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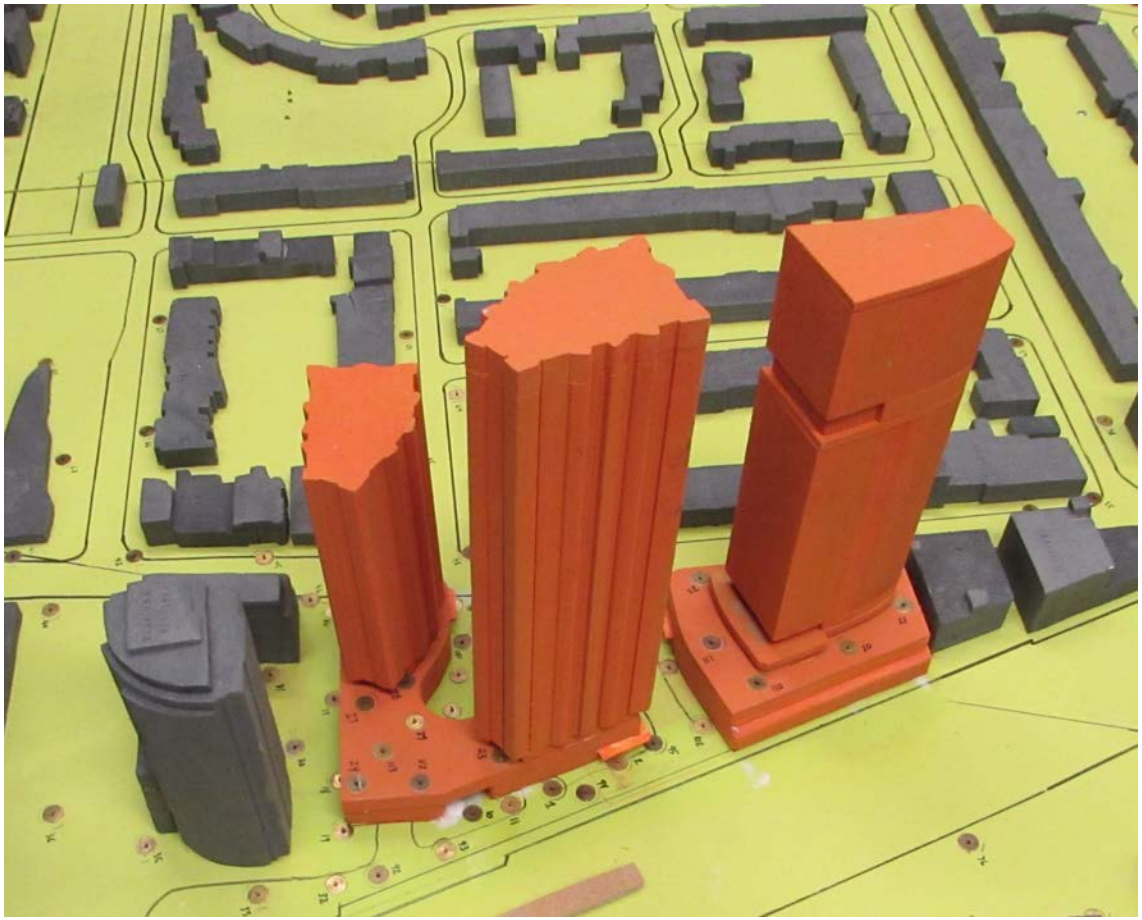
Date: October 9, 2024

Re: Pedestrian Wind Study
2400 Dundas Street West
Toronto, ON
SLR Project #241.V14270.00001



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Revision	Date	Prepared by	Checked by	Approved by
0	June 7, 2024	Jake Slusarczyk	Tahrana Lovlin	Tahrana Lovlin
1	June 20, 2024	Jake Slusarczyk	Tahrana Lovlin	Tahrana Lovlin
2	October 9, 2024	Jake Slusarczyk / Mu'taz Suleiman	Tahrana Lovlin	Tahrana Lovlin

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1.0 Introduction

SLR Consulting (Canada) Ltd. (SLR) was retained by Fora Developments to conduct a quantitative pedestrian wind study for the proposed development at 2400 Dundas Street West in Toronto, Ontario. This report is in support of the Zoning Bylaw Amendment (ZBA) resubmission for the development. SLR previously conducted a Pedestrian Wind Study for the original ZBA submission in March of 2023.

1.1 Existing Development

The proposed development is located at 2400 Dundas Street West, on the east side of the street, between Bloor Street West and Glenlake Avenue. The site is currently occupied by a large parking lot and two low-rise commercial buildings. Figure 1 provides an aerial view of the immediate study area. A virtual site visit was conducted by SLR using Google Earth images dated April 2024.

Immediately surrounding the site are low-rise commercial developments from southwest through north, the CP Railway to the northeast through southeast, and a high-rise development to the south. Beyond the immediate surroundings are mainly low-rise residential and commercial buildings in all directions.

Typically, developments with Zoning Bylaw Approval within the context extents are included as existing surroundings. For this assessment, the following ZBA-approved developments were included: 340 Wallace Avenue, 1540-1550 Bloor Street West, 1630-1632 Bloor Street West, 1423-1437 Bloor Street West & 278 Sterling Road, 72 Perth Avenue, 26 Ernest Avenue, 1480 Bloor Street West, 2376 Dundas Street West, and 2280 Dundas Street West.

Note, Project North is approximately 75° clockwise from True North. When referring to the building, we will use Project North. When referring to wind directions, we will use True North.

Figure 1: Aerial view of existing site & surroundings
Credit: Esri, Maxar, Earthstar Geographics, and the GIS User Community (Image Date June 2022)

1.2 Proposed Development

The proposed development will include two buildings. Building A includes a 37-storey tower (Tower A, approximately 124 m in height with the mechanical penthouse) atop a two-storey podium (approximately 15 m in height). Building B includes a 42-storey tower (Tower B1, approximately 137 m in height including the mechanical penthouse) and a 25-storey tower (Tower B2, approximately 85 m in height including the mechanical penthouse), both atop a two-storey podium (approximately 12 m in height). Figure 3 illustrates the west elevation of the proposed development.

1.3 Areas of Interest

Areas of interest for pedestrian wind conditions include those areas which pedestrians are expected to use on a frequent basis. Typically, these include sidewalks, main entrances, transit stops, plazas and parks. On-site areas of interest are shown in Figure 3.

The main entrance to Tower A located on the east facade of Building A, with another entrance located along the south facade. There are additional secondary entrances along the east and south facades of Building A, with two retail entrances located near its southwest corner of the building.

The two main entrances to Tower B1 are located on the south facade of Building B, with another entrance on the west side of Tower B2 and an additional entrance at the southeast corner of the building. There are secondary entrances located along the north side of Building B, with additional entrances and exits along the east and west facades of Tower B2, and one on the south side of Tower B2.

Additionally, there is an outdoor amenity space between the two buildings, fronting Dundas Street West. There are also outdoor amenity terraces atop the two-storey podium of both buildings.

There are six transit stops on either side of Dundas Street West, with two directly south of the site, another two past its southwest corner, and two more to the southeast at the intersection with Bloor Street West. The Bloor GO Station is approximately 150 m southeast of site.

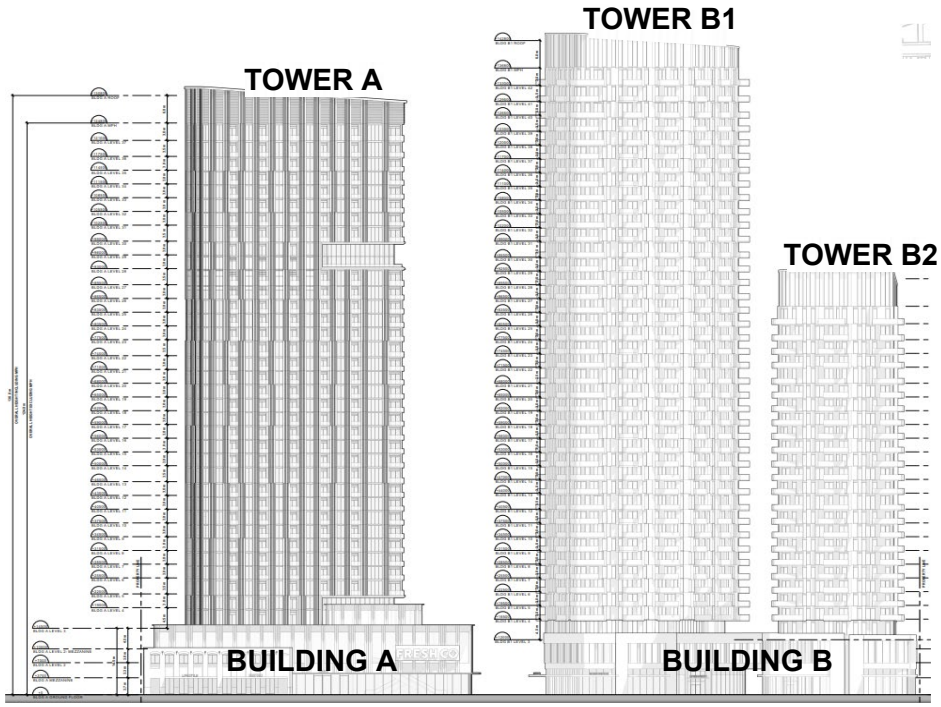


Figure 2: West elevation of proposed development
Credit: Giannone Petricone Associates

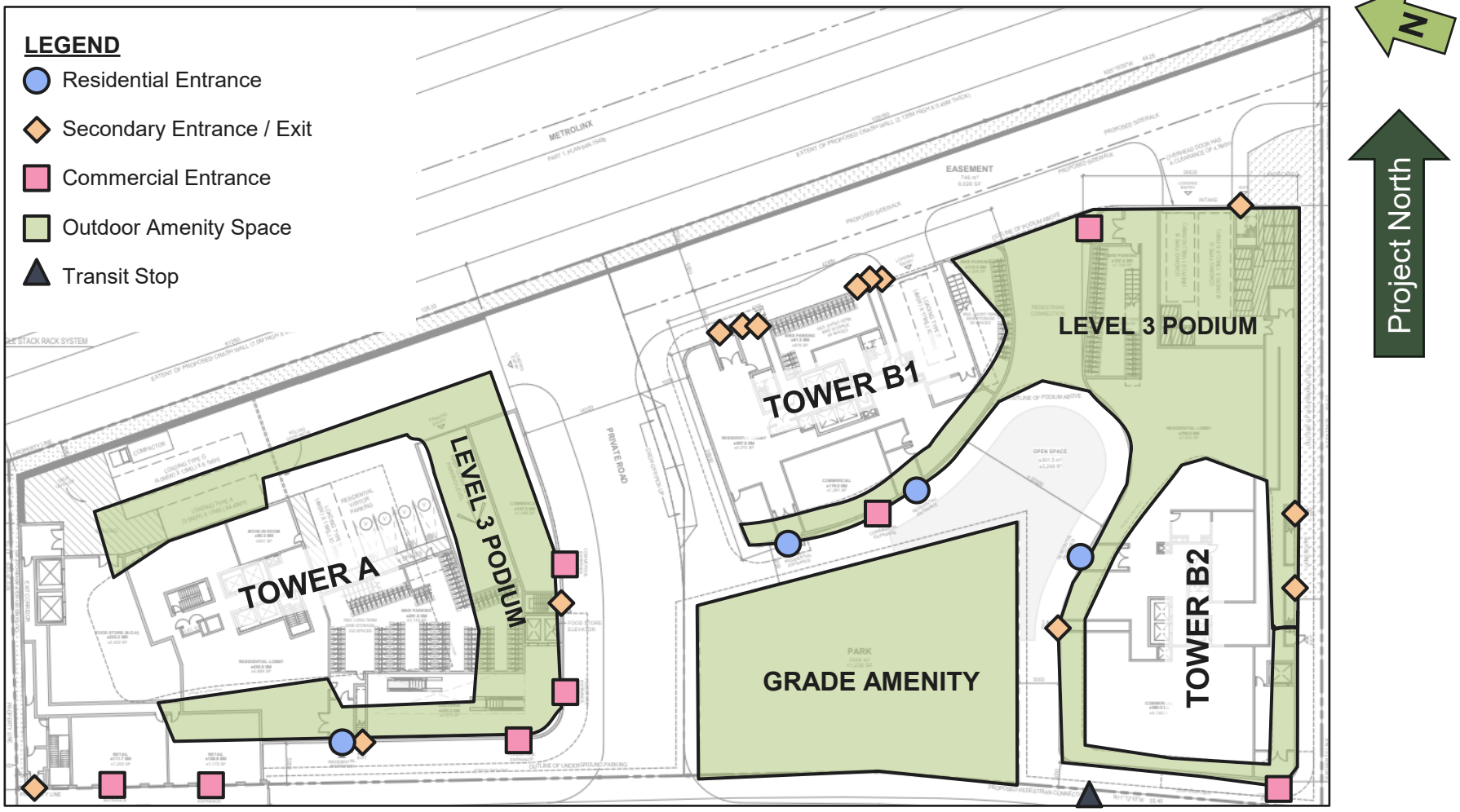


Figure 3: Areas of interest

2.0 Approach

The objective of the wind tunnel study is to assist the design team and City Planning officials in making informed decisions about the building form considered and its influence on pedestrian comfort. This quantitative analysis involves the construction of a physical model of the development and surrounding features that influence wind flow. The physical model is instrumented with probes and tested in a wind tunnel. Afterwards, the wind tunnel data are combined with regional meteorological data; this analysis is then compared to the relevant wind criteria and standards in order to determine how appropriate the wind conditions are for the intended pedestrian usage.

2.1 Scale Model Construction

A 1:400 scale model of the proposed development was constructed based on up-to-date drawing information received by SLR on May 13, 2024, from the client. A virtual site visit conducted by SLR on June 3, 2024.

The proximity model of the surrounding area was built in block form for a radius of approximately 480 m from the site centre. As existing buildings surrounding the site will influence wind characteristics, existing buildings, and those buildings with ZBA-approval were included in the model for both the Existing Configuration and Proposed Configuration. Information regarding which approved developments to include within the existing surrounds was determined per Section 1.1.

SLR assessed two configurations, for comparison, as follows:

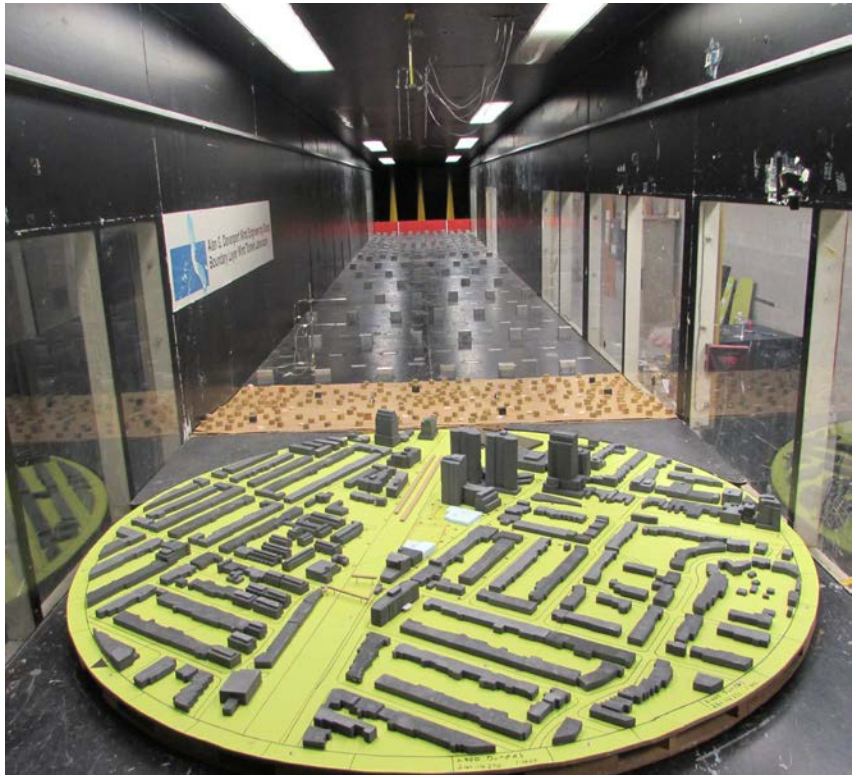
- **Existing Configuration:** Existing site with existing and ZBA-approved surroundings. This was originally tested in February 2023.
- **Proposed Configuration:** Proposed development with existing and ZBA-approved surroundings.

Photographs of the wind tunnel model showing both the Existing Configuration and the Proposed Configuration are included in Figures 4a and 4b.

2.2 Wind Tunnel

Wind tunnel tests were conducted in the Alan G. Davenport Wind Engineering Group Boundary-Layer Wind Tunnel Laboratory at the University of Western Ontario. The upstream test section of the wind tunnel included generic roughness blocks and turbulence-generating spires to modify the wind flow approaching the model. These features develop characteristics of the wind flow that are similar to the actual site. The test model is rotated on a turn-table to simulate different wind directions with the upstream terrain being changed as appropriate to reflect the various upwind conditions encountered around the site.

The test model was equipped with 115 omni-directional probes to record wind speed at the pedestrian-level (approximately 1.5 m above grade). The orientation of the model was rotated in 10° intervals on the turn-table to permit measurement of wind speed at each probe location for 36 wind directions. The wind tunnel data were then combined with the wind climate model for this region to predict the occurrence of wind speeds in the pedestrian realm and compare against wind criteria for comfort and safety.



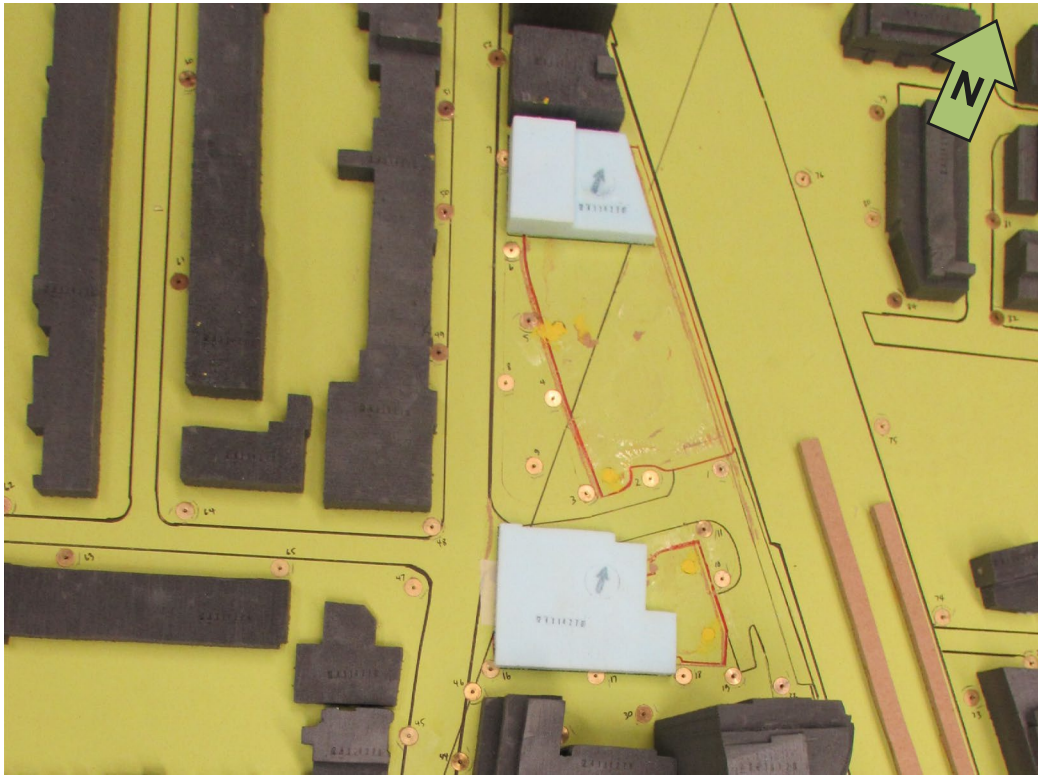
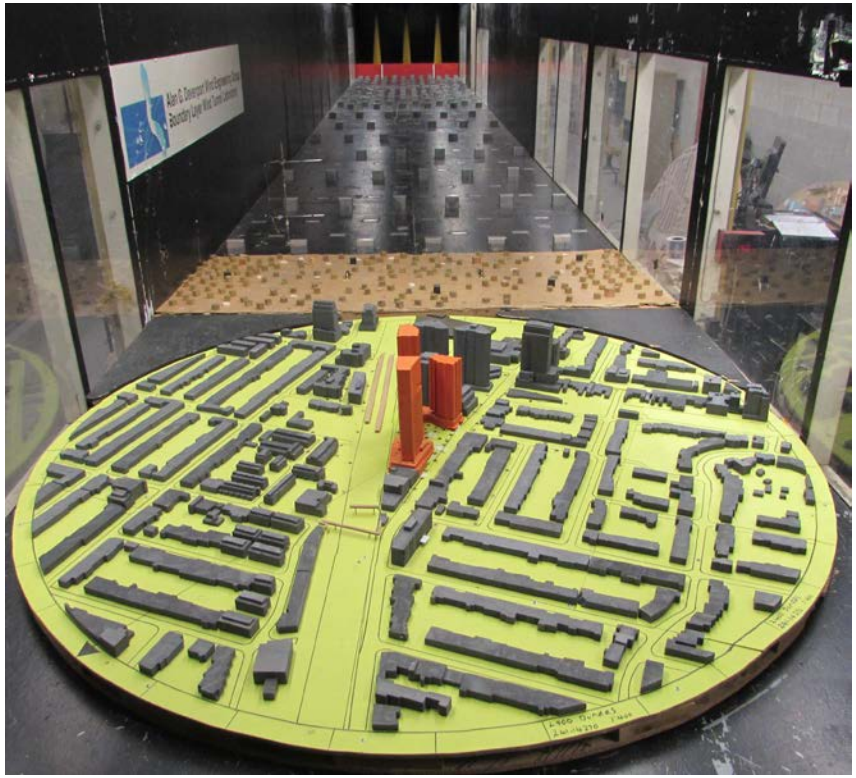
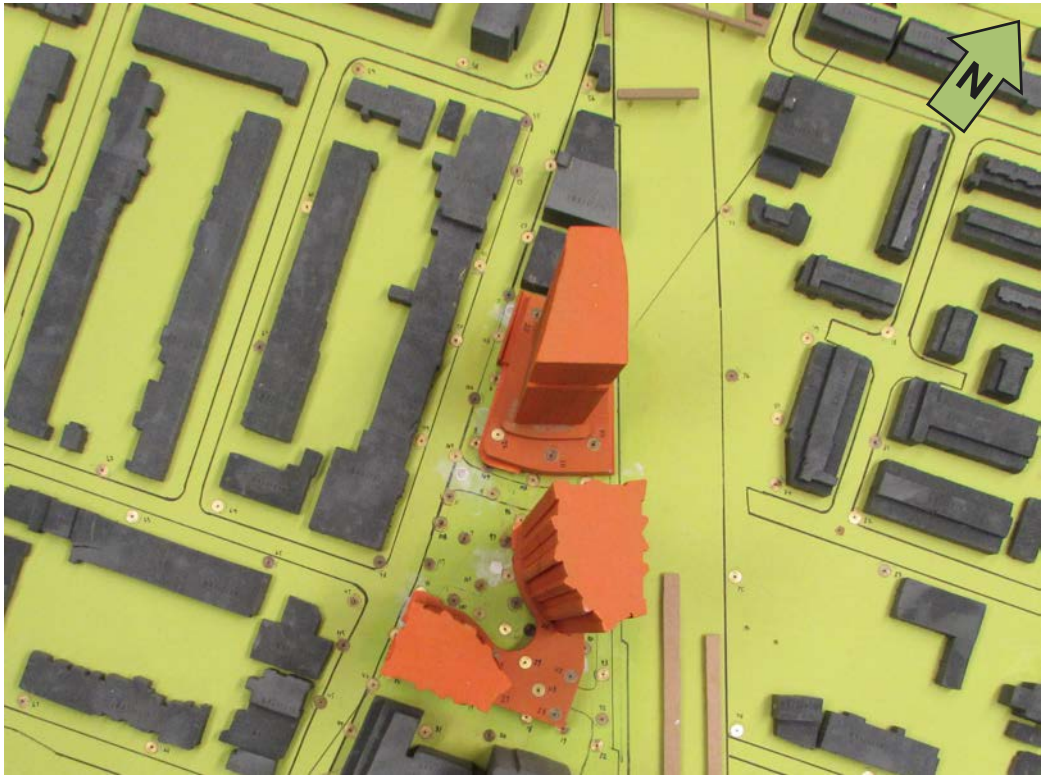


Figure 4a: Existing Configuration
Tested February 2023





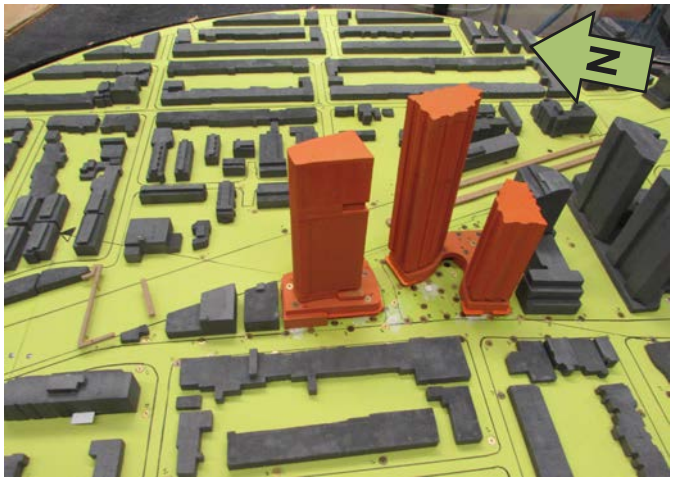


Figure 4b: Proposed Configuration Tested May 2024

2.3 Wind Climate

Wind data recorded at the Toronto Pearson International Airport for the period of 1991 to 2020 were obtained and analysed to create a wind climate model for the region. Annual and seasonal wind distribution diagrams ("wind roses") are shown in Figure 5. These diagrams illustrate the percentage of time wind blows from the 16 main compass directions. Of main interest are the longest peaks that identify the most frequently occurring wind directions. The annual wind rose indicates that wind approaching from the northwest quadrant are most prevalent. The seasonal wind roses readily show how the prevalent winds shift throughout the year.

The directions from which stronger winds (e.g., > 30 km/h) approach are also of interest as they have the highest potential of creating problematic wind conditions, depending upon site exposure and the building configurations. The wind roses in Figure 5 also identify the directional frequency of these stronger winds, as indicated in the figure's legend colour key. On an annual basis, strong winds occur from the west-southwest through northwest to north directions. All wind speeds and directions were included in the wind climate model.

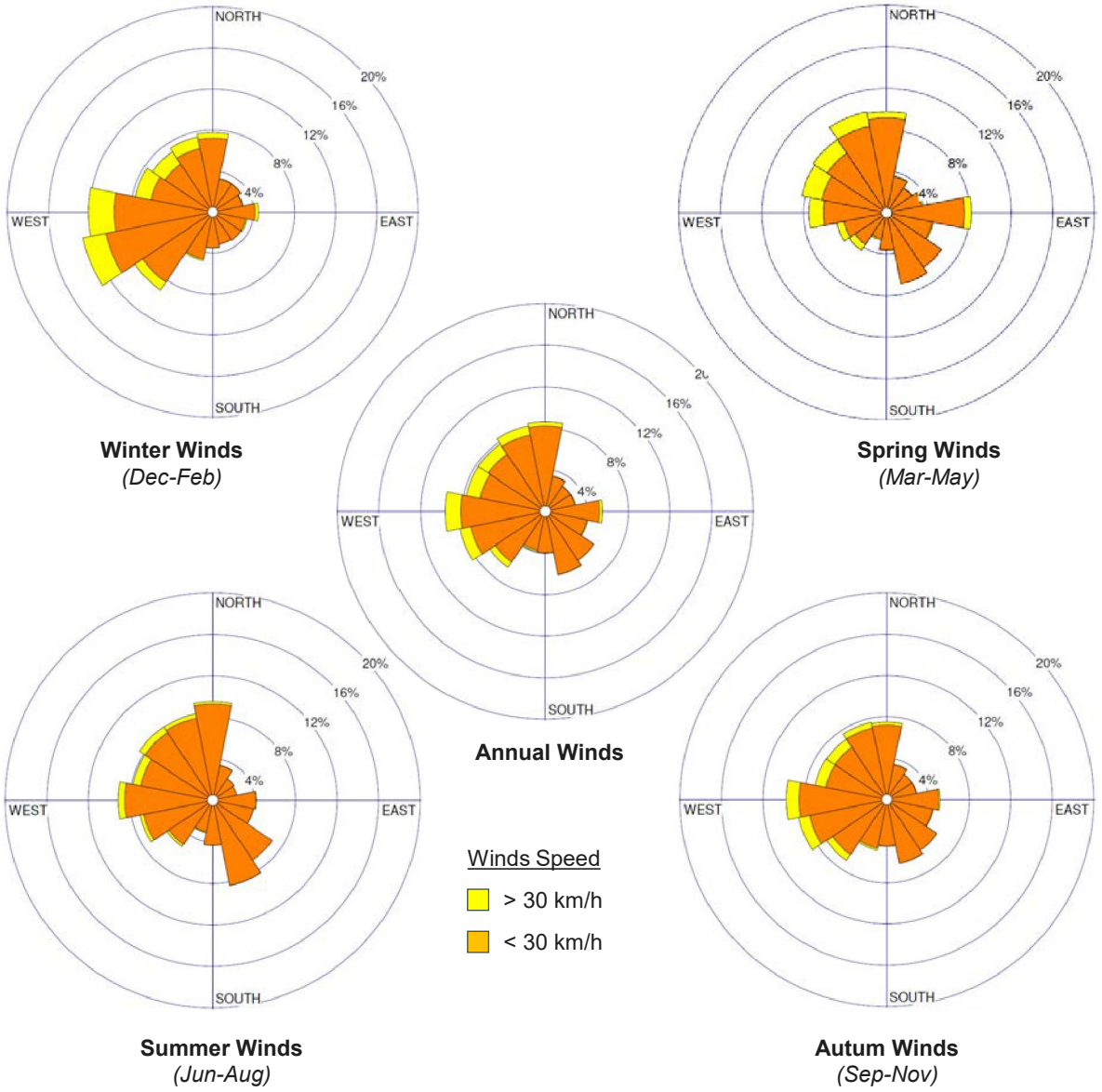


Figure 5: Wind Roses for Toronto Pearson International Airport (1991-2020)

3.0 Pedestrian Wind Criteria

Wind comfort conditions are discussed in terms of being acceptable for certain pedestrian activities and are based on predicted wind force and the expected frequency of occurrence. Wind chill, clothing, humidity and exposure to direct sun, for example, all affect a person's thermal comfort; however, these influences are not considered in the wind comfort criteria.

The comfort criteria, which are based on certain predicted hourly GEM wind speeds being exceeded 20% of the time, are summarized in Table 1. By allowing for a 20% exceedance, it assumes wind speeds will be comfortable for the corresponding activity at least four out of five days. The comfort criteria consider only daytime hours, between 6:00am and 11:00pm. GEM is defined as the maximum of either mean wind speed or gust wind speed divided by 1.85.

The criterion for wind safety in the table is based on hourly gust wind speeds that are exceeded nine hours per year (approximately 0.1% of the time). When the criterion is exceeded, wind mitigation measures are advised. The wind safety criterion is shown in Table 2.

These criteria are based on the *Pedestrian Level Wind Study Terms of Reference Guide* of the City of Toronto, which came into effect in June of 2022.

Table 1: Wind Comfort Criteria

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

Table 2: Wind Safety Criterion

Safety Criterion	Gust Wind Speed Exceeded Once Per Year (0.1%)	Description of Wind Effects
Exceeded	> 90 km/h	Excessive gust speeds that can adversely affect a pedestrian's balance and footing. Wind mitigation is typically required.

4.0 Results

Figures 6a through 7b present graphical images of the wind comfort conditions for the summer and winter months around the proposed development. These typically represent the seasonal extremes of best and worst case. Appendix A presents the wind comfort conditions for spring and autumn. The “comfort zones” shown are based on an integration of wind speed and frequency for all 36 wind directions tested with the seasonal wind climate model. The presence of mature trees can lead to wind comfort levels that are marginally more comfortable than shown, during seasons when foliage is present. Appendix B presents wind comfort and safety conditions in tabular form.

There are generally accepted wind comfort levels that are desired for various pedestrian uses. However, it some climates these may be difficult to achieve in the winter due to the overall climate. For sidewalks, walkways and pathways, wind conditions suitable for walking are desirable year-round but may not be feasible in the winter. For main entrances, transit stops, and public amenity spaces such as parks and playgrounds, wind conditions conducive to standing are preferred throughout the year. For on-site amenity areas, wind conditions suitable for sitting or standing are desirable during the summer, with stronger wind flows, conducive to walking, tolerated in the winter. The most stringent category of sitting is desirable during the summer for dedicated seating areas, such as patios, where calmer wind is expected for the comfort of patrons.

4.1 Building Entrances, Walkways & Amenity (Locations 1–19 & 92–109)

Existing wind conditions on-site are comfortable for walking or better throughout the year (Figures 6a and 6b).

With the addition of the proposed development, wind conditions onsite at grade are suitable for walking or better in the summer (Figure 7a). In the winter months, on-site wind conditions are generally acceptable for walking or better (Figure 7b). The exceptions are near the corners of Building B (Locations 15, 16, 95 and 96), within the breezeway beneath the Building B podium (Locations 10 and 99), and at the main and secondary entrances along the east side of Building A, (Locations 103, and 104), as well as in the northwest corner of the amenity space (Location 4). Wind conditions in the rest of the amenity space are comfortable for standing in the summer and walking in the winter months.

Wind mitigation recommendations are provided in Section 5.0.

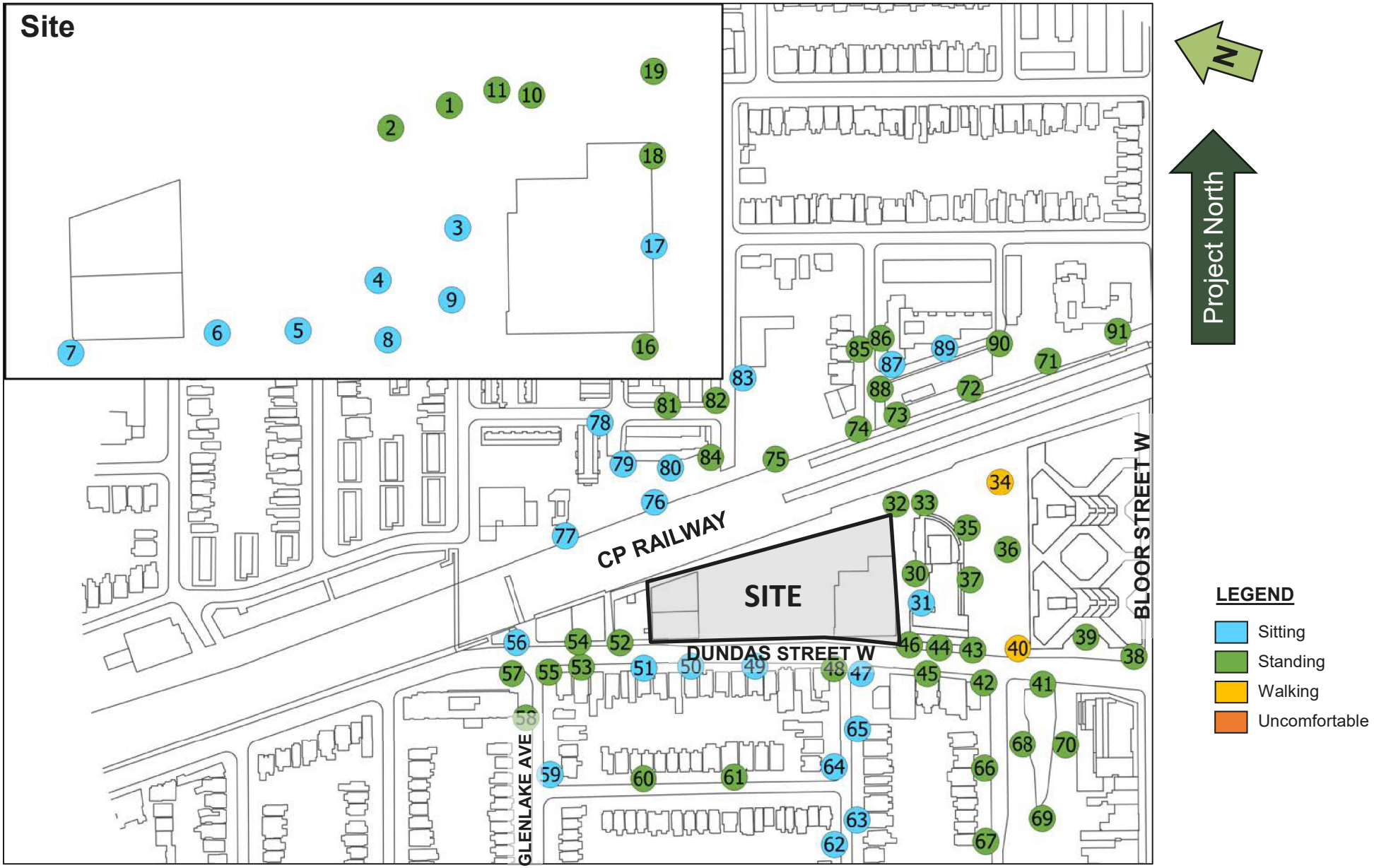


Figure 6a: Existing Configuration – Pedestrian Wind Comfort Conditions – On-Site and Surrounding Sidewalks – Summer

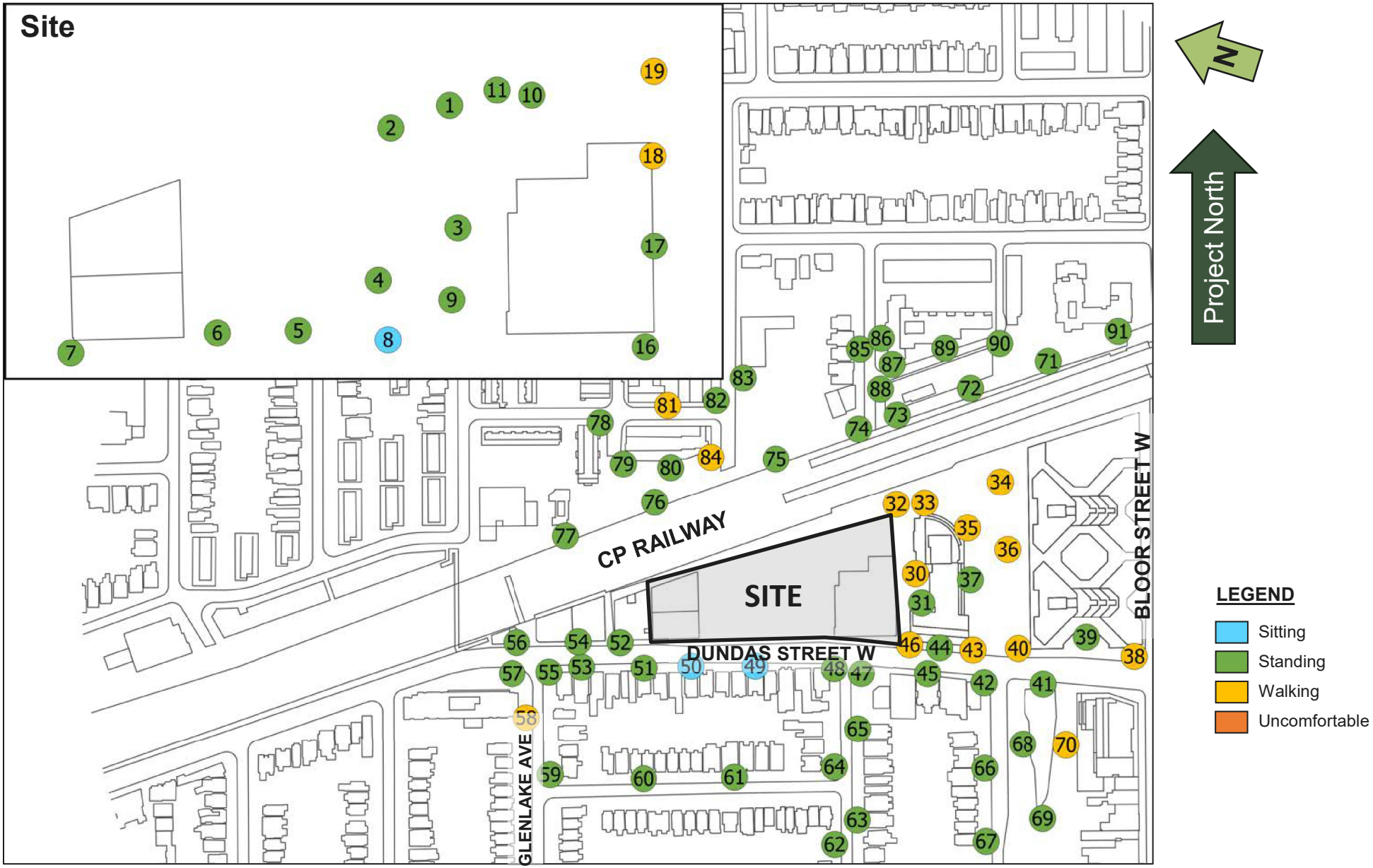


Figure 6b: Existing Configuration – Pedestrian Wind Comfort Conditions – On-Site and Surrounding Sidewalks – Winter

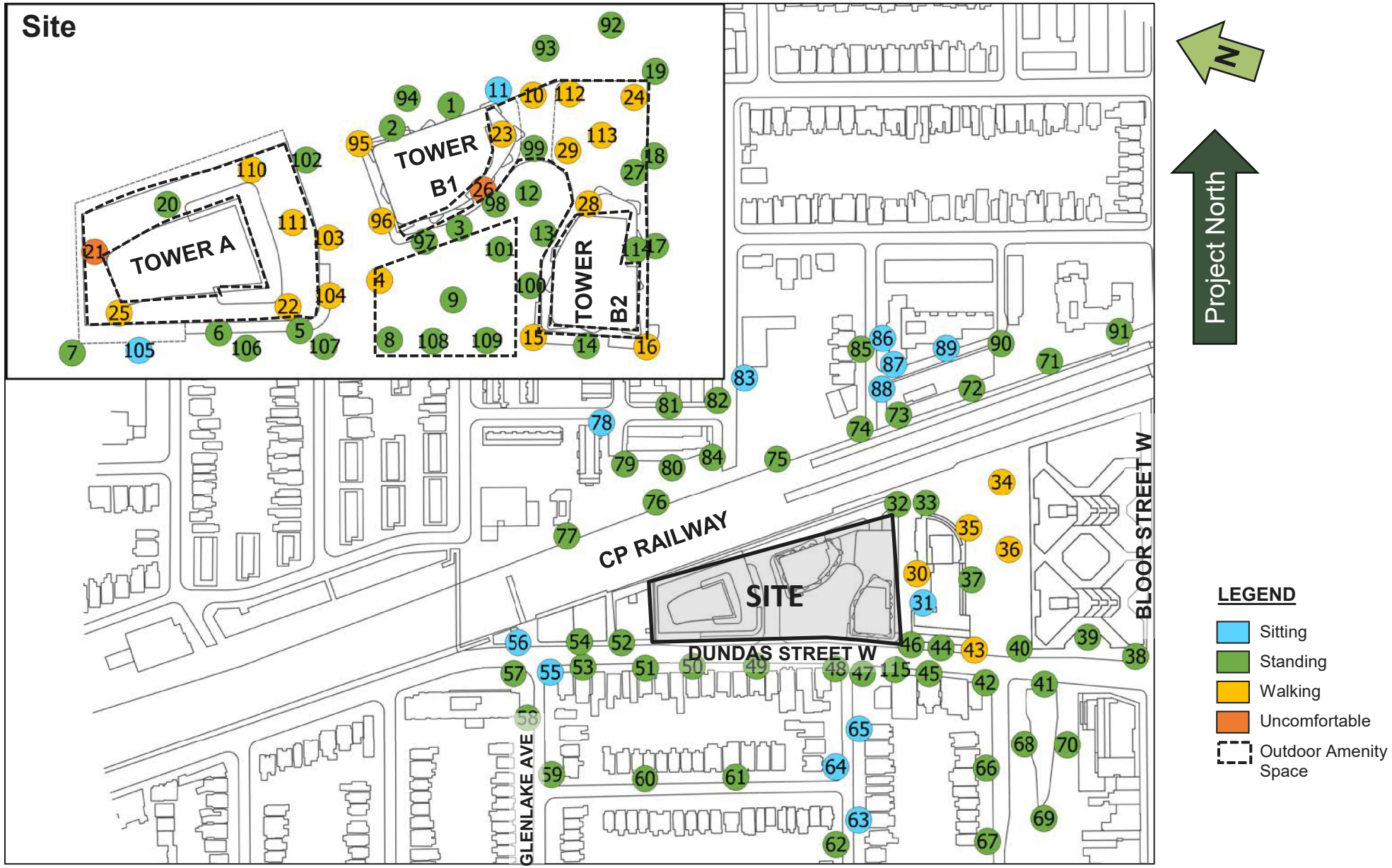


Figure 7a: Proposed Configuration – Pedestrian Wind Comfort Conditions – On-Site and Surrounding Sidewalks – Summer

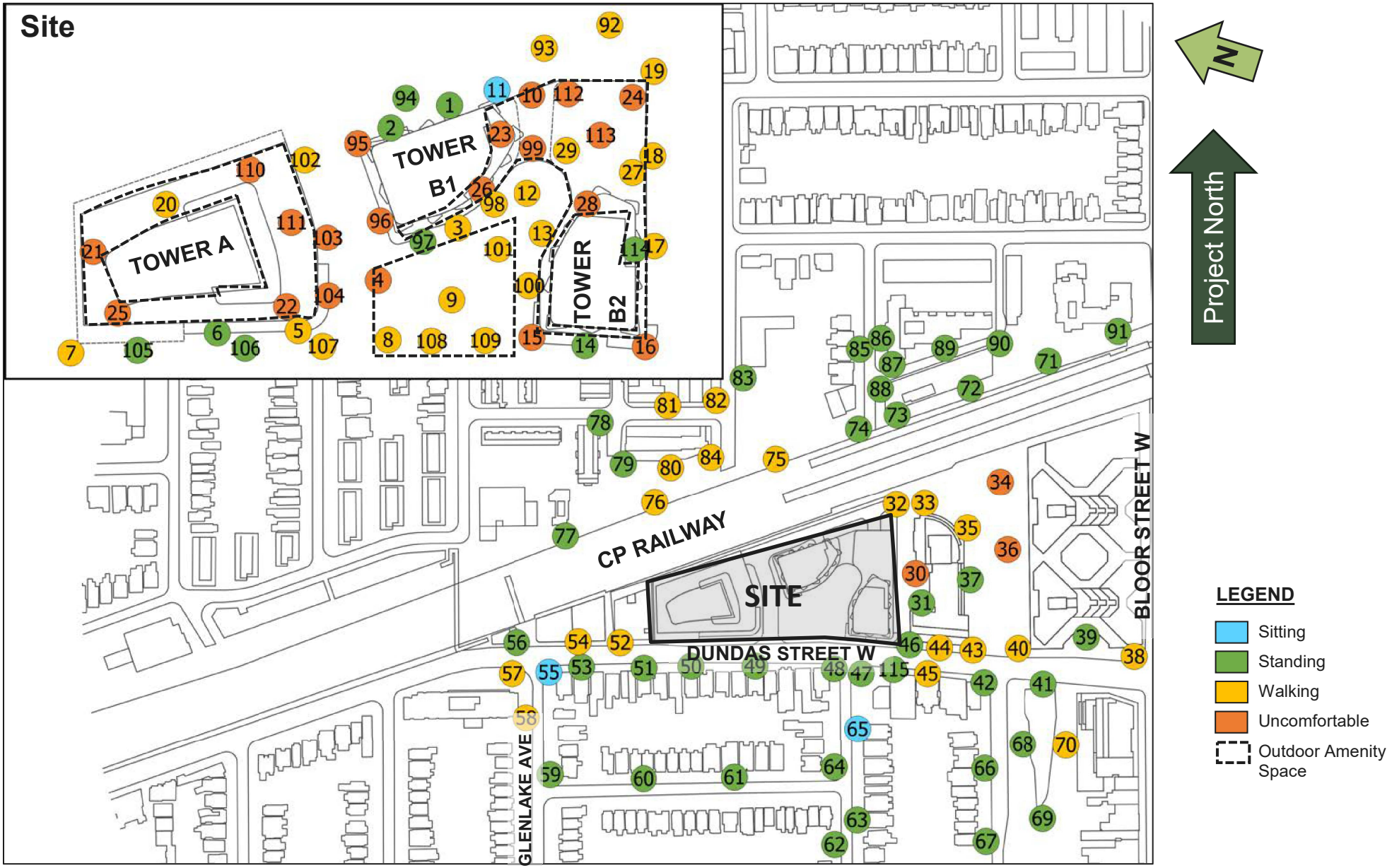


Figure 7b: Proposed Configuration – Pedestrian Wind Comfort Conditions – On-Site and Surrounding Sidewalks – Winter

4.2 Amenity Terraces (Locations 20–29 & 110–114)

The Level 3 terrace for Building A (Locations 20 to 22, 25, 110, and 111) is generally windier than desired throughout the year. In the summer, wind conditions are suitable for walking or better in most areas. The exception is at the northwest corner of the tower (Location 21) where wind conditions are uncomfortable in the summer. In the winter months wind conditions are generally uncomfortable on this terrace, with the exception on the north facade where wind conditions are conducive to walking (Figure 7b).

Wind conditions on the terrace of Building B (Locations 23, 24, 26 to 29, and 112 to 114) are generally comfortable for walking or better in the summer, with the exception of the southeast corner of Tower B1 (Location 26) where conditions are uncomfortable. During the winter months wind conditions are generally uncomfortable throughout this terrace, with some areas comfortable for walking (Figure 7b).

Wind mitigation measures are provided for the terraces in Section 5.0.

4.3 Surrounding Sidewalks (Locations 30–91)

Existing wind conditions along the nearby sidewalks of Dundas Street West, Chelsea Avenue, Glenlake Avenue, Bloor Street West, as well as on the west side of the CP railway, are comfortable for walking or better year-round. At the nearby transit stops along Dundas Street West (Locations 38, 41, 48, 56, 57, and 68 through 70) wind conditions are comfortable for walking or better year-round (Figures 6a and 6b).

In the Proposed Configuration, wind conditions along the nearby surrounding sidewalks generally remain comfortable for walking or better throughout the year. The exceptions are to the east of the proposed site around the existing towers (Locations 30, 34 and 36) where wind conditions are uncomfortable in the winter. Wind conditions remain comfortable for walking throughout the year at the nearby transit stops (Figures 7a and 7b).

4.4 Wind Safety

In the Existing Configuration, the wind safety criterion is met in almost all areas. The only exception is the off-site parking (Location 34), where the safety criterion is exceeded on an annual basis (Figure 8a).

In the Proposed Configuration (Figure 8b), the wind safety criterion is met in most areas surrounding the site on an annual basis. The same exception remains in the nearby parking lot (Location 34), with an additional safety exceedance to the north of the CP Railway (Location 75).

The on-site wind safety criterion for the Proposed Configuration is met at grade in most areas. The exceptions are at the northwest corner of Tower B1 (Location 95), and at the emergency exit on the east facade of Tower B2 (Location 17).

On the amenity terraces of Building A, the wind flows are so strong as to exceed the wind safety criterion in most areas (Locations 21, 22, 25, 110 and 111). Similar strong wind flows occur on the amenity terrace of Building B, as the safety criterion is exceeded between the two towers (Locations 26, 28 and 112).

The wind mitigation measures described in Section 5.0 will be beneficial to reduce the impact of the described wind phenomena eliminate the safety concerns.

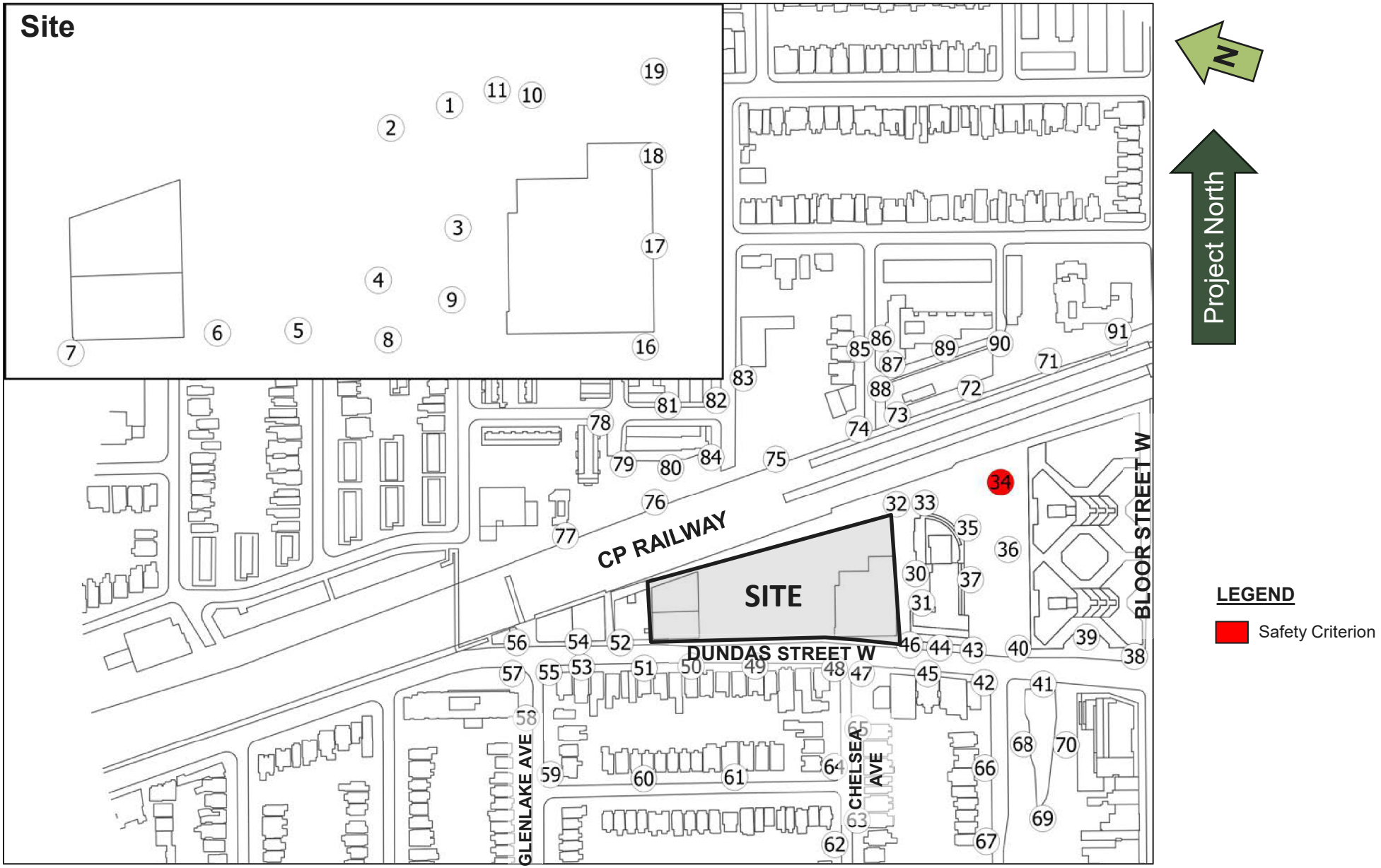


Figure 8a: Existing Configuration – Pedestrian Wind Comfort Conditions – On-Site and Surrounding Sidewalks – Safety

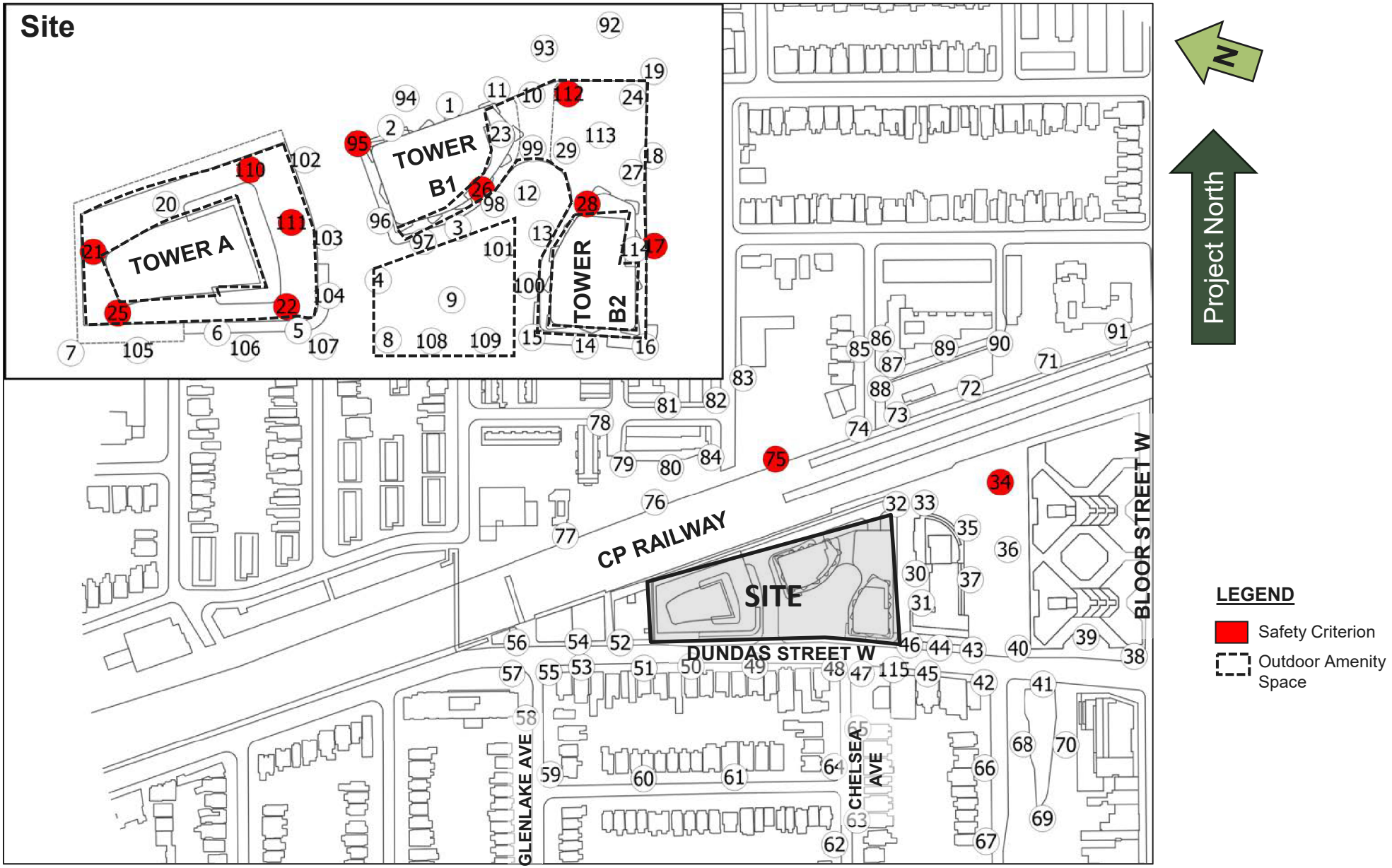


Figure 8b: Proposed Configuration – Pedestrian Wind Comfort Conditions – On-Site and Surrounding Sidewalks – Safety

5.0 Recommendations for Mitigation

The strong wind flows between Building A and Building B are to due to the downwashing of the prevailing westerly winds around the southeast corner of Building A, and the southwest corner of Building B. These flows are then constricted between the buildings, creating local wind accelerations referred to as channeling (see images on the right).

To improve wind conditions at the nearby entrances to Building A (Locations 103 and 104), we recommend the design team elongate the canopy to include the commercial entrance (Location 103). In addition, we recommend including wind screens on both sides of each entrance, to provide local wind protection. To improve wind conditions along the east side of Tower B1 (Locations 95 and 96), we recommend increasing the depth of the canopy, in addition to including staggered wind screens along the sidewalk. Alternatively, the design team may want to consider installing a large canopy between Buildings A and B, above the driveway.

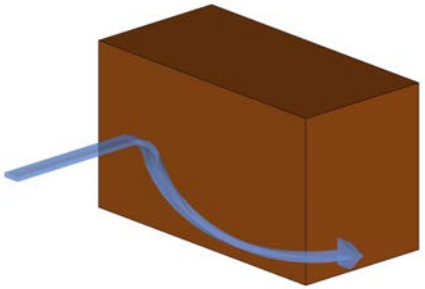
At the southeast and southwest corners of Tower B2 (Locations 15 and 16) the downwashing of the prevailing westerly winds (see image) creates uncomfortable wind conditions. To improve wind conditions in these areas we recommend enlarging the canopy depth, in addition to providing local wind screens on either side of the commercial entrance.

The strong wind flows in the breezeway beneath Building B (Locations 10 and 99) are due to the acceleration of westerly and easterly winds through the space. We recommend the design team consider staggered, porous wind screens (at grade or hanging from the soffit) to disrupt the wind flows. Alternatively, a porous feature could be installed in the open space immediately to the east.

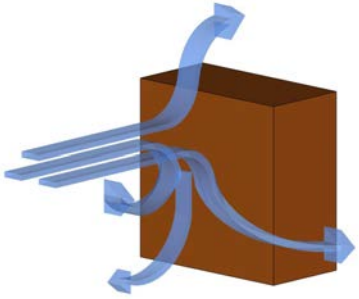
The strong wind flows on the terraces are primarily due to downwashing of the prevailing winds, off the tower faces, in addition to the terraces' overall exposure to predominant winds. To deflect the downwashing flows, we recommend including pergolas, trellises and/or canopies to provide local wind protection. In addition, tall vertical wind screens should be included around the perimeter of each terrace.

Example images of mitigation measures are included in Figure 9.

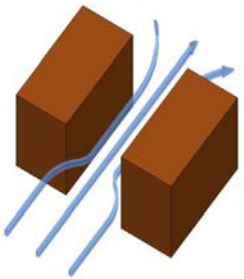
SLR will work with the team to determine practical and effective wind control measures as the design progresses.



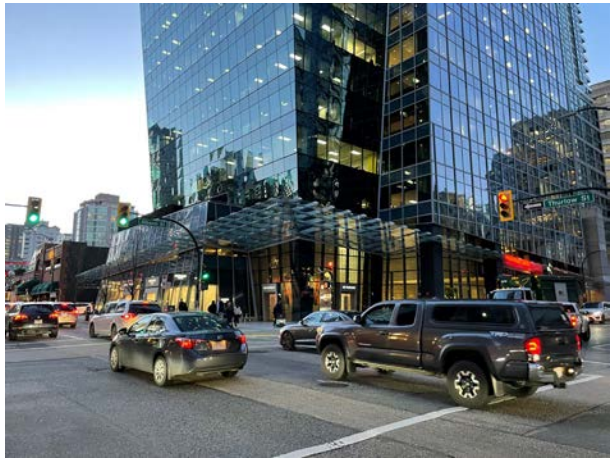
Wind flow around corners



Downwashing Flow



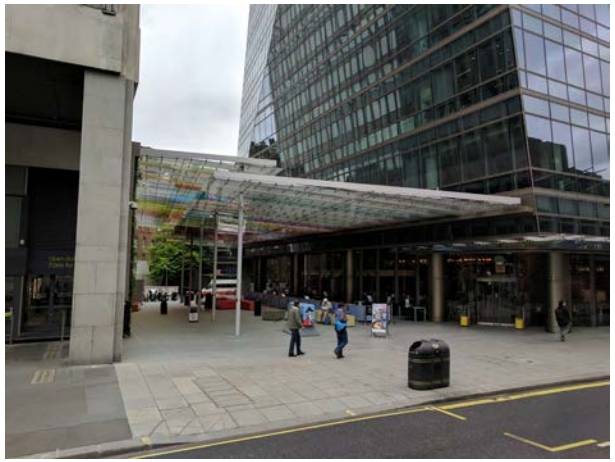
Channeling Flow



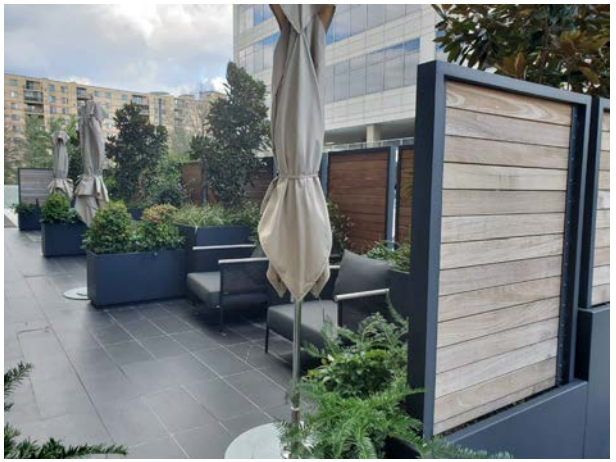
Wrap-around canopy

Tall wind screens

Local wind screens around seating



Interconnected canopies



Terrace landscaping and trellises

Wind screens

Figure 9: Examples of mitigation measures

6.0 Updated Architectural Information

Updated architectural information was received from Giannone Petricone Associates Inc. Architects on October 4, 2024, after the analysis was completed.

SLR noted the following differences in the updated information:

- Tower A has increased in height by 1 m, rising from 123.8 m to 124.8 m.
- The setback for Tower A at the Level 4 podium has increased by 0.85 m from the south and 0.6 m from the east.
- The floorplates of Towers A, B1, and B2 have been slightly altered. The overall massing of the towers is similar.
- The locations of building entrances and exits have been modified in numerous areas as the internal programming has been updated.

These minor massing changes will have a negligible influence on pedestrian wind comfort on the site and surroundings. Therefore, the wind conditions discussed in Section 4.0 of this report remain applicable.

7.0 Conclusion & Recommendations

The pedestrian wind conditions predicted for the proposed development at 2400 Dundas Street West in Toronto, have been assessed through quantitative wind tunnel modelling techniques. Based on the results of our study, the following conclusions have been reached:

- In the Existing Configuration the wind safety criterion was exceeded at one location. In the Proposed Configuration, 12 locations exceeded the wind safety criterion. These exceedances primarily occurred on the outdoor terraces of the development. Wind control measures are recommended and described.
- Wind conditions on the site, including the numerous entrances and at grade amenity spaces, are generally suitable for the intended use year-round. Localized wind control measures are recommended for areas.
- On the sidewalks surrounding the proposed development, wind conditions are generally suitable for the intended use in both configurations throughout the year.
- Wind conditions on the proposed terraces are generally windier than desired. Wind control measures are recommended.
- SLR will work with the design team to refine wind control measures prior to the next planning submission.

8.0 Statement of Limitations

This report has been prepared by SLR Consulting (Canada) Ltd. (SLR) for Fora Developments (Client) in accordance with the scope of work and all other terms and conditions of the agreement between such parties. SLR acknowledges and agrees that the Client may provide this report to government agencies, interest holders, and/or Indigenous communities as part of project planning or regulatory approval processes. Copying or distribution of this report, in whole or in part, for any other purpose other than as aforementioned is not permitted without the prior written consent of SLR.

Any findings, conclusions, recommendations, or designs provided in this report are based on conditions and criteria that existed at the time work was completed and the assumptions and qualifications set forth herein.

This report may contain data or information provided by third party sources on which SLR is entitled to rely without verification and SLR does not warranty the accuracy of any such data or information.

Nothing in this report constitutes a legal opinion nor does SLR make any representation as to compliance with any laws, rules, regulations, or policies established by federal, provincial territorial, or local government bodies, other than as specifically set forth in this report. Revisions to legislative or regulatory standards referred to in this report may be expected over time and, as a result, modifications to the findings, conclusions, or recommendations may be necessary.

9.0 References

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Appendix A

Pedestrian Wind Comfort & Safety
Spring (March – May) & Autumn (September – November)

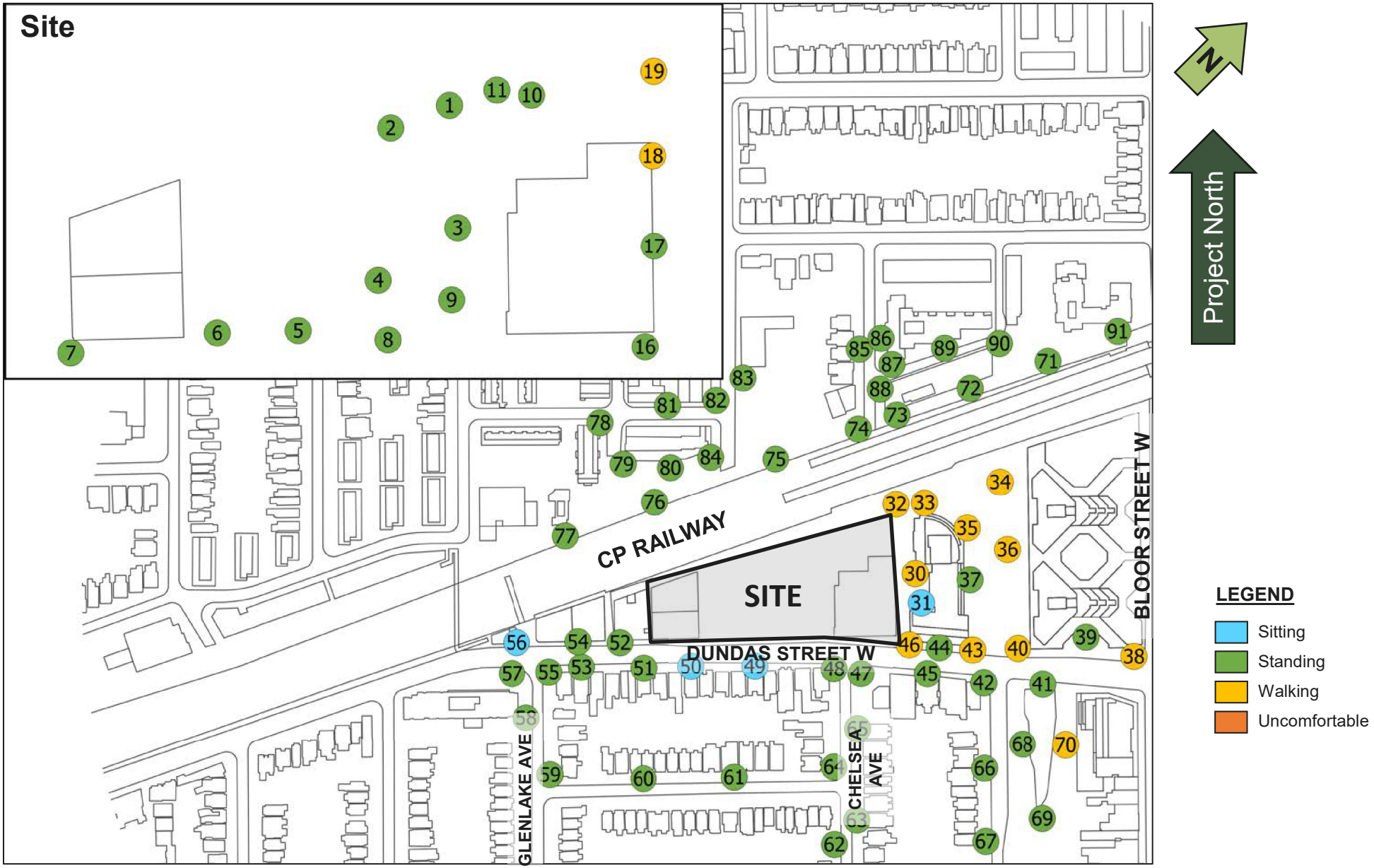

Figure A1a: Existing Configuration – Pedestrian Wind Comfort Conditions – On-Site and Surroundings – Spring

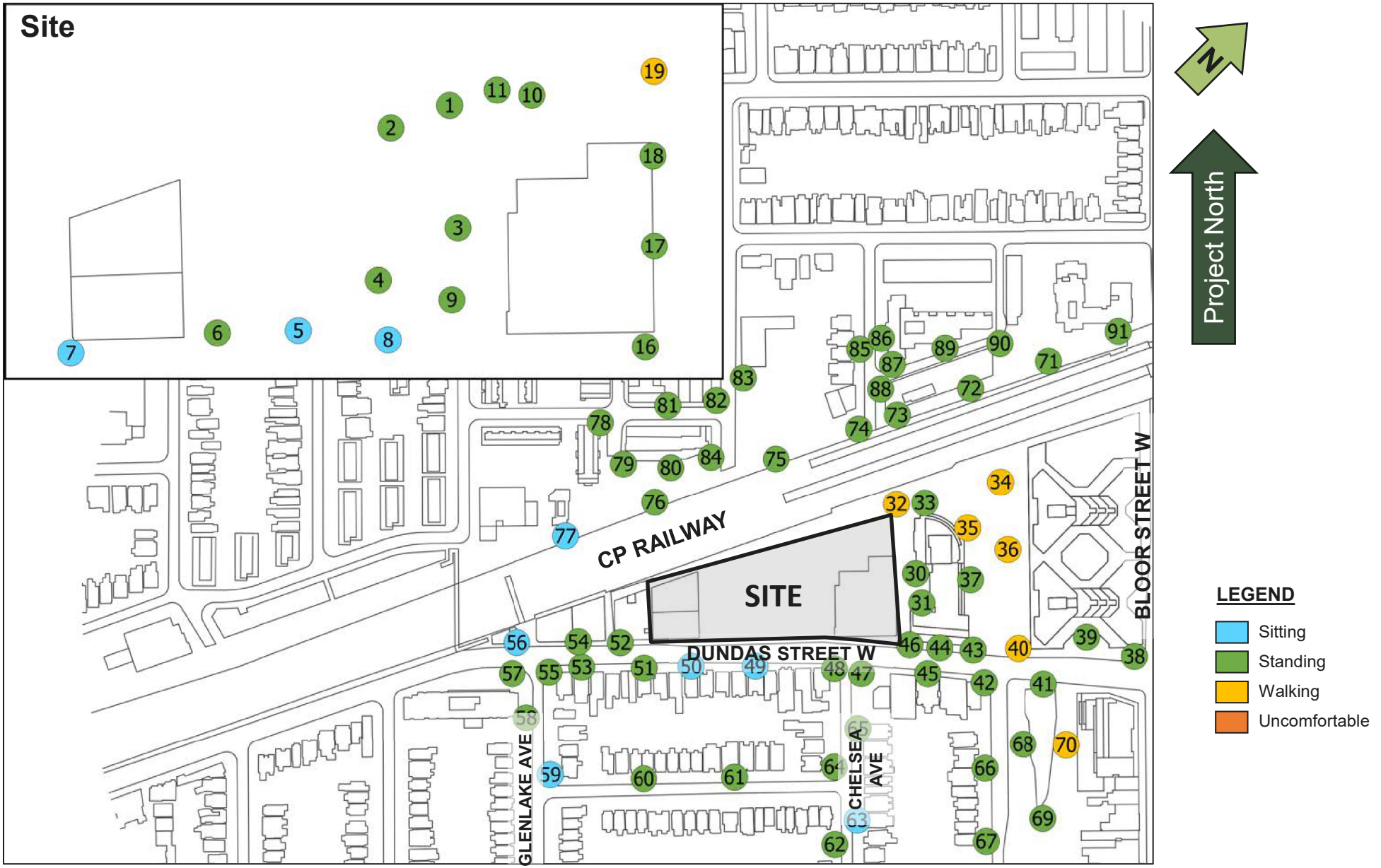

Figure A1b: Existing Configuration – Pedestrian Wind Comfort Conditions – On-Site and Surroundings – Autumn

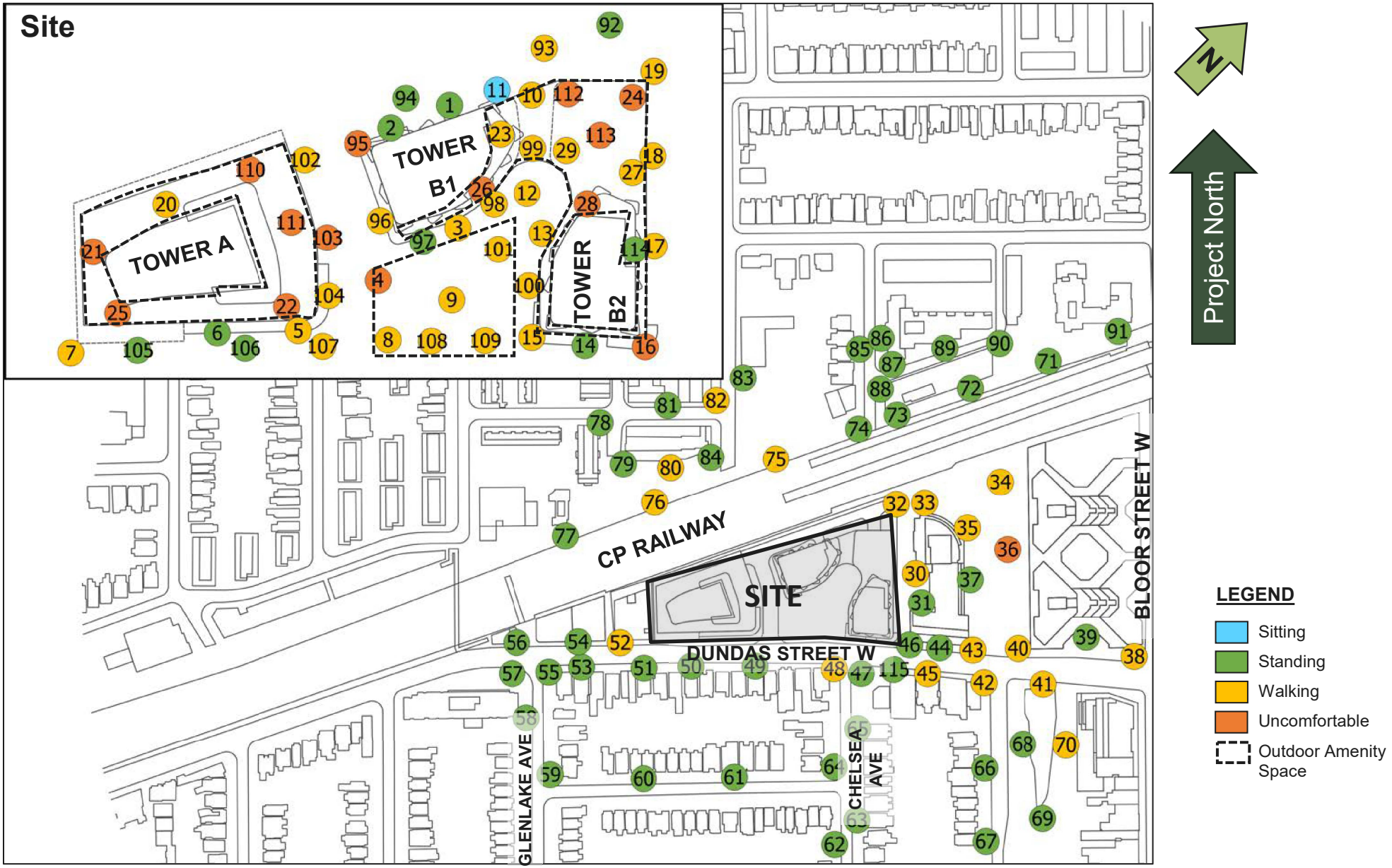

Figure A2a: Proposed Configuration – Pedestrian Wind Comfort Conditions – On-Site and Surroundings – Spring

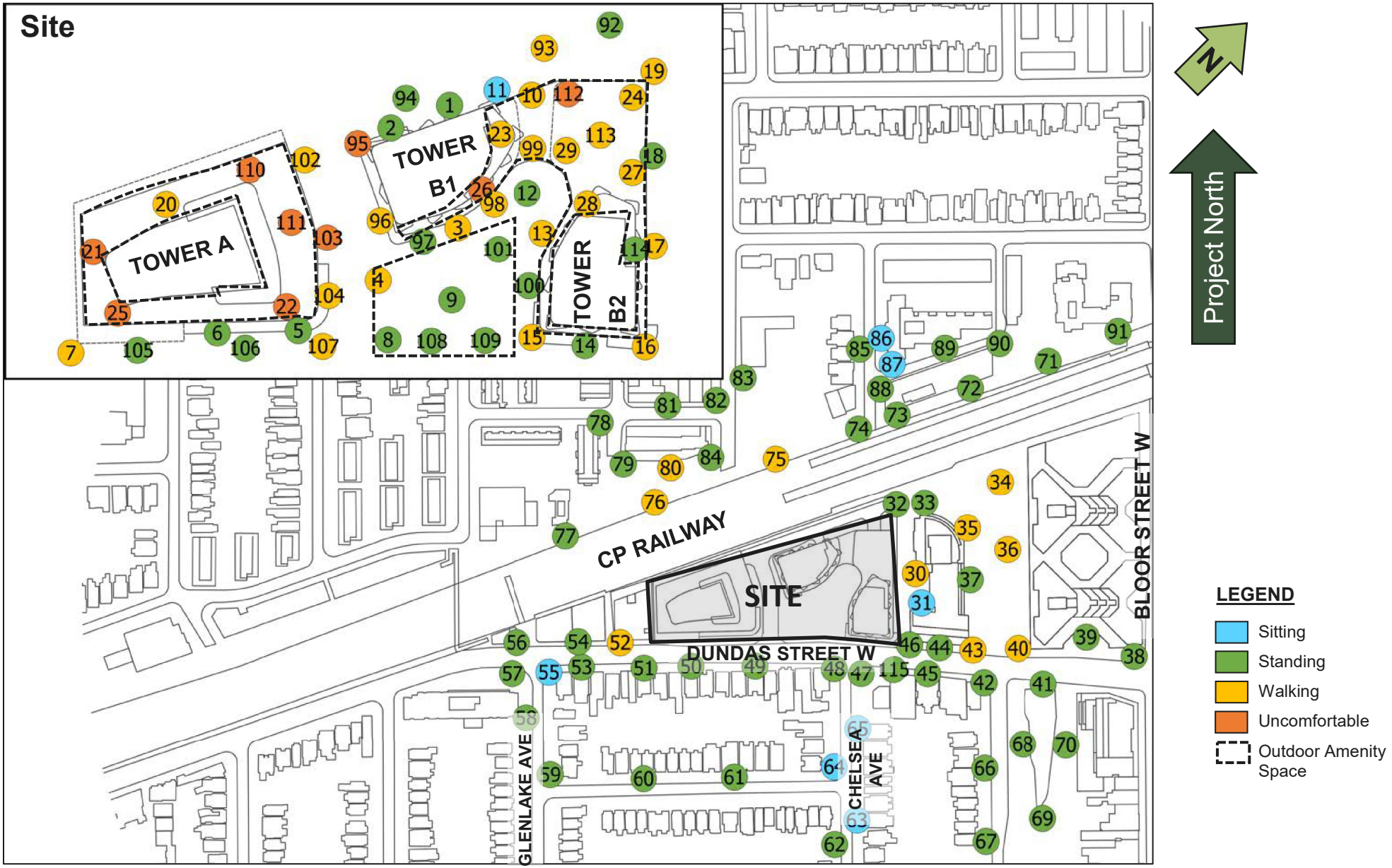

Figure A2b: Proposed Configuration – Pedestrian Wind Comfort Conditions – On-Site and Surroundings – Autumn

Appendix B

Pedestrian Wind Comfort & Safety Tables

Interpretation of Results

Example Table 1 illustrates the wind comfort and safety criteria. The table provides the GEM (Gust Equivalent Mean) wind speed (in km/h) exceeded 20% of the time for comfort for each of the four seasons for each configuration. It also categorizes the wind speeds as either sitting, standing, walking or uncomfortable (see wind speed ranges in Example Table 2). In addition, the table provides the gust wind speed exceeded 0.1% of the time annually.

For instance, at Location 1 there is not data in the Existing Configuration, while in the Proposed Configuration, wind conditions are suitable for walking in the winter, spring and autumn seasons, while in the summer wind conditions are suitable for standing.

At Location 3, wind conditions are suitable for walking in the winter, spring and autumn seasons in the Existing Configuration, while in the summer wind conditions are conducive to sitting. In the Proposed Configuration, wind conditions are suitable for walking in the spring and autumn, standing in the summer, and uncomfortable in the winter. In addition, the safety criteria is exceeded on an annual basis at Location 3 in the Proposed Configuration.

Example Table 1: Pedestrian Wind Conditions

Location	Configuration	Wind Comfort				Wind Safety
		GEM Speed Exceeded 20% of the Time (km/h)				Gust Speed Exceeded 0.1% of the Time (km/h)
		Winter	Spring	Summer	Autumn	
1	Existing					
1	Proposed	19.3	18.3	15.0	16.1	71.7
2	Existing	12.5	11.3	6.8	11.7	71.4
2	Proposed	16.6	18.1	14.7	15.8	80.0
3	Existing	17.6	14.2	9.8	15.8	79.5
3	Proposed	20.9	15.7	10.3	18.6	95.6

Example Table 2: Categories

Criteria	Speed
Sitting	≤ 10 km/h
Standing	≤ 15 km/h
Walking	≤ 20 km/h
Uncomfortable	> 20 km/h
Safety	> 90 km/h

Table B1-1: Pedestrian Wind Conditions

Location	Configuration	Wind Comfort					Wind Safety
		GEM Speed Exceeded 20% of the Time (km/h)					Gust Speed Exceeded 0.1% of the Time (km/h)
		Annual	Winter	Spring	Summer	Autumn	
1	Existing	13.6	15.0	14.3	11.9	13.1	58.7
1	Proposed	12.6	13.4	13.7	11.1	12.0	54.3
2	Existing	12.9	14.0	13.9	11.4	12.5	55.2
2	Proposed	12.7	12.9	14.5	11.3	12.1	58.2
3	Existing	12.6	13.8	13.3	11.0	12.2	52.3
3	Proposed	17.5	19.4	18.3	15.1	16.9	81.8
4	Existing	12.1	13.2	12.9	10.6	11.7	49.0
4	Proposed	21.1	22.5	23.7	18.1	19.9	90.0
5	Existing	11.5	12.3	12.2	10.1	11.1	46.1
5	Proposed	16.5	19.3	16.6	14.1	15.8	93.0
6	Existing	12.0	13.5	12.4	10.4	11.6	57.8
6	Proposed	13.4	14.5	14.5	11.6	12.7	54.6
7	Existing	11.6	12.9	12.2	10.0	11.2	54.0
7	Proposed	17.4	19.3	18.3	14.8	16.8	71.3
8	Existing	10.5	11.2	11.4	9.2	10.0	42.6
8	Proposed	16.7	18.0	18.4	14.4	15.7	69.8
9	Existing	12.3	13.4	13.1	10.6	11.8	50.9
9	Proposed	17.4	18.5	19.2	15.2	16.3	80.2
10	Existing	13.5	14.6	14.3	11.8	13.0	56.6
10	Proposed	20.4	24.1	20.5	17.3	19.8	96.3

Table B1-2: Pedestrian Wind Conditions

Location	Configuration	Wind Comfort					Wind Safety
		GEM Speed Exceeded 20% of the Time (km/h)					Gust Speed Exceeded 0.1% of the Time (km/h)
		Annual	Winter	Spring	Summer	Autumn	
11	Existing	13.3	14.5	14.1	11.6	12.8	57.1
11	Proposed	9.8	10.3	10.8	8.8	9.3	40.7
12	Existing						
12	Proposed	16.6	17.6	18.3	14.3	15.7	70.5
13	Existing						
13	Proposed	17.4	18.7	19.0	15.1	16.6	70.5
14	Existing						
14	Proposed	12.8	13.8	13.7	11.1	12.3	56.3
15	Existing						
15	Proposed	20.5	23.0	21.5	17.4	19.8	88.3
16	Existing	13.7	15.0	14.7	11.8	12.9	56.7
16	Proposed	20.7	23.1	22.1	17.7	19.7	94.9
17	Existing	12.1	13.5	12.5	10.6	11.7	50.9
17	Proposed	18.6	21.0	19.2	16.1	17.9	102.3
18	Existing	16.8	18.3	18.4	14.4	15.8	71.7
18	Proposed	16.4	17.5	17.6	14.3	15.8	68.5
19	Existing	18.4	19.9	20.2	15.7	17.4	77.3
19	Proposed	18.7	21.7	18.6	15.6	18.2	76.3
20	Existing						
20	Proposed	18.6	20.3	20.2	16.2	17.5	89.6

Table B1-3: Pedestrian Wind Conditions

Location	Configuration	Wind Comfort					Wind Safety
		GEM Speed Exceeded 20% of the Time (km/h)					Gust Speed Exceeded 0.1% of the Time (km/h)
		Annual	Winter	Spring	Summer	Autumn	
21	Existing						
21	Proposed	26.5	30.4	27.7	22.4	25.1	128.9
22	Existing						
22	Proposed	25.7	29.3	26.3	21.5	24.9	117.0
23	Existing						
23	Proposed	21.0	23.7	21.7	17.6	20.5	91.9
24	Existing						
24	Proposed	21.6	23.8	22.5	18.7	20.9	89.0
25	Existing						
25	Proposed	25.0	28.8	25.5	21.5	24.3	107.1
26	Existing						
26	Proposed	28.2	33.4	27.5	23.4	27.6	116.2
27	Existing						
27	Proposed	17.5	19.0	18.7	15.1	16.9	74.5
28	Existing						
28	Proposed	21.3	23.4	22.9	18.6	19.9	117.5
29	Existing						
29	Proposed	19.6	22.0	20.1	16.7	19.0	86.7
30	Existing	15.6	17.1	17.0	13.3	14.8	68.8
30	Proposed	20.4	22.6	21.8	17.6	19.3	92.9

Table B1-4: Pedestrian Wind Conditions

Location	Configuration	Wind Comfort					Wind Safety
		GEM Speed Exceeded 20% of the Time (km/h)					Gust Speed Exceeded 0.1% of the Time (km/h)
		Annual	Winter	Spring	Summer	Autumn	
31	Existing	11.4	12.9	11.4	10.7	11.6	49.3
31	Proposed	10.4	11.5	11.1	9.0	10.0	43.3
32	Existing	18.5	20.2	19.9	15.9	17.5	78.5
32	Proposed	16.1	17.7	16.9	13.9	15.4	66.4
33	Existing	18.0	19.2	20.1	15.7	16.6	86.3
33	Proposed	16.0	16.9	18.1	13.9	14.8	71.8
34	Existing	20.3	21.8	22.3	18.2	18.9	103.6
34	Proposed	20.2	22.3	21.1	18.1	19.2	101.7
35	Existing	18.3	19.6	20.1	16.0	17.4	75.8
35	Proposed	19.6	21.5	20.8	17.3	18.8	81.7
36	Existing	18.9	20.0	21.4	16.7	17.5	87.0
36	Proposed	21.8	23.5	23.9	19.1	20.5	98.5
37	Existing	15.6	16.8	16.5	14.0	15.1	66.3
37	Proposed	15.5	16.5	16.4	13.9	14.9	60.1
38	Existing	17.5	18.9	19.1	15.4	16.4	85.2
38	Proposed	16.8	18.5	18.2	14.7	15.7	90.7
39	Existing	13.9	14.6	15.5	12.4	13.0	67.5
39	Proposed	12.6	13.3	13.8	11.2	11.9	57.2
40	Existing	19.4	20.3	20.6	17.8	18.7	77.1
40	Proposed	17.8	18.8	18.9	16.3	17.2	71.1

Table B1-5: Pedestrian Wind Conditions

Location	Configuration	Wind Comfort					Wind Safety
		GEM Speed Exceeded 20% of the Time (km/h)					Gust Speed Exceeded 0.1% of the Time (km/h)
		Annual	Winter	Spring	Summer	Autumn	
41	Existing	15.1	15.2	16.6	13.8	14.5	66.0
41	Proposed	15.6	16.0	17.3	14.1	14.9	69.2
42	Existing	15.7	16.0	16.5	14.5	15.3	63.1
42	Proposed	15.8	16.5	16.7	14.5	15.4	60.4
43	Existing	17.1	18.6	17.5	15.4	16.6	75.4
43	Proposed	19.6	21.7	20.6	17.1	18.7	97.5
44	Existing	15.0	16.1	15.5	13.7	14.7	60.3
44	Proposed	15.7	17.5	16.4	14.1	15.1	83.8
45	Existing	15.3	16.0	15.9	14.1	14.9	59.3
45	Proposed	15.8	16.9	17.0	14.2	15.1	67.2
46	Existing	16.5	18.3	16.9	14.4	16.0	69.8
46	Proposed	14.8	16.1	15.5	13.0	14.3	62.7
47	Existing	11.8	12.7	12.7	10.5	11.4	47.3
47	Proposed	14.5	15.7	15.6	12.6	13.7	58.5
48	Existing	13.8	14.8	14.5	12.2	13.4	54.9
48	Proposed	14.7	15.4	16.7	12.8	13.9	67.6
49	Existing	9.8	10.2	10.8	8.7	9.4	42.9
49	Proposed	14.5	15.7	15.7	12.4	13.9	61.1
50	Existing	10.6	11.4	11.4	9.3	10.2	43.2
50	Proposed	15.0	16.1	16.4	12.9	14.4	64.0

Table B1-6: Pedestrian Wind Conditions

Location	Configuration	Wind Comfort					Wind Safety
		GEM Speed Exceeded 20% of the Time (km/h)					Gust Speed Exceeded 0.1% of the Time (km/h)
		Annual	Winter	Spring	Summer	Autumn	
51	Existing	12.0	12.8	13.3	10.4	11.4	53.0
51	Proposed	15.1	16.5	16.3	12.7	14.5	74.5
52	Existing	14.2	16.3	14.0	12.1	13.9	65.6
52	Proposed	17.2	19.8	17.4	14.4	16.9	77.6
53	Existing	13.7	15.1	14.5	11.8	13.1	57.0
53	Proposed	14.8	16.2	15.8	12.5	14.3	64.8
54	Existing	14.5	16.1	15.0	12.5	14.0	63.5
54	Proposed	16.4	19.3	15.9	13.7	16.3	80.3
55	Existing	13.1	14.6	13.8	11.4	12.5	64.4
55	Proposed	10.2	10.6	11.8	8.8	9.5	46.1
56	Existing	10.6	11.9	10.9	9.1	10.3	45.8
56	Proposed	11.5	12.7	12.2	9.8	11.2	48.5
57	Existing	15.5	16.7	16.5	13.4	14.9	65.8
57	Proposed	16.1	18.0	16.4	13.7	15.7	68.6
58	Existing	16.7	19.2	16.7	14.2	16.3	78.7
58	Proposed	15.8	18.3	16.2	13.2	15.3	76.9
59	Existing	11.8	12.8	12.9	10.2	11.0	49.4
59	Proposed	12.8	13.5	14.3	11.1	12.2	56.3
60	Existing	13.7	15.3	14.0	11.9	13.3	62.3
60	Proposed	13.7	15.9	13.5	12.1	13.7	62.0

Table B1-7: Pedestrian Wind Conditions

Location	Configuration	Wind Comfort					Wind Safety
		GEM Speed Exceeded 20% of the Time (km/h)					Gust Speed Exceeded 0.1% of the Time (km/h)
		Annual	Winter	Spring	Summer	Autumn	
61	Existing	14.3	15.9	14.6	12.5	14.0	63.4
61	Proposed	13.6	15.1	14.2	11.7	13.1	62.1
62	Existing	12.5	13.4	13.1	11.2	12.2	49.8
62	Proposed	12.6	13.4	13.3	11.2	12.1	52.2
63	Existing	11.6	12.6	12.6	10.1	11.2	46.7
63	Proposed	10.6	11.3	11.5	9.4	10.1	43.1
64	Existing	12.4	13.4	13.1	11.1	12.1	51.6
64	Proposed	11.4	12.1	12.1	10.3	11.0	47.7
65	Existing	12.1	13.0	13.3	10.4	11.5	49.5
65	Proposed	10.3	11.0	11.4	9.2	9.8	44.4
66	Existing	13.8	14.3	14.6	12.8	13.4	51.7
66	Proposed	14.1	14.4	15.1	13.0	13.6	52.0
67	Existing	12.7	13.5	13.3	11.5	12.3	55.5
67	Proposed	12.8	13.5	13.7	11.5	12.4	54.6
68	Existing	14.6	15.8	15.7	13.0	14.0	60.6
68	Proposed	13.7	14.3	15.0	12.3	13.0	56.5
69	Existing	14.5	14.8	15.5	13.6	14.0	52.9
69	Proposed	13.1	13.2	14.3	12.4	12.7	50.8
70	Existing	18.0	19.2	19.3	15.8	17.4	73.2
70	Proposed	16.6	17.4	17.9	14.6	16.1	77.0

Table B1-8: Pedestrian Wind Conditions

Location	Configuration	Wind Comfort					Wind Safety
		GEM Speed Exceeded 20% of the Time (km/h)					Gust Speed Exceeded 0.1% of the Time (km/h)
		Annual	Winter	Spring	Summer	Autumn	
71	Existing	13.9	14.8	14.7	12.3	13.3	62.0
71	Proposed	12.9	14.1	13.6	11.5	12.5	54.6
72	Existing	15.3	16.6	16.2	13.7	14.7	73.9
72	Proposed	14.0	15.3	14.3	12.7	13.6	59.8
73	Existing	15.1	15.5	16.0	14.2	14.6	66.1
73	Proposed	15.5	16.3	16.2	14.4	15.0	61.6
74	Existing	13.9	14.0	14.9	13.1	13.4	61.3
74	Proposed	15.2	16.2	15.8	14.1	14.7	62.1
75	Existing	14.4	15.8	15.1	12.7	13.7	64.9
75	Proposed	17.6	20.5	17.8	15.6	16.9	100.5
76	Existing	11.9	13.2	12.4	10.4	11.4	58.9
76	Proposed	16.9	19.6	16.8	14.3	16.6	82.6
77	Existing	11.0	12.3	11.4	9.9	10.6	57.5
77	Proposed	13.5	15.4	13.8	11.4	13.1	61.0
78	Existing	13.1	14.5	13.7	11.3	12.7	55.0
78	Proposed	11.7	13.1	12.1	10.1	11.3	54.3
79	Existing	13.0	14.7	13.4	11.3	12.6	56.7
79	Proposed	14.0	16.5	13.6	11.9	13.9	69.4
80	Existing	12.9	14.3	13.4	11.2	12.3	65.9
80	Proposed	17.1	20.3	16.6	14.3	16.7	85.1

Table B1-9: Pedestrian Wind Conditions

Location	Configuration	Wind Comfort					Wind Safety
		GEM Speed Exceeded 20% of the Time (km/h)					Gust Speed Exceeded 0.1% of the Time (km/h)
		Annual	Winter	Spring	Summer	Autumn	
81	Existing	14.6	17.1	14.6	12.4	14.2	74.7
81	Proposed	14.2	16.8	14.0	12.1	13.8	79.9
82	Existing	14.5	15.6	15.5	13.2	13.8	79.0
82	Proposed	16.1	18.2	16.7	14.2	15.4	86.4
83	Existing	11.8	13.0	12.3	10.3	11.4	49.1
83	Proposed	11.7	13.0	12.0	10.3	11.3	55.5
84	Existing	15.6	17.5	16.1	13.7	14.9	71.5
84	Proposed	16.1	18.2	16.5	14.4	15.6	86.4
85	Existing	13.7	14.8	14.7	12.3	13.0	60.5
85	Proposed	12.7	13.7	13.3	11.5	12.3	51.6
86	Existing	13.6	14.8	14.7	11.9	12.7	67.5
86	Proposed	11.2	12.0	12.1	9.9	10.5	52.2
87	Existing	12.9	13.9	14.3	11.3	12.0	57.2
87	Proposed	11.6	12.3	12.9	10.2	10.8	53.8
88	Existing	14.3	15.7	15.4	12.5	13.3	68.3
88	Proposed	12.4	13.3	13.2	10.9	11.7	53.1
89	Existing	12.2	12.9	13.2	10.7	11.6	52.9
89	Proposed	12.1	12.9	13.0	10.7	11.6	47.9
90	Existing	14.2	15.1	14.9	13.0	13.8	59.0
90	Proposed	14.5	16.2	14.3	13.1	14.3	70.1

Table B1-10: Pedestrian Wind Conditions

Location	Configuration	Wind Comfort					Wind Safety
		GEM Speed Exceeded 20% of the Time (km/h)					Gust Speed Exceeded 0.1% of the Time (km/h)
		Annual	Winter	Spring	Summer	Autumn	
91	Existing	14.8	15.5	15.8	13.7	14.2	81.4
91	Proposed	13.1	13.2	14.2	12.7	12.5	76.1
92	Existing						
92	Proposed	15.4	17.1	16.2	13.5	14.7	63.6
93	Existing						
93	Proposed	17.9	19.6	19.2	15.4	17.1	71.4
94	Existing						
94	Proposed	13.8	14.6	15.1	12.3	13.2	54.7
95	Existing						
95	Proposed	24.5	27.9	25.4	20.3	23.7	106.5
96	Existing						
96	Proposed	20.0	22.4	20.7	17.0	19.3	85.3
97	Existing						
97	Proposed	13.1	14.4	13.9	11.2	12.6	56.7
98	Existing						
98	Proposed	17.0	19.3	17.1	14.3	16.6	76.5
99	Existing						
99	Proposed	19.6	22.3	20.6	16.4	18.9	81.7
100	Existing						
100	Proposed	15.6	16.7	17.3	13.4	14.8	67.2

Table B1-11: Pedestrian Wind Conditions

Location	Configuration	Wind Comfort					Wind Safety
		GEM Speed Exceeded 20% of the Time (km/h)					Gust Speed Exceeded 0.1% of the Time (km/h)
		Annual	Winter	Spring	Summer	Autumn	
101	Existing						
101	Proposed	16.7	18.1	17.9	14.3	16.0	65.9
102	Existing						
102	Proposed	18.8	21.8	18.8	15.9	18.4	88.8
103	Existing						
103	Proposed	23.0	25.5	24.3	19.4	22.3	89.8
104	Existing						
104	Proposed	20.4	22.8	21.4	17.3	19.7	87.3
105	Existing						
105	Proposed	12.7	13.9	13.6	10.8	12.1	51.4
106	Existing						
106	Proposed	15.1	16.4	16.5	13.1	14.3	61.3
107	Existing						
107	Proposed	18.0	20.0	19.3	15.3	17.2	80.8
108	Existing						
108	Proposed	16.1	17.2	17.9	14.1	15.2	70.2
109	Existing						
109	Proposed	16.2	17.4	17.6	14.0	15.4	71.8
110	Existing						
110	Proposed	23.9	27.1	24.3	20.4	23.2	108.1

Table B1-12: Pedestrian Wind Conditions

Location	Configuration	Wind Comfort					Wind Safety
		GEM Speed Exceeded 20% of the Time (km/h)					Gust Speed Exceeded 0.1% of the Time (km/h)
		Annual	Winter	Spring	Summer	Autumn	
111	Existing						
111	Proposed	25.8	29.3	26.4	21.6	25.0	105.5
112	Existing						
112	Proposed	24.3	26.6	25.7	21.2	23.2	114.0
113	Existing						
113	Proposed	21.3	23.4	22.2	18.5	20.5	95.7
114	Existing						
114	Proposed	13.6	15.5	13.8	11.5	13.3	60.4
115	Existing						
115	Proposed	14.6	15.8	15.9	12.8	13.8	62.9