FINAL REPORT

1029-1033 WATERDOWN ROAD

BURLINGTON, ON

PEDESTRIAN WIND STUDY
RWDI # 2103229
December 7, 2021

SUBMITTED TO

Arjun Anand, B.Eng., MBA, CFA
Director
arjun.anand@infinitydevelopment.ca

Infinity Development Group
2275 Upper Middle Road East
Oakville, Ontario, L6H 0C3
T: 647.502.9954

SUBMITTED BY

Shivani Jariwala, M.E.Sc.
Technical Coordinator
Shivani.Jariwala@rwdi.com

Hanqing Wu, Ph.D., P.Eng.
Senior Technical Director | Principal
Hanqing.Wu@rwdi.com

Stefan Gopaul, M.A.Sc., P.Eng.
Project Manager | Senior Engineer
Stefan.Gopaul@rwdi.com

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

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EXECUTIVE SUMMARY

RWDI was retained to conduct a pedestrian wind assessment for the proposed 1029-1022 Waterdown Road development in Burlington, ON (Image 1). Based on our wind-tunnel testing for the proposed development under the Existing and Proposed configurations (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 3B, while the associated wind speeds are listed in Table 1. These results can be summarized as follows:

- Existing wind speeds are suitable for the intended use in most areas throughout the year; however, uncomfortable conditions occur at the southwest corner of Waterdown Road and Plains Road East.
- With the addition of the proposed development, grade-level wind conditions are expected to be comfortable for the intended pedestrian usage at all areas in the summer and at most areas in the winter. In the winter, uncomfortable wind speeds are predicted at the northeast and southwest building corners.
- Wind conditions on the Level 5 and 7 terraces are predicted to be suitable throughout the year. Slightly elevated wind speeds predicted at northwest terrace space at Level 7 podium in the winter can be considered acceptable since this area would not be used during the colder winter months.
- Existing wind speeds meet the wind safety criterion at all locations tested. With the addition of the proposed development, wind speeds still meet the wind safety criterion at most grade-level areas and at all above-grade areas; however, wind speeds that do not meet the criterion are expected at the southwest building corner at grade.

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1 INTRODUCTION

RWDI was retained to conduct a pedestrian wind assessment for the proposed 1029-1033 Waterdown Road development in Burlington, ON. This report presents the project objectives, approach and the main results from RWDI's assessment and provides conceptual wind control measures, where necessary.

1.1 Project Description

The project (site shown in Image 1) is located on the north side of the intersection of Waterdown Road and Plains Road East and is situated along Waterdown Road. It consists of a 29-story residential tower with outdoor amenity and terrace spaces located on Levels 5 and 7.



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

1.2 Objectives

The objectives of the study were 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 appropriate criteria for gauging wind comfort and safety in pedestrian areas. The assessment focused on critical pedestrian areas, including the main building entrance, amenity space at grade level, public sidewalks, and the outdoor amenity area and terraces at Levels 5 and 7.

2 BACKGROUND AND APPROACH

2.1 Wind Tunnel Study Model

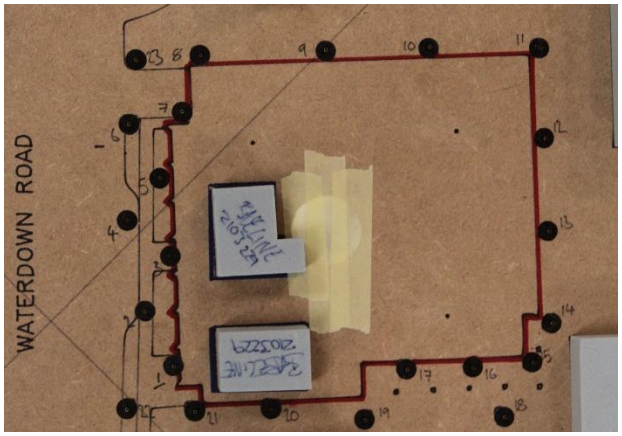
To assess the wind environment around the proposed project, a 1:300 scale model of the project site and surroundings was constructed for the wind tunnel tests of the following configurations:

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

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

The wind tunnel model included all relevant surrounding buildings and topography within an approximate 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 73 wind speed sensors (57 sensors at grade and 16 on the building model) to measure mean and gust speeds at a full-scale height of approximately 1.5 m above local grade in pedestrian areas throughout the study site. Wind speeds were measured for 36 directions in 10° increments. The measurements at each sensor location were recorded in the form of ratios of local mean and gust speeds to the mean wind speed at a reference height above the model. The placement of wind measurement locations was based on our experience and understanding of the pedestrian usage for this site.





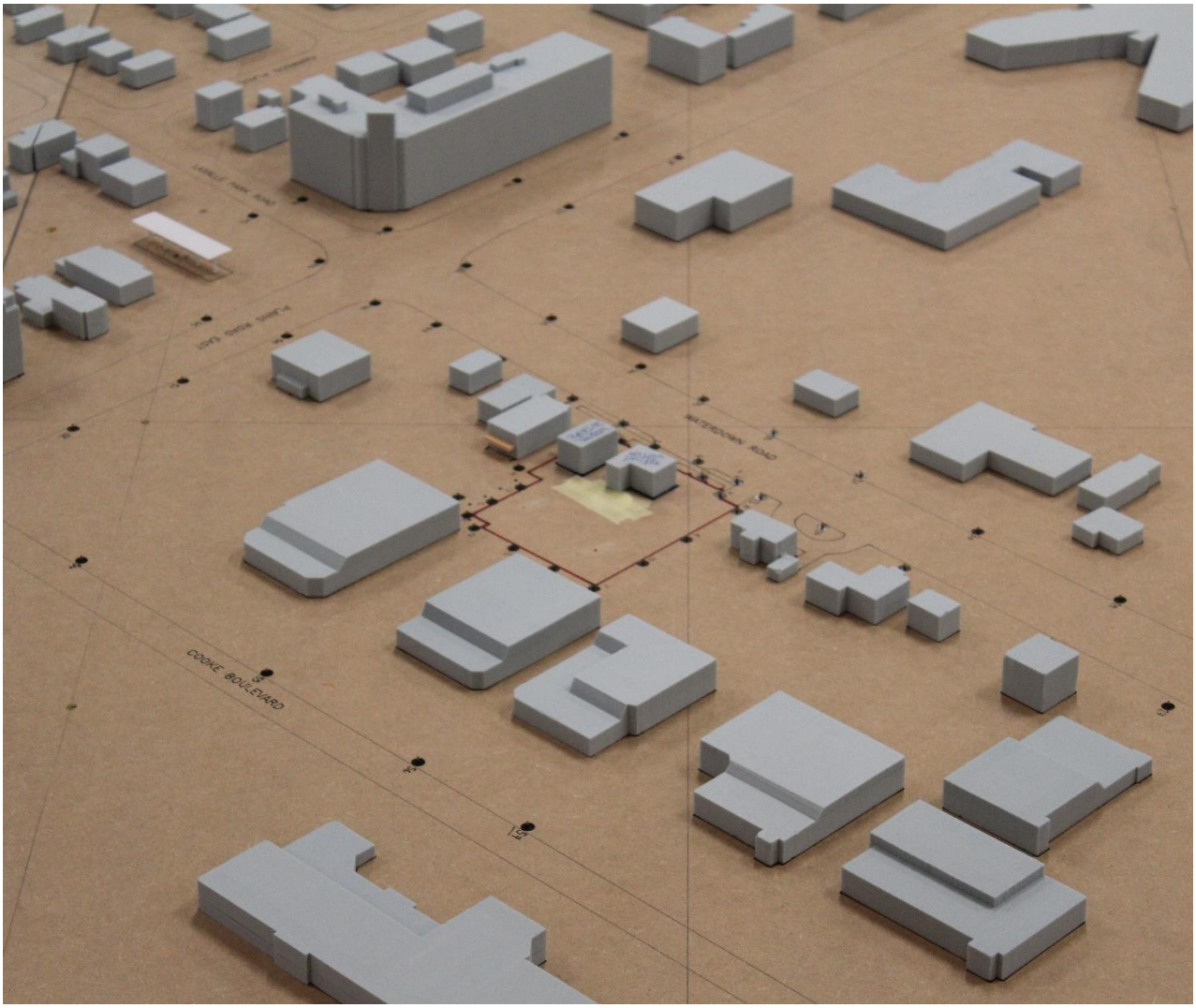


Image 2A: Wind Tunnel Study Model – Existing Configuration

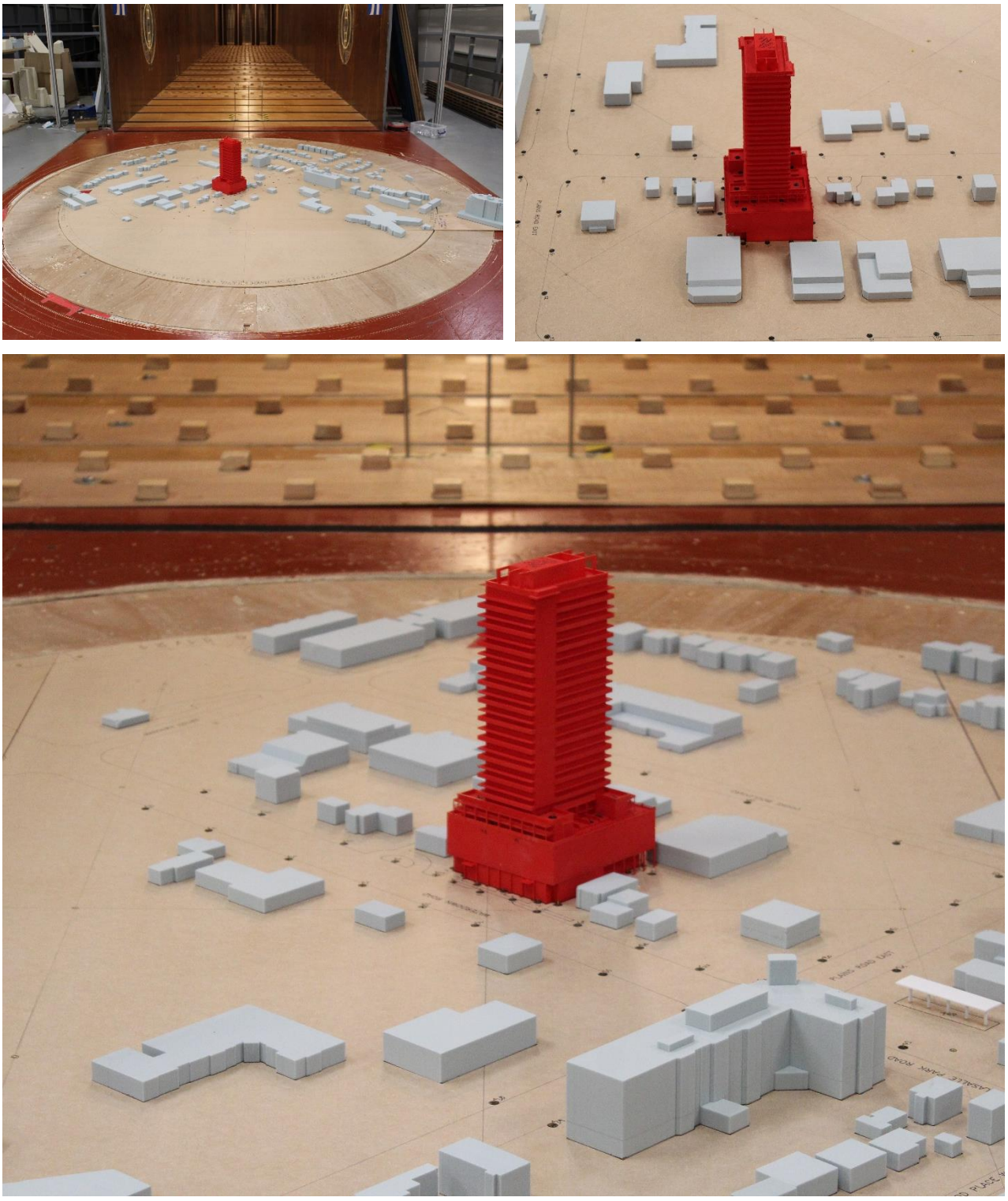
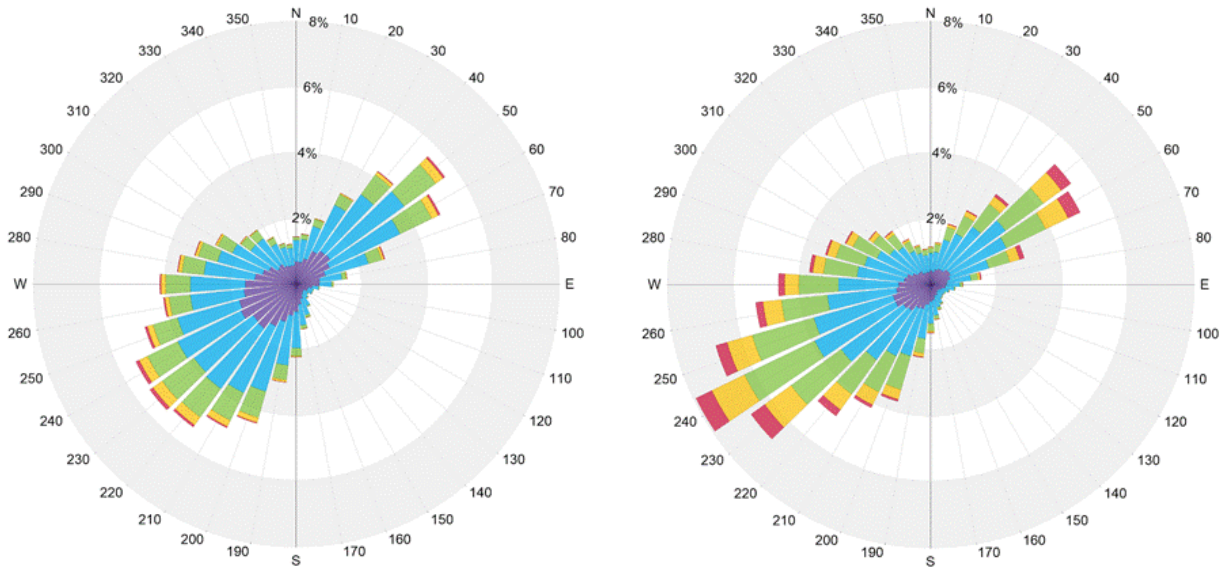


Image 2B: Wind Tunnel Study Model – Proposed Configuration

2.2 Meteorological Data

Wind statistics recorded at Hamilton 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 and northeast directions are predominant throughout the year, as indicated by the wind roses. Strong winds of a mean speed greater than 30 km/h measured at the airport (at an anemometer height of 10 m) occur for 3.8% and 12.6% of the time during the summer and winter seasons, respectively, and they are primarily from the southwest and northeast directions.

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.



Wind Speed (km/h)	Probability (%) Summer	Winter
Calm	3.9	2.3
1-10	33.7	21.7
11-20	43.1	39.5
21-30	15.5	23.9
31-40	3.0	9.0
>40	0.8	3.6

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

2.3 RWDI Pedestrian Wind Criteria

The RWDI pedestrian wind criteria, which have been developed by RWDI through research and consulting practice since 1974, are used in the current study. These criteria have been widely accepted by municipal authorities as well as by the building design and city planning community. Regional differences in wind climate and thermal conditions as well as variations in age, health, clothing, etc. can affect a person's perception of the wind climate. Therefore, comparisons of wind speeds for the existing and proposed building configurations are the most objective way in assessing local pedestrian wind conditions. In general, the combined effect of mean and gust speeds on pedestrian comfort can be quantified by a Gust Equivalent Mean (GEM).

Comfort Category	GEM Speed (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	≤ 14	Gentle breezes suitable for main building entrances, bus stops, and other places where pedestrians may linger
Strolling	≤ 17	Moderate winds that would be appropriate for window shopping and strolling along a downtown street, plaza or park
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 all pedestrian activities, and wind mitigation is typically recommended

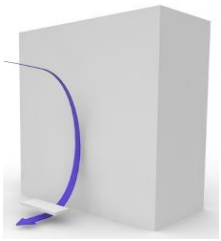
Notes:
(1) GEM Speed = max (Mean Speed, Gust Speed/1.85) and Gust Speed = Mean Speed + 3*RMS Speed;
(2) Wind conditions are considered to be comfortable if the predicted GEM speeds are within the respective thresholds for at least 80% of the time between 6:00 and 23:00. Nightly hours between 0:00 and 5:00 are excluded from the wind analysis for comfort since limited usage of outdoor spaces is anticipated; and,
(3) Instead of standard four seasons, two periods of summer (May to October) and winter (November to April) are adopted in the wind analysis, because in a cold climate such as that found in Burlington, there are distinct differences in pedestrian outdoor behaviours between these time periods.

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; and,
(2) Only gust speeds need to be considered in the wind safety criterion. These are usually rare events but deserve special attention in city planning and building design due to their potential safety impact on pedestrians.

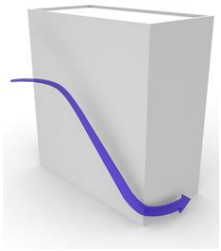
2.4 Generalized Wind Flows

In our discussion of wind conditions, reference 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.

Image 4: Generalized Wind Flows

3 RESULTS AND DISCUSSION

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

3.1 Grade Level (Locations 1 through 57)

Wind conditions comfortable for walking or strolling are appropriate for sidewalks and walkways as pedestrians will be active and less likely to remain in one area for prolonged periods of time. Lower wind speeds conducive to standing are preferred at main entrances where pedestrians are apt to linger. Wind speeds comfortable for sitting and standing are preferred for areas intended for passive activities, such as for the grade level amenity space.

3.1.1 Existing Configuration

Existing wind speeds on and around the site are comfortable for sitting or standing during the summer (see Figure 1A). Seasonally stronger winds during the winter months are expected to result in increased wind speeds around the site, along Plain Road East, and to the north of Waterdown Road with conditions generally comfortable for strolling. These conditions are appropriate for the intended use of various pedestrian areas. Uncomfortable wind speeds are predicted at the southwest corner of Plains Road East and Waterdown Road. Wind conditions comfortable for standing are predicted in the areas adjacent to the project site during the winter season (see Figure 2A). The pedestrian wind safety criterion is met at all areas assessed for the Existing configuration (see Figure 3A).

3.1.2 Proposed Configuration

With the addition of the proposed building, wind speeds are expected to slightly increase around the building corners of the proposed development due to the prevailing winds from the southwest and northeast directions accelerating around the corners.

In the summer (Figure 1B), wind conditions are generally predicted to be comfortable for sitting or standing in most areas, with wind speeds comfortable for strolling or walking near the building corners. These conditions are suitable for the intended use. During the winter season, wind conditions are predicted to be predominantly comfortable for walking or better in most areas, which is appropriate. Higher winds speeds predicted in the amenity space at the southeast corner can be considered acceptable as this area would not be used frequently in the winter. Seasonally stronger wind speeds during the winter are expected to result in uncomfortable wind conditions near the southwest and northeast building corners (Locations 11, 21, and 22, Figure 2B). Wind speeds meet the wind safety criterion at most locations tested; however, wind speeds that do not meet the criterion are predicted at the southwest corner (Locations 20 and 21, Figure 3B).

A reduction in wind speeds at the southwest corner can be achieved using a canopy wrapping the southwest corner, as shown in Image 5, to deflect the downwashing southwesterly winds away from the grade level areas underneath the canopy. Coniferous or marcescent trees (also shown in Image 5) can be implemented in this area to reduce wind speeds. Moreover, the uncomfortable wind condition, as predicted for the Existing configuration at Location 41 in Figure 1A, prevails for the Proposed scenario (Figure 2B) and is therefore not the result of the proposed development.

The main entrance of the proposed building is situated near Locations 3 in Figures 1B and 2B. Wind conditions at this entrance location are predicted to be comfortable for sitting throughout the year, which is suitable for the intended usage.

3.2 Above-Grade Levels (Locations 58 through 73)

It is generally desirable for wind conditions on terraces intended for passive activities to be comfortable for sitting or standing more than 80% of the time in the summer. During the winter, the area would not be used frequently, and increased wind activity would be considered appropriate.

Wind conditions at the Level 5 and Level 7 terrace areas assessed are predicted to be comfortable for sitting and standing at all locations in the summer and at most areas in the winter, which is appropriate (Figures 1B & 2B). The slightly higher-than-desired wind speeds expected at the northwest corner in the winter can be considered acceptable considering this outdoor area will not be frequently used during the winter season.

Wind speeds that meet the wind safety criterion are anticipated at all terrace locations (Figure 3B).

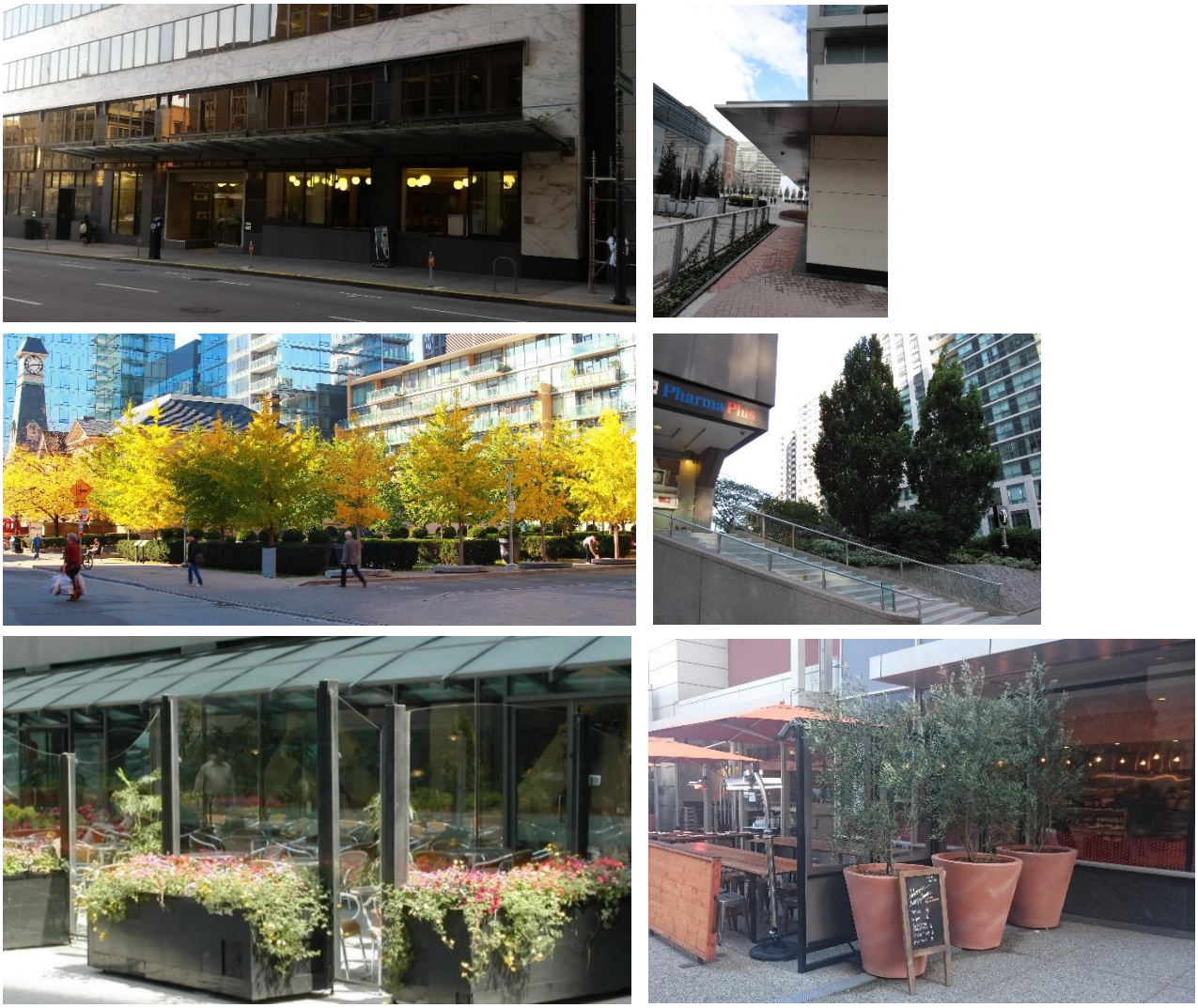


Image 5: Examples of Wind Control Measures Applicable to the Amenity Area and the Grade Level Area near Southwest Corner

4 APPLICABILITY OF RESULTS

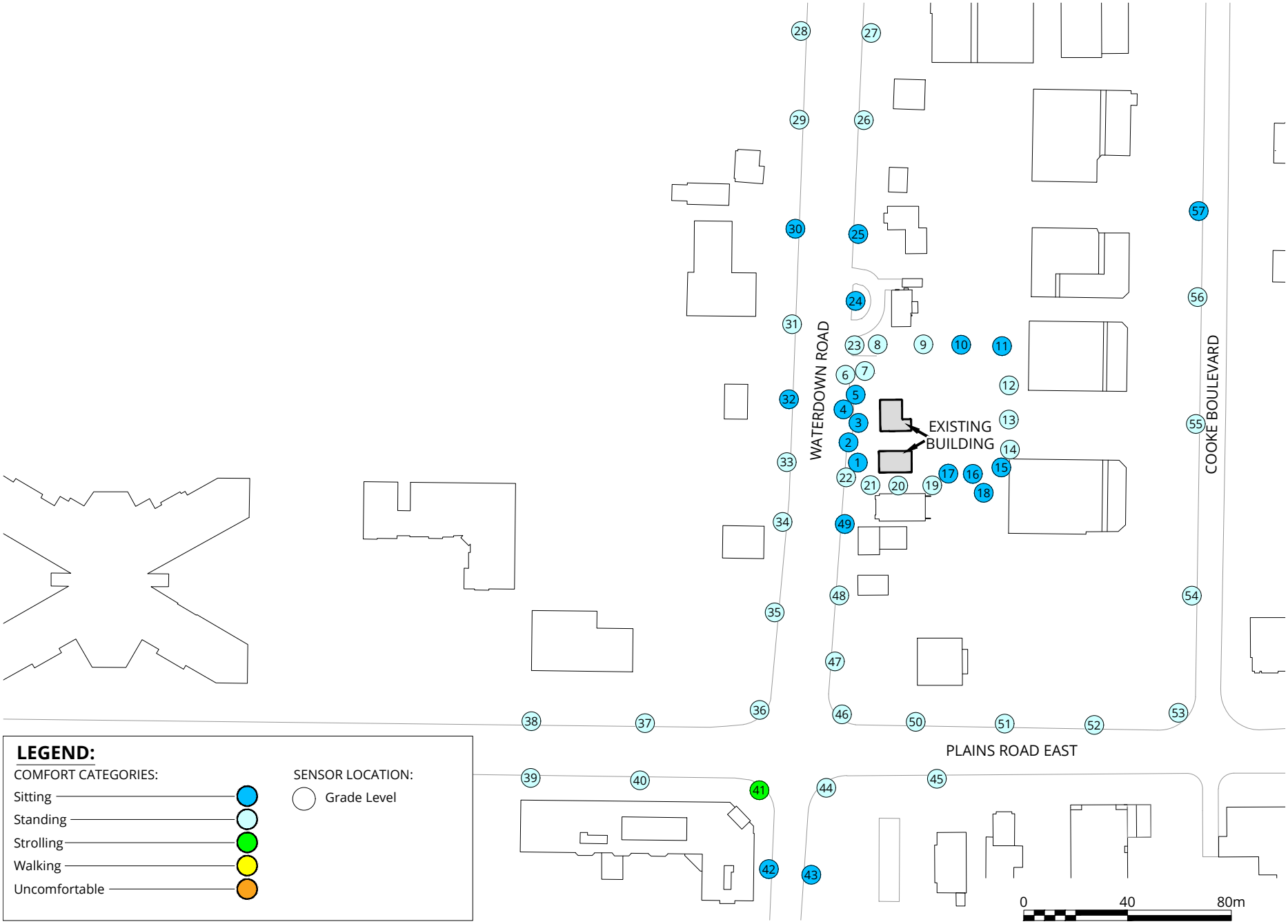
The wind conditions presented in this report pertain to the model of the 1029-1033 Waterdown Road development constructed using the drawings and information listed below. Should there be any design changes that deviate from this list of drawings, the predicted wind conditions may change. Therefore, if changes in the design are made, it is recommended that RWDI be contacted and requested to review their potential effects on wind conditions.

File Name	File Type	Date Received (dd/mm/yyyy)
INFINITY TOWER DXF	DWG	03/11/2021
INFINITY TOWER FBX	Rhino	03/11/2021

5 REFERENCES

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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



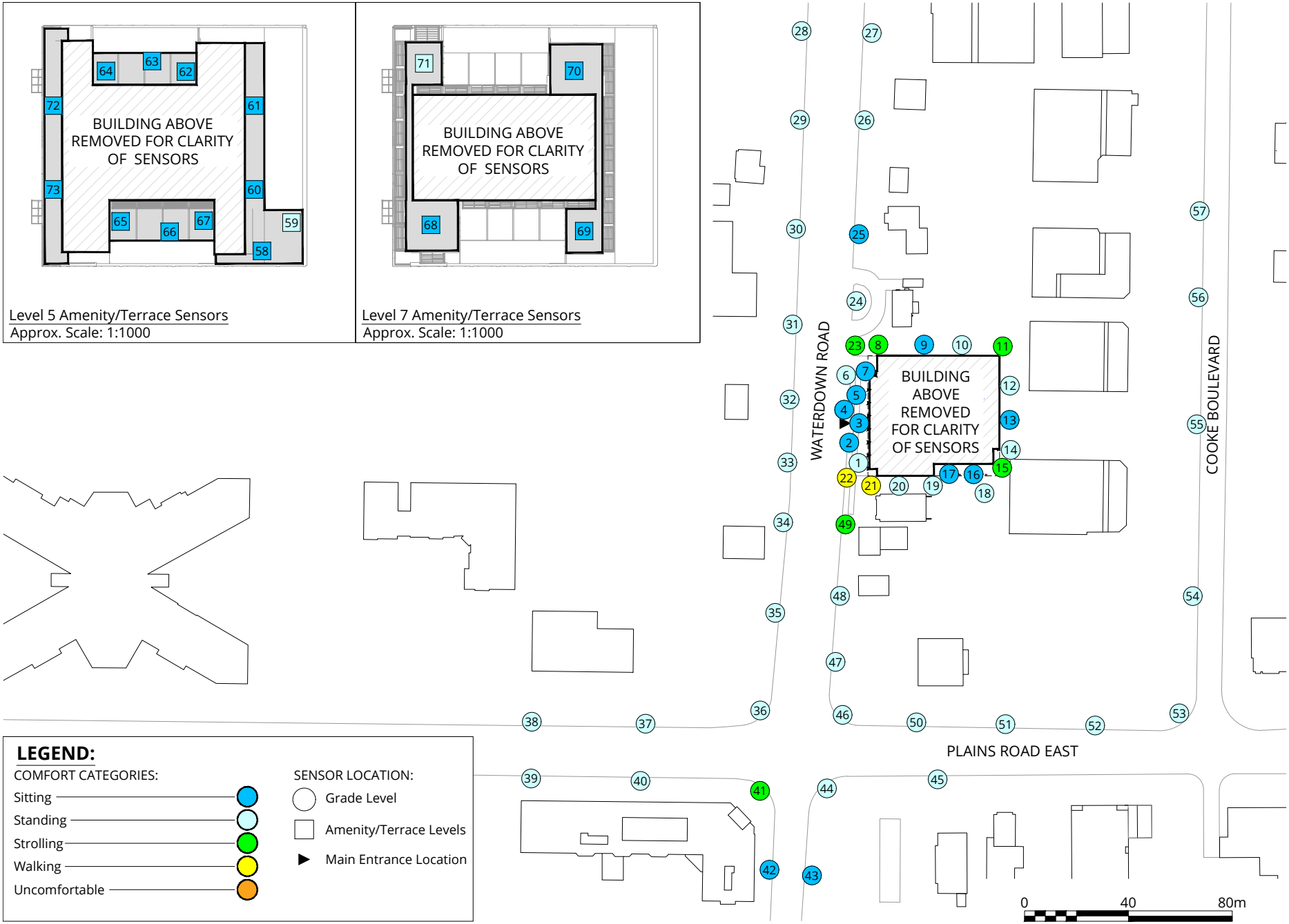
Pedestrian Wind Comfort Conditions
Existing Configuration
Summer (May to October, 6:00 to 23:00)

1029-1033 Waterdown Road - Burlington, ON

True North

Project #2103229

Drawn by: DF	Figure: 1A
Approx. Scale:	1:2000
Date Revised:	Nov. 29, 2021



Level 5 Amenity/Terrace Sensors
Approx. Scale: 1:1000

Level 7 Amenity/Terrace Sensors
Approx. Scale: 1:1000

LEGEND:

COMFORT CATEGORIES:
- Sitting
- Standing
- Strolling
- Walking
- Uncomfortable

SENSOR LOCATION:
- Grade Level
- Amenity/Terrace Levels
- Main Entrance Location

Pedestrian Wind Comfort Conditions

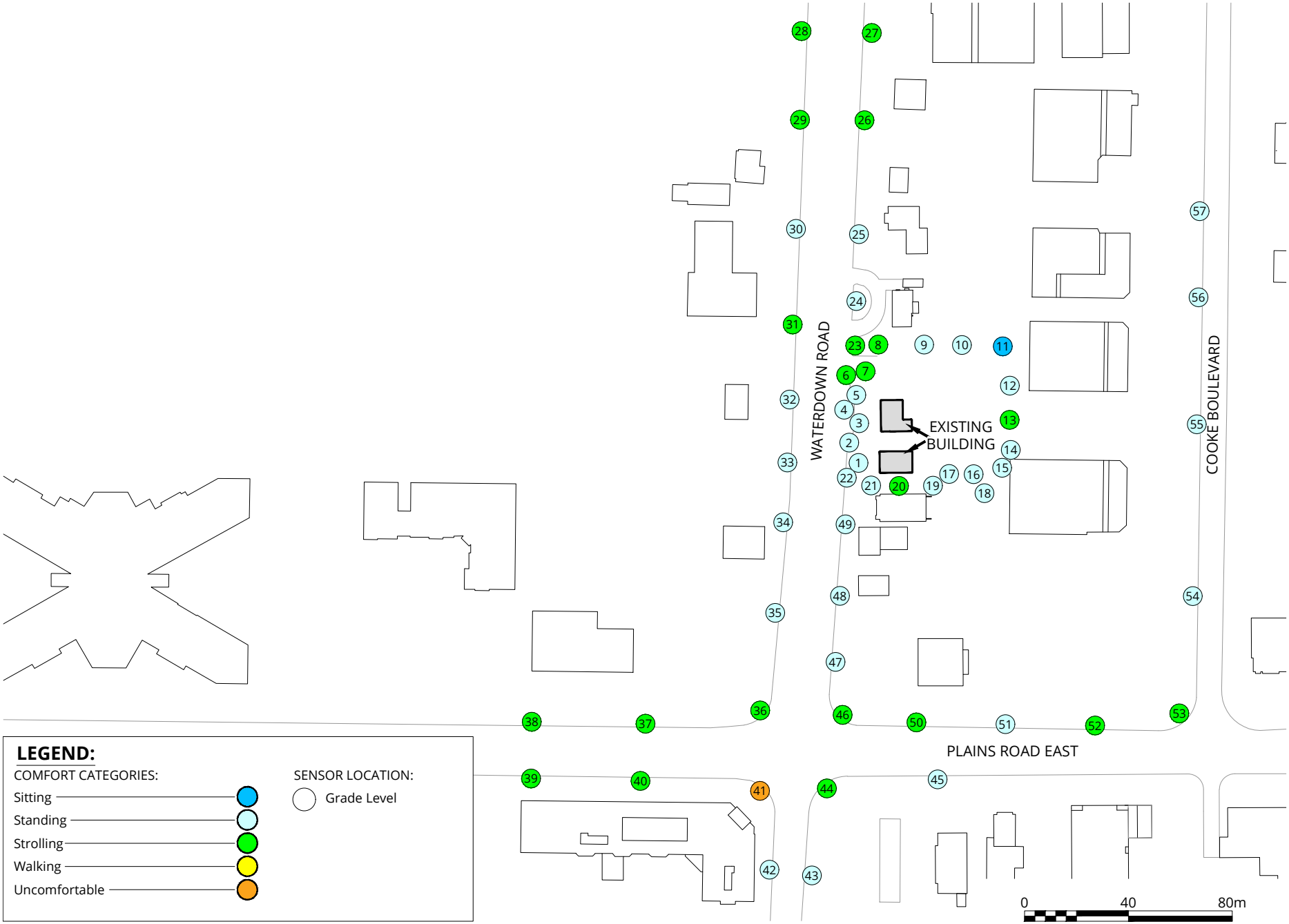
Proposed Configuration
Summer (May to October, 6:00 to 23:00)

1029-1033 Waterdown Road - Burlington, ON

True North

Project #2103229

Drawn by: DF	Figure: 1B
Approx. Scale:	1:2000
Date Revised:	Nov. 29, 2021



Pedestrian Wind Comfort Conditions

Existing Configuration

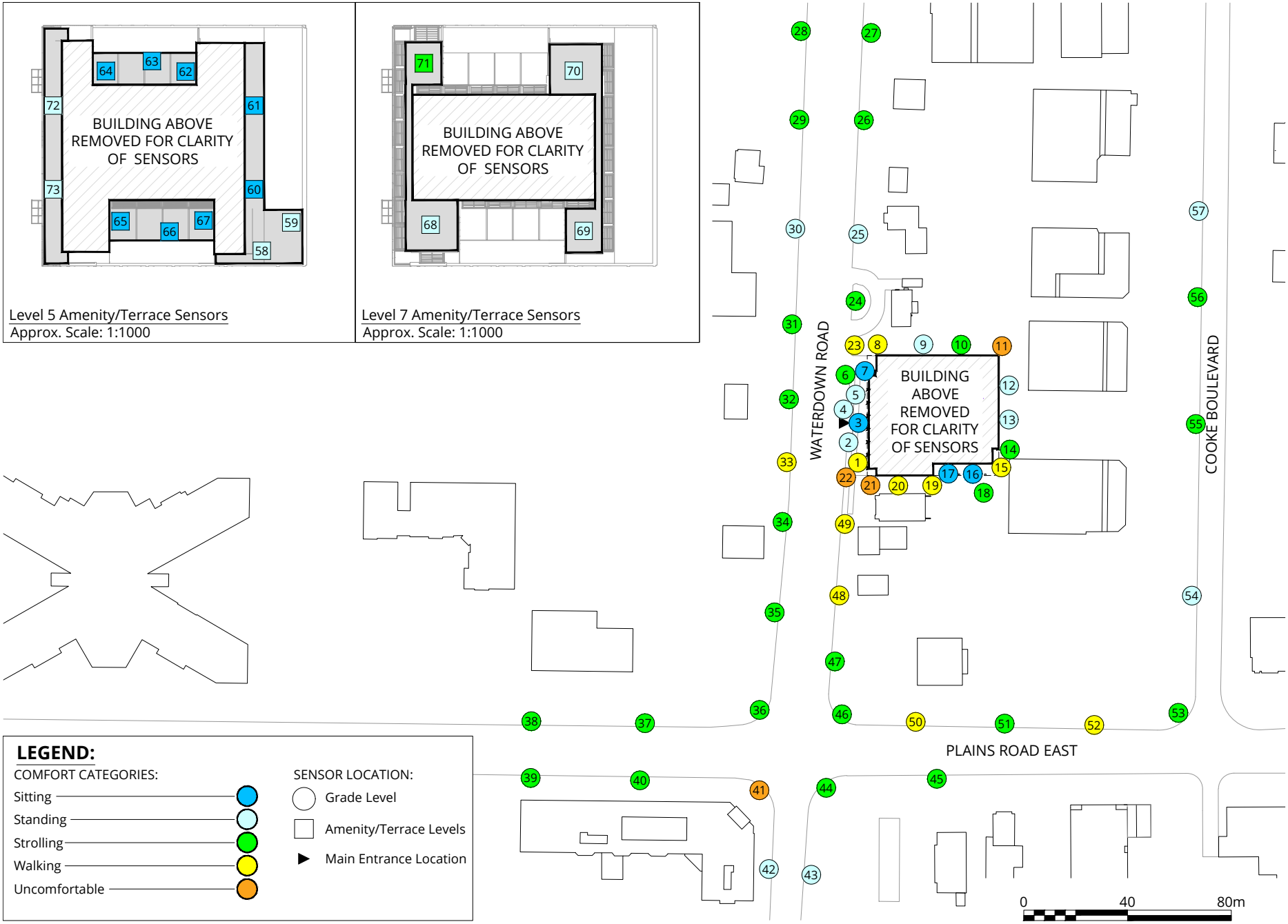
Winter (November to April, 6:00 to 23:00)

1029-1033 Waterdown Road - Burlington, ON

True North

Project #2103229

Drawn by: DF	Figure: 2A
Approx. Scale:	1:2000
Date Revised:	Nov. 29, 2021



Level 5 Amenity/Terrace Sensors
Approx. Scale: 1:1000

Level 7 Amenity/Terrace Sensors
Approx. Scale: 1:1000

Pedestrian Wind Comfort Conditions

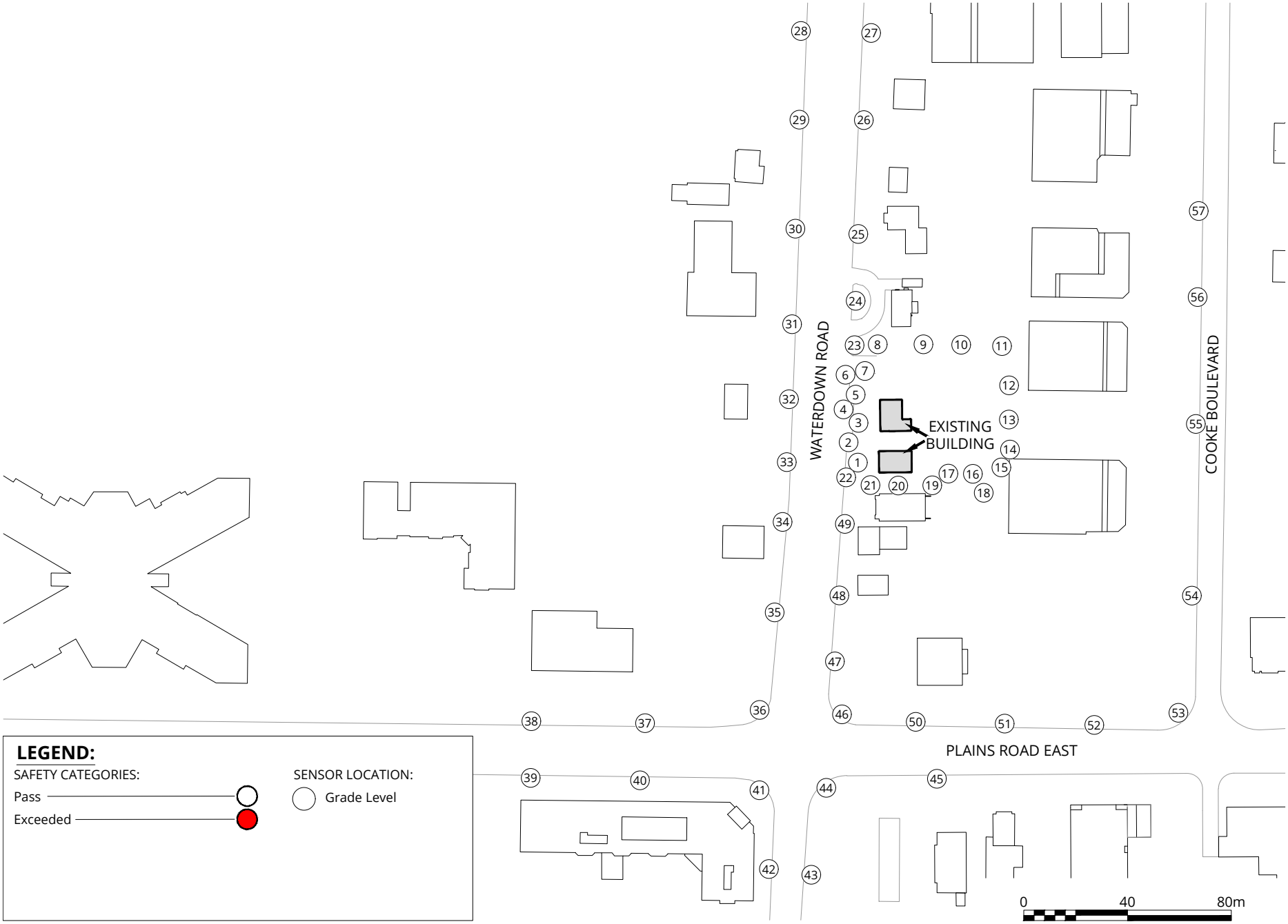
Proposed Configuration
Winter (November to April, 6:00 to 23:00)

1029-1033 Waterdown Road - Burlington, ON

True North

Project #2103229

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Approx. Scale:	1:2000
Date Revised:	Nov. 29, 2021



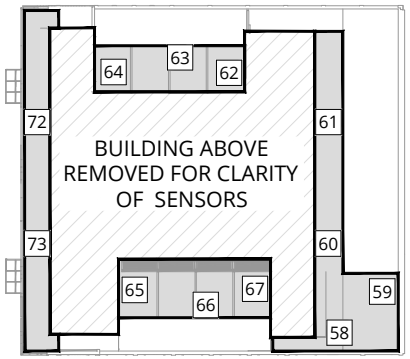
Pedestrian Wind Safety Conditions
Existing Configuration
Annual (January to December, 0:00 to 23:00)

1029-1033 Waterdown Road - Burlington, ON

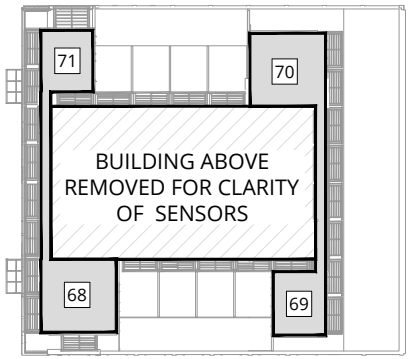
True North

Project #2103229

Drawn by: DF	Figure: 3A
Approx. Scale:	1:2000
Date Revised:	Nov. 29, 2021



Level 5 Amenity/Terrace Sensors
Approx. Scale: 1:1000



Level 7 Amenity/Terrace Sensors
Approx. Scale: 1:1000

LEGEND:

SAFETY CATEGORIES:
- Pass
- Exceeded

SENSOR LOCATION:
- Grade Level
- Amenity/Terrace Levels
- Main Entrance Location

Pedestrian Wind Safety Conditions

Proposed Configuration
Annual (January to December, 0:00 to 23:00)

1029-1033 Waterdown Road - Burlington, ON

True North

Project #2103229

Drawn by: DF	Figure: 3B
Approx. Scale:	1:2000
Date Revised:	Nov. 29, 2021

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	9	Sitting	12	Standing	48	Pass
	Proposed	14	Standing	19	Walking	74	Pass
2	Existing	10	Sitting	13	Standing	54	Pass
	Proposed	10	Sitting	14	Standing	56	Pass
3	Existing	9	Sitting	11	Standing	45	Pass
	Proposed	8	Sitting	10	Sitting	41	Pass
4	Existing	10	Sitting	12	Standing	49	Pass
	Proposed	10	Sitting	13	Standing	60	Pass
5	Existing	10	Sitting	13	Standing	48	Pass
	Proposed	9	Sitting	11	Standing	43	Pass
6	Existing	11	Standing	15	Strolling	57	Pass
	Proposed	13	Standing	15	Strolling	77	Pass
7	Existing	12	Standing	15	Strolling	64	Pass
	Proposed	7	Sitting	9	Sitting	43	Pass
8	Existing	13	Standing	16	Strolling	62	Pass
	Proposed	15	Strolling	19	Walking	85	Pass
9	Existing	11	Standing	13	Standing	55	Pass
	Proposed	10	Sitting	13	Standing	57	Pass
10	Existing	9	Sitting	12	Standing	47	Pass
	Proposed	12	Standing	15	Strolling	62	Pass
11	Existing	8	Sitting	10	Sitting	43	Pass
	Proposed	17	Strolling	22	Uncomfortable	85	Pass
12	Existing	11	Standing	14	Standing	56	Pass
	Proposed	11	Standing	13	Standing	58	Pass
13	Existing	12	Standing	15	Strolling	58	Pass
	Proposed	10	Sitting	12	Standing	48	Pass
14	Existing	11	Standing	14	Standing	56	Pass
	Proposed	14	Standing	17	Strolling	66	Pass
15	Existing	9	Sitting	11	Standing	46	Pass
	Proposed	15	Strolling	18	Walking	73	Pass
16	Existing	9	Sitting	11	Standing	48	Pass
	Proposed	8	Sitting	10	Sitting	53	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
17	Existing	9	Sitting	11	Standing	45	Pass
	Proposed	7	Sitting	8	Sitting	55	Pass
18	Existing	9	Sitting	11	Standing	44	Pass
	Proposed	12	Standing	15	Strolling	86	Pass
19	Existing	11	Standing	14	Standing	55	Pass
	Proposed	14	Standing	19	Walking	86	Pass
20	Existing	11	Standing	15	Strolling	62	Pass
	Proposed	14	Standing	18	Walking	91	Exceeded
21	Existing	11	Standing	14	Standing	53	Pass
	Proposed	18	Walking	24	Uncomfortable	108	Exceeded
22	Existing	11	Standing	14	Standing	52	Pass
	Proposed	18	Walking	24	Uncomfortable	81	Pass
23	Existing	12	Standing	16	Strolling	59	Pass
	Proposed	16	Strolling	20	Walking	78	Pass
24	Existing	10	Sitting	13	Standing	49	Pass
	Proposed	13	Standing	16	Strolling	71	Pass
25	Existing	10	Sitting	13	Standing	50	Pass
	Proposed	10	Sitting	13	Standing	56	Pass
26	Existing	12	Standing	15	Strolling	59	Pass
	Proposed	12	Standing	15	Strolling	65	Pass
27	Existing	12	Standing	15	Strolling	53	Pass
	Proposed	12	Standing	15	Strolling	55	Pass
28	Existing	13	Standing	17	Strolling	58	Pass
	Proposed	13	Standing	17	Strolling	60	Pass
29	Existing	12	Standing	16	Strolling	57	Pass
	Proposed	12	Standing	15	Strolling	60	Pass
30	Existing	10	Sitting	13	Standing	52	Pass
	Proposed	11	Standing	13	Standing	61	Pass
31	Existing	11	Standing	15	Strolling	55	Pass
	Proposed	13	Standing	15	Strolling	73	Pass
32	Existing	10	Sitting	13	Standing	49	Pass
	Proposed	13	Standing	16	Strolling	65	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
33	Existing	11	Standing	14	Standing	53	Pass
	Proposed	14	Standing	18	Walking	77	Pass
34	Existing	11	Standing	14	Standing	56	Pass
	Proposed	13	Standing	17	Strolling	61	Pass
35	Existing	11	Standing	14	Standing	57	Pass
	Proposed	12	Standing	15	Strolling	59	Pass
36	Existing	12	Standing	15	Strolling	59	Pass
	Proposed	13	Standing	17	Strolling	61	Pass
37	Existing	12	Standing	15	Strolling	59	Pass
	Proposed	12	Standing	16	Strolling	61	Pass
38	Existing	12	Standing	16	Strolling	60	Pass
	Proposed	12	Standing	16	Strolling	60	Pass
39	Existing	14	Standing	17	Strolling	67	Pass
	Proposed	14	Standing	17	Strolling	66	Pass
40	Existing	13	Standing	16	Strolling	62	Pass
	Proposed	13	Standing	16	Strolling	64	Pass
41	Existing	16	Strolling	21	Uncomfortable	75	Pass
	Proposed	16	Strolling	21	Uncomfortable	76	Pass
42	Existing	10	Sitting	13	Standing	62	Pass
	Proposed	10	Sitting	12	Standing	63	Pass
43	Existing	10	Sitting	13	Standing	55	Pass
	Proposed	10	Sitting	12	Standing	51	Pass
44	Existing	12	Standing	16	Strolling	60	Pass
	Proposed	13	Standing	17	Strolling	63	Pass
45	Existing	11	Standing	14	Standing	55	Pass
	Proposed	12	Standing	16	Strolling	58	Pass
46	Existing	12	Standing	15	Strolling	57	Pass
	Proposed	13	Standing	17	Strolling	60	Pass
47	Existing	11	Standing	14	Standing	53	Pass
	Proposed	12	Standing	16	Strolling	58	Pass
48	Existing	11	Standing	14	Standing	53	Pass
	Proposed	13	Standing	18	Walking	68	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
49	Existing	9	Sitting	11	Standing	46	Pass
	Proposed	15	Strolling	20	Walking	82	Pass
50	Existing	13	Standing	17	Strolling	60	Pass
	Proposed	14	Standing	19	Walking	65	Pass
51	Existing	11	Standing	14	Standing	60	Pass
	Proposed	12	Standing	16	Strolling	62	Pass
52	Existing	13	Standing	16	Strolling	67	Pass
	Proposed	14	Standing	18	Walking	68	Pass
53	Existing	12	Standing	16	Strolling	62	Pass
	Proposed	13	Standing	16	Strolling	63	Pass
54	Existing	11	Standing	14	Standing	51	Pass
	Proposed	11	Standing	14	Standing	55	Pass
55	Existing	12	Standing	14	Standing	58	Pass
	Proposed	13	Standing	17	Strolling	71	Pass
56	Existing	11	Standing	14	Standing	57	Pass
	Proposed	13	Standing	16	Strolling	58	Pass
57	Existing	10	Sitting	13	Standing	51	Pass
	Proposed	11	Standing	13	Standing	53	Pass
58	Existing	-	-	-	-	-	-
	Proposed	9	Sitting	11	Standing	67	Pass
59	Existing	-	-	-	-	-	-
	Proposed	12	Standing	14	Standing	66	Pass
60	Existing	-	-	-	-	-	-
	Proposed	8	Sitting	10	Sitting	50	Pass
61	Existing	-	-	-	-	-	-
	Proposed	8	Sitting	10	Sitting	54	Pass
62	Existing	-	-	-	-	-	-
	Proposed	6	Sitting	9	Sitting	42	Pass
63	Existing	-	-	-	-	-	-
	Proposed	6	Sitting	8	Sitting	34	Pass
64	Existing	-	-	-	-	-	-
	Proposed	5	Sitting	6	Sitting	35	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
65	Existing	-	-	-	-	-	-
	Proposed	5	Sitting	7	Sitting	42	Pass
66	Existing	-	-	-	-	-	-
	Proposed	5	Sitting	6	Sitting	29	Pass
67	Existing	-	-	-	-	-	-
	Proposed	6	Sitting	7	Sitting	34	Pass
68	Existing	-	-	-	-	-	-
	Proposed	10	Sitting	13	Standing	75	Pass
69	Existing	-	-	-	-	-	-
	Proposed	10	Sitting	12	Standing	77	Pass
70	Existing	-	-	-	-	-	-
	Proposed	10	Sitting	12	Standing	69	Pass
71	Existing	-	-	-	-	-	-
	Proposed	12	Standing	16	Strolling	77	Pass
72	Existing	-	-	-	-	-	-
	Proposed	9	Sitting	11	Standing	45	Pass
73	Existing	-	-	-	-	-	-
	Proposed	10	Sitting	13	Standing	53	Pass

Season	Months	Hours
Summer	May - October	6:00 - 23:00 for comfort
Winter	November - April	6:00 - 23:00 for comfort
Annual	January - December	0:00 - 23:00 for safety

Configurations	
Existing	Existing site and surroundings
Proposed	Project with existing surroundings

Comfort Speed (km/h) (20% Seasonal Exceedance)	
≤ 10	Sitting
11 - 14	Standing
15 - 17	Strolling
18 - 20	Walking
> 20	Uncomfortable

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