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Assemble SRC Development Nominee Pty Ltd

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511-537 Sydney Road, Coburg



Wind Impact Statement



30N-23-0061-TNT-56171-4

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29 February 2024

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Executive Summary

Assemble SRC Development Nominee Pty Ltd commissioned Vipac Engineers and Scientists Ltd to prepare a statement of wind effects for the ground level areas adjacent to the proposed development at **511-537 Sydney Road, Coburg**. This appraisal is based on Vipac's experience as a wind-engineering consultancy.

Updated drawings of the proposed development were provided by **Jackson Clement Burrows Architects** in **February 2023**.

The findings of this study can be summarized as follows:

With proposed design:

- Wind conditions in the ground level footpath areas and access ways would be expected to be within the **walking** comfort criterion;
- Wind conditions at the main entrances would be expected to be within the **standing** comfort criterion;
- Wind conditions in the Level 3 courtyard would be expected to be within the **standing** comfort criterion;
- Wind conditions at the Level 9 communal terraces are expected to be within the recommended **walking / standing** comfort criteria;
- Wind conditions at the terraces and balconies would be expected to be within the recommended **walking** comfort criterion; and
- the proposed development is expected to generate the wind conditions within **safety** criterion.

As a general statement, educating occupants about wind conditions at open terrace/balcony areas during high-wind events and fixing loose, lightweight furniture on the terrace are highly recommended.

The assessments provided in this report have been made based on experience of similar situations in Melbourne and around the world. As with any opinion, it is possible that an assessment of wind effects based on experience and without experimental validation may not account for all complex flow scenarios in the vicinity.

Vipac recommends a scaled wind tunnel study be conducted at the detail design stage to quantify the wind conditions and determine the proper wind control measures wherever necessary.

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1 Introduction

Vipac Engineers and Scientists has been commissioned by **Assemble SRC Development Nominee Pty Ltd** to carry out an appraisal of the pedestrian wind effects at the ground level of the proposed development at **511-537 Sydney Road, Coburg**.

Strong winds in pedestrian areas are frequently encountered in central business districts of cities around the world; including Sydney, Melbourne and Brisbane. Wind characteristics such as the mean speed, turbulence and ambient temperature determine the extent of disturbance to users of pedestrian areas. These disturbances can cause both comfort and safety problems and require careful consideration to mitigate successfully.

The proposed development is a residential development comprising of twin towers with a common podium, with the height of northern tower at 49.75m from street level and the southern tower at 46.7m. The site is bounded by an empty lot to the north, Sydney Road to the east, Ross Street to the west and existing development to the south. A satellite image of the proposed development site and the east elevation of the building are shown in Figure 1 and Figure 2, respectively.

This report details the opinion of Vipac as an experienced wind engineering consultancy regarding the wind effects in ground level footpath areas adjacent to the development as proposed. No wind tunnel testing has been carried out for this development at this stage. Vipac has carried out wind tunnel studies on a large number of developments of similar shape and having similar exposure to that of the proposed development. These serve as a valid reference for the prediction of wind effects. Empirical data for typical buildings in boundary layer flows has also been used to estimate the likely wind conditions on the ground level areas of the proposed development [2] & [3].

Updated drawings of the proposed development were supplied to Vipac by **Jackson Clement Burrows Architects** in **February 2023**. A list of drawings supplied is provided in Appendix C of this report.



Figure 1: Aerial view of the proposed development site.

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Figure 2: East elevation of the proposed development.

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2 Analysis Approach

In assessing whether a proposed development is likely to generate adverse wind conditions in ground level footpath areas, Vipac has considered the following five main points:

- The exposure of the proposed development to wind;
- The regional wind climate;
- The geometry and orientation of the proposed development;
- The interaction of flows with adjacent developments; and
- The assessment criteria determined by the intended use of the areas affected by wind flows generated or augmented by the proposed development.

The pedestrian wind comfort at specific locations of ground level footpath areas may be assessed by predicting the gust and mean wind speeds with a probability of 0.1% and 20% expected at that location. The location may be deemed generally acceptable for its intended use while gust and mean wind speeds are within the threshold values noted in Section 2.5. Where Vipac predicts that a location would not meet its appropriate comfort criterion, the use of wind control devices and/or local building geometry modifications to achieve the desired comfort rating may be recommended. For complex flow scenarios or where predicted flow conditions are well in excess of the recommended criteria, Vipac recommends scale model wind tunnel testing to determine the type and scope of the wind control measures required to achieve acceptable wind conditions.

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2.1 Site Exposure

The proposed development is located on a relatively flat terrain. The site is surrounded within an approximately 3km radius predominately by low to mid-rise developments, and Coburg Lake Reserve to the north. A satellite image showing these site surroundings is shown in Figure 3.

Considering the immediate surroundings and terrain, for the purposes of this study, the site of the proposed development is assumed to be within Terrain Category 3 for all wind directions (Figure 3).

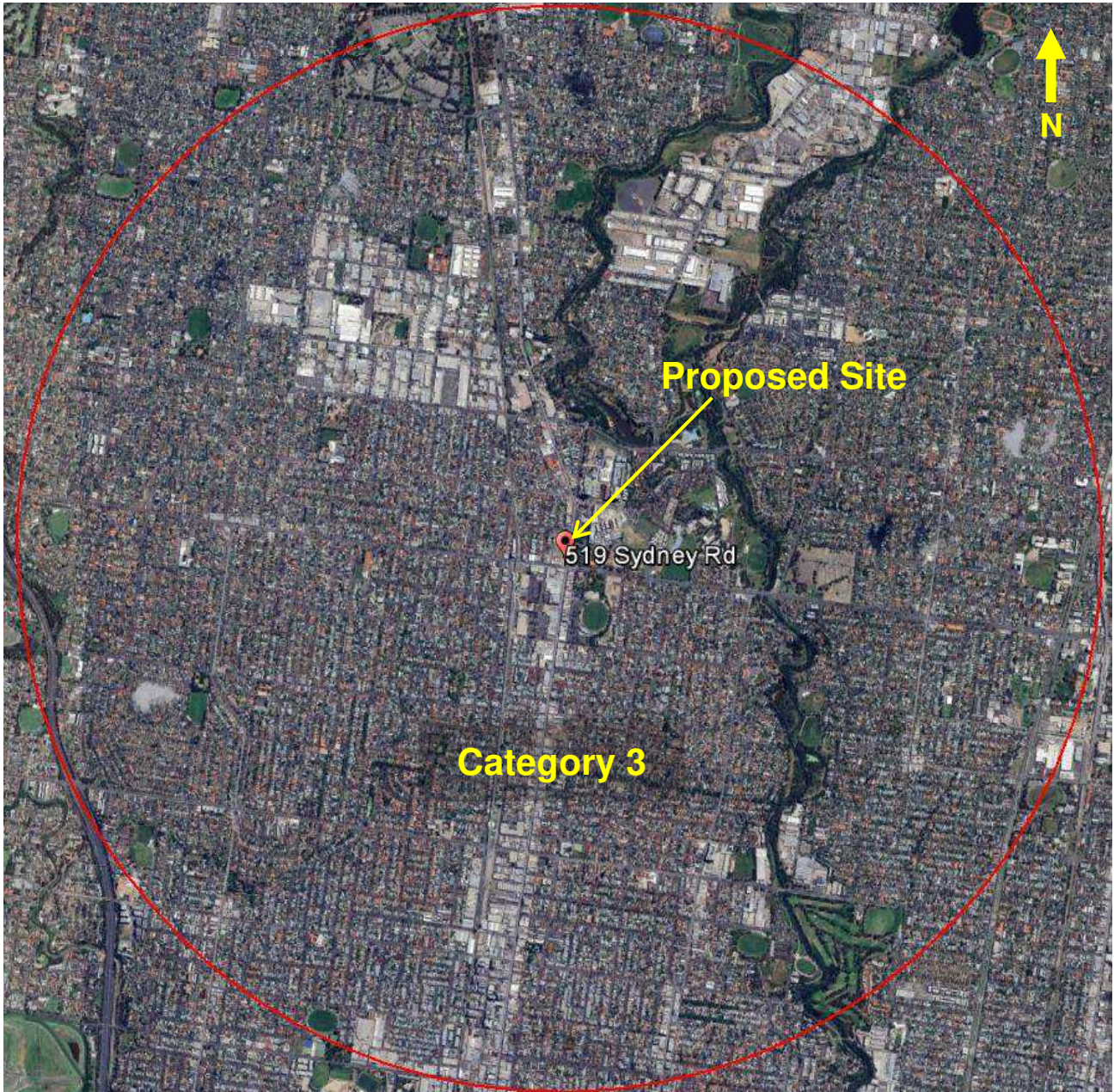


Figure 3: Assumed terrain categories for wind speed estimation.

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2.2 Regional Wind Climate

The mean and gust wind speeds have been recorded in the Melbourne area for over 30 years. This data has been analysed and the directional probability distribution of wind speeds has been determined. The directional distribution of hourly mean wind speed at the gradient height, with a probability of 0.1% of time and 20% of time exceeded are shown in Figure 4. The wind data at this free stream height is common to all Melbourne city sites and may be used as a reference to assess ground level wind conditions at the site.

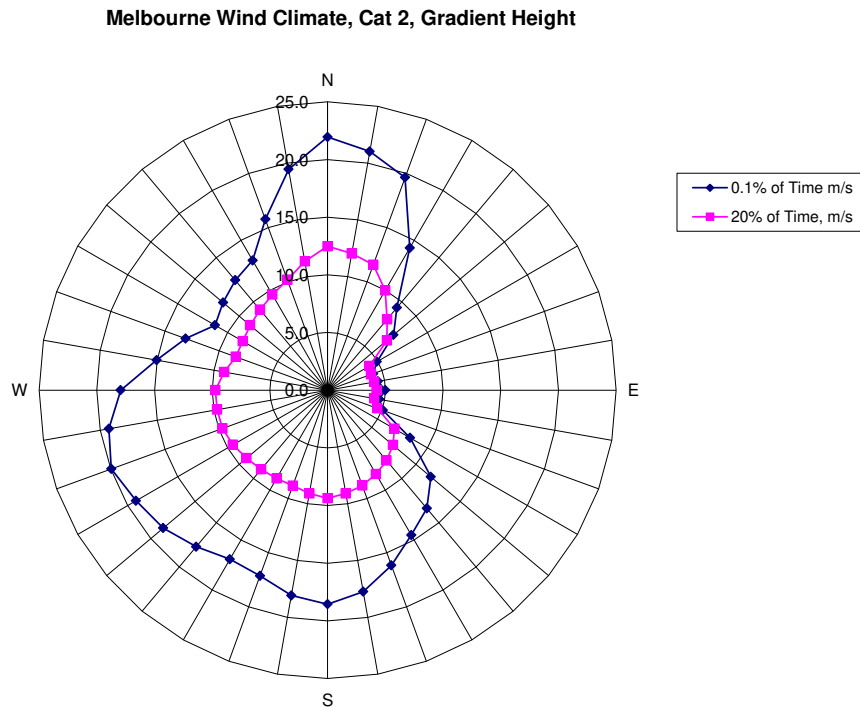


Figure 4: Directional Distribution of Mean Hourly Wind Velocities (m/s) for 0.1% and 20% exceeded at Gradient Height for Melbourne.

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2.3 Building Geometry and Orientation

The proposed development is a residential building comprising of twin towers with a common podium. The overall plan-form dimensions are approximately 67m x 75m as shown in Figure 5. The main entrances are located throughout the site.

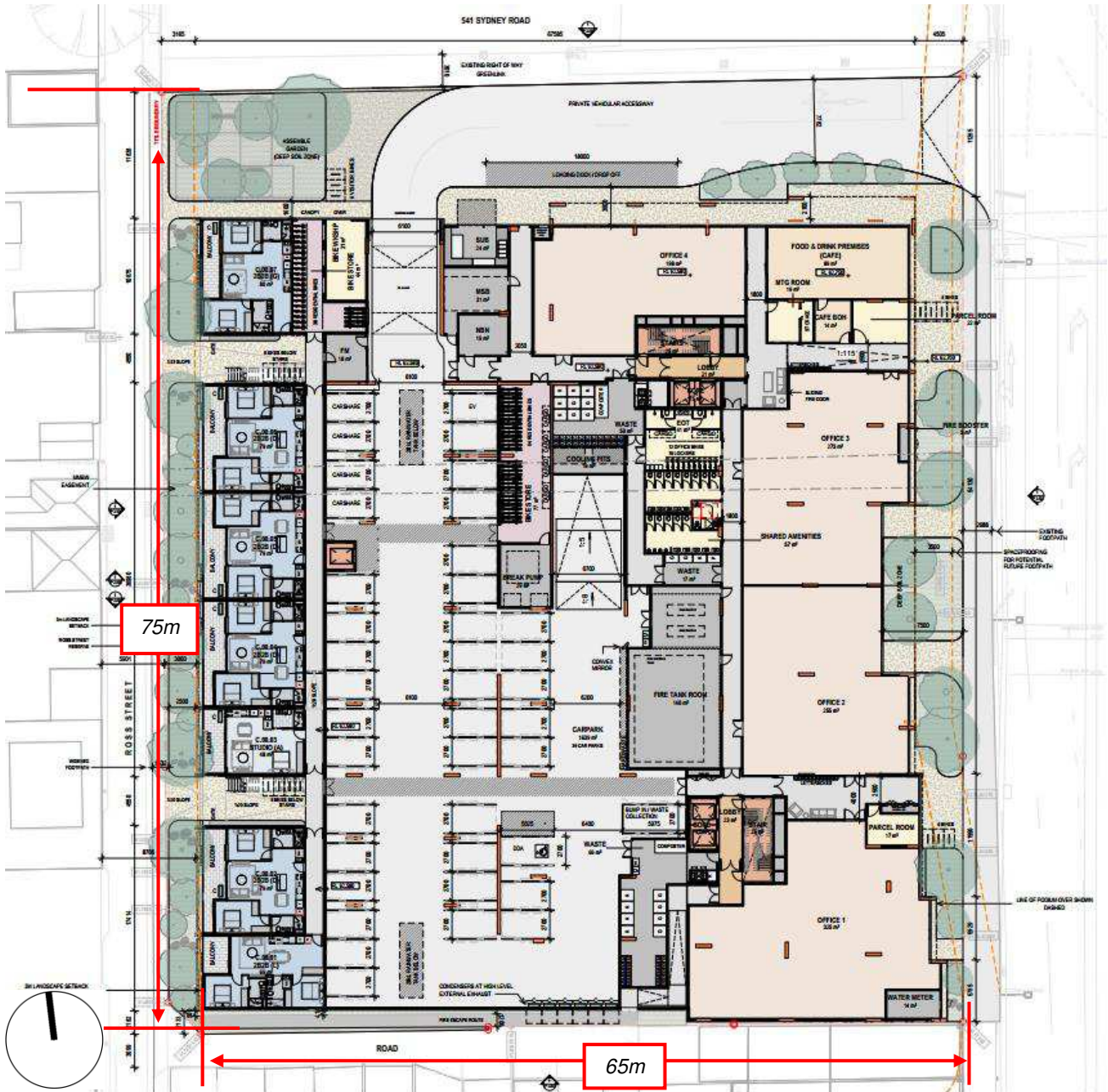


Figure 5: Ground floor plans with the plan-form dimensions overlaid.

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2.4 Flow interactions with Adjacent Developments

The immediately adjacent developments are shown in Figure 6. At ground level, the site is exposed to direct winds from the northerly directions channelling along Sydney Road. The building is oriented such that adverse impacts from corner acceleration of northerly winds is expected at ground level. The development is taller than the surrounding buildings and so is exposed to winds from all directions at the upper levels.



Figure 6: Immediately adjacent surroundings and their approximate number of storeys (S).

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2.5 Assessment Criteria

The following wind comfort criteria detailed in Table 1 were applied in this study.

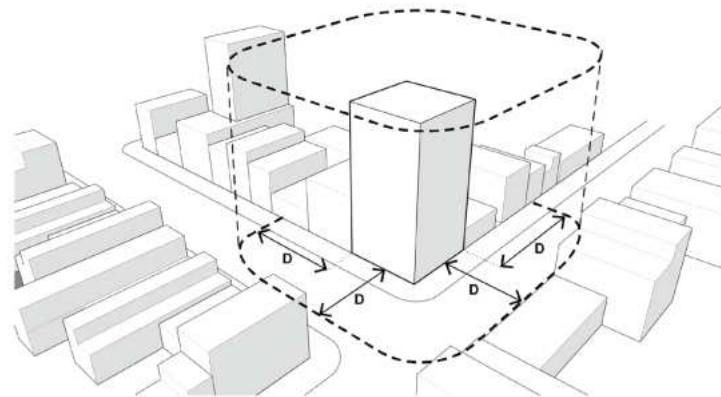
Table 1: Wind Comfort Criteria as per Clause 58.04-4

Unsafe	Comfortable
Annual maximum 3 second gust wind speed exceeding 20m/sec with a probability of exceedance of 0.1% considering at least 16 wind directions.	Hourly mean wind speed or gust equivalent mean speed from all wind directions combined with probability of exceedance less than 20% of the time, equal to or less than: 3m/sec for sitting areas (outdoor cafés) 4m/sec for standing areas (window shopping, queuing) 5m/sec for walking areas (steady steps for most pedestrians)

This criterion specifically calls for the safety criterion to be used to assess infrequent winds (e.g. peak event of $\leq 0.1\%$ of the time); and the perceived pedestrian comfort to be assessed based on frequently occurring winds (e.g. winds that occurs 80% of the time).

In Table 1, the mean wind velocity is defined as the maximum of hourly mean or gust equivalent mean (Gust/1.85)

This criteria specifies that safe and comfortable wind conditions must be achieved in publicly accessible areas within a distance equal to half the longest width of the building measured from all facades or half the overall height of the building, whichever is greater, as shown in Figure 7.



ASSESSMENT DISTANCE D = GREATER OF:
 L/2 (HALF LONGEST WIDTH OF BUILDING) OR
 H/2 (HALF OVERALL HEIGHT OF BUILDING)

Figure 7: Assessment distance.

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2.5.1 Use of Adjacent Pedestrian Occupied Areas & Recommended Comfort Criteria

The following table lists the specific areas adjacent to the proposed development and the corresponding recommended criteria.

Table 2: Recommended application of criteria

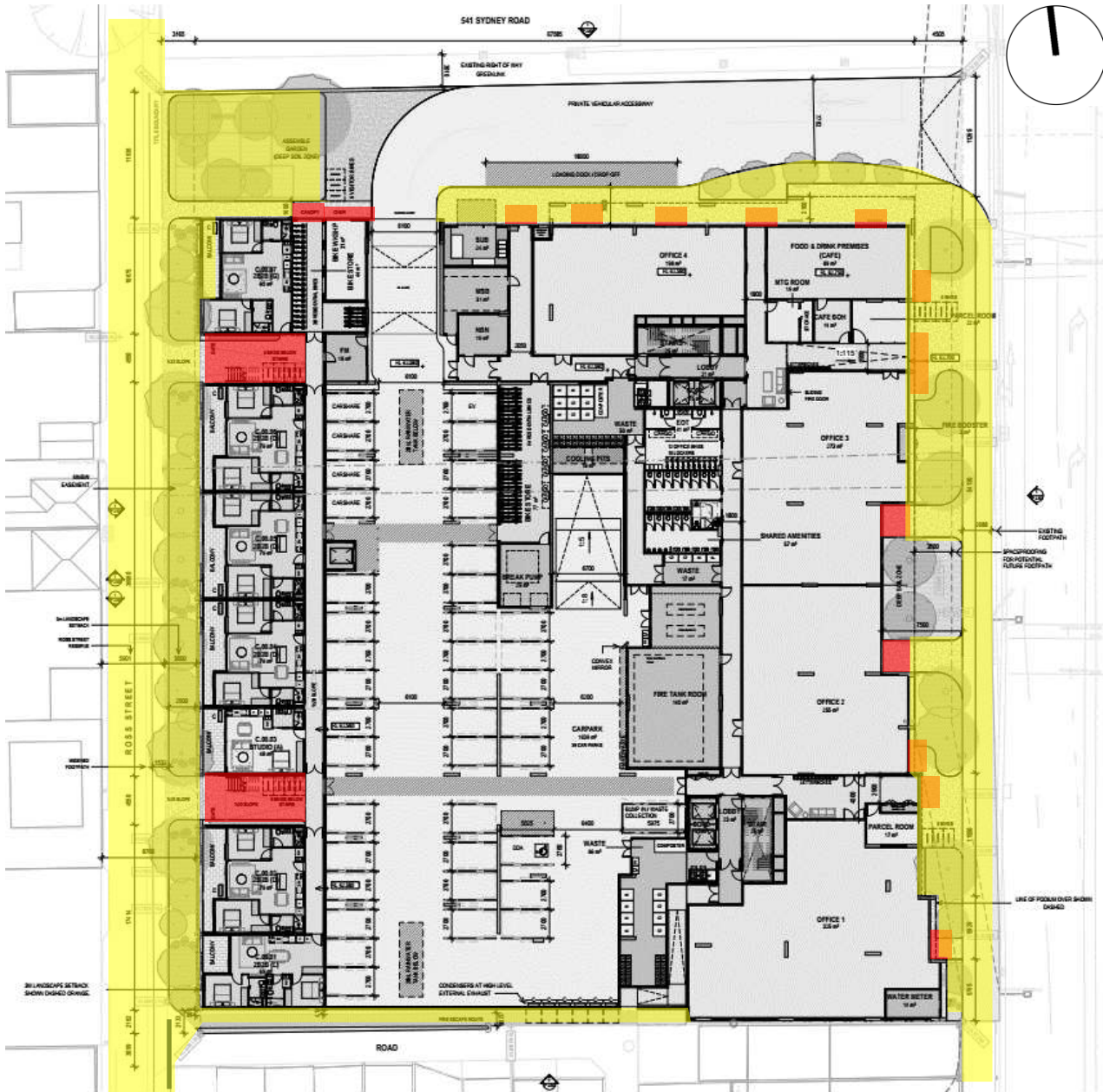
Area	Specific location	Recommended Criteria
Public Footpaths, Access ways	Along Sydney Road and Ross Street (Figure 8)	Walking
Assemble Garden	North west of site (Figure 8)	Walking
Building Entrances	Main building entrances throughout (Figure 8)	Standing
Podium Courtyard	Level 3 (Figure 9)	Standing
Outdoor Communal Areas	Level 9 (Figure 10)	Standing
Balcony/Terraces	Up the height of the building	Walking (See discussion below)

2.5.2 Terrace / Balcony Recommended Criterion Discussion

There are Private Balconies and Terraces located up the height of the development. Vipac recommends as a minimum that balcony/terrace areas meet the criterion for walking since:

- these areas are not public spaces;
- the use of these areas is optional, and only intended to be used on fair weather days with calm winds;
- many similar developments in Melbourne and other Australian capital cities experience wind conditions on balconies and elevated deck areas in the vicinity of the criterion for walking.

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Recommended to fulfil Walking Recommended to fulfil Standing

Figure 8: Ground floor plan with recommended wind criteria overlaid.

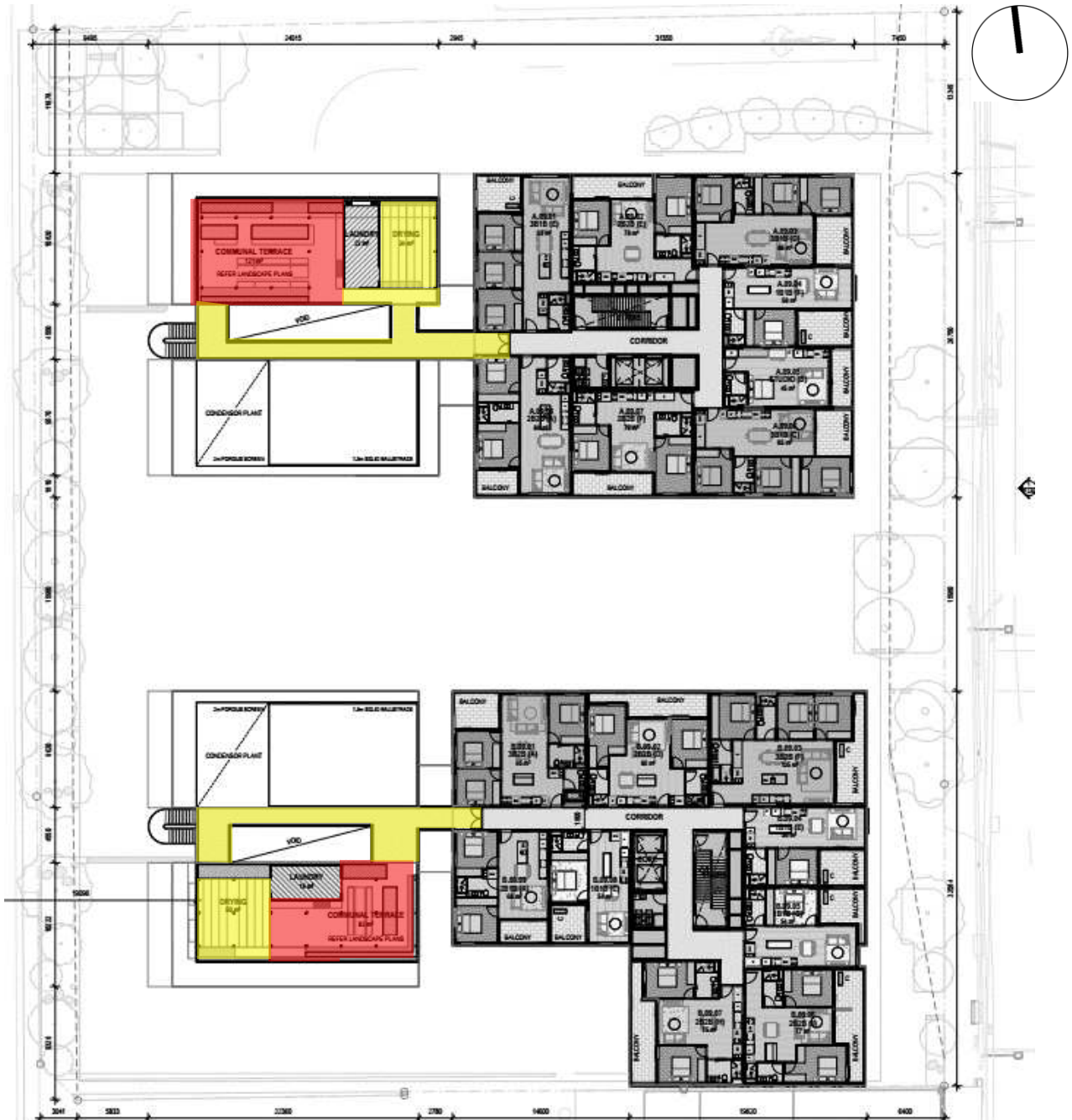
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Recommended to fulfil Standing

Figure 9: Level 3 plan with recommended wind criteria overlaid.

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Recommended to fulfil Walking Recommended to fulfil Standing

Figure 10: Level 9 plan with recommended wind criteria overlaid.

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3 Pedestrian Level Wind Effects

3.1 Discussion & Recommendations

Due to the proposed height above the surrounding areas, the proposed development is particularly exposed to adverse northerly, westerly and southerly winds. Such that high wind levels are expected along Sydney Road and Ross Street. However, the proposed development has a setback tower design from level 3 upwards, which are expected to be beneficial to the wind environment on the ground level. As such that the surrounding pedestrian streetscape is expected to be within the recommended walking comfort criterion.

The Assemble Garden at north west of site is exposed to direct northerly winds. Some elevated wind levels are expected at this location, and further investigations are recommended via wind tunnel testing.

The main entrances along Sydney Road are exposed to channelling northerly winds, however, are shielded by the protruding colonnades and the canopy above. The entrance along Sydney Road to the Assemble Café (north eastern of site) is expected to receive sufficient shielding from any adverse corner acceleration effects from the canopy above as well as the colonnade along the north. The entrances to the bike store and bike workshop are shielded from downwash action of northerly winds by the proposed canopies. Such that wind speeds at all main entrances are expected to be within the recommended standing comfort criterion.

The level 3 central courtyard is exposed to adverse westerly / south westerly winds channelling between the tower forms. This area has a number of design features that are expected to be beneficial to the wind environment. This is inclusive of but not limited to, the following:

- Approximately 3m high Assemble units;
- Pergola over deck;
- 1.1m high raised planters (Figure 11) and 1.5m high solid balustrades along the west;
- High, dense landscaping and 0.8m high mounded garden beds throughout the area (Figure 11); and
- Covered walkway. 2.5m high, solid balustrade along the perimeter before the channelling point of the westerly winds; and
- Western pergola to have a maximum 40% porosity.

The Level 9 communal terraces are shielded by the Services Plant and the development itself, these areas are still relatively exposed. The solid balustrades are 1.5 and 2m high porous screening (maximum 40% porosity) around the services plant are expected to be beneficial to the wind environment. Such that the wind levels are expected to be within the recommended standing and walking comfort criterion

Due to the small dimensions and setback nature of the private balconies, wind speeds are expected to be within the recommended walking comfort criterion.

The proposed development would be expected to have wind conditions within the safety criterion.

It should be noted that this study is based on experience only and has not utilised any experimental data for the analysis.

Vipac recommends a scaled wind tunnel study be conducted at the detail design stage to quantify the wind conditions and determine the proper wind control measures wherever necessary.

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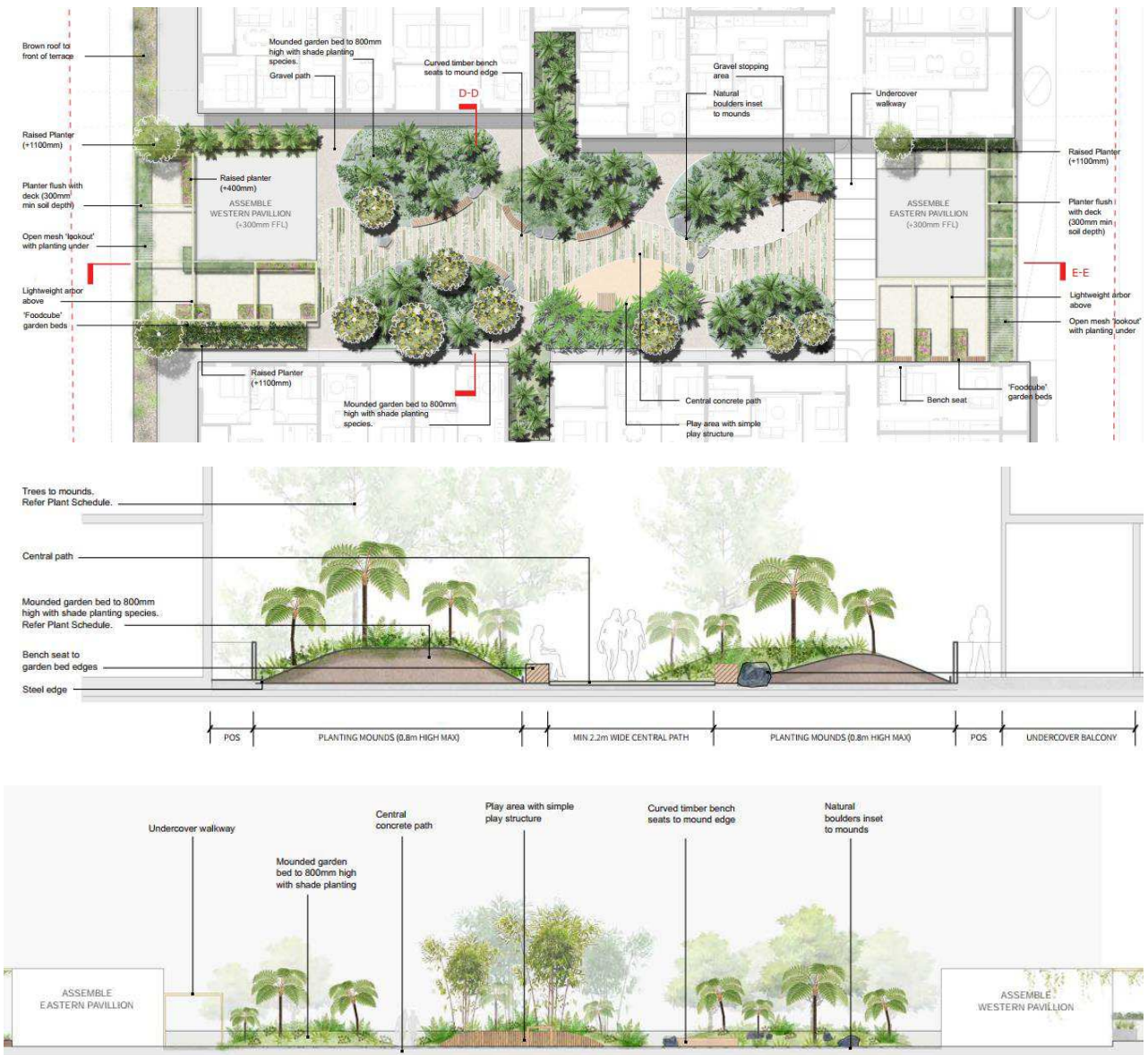


Figure 11: Landscaping plan of the level 3 courtyard.

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4 Conclusions

An appraisal of the likely wind conditions at the pedestrian ground level and terrace areas of the proposed development at **511-537 Sydney Road, Coburg** has been made.

Vipac has carefully considered the form and exposure of the proposed development, nominated criteria for various public areas according to their function and referred to past experience to produce our opinion of likely wind conditions.

The findings of this study can be summarised as follows:

With proposed design:

- Wind conditions in the ground level footpath areas and access ways would be expected to be within the **walking** comfort criterion;
- Wind conditions at the main entrances would be expected to be within the **standing** comfort criterion;
- Wind conditions in the Level 3 courtyard would be expected to be within the **standing** comfort criterion
- Wind conditions at the Level 9 communal terraces are expected to be within the recommended **walking / standing** comfort criteria
- Wind conditions at the terraces and balconies would be expected to be within the recommended **walking** comfort criterion; and
- the proposed development is expected to generate the wind conditions within **safety** criterion.

As a general statement, educating occupants about wind conditions at open terrace/balcony areas during high-wind events and fixing loose, lightweight furniture on the terrace are highly recommended.

The assessments provided in this report have been made based on experience of similar situations in Melbourne and around the world. As with any opinion, it is possible that an assessment of wind effects based on experience and without experimental validation may not account for all complex flow scenarios in the vicinity.

Vipac recommends a scaled wind tunnel study be conducted at the detail design stage to quantify the wind conditions and determine the proper wind control measures wherever necessary.

This Report has been Prepared

For

Assemble SRC Development Nominee Pty Ltd

By

VIPAC ENGINEERS & SCIENTISTS PTY LTD.

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Appendix A Environmental Wind Effects

Atmospheric Boundary Layer

As wind flows over the earth it encounters various roughness elements and terrain such as water, forests, houses and buildings. To varying degrees, these elements reduce the mean wind speed at low elevations and increase air turbulence. The wind above these obstructions travels with unattenuated velocity, driven by atmospheric pressure gradients. The resultant increase in wind speed with height above ground is known as a wind velocity profile. When this wind profile encounters a tall building, some of the fast-moving wind at upper elevations is diverted down to ground level resulting in local adverse wind effects.

The terminology used to describe the wind flow patterns around the proposed development is based on the aerodynamic mechanism, direction and nature of the wind flow.

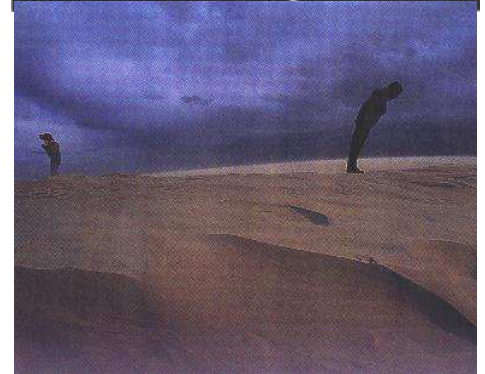
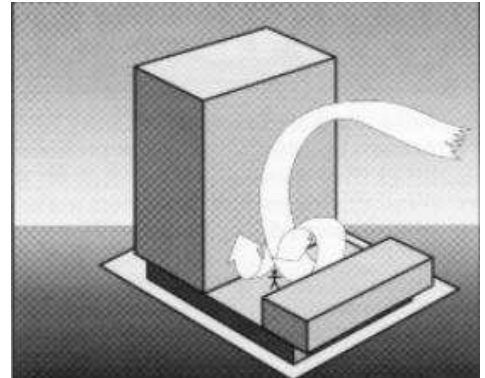
Downwash – refers to a flow of air down the exposed face of a tower. A tall tower can deflect a fast-moving wind at higher elevations downwards.

Corner Accelerations – when wind flows around the corner of a building it tends to accelerate in a similar manner to airflow over the top of an aeroplane wing.

Flow separation – when wind flowing along a surface suddenly detaches from that surface and the resultant energy dissipation produces increased turbulence in the flow. Flow separation at a building corner or at a solid screen can result in gusty conditions.

Flow channelling – the well-known “street canyon” effect occurs when a large volume of air is funnelled through a constricted pathway. To maintain flow continuity the wind must speed up as it passes through the constriction. Examples of this might occur between two towers, in a narrowing street or under a bridge.

Direct Exposure – a location with little upstream shielding for a wind direction of interest. The location will be exposed to the unabated mean wind and gust velocity. Piers and open water frontage may have such exposure.



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Appendix B References

- [1] *Structural Design Actions, Part 2: Wind Actions*, Australian/New Zealand Standard 1170.2:2021
- [2] *Wind Effects on Structures* E. Simiu, R Scanlan, Publisher: Wiley-Interscience
- [3] *Architectural Aerodynamics* R. Aynsley, W. Melbourne, B. Vickery, Publisher: Applied Science Publishers

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Appendix C Drawings List

Drawings received: **February 2023**

ARCHITECTURAL

TP 0-000 COVER PAGE 3
TP 0-102 SITE PLAN - PROPOSED
TP 1-102 LEVEL 00 GROUND FLOOR PLAN
TP 1-102b LEVEL 00 GROUND FLOOR PLAN - PAO CONDITION
TP 1-103 LEVEL 01 PLAN
TP 1-104 LEVEL 02 PLAN
TP 1-105 LEVEL 03 PLAN
TP 1-106 LEVEL 04 PLAN
TP 1-107 LEVEL 05 PLAN
TP 1-108 LEVEL 06 PLAN
TP 1-109 LEVEL 07 PLAN
TP 1-110 LEVEL 08 PLAN
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TP 1-112 LEVEL 10 PLAN
TP 1-113 LEVEL 11 PLAN
TP 1-114 LEVEL 12 PLAN
TP 1-115 LEVEL 13 PLAN
TP 1-116 LEVEL 14 PLAN
TP 1-117 LEVEL 15 PLAN
TP 1-118 ROOF
TP 2-101 NORTH ELEVATION
TP 2-102 EAST ELEVATION
TP 2-103 SOUTH ELEVATION
TP 2-104 WEST ELEVATION
TP 2-105 COURTYARD- SOUTH ELEVATION
TP 2-106 COURTYARD- NORTH ELEVATION
TP 3-101 SECTION AA
TP 3-102 SECTION BB
TP 3-103 SECTION CC

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LANDSCAPE DRAWINGS

LD00	Title Sheet
LD01	Technical Notes
LD02	Location Plan
LD03	Ground Floor Plan
LD04	Ground Floor Sections
LD05	Ground Floor Sections
LD06	Ground Floor - Pocket Park Blow-up Plan
LD07	Ground Floor - Pocket Park Section
LD08	Level 03 Plan 01/02
LD09	Level 03 Plan 02/02
LD10	Level 03 Sections
LD11	Level 03 Sections
LD 12	Level 09 Northern Roof Terrace Plan
LD 13	Level 09 Northern Roof Terrace Section
LD 14	Level 09 Southern Roof Terrace Plan
LD 15	Level 09 Southern Terrace Section
LD 16	Typical Details
LD 17	Typical Details
LD 18	Typical Details
LD 19	Planting Palette
LD 20	Planting Palette
LD 21	Planting Palette
LD22	Planting Palette
LD23	Planting Palette
LD24	Planting Schedule
LD25	Material Palette
LD26	Artist Impression - Ground Floor - Sydney Rd
LD27	Artist Impression - Level 03 - Central Courtyard

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