46-48 FERGUSON AVENUE SOUTH

HAMILTON, ON

PEDESTRIAN WIND DESKTOP ASSESSMENT

GNOBI # 010023

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PREPARED BY

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1.0 INTRODUCTION

This pedestrian wind desktop assessment report presents an analysis of the wind conditions around the proposed 30-storey (**Image 1**) residential development located at 46-48 Ferguson Avenue South in Hamilton, ON. The purpose of this study is to evaluate the potential wind effects on pedestrians and outdoor spaces within and around the site and was completed as part of the Design Review Panel application.

The analysis considered a range of factors that can influence wind patterns, including local topography, wind direction and speed, and the height and configuration of nearby buildings. The results of the analysis provide insight into the expected wind conditions at the site and allow for an assessment of the potential impact of wind on pedestrian comfort and safety.

Based on the analysis, recommendations are provided for design modifications that can improve the wind comfort conditions for pedestrians in the area. These recommendations consider various design elements, such as building soft and hardscape features that can mitigate the impact of wind on pedestrian comfort and safety.

Physical modelling or wind tunnel testing in an atmospheric boundary layer wind tunnel is recommended at an appropriate stage of the design (SPA) to confirm the predicted wind conditions and efficacy of recommended wind mitigation measures.

Image 1: Rendering of the Proposed Project, Courtesy: Graziani + Corazza Architects

2.0 PROJECT AND SITE CONTEXT

The proposed development is a 30-storey residential tower, with planned outdoor amenity podiums on Levels three (4) and thirteen (14). The site is located at 46-48 Ferguson Avenue South in Hamilton, Ontario. The site is situated on a somewhat rectangular shaped parcel of land with a total gross floor area of approximately 2,250 m² (**Image 2**). The surrounding area is mainly characterized by a mix of low-rise commercial and residential buildings in all directions, except to the west where several mid to high-rise buildings exist in the downtown core of the City.

Focal points of pedestrian activity that require careful attention include building entryways such as the main entrance(s) along Ferguson Avenue South, outdoor amenities and adjacent sidewalks.

The primary access point/main entrance to the development can be found at the southeastern corner along Fergusson Avenue South. Additionally, there is a retail entrance at ground level on the eastern side of the building, also facing Fergusson Avenue South (**Image 3**). The design includes outdoor amenities measuring 533m² on Level 4 and 390m² on Level 14.

Image 2: Aerial View of the Proposed Site, Source: Google Earth™

2.0 PROJECT AND SITE CONTEXT

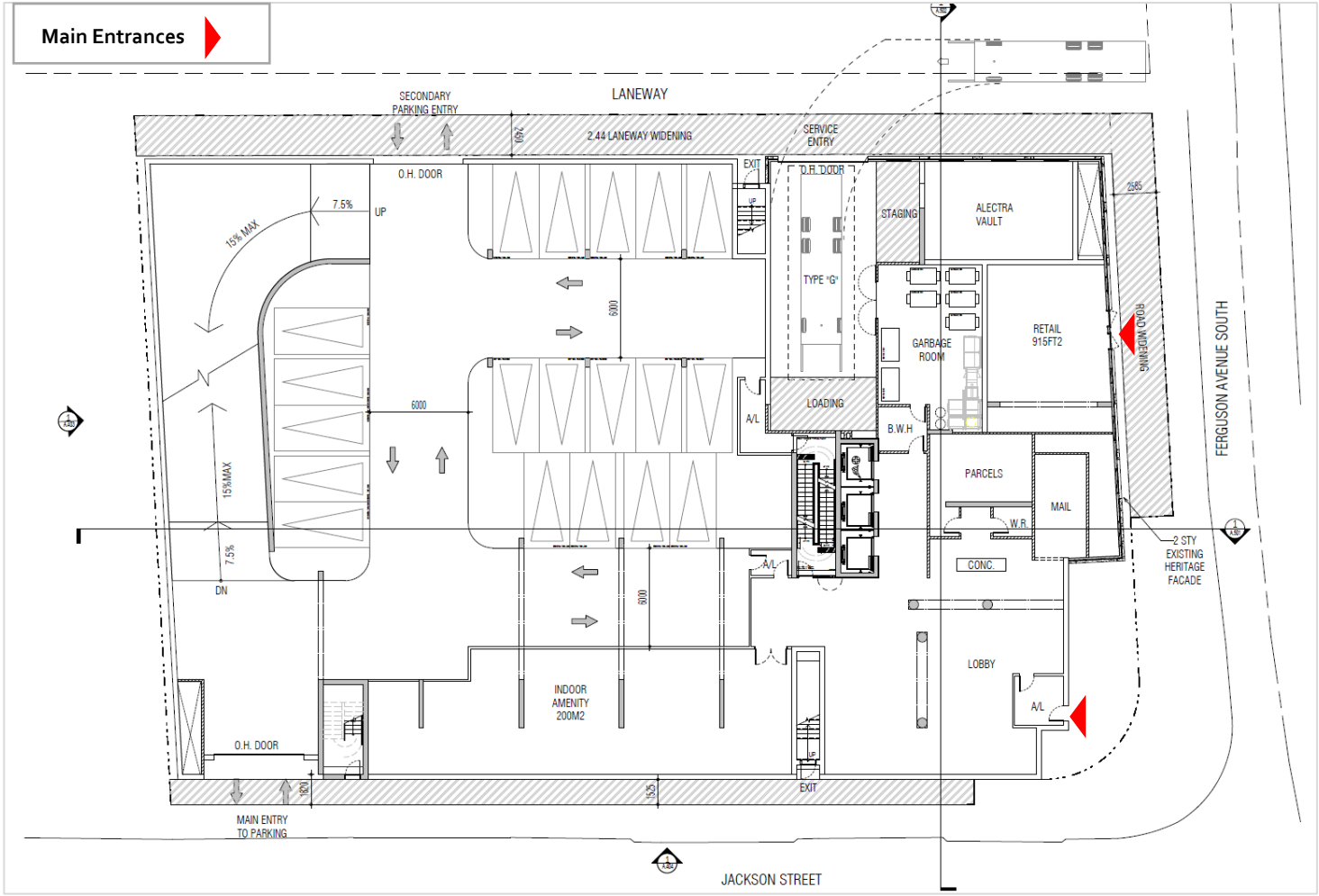


Image 3: Proposed Ground Floor Plan, Courtesy: Graziani + Corazza Architects

3.0 METHODOLOGY

3.1 Study Approach

Our study methodology involves a comprehensive assessment of the proposed building design in relation to the local wind climate, leveraging our expertise from previous completed projects, wind tunnel testing from similar projects, our engineering judgement and understanding of wind flow in built environment.

Long-term wind data, usually spanning 30 years from a nearby meteorological station, is used as a benchmark to evaluate the pedestrian wind conditions on and around the Project. The estimated wind speeds are then compared against predetermined wind speed thresholds and frequency of occurrence suitable for various pedestrian activities such as outdoor dining, standing or walking, or identified as hazardous.

Based on the outcome of the screening-level desktop wind assessment, we provide preliminary feedback and wind mitigation strategies that can be incorporated to enhance the wind conditions on and around the project as needed.

Wind tunnel testing may be required at an appropriate stage of the design process to validate the predicted wind conditions and effectiveness of recommended wind mitigation measures.

3.2 Meteorological Data

The local wind climate at the proposed site was evaluated using hourly wind data collected at John C. Munro Hamilton International Airport, situated at a height of 10 meters above ground level, as a point of reference. The wind roses in **Image 4** below presents the cumulative probability distribution of wind speeds for the summer (May to October) and winter (November to April) months.

Analysis of the data reveals that winter months are characterized by a higher frequency of strong winds than the summer months. Specifically, wind speeds greater than 20km/hr occur 18% of the time compared to 35% in the winter.

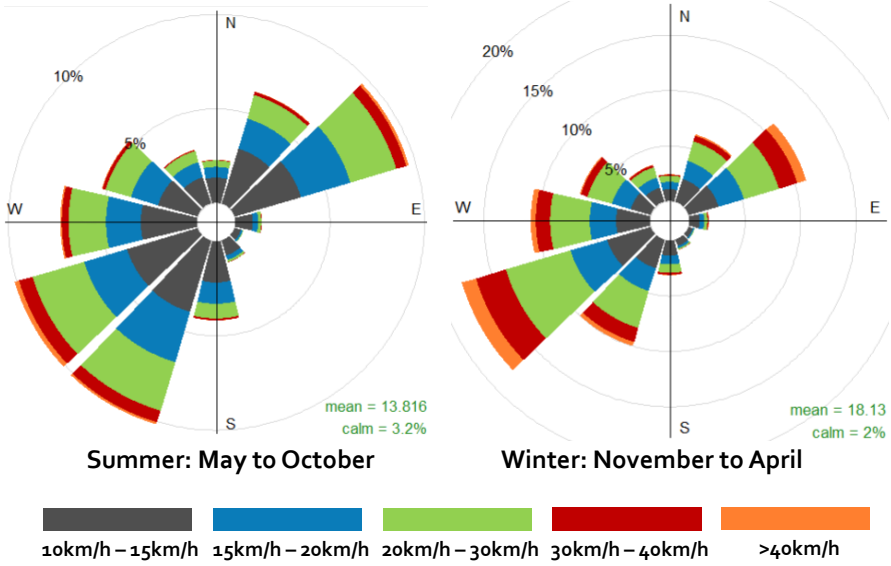


Image 4: Wind Data from John C. Munro Hamilton International Airport (1991 – 2022)

3.0 METHODOLOGY

3.3 Wind Criteria

The pedestrian wind criteria used in the current study are specified in the pedestrian level wind Terms of Reference of most cities in southern Ontario and are commonly used in the city of Hamilton, ON. The wind criteria are an essential component of building design in urban areas. They are established guidelines that determine the maximum allowable wind speed and frequency of occurrence that pedestrians can safely and comfortably tolerate for various passive or active activities such as sitting, standing, strolling or walking. The criteria are generally based on a combination of scientific data, engineering principles, and human experience. They take into consideration factors such as the intended use of the pedestrian spaces on and around the project.

The wind criteria referenced include two primary categories:

1. Pedestrian Wind Safety / Hazard

Pedestrian safety is correlated with gust wind speeds that exceed the threshold (90 km/h) capable of negatively impacting a pedestrian's stability and balance. When wind speeds capable of destabilizing an individual, at around 90 km/h, occur more than 0.1% of the time or for a duration of 9 hours per year, the wind conditions can be classified as hazardous.

Sitting	Standing	Walking	Uncomfortable
≤ 10 km/h	≤ 15 km/h	≤ 20 km/h	> 20 km/h

2. Pedestrian Wind Comfort

Sitting (≤ 10 km/h): Tranquil breezes desired for passive pedestrian activities such as outdoor dinning or seating areas.

Standing (≤ 14 km/h): Suitable for areas where pedestrians are apt to linger such as main building entrances, drop-off areas, parks and bus stops.

Strolling (≤ 17 km/h): Moderate winds that are suitable for leisure walking.

Walking (≤ 20 km/h): Relatively high speeds but are considered suitable for active pedestrian activities such as walking, running or cycling.

Uncomfortable (>20km/h): wind speeds exceeding 20km/h more than 20% of the time.

To determine suitable wind conditions for pedestrian activities such as sitting, standing, strolling or walking, it is recommended that the associated mean wind speeds be expected for at least 80% of the time (approximately five and half out of seven days). In areas where winds surpass the 20km/h limit for over 20% of the time or surpass the wind safety threshold, wind control measures are typically required to ensure the safety and comfort of individuals.

4.0 RESULTS AND DISCUSSION

4.1 Existing Wind Conditions

The area surrounding the site is mainly characterized by a mix of low-rise commercial and residential buildings in all directions, except to the west where several mid to high-rise buildings exist in the downtown core of the City. The existing wind conditions on and around the site are generally comfortable for sitting or standing throughout the year. In addition, the pedestrian wind hazard criterion is predicted to be satisfied in all areas on and around the existing site, indicating that wind conditions are unlikely to pose a hazard to pedestrians.

4.2 Proposed Design

The proposed project has several positive design features that are considered beneficial for favorable wind speeds and should be retained in the final design. These include: **(1)** the recessed location of the main entrance in the southeast corner of the site, **(2)** the proposed vestibule at the main residential entrance that will serve as an area for pedestrians to take shelter on particular windy days, **(3)** the location of the retail entrance away from exposed building corner areas that are more susceptible to strong winds, and **(4)** the proposed tower setbacks and podiums on Levels 4 and 14 to help disrupt potential downwashing wind flows off the tower façade and to keep downwashing winds above pedestrian height at grade.

4.3 Wind around the Proposed Project

In general, winds tend to flow smoothly over buildings with uniform height. However, taller buildings disrupt this smooth flow by intercepting and redirecting the wind around them, a phenomenon known as downwashing. As the wind flows around the corners of these buildings, it can cause a localized increase in wind activity, called corner acceleration.

At 30 storeys, the proposed tower is taller than its surroundings and will therefore redirect stronger winds at high elevations down to pedestrian areas at grade.

The impact of downwashing and corner accelerating wind flows are likely to be more prevalent along the east façade on Fergusson Avenue South.

Predicted wind flows include: downwashing and corner acceleration

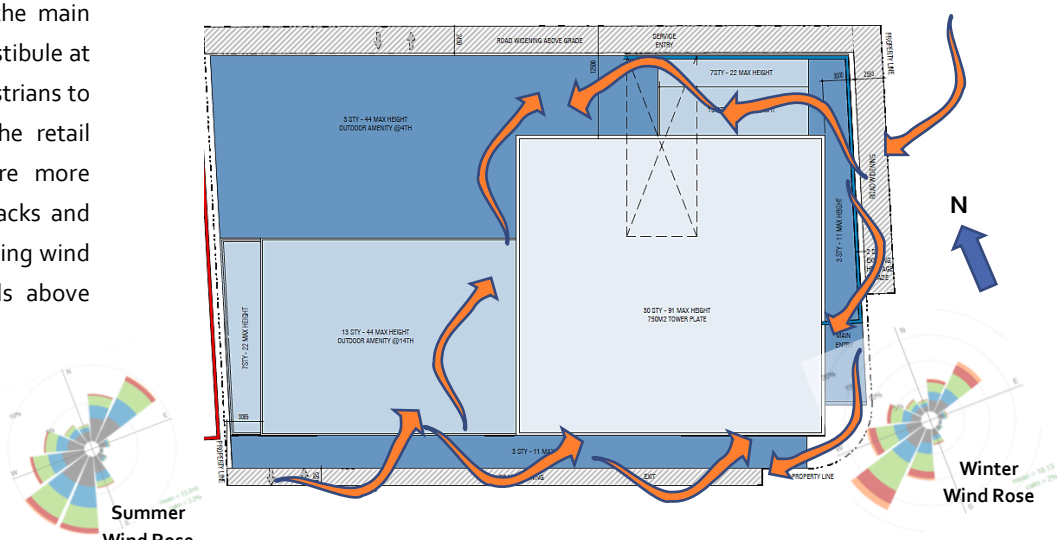


Image 5: Generalized Wind Flow around the Proposed Project

4.0 RESULTS AND DISCUSSION

4.4 Proposed Wind Conditions

Image 6A below presents a dot plot illustrating the estimated wind conditions during the summer around the proposed development. The analysis indicates that the wind conditions at the main residential entrance on the southeast corner of the site and the retail entrance along Fergusson Avenue are expected to be comfortable for standing, which is considered appropriate.

With the addition of the proposed, wind speeds at the sidewalks in the vicinity are anticipated to be suitable for sitting or standing. During the summer, the wind speeds on the proposed amenity on Level 4 are predicted to be comfortable for passive pedestrian activities such as sitting, in most areas. On Level 14, similar conditions are anticipated, except in areas near the tower on the podium where marginally higher wind speeds, comfortable for standing, may occur due to exposure to prevailing winds from the northeast and southwest quadrants.

In **Image 6B**, the analysis of winter wind conditions on and around the site indicates a general increase in wind strength due to stronger prevailing winds. The wind speeds at the sidewalks and surrounding areas of the site are anticipated to remain suitable for the intended use, meaning they are comfortable for standing or walking. The windiest areas at grade are anticipated near the southeast corner of the site and along the south, particularly in localized areas along Jackson St. East. Wind speeds in these areas may occasionally be uncomfortable, especially on particularly windy winter days, and could potentially exceed the wind safety/gust criterion.

Conversely, the winter wind speeds on the podium are expected to range between being comfortable for standing or walking, which is considered appropriate.

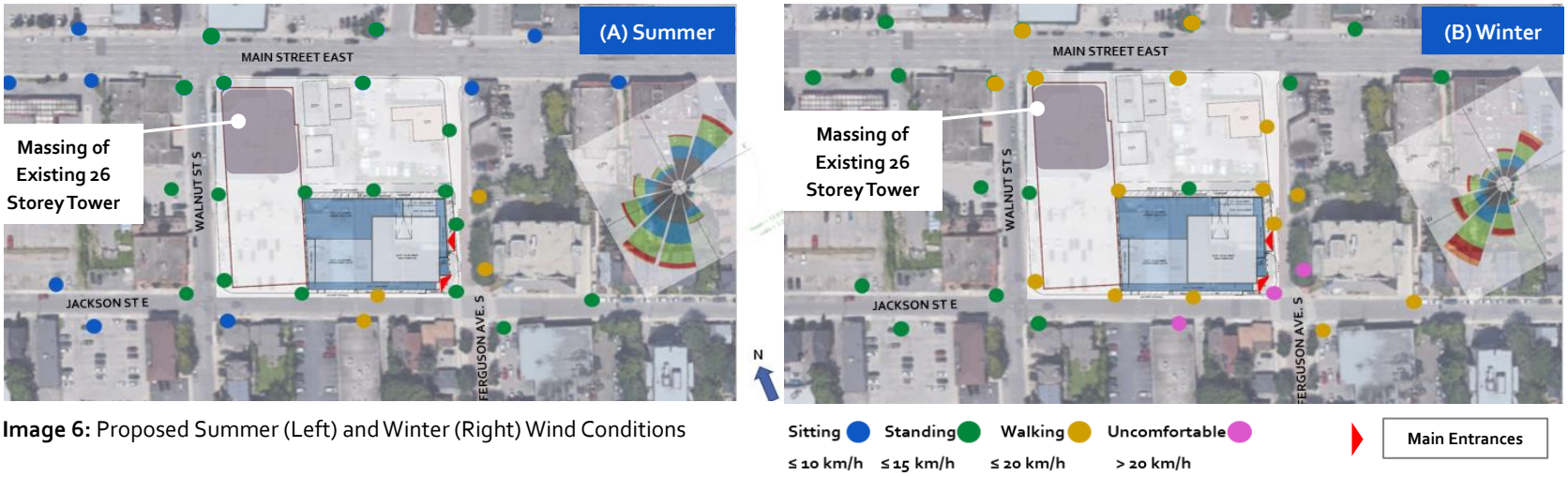


Image 6: Proposed Summer (Left) and Winter (Right) Wind Conditions

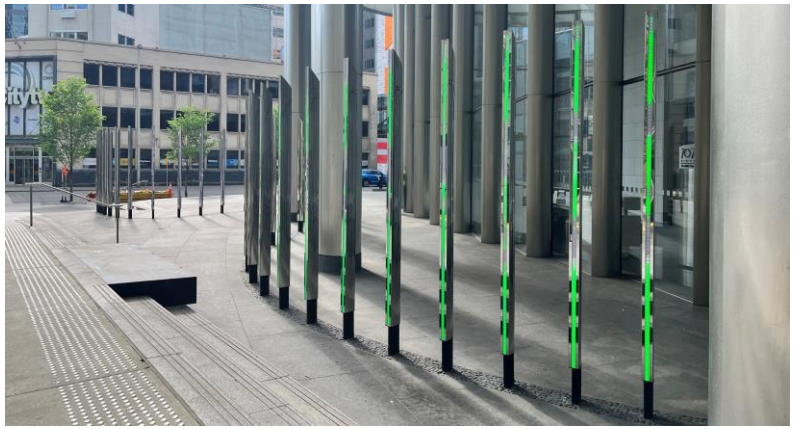
4.0 RESULTS AND DISCUSSION

4.5 Wind Improvement Strategies

Wind speeds at grade near the intersection of Jackson Street East and Fergusson Avenue South can be improved with the use of localized hard and softscape elements such as a large canopy wrapped around the southeast corner to help keep downwashing winds accelerating around the corner above pedestrian height at grade.

A combination of coniferous or marcescent landscaping, wind screens or street art can also be strategically implemented in the area to help disrupt the flow of strong winds in the area.

A more detailed assessment such as an atmospheric boundary layer wind tunnel test, can be conducted at an appropriate stage of the design to confirm the predicted wind conditions and efficacy of suggested wind control measures.



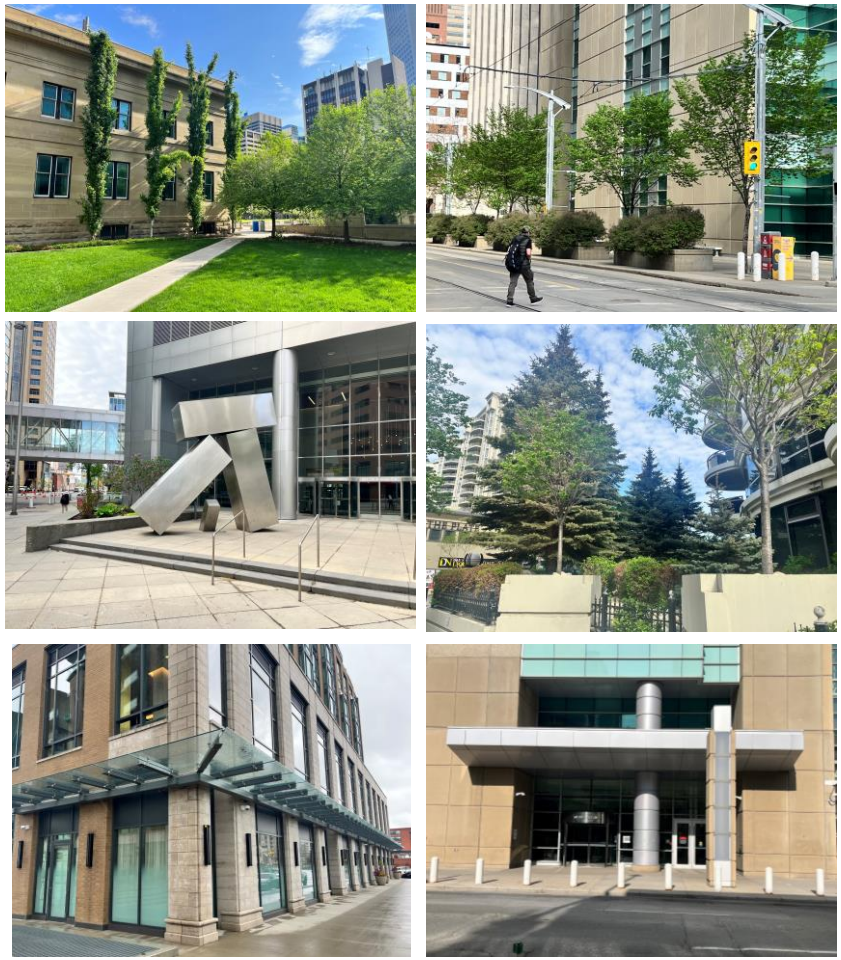


Image 7: Wind Control Measures for Consideration

5.0 CONCLUSION

Gnobi Consulting Inc. was contracted to complete a pedestrian level wind desktop assessment for the proposed 46 – 48 Ferguson Avenue South development in in Hamilton, ON. The screening level/qualitative desktop assessment was predicated on a comprehensive analysis of the local wind climate, the proposed development's design, the pre-existing surrounding buildings, our expertise in wind tunnel testing of analogous structures, as well as our engineering judgement and know-how of wind flows in the built environment.

In conclusion, the analysis of wind conditions around the proposed development reveals that the existing wind conditions are comfortable for sitting or standing or walking throughout the year, which is considered appropriate. The low-rise nature of the surrounding buildings in most directions contributes to these favorable conditions, and the pedestrian wind hazard criterion is expected to be met at all areas.

The proposed design incorporates several positive features that contribute to favorable wind speeds and should be retained in the final design. These include strategic placement of the retail entrance along Ferguson Avenue South away from exposed corners, the proposed vestibule at the southeast main residential entrance to serve as a sheltered waiting for pedestrians on windy days and the recessed design of the entrance. The proposed building setbacks and podiums proposed on Level 4 and 14 are also beneficial to help disrupt the flow of strong winds downwashing of the tower facades.

During the summer, wind conditions at the main residential entrance and retail entrance are expected to be comfortable for standing. The addition of the proposed project is predicted to result in suitable wind speeds for sitting or standing on the sidewalks in the vicinity. On Level 4, the wind speeds are anticipated to be comfortable for passive pedestrian activities such as sitting, while on Level 14, slightly higher wind speeds conducive to standing are predicted near the tower on the podium due to prevailing winds.

During the winter analysis, a general increase in wind strength is anticipated due to stronger prevailing winds. However, the wind speeds at the sidewalks and surrounding areas of the site are still expected to be suitable for standing or walking. The windiest areas are anticipated near the southeast corner of the site and along the south, particularly localized areas along Jackson St. East. The wind speeds in these areas may occasionally be uncomfortable and may exceed the recommended wind safety/gust criterion.

Wind conditions throughout the site can be improved with the use of soft or hard scape elements as discussed in the report.

Physical modelling or wind tunnel testing in an atmospheric boundary layer wind tunnel is recommended at an appropriate stage of the design, to confirm the predicted wind conditions and efficacy of recommended wind mitigation measures.

6.0 REFERENCES

Isyumov, N. and Davenport, A.G., (1977) "The Ground Level Wind Environment in Built-up Areas", Proc. Of 4th Int. Conference on Wind Effects on Buildings and Structures, London, England, Sept. 1975, Cambridge University Press, 1977.

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7.0 STUDY APPLICABILITY

The assessment presented in this report pertains to the proposed development at 46 - 48 Ferguson Avenue South, Hamilton, ON, and is predicated on the coordination set of architectural drawings by Graziani + Corazza Architects dated June 16, 2023. Should there be any substantial modifications to the design, Gnobi Consulting Inc. is available to evaluate their potential impact on the pedestrian wind conditions discussed in this report. It is incumbent upon others to initiate this process by contacting Gnobi Consulting Inc.