	8	Standing	45	Pass

Season	Months	Hours
Summer	May - October	6:00 - 23:00 for comfort
Winter	November - April	6:00 - 23:00 for comfort
Annual	January - December	0:00 - 23:00 for safety
Configurations		
Proposed: Proposed development with existing surroundings		

Comfort Speed (mph)	
(20% Seasonal Exceedance)	
≤ 6	Sitting
7 - 8	Standing
9 - 10	Strolling
11 - 12	Walking
> 12	Uncomfortable

Safety Speed (mph)	
(0.1% Annual Exceedance)	
≤ 56	Pass
> 56	Exceeded

600 Southgate Drive
Guelph ON Canada
N1G 4P6

Tel: +1.519.823.1311
Fax: +1.519.823.1316
E-mail: solutions@rwdi.com

January 5, 2022

Ian Hatch
Project Manager

BXP – Boston Properties
800 Boylston Street
Suite 1900
Boston, MA 02199-8103
Email: ihatch@bxp.com

Re: Pedestrian Wind Conditions – Summary of Comments
135 Broadway
RWDI Reference No. 2200459

Dear Ian,

RWDI has carried out detailed pedestrian wind modeling for the residential and commercial development proposed at 135 Broadway, in Boston, MA. A report summarizing the results and recommendations from our work was issued on October 22, 2021.

Following submission of this document, RWDI has received updated massing information for the 135 Broadway residential building on December 3, 2021, and for the Commercial Buildings C & D (290 & 250 Binney Street) on December 6, 2021. From our review of this information, we confirm that the updated design of the buildings will not have a significant impact on the results presented in our October 2021 report. As such, the conclusions and recommendations in the report remain unchanged.

It is RWDI's understanding that unsafe and/or uncomfortable pedestrian conditions identified in the study will be mitigated by the design team with the implementation of appropriate wind control measures.

Respectfully submitted by:
RWDI

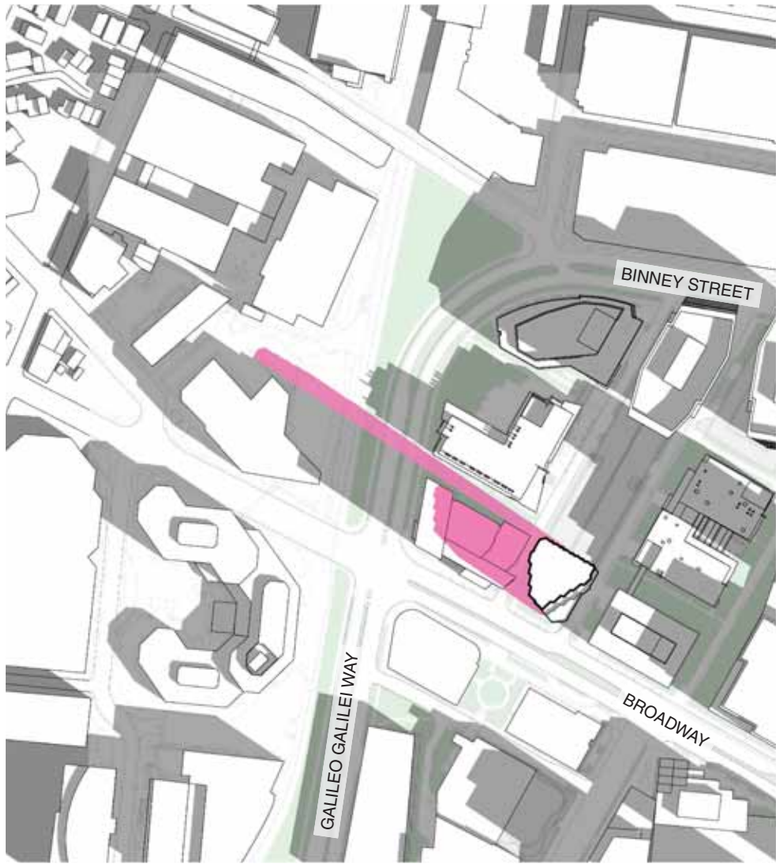
Sonia Beaulieu, M.Sc., PMP, P.Eng.
Senior Project Manager / Principal

Sreeyuth Lal, Ph.D.
Technical Coordinator

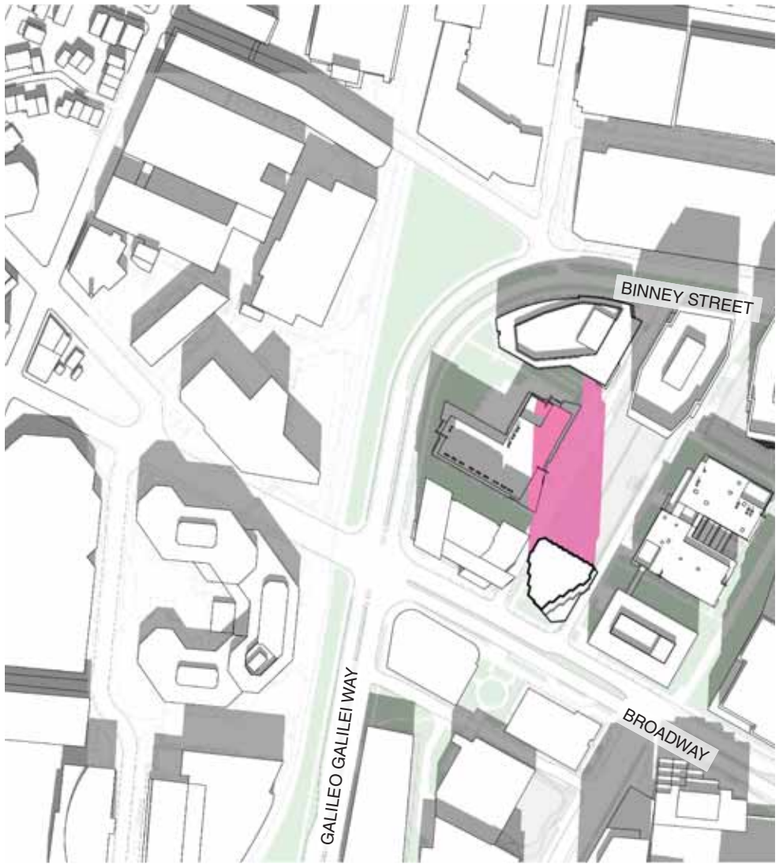
3.2 SHADOW STUDY

EQUINOX MARCH 21 & SEPTEMBER 21 (EST)

March 21 and September 21 are the Spring and Fall Equinoxes, respectively on which Cambridge experiences roughly equal length day and night.



MAR/SEP -9AM



MAR/SEP -12PM

MAR/SEP -3PM

KEY

New Shadow

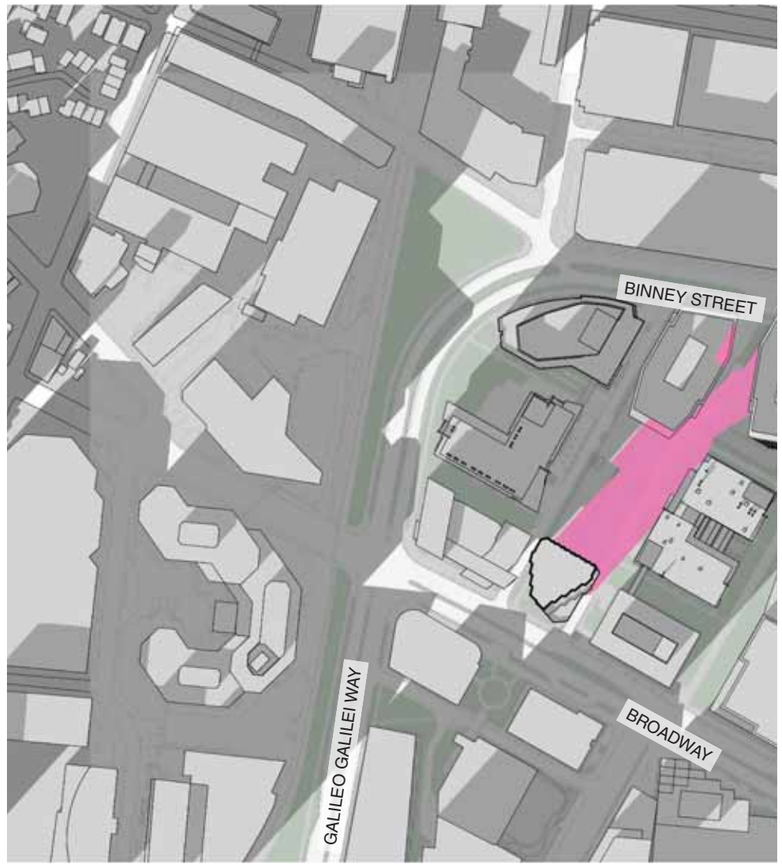
Existing shadow

3.2 SHADOW STUDY

WINTER SOLSTICE DEC 21 (EST)

DEC -9AM

DEC -12PM



DEC -3PM

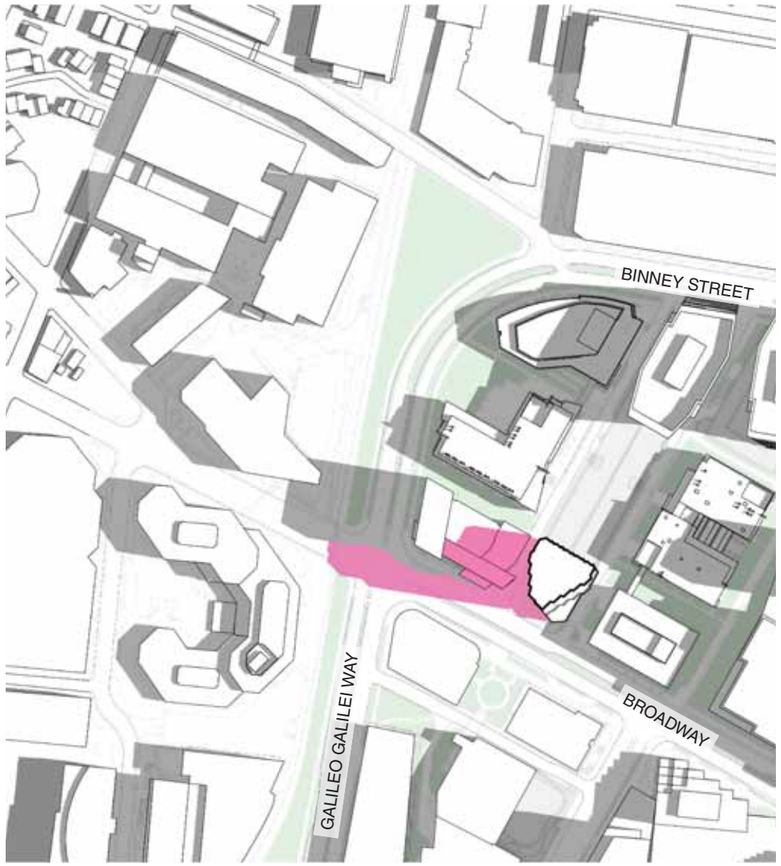
KEY

New Shadow

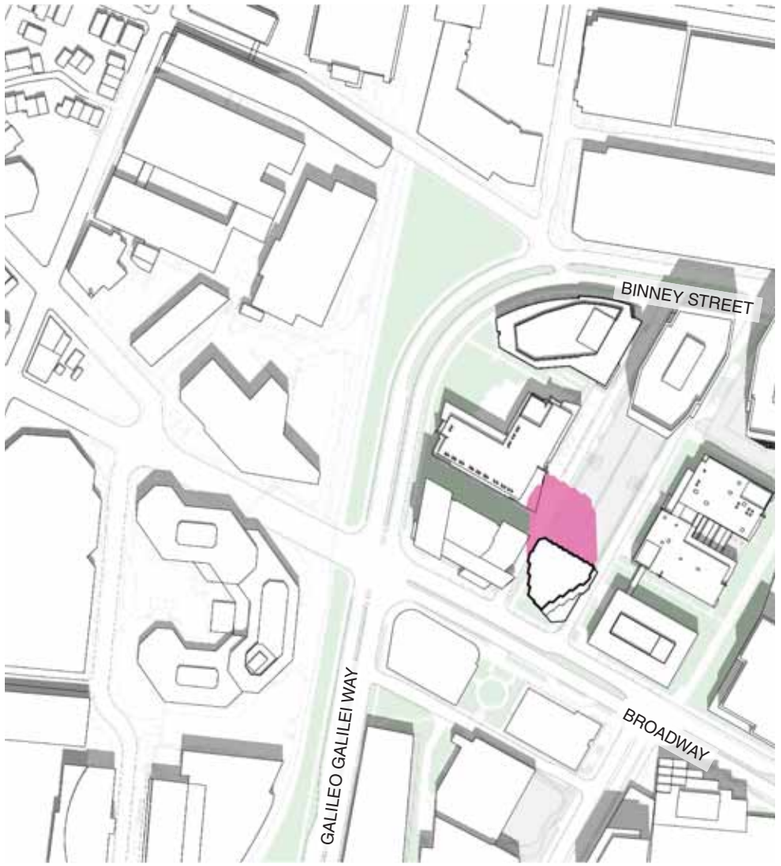
Existing shadow

3.2 SHADOW STUDY

SUMMER SOLSTICE JUNE 21



JUN -9AM



JUNE -12PM

JUN -3PM

KEY

New Shadow

Existing shadow

4. SUSTAINABILITY

4.1 SUSTAINABILITY

UPDATED

TABLE OF CONTENTS

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Residential Building South

135 Broadway Cambridge, MA 02142

Design Review Filing

Article 14.74: 'Sustainability'
&
Article 22.20: 'Green Building Requirements'

Table of Contents:

PROJECT DESCRIPTION

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Project Description

Residential Building South (135 Broadway), part of the MXD Infill Development Concept Plan (the "Concept Plan") within the Kendall Square Urban Renewal Plan (KSURP), is meeting the Article 22.20 requirement with a minimum of LEED Gold certification under the LEEDv4 for New Construction rating system. The LEED scorecard will develop over the course of design, possible points may be achieved, and any updates to this report will be included in subsequent submissions or applications.

Residential Building South is proposed as part of Phase 3 of the Concept Plan. The construction of Residential South consists of a new, up to 38 story (±400') residential building with an estimated 445 rental units, totaling approximately 418,136 GFA of net new development.

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 is looking into pursuing certification under a LEED Master Site. This will allow the project to show compliance with various LEED elements from a "campus approach".

General Project Information

SITE AND BUILDING AREA	
Total Site Area within the LEED Project Boundary (LPB)	TBD
Total Gross Floor Area	418,136 Gross Floor Area (GFA)
Amenity Square Feet	15,200 GSF
Retail Square Feet	1,130 GSF
Residential Square Feet	353,583 NSF
Building Footprint	12,900 SF
RESIDENTIAL UNIT BREAKDOWN	
Total Number of Rental Units	445
Studio	84
One Bedroom	194
Two Bedroom	152
Three Bedroom	15
TRANSPORTATION	
Parking Spaces	112
Long-Term Bike Storage	LEED requirement: 167 spaces
Short-Term Bike Storage	LEED requirement: 27 spaces

4.2 SUSTAINABILITY

GREEN BUILDING PROFESSIONAL AFFIDAVIT

GREEN BUILDING PROJECT CHECKLIST • ARTICLE 22.000 • GREEN BUILDING REQUIREMENTS

Affidavit Form for Green Building Professional
Special Permit

Green Building
Project Location: 135 Broadway, Cambridge, MA

Green Building Professional
Name: CHRISTOPHER R. SCHAFFNER
☐ Architect
☒ Engineer
License Number: MASSACHUSETTS 37211 MECHANICAL
Company: THE GREEN ENGINEER, INC.
Address: 23 BRADFORD ST CONCORD MA 01742
Contact Information
Email Address: CHRIS@GREENENGINEER.COM
Telephone Number: 978-369-8978

I, CHRISTOPHER R. 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) 5/6/21 (Date)

CHRISTOPHER SCHAFFNER MECHANICAL NO. 37211 REGISTERED PROFESSIONAL ENGINEER COMMONWEALTH OF MASSACHUSETTS

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.

Last Updated: May, 2020

City of Cambridge, MA 1

WATER MANAGEMENT

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Water Management

Pursuant to Article 14.74 (b) of the Cambridge Zoning ordinance, the Project will reduce overall potable water use and reduce wastewater generation compared to a conventional development through installation of low-flow plumbing fixtures and high-efficiency irrigation systems. The Project is currently targeting a minimum 40% water use reduction compared to conventional plumbing fixtures (per Energy Policy Act of 1992 fixture performance requirements). Additionally, all water-consuming appliances will be ENERGY STAR certified at the most current version of the applicable standard.

The landscape design will incorporate native and adaptive vegetation and the design of the irrigation system will target, at minimum, a 50% reduction in potable water use when compared to a mid-summer baseline using high-efficiency irrigation systems with controllers and moisture sensors. Non-potable water use strategies, such as rainwater reuse will be considered for irrigation. In addition, the landscape design will consist mostly of local, drought resistant species to minimize or eliminate the need for irrigation over the lifetime of the Project. Landscape areas will be designed to hold as much rainwater as practicable. The Applicant is also considering the use of rainwater capture for irrigation and the incorporation of green roofs and a rainwater harvesting tank for the building.

The Project will largely maintain the existing site drainage, replacing existing impervious rooftop and hardscape in kind on-site. The Project will be required to mitigate stormwater runoff to comply with City and MassDEP standards. Stormwater infrastructure will be designed and installed for the Project to reduce the runoff discharge rate and improve the quality of the runoff to the City's stormwater system and the Charles River basin.

As the design progresses, the design team will continue to analyze the potential to further increase the Project's potable water consumption, both indoors and outdoors.

4.3 SUSTAINABILITY

COOL ROOFS

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Cool Roofs

Pursuant to Article 14.74 (c) of the Cambridge Zoning ordinance, the Project is taking several steps to include building-specific strategies to help reduce the Project's impact on the local urban heat island effect. The project aims to achieve this using a light-colored roofing membrane with a minimum initial solar reflective index (SRI) of 82 (or three-year aged SRI of 64), hardscape materials with an initial solar reflectance (SR) of 0.33 or greater (or three-year aged SR of 0.28), and a below-grade parking structure that greatly reduces the uncovered and impervious surface area needed for the Project's required parking.

The Applicant is also exploring the use of green roof cover, where feasible. Vegetation and shading structures will also be employed to shade the building and outdoor spaces, where possible. The roof membrane on all Project Components will be a high albedo roof product, excluding any green roof areas.

The Applicant understands the City Council approved a zoning petition on May 3, 2021 that would require installation of green roofs, or bio-solar roofs on future construction and significant rehab of buildings that are 20,000 square feet and larger. The Applicant is taking this requirement into account as the design advances for the remaining phases of the Project.

MONITORING

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Monitoring

Pursuant to Article 14.74 (d) of the Cambridge Zoning Ordinance, the Applicant has a robust internal program for tracking building energy use over time, using Energy Star Portfolio Manager and other tools. The Project will include an energy management system to monitor operation of equipment or systems that are not already directly metered for electric or gas use.

In compliance with the Cambridge Building Energy Use Disclosure Ordinance, Chapter 8.67 of the Municipal Code, the Applicant will report energy use.

Lastly, as mentioned in the 'Commissioning' section of this report, the Project is considering implementing a monitoring-based commissioning plan which will allow the building operators to track energy consumption, detect faulty equipment operations, and identify / address unusual energy consumption trends as they occur.

4.4 SUSTAINABILITY

ROOFTOP EQUIPMENT NOISE MITIGATION

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Rooftop Equipment Noise Mitigation

Pursuant to Article 14.74 (e) of the Cambridge Zoning Ordinance, Pursuant to Article 14.74 (e) of the Cambridge Zoning Ordinance, the MEPFP system located near, discharging at, or on the roof shall be selected to be low sound models to reduce their sound emissions, where such selections are possible during the design process. In general, equipment will have variable speed drives to reduce equipment capacity and lower sound emissions when the equipment needs to operate at a lower capacity. Furthermore, equipment shall include sound attenuators and noise barriers to mitigate sound emissions to adjacent buildings and the surrounding community to comply with the City of Cambridge Noise Ordinance at full capacity operations and produce even lower sound levels when the demands from the building and equipment capacity are reduced.

COMMISSIONING

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Commissioning

Pursuant to Article 22.24.2 of the Cambridge Zoning Ordinance, the Applicant will pursue commissioning in line with LEED v4 Fundamental and Enhanced Commissioning requirements. 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, as they relate to energy, water, indoor environmental quality, and durability. Enhanced commissioning scope will include reviewing the Owner's Project Requirements, and the Basis of Design, creating, distributing and implementing a commissioning plan, performing a design review of the project documents, reviewing contractor submittals, witnessing on-site installations and testing and performing commissioning of installed HVAC, lighting, lighting controls and domestic hot water systems. Monitoring-based commissioning in line with LEED v4 Enhanced Commissioning Option 1 Path 2: Enhanced and Monitoring-Based Commissioning is also being considered. Monitoring-based commissioning allows the building operators to track energy consumption, detect faulty equipment operations, and identify / address unusual energy consumption trends as they occur.

The Applicant will also be pursuing envelope commissioning in line with LEED v4 Enhanced Commissioning Option 2: Envelope Commissioning. The building envelope commissioning agent will perform the scope of work required to comply with the credit in accordance with ASHRAE Guideline 0–2005 and the National Institute of Building Sciences (NIBS) Guideline 3–2012, Exterior Enclosure Technical Requirements for the Commissioning Process, as they relate to energy, water, indoor environmental quality, and durability.

4.5 SUSTAINABILITY

RESILIENCY

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Resiliency

The Applicant has studied the vulnerability of the infill development sites for the potential of precipitation-based inland flooding events. Potential building design resiliency measures being considered include limiting basement areas, and other improvements that may mitigate potential flooding. Additionally, ground floor finish elevations for the Project will be raised to the greatest extent possible to reduce the risk of internal flooding. Flood-resilient materials will be specified for first floor uses, where practicable.

Flood prevention techniques could include: sealed wall penetrations for cable and electrical lines; watertight door barriers; septic line backflow prevention valves, sump pumps, and discharge pumps—all of which could be connected to auxiliary external generator connections or resilient backup power. In addition, the Project is anticipated to include green roofs/roof gardens where feasible, and roofing membranes with high SRI to reduce the volume of storm water runoff and reduce solar heat gain/minimize air conditioning loads, respectively. Additionally, a high-performance curtain wall will be designed at an appropriate ratio to reduce energy use while still providing enough daylight and opening area for natural ventilation. This is an adaptive strategy in response to potential future increases in mean temperature. Other climate change adaptive strategies considered will include improved envelope insulation, high-performance glazing, and maximizing views and daylighting of interior spaces as a response to increasing temperatures thus reducing overall lighting loads and associated internal heat gains, which has a direct impact on the space cooling load. As climate change analysis shows, the rising temperature increases the space cooling demand in the Cambridge climate; therefore, any strategy that can reduce the space cooling demand is considered an adaptive strategy for climate change.

On-site renewable energy, and a district energy network also provide opportunities for added resiliency during periods of power loss during storms. While the KSURP area is served by underground utility power lines and gas mains, and as such, is not normally effected by storms that disrupt power or gas transmissions, according to Massachusetts Department of Energy Resources (DOER), the Kendall Square Cogeneration Station (the “Cogeneration Station)”) has been registered by the ISO-NE as a black start generation asset that can operate in island mode to provide both electricity to the Cambridge grid and thermal energy to the KSURP area in the event of a grid outage.

On-site combined heat and power (CHP), or solar PV, generally will operate in phase with the incoming utility power and needs incoming power to synchronize phase delivery. In “island mode”, generators and CHP systems can be made to operate independently of the grid and self-synchronize power phasing with on-site solar. However, this approach is normally used in large-scale shelter locations only, when long-term operation may be needed to protect a group of people.

HEALTH AND WELLNESS

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Health and Wellness

Human health and wellness are addressed in the Project through design, operations, and occupant behavior. Within the Project, special attention will be given to address human health and comfort during construction and once the building is occupied. This will be accomplished by implementing pollutant reduction strategies, using non-toxic materials, providing fresh air to occupants, installing individual lighting and heating controls, installing operable windows, and by providing natural daylight and views to outdoor green spaces.

The Applicant is also exploring the use of principles of the WELL and/or Fitwel Building Standards, which place human health and wellness at the center of design and can encourage and educate future tenants on healthy living practices. Active design principles, encouraging physical and social activity, will be employed where possible. The Project site will include vibrant spaces where people can safely walk, bike, use transit, and access open spaces. Ground level outdoor spaces will be easily accessible to both building residents and visitors alike.

EMBODIED CARBON

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Embodied Carbon

The Applicant understands that, while CO_2 emissions are a major concern related to a building's operation, many of the prominent building materials commonly used in the built environment include a carbon-intensive life cycle that needs to be considered if the Project is to accurately assess the carbon impact of the building.

To quantify the embodied carbon impact of the Project, the design team will be performing a whole-building life cycle analysis (LCA) using tools like Athena, Tally, or One Click LCA. Additionally, the design team will endeavor to specify materials and products with high-recycled content and that have no or very minimal carbon impact by using the Embodied Carbon Calculator in Construction (EC3) Tool, where possible. The team will also use environmental product declarations (EPDs) to assess individual product's embodied carbon impact, as appropriate.

Lastly, products that sequester carbon (i.e. wood) will be used, where practicable.

LEED SCORECARD

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LEED Scorecard

135 Broadway (the "Project") was reviewed for compliance using the USGBC's LEED for New Construction (LEED-NC), version 4 rating system. The Project is targeting 61 out of a possible 110 credit points with an additional 32 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-NC 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 minimizes impact on the environment, creates engaging and healthy spaces 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 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 these buildings intend 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
D	1			Credit 1	Integrative Process	1
	16	0	0	**Location and Transportation**		16
D			N	Credit 1	LEED for Neighborhood Development Location	
D	1			Credit 2	Sensitive Land Protection	1
D	2			Credit 3	High Priority Site	2
D	5			Credit 4	Surrounding Density and Diverse Uses	5
D	5			Credit 5 (LEEDv4.1)	Access to Quality Transit	5
D	1			Credit 6 (LEEDv4.1)	Bicycle Facilities	1
D	1			Credit 7 (LEEDv4.1)	Reduced Parking Footprint	1
D	1			Credit 8 (LEEDv4.1)	Electric Vehicles	1
	5	4	1	**Sustainable Sites**		10
C	Y			Prereq 1	Construction Activity Pollution Prevention	Required
D	1			Credit 1	Site Assessment	1
C	1		1	Credit 2	Site Development - Protect or Restore Habitat	2
D		1		Credit 3	Open Space	1
D		3		Credit 4 (LEEDv4.1)	Rainwater Management	3
D	2			Credit 5	Heat Island Reduction	2
D	1			Credit 6	Light Pollution Reduction	1
	7	4	0	**Water Efficiency**		11
D	Y			Prereq 1	Outdoor Water Use Reduction	Required
D	Y			Prereq 2	Indoor Water Use Reduction	Required
D	Y			Prereq 3	Building-Level Water Metering	Required
D	1	1		Credit 1	Outdoor Water Use Reduction	2
D	4	2		Credit 2	Indoor Water Use Reduction	6
D	1	1		Credit 3	Cooling Tower Water Use	2

4.6 SUSTAINABILITY

UPDATED

LEED SCORECARD

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	1			Credit 4	Water Metering	1
	13	**11**	**9**	**Energy and Atmosphere**		**33**
C	Y			Prereq 1	Fundamental Commissioning and Verification	Required
D	Y			Prereq 2	Minimum Energy Performance	Required
D	Y			Prereq 3	Building-Level Energy Metering	Required
D	Y			Prereq 4	Fundamental Refrigerant Management	Required
C	5	1		Credit 1	Enhanced Commissioning	6
D	6	6	6	Credit 2	Optimize Energy Performance	18
D		1		Credit 3	Advanced Energy Metering	1
D			2	Credit 4	Demand Response	2
D		2	1	Credit 5	Renewable Energy Production	3
D		1		Credit 6	Enhanced Refrigerant Management	1
C	2			Credit 7	Green Power and Carbon Offsets	2
	5	**5**	**3**	**Materials and Resources**		**13**
D	Y			Prereq 1	Storage and Collection of Recyclables	Required
C	Y			Prereq 2	Construction and Demolition Waste Management Planning	Required
D	1	3	1	Credit 1 (LEEDv4.1)	Building Life-Cycle Impact Reduction	5
C	1		1	Credit 2 (LEEDv4.1)	BPDO – EPDs	2
C		1	1	Credit 3 (LEEDv4.1)	BPDO - Sourcing of Raw Materials	2
C	1	1		Credit 4 (LEEDv4.1)	BPDO – Material Ingredients	2
C	2			Credit 5 (LEEDv4.1)	Construction and Demolition Waste Management	2
	6	**6**	**4**	**Indoor Environmental Quality**		**16**
D	Y			Prereq 1	Minimum Indoor Air Quality Performance	Required
D	Y			Prereq 2 (LEEDv4.1)	Environmental Tobacco Smoke Control	Required
D	Y			Prereq 3	Minimum Acoustic Performance	Required
D	1	1		Credit 1 (LEEDv4.1)	Enhanced Indoor Air Quality Strategies	2
C	3			Credit 2 (LEEDv4.1)	Low-Emitting Materials	3
C	1			Credit 3	Construction Indoor Air Quality Management Plan	1
D		2		Credit 4	IAQ Assessment	2
D		1		Credit 5	Thermal Comfort	1
D		2		Credit 6 (LEEDv4.1)	Interior Lighting	2
D			3	Credit 7	Daylight	3
D	1			Credit 8	Quality Views	1
D			1	Credit 9	Acoustic Performance	1
	6	**0**	**0**	**Innovation**		**6**
D	1			Credit 1	Innovation: Purchasing - Lamps	1
D	1			Credit 2	Innovation: O&M Starter Kit	1
D	1			Credit 3	Exemplary Performance: Heat Island Effect	1
D	1			Credit 4	Exemplary Performance: EPDs / Material Ingredients	1
C	1			Credit 5	Pilot Credit: Integrative Analysis of Building Materials	1
C	1			Credit 6	LEED Accredited Professional	1

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	3	**1**	**0**	**Regional Priority (earn up to 4 points)**		**4**
D	1			Credit 1	Regional Priority Credit: LTc3 High Priority Site (2 points)	1
D		1		Credit 2	Regional Priority Credit: SSc4 Rainwater Management (2 points)	1
D	1			Credit 3	Regional Priority Credit: WEc2 Indoor Water Use Reduction (4 points)	1
D		1		Credit 4	Regional Priority Credit: EAc2 Optimize Energy Performance - (8 points)	1
	61	**32**	**17**	**TOTALS**	**Possible Points:**	**110**

D = DESIGN PHASE

C = CONSTRUCTION PHASE

4.7 SUSTAINABILITY

LEED NARRATIVE

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LEED Narrative

Pursuant to Article 22.25.1 (b) of the Cambridge Zoning Ordinance, the Project meets the LEEDv4 Core & Shell Minimum Program Requirements, required, Prerequisites, and targeted Credits through the following strategies:

Integrative Process (IP)

IP Credit 1 Integrative Process — 1 credit point

The Project will meet the intent of this credit through identification of cross discipline opportunities to design a sustainable building project. Sustainable design focused meetings will be 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 is being 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 will continue to conduct interdisciplinary early meetings focusing on sustainability. These meetings will include the ownership group, architect, MEP engineer, energy analyst, and sustainability expert. An initial workshop was conducted in March 2021.

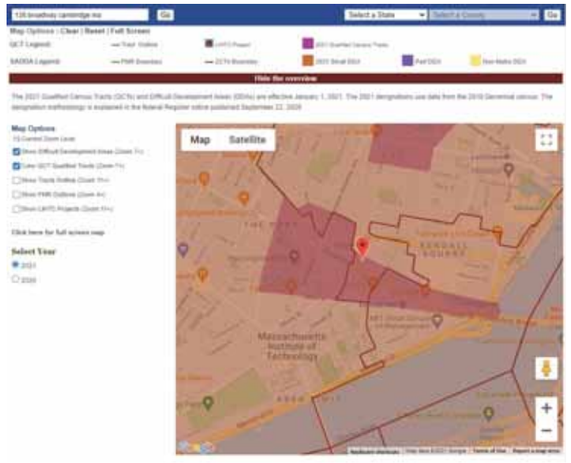
Location and Transportation (LT)

LT Credit 2 Sensitive Land Protection — 1 credit point

The Project will meet the credit requirements by locating the building on land that has been previously developed.

LT Credit 3 High Priority Site — 2 credit points

The project will meet the credit requirements by locating the building on a site in a U.S. Department of Housing and Urban Development's Qualified Census Tract.



Additionally, the Project site soils are contaminated and will require remediation.

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LT Credit 4 Surrounding Density and Diverse Uses — 5 credit points

The Project meets Option 1 for Surrounding Density by being located in an area with an average density greater than 35,000 sf/acre. The Project meets 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 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	Brothers Marketplace	0.4 mi.
Community Serving Retail	Convenience Store	2	Fresh Mart	0.5 mi.
	Hardware Store	3	Fran-Dan Corporation	0.4 mi.
	Other Retail	4	MIT COOP @Kendal Sq.	0.3 mi.
Services	Restaurant	5	B.GOOD	0.3 mi.
	Health Club	6	Cambridge Athletic Club	0.4 mi.
	Bank	7	Bank of America Financial Center	0.3 mi.
Civic and Community Facilities	Police or Fire station	8	Cambridge Police Dept.	0.3 mi.
	Public Park	9	Danny Lewin Park	0.3 mi.

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

The Project is located within ½ mile walking distance of the Kendall/MIT MBTA station. This transit station provides occupants with access to 445 weekday rides and 264 weekend rides via the MBTA Redline, and MBTA bus lines 64, 68, 85 and CT2 which is greater than the 250 weekday and 160 weekend trips required for 4 points.

4.7 SUSTAINABILITY

LEED NARRATIVE

LT Credit 6 Bicycle Facilities (LEEDv4.1) 1 credit point
Exterior short-term and covered long-term bicycle storage is planned for visitors and regular occupants of the project. 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, which are more stringent than the LEEDv4.1 LTc6 Bicycle Facilities requirements. Future retail employees will be provided with access to a shower to achieve the credit.

LT Credit 7 Reduced Parking Footprint (LEEDv4.1) 1 credit point
A new, underground parking garage is proposed to provide on-site parking for residents and visitors. The new parking garage will provide approximately 112 parking spaces for residents which results in a >30% reduction to the baseline number of parking spaces calculated from the ratios set forth in the LEED reference guide.

LT Credit 8 Electric Vehicles (LEEDv4.1) 1 credit point
The 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 approximately 112 parking spaces that will be provided for residents. For those spaces, the Owner will outfit 5% as electric vehicle charging stations (6), 10% with electric vehicle charging station infrastructure (12), or a combination of both electric vehicle charging stations and electric vehicle-ready spaces to meet the credit requirements.

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 was completed as part of the MXD Infill Development Concept Plan. The design team will continue to study topography, hydrology, climate, vegetation, soils, human use, and human health effects specific to 135 Broadway to inform the design.

SS Credit 2: Protect or Restore Habitat (LEEDv4.1) 1 credit point
The Owner will make a donation to a qualified Land Trust equivalent to $0.20 per square foot of project site area as long as this point is needed to achieve Gold certification.

SS Credit 3: Open Space *1 maybe point*
The project design will prioritize providing as much physically accessible outdoor space as possible. Once the landscape design progresses further, calculations will be performed to determine if the open space provided is equal to at least 30% of the total site area.
.
SS Credit 4 Rainwater Management (LEEDv4.1) *3 maybe points*
The Project will implement a stormwater management plan that decreases the volume of stormwater runoff and the peak runoff rate by capturing and treating runoff using acceptable best management practices (BMP's). Some of the BMP's being considered are as follows:

- *Subsurface infiltration systems*
- *Rainwater harvesting and reuse*
- *Stormwater detention tanks*

- *Pervious landscaped areas*
- *Deep sump, hooded catch basins*

The Project must comply with the Mass DEP Stormwater Management Policy, as well as reduce the peak rate for the 25-year design storm in the post-development condition to meet the two-year predevelopment condition, as required by Cambridge Department of Public Works (CDPW). Therefore, the Project will greatly improve stormwater contributions to the CDPW stormwater infrastructure by meeting the required mitigation thresholds.

SS Credit 5 Heat Island Reduction 2 credit points
The roof and non-roof hardscape materials will include light-colored surfaces to reduce the overall heat island effect impact on the project site. The roof membranes will be high albedo roof products with an initial SRI value of 82 minimum. The inclusion of a green roof will be further studied as the design progresses. Paving materials will target an initial SR value of 0.28 minimum. All parking associated with the Project will be located undercover.
.
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 Lighting Zone 3.

Water Efficiency (WE)

WE Prerequisite 1 Outdoor Water Use Reduction, 30% Required
The Projects will meet the minimum requirement of a 30% reduction in potable water use for irrigation. The Projects are still evaluating if permanent irrigation will be included as part of the Projects. If permanent irrigation is included for the Projects, it 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 for 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 50% 1 credit point, *1 maybe point*
The landscape design will incorporate native and adaptive plantings and the design of the irrigation system (if included in Project scope) will target at least a 50% reduction (1 point) in potable water use when compared to a mid-summer baseline using high controller efficiency and moisture sensors.

As the design progresses, the team will continue to analyze approaches to potentially achieve a 100% (2 points) reduction in potable water use for irrigation.

WE Credit 2 Indoor Water Use Reduction 4 credit points, *2 maybe points*
Through the specification of low flow and high efficiency plumbing fixtures, the project will implement water use reduction strategies that target 40% less 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.

Additional analysis will be performed will more aggressive water-saving fixtures to determine if the higher thresholds can be achieved.

WE Credit 3 Cooling Tower Water Use — 1 credit point, *1 maybe point*
The Project will conduct a one-time potable water analysis for the cooling tower water and calculate the cycles of concentration. Through increasing the level of treatment in the make-up and/or condenser water, the Project will achieve the calculated maximum number of cycles before any of the parameters analyzed exceed their maximum allowable levels of concentration. The control parameters that are required to be assessed are: Ca, total alkalinity, SiO_2, Ci, and conductivity.

The team will analyze the potential for using non-potable water for cooling tower makeup and/or increasing the treatment of the cooling tower makeup water to achieve 25% more cycles.

WE Credit 4 Water Metering — 1 credit point
The Project is planning to install permanent water meters for at least two of the following water subsystems: irrigation, indoor plumbing fixtures and fittings, domestic hot water, boilers with a projected annual use of 100,000 gallons or more than 500,000 BtuH, reclaimed water, or other process water.

Energy and Atmosphere (EA)

EA Prerequisite 1 Fundamental Commissioning and Verification — Required
A commissioning agent will be engaged by the Owner for purposes of providing fundamental commissioning services for the building energy-related systems by the end of Design Development. 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) will be independent of the project's design and construction management teams. The commissioning agent will report findings to the 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 compared to a baseline building's 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 Energy Code and MA Stretch Energy Code requirements. Comprehensive, iterative energy modeling will be used to explore design options to meet all Code requirements and to provide substantiation for the LEED applications. Energy performance goals have been established and will be monitored throughout the design phase.

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.

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 point*
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 Owner will engage a 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.

The Owner is considering pursuing monitoring-based commissioning for an additional point which entails measuring and evaluating the performance data of the building systems post-occupancy on a continuous basis with the goal of achieving consistent and optimal efficiency.

EA Credit 2 Optimize Energy Performance — 6 credit points, *6 maybe points*
For this submission, the Project is carrying an estimate that the project will perform at least 16% better than the ANSI/ASHRAE/IESNA Standard 90.1-2010 baseline building. We anticipate these percentages to increase as a result of the team's commitment to energy efficiency to meet the MA State Stretch Energy Code. Please see the Net Zero Narrative report in Appendix A for more information.

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 3 Advanced Energy Metering — 1 maybe point
Advanced energy meters are being considered for all whole-building energy sources and any individual energy end-uses that represent 10% or more of the total annual consumption of the building. Meters will be capable of recording data in intervals of one hour or less with a remotely accessible building automation system that can report hourly, daily, monthly, and annual energy use.

EA Credit 5 Renewable Energy Production — 2 maybe points
On-site renewable energy systems (i.e. PV) are being considered to potentially offset 1% (1pt) or 5% (2pts) of the predicted annual energy costs for the project. Additional analysis is required to determine if the installation of PV is cost-effective.

EA Credit 6 Enhanced Refrigerant Management *1 maybe point*
The HVAC equipment installed in the Project will use refrigerants that have low global warming and ozone depletion potential. Calculations will be run to determine compliance once equipment selections have been made.

EA Credit 7 Green Power and Carbon Offsets 2 credit points
The Owner will purchase of carbon offsets through a 5-year contract to offset a minimum of 100% of the Project's energy use with renewable sources as long as the points are needed to achieve Gold certification.

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 Project. Recyclable materials collected will include mixed paper, corrugated cardboard, glass, plastics, and metals, and the safe disposal of at least two of the following: batteries mercury-containing lamps, and/or electronic waste.

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)* 1 credit point, *3 maybe points*
The Owner has engaged the architect to conduct a whole-building life-cycle assessment for the Project. The analysis will be used to refine the design accordingly, ideally such that it demonstrates that the structure and enclosure achieve 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 BPDO: Environmental Product Declarations (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 3 BPDO: Sourcing of Raw Materials (LEEDv4.1) *1 maybe point*
The technical specifications will include information for applicable products and materials to meet one of the following extraction criteria (as applicable): Extended producer responsibility, Bio-Based materials, FSC wood, Materials reuse, Recycled Content, and/or regionally extracted and manufactured (within 100 miles of the project site). The Project will attempt this credit but compliance cannot be assured until well into construction of the building.

MR Credit 4 BPDO: Material Ingredients (LEEDv4.1) 1 credit point, *1 maybe 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

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certification. The team will provide documentation for 20 different permanently installed products sourced from at least 5 different manufacturers.

MR Credit 5 C&D Waste Management 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 specifications 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 using at least 4 different waste streams. On-site separation of waste will be prioritized as part of the strategy to meet this credit.

Indoor Environmental Quality (IEQ)

IEQ Prerequisite 1 Minimum IAQ Performance Required
The building mechanical systems will be designed to meet or exceed the requirements of ASHRAE Standard 62.1-2010 sections 4 through 7 and/or applicable building codes. The mechanical engineer will complete a ventilation rate procedure (VRP) calculator to verify compliance. Outdoor airflow monitors will be included in the project.

IEQ Prerequisite 2 Environmental Tobacco Smoke Control (LEEDv4.1) Required
Smoking is prohibited in the building 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 (LEEDv4.1) 1 credit point, *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.

Additionally, the Project is exploring the feasibility of providing CO2 sensors in all densely occupied spaces or increasing ventilation rates for an additional point.

IEQ Credit 2 Low Emitting Materials (LEEDv4.1) 3 credit points
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 manual 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 4 IAQ Assessment *2 maybe points*
To meet the requirements of this credit the Project would need to perform IAQ Testing after substantial completion but prior to occupancy. Due to potential add-cost and schedule implications, a decision has not been made at this point whether this credit will be pursued.

IEQ Credit 5 Thermal Comfort *1 maybe point*
To meet the requirements of this credit the Project HVAC systems and building envelope must be designed to meet the requirements of ASHRAE Standard 55–2010, Thermal Comfort Conditions for Human Occupancy, with errata.

Each unit must have thermal comfort controls and thermal comfort controls will be provided for at least 50% of individual occupant spaces such as administrative offices. Additionally, group thermal comfort controls must be provided for all shared multi-occupant spaces. Thermal comfort controls must allow occupants, whether in individual spaces or shared multi-occupant spaces, to adjust at

4.7 SUSTAINABILITY

LEED NARRATIVE

least one of the following in their local environment: air temperature, radiant temperature, air speed, and humidity.

The mechanical engineer is currently evaluating whether the Project will meet these requirements, as designed.

IEQ Credit 6 Interior Lighting (LEEDv4.1) *2 maybe points*
The Project is evaluating the feasibility of achieving at least one (1 point) or three (2 points) of the criteria required to achieve this credit. Options under consideration are: Glare Control, Color Rendering, Lighting Control, and/or Surface Reflectivity.

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

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 Owner 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 Exemplary Performance: SSc5 Heat Island Reduction 1 credit point
The Project will achieve Exemplary Performance for Heat Island Reduction by meeting both Option 1: Roof and Nonroof and Option 2: Parking Under Cover.

INc3 Exemplary Performance: LTc Reduced Parking Footprint 1 credit point
The Project exceeds the Exemplary Performance threshold of a 60% reduction compared to Baseline ITE Parking Ratio (~85% reduction based on current parking capacity).

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).

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 (20%/8 points), EAc5 Renewable Energy Production (5%/2 points), and MRc1 Building Life-Cycle Impact Reduction (2 points).

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The Project is currently tracking the following RPCs:

LTc3 High Priority Site	1 credit point
WEc2 Indoor Water Use Reduction	1 credit point
SSc4 Rainwater Management	*1 maybe point*
EAc2 Optimize Energy Performance	*1 maybe point*

4.8 SUSTAINTABILITY

ATTACHMENT A: NET ZERO NARRATIVE

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ATTACHMENT A
Net Zero Narrative

Project Name: 135 Broadway
Submitted By: The Green Engineer, Inc.
Date of Submission: 02/24/2022

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Project Profile

Development Characteristics

Lot Area (sq.ft.):	TBD
Existing Land Use(s) and Gross Floor Area (sq.ft.), by Use:	Existing site is 72,613. Existing 1,170 space parking garage.
Proposed Land Use(s) and Gross Floor Area (sq.ft.), by Use:	Residential Tower 411,753 GFA
Proposed Building Height(s) (ft. and stories):	412' to highest occupiable floor 38 Floors
Proposed Dwelling Units:	448
Proposed Open Space (sq.ft.):	Between Commercial East and Commercial West the Project will construct the approximately 56,000 square feet of new open space known as the “Center Plaza”.
Proposed Parking Spaces:	0.25 per unit
Proposed Bicycle Parking Spaces (Long-Term and Short-Term):	LEED requirement: 167 long-term spaces LEED requirement: 27 short-term spaces

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 New Construction	**Seeking Certification?**	Yes
Rating Level:	LEED Gold	**# of Points:**	61 (add 32 possible)

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

**NOTE: Certification is not required through the Green Building Requirements. However, you may choose to indicate if the Project Team intends to pursue formal certification through these Green Building Rating Programs (or their affiliates).*

Proposed Project Design Characteristics

Building Envelope

Assembly Descriptions:

Roof:	Insulation above deck, R-60 c.i. Assembly U-Value - 0.016
Exterior Walls:	Curtain wall with 6" batt insulation in stud backup wall and 4" exterior mineral wool between vertical mullions Assembly U-value- 0.11
Windows:	Assembly U-Value - 0.23; Assembly SHGC - 0.4; VLT - 44%
Window-to-Wall Ratio:	40.0%
Slab-on-Grade:	R-15 for 24in
Underground Walls:	R-7.5c.i.
Other Components:	N/A
Building Infiltration	0.4 CFM/SF

Envelope Performance:

	Proposed		Baseline	
	Area (sf)	*U-value*	*Area (sf)*	*U-value*
Window	81,840	0.23	48,888	0.42
Wall	122,220	0.11	154,812	0.055
WWR:	40%		24%	

Roof	12,000	0.016	12,000	0.032
Slabs on Grade	9,400	0.54	9,400	0.52
Below Grade Wall	4,000	0.119	4,000	0.119

Envelope Commissioning Process:

The Applicant will pursue envelope commissioning in line with LEED v4 Enhanced Commissioning Option 2: Envelope Commissioning.

Project Name: 135 Broadway
Submitted By: The Green Engineer, Inc.
Date of Submission: 02/24/2022

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Building Energy Systems

Systems Descriptions:

HVAC System	Residential Spaces: Water source heat pumps (WSHP) with ventilation air provided by dedicated outdoor air systems (DOAS) with energy recovery Corridors: DOAS with energy recovery with WSHP heating and cooling coils. WSHP condenser water is heated by air to water heat pumps.
Space Heating:	WSHP - COP 4.73 CW air to water heat pump - COP 2.5
Space Cooling:	WSHP - 14.0 EER
Heat Rejection:	High efficiency heat rejection plant with reduced HP, variable speed fans
Pumps & Auxiliary:	VFD's on CW pumps
Ventilation:	DOAS with energy recovery
Domestic Hot Water:	Preheat by air to water HPs, supplemented by electric resistance. Low Flow plumbing fixtures to reduce water use.
Interior Lighting:	Base Building: 100% LED lighting LPD will meet C406.3 values listed in MA Amendments
Exterior Lighting:	To meet code (TBD)
Other Equipment:	Residential Spaces: 0.9 W/SF (10% reduction from Baseline to account for Energy Star appliances)

Systems Commissioning Process:

The Applicant will pursue commissioning in line with LEED v4 Fundamental and Enhanced Commissioning requirements. 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. Enhanced commissioning scope will include reviewing the owner's project requirements, and the basis of design, creating, distributing and implementing a commissioning plan, performing a design review of the project documents, witnessing on-site installations and testing and performing commissioning of installed HVAC, lighting, lighting controls and domestic hot water systems.

4.8 SUSTAINTABILITY

ATTACHMENT A: NET ZERO NARRATIVE

Project Name: 135 Broadway
Submitted By: The Green Engineer, Inc.
Date of Submission: 02/24/2022

The Green Engineer
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Anticipated Energy Loads and Greenhouse Gas Emissions

Assumptions

The building is a residential tower. 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.

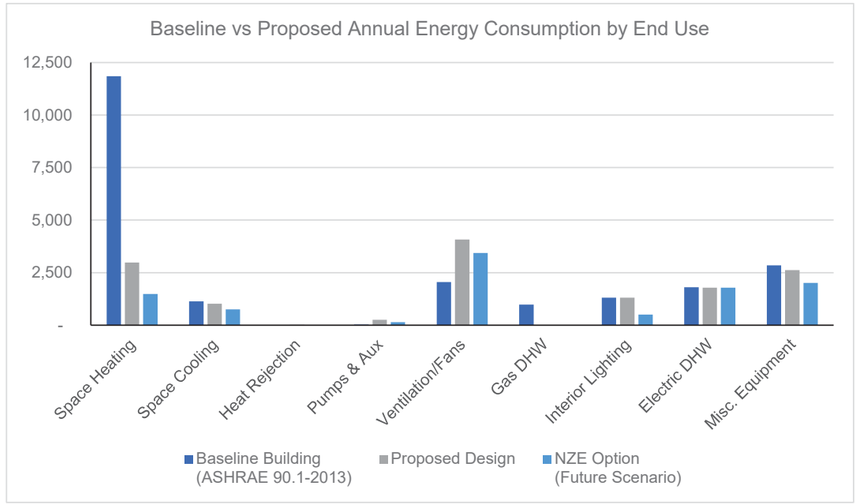
Annual Projected Energy Consumption and Greenhouse Gas (GHG) Emissions

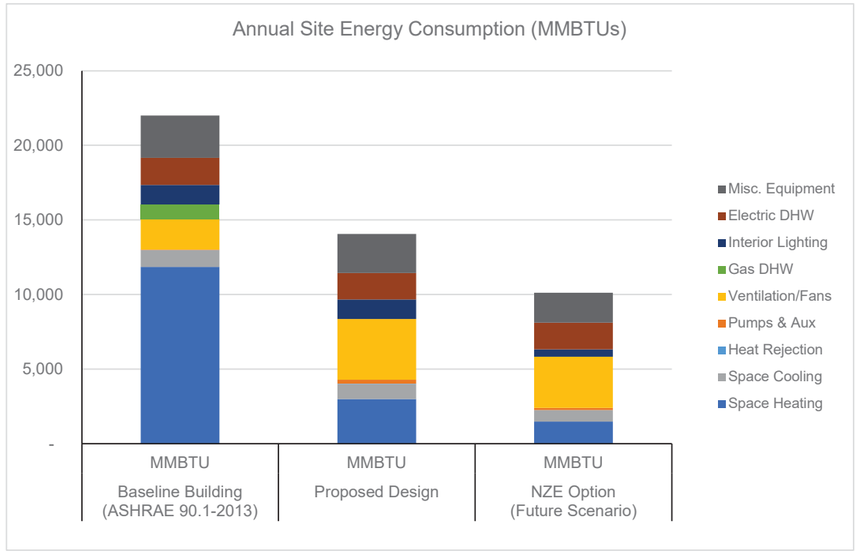
	Baseline Building (ASHRAE 90.1-2013)		Proposed Design		NZE Option (Future Scenario)	
	MMBTU	% of Total	MMBTU	% of Total	MMBTU	% of Total
Space Heating	11,848	54%	2,984	21%	1,484	15%
Space Cooling	1,131	5%	1,021	7%	754	7%
Heat Rejection	-	0%	14	0%	8	0%
Pumps & Aux	28	0%	261	2%	147	1%
Ventilation/Fans	2,053	9%	4,071	29%	3,431	34%
Gas DHW	981	4%	-	0%	-	0%
Interior Lighting	1,308	6%	1,308	9%	501	5%
Electric DHW	1,808	8%	1,778	13%	1,778	18%
Misc. Equipment	2,847	13%	2,621	19%	2,008	20%
On Site PV (future)						
	$US, kWh, MMBtu, Kbtu/sf		$US, kWh, MMBtu, Kbtu/sf	% Reduction from Baseline	$US, kWh, MMBtu, Kbtu/sf	% Reduction from Baseline
Total Energy Cost ($US)	599,694		679,634	-13.3%	488,879	18.5%
Total Electricity Use (kWh)	2,688,275		4,118,994	-53.2%	2,962,904	-10.2%
Total Gas Use (MMbtu)	12,829		-	100.0%	-	100.0%
Site EUI (kBTU/SF)	53.5		34.20	36.1%	24.60	54.0%
Source EUI (kBTU/SF)	93.2		93.7	-0.5%	67.4	27.7%
	MMBTU	% of Total	MMBTU	% of total	MMBTU	% of total
On-Site Renewable Energy Generation	-	-	-	-		0.0%
Off-Site Renewable Energy Generation	-	-	-	-	-	
	MTons CO2 [/sf]		MTCO2e [/sf]	% Reduction from Baseline	MTCO2e [/sf]	% Reduction from Baseline
GHG Emissions	1,283.5		922.6	28.1%	663.7	48.3%
GHG Emissions per sf	0.0031		0.0022		0.0016	

Results are based on energy model results from The Green Engineer, Inc.

Project Name: 135 Broadway
Submitted By: The Green Engineer, Inc.
Date of Submission: 02/24/2022

Anticipated Energy Usage





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:	The site has been previously developed and it is classified as a Difficult Development Area by the US Department of Housing and Urban Development. The selected site will provide access to the public transportation, bicycle network and facilities.
Building Orientation and Massing:	The Project is on a previously developed urban site with limited potential of massing and orientation changes. 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.
Mechanical Systems:	High efficiency equipment including DOAS with energy recovery ventilation, high efficiency WSHPs and air to water heat pumps providing heat to the condenser loop.
Renewable Energy Systems:	The Project's roof is being designed as solar ready from a structural and electrical perspective. Due to the all-electric nature of the Project, almost all of the roof will be occupied by large mechanical systems as well as occupiable terraces and facade access systems.
District-Wide Energy Systems	The Project will not be connected to the district steam because the emission data is not readily available and per the team's experience with evaluating Vicinity Steam and its environmental impacts for other similar projects, the overall GHG emissions for a building connected to the district steam will not be significantly better than a stand-alone building due to the fact that steam is generated via a non-renewable fuel source; therefore, it will not help the project to meet the City's Net Zero goals in the future.
Other Systems:	EV charging stations to be provided for 25% of the total parking capacity for the project.

Integrative Design Process:

The project team is pursuing the LEED Integrative Process credit for this project, and therefore, energy models were developed during the conceptual design phase. The project team for the overall master site development, including the ownership group, architects, Civil and MEP engineers, as well as the sustainability consultants and energy modelers met several times in the early stages of planning and design to discuss the project overall energy, sustainability, and environmental goals.
The preliminary and conceptual energy models were developed early on to investigate the project's compliance with the LEED v4 Minimum and Optimize Energy Performance criteria and the Massachusetts Stretch Energy Code requirements and to estimate the project site and source energy use and cost as well as the GHG emissions. As a result of these analyses, the design team proposed and evaluated additional energy conservation measures to improve the building overall performance and decided to improve the overall performance of the building envelope.

Project Name: 135 Broadway
Submitted By: The Green Engineer, Inc.
Date of Submission: 02/24/2022

The Green Engineer
Sustainable Design Consulting

Solar Ready Roof Assessment

The purpose of this assessment is to determine the technical feasibility of solar energy system installation, either as part of the proposed project or in the future. It is helpful to supplement this narrative with a plan depicting the information provided.

Total Roof Area (sf)	12,000 sf
Unshaded Roof Area (sf)	The roof will be covered by the mechanical equipment, occupiable terraces, and/or facade access equipment which will shade the uncovered areas.
Structural Support:	The roof will be able to handle any structural load of a future PV installation.
Electrical Infrastructure:	The design team will take electrical infrastructure into account while evaluating the economics for PV.
Other Roof Appurtenances:	Since the project prioritized being all-electric, almost all of the available roof area is designated for mechanical equipment (e.g. air-to-water heat-pump modules). The remaining roof area is designated for occupiable terraces.
Solar Ready Roof Area (SF)	None. Mechanical equipment and terraces use all available roof area.
Capacity of Solar Array (kW):	N/A
Financial Incentives ($):	There are federal and state (SMART) incentives available for eligible PV generation systems. These incentives programs are continuously changing. Therefore, this analysis will be performed at the time of PV system design (if included in Project).
Cost Feasibility:	N/A

Green Building Incentive Program Assistance

The Project has had multiple engagements with local utility representatives and is planning to participate in all relevant energy-efficiency incentive programs. An initial MassSave kickoff/energy charrette will be conducted in Spring 2021. The project will be participating in the Mass Save Integrated Design Path for Large Buildings as well as the EV make-ready program.

Project Name: 135 Broadway
Submitted By: The Green Engineer, Inc.
Date of Submission: 02/24/2022

The Green Engineer
Sustainable Design Consulting

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.

	Net Zero Condition	Transition Process
Building Envelope:	Likely minimal upgrades to envelope in future to achieve Net Zero. Potential for air sealing/retro-commissioning of envelope in the future.	N/A
Lighting Design	In a residential project, lighting design is driven by the tenants. 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).	Lighting will be All-LED, thus minimal additional energy savings anticipated from future upgrades.
Renewables	Due to the limited roof area, an on-site renewable system may not be feasible for the Project.	When the building is all-electrified and the Grid is clean, the project can achieve carbon neutrality.
Future Lighting Upgrades	We anticipate that overtime, the future lighting improvements will reduce both interior and exterior lighting by 50%. This will also have the effect of reducing cooling loads while increasing heating loads.	Lighting technology continues to improve, as LED technology and automatic lighting controls become commonplace. Lighting upgrades may be implemented to take advantage of a future enhanced technology.
Domestic Hot Water:	To lower energy use in the future, 100% of the DHW load can be provided by a heat pump type water heater.	The proposed DHW system is all-electric. It includes pre-heating the DHW with the air-to-water heat pump system and using electric storage tanks to bring it to the design supply temperature. At the end of life of the original equipment it may be possible to convert the existing system to use heat pumps for 100% of the DHW load.
Receptacle Loads	In Net Zero Option, plug loads are assumed to be 25% lower than the current design scenario. This would also have the effect of reducing cooling loads while increasing heating loads	Receptacle loads represent a significant energy end use in the Project. Currently plug loads are growing and continue to grow, as phones, tablets, etc. proliferate, along with phantom loads their chargers create. We anticipate that this trend will reverse with improvement in technology.
Fossil Fuel Free HVAC Systems	The HVAC system is designed with high-efficiency equipment and electrification using heat pump technology.	Not applicable. The HVAC system is currently designed to be all-electric in order to take advantage of the reduced GHG emissions once the grid transitions to renewable energy.

Project Name: 135 Broadway
Submitted By: The Green Engineer, Inc.
Date of Submission: 02/24/2022

The Green Engineer
Sustainable Design Consulting

Energy Systems Comparison

Overview:

This section should describe the results of an analysis comparing the technical and financial feasibility to meet the projected HVAC and domestic hot water demands of the building using energy systems that do not consume carbon-based fuels on-site compared to code-compliant energy systems that consume carbon- based fuels on-site.

A full building energy model was created to evaluate the current design and an alternate all-electric / net zero design. The current design already includes full electrification of HVAC and DHW systems. The net zero scenario involves further load reduction strategies and more efficiently electrified HVAC and DHW equipment.

Assumptions:

Describe what building energy systems were included and excluded in your analysis and why.

	Included in analysis?		Describe the systems for which this was analyzed or explain why it was not included in the analysis.
	Yes	No	
Solar PV:	x		Refer to PV Assessment section.
Solar Hot Water:		x	Not analyzed. Limited roof area and high DHW loads. System would not have a significant impact from a cost or energy savings perspective.
Ground-Source Heat Pumps:		x	This building is located on a compact site that is over/ adjacent to the Eversource Electrical Substation and therefore, locating geothermal boreholes under and adjacent to these structures won't be feasible.
Water-Source Heat Pumps:	x		Included in Basis of Design.
Air-Source Heat Pumps:	x		Included in all-electric scenario.
Non-Carbon-Fuel District Energy:		x	Not analyzed.
Other Non-Carbon-Fuel Systems:		x	It will be analyzed as design progresses

Non-Carbon-Fuel Scenario:

Describe the final scenario used in this analysis.

Since the proposed design is already all-electric, the Non-Carbon-Fuel (Net Zero Energy) option focuses on upgrades to the efficiencies of the building HVAC & DHW systems, as well as increases in efficiency for lighting and equipment loads. The primary HVAC system would still be an air-to-water heat pump but with higher efficiency due to assumed advances in heat pump technology by the end-of-life of the installed equipment. 100% of the DHW would be supplied by heat pump technology.

The Green Engineer
Sustainable Design Consulting

www.greenengineer.com

ATTACHMENT B
Green Building Requirements Checklist

Green Building Project Checklist

Green Building Project Location: 135 Broadway, Cambridge, MA

Applicant

Name: Boston Properties Limited Partnership

Address: 800 Boylston Street, Suite 1900

Contact Information

Email Address: ihatch@bxp.com

Telephone #: 617-236-3602

Project Information (select all that apply):

- ☐ New Construction – GFA: 411,753
- ☐ Addition – GFA of Addition: _____
- ☐ Rehabilitation of Existing Building – GFA of Rehabilitated Area: _____
  - ☐ Existing Use(s) of Rehabilitated Area: _____
  - ☐ Proposed Use(s) of Rehabilitated Area: _____
- ☒ 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: LEED version 4
  - ☒ Building Design + Construction (BD+C) – Subcategory: New Construction
  - ☐ Residential BD+C – Subcategory: _____
  - ☐ Interior Design + Construction (ID+C) – Subcategory: _____
  - ☐ Other: _____
- ☐ Passive House – Version: _____
  - ☐ PHIUS+
  - ☐ Passivhaus Institut (PHI)
  - ☐ Other: _____
- ☐ Enterprise Green Communities – Version: _____

Last Updated: May, 2020

4.9 SUSTAINTABILITY

ATTACHMENT B: GREEN BUILDING REQUIREMENTS CHECKLIST

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

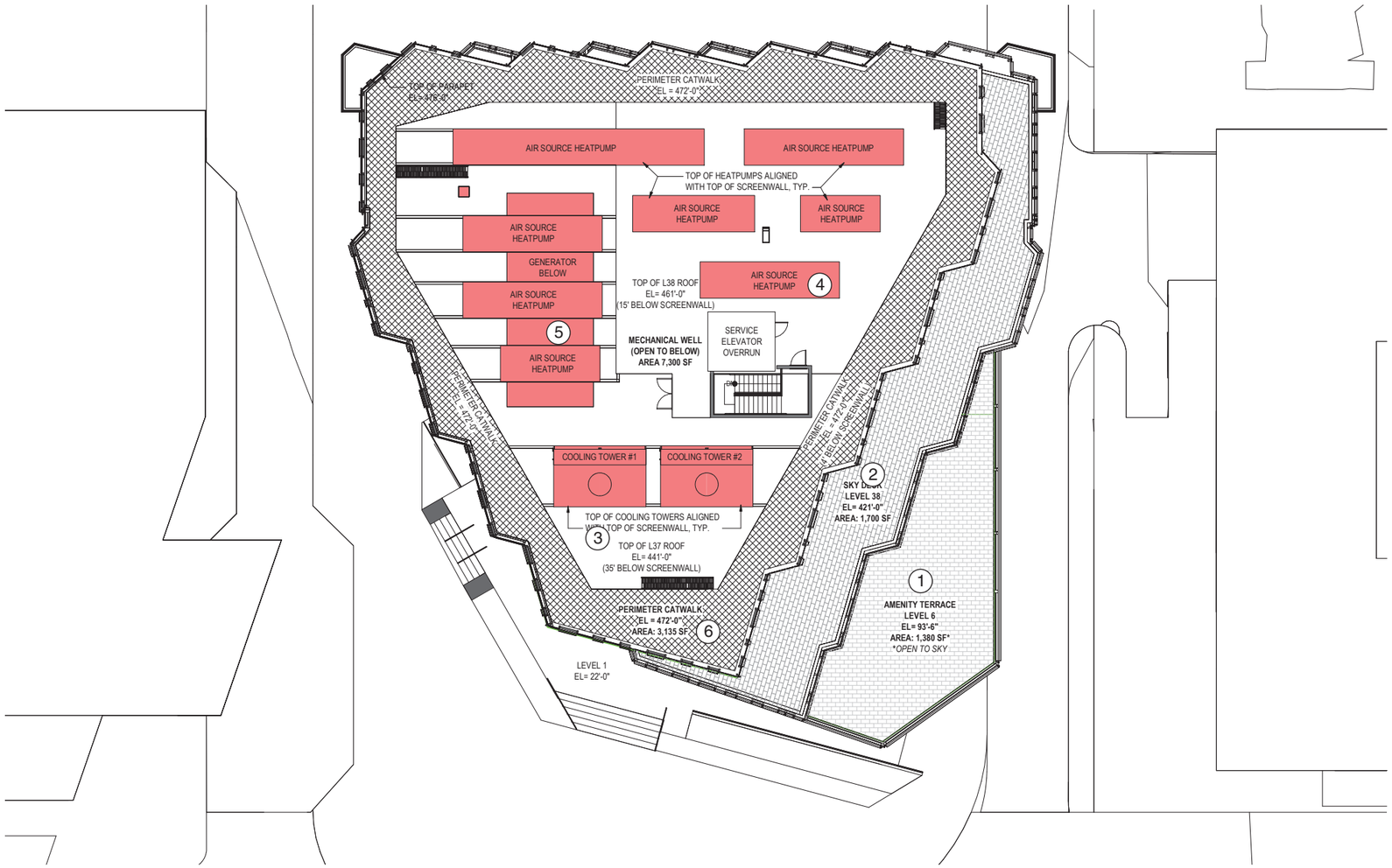
☒ Net zero narrative (see example template for guidance)

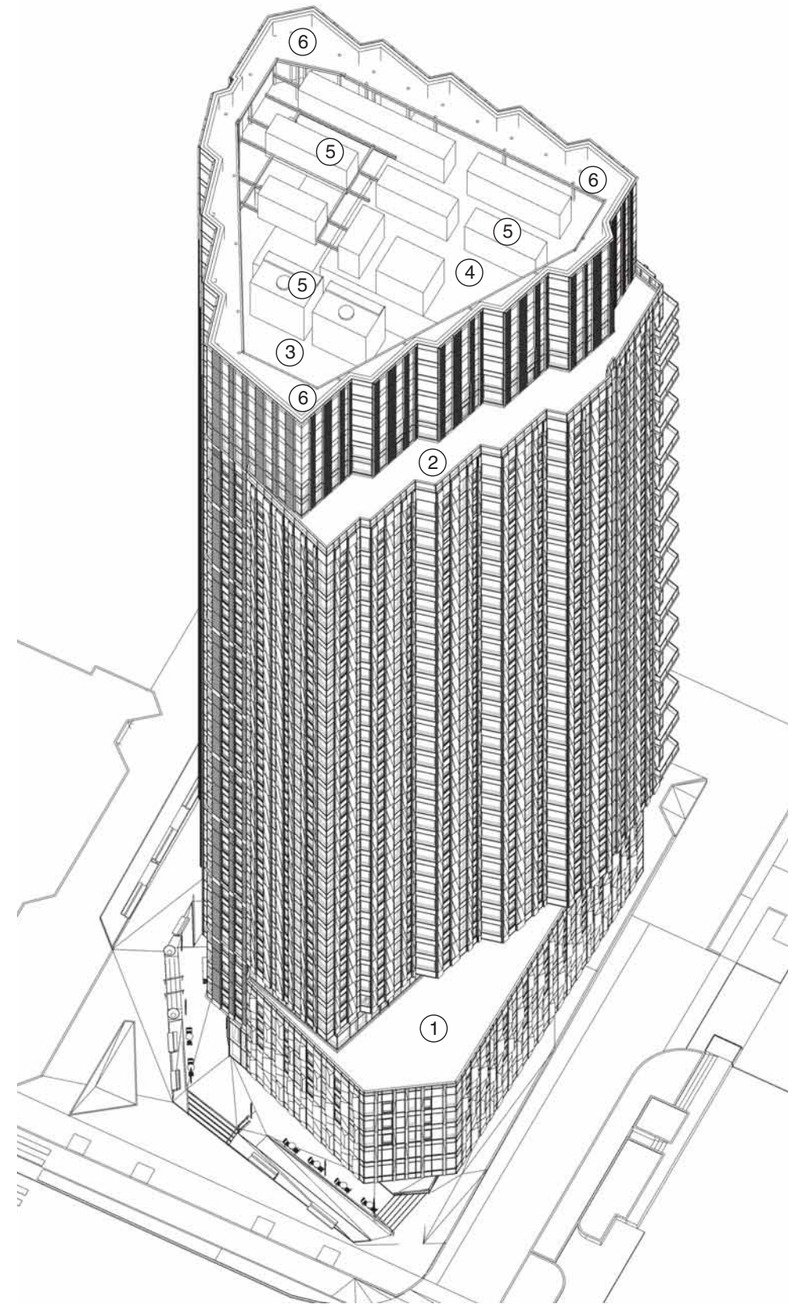
☒ Affidavit signed by Green Building Professional with attached credentials – use City form provided (Special Permit)

4.10 SUSTAINTABILITY

UPDATED

SOLAR READY PLAN / GREEN ROOF





SOLAR READY HIGH LEVEL DETAILS:

The 135 Broadway Residential Tower was studied for Solar Ready opportunities. Unfortunately, all roof space is occupied by either amenity terrace programming, or mechanical equipment. Point towers by nature have less roof space available, but the issue is multiplied by the mechanical equipment require for an all-electric building (see Air-Source Heatpumps).

See below for listing of conflicts:

1. Level 6 Amenity Terrace
2. Level 37 Sky Deck Amenity Terrace
3. Level 37 Low Roof (within Mechanical Well, 15' below screen wall)
4. Level 38 Mid Roof (within Mechanical Well, 35' below screen wall)
5. Mechanical Equipment (cannot be covered, requires air flow
6. Perimeter Catwalk (required for window washing, maintenance)

ROOF AREA SUMMARY:

1. Level 6 Amenity Terrace
   1,380 SF
2. Level 37 Sky Deck 1,700 SF

3/4/5. Mechanical Well
7,300 SF

6. Perimeter Catwalk
   3,135 SF

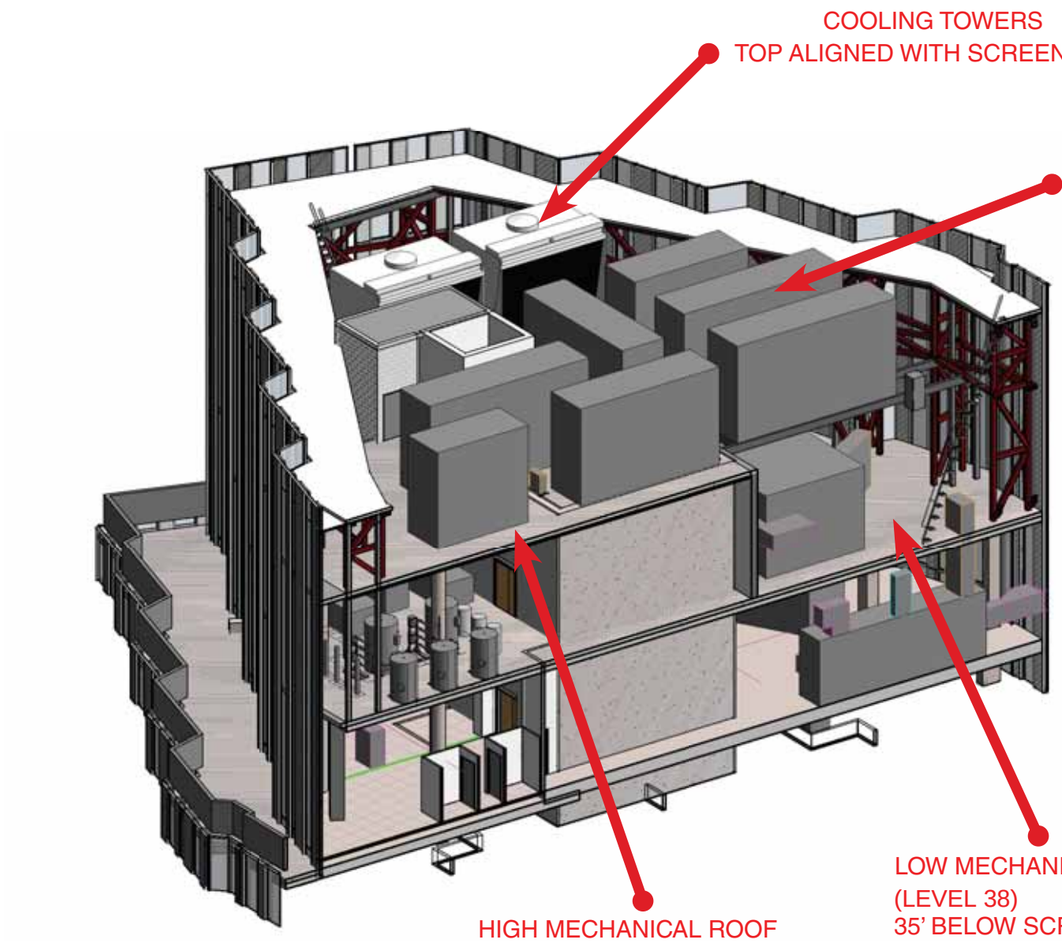
TOTAL: 13,515 SF

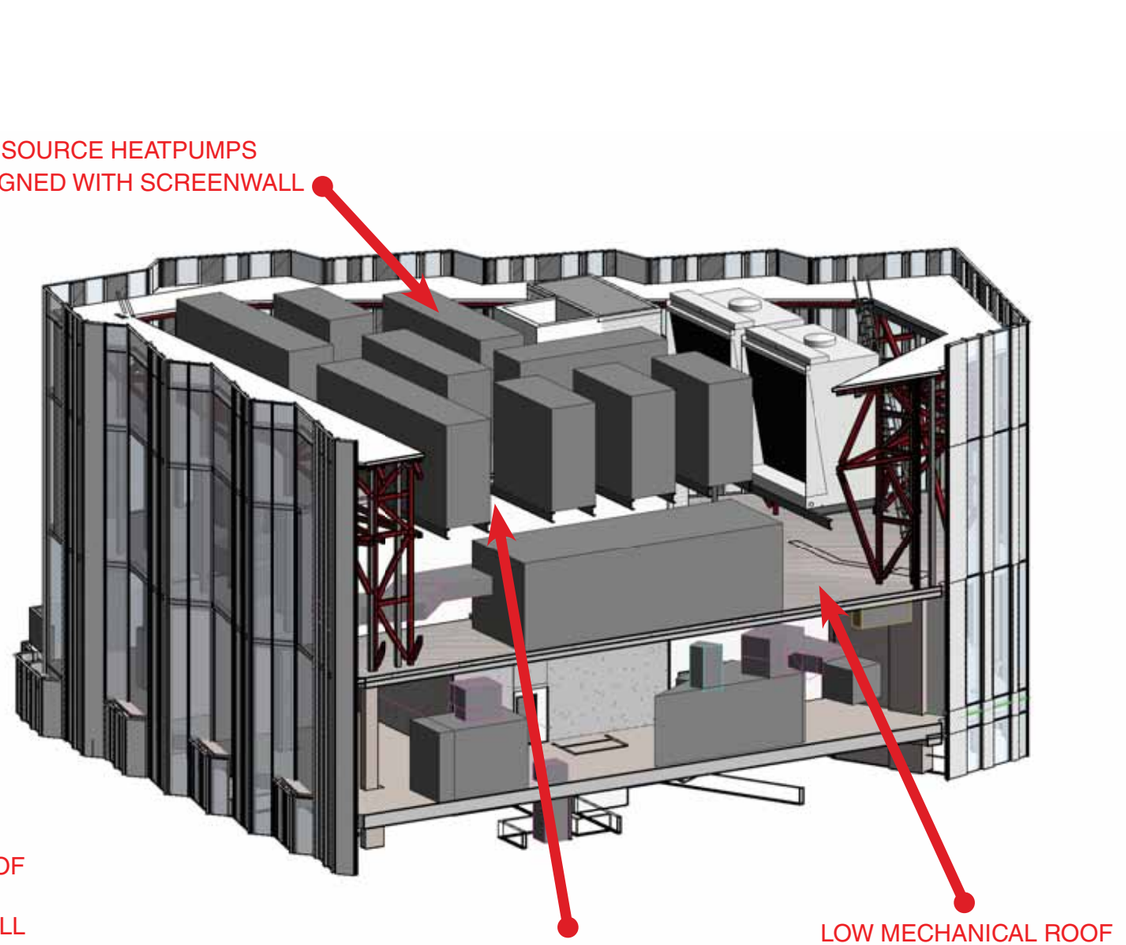
See Sections next sheet

4.10 SUSTAINTABILITY

SOLAR READY PLAN / GREEN ROOF

NEW SHEET

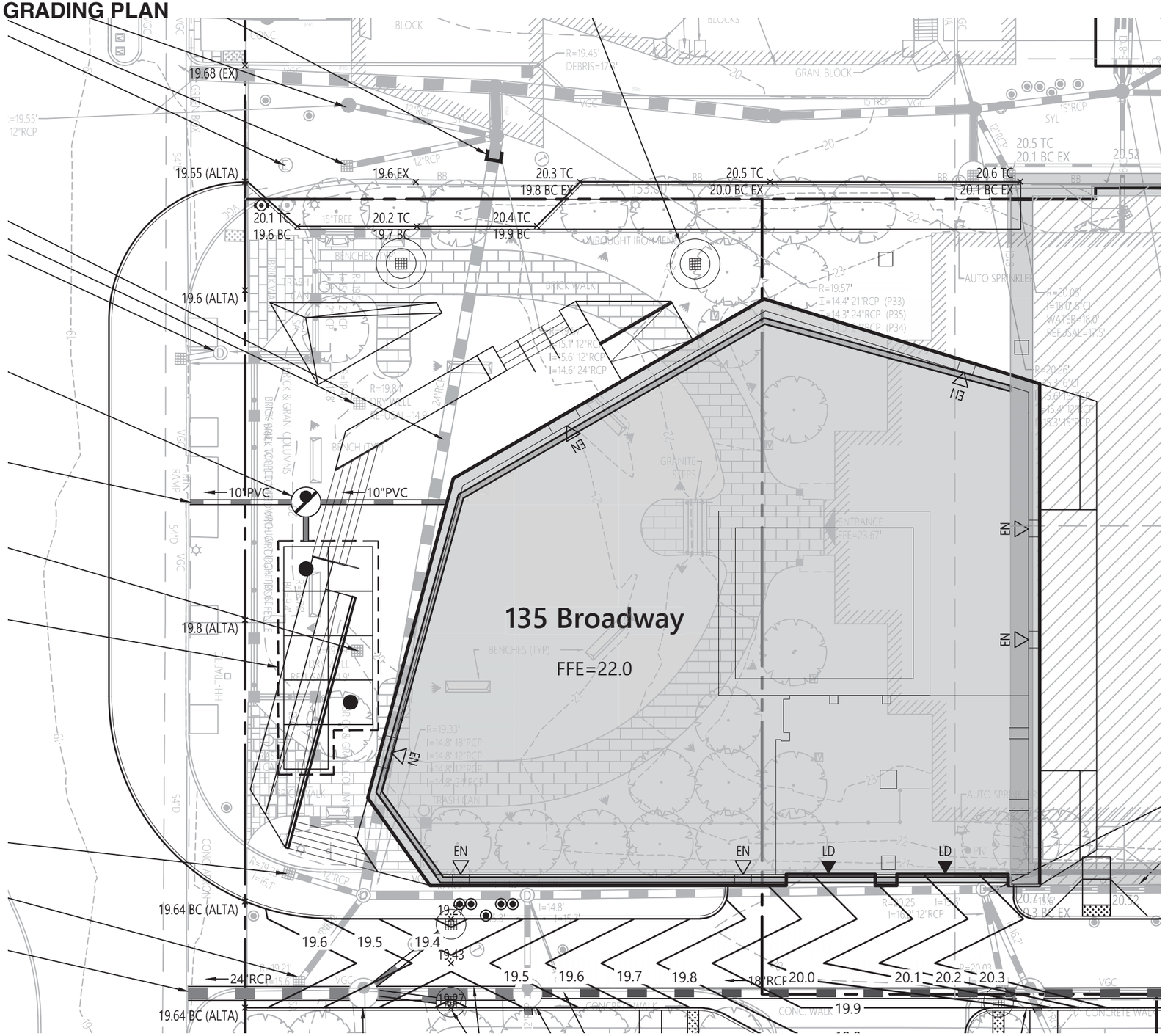




4.11 RESILIENCY

NEW SHEET

GRADING PLAN



Cambridge's forthcoming 2070 floor plain mapping projects a 100 year flood plain elevation of 23.45' for this site.

To mitigate damage that could be caused by these floors, the project is taking a series of precautionary measures:

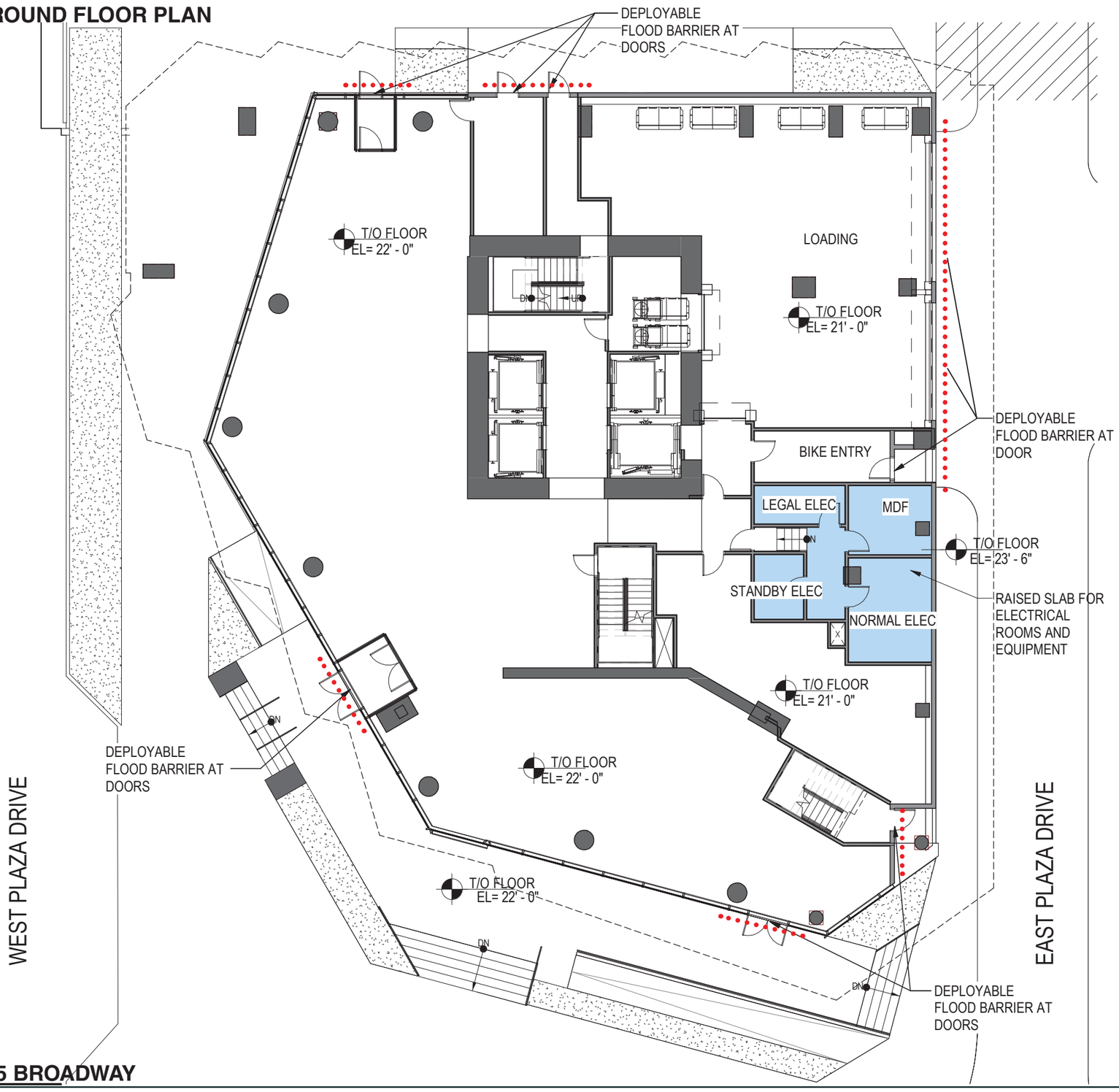
1. Critical building infrastructure has been raised to an elevation of 23.5'
2. The Lobby has been raised to 22'-0". It was determined that raising the lobby to an elevation of 23.5' would be to compromising to the urban streetscape and building access due to existing grading.
3. The curtainwall and opaque walls will sit atop concrete curbs at a height of 23.5', acting as a barrier to floor waters.
4. Swing doors and the loading dock doors will have flood barriers that will deployed in the event of storm surge or flooding, as these cannot be otherwise protected.

Through rigorous study, it was determined that this approach was the best way to protect from inevitable storms, while not compromising the urban fabric and building access.

4.11 RESILIENCY

NEW SHEET

GROUND FLOOR PLAN



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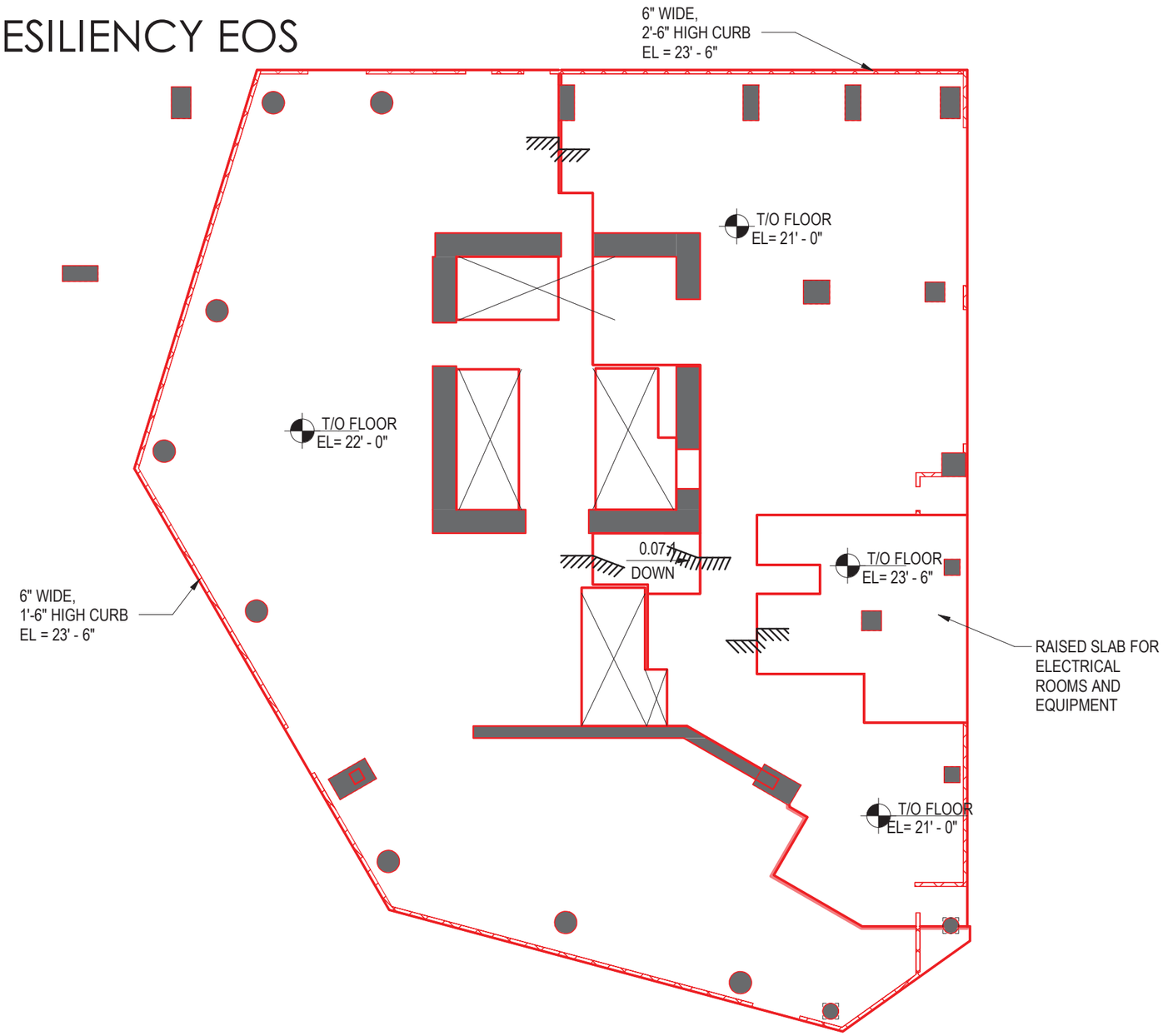
Through rigorous study, it was determined that this approach was the best way to protect from inevitable storms, while not compromising the urban fabric and building access.

4.11 RESILIENCY

EDGE OF SLAB AND CURB PLAN

NEW SHEET

GROUND FLOOR - RESILIENCY EOS



5. DESIGN GUIDELINES

5. Built Form

The existing Kendall Square embraces various styles of developments each symbolizing the predominant economy of different eras: industrial and manufacturing, R&D, and now, the knowledge economy. Recently, companies are increasingly seeking for buildings with large floor plates to allow greater flexibility to accommodate multiple disciplines and provide opportunities for interaction, collaboration, and creativity.

a. Architectural Identity of Kendall Square

Goal: Architectural composition should particularly emphasize a distinct identity for the building as well as for Kendall Square. This identity should be legible from adjacent streets and critical viewpoints, as well as within the overall Kendall Square skyline when seen from a distance.

Measures:

a. Methods of creating a distinct architectural composition include use and proportioning of materials, colors and shapes that differ from those of adjacent buildings.
b. Convey the act and spirit of innovation in Kendall Square through transparency that directly reveals activity, and active media.
c. Create a well designed streetwall to help frame Kendall Square's streets and public spaces.

b. Scale and Massing

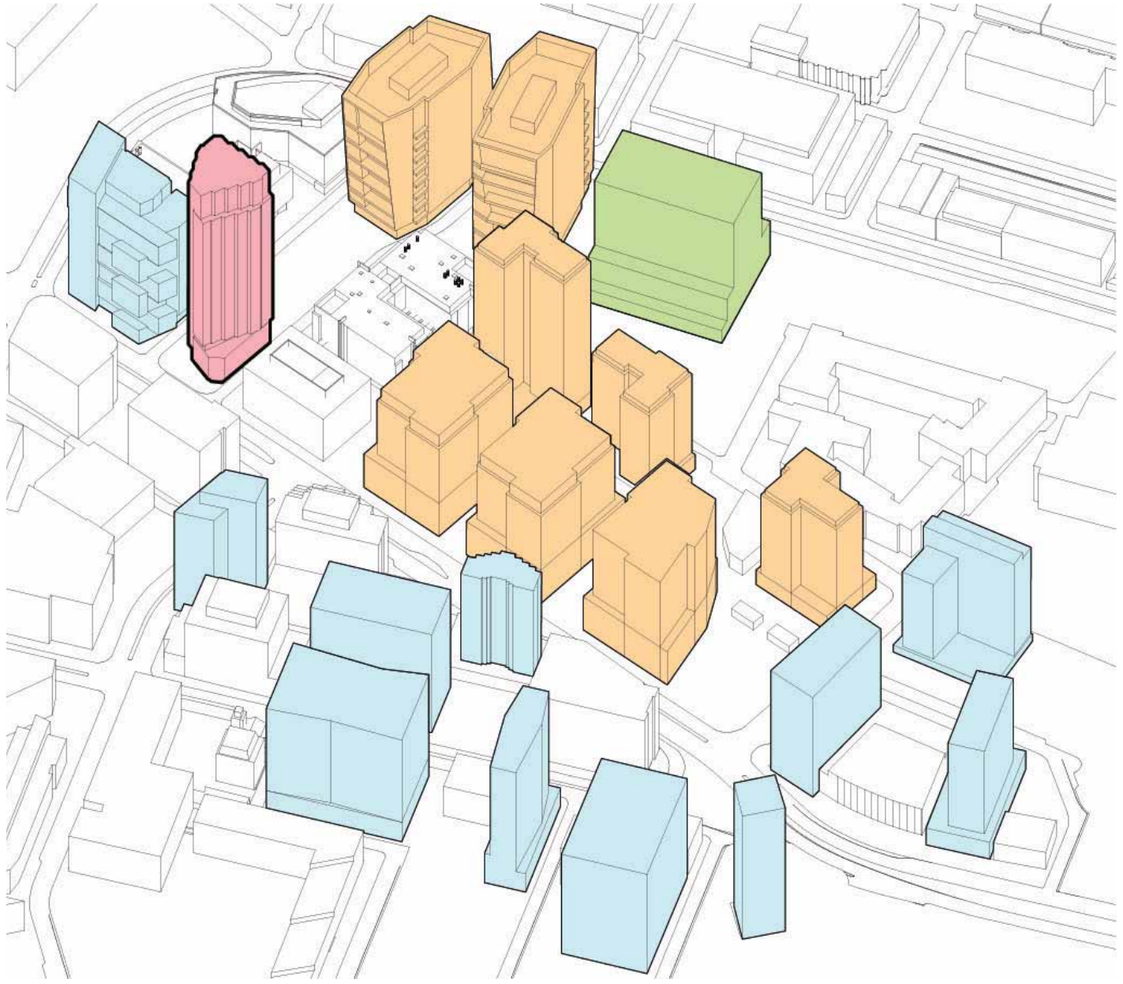
Goal: Encourage building forms and site planning that relate to the surrounding context. New buildings should create sensitive transitions to neighboring uses, especially to existing residential buildings, historical structures, and public parks.

Measures:

a. Include setbacks to create transitions to adjacent low-scale buildings
b. Design and locate public and private open space to be responsive to adjacent uses
c. Use sensitive site planning and building design to reduce impact on significant view corridors from public spaces

Kendall Square Design Guideline

Proposed Design



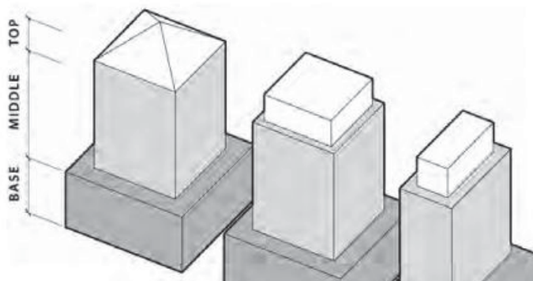
Existing
Under Construction
Proposed
135 Broadway

5.1.2 BUILT FORM
SCALE AND MASSING

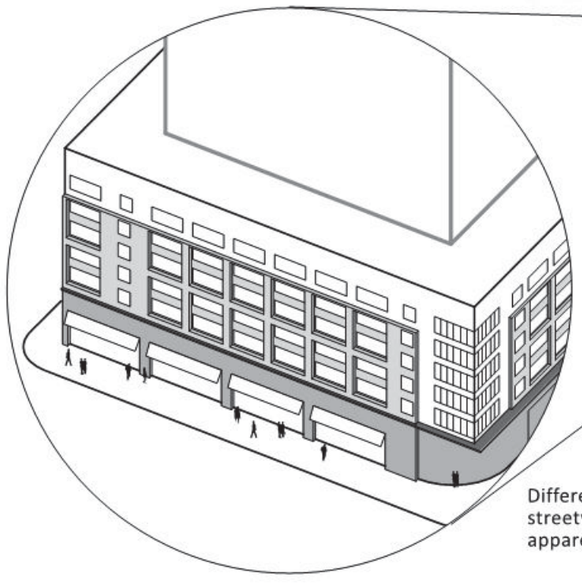
Goal: Design buildings to minimize monolithic massing and break down the scale of large buildings

Measures:

a. Buildings should have a clearly expressed base, middle, and top. This division should be expressed within the streetwall height zone as well as for buildings exceeding streetwall height.
b. Pay special attention to the first floors (bottom 20 feet) of buildings, where buildings relate the most to the street and pedestrians. Different design guidelines may be applicable depending on location and uses of buildings.



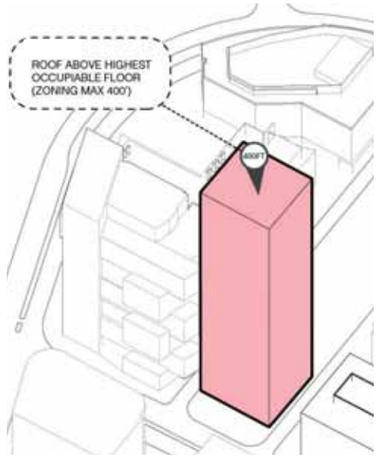
Clearly expressed base, middle, and top for tall buildings will bring unique identity for each building and will contribute to the overall architectural rhythm



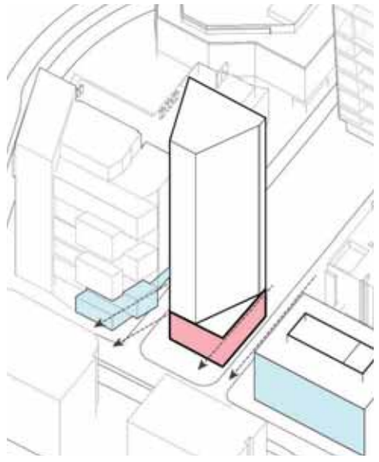
Differentiated facade within the streetwall height will break down the apparent scale of buildings

Kendall Square Design Guideline

Proposed Design

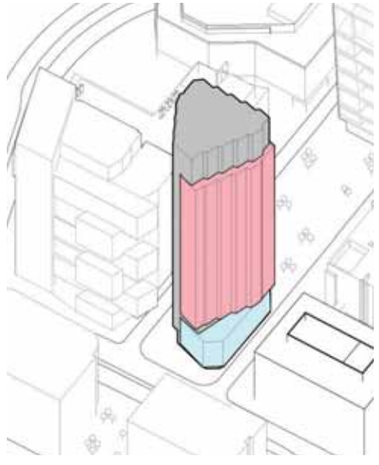


The site footprint shown extruded to the zoning max of 400 ft at the roof above the highest occupied floor.



Tower massing is tapered towards a point on Broadway, creating a unique skyline typology.

Podium base massing projects from tower form, retaining select street wall frontages and creating a distinct pedestrian scale base form.



The podium base has been meets Broadway at an angle, creating space for an urban plaza.

Cuts to the tower extrusion at key moments reinforce a base-middle-top hierarchy.

5.1.3 BUILT FORM

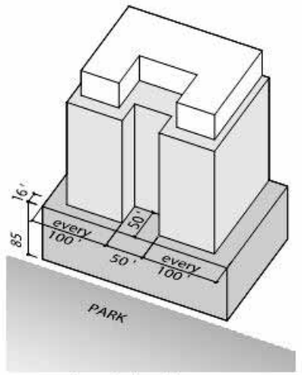
PARK EDGES

– ***Park Edges***

Goal: Development around parks and plazas should support an environment that is active, welcoming safe and welcoming to a wide spectrum of users throughout the day, week and year.

Measures :

a. Pay special attention to scale and shadows of buildings along park edges.
b. Set back about two-thirds of the building façade above 85 feet from the principal façade depth of approximately 15 feet
c. Create vertical breaks for building volumes above 120' in height facing the park -- façades facing the park exceeding 100' in width should be separated from adjacent façades by a gap of approximately 50 feet, extending back 50 feet from the ground level façade. Residential balconies may project up to 4 feet into setbacks and gaps.
d. Façade areas without setback may be appropriate at corners or in specific locations to create architectural variety.



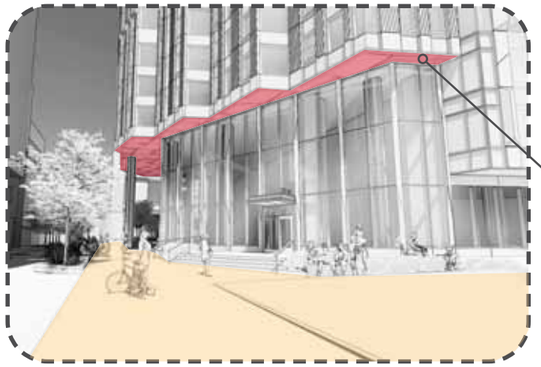
Example of a building massing located at park edges

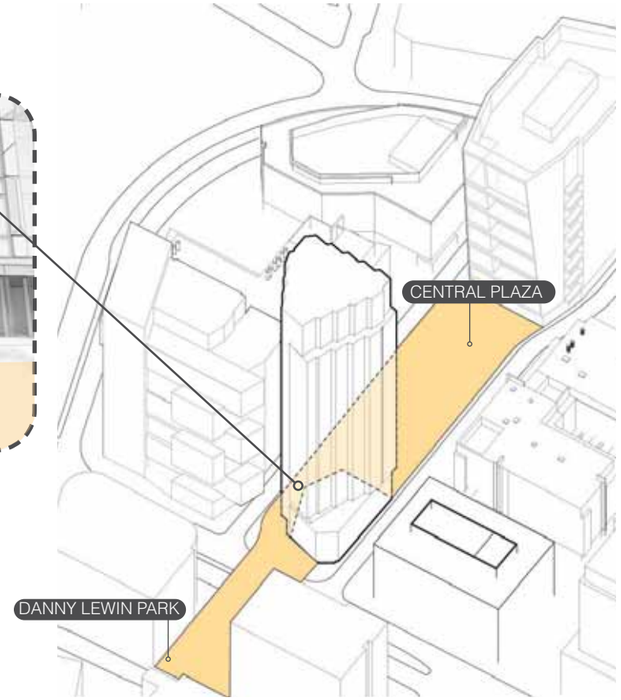
VOLPE DESIGN GUIDELINES

- Create variation in heights, setbacks, and stepbacks on different parts of the site to maximize compatibility with existing buildings and to create a sense of affinity between new and existing buildings.
- Create compatibility in heights, and stepback buildings adjoining the site and on opposite sides of the street.
- Adhere to minimum and maximum street wall heights. The upper boundary of the street wall may be demarcated by stepbacks above that level or by cornice lines. Stepbacks and cornice lines should relate to each other, but can vary where appropriate to allow for emphasis and increase the richness of the overall urban design.

Kendall Square Design Guideline

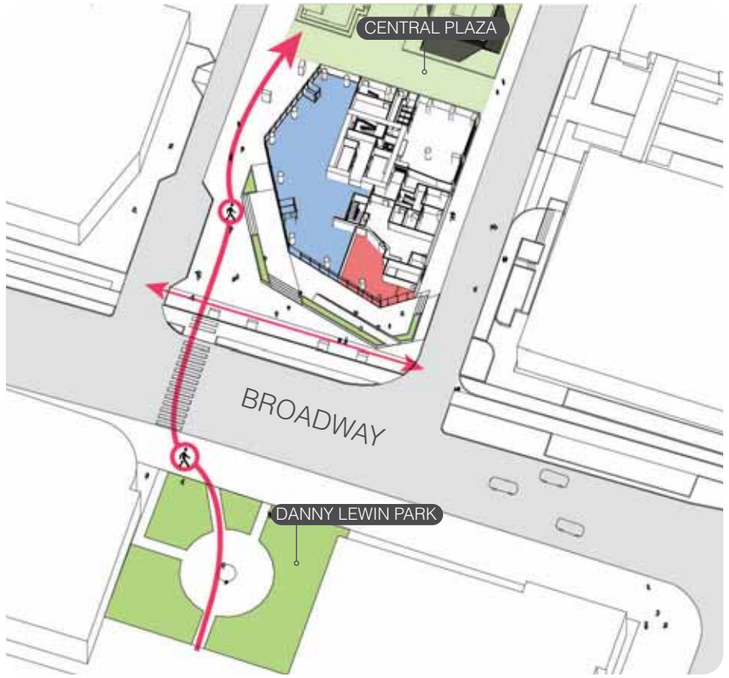
Proposed Design





The angled podium base created an urban plaza space along Broadway and provides a clear open space connection between Danny Lewin Park and the Central Plaza.

The tower mass is held above the street plaza at the East and West podium facades. These massing moments create a civic scale and allow for covered pedestrian connection paths through the site.



5.1.4 BUILT FORM
VISUAL INTEREST

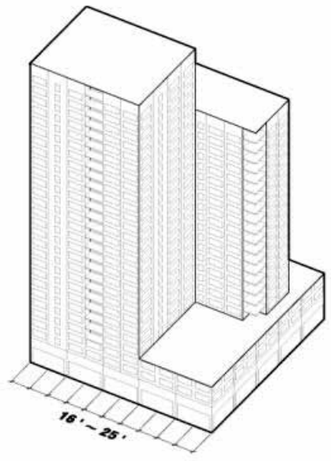
c. *Visual Interest*

Goal: Buildings should reflect a rhythm and variation appropriate to the urban context.

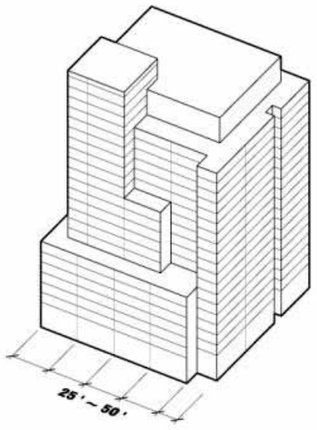
Measures:

a. Express bay widths of 16 to 25 feet in predominantly residential areas and 25 to 50 feet along edges where commercial and institutional uses are prevalent.

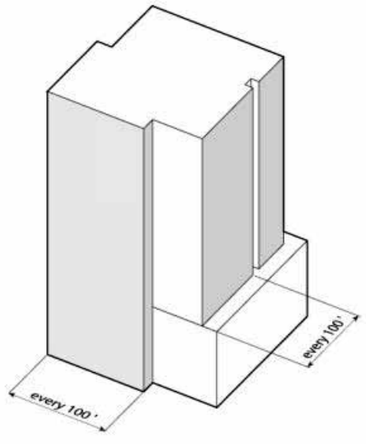
b. Establish an urban rhythm by creating a major vertical break for every 100' of façade length with a displacement of approx. 8' in depth or that divides building form into major distinct massing elements.



a. Bay widths of 16 to 25 feet for residential uses



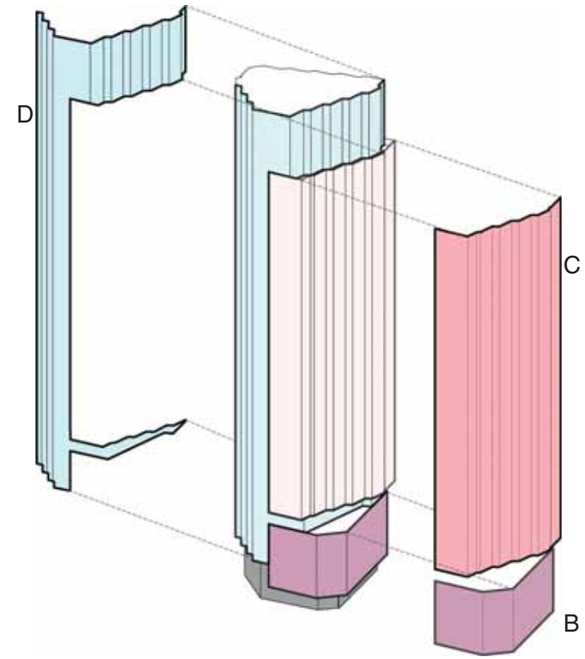
a. Bay widths of 25 to 50 feet for commercial and institutional uses



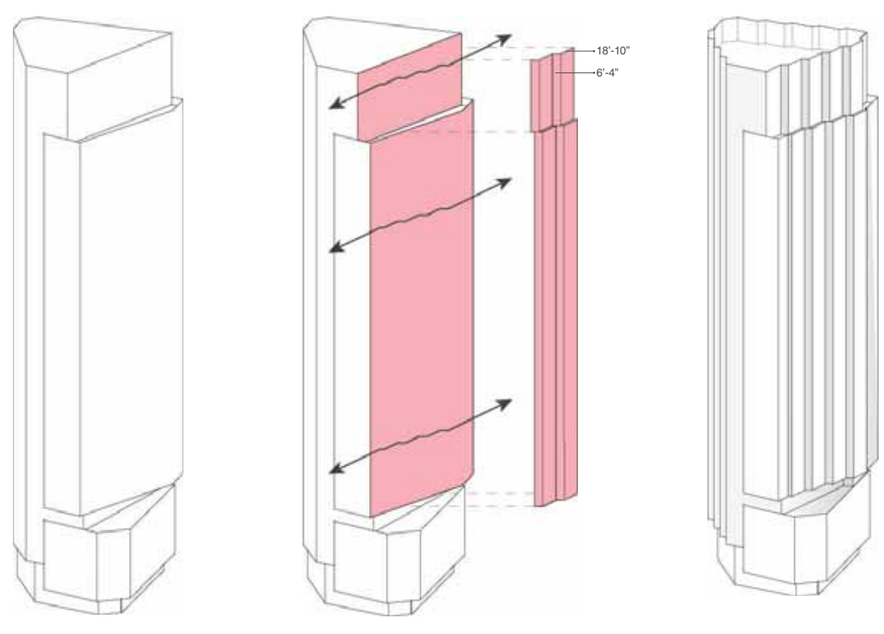
b. Example of a vertical break

Kendall Square Design Guideline

Proposed Design



The four primary facade languages reinforce the associated massing, providing differentiation of base-middle-top and east-west expressions.



The two tower facades languages employ a 23' folded-bay motif, breaking down each facade and orienting the primary vision glass faces.

5.1.4 BUILT FORM
VISUAL INTEREST

d. Visual Interest

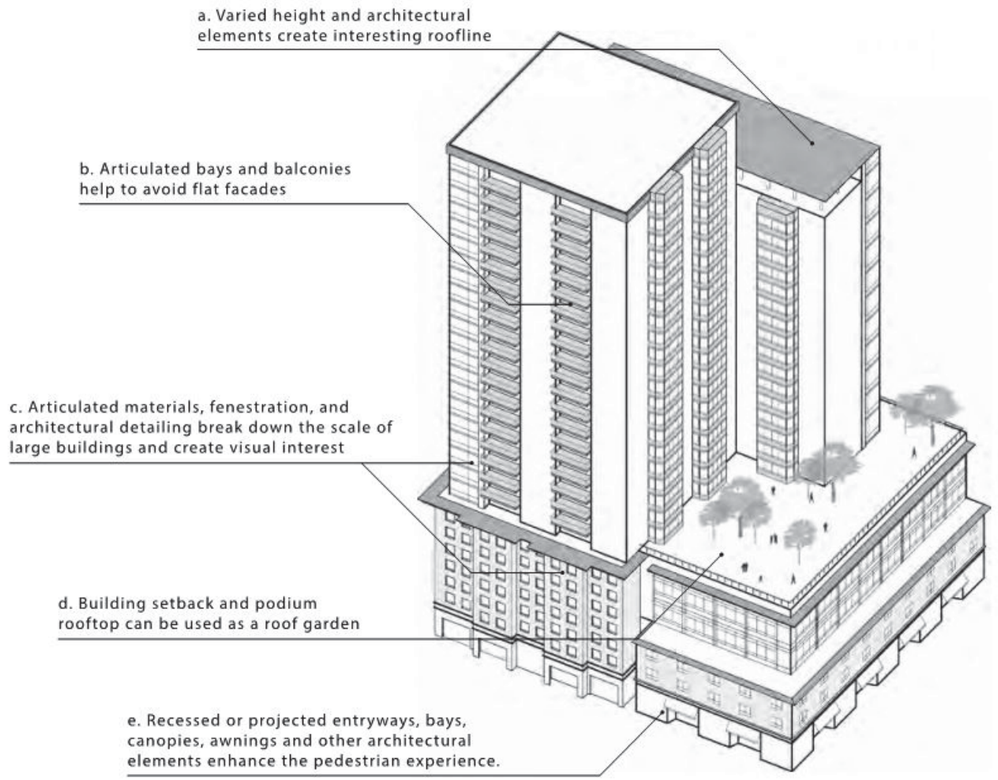
Goal: Vary the architecture of individual buildings to create architecturally diverse districts.

Measures:

a. Use variations in height and architectural elements such as parapets, cornices, passive shading devices, illumination and other details to create interesting and varied rooflines.

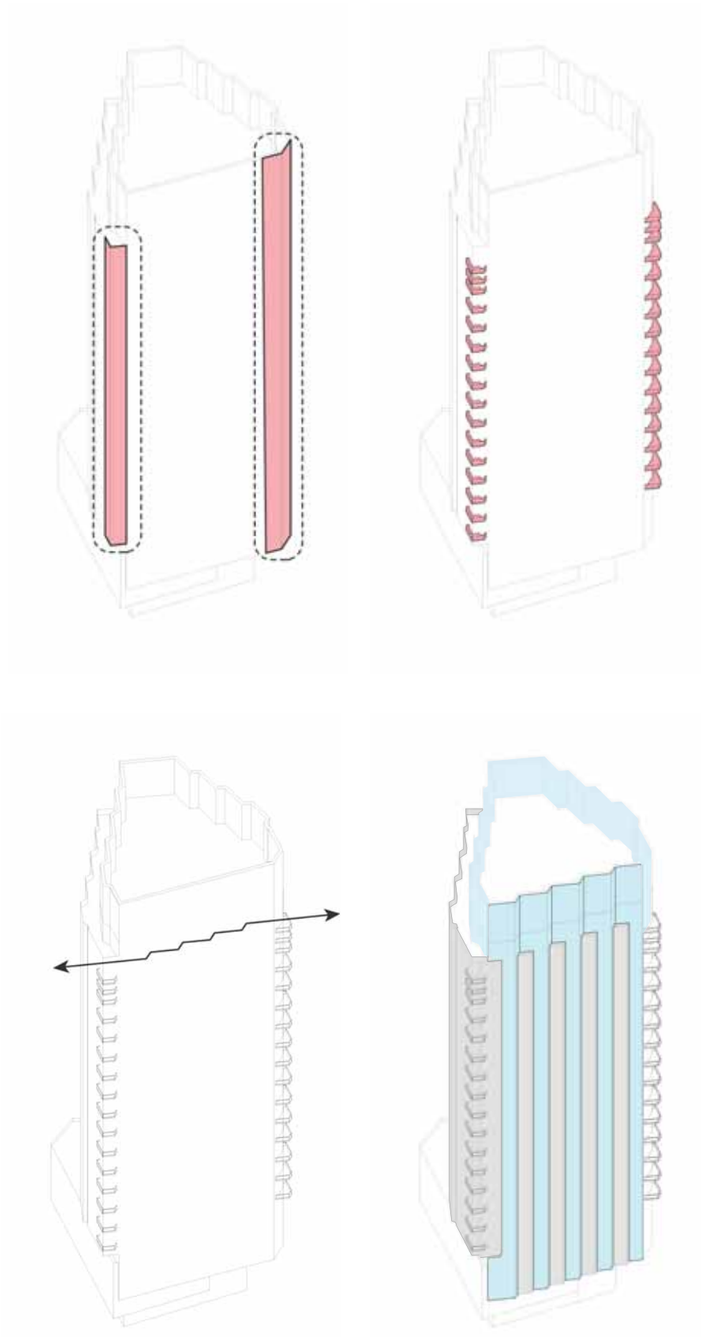
b. Avoid flat façades and create visual interest.
   - Articulate bays and balconies.
   - Utilize architectural articulation such as changes in material, fenestration, architectural detailing, or other elements to break down the scale.

c. Where buildings are set back at upper stories, use lower roofs as green roofs, balconies, terraces, and gardens.



Kendall Square Design Guideline

Proposed Design



Northwest and Northeast tower corners include a series of residential balconies

The folded east and west facade languages are combined at the north facade.

The height of the intermediate folds are varied to provide texture and align with the associate massing elements.

5.1.5 BUILT FORM
TALL BUILDINGS

d. Tall Buildings

Goal: Buildings over 200 feet tall should be designed with particular attention to the architectural character of the top of the building, which will be visible from significant public spaces and from some distance. Tall buildings could potentially enhance the identity of Kendall Square by defining edges or serving as landmarks.

Measures:

a. During design, consider the variety of vantage points from which tall buildings may be seen, especially from significant public spaces and nearby low-scale residential neighborhood.
b. Tall buildings should be articulated to avoid a monolithic appearance, and should emphasize slender, vertically-oriented proportions.
   - Emphasize corners using taller elements such as towers, turrets, and bays,
   - Consider the use of at least two distinct finish materials and colors on each building,
   - Consider variation in forms that present different profiles to different vantage points, if appropriate.
c. Avoid broad "slab" volumes that make the building appear bulky. Point towers expressing vertical volumes are encouraged.
d. Consider legibility of the building top both by day and night, while demonstrating responsible use of lighting and energy consistent with sustainability requirements.

VOLPE DESIGN GUIDELINES

- Break up the monolithic mass and bulk of large buildings by dividing façades into separate vertically oriented components, differentiated by changes in material, color, fenestration, setback, vertical reveals, etc.

- Where buildings are stepped back, provide green roofs, balconies, terraces, or gardens. Roof terraces for residential and commercial tenants are encouraged as important private amenities and for on-site rainwater retention.

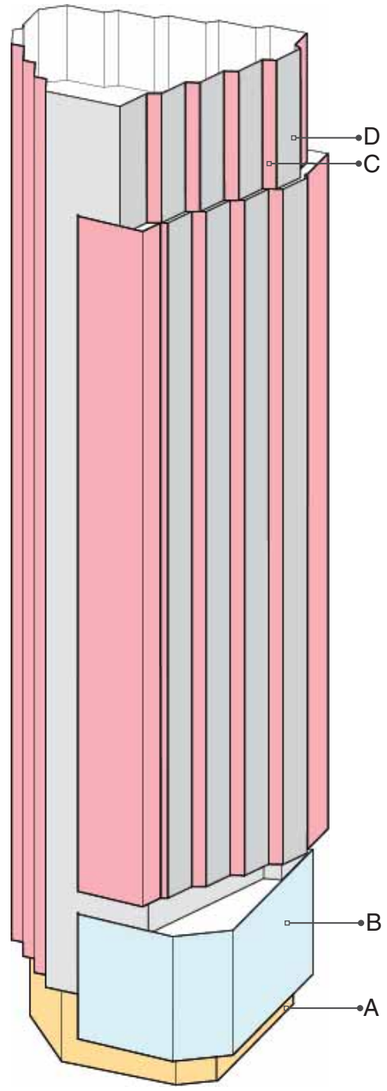
- Use building volumes to give definition to streets and other open spaces and at the same time create a comfortable pedestrian scale.

- Create variation in heights, setbacks, and stepbacks on different parts of the site to maximize compatibility with existing buildings and to create a sense of affinity between new and existing buildings.

- Create compatibility in heights, and stepback buildings adjoining the site and on opposite sides of the street.

Kendall Square Design Guideline

Proposed Design



A. The ground level facades at public spaces are designed as the most open and transparent systems.

B The projecting podium mass is a highly articulated facade that reinforces the street wall and provides shelter.

C The folds are designed so that noted short-fold areas of vision glass can catch the sun throughout the day.

D Broad-fold faces combine opaque cladding & vision glass, intended to clearly define the massing form.

5.1.6 BUILT FORM
ROOF TOPS

f. Rooftops

Goal: The design of rootops, including mechanical equipment and cellular installations, should be conceived as integral to the rest of the architecture of the building.

Measures:

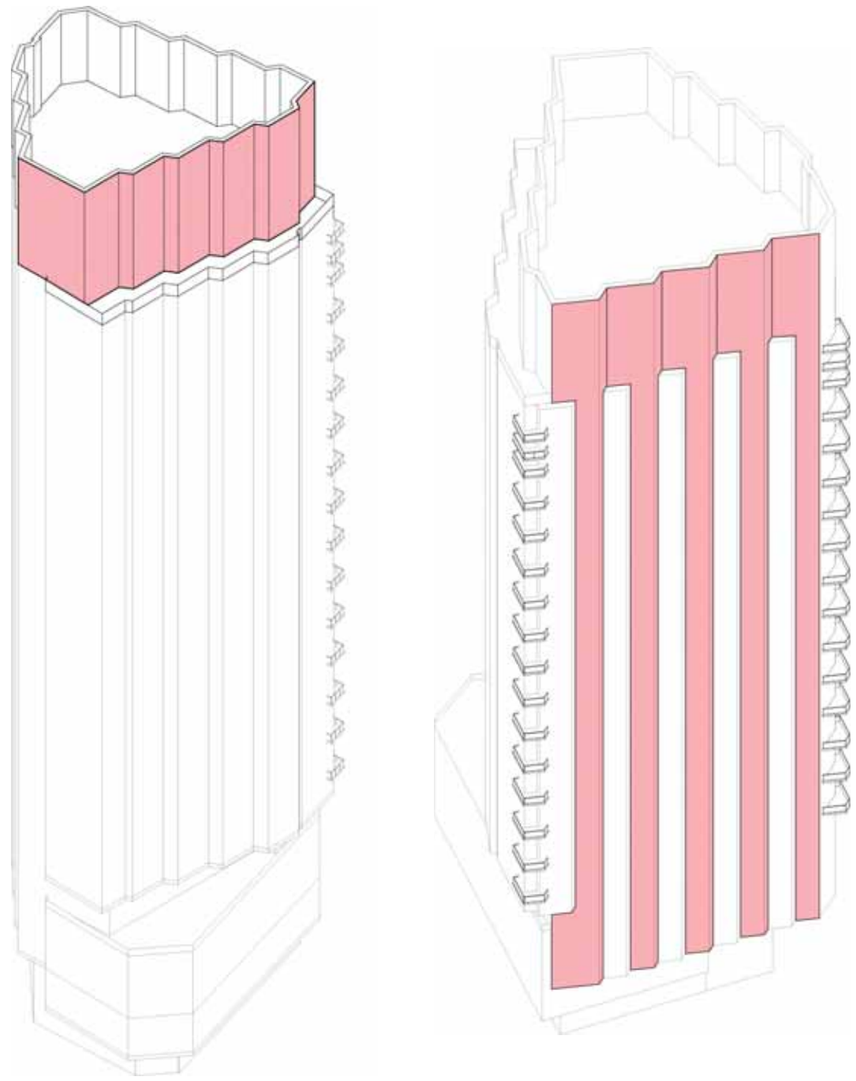
a. Rooftop mechanicals may be designed to stand out as machinery, in which case it needs to be carefully arranged to give a pleasing visual image.
b. Screening may be used to conceal rooftop mechanicals, and in this case, the screening should be in the same idiom as the rest of the architecture.
c. It may be possible to use both techniques listed above.
d. To the extent possible, provisions should be made so that future cellular installations may be placed upon the building without detriment to the architecture, e.g. a blank wall of a mechanical screen may be conceived as such a location.

VOLPE DESIGN GUIDELINES

- Ensure that towers are increasingly slender and broken down in scale toward the top. Buildings should provide animated silhouettes that enliven views to the site.
- Use variations in height to create varied rooflines that contribute to the Cambridge skyline.
- Break up the monolithic mass and bulk of large buildings by dividing façades into separate vertically oriented components, differentiated by changes in material, color, fenestration, setback, vertical reveals, etc.

Kendall Square Design Guideline

Proposed Design



The eastern tower massing steps back at the upper levels to clearly define a tower ‘crown’ element. This element wraps all sides of the tower, and has enhance detail elements to define this area.

The typical tower facade language will incorporate areas of screened mechanical equipment at the crown and podium electrical vault. The screens will be interwoven with finish facade cladding panels, minimizing their effect on the overall facade expression.

5.2.1 GROUND FLOOR

RETAIL OR MIXED-USE GROUND FLOORS

UPDATED

b. *Residential Use Ground Floors*

– ***Setbacks***

Goal: Contribute to a pedestrian-friendly environment with residential character that includes ample space for walking, street trees and other plantings, and significant access to direct sunlight and sky views.

Goal: Create a consistent residential edge, with a setback from the sidewalk for compact front stoops, porches, and gardens, while ensuring compliance with state and federal access regulations.

– ***Entrances***

Goal: Ensure that ground floor residences meet and exceed access needs of all users and incorporate 'visitability' measures. Providing fully accessible front entrances, beyond code requirements, is strongly encouraged, while balancing need for interior privacy. Consider strategies including:

Measures:

a. Accessible raised ramps lining the façade (with a continuous accessible passage as well as defined semi-private areas)
b. Ground-level entrances with added privacy elements such as 3- to 4- foot high walls, screens or vegetation, projecting trellises, or similar elements marking a transition to private space

– ***Façades***

Goal: Wherever appropriate, design buildings with individual units and front doors facing the street, including row house units on the lower levels of multi-family buildings to create a rhythm of entrances and create a residential feel. Where residential lobbies face the street, doors should generally be spaced no more than 75 feet apart.

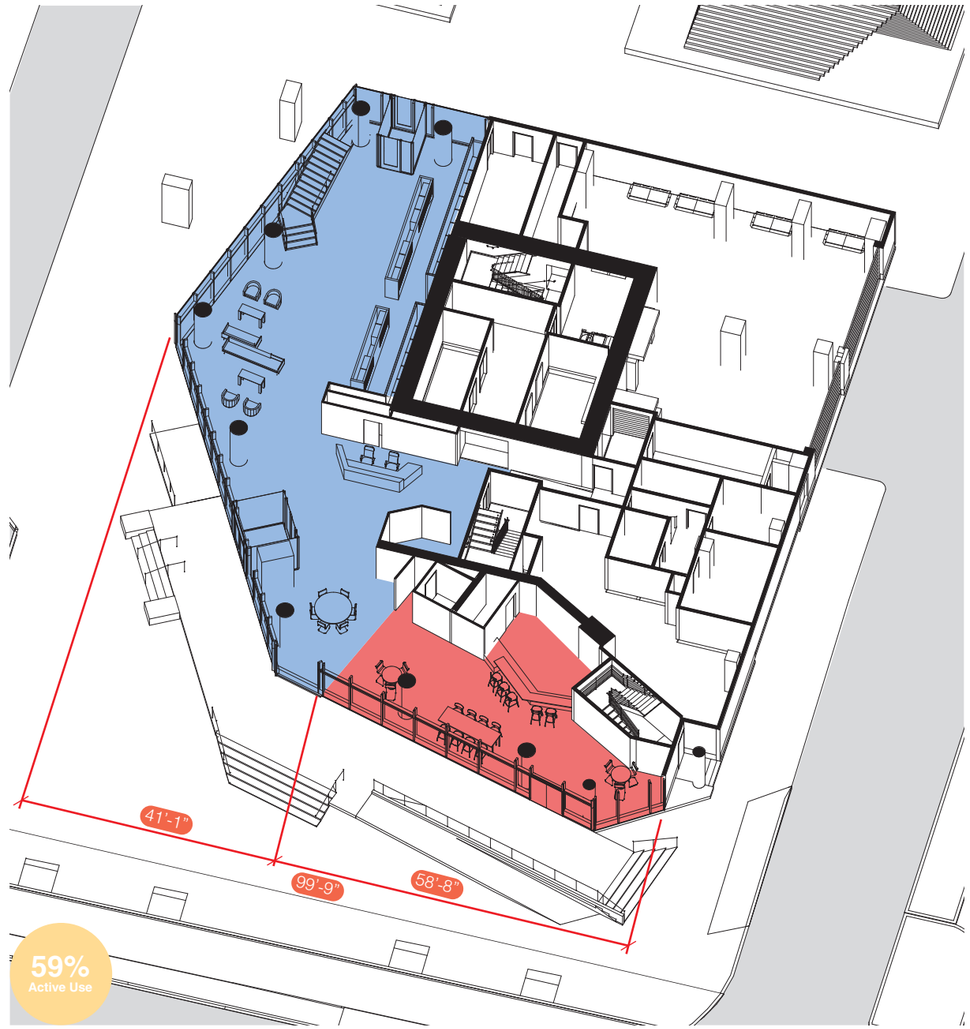
Goal: Residential buildings should also attempt to accommodate active uses that will enliven pedestrian activities.

Measures:

a. In parts of the street level façade that do not include residential units (e.g. common places and lobbies), incorporate 40 to 60 percent transparent glazing in the ground level façade with direct views between sidewalk and interior building spaces to expand the apparent width of public space at ground level.
b. Blank walls exceeding 20 feet in length should be avoided along all streets and pedestrian walkways.

Kendall Square Design Guideline

Proposed Design



a. The active use programing of retail and the residential lobby has been situated along Broadway, and the western promenande that connects Broadway to the Central Plaza. This creates a Square at the intersection of Broadway and West Plaza Drive that services the building lobbies and building retail spaces.

b. The retail footprint comprises 59% of the Broadway facade, exceeding zoning guidelines.

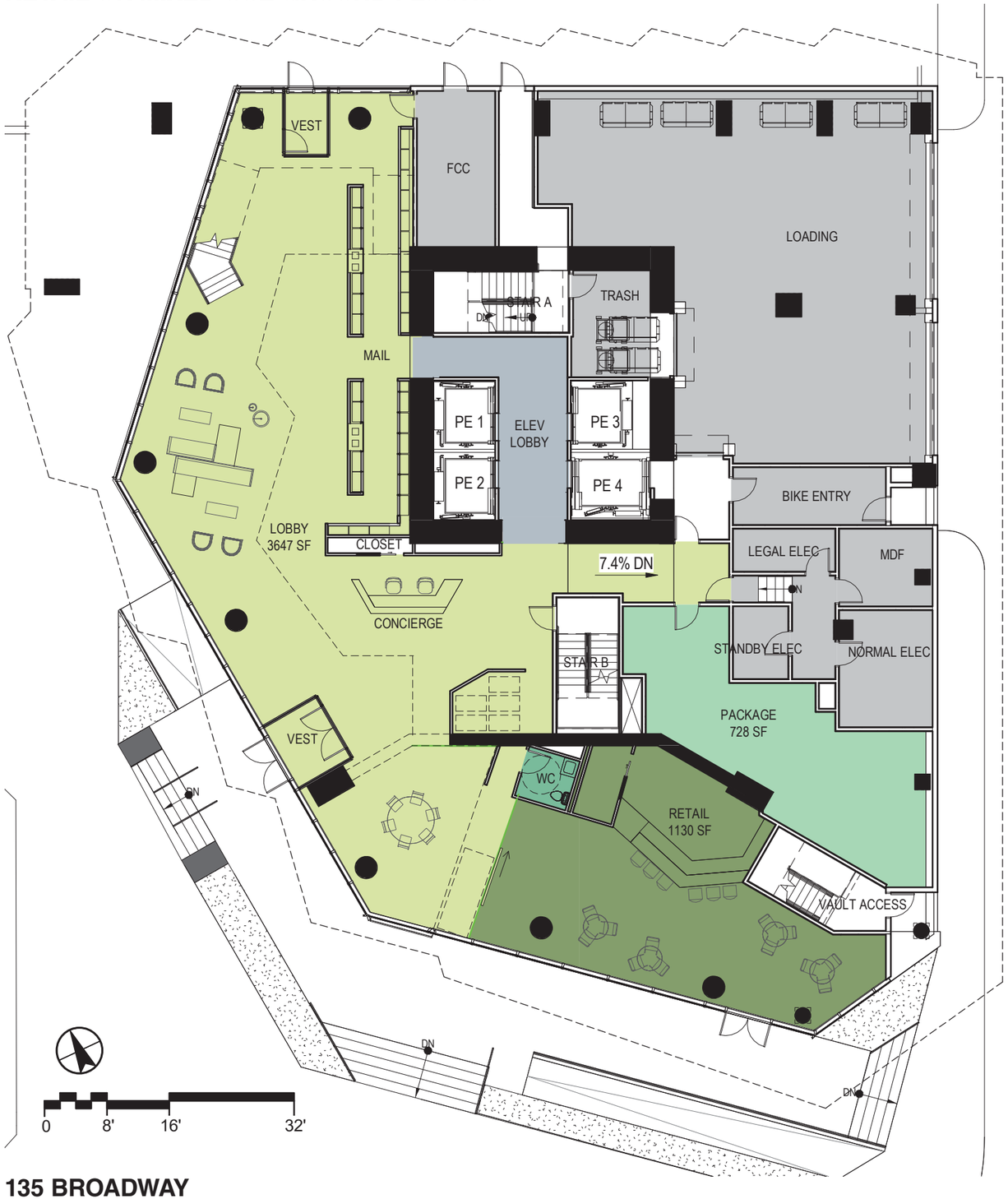
c. Curtainwall will wrap around the retail and residential lobby, from Retail on East Plaza Drive to the Central Plaza on the north side.

d. Required service uses have been consolidated to the east and northeast corner, across from 10CC's loading dock and the substation's ventilation intake.

5.2.1 GROUND FLOOR

RETAIL OR MIXED-USE GROUND FLOORS

NEW SHEET



The lobby will feature a mezzanine with co-working seating and booths, giving residents a place to to work from home.

The result will a vibrant and interesting multi-level lobby filled with people and activity.

The retail will have a porous division between retail and lobby, and will spill into the lobby space.

5.2.1 GROUND FLOOR

RETAIL OR MIXED-USE GROUND FLOORS

NEW SHEET

The lobby will feature a mezzanine with co-working seating and booths, giving residents a place to to work from home.

The result will a vibrant and interesting multi-level lobby filled with people and activity.

The retail will have a porous division between retail and lobby, and will spill into the lobby space.

5.2.2 GROUND FLOOR

ENTRANCES

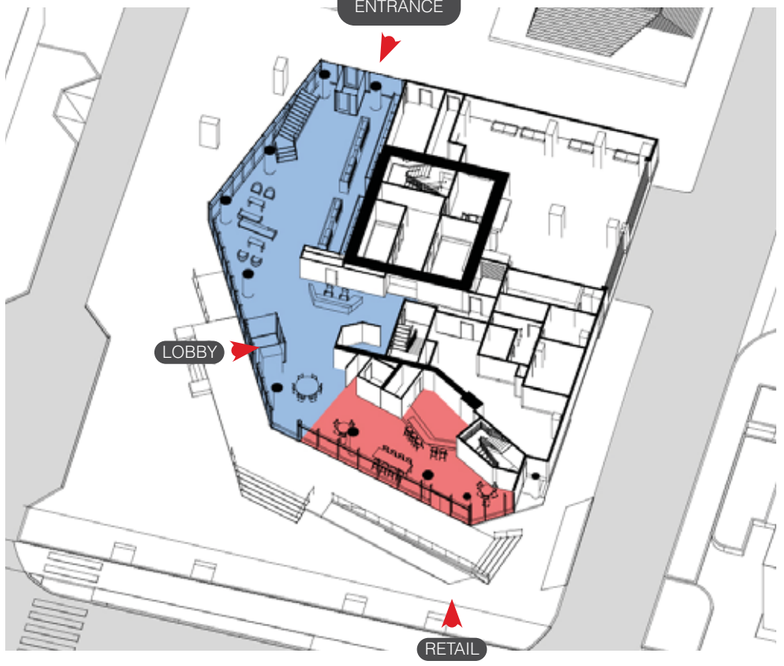
UPDATED

– ***Entrances***

Goal: Major entrances should be located on public streets, and on corners wherever possible. If appropriate, entrances should relate to crosswalks and pathways that lead to bus stops, transit and bike stations.

Kendall Square Design Guideline

Proposed Design



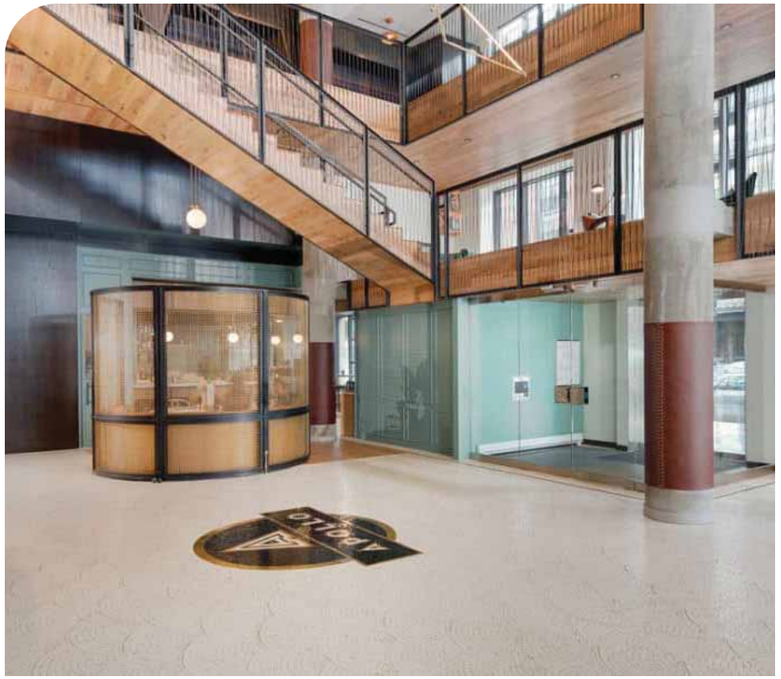
a. The tower entrances favor Broadway, and are pulled back from the street edge to create an active public space.

b. The residential building entrance is located in the southwest corner of the ground floor. This location activates the public promenade on the west side of the tower that connects Broadway to the Central Plaza.

c. The ground floor is raised to +22’ for resiliency reasons, and thus requires a platform outside the entrances. The platform, also at +22’ is accessible from the ~20’-6” sidewalk by stair and ramp.

6. RETAIL & ACTIVE USE

6.1 RETAIL PRECEDENT IMAGES



RETAIL AND ACTIVE USE VISION

Despite its small footprint, the retail at 135 Broadway will lean on its prominent location on Broadway, as well as its home inside a ~450 unit apartment building. It is being envisioned as having a symbiotic relationship with the Residential Lobby, both in capturing the customer base within the tower as the come and go, and also by acting as an extension of the towers's amenities.

This can be achieved by strategic curating of active-use retail program (i.e. cafe, coffee shop, wine bar, etc.). To integrate the Lobby with the Retail, the wall between is seen as porous, allowing the retail to spill out into a flex space of the lobby, while inviting residents into the space.

Precedent for this approach can be seen in images on this page, showing The Apollo, an apartment building in Washington DC.

6.1 RETAIL PRECEDENT IMAGES

GALLERY USE AND ACTIVE USE VISION

Because of its small footprint, it is important to explore creative opportunities for this space, focusing on those that will enrich the community and contribute to the culture of Kendall Square.

This approach takes inspiration from the The Gallery at Atlantic Wharf in Boston (owned by the Applicant), where a partnership with the Fort Point Arts Commission led to a gallery being situated off of the office lobby.

This idea is becoming popular in the hotel industry, where they celebrate local art as a way of integrating with the locale, and creating experience for patrons, all while supporting their communities.

The gallery space in red could be home to rotating exhibits curated and managed in conjunction with the Cambridge Arts Council, while permanent works or even works for sale could be hung in the lobby, thereby extending the gallery into the lobby and drawing the residents into the gallery.

Precedent for this approach can be seen in images on this page, showing The Ellerman House, a hotel in Cape Town, South Africa.

6.2 BIKE PARKING

SITE KEY PLAN

UPDATED

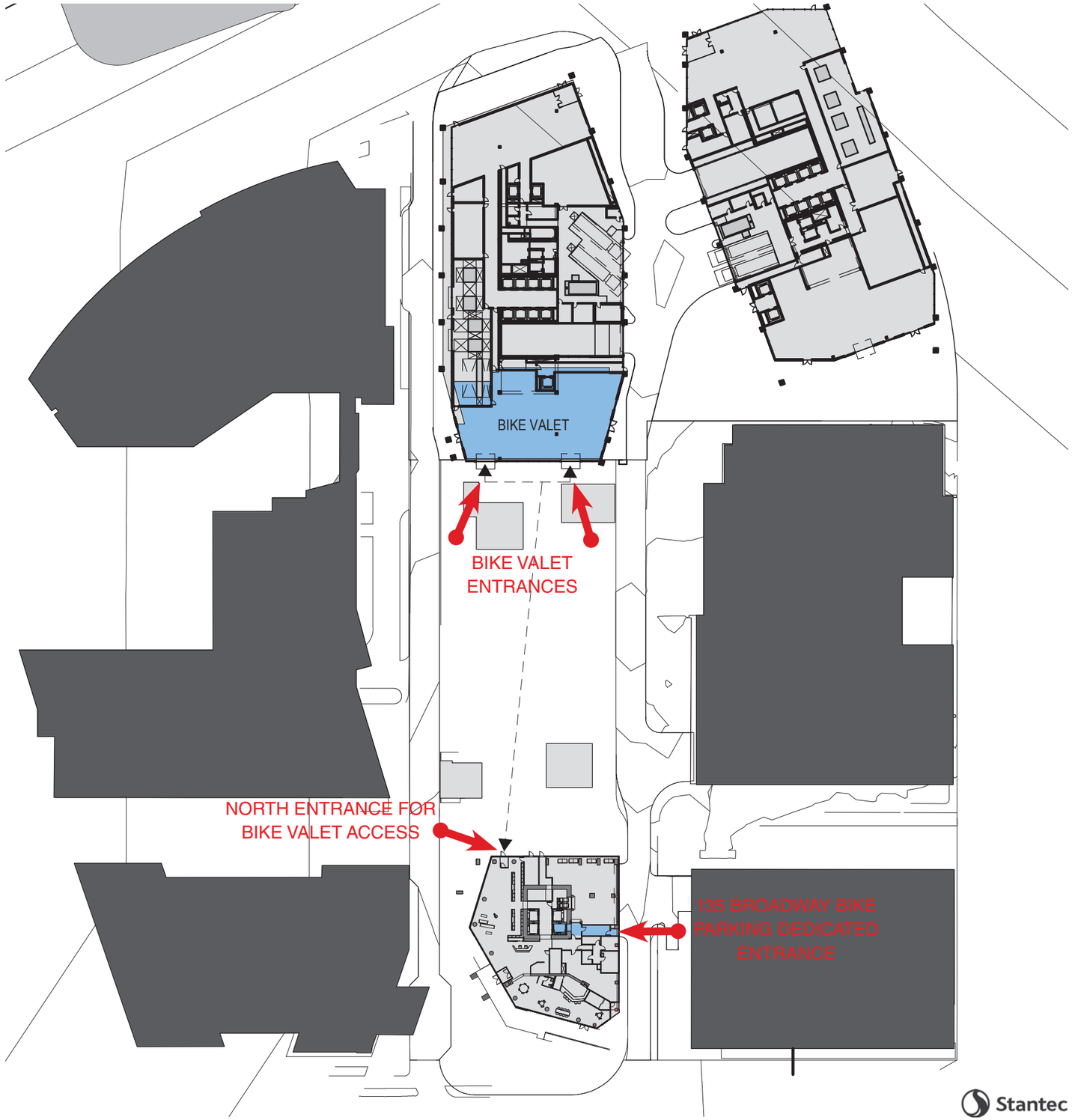
Bike Parking Approach:

Bike parking for residents will be achieved through a combination of methods in an effort to keep building areas active and to provide a variety of accommodations to suit bicyclists' varying preferences.

On the north side of the plaza will be a Bike Valet, offered to residents of 135 Broadway, as well office employees and the public. The operations of which are explained on the next page.

Within 135 Broadway will be accommodations for 204 bicycles, around 43% of the bike parking requirements. These will be provided through a mix of Cambridge compliant bike racks and spaces, along with a mix of high-density racks.

The mix of parking locations and types will provide residents with the options to suit their needs, as some may prefer the convenience of having their bike stored and in a managed valet setting, while others may prefer to have it closer inside the building.

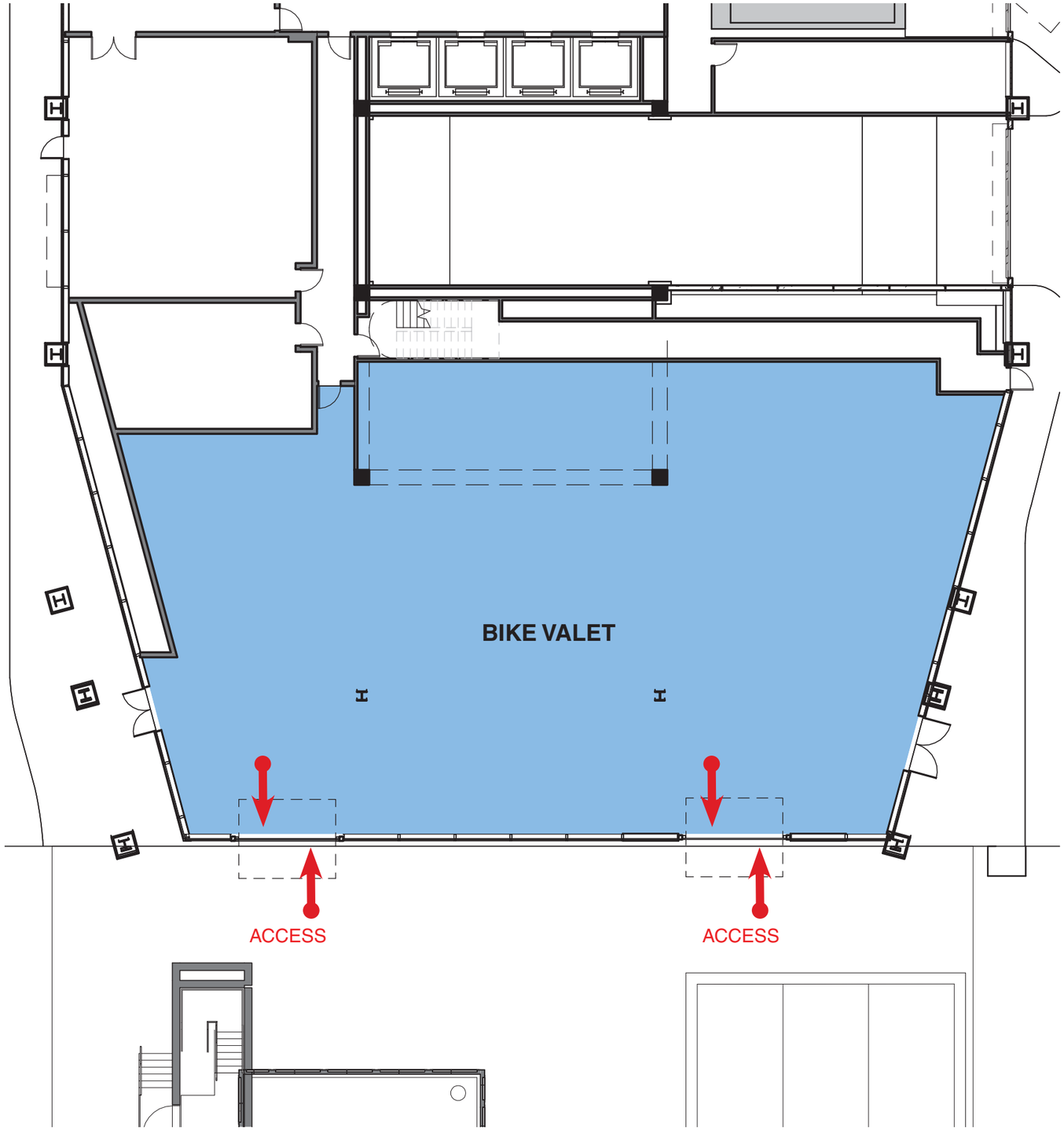


6.2 BIKE PARKING

BIKE VALET

Pick-up process:

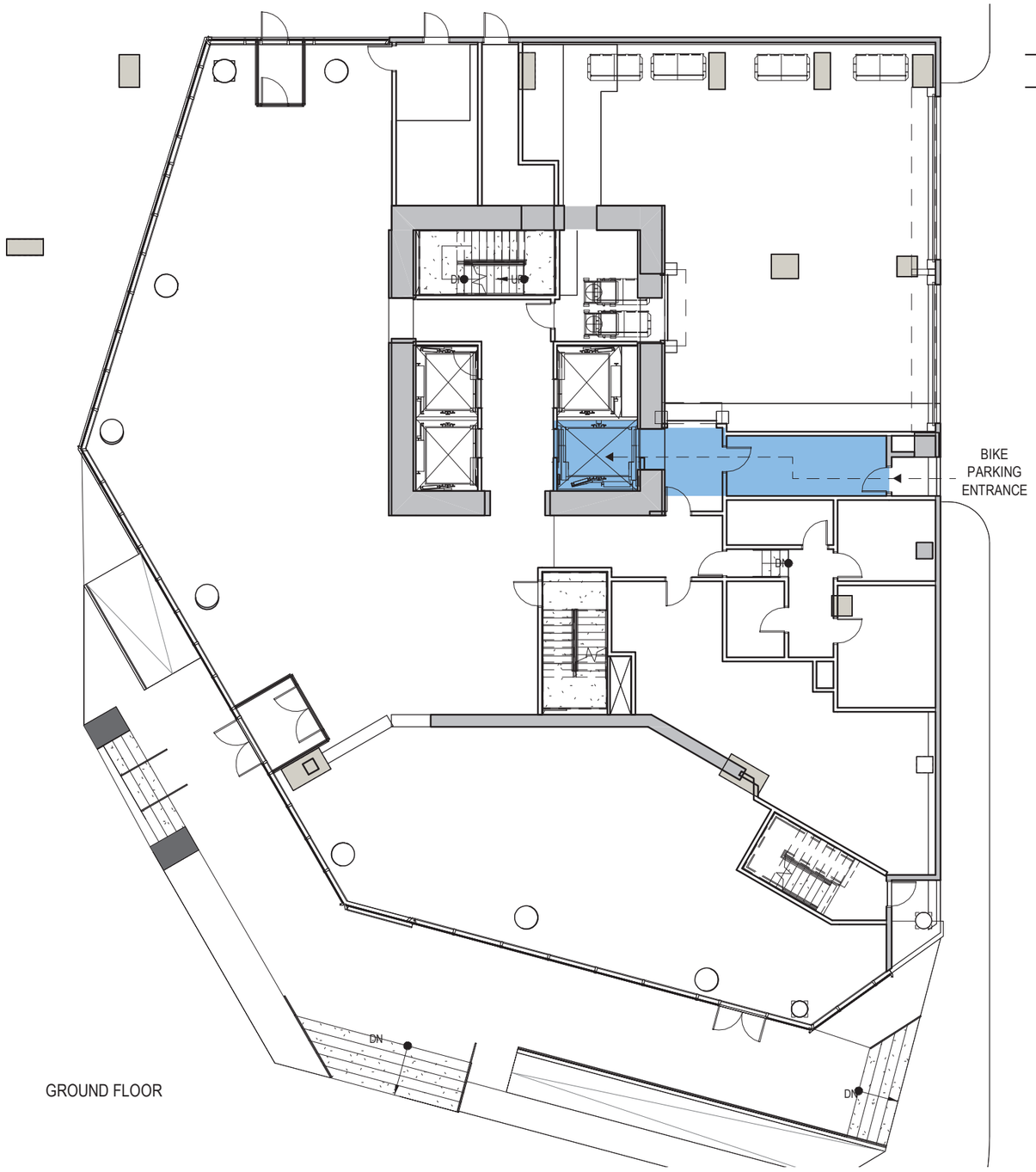
1. Residents retrieving bicycles from the valet will be able provide advance notice of retrieval to staff via text message or simply show up in person.
2. Valet staff will respond by retrieving the resident's bike and place adjacent to the attendant booth.
3. If time permits, attendant will check tires, chain, and brakes.
4. When resident arrives at the valet facility, they will scan their building badge to confirm ownership of the bike.
5. A proprietary software solution will assign each bike a parking space number inside the facility for tracking purposes
6. Valet staff will then hand the resident their bike.
7. In the event that sufficient space can be created for shop space in the commercial buildings (subject to design review) repair requests can be fulfilled while a bicycle is stored.



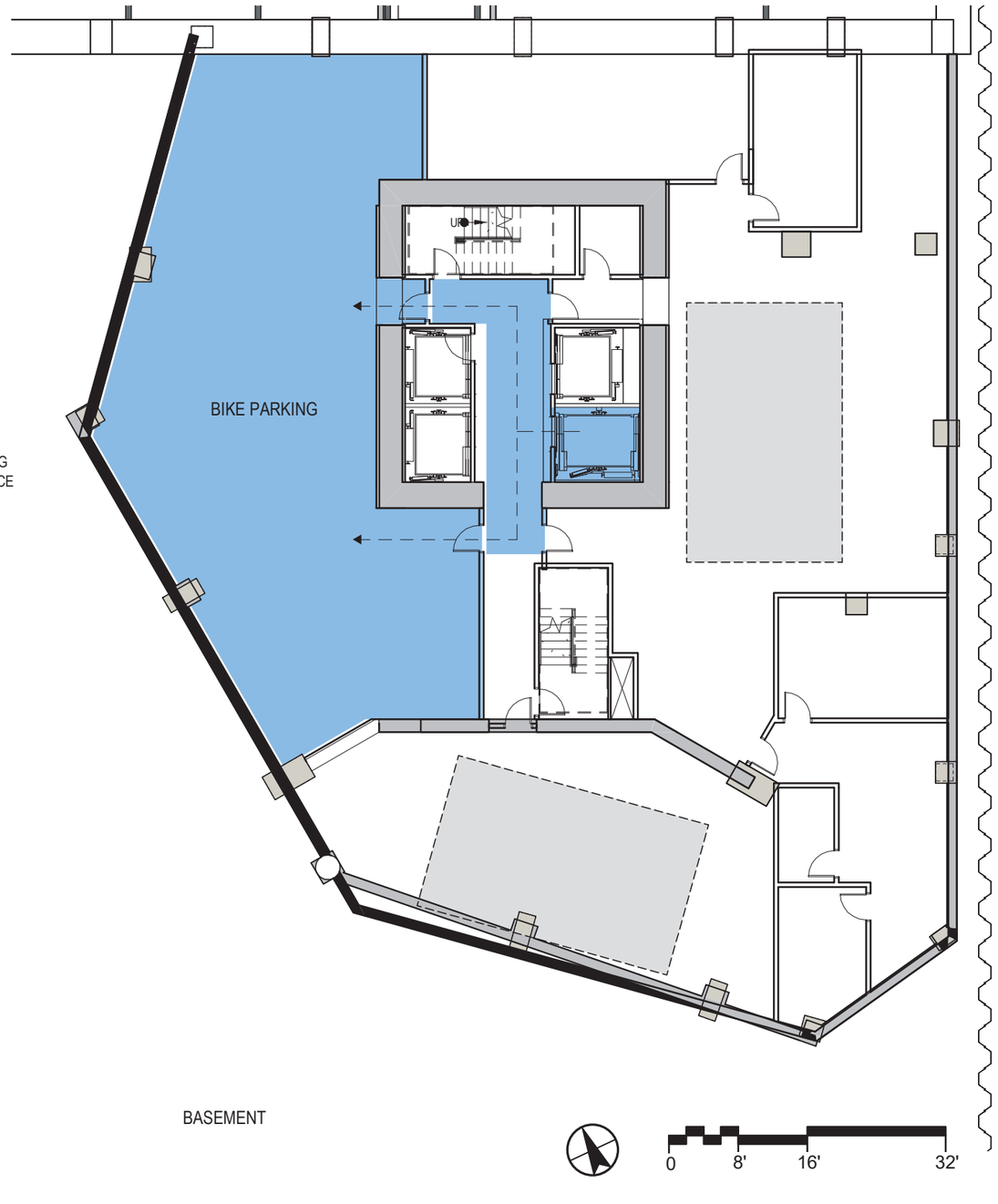
6.2 BIKE PARKING

135 BROADWAY BASEMENT

UPDATED



GROUND FLOOR



BASEMENT

GROUND FLOOR

BASEMENT

6.2 BIKE PARKING

OPTION 1 - SPECIAL PERMIT MINIMUM

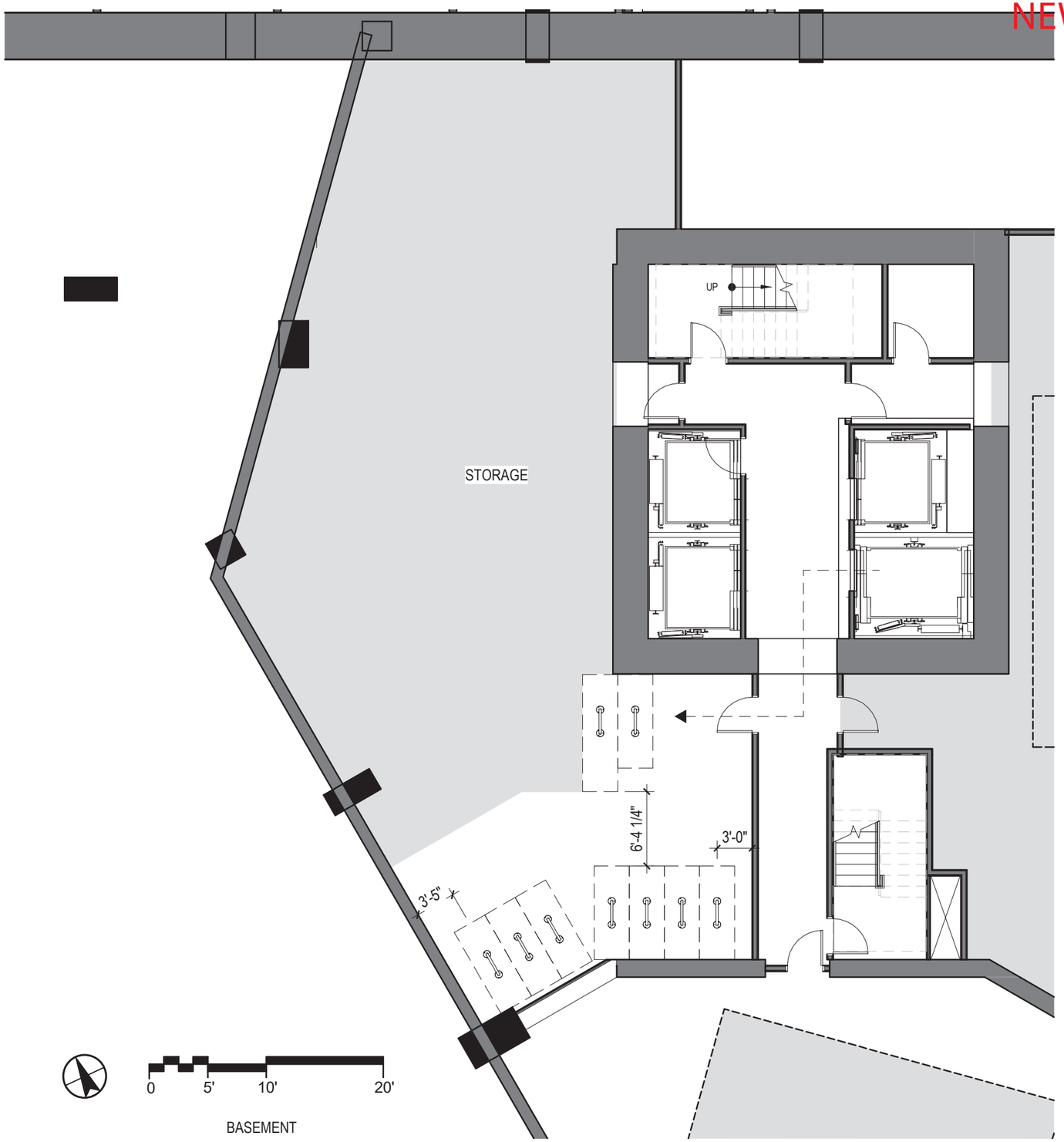
NEW SHEET

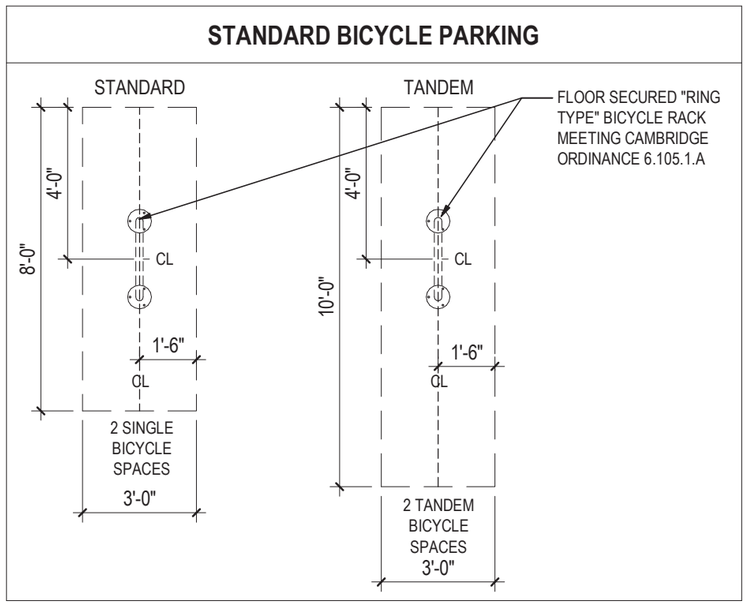
Option 1:

20 long term spaces located in basement, conforming with Cambridge standard bike rack specification.

Quantity of spaces meet requirement of Special Permit.

CAMBRIDGE STANDARD: 18
TANDEM: 2
TOTAL: 20





6.2 BIKE PARKING

OPTION 2 - ADDITIONAL CAMBRIDGE RACKS

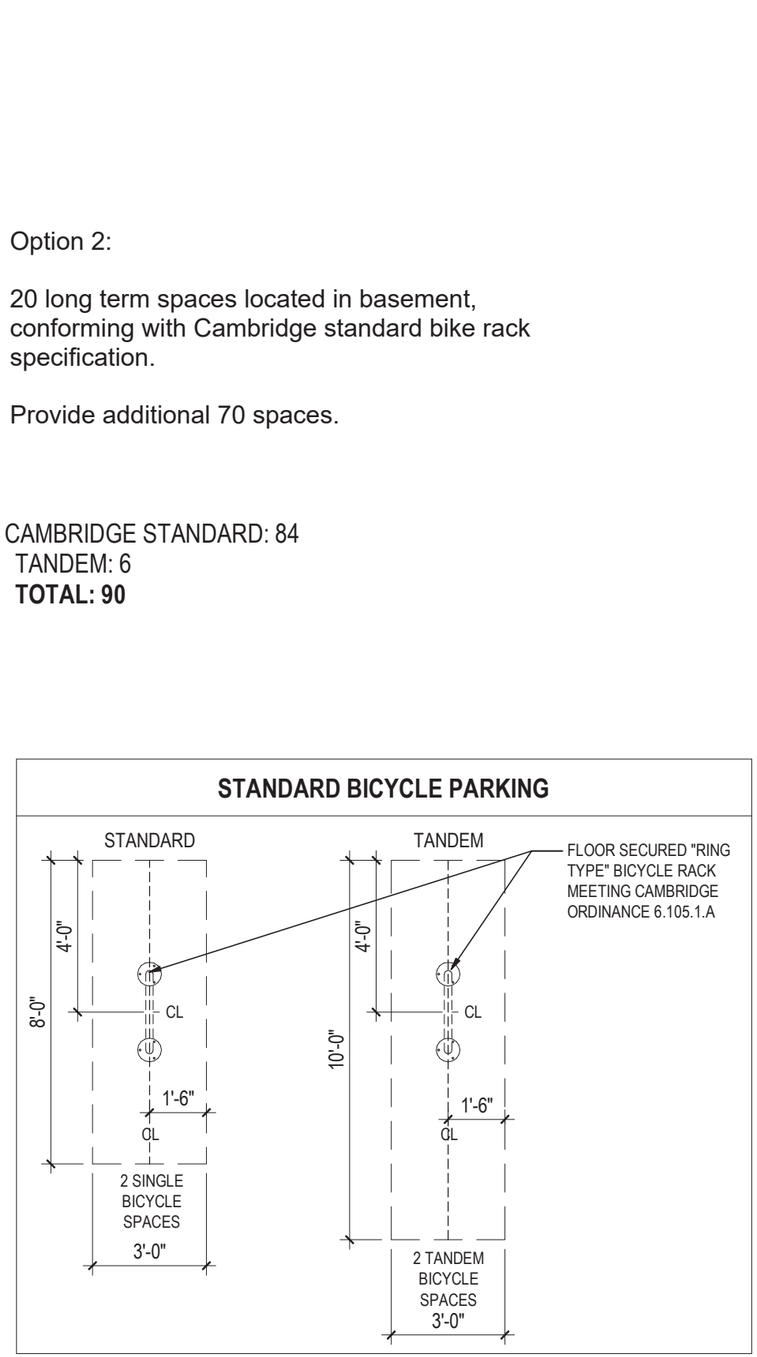
NEW SHEET

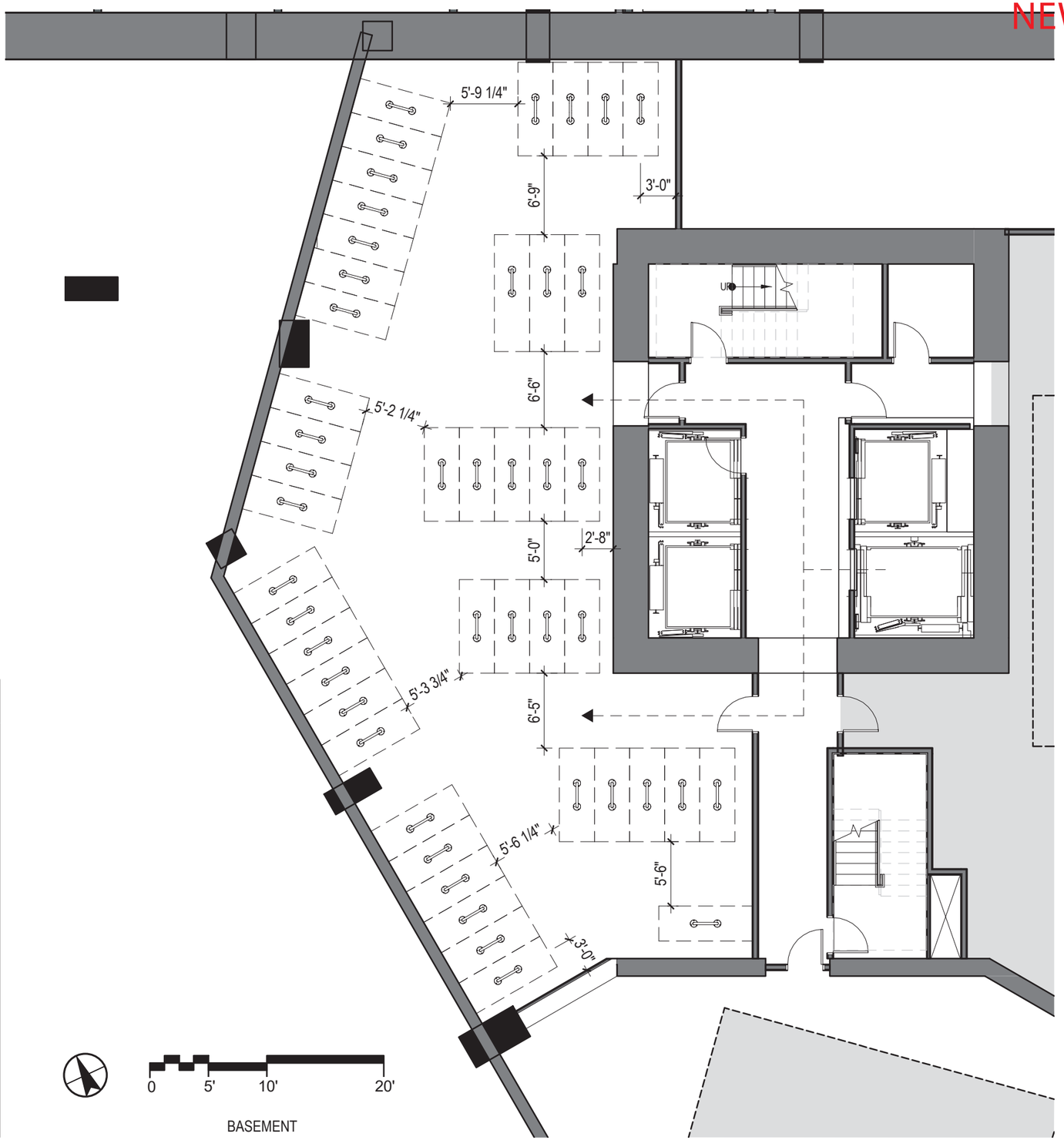
Option 2:

20 long term spaces located in basement, conforming with Cambridge standard bike rack specification.

Provide additional 70 spaces.

CAMBRIDGE STANDARD: 84
TANDEM: 6
TOTAL: 90





6.2 BIKE PARKING

OPTION 3 - HIGH DENSITY RACKS

NEW SHEET

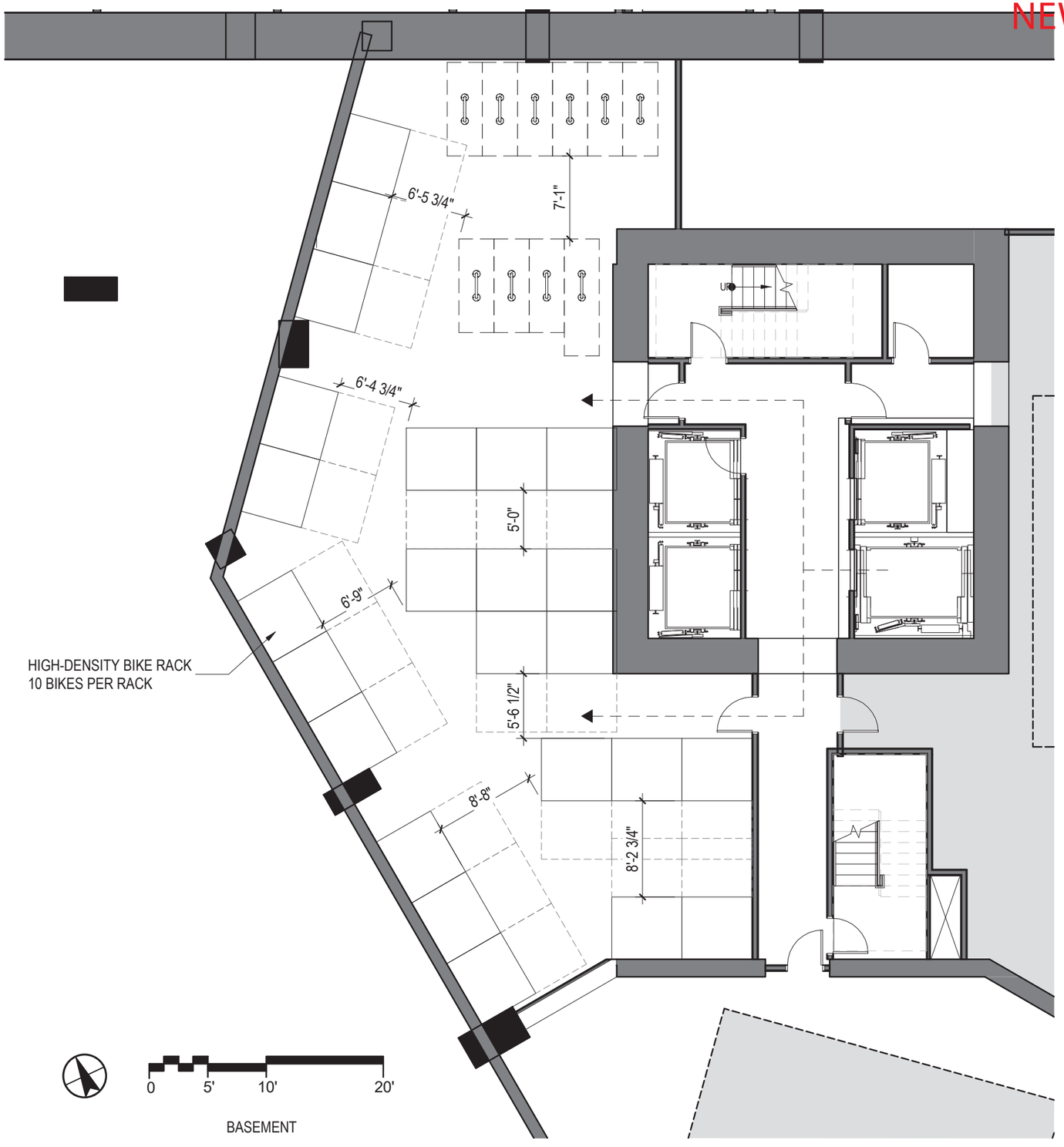
Option 3:

20 long term spaces located in basement, conforming with Cambridge standard bike rack specification.

Additional area for unassigned high-density bicycle racks.

CAMBRIDGE STANDARD: 18
TANDEM: 2
HIGH-DENSITY (10 / RACK): 240
TOTAL: 260

HIGH DENSITY BIKE RACK



6.2 BIKE PARKING

OPTION 4 - E-SCOOTER CAGES

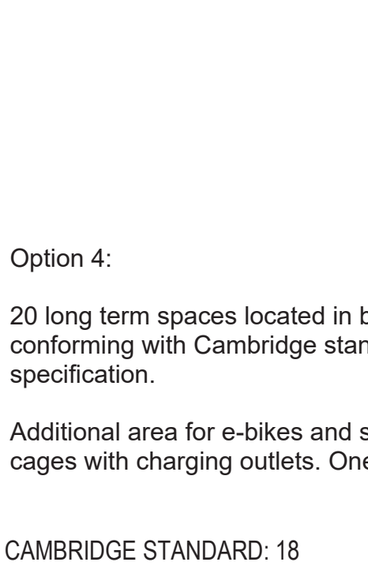
NEW SHEET

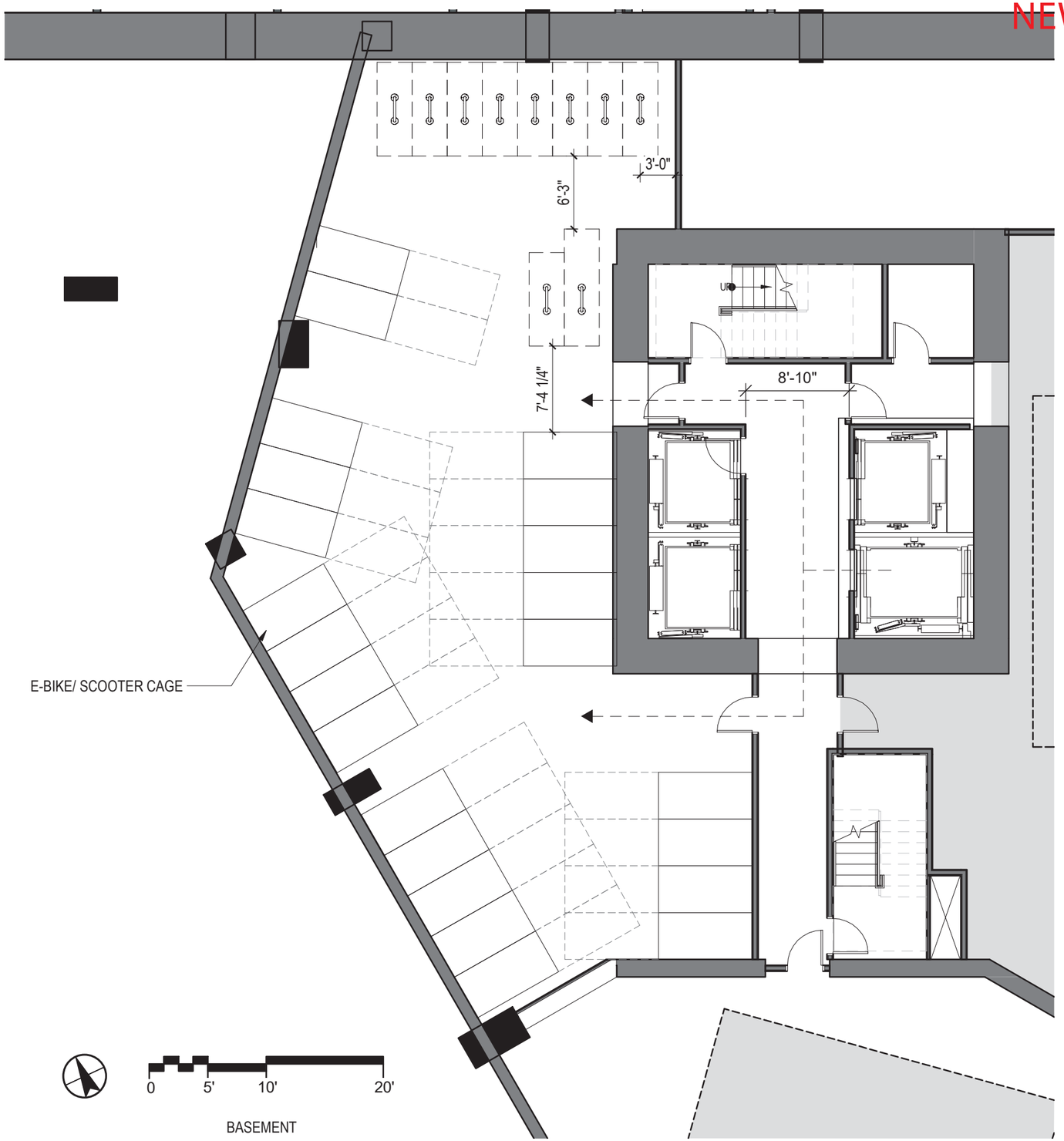
Option 4:

20 long term spaces located in basement, conforming with Cambridge standard bike rack specification.

Additional area for e-bikes and scooters in secure cages with charging outlets. One bike per cage.

CAMBRIDGE STANDARD: 18
TANDEM: 2
E-BIKE / SCOOTER CAGE: 23
TOTAL: 43

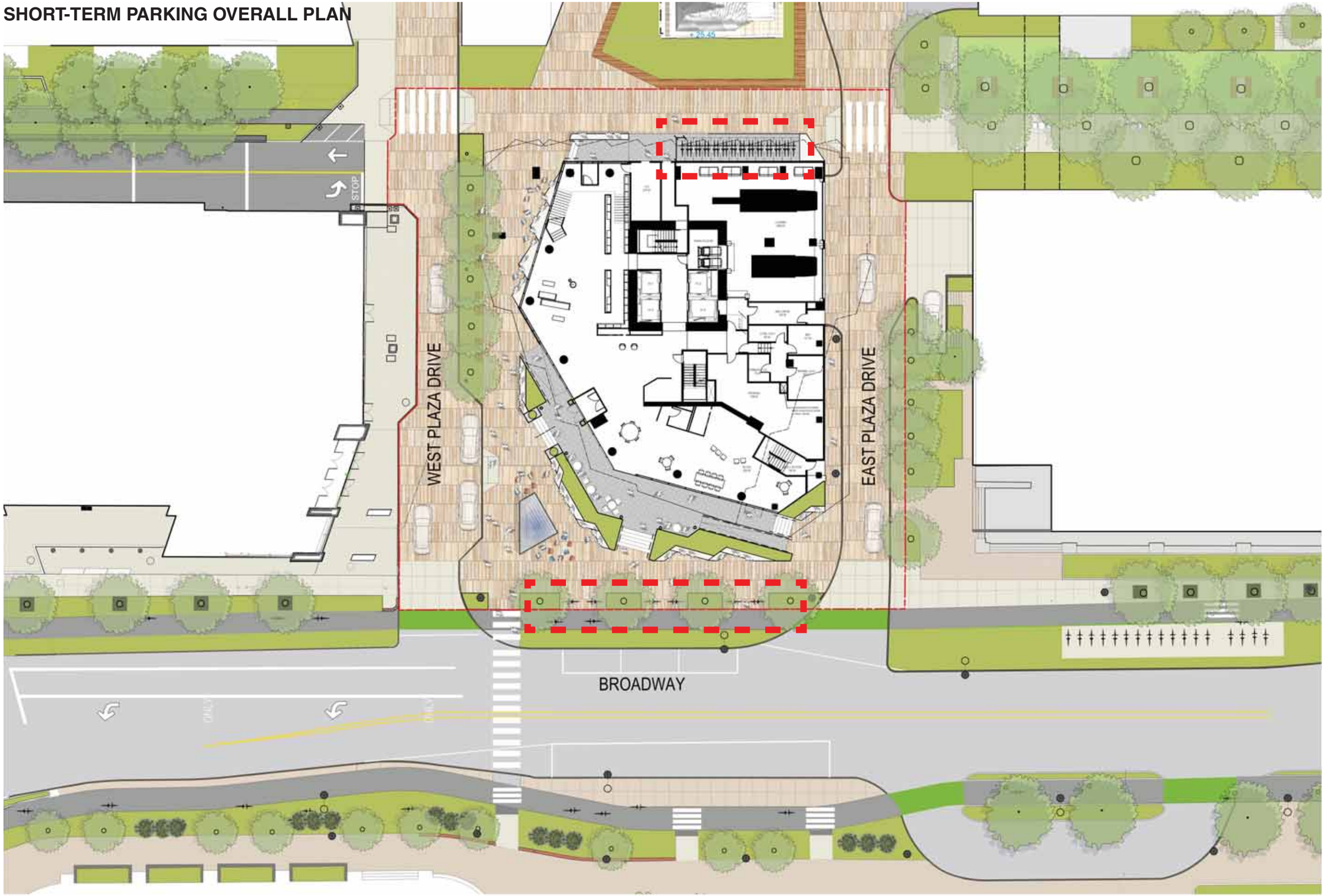




6.2 BIKE PARKING

SHORT-TERM PARKING OVERALL PLAN

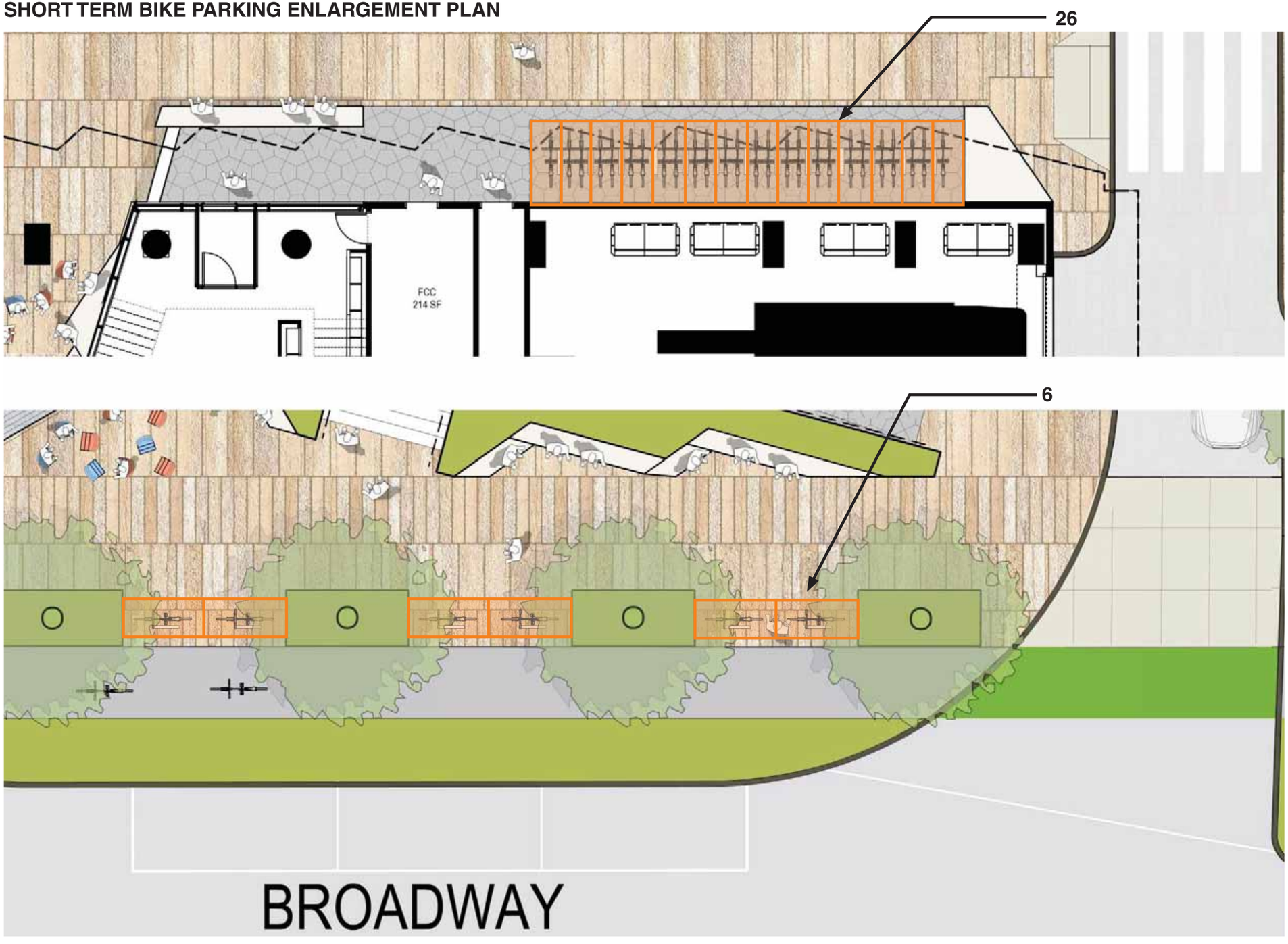
NEW SHEET



6.2 BIKE PARKING

NEW SHEET

SHORT TERM BIKE PARKING ENLARGEMENT PLAN



TOTAL SHORT TERM BIKE PARKING

BIKE LOCATIONS - 32

2.5' 5' 10'