June 3, 2013

Mr. Steven Grandmont, Chief Operating Officer
Richcraft Group of Companies
2280 St. Laurent Boulevard
Ottawa, Ontario
K1G 4K1

Dear Mr. Grandmont:

Re: Qualitative Pedestrian Wind Assessment
250 & 274 Parkdale Avenue, Ottawa
***GmE* File Ref.: 13-052-DTPLW**

1. INTRODUCTION

Gradient Microclimate Engineering Inc. (*GmE*) was retained by Richcraft Group of Companies to undertake a qualitative pedestrian level wind assessment for a proposed dual-tower mixed-use development to be located at 250 and 274 Parkdale Avenue in Ottawa, Ontario. This report provides a qualitative assessment of pedestrian wind comfort for the noted site based on architectural drawings provided by Roderick Lahey Architect Inc. in May 2013, a review of existing surrounding context, statistical knowledge of the Ottawa wind climate, and experience with similar past projects in Ottawa. A qualitative wind assessment, as distinct from the more elaborate wind tunnel or computational study, is suitable to identify potential pedestrian comfort issues at an early design stage, and develop mitigation strategies as may be necessary.

2. TERMS OF REFERENCE

The focus of this qualitative wind assessment is a planned dual-tower development to be located at 250 and 274 Parkdale Avenue in Ottawa, Ontario. The site is situated on a parcel of land bounded by Parkdale Avenue to the east, Bullman Street to the south, Holland Avenue to the west, and Scott Street to the north.

The rectangular and semi-elliptical plan-form towers of thirty-two (32) and twenty-eight (28) storeys, respectively identified as tower 'A' (250 Parkdale Avenue) and tower 'B' (274 Parkdale Avenue), rise from independent four (4) storey podia with the long axis of their rectangular floor plates rotated 8 degrees clockwise from the centerline of Scott Street. Multiple levels of below-grade parking are scheduled for each development, with egress/ingress provided via ramp access at the northwest corner of tower A from Scott Street, as well as at the southwest corner of tower B from Bullman Street. An amenity terrace is located atop the podium roof of tower B, while both towers A and B are served by mechanical penthouses.

Regarding wind exposure, the study buildings are surrounded in close proximity by lower commercial and residential buildings to the west, south and east, and a cluster of mid-height commercial and mixed-use buildings to the north, located north of Scott Street. At greater distances, referred to as the far field, the site is surrounded by the Ottawa River to the north and low-rise residential properties for most other directions. As such, the existing massing creates generally suburban wind exposures for the northeast clockwise through to southwest quadrants, and hybrid suburban-open exposures for the remaining cardinal directions.

With respect to pedestrian winds, key areas under investigation include the public sidewalks along Parkdale Avenue and Scott Street, the main entrances and exit doors for both buildings, and the noted tower B podium roof amenity terrace. A hybrid roof plan and ground floor plan is provided in Figure 1.

3. METHODOLOGY

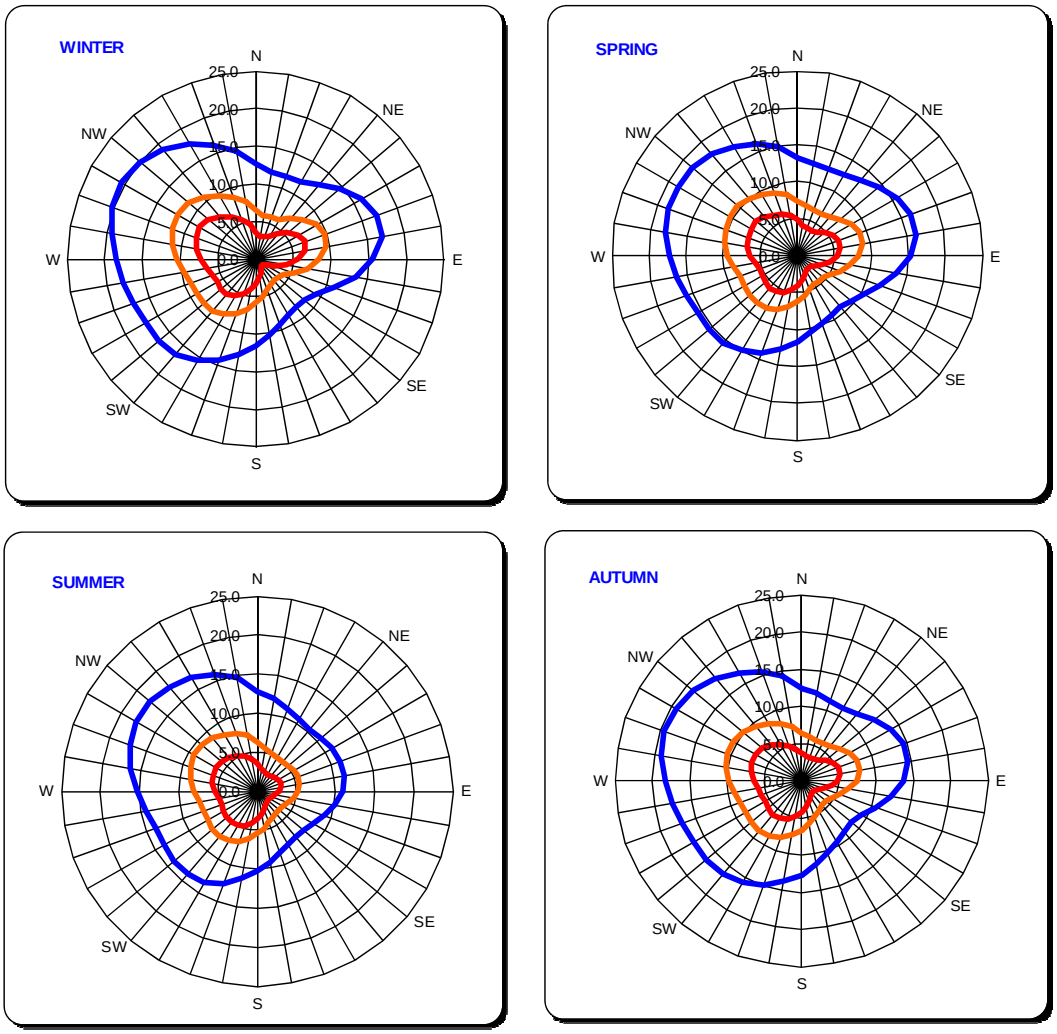
The following section describes the analysis process, including a background discussion of pedestrian comfort. The essential aspects of a qualitative wind analysis include: (i) consideration of the statistical properties of the local wind climate; (ii) consideration of the massing of the site (i.e., the shape, height and orientation of the buildings); and (iii) estimation of anticipated pedestrian comfort conditions based on in-house experience.

3.1 Meteorological Data Analysis

A statistical model of the Ottawa wind climate, indicating the directional character of local winds on a seasonal basis, is presented on the following page. The plots illustrate three contours representing three probability levels superimposed on a polar grid of wind speed at gradient height in metres/second (m/s). The three contours represent the mean hourly wind speed occurring once per month (innermost contour), once per year and once every ten years (outermost contour). The preferred wind directions can be identified as the angular position where the given contour has the largest radial distance from the centre. For Ottawa, the most common winds occur for westerly wind directions, followed by those from the east; the directional preferences and corresponding wind speeds vary seasonally. By convention in microclimate studies, wind direction refers to the wind origin (e.g., a north wind blows from north to south).

SEASONAL DISTRIBUTION OF WINDS FOR VARIOUS PROBABILITIES

MACDONALD-CARTIER INTERNATIONAL AIRPORT, OTTAWA



Notes:

1. Radial distances indicate wind speed in metres/second at a height of 10 m above grade.
2. A point along the innermost contour represents the wind speed exceeded on average 0.1% of the time within a 10° sector centered on that direction.
3. The middle and outermost contours represent probability levels of 0.01% and 0.001%, respectively.

3.2 Pedestrian Wind Comfort Criteria

Pedestrian comfort criteria are based on mechanical wind effects without consideration of other meteorological conditions (e.g., temperature, relative humidity). The criteria provide an assessment of comfort, assuming that pedestrians are appropriately dressed for a specified outdoor activity during any given season, and are based on statistical progression. Five pedestrian comfort classes and corresponding gust wind speed ranges are used to assess pedestrian comfort, which include: (i) Sitting; (ii) Standing; (iii) Walking; (iv) Uncomfortable; and (v) Dangerous. More specifically, the comfort classes, associated wind speed ranges and limiting criteria are summarized as follows:

i) **Sitting** – Wind speeds below 14 km/h (i.e. 0 - 14 km/h), occurring more than 70% of the time, are acceptable for sedentary activities, including sitting.
ii) **Standing** – Wind speeds below 22 km/h (i.e. 0 - 22 km/h), occurring more than 80% of the time, are acceptable for activities such as standing, strolling or more vigorous activities.
iii) **Walking** – Wind speeds below 30 km/h (i.e. 0 - 30 km/h), occurring more than 80% of the time, are acceptable for walking or more vigorous activities.
iv) **Uncomfortable** – Uncomfortable conditions are characterized by predicted values that fall below the 80% criterion target for walking. Brisk walking and exercise, such as jogging, would be acceptable for moderate excesses of this criterion.
v) **Dangerous** – Wind speeds greater than 90 km/h, occurring more than 0.01% of the time, are classified as dangerous. From calculations of stability, it can be shown that gust wind speeds of 90 km/h would be the approximate threshold that would cause an average elderly person in good health to fall.

The wind speeds associated with the above categories are gust wind speeds. Corresponding mean wind speeds are approximately calculated as gust wind speed divided by 1.5. Gust speeds are used in the criteria because people tend to be more sensitive to wind gusts than to steady winds for lower wind speed ranges. These criteria are applied according to the intended use of the outdoor area. For example, an entrance to a building without a vestibule should be suitable for standing, but need not be suitable for sitting.

3.3 Massing vs. Climate – Geometric Effects

Physical features of a site that influence the local wind microclimate include: the density of surrounding buildings, the massing of the study site and the geometry of the study building(s). Massing density typically increases over time, which can provide greater shielding to wind and calmer wind conditions at grade.

For the study site, pedestrian comfort will primarily be influenced by winds originating from the northwest counterclockwise through to southwest, as well as from the east. Although the remaining wind directions have a lower statistical frequency of occurrence, strong wind flows associated with multiple low probability wind directions can cumulatively influence pedestrian comfort.

Based on the orientation of the development relative to prominent wind directions, the form of the study buildings, and in-house knowledge of common wind impacts, moderate wind conditions at grade level are generally expected to be acceptable for anticipated pedestrian uses. Specific wind conditions for the study site are discussed in the following section.

4. ANTICIPATED PEDESTRIAN COMFORT

Based on the massing of the study site, surrounding building massing and the orientation to the local wind climate, the following statements summarize our experience of how these conditions affect pedestrian comfort in key areas around the site.

Tower A Main Residential and Retail Entrances, Exit Door and Ramp Access to Below-Grade Parking on North Façade; Scott Street Sidewalk (Figure 1, Tags A and B): The main residential entrance for tower A is located on the north façade and is served by a vestibule, while a dedicated retail entrance is located at the northeast corner of the podium. Ramp access to below-grade parking is located to the immediate west of the main residential entrance, while a stairwell exit is flanked by the noted entrances. All noted tower A access points, which are identified as Tag 'A' in Figure 1, front onto Scott Street. Given that the 5th floor of the podium overhangs the ground floor, the noted access points are adequately protected from downward flow coming off the 32-storey tower A. Additional features that are favourable with respect to pedestrian comfort at grade include the density of upwind suburban massing to the east and west, as well as the sufficient distance between the proposed development and the south shoreline of the Ottawa River. As a result, wind conditions at the main entrance, retail entrance and stairwell exit are expected to be suitable for sitting during the summer and autumn seasons, and suitable for standing during the remaining colder months. The noted conditions are considered to be acceptable.

For the Scott Street sidewalk area, identified as Tag 'B' in Figure 1, slightly windier conditions suitable for sitting during the summer months, standing during the autumn, and suitable for walking, or better, during the remaining colder months are anticipated; conditions which are nonetheless considered acceptable for the anticipated pedestrian uses.

Exit Doors on East Façade of Towers A and B, and Retail Entrance on East Façade of Tower B; Parkdale Avenue Sidewalk (Figure 1, Tags C and D): The east elevations of towers A and B, identified as Tag 'C' in Figure 1, include stairwell exits for towers A and B, as well as a single retail entrance for tower B. Although the east elevations are primarily exposed to prominent east winds, the suburban upwind massing will tend to create an increase in turbulence, which will benefit pedestrians located near to the east elevations of both towers A and B. Additionally, with the inclusion of coniferous and deciduous plantings along Parkdale Avenue, oncoming winds will be further mitigated. Therefore, considering the noted impact of the planned landscaping, wind conditions are anticipated to be suitable for sitting during the summer and autumn seasons, and suitable for standing during the remaining colder months. The standing criterion is considered acceptable for retail entrances and building exits.

For the Parkdale Avenue sidewalk area, identified as Tag 'D' in Figure 1, wind conditions are expected to be similar to those reported for the Scott Street sidewalk area. More specifically, wind conditions are expected to be suitable for sitting during the summer, standing during the autumn, and suitable for walking, or better, during the remaining colder seasons. Since the walking criterion is considered acceptable and appropriate for public sidewalks, the noted conditions are acceptable.

Tower B Main Residential and Retail Entrances, Exit Door and Ramp Access to Below-Grade Parking on South Façade; Bullman Street Sidewalk (Figure 1, Tags E and F): The entrance providing access to the residential lobby, as well as a dedicated retail entrance, are served by vestibules and located on the south façade of tower B. Ramp access to below-grade parking is located at the southwest corner of the tower B development, while a stairwell exit is flanked by the noted entrances. All noted tower B access points, which are identified as Tag 'E' in Figure 1, front onto Bullman Street. Given that the tower is setback from its podium, the noted access points are adequately protected from downward flow coming off the 28-storey tower B. Additionally, the density of upwind suburban massing to the east and west will tend to create an increase in turbulence, which will benefit pedestrians located near to the tower's south façade. As a result, wind conditions at the main entrance, retail entrance and stairwell exit are expected to be suitable for sitting during the summer and autumn seasons, and suitable

for standing during the remaining colder months. The noted conditions are considered to be acceptable.

For the Bullman Street sidewalk area, identified as Tag 'F' in Figure 1, slightly windier conditions suitable for sitting during the summer months, standing during the autumn, and suitable for walking, or better, during the remaining colder months are anticipated; conditions which are nonetheless considered acceptable for the anticipated pedestrian uses.

West Elevations of Towers A and B; Laneway (Figure 1, Tags G and H): The west elevations of both towers A and B, identified as Tag 'G' in Figure 1, are exposed to statistically prominent southwest clockwise through to northwest winds. The wind conditions are anticipated to be suitable for sitting during the summer, standing during the autumn, and suitable for walking during the remaining colder months. With respect to the architectural drawing set, although no building access points are scheduled to occupy the west elevations of towers A and B at ground level, wind conditions suitable for walking, or better, are considered acceptable and appropriate.

For the laneway formed between towers A and B, which is identified as Tag 'H' in Figure 1, the potential for accelerated wind flow is created by the massing of the proposed towers in combination with statistically prominent westerly winds. The resulting wind conditions are expected to be similar to those anticipated for the Parkdale Avenue sidewalk area. More specifically, acceptable conditions suitable for sitting during the summer months, standing during the autumn, and suitable for walking, or better, during the remaining colder months are expected.

Terrace atop 4-Storey Podium of Tower B: The large private terrace atop the 4-storey segment of tower B is exposed to all prominent winds. As such, moderately strong wind conditions are anticipated year round which will not be conducive to prolonged sitting or lounging. Given that the terrace area and landscape plan are not defined at this time, mitigation may or may not be required. If the terrace is located closer to the edge of the roof and intended for extended sitting, dining or other long-term sedentary activity, extensive mitigation may not be required. However, if the terrace is located close to tower B, mitigation in the form of building canopies, vertical windscreens and/or dense coniferous plantings would likely be required due to the expected increases in both vertical and horizontal air flow caused by the tower's elliptically-shaped north façade. More specific comments can be provided once terrace details are known.

Within the context of typical weather patterns (excluding severe local storm events, such as thunderstorms, tornadoes and downbursts), no dangerous or consistently strong wind conditions are expected anywhere over the subject site on a seasonal, nor on an annual, basis. During severe events, pedestrians are expected to seek shelter and not linger at outdoor spaces.

5. SUMMARY AND RECOMMENDATIONS

This assessment was performed in accordance with the scope of work outlined in *GmE* proposal #13-072P, dated May 9th, 2013. Based on the qualitative analysis of site plans, building forms and the local climate, the following statements summarize our interpretation of future wind conditions for the subject site massing.

In general terms, the anticipated wind conditions at grade surrounding the proposed 32-storey tower A and 28-storey tower B are expected to be suitable for the intended pedestrian uses over all areas at grade. However, for the large private terrace atop the 4-storey segment of tower B, mitigation in the form of building canopies, vertical windscreens and/or dense coniferous plantings may be required depending on the final location and its intended use. However, with the noted mitigation measures in place, most terrace locations can be configured to create comfortable conditions for outdoor occupant use.

The foregoing analysis and statements are based on experience and knowledge of wind flow patterns in suburban settings. While the statements and conclusions relating to pedestrian safety are expected to be reliable for the site as a whole, the evaluation of comfort is more difficult to assess due to the limitations of visualizing local wind flows, as well as the variable physiological response of pedestrians to similar environmental conditions. As a result, this assessment is intended to assure adequate pedestrian safety relating to wind, while providing general guidance relating to pedestrian comfort around the subject site.

This concludes our pedestrian level wind assessment and report. Please advise the undersigned of any questions or comments.

Sincerely,

Gradient Microclimate Engineering Inc.

Justin Ferraro, B.Eng., EIT
Project Manager
GmE 13-052-DTPLW

Vincent Ferraro, M.Eng., P.Eng.
Principal

NOTES:

1. SCALE IS APPROXIMATE.
2. (#) PEDESTRIAN LEVEL WIND SENSOR LOCATION.

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Gradient Microclimate Engineering Inc

PROJECT	250 & 274 PARKDALE AVENUE, OTTAWA PEDESTRIAN LEVEL WIND STUDY		
SCALE	1:600 (APPROX.)	DRAWING NO.	GME13-052-DTPLW-1
DATE	JUNE 3, 2013	DRAWN BY	K.A.

DESCRIPTION

FIGURE 1:
HYBRID ROOF AND GROUND FLOOR PLAN
FOR PROPOSED DEVELOPMENT