REPORT

WESTMINSTER UNITED CHURCH (4094 TOMKEN ROAD)

MISSISSAUGA, ONTARIO

PEDESTRIAN WIND STUDY
RWDI # 2201947
August 10, 2023

SUBMITTED TO

Christina Wilkinson
cwilkinson@kpmbarchitects.com
T: 416.977.5104 x415

KPMB Architects
351 King Street East, Suite 1200
Toronto, ON M5A 0L6

SUBMITTED BY

Ejiro Mowarin, M.Sc., EIT
Technical Coordinator
Ejiro.Mowarin@rwdi.com

Tim Wiechers, M.Sc.
Senior Technical Coordinator
Tim.Wiechers@rwdi.com

Scott Bell
Project Manager
Scott.Bell@rwdi.com

RWDI
600 Southgate Drive
Guelph, Ontario N1G 4P6
T: 519.823.1311 x2076

EXECUTIVE SUMMARY

RWDI was retained to conduct a pedestrian wind assessment for the proposed Westminster United Church in Mississauga, ON (Image 1). Based on our wind-tunnel testing under the Existing and Proposed configurations with landscaping and wind control measures (Images 2A and 2B), and the local wind records (Image 3), the potential wind comfort and safety conditions are predicted as shown on site plans in Figures 1A through 2B, while the associated wind speeds are listed in Table 1. These results can be summarized as follows:

- The pedestrian wind safety criterion is expected to be met at all assessed grade level locations for both configurations tested.
- Wind speeds at the existing site and along the surrounding sidewalks are suitable for the intended use at all areas assessed year-round.
- With the addition of the proposed buildings, landscaping, and wind control measures (i.e., wind screens) wind conditions are anticipated to remain similar to those in the Existing configuration, with slightly increased wind activity predicted near the proposed buildings in localized areas. Wind conditions in the outdoor amenity spaces at grade are predicted to have acceptable wind speeds and the use of windscreens in the breezeway were found to be effective in reducing wind speeds to appropriate levels.
- Wind conditions further away from the project site and in adjacent private backyards are not expected to be negatively impacted with the addition of the proposed development, with conditions remaining similar to those in the Existing configuration.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1 INTRODUCTION

RWDI was retained to conduct a pedestrian wind assessment for the proposed Westminster United Church project in Mississauga, ON. This report presents the project objectives, background and approach, and discusses the results from RWDI's assessment. Our Statement of Limitations as it pertains to this study can be found in Section 4 of this report.

1.1 Project Description

The project site is located to the south of the intersection of Rathburn Road East and Tomken Road. The development consists of the addition of two 12-storey/44 m tall residential buildings on either side of the existing Westminster United Church on the site. The project includes outdoor amenity areas and a play area associated with the Montessori at grade.

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 Mississauga City pedestrian wind comfort and safety criteria for gauging wind comfort and safety in pedestrian areas. The assessment focused on critical pedestrian areas at grade, including building entrances, public sidewalks, grade level outdoor amenity areas, and adjacent private backyards.

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

2 BACKGROUND AND APPROACH

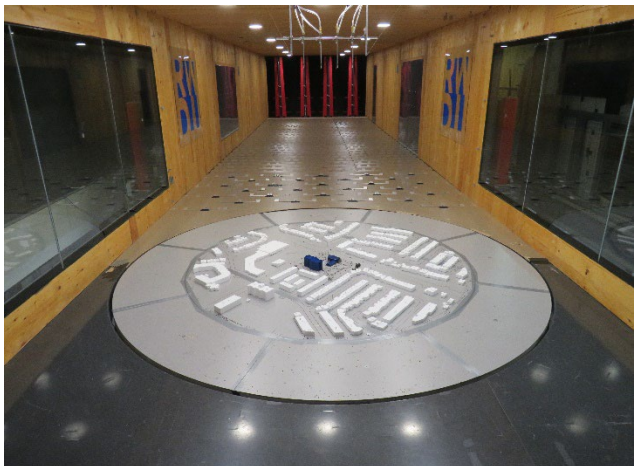
2.1 Wind Tunnel Study Model

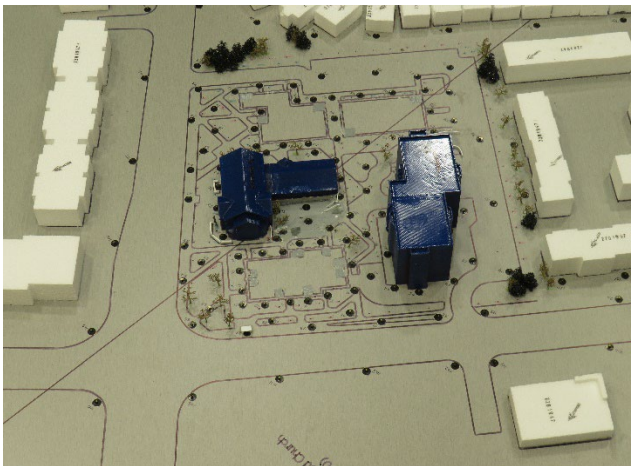
To assess the wind environment around the proposed project, a 1:300 scale model of the project site and surroundings was constructed for the wind tunnel tests of the following configurations:

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

B - Proposed: Proposed project with existing surroundings, including landscaping and four (4) vertical wind screens (Image 2B).

The wind tunnel model included all relevant surrounding buildings and topography within an approximately 360 m 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 143 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. Wind speeds were measured for 36 directions in a 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 KPMB Architects.





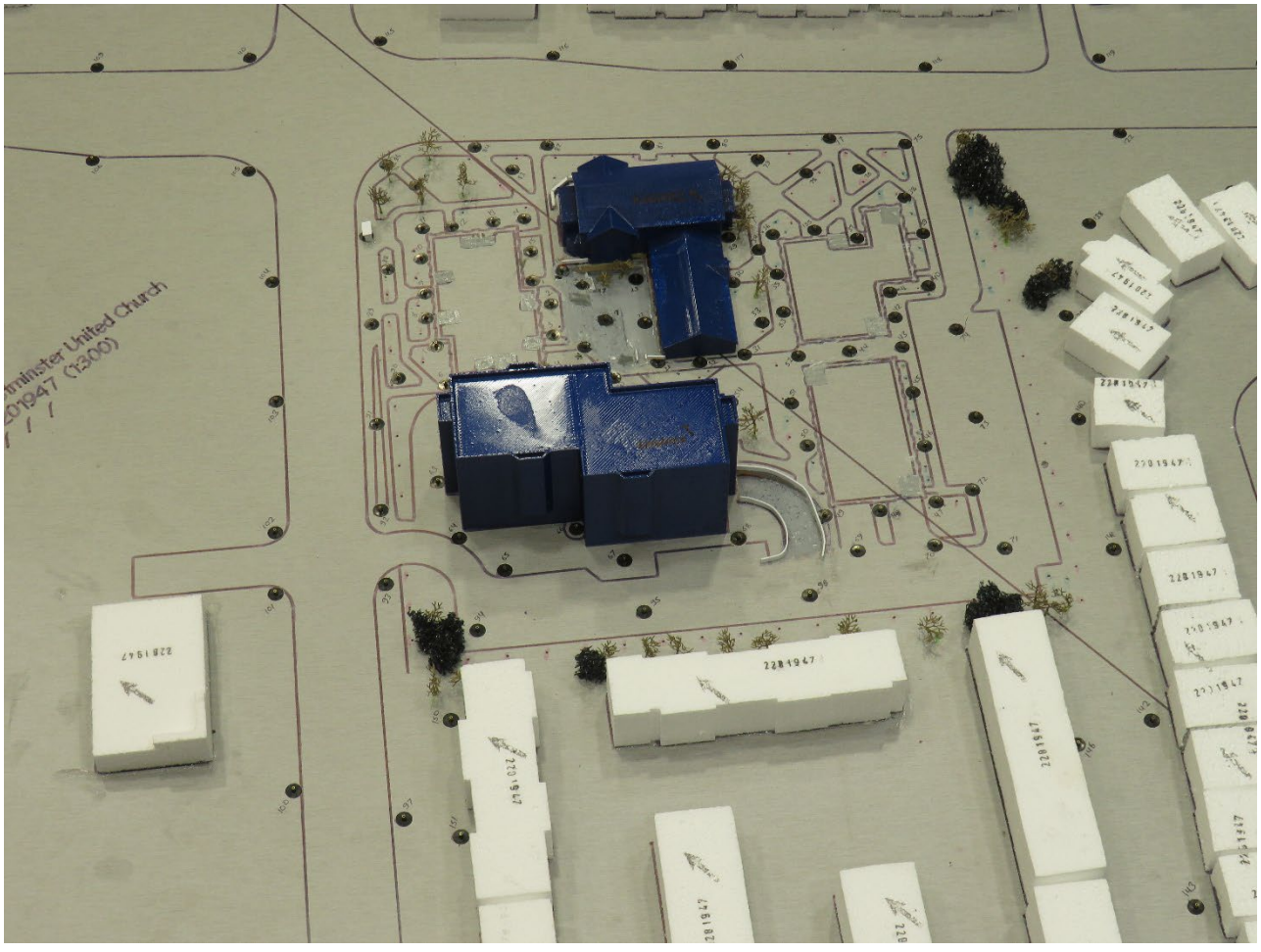


Image 2A: Wind Tunnel Study Model – Existing Configuration

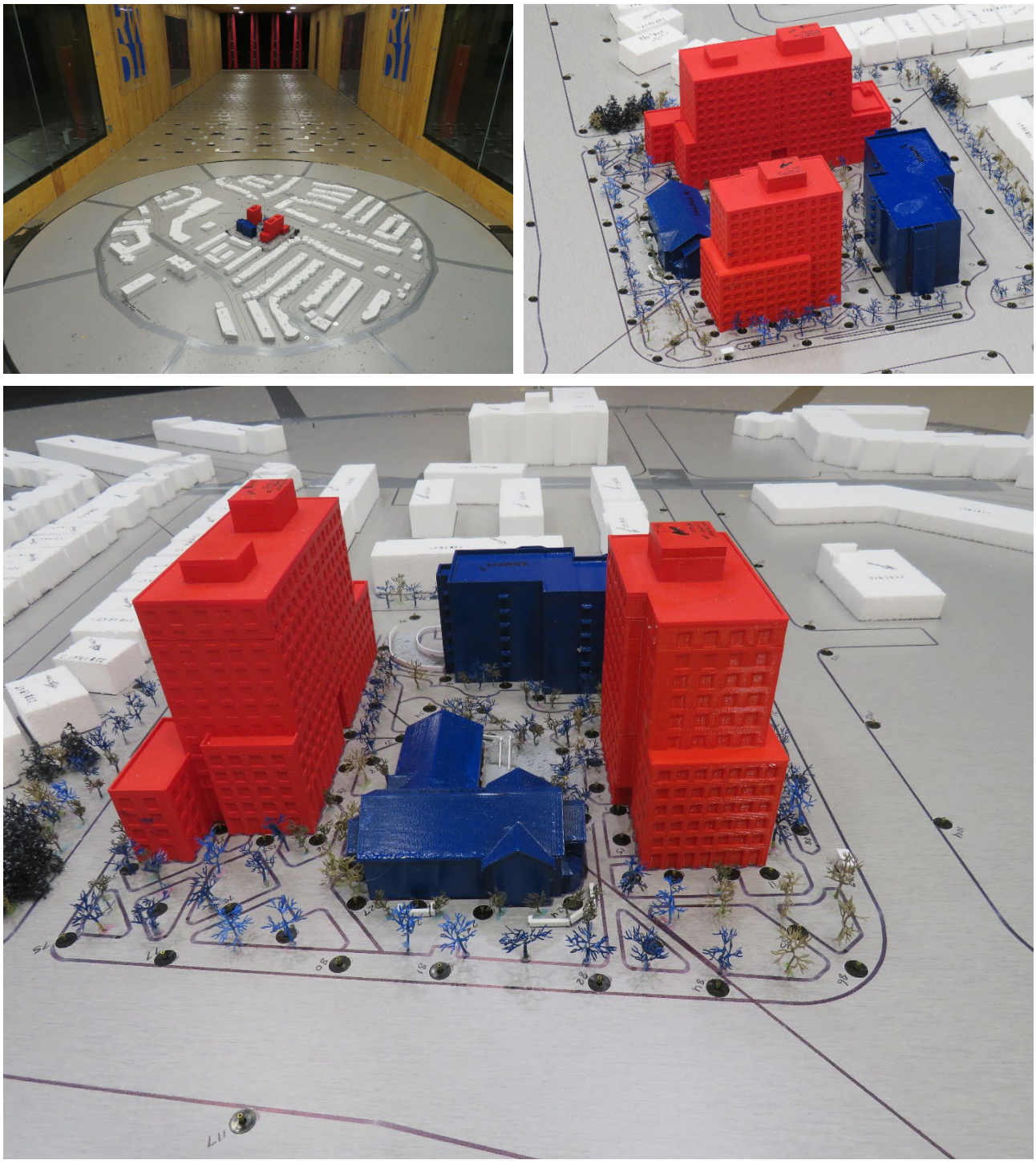
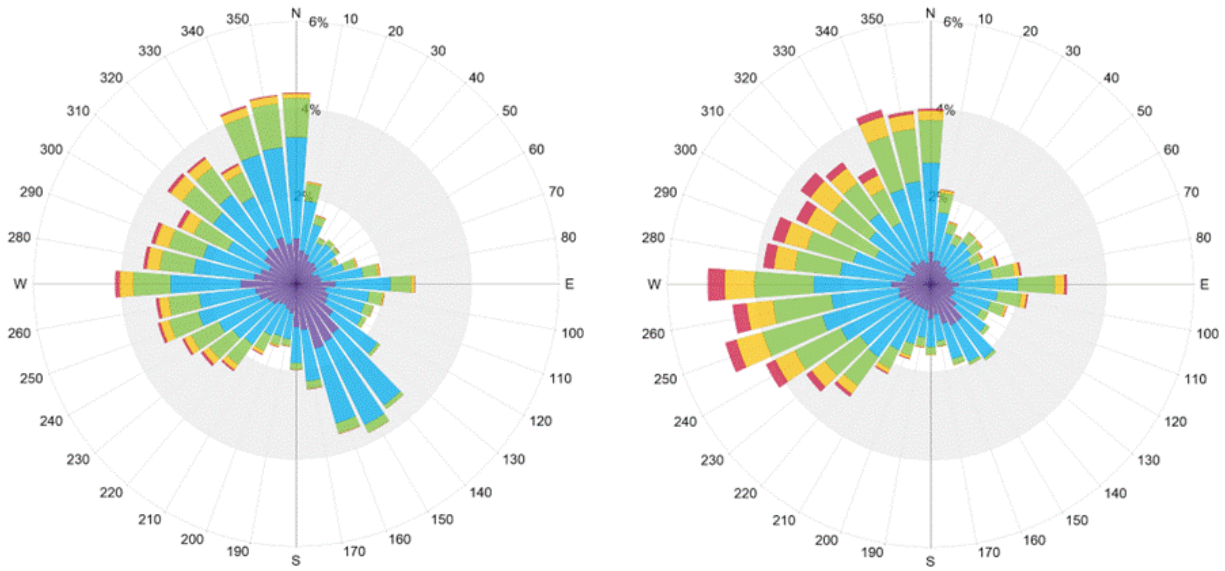


Image 2B: Wind Tunnel Study Model – Proposed Configuration

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 (km/h)	Probability (%) 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". The following defines the criterion in detail.

Comfort Category	GEM Speed (km/h)	Description
Sitting	≤ 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	≤ 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

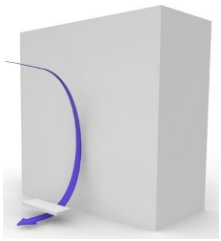
Notes:
(1) *GEM Speed = max (Mean Speed, Gust Speed/1.85)* and *Gust Speed = Mean Speed + 3*RMS Speed*;
(2) GEM speeds listed above are based on a seasonal exceedance of 20% of the time between 6:00 and 23:00.

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.

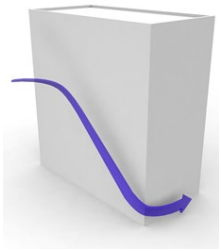
2.4 Generalized Wind Flows

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



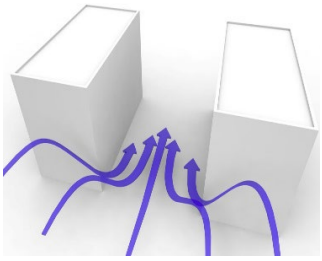
DOWNWASHING

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)

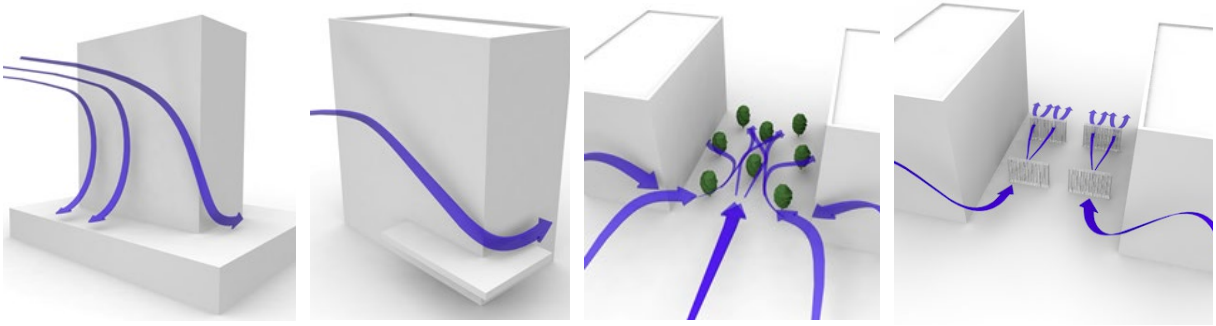


Image 5: Common Wind Control Measures

3 RESULTS AND DISCUSSION

The predicted wind conditions are shown on a site plan in Figures 1A through 2B 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. The following is a detailed discussion of the suitability of the predicted wind conditions for the anticipated pedestrian use of each area of interest.

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

3.1 Grade Level (Locations 1 through 143)

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 sitting or standing are preferred at main entrances where pedestrians are apt to linger. Wind speeds comfortable for sitting are preferred for areas intended for prolonged passive activities or relaxed uses like seating and lounging such as the grade level amenity areas.

3.1.1 Existing Configuration

Wind speeds on and around the existing site and nearby sidewalks are comfortable for sitting or standing year-round (Figures 1A and 2A). Seasonally stronger winds during the winter months are expected to result in slightly increased wind speeds suitable for walking to the west of the site around the existing Tomken Grove residential building.

Wind speeds comfortable for sitting are predicted at the main entrances for the existing church and the existing Tomken Grove residential building (Locations 28, 30, 57, and 66 in Figures 1A and 2A). The private backyards of the nearby existing residences on Wetherby Lane and Westminster Place and the residences along Tomken Road are anticipated to be comfortable for sitting or standing at all locations assessed year-round (Locations 124 through 140 in Figures 1A and 2A). Wind speeds comfortable for sitting are predicted at the existing bus stop along Rathburn Road East throughout the year (Location 87 in Figures 1A and 2A). All of these conditions are appropriate for the intended use of various pedestrian areas.

3.1.2 Proposed Configuration

With the addition of the proposed buildings and landscaping, wind conditions are predicted to remain similar to those in the Existing configuration throughout the year, with slightly higher wind activity anticipated near the proposed buildings due to downwashing and corner accelerating wind flows (Figures 1B and 2B). These conditions nevertheless are considered suitable for the intended pedestrian use of walkways and sidewalks onsite and in the immediate vicinity.

On the project site, during the summer, the outdoor amenity area to the south of Building 1 is predicted to be comfortable for sitting and standing (Locations 4 and 19 in Figure 1B). Wind speeds in the outdoor amenity area to

the east of the existing Tomken Grove residential building (Locations 60 and 62 in Figure 1B) are predicted to be comfortable for standing during summer. These conditions may be marginally higher than desired if designated seating spaces are proposed here; however, may be considered acceptable for most other outdoor uses. The outdoor play area for the Montessori Daycare located on the west side of Building 2 is expected to be comfortable for standing in the summer (Location 54 in Figures 1B and 2B). These conditions may be considered appropriate as children and staff are expected to be actively moving. Slightly higher wind speeds during winter are acceptable due to reduced outdoor usage.

Wind conditions are predicted to remain calm and comfortable in the existing bus stop adjacent to Building 1 throughout the year (Location 87 in Figures 1B and 2B). The private backyards of the nearby existing residences on Wetherby Lane and Westminster Place (Locations 124 through 140 in Figures 1B and 2B) and residences along Tomken Road (Locations 116 through 118 and 141 to 142 in Figures 1B and 2B) are positively not expected to be negatively impacted by the proposed development, with conditions remaining similar to those in the Existing configuration. Furthermore, with the addition of staggered wind screens in the breezeway of Building 2, wind conditions are predicted to be comfortable for standing during summer and walking during winter (Location 44 in Figures 1B and 2B), which is comfortable for the anticipated pedestrian use.

Lastly, wind conditions comfortable for sitting or standing throughout the year are predicted at the main entrances of Building 1 (Locations 1, 9, and 12), Building 2 (Locations 37, 53, and 143), the existing church (Locations 28 and 30), and the existing residential building (Locations 57, and 66), as seen in Figures 1A through 2B. These conditions are apt for the intended usage of the entrance areas where patrons may linger.

4 STATEMENT OF LIMITATIONS

Limitations

This report was prepared by Rowan Williams Davies & Irwin, Inc. ("RWDI") for KPMB Architects ("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 KPMB Architects and used to construct the scale model of the proposed Westminster United Church development **("Project Data")**.

File Name	File Type	Date Received (dd/mm/yyyy)
2023.07.20 Westminster Mississauga Massing.rvt	Revit	20/7/2023
A1-03 - SITE PLAN.pdf	PDF	20/7/2023
A2-00 SERIES - OVERALL FLOOR PLANS.pdf	PDF	20/7/2023
A5-00 SERIES - OVERALL ELEVATIONS.pdf	PDF	20/7/2023
A6-00 SERIES - BUILDING SECTIONS.pdf	PDF	20/7/2023
2023-07-14_Westminster United_Landscape_Re-Issued for ZBA.pdf	PDF	20/7/2023

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.

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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.

FIGURES

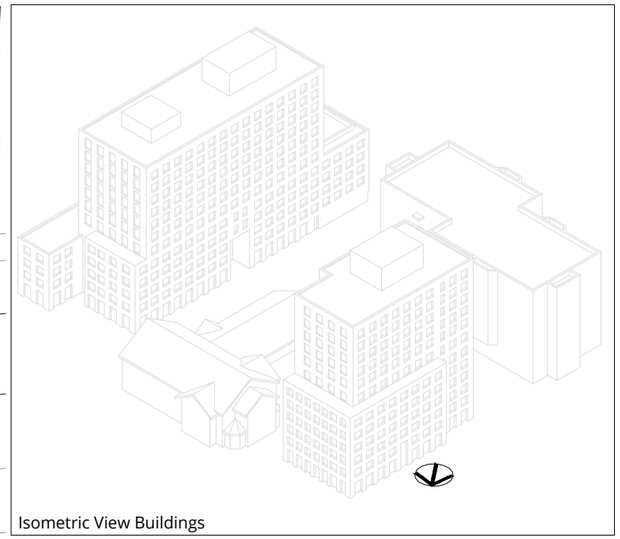
Pedestrian Wind Comfort Conditions
Existing Configuration
Summer (May to October, 6:00 to 23:00)

Westminster United Church - Mississauga, ON

True North

Project #2201947

Drawn by: ALJM	Figure:	1A
Approx. Scale:		1:1500
Date Revised:		Aug. 9, 2023



RATHBURN ROAD EAST

STARLIGHT CRESCENT

RATHBURN ROAD EAST

WESTMINSTER PLACE

TOMKEN ROAD

UXBRIDGE LANE

BUILDING 1

EXISTING BUILDING

EXISTING CHURCH

BUILDING 2

BUILDING 2

WETHERBY LANE

LOVINGSTON CRESCENT

LEGEND:

COMFORT CATEGORIES:
- Sitting
- Standing
- Walking
- Uncomfortable

SENSOR LOCATION:
- Grade Level
- Building Above Removed for Clarity
- Main Entrance Location

MITIGATION:
- 7ft x 7ft 30% Open Wind Screen

LANDSCAPING:
- Existing Deciduous
- Existing Coniferous
- Proposed Deciduous
- Proposed Multistem

0 25 50m

Pedestrian Wind Comfort Conditions

Proposed Configuration

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

Westminster United Church - Mississauga, ON

True North

Project #2201947

Drawn by: ALJM	Figure:	1B
Approx. Scale:	1:1500	
Date Revised:	Aug. 9, 2023	

RATHBURN ROAD EAST

STARLIGHT CRESCENT

RATHBURN ROAD EAST

WESTMINSTER PLACE

EXISTING BUILDING

EXISTING CHURCH

TOMKEN ROAD

UXBRIDGE LANE

WETHERBY LANE

LOVINGSTON CRESCENT

Isometric View Buildings

LEGEND:

COMFORT CATEGORIES:
- Sitting
- Standing
- Walking
- Uncomfortable

SENSOR LOCATION:
- Grade Level
- Building Above Removed for Clarity
- Main Entrance Location

LANDSCAPING:
- Existing Deciduous
- Existing Coniferous

0 25 50m

Pedestrian Wind Comfort Conditions

Existing Configuration

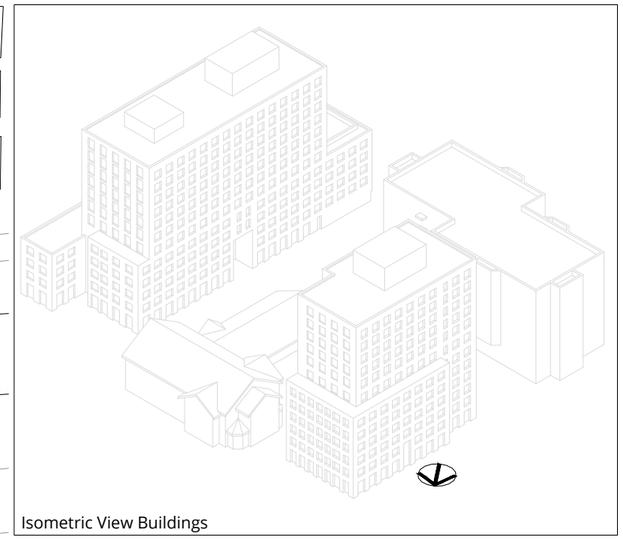
Winter (November to April, 6:00 to 23:00)

Westminster United Church - Mississauga, ON

True North

Project #2201947

Drawn by: ALJM	Figure: 2A
Approx. Scale:	1:1500
Date Revised:	Aug. 9, 2023



RATHBURN ROAD EAST

STARLIGHT CRESCENT

RATHBURN ROAD EAST

WESTMINSTER PLACE

TOMKEN ROAD

UXBRIDGE LANE

BUILDING 1

EXISTING BUILDING

EXISTING CHURCH

BUILDING 2

BUILDING 2

WETHERBY LANE

LOVINGSTON CRESCENT

LEGEND:

COMFORT CATEGORIES:
- Sitting
- Standing
- Walking
- Uncomfortable

SENSOR LOCATION:
- Grade Level
- Building Above Removed for Clarity
- Main Entrance Location

MITIGATION:
- 7ft x 7ft 30% Open Wind Screen

LANDSCAPING:
- Existing Deciduous
- Existing Coniferous
- Proposed Deciduous
- Proposed Multistem

0 25 50m

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

Westminster United Church - Mississauga, ON

True North

Project #2201947

Drawn by: ALJM	Figure: 2B
Approx. Scale:	1:1500
Date Revised:	Aug. 9, 2023

TABLES

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
1	Existing	10	Sitting	12	Standing	48	Pass
	Proposed	7	Sitting	8	Sitting	37	Pass
2	Existing	11	Standing	13	Standing	51	Pass
	Proposed	10	Sitting	12	Standing	52	Pass
3	Existing	11	Standing	13	Standing	54	Pass
	Proposed	9	Sitting	11	Standing	50	Pass
4	Existing	11	Standing	13	Standing	55	Pass
	Proposed	11	Standing	13	Standing	56	Pass
5	Existing	12	Standing	15	Standing	65	Pass
	Proposed	10	Sitting	12	Standing	58	Pass
6	Existing	12	Standing	16	Walking	65	Pass
	Proposed	13	Standing	15	Standing	66	Pass
7	Existing	12	Standing	15	Standing	59	Pass
	Proposed	9	Sitting	10	Sitting	48	Pass
8	Existing	12	Standing	15	Standing	58	Pass
	Proposed	8	Sitting	10	Sitting	45	Pass
9	Existing	11	Standing	14	Standing	56	Pass
	Proposed	7	Sitting	9	Sitting	44	Pass
10	Existing	10	Sitting	13	Standing	52	Pass
	Proposed	8	Sitting	10	Sitting	46	Pass
11	Existing	11	Standing	13	Standing	52	Pass
	Proposed	13	Standing	16	Walking	72	Pass
12	Existing	11	Standing	13	Standing	53	Pass
	Proposed	7	Sitting	9	Sitting	52	Pass
13	Existing	10	Sitting	12	Standing	52	Pass
	Proposed	8	Sitting	9	Sitting	56	Pass
14	Existing	9	Sitting	11	Standing	50	Pass
	Proposed	11	Standing	13	Standing	55	Pass
15	Existing	9	Sitting	10	Sitting	43	Pass
	Proposed	9	Sitting	10	Sitting	45	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
16	Existing	10	Sitting	12	Standing	50	Pass
	Proposed	10	Sitting	12	Standing	55	Pass
17	Existing	6	Sitting	7	Sitting	33	Pass
	Proposed	7	Sitting	9	Sitting	43	Pass
18	Existing	8	Sitting	9	Sitting	39	Pass
	Proposed	10	Sitting	12	Standing	58	Pass
19	Existing	10	Sitting	12	Standing	51	Pass
	Proposed	9	Sitting	11	Standing	49	Pass
20	Existing	12	Standing	14	Standing	54	Pass
	Proposed	11	Standing	13	Standing	56	Pass
21	Existing	11	Standing	12	Standing	48	Pass
	Proposed	11	Standing	13	Standing	51	Pass
22	Existing	8	Sitting	10	Sitting	44	Pass
	Proposed	7	Sitting	8	Sitting	35	Pass
23	Existing	6	Sitting	8	Sitting	36	Pass
	Proposed	5	Sitting	7	Sitting	34	Pass
24	Existing	11	Standing	14	Standing	65	Pass
	Proposed	8	Sitting	9	Sitting	37	Pass
25	Existing	8	Sitting	10	Sitting	44	Pass
	Proposed	7	Sitting	8	Sitting	38	Pass
26	Existing	6	Sitting	7	Sitting	32	Pass
	Proposed	6	Sitting	7	Sitting	28	Pass
27	Existing	9	Sitting	10	Sitting	46	Pass
	Proposed	7	Sitting	9	Sitting	37	Pass
28	Existing	6	Sitting	7	Sitting	33	Pass
	Proposed	9	Sitting	11	Standing	49	Pass
29	Existing	5	Sitting	6	Sitting	32	Pass
	Proposed	8	Sitting	10	Sitting	41	Pass
30	Existing	7	Sitting	8	Sitting	34	Pass
	Proposed	9	Sitting	11	Standing	45	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
31	Existing	8	Sitting	10	Sitting	47	Pass
	Proposed	12	Standing	13	Standing	54	Pass
32	Existing	9	Sitting	11	Standing	44	Pass
	Proposed	10	Sitting	12	Standing	61	Pass
33	Existing	9	Sitting	10	Sitting	43	Pass
	Proposed	11	Standing	14	Standing	63	Pass
34	Existing	8	Sitting	9	Sitting	42	Pass
	Proposed	13	Standing	16	Walking	58	Pass
35	Existing	9	Sitting	11	Standing	44	Pass
	Proposed	9	Sitting	12	Standing	54	Pass
36	Existing	9	Sitting	10	Sitting	44	Pass
	Proposed	13	Standing	16	Walking	70	Pass
37	Existing	10	Sitting	12	Standing	51	Pass
	Proposed	6	Sitting	7	Sitting	33	Pass
38	Existing	11	Standing	13	Standing	53	Pass
	Proposed	11	Standing	13	Standing	52	Pass
39	Existing	10	Sitting	12	Standing	53	Pass
	Proposed	8	Sitting	10	Sitting	43	Pass
40	Existing	10	Sitting	12	Standing	52	Pass
	Proposed	11	Standing	12	Standing	50	Pass
41	Existing	10	Sitting	12	Standing	53	Pass
	Proposed	6	Sitting	7	Sitting	33	Pass
42	Existing	10	Sitting	12	Standing	53	Pass
	Proposed	8	Sitting	9	Sitting	47	Pass
43	Existing	10	Sitting	12	Standing	51	Pass
	Proposed	10	Sitting	12	Standing	54	Pass
44	Existing	10	Sitting	12	Standing	52	Pass
	Proposed	15	Standing	18	Walking	71	Pass
45	Existing	10	Sitting	12	Standing	49	Pass
	Proposed	7	Sitting	8	Sitting	41	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
46	Existing	10	Sitting	12	Standing	53	Pass
	Proposed	7	Sitting	8	Sitting	40	Pass
47	Existing	11	Standing	13	Standing	58	Pass
	Proposed	13	Standing	15	Standing	68	Pass
48	Existing	10	Sitting	13	Standing	54	Pass
	Proposed	8	Sitting	10	Sitting	55	Pass
49	Existing	7	Sitting	8	Sitting	40	Pass
	Proposed	12	Standing	14	Standing	60	Pass
50	Existing	11	Standing	13	Standing	53	Pass
	Proposed	10	Sitting	12	Standing	58	Pass
51	Existing	11	Standing	14	Standing	56	Pass
	Proposed	11	Standing	13	Standing	62	Pass
52	Existing	9	Sitting	11	Standing	47	Pass
	Proposed	12	Standing	13	Standing	53	Pass
53	Existing	9	Sitting	11	Standing	45	Pass
	Proposed	9	Sitting	11	Standing	49	Pass
54	Existing	12	Standing	13	Standing	55	Pass
	Proposed	13	Standing	16	Walking	68	Pass
55	Existing	13	Standing	15	Standing	59	Pass
	Proposed	11	Standing	13	Standing	55	Pass
56	Existing	8	Sitting	9	Sitting	45	Pass
	Proposed	9	Sitting	10	Sitting	50	Pass
57	Existing	7	Sitting	8	Sitting	35	Pass
	Proposed	8	Sitting	10	Sitting	42	Pass
58	Existing	12	Standing	13	Standing	64	Pass
	Proposed	12	Standing	14	Standing	66	Pass
59	Existing	12	Standing	14	Standing	62	Pass
	Proposed	14	Standing	17	Walking	74	Pass
60	Existing	10	Sitting	12	Standing	53	Pass
	Proposed	14	Standing	17	Walking	69	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
61	Existing	13	Standing	16	Walking	70	Pass
	Proposed	16	Walking	20	Walking	71	Pass
62	Existing	13	Standing	16	Walking	71	Pass
	Proposed	13	Standing	16	Walking	65	Pass
63	Existing	10	Sitting	12	Standing	59	Pass
	Proposed	9	Sitting	11	Standing	50	Pass
64	Existing	14	Standing	16	Walking	68	Pass
	Proposed	13	Standing	16	Walking	66	Pass
65	Existing	14	Standing	17	Walking	71	Pass
	Proposed	14	Standing	17	Walking	71	Pass
66	Existing	7	Sitting	8	Sitting	34	Pass
	Proposed	6	Sitting	7	Sitting	32	Pass
67	Existing	10	Sitting	11	Standing	55	Pass
	Proposed	10	Sitting	11	Standing	51	Pass
68	Existing	11	Standing	14	Standing	57	Pass
	Proposed	9	Sitting	11	Standing	51	Pass
69	Existing	10	Sitting	12	Standing	48	Pass
	Proposed	10	Sitting	12	Standing	51	Pass
70	Existing	10	Sitting	12	Standing	53	Pass
	Proposed	13	Standing	15	Standing	62	Pass
71	Existing	10	Sitting	12	Standing	51	Pass
	Proposed	12	Standing	15	Standing	60	Pass
72	Existing	10	Sitting	12	Standing	51	Pass
	Proposed	13	Standing	15	Standing	62	Pass
73	Existing	10	Sitting	12	Standing	49	Pass
	Proposed	11	Standing	13	Standing	58	Pass
74	Existing	10	Sitting	13	Standing	52	Pass
	Proposed	11	Standing	13	Standing	57	Pass
75	Existing	11	Standing	13	Standing	50	Pass
	Proposed	11	Standing	12	Standing	48	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
76	Existing	11	Standing	13	Standing	50	Pass
	Proposed	11	Standing	13	Standing	60	Pass
77	Existing	11	Standing	13	Standing	52	Pass
	Proposed	11	Standing	13	Standing	61	Pass
78	Existing	10	Sitting	12	Standing	49	Pass
	Proposed	10	Sitting	12	Standing	58	Pass
79	Existing	11	Standing	13	Standing	51	Pass
	Proposed	10	Sitting	12	Standing	59	Pass
80	Existing	10	Sitting	12	Standing	51	Pass
	Proposed	10	Sitting	11	Standing	49	Pass
81	Existing	11	Standing	13	Standing	53	Pass
	Proposed	10	Sitting	12	Standing	49	Pass
82	Existing	11	Standing	14	Standing	54	Pass
	Proposed	11	Standing	13	Standing	58	Pass
83	Existing	11	Standing	14	Standing	53	Pass
	Proposed	11	Standing	13	Standing	62	Pass
84	Existing	11	Standing	14	Standing	53	Pass
	Proposed	12	Standing	15	Standing	65	Pass
85	Existing	12	Standing	14	Standing	53	Pass
	Proposed	13	Standing	16	Walking	66	Pass
86	Existing	11	Standing	14	Standing	53	Pass
	Proposed	11	Standing	14	Standing	59	Pass
87	Existing	5	Sitting	7	Sitting	28	Pass
	Proposed	5	Sitting	6	Sitting	30	Pass
88	Existing	11	Standing	14	Standing	53	Pass
	Proposed	11	Standing	14	Standing	59	Pass
89	Existing	12	Standing	14	Standing	56	Pass
	Proposed	11	Standing	13	Standing	55	Pass
90	Existing	12	Standing	14	Standing	59	Pass
	Proposed	12	Standing	14	Standing	56	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
91	Existing	12	Standing	14	Standing	60	Pass
	Proposed	12	Standing	14	Standing	59	Pass
92	Existing	11	Standing	13	Standing	55	Pass
	Proposed	11	Standing	13	Standing	55	Pass
93	Existing	12	Standing	14	Standing	53	Pass
	Proposed	11	Standing	13	Standing	52	Pass
94	Existing	11	Standing	12	Standing	58	Pass
	Proposed	10	Sitting	12	Standing	58	Pass
95	Existing	14	Standing	18	Walking	71	Pass
	Proposed	13	Standing	16	Walking	68	Pass
96	Existing	12	Standing	15	Standing	64	Pass
	Proposed	12	Standing	14	Standing	62	Pass
97	Existing	10	Sitting	11	Standing	48	Pass
	Proposed	9	Sitting	11	Standing	47	Pass
98	Existing	10	Sitting	12	Standing	48	Pass
	Proposed	10	Sitting	11	Standing	48	Pass
99	Existing	9	Sitting	11	Standing	49	Pass
	Proposed	9	Sitting	11	Standing	48	Pass
100	Existing	11	Standing	14	Standing	54	Pass
	Proposed	11	Standing	13	Standing	55	Pass
101	Existing	12	Standing	14	Standing	53	Pass
	Proposed	11	Standing	13	Standing	54	Pass
102	Existing	12	Standing	14	Standing	55	Pass
	Proposed	11	Standing	13	Standing	52	Pass
103	Existing	12	Standing	14	Standing	55	Pass
	Proposed	11	Standing	13	Standing	51	Pass
104	Existing	12	Standing	15	Standing	55	Pass
	Proposed	11	Standing	13	Standing	57	Pass
105	Existing	13	Standing	15	Standing	58	Pass
	Proposed	12	Standing	15	Standing	57	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
106	Existing	13	Standing	15	Standing	58	Pass
	Proposed	12	Standing	15	Standing	57	Pass
107	Existing	12	Standing	14	Standing	57	Pass
	Proposed	11	Standing	14	Standing	55	Pass
108	Existing	12	Standing	14	Standing	58	Pass
	Proposed	11	Standing	14	Standing	57	Pass
109	Existing	12	Standing	15	Standing	59	Pass
	Proposed	12	Standing	14	Standing	57	Pass
110	Existing	12	Standing	15	Standing	59	Pass
	Proposed	12	Standing	15	Standing	60	Pass
111	Existing	10	Sitting	13	Standing	57	Pass
	Proposed	11	Standing	14	Standing	58	Pass
112	Existing	9	Sitting	11	Standing	48	Pass
	Proposed	9	Sitting	11	Standing	48	Pass
113	Existing	10	Sitting	12	Standing	51	Pass
	Proposed	10	Sitting	12	Standing	52	Pass
114	Existing	10	Sitting	12	Standing	52	Pass
	Proposed	10	Sitting	12	Standing	53	Pass
115	Existing	12	Standing	14	Standing	57	Pass
	Proposed	11	Standing	14	Standing	56	Pass
116	Existing	11	Standing	13	Standing	52	Pass
	Proposed	11	Standing	14	Standing	58	Pass
117	Existing	11	Standing	13	Standing	52	Pass
	Proposed	12	Standing	14	Standing	56	Pass
118	Existing	11	Standing	13	Standing	54	Pass
	Proposed	12	Standing	14	Standing	57	Pass
119	Existing	11	Standing	12	Standing	53	Pass
	Proposed	10	Sitting	11	Standing	48	Pass
120	Existing	11	Standing	13	Standing	52	Pass
	Proposed	10	Sitting	11	Standing	45	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
121	Existing	11	Standing	13	Standing	52	Pass
	Proposed	10	Sitting	12	Standing	50	Pass
122	Existing	11	Standing	12	Standing	52	Pass
	Proposed	10	Sitting	11	Standing	53	Pass
123	Existing	11	Standing	13	Standing	55	Pass
	Proposed	9	Sitting	11	Standing	48	Pass
124	Existing	8	Sitting	10	Sitting	45	Pass
	Proposed	8	Sitting	10	Sitting	45	Pass
125	Existing	9	Sitting	10	Sitting	44	Pass
	Proposed	8	Sitting	10	Sitting	45	Pass
126	Existing	9	Sitting	11	Standing	50	Pass
	Proposed	9	Sitting	11	Standing	49	Pass
127	Existing	7	Sitting	9	Sitting	40	Pass
	Proposed	8	Sitting	9	Sitting	40	Pass
128	Existing	9	Sitting	10	Sitting	45	Pass
	Proposed	9	Sitting	11	Standing	51	Pass
129	Existing	10	Sitting	12	Standing	52	Pass
	Proposed	9	Sitting	11	Standing	54	Pass
130	Existing	11	Standing	13	Standing	57	Pass
	Proposed	9	Sitting	11	Standing	49	Pass
131	Existing	11	Standing	13	Standing	59	Pass
	Proposed	10	Sitting	12	Standing	59	Pass
132	Existing	10	Sitting	12	Standing	51	Pass
	Proposed	9	Sitting	12	Standing	50	Pass
133	Existing	10	Sitting	11	Standing	51	Pass
	Proposed	10	Sitting	12	Standing	52	Pass
134	Existing	9	Sitting	10	Sitting	44	Pass
	Proposed	8	Sitting	9	Sitting	42	Pass
135	Existing	6	Sitting	7	Sitting	36	Pass
	Proposed	6	Sitting	8	Sitting	34	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
136	Existing	9	Sitting	10	Sitting	42	Pass
	Proposed	9	Sitting	11	Standing	52	Pass
137	Existing	8	Sitting	10	Sitting	46	Pass
	Proposed	8	Sitting	10	Sitting	48	Pass
138	Existing	8	Sitting	10	Sitting	44	Pass
	Proposed	7	Sitting	9	Sitting	42	Pass
139	Existing	9	Sitting	11	Standing	50	Pass
	Proposed	9	Sitting	11	Standing	50	Pass
140	Existing	11	Standing	13	Standing	57	Pass
	Proposed	11	Standing	13	Standing	58	Pass
141	Existing	9	Sitting	10	Sitting	42	Pass
	Proposed	9	Sitting	10	Sitting	41	Pass
142	Existing	10	Sitting	12	Standing	55	Pass
	Proposed	10	Sitting	11	Standing	55	Pass
143	Existing	9	Sitting	11	Standing	46	Pass
	Proposed	6	Sitting	6	Sitting	30	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 with surroundings and landscaping
Proposed	Project with surroundings, landscaping & mitigation

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