REPORT

ĀLIA - BLOCK I

HONOLULU, HI

PEDESTRIAN WIND STUDY
RWDI # 2203689
May 9, 2022

SUBMITTED TO

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EXECUTIVE SUMMARY

RWDI was retained to conduct a pedestrian wind assessment for the proposed Ālia - Block I in Honolulu, Hawaii (Image 1). The assessment is based on our wind tunnel testing for the proposed project under the Existing, Proposed and Future configurations (Images 2A through 2C), and the local wind records (Image 3). The potential wind comfort conditions are predicted as shown on site plans in Figures 1A through 2C, while the associated wind speeds are listed in Table 1. The results have been evaluated against the RWDI pedestrian wind criteria (appended to this document) that considers pedestrian safety (pertaining to infrequent but strong gusts that could affect a person's footing) and pedestrian comfort (pertaining to common wind speeds conducive to different levels of human activity). These results can be summarized as follows:

- Wind conditions at all areas assessed are predicted to meet the criterion used to assess pedestrian wind safety.
- The wind conditions on and around the existing project site are comfortable for pedestrian use throughout the year.
- With the addition of the proposed project, an increase in wind speeds is expected around the building. Wind conditions at most areas at grade level are predicted to remain comfortable for the intended use throughout the year. Slightly elevated wind speeds are predicted near the north food & beverage entrances, mostly, during the summer months, when stronger winds occur in Honolulu.
- Windy conditions are predicted at multiple locations on the Level 6 recreation space throughout the year, including entrances and the main pool deck. Uncomfortable wind conditions are also predicted at localized areas on the southeast and northwest sides of the tower.
- The addition of the future buildings is expected to improve the wind conditions on and around the proposed building, but the wind speeds in the areas noted above are predicted to continue to be higher than desired.
- Wind control strategies and concepts have been provided for the design team's consideration.

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1 INTRODUCTION

RWDI was retained to conduct a pedestrian wind assessment for the proposed Ālia - Block I Project in Honolulu, HI. This report presents the project objectives, approach and the main results from RWDI's assessment and provides conceptual wind control measures, where necessary.

1.1 Project Description

The project (site shown in Image 1) is bound by Koula Street, Auahi Street, Ward Avenue and Ala Moana Boulevard, surrounded by low to mid-rise buildings in the proximity. A few taller buildings exist to the northwest through east. Hawaii Pacific University is approximately 0.8 miles to the northwest, and Māmala Bay is about 0.5 miles to the south. The project is a mixed-use residential development that will consist primarily of a 39-story building with a 6-story podium and a recreation deck at Level 6. The building will have a large podium, which is favourable for reducing downwashing wind impacts to the ground.

1.2 Objectives

The objectives of the study were to assess the effect of the proposed project on local conditions in pedestrian areas on and around the study site and provide recommendations for minimizing adverse effects, if needed. This quantitative assessment was based on wind speed measurements on a scale model of the project and its surroundings in one of RWDI's boundary-layer wind tunnels. These measurements were combined with the local wind records and compared to the RWDI criteria for gauging wind comfort and safety in pedestrian areas. In addition to sidewalks and properties near the project site, the assessment focused on critical pedestrian areas, including building main entrances, archaeological preserve garden, and Level 6 recreation space.

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

2 BACKGROUND AND APPROACH

2.1 Wind Tunnel Study Model

To assess the wind environment around the proposed project, a 1:300 scale model of the project site and surroundings was constructed for the wind tunnel tests of the following configurations:

A - Existing: Existing site with existing surroundings (Image 2A),

B - Proposed: Proposed project with existing surroundings (Image 2B), and,

C - Future: Proposed project with future surroundings (Image 2C).

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 modeled area were also simulated in RWDI's wind tunnel. The wind tunnel model was instrumented with 116 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 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, and reviewed by the design team.

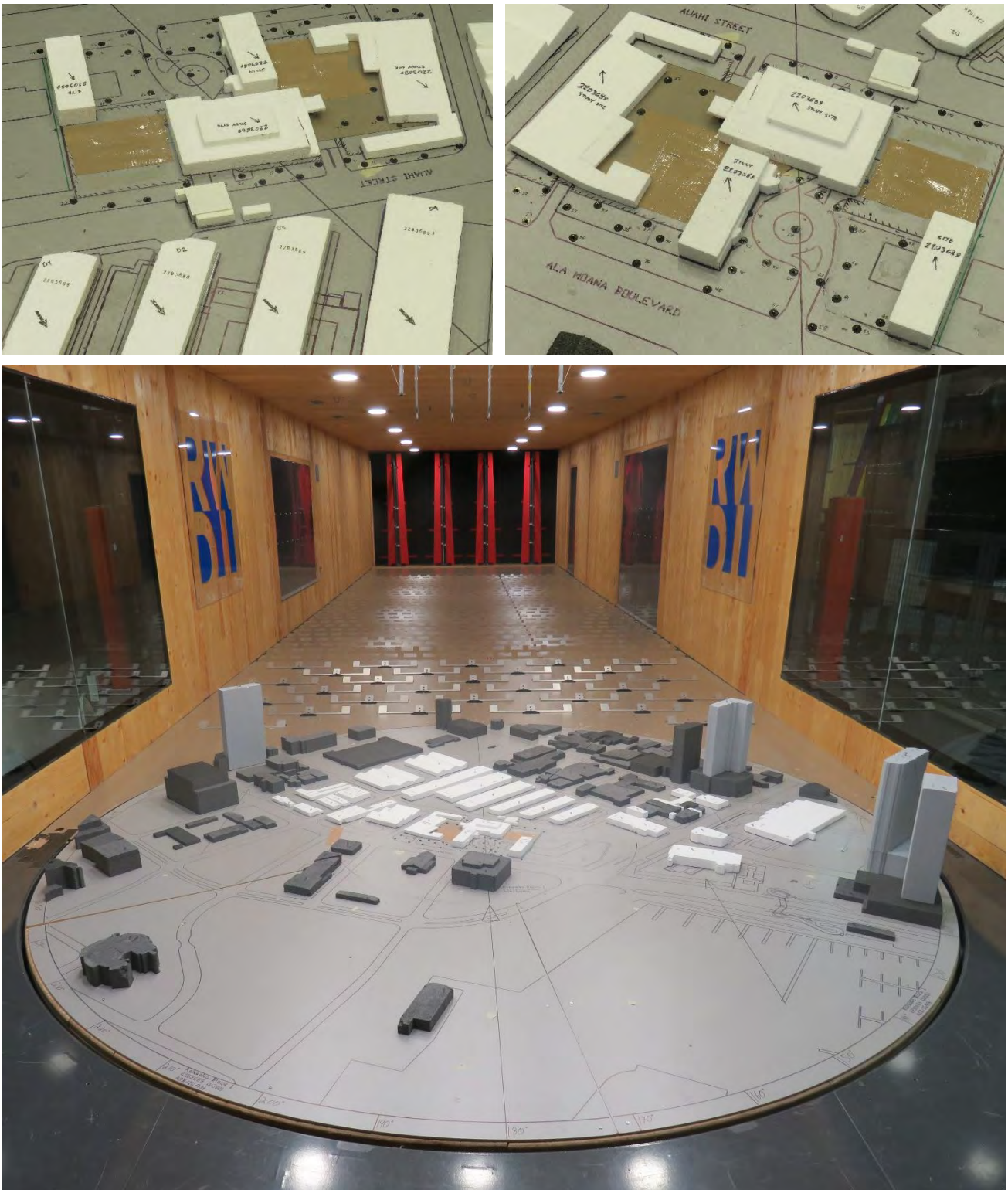


Image 2A: Wind Tunnel Study Model – Existing Configuration

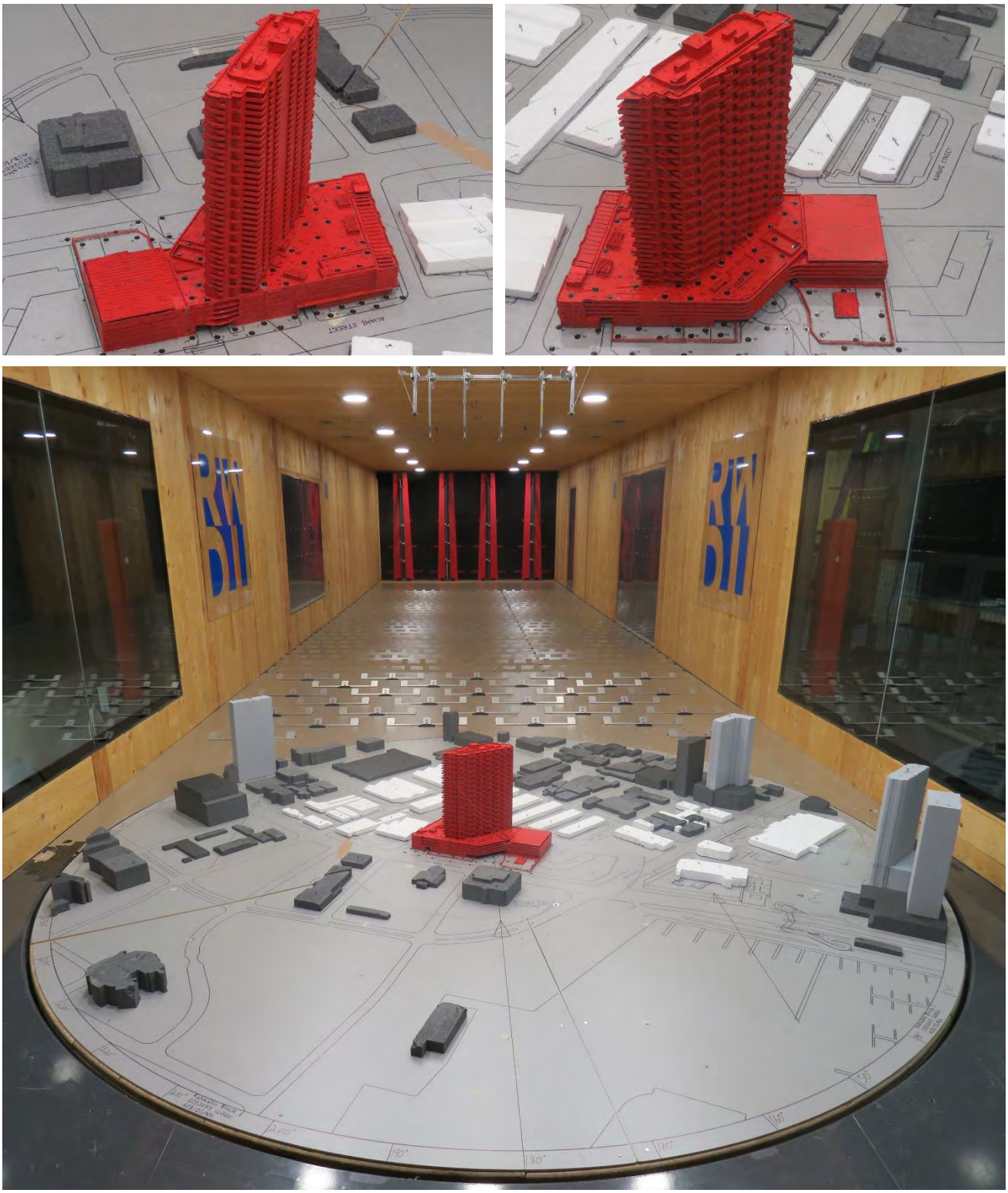


Image 2B: Wind Tunnel Study Model – Proposed Configuration

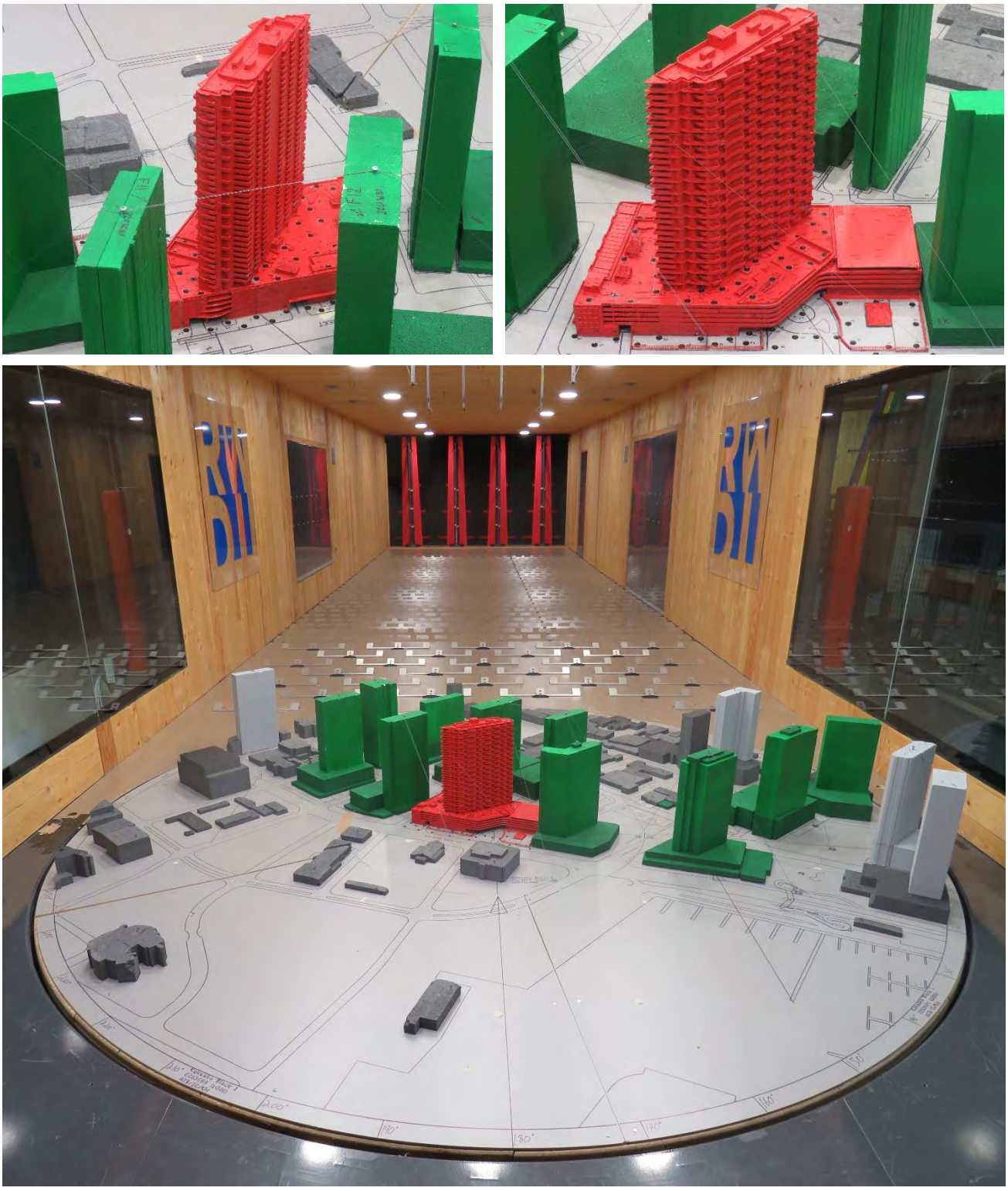
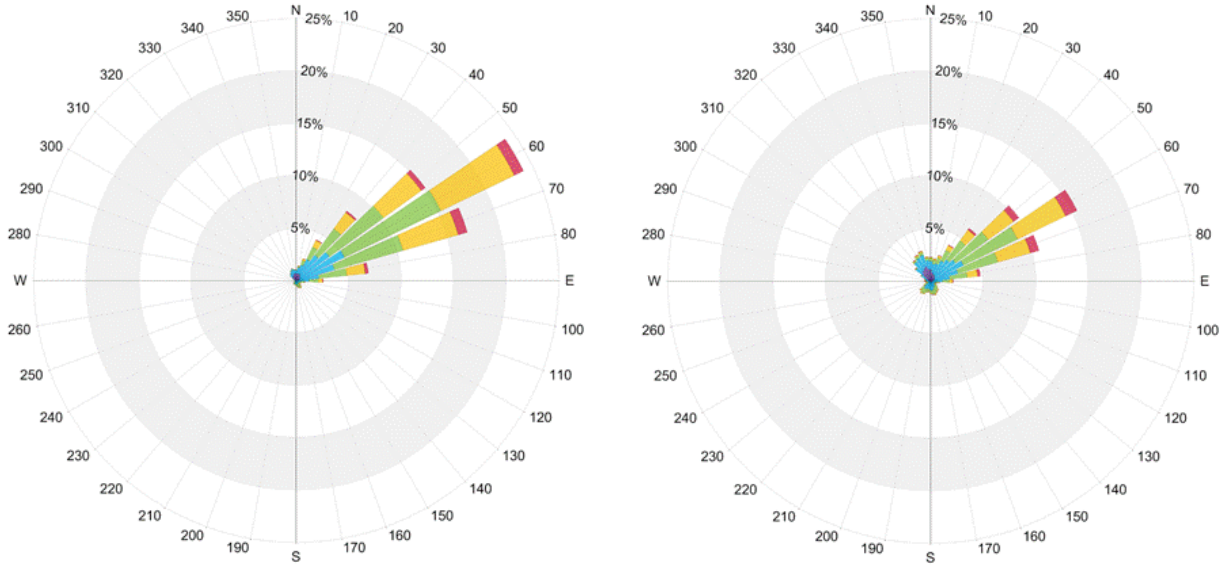


Image 2C: Wind Tunnel Study Model – Future Configuration

2.2 Meteorological Data

Wind statistics recorded at Honolulu International Airport between 1989 and 2019, inclusive, were analyzed for the Summer (May through October) and Winter (November through April) seasons. Image 3 graphically depicts the directional distributions of wind frequencies and speeds for these two seasons. Winds from the northeast directions are predominant throughout the year as indicated by the wind roses. Strong winds of a mean speed greater than 15 mph measured at the airport (at an anemometer height of 30 ft) occur for 25.9% and 19.8% of the time during the summer and winter seasons, respectively.

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



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

Wind Speed (mph)	Probability (%) Summer	Winter
Calm	3.6	7.2
1-5	9.3	15.1
6-10	26.4	30.9
11-15	34.8	27.0
16-20	23.1	16.4
>20	2.8	3.4

Image 3: Directional Distribution of Winds Approaching Honolulu International Airport between 1989 and 2019

2.3 RWDI Pedestrian 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.

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.

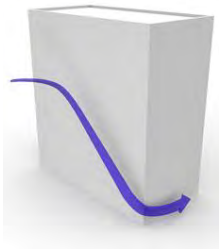
Notes:
(1) Based on an annual exceedance of 9 hours or 0.1% of the time for 24 hours a day; and,
(2) Only gust speeds need to be considered in the wind safety criterion. These are usually rare events but deserve special attention in city planning and building design due to their potential safety impact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

2.4 Generalized Wind Flows

In our discussion of wind conditions, reference is made to the following generalized wind flows (Image 4):

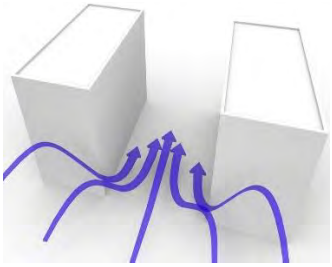
DOWNWASHING

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 4: 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 5) 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)

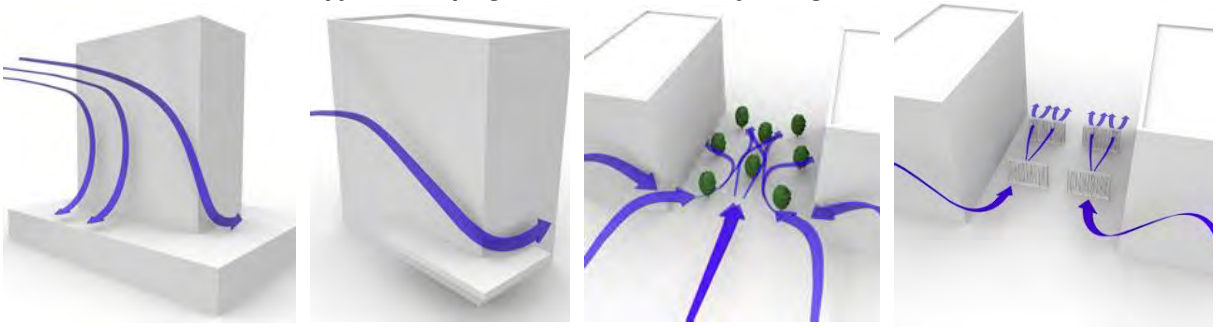


Image 5: Common Wind Control Measures

3 RESULTS AND DISCUSSION

The predicted wind conditions are shown on site plans in Figures 1A through 2C 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 of this report.

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 or sitting are preferred at main entrances where pedestrians are apt to linger. Wind speeds comfortable for sitting are preferred for areas intended for passive activities.

It is generally desirable for wind conditions on terraces intended for passive activities to be comfortable for sitting more than 80% of the time. However, in the warm climate experienced in Honolulu, a breeze is often welcome, and patrons may be tolerant to slightly higher speeds comfortable for standing.

Wind conditions that meet the safety criterion are predicted at all locations for all configurations assessed.

The following is a detailed discussion of the suitability of the predicted wind conditions for the anticipated pedestrian use of each area of interest.

3.1 Existing Configuration

The wind conditions on and around the existing project site are comfortable for sitting or standing throughout the year (Figures 1A and 2A). These conditions are suitable for the intended pedestrian use.

3.2 Proposed Configuration

3.2.1 Grade Level (Locations 1 through 72)

The addition of the proposed building to the project site is predicted to cause higher wind speeds, compared to the existing conditions, which is primarily due to the height of the proposed building relative to the low-rise surrounding buildings in the predominant wind directions. Notwithstanding, the project has several positive wind-responsive design features that help to moderate the wind conditions at grade level. These features include:

- narrow façade of tower facing predominant winds;
- rounded corners and massing texture created by the offset/inset faces of the tower;
- the low height of the podium; and,
- large podium extension in the downwind direction and around the tower that is wind-responsive.

With the addition of the proposed building to the project site, wind speeds are expected to remain comfortable for sitting or standing at most locations during the summer and winter (Figures 1B and 2B), including the main and reserve housing lobby entrances (Locations 1, 25 and 29), the southern outdoor exercise/event and the playground spaces, as well as archaeological preserve garden on the southeast side of the building. These conditions are appropriate for the intended use.

Wind speeds conducive for walking are predicted at a localized area at the north end of the passage/driveway (Location 5, summer and winter), which may be considered appropriate as the area is intended for pedestrian transit. Elevated wind speeds conducive for strolling or walking are predicted near the food & beverage entrances along the north façade (Locations 14, 16 and 18, Figure 1B) during the summer, which is higher than desired for entrances.

We understand that areas around the proposed building may be landscaped with trees and/or large shrubs. Tall and large plantings will have a localized impact and reduce wind speeds around them. To further lower wind speeds near the north food & beverage entrances, if feasible, we recommend moving the entrance near Location 18 away from the northwest corner. It is also recommended to recess the food & beverage entrances from the façade. Alternatively, we recommend the placement of wind screens and/or planters on east side of the entrances. The round corner of the proposed podium is a positive feature that will reduce the downwashing effects (Image 4) and should be kept in the design. Examples are shown in Image 6 for reference.

Image 6: Examples of Wind Control Options Applicable for Entrances

3.2.2 Recreation Space Level (Locations 73 through 116)

Wind speeds at most areas on the Level 6 recreation space are expected to be comfortable for sitting or standing during the summer and winter (Figures 1B and 2B), including the lobby entrances near Locations 84 (summer and winter) and 105 (winter only). The cabanas are positive for wind sheltering; wind conditions under the cabanas are, therefore, comfortable for sitting throughout the year (Locations 98, 103 and 114).

Higher wind speeds conducive for strolling and walking are predicted at several locations on the northern and southern sides of the tower, including the main pool deck (Locations 83, 86 and 88). Also, wind conditions conducive for standing are predicted at the adult pool deck (Locations 108 and 110). While wind speeds comfortable for standing may be acceptable considering the warm climate in Honolulu, wind speeds comfortable for strolling are higher than desired for long-term passive use or lounging at the pool deck.

Conditions that are comfortable for strolling and walking are predicted near the north lobby entrance during the summer (Location 105, Figure 1B), and near the vestibule during the summer and winter (Location 97, Figures 1B and 2B), respectively. These wind speeds are higher than desired for entrance use, and the entrances would benefit from the mitigation options recommended in Section 3.2.1.

Uncomfortable wind conditions are predicted at a localized area near the southeast corner of the tower (Location 75, Figure 1B) during the summer. The uncomfortable wind conditions stem from prevailing winds downwashing from the east façade of the tower and accelerating around the southeast corner (Image 4). Uncomfortable wind conditions are also predicted at a localized area on the northwest side of the tower (Location 100) during the summer and winter, which are influenced by the flow acceleration due to the channeling effect between the walls of the cabana and the photovoltaics space.

We understand that the recreation space maybe landscaped with different types of trees/large shrubs as indicated in the latest drawing set received from the design team. Those design considerations are positive and expected to reduce wind speeds around them and throughout the recreation space. To achieve satisfactory wind speeds that are ideal for prolonged passive use and lounging in the pool deck, the design team may also consider increasing the parapet/railing height along the perimeters of the podium. Landscaping features in the form of planters, screens, and trellises or pergolas around the designated seating areas are also recommended. These features should be at least 7 ft tall and no more than 30% porous; a lower height of 5 ft may be considered around designated seating areas. The trellises or pergolas can be fixed or movable depending on the intended programming of the space. Examples are shown in Image 7 for reference.

3.3 Future Configuration

The addition of future surrounding buildings is expected to reduce the wind speeds at most locations at grade level and on the recreation space on Level 6, relative to the conditions predicted in the Proposed configuration (Figures 1C and 2C). Positively, the windy conditions at the food & beverage entrance near the northwest corner (Location 18) are expected to be mitigated when the future buildings are constructed. Nonetheless, the future buildings are

not expected to improve the wind conditions predicted at the other food & beverage entrances near Locations 14 and 16 at grade level, and may potentially increase wind speeds on Level 6 around the east end of the tower base (Figure 2C).

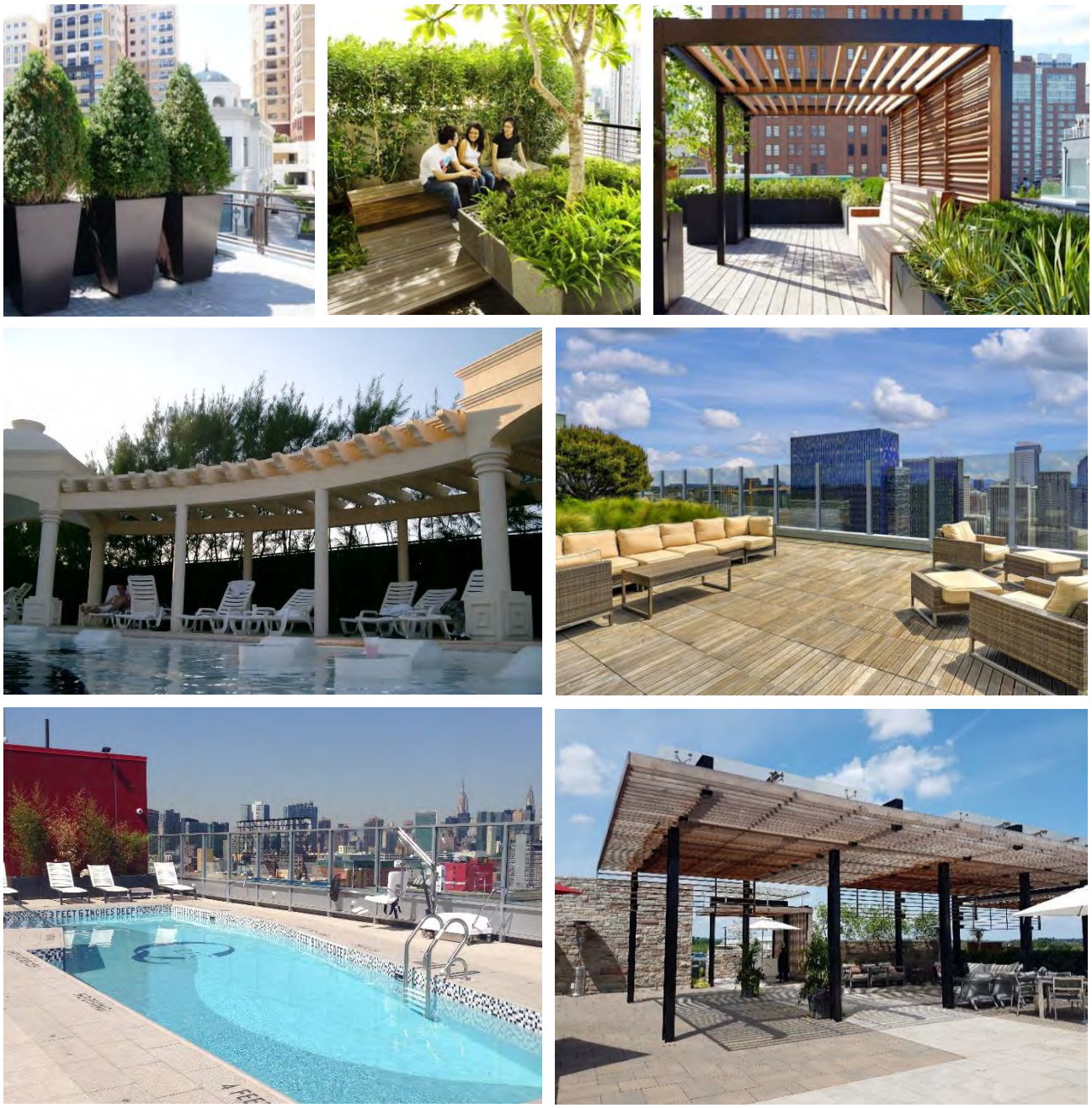


Image 7: Examples of Wind Control Options Applicable to the Levels 6 Recreation Space

4 APPLICABILITY OF RESULTS

The wind conditions presented in this report pertain to the model of the Ālia - Block I constructed using the drawings and information listed below. Should there be any design changes that deviate from this list of drawings, the wind condition predictions presented may change. Therefore, if changes in the design are made, it is recommended that RWDI be contacted and requested to review their potential effects on wind conditions.

File Name	File Type	Date Received (mm/dd/yyyy)
BLOCKI-CS-AR.rvt	Revit	02/28/2022
BLOCKI-CS-AR.rvt	Revit	03/18/2022
210318_Block I_Arch_50% SD_Drawing Set	Adobe Portable Document Format	03/18/2022
220325_Block I_Arch	Adobe Portable Document Format	03/25/2022
220414_Block I_100SD_Drawing Set	Adobe Portable Document Format	04/14/2022

5 REFERENCES

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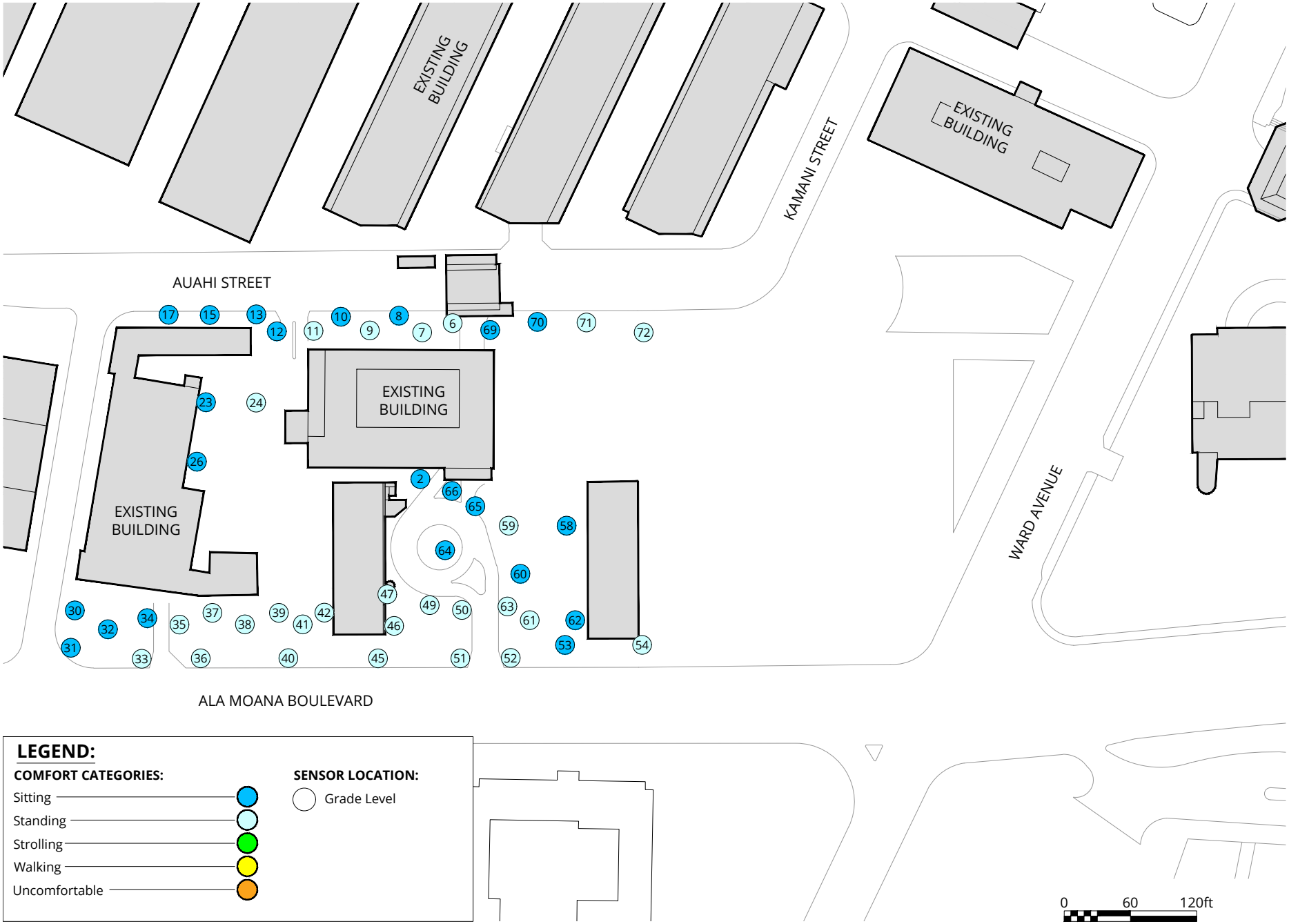
FIGURES



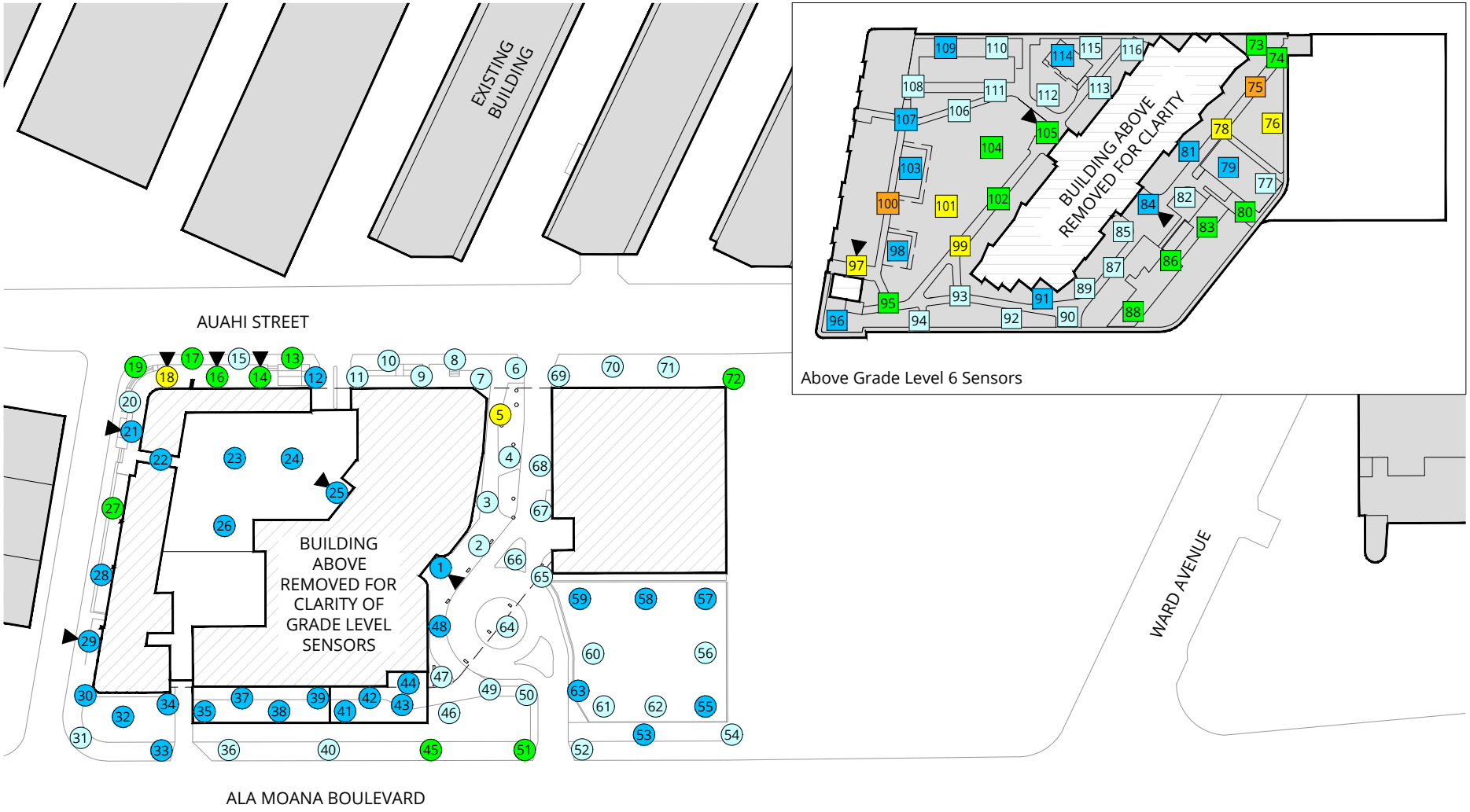
Pedestrian Wind Comfort Conditions
Existing Configuration
Summer (May to October, 6:00 to 23:00)

Alia Block I - Honolulu, HI

True North

Project #2203689

Drawn by: DAR	Figure: 1A
Approx. Scale:	1"=120'
Date Revised:	May. 4, 2022



Pedestrian Wind Comfort Conditions

Proposed Configuration

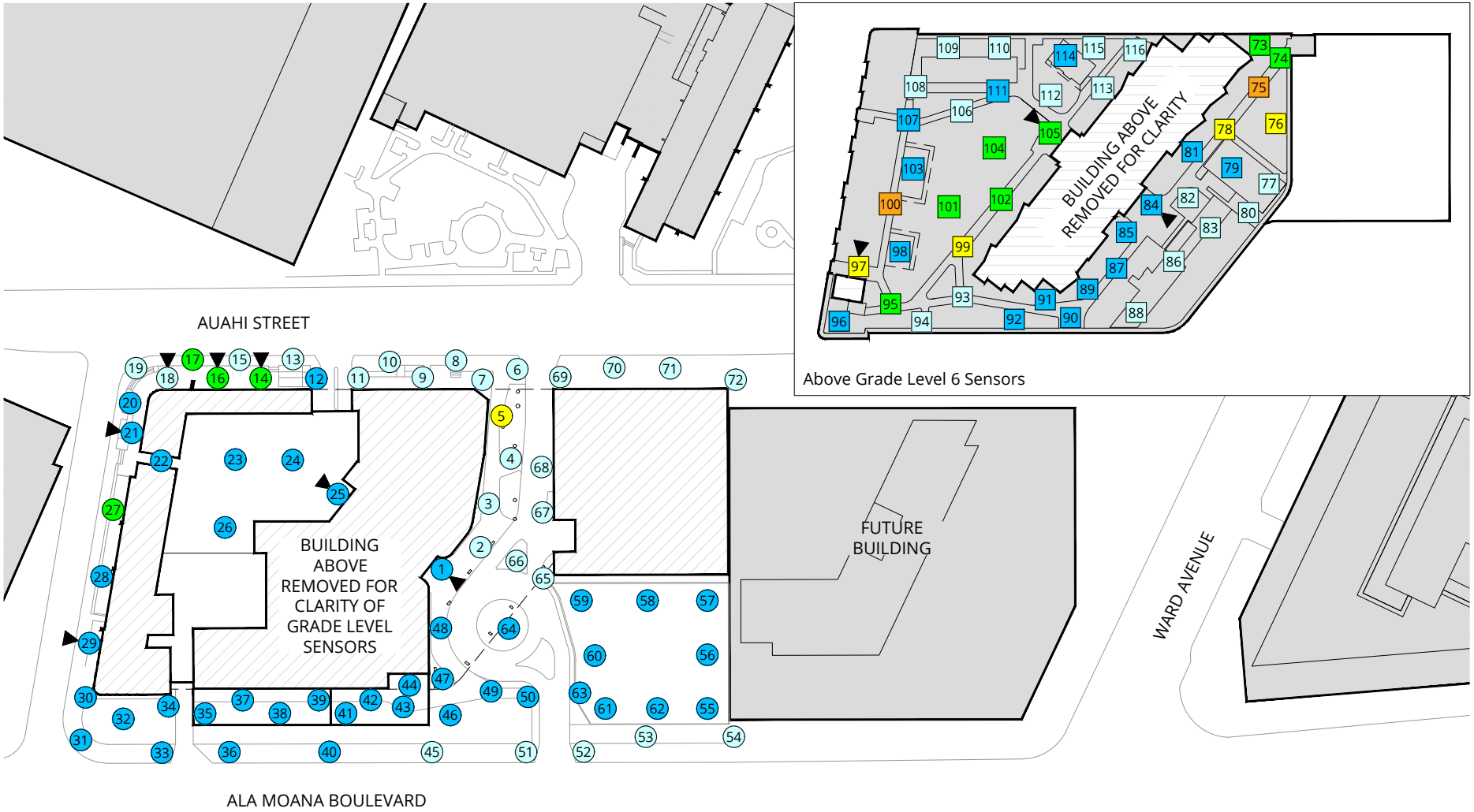
Summer (May to October, 6:00 to 23:00)

Alia Block I - Honolulu, HI

True North

Project #2203689

Drawn by: DAR	Figure: 1B
Approx. Scale:	1"=120'
Date Revised:	May. 4, 2022



LEGEND:

COMFORT CATEGORIES:

- Sitting
- Standing
- Strolling
- Walking
- Uncomfortable

SENSOR LOCATION:

- Grade Level
- Above Grade Level
- Main Entrance Location

0 60 120ft

Pedestrian Wind Comfort Conditions

Future Configuration

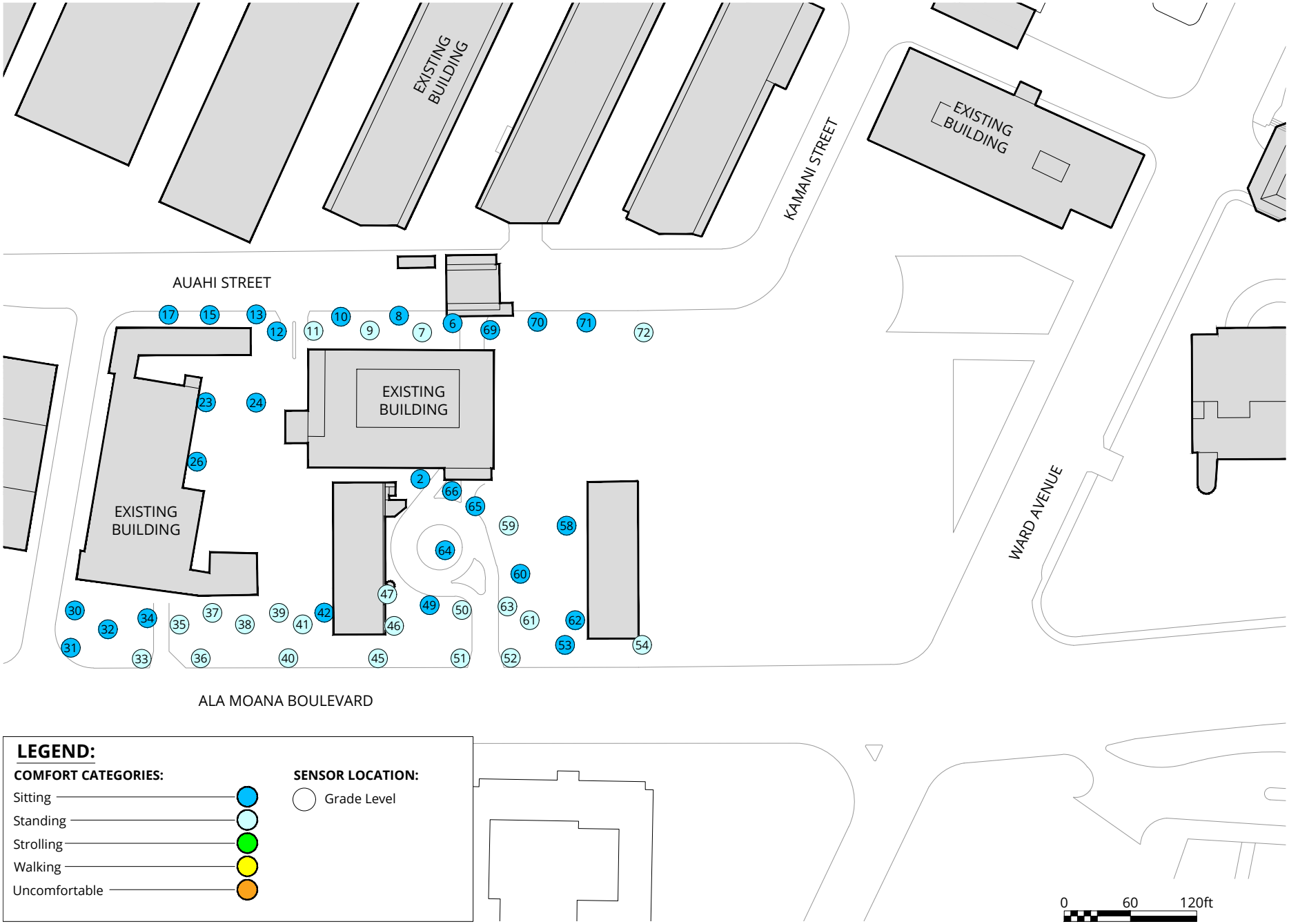
Summer (May to October, 6:00 to 23:00)

Alia Block I - Honolulu, HI

True North

Project #2203689

Drawn by: DAR	Figure: 1C
Approx. Scale:	1"=120'
Date Revised:	May. 4, 2022



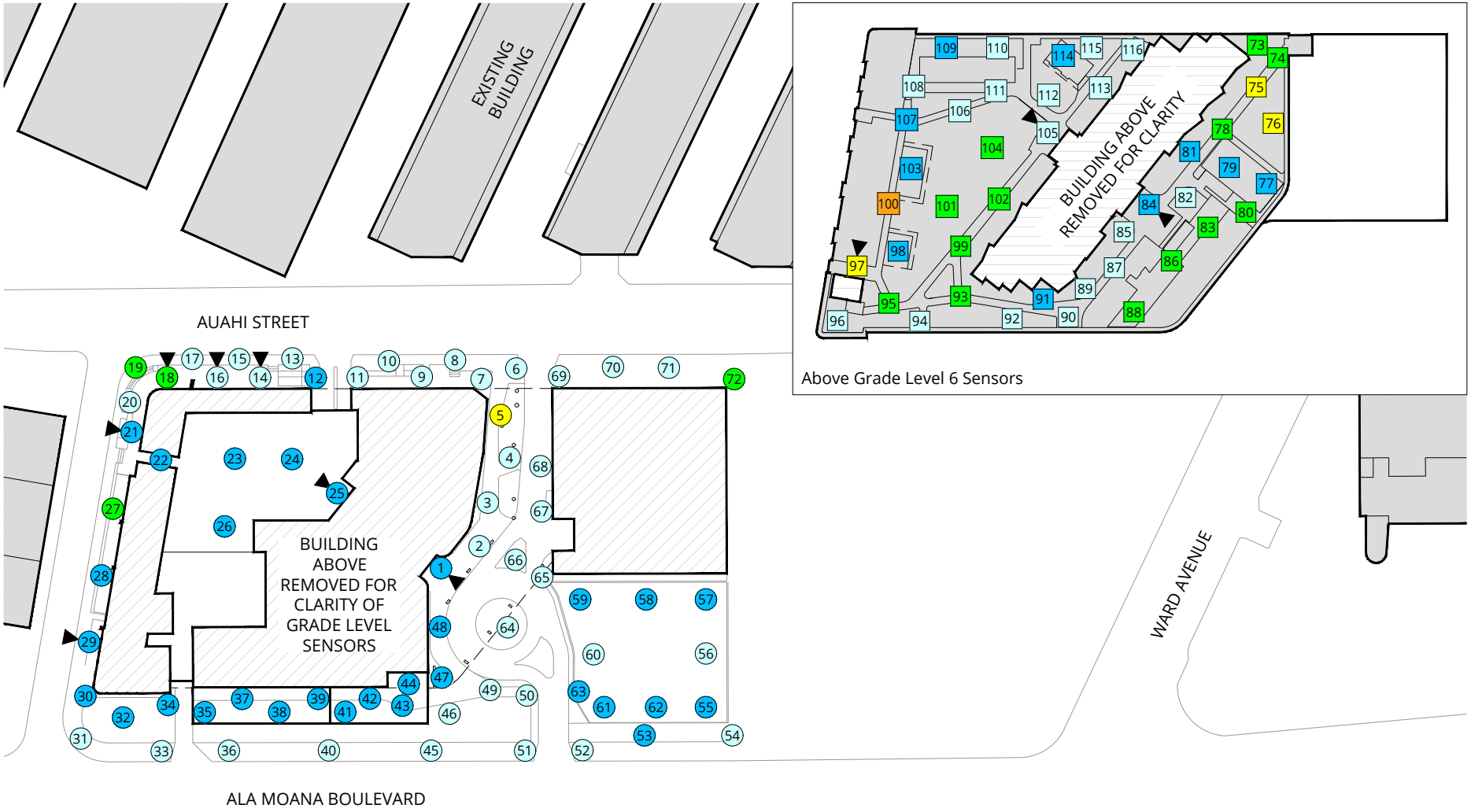
Pedestrian Wind Comfort Conditions
Existing Configuration
Winter (November to April, 6:00 to 23:00)

Alia Block I - Honolulu, HI

True North

Project #2203689

Drawn by: DAR	Figure: 2A
Approx. Scale:	1"=120'
Date Revised:	May. 4, 2022



LEGEND:

COMFORT CATEGORIES:

- Sitting
- Standing
- Strolling
- Walking
- Uncomfortable

SENSOR LOCATION:

- Grade Level
- Above Grade Level
- Main Entrance Location

Pedestrian Wind Comfort Conditions

Proposed Configuration

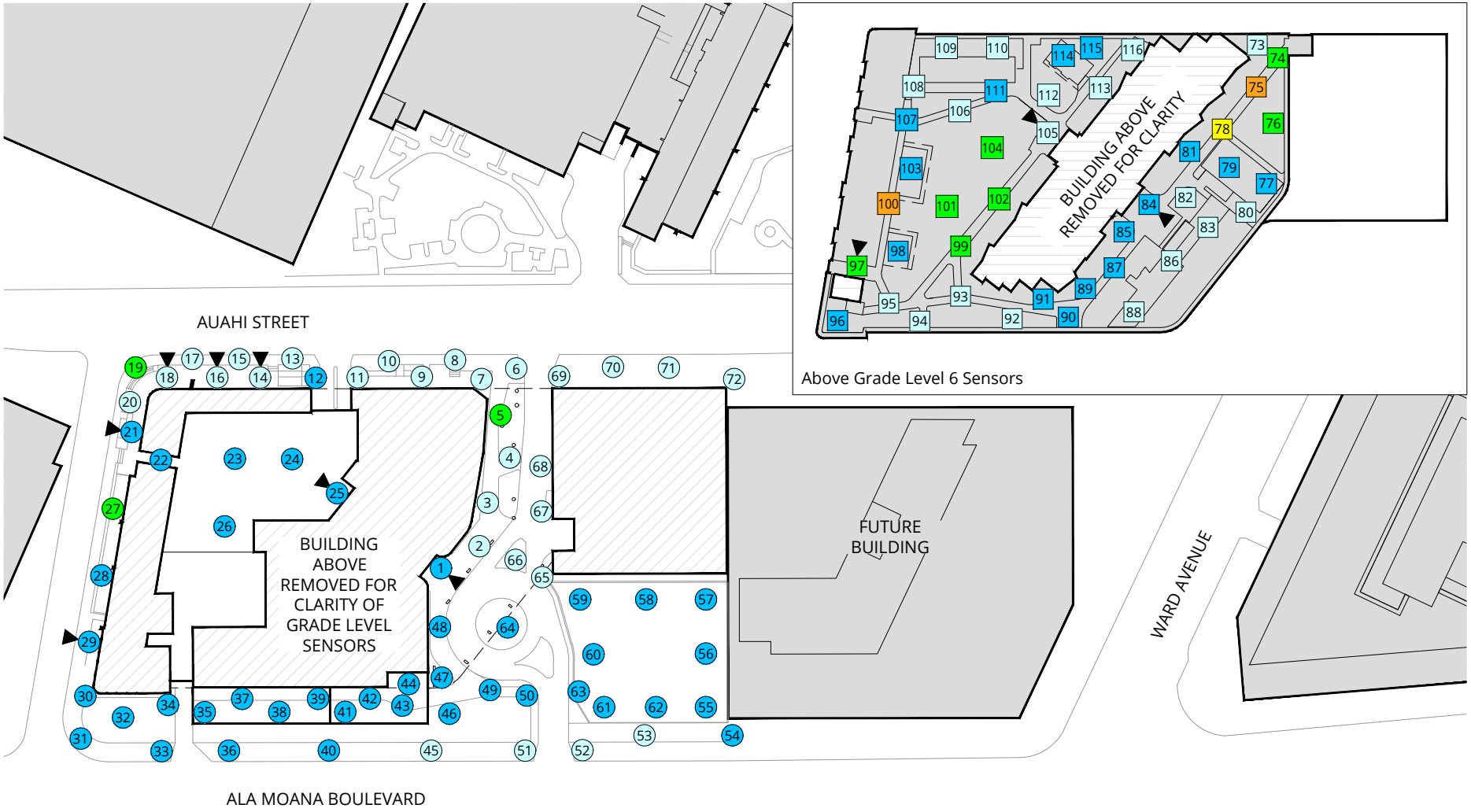
Winter (November to April, 6:00 to 23:00)

Alia Block I - Honolulu, HI

True North

Project #2203689

Drawn by: DAR	Figure: 2B
Approx. Scale:	1"=120'
Date Revised:	May. 4, 2022



LEGEND:

COMFORT CATEGORIES:

- Sitting
- Standing
- Strolling
- Walking
- Uncomfortable

SENSOR LOCATION:

- Grade Level
- Above Grade Level
- Main Entrance Location

0 60 120ft

Pedestrian Wind Comfort Conditions

Future Configuration

Winter (November to April, 6:00 to 23:00)

Alia Block I - Honolulu, HI

True North

Project #2203689

Drawn by: DAR	Figure: 2C
Approx. Scale:	1"=120'
Date Revised:	May. 4, 2022

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	Existing	-	-	-	-	-	-
	Proposed	2	Sitting	2	Sitting	7	Pass
	Future	2	Sitting	2	Sitting	7	Pass
2	Existing	6	Sitting	6	Sitting	20	Pass
	Proposed	8	Standing	7	Standing	22	Pass
	Future	8	Standing	8	Standing	21	Pass
3	Existing	-	-	-	-	-	-
	Proposed	8	Standing	8	Standing	22	Pass
	Future	8	Standing	8	Standing	22	Pass
4	Existing	-	-	-	-	-	-
	Proposed	8	Standing	8	Standing	27	Pass
	Future	8	Standing	8	Standing	24	Pass
5	Existing	-	-	-	-	-	-
	Proposed	12	Walking	11	Walking	37	Pass
	Future	12	Walking	10	Strolling	30	Pass
6	Existing	7	Standing	6	Sitting	22	Pass
	Proposed	8	Standing	8	Standing	29	Pass
	Future	7	Standing	7	Standing	25	Pass
7	Existing	7	Standing	7	Standing	22	Pass
	Proposed	7	Standing	7	Standing	30	Pass
	Future	7	Standing	7	Standing	25	Pass
8	Existing	6	Sitting	6	Sitting	21	Pass
	Proposed	8	Standing	7	Standing	29	Pass
	Future	8	Standing	7	Standing	26	Pass
9	Existing	7	Standing	7	Standing	24	Pass
	Proposed	7	Standing	7	Standing	27	Pass
	Future	7	Standing	7	Standing	25	Pass
10	Existing	6	Sitting	6	Sitting	21	Pass
	Proposed	8	Standing	8	Standing	28	Pass
	Future	8	Standing	8	Standing	28	Pass
11	Existing	8	Standing	7	Standing	25	Pass
	Proposed	7	Standing	7	Standing	22	Pass
	Future	7	Standing	7	Standing	24	Pass
12	Existing	6	Sitting	6	Sitting	21	Pass
	Proposed	6	Sitting	6	Sitting	21	Pass
	Future	6	Sitting	6	Sitting	21	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
13	Existing	6	Sitting	6	Sitting	20	Pass
	Proposed	9	Strolling	8	Standing	28	Pass
	Future	8	Standing	8	Standing	27	Pass
14	Existing	-	-	-	-	-	-
	Proposed	9	Strolling	8	Standing	31	Pass
	Future	9	Strolling	8	Standing	30	Pass
15	Existing	6	Sitting	5	Sitting	18	Pass
	Proposed	8	Standing	8	Standing	29	Pass
	Future	8	Standing	8	Standing	27	Pass
16	Existing	-	-	-	-	-	-
	Proposed	10	Strolling	8	Standing	33	Pass
	Future	10	Strolling	8	Standing	31	Pass
17	Existing	6	Sitting	5	Sitting	19	Pass
	Proposed	9	Strolling	8	Standing	31	Pass
	Future	9	Strolling	8	Standing	30	Pass
18	Existing	-	-	-	-	-	-
	Proposed	12	Walking	10	Strolling	37	Pass
	Future	8	Standing	8	Standing	29	Pass
19	Existing	-	-	-	-	-	-
	Proposed	10	Strolling	10	Strolling	33	Pass
	Future	8	Standing	9	Strolling	31	Pass
20	Existing	-	-	-	-	-	-
	Proposed	7	Standing	7	Standing	25	Pass
	Future	6	Sitting	7	Standing	26	Pass
21	Existing	-	-	-	-	-	-
	Proposed	5	Sitting	5	Sitting	17	Pass
	Future	5	Sitting	6	Sitting	21	Pass
22	Existing	-	-	-	-	-	-
	Proposed	4	Sitting	4	Sitting	17	Pass
	Future	3	Sitting	3	Sitting	11	Pass
23	Existing	5	Sitting	5	Sitting	17	Pass
	Proposed	5	Sitting	4	Sitting	12	Pass
	Future	6	Sitting	5	Sitting	12	Pass
24	Existing	7	Standing	6	Sitting	21	Pass
	Proposed	4	Sitting	4	Sitting	12	Pass
	Future	4	Sitting	4	Sitting	13	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
25	Existing	-	-	-	-	-	-
	Proposed	2	Sitting	2	Sitting	7	Pass
	Future	2	Sitting	2	Sitting	8	Pass
26	Existing	6	Sitting	6	Sitting	19	Pass
	Proposed	3	Sitting	3	Sitting	14	Pass
	Future	2	Sitting	2	Sitting	9	Pass
27	Existing	-	-	-	-	-	-
	Proposed	10	Strolling	10	Strolling	21	Pass
	Future	10	Strolling	10	Strolling	23	Pass
28	Existing	-	-	-	-	-	-
	Proposed	6	Sitting	6	Sitting	16	Pass
	Future	6	Sitting	6	Sitting	13	Pass
29	Existing	-	-	-	-	-	-
	Proposed	2	Sitting	3	Sitting	19	Pass
	Future	3	Sitting	3	Sitting	18	Pass
30	Existing	4	Sitting	4	Sitting	20	Pass
	Proposed	4	Sitting	6	Sitting	33	Pass
	Future	3	Sitting	4	Sitting	22	Pass
31	Existing	6	Sitting	6	Sitting	22	Pass
	Proposed	7	Standing	8	Standing	30	Pass
	Future	4	Sitting	5	Sitting	22	Pass
32	Existing	6	Sitting	6	Sitting	21	Pass
	Proposed	4	Sitting	5	Sitting	29	Pass
	Future	3	Sitting	4	Sitting	21	Pass
33	Existing	8	Standing	7	Standing	26	Pass
	Proposed	6	Sitting	7	Standing	32	Pass
	Future	4	Sitting	4	Sitting	23	Pass
34	Existing	6	Sitting	5	Sitting	20	Pass
	Proposed	3	Sitting	3	Sitting	20	Pass
	Future	2	Sitting	2	Sitting	22	Pass
35	Existing	7	Standing	7	Standing	23	Pass
	Proposed	3	Sitting	4	Sitting	21	Pass
	Future	2	Sitting	3	Sitting	16	Pass
36	Existing	8	Standing	7	Standing	25	Pass
	Proposed	7	Standing	7	Standing	33	Pass
	Future	4	Sitting	5	Sitting	23	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
37	Existing	7	Standing	7	Standing	25	Pass
	Proposed	3	Sitting	4	Sitting	19	Pass
	Future	2	Sitting	3	Sitting	17	Pass
38	Existing	7	Standing	7	Standing	25	Pass
	Proposed	4	Sitting	4	Sitting	19	Pass
	Future	2	Sitting	3	Sitting	17	Pass
39	Existing	8	Standing	7	Standing	25	Pass
	Proposed	4	Sitting	4	Sitting	17	Pass
	Future	2	Sitting	3	Sitting	16	Pass
40	Existing	8	Standing	7	Standing	25	Pass
	Proposed	7	Standing	7	Standing	30	Pass
	Future	6	Sitting	6	Sitting	22	Pass
41	Existing	8	Standing	8	Standing	27	Pass
	Proposed	4	Sitting	4	Sitting	19	Pass
	Future	2	Sitting	3	Sitting	17	Pass
42	Existing	7	Standing	6	Sitting	21	Pass
	Proposed	4	Sitting	4	Sitting	17	Pass
	Future	3	Sitting	3	Sitting	14	Pass
43	Existing	-	-	-	-	-	-
	Proposed	4	Sitting	4	Sitting	20	Pass
	Future	3	Sitting	3	Sitting	17	Pass
44	Existing	-	-	-	-	-	-
	Proposed	2	Sitting	2	Sitting	14	Pass
	Future	2	Sitting	2	Sitting	13	Pass
45	Existing	8	Standing	7	Standing	25	Pass
	Proposed	9	Strolling	8	Standing	29	Pass
	Future	7	Standing	7	Standing	25	Pass
46	Existing	7	Standing	7	Standing	22	Pass
	Proposed	7	Standing	7	Standing	24	Pass
	Future	6	Sitting	6	Sitting	20	Pass
47	Existing	7	Standing	7	Standing	22	Pass
	Proposed	7	Standing	6	Sitting	21	Pass
	Future	6	Sitting	6	Sitting	19	Pass
48	Existing	-	-	-	-	-	-
	Proposed	3	Sitting	3	Sitting	12	Pass
	Future	3	Sitting	3	Sitting	13	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
49	Existing	7	Standing	6	Sitting	22	Pass
	Proposed	7	Standing	7	Standing	23	Pass
	Future	5	Sitting	5	Sitting	17	Pass
50	Existing	7	Standing	7	Standing	23	Pass
	Proposed	7	Standing	7	Standing	24	Pass
	Future	6	Sitting	6	Sitting	19	Pass
51	Existing	8	Standing	7	Standing	25	Pass
	Proposed	9	Strolling	8	Standing	34	Pass
	Future	7	Standing	7	Standing	27	Pass
52	Existing	7	Standing	7	Standing	25	Pass
	Proposed	7	Standing	7	Standing	31	Pass
	Future	8	Standing	7	Standing	27	Pass
53	Existing	6	Sitting	6	Sitting	25	Pass
	Proposed	6	Sitting	6	Sitting	25	Pass
	Future	7	Standing	7	Standing	24	Pass
54	Existing	8	Standing	7	Standing	26	Pass
	Proposed	8	Standing	8	Standing	27	Pass
	Future	7	Standing	6	Sitting	25	Pass
55	Existing	-	-	-	-	-	-
	Proposed	6	Sitting	6	Sitting	22	Pass
	Future	5	Sitting	5	Sitting	21	Pass
56	Existing	-	-	-	-	-	-
	Proposed	8	Standing	7	Standing	29	Pass
	Future	6	Sitting	6	Sitting	21	Pass
57	Existing	-	-	-	-	-	-
	Proposed	4	Sitting	4	Sitting	16	Pass
	Future	5	Sitting	5	Sitting	18	Pass
58	Existing	6	Sitting	6	Sitting	21	Pass
	Proposed	4	Sitting	4	Sitting	22	Pass
	Future	4	Sitting	4	Sitting	23	Pass
59	Existing	7	Standing	7	Standing	24	Pass
	Proposed	4	Sitting	4	Sitting	16	Pass
	Future	3	Sitting	3	Sitting	16	Pass
60	Existing	6	Sitting	6	Sitting	21	Pass
	Proposed	7	Standing	7	Standing	23	Pass
	Future	6	Sitting	5	Sitting	19	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
61	Existing	7	Standing	7	Standing	24	Pass
	Proposed	7	Standing	6	Sitting	25	Pass
	Future	4	Sitting	4	Sitting	16	Pass
62	Existing	5	Sitting	5	Sitting	20	Pass
	Proposed	7	Standing	6	Sitting	24	Pass
	Future	5	Sitting	5	Sitting	19	Pass
63	Existing	7	Standing	7	Standing	23	Pass
	Proposed	6	Sitting	6	Sitting	20	Pass
	Future	4	Sitting	4	Sitting	16	Pass
64	Existing	6	Sitting	6	Sitting	18	Pass
	Proposed	7	Standing	7	Standing	25	Pass
	Future	6	Sitting	6	Sitting	19	Pass
65	Existing	5	Sitting	5	Sitting	18	Pass
	Proposed	7	Standing	7	Standing	25	Pass
	Future	7	Standing	7	Standing	21	Pass
66	Existing	4	Sitting	4	Sitting	18	Pass
	Proposed	7	Standing	7	Standing	24	Pass
	Future	7	Standing	7	Standing	22	Pass
67	Existing	-	-	-	-	-	-
	Proposed	7	Standing	7	Standing	23	Pass
	Future	7	Standing	7	Standing	20	Pass
68	Existing	-	-	-	-	-	-
	Proposed	8	Standing	8	Standing	30	Pass
	Future	7	Standing	7	Standing	21	Pass
69	Existing	6	Sitting	6	Sitting	21	Pass
	Proposed	7	Standing	7	Standing	25	Pass
	Future	7	Standing	7	Standing	23	Pass
70	Existing	6	Sitting	6	Sitting	21	Pass
	Proposed	8	Standing	8	Standing	31	Pass
	Future	8	Standing	7	Standing	27	Pass
71	Existing	7	Standing	6	Sitting	21	Pass
	Proposed	8	Standing	8	Standing	32	Pass
	Future	7	Standing	7	Standing	30	Pass
72	Existing	7	Standing	7	Standing	23	Pass
	Proposed	10	Strolling	10	Strolling	34	Pass
	Future	7	Standing	7	Standing	23	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
73	Existing	-	-	-	-	-	-
	Proposed	10	Strolling	10	Strolling	34	Pass
	Future	9	Strolling	8	Standing	30	Pass
74	Existing	-	-	-	-	-	-
	Proposed	10	Strolling	10	Strolling	31	Pass
	Future	10	Strolling	10	Strolling	29	Pass
75	Existing	-	-	-	-	-	-
	Proposed	14	Uncomfortable	12	Walking	47	Pass
	Future	16	Uncomfortable	14	Uncomfortable	45	Pass
76	Existing	-	-	-	-	-	-
	Proposed	12	Walking	11	Walking	40	Pass
	Future	11	Walking	10	Strolling	35	Pass
77	Existing	-	-	-	-	-	-
	Proposed	7	Standing	6	Sitting	27	Pass
	Future	7	Standing	6	Sitting	23	Pass
78	Existing	-	-	-	-	-	-
	Proposed	11	Walking	10	Strolling	34	Pass
	Future	12	Walking	12	Walking	37	Pass
79	Existing	-	-	-	-	-	-
	Proposed	6	Sitting	6	Sitting	21	Pass
	Future	6	Sitting	6	Sitting	25	Pass
80	Existing	-	-	-	-	-	-
	Proposed	10	Strolling	9	Strolling	34	Pass
	Future	8	Standing	8	Standing	30	Pass
81	Existing	-	-	-	-	-	-
	Proposed	6	Sitting	6	Sitting	20	Pass
	Future	6	Sitting	6	Sitting	21	Pass
82	Existing	-	-	-	-	-	-
	Proposed	8	Standing	8	Standing	27	Pass
	Future	7	Standing	7	Standing	24	Pass
83	Existing	-	-	-	-	-	-
	Proposed	10	Strolling	9	Strolling	34	Pass
	Future	8	Standing	8	Standing	30	Pass
84	Existing	-	-	-	-	-	-
	Proposed	4	Sitting	4	Sitting	19	Pass
	Future	4	Sitting	4	Sitting	15	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
85	Existing	-	-	-	-	-	-
	Proposed	7	Standing	7	Standing	27	Pass
	Future	6	Sitting	6	Sitting	24	Pass
86	Existing	-	-	-	-	-	-
	Proposed	10	Strolling	9	Strolling	32	Pass
	Future	8	Standing	8	Standing	29	Pass
87	Existing	-	-	-	-	-	-
	Proposed	7	Standing	7	Standing	30	Pass
	Future	6	Sitting	6	Sitting	32	Pass
88	Existing	-	-	-	-	-	-
	Proposed	10	Strolling	9	Strolling	31	Pass
	Future	8	Standing	8	Standing	29	Pass
89	Existing	-	-	-	-	-	-
	Proposed	8	Standing	8	Standing	32	Pass
	Future	6	Sitting	6	Sitting	32	Pass
90	Existing	-	-	-	-	-	-
	Proposed	7	Standing	7	Standing	28	Pass
	Future	6	Sitting	6	Sitting	27	Pass
91	Existing	-	-	-	-	-	-
	Proposed	3	Sitting	3	Sitting	16	Pass
	Future	2	Sitting	2	Sitting	16	Pass
92	Existing	-	-	-	-	-	-
	Proposed	7	Standing	7	Standing	33	Pass
	Future	6	Sitting	7	Standing	30	Pass
93	Existing	-	-	-	-	-	-
	Proposed	8	Standing	9	Strolling	33	Pass
	Future	8	Standing	8	Standing	27	Pass
94	Existing	-	-	-	-	-	-
	Proposed	8	Standing	8	Standing	32	Pass
	Future	7	Standing	8	Standing	26	Pass
95	Existing	-	-	-	-	-	-
	Proposed	9	Strolling	9	Strolling	33	Pass
	Future	9	Strolling	8	Standing	30	Pass
96	Existing	-	-	-	-	-	-
	Proposed	6	Sitting	7	Standing	29	Pass
	Future	6	Sitting	6	Sitting	23	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
97	Existing	-	-	-	-	-	-
	Proposed	12	Walking	11	Walking	27	Pass
	Future	11	Walking	10	Strolling	27	Pass
98	Existing	-	-	-	-	-	-
	Proposed	4	Sitting	5	Sitting	22	Pass
	Future	4	Sitting	4	Sitting	20	Pass
99	Existing	-	-	-	-	-	-
	Proposed	11	Walking	10	Strolling	35	Pass
	Future	11	Walking	10	Strolling	34	Pass
100	Existing	-	-	-	-	-	-
	Proposed	16	Uncomfortable	14	Uncomfortable	30	Pass
	Future	15	Uncomfortable	14	Uncomfortable	30	Pass
101	Existing	-	-	-	-	-	-
	Proposed	11	Walking	10	Strolling	34	Pass
	Future	10	Strolling	10	Strolling	33	Pass
102	Existing	-	-	-	-	-	-
	Proposed	10	Strolling	9	Strolling	32	Pass
	Future	10	Strolling	9	Strolling	30	Pass
103	Existing	-	-	-	-	-	-
	Proposed	6	Sitting	6	Sitting	20	Pass
	Future	5	Sitting	5	Sitting	21	Pass
104	Existing	-	-	-	-	-	-
	Proposed	10	Strolling	10	Strolling	32	Pass
	Future	10	Strolling	9	Strolling	31	Pass
105	Existing	-	-	-	-	-	-
	Proposed	9	Strolling	8	Standing	29	Pass
	Future	10	Strolling	8	Standing	28	Pass
106	Existing	-	-	-	-	-	-
	Proposed	7	Standing	7	Standing	24	Pass
	Future	7	Standing	7	Standing	22	Pass
107	Existing	-	-	-	-	-	-
	Proposed	6	Sitting	6	Sitting	20	Pass
	Future	6	Sitting	6	Sitting	19	Pass
108	Existing	-	-	-	-	-	-
	Proposed	7	Standing	7	Standing	24	Pass
	Future	7	Standing	7	Standing	24	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	Existing	-	-	-	-	-	-
	Proposed	6	Sitting	6	Sitting	20	Pass
	Future	7	Standing	7	Standing	23	Pass
110	Existing	-	-	-	-	-	-
	Proposed	7	Standing	7	Standing	23	Pass
	Future	7	Standing	7	Standing	23	Pass
111	Existing	-	-	-	-	-	-
	Proposed	7	Standing	7	Standing	24	Pass
	Future	6	Sitting	6	Sitting	22	Pass
112	Existing	-	-	-	-	-	-
	Proposed	8	Standing	8	Standing	28	Pass
	Future	7	Standing	7	Standing	24	Pass
113	Existing	-	-	-	-	-	-
	Proposed	8	Standing	7	Standing	27	Pass
	Future	8	Standing	8	Standing	28	Pass
114	Existing	-	-	-	-	-	-
	Proposed	3	Sitting	3	Sitting	14	Pass
	Future	3	Sitting	3	Sitting	14	Pass
115	Existing	-	-	-	-	-	-
	Proposed	8	Standing	7	Standing	25	Pass
	Future	7	Standing	6	Sitting	22	Pass
116	Existing	-	-	-	-	-	-
	Proposed	8	Standing	7	Standing	26	Pass
	Future	8	Standing	7	Standing	27	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	
Existing	Existing site and surroundings
Proposed	Project with existing surroundings
Future	Project with future 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