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Date: April 25, 2022

To: 335 Plains Holding Inc. & 355 Plains Holding Inc.
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Re: **Pedestrian Wind Assessment**
355 Plains Road &
1010 Downsview Drive
Burlington, ON
SLR Project #241.30473.00000

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Credit: srm Architects Inc.



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1.0 INTRODUCTION

SLR Consulting (Canada) Ltd. (SLR) was retained by 335 Plains Holding Inc. & 355 Plains Holding Inc. to conduct a pedestrian wind assessment for the proposed development at 355 Plains Road East and 1010 Downsview Drive in Burlington, Ontario. This report is in support of the combined Official Plan Amendment (OPA) and Zoning By-law Amendment (ZBA) application for the development.

1.1 Existing Site

The proposed development is located at the intersection of Plains Road East and Downsview Drive, on both sides of Downsview Drive in Burlington, Ontario. The site is currently occupied by two low-rise commercial buildings, which will be demolished. Figure 1 provides an aerial view of the immediate study area. A virtual site visit was conducted by SLR using Google Earth images dated June 2018 and October 2020; some of these images are included in Figures 2a through 2d.

Immediately surrounding the site are low-rise residential and commercial developments in all directions. Beyond the immediate surroundings there are also low-rise residential and commercial buildings in all directions. Aldershot Park and tennis club is approximately 220 m to the west of the project site.

Typically, developments with Site Plan Control approval and/or those currently under construction within a 500 m radius are included as existing surroundings. For this assessment, the following SPC-approved developments were included per the City's instructions: 284-292 Plains Road East and the recently constructed 320-340 Plains Road East.



Figure 1: Aerial view of existing site & surroundings
Credit: Google Earth Pro, dated 7/8/2018



Figure 2a: Along Downsview looking northeast at the site



Figure 2b: Along Downsview looking southwest at the site



Figure 2c: Along Plains Road East looking northeast (site to the left)



Figure 2d: Along Downland Crescent looking southeast

1.2 Proposed Development

The proposed development includes two buildings and a row of townhouse units. Figure 3 provides the north elevation of the proposed development.

The proposed 355 Plains Road East development is located on the east side of Downview Drive. It includes two buildings 8 and is 11-storeys tall, with its highest point being 34 m excluding the mechanical penthouse and 39 m including the mechanical penthouse.

The proposed 1010 Dowsnview Drive development is located on the west side of Downsview Drive and is nine storeys tall, for a total height of approximately 25 m excluding the mechanical penthouse and 30 m including the mechanical penthouse.

In addition, there are two three-storey townhouse buildings located on the north edge of both lots.

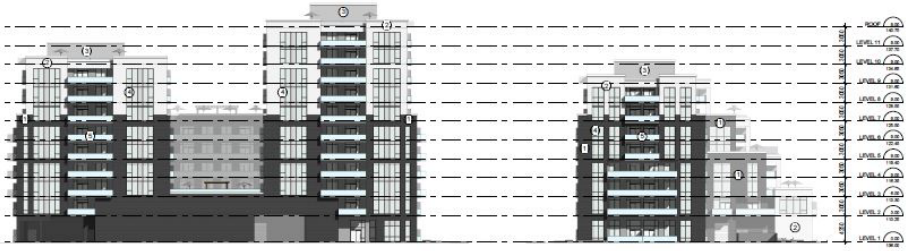


Figure 3: North elevation of proposed development
Credit: srm Architects Inc.

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. There are two transit stops along Plains Road East within the project's vicinity.

The main entrances and commercial entrances to the proposed development are located on the south facades along Plains Road East. Individual townhouse entrances are located on the north side of the site. On-site areas of interest are shown in Figure 4. In addition, outdoor amenity terraces of the proposed development are located on Level 3 of both proposed buildings and Level 7 of 355 Plains Road East development.

Note, Project North is approximately 44° counter-clockwise from True North. When referring to the building, Project North is used; when referring to wind directions, True North is used.

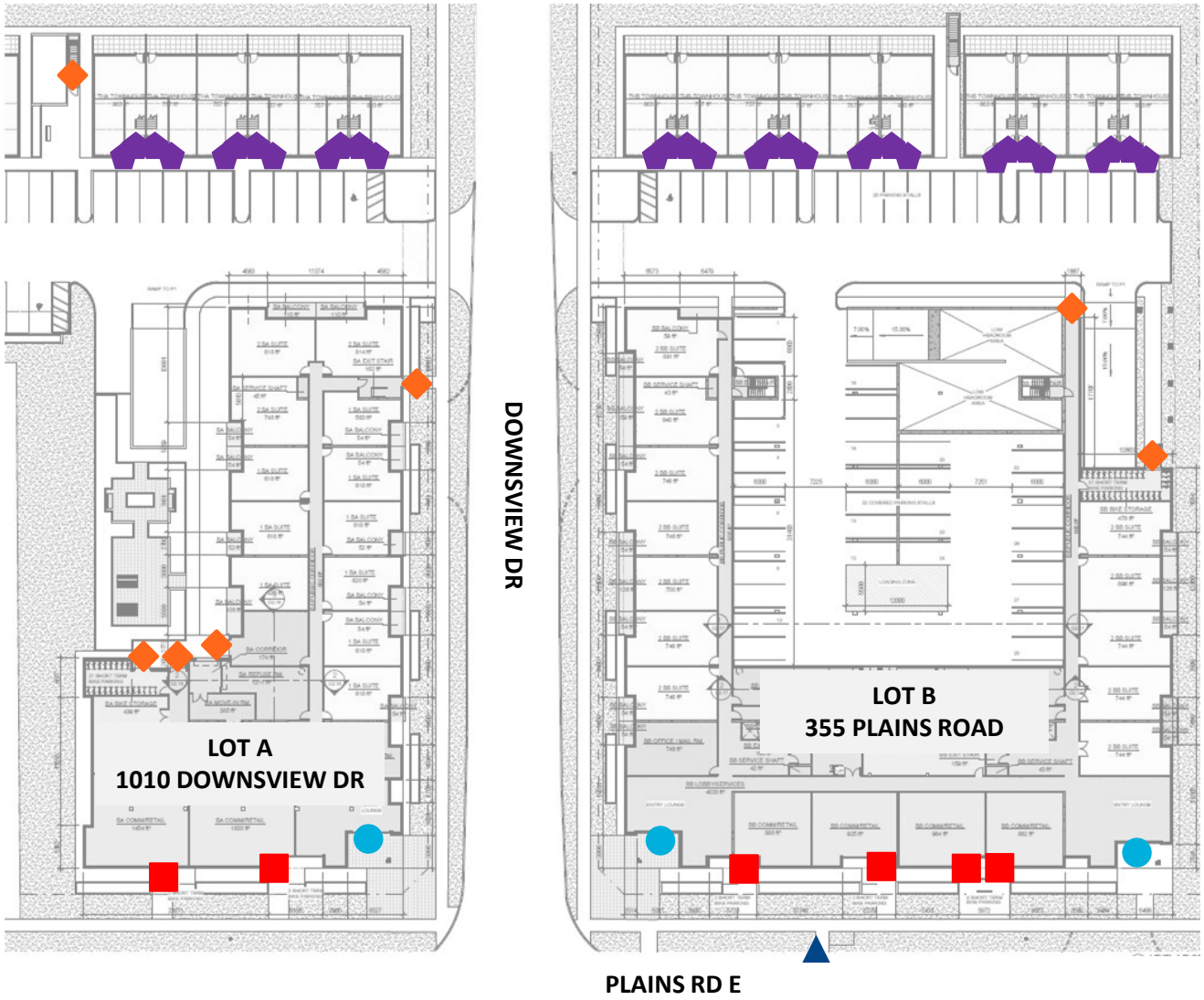


Figure 4: Areas of interest – Main floor plan

2.0 APPROACH

A screening-level assessment was conducted using computational fluid dynamics (CFD). As with any simulation, there are some limitations with this modeling technique, specifically in the ability to simulate the turbulence, or gustiness, of the wind. Nonetheless, CFD analysis remains a useful tool to identify potential wind issues, especially when assessing mean wind speeds. This CFD-based mean wind speed assessment employs a comparable analysis methodology to that used in wind tunnel testing. The results of CFD modeling are also an excellent means of readily identifying relative changes in wind conditions associated with different site configurations or with alternative built forms.

2.1 Methodology

Wind comfort conditions for areas of interest were predicted on and around the development site to identify potentially problematic windy areas. A 3D model of the proposed development, as well as floor plans and elevations, were provided by srm Architects Inc. on March 1, 2022. A view of the 3D model used in the computer wind comfort analysis is shown in Figure 5b. This model included surrounding buildings within 500 m from the study site centre. The simulations were performed using CFD software by Meteodyn Inc. The entire 3D space throughout the modeled area is filled with a three-dimensional grid. The CFD virtual wind tunnel calculates wind speed at each one of the 3D grid points. The upstream "roughness" for each test direction is adjusted to reflect the various upwind conditions and wind characteristics encountered around the actual site. Wind flows for a total of 16 compass directions were simulated. Although wind speeds are calculated throughout the entire modeled area, wind comfort conditions were only plotted for a smaller area immediately surrounding the proposed development.

SLR assessed two configurations for comparison purposes. The descriptions are as follows:

- **Existing Configuration:** Existing site with existing and approved surroundings
- **Proposed Configuration:** Proposed development with existing and approved surroundings

A view of two configurations are shown in Figures 5a and 5b.

Wind flows were predicted for both the existing site, as well as with the proposed development for comparison. The CFD-predicted wind speeds for all test directions and grid points were then combined with historical wind climate data for the region to predict the occurrence of wind speeds in the pedestrian realm, and to compare against wind criteria for comfort and safety; these results are shown in the various wind flow images. The analysis of wind conditions is undertaken for two seasons: Winter (November to April) and Summer (May to October).

Results are presented through discussion of the wind conditions along major streets and the areas of interest. The comfort criteria are based on predictions of localized wind forces combined with frequency of occurrence. Climate factors that influence a person's overall "thermal" comfort, (e.g., temperature, humidity, wind chill, exposure to sun or shade, etc.) are not considered in the comfort rating.

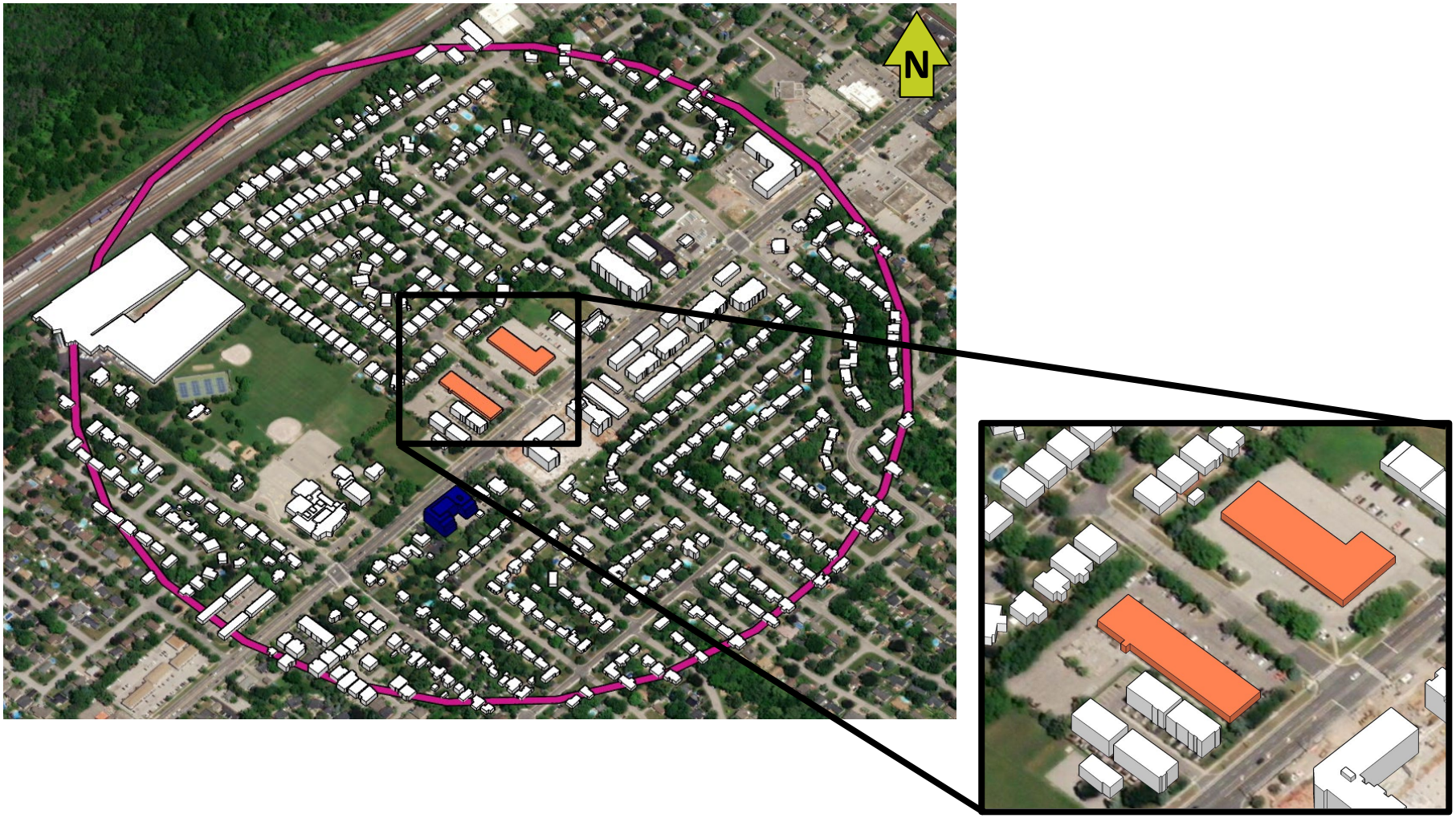


Figure 5a: Massing Model – Existing Configuration

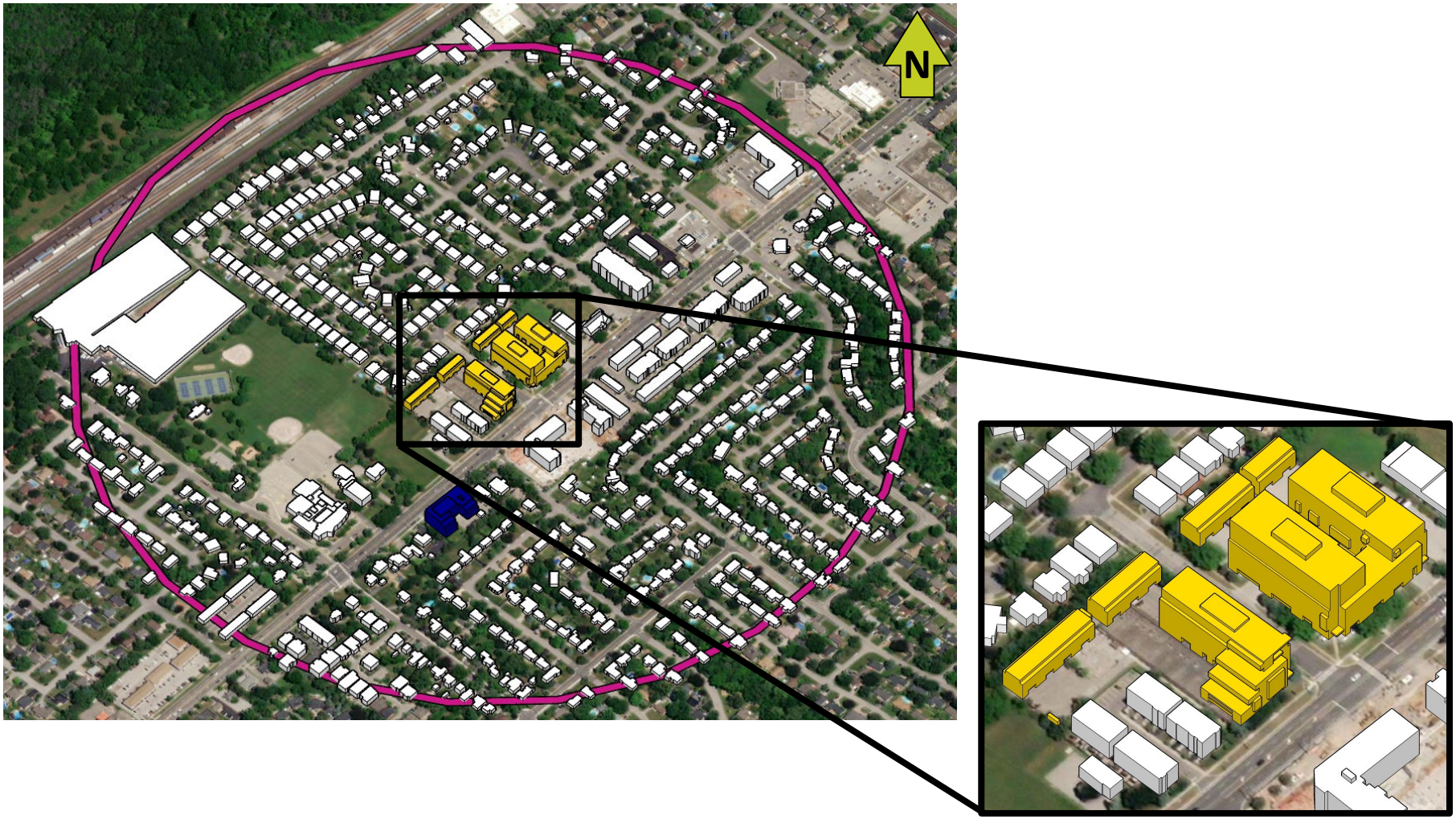


Figure 5b: Massing Model – Proposed Configuration

WIND CLIMATE

Wind data recorded at John C. Munro International Airport in Hamilton for the period of 1993 to 2019 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 6. 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 southwest and northeast quadrants are most prevalent. The seasonal wind roses readily show how the prevalent winds shift throughout the year. The seasonal wind roses show daytime winds, from 6:00 – 23:00, while the annual wind rose shows all hours.

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 6 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 southwest and northeast quadrants. All wind speeds and directions were included in the wind climate model.

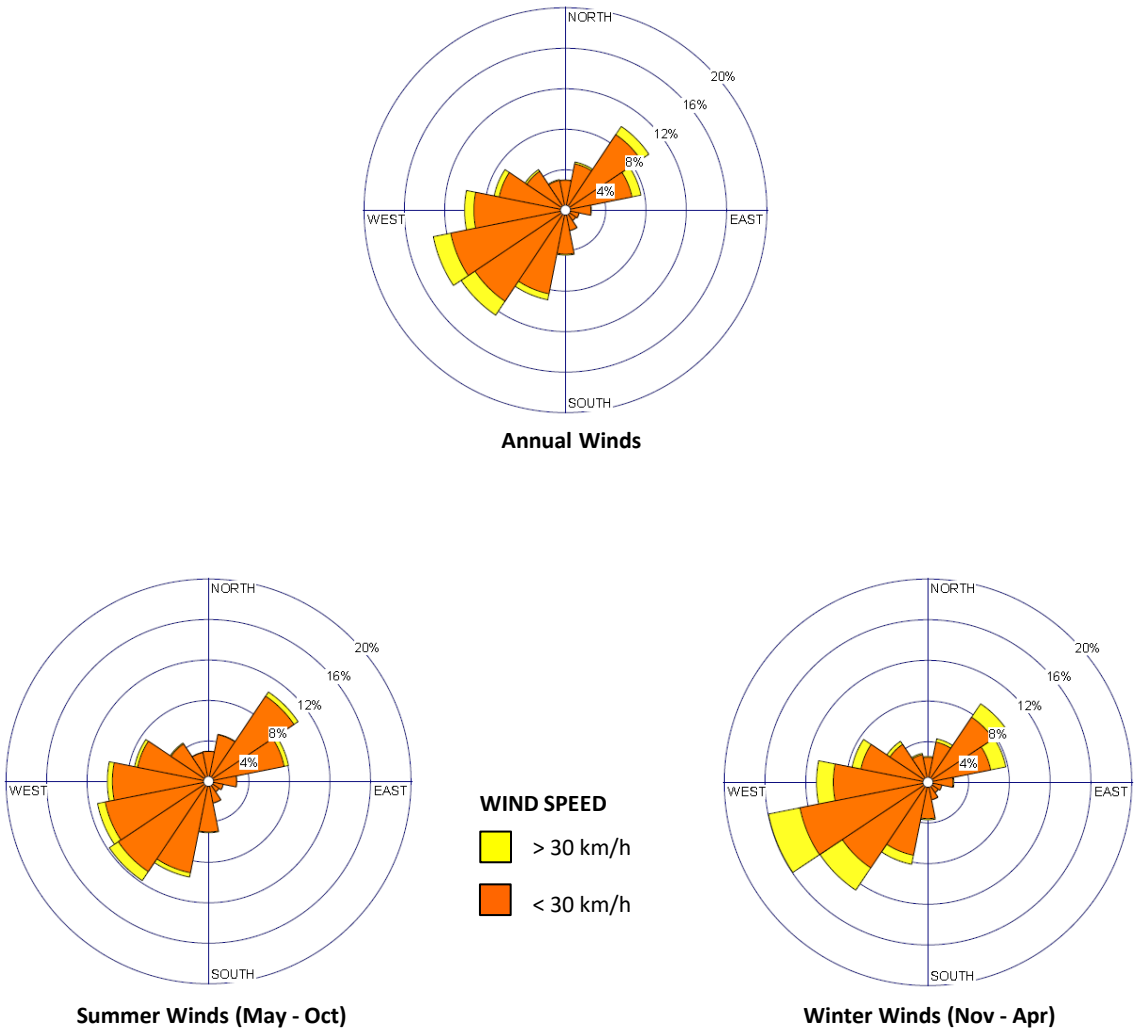


Figure 6: Wind Roses for John C. Munro International Airport (1993-2019, 6am–11pm)

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 criteria utilized for this analysis is provided by the City of Burlington, in the document Pedestrian Level Wind Study Guidelines and Terms of Reference (June 2020). The comfort criteria, which is based on certain predicted hourly gust-equivalent mean (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 mean wind speed or the 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 more than one event is predicted annually, wind mitigation measures are then advised. The wind safety criterion is shown in Table 2.

Table 1: Wind Comfort Criteria

Activity	Comfort Ranges for GEM Wind Speed Exceeded 20% of the Time		Description of Wind Comfort
Sitting	0 to 10 km/h	0 to 2.8 m/s	Calm or light breezes desired for outdoor restaurants and seating areas where one can read a paper comfortably.
Standing	0 to 14 km/h	0 to 3.9 m/s	Gentle breezes suitable for main building entrances and transit stops.
Strolling	0 to 17 km/h	0 to 4.7 m/s	Moderate breezes suitable for walking along pedestrian thorough fares.
Walking	0 to 20 km/h	0 to 5.6 m/s	Strong breezes that can be tolerated if one's objective is to walk, run or cycle without lingering.
Uncomfortable	> 20 km/h	> 5.6 m/s	Strong winds of this magnitude are considered a nuisance for most activities, and wind mitigation is typically recommended.

Table 2: Wind Safety Criterion

Activity	Safety Criterion Gust Wind Speed Exceeded Once Per Year (0.1%)		Description of Wind Effects
Any	90 km/h	25 m/s	Excessive gust speeds that can adversely affect a pedestrian's balance and footing. Wind mitigation is typically required.

4.0 RESULTS

Figures 7a through 10b present graphical images of the wind comfort conditions for the summer and winter months around the proposed development. These represent the seasonal extremes of best and worst cases. Appendix A presents the wind safety conditions on an annual basis.

There are generally accepted wind comfort levels that are desired for various pedestrian uses. For example, for public sidewalks, wind comfort suitable for leisurely walking would be desirable year-round. For main entrances and transit stops, wind conditions conducive to standing would be preferred throughout the year, but can be difficult to achieve in regions where winter winds are inherently harsh. For amenity spaces, wind conditions suitable for sitting and/or standing are generally desirable during the summer months. The most stringent category of sitting is considered appropriate for cafes and dedicated seating areas, while for parks sitting and/or standing would be appropriate in the summer.

4.1 Building Entrances & Walkways

Existing wind conditions on-site are expected to be comfortable for sitting or standing year-round (Figures 7a and 8a).

In the Proposed Configuration, wind conditions on the site are predicted to remain comfortable for sitting or standing throughout the year (Figures 7b and 8b). This includes the parking lots of the proposed development.

Wind conditions at the main entrances, commercial entrances and all secondary entrances are expected to be comfortable for sitting or standing year-round, which is considered suitable for the intended use (Figures 9a and 9b).

4.2 Amenity Terraces

Wind conditions on the proposed terraces of both buildings, at Levels 3 and 7, are expected to be comfortable for sitting and standing throughout the year, which is considered suitable for the intended use (Figures 10a and 10b).

4.3 Surrounding Sidewalks

Existing wind conditions along the sidewalks of Plains Road East, Downsview Drive and Dowland Crescent are expected to be comfortable for sitting or standing year-round. Wind conditions at the nearby transit stops along Plains Road East are expected to be comfortable for sitting year-round. Wind conditions in Aldershot Park are also expected to be comfortable for sitting year-round (Figures 7a and 8a).

With the proposed development in place, wind conditions are predicted to remain suitable for sitting or standing throughout the year on the surrounding sidewalks, park and at the nearby transit stops (Figures 7b and 8b).

These wind conditions are considered satisfactory for the anticipated use.

4.4 Wind Safety

The wind safety criterion is expected to be met in all at-grade level and above-grade level areas on an annual basis for both the Existing and Proposed Configurations (Appendix A).

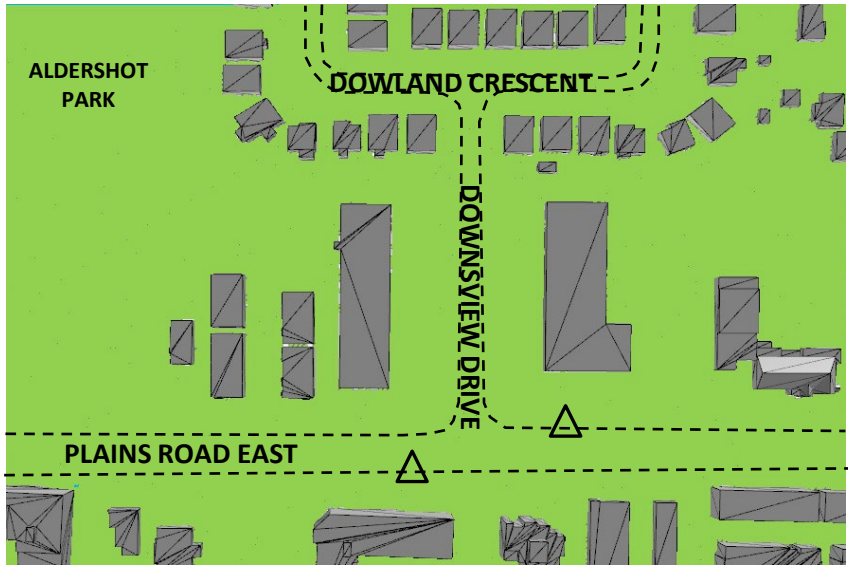


Figure 7a: Existing Configuration – Pedestrian Wind Comfort Summer – On-site & Surrounding Areas

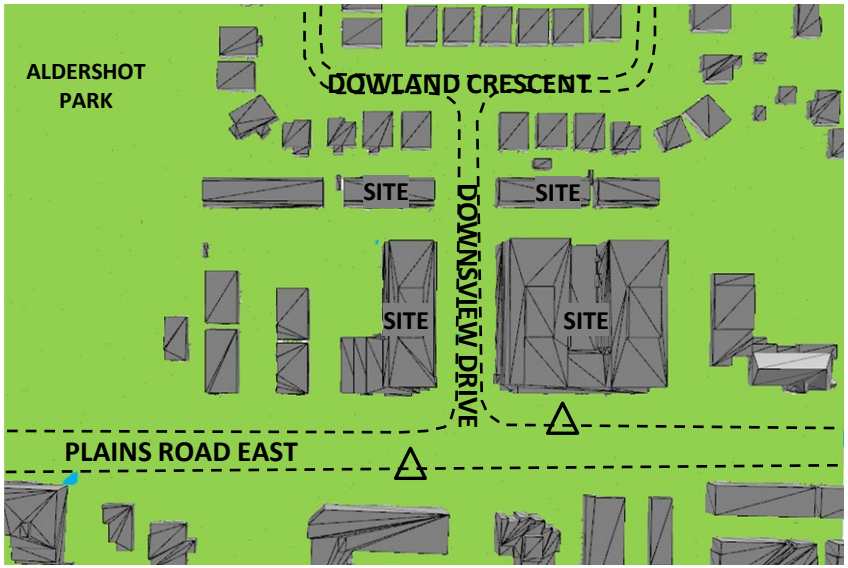


Figure 7b: Proposed Configuration – Pedestrian Wind Comfort Summer – On-site & Surrounding Areas

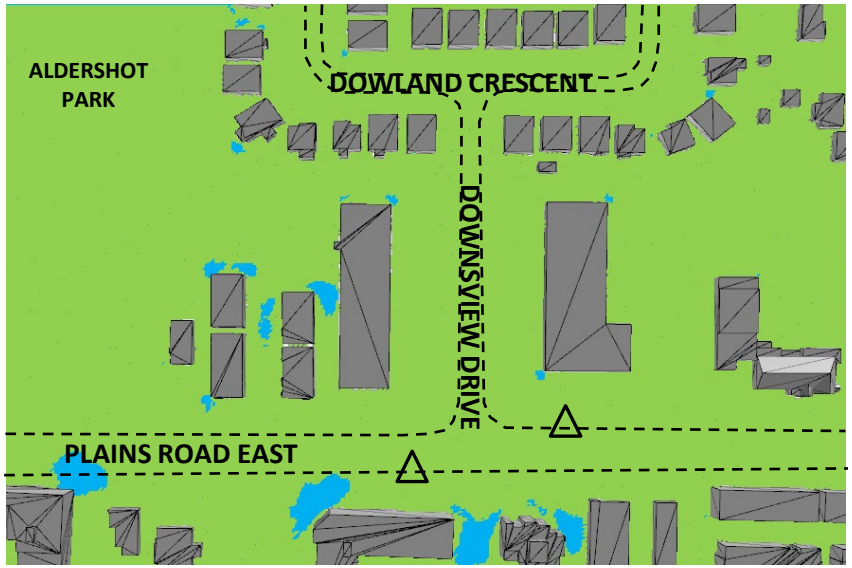


Figure 8a: Existing Configuration – Pedestrian Wind Comfort Winter – On-site & Surrounding Areas

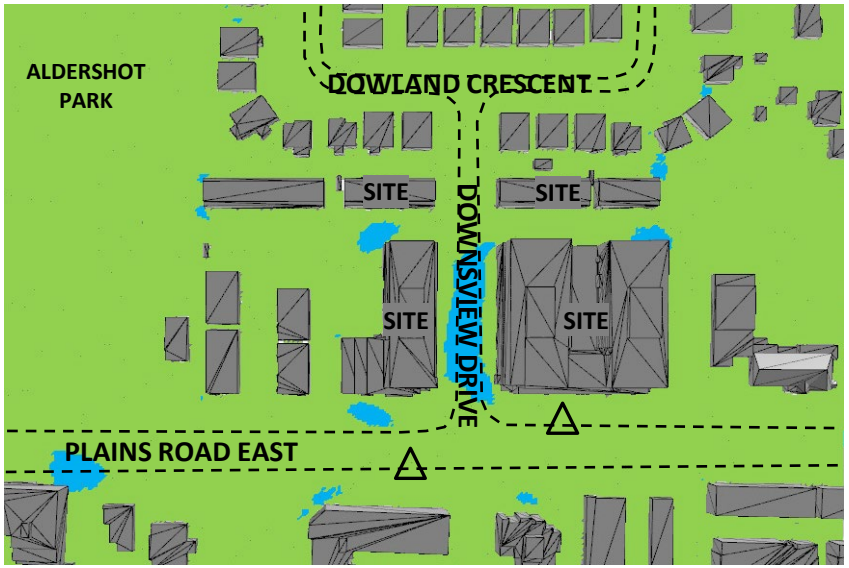


Figure 8b: Proposed Configuration – Pedestrian Wind Comfort Winter – On-site & Surrounding Areas

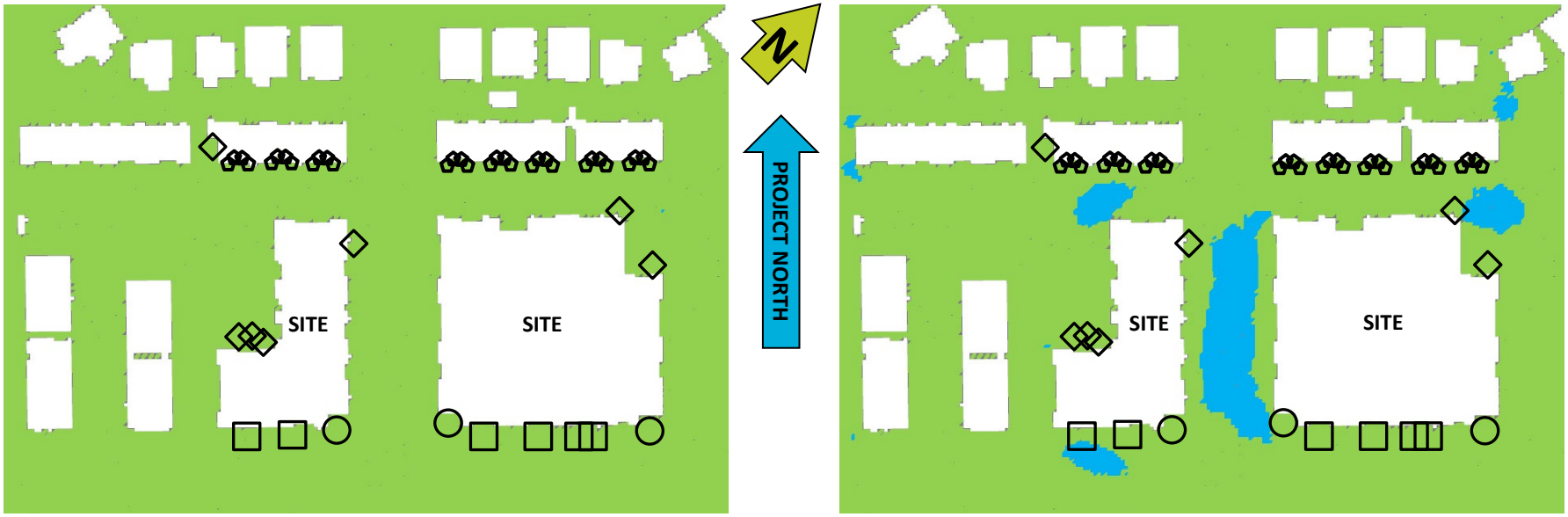


Figure 9a: **Proposed Configuration – Pedestrian Wind Comfort Summer – Building Entrances & Walkways**

Figure 9b: **Proposed Configuration – Pedestrian Wind Comfort Winter – Building Entrances & Walkways**

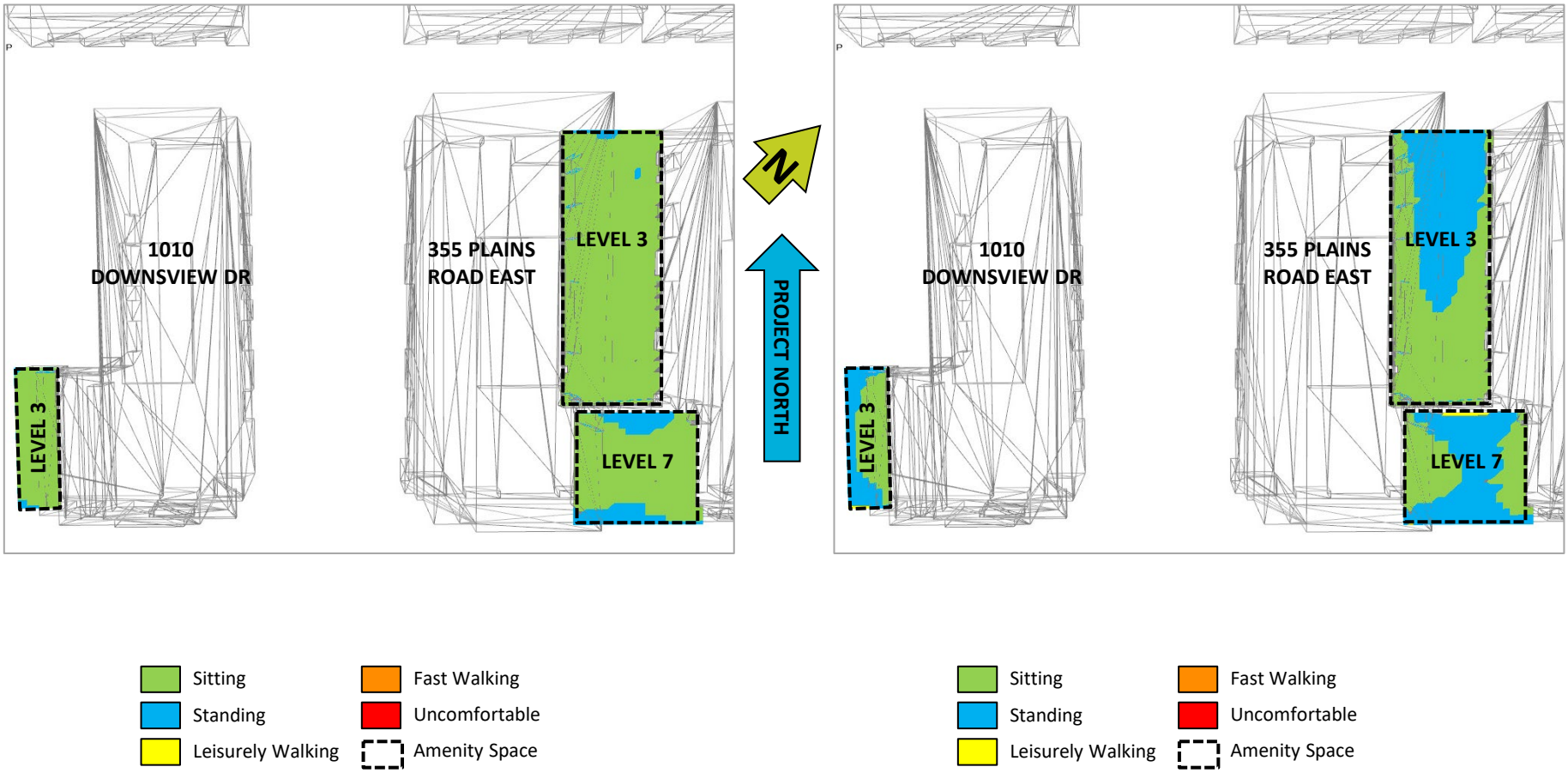


Figure 10a: Proposed Configuration – Pedestrian Wind Comfort Summer – Amenity Terraces

Figure 10b: Proposed Configuration – Pedestrian Wind Comfort Winter – Amenity Terraces

5.0 CONCLUSIONS & RECOMMENDATIONS

The pedestrian wind conditions predicted for the proposed development at 355 Plains Road East & 1010 Downsview Drive have been assessed through computational fluid dynamics modeling techniques. Based on the results of our assessment, the following conclusions have been reached:

- The wind safety criterion is predicted to be met in all areas on-site and surrounding the development in both the Existing and Proposed Configurations.
- Wind conditions on the site, including all entrances, are expected to be suitable for the intended use year-round.
- Wind conditions on the proposed terraces are predicted to be suitable for the intended use.
- On the sidewalks surrounding the proposed development and at the nearby transit stops, wind conditions are suitable for the intended use.

6.0 ASSESSMENT APPLICABILITY

This assessment is based on computer modeling techniques and provides a qualitative overview of the pedestrian wind comfort conditions on and surrounding the proposed development site relative to the City of Burlington pedestrian Study Guidelines and Terms of Reference. Any subsequent alterations to the design may influence these findings, possibly requiring further review by SLR. Should you have any questions or concerns, please do not hesitate to contact the undersigned.

Sincerely,

SLR Consulting (Canada) Ltd.

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7.0 REFERENCES

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Appendix A

Pedestrian Wind Safety Analysis

Annual

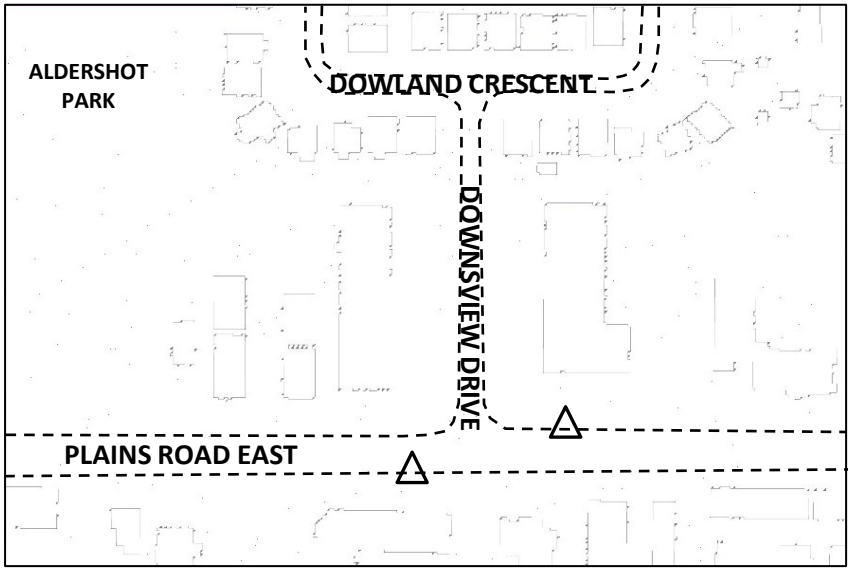


Figure A1a: Existing Configuration – Wind Safety Annual – On-site & Surrounding Areas

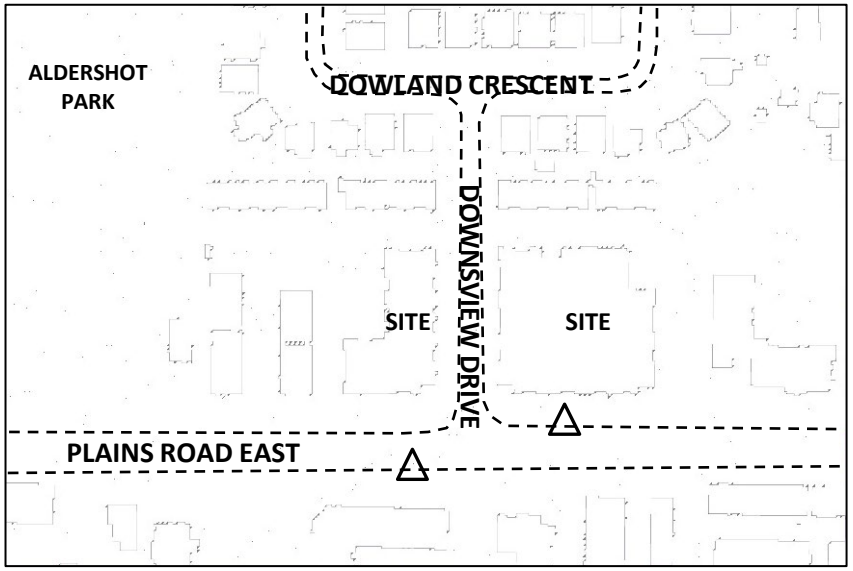
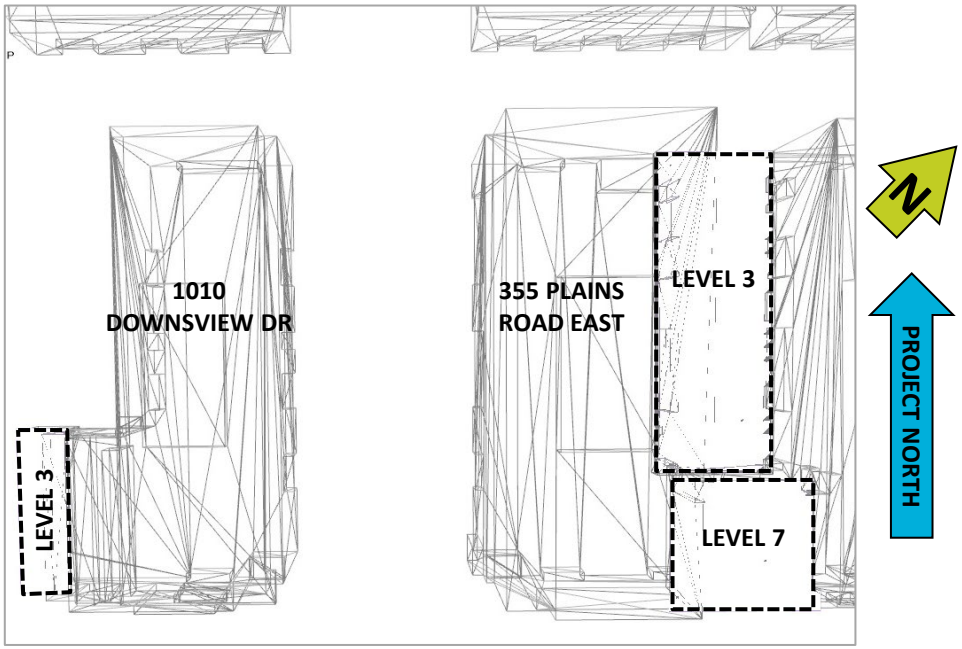


Figure A1b: Proposed Configuration – Wind Safety Annual – On-site & Surrounding Areas



Exceeded Safety Criterion

Amenity Space

Figure A2a: Proposed Configuration – Pedestrian Wind Comfort Summer – Amenity Terraces