



# PEDESTRIAN WIND ENVIRONMENT STATEMENT

16-30 DAWES AVENUE, 4-8 HUGHES AVENUE & 2-6  
CADMAN CORNER, CASTLE HILL

WJ989-01F02(REV0)- WS REPORT

JUNE 20, 2025

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Date	Revision History	Issued Revision	Prepared By (initials)	Instructed By (initials)	Reviewed & Authorised by (initials)
June 20, 2025	Initial.	0	JAF	TR	MLO/TR

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# EXECUTIVE SUMMARY

This report presents an opinion on the likely impact of the proposed development at 16-30 Dawes Avenue, 4-8 Hughes Avenue & 2-6 Cadman Corner, located in Castle Hill, 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, south to south-easterly, 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 3 June 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:
  - Inclusion of 1.5-1.8m high vegetation (e.g. hedges / shrubs) between Buildings B and E, and C and D.
  - Retention of all existing / proposed tree planting within the site boundary.
  - Inclusion of additional densely foliating evergreen trees between Buildings C and D.
  - Retention of impermeable full height screens between ground level terraces.
  - Inclusion of impermeable balustrades on the corner terraces on Buildings D, F, and H.
  - Inclusion of 2.5m high screening with porosity of up to 30% between Buildings E and F.
- Typical corner balconies on Levels 1-3 and 5-7:
  - Retention of impermeable balustrades.
  - Retention of impermeable full height screens.
- Level 4 Terraces:
  - Retention of impermeable balustrades.
  - Retention of impermeable full height screens.

- Retention of proposed raised planter boxes.
- Rooftop Communal Open Spaces:
  - Retention of proposed raised planters surrounding the trafficable zones

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. Nonetheless, wind tunnel testing is recommended to be undertaken at a more detailed design to quantitatively assess the wind conditions and to optimise the size and extent of the treatments required.

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# INTRODUCTION

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 for this assessment is provided in the table below.

Table 1: List of Architectural Drawings Referenced

Drawing/file name	Revision number	Date
GROUND FLOOR PLAN	3	16/06/2025
LEVEL 1 PLAN	2	11/03/2025
LEVEL 2 PLAN	2	11/03/2025
LEVEL 3 PLAN	2	11/03/2025
LEVEL 4 PLAN	2	11/03/2025
LEVEL 5 PLAN	2	11/03/2025
LEVEL 6 PLAN	2	11/03/2025
LEVEL 7 PLAN	2	11/03/2025
ROOF PLAN	4	16/06/2025
UPPER ROOF PLAN	4	16/06/2025

## DESCRIPTION OF DEVELOPMENT AND SURROUNDINGS

The site is located at 16-30 Dawes Avenue, 4-8 Hughes Avenue & 2-6 Cadman Corner, Castle Hill, and is bounded by Dawes Avenue to the north, Cadman Crescent to the south, Hughes Avenue to the west, and low rise residential buildings to the south-east. The buildings surrounding the subject development are predominately low rise residential buildings, with a few mid-rise apartment buildings to the north and north-west.

A survey of the land topography indicates a slope towards the east, reaching its peak at the end of Dawes Avenue

An aerial image of the subject site and the local surroundings is shown in Figure 1, with the frequency and magnitude of the prevailing winds is superimposed for each wind direction.

The existing site consists of 1-2 storey residential buildings. The proposed development consists of 8 buildings which are each 8 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.
- Rooftop terraces.

### Legend

- Line thickness represents the magnitude of the regional wind from that direction
- Line length represents the frequency that the regional wind occurs for that direction

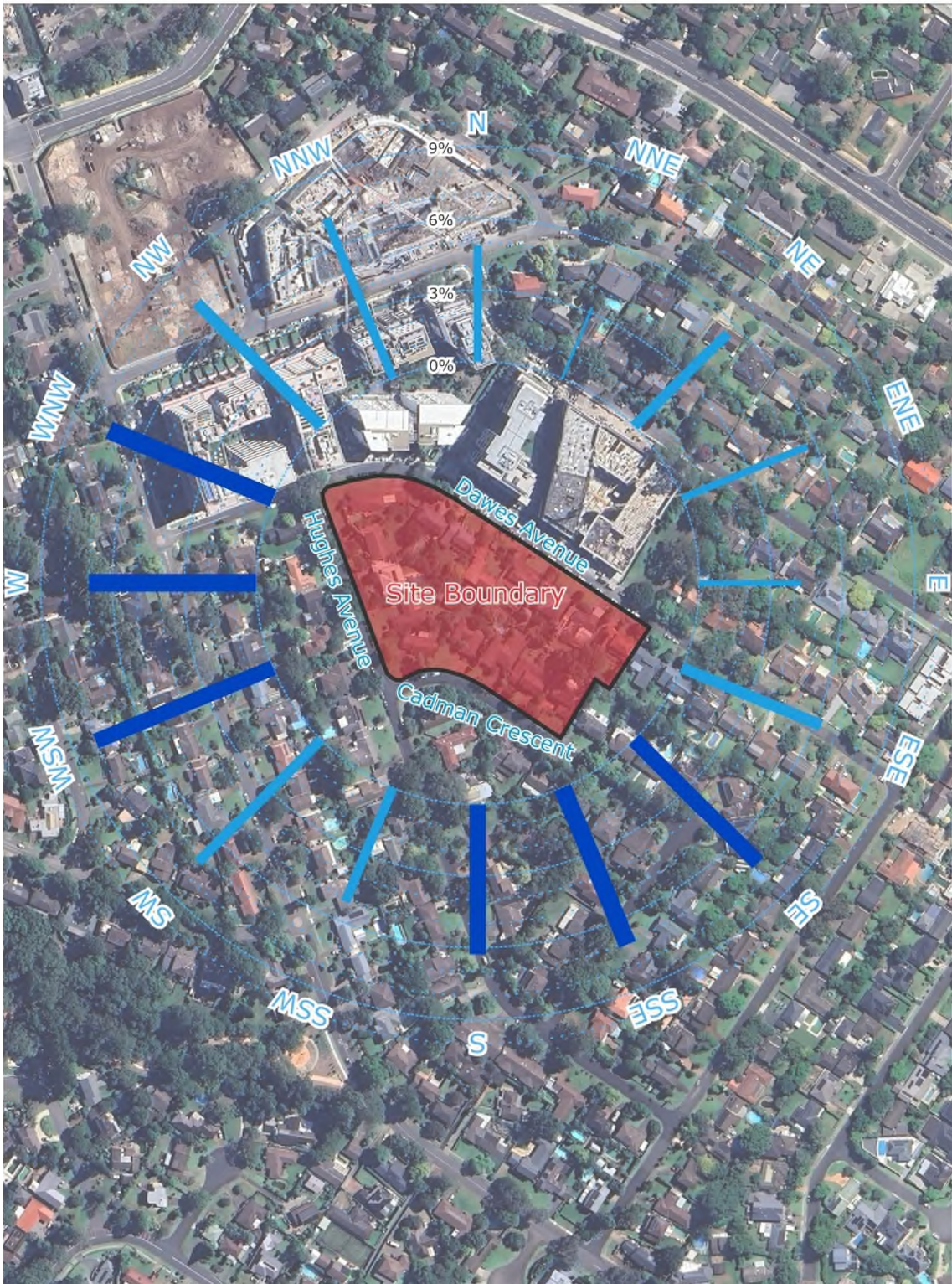


Figure 1: Aerial Image of the Site Location and Prevailing Wind Directions

### 3 REGIONAL WIND

The Castle Hill region is governed by three principal wind directions that can potentially affect the subject development. These winds prevail from the north-east, south-south-east, 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 Bankstown Airport (recorded from 1993 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 2 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 2.

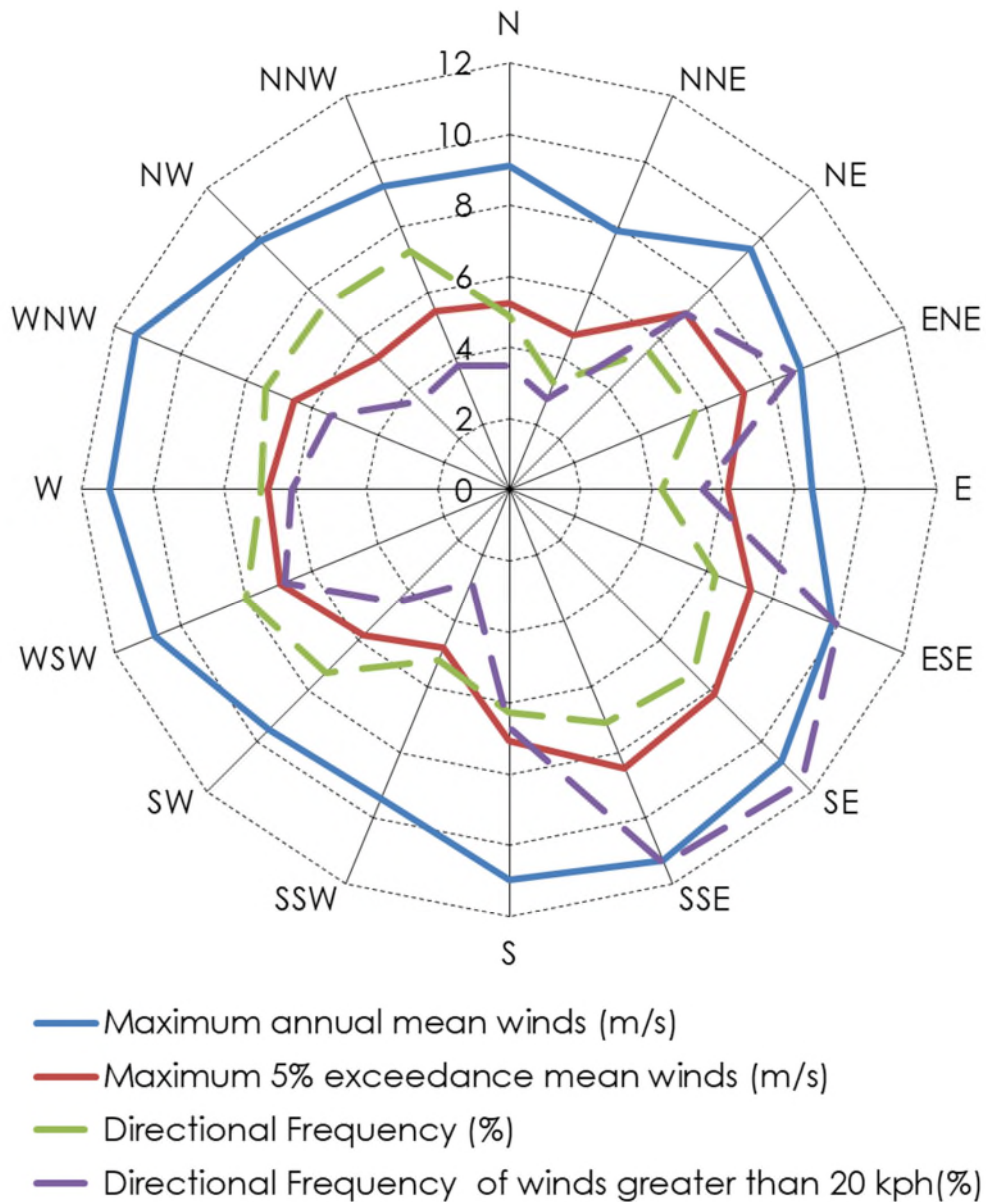


Figure 2: Directional Annual and 5% Exceedance Hourly Mean Wind Speeds (referenced to 10m height in standard open terrain), and Frequencies of Occurrence, for the Castle Hill Region

## 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 2 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 2: 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.

## 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 Dawes Avenue is primarily exposed to the north-easterly prevailing winds. Due to the 7.5m setback of the tower form it is expected that the wind conditions will remain suitable and/or equivalent to the existing conditions. The walkways along Hughes Avenue and Cadman Crescent are primarily exposed to the south-south-easterly and westerly prevailing winds. Similarly, the setback of the tower form is expected to ensure that the wind conditions will remain suitable and/or equivalent to the existing conditions.

The ground level terraces along the northern aspect of Buildings A - C and the western aspect of Building H are exposed to sidestreaming effects from the prevailing north-easterly and westerly winds, respectively. The retention of the proposed full height inter-tenancy screens is expected to sufficiently mitigate adverse wind impacts and ensure comfort levels are suitable. The corner terraces on Buildings D, F, and H are also susceptible to corner acceleration effects. The inclusion of impermeable balustrades around these terraces is recommended to improve wind comfort conditions.

The trafficable areas and communal spaces within the site boundary at Ground Level are mainly susceptible to corner accelerating and funnelling north-easterly and south-easterly winds between the development buildings. The north-easterly winds are likely to funnel between Buildings C and D, while the south easterly winds will be funnelling between Buildings E and F. The retention of all existing and proposed tree planting is recommended to block funnelling winds. Also, the addition of a 2.5m high screen with up to 30% porosity is recommended to be included between Buildings E and F above the carpark entry to mitigate the south-easterly winds impacting the trafficable areas.

The abovementioned treatments are shown in Figure 3 below.

**Treatments Legend**

- Inclusion of 1.5-1.8m high vegetation (e.g. hedges/shrubs).
- Inclusion of impermeable balustrades.
- Retention of impermeable full height screens.
- Inclusion of 2.5m high screening of up to 30% porosity.
- Retention of the existing / proposed densely foliageing evergreen trees.



Figure 3: Recommended Treatment for the Ground Level

## 5.2 Private Balconies / Terraces

The majority of 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, impermeable intertenancy screens, louvers, and full-height impermeable end screens. These features should be retained in the final design.

The only concern of note on typical levels is that corner acceleration and sidestreaming effects may occur around the corner balconies of the development from the prevailing wind directions. The retention of the proposed impermeable balustrades and full height screens is recommended to ensure no adverse wind conditions occur.

Similarly, on the Level 4 terraces of Buildings A - F, the primary adverse effect expected to occur would be sidestreaming winds across the façade from the prevailing north-easterly and south-easterly directions. The retention of the proposed raised planters and impermeable balustrades surrounding the terrace is recommended to reduce wind impacts.

The abovementioned treatments are shown in Figures 4 to 6 below.

### Treatments Legend

- █ Retention of impermeable full height screens.
- █ Retention of impermeable balustrades.



Figure 4: Recommended Treatment for the Level 1-3 Balconies

**Treatments Legend**




-  Retention of the proposed raised planter / impermeable balustrades.
-  Retention of impermeable full height screens.
-  Retention of impermeable balustrades.



Figure 5: Recommended Treatment for the Level 4 Terraces

**Treatments Legend**

- Retention of impermeable balustrades.
- Retention of impermeable full height screens.




Figure 6: Recommended Treatment for the Level 5-7 Balconies

### 5.3 Rooftop Terraces

The rooftop trafficable terraces on Buildings A-H are expected to achieve suitable comfort levels with the proposed landscaping design. Although the prevailing winds may upwash from the façade below, the inclusion of the proposed raised planter boxes as illustrated in the architectural drawings is expected to sufficiently mitigate any adverse wind impacts on the trafficable area. Planting is recommended to be of a densely foliating variety with ability to grow to 1.2-1.5, above FFL as shown in Figure 7 below.

**Treatments Legend**

 Retention of the proposed raised planters ensuring the vegetation is of a densely foliage variety and extends to 1.2-1.5m above FFL.

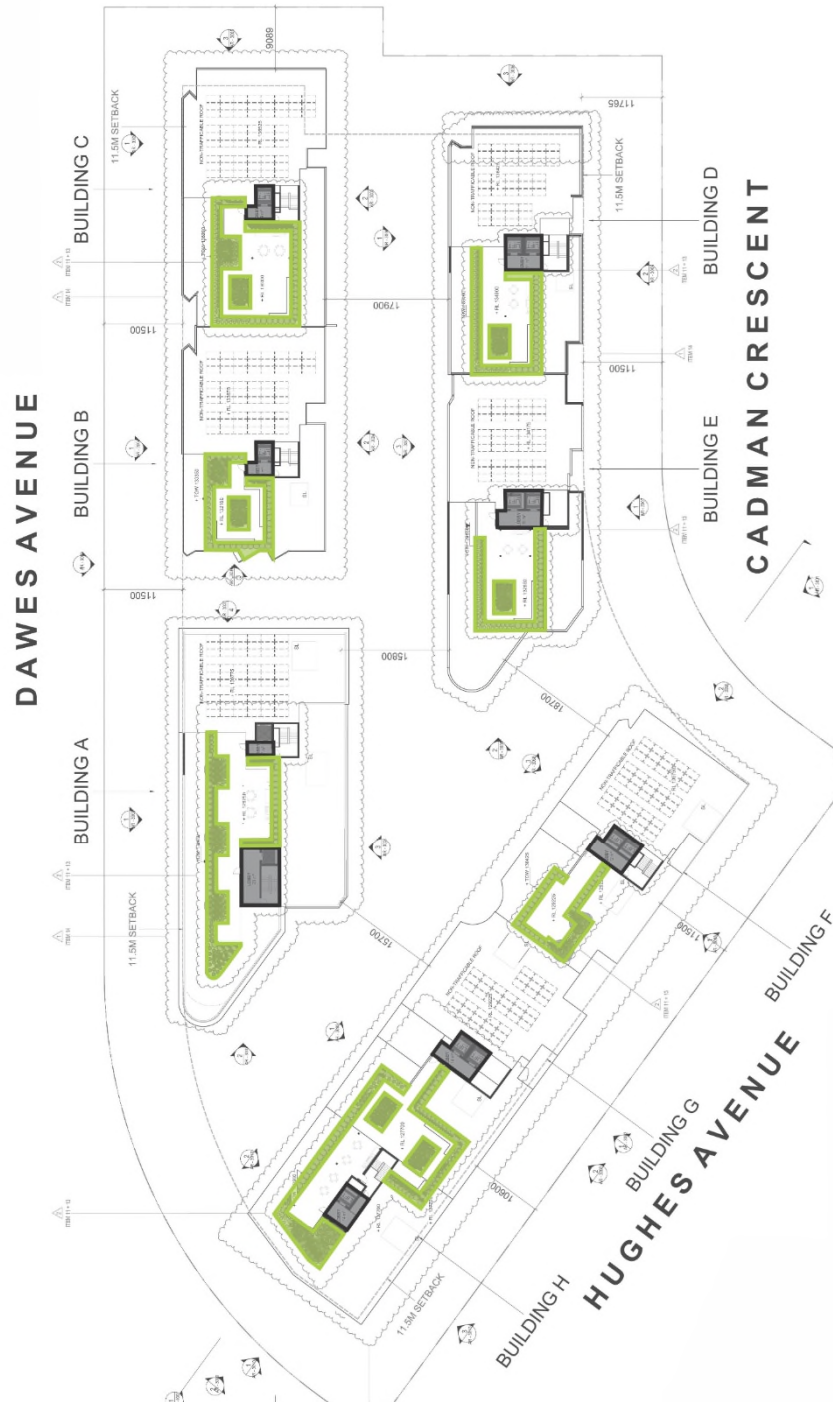


Figure 7: Recommended Treatment for the Private Balconies and Terraces

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.

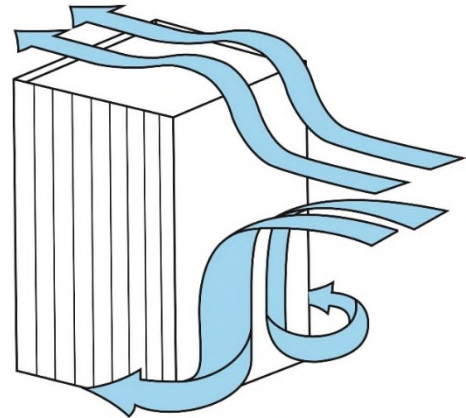


Figure A.1: Downwash Leading to Corner Wind Effect, and Upwash Effects

## 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.

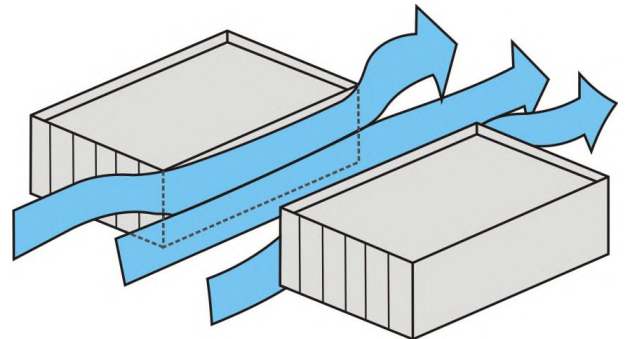


Figure A.2: Funnelling/Venturi Wind Effect

## 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.

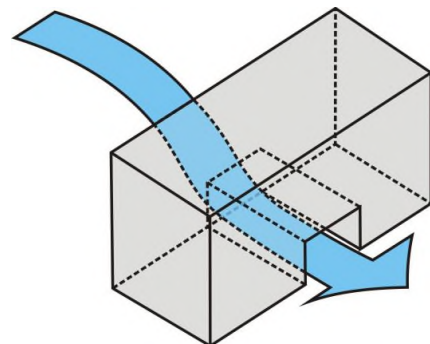


Figure A.3: Gap Wind Effect

## 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.

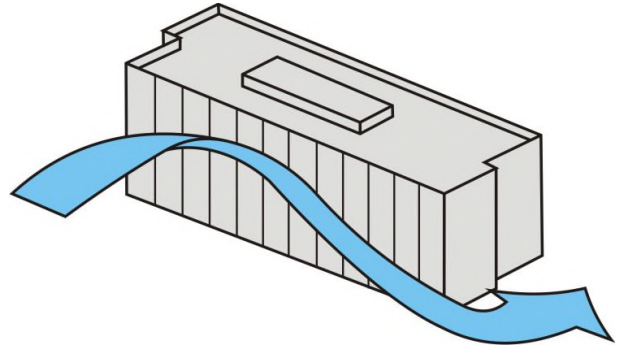


Figure A.4: Sidestream and Corner Wind Effect

## 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.