



WIND ENGINEERING  
CONSULTANTS

QUALITATIVE WIND ASSESSMENT  
CPP PROJECT 22464  
27 FEBRUARY 2026

# 40-48 Redan Street

*Mosman, NSW*

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## Executive Summary

A qualitative assessment of the 40-48 Redan Street development to be built in Mosman, NSW was conducted to provide an initial assessment of the surrounding pedestrian wind environment. The assessment was based on the local wind climate, CPP's experience in the region and on comparable projects, and the characteristics of the proposed development.

The wind environment around the development is likely to be generally suitable for pedestrian walking style activities from a comfort perspective with reference to the Lawson criteria. No major adverse impacts to pedestrian comfort or amenity are foreseen as a result of the proposed development. Areas intended for long term stationary activity such as seating are likely to require treatment to ensure they are suitable for their intended use. All areas in the public domain in the vicinity of the subject site are expected to satisfy the relevant wind safety criterion.

Relatively windy conditions are expected to occur on the southern-most part of the communal terrace on Level 5 which can be partly mitigated by perimeter landscaping. The majority of this terrace is located under the overhang of the building above. To prevent strong cross flow between the east and west side of this part of the terrace it is recommended to have the possibility to enclose at least one side under inclement wind conditions.

Wind conditions on residential balconies are expected to be generally mild with the large penthouse balconies being more exposed to potential cross flow.

This report is a high-level qualitative assessment based on basic features of the local wind climate and proposed built environment.

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# 1. Background

## INTRODUCTION

This report has been prepared to support a State Significant Development Application (**SSDA**) SSD-93020230 for the site at 40-48 Redan Street, Mosman.

The Minister for Planning and Public Spaces, or their delegate, is the consent authority for the SSDA and this application is lodged with the NSW Department of Planning, Housing and Infrastructure (**DPHI**) for assessment.

The SSDA seeks consent for a multi-storey residential development that utilises the Low and Mid-Rise Housing (**LMR**) and In-fill Affordable Housing (**IAH**) policies recently introduced under the *State Environmental Planning Policy (Housing) 2021 (Housing SEPP)*. The design is outlined in the Architectural Plan set prepared by FJC Studio and provided within the SSDA.

This report has been prepared in response to the requirements contained within the Secretary's Environmental Assessment Requirements (**SEARs**) dated 5 September 2025 (SSD- 93020230). Specifically, this report has been prepared to respond to the following SEARs:

Secretary's Environmental Assessment Requirements	Refer Report Section
<b>7. Environmental Amenity</b> Assess amenity impacts on the surrounding locality, including solar access, visual privacy, view loss and view sharing, as well as <b>wind</b> , lighting and reflectivity impacts. A high level of environmental amenity for any surrounding residential or other sensitive land uses must be demonstrated.	Whole report

## PROJECT DESCRIPTION

The application seeks development consent for the redevelopment of the site for a multi-storey in-fill affordable housing residential development for 53 dwellings.

Specifically, this application seeks approval for the following:

- Demolition of the existing structures on site, including 5 dwellings and vehicle crossovers.
- Site preparation works including:
  - Tree removal.
  - Excavation across the site.
- Construction of a multi-storey residential flat building comprising:
  - Two levels of basement for 106 car parking spaces, services and storage.
  - 53 residential dwellings in 2-, 3- and 4-bedroom configurations.

- Communal open space at ground level, level 1 and level 5.
- Ancillary vehicular entry and public domain works from Redan Street.
- Provision of 15% affordable housing to be managed by a community housing provider for a period of 15 years from date of the Occupation Certificate.
- Extension and augmentation of physical infrastructure and utilities as required.

Refer to Architectural Plans prepared by FJC Studio appended to the Environmental Impact Statement.

## THE SITE

The site is located at 40-48 Redan Street, Mosman and comprises the following landholdings:

- Lot 1 on Deposited Plan 33257
- Lot 2 on Deposited Plan 33257
- Lot 1 on Deposited Plan 921113
- Lot 13 on Deposited Plan 920285
- Lot 1 on Deposited Plan 455982
- Lot 9 on Deposited Plan 1350
- Lot 10 on Deposited Plan 1350
- Lot 11 on Deposited Plan 1350

The site is regular in shape and has an area of approximately 3,233 square metres. The site currently accommodates four 2-storey residential dwellings, and one 2-storey attached dwelling in a landscaped setting. The site has a primary frontage to Redan Street to the east and a rear frontage to Redan Lane to the west.

The site is in Mosman, a suburban local government area (**LGA**) in Sydney's north shore. The site has excellent access to public amenities including supermarkets, cafes and destination shops along Military Road and at Spit Junction, and access to recreational areas including Balmoral Beach to the east and Georges Heights headland to the south. Spit Junction is a recognised town centre under the low and mid-rise (**LMR**) policy. The site is also close to regular bus services in the immediate vicinity.

The site is not a listed heritage item or located within a heritage conservation area, however Redan Street reserve is listed as a local heritage item in the *Mosman Local Environmental Plan 2012 (LEP)*. The site to the immediate south at 36-38 Redan Street containing a pair of semi-detached houses and to the east at 29 Redan Street containing a house are also a listed local heritage item.

The location of the site is illustrated in Figure 1

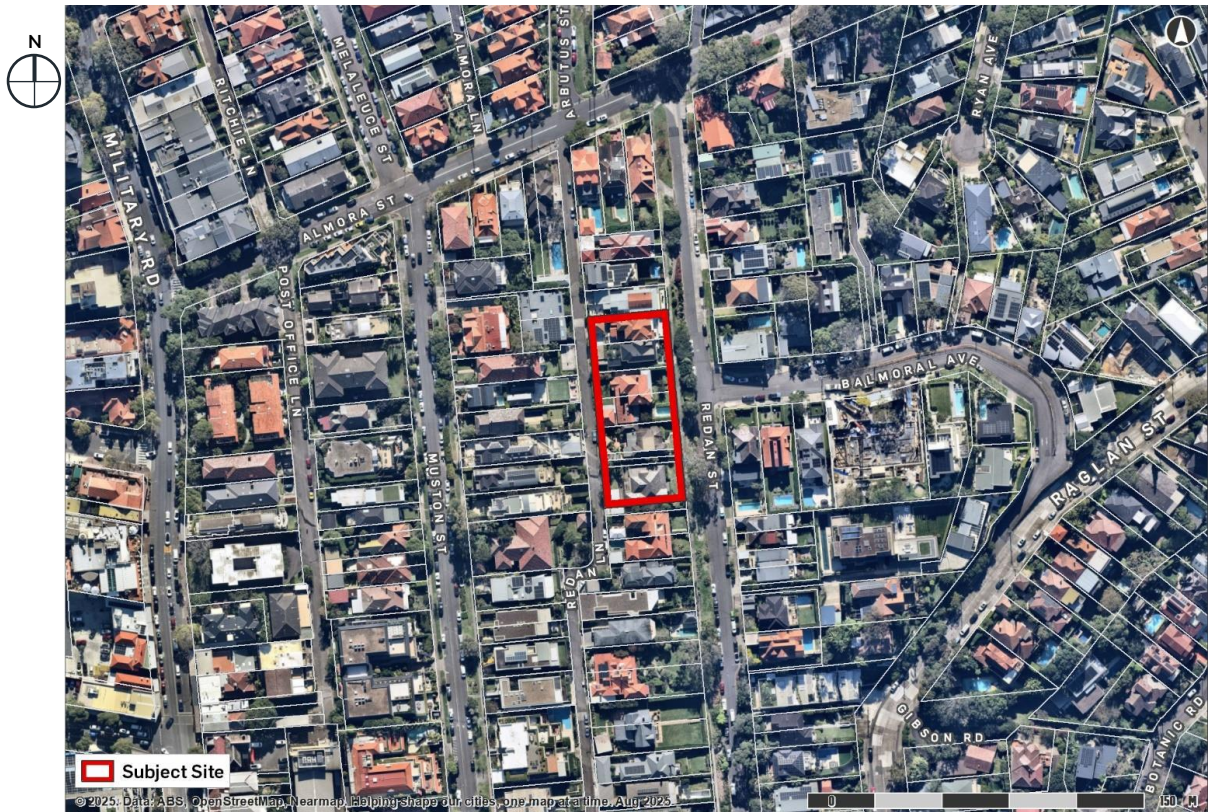


Figure 1: Aerial view of proposed development site

## 2. Introduction

The assessment of the wind environment around developments can ensure adverse impacts are minimized and inform designers about the suitability of outdoor areas for their intended uses. Where necessary, design modifications can be made, or intervention measures added to mitigate areas with the potential for excessive wind speeds.

The proposed development is located in Mosman, approximately 500 m to the west of Balmoral Beach. The surrounding terrain is comprised primarily of low-rise suburban development, with Sydney Harbour to the east, Figure 2

The proposed development is comprised of a single building with two prismatic wings. The north wing rises 10 storeys, and the south wing rises 9 storey, consisting of a 7 storey and 6 storey tower respectively, over a shared 3-storey podium, reaching a maximum height of about 34 m above ground level, Figure 3. As it is slightly larger than most of the surrounding structures, the addition of the proposed development is expected to have some impact on the local wind conditions, and the extents are broadly discussed in this report.



Figure 2: Aerial view of surroundings of proposed development site (Google Earth, 2025)



Figure 3: Level 3 floor plan and West Elevation of proposed development

### 3. Wind Climate

The proposed development lies approximately 16 km to the north-north-east of the Sydney Airport Bureau of Meteorology anemometer, which provides the best source of historical wind data for the project. To enable a qualitative assessment of the wind environment, the wind frequency and direction information measured by the Bureau of Meteorology at a standard height of 10 m from 1995 – 2024 have been used in this analysis.

The wind rose for Sydney Airport is shown in Figure 4. The arms of the wind roses point in the direction from where the wind is blowing, the width and colour of the arm represent the wind speed, and the length of the arm indicates the percent of the time that the wind blows for that combination of speed and direction.

The distribution and frequency of winds on an annual basis were analysed to assess the project with regards to wind comfort and safety. As can be seen from the wind rose in Figure 4, prevailing strong winds come from the north-east, south, and west quadrants. This wind assessment is structured around these prevailing wind directions.

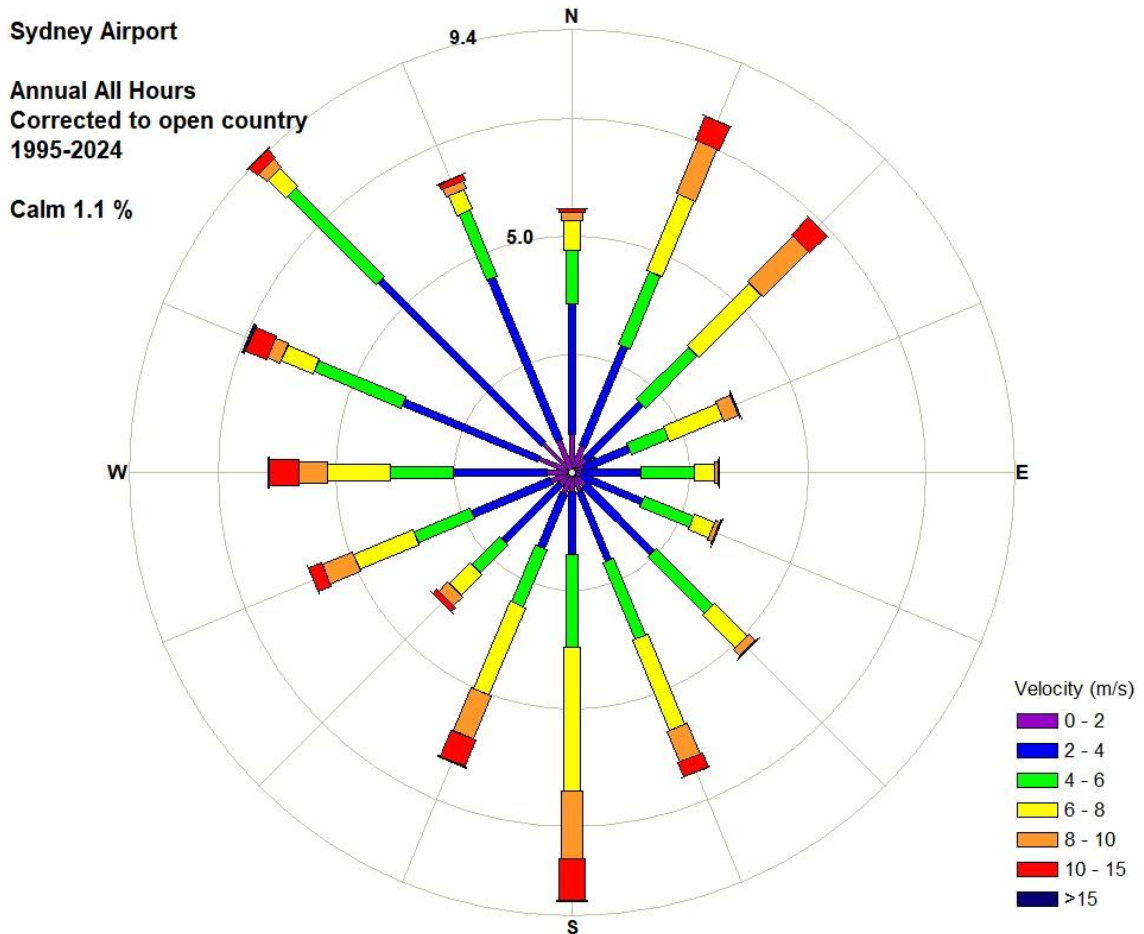


Figure 4: Probability of Wind Speeds by Direction Sydney Airport –(1995 – 2024, All Hours)

## 4. Wind Assessment Criteria

A number of researchers have suggested quantitative methods for assessing wind comfort and safety based on estimated wind speeds and local climate statistics. These criteria provide a means of evaluating the wind amenity of location based on the frequency of threshold wind speeds, noting that pedestrians will tolerate higher wind speeds for a shorter time period than lower speeds. The comfort criteria also allow planners to assess the usability, with respect to the wind environment, of different locations for various purposes. A discussion on various criteria is presented in Appendix B.

Mosman Council does not specify a method of assessing wind comfort or safety for this site (2024). CPP uses a modified form of the widely-accepted pedestrian-level wind criteria developed by Lawson (1990). Lawson's criteria are divided into separate categories of comfort and distress (safety).







Lawson's criteria are based on wind speeds exceeded 5% of the time, and are described as categories for comfort ranging from 'Pedestrian Sitting' to 'Business Walking', allowing planners to judge the usability of locations for various intended purposes. The criteria also include a distress rating, for safety assessment, which is based on occasional (once or twice per year) wind speeds, to identify locations where wind speeds may be hazardous to pedestrians.

The categories and criteria are specified in Table 1. In general, wind conditions comfortable for Sitting and Standing are considered appropriate for areas such as entrances where pedestrians are likely to gather for longer durations, while wind conditions comfortable for Casual Walking and Business Walking are more appropriate for sidewalks where pedestrians are actively in transit. Locations rated as Uncomfortable are generally less suitable for most pedestrian activities and wind control solutions are often sought. Whether mitigation is needed at a location depends upon the intended pedestrian use of the location.

Satisfaction of the safety rating is generally required for areas accessible to the general public. A rating of 'Able-Bodied' may be acceptable for areas with managed access or where pedestrians are unlikely to be present under adverse conditions.

Pedestrians' perception of wind can often be subjective and vary depending on regional difference in wind climate and thermal conditions, as well as by individual. Calibration to the local wind environment should be taken into account when evaluating predicted wind comfort conditions. Note that the ratings of 'Uncomfortable' and 'Safety' are the words of the published wind criteria and applicability may vary by project and location.




Table 1: Wind Comfort and Safety criteria (after Lawson, 1990)

COMFORT RATING	U <sub>EQUIV</sub> *	DESCRIPTION
 Dining**	< 2 m/s	Calm / light breezes suitable for outdoor restaurant uses, seating areas, and other amenities based on CPP experience.
 Sitting	2-4 m/s	Calm or light breezes suitable for long duration seating areas, and other amenities.
 Standing	4-6 m/s	Gentle breezes suitable for sitting for shorter periods, main entrances and bus stops where pedestrians may linger.
 Pedestrian Walking	6-8 m/s	Moderate winds appropriate for window shopping and strolling along a downtown street, or park.
 Business Walking	8-10 m/s	Relatively high speeds that can be tolerated if one's objective is to walk, run, or cycle.
 Uncomfortable	> 10 m/s	Strong winds unacceptable for all pedestrian activities; wind mitigation is typically required.

\*U<sub>Equiv</sub> = Max (U<sub>Mean</sub>, U<sub>Gust</sub> / 1.85).

\*U<sub>Equiv</sub> speeds are based on an annual exceedance of 5% (~8 hours / week) assessed over all hours.

\*\* For regular outdoor dining, and in semi-enclosed spaces, it has been the experience of CPP that the comfort rating of Sitting may be windier than desired and a comfort criterion of 4 m/s or less may be more applicable.

SAFETY RATING	U <sub>EQUIV</sub> *	DESCRIPTION
 Pass	< 15 m/s	Meets wind safety criterion.
 Able-Bodied	15-20 m/s	Acceptable where only able-bodied people would be expected; not acceptable for frail persons or cyclists
 Fail	>20 m/s	Excessive wind speeds that can adversely affect a pedestrian's balance and footing. Wind mitigation is often required.

\* U<sub>Equiv</sub> = Max (U<sub>Mean</sub>, U<sub>Gust</sub> / 1.85).

\*U<sub>Equiv</sub> speeds are based on an annual exceedance of 0.022% (~2 / year or 1 / season) assessed over all hours.

## 5. Assessment

### SITE DESCRIPTION

The development site is surrounded in most directions by low-rise buildings, with Sydney Harbour to the east. Winds in such surrounds tend to experience less channelling than areas with many tall structures, with local effects instead being dictated by exposed buildings and their relation to prevailing strong wind directions. Topography surrounding the site is rising from the coastline to the east which will increase wind speeds for winds from the east quadrant at the site and reduce wind speeds for winds from the west. The downward slope from the south would reduce wind speeds from that direction. Several wind flow mechanisms such as downwash and channelling flow are described in Appendix A, including the effectiveness of some common wind mitigation measures.

The subject site is located on a block bounded by Redan Street to the east and Redan Lane to the west. The proposed development consists of a single building with two prismatic tower wings with a rectangular planform. A ground floor plan is shown in Figure 5.

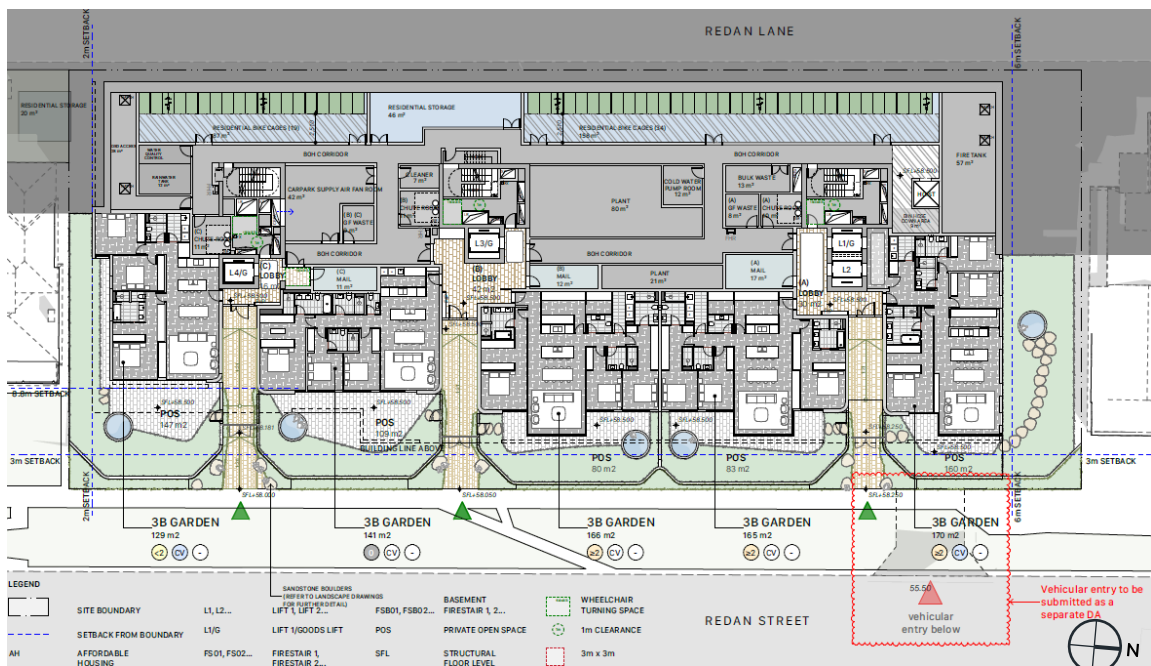


Figure 5: Ground floor plan of proposed development

### WINDS FROM THE NORTH-EAST

Winds from the north-east are summer sea breezes occurring on hot summer afternoons, typically lasting from noon to dusk. These are small-scale temperature driven effects, the larger the temperature differential between land and sea, the stronger the wind.

Winds from the north-east quadrant will approach the site over a region of suburban development and the open area of Sydney Harbour. The rise in topography from Balmoral Beach to the site will increase the wind speeds reaching the site. The incident winds would be oblique to the wide eastern face of the building, which would encourage horizontal flow rather than inducing downwash. A slight increase in

wind speeds along the Redan Street frontage would be expected as a result of the added massing of the proposed development. Pressure-driven flow would be experienced between the two wings of the tower which may impact the wind conditions on the private terraces in the gap, depending on the type and height of the surrounding fence.

### WINDS FROM THE SOUTH

Prevailing winds from the south occur all year round and tend to be cool and associated with large synoptic systems. The site is relatively exposed to winds from this direction due to the low-rise suburban surroundings in this direction. The downward sloping topography from the south would lead to a lower wind speed at the site than further upwind.

Winds from the south quadrant would impinge on the narrow south façade of the building. The stepped design of the building will encourage flow over the top of the building rather than downwash. No significant impact of the wind conditions around the site is expected for winds from the south quadrant.

### WINDS FROM THE WEST

Winds from the west quadrant are most frequent in the colder months and are among the strongest winds in the Sydney region. The approximately 20 m drop in topography over 200 m from the west of the site will decrease the wind speeds at the site and encourage some flow over the top of the building rather than downwards off the western façade of the building. Some downwash is expected to be generated off the western façade of the building. The small setback to the west would not significantly affect the amount of downwash reaching ground level. The areas to the north and south of the site would be subject to accelerated wind flow, the impact of which depends on the intended use of these areas. The northern part of the communal open space on Level 2, Figure 6, may be impacted by some cross flow and partial enclosure to the north may be considered to improve wind conditions in this space.

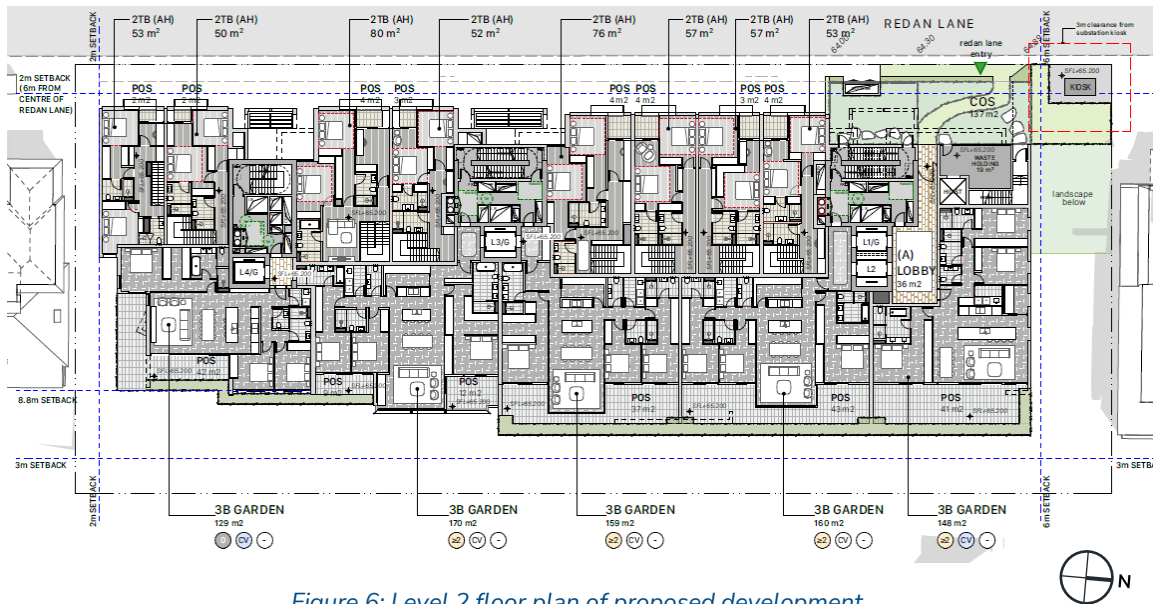


Figure 6: Level 2 floor plan of proposed development.

## SUMMARY – PUBLIC DOMAIN

For most locations, wind conditions within the proposed development site are expected to remain similar to the existing wind conditions. From a pedestrian comfort perspective, the wind environment around the proposed development site is likely to be classified as acceptable for pedestrian walking under Lawson. These pedestrian comfort levels would be suitable for public accessways, and for stationary short-term exposure activities. The building entrances are located well from a wind perspective, recessed into the building to provide a sheltered location. All areas around the site would be expected to satisfy the safety/distress criterion.

## WIND CONDITIONS WITHIN THE DEVELOPMENT

### COMMUNAL OUTDOOR SPACES

The development includes communal outdoor spaces on the Redan Lane side on Level 1 and 2 and a large communal terrace on Level 5 on the south wing. The spaces on Levels 1 and 2 are largely shielded from cross-winds and are expected to be subject to relatively mild wind conditions. The southern portion of the large communal terrace at Level 5 however is in an exposed location and would be subject to strong cross-winds particularly for winds from the east and west quadrants, and to a lesser degree from the south, Figure 7. The planned landscaping in this area and on the perimeter will assist in reducing the wind impact here. The covered part of the terrace is expected to be subject to pressure driven flow through the openings on the east and west side. It is recommended that the possibility to enclose this space on at least the western side, e.g. by including operable louvres or temporary screens to ensure amenable wind conditions for a longer period of time on the covered terrace space.

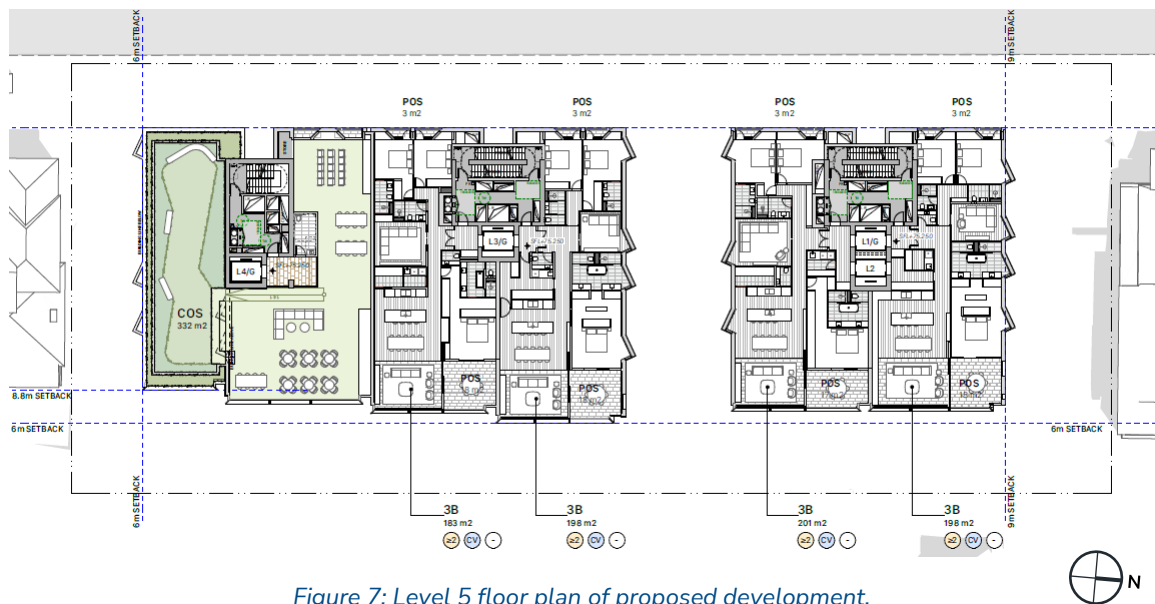


Figure 7: Level 5 floor plan of proposed development.

## BALCONIES

The majority of residential balconies shown in the plans are inset into the façade and therefore protected from strong cross-flow. Balconies on building corners appear to have the short side enclosed, which provides effective protection from strong winds. The large penthouse balconies on the east are more open than lower-level balconies. The open nature in combination with the higher elevation are expected to contribute to stronger wind conditions on these balconies.

Overall, the wind conditions on terraces and balconies are likely to be similar to those on comparable developments in the region, and no specific requirement for mitigation measures is foreseen for normal discretionary use.

## 6. Conclusion

Cermak Peterka Petersen Pty. Ltd. has provided a qualitative assessment of the impact of the proposed 40-48 Redan Street project on the local wind environment in and around the development site. Being slightly larger than most surrounding structures, the proposed development will have some effect on the local wind environment, though any changes are not expected to be significant from the perspective of pedestrian comfort or safety. Wind conditions around the development are expected to be classified as acceptable for pedestrian standing or walking from a Lawson comfort perspective and pass the distress/safety criterion. No adverse conditions requiring specific mitigation are foreseen, however local amelioration may be advised for areas intended for long-term stationary activities.

## References

Lawson, T.V. (1990), "The Determination of the Wind Environment of a Building Complex before Construction" Department of Aerospace Engineering, University of Bristol, Report Number TVL 9025.

Mosman Council, (2024), Mosman Residential Development Control Plan 2012, amended December 2024.

## Appendix A – Wind Flow Mechanisms

An urban environment generates a complex wind flow pattern around closely spaced structures, hence it is exceptionally difficult to generalise the flow mechanisms and impact of specific buildings as the flow is generated by the entire surrounds. However, it is best to start with an understanding of the basic flow mechanisms around an isolated structure.

### ISOLATED BUILDING

When the wind hits an isolated building, the wind is decelerated on the windward face generating an area of high pressure, Figure 8, with the highest pressure at the stagnation point at about two thirds of the height of the building. The higher pressure bubble extends a distance from the building face of about half the building height or width, whichever is lower. The flow is then accelerated down and around the windward corners to areas of lower pressure, Figure 8. This flow mechanism is called **downwash** and causes the windiest conditions at ground level on the windward corners and along the sides of the building.

Rounding the building corners or chamfering the edges reduces downwash by encouraging the flow to go around the building at higher levels. However, concave curving of the windward face can increase the amount of downwash. Depending on the orientation and isolation of the building, uncomfortable downwash can be experienced on buildings of greater than about 6 storeys.

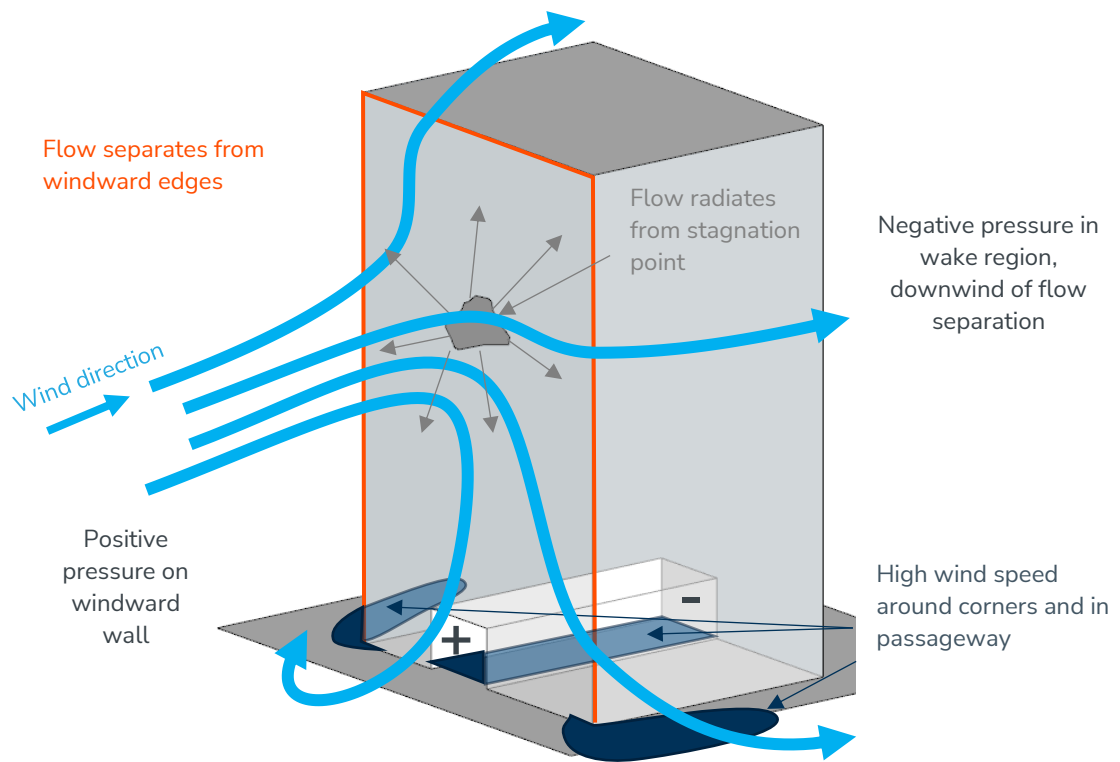


Figure 8: Schematic wind flow around tall isolated building

Techniques to mitigate the effects of downwash winds at ground level include the provision of horizontal elements, the most effective being a podium to divert the downward flow away from pavements and building entrances, but this will generate windy conditions on the podium roof, Figure 9. Generally, the lower the podium roof and deeper the setback from the podium edge to the tower improves the ground level wind conditions. The provision of an 8 m setback on an isolated building is generally sufficient to improve ground level conditions, but is highly dependent on the building isolation, orientation to prevailing wind directions, shape and width of the building, and any plan form changes at higher level.

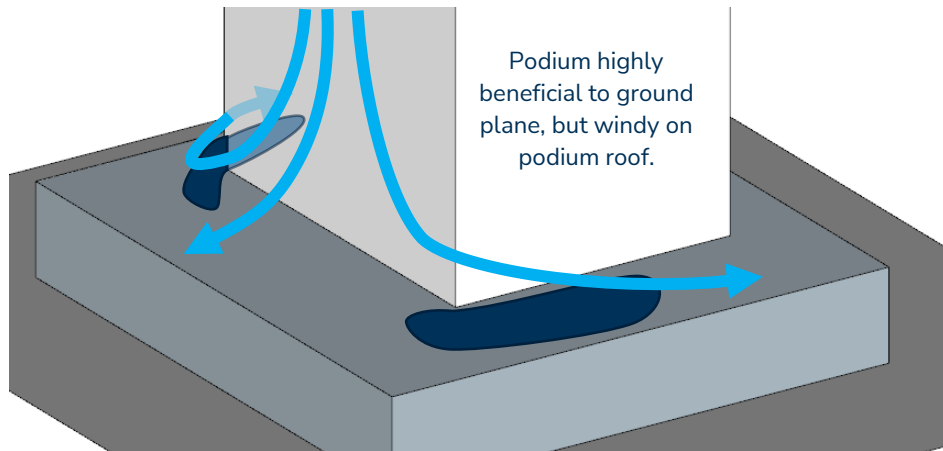


Figure 9: Schematic flow pattern around building with podium

Awnings along street frontages perform a similar function as a podium, and generally the larger the horizontal projection from the façade, the more effective it will be in diverting downwash flow, Figure 10. Awnings become less effective if they are not continuous along the entire façade, or on wide buildings as the positive pressure bubble extends beyond the awning resulting in horizontal flow under the awning.

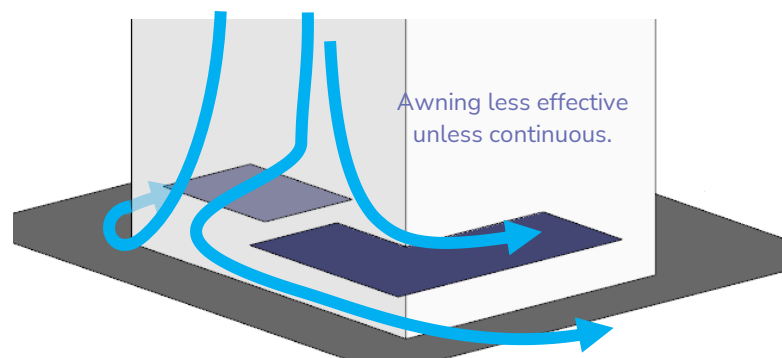


Figure 10: Schematic flow pattern around building with awnings

It should be noted that colonnades at the base of a building with no podium generally create augmented windy conditions at the corners due to an increase in the pressure differential, Figure 11. Similarly, open through-site links through a building cause wind issues as the pressure tries to equilibrate between the entrances to the link causing strong flow, Figure 8. If the link is blocked, wind conditions will be relatively calm, Figure 12. This area is in a region of high pressure and therefore there is the potential for internal flow issues. A ground level recessed corner has a similar effect as an undercroft, resulting in windier conditions, Figure 12.

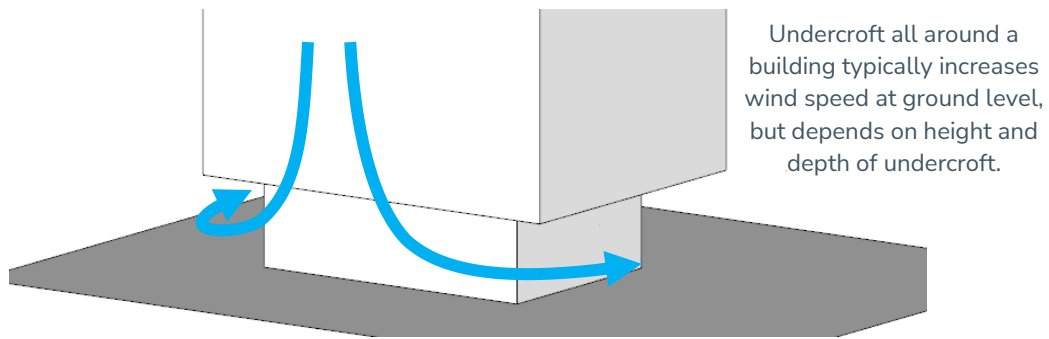


Figure 11: Schematic of flow patterns around isolated building with undercroft

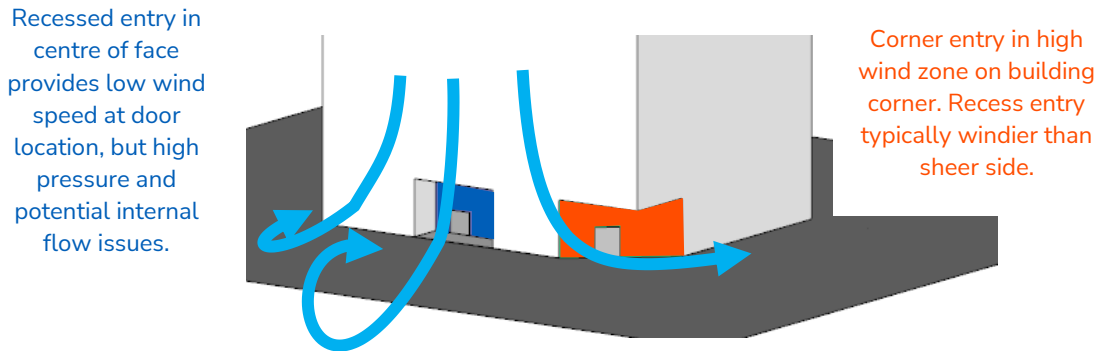


Figure 12: Schematic of flow patterns around isolated building with ground articulation

### MULTIPLE BUILDINGS

When a building is located in a city environment, depending on upwind buildings, the interference effects may be positive or negative, Figure 13. If the building is taller, more of the wind impacting on the exposed section of the building is likely to be drawn to ground level by the increase in height of the stagnation point, and the additional negative pressure induced at the base by the surrounding buildings. If the upwind buildings are of similar height then the pressure around the building will be more uniform hence downwash is typically reduced with the flow passing over the buildings.

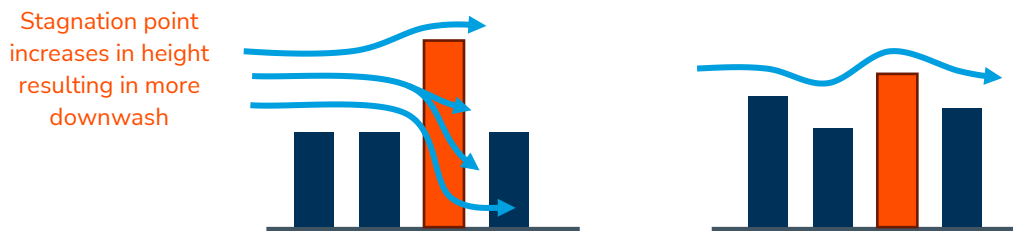


Figure 13: Schematic of flow pattern interference from surrounding buildings

The above discussion becomes more complex when three-dimensional effects are considered, both with orientation and staggering of buildings, and incident wind direction, Figure 14.

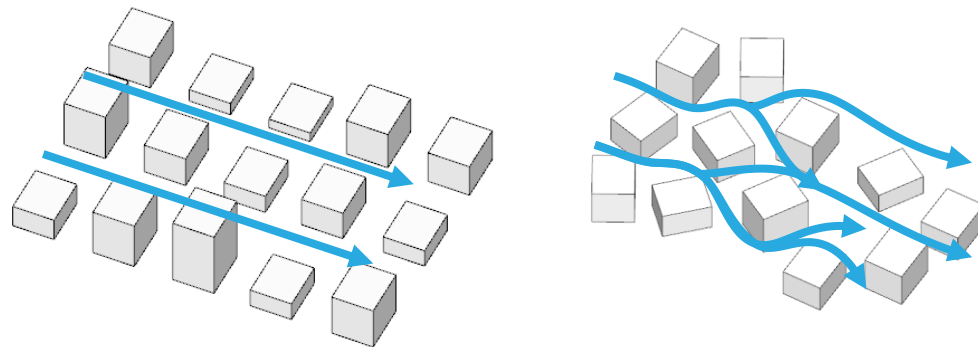


Figure 14 Schematic of flow patterns through a grid and random street layout

On the fringe of a city, the compound shape of neighbouring buildings instigates the flow pattern through the city. The overall massing causes an obstruction to the flow causing a slowing of the incident flow and increasing the windward pressure. Pressure driven flow is produced between the buildings, Figure 15. The vertical component in pressure driven flow is lower than downwash flow.

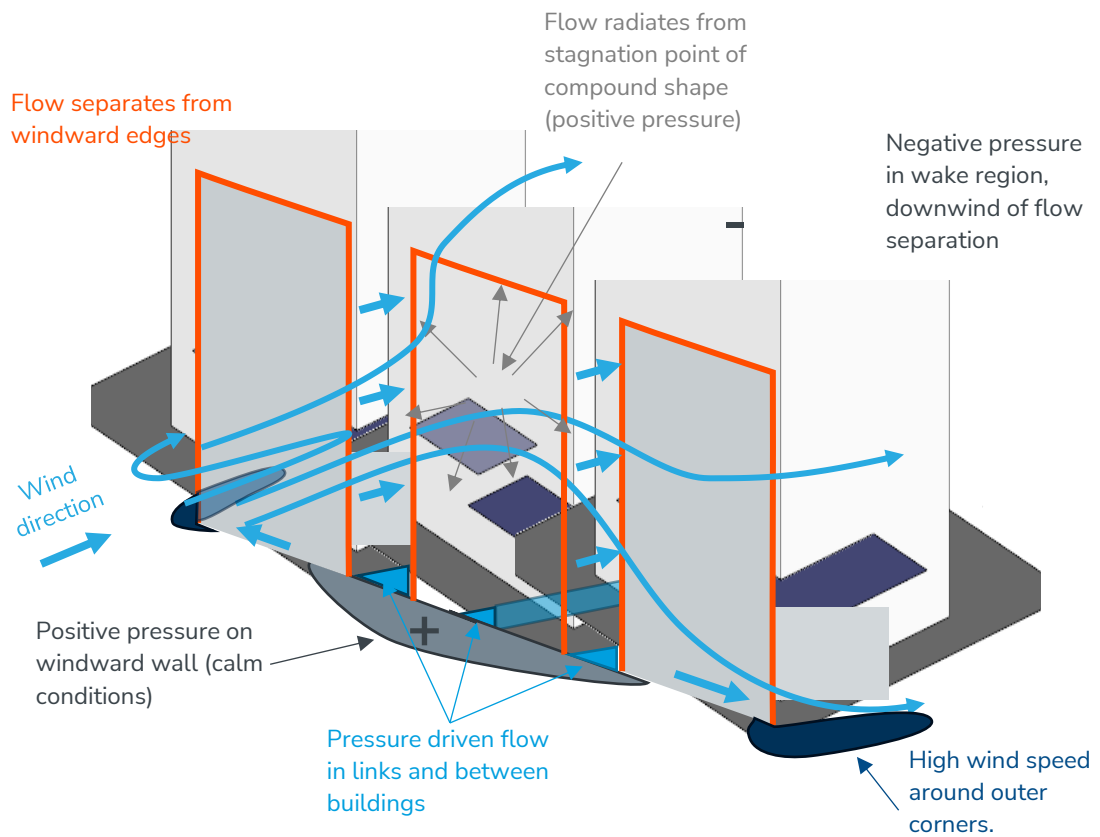


Figure 15: General flow pattern around multiple buildings

Channelling is instigated when pressure driven flow accelerates between two buildings, and continues along straight streets with buildings on either side, Figure 14(L). This occurs on the edge of large built-up areas where the approaching flow is diverted around the overall massing and channelled along the fringe by a relatively continuous wall of building facades. This is generally the primary mechanism producing strong wind conditions on the perimeter of a built-up area, particularly on corners, which can be exposed to multiple prevailing wind directions. The perimeter edge zone in a built-up area is typically about two blocks deep. Downwash is the more important flow mechanism for the edge zone of a built-up area with buildings of similar height.

As the city expands, the central section of the city typically becomes calmer, particularly if the grid pattern of the streets is discontinued, Figure 14(R). When buildings are located on the corner of a central city block, the geometry becomes slightly more important with respect to the local wind environment.

### BARRIERS AND SCREENS

The wind flow pattern over a vertical barrier is illustrated in Figure 16, showing there will be recirculation zones near the windward wall and in the immediate lee of the barrier. The typical extent of these recirculation zones relative to the height of the barrier,  $h$ , is illustrated in Figure 16. These regions are not fixed but fluctuate in time. The mean wind speed in the wake areas drops significantly compared with the incident flow. With increasing distance from the barrier, the flow pattern will resort to the undisturbed state. Typically, the mean velocity and turbulence intensity at barrier height would be expected to be within 10% of the free stream conditions at 10 times the height of the structure downwind from the barrier.

Multiple barriers offer improved wind conditions between the barriers by preventing the flow from reattaching to the surface.

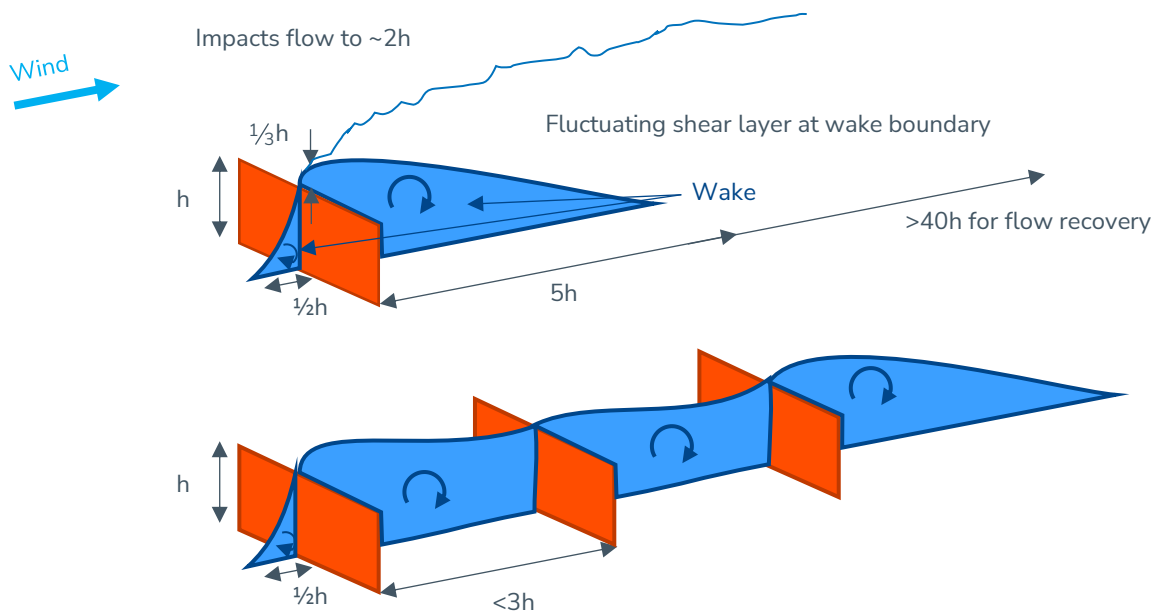


Figure 16: Sketch of the flow pattern over vertical elements

## Appendix B - Wind Speed Criteria

### GENERAL DISCUSSION

Primary controls that are used in the assessment of how wind affects pedestrians are the wind speed, and rate of change of wind speed. A description of the effect of a specific wind speed on pedestrians is provided in Table 2. It should be noted that the turbulence, or rate of change of wind speed, will affect human response to wind and the descriptions are more associated with response to mean wind speed.

Table 2: Summary of wind effects on pedestrians

Description	Speed (m/s)	Effects
Calm, light air	0–2	Human perception to wind speed at about 0.2 m/s. Napkins blown away and newspapers flutter at about 1 m/s.
Light breeze	2–3	Wind felt on face. Light clothing disturbed. Cappuccino froth blown off at about 2.5 m/s.
Gentle breeze	3–5	Wind extends light flag. Hair is disturbed. Clothing flaps.
Moderate breeze	5–8	Raises dust, dry soil. Hair disarranged. Sand on beach saltates at about 5 m/s. Full paper coffee cup blown over at about 5.5 m/s.
Fresh breeze	8–11	Force felt on body. Limit of agreeable wind on land. Umbrellas used with difficulty. Wind sock fully extended at about 8 m/s.
Strong breeze	11–14	Hair blown straight. Difficult to walk steadily. Wind noise on ears unpleasant. Windborne snow above head height (blizzard).
Near gale	14–17	Inconvenience felt when walking.
Gale	17–21	Generally impedes progress. Difficulty with balance in gusts.
Strong gale	21–24	People blown over by gusts.

Local wind effects can be assessed with respect to a number of environmental wind speed criteria established by various researchers. These have all generally been developed around a peak 3 s gust in an hour, or 1 hour mean wind speed. During strong events, a pedestrian would react to a significantly shorter duration gust than a 3 s, and historic weather data is normally presented as a 10 minute mean.

Despite the apparent differences in numerical values and assumptions made in their development, it has been found that when these are compared on a probabilistic basis, there is some agreement between the various criteria. However, a number of studies have shown less agreement over a wider range of flow conditions. The downside of these criteria is that they have seldom been benchmarked, or confirmed through long-term measurements in the field, particularly for comfort conditions. The wind criteria were all developed in temperate climates and are unfortunately not the only environmental factor that affects pedestrian comfort.

For assessing the effects of wind on pedestrians, neither the random peak gust wind speed (3 s or otherwise), nor the mean wind speed in isolation are adequate. The gust wind speed gives a measure of the extreme nature of the wind, but the mean wind speed indicates the longer duration impact on pedestrians. The extreme gust wind speed is considered to be suitable for safety considerations, but not necessarily for serviceability comfort issues such as outdoor dining. This is because the instantaneous gust wind speed does not always correlate well with mean wind speed, and is not necessarily representative of the parent distribution. Hence, the perceived 'windiness' of a location can either be dictated by strong steady flows, or gusty turbulent flow with a smaller mean wind speed.

To measure the effect of turbulent wind conditions on pedestrians, a statistical procedure is required to combine the effects of both mean and gust. This has been conducted by various researchers to develop an equivalent mean wind speed to represent the perceived effect of a gust event. This is called the 'gust equivalent mean' or 'effective wind speed' and the relationship between the mean and 3 s gust wind speed is defined within the criteria, but two typical conversions are:

$$U_{GEM} = \frac{(U_{1 \text{ hour mean}} + 3 \cdot \sigma_u)}{1.85} \quad \text{and} \quad U_{GEM} = \frac{1.3 \cdot (U_{1 \text{ hour mean}} + 2 \cdot \sigma_u)}{1.85}$$

It is evident that a standard description of the relationship between the mean and impact of the gust would vary considerably depending on the approach turbulence, and use of the space.

A comparison between the mean and 3 s gust wind speed criteria from a probabilistic basis are presented in Figure 17 and Figure 18. The grey lines are typical results from modelling and show how the various criteria would classify a single location. City of Auckland has control mechanisms for accessing usability of spaces from a wind perspective as illustrated in Figure 17 with definitions of the intended use of the space categories included in this Figure.

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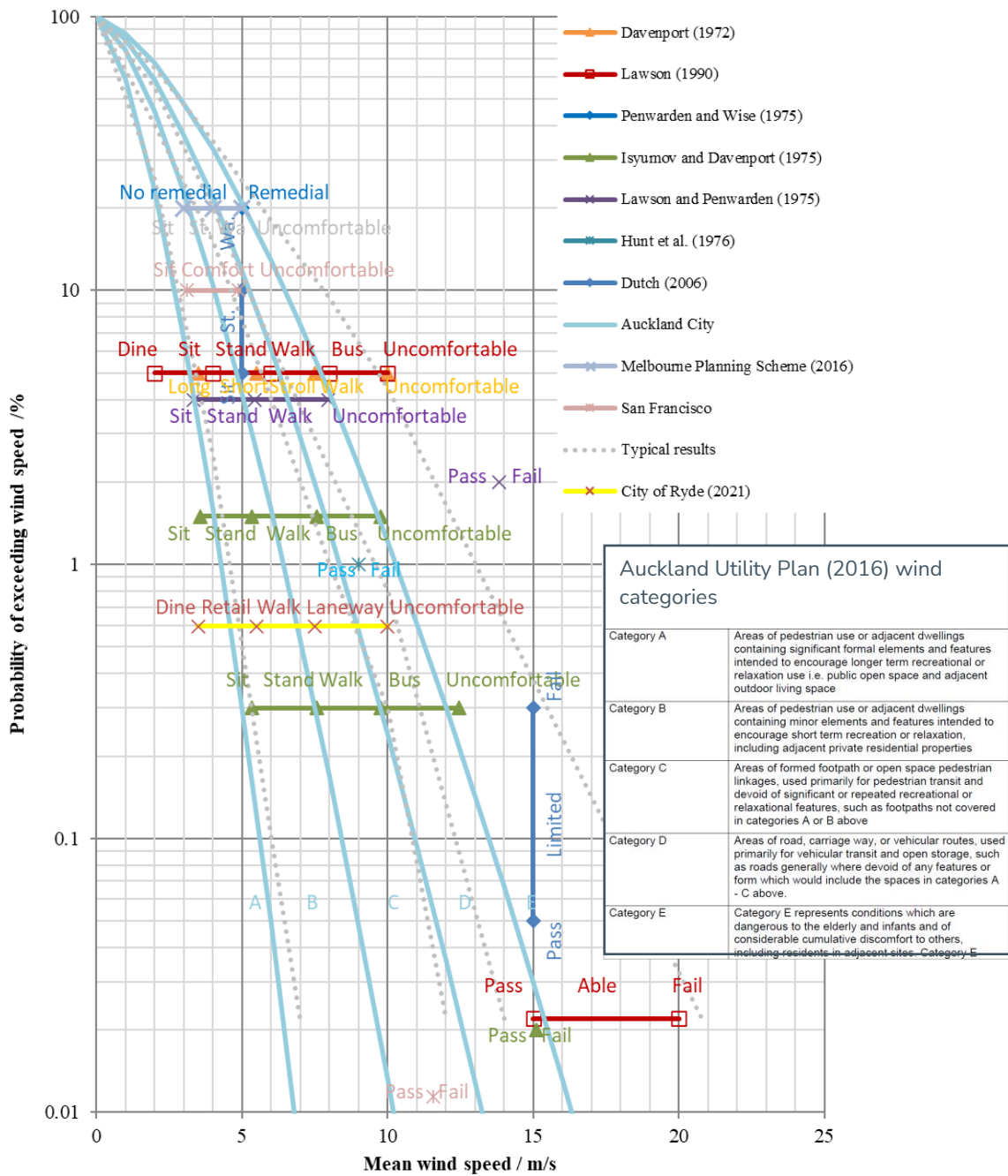


Figure 17: Probabilistic comparison between wind criteria based on mean wind speed

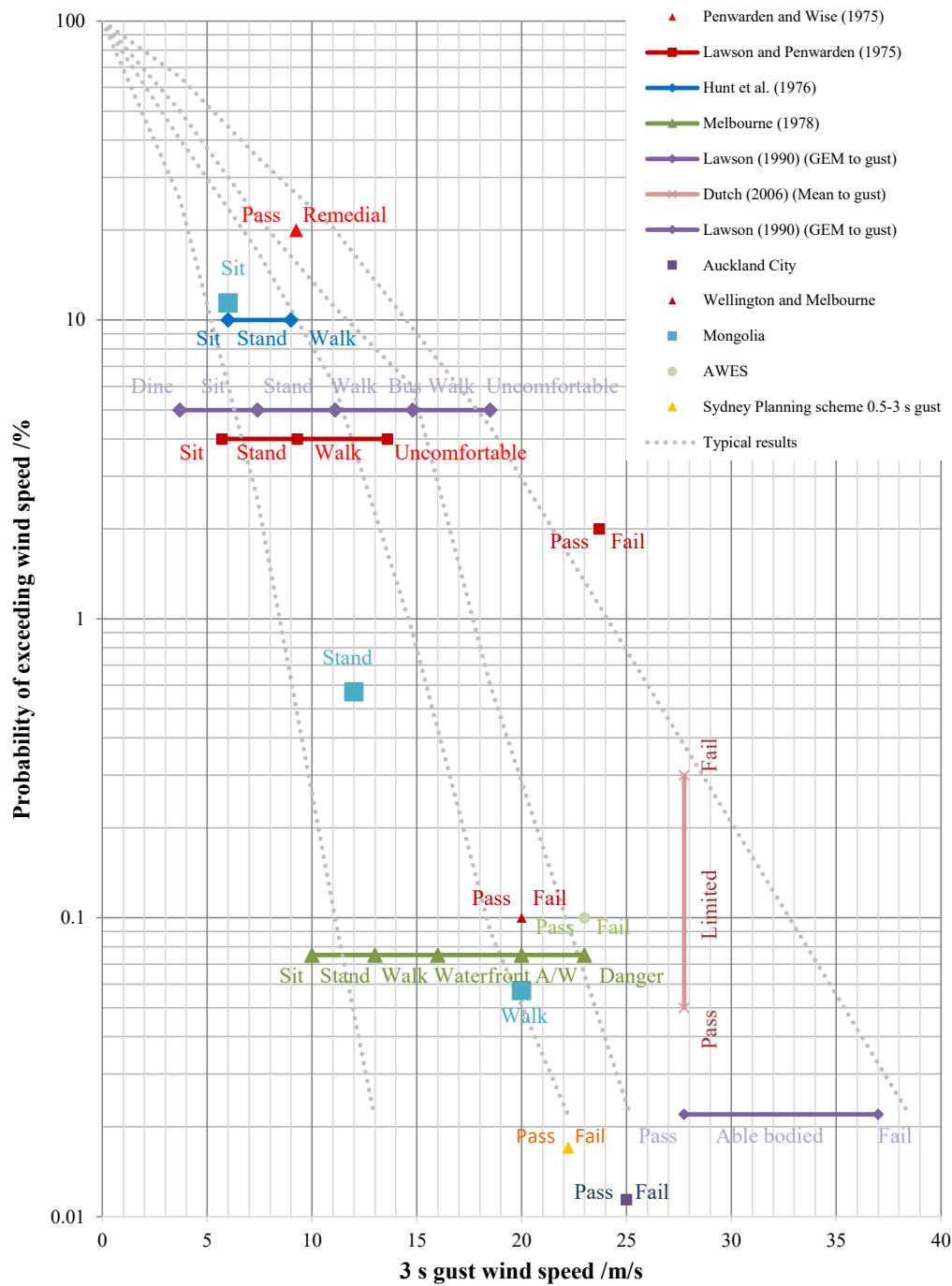


Figure 18: Probabilistic comparison between wind criteria based on 3 s gust wind speed