

# GRADIENTWIND

ENGINEERS & SCIENTISTS

August 20, 2024

Westrich Pacific Corp.  
10309 102 Avenue NW  
Edmonton, AB T5J 0L1

Attn: Kennedy Minogue, Development Coordinator  
[kennedy@westrichpacific.com](mailto:kennedy@westrichpacific.com)

Dear Ms. Minogue:

Re: Pedestrian Wind Comfort Opinion Letter  
11630 87 Avenue NW, Edmonton  
Gradient Wind File 24-051

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Gradient Wind Engineering Inc. (Gradient Wind) was retained by Westrich Pacific Corp. to undertake a desktop pedestrian level wind (PLW) assessment regarding anticipated pedestrian wind conditions within and surrounding the planned 30-storey residential development known as Windsor Park, located at 11630 87 Avenue NW in Edmonton, Alberta. This report provides a qualitative assessment of pedestrian wind comfort and safety for the subject site based on an architectural design provided by Green Space Alliance in March 2024, consideration of existing and approved future surrounding buildings, statistical knowledge of the Edmonton wind climate, and experience with similar past projects in Edmonton.

## 1. TERMS OF REFERENCE

The subject site is situated at the northeast intersection of 87 Avenue NW and 117 Street NW; bordered by 87 Avenue NW to the south, 117 Street NW to the west, and laneways to the north and east.

The subject site comprises a rectangular building, with its short axis orientated along 87 Avenue NW. The proposed development comprises a 30-storey tower rising above a 2-storey podium. The tower is setback by 4.5 metres (m) from the north, east, and south elevations of the podium, and 9.75 m from the west elevation, accommodating a common amenity terrace within the large setback atop the podium to the west of the tower, and private terraces elsewhere.

The site wind conditions are influenced by the local wind exposures, which are characterized in the near field by a low-rise and mid-rise buildings to the west, a cluster of high-rise towers and a low-rise building comprising University of Alberta residences and buildings to the south, a parking lot and outdoor sports areas to the east, and low-rise residential buildings in the remaining directions.

In the far-field, the wind exposures are primarily characterized by the mix of mid- and high-rise buildings defining the University of Alberta campus from the north clockwise to the south-southeast followed by a mix of green spaces in the northeast quadrant and suburban massing in the southeast quadrant, low-rise buildings from the south clockwise to the south-southwest, and suburban massing followed by the Edmonton River Valley and green spaces in the remaining directions. The North Saskatchewan River is located approximately 875 m to the west of the subject site.

A site plan illustrating the subject site in its contextual surroundings is provided in Figure 1, while a site plan is provided in Figures 2 and 3 which include letter tags identifying the wind-sensitive pedestrian locations considered in this assessment and their associated expected wind comfort conditions for the summer and winter seasons, respectively.

## **2. METHODOLOGY**

The main aspects of a desktop pedestrian level wind assessment include (i) consideration of the statistical properties of the local wind climate; (ii) knowledge of wind flow behaviour in typical urban and suburban environments; and (iii) an understanding of how common wind conditions relate to typical pedestrian activity types. The following sections describe this analysis procedure, including a discussion of the City of Edmonton pedestrian wind criteria<sup>1</sup>.

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<sup>1</sup> Edmonton, *Wind Impact Assessments Terms of Reference*, 2021  
[https://www.edmonton.ca/sites/default/files/public-files/assets/Wind\\_Impact\\_Assessments\\_TermsOfReference.pdf](https://www.edmonton.ca/sites/default/files/public-files/assets/Wind_Impact_Assessments_TermsOfReference.pdf)

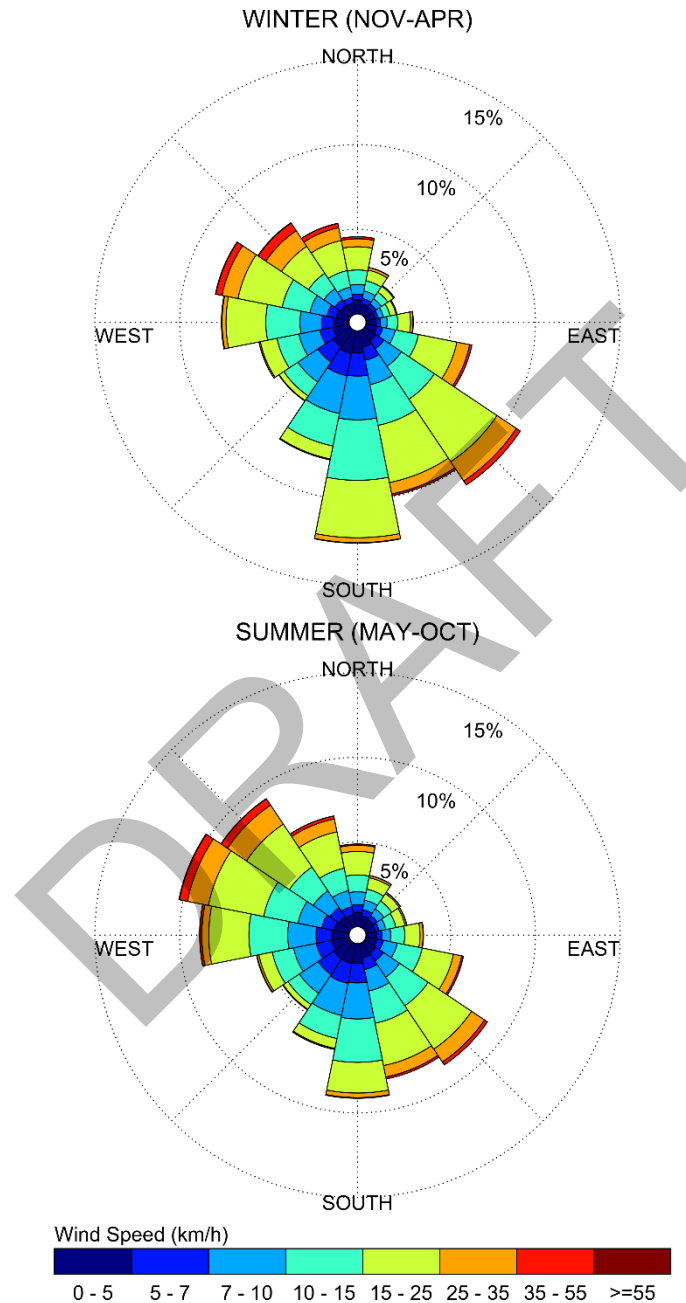
## 2.1 Wind Climate

A statistical model for winds in Edmonton was developed from approximately 40 years of hourly meteorological wind data recorded at Edmonton International Airport and obtained from Environment and Climate Change Canada. Wind speed and direction data were divided into two distinct seasons, as stipulated in the wind criteria. Specifically, the summer season is defined as May through October and the winter season is defined as November through April, inclusive.

The statistical model of the Edmonton 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 winds can be identified by the longer length of the bars. For Edmonton, the most common winds occur for southwesterly and northeasterly wind directions, while the most common wind speeds are below 25 km/h. The directional prominence and relative magnitude of wind speed changes somewhat from season to season.



**SEASONAL DISTRIBUTION OF WIND  
EDMONTON INTERNATIONAL AIRPORT, EDMONTON, ALBERTA**



**Notes:**

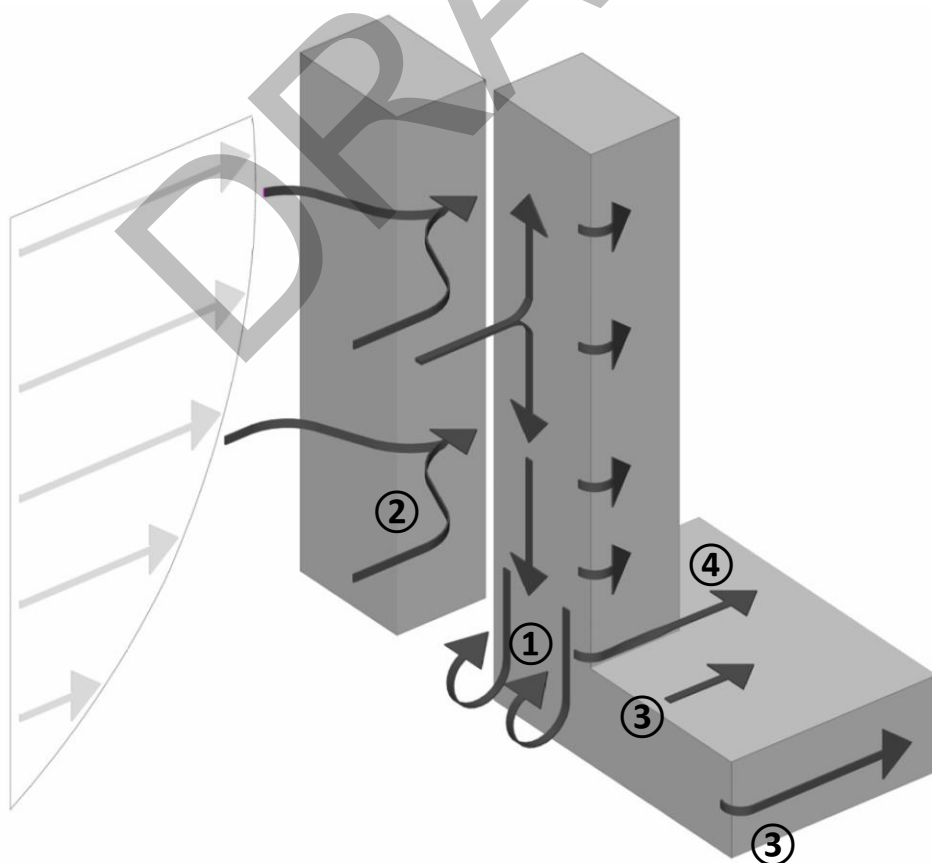
1. Radial distances indicate percentage of time of wind events.
2. Wind speeds are mean hourly in km/h, measured at 10 m above the ground.



## 2.2 Massing vs. Climate – Geometric Effects

The physical features of a development site that are most influential to the local wind conditions include the massing and relative spacing of surrounding buildings, the geometry and orientation of the study building, and the alignment of the study building with respect to statistically prominent wind directions.

Wind flow characteristics which combine to determine how conditions will develop include phenomena known as downwash, channelling coupled with acceleration, and shielding, as illustrated in the image below. Downwash ① relates to the effect of winds against a tall building, whereby much of the impinging flow on the windward side of the building, nominally below two-thirds of the total height, is directed to lower levels. Taller buildings with smooth façades and no podiums produce the strongest downwash effects at grade, while the presence of protruding balconies and a tower setback from the podium edge mitigates downwash effects at the ground level. Channelling ② refers to acceleration of wind through gaps between buildings, while acceleration of wind ③ occurs around building corners. Shielding ④ relates to calm zones on the leeward side of buildings, protected from prevailing winds.



## 2.3 Pedestrian Wind Comfort and Safety Criteria – City of Edmonton

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. Since both mean and gust wind speeds affect pedestrian comfort, their combined effect is defined in the City of Edmonton Wind Impact Assessments Terms of Reference. Specifically, the criteria are defined as a Gust Equivalent Mean (GEM) wind speed, which is the greater of the mean wind speed or the gust wind speed divided by 1.85.

The wind speed ranges are selected based on the Beaufort Scale, which describes the effects of forces produced by varying wind speed levels on objects. Four pedestrian comfort classes and corresponding gust wind speed ranges are used to assess pedestrian comfort: (1) Sitting; (2) Standing; (3) Walking; and (4) Uncomfortable. Wind conditions suitable for sitting are represented by the colour blue, standing by green, and walking by yellow; uncomfortable conditions are represented by the colour orange, consistent with the City of Edmonton Terms of Reference. Specifically, the comfort classes, associated wind speed ranges, and limiting criteria are summarized as follows:

**PEDESTRIAN WIND COMFORT CLASS DEFINITIONS**

| Wind Comfort Class   | GEM Speed (km/h) |        | Description                                                                                                                                                                                                                |
|----------------------|------------------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                      | SUMMER           | WINTER |                                                                                                                                                                                                                            |
| <b>SITTING</b>       | ≤ 10             | ≤ 8    | GEM wind speeds no greater than 10 km/h in the summer and 8 km/h in the winter occurring at least 80% of the time would be considered acceptable for sedentary activities, including sitting.                              |
| <b>STANDING</b>      | ≤ 15             | ≤ 12   | GEM wind speeds no greater than 15 km/h in the summer and 12 km/h in the winter occurring at least 80% of the time are acceptable for activities such as standing, strolling or more vigorous activities.                  |
| <b>WALKING</b>       | ≤ 20             | ≤ 16   | GEM wind speeds no greater than 20 km/h in the summer and 16 km/h in the winter occurring at least 80% of the time are acceptable for walking or more vigorous activities.                                                 |
| <b>UNCOMFORTABLE</b> | > 20             | > 16   | Uncomfortable conditions are characterized by predicted values that fall below the 80% target for walking. Brisk walking and exercise, such as jogging, are considered acceptable for moderate excesses of this criterion. |



Regarding wind safety, gust wind speeds greater than 90 km/h, occurring more than 0.1% of the time on an annual basis (based on wind events recorded for 24 hours a day), are classified as dangerous.

The criteria are applied to the intended use of an outdoor area. For example, an entrance to a building should be suitable for standing, while a public sidewalk need only be suitable for walking in most circumstances.

### **3. ANTICIPATED PEDESTRIAN WIND COMFORT**

Based on consideration of the subject site, surrounding building massing, and the relationship to the local wind climate, the statements below summarize our assessment of wind comfort and safety at key pedestrian areas, as identified by the letter tags in Figures 2 and 3 for the summer and winter seasons, respectively. Wind conditions suitable for sitting are represented by tags that are coloured blue, standing by green, and walking by yellow; uncomfortable conditions are represented by the colour orange, consistent with the City of Edmonton Terms of Reference.

**Neighbouring Laneways (Tags A and B):** The laneways bordering the subject site along its north and east elevations are exposed to lower-level winds from the northwest and southeast and downwash effects of northwesterly winds and southwesterly winds over the north and east tower façades to grade-level and acceleration of these salient winds around the northeastern and southeastern building corners are expected. These conditions are expected to be somewhat mitigated by the modest shielding effects provided by the suburban environs. The 4.5 m tower setbacks from the east and north podium elevations are positive design features that act to help mitigate the downwash of the higher-level winds to grade-level.

Overall, conditions over the noted laneway along the north elevation (Tag A) are expected to be suitable for standing during the summer and winter, with conditions expected to be suitable for walking near the northeast corner of the building, while conditions along the laneway along the east elevation (Tag B) are expected to be suitable for a mix of sitting and standing during the summer, and a mix of standing and walking during the winter. Owing to the protection provided by the building façade, conditions in the vicinity of the nearby building entrance at the northeast corner of the proposed development are expected to be suitable for a mix of sitting and standing throughout the year. The noted conditions are considered acceptable.



**Neighbouring Surface Parking Lot (Tag C):** While the neighbouring surface parking lot situated to the immediate east of the subject site will be shielded from winds from the northwest by the proposed building massing, the area will be exposed to southeasterly winds. Overall, conditions over the noted existing surface parking lot are expected to be suitable for mostly sitting during the summer and standing during the winter. The noted conditions are considered acceptable.

**Sidewalks and Transit Stop along 87 Avenue NW (Tags D, E, F, and G):** While the nearby sidewalks to the north along 87 Avenue NW (Tags D, E, and G) are shielded from northwesterly winds by the proposed massing and the mid-rise buildings to the west of the subject site, owing to the exposure of the area to prevailing westerly and southeasterly winds, the noted areas are expected to be suitable for a mix of sitting and standing during the summer, becoming suitable for a mix of standing and walking during the winter months. Notably, the proposed 4.5 m setback of the tower from the south podium elevation is a positive design feature to help mitigate the downwash of the prevailing southerly and southeasterly winds to grade-level. The noted conditions are considered acceptable.

Over the public sidewalks and transit stop to the south along 87 Avenue NW (Tag F), the neighbouring high-rise buildings are expected to provide shielding from direct southerly winds, and conditions along the noted public sidewalks and transit stop are expected to be suitable for mostly sitting during the summer and standing during the winter. The noted conditions are considered acceptable.

Conditions in the vicinity of the proposed building entrances along 87 Avenue NW are expected to be suitable for standing throughout the year, primarily owing to the moderation of downwash provided by the setback from the south podium elevation, and the shielding provided by the mid-rise buildings to the west of the subject site. The noted conditions are considered acceptable.

**Public Sidewalks along 117 Street NW to the south of 87 Avenue NW (Tag H):** While the public sidewalks along 117 Street NW are exposed to the prevailing winds from the south, the surrounding massing provides shielding from winds from other directions for the public sidewalks along 117 Street NW to the south of 87 Avenue NW. Overall, the conditions over the sidewalks along 117 Street NW to the south of 87 Avenue NW are expected to be suitable for sitting during the summer and standing during the winter. The noted conditions are considered acceptable.



**Public Sidewalks along 117 Street NW to the north of 87 Avenue NW (Tags I, J, and K):** Similarly, the public sidewalks along 117 Street NW to the north of 87 Avenue NW are exposed to prevailing southerly winds while being shielded from direct southeasterly winds by the proposed development. Furthermore, the 9.75 m setback of the tower from the west elevation is expected to help mitigate the channeling of winds along 117 Street NW and the downwash of winds to grade-level from the west tower façade.

Overall, to the north (Tag K), conditions are expected to be suitable for sitting during the summer and a mix of sitting and standing during the winter, while to the west across 117 Street NW (Tag J), wind comfort conditions are expected to be suitable for a mix of mostly sitting and standing throughout the year. Over the sidewalks along the west elevation of the proposed development (Tag I), wind conditions are expected to be suitable for standing during the summer, and a mix of standing and walking during the winter, with the windiest conditions expected at the southwestern and northwestern corners of the proposed development where prevailing winds are expected to accelerate around the building massing. The noted conditions are considered acceptable.

Owing to the protection of the building façade, wind conditions in the vicinity of the building entrances along the west elevation are expected to be suitable for standing throughout the year. The noted conditions are considered acceptable.

**Level 3 Common Amenity Terrace (Tag L):** Atop the podium, the common amenity terrace to the west will be shielded from most direct winds from all directions, owing to the shielding provided by the proposed building for winds from the southeast, by the mid-rise buildings to the west, and the suburban massing to the northwest.

Higher-level prevailing winds from the northwest are expected to downwash over the western tower façade towards the terrace, while winds from the south and southeast are expected to be accelerate around the southwest tower corner, impacting the southern and western terrace areas. It is expected that conditions within the amenity terrace will be suitable for a mix of sitting and standing during the summer season, when the use of the terrace is most frequent, including designated seating and lounging areas. During the winter, conditions are expected to be suitable for a mix of standing and walking.



To provide conditions that are comfortable for sitting during the summer months throughout the terrace, mitigation strategies that may be considered by the design team may include canopies extending from the west tower façade, wrapping around the northwest and southwest tower corners with returns along the north and south tower elevations, a tall perimeter wind screen in place of standard height guards, particularly along the north and south elevations of the terrace, and mitigation inboard of the terrace perimeter that is targeted around designated seating or lounging areas, which may take the form of dense landscape elements, wind screens, or other typical landscape elements and canopies above designated seating areas.

The extent of mitigation is dependent on the programming of the terrace. As the design of the development progresses, future PLW studies using wind tunnel testing of a physical scale model of the proposed development in its surroundings to satisfy Development Permit application requirements are anticipated to confirm the wind conditions within the terrace and to develop and refine the mitigation strategy, as required.

**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 site are expected to experience conditions that could be considered dangerous, as defined in Section 2.3.

**Influence of the Proposed Development on Existing Wind Conditions near the Subject Site:** While the introduction of the proposed development is expected to reduce wind comfort over neighbouring areas beyond the subject site, nearby building entrances, sidewalks, laneways, parking areas, transit stops, and other pedestrian-sensitive areas beyond the subject site are expected to continue to experience acceptable wind conditions.



#### **4. SUMMARY AND RECOMMENDATIONS**

Based on a qualitative analysis of the architectural drawings, surrounding building massing, and the Edmonton wind climate, the following general statements summarize our prediction of future wind conditions for the proposed development in Edmonton, Alberta.

1. Wind comfort conditions at all grade-level pedestrian-sensitive locations within and surrounding the subject site are expected to be suitable for the anticipated uses without mitigation on a seasonal basis. The areas include nearby public sidewalks, transit stops, building entrances, walkways, laneways, and surface parking.
2. Regarding the common amenity terrace at Level 3 atop the podium, wind conditions during the summer season are expected to be suitable for a mix of sitting and standing. The extent and requirements for mitigation are dependent on the programming of the space and may include mitigation elements such as canopies extending from the tower façades, perimeter wind screens, and inboard wind mitigation around sensitive areas that is comprised of common landscaping elements and/or wind screens. As the design of the development progresses, future PLW studies using wind tunnel testing of a physical scale model of the proposed development in its surroundings to satisfy Development Permit application requirements are anticipated to confirm the wind conditions within the terrace and to develop and refine the mitigation strategy, as required.
3. The introduction of the proposed development is not expected to significantly reduce wind comfort over neighbouring areas beyond the subject site. Nearby building entrances, sidewalks, parking areas, transit stops, and other pedestrian-sensitive areas beyond the subject site are expected to continue to experience acceptable wind conditions.



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4. The foregoing statements and conclusions apply to common weather systems, during which no dangerous wind conditions 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.

In accordance with the City of Edmonton Terms of Reference, a quantitative PLW study is required to assess and confirm the predicted wind conditions within and surrounding the proposed development via wind tunnel testing of a physical scale model of the proposed development within its surroundings. This work would satisfy the future Development Permit application.

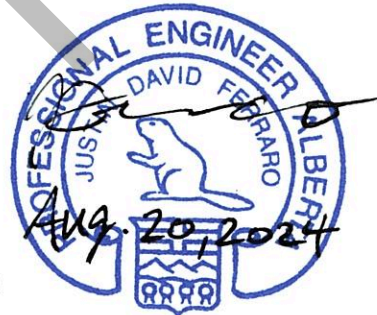
Sincerely,

**Gradient Wind Engineering Inc.**



David Huitema, M.Eng., P.Eng.  
CFD Lead Engineer

#268149



Justin Ferraro, MBA, P.Eng.  
Principal

