REPORT

145 WELLINGTON STREET WEST

TORONTO, ON

PEDESTRIAN WIND STUDY
RWDI # 2407154
June 14, 2024

SUBMITTED TO

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EXECUTIVE SUMMARY

RWDI was retained to conduct a pedestrian wind assessment for the proposed project at 145 Wellington Street West in Toronto, Ontario. The assessment was based on the wind-tunnel testing conducted for the proposed site under the Existing and Proposed configurations, in accordance with the requirements in the *Pedestrian Level Wind Study Terms of Reference Guide* (the Guide) published by the City of Toronto in June 2022. The results were analysed using wind records from Billy Bishop Toronto City Airport and evaluated against the Wind Criteria for Pedestrian Comfort and Safety specified in the Guide. The predicted wind conditions are presented in Figures 1A through 4B and Table 1, and are summarized as follows:

- The wind safety criterion is predicted to be met at all assessed locations in both the Existing and Proposed Configurations.
- Wind conditions around the existing site are comfortable for pedestrian use in all seasons.
- The proposed project will be constructed in a dense urban area and will benefit from the existence of other tall buildings upwind. As a result, wind speeds on the sidewalks and walkways around the site are anticipated to continue to be suitable for pedestrian use in all seasons.
- Appropriate wind conditions are also expected at the central residential entrance on Simcoe Street yearlong; however, higher-than-ideal wind speeds are predicted at the entrance close to the southwest corner of the building in the winter.
- The wind environment on the terraces on Levels 3 and 24 are expected to be comfortable for outdoor uses during the summer. Increased wind speeds are expected in the other seasons due to the wind climate in Toronto, especially on the north portion of Level 24.

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1 INTRODUCTION

RWDI was retained to conduct a pedestrian wind assessment for the proposed 145 Wellington Street West in Toronto, ON. This report presents the project objectives, approach, and the main results from RWDI's assessment and provides conceptual wind control measures, where necessary. Our Statement of Limitations as it pertains to this study can be found in Section 4 of this report.

1.1 Project Description

The proposed development site is located at the southwest corner of the intersection of Wellington Street West and Simcoe Street (Image 1). The development will consist of a 65-storey mixed use tower with the main residential entrances facing Simcoe Street.

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 City of Toronto Wind Criteria for Pedestrian Comfort and Safety. The assessment focused on critical pedestrian areas, including main building entrances and public sidewalks.

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

2 BACKGROUND AND APPROACH

2.1 Wind Tunnel Study Model

To assess the wind environment around the proposed project, a 1:400 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), and,

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

The wind tunnel model included all relevant surrounding buildings and topography within an approximate 480 m radius around 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 63 specially designed 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. The placement of wind measurement locations was based on our experience and understanding of the pedestrian usage for the 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.

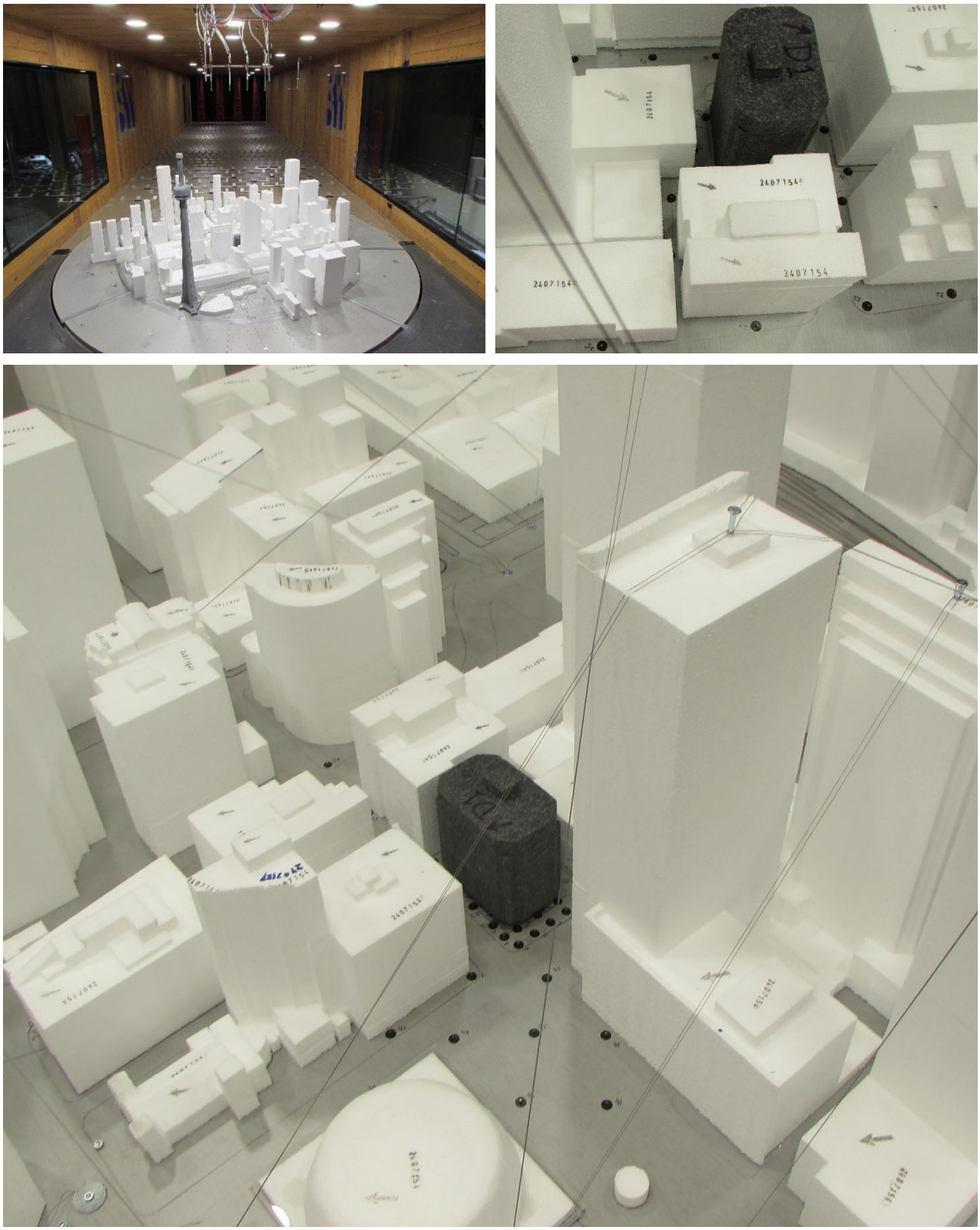


Image 2A: Wind Tunnel Study Model – Existing Configuration

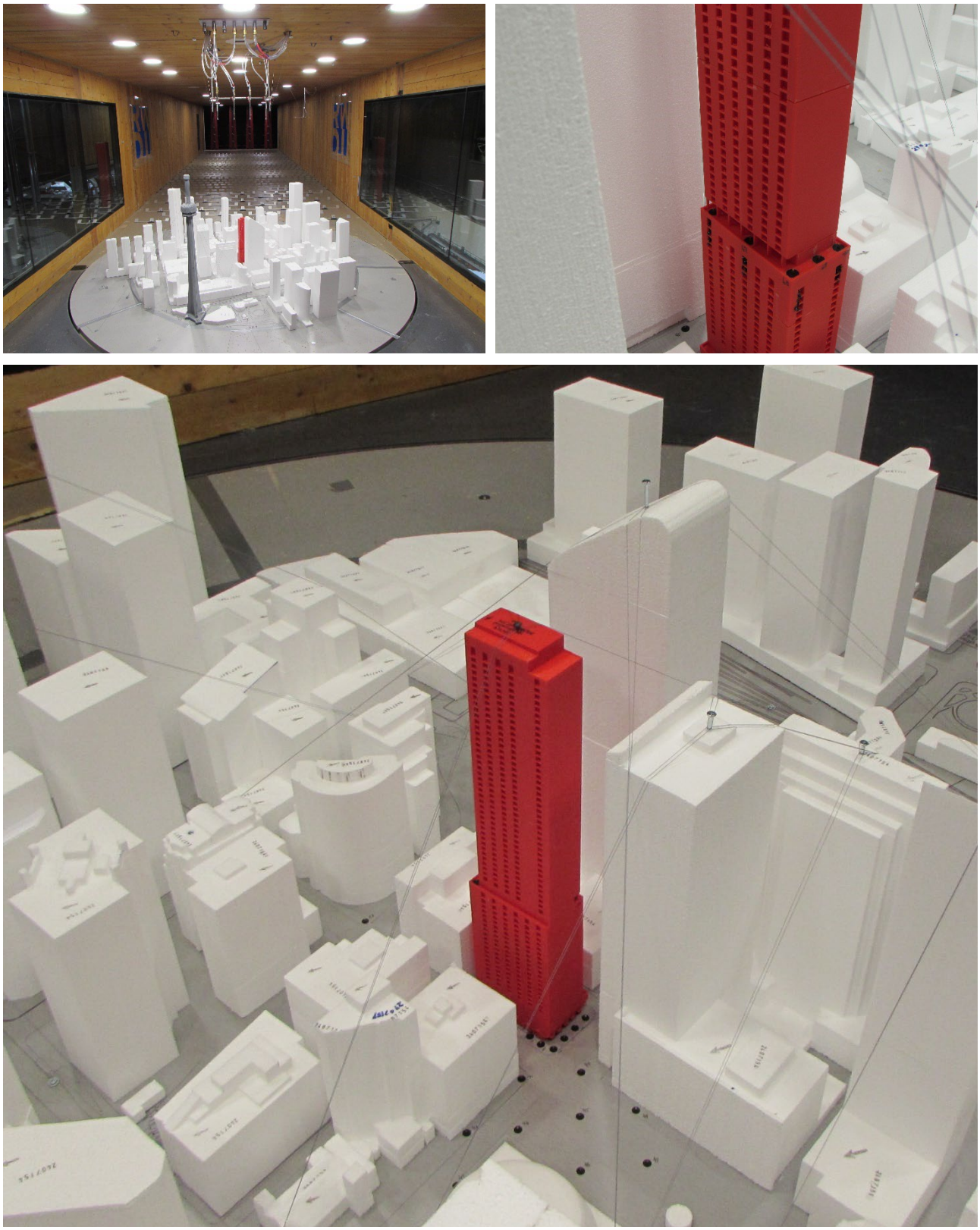
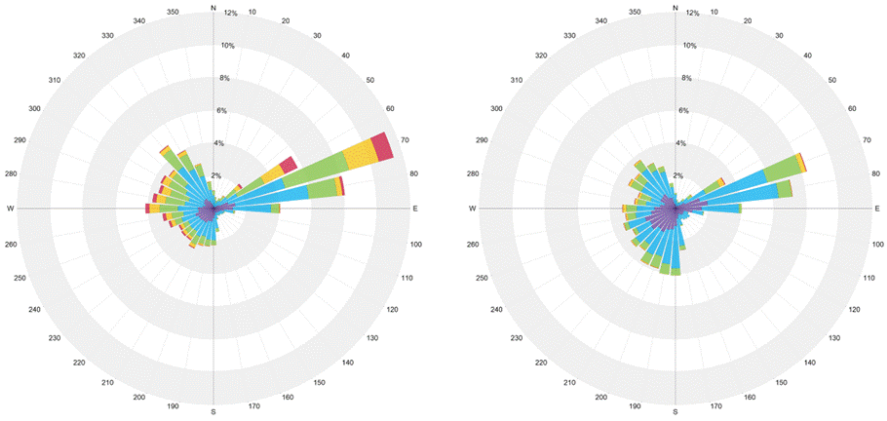


Image 2B: Wind Tunnel Study Model – Proposed Configuration

2.2 Wind Climate Data

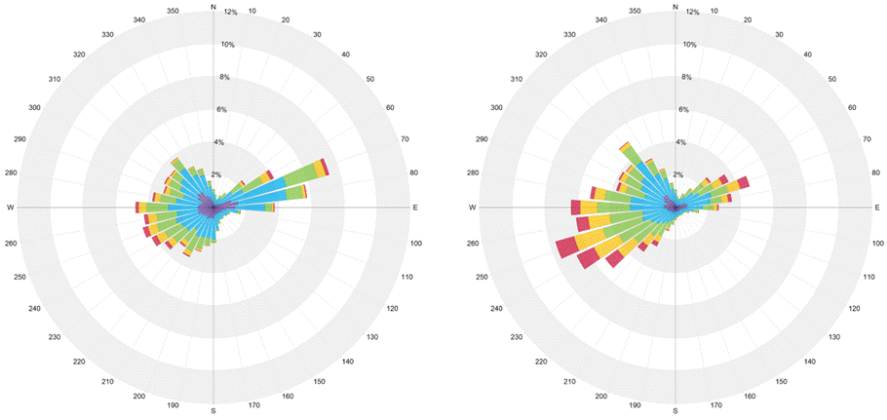
Wind statistics recorded at Billy Bishop Toronto City Airport between 1990 and 2020, inclusive, were analyzed for four seasonal periods as required by the City of Toronto – spring (March to May), summer (June to August), fall (September to November) and winter (December to February). Image 3 graphically depicts the seasonal directional distributions of wind frequencies and speeds. Winds from the east-northeast directions are predominant in all four seasons with strong winds from the westerly directions predominant in the spring, fall and winter indicated by the wind roses. Strong winds of a mean speed greater than 30km/h measured at the airport (at an anemometer height of 10m) occur primarily from the westerly directions and are most common in the winter, followed by spring, fall and summer in decreasing order of frequency.

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



Wind Speed (km/h)	Probability (%) Spring	Summer
Calm	3.6	5.7
1-10	21.4	33.4
11-20	39.3	44.6
21-30	23.5	14.0
31-40	8.6	2.1
>40	3.6	0.2

Spring (March – May) **Summer (June – August)**



Wind Speed (km/h)	Probability (%) Fall	Winter
Calm	4.2	1.9
1-10	24.2	14.9
11-20	41.8	35.7
21-30	21.2	26.7
31-40	6.2	13.4
>40	2.4	7.4

Fall (September – November) **Winter (December – February)**

Image 3: Directional Distribution of Winds Approaching Billy Bishop Toronto City Airport (1992 – 2022)

2.3 Wind Criteria for Pedestrian Comfort and Safety

The criteria specified in the *Pedestrian Level Wind Study Terms of Reference Guide (June 2022)* prepared by the city of Toronto are used in the current study and are presented below. The criteria consider pedestrian comfort (pertaining to common wind speeds conducive to different levels of human activity) and safety (pertaining to infrequent but strong gusts that could affect a person's footing).

COMFORT CATEGORY	GEM SPEED (km/h)	DESCRIPTION	AREA OF APPLICATION
Sitting	**≤ 10** at least 80% of the time	Light breezes desired for outdoor seating areas where one can read a paper without having it blown away.	Park benches, restaurant and café seating, balconies, amenity terraces, children's areas, etc. intended for relaxed, and usually seated activities.
Standing	**≤ 15** at least 80% of the time	Gentle breezes suitable for passive pedestrian activities where a breeze may be tolerated	Areas where seated activities are not expected but would be used for passive activities such as bus-stops, dog areas and main entrances.
Walking	**≤ 20** at least 80% of the time	Relatively high speeds that can be tolerated during intentional walking, running and other active movements.	Sidewalks, parking lots, alleyways and areas where pedestrian activity is primarily for walking.
Uncomfortable	**> 20** more than 20% of the time	Strong winds, considered a nuisance for most activities.	Not acceptable in areas with pedestrian access.

NOTES:
1) Gust Equivalent Mean (GEM) speed = maximum of either mean speed or gust speed/1.85.
2) Gust speed has been estimated as mean speed + (3 x RMS speed).
3) Comfort calculations are applied to each season and based on wind events recorded between 6:00 and 23:00 daily.
4) Wind speeds lower than 5 km/h for majority of the time (e.g., 80%) have the potential to create low air circulation. Potential problems related to low air flow are buildup of vehicle and/or building exhaust, and in full exposure to sun, low air flow can lead to issues related to thermal comfort.

SAFETY CRITERION	GUST SPEED (km/h)	DESCRIPTION	AREA OF APPLICATION
Exceeded	> 90 At least 0.1 % of the time annually (9 hours in a year)	Excessive gust speeds that can adversely affect a pedestrian's balance and footing. Wind mitigation is typically required.	Not acceptable in any area of interest

NOTES:
5) Safety calculations are applied to an annual period and based on wind events recorded for 24 hours a day

3 RESULTS AND DISCUSSION

The predicted wind conditions are shown on site plans in Figures 1A through 4B located in the "Figures" section of this report and the associated wind speeds are presented in Table 1, located in the "Tables" section of this report. **Wind conditions that meet the safety criterion are predicted at all locations for both configurations assessed.**

Wind conditions comfortable for walking 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. Wind speeds comfortable for sitting are preferred for areas intended for passive activities, such as outdoor amenities. 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 project site is located in a dense urban neighbourhood, which provides sheltering from winds in the area. Wind conditions at most assessed locations are comfortable for sitting or standing throughout the year (Figures 1A, 2A, 3A, and 4A). Higher wind speeds, comfortable for walking, occur at a localized area to the southwest of the building in the spring (Figure 1A) and at several locations along Simcoe Street and Wellington Street West during the winter (Figure 4A).

3.2 Proposed Configuration

The proposed tower is sheltered by the surrounding buildings and has a positive orientation from a wind control perspective, with the narrow façades facing east and west. As a result, it is expected to have a low impact on the wind conditions at the ground level.

3.2.1 Ground Level (Locations 1 through 55)

Wind conditions at the ground level are anticipated to continue to be comfortable for sitting or standing in most areas throughout the year (Figures 1B, 2B, 3B, and 4B). Increased wind speeds, comfortable for walking, are still expected to occur locally in the spring (Figure 1B) and over larger areas in the winter (Figure 4B). Conditions along Heenan Place are anticipated to be similar to the existing scenario. These conditions are suitable for sidewalks and walkways but are higher than ideal for the tower entrance close to the southwest corner (Location 1 in Figure 4B). Potential measures of improving wind conditions at this entrance include recessing the entrance to shelter it from the winds along the west facade or installing tall vertical barriers on both sides of the entrance to create a sheltered doorway. Conceptual examples of these options are shown in Image 4.

3.2.2 Levels 3 and 24 Terraces (Locations 56 through 63)

Wind conditions on the Levels 3 and 24 terraces are expected to be generally comfortable for sitting in the summer (Image 2B). Higher wind speeds are anticipated in the other seasons due to the wind climate in the area, especially on the north portion of Level 24 during the spring and winter. If improved conditions are desired, the design team may consider adding dividers or tall landscaping features around seating and gathering areas on the terraces and a tall guardrail at the north end of Level 24. Examples of these features are shown in Image 5.

Image 4: Wind Control Features for Entrances

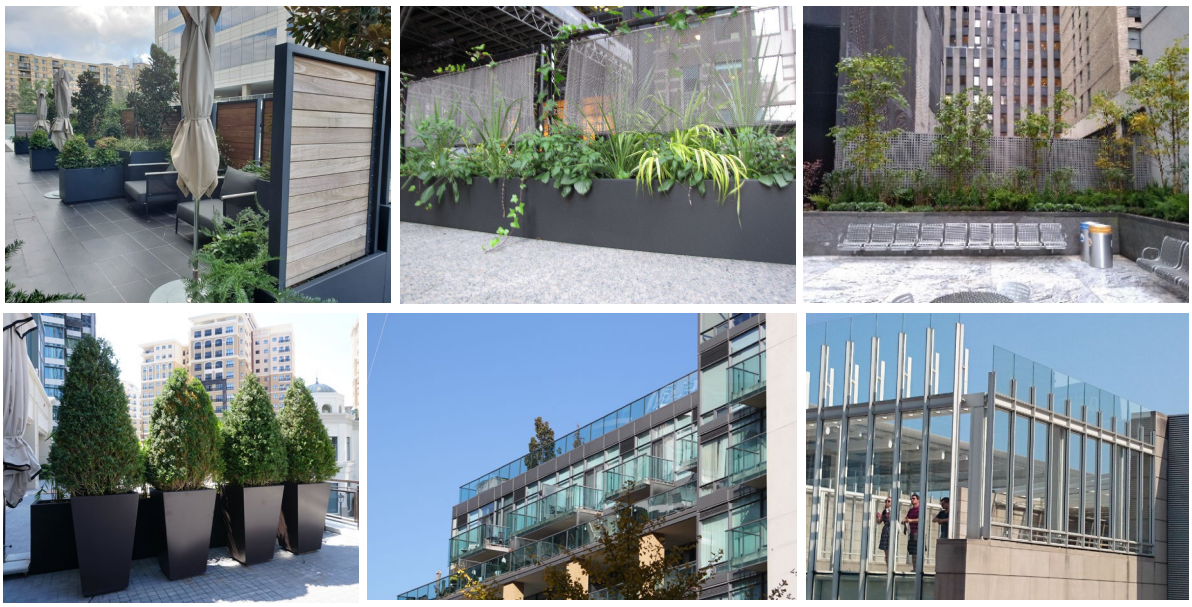


Image 5: Wind Control Features for Terraces

4 STATEMENT OF LIMITATIONS

Limitations

This report entitled was prepared by Rowan Williams Davies & Irwin, Inc. ("RWDI") for H&R REIT ("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 "**Assessment**") 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 H&R REIT and used to construct the scale model of the proposed development **("Project Data**")

File Name	File Type	Date Received (dd/mm/yyyy)
2024-05-09_18167P01-Sheet - SPA150 - FLOOR 01	.DWG	09/05/2024
2024-05-09_18167P01-Sheet - SPA005 - SITE PLAN - ROOF PLAN	.DWG	09/05/2024
2024-05-02_18167P01_PAC 3D massing	.SKP	03/05/2024
2024-04-15_18167P01_65 Storey Arch Set_Lr	.PDF	03/05/2024

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.

5 REFERENCES

1. ASCE Task Committee on Outdoor Human Comfort (2004). *Outdoor Human Comfort and Its Assessment*, 68 pages, American Society of Civil Engineers, Reston, Virginia, USA.

2. Williams, C.J., Hunter, M.A. and Waechter, W.F. (1990). "Criteria for Assessing the Pedestrian Wind Environment," *Journal of Wind Engineering and Industrial Aerodynamics*, Vol.36, pp.811-815.

3. Williams, C.J., Soligo M.J. and Cote, J. (1992). "A Discussion of the Components for a Comprehensive Pedestrian Level Comfort Criteria," *Journal of Wind Engineering and Industrial Aerodynamics*, Vol.41-44, pp.2389-2390.

4. Soligo, M.J., Irwin, P.A., and Williams, C.J. (1993). "Pedestrian Comfort Including Wind and Thermal Effects," *Third Asia-Pacific Symposium on Wind Engineering*, Hong Kong.

5. Soligo, M.J., Irwin, P.A., Williams, C.J. and Schuyler, G.D. (1998). "A Comprehensive Assessment of Pedestrian Comfort Including Thermal Effects," *Journal of Wind Engineering and Industrial Aerodynamics*, Vol.77&78, pp.753-766.

6. Williams, C.J., Wu, H., Waechter, W.F. and Baker, H.A. (1999). "Experiences with Remedial Solutions to Control Pedestrian Wind Problems," *Tenth International Conference on Wind Engineering*, Copenhagen, Denmark.

7. Lawson, T.V. (1973). "Wind Environment of Buildings: A Logical Approach to the Establishment of Criteria", *Report No. TVL 7321*, Department of Aeronautic Engineering, University of Bristol, Bristol, England.

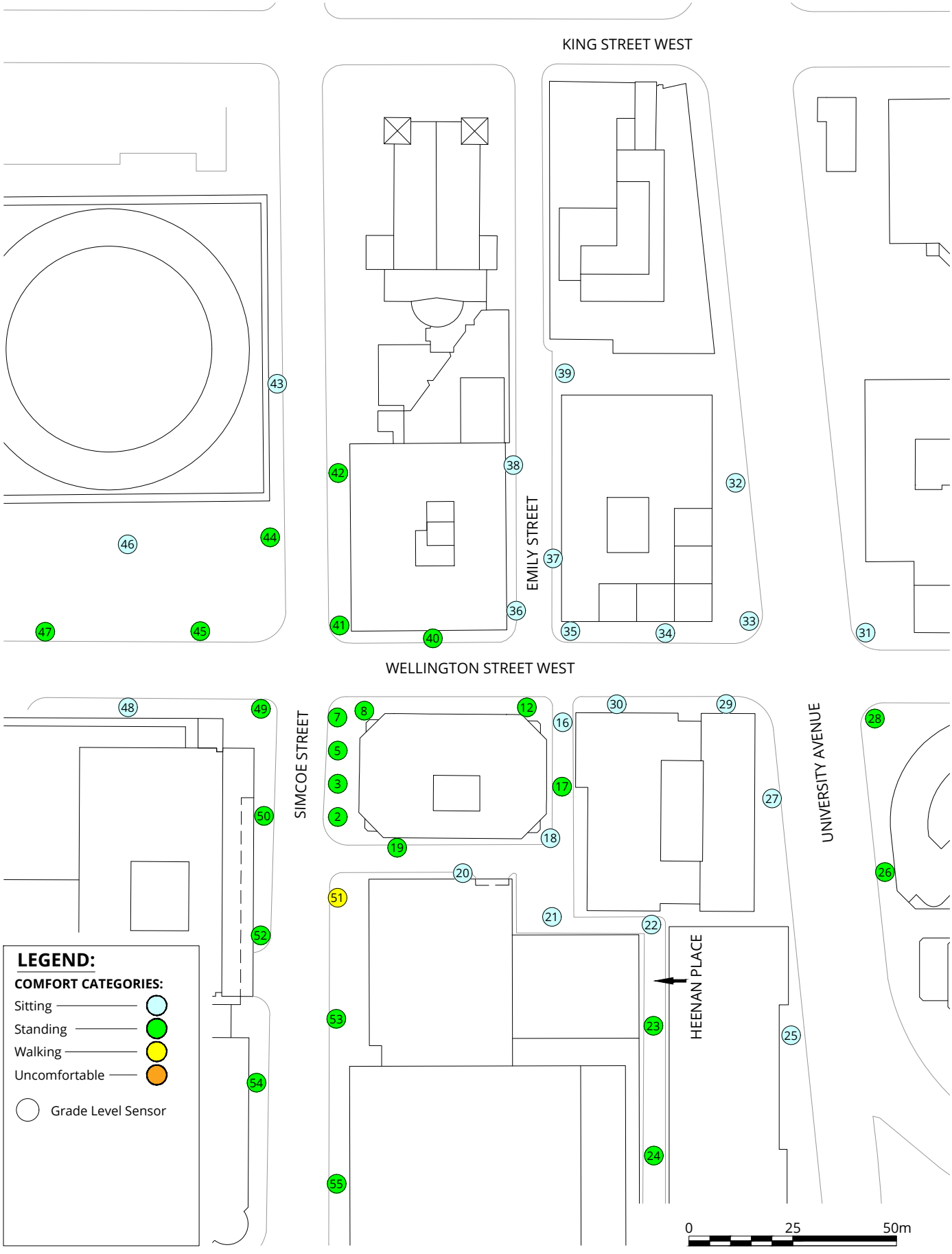
8. Durgin, F. H. (1997). "Pedestrian Level Wind Criteria Using the Equivalent average", *Journal of Wind Engineering and Industrial Aerodynamics*, Vol. 66, pp.215-226.

9. Wu, H. and Kriksic, F. (2012). "Designing for Pedestrian Comfort in Response to Local Climate", *Journal of Wind Engineering and Industrial Aerodynamics*, Vol.104-106, pp.397-407.

10. Wu, H., Williams, C.J., Baker, H.A. and Waechter, W.F. (2004), "Knowledge-based Desk-Top Analysis of Pedestrian Wind Conditions", *ASCE Structure Congress 2004,* Nashville, Tennessee.

11. City of Toronto Urban Design, City Planning (2022). *Pedestrian Level Wind Study Terms of Reference Guide*, 20 pages, City of Toronto, Ontario, Canada.

FIGURES



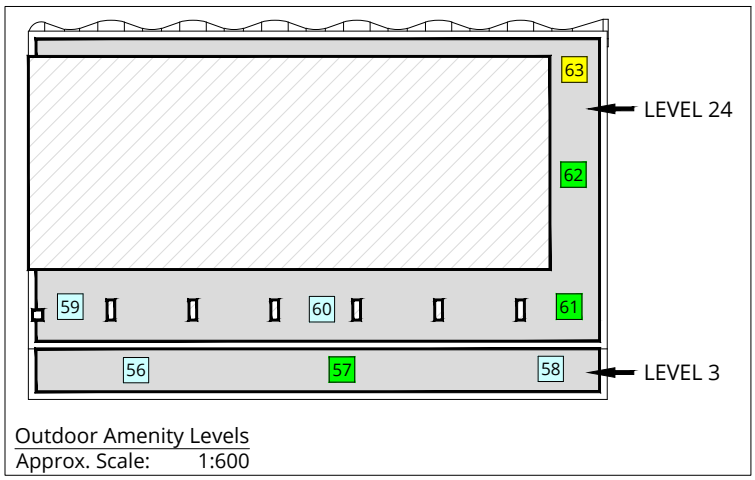
Pedestrian Wind Comfort Conditions
Existing Configuration
Spring (March to May, 6:00 to 23:00)

145 Wellington Street - Toronto, ON

Project #2407154

True North

Drawn by:	GRE	Figure:	1A
Approx. Scale:	1:1250		
Date Revised:	Jun. 6, 2024		



Outdoor Amenity Levels
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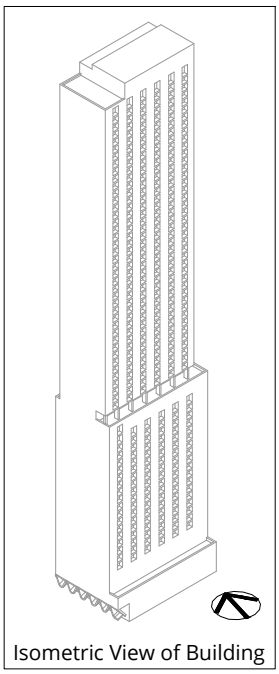

LEGEND:

COMFORT CATEGORIES:

- Sitting
- Standing
- Walking
- Uncomfortable
- Grade Level Sensor
- Amenity Level Sensor
- Building Above Removed for Clarity
- Main Entrance Location

0 25 50m

Pedestrian Wind Comfort Conditions

Proposed Configuration
Spring (March to May, 6:00 to 23:00)

145 Wellington Street - Toronto, ON

Project #2407154

True North

Drawn by:	GRE	Figure:	1B
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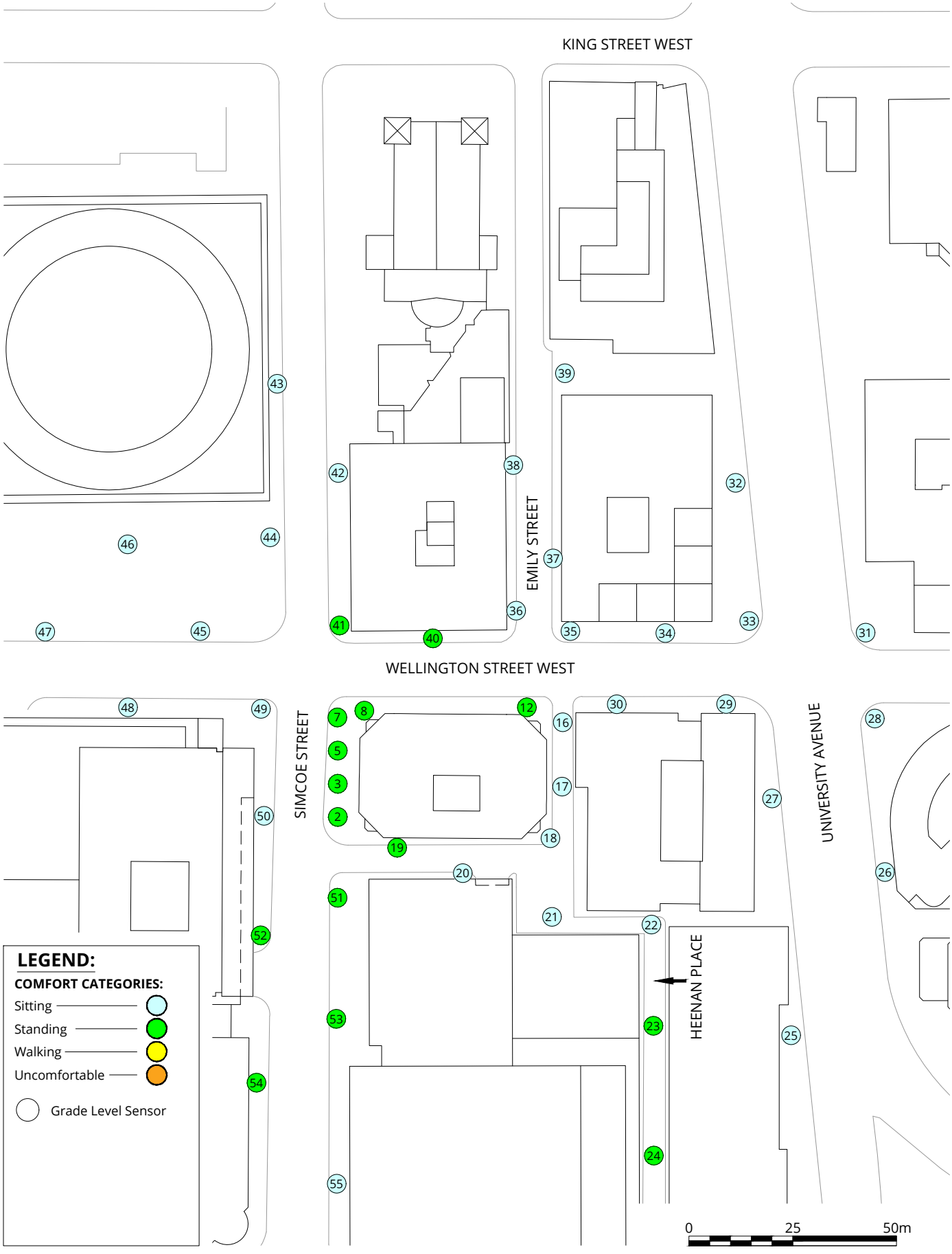
Date Revised:	Jun. 6, 2024		



Pedestrian Wind Comfort Conditions
Existing Configuration
Summer (June to August, 6:00 to 23:00)

145 Wellington Street - Toronto, ON

Project #2407154

True North

Drawn by:	GRE	Figure:	2A
Approx. Scale:	1:1250		
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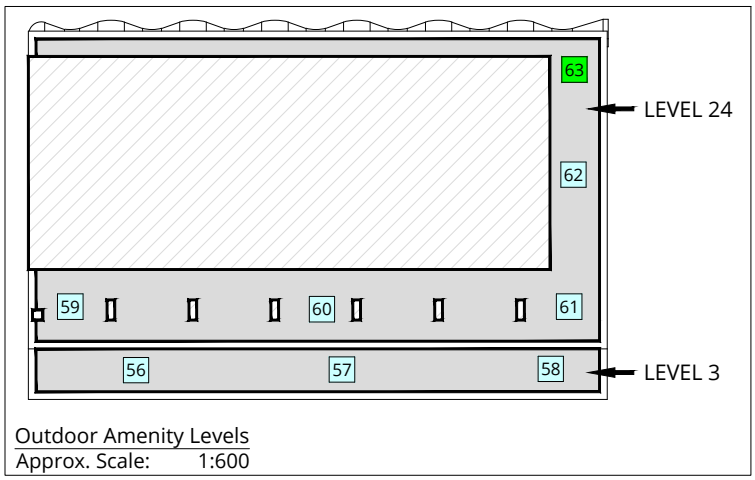
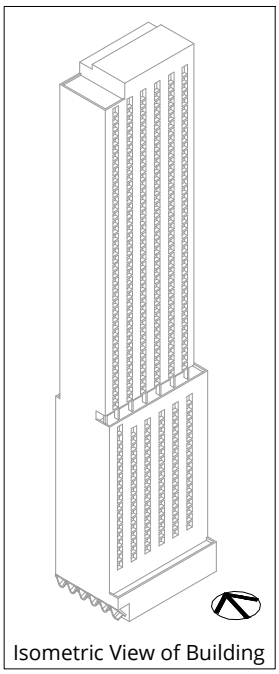


Outdoor Amenity Levels
Approx. Scale: 1:600



Isometric View of Building

Pedestrian Wind Comfort Conditions
Proposed Configuration
Summer (June to August, 6:00 to 23:00)

145 Wellington Street - Toronto, ON

Project #2407154

True North

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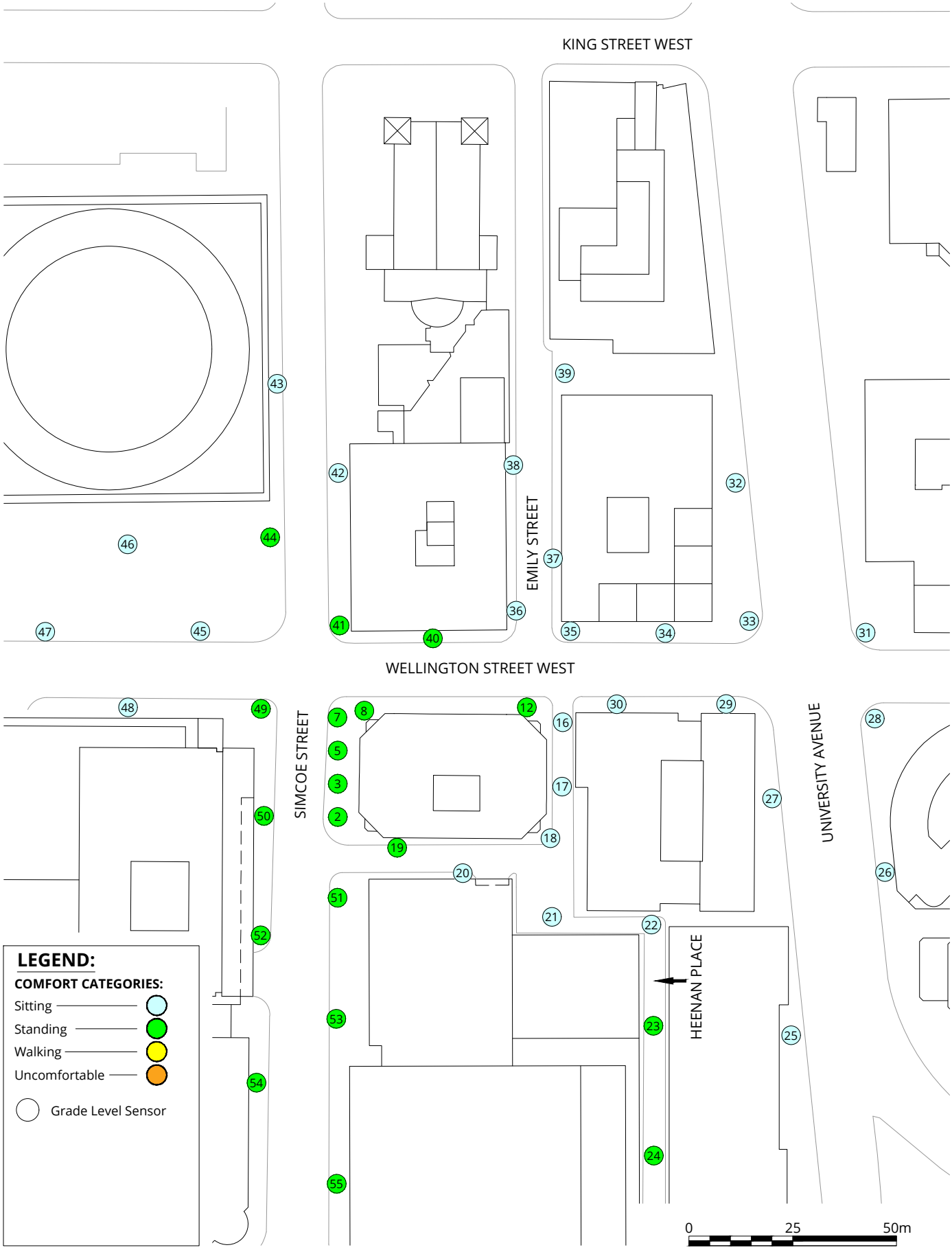
Date Revised: Jun. 6, 2024		



Pedestrian Wind Comfort Conditions
Existing Configuration
Fall (September to November, 6:00 to 23:00)

145 Wellington Street - Toronto, ON

Project #2407154

True North

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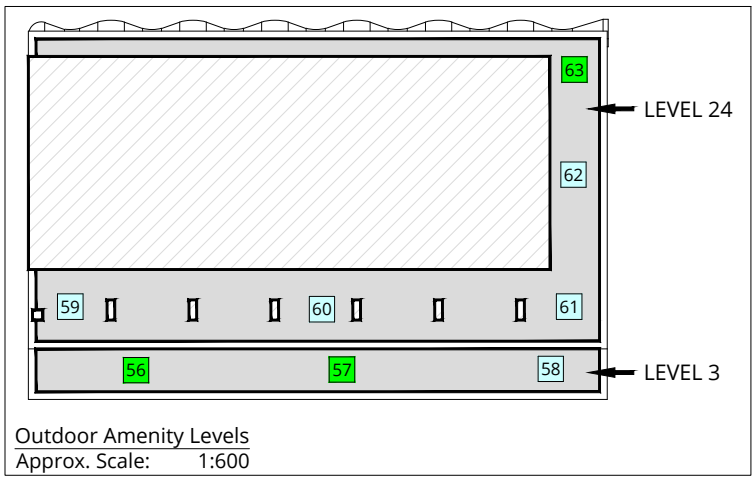
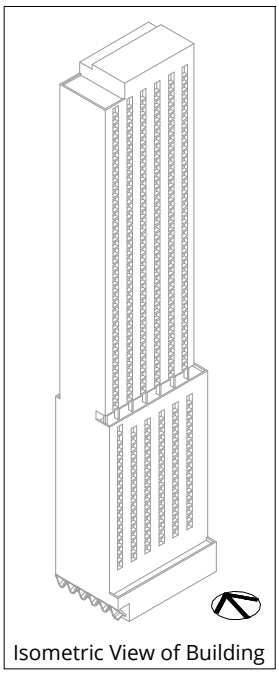


Outdoor Amenity Levels
Approx. Scale: 1:600



Isometric View of Building

LEGEND:

COMFORT CATEGORIES:

- Sitting
- Standing
- Walking
- Uncomfortable

- Grade Level Sensor
- Amenity Level Sensor
- Building Above Removed for Clarity
- Main Entrance Location

Pedestrian Wind Comfort Conditions

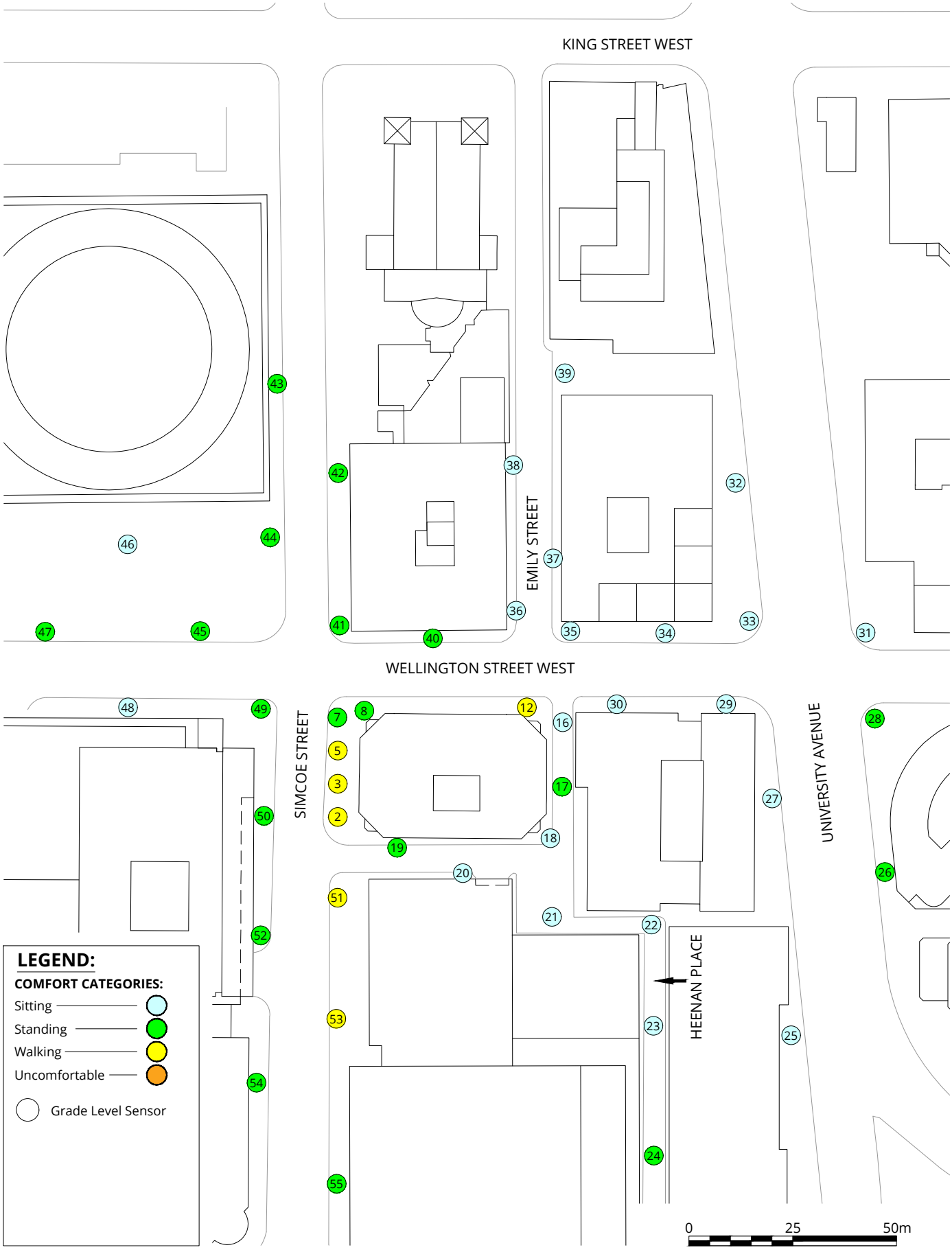
Proposed Configuration
Fall (September to November, 6:00 to 23:00)

145 Wellington Street - Toronto, ON

Project #2407154

True North

Drawn by:	GRE	Figure:	3B
Approx. Scale:	1:1250		
Date Revised:	Jun. 6, 2024		



Pedestrian Wind Comfort Conditions
Existing Configuration
Winter (December to February, 6:00 to 23:00)

145 Wellington Street - Toronto, ON

Project #2407154

True North

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Approx. Scale:	1:1250		
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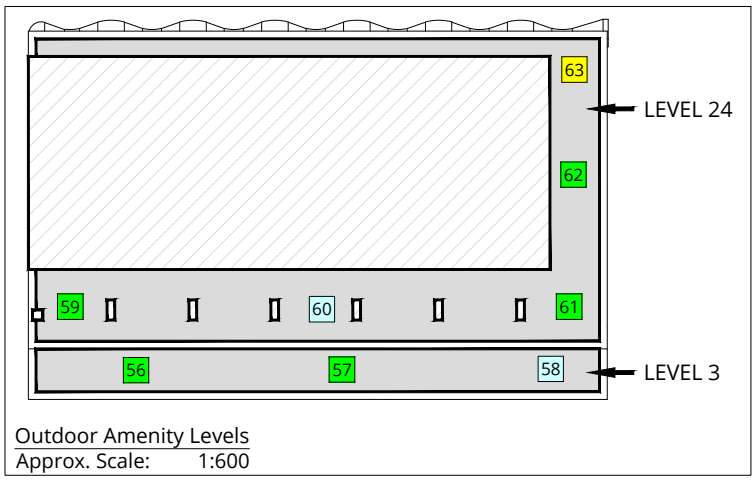
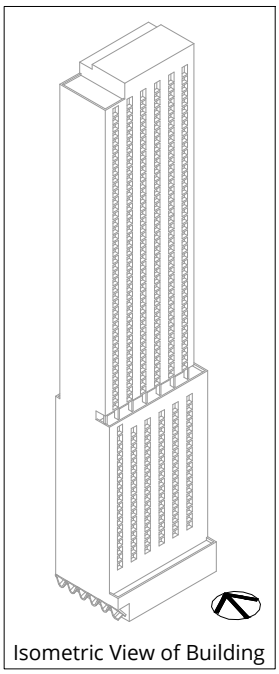


Outdoor Amenity Levels
Approx. Scale: 1:600



Isometric View of Building

Pedestrian Wind Comfort Conditions
Proposed Configuration
Winter (December to February, 6:00 to 23:00)

145 Wellington Street - Toronto, ON

Project #2407154

True North

Drawn by:	GRE	Figure:	4B
Approx. Scale:	1:1250		
Date Revised:	Jun. 6, 2024		

TABLES

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort								Wind Safety	
		Spring		Summer		Fall		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
1	Existing	-	-	-	-	-	-	-	-	-	-
	Proposed	15	Standing	12	Standing	14	Standing	17	Walking	63	Pass
2	Existing	15	Standing	13	Standing	15	Standing	17	Walking	68	Pass
	Proposed	16	Walking	13	Standing	15	Standing	18	Walking	65	Pass
3	Existing	15	Standing	13	Standing	14	Standing	17	Walking	64	Pass
	Proposed	15	Standing	12	Standing	14	Standing	16	Walking	58	Pass
4	Existing	-	-	-	-	-	-	-	-	-	-
	Proposed	13	Standing	11	Standing	13	Standing	15	Standing	58	Pass
5	Existing	15	Standing	12	Standing	14	Standing	16	Walking	62	Pass
	Proposed	14	Standing	12	Standing	13	Standing	15	Standing	54	Pass
6	Existing	-	-	-	-	-	-	-	-	-	-
	Proposed	13	Standing	11	Standing	12	Standing	15	Standing	56	Pass
7	Existing	15	Standing	13	Standing	14	Standing	15	Standing	68	Pass
	Proposed	14	Standing	12	Standing	13	Standing	15	Standing	55	Pass
8	Existing	14	Standing	11	Standing	12	Standing	14	Standing	70	Pass
	Proposed	13	Standing	11	Standing	12	Standing	14	Standing	59	Pass
9	Existing	-	-	-	-	-	-	-	-	-	-
	Proposed	9	Sitting	8	Sitting	9	Sitting	12	Standing	46	Pass
10	Existing	-	-	-	-	-	-	-	-	-	-
	Proposed	11	Standing	9	Sitting	11	Standing	14	Standing	52	Pass
11	Existing	-	-	-	-	-	-	-	-	-	-
	Proposed	10	Sitting	7	Sitting	9	Sitting	12	Standing	49	Pass
12	Existing	15	Standing	11	Standing	13	Standing	17	Walking	44	Pass
	Proposed	14	Standing	10	Sitting	13	Standing	16	Walking	45	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort								Wind Safety	
		Spring		Summer		Fall		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
13	Existing	-	-	-	-	-	-	-	-	-	-
	Proposed	8	Sitting	6	Sitting	7	Sitting	9	Sitting	31	Pass
14	Existing	-	-	-	-	-	-	-	-	-	-
	Proposed	4	Sitting	3	Sitting	4	Sitting	5	Sitting	18	Pass
15	Existing	-	-	-	-	-	-	-	-	-	-
	Proposed	4	Sitting	3	Sitting	3	Sitting	4	Sitting	14	Pass
16	Existing	9	Sitting	7	Sitting	8	Sitting	10	Sitting	43	Pass
	Proposed	12	Standing	9	Sitting	11	Standing	13	Standing	44	Pass
17	Existing	11	Standing	9	Sitting	10	Sitting	12	Standing	51	Pass
	Proposed	15	Standing	12	Standing	13	Standing	16	Walking	56	Pass
18	Existing	9	Sitting	8	Sitting	9	Sitting	10	Sitting	44	Pass
	Proposed	12	Standing	10	Sitting	11	Standing	12	Standing	48	Pass
19	Existing	13	Standing	11	Standing	12	Standing	14	Standing	63	Pass
	Proposed	13	Standing	10	Sitting	12	Standing	15	Standing	59	Pass
20	Existing	8	Sitting	6	Sitting	7	Sitting	9	Sitting	32	Pass
	Proposed	7	Sitting	6	Sitting	6	Sitting	7	Sitting	27	Pass
21	Existing	10	Sitting	9	Sitting	9	Sitting	10	Sitting	45	Pass
	Proposed	9	Sitting	8	Sitting	8	Sitting	9	Sitting	40	Pass
22	Existing	9	Sitting	7	Sitting	8	Sitting	9	Sitting	39	Pass
	Proposed	9	Sitting	7	Sitting	8	Sitting	9	Sitting	35	Pass
23	Existing	13	Standing	12	Standing	11	Standing	10	Sitting	63	Pass
	Proposed	13	Standing	12	Standing	11	Standing	10	Sitting	59	Pass
24	Existing	12	Standing	12	Standing	12	Standing	13	Standing	64	Pass
	Proposed	9	Sitting	9	Sitting	9	Sitting	11	Standing	56	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort								Wind Safety	
		Spring		Summer		Fall		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
25	Existing	10	Sitting	8	Sitting	9	Sitting	9	Sitting	51	Pass
	Proposed	11	Standing	8	Sitting	9	Sitting	9	Sitting	55	Pass
26	Existing	11	Standing	9	Sitting	10	Sitting	11	Standing	48	Pass
	Proposed	13	Standing	10	Sitting	11	Standing	13	Standing	50	Pass
27	Existing	8	Sitting	6	Sitting	8	Sitting	9	Sitting	37	Pass
	Proposed	9	Sitting	7	Sitting	8	Sitting	9	Sitting	37	Pass
28	Existing	11	Standing	8	Sitting	9	Sitting	11	Standing	51	Pass
	Proposed	12	Standing	10	Sitting	10	Sitting	11	Standing	52	Pass
29	Existing	8	Sitting	6	Sitting	7	Sitting	10	Sitting	43	Pass
	Proposed	10	Sitting	7	Sitting	9	Sitting	11	Standing	47	Pass
30	Existing	8	Sitting	6	Sitting	8	Sitting	10	Sitting	45	Pass
	Proposed	10	Sitting	7	Sitting	9	Sitting	12	Standing	46	Pass
31	Existing	10	Sitting	8	Sitting	9	Sitting	10	Sitting	43	Pass
	Proposed	11	Standing	9	Sitting	10	Sitting	11	Standing	44	Pass
32	Existing	10	Sitting	8	Sitting	8	Sitting	10	Sitting	41	Pass
	Proposed	10	Sitting	8	Sitting	9	Sitting	10	Sitting	42	Pass
33	Existing	9	Sitting	7	Sitting	8	Sitting	9	Sitting	39	Pass
	Proposed	10	Sitting	8	Sitting	9	Sitting	10	Sitting	39	Pass
34	Existing	8	Sitting	7	Sitting	8	Sitting	9	Sitting	38	Pass
	Proposed	10	Sitting	8	Sitting	9	Sitting	10	Sitting	40	Pass
35	Existing	9	Sitting	7	Sitting	8	Sitting	10	Sitting	40	Pass
	Proposed	10	Sitting	8	Sitting	9	Sitting	11	Standing	39	Pass
36	Existing	6	Sitting	4	Sitting	5	Sitting	7	Sitting	28	Pass
	Proposed	7	Sitting	6	Sitting	6	Sitting	8	Sitting	30	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort								Wind Safety	
		Spring		Summer		Fall		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
37	Existing	7	Sitting	6	Sitting	6	Sitting	8	Sitting	30	Pass
	Proposed	10	Sitting	8	Sitting	8	Sitting	10	Sitting	43	Pass
38	Existing	6	Sitting	5	Sitting	6	Sitting	9	Sitting	36	Pass
	Proposed	7	Sitting	6	Sitting	7	Sitting	10	Sitting	38	Pass
39	Existing	7	Sitting	5	Sitting	7	Sitting	9	Sitting	33	Pass
	Proposed	8	Sitting	7	Sitting	8	Sitting	10	Sitting	36	Pass
40	Existing	13	Standing	12	Standing	12	Standing	13	Standing	64	Pass
	Proposed	11	Standing	10	Sitting	11	Standing	13	Standing	60	Pass
41	Existing	13	Standing	11	Standing	12	Standing	15	Standing	55	Pass
	Proposed	13	Standing	10	Sitting	12	Standing	15	Standing	52	Pass
42	Existing	12	Standing	10	Sitting	10	Sitting	11	Standing	50	Pass
	Proposed	11	Standing	10	Sitting	10	Sitting	11	Standing	49	Pass
43	Existing	10	Sitting	8	Sitting	9	Sitting	11	Standing	50	Pass
	Proposed	11	Standing	9	Sitting	10	Sitting	12	Standing	51	Pass
44	Existing	12	Standing	9	Sitting	11	Standing	13	Standing	51	Pass
	Proposed	12	Standing	10	Sitting	11	Standing	14	Standing	51	Pass
45	Existing	13	Standing	9	Sitting	10	Sitting	12	Standing	54	Pass
	Proposed	14	Standing	10	Sitting	11	Standing	13	Standing	57	Pass
46	Existing	10	Sitting	7	Sitting	9	Sitting	10	Sitting	42	Pass
	Proposed	11	Standing	8	Sitting	9	Sitting	11	Standing	46	Pass
47	Existing	12	Standing	9	Sitting	10	Sitting	12	Standing	47	Pass
	Proposed	12	Standing	9	Sitting	10	Sitting	12	Standing	48	Pass
48	Existing	9	Sitting	7	Sitting	8	Sitting	9	Sitting	45	Pass
	Proposed	9	Sitting	6	Sitting	7	Sitting	9	Sitting	38	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort								Wind Safety	
		Spring		Summer		Fall		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
49	Existing	13	Standing	10	Sitting	11	Standing	13	Standing	53	Pass
	Proposed	14	Standing	11	Standing	12	Standing	14	Standing	53	Pass
50	Existing	12	Standing	9	Sitting	11	Standing	13	Standing	46	Pass
	Proposed	12	Standing	10	Sitting	11	Standing	13	Standing	49	Pass
51	Existing	16	Walking	13	Standing	15	Standing	18	Walking	74	Pass
	Proposed	15	Standing	13	Standing	14	Standing	18	Walking	67	Pass
52	Existing	12	Standing	11	Standing	12	Standing	15	Standing	68	Pass
	Proposed	12	Standing	10	Sitting	12	Standing	14	Standing	63	Pass
53	Existing	15	Standing	12	Standing	14	Standing	17	Walking	71	Pass
	Proposed	14	Standing	12	Standing	13	Standing	16	Walking	67	Pass
54	Existing	12	Standing	11	Standing	12	Standing	13	Standing	52	Pass
	Proposed	12	Standing	10	Sitting	11	Standing	13	Standing	50	Pass
55	Existing	13	Standing	10	Sitting	12	Standing	14	Standing	62	Pass
	Proposed	12	Standing	9	Sitting	11	Standing	13	Standing	61	Pass
56	Existing	-	-	-	-	-	-	-	-	-	-
	Proposed	10	Sitting	9	Sitting	11	Standing	14	Standing	57	Pass
57	Existing	-	-	-	-	-	-	-	-	-	-
	Proposed	11	Standing	10	Sitting	11	Standing	13	Standing	53	Pass
58	Existing	-	-	-	-	-	-	-	-	-	-
	Proposed	9	Sitting	8	Sitting	9	Sitting	9	Sitting	43	Pass
59	Existing	-	-	-	-	-	-	-	-	-	-
	Proposed	10	Sitting	9	Sitting	10	Sitting	12	Standing	56	Pass
60	Existing	-	-	-	-	-	-	-	-	-	-
	Proposed	8	Sitting	8	Sitting	8	Sitting	9	Sitting	53	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort								Wind Safety	
		Spring		Summer		Fall		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
61	Existing	-	-	-	-	-	-	-	-	-	-
	Proposed	11	Standing	9	Sitting	10	Sitting	11	Standing	72	Pass
62	Existing	-	-	-	-	-	-	-	-	-	-
	Proposed	12	Standing	9	Sitting	10	Sitting	12	Standing	56	Pass
63	Existing	-	-	-	-	-	-	-	-	-	-
	Proposed	18	Walking	13	Standing	14	Standing	17	Walking	69	Pass

Season	Months	Hours
Spring	March - May	6:00 - 23:00
Summer	June - August	6:00 - 23:00
Fall	September - November	6:00 - 23:00
Winter	December - February	6:00 - 23:00
Annual	January - December	0:00 - 23:00

Configurations	
Existing	Existing site and surroundings
Proposed	Project with existing surroundings

Comfort Speed (km/h)	
(20% Seasonal Exceedance)	
≤ 10	Sitting
11 - 15	Standing
16 - 20	Walking
> 20	Uncomfortable

Safety Speed (km/h)	
(0.1% Annual Exceedance)	
≤ 90	Pass
> 90	Exceeded