Health Infrastructure

Shoalhaven Hospital Redevelopment

Environmental Wind Assessment

Wind

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Executive summary

Arup have been commissioned by Health Infrastructure to provide an experienced-based impact assessment of the proposed redevelopment of Shoalhaven Hospital on the pedestrian level wind conditions for comfort and safety in and around the site.

It is considered that the proposed development would have an impact on the wind conditions in and around the site. Qualitatively, integrating the expected directional wind conditions around the site with the wind climate, it is considered that wind conditions at the majority of locations around the site would be classified as suitable for pedestrian standing and walking in more exposed locations.

Benefits of the design include the articulated nature in both the horizontal and vertical planes which reduce the potential for downwash by encouraging horizontal flow.

Wind conditions in the 2-storey undercroft are expected to be constant. This area is expected to be classified as suitable for pedestrian walking. The main door entry is shaped to ameliorate the conditions at the entry and allow for flow to pass through rather than into the building. Calmer conditions will be experienced away from the narrowest section that could be used for café outdoor seating when environmental conditions are appropriate.

Further from the site in the parkland area to the south, and the residential areas to the east, the overall wind classification would be expected to remain similar getting windier for some directions and calmer for others.

To quantify the qualitative advice provided in this report, numerical or physical modelling of the development would be required. This is not considered necessary for a development of this size, location and orientation, but if considered important is best conducted during detailed design.

Contents

Disclaimer

This assessment of the site environmental wind conditions is presented based on engineering judgement. In addition, experience from more detailed simulations have been used to refine recommendations. No detailed simulation, physical or computational study has been made to develop the recommendations presented in this report.

1 Introduction (client provided text)

Health Infrastructure NSW (HI) is the applicant for the proposed Shoalhaven Hospital Redevelopment at Scenic Drive, Nowra in the City of Shoalhaven Local Government Area (LGA).

The proposal is State Significant Development (SSD) for the purposes of the Environmental Planning and Assessment Act 1979 (EP&A Act) and section 14(a) of Schedule 1 of the State Environmental Planning Policy (Planning Systems) 2021 (Planning Systems SEPP) as it involves development for the purposes of a hospital with a capital investment value in excess of $30 million.

The Shoalhaven Hospital Redevelopment seeks to deliver significantly enhanced acute services, as well as a new campus main entry and drop-off area.

The proposed Acute Services Building will be located south and east of the hospital's existing cluster of buildings at will address Shoalhaven Street to the hospital's east. The development is proposed to be located on the site of the existing Shoalhaven Community Pre-school (which will be separately relocated) and part of the former Nowra Park.

The proposed Shoalhaven Hospital Redevelopment under this SSD relates primarily to the development of a new hospital building and its ancillary works. The scope includes a new 7-level building of about 31,000 m^2 GFA, with rooftop plant and helipad, generally accommodating the following:

Level 00	Back of House (BOH), Loading Dock, Kitchen, plant, Pharmacy, Staff amenities, Mortuary, and plant.
Level 01	Front of House (FOH), Emergency Department (ED), Medical Imaging, and Cafe
Level 02	Operating Suites & Endoscopy, Central Sterile Supply Department (CSSD), and linkway to Block B
Level 03	Coronary Care Unit (CCU), Close Observation Unit (COU), Intensive Care Unit (ICU), cultural centre, and plant
Level 04	In-Patient Unit (IPU), Mental Health, and plant
Level 05	In-Patient Unit (IPU)
Level 06	In-Patient Unit (IPU)
Level 07	Rooftop plant
Level 08	Helipad

This generally results in 279 new beds and treatment spaces across a range of departments, eight new operating theatres, and two new endoscopy theatres. The works include a new ambulance entry from Shoalhaven Street, new public and servicing accessway off North Street, and separate loading dock entry and mortuary parking off Shoalhaven Street.

A range of infrastructure and civil engineering works are proposed as well as demolition of existing structures within the footprint of the new building and/or on the existing hospital campus where a new linkway connection is proposed. Earthworks will be necessitated within the building's footprint and immediate environs.

Subdivision of the balance of Lot 104 (the former Nowra Park) remaining and consolidation of the existing pre-school lot into the hospital lot is also proposed.

A number of selected trees will require removal. Other significant trees will be retained and protected. Replacement planting at a minimum rate of 1:1 is proposed.

The development's SEARs were issued by the Department of Planning and Environment on 23 February 2022.

In preparing this report, the following SEARs General Requirements and Key Issues have been addressed, Table 1. The table sets out the reference or location of these matters within this report.

Table 1: SEARs general requirements

General Requirement or Key Issue	Reference / Location within this report
5 Environmental Amenity Assess amenity impacts on the surrounding locality, including lighting impacts, 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.	This entire report forms the required documentation for the Pedestrian Level Wind Assessment in particular Section 3

2 Site description

Shoalhaven Hospital redevelopment site is located is located on the block bounded by Scenic Drive, Shoalhaven Street, and North Street, Figure 1. The site is surrounded by low-rise buildings to the south and east, and exposed to the Shoalhaven River to the west and north. Topography surrounding the site is essentially flat from a wind perspective, with a slight drop to the south-east.

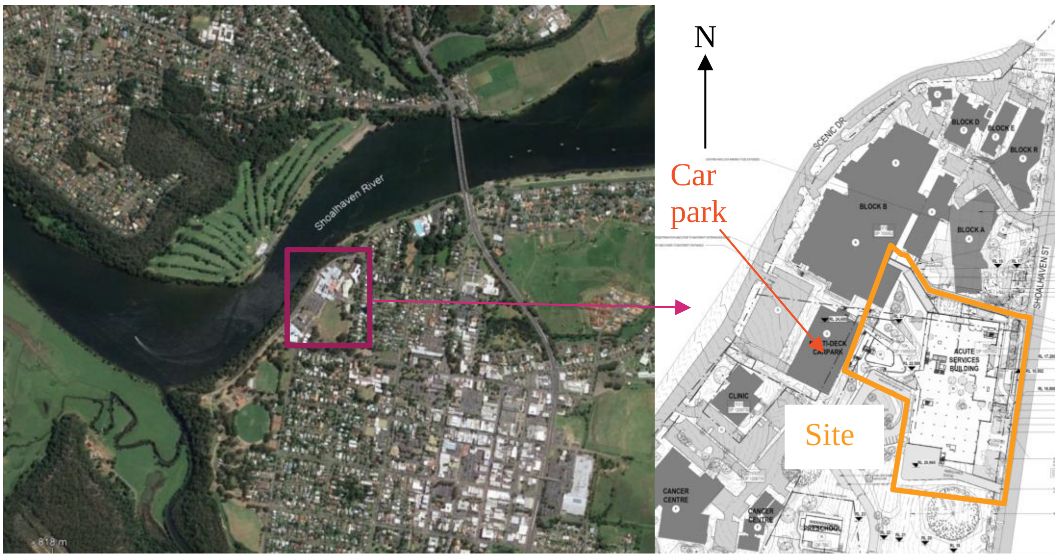

Figure 1: Satellite image of site location (source: Google Earth 2018)

The proposed building is articulated in both plan and elevation, Figure 2 and Figure 3. The eight-storey building rises to a maximum height of about 46 m above ground level. The use of the space around the site is primarily as a pedestrian accessway, with the primary route expected to be from the multi-level car park to the immediate west around the west wing to the main entrance on level 1. There is a proposed outdoor café on Level 1 under the west wing. There is a pedestrian passageway between café and the main building.

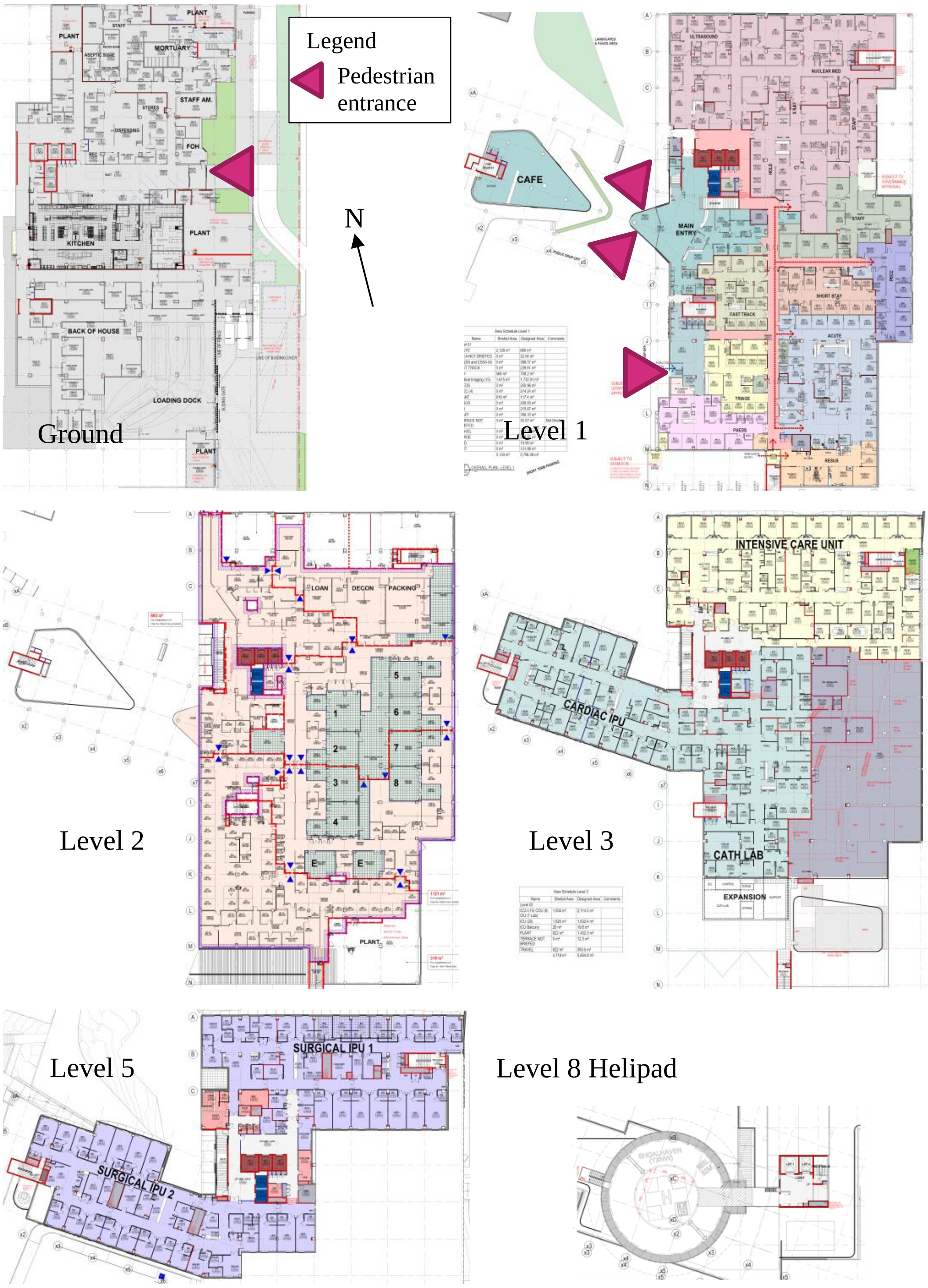

Figure 2: Various floor plan

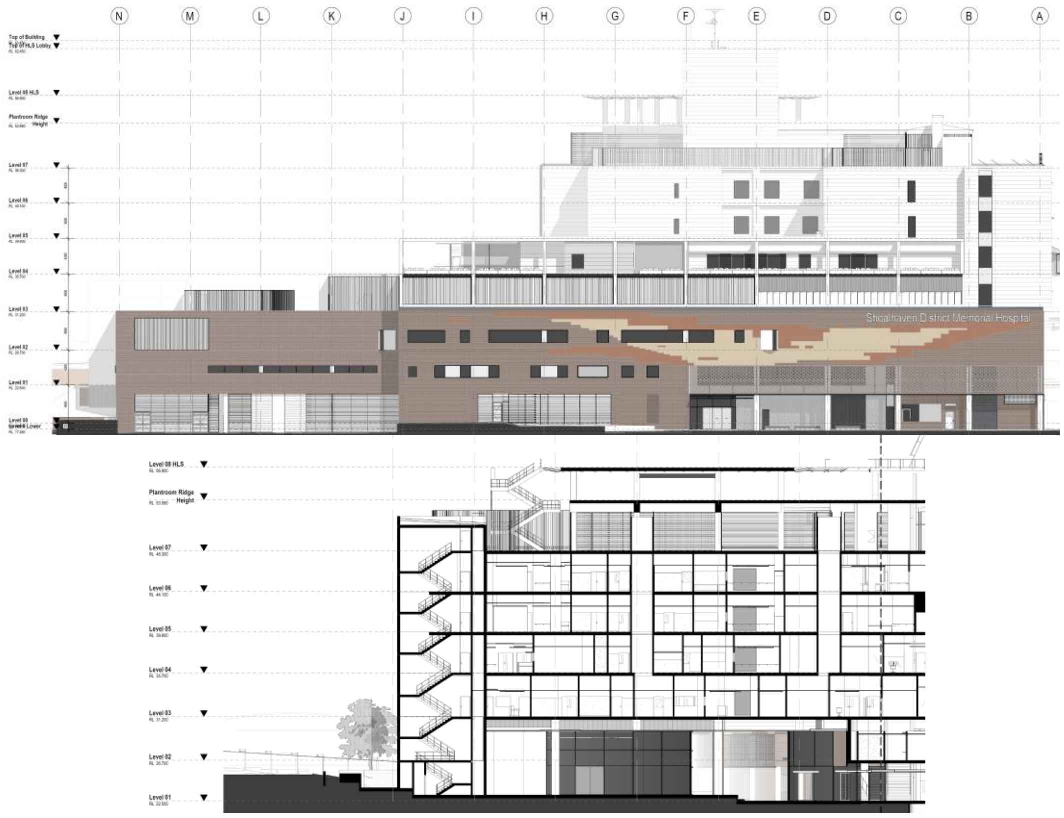

Figure 3: East elevation (T), section through helipad looking north-east (B)

3 Wind assessment

3.1 Local wind climate

Weather data recorded at Nowra RAN by the Bureau of Meteorology has been analysed for this project, Figure 4. The anemometer is located about 10 km to the south-west of the site. The arms of the wind rose point in the direction from where the wind is coming from. The directional wind speeds measured here are considered representative of the incident wind conditions at the site, due to relatively close proximity.

It is evident from Figure 4 that the prevailing wind directions are from north-west and south quadrants. The measured mean wind speed is about 4 m/s, and the 5% exceedance mean wind speed is about 9.5 m/s.

Seasonal and temporal wind roses are presented in Figure 5 and Figure 6 respectively. It is evident that winds from the north-west are the prevalent wind direction throughout the year except summer.

A general description on flow patterns around buildings is given in Appendix 1.

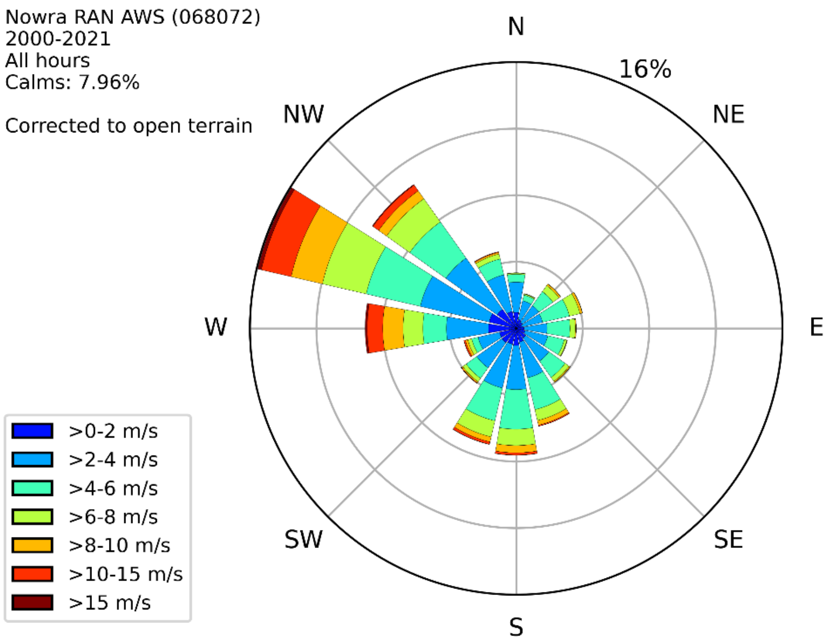

Figure 4: Wind rose showing probability of time of wind direction and speed

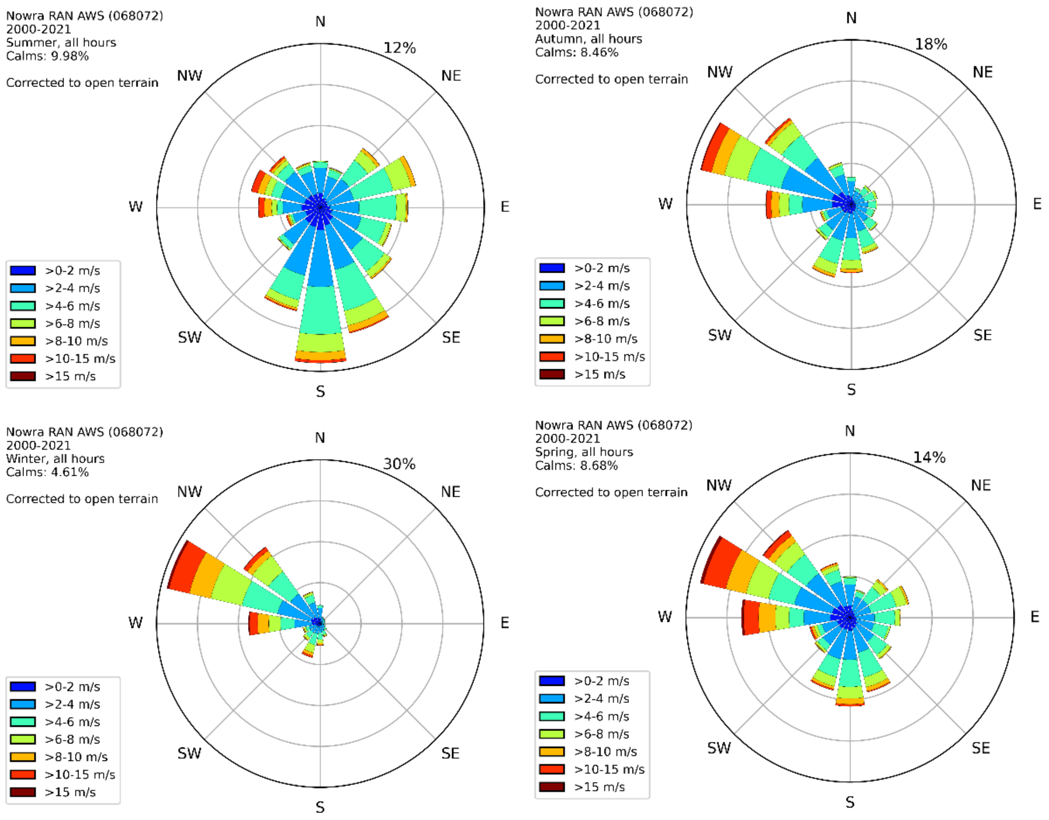

Figure 5: Seasonal wind roses

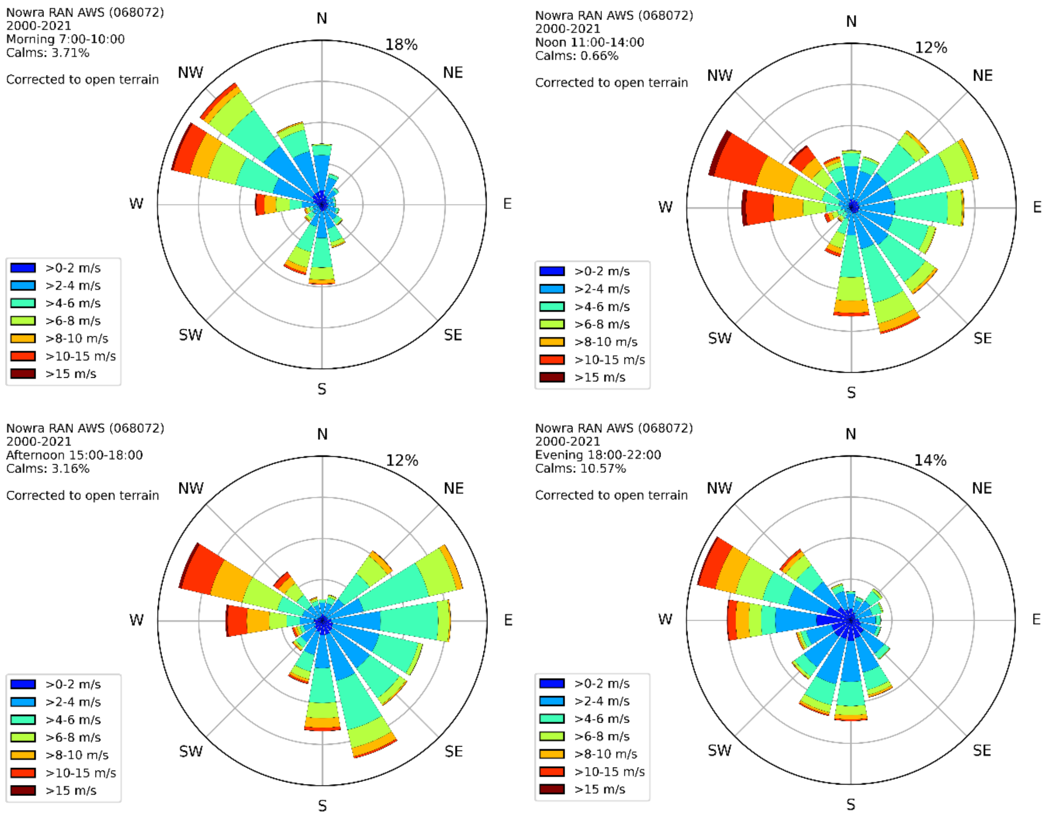

Figure 6: Temporal wind roses

3.2 Specific wind controls

Wind comfort is generally measured in terms of wind speed and rate of change of wind speed, where higher wind speeds and gradients are considered less comfortable. Air speed has a large impact on thermal comfort and are generally welcome during hot summer conditions. This assessment is focused on wind speed in terms of mechanical comfort.

There have been many wind comfort criteria proposed, and a general discussion is presented in Appendix 2.

There are no specific wind controls for the site. The wind comfort and safety controls used in this wind assessment are based on the work of Lawson (1990) as described in Figure 21 and Table 2.

Table 2 Pedestrian comfort criteria for various activities

Comfort (max. of mean or GEM wind speed exceeded 5% of the time)	
<2 m/s	Dining
2-4 m/s	Sitting
4-6 m/s	Standing
6-8 m/s	Walking
8-10 m/s	Objective walking or cycling
>10 m/s	Uncomfortable
Safety (max. of mean or GEM wind speed exceeded 0.022% of the time)	
<15 m/s	General access
<20 m/s	Able-bodied people (less mobile or cyclists not expected)

Converting the 5% of the time mean wind speed from the anemometer location to the site, to take account of the change in height and surrounding roughness, results in a mean wind speed of about 6 m/s. This wind speed would be classified as on the boundary of pedestrian standing and walking activities. The intention of more sedentary activities such as an outdoor café would require careful orientation and design and/or local amelioration.

3.3 Predicted wind conditions on ground plane

This section of the report outlines the predicted wind conditions in and around the site based on the local climate, topography, and building form.

The massing of the proposed redevelopment is significant compared with the massing of the surrounding low-rise buildings, and will therefore have an impact on the local wind conditions. Further form the site, the overall wind classification for specific locations would remain similar with slightly calmer conditions for certain wind directions, and slightly windier for others.

Winds from the north-west

Winds from the north-west are relatively unimpeded on reaching the site, passing over North Nowra, and the low-rise buildings to the immediate west of the site. The incident flow will impinge on the narrow west façade of the west wing. The narrow face minimises the amount of downwash reaching ground level, Figure 7, encouraging the flow to pass around the building horizontally. The lower building height to the south offers further protection to the ground level as the flow will pass over the roof of the building. The larger massing to the north would direct more flow to the north, but the façade articulation and link bridge provide obstacles encouraging flow to pass around and over the building.

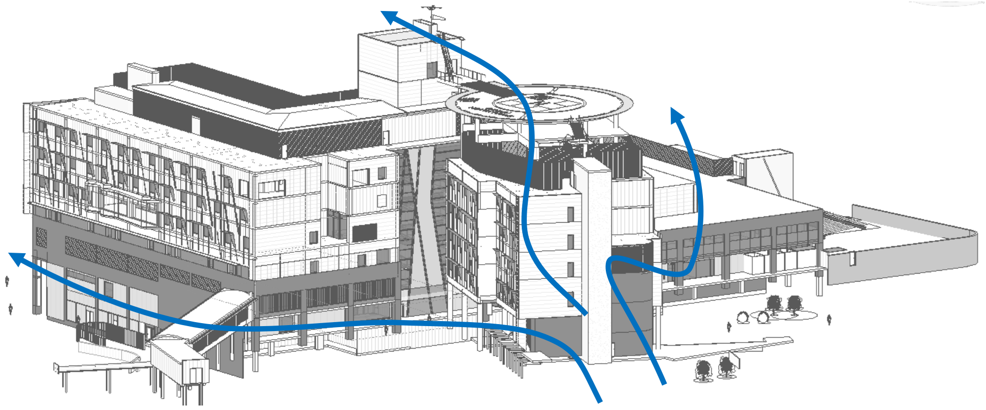

Figure 7: Sketch of expected flow patterns for winds from the north-west

Winds from the south

Winds from the south are relatively undisturbed on reaching the site. The vertically articulated building is an ideal massing from a wind perspective to lift the flow over and around the building rather than induce downwash, Figure 8.

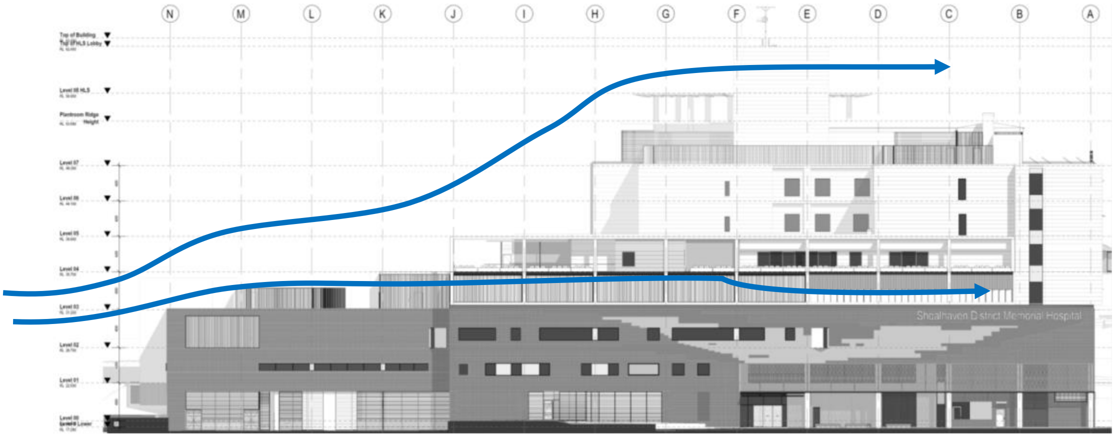

Figure 8: Sketch of expected flow patterns for winds from the south

Discussion

Qualitatively, integrating the expected directional wind conditions around the site with the wind climate, it is considered that wind conditions at the majority of locations around the site would be classified as suitable for pedestrian standing and walking. The main entrances are reasonably well protected from a wind perspective and the main entry door orientation designed to reduce the impact of internal flow into he building. This level of wind condition would be considered suitable for the intended use of the space.

Generally, external wind conditions are generated by the wind passing around a building massing. However, the flow mechanism through a building passageway, or between closely spaced buildings, is generated by pressure-driven flow, see Figure 13 in Appendix 1. For all incident wind directions, there will be a pressure difference between either side of the 2-storey opening under the west wing, hence there will be flow through this space with the fastest flow at the narrowest section. The speed of air through this space would be similar, or greater than, the incident wind speed. The exposed section of the raised outdoor-café seating area is exposed to this flow. The perimeter screening would offer limited protection to patrons in the exposed section. Outdoor seating would be more appropriate away from the narrow section.

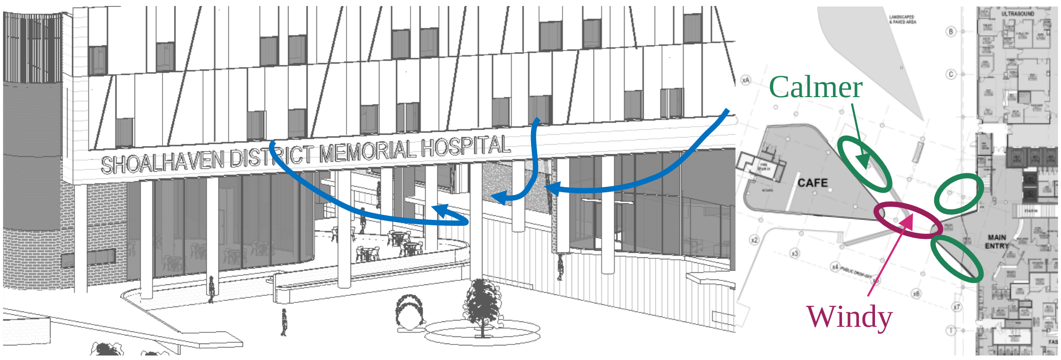

Figure 9: Pressure-driven flow for winds from the south

All locations would be expected to pass the safety criterion.

4 Helicopter rotorwash

Helicopter rotorwash is the outflow generated by the helicopter main rotor to enable flight, Figure 10. As noted in the Avipro report, the ‘final velocity’ of the rotorwash for an AW139 helicopter is about 26.5 m/s: this is considered to be the average wind speed across the diameter of the jet to support the helicopter mass, which will have some variance in wind speed across the diameter as illustrated in Figure 10. The impinging jet radiates upon impinging with the ground plane and can cause issues when interacting with the building form concentrating the rotorwash. It should be noted that rotorwash occurs almost instantly giving a pedestrian no warning, and with reference to Table 3 in Appendix 2 would be sufficient to blow pedestrians over.

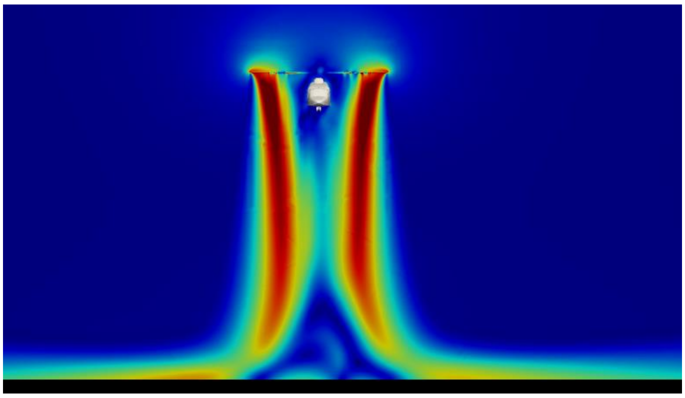

Figure 10: Helicopter rotorwash simulation

The rooftop helipad is above the west wing protecting the main entry. The preferred helicopter flight paths extracted from the Avipro Schematic Design Report are reproduced in Figure 11. The annual wind rose shows the dominant wind direction is from the west-north-west, hence helicopters would tend to approach from the south-east and depart to the north-west. The preferred flight paths tend to follow the building below and with the height of the helicopter during a Cat-A departure would not be expected to cause excessive rotorwash issues on the ground plane as the flow would be redirected by the roofs.

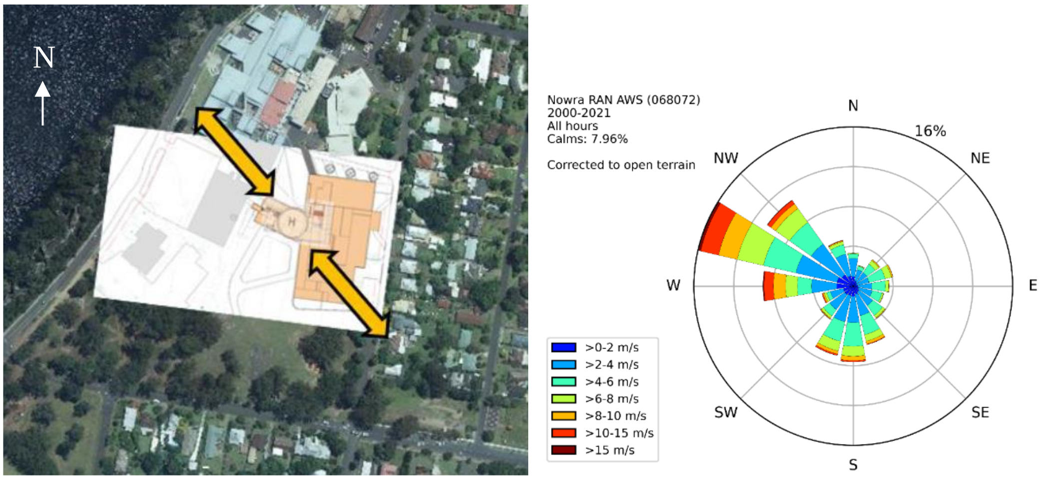

Figure 11: Preferred flight paths (Avipro, 2022)

As noted in the Avipro report, the helicopter approach varies depending on the weather conditions to ensure a safe landing. The greatest risk to pedestrians would be during strong winds from the south when helicopters may land from the north, directing undisturbed rotorwash into the courtyard to the north of the west wing. With the relatively low height of the approaching aircraft above ground level, the rotorwash would be expected to be noticeable. The articulated shape of the building has the potential to concentrate the rotorwash at ground level. Additional modelling would be required to quantify this effect.

There are exposed rooftop terraces on Level 4 that lie under the preferred flight path, which would be exposed to rotorwash for the main preferred approach direction from the south-east, Figure 12. It is understood that the staff and IPU terraces highlighted in Figure 12 are covered with a solid roof to ameliorate the impact of rotorwash. During operations, a management plan may be required for use of these terraces during helicopter operations. Any furniture on these terraces should be fixed and the use of outward opening swing doors should be reviewed.

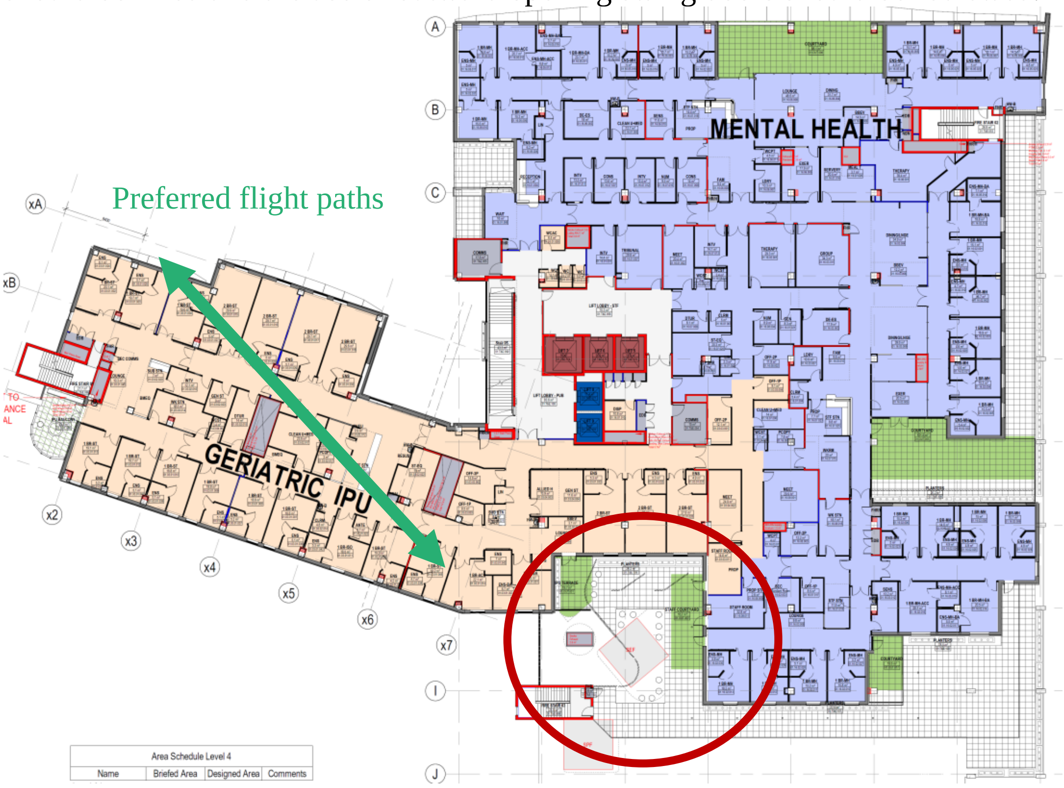

Figure 12: Level 4 floor plan

5 References

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Appendix 1: 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 13, 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 13. 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.

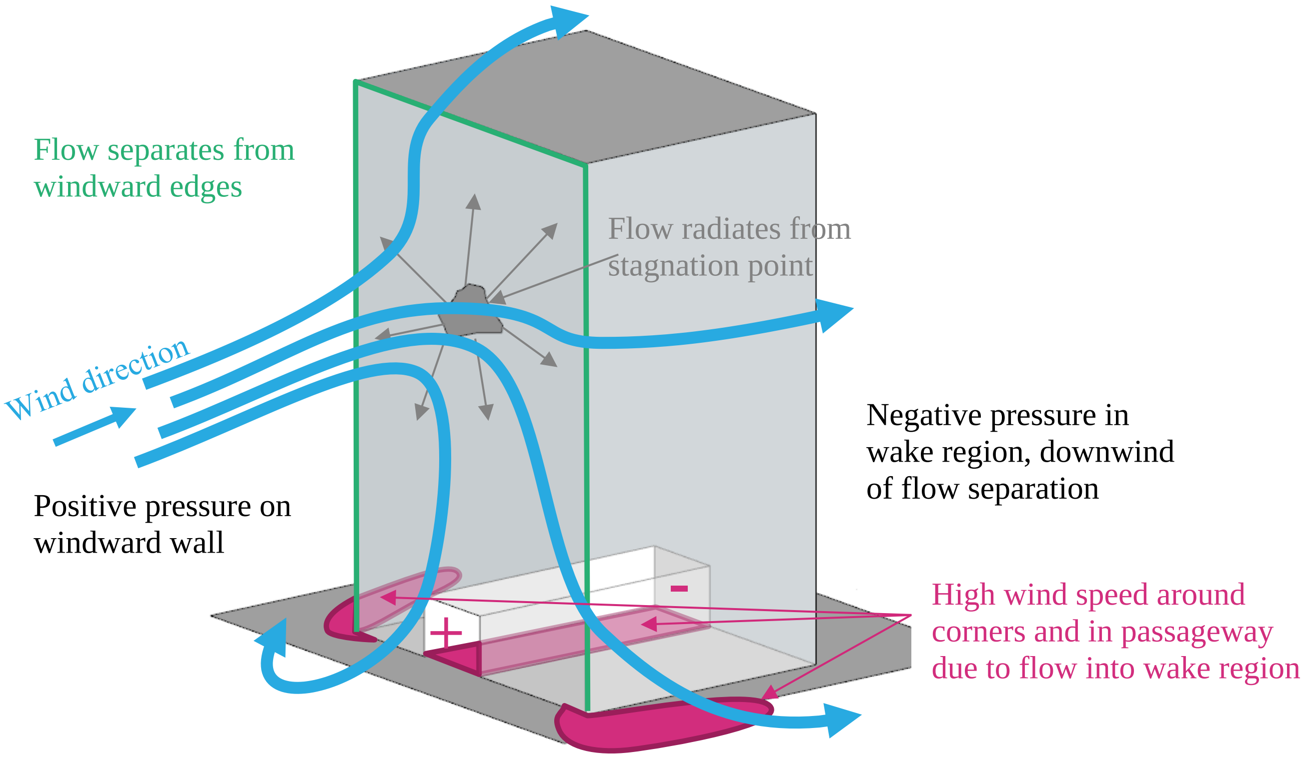

Figure 13 Schematic wind flow around tall isolated building

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 11. 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.

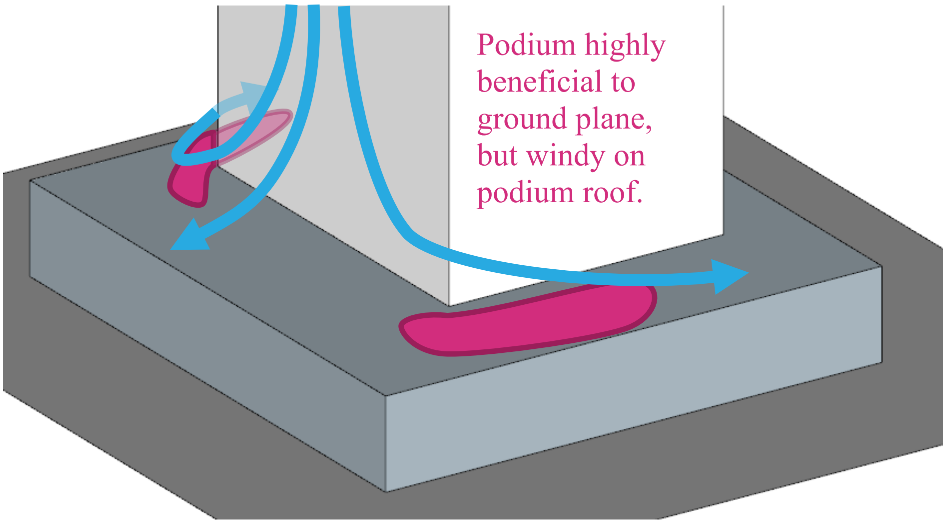

Figure 14 Schematic flow pattern around building with podium

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 15. 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.

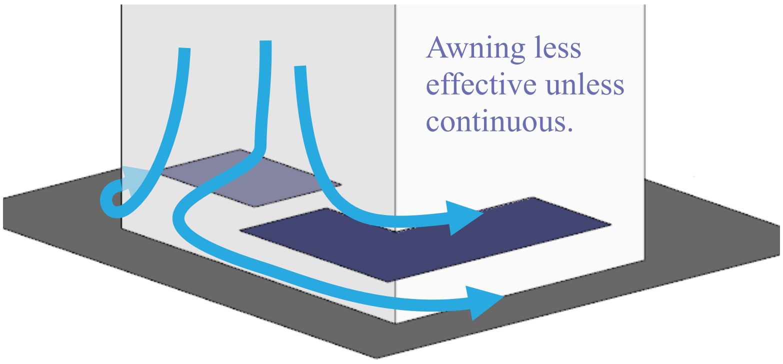

Figure 15 Schematic flow pattern around building with awning

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 16. Similarly, open through-site links through a building cause wind issues as the environment tries to equilibrate the pressure generated at the entrances to the link, Figure 13. If the link is blocked, wind conditions will be calm unless there is a flow path through the building, Figure 17. This area is in a region of high pressure and therefore the is the potential for internal flow issues. A ground level recessed corner has a similar effect as an undercroft, resulting in windier conditions, Figure 17.

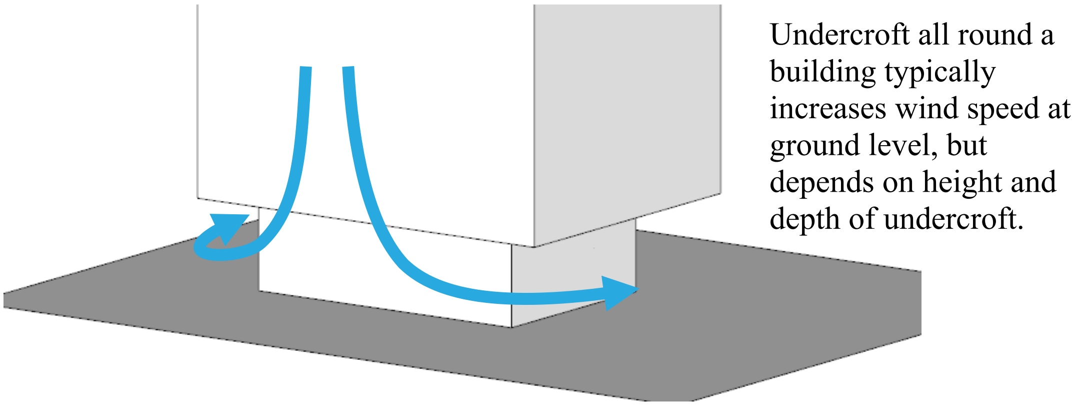

Figure 16 Schematic of flow patterns around isolated building with undercroft

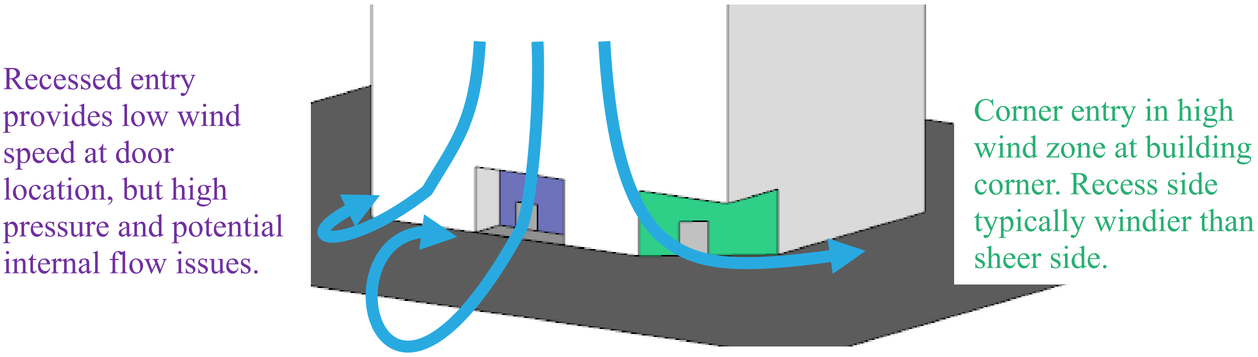

Figure 17 Schematic of flow patterns around isolated building with ground articulation

Multiple buildings

When a building is located in a city environment, depending on upwind buildings, the interference effects may be positive or negative, Figure 18. 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. 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.

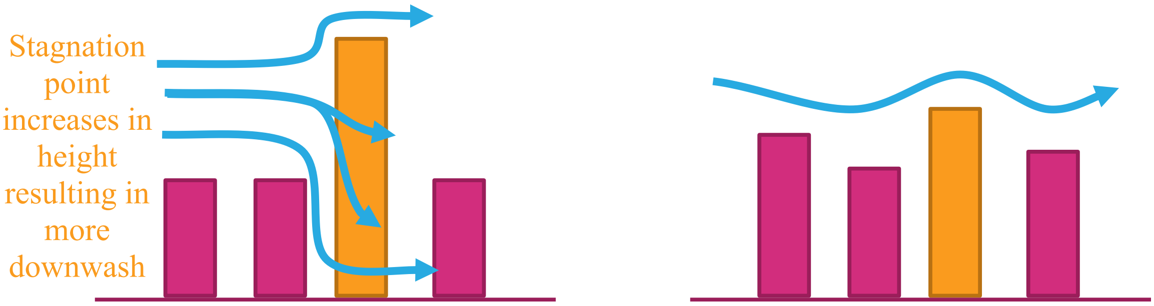

Figure 18 Schematic of flow pattern interference from surrounding buildings

The above discussion becomes more complex when three-dimensional effects are considered, both with orientation and staggering of buildings, and incident wind direction, Figure 19.

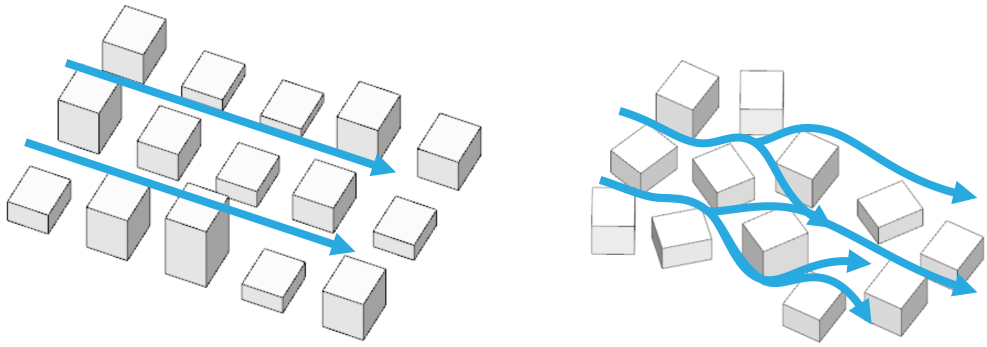

Figure 19 Schematic of flow patterns through a grid and random street layout

Channelling occurs when the wind is accelerated between two buildings, or along straight streets with buildings on either side, Figure 19(L), particularly on the edge of built-up areas where the approaching flow is diverted around the city massing and channelled along the fringe by a relatively continuous wall of building facades. This is generally the primary mechanism driving the wind conditions for this perimeter of a built-up area, particularly on corners, which are exposed to multiple wind directions. The perimeter edge zone in a built-up area is typically about two blocks deep. Downwash is 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 19(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.

Single barriers and screens

The wind flow pattern over a vertical barrier is illustrated in Figure 20, 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 20. 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.

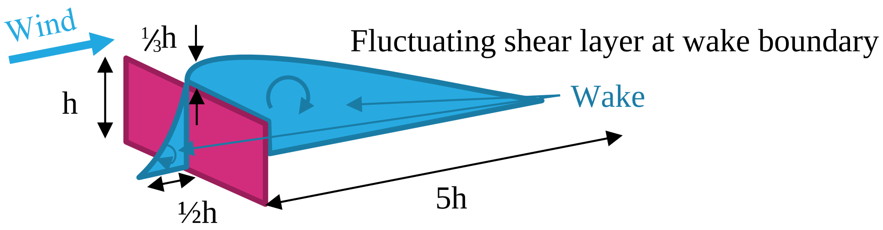

Figure 20: Sketch of the flow pattern over an isolated structure

Appendix 2: 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 3. 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 3 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 3 s gust, 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 that over a wider range of flow conditions, such as smooth flow across water bodies, to turbulent flow in city centres, there is less general agreement among. 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 velocity 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:

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

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 21 and Figure 23. 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 21 with definitions of the intended use of the space categories defined in Figure 22.

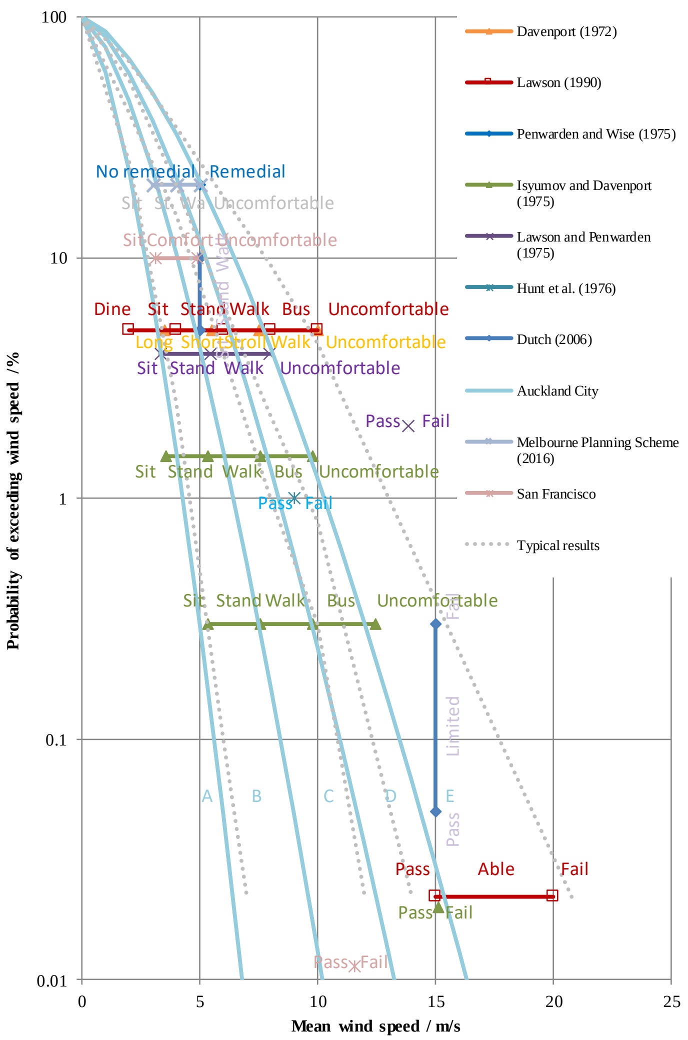

Figure 21 Probabilistic comparison between wind criteria based on mean wind speed

Category A	Areas of pedestrian use or adjacent dwellings containing significant formal elements and features intended to encourage longer term recreational or relaxation use i.e. public open space and adjacent outdoor living space
Category B	Areas of pedestrian use or adjacent dwellings containing minor elements and features intended to encourage short term recreation or relaxation, including adjacent private residential properties
Category C	Areas of formed footpath or open space pedestrian linkages, used primarily for pedestrian transit and devoid of significant or repeated recreational or relaxational features, such as footpaths not covered in categories A or B above
Category D	Areas of road, carriage way, or vehicular routes, used primarily for vehicular transit and open storage, such as roads generally where devoid of any features or form which would include the spaces in categories A - C above.
Category E	Category E represents conditions which are dangerous to the elderly and infants and of considerable cumulative discomfort to others, including residents in adjacent sites. Category E

Figure 22: Auckland Utility Plan (2016) wind categories

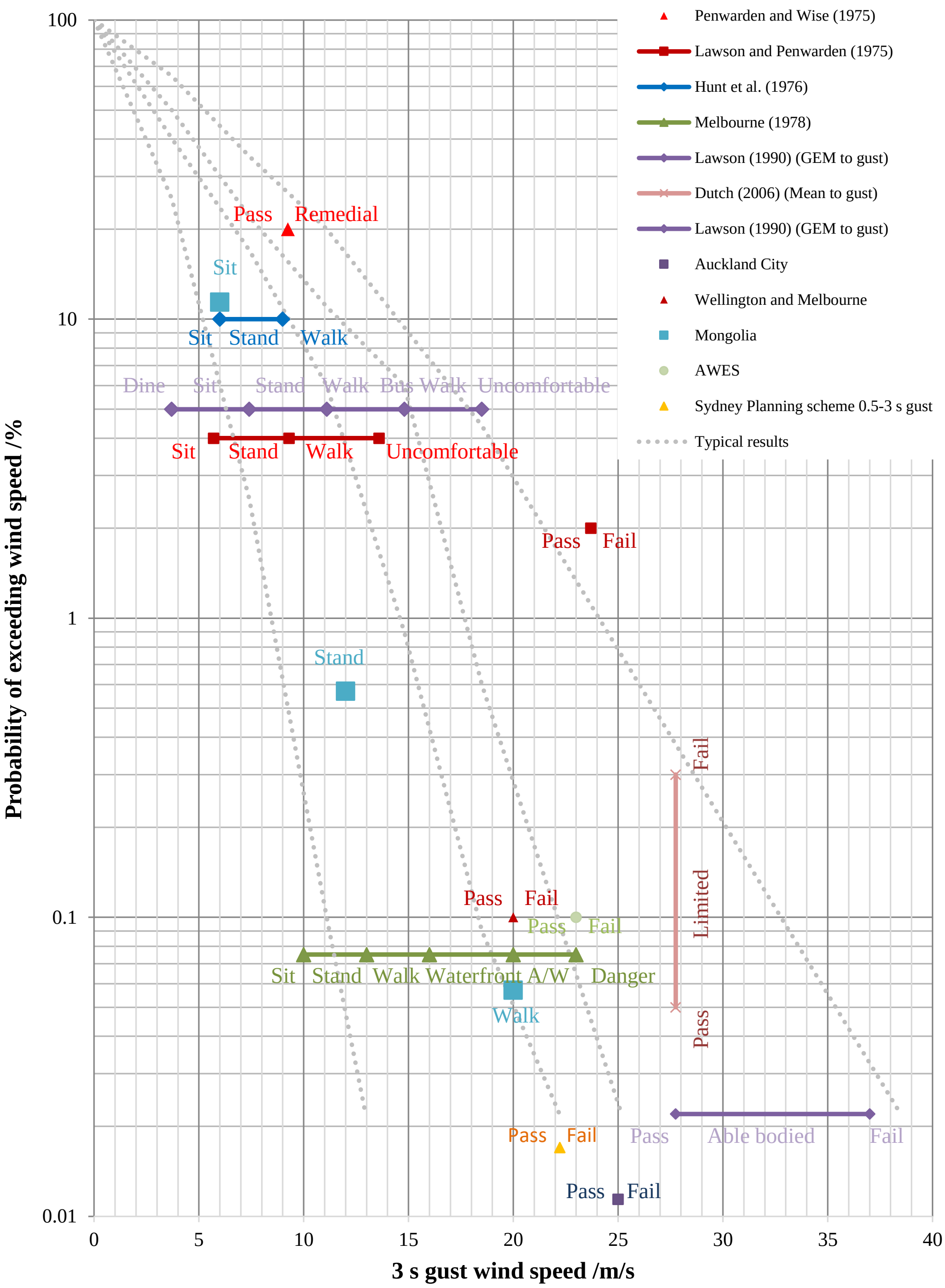

Figure 23 Probabilistic comparison between wind criteria based on 3 s gust wind speed

Appendix 3: Reference documents

In preparing the assessment, the following documents have been referenced to understand the building massing and features.

ASB-SD-DR-AR-0101-9.pdf
ASB-SD-DR-AR-0111-9.pdf
ASB-SD-DR-AR-0121-9.pdf
ASB-SD-DR-AR-0122-6.pdf
ASB-SD-DR-AR-0131-10.pdf
ASB-SD-DR-AR-0141-10.pdf
ASB-SD-DR-AR-0151-8.pdf
ASB-SD-DR-AR-0161-8.pdf
ASB-SD-DR-AR-0171-8.pdf
ASB-SD-DR-AR-0181-5.pdf
ASB-SD-DR-AR-1000-9.pdf
ASB-SD-DR-AR-1000-10.pdf
ASB-SD-DR-AR-2201-13.pdf
ASB-SD-DR-AR-2211-13.pdf
ASB-SD-DR-AR-2212-4.pdf
ASB-SD-DR-AR-2221-13.pdf
ASB-SD-DR-AR-2222-10.pdf
ASB-SD-DR-AR-2231-14.pdf
ASB-SD-DR-AR-2241-13.pdf
ASB-SD-DR-AR-2251-12.pdf
ASB-SD-DR-AR-2261-12.pdf
ASB-SD-DR-AR-2271-13.pdf
ASB-SD-DR-AR-2281-12.pdf
ASB-SD-DR-AR-2501-2.pdf
ASB-SD-DR-AR-2511-2.pdf
ASB-SD-DR-AR-2521-2.pdf
ASB-SD-DR-AR-2531-2.pdf
ASB-SD-DR-AR-2541-2.pdf
ASB-SD-DR-AR-2551-2.pdf
ASB-SD-DR-AR-2561-2.pdf
ASB-SD-DR-AR-2571-1.pdf
ASB-SD-DR-AR-2581-1.pdf
ASB-SD-DR-AR-2701-2.pdf
ASB-SD-DR-AR-2711-2.pdf
ASB-SD-DR-AR-2721-2.pdf
ASB-SD-DR-AR-2722-2.pdf
ASB-SD-DR-AR-2731-2.pdf
ASB-SD-DR-AR-2741-2.pdf
ASB-SD-DR-AR-2751-2.pdf
ASB-SD-DR-AR-2761-2.pdf
ASB-SD-DR-AR-3001-3.pdf
ASB-SD-DR-AR-3002-3.pdf
ASB-SD-DR-AR-3003 - 3.pdf
ASB-SD-DR-AR-3004-2.pdf
ASB-SD-DR-AR-3015 - 1.pdf
ASB-SD-DR-AR-3016 - 1.pdf
ASB-SD-DR-AR-3501-3.pdf
ASB-SD-DR-AR-3502-2.pdf
ASB-SD-DR-AR-4001-2.pdf
ASB-SD-DR-AR-4002-2.pdf
ASB-SD-DR-AR-4003-1.pdf
ASB-SD-DR-AR-4010-2.pdf
ASB-SD-DR-AR-4011-1.pdf
ASB-SD-DR-AR-5301- 3.pdf
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ASB-SD-DR-AR-5310 - 3.pdf
ASB-SD-DR-AR-5311- 3.pdf
BLA-SD-DR-AR-0201-1.pdf
BLA-SD-DR-AR-2101-2.pdf
BLA-SD-DR-AR-2102-3.pdf
BLA-SD-DR-AR-2111-2.pdf
BLA-SD-DR-AR-2112-2.pdf
BLA-SD-DR-AR-2121-3.pdf
BLA-SD-DR-AR-2201-5.pdf
BLA-SD-DR-AR-2221-5.pdf
BLA-SD-DR-AR-2501-1.pdf
BLA-SD-DR-AR-2511-1.pdf
BLA-SD-DR-AR-2521-1.pdf
BLB-SD-DR-AR-0111-3.pdf
BLB-SD-DR-AR-0201-1.pdf
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BLB-SD-DR-AR-2114-2.pdf
BLB-SD-DR-AR-2121-2.pdf
BLB-SD-DR-AR-2122-4.pdf
BLB-SD-DR-AR-2123-3.pdf
BLB-SD-DR-AR-2124-2.pdf
BLB-SD-DR-AR-2211-5.pdf
BLB-SD-DR-AR-2221-6.pdf
BLB-SD-DR-AR-2511-1.pdf
BLB-SD-DR-AR-2521-1.pdf
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BLR-SD-DR-AR-2111-2.pdf
BLR-SD-DR-AR-2201-3.pdf
BLR-SD-DR-AR-2211-3.pdf
BLR-SD-DR-AR-2511-1.pdf