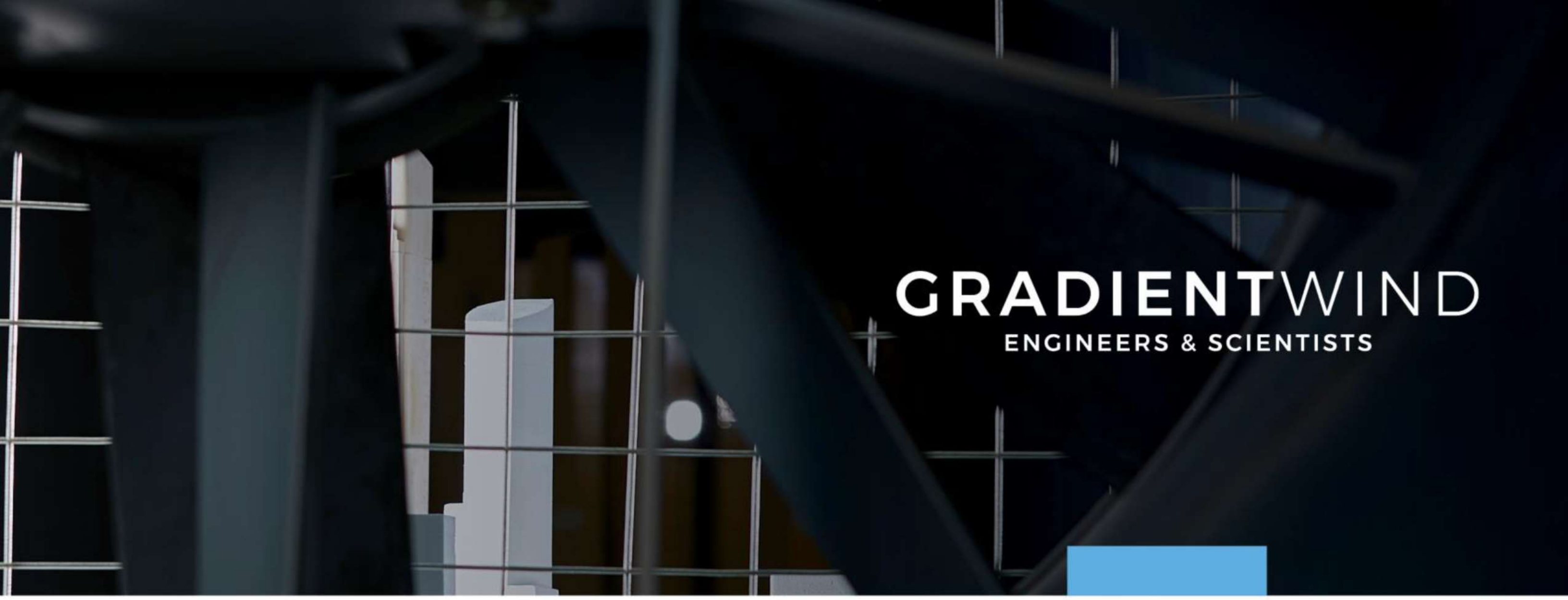
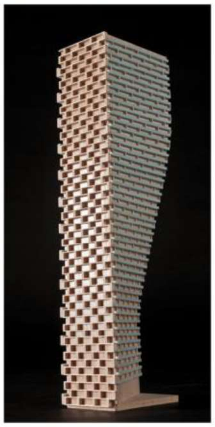


PEDESTRIAN LEVEL WIND STUDY

Petrie's Landing III
8600 Jeanne-d'Arc Boulevard North
Ottawa, Ontario

Report: 23-056-PLW-2025



May 1, 2025

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EXECUTIVE SUMMARY

This report describes a pedestrian level wind (PLW) study undertaken to satisfy concurrent Official Plan Amendment (OPA) and Zoning By-law Amendment (ZBLA) application requirements for the proposed multi-building development, referred to as "Petrie's Landing III", located at 8600 Jeanne-d'Arc Boulevard North in Ottawa, Ontario (hereinafter referred to as "subject site" or "proposed development"). Our mandate within this study is to investigate pedestrian wind conditions within and surrounding the subject site, and to identify areas where conditions may interfere with certain pedestrian activities so that mitigation measures may be considered, where required.

The study involves simulation of wind speeds for selected wind directions in a three-dimensional (3D) computer model using the computational fluid dynamics (CFD) technique, combined with meteorological data integration, to assess pedestrian wind comfort and safety within and surrounding the subject site according to City of Ottawa wind comfort and safety criteria. The results and recommendations derived from these considerations are detailed in the main body of the report (Section 5), illustrated in Figures 3A-9, and summarized as follows:

1) The subject site is located on the banks of the Ottawa River and is exposed to the prevailing winds from the west clockwise to the north-northwest, and the surrounding rural environs comprise sparse massing to the north-northeast and east and in the southwest compass quadrant. Conditions over the area prior to the introduction of the proposed development are predicted to be windy and suitable for mostly standing during the summer, strolling during the autumn, and strolling and walking during the spring and winter seasons, with wind conditions considered uncomfortable for walking predicted at some areas beyond the property limits during the colder months.

2) Following the introduction of the proposed development, wind conditions at most areas over the subject site and within the surroundings are predicted to improve, while the prevailing winds interact with the high-rise massing within the eastern blocks of the proposed development, with some windier areas considered occasionally uncomfortable for walking predicted at isolated locations during the colder months of the year, as described in Section 5.1.

a. Of importance, the current massing is at the demonstration stage, and the current assessment represents a worst-case baseline scenario. Targeted mitigation elements such as building canopies and staggered clusters of vertical wind barriers may be incorporated at the base of the podia serving the high-rise massing to deflect downwashing winds and corner acceleration, between Buildings D1 and D2 and between Buildings C2 and D1. As the design progresses and evolves, and the massing is further defined at future application stages, an appropriate mitigation strategy may be developed in collaboration with the design team and the wind consultant.

b. It is recommended that the primary entrances serving Buildings A2, B2, D1 (north tower), and D2, as well as the secondary entrance serving Building D2 be recessed into the building façades by at least 2 m.

c. If the parkland dedication and potential POPS near the southwest corner of Building B2 will include designated seating or lounging areas where conditions are predicted to be suitable for standing or walking during the typical use period (May to October, inclusive), it is recommended to implement targeted mitigation adjacent to these pedestrian-sensitive areas, including tall wind screens and coniferous trees in dense arrangements in combination with strategically placed seating with high-back benches and other local wind mitigation. The extent of mitigation measures is dependent on the programming of the spaces and an appropriate mitigation strategy may be developed in collaboration with the building and landscape architects as the design of the proposed development progresses towards the future Site Plan Control application stage.

3) Regarding above-grade common amenity areas, the roofs of the mid-rise buildings and the podia roof levels of the high-rise blocks were considered as potential amenity terraces as part of a preliminary assessment. Wind comfort conditions during the typical use period within these areas are predicted to be suitable for a mix of sitting and standing with some areas suitable for strolling within the podia roofs serving Buildings B3 and C2.

a. If the noted roof areas will serve as exterior amenity spaces, tall wind screens, in place of standard height guards, may be implemented along the roof perimeters to improve wind conditions within these spaces, in combination with mitigation inboard of the perimeters which could take the form of wind screens and planters around sensitive areas, and canopies located above designated seating areas. Canopies extending from select tower elevations above select terraces would also be beneficial to deflect downwashing winds.

b. The extent of the mitigation measures is dependent on the programming of these areas. An appropriate mitigation strategy may be developed in collaboration with the building and landscape architects as the design of the proposed development progresses. This work is expected to support the future applications.

4) The foregoing statements and conclusions apply to common weather systems, during which no dangerous wind conditions, as defined in Section 4.4, are expected anywhere over the subject site. During extreme weather events, (for example, thunderstorms, tornadoes, and downbursts), pedestrian safety is the main concern. However, these events are generally short-lived and infrequent and there is often sufficient warning for pedestrians to take appropriate cover.

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1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by 11034936 Canada Inc. to undertake a pedestrian level wind (PLW) study to satisfy Official Plan Amendment (OPA) and Zoning By-law Amendment (ZBLA) application resubmission requirements for the proposed multi-building development, referred to as "Petrie's Landing III", located at 8600 Jeanne-d'Arc Boulevard North in Ottawa, Ontario (hereinafter referred to as "subject site" or "proposed development"). A PLW study was conducted in May 2023 for the previous design of the proposed development[1]. Our mandate within the current study is to investigate pedestrian wind conditions within and surrounding the subject site, and to identify areas where conditions may interfere with certain pedestrian activities so that mitigation measures may be considered, where required.

Our work is based on industry standard computer simulations using the computational fluid dynamics (CFD) technique and data analysis procedures, City of Ottawa wind comfort and safety criteria, architectural drawings prepared by BDP Quadrangle in February 2025, surrounding street layouts and existing and approved future building massing information obtained from the City of Ottawa, as well as recent satellite imagery.

2. TERMS OF REFERENCE

The subject site is located at 8600 Jeanne-d'Arc Boulevard North in Ottawa, situated to the east at the intersection of Jeanne-d'Arc Boulevard North and Parkrose Private and located on a parcel of land bounded by Jeanne-d'Arc Boulevard North to the north, an educational institution to the east, Highway 174 to the south, and Taylor Creek and low-rise residential dwellings to the west. Internal public and private roads extending from Jeanne-d'Arc Boulevard North and a future connection extending from the existing laneway situated to the east of the subject site divide the subject site into four blocks (identified as 'A', 'B', 'C', and 'D'). The proposed development comprises 11 buildings with a mixture of residential units and retail spaces. A parkland dedication is situated to the west of the subject site.

[1] Gradient Wind Engineering Inc., '*Pedestrian Level Wind Study – Petrie's Landing III, 8600 Jeanne d'Arc Boulevard North,*' [May 25, 2023]

Block A is situated at the northwest corner of the subject site and includes Buildings A1, A2, A3, and A4. Buildings A1, A2, and A4 comprise nominally rectangular planforms and Building A3 comprises an 'L'-shaped planform with its long axis-oriented along Jeanne-d'Arc Boulevard North. Building A1 rises to four storeys while Buildings A2, A3, and A4 rise to six storeys. A potential privately-owned publicly accessible space (POPS) is located at the southwest corner of Building A3.

Block B is situated central to the subject site and includes Buildings B1, B2, and B3. Buildings B1 and B2 each rise to nine storeys, with Building B1 comprising a 'U'-shaped planform and Building B2 comprising an 'L'-shaped planform. Building B3 includes a rectangular 30- to 40-storey tower inclusive of a trapezoidal six-storey podium. A potential POPS is located at the southeast corner of Building B2. For the purposes of the current assignment, performed for the demonstration plan, a tower height of 40 storeys was modelled for Tower B3, representing the 'worst-case' wind conditions for wind comfort and safety in the area.

Block C is situated at the northeast corner of the subject site and includes Buildings C1 and C2, each rectangular in shape. Building C1 rises to nine storeys. Building C2 includes a 30- to 40-storey tower with a six-storey podium. Similarly, Building C2 was modelled at 40-storeys to consider worst-case conditions.

Block D is situated to the southeast of the subject site and includes Buildings D1 and D2. Building D1 comprises two 30- to 40-storey towers with a shared six-storey podium, while Building D2 comprises a 30- to 40-storey tower with a six-storey podium. Similarly, for the purposes of the present study, the towers serving Block D were modelled at 40-storeys to represent worst-case wind comfort and safety conditions at the current demonstration plan stage.

The near-field surroundings, defined as an area within 200 metres (m) of the subject site, comprise green spaces in all compass directions with Highway 174 to the southeast, low-rise residential dwellings to the southwest, and Taylor Creek to the west.

The far-field surroundings, defined as an area beyond the near-field but within a 2-kilometre (km) radius of the subject site, are characterized primarily by low-rise massing from the southeast clockwise to the west, and by primarily open exposure from the west clockwise to the southeast with an isolated high-rise building to the northeast and isolated mid-rise buildings to the southwest. The Ottawa River flows from the west-northwest to the northeast, approximately 600 m to the north.

Site plans for the proposed and existing massing scenarios are illustrated in Figures 1A and 1B, while Figures 2A-2H illustrate the computational models used to conduct the study. The existing massing scenario includes the existing massing and any future developments approved by the City of Ottawa.

3. OBJECTIVES

The principal objectives of this study are to (i) determine pedestrian level wind conditions at key areas within and surrounding the development site; (ii) identify areas where wind conditions may interfere with the intended uses of outdoor spaces; and (iii) recommend suitable mitigation measures, where required.

4. METHODOLOGY

The approach followed to quantify pedestrian wind conditions over the site is based on CFD simulations of wind speeds across the subject site within a virtual environment, meteorological analysis of the Ottawa area wind climate, and synthesis of computational data with City of Ottawa wind comfort and safety criteria[2]. The following sections describe the analysis procedures, including a discussion of the noted pedestrian wind criteria.

4.1 Computer-Based Context Modelling

A computer based PLW study was performed to determine the influence of the wind environment on pedestrian comfort over the proposed development site. Pedestrian comfort predictions, based on the mechanical effects of wind, were determined by combining measured wind speed data from CFD simulations with statistical weather data obtained from Ottawa Macdonald-Cartier International Airport. The general concept and approach to CFD modelling is to represent building and topographic details in the immediate vicinity of the subject site on the surrounding model, and to create suitable atmospheric wind profiles at the model boundary. The wind profiles are designed to have similar mean and turbulent wind properties consistent with actual site exposures.

[2] City of Ottawa Terms of References: Wind Analysis
https://documents.ottawa.ca/sites/default/files/torwindanalysis_en.pdf

An industry standard practice is to omit trees, vegetation, and other existing and planned landscape elements from the model due to the difficulty of providing accurate seasonal representation of vegetation. The omission of trees and other landscaping elements produces slightly stronger wind speeds.

4.2 Wind Speed Measurements

The PLW analysis was performed by simulating wind flows and gathering velocity data over a CFD model of the site for 16 wind directions. The CFD simulation model was centered on the proposed development, complete with surrounding massing within a radius of 620 m. The process was performed for two context massing scenarios, as noted in Section 2.

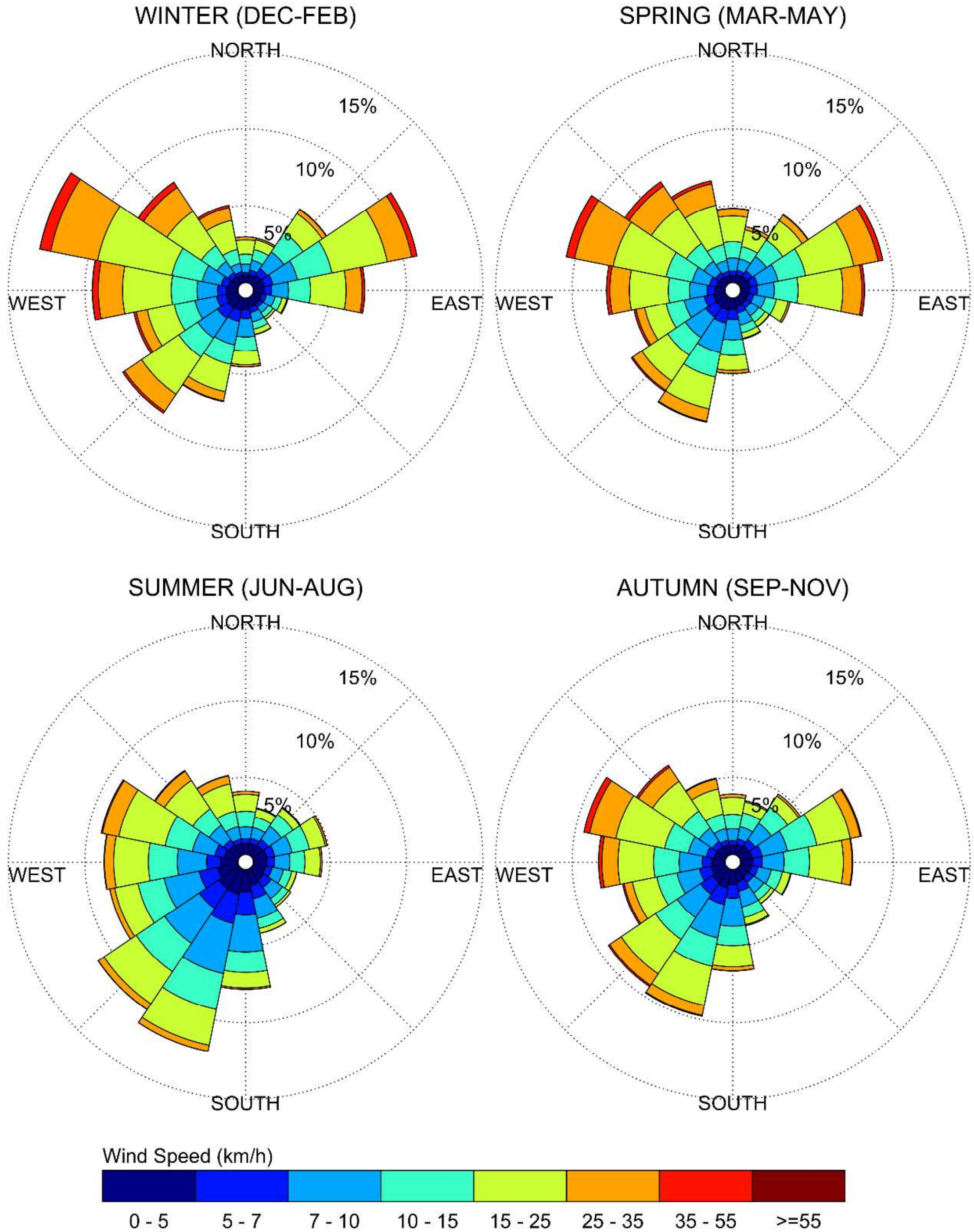
Mean and peak wind speed data obtained over the subject site for each wind direction were interpolated to 36 wind directions at 10° intervals, representing the full compass azimuth. Measured wind speeds approximately 1.5 m above local grade and the podia roof levels were referenced to the wind speed at gradient height to generate mean and peak velocity ratios, which were used to calculate full-scale values. Gradient height represents the theoretical depth of the boundary layer of the earth's atmosphere, above which the mean wind speed remains constant. Further details of the wind flow simulation technique are presented in Appendix A.

4.3 Historical Wind Speed and Direction Data

A statistical model for winds in Ottawa was developed from approximately 40 years of hourly meteorological wind data recorded at Ottawa Macdonald-Cartier International Airport and obtained from Environment and Climate Change Canada. Wind speed and direction data were analyzed during the appropriate hours of pedestrian usage (that is, between 06:00 and 23:00) and divided into four distinct seasons, as stipulated in the wind criteria. Specifically, the spring season is defined as March through May, the summer season is defined as June through August, the autumn season is defined as September through November, and the winter season is defined as December through February, inclusive.

The statistical model of the Ottawa area wind climate, which indicates the directional character of local winds on a seasonal basis, is illustrated on the following page. The plots illustrate seasonal distribution of measured wind speeds and directions in kilometers per hour (km/h). Probabilities of occurrence of different wind speeds are represented as stacked polar bars in sixteen azimuth divisions. The radial direction represents the percentage of time for various wind speed ranges per wind direction during the measurement period. The prominent wind speeds and directions can be identified by the longer length of the bars. For Ottawa, the most common winds occur for westerly wind directions, followed by those from the east, while the most common wind speeds are below 36 km/h. The directional prominence and relative magnitude of wind speed changes somewhat from season to season.

SEASONAL DISTRIBUTION OF WIND
OTTAWA MACDONALD-CARTIER INTERNATIONAL AIRPORT



Notes:

1. Radial distances indicate percentage of time of wind events.
2. Wind speeds are mean hourly in km/h, measured at 10 m above the ground.

4.4 Pedestrian Wind Comfort and Safety Criteria – City of Ottawa

Pedestrian wind comfort and safety criteria are based on the mechanical effects of wind without consideration of other meteorological conditions (that is, temperature and relative humidity). The comfort criteria assume that pedestrians are appropriately dressed for a specified outdoor activity during any given season. Five pedestrian comfort classes based on 20% non-exceedance mean wind speed ranges are used to assess pedestrian comfort: (1) Sitting; (2) Standing; (3) Strolling; (4) Walking; and (5) Uncomfortable. The gust speeds, and equivalent mean speeds, are selected based on the Beaufort scale, which describes the effects of forces produced by varying wind speed levels on objects. Wind conditions suitable for sitting are represented by the colour blue, standing by green, strolling by yellow, and walking by orange; uncomfortable conditions are represented by the colour magenta. Specifically, the comfort classes, associated wind speed ranges, and limiting criteria are summarized as follows:

PEDESTRIAN WIND COMFORT CLASS DEFINITIONS

Wind Comfort Class	Mean Speed (km/h)	Description
SITTING	≤ 10	Mean wind speeds no greater than 10 km/h occurring at least 80% of the time. The equivalent gust wind speed is approximately 16 km/h.
STANDING	≤ 14	Mean wind speeds no greater than 14 km/h occurring at least 80% of the time. The equivalent gust wind speed is approximately 22 km/h.
STROLLING	≤ 17	Mean wind speeds no greater than 17 km/h occurring at least 80% of the time. The equivalent gust wind speed is approximately 27 km/h.
WALKING	≤ 20	Mean wind speeds no greater than 20 km/h occurring at least 80% of the time. The equivalent gust wind speed is approximately 32 km/h.
UNCOMFORTABLE	> 20	Uncomfortable conditions are characterized by predicted values that fall below the 80% target for walking. Brisk walking and exercise, such as jogging, would be acceptable for moderate excesses of this criterion.

Regarding wind safety, the pedestrian safety wind speed criterion is based on the approximate threshold that would cause a vulnerable member of the population to fall. A 0.1% exceedance gust wind speed of 90 km/h is classified as dangerous. From calculations of stability, it can be shown that gust wind speeds of 90 km/h would be the approximate threshold wind speed that would cause an average elderly person in good health to fall. Notably, pedestrians tend to be more sensitive to wind gusts than to steady winds for lower wind speed ranges. For strong winds approaching dangerous levels, this effect is less important because the mean wind can also create problems for pedestrians.

Experience and research on people's perception of mechanical wind effects has shown that if the wind speed levels are exceeded for more than 20% of the time, the activity level would be judged to be uncomfortable by most people. For instance, if a mean wind speed of 10 km/h (equivalent gust wind speed of approximately 16 km/h) were exceeded for more than 20% of the time most pedestrians would judge that location to be too windy for sitting. Similarly, if mean wind speed of 20 km/h (equivalent gust wind speed of approximately 32 km/h) at a location were exceeded for more than 20% of the time, walking or less vigorous activities would be considered uncomfortable. As these criteria are based on subjective reactions of a population to wind forces, their application is partly based on experience and judgment.

Once the pedestrian wind speed predictions have been established throughout the subject site, the assessment of pedestrian comfort involves determining the suitability of the predicted wind conditions for discrete regions within and surrounding the subject site. This step involves comparing the predicted comfort classes to the target comfort classes, which are dictated by the location type for each region (that is, a sidewalk, building entrance, amenity space, or other). An overview of common pedestrian location types and their typical windiest target comfort classes are summarized on the following page. Depending on the programming of a space, the desired comfort class may differ from this table.

TARGET PEDESTRIAN WIND COMFORT CLASSES FOR VARIOUS LOCATION TYPES

Location Types	Target Comfort Classes
Primary Building Entrance	Standing
Secondary Building Access Point	Walking
Public Sidewalk / Bicycle Path	Walking
Outdoor Amenity Space	Sitting / Standing
Café / Patio / Bench / Garden	Sitting / Standing
Transit Stop (Without Shelter)	Standing
Transit Stop (With Shelter)	Walking
Public Park / Plaza	Sitting / Standing
Garage / Service Entrance	Walking
Parking Lot	Walking
Vehicular Drop-Off Zone	Walking

5. RESULTS AND DISCUSSION

The following discussion of the predicted pedestrian wind conditions for the subject site is accompanied by Figures 3A-6B, illustrating wind conditions at grade level for the proposed and existing massing scenarios, and by Figures 8A-8D illustrating wind conditions at the podia roof levels, which may serve as potential exterior common amenity spaces. Conditions are presented as continuous contours of wind comfort throughout the subject site and correspond to the comfort classes presented in Section 4.4.

Wind comfort conditions at grade level are also reported for the typical use period, which is defined as May to October, inclusive. Figures 7 and 9 illustrates wind comfort conditions during this period at grade and over the podia roof levels, respectively, consistent with the comfort classes in Section 4.4.

The details of these conditions are summarized in the following pages for each area of interest.

5.1 Wind Comfort Conditions – Grade Level

The mostly rural environs and the limited built-up massing in the vicinity of the proposed development exposes the subject site to prevailing winds from multiple directions. Of particular note, the subject site is located on the banks of the Ottawa River and is exposed to the prevailing unmitigated winds from the west clockwise to the north-northwest, while the sparse surroundings to the north-northeast and east and in the southwest compass quadrant offer limited shielding to salient winds from these directions. Windy conditions within and surrounding the proposed development are expected following the introduction of the tall building development.

Under the existing massing, which is comprised of a vacant lot, wind comfort conditions over the subject site are predicted to be windy and suitable for mostly standing during the summer, strolling during the autumn, and walking and strolling during the spring and winter seasons. Over nearby areas beyond the limits of the property line, windy conditions are predicted along Jeanne-d'Arc Boulevard North and Highway 174, including the transit stops to the northeast of the subject site, as well as over the nearby existing surface parking to the northeast. Of note, wind conditions considered uncomfortable for walking during the spring and winter are predicted to the northwest along Jeanne-d'Arc Boulevard North under the existing massing.

In this context and wind environment, the introduction of the proposed development acts as a wind break. Wind comfort conditions are predicted to significantly improve at most areas within and surrounding the subject site, including along Jeanne-d'Arc Boulevard North, the existing parking lot to the northeast, and Highway 174, as well as in the vicinity of the existing transit stops to the northeast of the proposed development.

These existing winds conditions are predicted to combine and interact with the proposed high-rise towers within the eastern blocks of the proposed development, wherein the prevailing winds are predicted to downwash over the façades of the towers as well as accelerate around the southeast corner of Building C2, the northeast corner of Building D1, the west corners of Building D1, and the southwest corner of D2. Additional wind channelling is predicted between Buildings C2 and D1 and Buildings D1 and D2.

During the spring and winter seasons, isolated regions of wind conditions that may be considered occasionally uncomfortable for walking are predicted between Buildings C2 and D1, to the east and at the southwest corner of Building D2, to the southeast of Building B2, and to the southwest of Building C1.

The current massing is at a demonstration stage; this assessment represents a worst-case baseline scenario. As the design progresses and evolves, and the massing is further defined at future application stages, an appropriate mitigation strategy may be developed in collaboration with the design team and the wind consultant. Targeted mitigation elements such as building canopies and staggered clusters of vertical wind barriers may be incorporated at the base of the podia serving the high-rise massing to deflect downwashing winds and corner acceleration, between Buildings D1 and D2 and between Buildings C2 and D1.

Sidewalks and Transit Stops along Jeanne-d'Arc Boulevard North: Following the introduction of the proposed development, wind comfort conditions over the public sidewalks along Jeanne-d'Arc Boulevard North are predicted to be suitable for a mix of sitting, standing, and strolling during the summer and autumn, becoming suitable for walking, or better, during the remainder of the year. Conditions in the vicinity of the nearby eastbound and westbound transit stops along Jeanne d'Arc Boulevard North, which are served by typical transit shelters, are predicted to be suitable for standing during the summer, becoming suitable for strolling during the autumn and walking during the spring and winter. The noted conditions are considered acceptable.

Wind conditions over the sidewalks along Jeanne-d'Arc Boulevard North with the existing massing are predicted to be suitable for a mix of standing and strolling during the summer, strolling during the autumn, and walking throughout the remainder of the year with conditions uncomfortable for walking to the west of the subject site. Conditions in the vicinity of the nearby eastbound and westbound transit stops along Jeanne-d'Arc Boulevard North are predicted to be suitable for strolling during the summer and the autumn, becoming suitable for walking during the spring and the winter. As noted above, the introduction of the proposed development is predicted to improve comfort levels along Jeanne-d'Arc Boulevard North, in comparison to existing conditions.

Existing Parking Lot and Laneways East of Subject Site: Following the introduction of the proposed development, wind conditions over the existing parking lot, laneways, and walkways serving the neighbouring educational institution, situated to the east of the subject site, are predicted to be suitable for a mix of sitting and standing during the summer, becoming suitable for strolling, or better, during the spring, autumn, and winter, with isolated regions suitable for walking during the spring and winter. The noted conditions are considered acceptable.

Wind conditions over the noted areas under the existing massing are predicted to be suitable for a mix of standing and strolling during the summer and autumn, becoming suitable for a mix of walking and strolling throughout the remainder of the year. Notably, as noted above, the introduction of the proposed development is predicted to improve comfort levels over the noted areas, in comparison to existing conditions.

Highway 174 South of Subject Site: Following the introduction of the proposed development, conditions over Highway 174, situated to the south of the subject site, are predicted to be suitable for strolling or better during the summer and the autumn, becoming suitable for mostly walking, or better, during the spring and winter, with the exception of the region to the southwest of Building D2 where conditions may be occasionally considered uncomfortable for walking as noted above.

Wind conditions over Highway 174 with the existing massing are predicted to be suitable for standing during the summer, becoming suitable for strolling during the autumn, and suitable for walking, or better, during the remainder of the year.

Internal Walkways, Public and Private Roads, and Future Connection: Wind conditions over the internal walkways along the internal private road are predicted to be standing, or better, during the summer, becoming suitable for strolling, or better, throughout the remainder of the year.

Wind conditions over the internal walkways along the internal public road are predicted to be suitable for standing, or better, during the summer, becoming suitable for mostly walking, or better, throughout the remainder of the year, with the exception of isolated windier regions between Buildings C2 and D1, that may be considered occasionally uncomfortable for walking during the spring and winter as noted above.

Wind conditions over the internal walkways along the future connection are predicted to be suitable for strolling, or better, during the summer, becoming suitable for a mix of strolling, and walking during the remainder of the year with the exception of the windier region between Buildings C2 and D1, as noted above.

Park and Potential POPS: Wind comfort conditions during the typical use period within the potential POPS at the southwest corner of Building A3 are predicted to be suitable for sitting. The noted conditions are considered acceptable.

Conditions during the typical use period within the potential POPS at the southeast corner of Building B2 are predicted to be suitable for a mix of sitting and standing over the majority of the area, with a region to the south of the POPS near to the future connection where conditions are predicted to be suitable for walking. Over most of the areas that are predicted to be suitable for standing, these areas are also predicted to be suitable for sitting for at least 75 % of the time during the same period.

Conditions within the parkland dedication are predicted to be suitable for sitting within the majority of the park, with regions suitable for standing to the east and at the southeast corner. Where conditions are predicted to be suitable for standing, they are also predicted to be suitable for sitting for at least 75% of the time during the same period, where the target is 80% to achieve the sitting comfort class. Depending on the programming of the parkland dedication, the noted wind comfort conditions may be considered acceptable. Specifically, if the noted windier areas will not accommodate seating or lounging activities, the noted conditions would be considered acceptable.

The extent of mitigation measures is dependent on the programming of the spaces. Comfort levels within the windier areas within the potential POPS and parkland dedication may be improved by implementing landscaping elements around sensitive areas such as tall wind screens and coniferous trees in dense arrangements, in combination with strategically placed seating with high-back benches and other local wind mitigation.

An appropriate mitigation strategy will be developed in collaboration with the building and landscape architects as the design of the proposed development progresses. This work is expected to support the future Site Plan Control application.

Building Access Points: Windier conditions are predicted during the colder months in the vicinity of the primary entrances serving Buildings A2, B2, D1 (north tower), and D2, as well as the secondary entrance serving Building D2. It is recommended that the noted entrances be recessed into the building façades by at least 2 m.

Owing to the protection of the building façades, conditions in the vicinity of the remaining building access points as illustrated on the present demonstration plan for the proposed development are considered acceptable; as the design of the proposed development progresses, it is recommended that entrances and exits be placed where wind conditions are predicted to be overall calmer, particularly during the spring and winter seasons.

5.2 Wind Comfort Conditions – Roof Level

The mid-rise roof levels and podia roofs serving the proposed development were considered as potential amenity terraces, with conditions within these terraces illustrated in Figures 8A-9. It is noted that these areas were included as part of a preliminary assessment, and that the programming of these roof areas has not yet been defined. Wind comfort conditions during the typical use period within these roof areas and recommendations regarding wind mitigation are provided as follows:

Wind comfort conditions during the typical use period are predicted to be suitable for a mix of sitting and standing over the roofs of Buildings A3 and A4, suitable for mostly standing over the roofs of Buildings A1, A2, B1, B2, and C1 as well as the podia roof serving D1, and suitable for mostly strolling, or better, over the podia roofs of Buildings B3 and C2.

If these roof areas will accommodate common exterior amenity spaces, it is recommended that tall wind screens, in place of standard height guards, be implemented along their perimeters in combination with mitigation inboard of the terrace perimeters. This inboard mitigation could take the form of combination of wind screens and canopies located above designated seating areas. Canopies extending from select tower elevations above select terraces may also be beneficial to deflect downwashing winds from the tower façades. The extent of the mitigation measures is dependent on the programming of the terraces. An appropriate mitigation strategy will be developed in collaboration with the building and landscape architects as the design of the proposed development progresses. This work is expected to support the future Site Plan Control application.

5.3 Wind Safety

Within the context of typical weather patterns, which exclude anomalous localized storm events such as tornadoes and downbursts, no pedestrian areas within or surrounding the subject are expected to experience conditions that could be considered dangerous, as defined in Section 4.4.

5.4 Applicability of Results

Pedestrian wind comfort and safety have been quantified for the specific configuration of existing and foreseeable construction around the subject site. Future changes (that is, construction or demolition) of these surroundings may cause changes to the wind effects in two ways, namely: (i) changes beyond the immediate vicinity of the subject site would alter the wind profile approaching the subject site; and (ii) development in proximity to the subject site would cause changes to local flow patterns.

6. CONCLUSIONS AND RECOMMENDATIONS

A complete summary of the predicted wind conditions is provided in Section 5 and illustrated in Figures 3A-9. Based on computer simulations using the CFD technique, meteorological data analysis of the Ottawa wind climate, City of Ottawa wind comfort and safety criteria, and experience with numerous similar developments, the study concludes the following:

1) The subject site is located on the banks of the Ottawa River and is exposed to the prevailing winds from the west clockwise to the north-northwest, and the surrounding rural environs comprise sparse massing to the north-northeast and east and in the southwest compass quadrant. Conditions over the area prior to the introduction of the proposed development are predicted to be windy and suitable for mostly standing during the summer, strolling during the autumn, and strolling and walking during the spring and winter seasons, with wind conditions considered uncomfortable for walking predicted at some areas beyond the property limits during the colder months.

2) Following the introduction of the proposed development, wind conditions at most areas over the subject site and within the surroundings are predicted to improve, while the prevailing winds interact with the high-rise massing within the eastern blocks of the proposed development, with some windier areas considered occasionally uncomfortable for walking predicted at isolated locations during the colder months of the year, as described in Section 5.1.

    a. Of importance, the current massing is at the demonstration stage, and the current assessment represents a worst-case baseline scenario. Targeted mitigation elements such as building canopies and staggered clusters of vertical wind barriers may be incorporated at the base of the podia serving the high-rise massing to deflect downwashing winds and corner acceleration, between Buildings D1 and D2 and between Buildings C2 and D1. As the design progresses and evolves, and the massing is further defined at future application stages, an appropriate mitigation strategy may be developed in collaboration with the design team and the wind consultant.

b. It is recommended that the primary entrances serving Buildings A2, B2, D1 (north tower), and D2, as well as the secondary entrance serving Building D2 be recessed into the building façades by at least 2 m.

c. If the parkland dedication and potential POPS near the southwest corner of Building B2 will include designated seating or lounging areas where conditions are predicted to be suitable for standing or walking during the typical use period (May to October, inclusive), it is recommended to implement targeted mitigation adjacent to these pedestrian-sensitive areas, including tall wind screens and coniferous trees in dense arrangements in combination with strategically placed seating with high-back benches and other local wind mitigation. The extent of mitigation measures is dependent on the programming of the spaces and an appropriate mitigation strategy may be developed in collaboration with the building and landscape architects as the design of the proposed development progresses towards the future Site Plan Control application stage.

3) Regarding above-grade common amenity areas, the roofs of the mid-rise buildings and the podia roof levels of the high-rise blocks were considered as potential amenity terraces as part of a preliminary assessment. Wind comfort conditions during the typical use period within these areas are predicted to be suitable for a mix of sitting and standing with some areas suitable for strolling within the podia roofs serving Buildings B3 and C2.

a. If the noted roof areas will serve as exterior amenity spaces, tall wind screens, in place of standard height guards, may be implemented along the roof perimeters to improve wind conditions within these spaces, in combination with mitigation inboard of the perimeters which could take the form of wind screens and planters around sensitive areas, and canopies located above designated seating areas. Canopies extending from select tower elevations above select terraces would also be beneficial to deflect downwashing winds.

b. The extent of the mitigation measures is dependent on the programming of these areas. An appropriate mitigation strategy may be developed in collaboration with the building and landscape architects as the design of the proposed development progresses. This work is expected to support the future applications.

4) The foregoing statements and conclusions apply to common weather systems, during which no dangerous wind conditions, as defined in Section 4.4, are expected anywhere over the subject site. During extreme weather events, (for example, thunderstorms, tornadoes, and downbursts), pedestrian safety is the main concern. However, these events are generally short-lived and infrequent and there is often sufficient warning for pedestrians to take appropriate cover.

Sincerely,

Gradient Wind Engineering Inc.

LICENSED PROFESSIONAL ENGINEER
D. T. HUITEMA
100561777
May 01, 2025
PROVINCE OF ONTARIO

Omar Rioseco, B.Eng.
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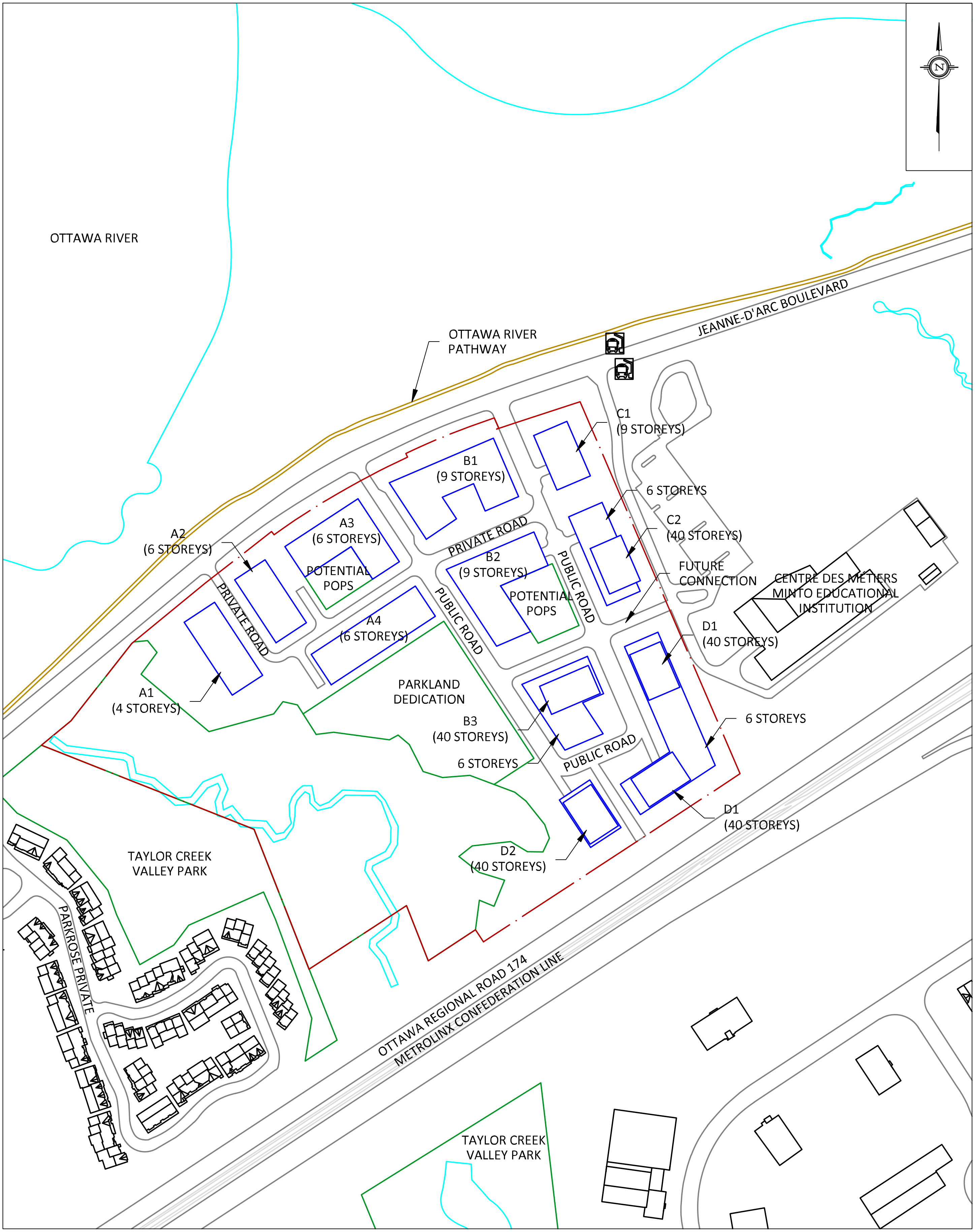

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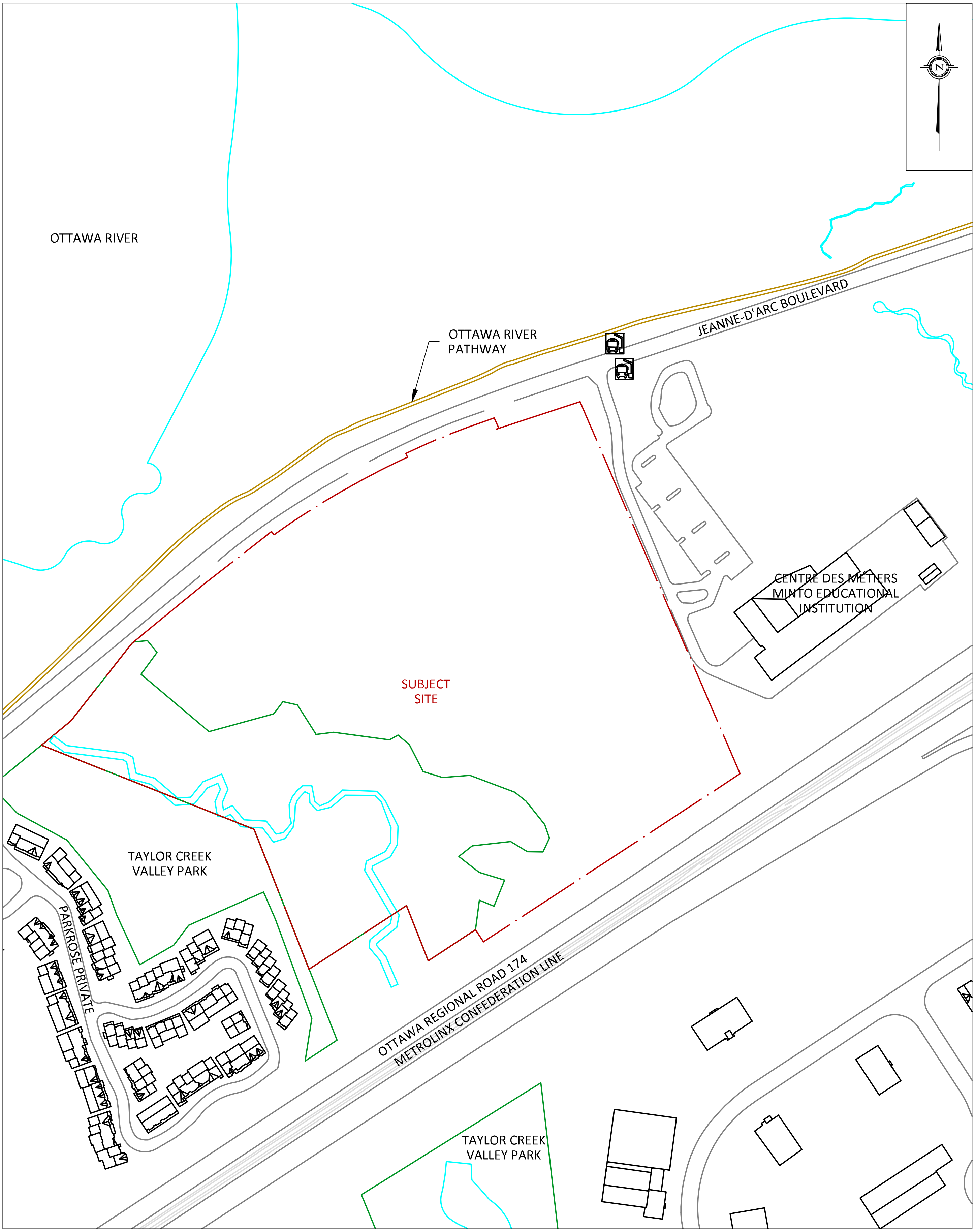
PROJECT		DESCRIPTION
PETRIE'S LANDING III, OTTAWA PEDESTRIAN LEVEL WIND STUDY		FIGURE 1A: PROPOSED SITE PLAN AND SURROUNDING CONTEXT
SCALE: 1:3500	DRAWING NO.: 23-056-PLW-1A	
DATE: MARCH 12, 2025	DRAWN BY: N.M.P.	



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PROJECT	PETRIE'S LANDING III, OTTAWA PEDESTRIAN LEVEL WIND STUDY
SCALE	1:3500
DRAWING NO.	23-056-PLW-1B
DATE	MARCH 12, 2025
DRAWN BY	N.M.P.
DESCRIPTION	FIGURE 1B: EXISITNG SITE PLAN AND SURROUNDING CONTEXT

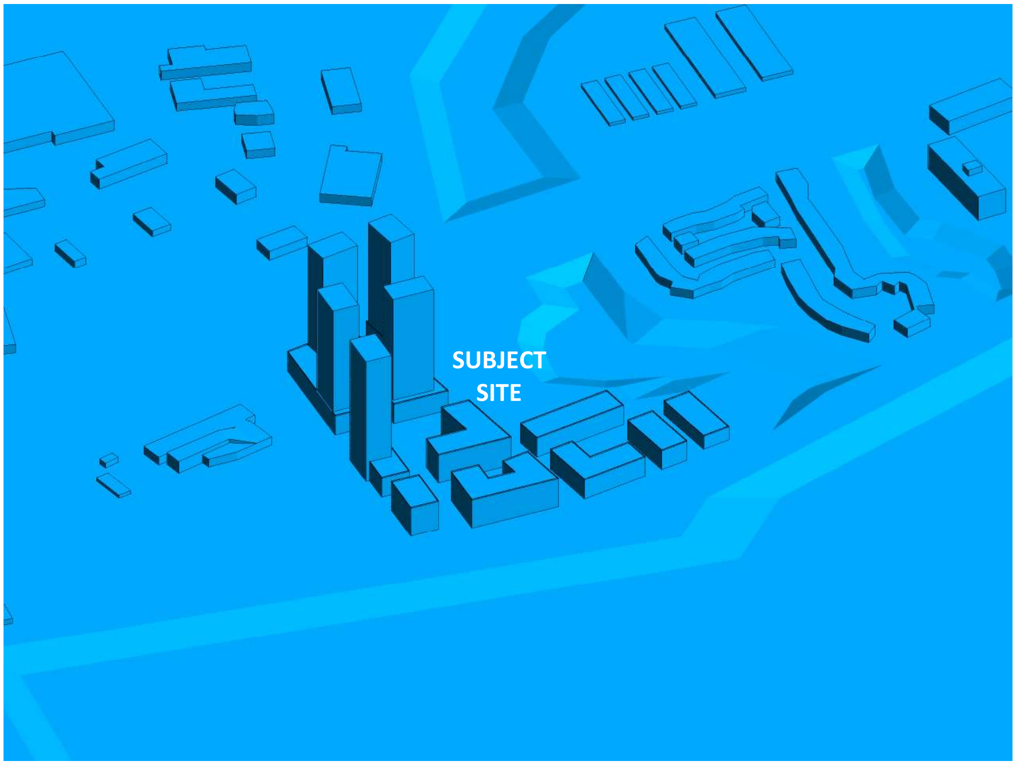


FIGURE 2A: COMPUTATIONAL MODEL, PROPOSED MASSING, NORTH PERSPECTIVE

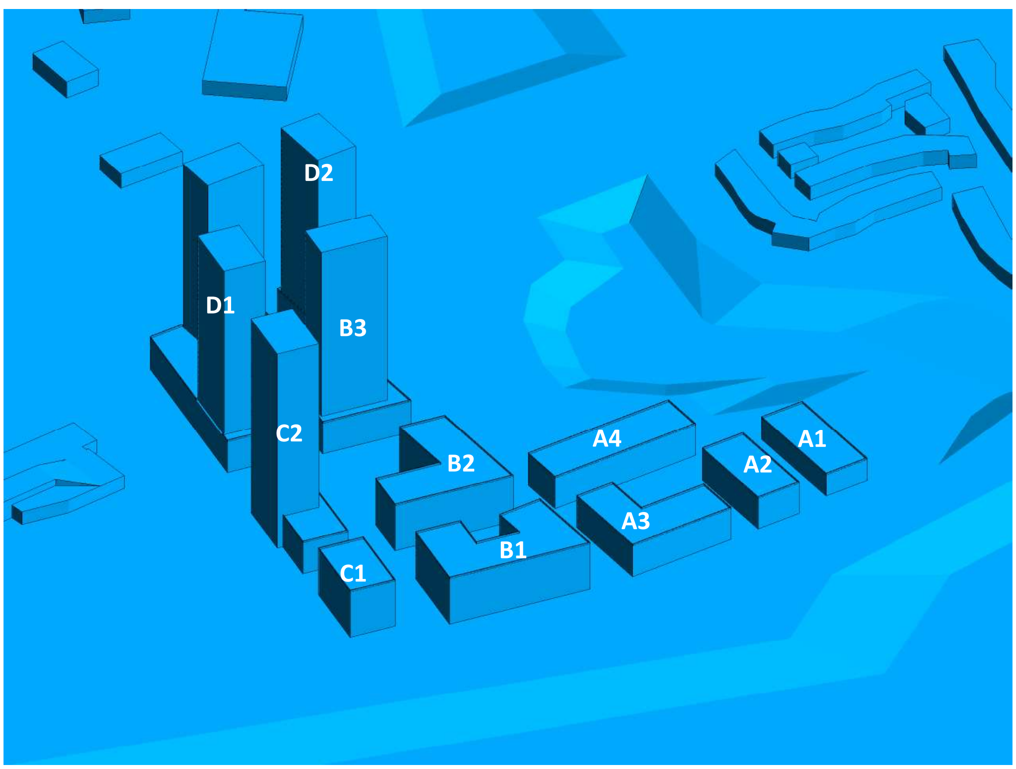


FIGURE 2B: CLOSE UP OF FIGURE 2A

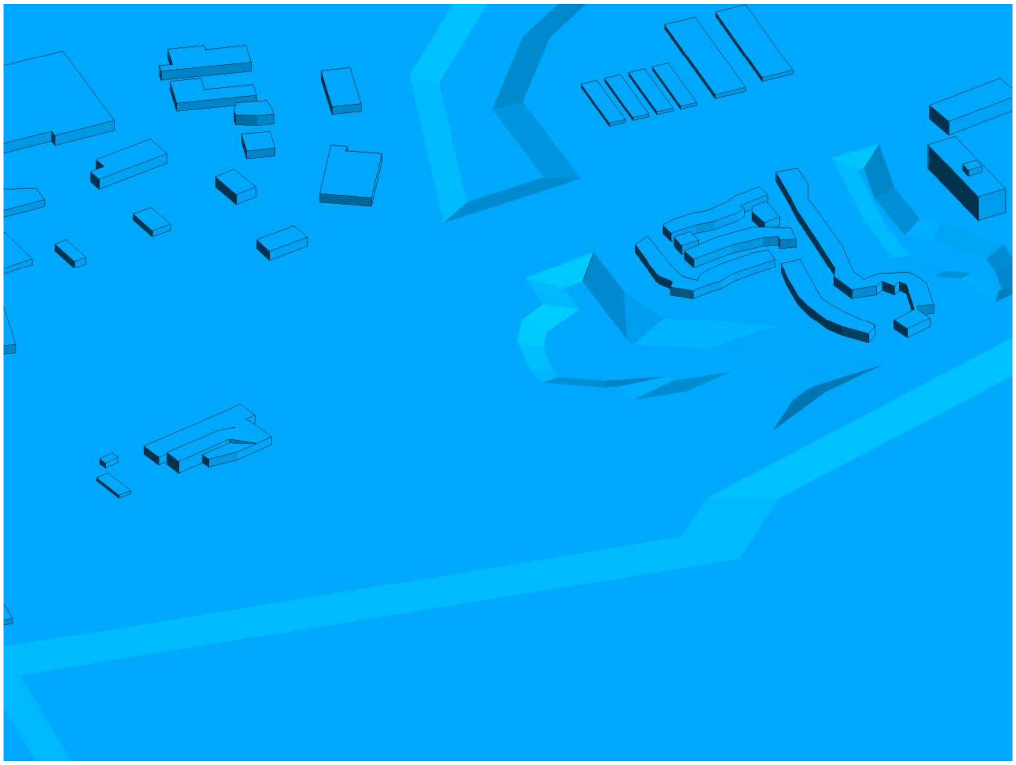


FIGURE 2C: COMPUTATIONAL MODEL, EXISTING MASSING, NORTH PERSPECTIVE

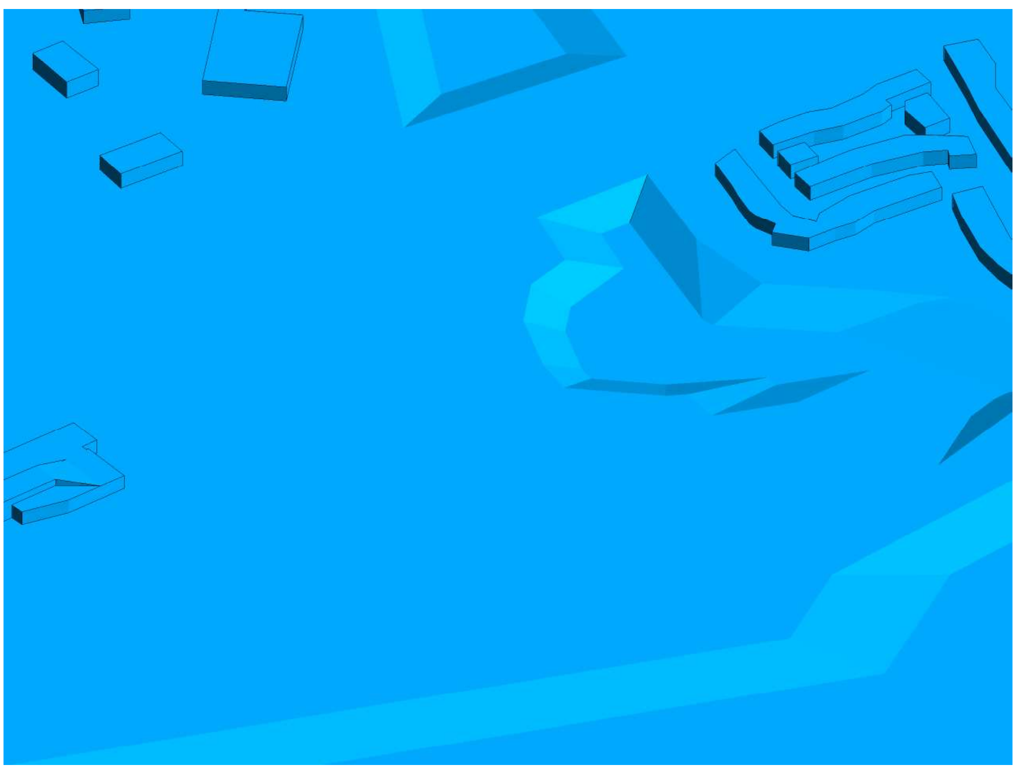


FIGURE 2D: CLOSE UP OF FIGURE 2C

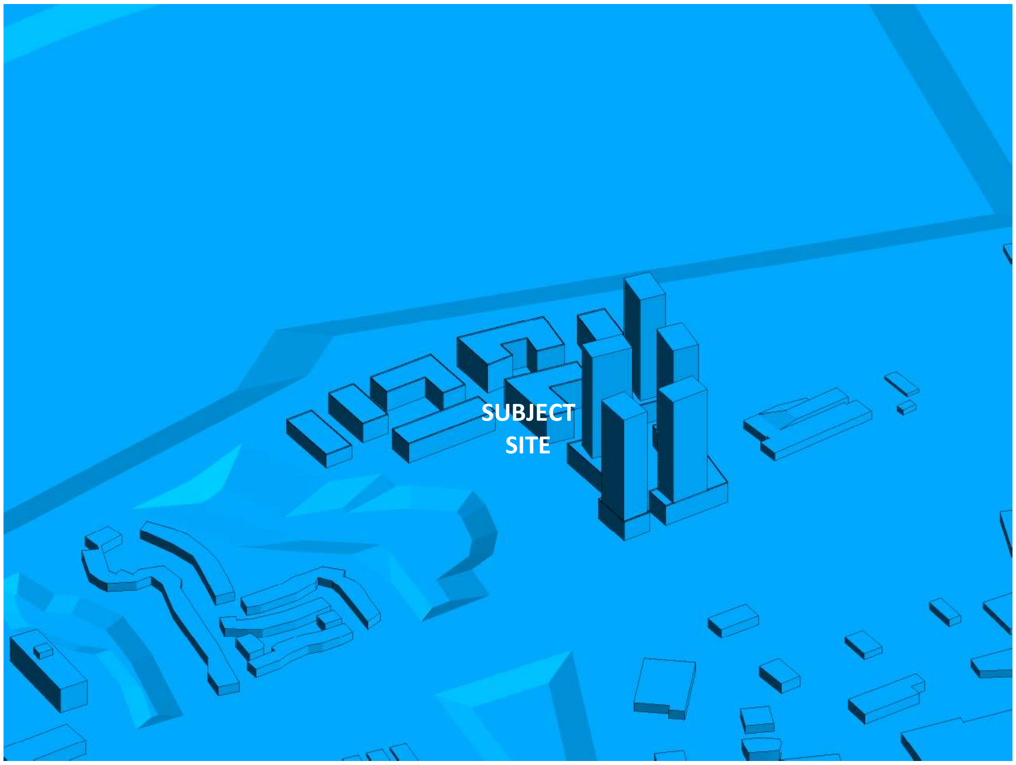


FIGURE 2E: COMPUTATIONAL MODEL, PROPOSED MASSING, SOUTH PERSPECTIVE

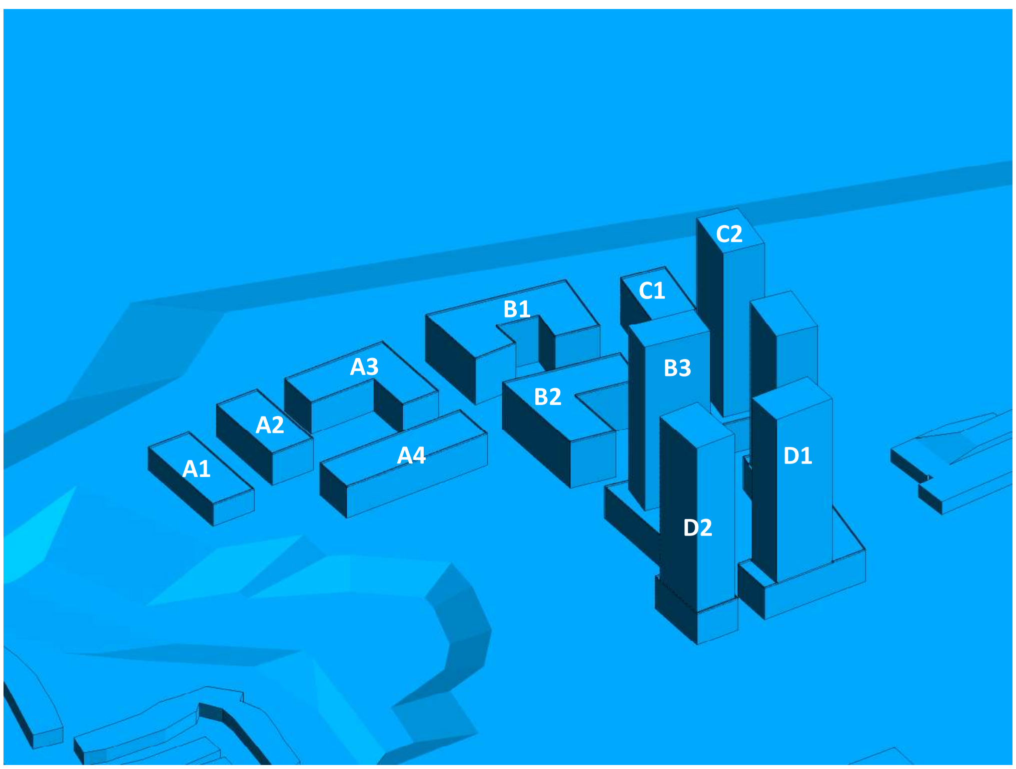


FIGURE 2F: CLOSE UP OF FIGURE 2E

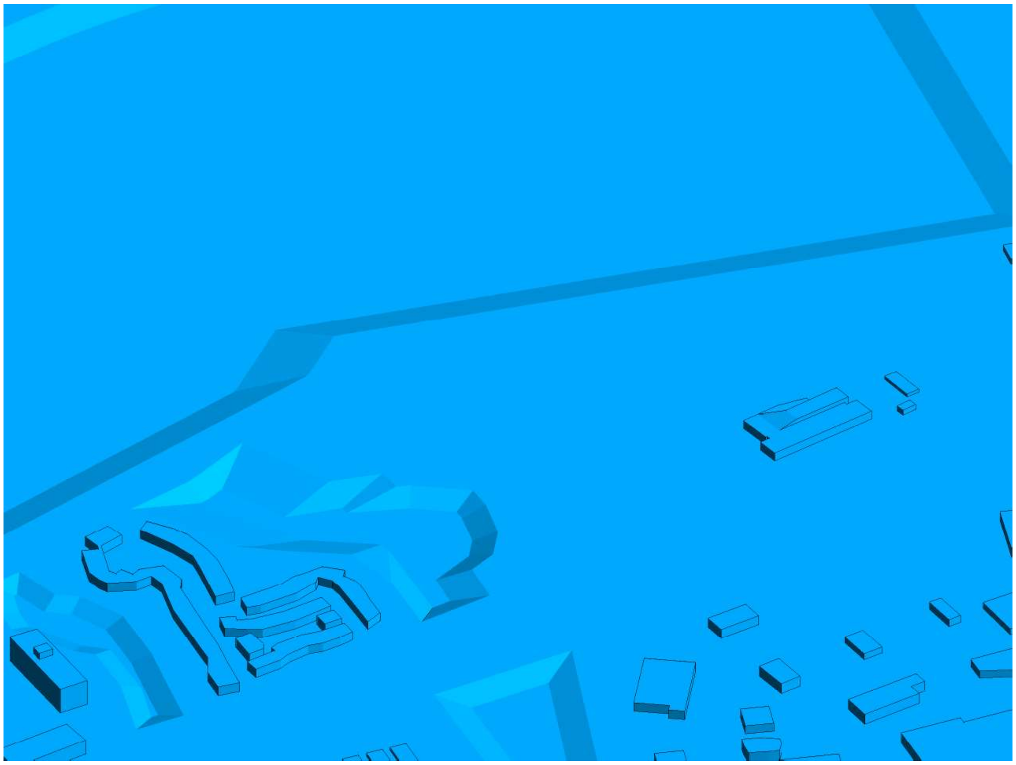


FIGURE 2G: COMPUTATIONAL MODEL, EXISTING MASSING, SOUTH PERSPECTIVE

FIGURE 2H: CLOSE UP OF FIGURE 2G

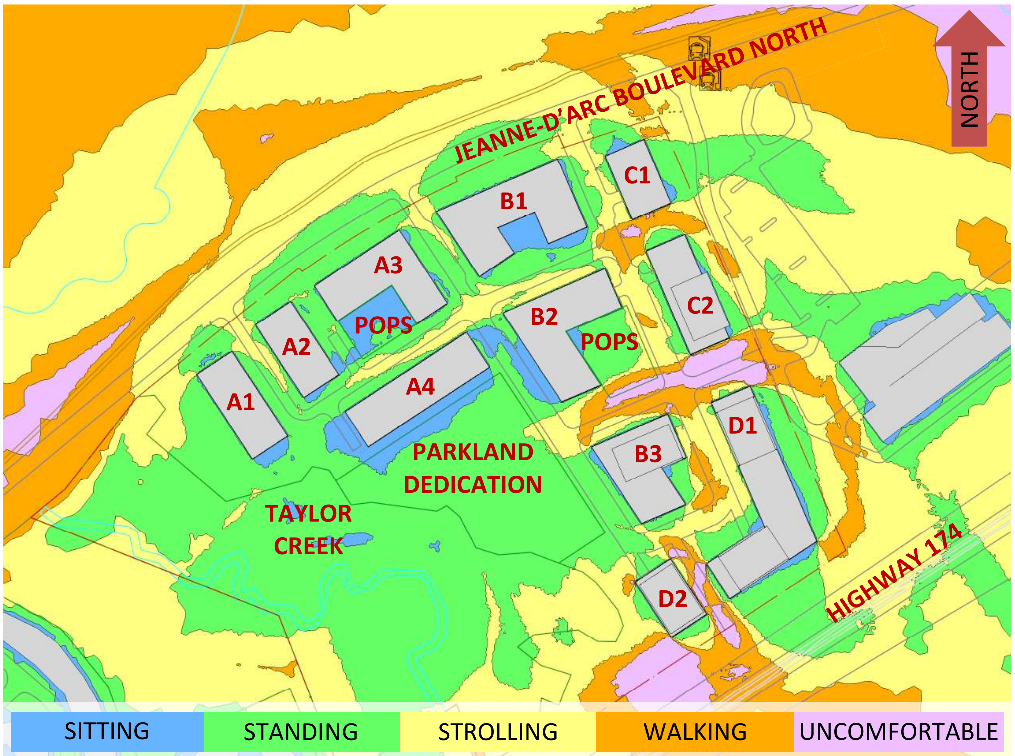


FIGURE 3A: SPRING – WIND COMFORT, GRADE LEVEL – PROPOSED MASSING

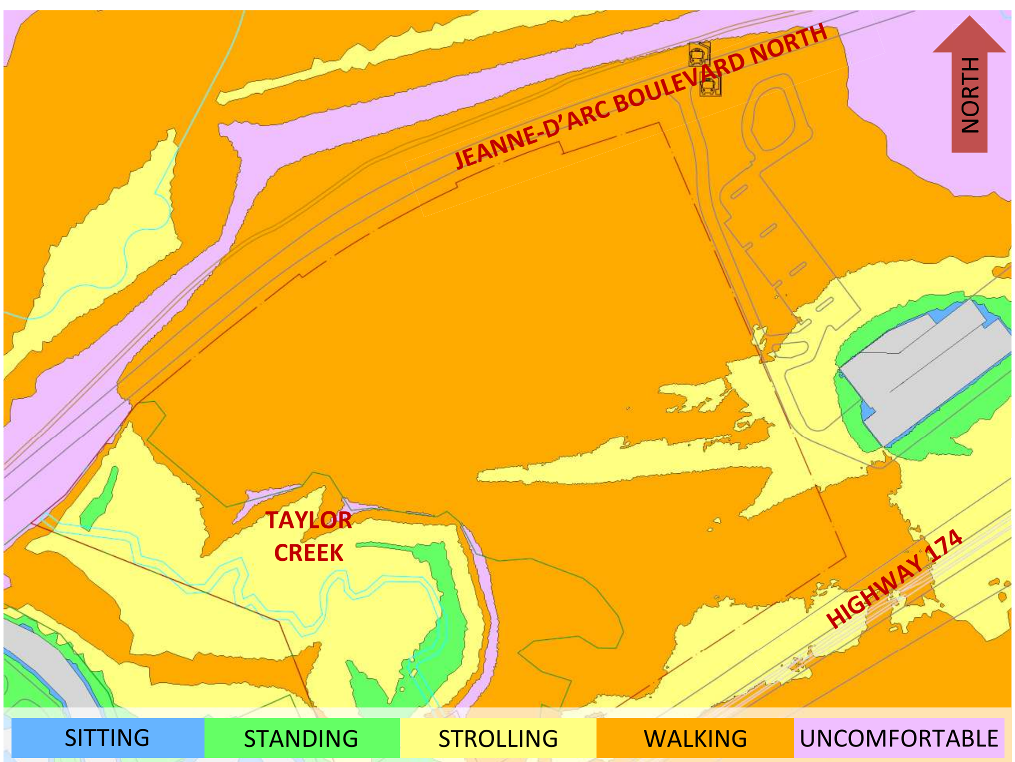


FIGURE 3B: SPRING – WIND COMFORT, GRADE LEVEL – EXISTING MASSING

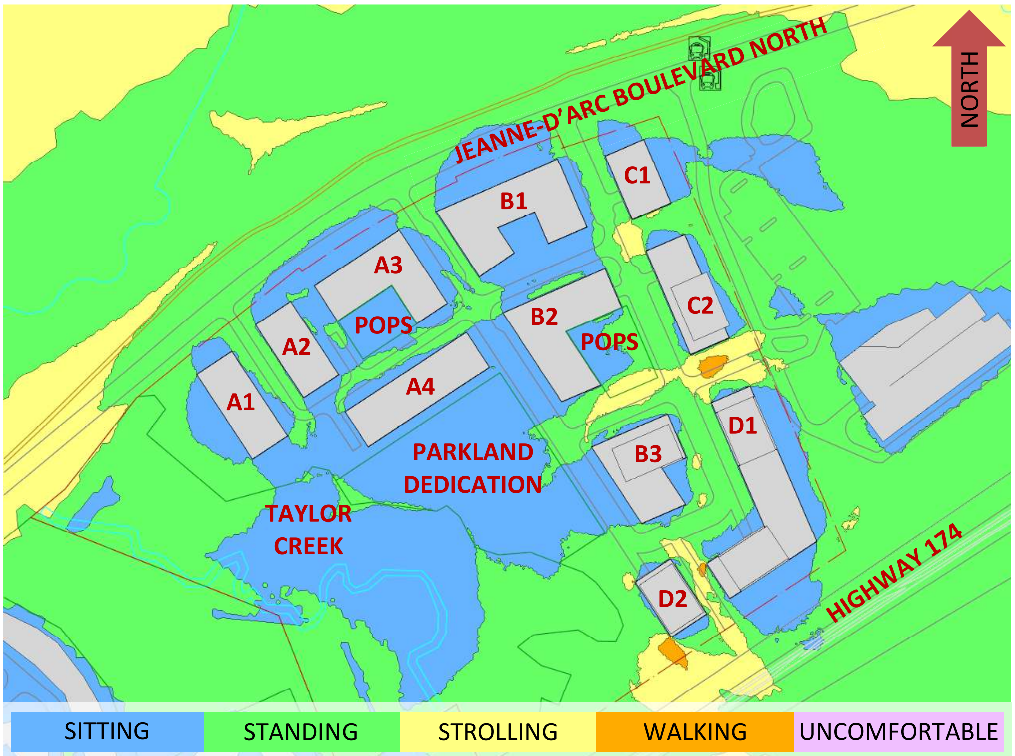


FIGURE 4A: SUMMER – WIND COMFORT, GRADE LEVEL – PROPOSED MASSING

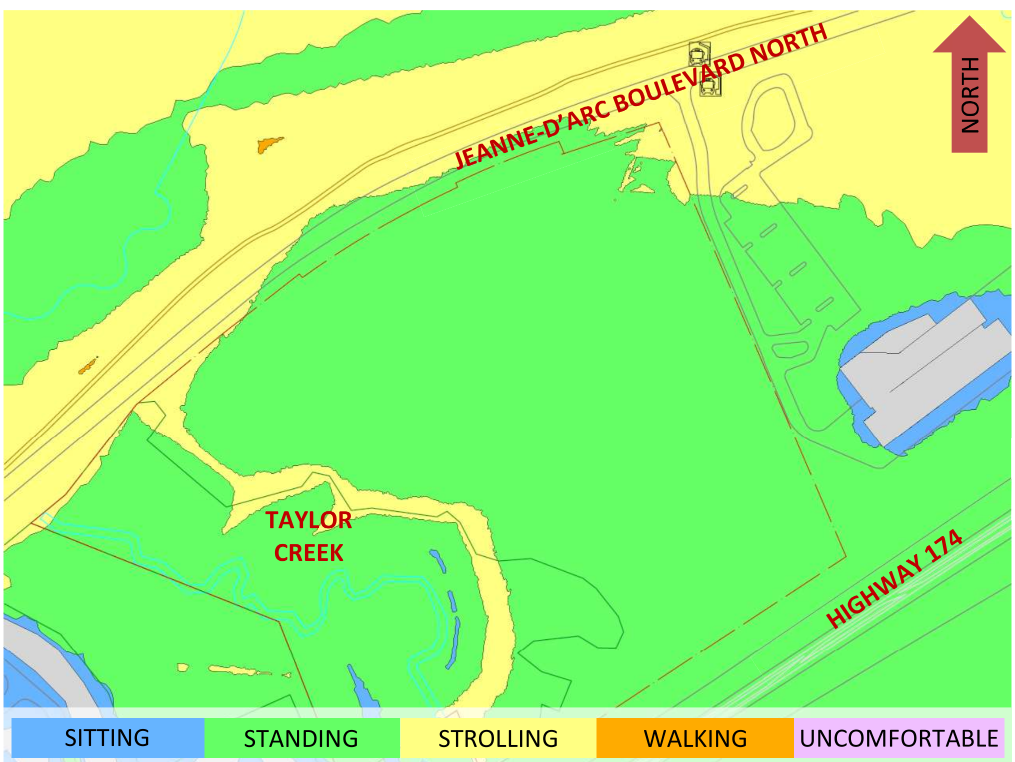


FIGURE 4B: SUMMER – WIND COMFORT, GRADE LEVEL – EXISTING MASSING

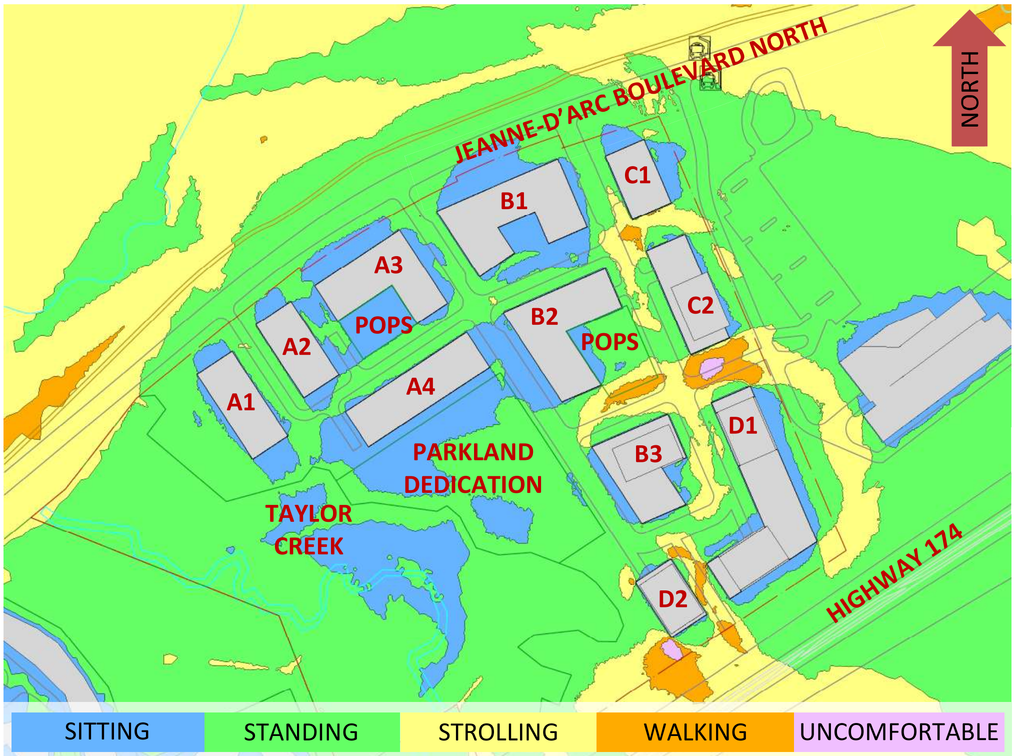


FIGURE 5A: AUTUMN – WIND COMFORT, GRADE LEVEL – PROPOSED MASSING

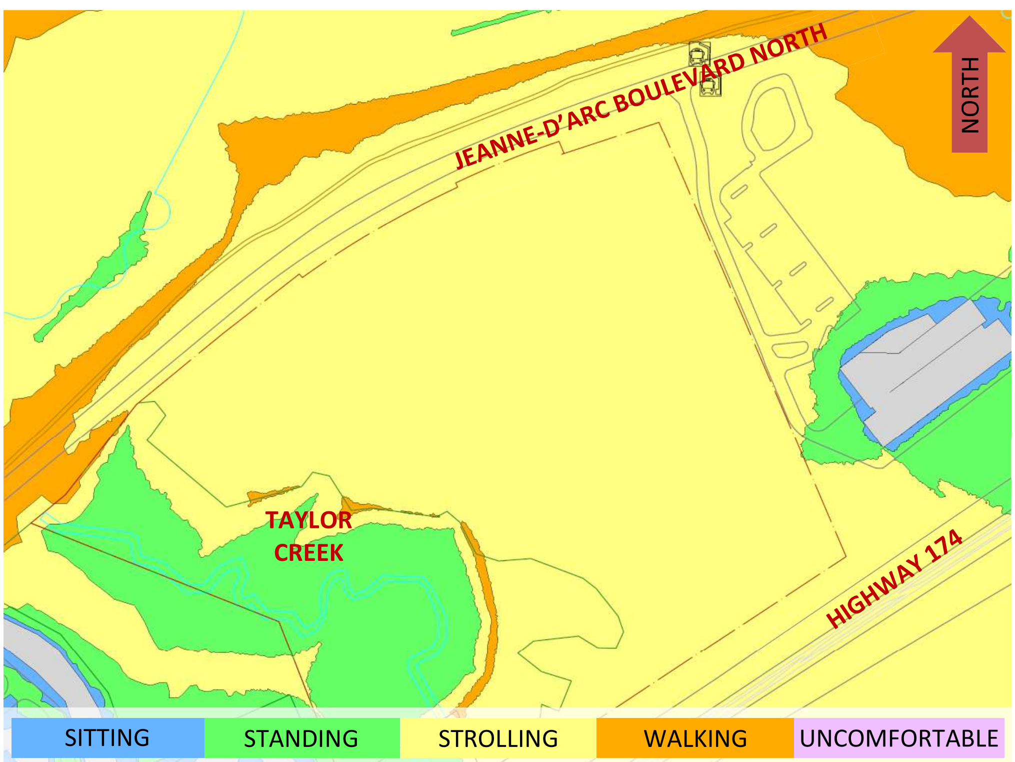


FIGURE 5B: AUTUMN – WIND COMFORT, GRADE LEVEL – EXISTING MASSING

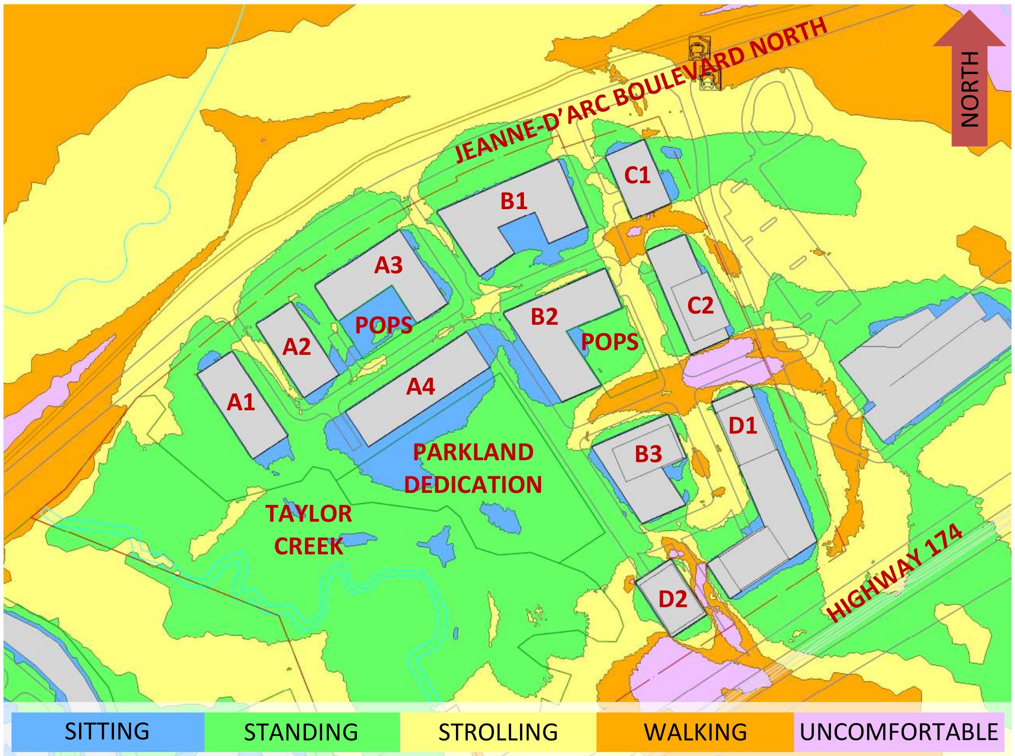


FIGURE 6A: WINTER – WIND COMFORT, GRADE LEVEL – PROPOSED MASSING

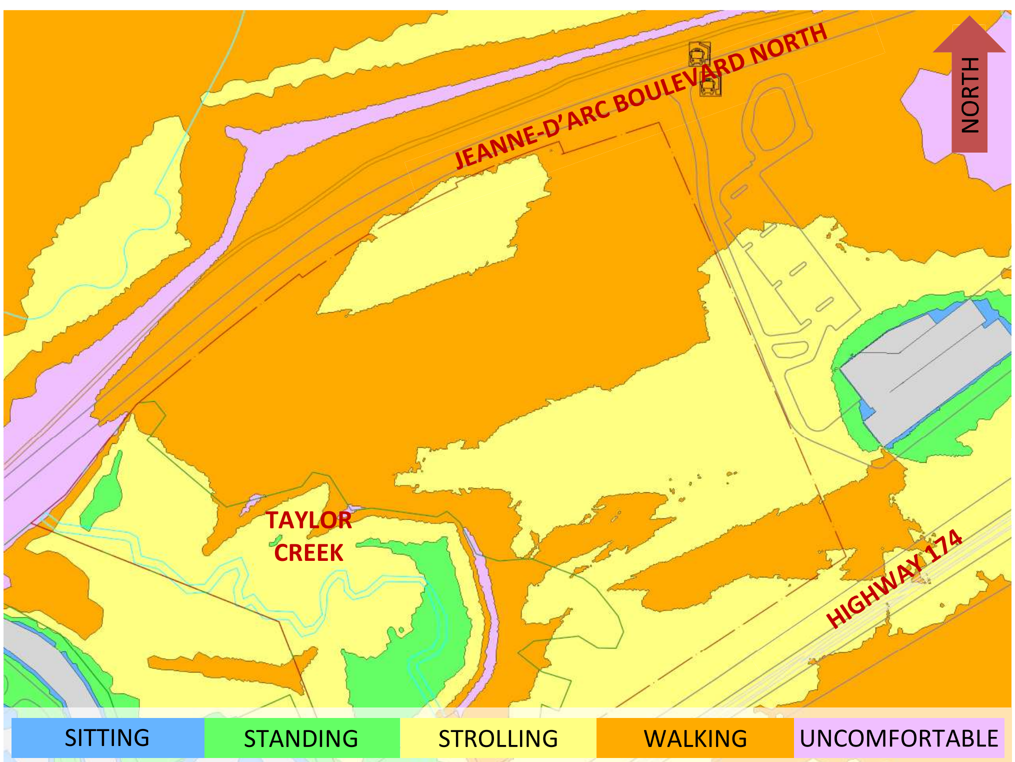


FIGURE 6B: WINTER – WIND COMFORT, GRADE LEVEL – EXISTING MASSING

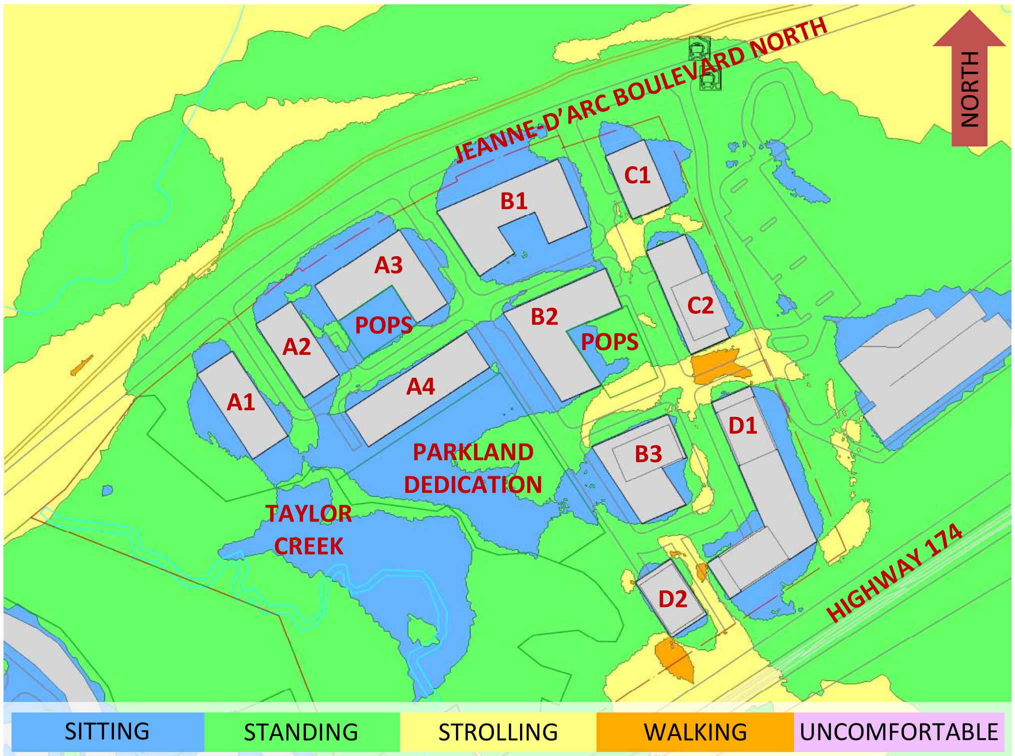


FIGURE 7: TYPICAL USE PERIOD – WIND COMFORT, GRADE LEVEL – PROPOSED MASSING

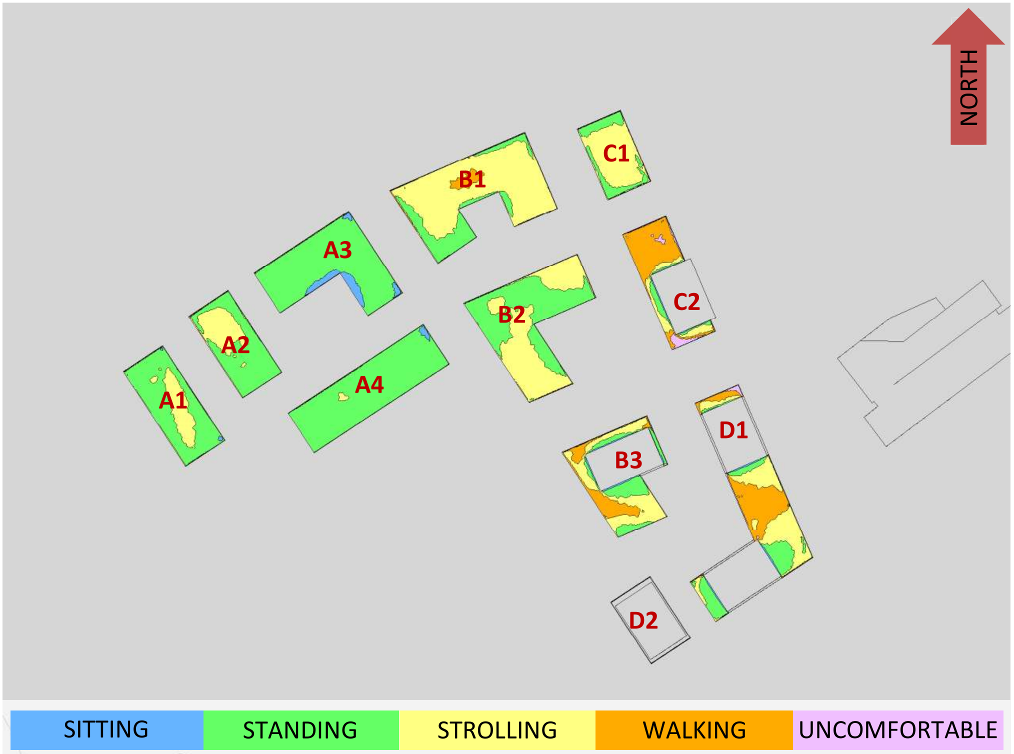


FIGURE 8A: SPRING – WIND COMFORT, ROOF LEVEL

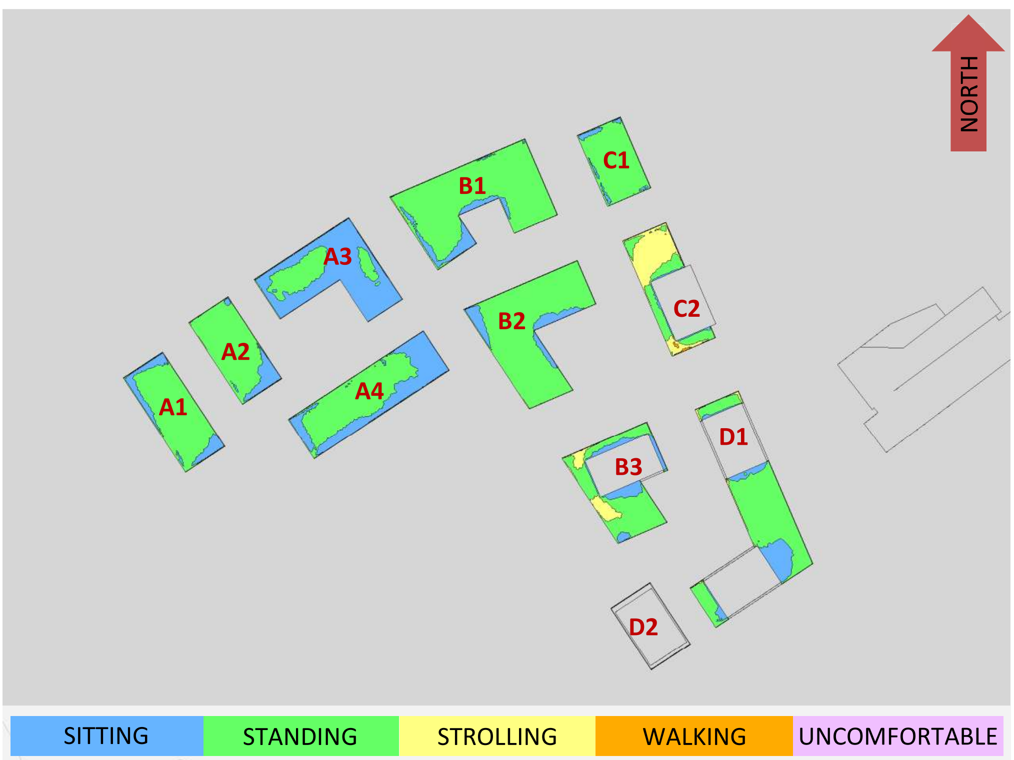


FIGURE 8B: SUMMER – WIND COMFORT, ROOF LEVEL

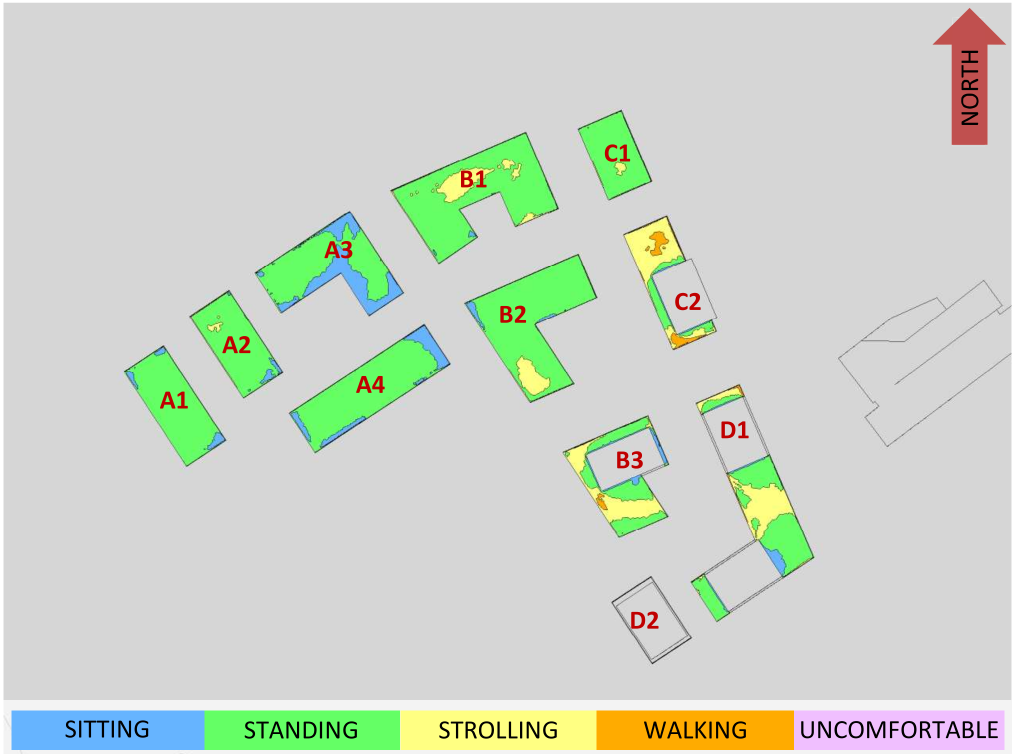


FIGURE 8C: AUTUMN – WIND COMFORT, ROOF LEVEL

FIGURE 8D: WINTER – WIND COMFORT, ROOF LEVEL

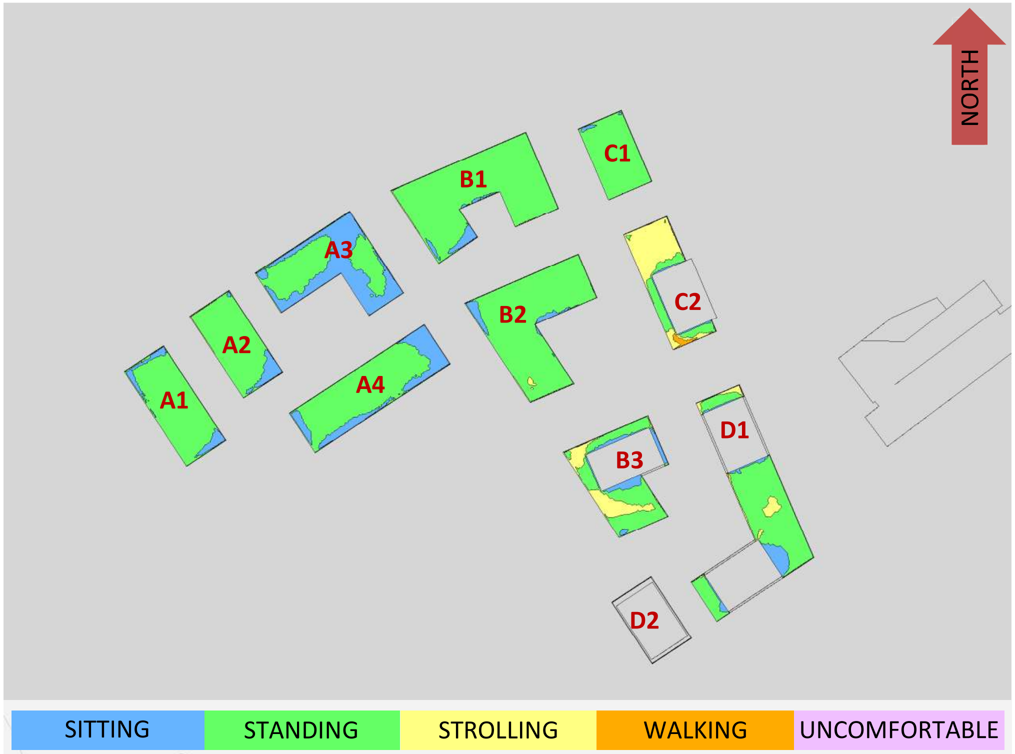
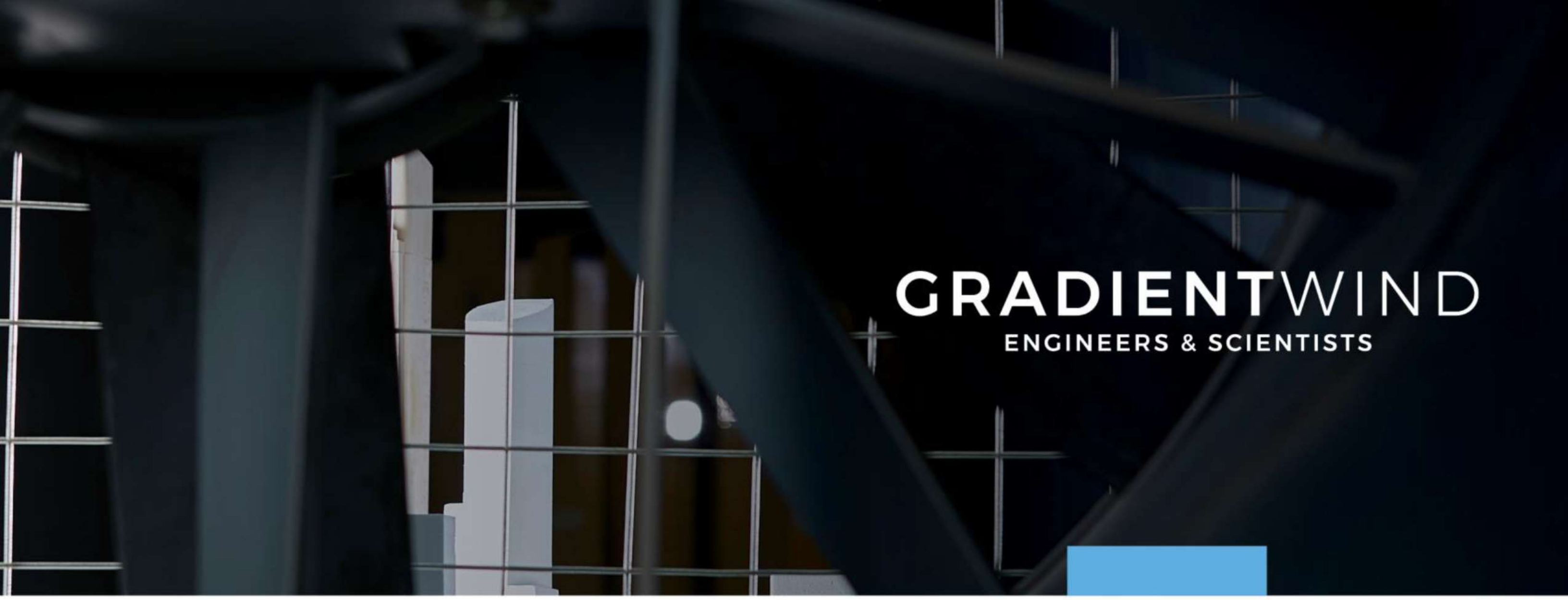
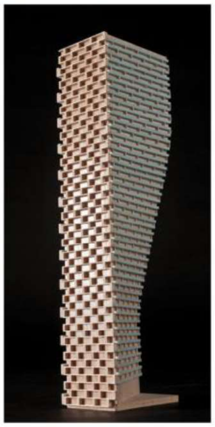


FIGURE 9: TYPICAL USE PERIOD – WIND COMFORT, ROOF LEVEL





APPENDIX A

SIMULATION OF THE ATMOSPHERIC BOUNDARY LAYER

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SIMULATION OF THE ATMOSPHERIC BOUNDARY LAYER

The atmospheric boundary layer (ABL) is defined by the velocity and turbulence profiles according to industry standard practices. The mean wind profile can be represented, to a good approximation, by a power law relation, Equation (1), giving height above ground versus wind speed (1), (2).

$$U = U_g \left(\frac{Z}{Z_g}\right)^{\alpha} \qquad \text{Equation (1)}$$

where $\boldsymbol{U}$ = mean wind speed, $\boldsymbol{U_g}$ = gradient wind speed, $\boldsymbol{Z}$ = height above ground, $\boldsymbol{Z_g}$ = depth of the boundary layer (gradient height), and α is the power law exponent.

For the model, U_g is set to 6.5 metres per second (m/s), which approximately corresponds to the 60% mean wind speed for Ottawa based on historical climate data and statistical analyses. When the results are normalized by this velocity, they are relatively insensitive to the selection of gradient wind speed.

Z_g is set to 540 m. The selection of gradient height is relatively unimportant, so long as it exceeds the building heights surrounding the subject site. The value has been selected to correspond to our physical wind tunnel reference value.

α is determined based on the upstream exposure of the far-field surroundings (that is, the area that it not captured within the simulation model).

Table 1 presents the values of α used in this study, while Table 2 presents several reference values of α. When the upstream exposure of the far-field surroundings is a mixture of multiple types of terrain, the α values are a weighted average with terrain that is closer to the subject site given greater weight.

TABLE 1: UPSTREAM EXPOSURE (ALPHA VALUE) VS TRUE WIND DIRECTION

Wind Direction (Degrees True)	Alpha Value (α)
0	0.19
22.5	0.18
45	0.19
67.5	0.20
90	0.20
112.5	0.21
135	0.23
157.5	0.24
180	0.24
202.5	0.24
225	0.24
247.5	0.22
270	0.19
292.5	0.17
315	0.18
337.5	0.18

TABLE 2: DEFINITION OF UPSTREAM EXPOSURE (ALPHA VALUE)

Upstream Exposure Type	Alpha Value (α)
Open Water	0.14-0.15
Open Field	0.16-0.19
Light Suburban	0.21-0.24
Heavy Suburban	0.24-0.27
Light Urban	0.28-0.30
Heavy Urban	0.31-0.33

The turbulence model in the computational fluid dynamics (CFD) simulations is a two-equation shear-stress transport (SST) model, and thus the ABL turbulence profile requires that two parameters be defined at the inlet of the domain. The turbulence profile is defined following the recommendations of the Architectural Institute of Japan for flat terrain (3).

$$I(Z) = \begin{cases} 0.1\left(\frac{Z}{Z_g}\right)^{-\alpha-0.05}, & Z > 10 \text{ m} \\ 0.1\left(\frac{10}{Z_g}\right)^{-\alpha-0.05}, & Z \leq 10 \text{ m} \end{cases} \quad \text{Equation (2)}$$

$$L_t(Z) = \begin{cases} 100 \text{ m}\sqrt{\frac{Z}{30}}, & Z > 30 \text{ m} \\ 100 \text{ m}, & Z \leq 30 \text{ m} \end{cases} \quad \text{Equation (3)}$$

where ***I*** = turbulence intensity, L_t = turbulence length scale, ***Z*** = height above ground, and **α** is the power law exponent used for the velocity profile in Equation (1).

Boundary conditions on all other domain boundaries are defined as follows: the ground is a no-slip surface; the side walls of the domain have a symmetry boundary condition; the top of the domain has a specified shear, which maintains a constant wind speed at gradient height; and the outlet has a static pressure boundary condition.

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[2] S. A. Hsu, E. A. Meindl and D. B. Gilhousen, "Determining the Power-Law Wind Profile Exponent under Near-neutral Stability Conditions at Sea," vol. 33, no. 6, 1994.

[3] Y. Tamura, H. Kawai, Y. Uematsu, K. Kondo and T. Okhuma, "Revision of AIJ Recommendations for Wind Loads on Buildings," in *The International Wind Engineering Symposium, IWES 2003*, Taiwan, 2003.