WINDTECH

PEDESTRIAN WIND ENVIRONMENT STATEMENT

40-64 YORKTOWN PARADE & 195-213 FITZGERALD AVENUE, MAROUBRA

WJ003-01F02(REV1)- WS REPORT

OCTOBER 8, 2024

Prepared for:

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DOCUMENT CONTROL

Date	Revision History	Issued Revision	Prepared By (initials)	Instructed By (initials)	Reviewed & Authorised by (initials)
September 27, 2024	Initial.	0	JAF	MM	MLO
October 08, 2024	Updated with comments/new drawings	1	JAF	MM	GC

EXECUTIVE SUMMARY

This report presents an opinion on the likely impact of the proposed 40-64 Yorktown Parade & 195-213 Fitzgerald Avenue development, located in Maroubra, on the local wind environment at the critical outdoor areas within and around the subject site. The effect of wind activity has been examined for the three predominant wind directions for the region, namely the north-easterly, southerly, and westerly winds. The analysis of the wind effects relating to the proposed development have been carried out in the context of the local wind climate, building morphology and land topography.

The conclusions of this report are drawn from our extensive experience in this field and are based on an examination of the latest architectural drawings. No wind tunnel testing has been undertaken for the subject development, and hence this report addresses only the general wind effects and any localised effects that are identifiable by visual inspection of the architectural drawings provided (received 02 October 2024). This level of assessment is appropriate for a low-lying structure such as the proposed development. Any recommendations in this report are made only in-principle and are based on our extensive experience in the study of wind environment effects.

The results of this assessment indicate that the development has incorporated several design features and wind mitigating strategies and is expected to be suitable for the intended use for the majority of the outdoor trafficable areas. Wind conditions around the elevated terraces are not expected to be severe, but instead equivalent to the existing conditions due to the proposed development being three stories high. However, there are some areas that are likely to be exposed to stronger winds. It is expected that the wind effects identified in the report can be ameliorated with the consideration of the following treatment strategies into the design of the development:

- Ground level trafficable areas:
    - Inclusion of the proposed landscaping plan elements.
- Private terraces:
    - Inclusion of the proposed impermeable balustrades.
    - Inclusion of the proposed full height barriers/screens located on the elevated terraces.

With the inclusion of the abovementioned recommendations in the final design, it is expected that wind conditions for the various trafficable outdoor areas within and around the development will be suitable for their intended uses or equivalent to the existing wind conditions, and that the wind speeds will satisfy the applicable criteria for pedestrian comfort and safety.

CONTENTS

1 INTRODUCTION

This desktop pedestrian wind environment statement has been prepared by Windtech Consultants on behalf of Homes NSW for a State Significant Development Application (SSD-71454960) for the redevelopment of existing social housing (the Project) at 195-213 Fitzgerald Avenue and 40-64 Yorktown Parade, Maroubra (the Site). The Project involves the replacement of the 33 social housing units across eight 2 storey apartment buildings and a single storey dwelling with 144 units across four 3 storey buildings and two part 3/part 4 storey buildings.

The purpose of this desktop pedestrian wind environment statement is to present an opinion on the likely impact of the proposed design on the local wind environment affecting pedestrians within the critical outdoor areas within and around the subject development and to address the Secretary's Environmental Assessment Requirements (SEARs) for the project issued on 6 June 2024 which identified the following specific assessment requirements:

Table 1: SEARs and Relevant Reference

Item	SEARS Requirement	Report Reference
5	Environmental Amenity • Assess amenity impacts on the surrounding locality, including lighting impacts, reflectivity, solar access, visual privacy, visual amenity, view loss and view sharing, overshadowing and wind impacts. A high level of environmental amenity for any surrounding residential or other sensitive land uses must be demonstrated.	Pedestrian Wind Environment Assessment, Section 5
7	Public Space • Demonstrate how the development maximises the amenity of public spaces in line with their intended use, such as through adequate facilities, solar access, shade and wind protection.	Pedestrian Wind Environment Assessment, Section 5

1.1 The Site

The Site is located within the Randwick City Council local government area (LGA) and is zoned R3 Medium Density Residential under the Randwick Local Environmental Plan (LEP) 2012.

The Site has a total area of approximately 9,647 square metres (sqm) with frontages to Fitzgerald Avenue to the north and Yorktown Parade to the south. Refer to Figure 1.

The existing buildings on the Site are currently occupied. There are street trees located along the Fitzgerald Avenue frontage and a series of trees within the Site between the buildings and along both street frontages.

The site is accessible by public transport with services that run along Fitzgerald Avenue with frequent services to Maroubra town centre and Bondi Junction, with connecting services to Sydney CBD.

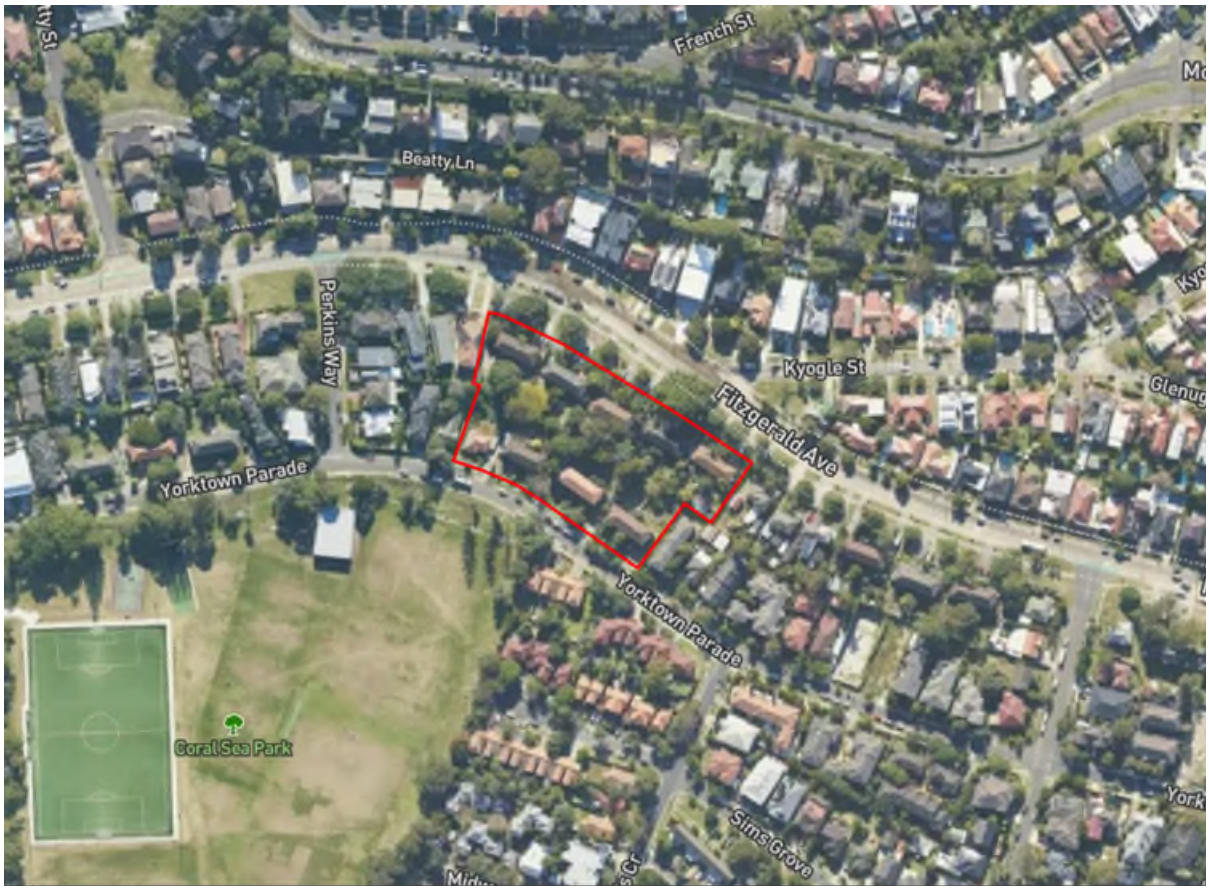

Figure 1: Site location

1.2 Proposed Development

The proposed development comprises demolition of existing buildings and the construction of four 3 storey and two part 3/part 4 storey residential flat buildings to accommodate 144 social and affordable housing apartments, a communal room and a single level basement car park including bulk earthworks, tree removal and associated landscaping and public domain works. Refer to Site Plan at Figure 2 below.

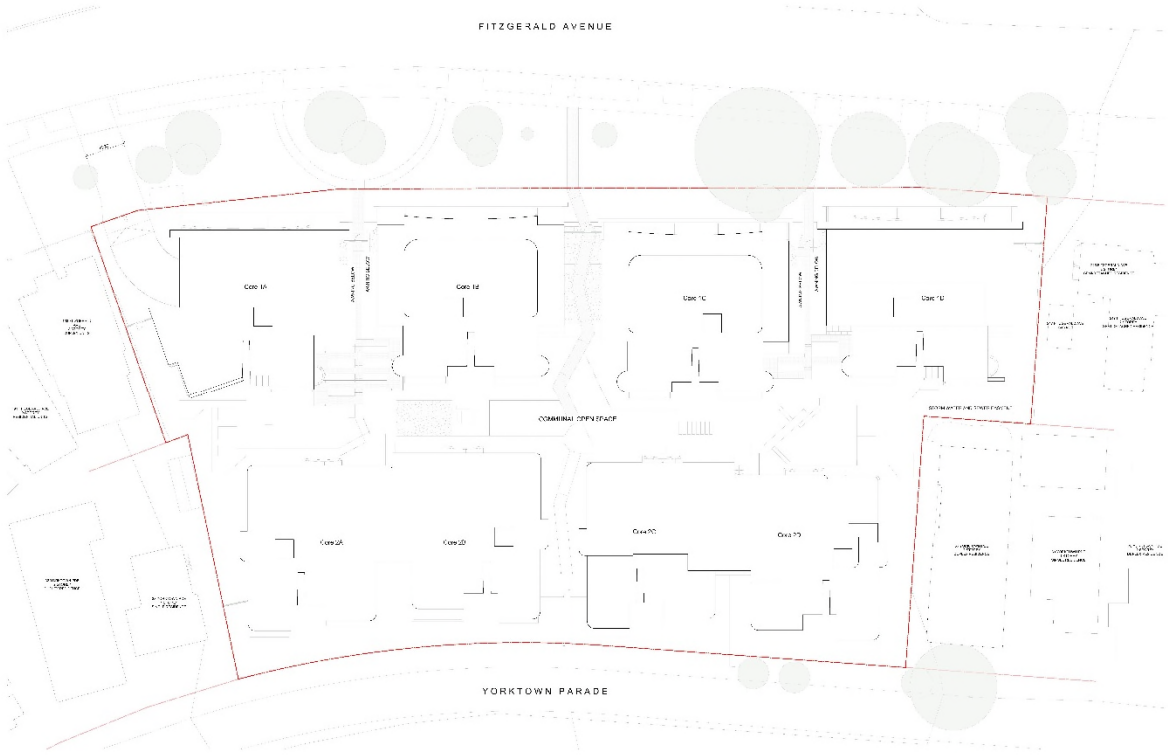

Figure 2: Site Plan

The analysis of wind effects relating to the proposed development has been carried out in the context of the predominant wind directions for the region, building morphology of the development and nearby buildings, and local land topography. The conclusions of this report are drawn from our extensive experience in the field of wind engineering and studies of wind environment effects.

No wind tunnel testing has been undertaken for this assessment. Hence this report addresses only the general wind effects and any localised effects that are identifiable by visual inspection, and any recommendations in this report are made only in-principle.

A list of the architectural drawings referenced for this assessment is provided in the table below.

Table 2: List of Drawings Referenced

Drawing name	Drawing No.	Revision number	Date
FLOOR PLAN - GROUND	DA1003	H	01/10/2024
FLOOR PLAN - LEVEL 01	DA1004	G	01/10/2024
FLOOR PLAN - LEVEL 02	DA1005	G	01/10/2024
FLOOR PLAN - LEVEL 03	DA1006	C	01/10/2024
ELEVATIONS - NORTH & SOUTH	DA1401	F	01/10/2024
ELEVATIONS - EAST & WEST	DA1402	F	01/10/2024
Landscape Planting Plan - Tree Planting	LDA - 08	A	12/08/2024

2 DESCRIPTION OF DEVELOPMENT AND SURROUNDINGS

The site is located at 40-64 Yorktown Parade & 195-213 Fitzgerald Avenue, Maroubra, and is bounded by Fitzgerald Avenue to the north, Yorktown Parade to the south, and low-rise residential buildings to the east and west. The buildings surrounding the subject development are also of low-rise residential buildings.

A survey of the land topography indicates a slope towards the north, however, there are no major elevation changes in the area immediately surrounding the site.

An aerial image of the subject site and the local surroundings is shown in Figure 3, with the frequency and magnitude of the prevailing winds is superimposed for each wind direction.

The existing site consists of multiple 1-2 storey residential buildings. The proposed development is 3-4 storeys high.

The critical outdoor trafficable areas associated with the proposed development, which are the focus of this assessment with regards to wind effects, are listed as follows:

- Ground Level areas and pedestrian footpath.
- Private balconies and terraces.

Figure 3: Aerial Image of the Site Location and Prevailing Wind Directions

3 REGIONAL WIND

The Sydney region is governed by three principal wind directions that can potentially affect the subject development. These winds prevail from the north-east, south, and west. These wind directions were determined from an analysis undertaken by Windtech Consultants of recorded directional wind speeds obtained from the meteorological station located at Kingsford Smith Airport by the Bureau of Meteorology (recorded from 1995 to 2016). The data has been corrected to represent winds over standard open terrain at a height of 10m above ground level. The results of this analysis are presented in Figure 4 in the form of a directional plot of the annual and 5% exceedance mean winds for the region. The frequency of occurrence of these winds is also shown in Figure 4.

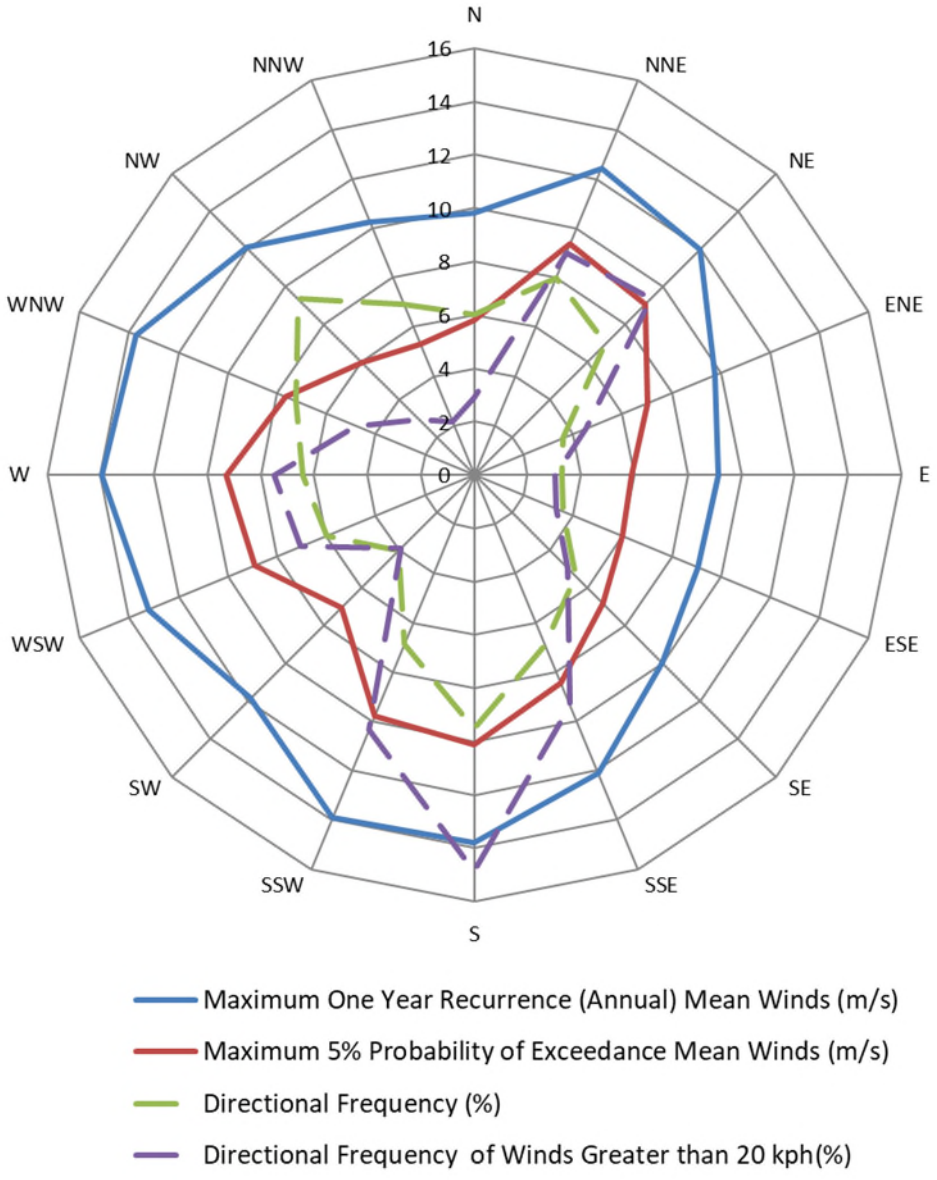

Figure 4: Directional Annual and 5% Exceedance Hourly Mean Wind Speeds (referenced to 10m height in standard open terrain), and Frequencies of Occurrence, for the Sydney Region

4 WIND EFFECTS ON PEOPLE

The acceptability of wind in any area is dependent upon its use. For example, people walking, or window-shopping will tolerate higher wind speeds than those seated at an outdoor restaurant. Various other researchers, such as A.G. Davenport, T.V. Lawson, W.H. Melbourne, and A.D. Penwarden, have published criteria for pedestrian comfort for pedestrians in outdoor spaces for various types of activities. Some Councils and Local Government Authorities have adopted elements of some of these into their planning control requirements.

For example, A.D. Penwarden (1973) developed a modified version of the Beaufort scale which describes the effects of various wind intensities on people. Table 3 presents the modified Beaufort scale. Note that the effects listed in this table refers to wind conditions occurring frequently over the averaging time (a probability of occurrence exceeding 5%). Higher ranges of wind speeds can be tolerated for rarer events.

Table 3: Summary of Wind Effects on People (A.D. Penwarden, 1973)

Type of Winds	Beaufort Number	Mean Wind Speed (m/s)	Effects
Calm	0	Less than 0.3	Negligible.
Calm, light air	1	0.3 – 1.6	No noticeable wind.
Light breeze	2	1.6 – 3.4	Wind felt on face.
Gentle breeze	3	3.4 – 5.5	Hair is disturbed, clothing flaps, newspapers difficult to read.
Moderate breeze	4	5.5 – 8.0	Raises dust, dry soil and loose paper, hair disarranged.
Fresh breeze	5	8.0 – 10.8	Force of wind felt on body, danger of stumbling
Strong breeze	6	10.8 – 13.9	Umbrellas used with difficulty, hair blown straight, difficult to walk steadily, wind noise on ears unpleasant.
Near gale	7	13.9 – 17.2	Inconvenience felt when walking.
Gale	8	17.2 – 20.8	Generally impedes progress, difficulty balancing in gusts.
Strong gale	9	Greater than 20.8	People blown over.

It should be noted that wind speeds affecting this particular development can only be accurately quantified with a wind tunnel study. This assessment addresses only the general wind effects and any localised effects that are identifiable by visual inspection and the acceptability of the conditions for outdoor areas are determined based on their intended use. Any recommendations in this report are made only in-principle and are based on our extensive experience in the study of wind environment effects.

5 RESULTS AND DISCUSSION

The expected wind conditions affecting the development are discussed in the following sub-sections of this report for the various outdoor areas within and around the subject development. The interaction between the wind and the building morphology in the area is considered and important features taken into account including the distances between the surrounding buildings and the proposed building form, as well as the surrounding landform. Note that only the potentially critical wind effects are discussed in this report. A glossary of the different wind effects described in this report included in Appendix A.

For this assessment, the wind speed criteria for pedestrian comfort that are considered are listed as follows:

- Walking Criterion (8m/s with a 5% probability of exceedance)
  for general circulation and pedestrian thoroughfares, e.g. footpaths, private balconies/terraces, through-site links etc.

- Standing (Short Exposure) Criterion (6m/s with a 5% probability of exceedance)
  for stationary activities generally less than an hour, e.g. waiting areas, communal terraces, main entries, café seating etc.

Note that the above wind comfort levels are derived from the Lawson (1975) criteria. Although this assessment is qualitative in nature, the abovementioned criteria for pedestrian comfort are considered when assessing the wind environment impacts. However, all areas are also assessed with consideration to a pedestrian safety criterion of 23m/s for the annual maximum gust.

5.1 Ground Level Areas

The pedestrian footpath along Fitzgerlad Avenue is primarily exposed to the north-easterly and westerly prevailing winds, while the pedestrian footpath along Yorktown parade is primarily exposed to the southerly and westerly prevailing winds. Due to the setback of the development and the proposed and existing planting within and around the site, it is expected that the wind conditions will remain suitable and/or equivalent to the existing conditions. Thus, the retention of all trees planting as shown in Figure 5 is recommended. The selection of densely foliating evergreen species is preferable due to their year-round wind mitigating ability.

The through site walkways are expected to be susceptible to funnelling winds from the north-east and west. With the inclusion of the proposed trees shown in Figure 5, any funnelling that may occur between the building forms is expected to be significantly reduced. The retention of the proposed awnings above the north-eastern through-site links is recommended.

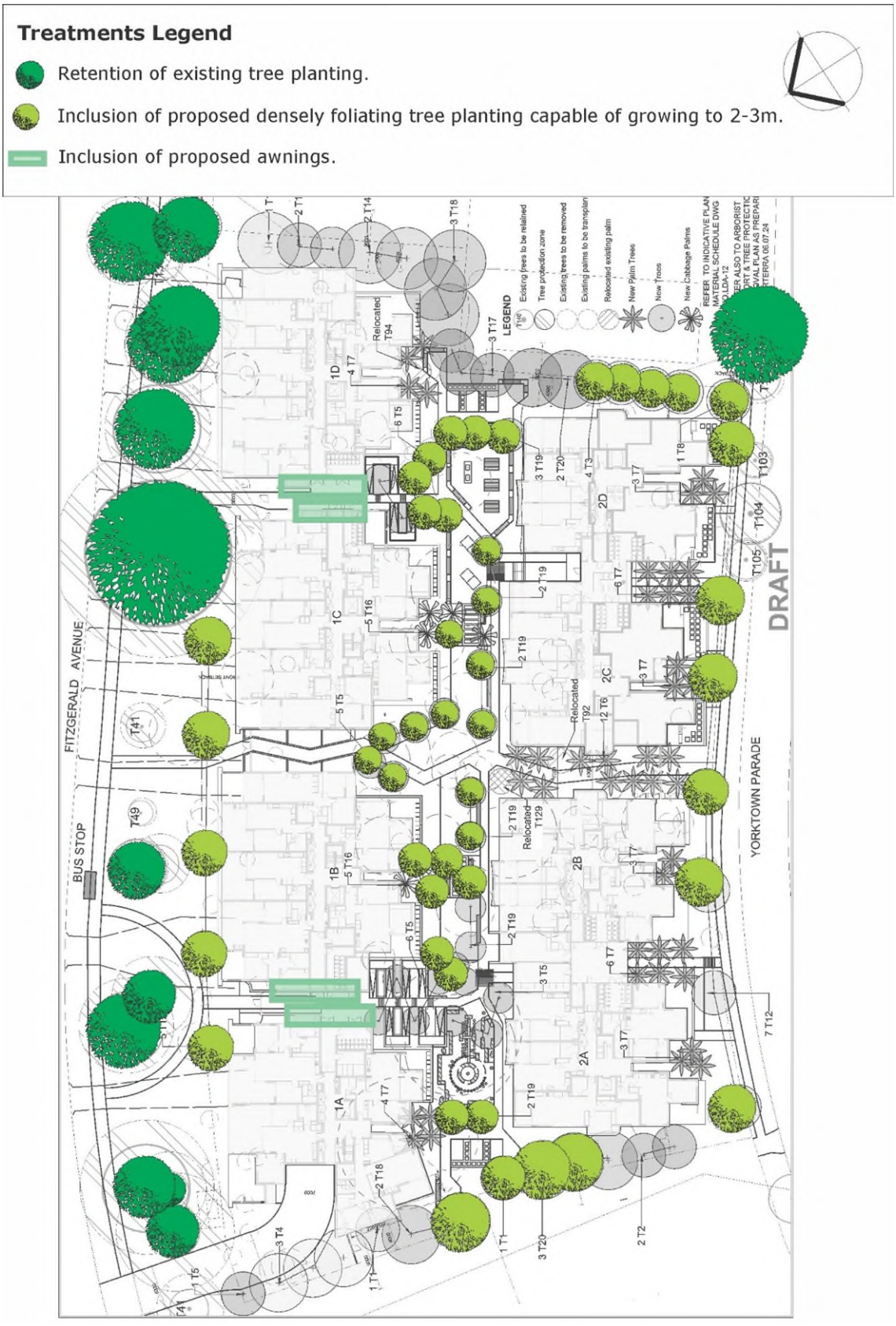

Figure 5: Recommended Treatment for the Ground Level

5.2 Private Balconies and Courtyards

The balconies of the development are expected to be suitable for their intended use due to the inclusion of various wind mitigation features such as their overall recessed design, impermeable balustrades, intertenancy screens, and full-height end screens. These features should be retained in the final design. Additional shielding is also expected to be provided by nearby vegetation and neighbouring buildings.

The majority of the ground level terraces of the development are expected to experience similar wind conditions to the pedestrian walkways within and around the site and hence are not expected to experience any adverse wind effects with the inclusion of the ground level tree planting recommended above. However, vulnerable terraces in western corner areas of Cores 1A and 2A may experience corner accelerating westerly winds and therefore the inclusion of the proposed impermeable balustrades is recommended. Similarly, the inclusion of impermeable balustrades is recommended on the northeastern terraces of Cores 1A-D to mitigate impacting northeasterly winds.

Wind conditions around the elevated terraces are not expected to be severe, but instead similar to the existing conditions due to the proposed development being three stories high. Nevertheless, some balconies are more vulnerable to adverse wind impacts. The effects of concern on the elevated terraces on Levels 01-02 are primarily direct impacts, corner acceleration effects, and sidestreaming on corner balconies from the northeasterly, westerly, and southerly prevailing winds. Similar to the ground level, the western corner balcony of Core 1A is vulnerable to corner accelerating westerly winds. The north-eastern terraces are also susceptible to impacting north-easterly winds. Additionally, southern corner balconies with multiple aspects are vulnerable to corner accelerating winds from the south around the building forms. The inclusion of the proposed impermeable balustrades and full height end-screens are therefore recommended. The rounded corner balconies on the southwestern aspects of Cores 1A-D may be vulnerable to funnelling and sidestreaming north-easterly winds from between the building forms. The retention of the full height impermeable screens/barriers is recommended to mitigate corner acceleration in the trafficable pedestrian area.

The Level 3 terraces on Cores 1B and 1C are expected to be vulnerable to impacting winds from the north-east. The inclusion of the proposed impermeable balustrades and intertenancy screens is recommended in the final design. The setback of these terraces from the main façade is also expected to reduce adverse wind impacts.

6 REFERENCES

Davenport, A.G., 1972, "An approach to human comfort criteria for environmental conditions". Colloquium on Building Climatology, Stockholm.

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Penwarden, A.D. (1973). "Acceptable Wind Speeds in Towns", Building Science, vol. 8: pp259–267.

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APPENDIX A WIND EFFECTS GLOSSARY

A.1 Downwash and Upwash Effects

The downwash wind effect occurs when wind is deflected down the windward face of a building, causing accelerated winds at pedestrian level. This can lead to other adverse effects as corner acceleration as the wind attempts to flow around the building, as seen in Figure A.1.

This can also lead to recirculating flow in the presence of a shorter upstream building, causing local ground level winds to move back into the prevailing wind.

The upwash effect occurs near upper level edge of a building form as the wind flows over the top of the building. This has the potential to cause acceleration of winds near the leading edge, as well as potentially reattaching onto the roof area. This effect causes wind issues particularly near the leading edges of tall building and on the rooftop areas if there is sufficient depth along the wind direction. Upwash is more apparent in taller towers and podia.

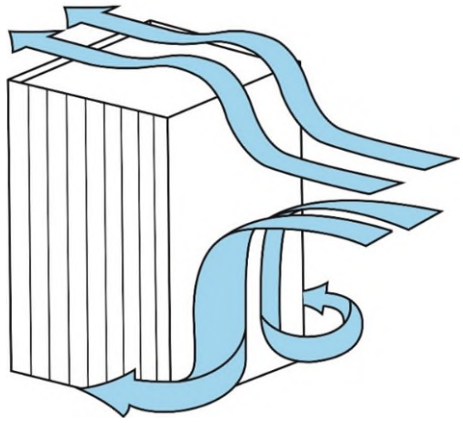

Figure A.1: Downwash Leading to Corner Wind Effect, and Upwash Effects

A.2 Funnelling/Venturi Effect

Funnelling occurs when the wind interacts with two or more buildings which are located adjacent to each other, which results in a bottleneck, as shown in Figure A.2. This causes the wind to be accelerated through the gap between the buildings, resulting in adverse wind conditions and pedestrian discomfort within the constricted space. Funnelling effects are common along pedestrian links and thoroughfares generally located between neighbouring buildings that have moderate gaps between them.

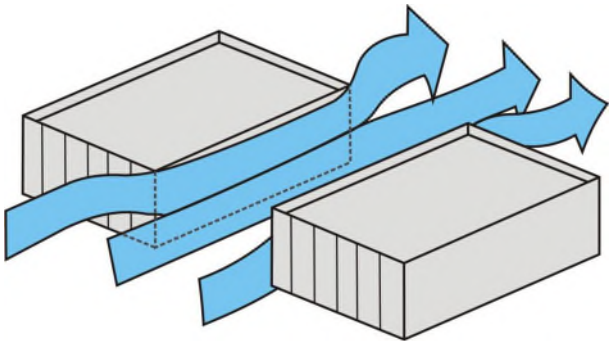

Figure A.2: Funnelling/Venturi Wind Effect

A.3 Gap Effect

The gap effect occurs in small openings in the façade that are open to wind on opposite faces, as seen in Figure A.3. This can involve a combination of funnelling and downwash effects. Presenting a small gap in the façade on the windward aspect as the easiest means through which the wind can flow through can result in wind acceleration through this gap. The pressure difference between the windward façade and the leeward façade also tends to exacerbate the wind flow through this gap.

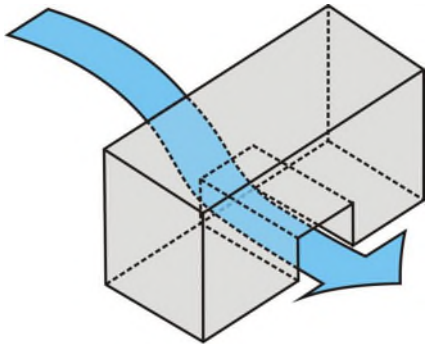

Figure A.3: Gap Wind Effect

A.4 Sidestream and Corner Effects

The sidestream effect is due to a gradual accumulation of wind shearing along the building façade that eventuates in an acceleration corner effect. The flow is parallel to the façade and can be exacerbated by downwash effects as well, or due to corner effect winds reattaching on the façade.

This is shown in Figure A.4. The corner refers to the acceleration of wind at the exterior vertical edge of a building, caused by the interaction of a large building massing with the incident wind, with the flow at the corner being accelerated due to high pressure differentials sets up between the windward façade and the orthogonal aspects. It can be further exacerbated by downwash effects that build up as the flow shears down the façade.

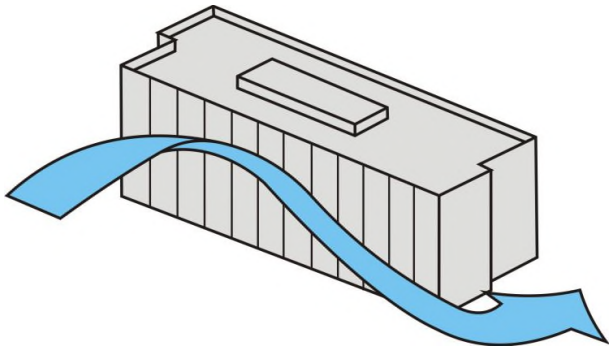

Figure A.4: Sidestream and Corner Wind Effect

A.5 Stagnation

Stagnation in a region refers to an area where the wind velocity is significantly reduced due to the effect of the flow being impeded by the bluff body. For a particular prevailing wind direction, this is typically located near the middle of the windward face of the building form or over a short distance in front of the windward face of a screen or fence. Concave building shapes tend to create an area of stagnation within the cavity, and wind speeds are generally low in these areas.