10301 – 104TH STREET

EDMONTON , AB

WIND IMPACT STATEMENT

PROJECT #2101774
FEBRUARY 5, 2021

SUBMITTED TO

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1. INTRODUCTION

RWDI was retained by Stantec to prepare a Wind Impact Statement for the proposed Project at 10301 – 104th Street in Edmonton, AB, as required by the City of Edmonton Zoning Bylaw 12800 Section 860.5 (8b) for the Development Permit application for the project.

The project site, located at the intersection of 104 St and 103 Ave one block south of Rogers Place, is currently occupied by a low-rise building (see Image 1). The Edmonton Ice District development, which includes several blocks currently under construction, is to the east and northeast of the site and the downtown core is to the southeast. Surroundings primarily comprise low-rise buildings in the northerly directions, a mix of low-rise and mid-rises to the west and mainly high-rises to the southeast and south.

The project is a 40-storey residential building with the potential to be increased up to 50 storeys (160m). Three levels of commercial/retail spaces and underground parking are proposed. Key areas of interest for this study include the main entrance proposed on 104 St and public sidewalks on both 103 Ave and 104 St. The site plan and elevations received from Stantec are shown in Image 2.

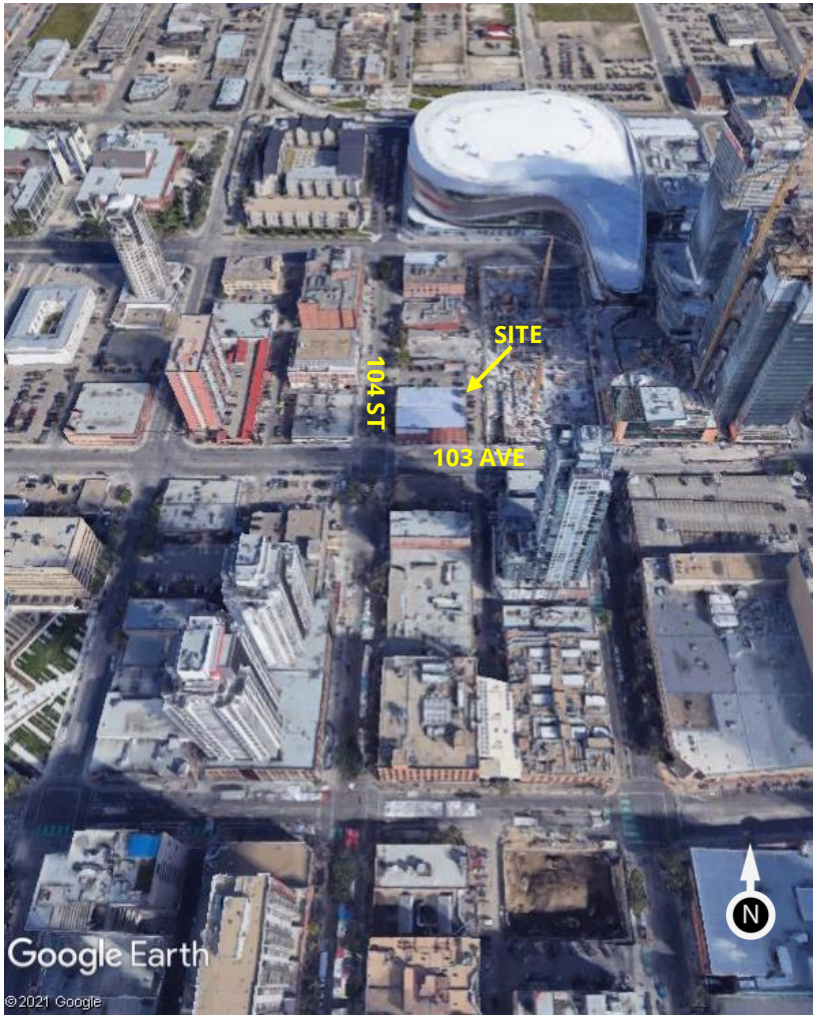


Image 1: Aerial view of existing site and surrounding

1. INTRODUCTION

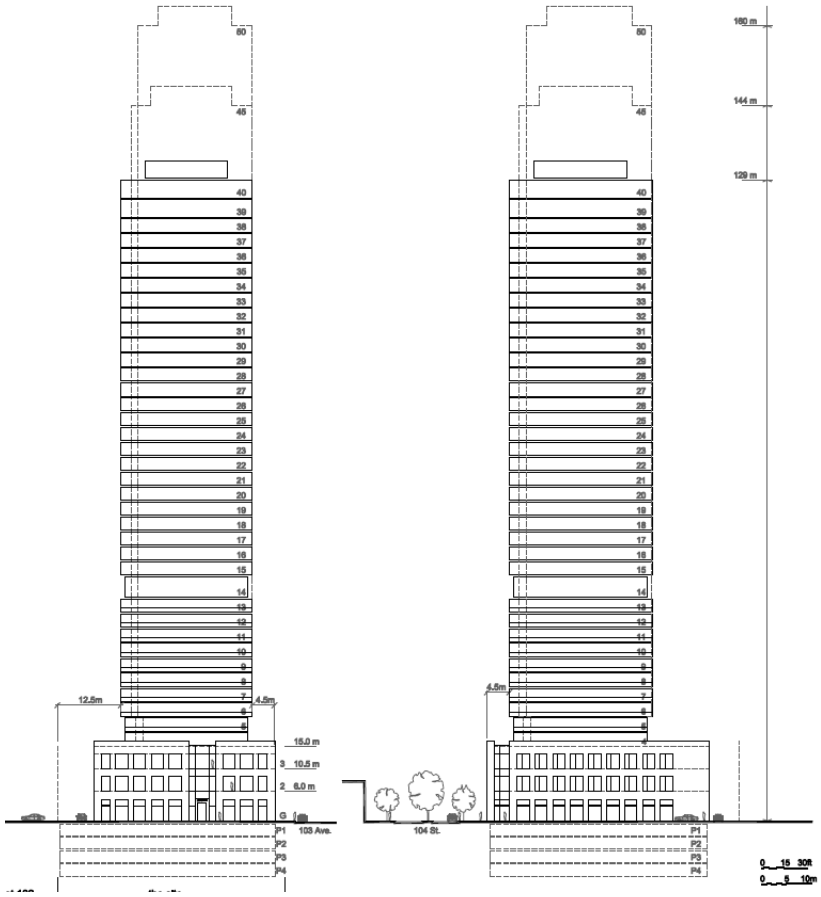


Image 2: Project Drawings

2. METHODOLOGY

Predicting wind speeds and occurrence frequencies is complex. It involves the combined assessment of building geometry, orientation, position and height of surrounding buildings, upstream terrain and the local wind climate.

Over the years, RWDI has conducted thousands of wind-tunnel model studies on pedestrian wind conditions around buildings, yielding a broad knowledge base. In some situations, this knowledge and experience, together with literature, allow for a reliable, consistent and efficient desktop estimation of pedestrian wind conditions without wind-tunnel testing. This approach provides a screening-level estimation of potential wind conditions and offers conceptual wind control measures for improved wind comfort, where necessary.

In order to quantify and confirm the predicted conditions or refine any of the suggested conceptual wind control measures, physical scale model tests in a boundary-layer wind tunnel would be required.

RWDI's assessment is based on the following:

- Site diagram and elevations of the project, dated November 27, 2020, provided by Stantec;
- A review of the regional long-term meteorological data from Edmonton International Airport;
- Use of RWDI's proprietary software (*WindEstimator*[1]) for providing a screening-level numerical estimation of potential wind conditions around generalized building forms;
- Wind-tunnel studies and desktop assessments undertaken by RWDI for projects in the Edmonton area;
- RWDI's engineering judgement and knowledge of wind flows around buildings[2, 3]; and,
- RWDI Criteria for pedestrian wind comfort and safety.

Note that other microclimate issues such as those relating to cladding and structural wind loads, snow loading and drifting, door operability, etc. are not part of the scope of this assessment.

1. H. Wu, C.J. Williams, H.A. Baker and W.F. Waechter (2004), "Knowledge-based Desk-Top Analysis of Pedestrian Wind Conditions", *ASCE Structure Congress 2004,* Nashville, Tennessee.
2. H. Wu and F. Kriksic (2012). "Designing for Pedestrian Comfort in Response to Local Climate", *Journal of Wind Engineering and Industrial Aerodynamics*, vol.104-106, pp.397-407.
3. C.J. Williams, H. Wu, W.F. Waechter and H.A. Baker (1999), "Experience with Remedial Solutions to Control Pedestrian Wind Problems", *10th International Conference on Wind Engineering*, Copenhagen, Denmark.

3. METEOROLOGICAL DATA

Meteorological data from Edmonton International Airport, for the period from 1990 to 2019, were used as reference for wind conditions in the area. This is the nearest station with current, reliable wind data.

The distributions of wind frequency and directionality for the summer (May through October) and winter (November through April) seasons are shown in Image 4. When all winds are considered, winds from southeast through south and west through north-northwest directions are predominant in both the summer and winter seasons. Strong winds of a mean speed greater than 30 km/h measured at the airport (red and yellow bands in Image 4) occur slightly more frequently during the summer than the winter season, and they are typically from the northwesterly and southeasterly directions.

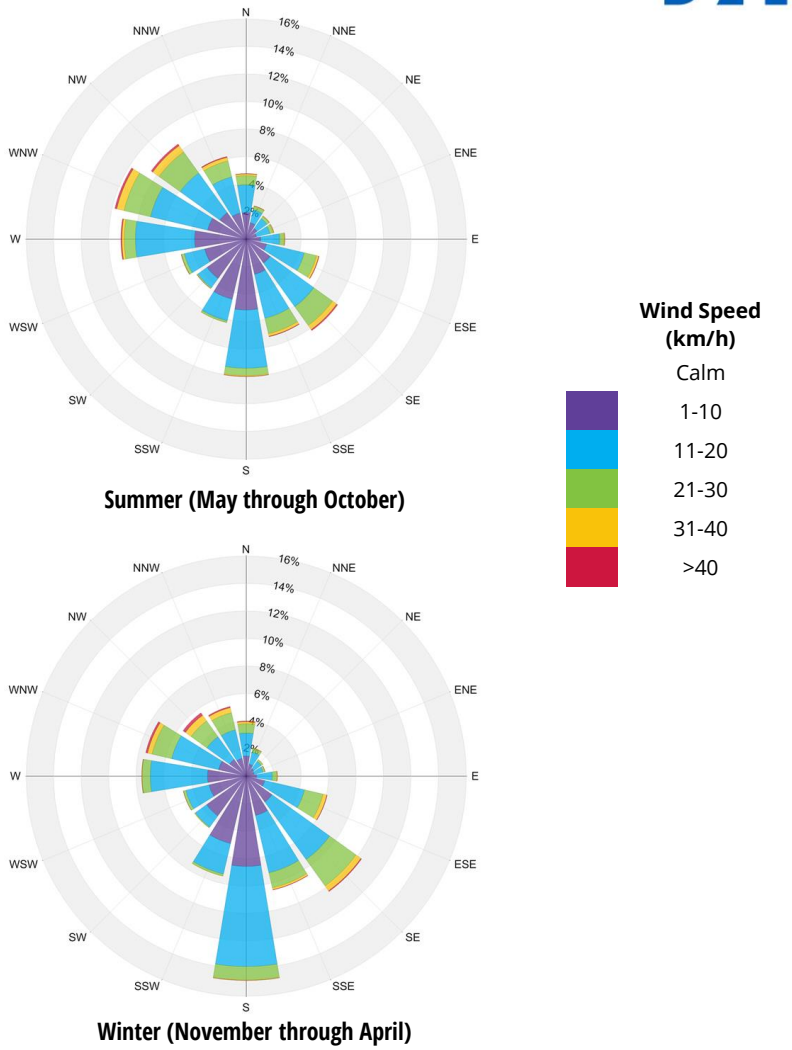


Image 4: Directional Distribution of Winds Approaching Edmonton International Airport (1990 to 2019)

4. WIND CRITERIA

The RWDI pedestrian wind criteria are used in the current study. These criteria have been developed by RWDI through research and consulting practice since 1974. They have also been widely accepted by municipal authorities, including the City of Edmonton. The criteria are as follows:

4.1 Safety Criterion

Pedestrian safety is associate with excessive gust that can adversely affect a pedestrian's balance and footing. If strong winds that can affect a person's balance (**90 km/h**) occur more than **0.1%** of the time or 9 hours per year, the wind conditions are considered severe.

4.2 Pedestrian Comfort Criteria

Wind comfort can be categorized by typical pedestrian activities:

Sitting (≤ 10 km/h): Calm or light breezes desired for outdoor seating areas where one can read a paper without having it blown away.

Standing (≤ 14 km/h): Gentle breezes suitable for main building entrances and bus stops.

Strolling (≤ 17 km/h): Moderate winds that would be appropriate for window shopping and strolling along a downtown street, plaza or park.

Walking (≤ 20 km/h): Relatively high speeds that can be tolerated if one's objective is to walk, run or cycle without lingering.

Uncomfortable: The comfort category for walking is not met.

Wind conditions are considered suitable for sitting, standing, strolling or walking if the associated mean wind speeds are expected for at least four out of five days (**80% of the time**). Wind control measures are typically required at locations where winds are rated as uncomfortable or they exceed the wind safety criterion.

Note that these wind speeds are assessed at the pedestrian height (i.e., 1.5m above grade or the concerned floor level), typically lower than those recorded in the airport (10m height and open terrain).

These criteria for wind forces represent average wind tolerance. They are sometimes subjective and regional differences in wind climate and thermal conditions as well as variations in age, health, clothing, etc. can also affect people's perception of the wind climate.

For the current development, wind speeds comfortable for walking or strolling are appropriate for sidewalks; lower wind speeds comfortable for standing or sitting are required for building entrances where pedestrians may linger, and calmer wind speeds suitable for sitting are desired in any area where passive activities are anticipated.

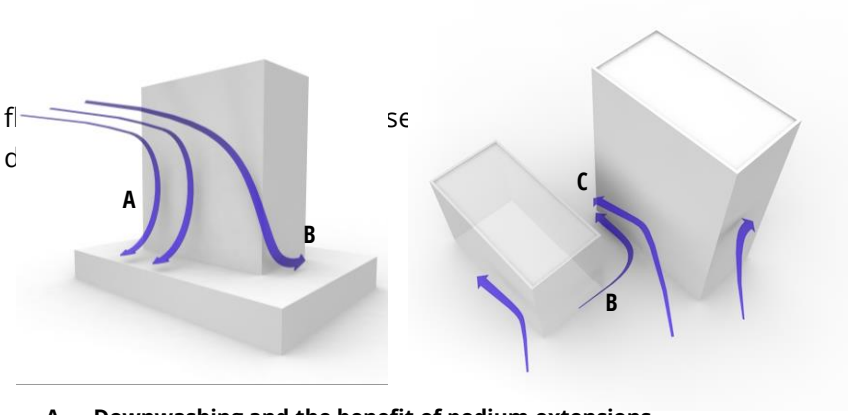
5. RESULTS AND DISCUSSION

5.1 Wind Flow Around the Project

The proposed site is surrounded by dense high-rise structures to the easterly and southerly directions, including several proposed buildings that are under construction. These built-up areas create lower wind speeds downwind due to the aerodynamic drag they provide. Thus, the proposed site would generally be sheltered from prevailing winds from southeast through south.

Buildings that are taller than structures surrounding them tend to intercept the stronger winds at higher elevations and redirect them to the ground level (Downwashing). These winds subsequently move around exposed building corners, causing a localized increase in wind activity due to Corner Acceleration or Channelling through narrow gaps/streets between tall towers. These flow mechanisms, illustrated in Image 5, are expected on the north and west sides of the project due to the building height relative to the surroundings, and exposure to the predominant westerly and northwesterly winds. Channelling flows are expected following the addition of tall buildings on blocks that neighbour the project site.

The proposed three-storey podium extension on all sides of the tower (Image 6) will act as a horizontal break for downwashing and corner acceleration flows (Image 5) and reduce potential wind impacts on adjacent streets. The recessed design of the main entrance recess would afford localized protection for patrons entering and exiting the building from ambient wind



A. Downwashing and the benefit of podium extensions
B. Corner Acceleration
C. Channelling

Image 5: Generalized Wind Flows

Image 6: Preliminary West Elevation

5.2 Existing Scenario

The wind climate in Edmonton may be considered moderate. The existing site is occupied by a relatively low building and surrounded by a mix of low buildings of comparable height or taller buildings, and as such fairly sheltered from prevailing winds. Currently, wind conditions on and around the site are likely comfortable for pedestrian use, meeting the criteria for sitting or standing in the summer and winter. Wind conditions also meet the criterion used to assess wind safety for pedestrians.

5.3 Proposed Scenario

The wind-responsive design features (podium and recessed entrance) will reduce the potential wind impact of the proposed project on the surrounding streets. A slight increase in wind speeds relative to existing conditions is still expected because of the addition of a significantly tall structure to the existing low-rise context to the northwesterly directions. The project is not expected to influence wind conditions beyond the boundaries of the site and adjacent sidewalks.

Wind speeds are predicted to continue to meet the prescribed safety criterion and be appropriate for pedestrian use, meeting the criteria for sitting, standing or strolling in the summer and winter. Wind speeds in the winter will be lower than in the summer. The highest speeds (comfortable for strolling) are expected in the summer at the northwest and southwest corners; these conditions are appropriate for general pedestrian activity on the sidewalk but windier than desirable for the uses of entrances and outdoor patios. We recommend that any entrances or patios not be located at these corners; if a corner entrance is desired, we recommend recessing it at least 2m from the main podium façade. Any dense street trees added will further enhance wind comfort in the summer when they are in full-leaf.

The podium roof, while acting as a windbreak, will be windy for passive use. Currently there is no information on the planned usage of the podium roof. If passive usage such as relaxed seating or general amenity use is planned, we recommend considering wind control features such as trellises or arbors, tall landscaping features and/or screens to the north and west of designated patron areas. These features should be at least 2m wide and 2m tall, and not more than 30% open for effective wind control. RWDI can provide further advice when the design has advanced, and the programming of this area is known.

6. SUMMARY

RWDI was retained to provide a Wind Impact Statement for the proposed project at 10301 – 104th Street in Edmonton, AB. This statement was prepared following a screening-level assessment of pedestrian wind conditions based on the local wind climate, current design drawings, existing surroundings and our knowledge and experience with wind flows around similar buildings.

Given the moderate wind climate in Edmonton, the general density of the built area around the project site and wind-responsive massing features, wind conditions that are appropriate for pedestrian use are predicted on and around the project at ground level. The influence of the project on wind conditions is not expected to extend beyond the site perimeter.

Increased wind speeds are expected around the western building corners and on the podium. Depending on the usage, localized wind control measures may need to be considered to improve the wind comfort.

7. APPLICABILITY OF RESULTS

The assessment presented in this report are for the proposed project based on the site plan and elevations provided by Stantec, dated November 27, 2020. In the event of any significant changes to the design, construction or operation of the building or addition of surroundings in the future, RWDI should be contacted to review any potential changes to the wind impact of the project.