FINAL REPORT



ANZAC PARK EAST

CAMPBELL, AUSTRALIAN CAPITAL TERRITORY

PEDESTRIAN WIND STUDY RWDI # 2105424 September 6, 2022

SUBMITTED TO

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EXECUTIVE SUMMARY

RWDI Australia Pty Ltd (RWDI) was retained to conduct a pedestrian wind assessment for the Proposed Development at Anzac Park East located in Campbell, Australian Capital Territory. The pedestrian level wind microclimate assessment was conducted for the existing Site as well as with the inclusion of the Proposed Development (Portal Building) (Existing and Proposed configuration respectively), to understand the effect of the Proposed Development on the wind conditions in the local surrounding area. The wind conditions were predicted using the results from a boundary-layer wind tunnel test combined with historical meteorological wind records for the area and are shown as site plans in Figures 1A through 2B, while the associated wind speeds are listed in Table 1. The results can be summarised as follows:

- Wind conditions on and around the Proposed Development are predicted to be within the acceptable thresholds for pedestrian comfort and safety for both the Existing and Proposed configurations.
- With the incorporation of the Proposed development, the overall wind environment would generally remain similar to that in the Existing configuration. The proposed development generally shields the site from prevailing regional winds, thereby improving the local wind conditions immediately to the north and south of the development site. Inclusion of existing street vegetation would further improve the wind environment.
- Wind speeds at all main entrances to the Proposed Development are appropriate for the intended pedestrian use.
- The Amended Works Approval drawing set for the Overall Concept Masterplan dated 2 September 2022 has been reviewed. These modifications are not expected to alter the local wind microclimate as documented in this report. The proposed landscaping is also likely to considerably baffle the winds around the site with most areas likely to be suitable for passive use throughout the year.



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1 INTRODUCTION

RWDI Australia Pty Ltd. (RWDI) was retained to conduct a pedestrian wind assessment for the Proposed Development (Portal Building) of Anzac Park East located in Campbell, ACT. This report presents the project objectives, discusses the result from RWDI's assessment and, where necessary, provides conceptual wind control measures.

1.1 Project Description

The proposed development (site shown in Image 1) is bounded by Constitution Avenue, Wendouree Drive, Parkes Way and ANZAC Parade, and is located within the significant National Triangle. The Proposed mixed-use development consists of three blocks which include residential apartments, a retail building and the 'Portal Building', intended as commercial office space, that is the primary focus of this assessment. Entrances to the Proposed Development are located along the southern aspect.



Image 1: Aerial View of Site and Surroundings (Source: Nearmap)

1.2 Objectives

The objective of the study was to assess the wind speeds in pedestrian areas on and around the Proposed Development and provide recommendations for minimizing adverse wind effects, if needed. This quantitative assessment was based on wind speed measurements on a scale model of the Proposed Development and its surroundings in one of RWDI's boundary-layer wind tunnels. These measurements were combined with the local wind records and compared to appropriate criteria for gauging wind comfort and safety in pedestrian areas. The assessment focused on critical pedestrian areas, including walkways and footpaths around the Proposed Development, building entrances and amenity spaces.



2 BACKGROUND AND APPROACH

2.1 Wind Tunnel Study Model

To assess the wind environment around the Proposed Development, a 1:300 scale model of the project Site and surroundings was constructed for the wind tunnel tests of the following configurations:

A – Existing: Existing Site and existing and under-construction / approved buildings in the surroundings (image 2A), and

B - Proposed: Proposed Development with existing and under-construction / approved buildings in the surroundings (Image 2B).

The wind tunnel model included all relevant surrounding buildings and topography within an approximately 360 m radius of the study Site. The wind and turbulence profiles in the atmospheric boundary layer beyond the modelled area were also simulated in RWDI's wind tunnel. The wind tunnel model was instrumented with 67 specially designed wind speed sensors to measure mean and gust speeds at a full-scale height of approximately 1.5 m above local grade in pedestrian areas throughout the study Site. Wind speeds were measured for 36 directions in 10-degree increments. The measurements at each sensor location were recorded in the form of ratios of local mean and gust speeds to the mean wind speed at a reference height above the model. The placement of wind measurement locations was based on our experience and understanding of the pedestrian usage for this Site.



Image 2A: Wind Tunnel Study Model – Existing Configuration

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2.2 Meteorological Data

Wind statistics recorded at Canberra Airport between 1998 and 2018, inclusive, were analysed for the Summer (November to April) and Winter (May to October) seasons. Image 3 graphically depicts the directional distributions of wind frequencies and speeds for these two seasons. Winds are predominantly from the southeast and northwest quadrants, with summer winds being more frequent from the southeast while the winter winds are more common from the northwest direction, as indicated by the wind roses. Strong winds of a mean speed greater than 30 km/h measured at the airport (at an anemometer height of 10 m) occur more often in the winter (5.6%) than in the summer (3.2%).

Wind statistics were combined with the wind tunnel data to predict the frequency of occurrence of full-scale wind speeds. The full-scale wind predictions were then compared with the wind criteria for pedestrian comfort and safety.



Summer (November to April)



Winter (May to October)

	Wind Speed	Probat	oility (%)
	(km/h)	Summer	Winter
	Calm	8.7	13.7
	1-10	38.9	36.3
	11-20	32.3	25.2
	21-30	16.9	19.3
	31-40	2.9	4.9
	>40	0.3	0.7

Image 3: Directional Distribution of Winds Approaching Canberra Airport from 1998 to 2018



2.3 Pedestrian Wind Criteria

2.3.1 Safety

Excessive gusts speeds can adversely affect the balance and footing of a pedestrian. The Australasian Wind Engineering Society (AWES) recommended speed of 23 m/s (83 km/h) is considered in the present study. If gust speeds in excess of 83 km/h occur more than 9 hours or 0.1% of the time on an annual basis, the wind conditions are considered severe. Wind control measures are typically required at locations where winds exceed the wind safety criterion.

2.3.2 Comfort

The RWDI pedestrian wind criteria, which have been developed by RWDI through research and consulting practice since 1974, are used in the current study. These criteria have been widely accepted by municipal authorities as well as by the building design and city planning community. Regional differences in wind climate and thermal conditions as well as variations in age, health, clothing, etc. can affect a person's perception of the wind climate. Therefore, comparisons of wind speeds for the existing and proposed building configurations are the most objective way in assessing local pedestrian wind conditions. In general, the combined effect of mean and gust speeds on pedestrian comfort can be quantified by a Gust Equivalent Mean (GEM).

Comfort Category	GEM Speed (km/h)	Description
Sitting	<u><</u> 10	Calm or light breezes desired for outdoor restaurants and seating areas where one can read a paper without having it blown away
Standing	<u><</u> 14	Gentle breezes suitable for main building entrances, bus stops, and other places where pedestrians may linger
Strolling	<u><</u> 17	Moderate winds that would be appropriate for window shopping and strolling along a downtown street, plaza or park
Walking	<u><</u> 20	Relatively high speeds that can be tolerated if one's objective is to walk, run or cycle without lingering
Uncomfortable	> 20	Strong winds of this magnitude are considered a nuisance for all pedestrian activities, and wind mitigation is typically recommended

Notes:

- (1) GEM speed = max (mean speed, gust speed/1.85); and Gust Speed = Mean Speed + 3*RMS Speed;
- (2) Wind conditions are considered to be comfortable if the predicted GEM speeds are within the respective thresholds for at least 80% of the time between 6:00 and 23:00. Nightly hours between 0:00 and 5:00 are excluded from the wind analysis for comfort since limited usage of outdoor spaces is anticipated; and,
- (3) Instead of standard four seasons, two periods of summer (November to April) and winter (May to October) are adopted in the wind analysis, because in a sub-tropical climate, there are distinct differences in pedestrian outdoor behaviours between these two time periods.

September 6, 2022



3 RESULTS AND DISCUSSION

The predicted wind conditions are shown on Site plans in Figures 1A through 2B located in the "Figures" section of this report. These conditions and the associated wind speeds are also represented in Table 1, located in the "Tables" section of this report.

The following is a detailed discussion of the suitability of the predicted wind conditions for the anticipated pedestrian use of each area of interest.

3.1 Wind Safety

The test results indicate that the wind speeds at all areas assessed on and around the Proposed Developments would meet the recommended safety criterion.

3.2 Pedestrian comfort - Grade Level (Locations 01 through 67)

Wind conditions comfortable for walking or strolling are appropriate for footpaths, walkways and service lanes as pedestrians will be active and less likely to remain in one area for prolonged periods of time. Lower wind speeds conducive to standing are preferred at main entrances where pedestrians are likely to linger. Wind speeds conducive to sitting are preferred for areas intended for passive activities.

3.2.1 Existing Configuration

The wind conditions around the Site are considered suitable for sitting and standing at all locations during the summer season and the majority of locations during the winter season. Wind speeds suitable for strolling use occur north and south of Site, whereas an isolated walking use conditions occur across Constitution Avenue from the Site (sensor locations 31 as in Figure 2A). However, as most of the thoroughfares are suitable for walking use or calmer, these are currently acceptable for active pedestrian use.

3.2.2 Proposed Configuration

With the completion of the Proposed Development, wind conditions around the site are noted to be similar at the majority of locations when compared to the existing configuration. Slight sheltering of the winds is observed immediately to the north and south of the Portal Building. The wind conditions would be suitable for sitting and standing use for the majority of the areas throughout the year which would be suitable for the intended pedestrian use. The off-Site strolling and walking use conditions (sensor locations 23 and 24 during the Summer and sensor locations 9, 16, 17, 23 – 25, 30 and 31 during Winter as in Figure 1B and 2B) observed are appropriate for the intended pedestrian use along footpaths and walkways. It is also worth noting that the assessment has been completed without the inclusion of existing landscaping to present a worst-case scenario. In considering the effect of the existing mature trees along Constitution Avenue and Anzac Parade, it would be expected that wind conditions would be considerably calmer.

Wind conditions at the main entrances (sensor locations 2, 3, 4, 5 and 6 as in Figure 1B and 2B) would be suitable for the intended pedestrian use with conditions comfortable for sitting and standing at all locations throughout the year.

September 6, 2022



4 REVIEW OF AMENDED WA SET

RWDI have also reviewed the Amended Works Approval drawing set for the Overall Concept Masterplan provided by Amalgamated Property Group dated 2 September 2022. The latest scheme shows that the overall massing of the Portal Building is similar to what has been tested and presented in this report. Slight changes to the massing of the residential buildings are also noted. However, given the relatively calm wind conditions around the site, these modifications are not expected to alter the local wind microclimate. The proposed landscaping is also likely to considerably baffle the winds around the site with most areas likely to be suitable for passive use throughout the year. September 6, 2022



5 APPLICABILITY OF RESULTS

The wind conditions presented in this report below were received for ANZAC Park East and are constructed using the drawings and information listed below. Should there be any design changes that deviate from this list of drawings, the wind condition predictions presented may change. Therefore, if changes in the design are made, it is recommended that RWDI be contacted and requested to review their potential effects on wind conditions.

File Name	File Type	Date Received (dd/mm/dd/yyyy)
18_27 APEEOI_wind study 210928.rvt	Revit	28/09/2021
DBI-185160-R22-Central_Uncontrolled.rvt	Revit	06/10/2021
DBI-185160-R22-Residential_Uncontrolled.rvt	Revit	06/10/2021
DBI-185160-R22-Site_Uncontrolled.rvt	Revit	06/10/2021

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			Wir	nd Co <u>mfort</u>		W	/ind Saf <u>ety</u>
	Configuration		Summer		Winter		Annual
Location		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
1	Existing	13	Standing	15	Strolling	50	Pass
	Proposed	10	Sitting	10	Sitting	42	Pass
2	Existing	13	Standing	14	Standing	50	Pass
	Proposed	11	Standing	10	Sitting	59	Pass
3	Existing	13	Standing	14	Standing	49	Pass
	Proposed	9	Sitting	9	Sitting	53	Pass
4	Existing	13	Standing	14	Standing	49	Pass
	Proposed	4	Sitting	4	Sitting	24	Pass
5	Existing	13	Standing	15	Strolling	49	Pass
	Proposed	4	Sitting	4	Sitting	18	Pass
6	Existing	13	Standing	15	Strolling	50	Pass
	Proposed	10	Sitting	10	Sitting	42	Pass
7	Existing	12	Standing	15	Strolling	55	Pass
	Proposed	9	Sitting	9	Sitting	46	Pass
8	Existing	13	Standing	16	Strolling	55	Pass
	Proposed	8	Sitting	10	Sitting	40	Pass
9	Existing	12	Standing	15	Strolling	50	Pass
	Proposed	12	Standing	16	Strolling	70	Pass
10	Existing	12	Standing	15	Strolling	50	Pass
	Proposed	8	Sitting	9	Sitting	43	Pass
11	Existing	13	Standing	14	Standing	49	Pass
	Proposed	7	Sitting	9	Sitting	40	Pass
12	Existing	13	Standing	14	Standing	50	Pass
	Proposed	7	Sitting	9	Sitting	39	Pass
13	Existing	13	Standing	14	Standing	51	Pass
	Proposed	6	Sitting	9	Sitting	38	Pass
14	Existing	13	Standing	14	Standing	51	Pass
	Proposed	10	Sitting	14	Standing	58	Pass
15	Existing	13	Standing	14	Standing	50	Pass
	Proposed	7	Sitting	9	Sitting	43	Pass
16	Existing	14	Standing	15	Strolling	53	Pass
	Proposed	13	Standing	15	Strolling	56	Pass
17	Existing	13	Standing	15	Strolling	52	Pass
	Proposed	13	Standing	16	Strolling	64	Pass
18	Existing	13	Standing	14	Standing	50	Pass
	Proposed	12	Standing	12	Standing	56	Pass
19	Existing	13	Standing	14	Standing	49	Pass
	Proposed	11	Standing	12	Standing	50	Pass
20	Existing	13	Standing	14	Standing	49	Pass
	Proposed	11	Standing	11	Standing	44	Pass



			Wind	Comfort		N N	/ind Safety
	Configuration			Summer Winter			Annual
Location		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
21	Existing	12	Standing	14	Standing	49	Pass
	Proposed	13	Standing	14	Standing	66	Pass
22	Existing	13	Standing	15	Strolling	51	Pass
	Proposed	12	Standing	12	Standing	51	Pass
23	Existing	13	Standing	17	Strolling	59	Pass
	Proposed	15	Strolling	17	Strolling	67	Pass
24	Existing	12	Standing	15	Strolling	58	Pass
	Proposed	15	Strolling	18	Walking	64	Pass
25	Existing	11	Standing	12	Standing	54	Pass
	Proposed	13	Standing	16	Strolling	60	Pass
26	Existing	12	Standing	15	Strolling	55	Pass
	Proposed	11	Standing	10	Sitting	53	Pass
27	Existing	13	Standing	15	Strolling	51	Pass
	Proposed	11	Standing	10	Sitting	46	Pass
28	Existing	13	Standing	15	Strolling	50	Pass
	Proposed	14	Standing	14	Standing	71	Pass
29	Existing	14	Standing	16	Strolling	53	Pass
	Proposed	14	Standing	12	Standing	61	Pass
30	Existing	14	Standing	15	Strolling	52	Pass
	Proposed	14	Standing	18	Walking	67	Pass
31	Existing	14	Standing	18	Walking	63	Pass
	Proposed	13	Standing	16	Strolling	60	Pass
32	Existing	10	Sitting	11	Standing	55	Pass
	Proposed	11	Standing	14	Standing	60	Pass
33	Existing	9	Sitting	10	Sitting	52	Pass
	Proposed	11	Standing	12	Standing	68	Pass
34	Existing	11	Standing	12	Standing	58	Pass
	Proposed	12	Standing	12	Standing	66	Pass
35	Existing	11	Standing	11	Standing	49	Pass
	Proposed	12	Standing	13	Standing	49	Pass
36	Existing	12	Standing	14	Standing	53	Pass
	Proposed	9	Sitting	10	Sitting	39	Pass
37	Existing	12	Standing	14	Standing	50	Pass
	Proposed	8	Sitting	7	Sitting	63	Pass
38	Existing	12	Standing	13	Standing	49	Pass
	Proposed	5	Sitting	4	Sitting	29	Pass
39	Existing	12	Standing	14	Standing	51	Pass
	Proposed	9	Sitting	9	Sitting	51	Pass
40	Existing	12	Standing	14	Standing	50	Pass
	Proposed	6	Sitting	6	Sitting	28	Pass



			Win	d Comfort		V	/ind Safetv
	Configuration		Summer Winter		Winter	Annual	
Location		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
41	Existing	13	Standing	14	Standing	49	Pass
	Proposed	9	Sitting	11	Standing	48	Pass
42	Existing Proposed	13 10	Standing Sitting	14 10	Standing Sitting	51 57	Pass Pass
43	Existing	14	Standing	15	Strolling	51	Pass
	Proposed	12	Standing	12	Standing	53	Pass
44	Existing	13	Standing	14	Standing	50	Pass
	Proposed	9	Sitting	10	Sitting	53	Pass
45	Existing	13	Standing	15	Strolling	53	Pass
	Proposed	10	Sitting	11	Standing	63	Pass
46	Existing	14	Standing	15	Strolling	52	Pass
	Proposed		Stanuling	12	Stanuing	50	Pass
47	Existing	14	Standing	15	Strolling	51	Pass
	Proposed	11	Standing	11	Standing	47	Pass
48	Existing	13	Standing	15	Strolling	51	Pass
	Proposed	11	Standing	10	Sitting	64	Pass
49	Existing	13	Standing	14	Standing	52	Pass
	Proposed	10	Sitting	10	Sitting	50	Pass
50	Existing	13	Standing	15	Strolling	52	Pass
	Proposed	9	Sitting	9	Sitting	44	Pass
51	Existing	12	Standing	13	Standing	49	Pass
	Proposed	8	Sitting	8	Sitting	51	Pass
52	Existing	11	Standing	13	Standing	49	Pass
	Proposed	5	Sitting	5	Sitting	31	Pass
53	Existing	11	Standing	12	Standing	49	Pass
	Proposed	9	Sitting	9	Sitting	54	Pass
54	Existing	12	Standing	14	Standing	51	Pass
	Proposed	9	Sitting	9	Sitting	47	Pass
55	Existing	12	Standing	13	Standing	49	Pass
	Proposed	7	Sitting	8	Sitting	37	Pass
56	Existing	12	Standing	12	Standing	48	Pass
	Proposed	5	Sitting	5	Sitting	26	Pass
57	Existing	12	Standing	14	Standing	51	Pass
	Proposed	11	Standing	12	Standing	50	Pass
58	Existing	13	Standing	14	Standing	51	Pass
	Proposed	9	Sitting	9	Sitting	54	Pass
59	Existing	10	Sitting	11	Standing	47	Pass
	Proposed	9	Sitting	10	Sitting	44	Pass
60	Existing	10	Sitting	11	Standing	46	Pass
	Proposed	11	Standing	12	Standing	51	Pass



	Configuration	Wind Comfort				Wind Safety	
Location			Summer	er Winter		Annual	
Location		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
61	Existing	10	Sitting	11	Standing	48	Pass
	Proposed	11	Standing	12	Standing	53	Pass
62	Existing	14	Standing	14	Standing	51	Pass
	Proposed	12	Standing	12	Standing	53	Pass
63	Existing	13	Standing	13	Standing	48	Pass
	Proposed	12	Standing	12	Standing	47	Pass
64	Existing	12	Standing	13	Standing	49	Pass
	Proposed	7	Sitting	6	Sitting	34	Pass
65	Existing	12	Standing	13	Standing	49	Pass
	Proposed	10	Sitting	10	Sitting	45	Pass
66	Existing	12	Standing	13	Standing	49	Pass
	Proposed	11	Standing	10	Sitting	48	Pass
67	Existing	12	Standing	13	Standing	50	Pass
	Proposed	12	Standing	10	Sitting	56	Pass

Season	Months	Hours	Comfort Speed (km/h)	Safety Speed (km/h)
Summer	November to April	6:00 - 23:00 for comfort	(20% Seasonal Exceedance)	(0.1% Annual Exceedance)
Winter	May - October	6:00 - 23:00 for comfort	≤ 10 Sitting	≤ 83 Pass
Annual	January - December	0:00 - 23:00 for safety	11 - 14 Standing	> 83 Exceeded
Configurat	tions		15 - 17 Strolling	
Existing	Existing site and sur	roundings	18 - 20 Walking	
Proposed	Project with existing	surroundings	> 20 Uncomfortable	