

UTS ULTIMO PRECINCT SITES 13-15

ULTIMO, NEW SOUTH WALES

PEDESTRIAN WIND STUDY

RWDI # 2103928

August 25, 2021

SUBMITTED TO

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EXECUTIVE SUMMARY

RWDI Australia Pty Ltd was retained to conduct a pedestrian wind assessment for the Massing Envelope of the proposed development of Sites 13-15 of the UTS Ultimo Precinct in Ultimo, New South Wales. The pedestrian level wind microclimate assessment was conducted for the existing Site as well as with the inclusion of the proposed Massing Envelope of the development (Existing and Proposed configurations respectively), to understand the effect of the Massing Envelope on the wind conditions in the local surrounding area. The potential wind conditions at pedestrian level on and around the site were predicted using the results from a boundary-layer wind tunnel test combined with historical meteorological wind records for the areas as shown in 'Figures', while the associated wind speeds are listed in Table 1. The following is a summary of the expected wind conditions assessed:

- Gust speeds in the study area were found to meet the wind safety criterion at all measured locations. We therefore do not anticipate any safety concerns for pedestrians or building occupants in relation to the wind force in the areas assessed.
- The wind conditions assessed for Existing and Proposed configurations would be suitable at all locations assessed for the intended use at grade level throughout the year.
- Wind conditions on the Heritage roof top at Level 4 are anticipated to be one category windier than required for the intended passive use throughout the year and would benefit from mitigation as described in this report.

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1 INTRODUCTION

This report has been prepared on behalf of University of Technology Sydney (UTS) in support of its Ultimo Haymarket Precinct Key Site Master Plan.

The Master Plan is being progressed under the framework established by the Pyrmont Peninsula Place Strategy (PPPS), where UTS is identified as one of four “key sites”. The PPPS sets out the NSW Government’s 20-year strategic direction and vision for Pyrmont, where Pyrmont’s locational advantages in terms of its proximity to Central Sydney, context within the Innovation Corridor and delivery of a new metro station have been embraced as part of its next evolution as the Western Gateway to the CBD.

As an identified “key site” it is recognised that UTS has the greatest potential to deliver strategic growth and change across the Peninsula together with leveraging the delivery of broader public benefits and infrastructure.

The Master Plan ultimately seeks to inform updated planning controls in relation to UTS’s short-term development plans for UTS Sites 13 -15, where it is planning to deliver Australia’s largest Indigenous Residential College (IRC) including Indigenous Arts Centre and Library.

In particular this report details the pedestrian wind assessment undertaken for the Massing Envelope for the proposed development of Sites 13-15. This report presents the project objectives, discusses the results from RWDI’s assessment and, where necessary, provides conceptual wind control measures.

1.1 Pyrmont Peninsula Place Strategy (PPPS)

The Pyrmont Peninsula Place Strategy provides a 20-year framework that identifies areas that can accommodate future growth in order to support Pyrmont’s evolution as the western gateway to the CBD and a hub for jobs in innovation, technology, creative industries, and media.

A balanced approach to growth has been established within the PPPS to ensure its local character and heritage is protected and it remains a great place to live, with the focus of strategic change occurring within four “key sites”, including UTS (refer to Image 1a).

The first phase in implementing the PPPS is the preparation of master plans for each of the seven sub-precincts (“places”) that make up the Peninsula (Image 1b). The master plans will provide the next level of detail, outlining the spatial components of the PPPS, which will be used to inform changes to land use zones, building height and density, and community infrastructure requirements etc.

As a “Key Site”, UTS is progressing its own master plan for its “Key Site” which seeks to respond, inform and align with the sub-precinct master plan process and broader aspirations for the Peninsular.

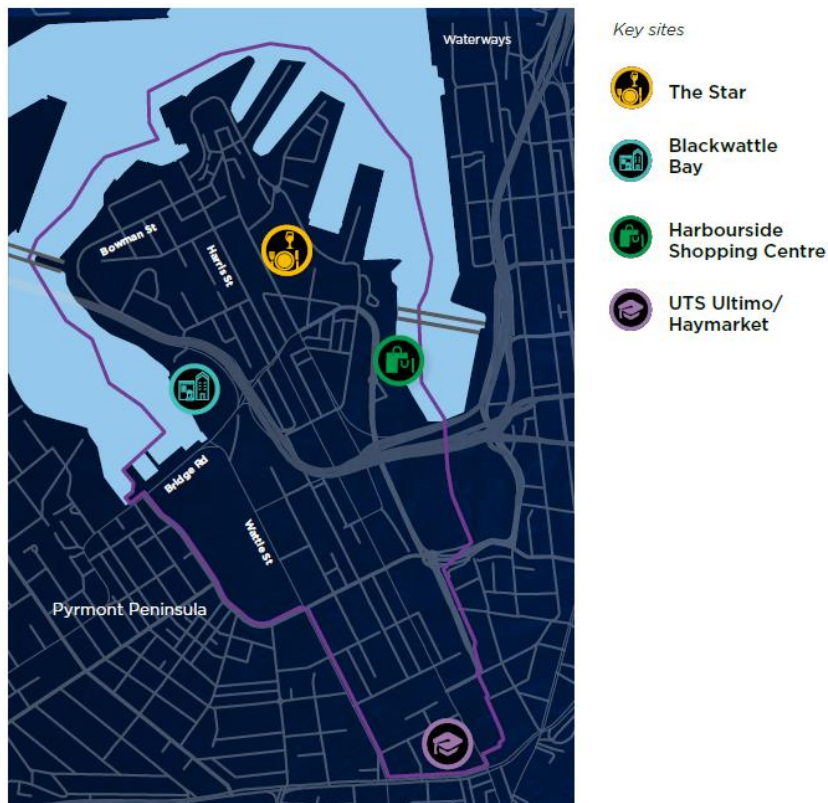


Image 1a: Pyrmont Peninsula and Key Sites



Image 1b: Pyrmont Peninsula Sub-Precincts

1.2 Background

UTS is a public university of technology committed to research, innovation and social justice, indigenous knowledge, and collaboration with industry. With a total enrolment of over 44,000 students, UTS is one of the largest universities in Australia. It has a culturally diverse campus next to Sydney's central business district (CBD).

UTS is an anchor institution within the Pyrmont Peninsula and plays an important role in the success of Sydney and NSW, with the Greater Sydney Commission's Sydney Regional and District plan acknowledging this importance and identifying the need to protect and support the growth of education activity within the Harbour CBD Innovation Corridor.

UTS has largely completed its \$1 billion+ Broadway Precinct master plan and is now planning for its next growth phase at its Ultimo Haymarket Precinct, leveraging the opportunities and strategic planning focus on innovation, technology, creative industries and diverse housing (Image 1c). UTS's immediate short-term plans are focused on the redevelopment of Sites 13-15 (CB13-15) into an Indigenous Residential College (IRC) including adaptive reuse of the local heritage listed building and public realm improvements. UTS redevelopment plans for its other significant site (Site 5 – CB05) will be progressed through a separate process with the City of Sydney and its Central Sydney planning framework in the future.

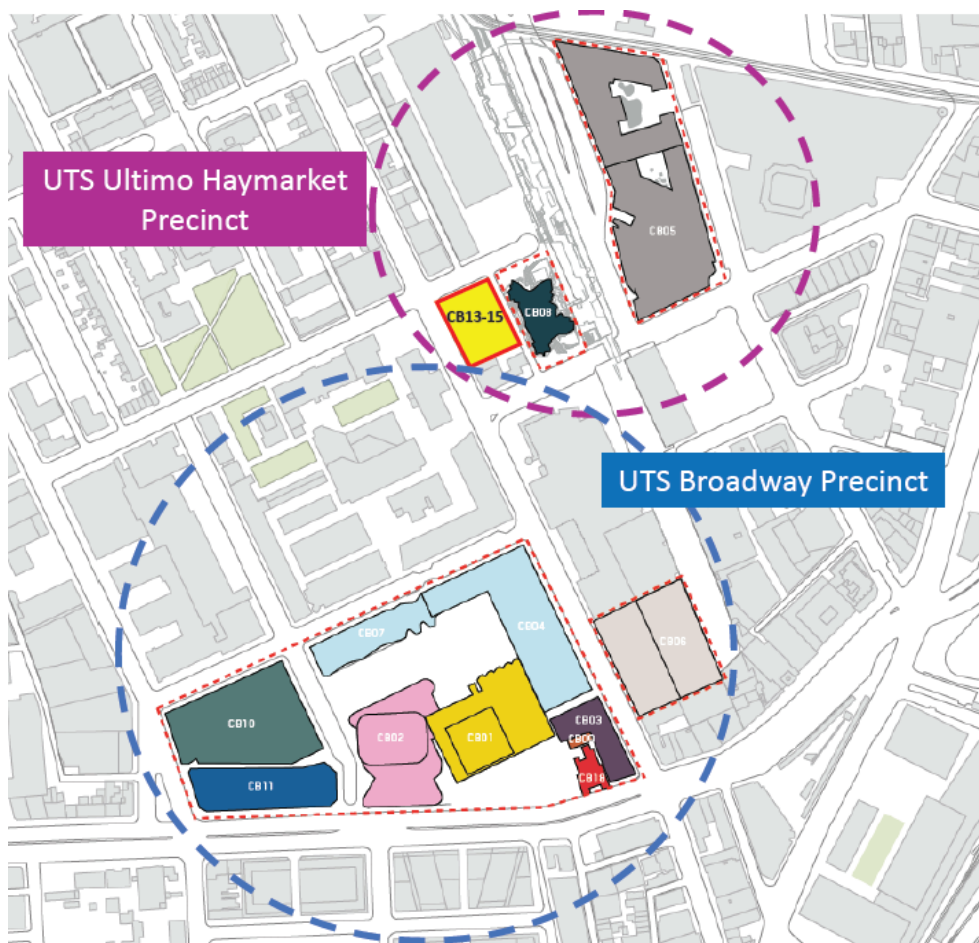


Image 1c: UTS City Campus

1.3 The Proposal

The UTS Key Site Master Plan is proposing to “rezone” Sites 13-15 in order to establish new planning controls to enable its redevelopment as an Indigenous focused Residential College, arts centre and library. Site 13-15 is more specifically identified within Image 1d.



Image 1d: UTS City Campus

The rezoning and proposed planning controls are based on an envelope informed by detailed site planning considerations and local context analysis, an indigenous led design brief for the college, and tested by a reference design. The proposed new planning controls including LEP amendments and Design Guide respond to the vision, strategic directions, big moves and place priorities established within the PPPS along with site specific opportunities and constraints informed through environmental, social and economic considerations.

The key development outcomes sought to be achieved for Site 13-15 from the Key Site Master Plan process include:

- A new 250 bed Indigenous Residential College and supporting arts centre and library
- Retention and adaptive re-use of a local heritage item accommodating a mix of uses, including potential teaching/university support space
- Creation of new open space within the site
- Creation of a new pedestrian through-site link from Harris Street to Omnibus Lane
- A country led design and landscape outcome
- Potential for additional local public domain works for Omnibus Lane and Mary Ann Street subject to a VPA

Once new planning controls are in place, UTS will progress with the detailed design and planning of the IRC project, including progressing with a design competition and securing development approval for the winning design.

1.4 General Requirements

This report has been prepared with reference to the General Requirements for Preparing Key Site Master Plans under the Pyrmont Peninsula Place Strategy and the alignment review prepared by the Department of Planning, Industry and Environment (DPIE) dated 5 May 2021. Specifically, this report provides analysis of wind conditions to assess the level of wind amenity.

The objective of the study was to assess the effect of the Massing Envelope of the proposed development on wind speeds in pedestrian areas on and around the study Site and provide recommendations for minimizing adverse effects, if needed. This quantitative assessment was based on wind speed measurements on a scale model of the Massing Envelope 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.

1.5 Wind Considerations

The proposed development integrates with the existing heritage building and is approximately 74 m tall with planned outdoor amenity spaces located on the roof of the heritage building at Level 4. Other outdoor amenity spaces are being considered as part of the reference design scheme which are outside the scope of the present study of the massing envelope. High-rise developments are sited to the north-east and southwest.

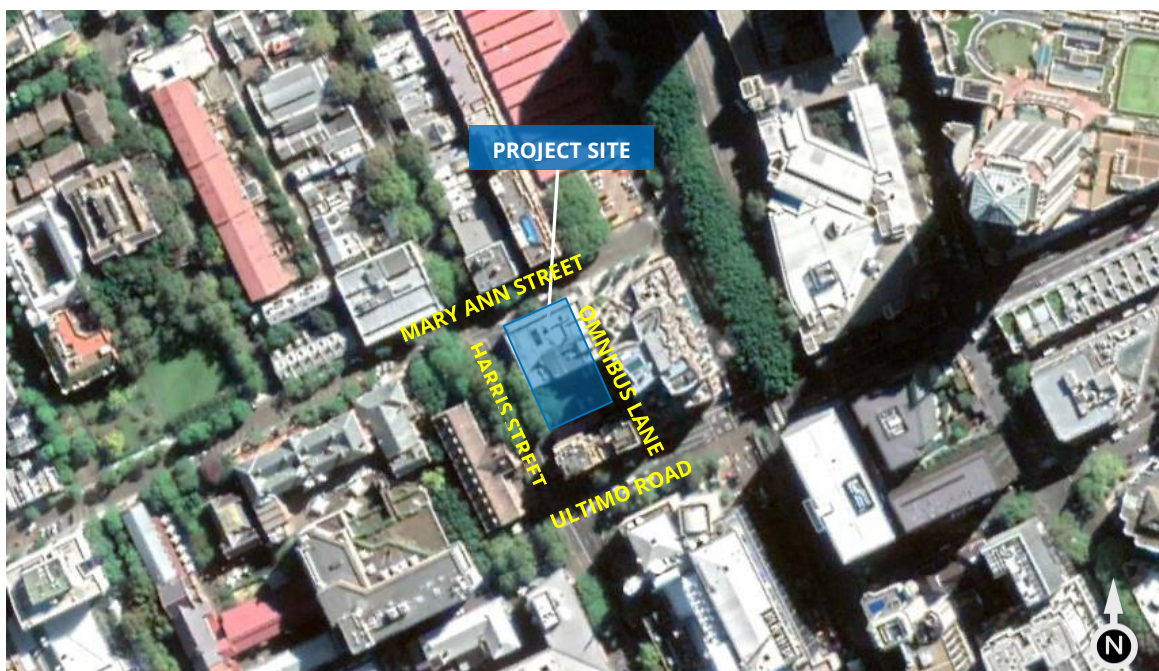


Image 1e: Aerial View of Site and Surroundings (Photo Courtesy of Google™ Earth)

2 BACKGROUND AND APPROACH

2.1 Wind Tunnel Study Model

To assess the wind environment around the Massing Envelope of 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 surrounding buildings (image 2A), and
- B - Proposed: Massing Envelope of the proposed development with existing surrounding buildings (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 65 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 and reviewed by the project team.



Image 2A: Wind Tunnel Study Model – Existing Configuration

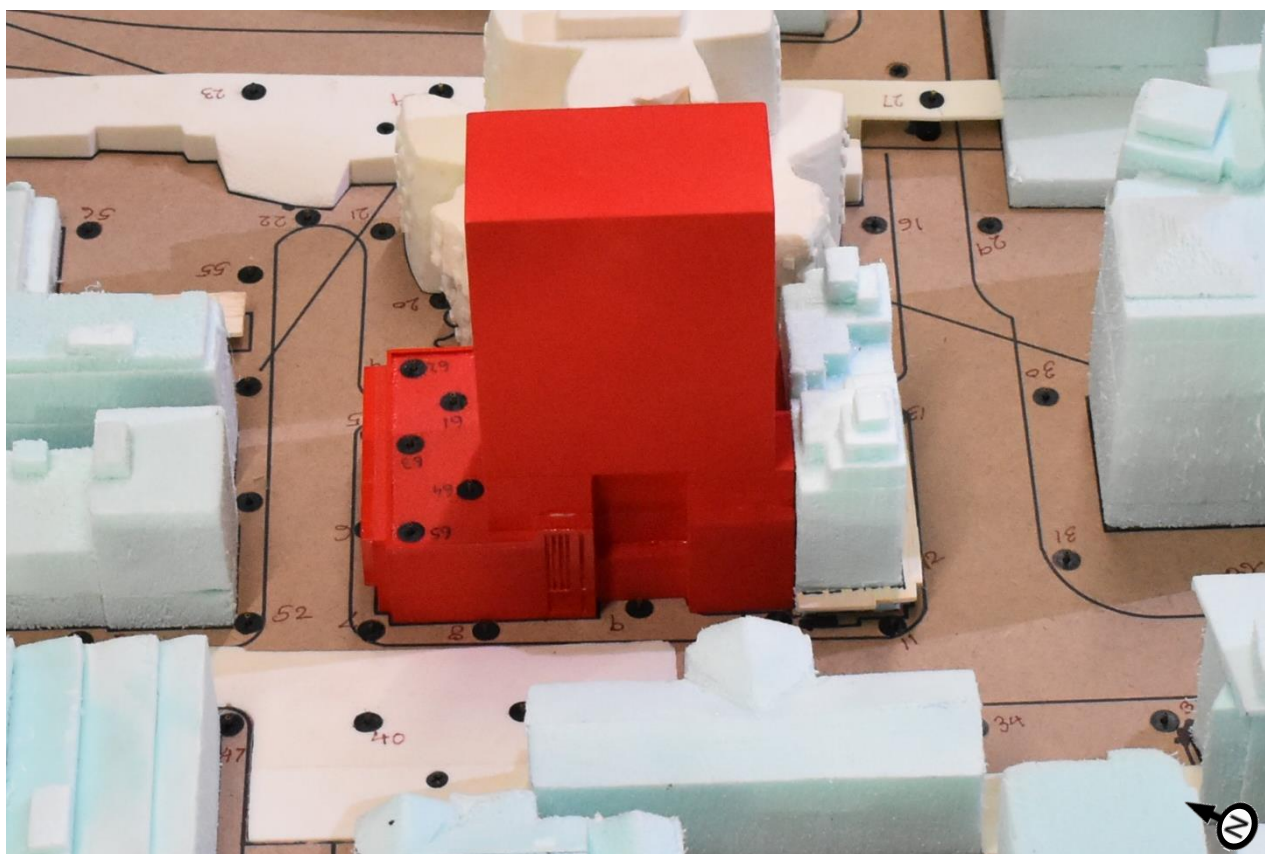


Image 2B: Wind Tunnel Study Model - Proposed Configuration

2.2 Meteorological Data

Wind statistics recorded at Sydney International Airport between 1999 and 2018, inclusive, were analyzed annually. Image 3 graphically depicts the annual directional distributions of wind frequencies and speeds. Winds from the northwest, west and northeast, and south directions are predominant throughout the year as indicated by the wind rose (Image 3). Strong winds of a mean speed greater than 30 km/h measured at the airport (at an anemometer height of 10 m) occur for 9.4% of the time throughout the year.

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.

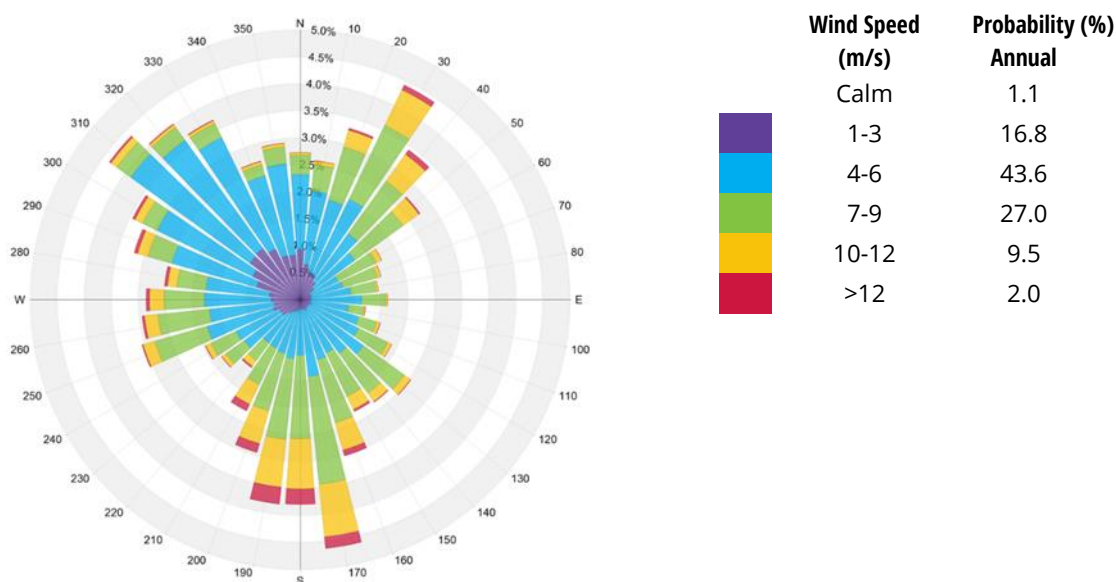


Image 3: Directional Distribution of Winds Approaching Sydney International Airport From 1999 to 2018

2.3 The Draft Sydney Planning Strategy 2016-2036 wind criteria

The wind criteria presented in the Central Sydney Planning Strategy 2016-2036 are described in the table below. 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 of 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 (m/s)	Description
Sitting	≤ 4	Calm or light breezes desired for outdoor restaurants and seating areas where one can read a paper without having it blown away
Standing	≤ 6	Gentle breezes suitable for main building entrances, bus stops, and other places where pedestrians may linger
Walking	≤ 8	Relatively high speeds that can be tolerated if one's objective is to walk, run or cycle without lingering
Uncomfortable	> 8	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,
- (2) GEM speeds listed above are based on a seasonal exceedance of 5% of the time between 6:00 and 22:00.

Safety Criterion	Gust Speed (m/s)	Description
Exceeded	> 24	Excessive gust speeds that can adversely affect a pedestrian's balance and footing. Wind mitigation is typically required.

Notes:

- (1) Based on an annual exceedance of 0.0171% of the time.
- (2) Only gust speeds need to be considered in the wind safety criterion. These are usually rare events but deserve special attention in city planning and building design due to their potential safety impact on pedestrians.

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 presented 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 wind conditions at all the locations assessed on and around the proposed development were found to meet the recommended safety criterion.

3.2 Pedestrian comfort - Grade Level (Locations 01 through 59)

Wind conditions comfortable for walking 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 comfortable for sitting are preferred for areas intended for passive activities.

For the Existing configuration, the conditions would be comfortable for sitting use at the majority of locations with an isolated standing use condition (location 26 in Figure 1A) on the east side of UTS Business school, on the elevated pedestrian walkway. These conditions are suitable for the intended pedestrian use.

Wind conditions with the incorporation of the Massing Envelope would remain comfortable for the intended use with sitting conditions at most of the locations and slightly increased wind speeds (to standing category) along Mary Ann Street, Harris Street and across Ultimo road. All the conditions assessed would be suitable for the intended pedestrian use throughout the year. An existing tree on the Harris Street (near location 9 in Figure 1B) would be retained for the Proposed configuration which would further reduce the wind speeds along the street.

3.3 Pedestrian comfort - Above-Grade Levels (Locations 60 through 65)

It is generally desirable for wind conditions on terraces intended for passive activities to be comfortable for sitting (corresponding to 4m/s or less for at least 95% of the time) during appropriate weather conditions. This criterion would apply to the Heritage roof top terrace at Level 4 (probe locations 60 to 65), which we understand is intended for outdoor amenity use.

The wind conditions on the Heritage roof top would be suitable for standing use throughout the year which would be one category windier than desired for passive use. We would also note that the northeastern corner (location 60) is somewhat windier during the winter season. We recommend the inclusion of landscaping measures on the terrace, which could indicatively comprise a mixture of trees or shrubs in planters, solid or porous screens of 1.5 m height and awnings to provide sufficient shelter for passive use activities.



4 APPLICABILITY OF RESULTS

The drawings and information listed below were received for the Massing Envelope of the proposed development of Site 13-15 of the UTS Ultimo Precinct in Ultimo, New South Wales. The wind conditions presented in this report pertain to the proposed as detailed in the architectural design drawings listed in the table 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.

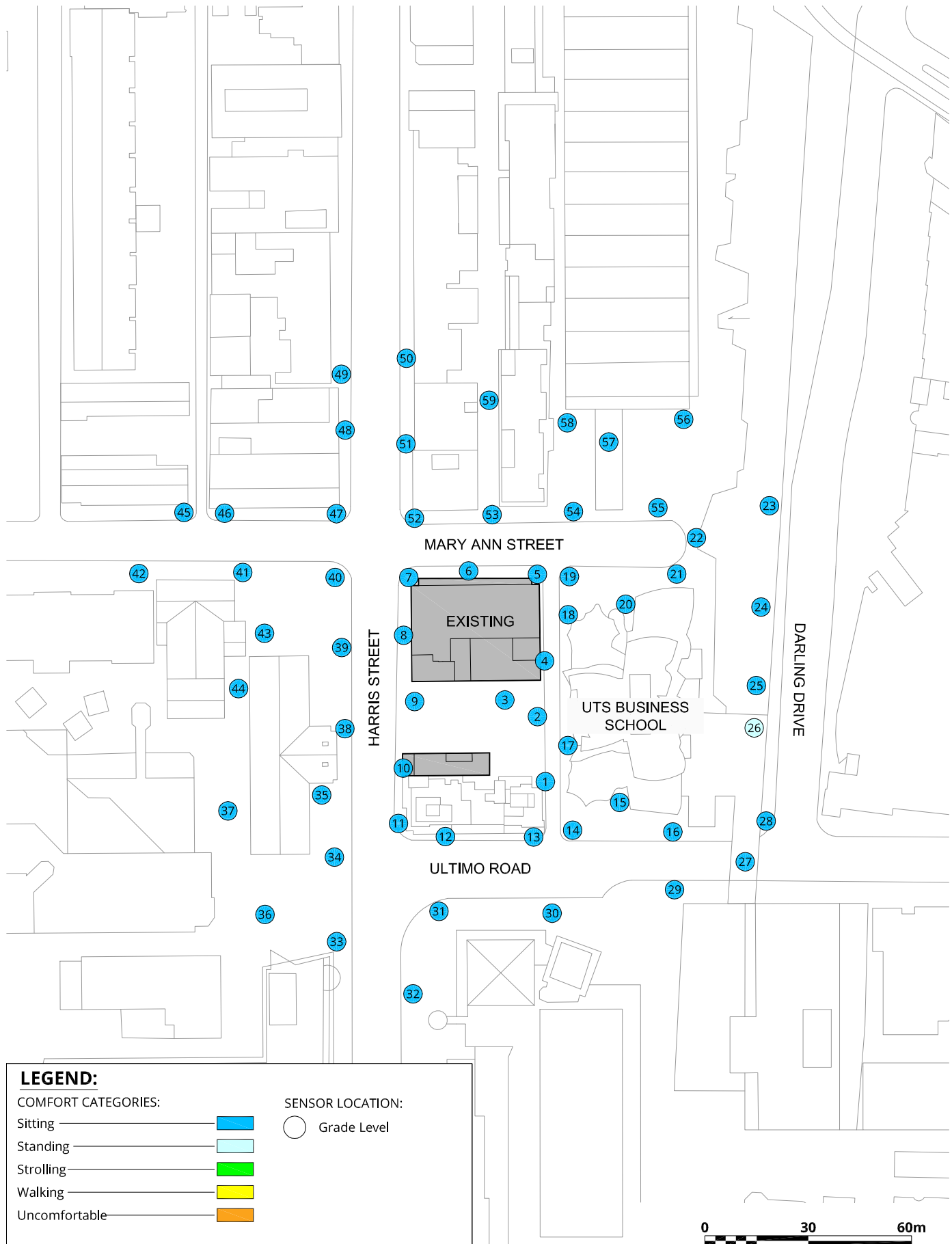
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210713_UTS Site 1315 – Planning Envelope (GDA2020_MGA56).dwg	.dwg	13/07/2021

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FIGURES



Pedestrian Wind Comfort Conditions - Existing

Annual (January to December, 0:00 to 23:00)

UTS Ultimo Precinct - Sydney



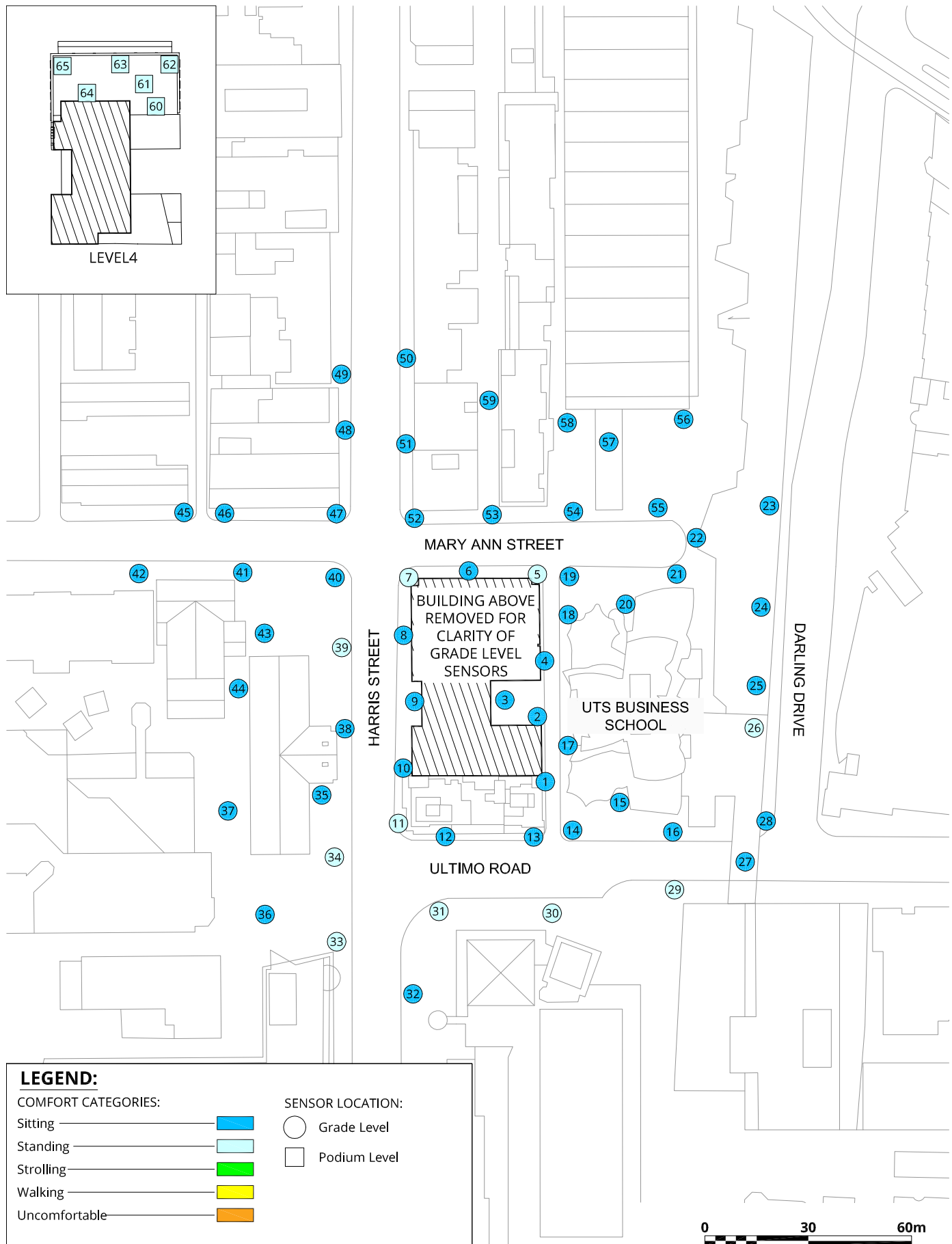
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Approx. Scale: 1:1500

Date Revised: July 15, 2021





Pedestrian Wind Comfort Conditions - Proposed

Annual (January to December, 0:00 to 23:00)

UTS Ultimo Precinct - Sydney

True North



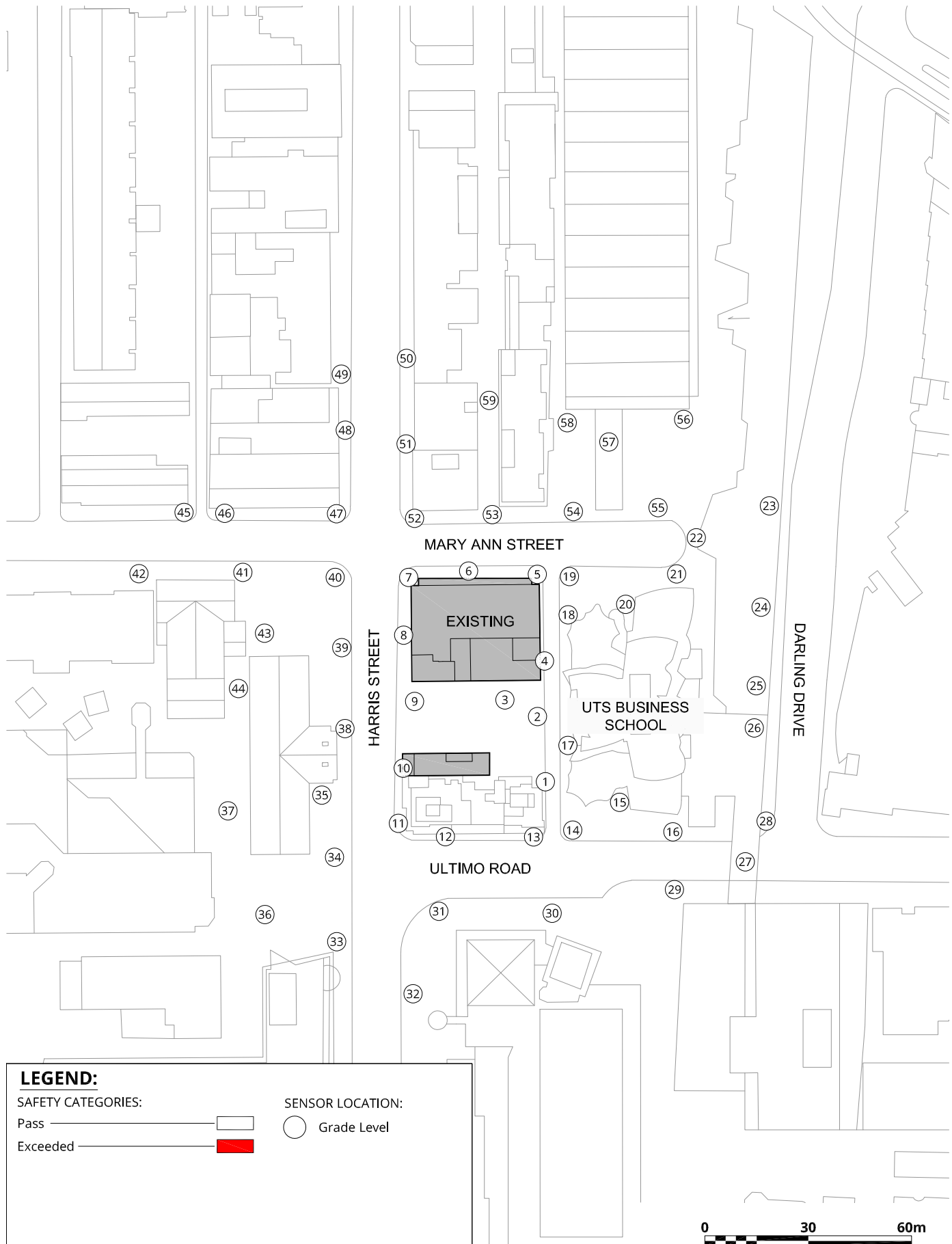
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Approx. Scale: 1:1500

Date Revised: July 15, 2021





Pedestrian Wind Safety Conditions - Existing

Annual (January to December, 0:00 to 23:00)

UTS Ultimo Precinct - Sydney

True North



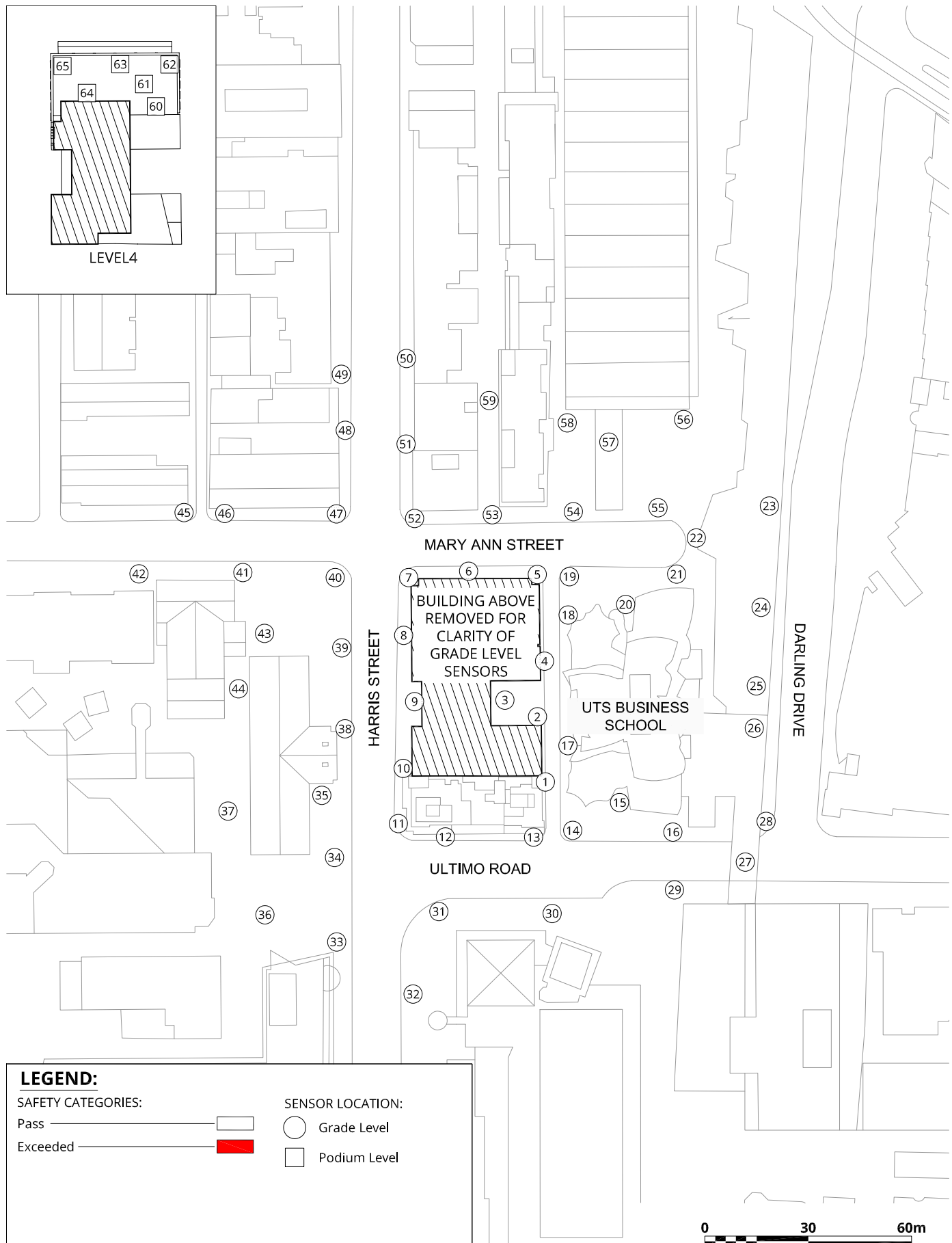
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Drawn by: SSU Figure: 2A

Approx. Scale: 1:1500

Date Revised: July 15, 2021





Pedestrian Wind Safety Conditions - Proposed

Annual (January to December, 0:00 to 23:00)

UTS Ultimo Precinct - Sydney

True North



Project #2103928

Drawn by: SSU Figure: 2B

Approx. Scale: 1:1500

Date Revised: July 15, 2021



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TABLES

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Season	Configuration	Wind Comfort		Wind Safety	
			Speed (m/s)	Rating	Speed (m/s)	Rating
1	Summer	Existing	3.4	Sitting	13.8	Pass
		Proposed	3.3	Sitting	10.1	Pass
	Winter	Existing	4.0	Sitting	15.8	Pass
		Proposed	3.1	Sitting	11.7	Pass
	Annual	Existing	3.7	Sitting	14.7	Pass
		Proposed	3.2	Sitting	11.1	Pass
2	Summer	Existing	2.9	Sitting	11.6	Pass
		Proposed	2.6	Sitting	12.4	Pass
	Winter	Existing	3.3	Sitting	15.2	Pass
		Proposed	3.6	Sitting	14.3	Pass
	Annual	Existing	3.1	Sitting	13.7	Pass
		Proposed	3.1	Sitting	13.2	Pass
3	Summer	Existing	2.8	Sitting	12.1	Pass
		Proposed	2.9	Sitting	13.9	Pass
	Winter	Existing	3.6	Sitting	14.5	Pass
		Proposed	3.8	Sitting	15.7	Pass
	Annual	Existing	3.2	Sitting	13.1	Pass
		Proposed	3.3	Sitting	14.9	Pass
4	Summer	Existing	2.9	Sitting	11.2	Pass
		Proposed	2.6	Sitting	11.3	Pass
	Winter	Existing	3.2	Sitting	13.8	Pass
		Proposed	3.3	Sitting	14.0	Pass
	Annual	Existing	3.1	Sitting	12.9	Pass
		Proposed	3.0	Sitting	12.7	Pass
5	Summer	Existing	3.0	Sitting	14.1	Pass
		Proposed	3.6	Sitting	15.3	Pass
	Winter	Existing	3.7	Sitting	17.9	Pass
		Proposed	4.5	Standing	18.6	Pass
	Annual	Existing	3.3	Sitting	16.6	Pass
		Proposed	4.1	Standing	17.4	Pass
6	Summer	Existing	2.6	Sitting	10.2	Pass
		Proposed	2.7	Sitting	11.4	Pass
	Winter	Existing	3.0	Sitting	11.8	Pass
		Proposed	3.2	Sitting	13.5	Pass
	Annual	Existing	2.8	Sitting	11.5	Pass
		Proposed	3.0	Sitting	13.1	Pass
7	Summer	Existing	2.6	Sitting	10.0	Pass
		Proposed	3.8	Sitting	16.2	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Season	Configuration	Wind Comfort		Wind Safety		
			Speed (m/s)	Rating	Speed (m/s)	Rating	
	Winter	Existing	2.9	Sitting	11.6	Pass	
		Proposed	4.7	Standing	19.0	Pass	
	Annual	Existing	2.8	Sitting	11.1	Pass	
		Proposed	4.3	Standing	18.4	Pass	
	8	Summer	Existing	2.4	Sitting	10.4	Pass
			Proposed	3.1	Sitting	14.5	Pass
Winter		Existing	2.7	Sitting	11.7	Pass	
		Proposed	4.2	Standing	16.1	Pass	
Annual		Existing	2.5	Sitting	11.4	Pass	
		Proposed	3.8	Sitting	15.1	Pass	
9	Summer	Existing	2.8	Sitting	9.1	Pass	
		Proposed	2.8	Sitting	13.2	Pass	
	Winter	Existing	2.8	Sitting	10.1	Pass	
		Proposed	3.8	Sitting	14.8	Pass	
	Annual	Existing	2.8	Sitting	9.7	Pass	
		Proposed	3.4	Sitting	13.9	Pass	
10	Summer	Existing	2.2	Sitting	9.9	Pass	
		Proposed	2.5	Sitting	11.1	Pass	
	Winter	Existing	2.5	Sitting	10.8	Pass	
		Proposed	3.3	Sitting	12.6	Pass	
	Annual	Existing	2.4	Sitting	10.6	Pass	
		Proposed	2.9	Sitting	11.9	Pass	
11	Summer	Existing	2.4	Sitting	11.3	Pass	
		Proposed	3.5	Sitting	20.7	Pass	
	Winter	Existing	2.8	Sitting	12.5	Pass	
		Proposed	5.9	Standing	22.6	Pass	
	Annual	Existing	2.6	Sitting	12.0	Pass	
		Proposed	5.1	Standing	21.4	Pass	
12	Summer	Existing	2.9	Sitting	10.7	Pass	
		Proposed	2.8	Sitting	11.8	Pass	
	Winter	Existing	2.7	Sitting	11.2	Pass	
		Proposed	3.1	Sitting	13.0	Pass	
	Annual	Existing	2.8	Sitting	11.0	Pass	
		Proposed	2.9	Sitting	12.4	Pass	
13	Summer	Existing	2.9	Sitting	9.6	Pass	
		Proposed	3.0	Sitting	12.8	Pass	
	Winter	Existing	2.4	Sitting	10.8	Pass	
		Proposed	3.5	Sitting	14.5	Pass	

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Season	Configuration	Wind Comfort		Wind Safety	
			Speed (m/s)	Rating	Speed (m/s)	Rating
	Annual	Existing	2.7	Sitting	10.4	Pass
		Proposed	3.3	Sitting	13.8	Pass
14	Summer	Existing	3.5	Sitting	14.5	Pass
		Proposed	3.3	Sitting	14.0	Pass
	Winter	Existing	4.0	Sitting	15.8	Pass
		Proposed	3.8	Sitting	15.9	Pass
	Annual	Existing	3.8	Sitting	15.1	Pass
		Proposed	3.6	Sitting	15.1	Pass
15	Summer	Existing	2.3	Sitting	10.9	Pass
		Proposed	2.3	Sitting	10.1	Pass
	Winter	Existing	2.6	Sitting	11.9	Pass
		Proposed	2.8	Sitting	11.6	Pass
	Annual	Existing	2.4	Sitting	11.6	Pass
		Proposed	2.6	Sitting	11.0	Pass
16	Summer	Existing	3.8	Sitting	12.4	Pass
		Proposed	3.6	Sitting	11.7	Pass
	Winter	Existing	3.2	Sitting	12.4	Pass
		Proposed	3.3	Sitting	12.9	Pass
	Annual	Existing	3.5	Sitting	12.4	Pass
		Proposed	3.4	Sitting	12.4	Pass
17	Summer	Existing	2.1	Sitting	9.9	Pass
		Proposed	2.5	Sitting	8.4	Pass
	Winter	Existing	2.7	Sitting	11.1	Pass
		Proposed	2.3	Sitting	8.4	Pass
	Annual	Existing	2.5	Sitting	10.7	Pass
		Proposed	2.4	Sitting	8.4	Pass
18	Summer	Existing	2.9	Sitting	10.7	Pass
		Proposed	3.2	Sitting	11.2	Pass
	Winter	Existing	3.2	Sitting	12.6	Pass
		Proposed	3.7	Sitting	13.6	Pass
	Annual	Existing	3.1	Sitting	11.8	Pass
		Proposed	3.4	Sitting	12.9	Pass
19	Summer	Existing	2.8	Sitting	12.3	Pass
		Proposed	3.1	Sitting	14.7	Pass
	Winter	Existing	3.6	Sitting	14.5	Pass
		Proposed	4.2	Standing	18.0	Pass
	Annual	Existing	3.2	Sitting	13.8	Pass
		Proposed	3.8	Sitting	17.4	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Season	Configuration	Wind Comfort		Wind Safety	
			Speed (m/s)	Rating	Speed (m/s)	Rating
20	Summer	Existing	1.6	Sitting	7.0	Pass
		Proposed	1.9	Sitting	8.3	Pass
	Winter	Existing	1.9	Sitting	8.1	Pass
		Proposed	2.4	Sitting	10.4	Pass
	Annual	Existing	1.8	Sitting	7.7	Pass
		Proposed	2.1	Sitting	10.1	Pass
21	Summer	Existing	3.2	Sitting	11.9	Pass
		Proposed	3.3	Sitting	13.2	Pass
	Winter	Existing	3.5	Sitting	14.0	Pass
		Proposed	3.9	Sitting	15.6	Pass
	Annual	Existing	3.4	Sitting	13.1	Pass
		Proposed	3.6	Sitting	14.8	Pass
22	Summer	Existing	3.7	Sitting	14.2	Pass
		Proposed	3.8	Sitting	13.4	Pass
	Winter	Existing	3.8	Sitting	16.4	Pass
		Proposed	3.8	Sitting	16.1	Pass
	Annual	Existing	3.7	Sitting	15.9	Pass
		Proposed	3.8	Sitting	15.2	Pass
23	Summer	Existing	3.0	Sitting	13.1	Pass
		Proposed	3.1	Sitting	13.3	Pass
	Winter	Existing	3.6	Sitting	15.1	Pass
		Proposed	3.8	Sitting	15.6	Pass
	Annual	Existing	3.3	Sitting	14.4	Pass
		Proposed	3.5	Sitting	14.7	Pass
24	Summer	Existing	3.8	Sitting	13.8	Pass
		Proposed	3.8	Sitting	14.0	Pass
	Winter	Existing	3.9	Sitting	15.8	Pass
		Proposed	4.2	Standing	16.1	Pass
	Annual	Existing	3.9	Sitting	15.1	Pass
		Proposed	4.0	Sitting	15.6	Pass
25	Summer	Existing	3.8	Sitting	14.7	Pass
		Proposed	3.7	Sitting	14.9	Pass
	Winter	Existing	4.2	Standing	17.4	Pass
		Proposed	4.1	Standing	17.1	Pass
	Annual	Existing	4.0	Sitting	16.1	Pass
		Proposed	3.9	Sitting	16.1	Pass
26	Summer	Existing	4.0	Sitting	14.7	Pass
		Proposed	4.1	Standing	15.4	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Season	Configuration	Wind Comfort		Wind Safety	
			Speed (m/s)	Rating	Speed (m/s)	Rating
	Winter	Existing	4.2	Standing	17.6	Pass
		Proposed	4.2	Standing	17.6	Pass
	Annual	Existing	4.1	Standing	16.2	Pass
		Proposed	4.1	Standing	16.8	Pass
	Summer	Existing	3.9	Sitting	12.4	Pass
		Proposed	4.1	Standing	12.8	Pass
27	Winter	Existing	3.5	Sitting	13.7	Pass
		Proposed	3.9	Sitting	14.8	Pass
	Annual	Existing	3.7	Sitting	12.9	Pass
		Proposed	4.0	Sitting	13.9	Pass
	Summer	Existing	3.3	Sitting	11.8	Pass
		Proposed	3.3	Sitting	12.1	Pass
28	Winter	Existing	3.4	Sitting	12.8	Pass
		Proposed	3.4	Sitting	13.4	Pass
	Annual	Existing	3.4	Sitting	12.4	Pass
		Proposed	3.4	Sitting	12.8	Pass
	Summer	Existing	3.8	Sitting	14.0	Pass
		Proposed	4.0	Sitting	15.8	Pass
29	Winter	Existing	3.7	Sitting	15.4	Pass
		Proposed	4.2	Standing	17.5	Pass
	Annual	Existing	3.8	Sitting	14.8	Pass
		Proposed	4.1	Standing	17.0	Pass
	Summer	Existing	4.0	Sitting	14.1	Pass
		Proposed	4.2	Standing	17.4	Pass
30	Winter	Existing	3.5	Sitting	13.7	Pass
		Proposed	4.6	Standing	19.3	Pass
	Annual	Existing	3.8	Sitting	13.9	Pass
		Proposed	4.4	Standing	18.6	Pass
	Summer	Existing	4.1	Standing	14.6	Pass
		Proposed	4.2	Standing	15.0	Pass
31	Winter	Existing	3.8	Sitting	13.9	Pass
		Proposed	4.4	Standing	16.6	Pass
	Annual	Existing	4.0	Sitting	14.4	Pass
		Proposed	4.3	Standing	15.9	Pass
	Summer	Existing	2.7	Sitting	14.0	Pass
		Proposed	3.0	Sitting	15.4	Pass
32	Winter	Existing	3.7	Sitting	15.3	Pass
		Proposed	4.0	Sitting	17.3	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Season	Configuration	Wind Comfort		Wind Safety	
			Speed (m/s)	Rating	Speed (m/s)	Rating
	Annual	Existing	3.3	Sitting	14.9	Pass
		Proposed	3.5	Sitting	16.5	Pass
33	Summer	Existing	3.9	Sitting	11.1	Pass
		Proposed	4.1	Standing	12.8	Pass
	Winter	Existing	3.7	Sitting	12.5	Pass
		Proposed	4.3	Standing	14.9	Pass
	Annual	Existing	3.8	Sitting	11.6	Pass
		Proposed	4.2	Standing	13.9	Pass
34	Summer	Existing	2.6	Sitting	10.6	Pass
		Proposed	3.3	Sitting	18.0	Pass
	Winter	Existing	2.8	Sitting	11.5	Pass
		Proposed	5.0	Standing	19.8	Pass
	Annual	Existing	2.6	Sitting	11.0	Pass
		Proposed	4.3	Standing	18.8	Pass
35	Summer	Existing	2.3	Sitting	7.9	Pass
		Proposed	2.9	Sitting	12.9	Pass
	Winter	Existing	2.0	Sitting	7.6	Pass
		Proposed	3.7	Sitting	14.4	Pass
	Annual	Existing	2.1	Sitting	7.8	Pass
		Proposed	3.3	Sitting	13.4	Pass
36	Summer	Existing	3.6	Sitting	12.0	Pass
		Proposed	3.8	Sitting	12.5	Pass
	Winter	Existing	3.8	Sitting	14.2	Pass
		Proposed	3.9	Sitting	14.7	Pass
	Annual	Existing	3.7	Sitting	13.3	Pass
		Proposed	3.9	Sitting	14.1	Pass
37	Summer	Existing	2.9	Sitting	10.5	Pass
		Proposed	3.0	Sitting	10.6	Pass
	Winter	Existing	2.9	Sitting	11.5	Pass
		Proposed	2.9	Sitting	11.2	Pass
	Annual	Existing	2.9	Sitting	10.9	Pass
		Proposed	3.0	Sitting	10.8	Pass
38	Summer	Existing	2.6	Sitting	8.8	Pass
		Proposed	3.1	Sitting	11.3	Pass
	Winter	Existing	2.6	Sitting	10.4	Pass
		Proposed	3.6	Sitting	13.4	Pass
	Annual	Existing	2.6	Sitting	9.8	Pass
		Proposed	3.3	Sitting	12.1	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Season	Configuration	Wind Comfort		Wind Safety	
			Speed (m/s)	Rating	Speed (m/s)	Rating
39	Summer	Existing	2.6	Sitting	9.5	Pass
		Proposed	3.8	Sitting	17.0	Pass
	Winter	Existing	2.8	Sitting	10.5	Pass
		Proposed	4.9	Standing	19.8	Pass
	Annual	Existing	2.7	Sitting	10.2	Pass
		Proposed	4.5	Standing	19.0	Pass
40	Summer	Existing	2.7	Sitting	10.8	Pass
		Proposed	3.4	Sitting	16.2	Pass
	Winter	Existing	3.0	Sitting	12.3	Pass
		Proposed	4.3	Standing	18.8	Pass
	Annual	Existing	2.8	Sitting	11.6	Pass
		Proposed	3.9	Sitting	18.0	Pass
41	Summer	Existing	3.3	Sitting	12.3	Pass
		Proposed	3.2	Sitting	11.0	Pass
	Winter	Existing	3.7	Sitting	14.2	Pass
		Proposed	3.3	Sitting	12.6	Pass
	Annual	Existing	3.5	Sitting	13.3	Pass
		Proposed	3.3	Sitting	11.9	Pass
42	Summer	Existing	2.5	Sitting	11.5	Pass
		Proposed	2.7	Sitting	10.9	Pass
	Winter	Existing	3.1	Sitting	12.9	Pass
		Proposed	3.0	Sitting	13.1	Pass
	Annual	Existing	2.8	Sitting	12.5	Pass
		Proposed	2.8	Sitting	12.2	Pass
43	Summer	Existing	2.8	Sitting	9.0	Pass
		Proposed	3.1	Sitting	9.2	Pass
	Winter	Existing	2.9	Sitting	11.2	Pass
		Proposed	3.1	Sitting	10.5	Pass
	Annual	Existing	2.8	Sitting	10.6	Pass
		Proposed	3.1	Sitting	9.9	Pass
44	Summer	Existing	1.9	Sitting	5.8	Pass
		Proposed	1.9	Sitting	6.3	Pass
	Winter	Existing	1.8	Sitting	6.9	Pass
		Proposed	1.7	Sitting	6.8	Pass
	Annual	Existing	1.8	Sitting	6.4	Pass
		Proposed	1.8	Sitting	6.6	Pass
45	Summer	Existing	2.6	Sitting	10.0	Pass
		Proposed	2.6	Sitting	9.2	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Season	Configuration	Wind Comfort		Wind Safety	
			Speed (m/s)	Rating	Speed (m/s)	Rating
	Winter	Existing	2.6	Sitting	11.5	Pass
		Proposed	2.7	Sitting	11.1	Pass
	Annual	Existing	2.6	Sitting	11.0	Pass
		Proposed	2.6	Sitting	10.4	Pass
	Summer	Existing	3.0	Sitting	12.8	Pass
		Proposed	3.0	Sitting	11.8	Pass
46	Winter	Existing	3.5	Sitting	14.8	Pass
		Proposed	3.4	Sitting	13.4	Pass
	Annual	Existing	3.3	Sitting	14.0	Pass
		Proposed	3.2	Sitting	12.8	Pass
	Summer	Existing	2.8	Sitting	9.9	Pass
		Proposed	3.2	Sitting	11.7	Pass
47	Winter	Existing	2.6	Sitting	11.3	Pass
		Proposed	3.3	Sitting	13.7	Pass
	Annual	Existing	2.7	Sitting	10.7	Pass
		Proposed	3.3	Sitting	12.8	Pass
	Summer	Existing	2.6	Sitting	8.6	Pass
		Proposed	2.9	Sitting	10.7	Pass
48	Winter	Existing	2.6	Sitting	9.7	Pass
		Proposed	2.9	Sitting	13.5	Pass
	Annual	Existing	2.6	Sitting	9.4	Pass
		Proposed	2.9	Sitting	12.9	Pass
	Summer	Existing	2.6	Sitting	9.2	Pass
		Proposed	2.8	Sitting	9.2	Pass
49	Winter	Existing	2.3	Sitting	8.7	Pass
		Proposed	2.8	Sitting	10.4	Pass
	Annual	Existing	2.4	Sitting	8.9	Pass
		Proposed	2.8	Sitting	9.8	Pass
	Summer	Existing	3.1	Sitting	10.6	Pass
		Proposed	3.3	Sitting	12.4	Pass
50	Winter	Existing	3.0	Sitting	11.8	Pass
		Proposed	3.2	Sitting	14.2	Pass
	Annual	Existing	3.1	Sitting	11.2	Pass
		Proposed	3.3	Sitting	13.9	Pass
	Summer	Existing	3.0	Sitting	10.7	Pass
		Proposed	3.1	Sitting	12.1	Pass
51	Winter	Existing	3.2	Sitting	11.9	Pass
		Proposed	3.5	Sitting	14.1	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Season	Configuration	Wind Comfort		Wind Safety	
			Speed (m/s)	Rating	Speed (m/s)	Rating
	Annual	Existing	3.1	Sitting	11.6	Pass
		Proposed	3.3	Sitting	13.7	Pass
52	Summer	Existing	2.4	Sitting	9.1	Pass
		Proposed	2.9	Sitting	11.4	Pass
	Winter	Existing	2.7	Sitting	10.8	Pass
		Proposed	3.4	Sitting	13.4	Pass
	Annual	Existing	2.5	Sitting	10.0	Pass
		Proposed	3.2	Sitting	12.9	Pass
53	Summer	Existing	2.7	Sitting	14.3	Pass
		Proposed	3.2	Sitting	14.1	Pass
	Winter	Existing	4.1	Standing	15.5	Pass
		Proposed	4.3	Standing	16.4	Pass
	Annual	Existing	3.5	Sitting	15.0	Pass
		Proposed	3.9	Sitting	15.2	Pass
54	Summer	Existing	2.8	Sitting	11.8	Pass
		Proposed	3.0	Sitting	15.5	Pass
	Winter	Existing	3.4	Sitting	14.0	Pass
		Proposed	3.8	Sitting	18.3	Pass
	Annual	Existing	3.0	Sitting	13.3	Pass
		Proposed	3.5	Sitting	17.8	Pass
55	Summer	Existing	3.1	Sitting	12.8	Pass
		Proposed	3.4	Sitting	13.0	Pass
	Winter	Existing	3.4	Sitting	14.8	Pass
		Proposed	3.7	Sitting	15.6	Pass
	Annual	Existing	3.3	Sitting	14.4	Pass
		Proposed	3.6	Sitting	15.3	Pass
56	Summer	Existing	2.4	Sitting	8.5	Pass
		Proposed	2.5	Sitting	10.9	Pass
	Winter	Existing	2.6	Sitting	10.1	Pass
		Proposed	3.2	Sitting	11.9	Pass
	Annual	Existing	2.5	Sitting	9.3	Pass
		Proposed	2.9	Sitting	11.3	Pass
57	Summer	Existing	2.4	Sitting	8.9	Pass
		Proposed	2.4	Sitting	8.4	Pass
	Winter	Existing	2.5	Sitting	10.0	Pass
		Proposed	2.7	Sitting	10.1	Pass
	Annual	Existing	2.5	Sitting	9.7	Pass
		Proposed	2.6	Sitting	9.5	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Season	Configuration	Wind Comfort		Wind Safety	
			Speed (m/s)	Rating	Speed (m/s)	Rating
58	Summer	Existing	2.0	Sitting	6.7	Pass
		Proposed	2.3	Sitting	6.6	Pass
	Winter	Existing	2.1	Sitting	8.0	Pass
		Proposed	2.3	Sitting	8.0	Pass
	Annual	Existing	2.1	Sitting	7.5	Pass
		Proposed	2.3	Sitting	7.4	Pass
59	Summer	Existing	2.5	Sitting	12.4	Pass
		Proposed	2.7	Sitting	12.9	Pass
	Winter	Existing	3.4	Sitting	13.2	Pass
		Proposed	3.6	Sitting	13.3	Pass
	Annual	Existing	3.1	Sitting	13.0	Pass
		Proposed	3.1	Sitting	13.2	Pass
60	Summer	Existing	-	N/A	-	N/A
		Proposed	5.1	Standing	21.4	Pass
	Winter	Existing	-	N/A	-	N/A
		Proposed	6.6	Walking	24.4	Exceeded
	Annual	Existing	-	N/A	-	N/A
		Proposed	5.9	Standing	22.9	Pass
61	Summer	Existing	-	N/A	-	N/A
		Proposed	3.9	Sitting	18.1	Pass
	Winter	Existing	-	N/A	-	N/A
		Proposed	5.4	Standing	20.4	Pass
	Annual	Existing	-	N/A	-	N/A
		Proposed	4.9	Standing	18.9	Pass
62	Summer	Existing	-	N/A	-	N/A
		Proposed	3.5	Sitting	15.2	Pass
	Winter	Existing	-	N/A	-	N/A
		Proposed	4.6	Standing	17.6	Pass
	Annual	Existing	-	N/A	-	N/A
		Proposed	4.1	Standing	16.5	Pass
63	Summer	Existing	-	N/A	-	N/A
		Proposed	4.5	Standing	19.6	Pass
	Winter	Existing	-	N/A	-	N/A
		Proposed	5.9	Standing	22.8	Pass
	Annual	Existing	-	N/A	-	N/A
		Proposed	5.3	Standing	22.1	Pass
64	Summer	Existing	-	N/A	-	N/A
		Proposed	3.6	Sitting	19.6	Pass

Table 1: Pedestrian Wind Comfort and Safety Conditions

Location	Season	Configuration	Wind Comfort		Wind Safety	
			Speed (m/s)	Rating	Speed (m/s)	Rating
	Winter	Existing Proposed	- 5.3	N/A Standing	- 20.8	N/A Pass
	Annual	Existing Proposed	- 4.6	N/A Standing	- 20.1	N/A Pass
65	Summer	Existing Proposed	- 4.2	N/A Standing	- 16.6	N/A Pass
	Winter	Existing Proposed	- 5.3	N/A Standing	- 20.0	N/A Pass
	Annual	Existing Proposed	- 4.9	N/A Standing	- 18.6	N/A Pass

Seasons	Months	Hours	Wind Comfort (m/s)		Wind Safety (m/s)	
Summer	November - April	6:00 - 22:00	< 4	Sitting	≤ 24	Pass
Winter	May - October	6:00 - 22:00	≤ 6	Standing	> 24	Exceeded
Annual	January - December	6:00 - 22:00	≤ 8	Walking		
			> 8	Uncomfortable		

Configurations	
Existing	Existing site and surroundings
Proposed	Project with existing surroundings