WINDTECH

PEDESTRIAN WIND ENVIRONMENT STATEMENT

2 FLIDE STREET, CARINGBAH

WK291-01F02- WS REPORT (REV1)

SEPTEMBER 26, 2025

Prepared for:

NSW Land and Housing Corporation

Level G 4 Parramatta Square, Darcy Street, Parramatta, NSW 2150

AT THE LEADING EDGE

WINDTECH CONSULTANTS
www.windtechconsult.com
reception@windtechglobal.com

Sydney | Singapore | London | Melbourne | Mumbai | New York | Hong Kong | Dubai | Miami | Toronto

DOCUMENT CONTROL

Date	Revision History	Issued Revision	Prepared By (initials)	Instructed By (initials)	Reviewed & Authorised by (initials)
September 23, 2025	Initial.	0	GCO	MM	GC
September 26, 2025	Revised recommendations and excluding discussion related to private areas of the development	1	GCO	MM	GC

The work presented in this document was carried out in accordance with the Windtech Consultants Quality Assurance System, which is based on International Standard ISO 9001.
This document is issued subject to review and authorisation by the Team Leader noted by the initials printed in the last column above. If no initials appear, this document shall be considered as preliminary or draft only and no reliance shall be placed upon it other than for information to be verified later.
This document is prepared for our Client's particular requirements which are based on a specific brief with limitations as agreed to with the Client. It is not intended for and should not be relied upon by a third party and no responsibility is undertaken to any third party without prior consent provided by Windtech Consultants. The information herein should not be reproduced, presented or reviewed except in full. Prior to passing on to a third party, the Client is to fully inform the third party of the specific brief and limitations associated with the commission.

EXECUTIVE SUMMARY

This report presents an opinion on the likely impact of the proposed development located at 2 Flide Street, Caringbah, 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 23 September 2025). 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. 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:
    - Existing design feature of existing trees along Gardere Street and Flide Street.
    - Existing design feature of 3-5m proposed trees of an evergreen densely floating variety along Willarong Road, Gardere Street and in the central courtyard.
    - Existing design feature of the proposed planter box and inclusion of densely foliated hedge planting.
    - Existing design feature of the full height screen to the west of the north-eastern building entry.
    - Inclusion of full height impermeable screen or wall to the west of the north-western building entry.
- Communal areas:
    - Existing design feature of 1.5m impermeable balustrades within the breezeway.
    - Inclusion of full height screen on the south-eastern corner of the communal terrace.

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, 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 concurrent State Significant Development Application (SSD-84862461) and Planning Proposal for the redevelopment of existing social housing (the Project) at 2 Flide Street, Caringbah (the Site). The project involves the construction of two residential flat buildings—one rising to part 13 and part 14 storeys, and the other to 8 storeys—comprising a total of 164 social and affordable housing apartments. The development also includes a communal room and a two-level basement car park. To support the Proposal, adjustments to the permissible building height and floor space ratio (FSR) increase via an amendment to the Sutherland Shire Local Environment Plan 2015 are required.

The purpose of this desktop pedestrian wind environment statement is to presents 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 is presented in this report. 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 in this report is shown in the Table below.

Table 1: List of Architectural Drawing Referenced

SSDA - Drawing List

Sheet Number	Sheet Name	Current Revision	Current Revision Date
DA00.001	Drawing List	2	19.09.2025
DA01 - Site			
DA01.100	Proposed Site Plan	2	19.09.2025
DA03 - General Arrangement Plans			
DA03.001	Basement 01	3	19.09.2025
DA03.100	Lower Ground Level 00	3	19.09.2025
DA03.101	Upper Ground Level 01	3	19.09.2025
DA03.102	Level 02	3	19.09.2025
DA03.103	Level 03, 05, 06, 08	3	19.09.2025
DA03.104	Level 04, 07	3	19.09.2025
DA03.109	Level 09-13	3	19.09.2025
DA03.114	Level 14	3	19.09.2025
DA03.115	Level 15 - Roof	3	19.09.2025
DA09 - Elevations			
DA09.001	North Elevation	2	19.09.2025
DA09.002	East Elevation	2	19.09.2025
DA09.003	West Elevation	2	19.09.2025
DA09.004	South Elevation	2	19.09.2025
DA09.005	Courtyard Elevations	2	19.09.2025
DA10 - Sections			
DA10.001	Section AA	2	19.09.2025
DA10.002	Section BB	2	19.09.2025
DA13 - Apartment Types			
DA13.010	Social Housing 01	2	19.09.2025
DA13.011	Affordable Housing 01	2	19.09.2025
DA13.012	Affordable Housing 02	2	19.09.2025
DA21 - Compliance			
DA21.001	Solar Access	1	19.09.2025
DA21.003	Cross Ventilation	1	19.09.2025
DA22 - Area Plans			
DA22.001	GFA	2	19.09.2025

Additionally, this report aims to address:

1. The Secretary's Environmental Assessment Requirements (SEARs) for the Project issued on 6 June 2025 which identified the following specific assessment requirements:

Table 2: Secretary's Environmental Assessment Requirements (SEARs)

Item	SEARS Requirement	Report Reference
	Environmental Amenity	
	— Assess amenity impacts on the surrounding locality, including solar access, visual privacy, view loss and view sharing, as well as wind, lighting and reflectivity 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

The Site

The Site is located within the Sutherland Shire local government area (LGA) and is zoned R4 High Density Residential under the Sutherland Shire Local Environmental Plan (SSLEP) 2015.

The Site has a total area of approximately 3,596 square metres (sqm) and is bound by Flide Street to the north, Gardere Street to the west, Willawong Road to the east and the rail corridor for the T4 Eastern Suburbs & Illawarra Line to the south. Refer to Figure 1.

The site is accessible by public transport, being within 400m of the entrance to Caringbah Station and bust stops on the Kingsway which have frequent services to Sutherland, Miranda and Cronulla.

The Site currently comprises 38 social housing units within two 3 storey buildings with a single level basement car park.

Figure 1 Site location (Source: Google Earth)

Proposed Development

The proposed development comprises the construction of two residential flat buildings—one rising to part 13 and part 14 storeys, and the other to 8 storeys—comprising a total of 164 social and affordable housing apartments. The development also includes a communal room and a two-level basement car park.

The proposal includes bulk earthworks, tree removal and associated landscaping and public domain works.

To support the Proposal, a concurrent Planning Proposal seeks amendments to the development standards within SSLEP as follows:

Building Height – Increase the maximum building height development standard from 16m to 50m; and

FSR – Increase the maximum FSR development standard from 1.2:1 to 4.0:1.

The existing buildings on the Site were approved for demolition under Division 5.1 of the Environmental Planning and Assessment Act 1979, and does not form part of this proposal. This included removal of all trees on top of the existing basement.

2 DESCRIPTION OF DEVELOPMENT AND SURROUNDINGS

The site is located at 2 Flide Street, Caringbah, and is bounded by Flide Street to the north, Gardere Street to the west, Willarong Road to the east and a railway line to the south. The buildings surrounding the subject development are predominately low-rise residential buildings, with a few mid-rise apartment buildings to the east and north-east.

A survey of the land topography indicates a gradual slope downwards towards the east and the west, as the development located at the peak of a hill.

An aerial image of the subject site and the local surroundings is shown in Figure 2, with the frequency and magnitude of the prevailing winds is superimposed for each wind direction.

The existing site consists of 3 storey residential buildings. The proposed development is a 14 storeys high residential building.

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.
- Communal areas.

Figure 2: 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 2025). 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 3 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 3.

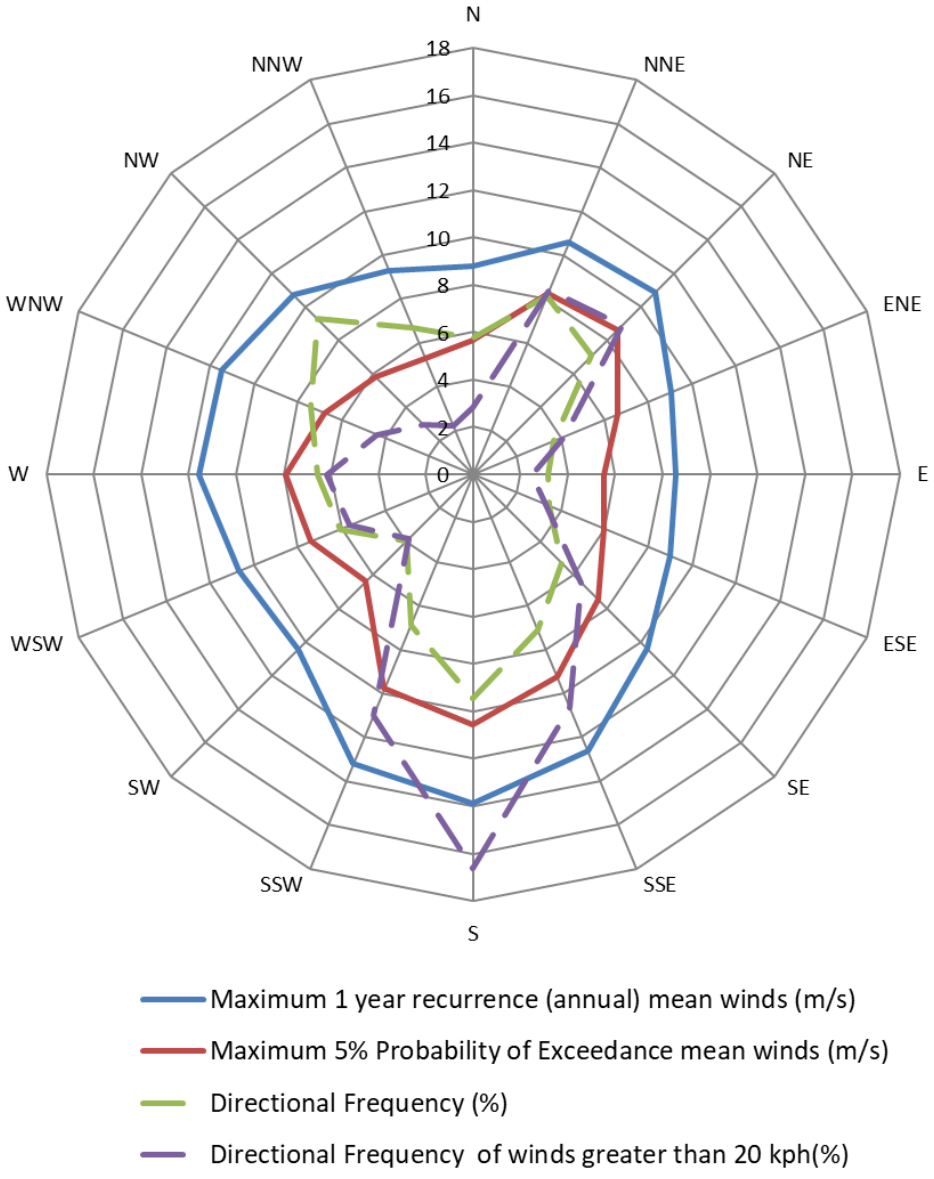

Figure 3: Directional Annual and 5% Exceedance Hourly Mean Wind Speeds (referenced to 10m height in standard open terrain), and Frequencies of Occurrence, for the Sydney Region

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.

- Sitting (Long Exposure) (4m/s with a 5% probability of exceedance)
  for stationary activities longer than an hour, e.g. outdoor cinemas, outdoor fine dining 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 Willarong Road is primarily exposed to prevailing north-easterly and southerly winds. The north-easterly winds are expected to side-stream along the eastern façade and corner accelerate around the south-eastern corner. However, for the north-easterly winds, the footpath is expected to benefit from the shielding provided by the mid-rise building to the east and the wind conditions are expected to be equivalent to the existing conditions. Whereas the southerly winds are also expected to side-stream along and downwash off the same face exacerbating the corner acceleration around the north-eastern corner.

The wind conditions on the pedestrian footpaths along Flide Street and Gardere Street are expected to remain comparable to existing conditions due to the building's setback from the footpath and the relatively narrow facades on these sides are not expected to create any sidestreaming effects.

The central courtyard of the development is primarily exposed to prevailing north-easterly and westerly winds. Both the north-easterly and westerly winds are expected to downwash and then corner accelerate around the north-eastern and south-western corners respectively. Additionally, both the prevailing winds are expected to directly impact this area, causing potential adverse wind conditions for pedestrians.

The building entries on the north-eastern corner and the south-western corner are exposed to the north-easterly and westerly winds respectively. Regarding the north-eastern entry, the north-easterly winds are expected to corner accelerate and impact this entryway. The westerly winds are expected to corner accelerate around the south-western corner, similarly impacting the entryway.

To ameliorate the wind impact of these areas, the existing design features which includes the proposed planting of 3-5m high trees of an evergreen densely floating variety along Willarong Road, Gardere Road and within the Courtyard is expected to aid the wind conditions. Furthermore, the existing tree plantings along Gardere Street and Flide Street is also expected to aid in wind mitigation along around the north-eastern and south-western corners of the development and the central courtyard. Additionally, the feature of planter boxes including dense hedge planting in the central courtyard included in the current design is expected to further improved wind conditions.

Regarding the entryways, a minimum 1.5 m high impermeable screen or wall to the west of the entryway at the north-western entry is recommended to be included to protect against corner acceleration effects, in conjunction with the proposed tree planting near this entryway. Additionally, the existing design feature of a full height screen to the west of north-eastern entry as well as the proposed plantings is expected to similarly protect against the corner accelerated winds.

With the inclusion of these treatments and the existing design features, all the ground level pedestrian areas are expected to be suitable for their intended use. The recommended treatments for the ground level are shown in Figure 4 below.

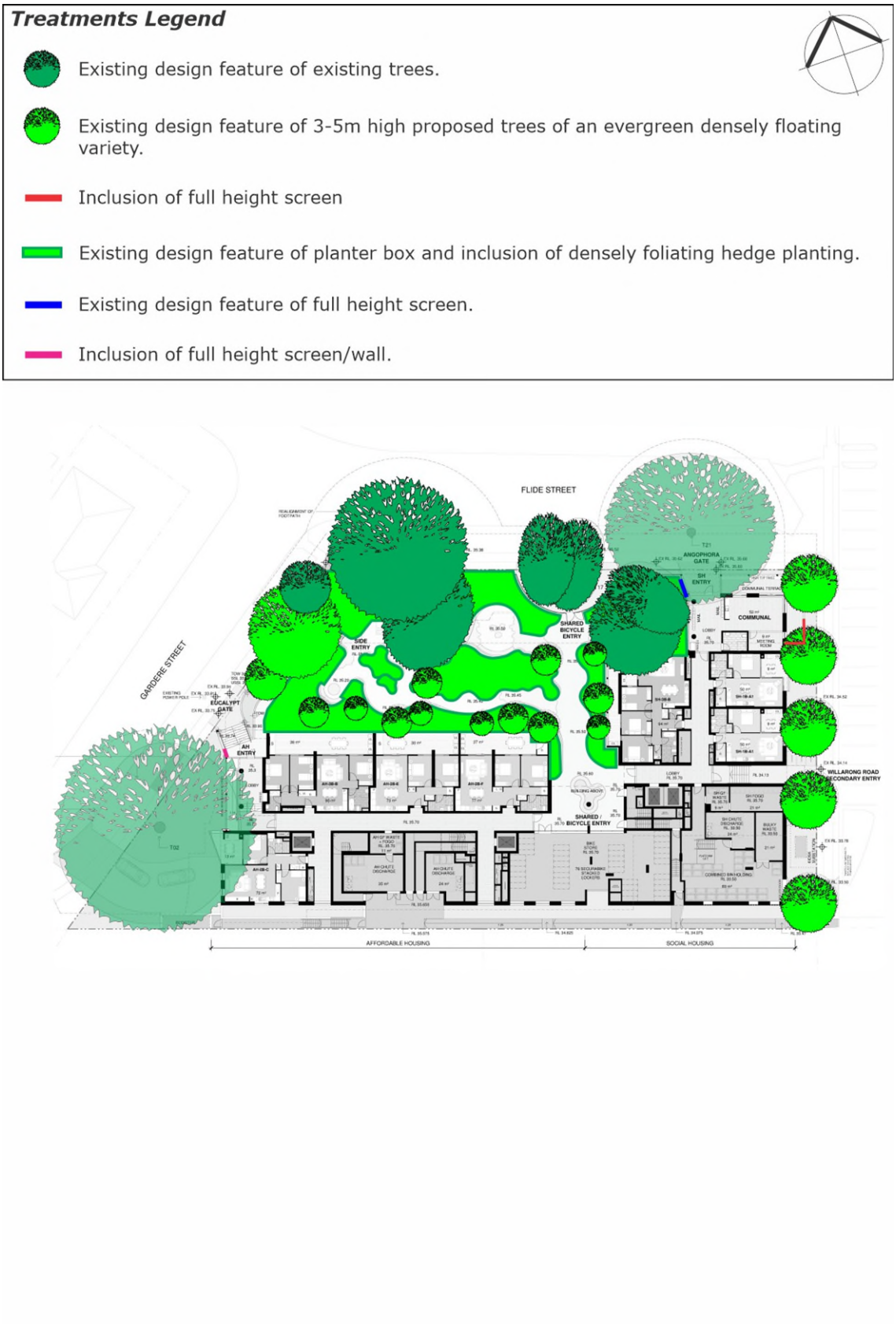

Figure 4: Recommended Treatments for the Upper Ground Level 01

5.2 Communal Areas

The communal terrace on the north-eastern corner of the ground floor is primarily exposed to the north-easterly and southerly winds. The north-easterly winds are expected to directly impact and side streaming along the eastern façade negatively affecting this terrace. Additionally, the southerly winds are expected to side stream along the eastern façade and corner accelerate around the north-eastern corner impacting the communal terrace. To ameliorate these conditions, it is recommended to include a full height screen on the south-eastern corner of the communal terrace. Furthermore, the existing and proposed tree plantings on Flide Street, Willarong Road and within the courtyard is expected to further aid the wind conditions. With the inclusion of this recommended treatment and the existing landscaping features, it is expected to be suitable for its intended use.

The recommended treatment for the communal terrace is shown in Figure 4 above.

The breezeway is expected to be exposed to the north-easterly and southerly winds. The north-easterly winds are expected to side stream along the eastern façade and corner accelerate into the breezeway causing a funnelling effect and impacting the wind conditions of this area. Similarly, the southerly winds are expected to side stream along the eastern facade and corner accelerate, funnelling into the breezeway as well. The current proposed design of 1.5m impermeable balustrades on either end of the breezeway is expected to ameliorate the wind conditions and allow the area to be suitable for its intended use.

The recommended treatment for the breezeway is shown in Figure 5 below.

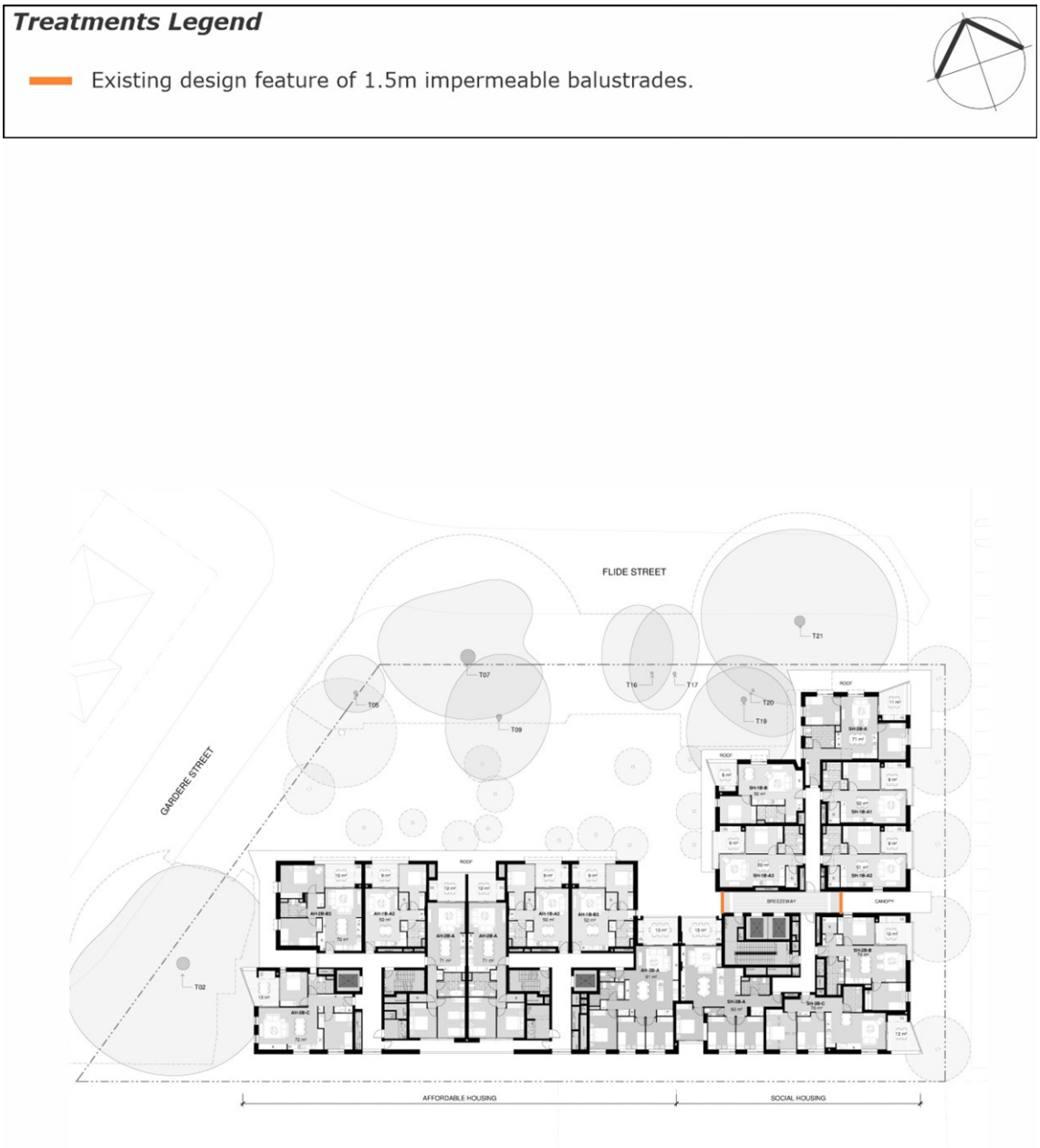

Figure 5: Recommended Treatments for the Typical Level

6 REFERENCES

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

Lawson, T.V., 1973, "The wind environment of buildings: a logical approach to the establishment of criteria". Bristol University, Department of Aeronautical Engineering.

Lawson, T.V., 1975, "The determination of the wind environment of a building complex before construction". Bristol University, Department of Aeronautical Engineering.

Lawson, T.V., 1980, "Wind Effects on Buildings - Volume 1, Design Applications". Applied Science Publishers Ltd, Ripple Road, Barking, Essex, England.

Melbourne, W.H., 1978, "Criteria for Environmental Wind Conditions". *Journal of Wind Engineering and Industrial Aerodynamics*, vol. 3, pp241-249.

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

Penwarden, A.D., Wise A.F.E., 1975, "Wind Environment Around Buildings". Building Research Establishment Report, London.

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.

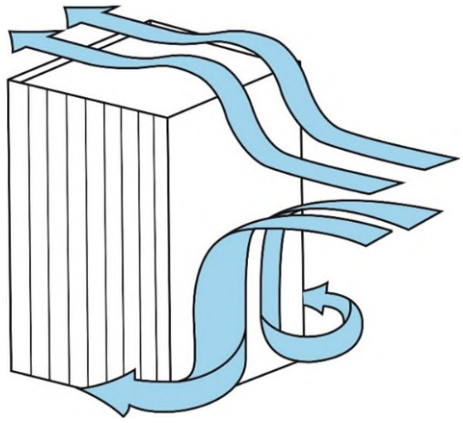

Figure A.1: Downwash Leading to Corner Wind Effect, and Upwash Effects

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.

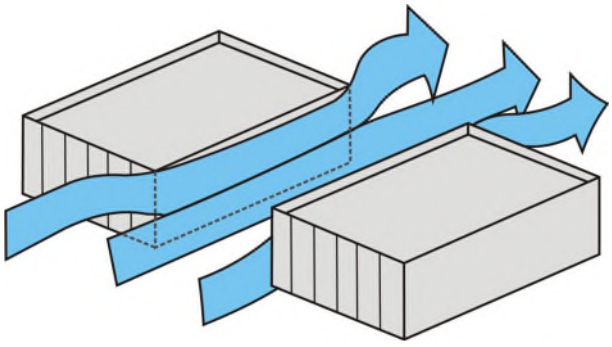

Figure A.2: Funnelling/Venturi Wind Effect

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.

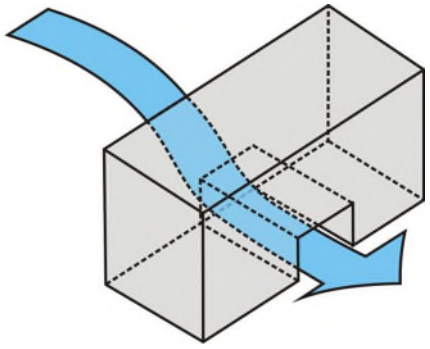

Figure A.3: Gap Wind Effect

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.

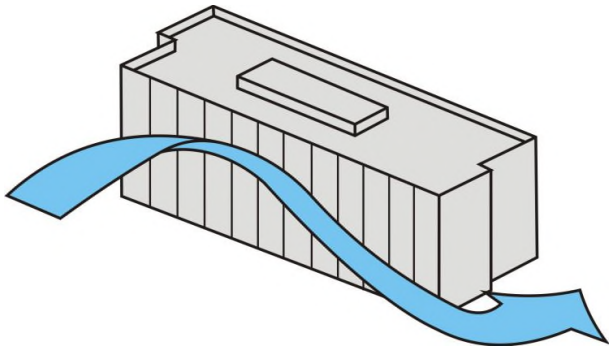

Figure A.4: Sidestream and Corner Wind Effect

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.