REPORT



65 & 71 AGNES STREET

MISSISSAUGA, ONTARIO

PEDESTRIAN WIND STUDY RWDI # 2405697 September 24, 2024

SUBMITTED TO

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EXECUTIVE SUMMARY

RWDI was retained to conduct a pedestrian wind assessment for the proposed 65 & 71 Agnes Street in Mississauga, Ontario. The assessment was based on the wind-tunnel testing conducted for the proposed development site under the Existing and Proposed configurations of the site and surroundings. The results were analysed using the regional wind climate records and evaluated against the Mississauga Wind Criteria for pedestrian comfort (pertaining to common wind speeds conducive to different levels of human activity) and pedestrian safety (pertaining to infrequent but strong gusts that could affect a person's footing). The predicted wind conditions are presented in Figures 1A through 3B, and Table 1, and are summarized as follows:

- Existing wind speeds in all areas on and around the project site are comfortable for pedestrian use throughout the year, and meet the annual criterion used to assess pedestrian safety.
- With the addition of the proposed development, wind speeds in the summer at all areas on and around the site, including sidewalks and the main entrance, are expected to be appropriate for the intended pedestrian uses. Elevated wind speeds are expected at a localized area near the southwest corner of the site.
- Seasonally stronger winds in the winter are expected to result in elevated wind speeds compared to the summer on and around the proposed building site. Wind conditions at most areas are expected to be appropriate for pedestrian use, including the main entrance; however, uncomfortable wind conditions are expected at the southwest and east side of site as well as sidewalk areas across Agnes Street and Cook Street.
- Wind speeds at most areas on the Level 5 and Level 7 outdoor amenity areas are expected to be higher than desired for passive patron use in the summer and winter. The wind activity at one location on Level 5 and all locations on Level 7 are expected to exceed the wind safety criterion.

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1 INTRODUCTION

RWDI was retained to conduct a pedestrian wind assessment for the proposed 65 and 71 Agnes Street project in Mississauga, Ontario. This report presents the project objectives, background and approach, and discusses of the 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 located at the northwest intersection of Agnes Street and Cook Street. The project consists of a 29-storey residential building, with outdoor amenity terraces on Levels 5 and 7.

1.2 Objectives

The objective of the study was to assess the effect of the proposed development 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 Mississauga criteria for gauging wind comfort and safety in pedestrian areas. The assessment focused on critical pedestrian areas, including building entrances, public sidewalks and outdoor amenity areas.



Image 1: Aerial View of Existing Site and 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 and surroundings (Image 2A), and,
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B - Proposed: Proposed project with existing surroundings (Image 2B).

The wind tunnel model included all relevant surrounding buildings and topography within an approximately 360m 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 55 wind speed sensors to measure mean and gust speeds at a full-scale height of approximately 1.5 m above local grade in pedestrian areas throughout the study site. Wind speeds were measured for 36 directions in 10-degree increment. 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.

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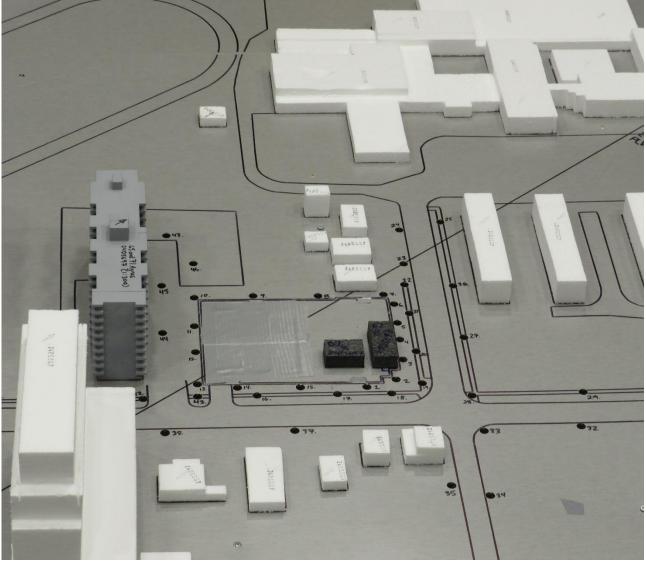


Image 2A: Wind Tunnel Study Model – Existing Configuration

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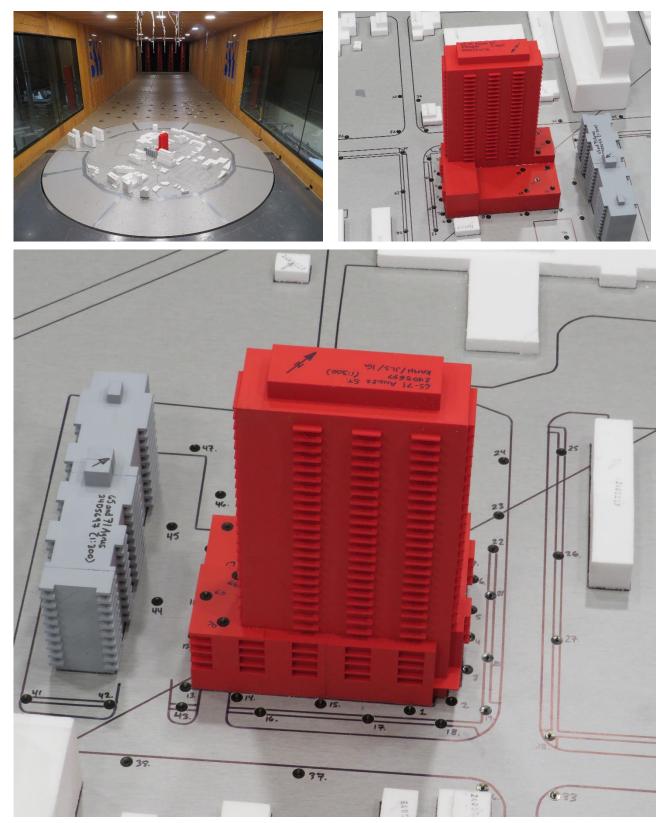
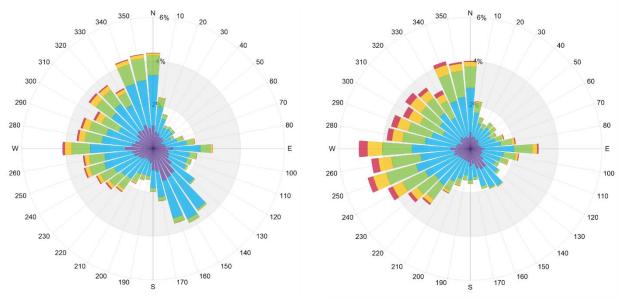


Image 2B: Wind Tunnel Study Model – Proposed Configuration

2.2 Meteorological Data

Wind statistics recorded at Toronto Pearson International Airport between 1990 and 2020, 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 southwest, west and northwest directions are predominant during both summer and winter. During the winter season, the prevailing winds from the east direction are also frequent, as indicated by the wind roses. The southeast winds are frequent in the summer, but typically of low wind speeds. Strong winds of a mean speed greater than 30 km/h measured at the airport (at an anemometer height of 10 m) occur for 4.8% and 11.4% 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 wind criteria for pedestrian comfort and safety.



Summer (May – October)

Winter (November - April)

Wind Speed	Probability (%)		
(km/h)	Summer	Winter	
 Calm	5.3	3.7	
1-10	30.7	22.5	
11-20	42.9	39.9	
21-30	16.2	22.6	
31-40	3.9	8.1	
>40	0.9	3.3	

Image 3: Directional Distribution of Winds Approaching Toronto Pearson International Airport between 1990 and 2020



2.3 Mississauga Pedestrian Wind Criteria

The Mississauga pedestrian wind criteria, developed in June 2014, are specified in the Urban Design Terms of Reference, "Pedestrian Wind Comfort and Safety Studies". As both mean and gust wind speeds can affect pedestrian comfort, their combined effect is used as the basis of the comfort criteria and defined as a Gust Equivalent Mean (GEM) wind speed. A 20% exceedance is used in these comfort criteria to determine the comfort category, which suggests that wind speeds would be comfortable for the corresponding activity at least 80% of the time or four out of five days.

Only gust winds are considered in the safety criterion. These are usually rare events but deserve special attention in city planning and building design due to their potential impact on pedestrian safety.

The following defines the criteria.

Comfort Category	GEM Speed (km/h)	Description	
Sitting	<u><</u> 10	Calm or light breezes desired for outdoor restaurants and seating areas where one can read a paper without having it blown away	
Standing ≤ 15		Gentle breezes suitable for main building entrances and bus stops	
Walking	<u><</u> 20	Relatively high speeds that can be tolerated if one's objective is to walk, run or cycle without lingering	
Uncomfortable	> 20	Strong winds of this magnitude are considered a nuisance for most activities, and wind mitigation is typically recommended	

Notes:

(1) GEM speed = max (mean speed, gust speed/1.85),

(2) GEM speeds listed above are based on a seasonal exceedance of 20% of the time between 6:00 and 23:00.

Safety Criterion	Gust Speed (km/h)	Description
Exceeded	> 90	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.



2.1 Generalized Wind Flows

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



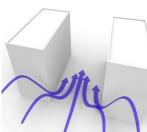
DOWNWASHING

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.



CHANNELLING 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 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, landscaping and wind screens (left to right)

3 RESULTS AND DISCUSSION

The predicted wind conditions are shown on site plans in Figures 1A through 3B, located in the "Figures" section of this report. These conditions and the associated wind speeds are also presented in Table 1, located in the "Tables" section.

3.1 Grade Level (Locations 1 through 55)

Wind conditions comfortable for walking are appropriate for sidewalks and walkways on and around the project site 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.

Note that references to wind directions are based on true north, while project north has been considered for references to the project site and buildings.

3.1.1 Existing Configuration

Existing wind speeds on and around the site are generally calm and comfortable for sitting or standing in the summer (Figure 1A) and for standing or walking in the winter (Figure 2A). These conditions are considered appropriate for the intended pedestrian usage on the sidewalks and other public areas. Wind speeds that meet the safety criterion are anticipated at all areas assessed in the Existing configuration (Figure 3A).

3.1.2 Proposed Configuration

The addition of the proposed project to the site is generally expected to cause higher wind speeds, compared to the Existing configuration, primarily because the proposed building is much taller relative to its surroundings. The podium steps and low roofs on the west side of the tower are positive design features that are expected to reduce the impact of winds redirected by the building towards the grade level.

Wind speeds that meet the safety criterion are anticipated at all grade level areas assessed in the Proposed configuration (Figure 3B).

The main entrance of the building is located near Location 1 in Figures 1B and 2B. Wind conditions at this entrance are predicted to be comfortable for standing in both the summer and winter, which is suitable for an entrance location.

During the summer, wind conditions on and around the site are generally predicted to be comfortable for walking or more passive use in most areas (Figure 1B), with wind speeds at most areas near the perimeter of the building expected to be comfortable for sitting or standing, which is appropriate. Wind speeds at a localized area near the southwest corner of the site is anticipated to be uncomfortable.

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During the winter, seasonally stronger winds are expected to cause increased wind speeds on and around the site (Figure 2B). Wind conditions comfortable for walking or standing are expected in most areas, which is appropriate. Uncomfortable conditions are predicted near the southwest corner of the building and across Agnes Street (Locations 13, 37, 38 and 43 in Figure 2B). These uncomfortable conditions stem primarily from northwesterly through southwesterly prevailing winds channelling between the proposed building and the neighboring 96 Agnes Street and 98 Agnes Street to the west and southwest, respectively, and further accelerating around the building corner and across Agnes Street. Uncomfortable wind conditions are also predicted along the sidewalk on the east side of building and locations across Cook Street due to westerly and easterly winds accelerating around the building corners (Locations 20, 27 and 28 in Figure 2B.)

Reduced wind speeds near the southwest corner of the building can be achieved by adding windscreens or dense coniferous or marcescent landscaping between the proposed building and the 96 Agnes Street building. Deciduous landscaping would shed their foliage during the winter months, when potentially adverse wind conditions are predicted, and would only provide minimal wind protection during the winter. Adding a wide canopy on the southern façade wrapped around the southeast building corner will help with winds accelerating around building corner. Any proposed landscaping, planters or street art will also help reduce wind speeds at the southeast corner. Examples of mitigation strategies are provided in Image 4.



Image 4: Examples of Wind Mitigation Strategies at Grade Level



3.1.3 Level 5 and 7 Outdoor Amenity Terraces (Locations 48 to 55)

It is generally desirable for wind conditions on outdoor amenities intended for passive activities to be comfortable for sitting or standing more than 80% of the time in the summer. During the winter, these areas would not be used frequently, thus, increased wind activity would be considered acceptable.

During the summer, wind conditions comfortable for sitting or standing are predicted in a small area on the eastern side of the Level 5 outdoor amenity area (Locations 49 to 51 in Figure 1B); however, higher wind speeds than appropriate for passive uses are predicted on the western side of the space (see conditions comfortable for walking at Locations 48, 50 and 52). On Level 7 winds speeds are expected to be higher than desired for passive use, with conditions at some locations expected to be uncomfortable in the summer (Location 54 and 55 in Figure 1B).

During the winter, generally higher wind speeds and potentially uncomfortable conditions are anticipated on the terraces (Figure 2B); however, this may not be a concern as this area may not be used frequently during the colder months.

Wind speeds at most locations on Level 5 expected to meet the wind safety criterion expect one location at the southeast corner which exceeds the criterion (Location 52 in Figure 3B). All locations on Level 7 are expected to exceed the wind safety criterion (Locations 53 through 55).

Lower wind speeds on the terrace can be achieved with a combination of vertical and horizontal mitigation features such as tall parapets, windscreens, landscaping and trellises. RWDI can provide further guidance on the placement of wind control measures as the design and programming of the terrace evolves. Examples of wind control measures are shown in Image 5 below.

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Image 5: Examples of Potential Wind Control Measures for the Level 5 and 7 Amenity Terraces

4 STATEMENT OF LIMITATIONS

Limitations

This report was prepared by Rowan Williams Davies & Irwin, Inc. ("RWDI") for Intentional Capital ("Client"). The findings and conclusions presented in this report have been prepared for the Client and are specific to the project described herein ("Project"). The conclusions and recommendations contained in this report are based on the information available to RWDI when this report was prepared.

The conclusions and recommendations contained in this report have also been made for the specific purpose(s) set out herein. Should the Client or any other third party utilize the report and/or implement the conclusions and recommendations contained therein for any other purpose or project without the involvement of RWDI, the Client or such third party assumes any and all risk of any and all consequences arising from such use and RWDI accepts no responsibility for any liability, loss, or damage of any kind suffered by Client or any other third party arising therefrom.

Finally, it is imperative that the Client and/or any party relying on the conclusions and recommendations in this report carefully review the stated assumptions contained herein and to understand the different factors which may impact the conclusions and recommendations provided.

Design Assumptions

RWDI confirms that the pedestrian wind assessment (the "**Assessmen**t") discussed herein was performed by RWDI in accordance with generally accepted professional standards at the time when the Assessment was performed and in the location of the Project. No other representations, warranties, or guarantees are made with respect to the accuracy or completeness of the information, findings, recommendations, or conclusions contained in this Report. This report is not a legal opinion regarding compliance with applicable laws.

The findings and recommendations set out in this report are based on the following information disclosed to RWDI. Drawings and information listed below were received from Sweeny &Co Architects Inc. and used to construct the scale model of the proposed 65 & 71 Agnes Street project **("Project Data**").

File Name	File Type	Date Received (dd/mm/yyyy)
65 Agnes Massing	Revit	22/03/2024
65 Agnes_Massing	AutoCAD	22/03/2024
2131_65 Agnes_R23	PDF	22/03/2024

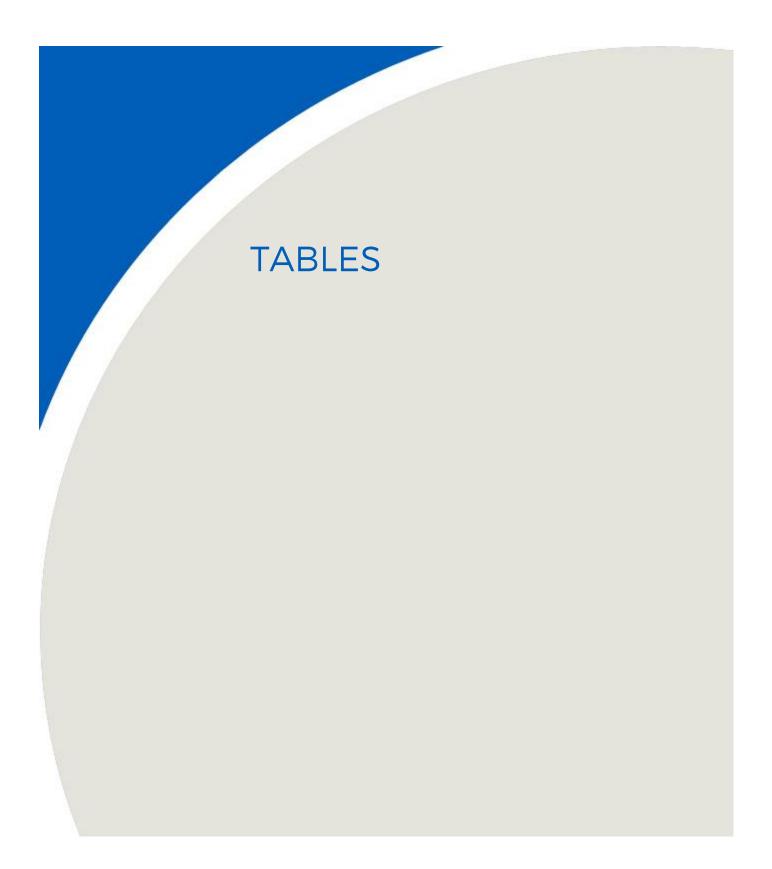
The recommendations and conclusions are based on the assumption that the Project Data and Climate Data are accurate and complete. RWDI assumes no responsibility for any inaccuracy or deficiency in information it has received from others. In addition, the recommendations and conclusions in this report are partially based on historical data and can be affected by a number of external factors, including but not limited to Project design, quality of materials and construction, site conditions, meteorological events, and climate change. As such, the conclusions and recommendations contained in this report do not list every possible outcome.

The opinions in this report can only be relied upon to the extent that the Project Data and Project Specific Conditions have not changed. Any change in the Project Data or Project Specific Conditions not reflected in this report can impact and/or alter the recommendations and conclusions in this report. Therefore, it is incumbent upon the Client and/or any other third party reviewing the recommendations and conclusions in this report to contact RWDI in the event of any change in the Project Data and Project Specific Conditions in order to determine whether any such change(s) may impact the assumptions upon which the recommendations and conclusions were made. RWDI #2405697 September 24, 2024

5 REFERENCES

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Wind Comfort Wind Safety Winter Annual Summer Configuration Location Speed Speed Speed Rating Rating Rating (km/h) (km/h) (km/h)1 Existing 8 Sitting 10 Sitting 45 Pass Proposed 12 Standing 13 Standing 53 Pass 2 Existing 10 Sitting 12 Standing 49 Pass Proposed 16 Walking 17 Walking 81 Pass 3 Existing 11 Standing 13 Standing 53 Pass Proposed Walking Walking 17 19 73 Pass Standing 4 Existing 11 Standing 13 58 Pass Proposed 14 Standing 15 Standing 62 Pass 5 Existing 11 Standing 13 Standing 53 Pass Proposed 14 Standing 15 Standing 63 Pass Standing Standing 6 Existing 11 13 60 Pass Proposed Standing Standing 13 15 67 Pass 7 Existing Standing Standing 11 13 57 Pass Proposed Standing Walking 13 17 76 Pass 8 Standing Standing Existing 11 14 57 Pass Proposed 10 Sitting 11 Standing 50 Pass 9 Existing 13 Standing 15 Standing 64 Pass Proposed 11 Standing 12 Standing 50 Pass 10 Existing Standing Walking Pass 13 16 66 Proposed Walking Walking 16 18 70 Pass 11 Standing Walking Existing 13 16 62 Pass Proposed 13 Standing Standing 61 Pass 14 12 Existing 13 Standing 16 Walking 61 Pass Proposed 15 Standing 17 Walking 69 Pass 13 Existing 15 Standing 18 Walking 75 Pass Proposed Uncomfortable 19 Walking 23 82 Pass 14 Existing 14 Standing 17 Walking 74 Pass Proposed Standing Standing 15 Pass 13 66 15 Existing Standing Walking 13 16 65 Pass Proposed 13 Standing 15 Standing 66 Pass 16 Existing 14 Standing 17 Walking 72 Pass Proposed 14 Standing 16 Walking 75 Pass Standing 17 Existing 10 Sitting 12 53 Pass Proposed 13 Standing 15 Standing 66 Pass



			Win	d Comfort		W	/ind Safety
	Configuration		Summer		Winter		Annual
Location	Configuration	Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
18	Existing	10	Sitting	12	Standing	47	Pass
	Proposed	17	Walking	19	Walking	78	Pass
19	Existing	10	Sitting	11	Standing	45	Pass
	Proposed	17	Walking	19	Walking	80	Pass
20	Existing	12	Standing	14	Standing	61	Pass
	Proposed	19	Walking	21	Uncomfortable	78	Pass
21	Existing	12	Standing	14	Standing	56	Pass
	Proposed	18	Walking	20	Walking	79	Pass
22	Existing	12	Standing	14	Standing	60	Pass
	Proposed	16	Walking	18	Walking	75	Pass
23	Existing	12	Standing	14	Standing	63	Pass
	Proposed	14	Standing	15	Standing	67	Pass
24	Existing	11	Standing	14	Standing	60	Pass
	Proposed	13	Standing	14	Standing	68	Pass
25	Existing	13	Standing	15	Standing	61	Pass
	Proposed	13	Standing	15	Standing	62	Pass
26	Existing	14	Standing	16	Walking	69	Pass
	Proposed	17	Walking	19	Walking	73	Pass
27	Existing	13	Standing	15	Standing	62	Pass
	Proposed	18	Walking	21	Uncomfortable	73	Pass
28	Existing	13	Standing	15	Standing	62	Pass
	Proposed	18	Walking	22	Uncomfortable	84	Pass
29	Existing	14	Standing	16	Walking	61	Pass
	Proposed	15	Standing	19	Walking	72	Pass
30	Existing	16	Walking	19	Walking	76	Pass
	Proposed	17	Walking	20	Walking	84	Pass
31	Existing	13	Standing	16	Walking	67	Pass
	Proposed	15	Standing	18	Walking	78	Pass
32	Existing	14	Standing	16	Walking	65	Pass
	Proposed	15	Standing	19	Walking	76	Pass
33	Existing	13	Standing	16	Walking	64	Pass
	Proposed	16	Walking	19	Walking	86	Pass
34	Existing	13	Standing	15	Standing	63	Pass
	Proposed	15	Standing	18	Walking	76	Pass



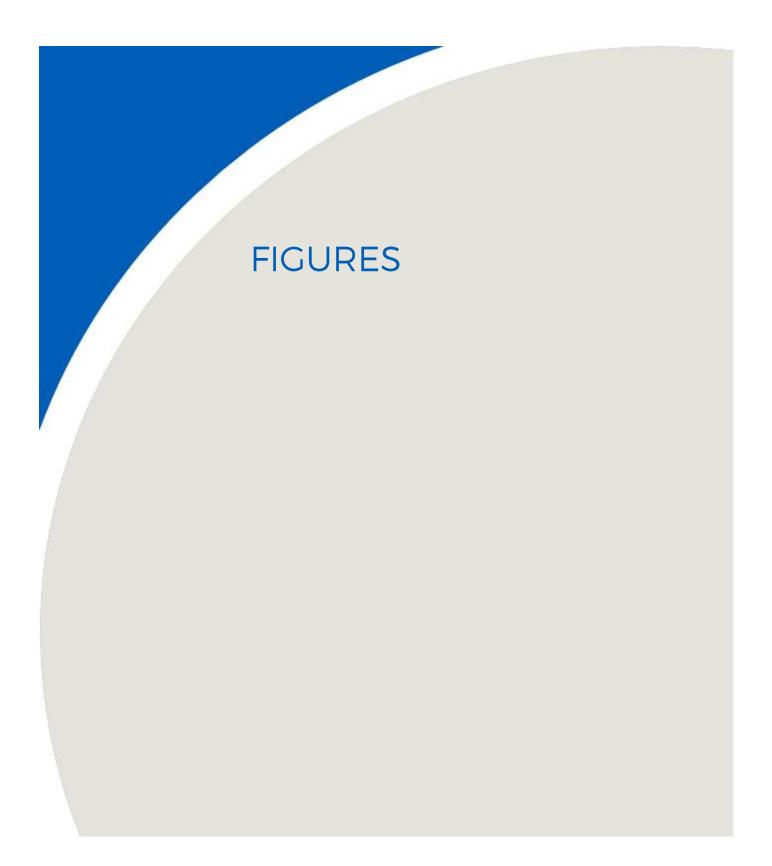
Wind Comfort Wind Safety Winter Annual Summer Configuration Location Speed Speed Speed Rating Rating Rating (km/h) (km/h) (km/h)35 Existing 11 Standing 13 Standing 53 Pass Proposed 14 Standing 17 Walking 70 Pass 36 Existing 10 Sitting 12 Standing 53 Pass Proposed Standing 14 15 Standing 59 Pass 37 Existing 13 Standing 16 Walking 68 Pass Proposed Walking Uncomfortable 18 21 84 Pass 38 Existing 15 Standing 19 Walking 76 Pass Proposed 19 Walking 23 Uncomfortable 81 Pass 39 Existing 15 Standing 19 Walking 86 Pass Proposed 14 Standing 18 Walking 80 Pass 40 Walking Walking Pass Existing 16 18 79 Proposed Walking 19 Walking Pass 16 76 41 Standing Walking Existing 15 18 80 Pass Proposed 17 Walking 19 Walking 78 Pass 42 Standing Walking Existing 14 16 79 Pass Proposed 17 Walking 19 Walking 77 Pass 43 Existing 14 Standing 17 Walking 75 Pass Proposed 21 Uncomfortable 24 Uncomfortable 84 Pass Existing 44 Standing Standing Pass 12 14 60 Proposed Walking Walking 18 20 79 Pass 45 Standing Standing 65 Existing 13 15 Pass Proposed 15 Standing 16 Walking 83 Pass 46 Existing 14 Standing 18 Walking 72 Pass Proposed 14 Standing 16 Walking 77 Pass 47 Existing 15 Standing 19 Walking 74 Pass Proposed 16 Walking 18 Walking 76 Pass 48 Existing ------Proposed 17 Walking 20 Walking 78 Pass 49 Existing - -- -- -Proposed 15 Standing 17 Walking 70 Pass 50 Existing ------Proposed 16 Walking 19 Walking 78 Pass 51 Existing ------Proposed 15 Standing 17 Walking 80 Pass

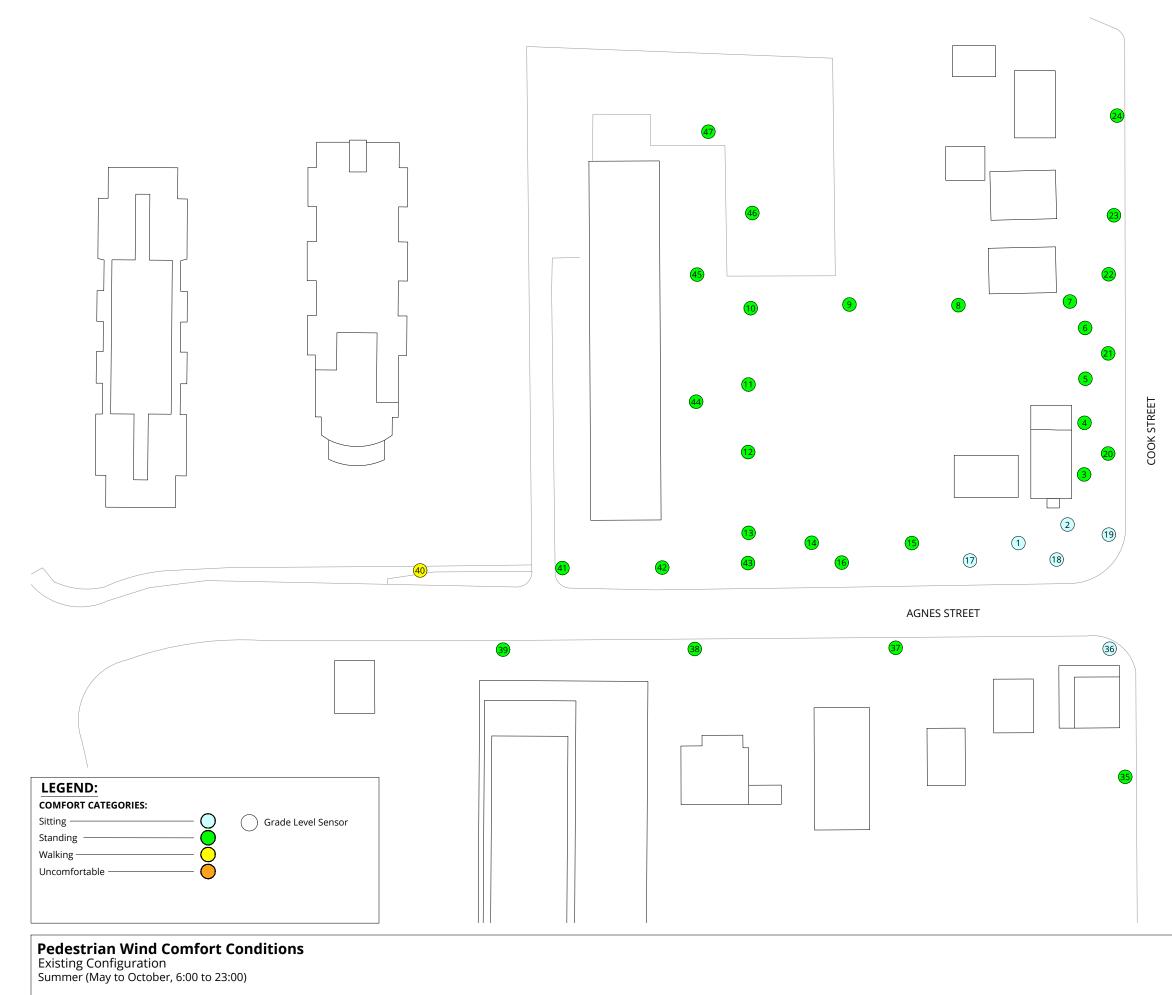


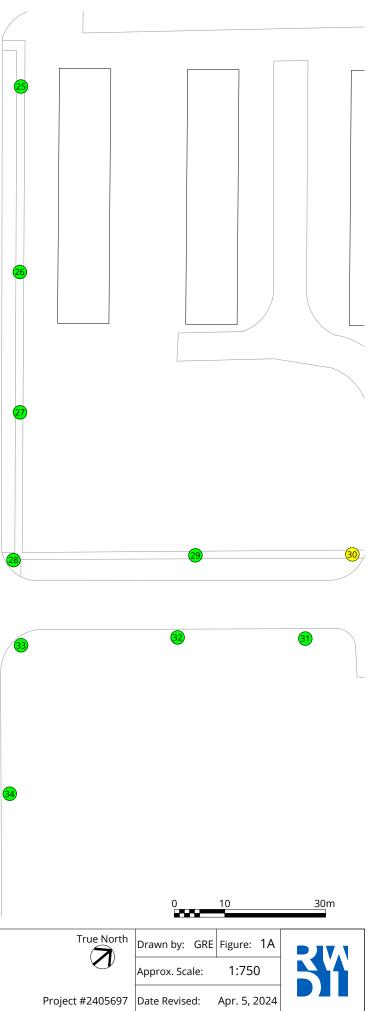
		Wind Comfort			Wind Safety		
Location	Configuration		Summer		Winter		Annual
Location		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
52	Existing Proposed	- 20	- Walking	- 23	- Uncomfortable	- 92	- Exceeded
53	Existing Proposed	- 16	- Walking	- 19	- Walking	- 110	- Exceeded
54	Existing Proposed	- 21	- Uncomfortable	- 23	- Uncomfortable	- 100	- Exceeded
55	Existing Proposed	- 21	- Uncomfortable	- 24	- Uncomfortable	- 97	- Exceeded

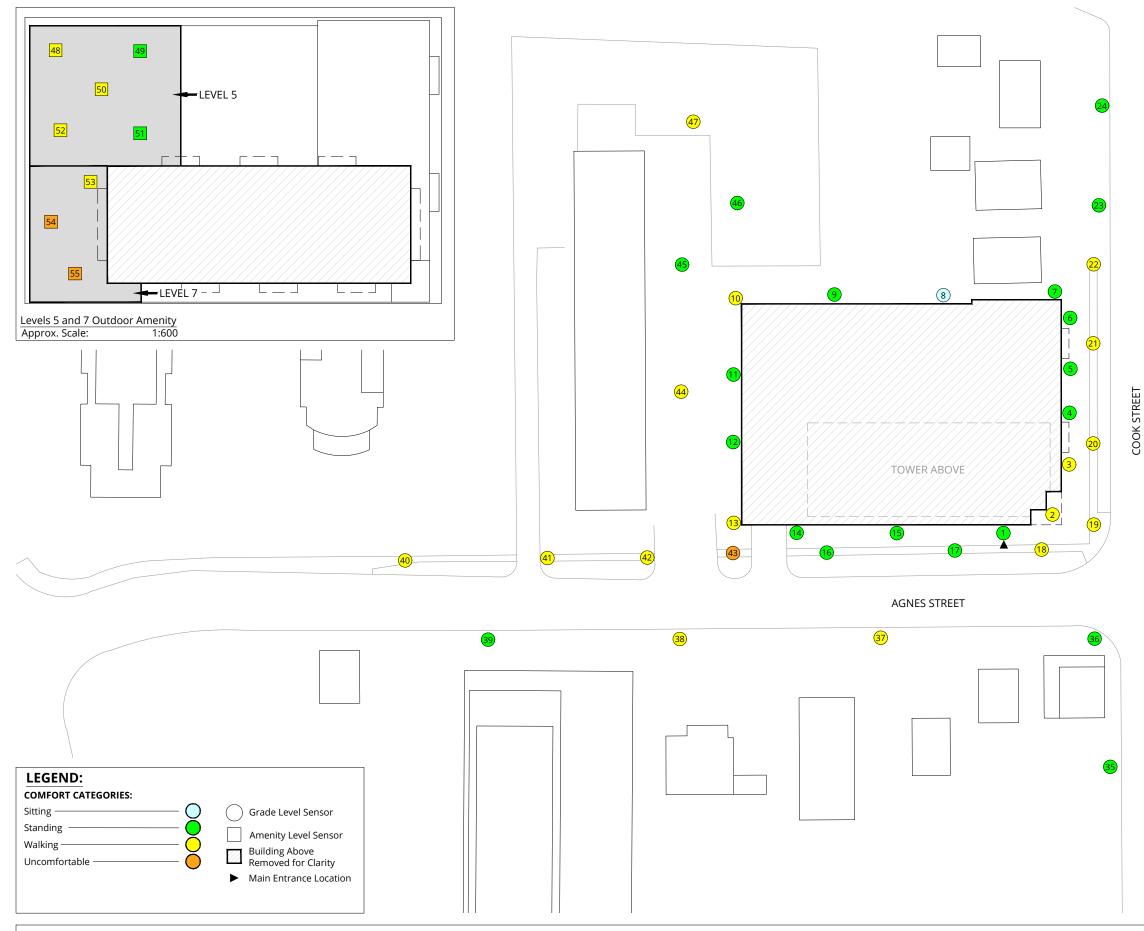
Season	Months	Hours	Comfort Speed (km/h)	Safety Speed (km/h)
Summer	May - October	6:00 - 23:00 for comfort	(20% Seasonal Exceedance)	(0.1% Annual Exceedance)
Winter	November - April	6:00 - 23:00 for comfort	≤ 10 Sitting	≤ 90 Pass
Annual	January - December	0:00 - 23:00 for safety	11 - 15 Standing	> 90 Exceeded
Configura	tions		16 - 20 Walking	
Existing	Existing site and surroundings		> 20 Uncomfortable	
Proposed	Project with existing	surroundings		



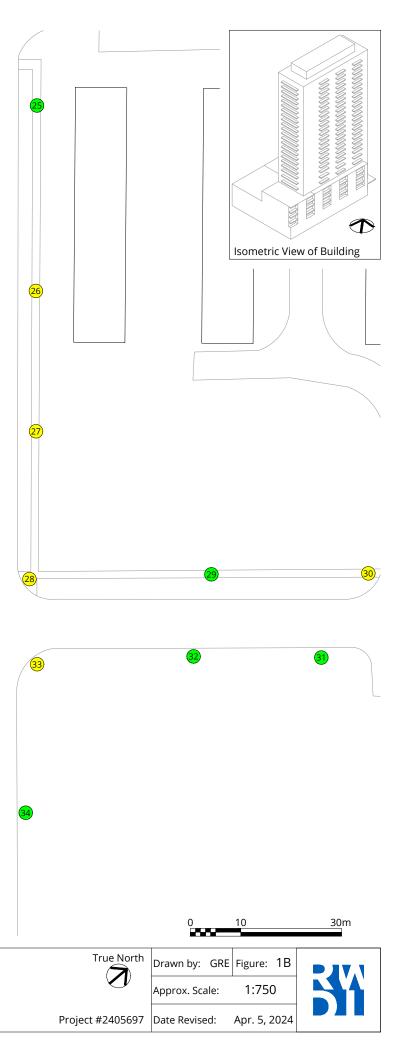


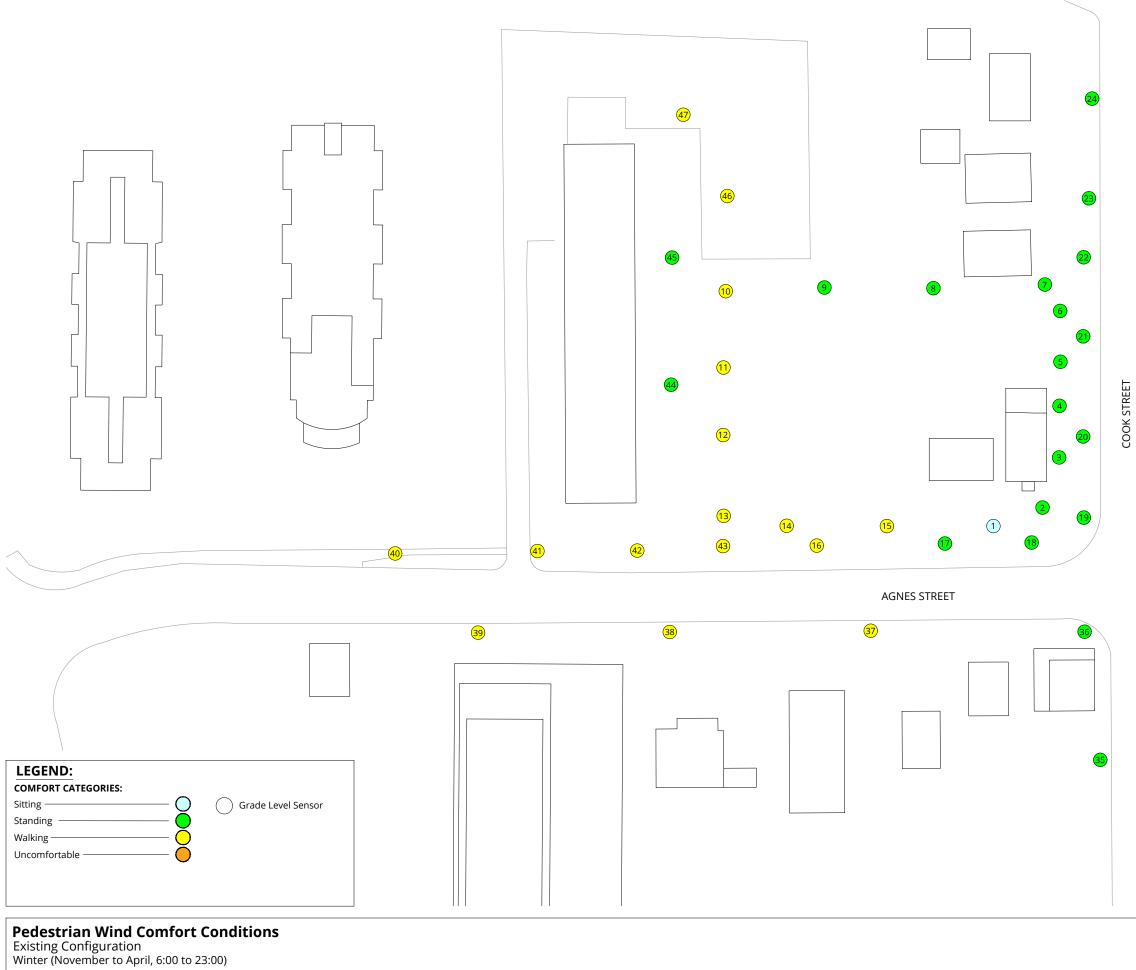


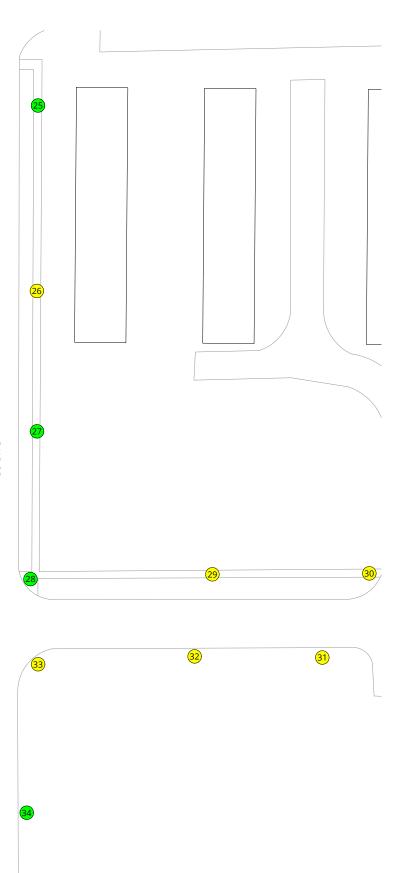


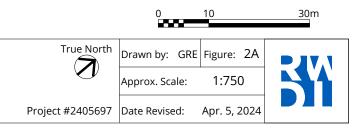


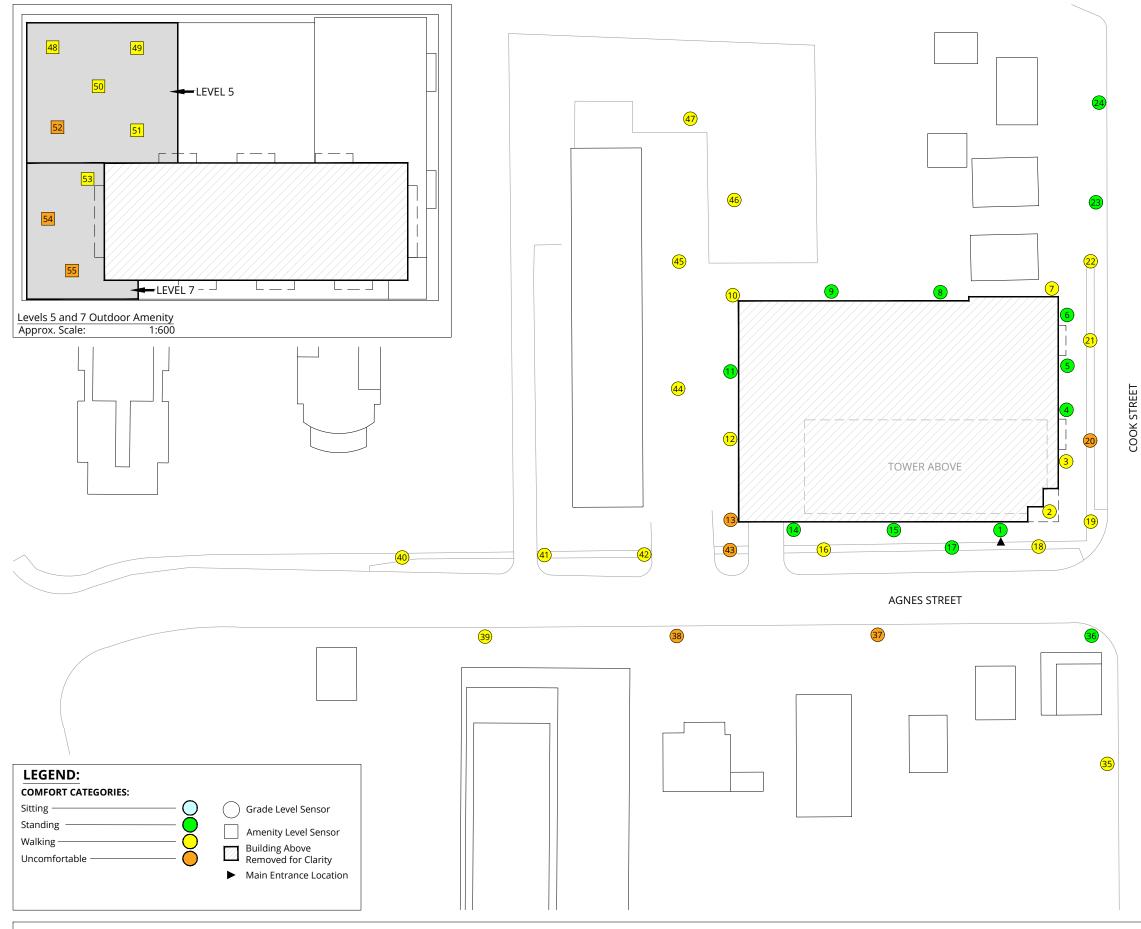
Pedestrian Wind Comfort Conditions Proposed Configuration Summer (May to October, 6:00 to 23:00)



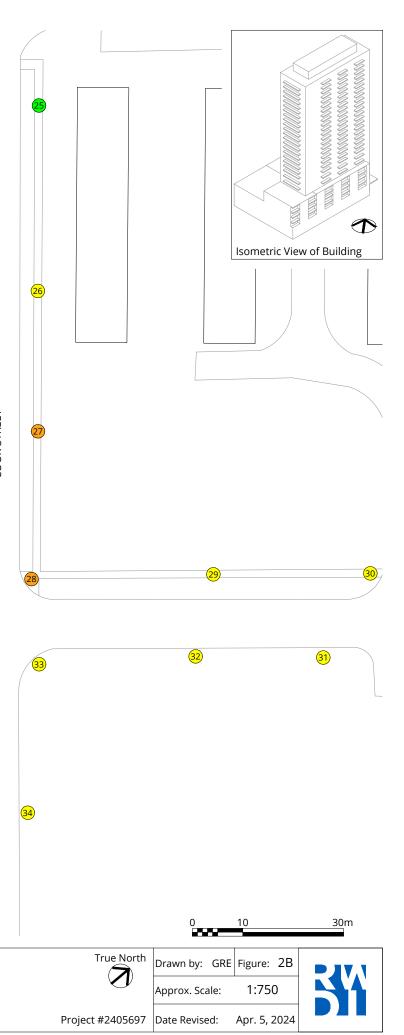


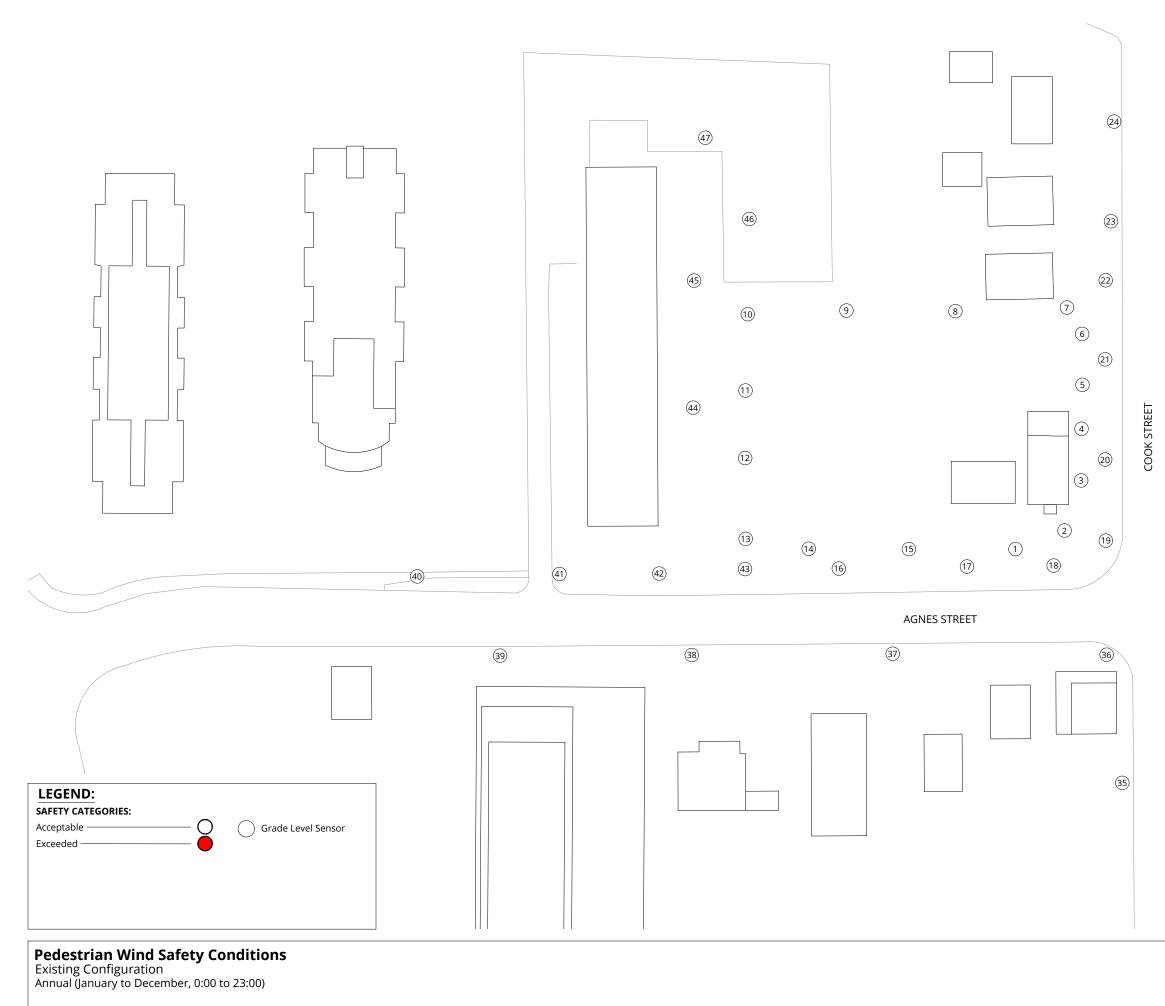


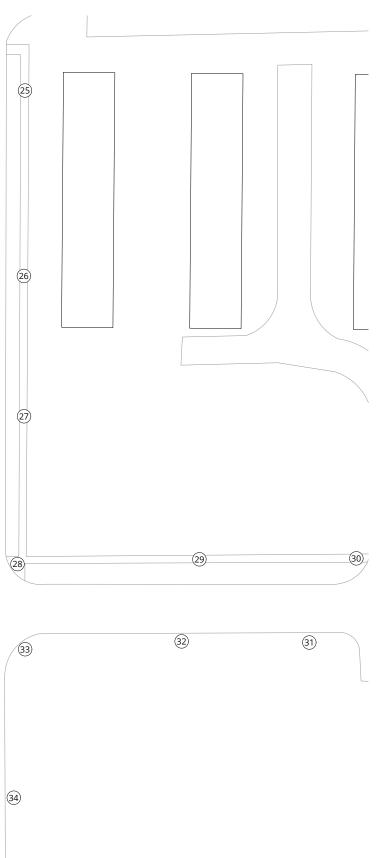


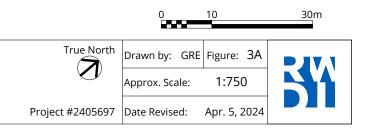


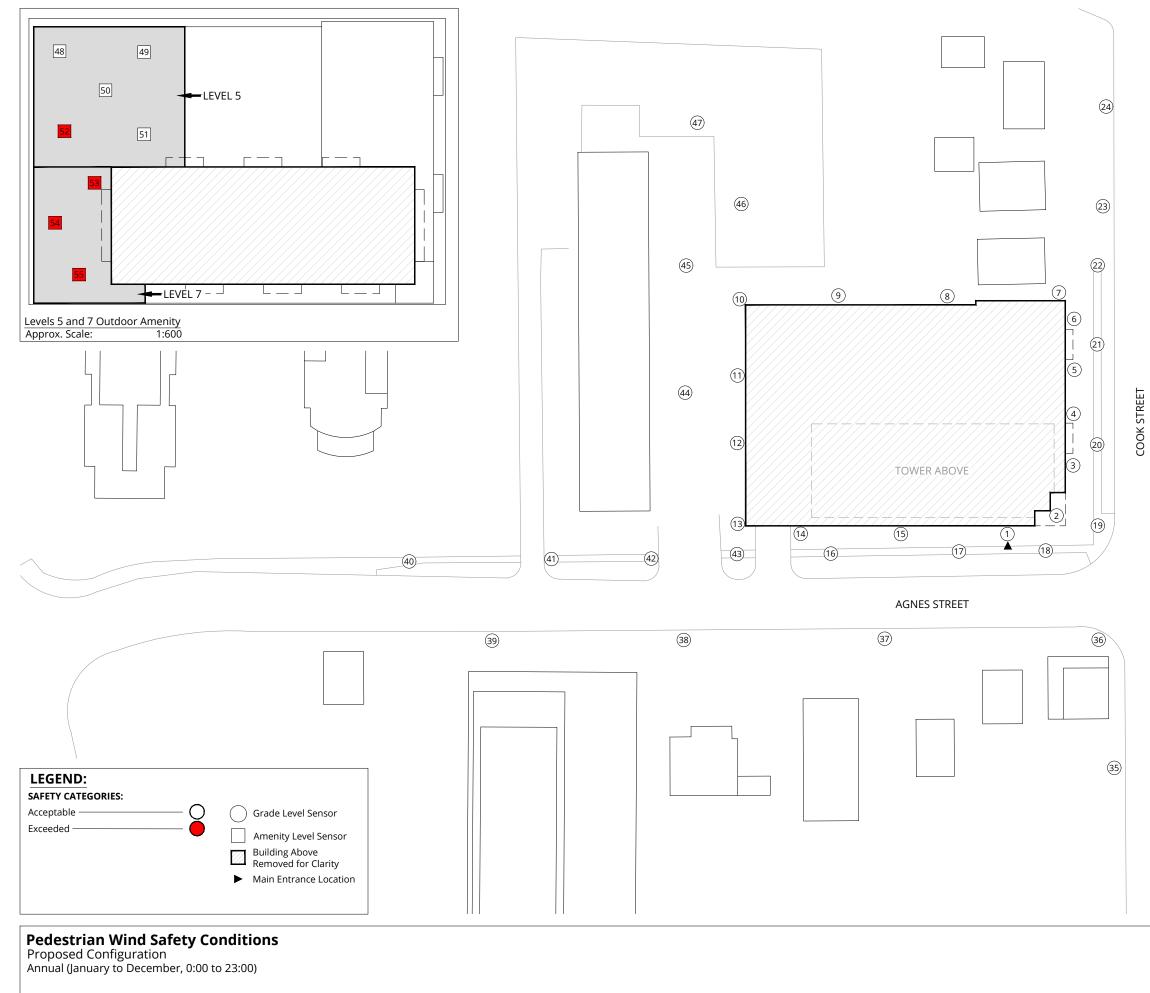
Pedestrian Wind Comfort Conditions Proposed Configuration Winter (November to April, 6:00 to 23:00)

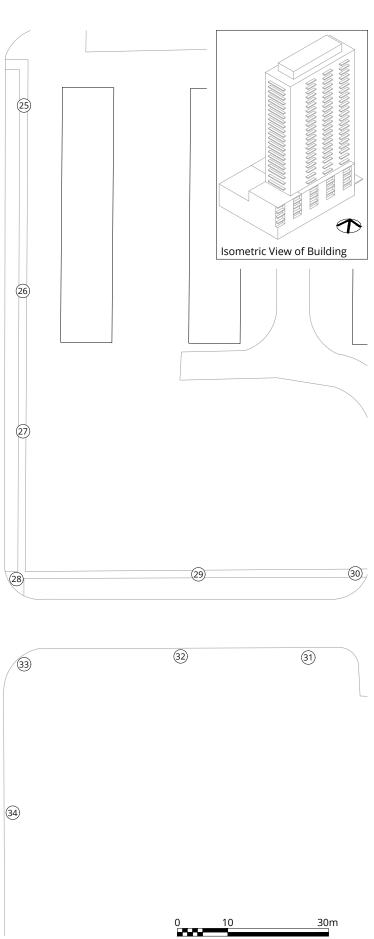












True North	Drawn by: GRE	Figure: 3B	
	Approx. Scale:	1:750	
Project #2405697	Date Revised:	Apr. 5, 2024	