

Natural Ventilation Statement
for the proposed development at
23-37 Lindfield Avenue, Lindfield

April 10, 2011

Report Reference No. WA869-02F01(rev0)- NV Report

Document Control

Revision Number	Date	Revision History	Prepared By (initials)	Reviewed & Authorised By (initials)
0	10/04/2011	Revised for the updated drawings	TH	TR

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1.0 Introduction

This report presents an opinion on the natural ventilation characteristics of the various residential units of the proposed development located at 23-37 Lindfield Avenue, Lindfield.

The conclusions of this report are drawn from our extensive experience in this field and are based on an examination of the architectural drawings prepared by PTI Architecture, dated April 2011. The results of the study are compared to the wind-driven natural ventilation criteria detailed in the State Environmental Planning Policy No. 65 (SEPP65).

No wind tunnel tests have been undertaken for the subject development. As such, this report addresses only the general wind effects and any localised effects that are identifiable by visual inspection. Any recommendations in this report are made only in-principle and are based on our extensive experience in the study of wind-driven natural ventilation effects.

2.0 Sydney Wind Climate

Natural ventilation in Sydney is most important during the summer months of the year, which is when the occupants of the residential units of the proposed development are expected to take advantage of this effect. The local climate for Sydney during these months is dominated by north-easterly and southerly winds, as indicated in Table 1. During winter the westerly winds tend to dominate. Wind roses for the Sydney region (recorded at Kingsford Smith Airport) are also presented in the attached Appendix A. An analysis of the Sydney wind climate data for the 6 warmer months of the year (October to March), indicates the north-easterly winds account for 39% of all occurrences, and the southerly winds for 43% of all occurrences.

Table 1: Principal Time of Occurrence of Winds – Sydney Region

Month	Wind Direction		
	North-Easterly	Southerly	Westerly
January	X	X	
February	X	X	
March	X	X	
April		X	X
May			X

Table 1: Principal Time of Occurrence of Winds – Sydney Region (cont..)

Month	Wind Direction		
	North-Easterly	Southerly	Westerly
June			X
July			X
August			X
September		X	X
October	X	X	
November	X	X	
December	X	X	

3.0 Natural Ventilation Criteria

Natural ventilation is effective when the occupant of the building chooses to benefit from the effects by opening windows to allow airflow through the occupied area. As such, natural ventilation is more beneficial during the warmer months of the year when the occupant will have openings to their unit open, while during the winter months it is considered more beneficial for air quality purposes. The predominant wind directions for the Sydney region has been analysed in Section 2.0. From this analysis, only the north-easterly and southerly winds should be considered as the predominant wind directions that contribute to natural ventilation for the warmer months of the year, since these are the predominant wind directions for the Sydney region for the warmer months of the year. The westerly winds are more predominant during the cooler winter months and would be primarily beneficial for an air quality perspective.

The NSW State Environmental Planning Policy No. 65 (SEPP65) defines that for a development to be considered naturally ventilated it is required that 60% of the individual units of the development be considered naturally ventilated. For a unit to be considered naturally ventilated, it is required that they perform to the minimum performance of a double-ended unit or corner unit with effective openings either on orthogonal aspects or opposite aspects, providing good cross ventilation as indicated in Figure 1a and 1b from SEPP65.

In addition to the analysis of SEPP65 compliance, an assessment for natural ventilation is presented based on wind tunnel testing of numerous developments. This alternative assessment is structured around an alternative set of criteria to determine the number of units which are expected to achieve similar performance to those units that are deemed to satisfy the SEPP65 requirements. This alternative set of criteria considers the predominant wind directions for the area during the warmer months of the year and the ability of

the façade profile to achieve sufficient pressure differential between openings to the living and bedroom spaces within the dwelling.

Four key criteria have been formulated in the alternative approach and are listed below:

- (i) The individual unit needs to have openings located either on orthogonal aspects or opposite aspects. **(SEPP65 Requirement)**
- (ii) One of the aspects of the individual unit needs to have openings either facing or orthogonal to the north-easterly direction, with minimal obstruction. In the case of a single-aspect unit the prevailing wind direction needs to be form an obtuse angle.
- (iii) One of the aspects of the individual unit needs to have openings either facing or orthogonal to the southerly direction, with minimal obstruction. In the case of a single-aspect unit the prevailing wind direction needs to be form an obtuse angle.
- (iv) The façade of the single aspect unit with window openings to the living area needs to be stepped (in or out) by at least 2 metres. The setback in the window opening locations needs to be such that it can generate a positive pressure at one opening and a neutral or negative pressure at the other opening.

If the dwelling satisfies **Criterion i**, it is deemed to satisfy the requirements of SEPP65.

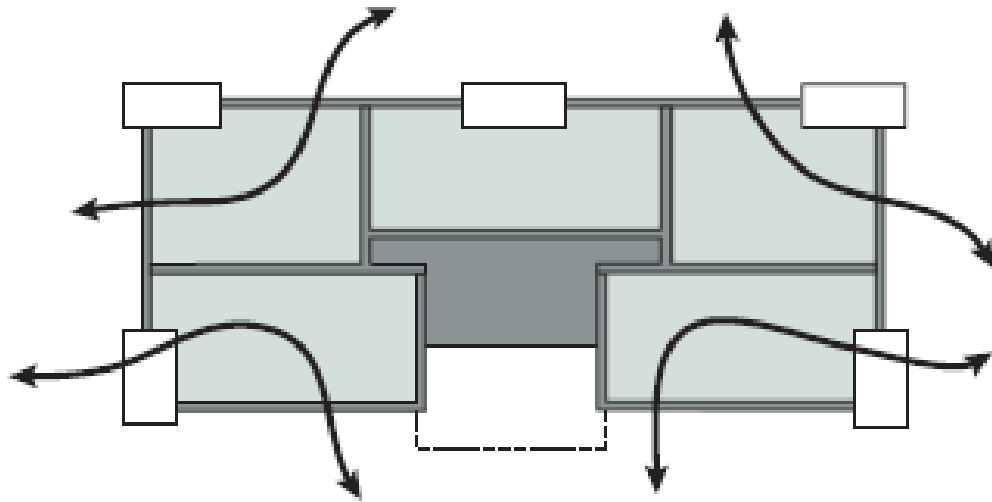
If a unit satisfies **all four criteria** then it is considered to have **excellent** natural ventilation characteristics.

If a unit satisfies **Criterion i** as well as **Criterion ii** or **iii** then it is considered to have **very good** natural ventilation characteristics.

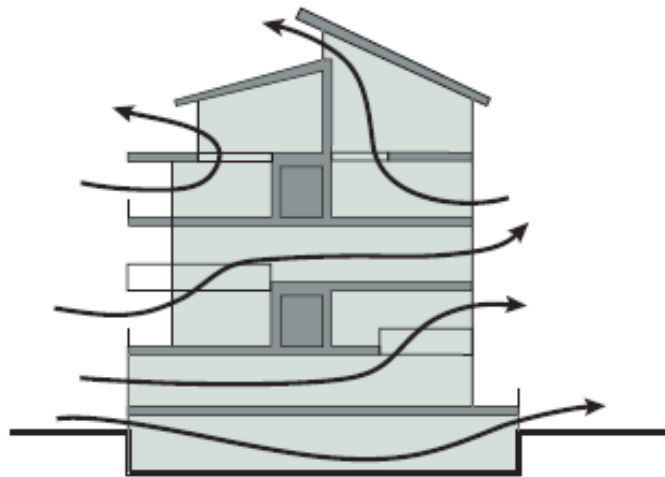
If a unit satisfies **Criterion i** only, or if the unit satisfies **Criterion iv** as well as **Criterion ii** or **iii** then it is considered to have **good** natural ventilation characteristics.

If a unit satisfies one or both of **Criteria ii** and **iii** only then it is considered to have **below average** natural ventilation characteristics.

If a unit satisfies none of the abovementioned criteria or **Criterion iv** only, then it is deemed to have **poor** natural ventilation characteristics.



**Figure 1a: Units Achieving Effective Natural Ventilation
(floor plan of a typical residential building)**



**Figure 1b: Units Achieving Effective Natural Ventilation
(section elevation of a typical residential building)**

4.0 Description of the Proposed Development

The site is located at 23-37 Lindfield Avenue, Lindfield. Figure 2 shows an aerial image of the site location. The site is bounded by Havilah Lane to the north-east, Lindfield Avenue to the west, Kochia Lane to the south and a service station to the north. The local land topography generally rises to the north and west of the site.

The proposed development consists of two main buildings on a common podium with mixed used development. There are a total of 91 residential units across six residential floors. The building heights, based on the latest architectural drawings, range from six to eight stories above ground.

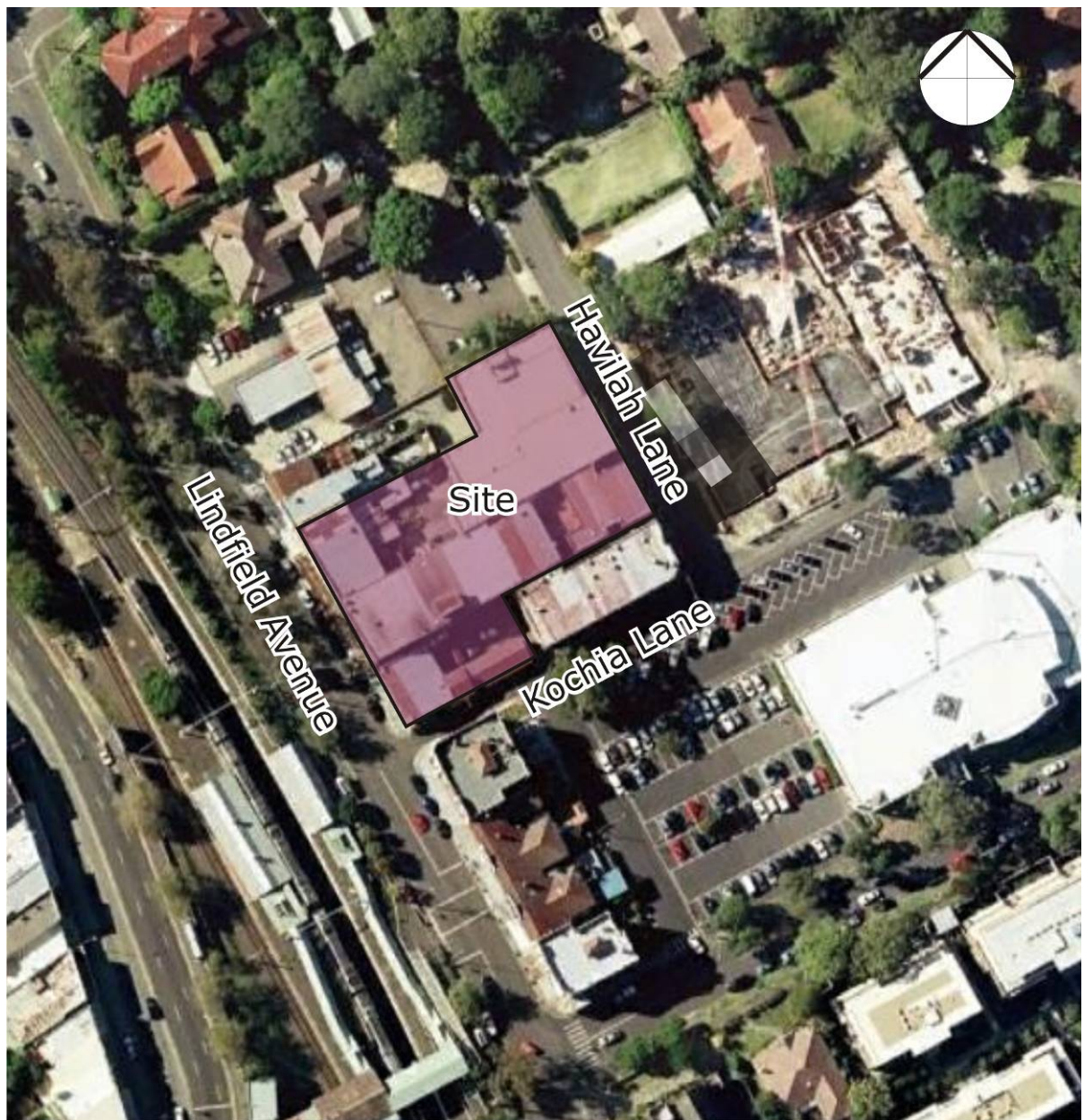


Figure 2: Aerial Image of the Proposed Development Site

5.0 Results of the Analysis

For each of the predominant wind directions for the Sydney region, the interaction between the wind and the building morphology in the area was considered. Important features taken into account include the distances between the proposed building forms, their overall heights and bulk as well as the landform. Note that westerly winds are not considered for the natural ventilation assessment since these winds predominantly occur during the winter months, when wind-driven natural ventilation is not desired.

The following Table 2 present the results of the analysis of the wind-driven natural ventilation characteristics for each living space of the various residential units of the proposed development. The indicated unit numbers in these tables correspond to the unit numbering scheme as indicated in Appendix B of this report and based on the latest architectural drawings prepared by PTI Architecture, dated April 2011.

The results for the natural ventilation characteristics for the various residential units within the proposed development are presented in Table 2 below. Note that each residential unit is compared to the three basic criteria detailed in Section 3.0 of this report.

Table 2: Natural Ventilation Results

Unit Number	Satisfies Criteria				Natural Ventilation Rating
	Criterion (i)	Criterion (ii)	Criterion (iii)	Criterion (iv)	
A.2.01	YES	YES	NO	NO	Very Good
A.2.02	NO	YES	NO	NO	Below Average
A.2.03	NO	YES	NO	NO	Below Average
A.2.04	NO	YES	NO	NO	Below Average
A.2.05	NO	YES	NO	NO	Below Average
A.2.06	NO	YES	NO	NO	Below Average
A.2.07	NO	YES	NO	NO	Below Average
A.2.08	NO	NO	YES	NO	Below Average
A.2.09	NO	NO	YES	NO	Below Average
A.2.10	NO	NO	YES	NO	Below Average
A.3.01	YES	YES	YES	NO	Very Good
A.3.02	NO	YES	NO	NO	Below Average
A.3.03	NO	YES	NO	NO	Below Average
A.3.04	YES	YES	YES	NO	Very Good
A.3.05	YES	YES	YES	NO	Very Good
A.3.06	NO	YES	NO	NO	Below Average

A.3.07	NO	YES	NO	NO	Below Average
A.3.08	YES	YES	YES	NO	Very Good
A.3.09	NO	NO	YES	NO	Below Average
A.3.10	NO	NO	YES	NO	Below Average
A.4.01	YES	YES	YES	NO	Very Good
A.4.02	NO	YES	NO	NO	Below Average
A.4.03	NO	YES	NO	NO	Below Average
A.4.04	YES	YES	YES	NO	Very Good
A.4.05	YES	YES	YES	NO	Very Good
A.4.06	NO	YES	NO	NO	Below Average
A.4.07	NO	YES	NO	NO	Below Average
A.4.08	YES	YES	YES	NO	Very Good
A.4.09	NO	NO	YES	NO	Below Average
A.4.10	NO	NO	YES	NO	Below Average
A.5.01	YES	YES	YES	NO	Very Good
A.5.02	YES	YES	YES	NO	Very Good
A.5.03	YES	YES	YES	NO	Very Good
A.5.04	YES	YES	YES	NO	Very Good
B.2.01	YES	YES	NO	YES	Very Good
B.2.02	NO	YES	NO	YES	Good
B.2.03	YES	YES	NO	NO	Very Good
B.2.04	YES	YES	NO	NO	Very Good
B.2.05	YES	YES	NO	NO	Very Good
B.2.06	YES	NO	YES	YES	Very Good
B.2.07	NO	NO	YES	NO	Below Average
B.2.08	NO	NO	YES	NO	Below Average
B.2.09	NO	NO	YES	NO	Below Average
B.2.10	NO	NO	YES	NO	Below Average
B.2.11	YES	NO	YES	NO	Very Good
B.3.01	YES	YES	NO	YES	Very Good
B.3.02	YES	YES	YES	NO	Very Good
B.3.03	YES	YES	YES	NO	Very Good
B.3.04	YES	YES	NO	NO	Very Good
B.3.05	YES	YES	NO	NO	Very Good
B.3.06	YES	YES	YES	NO	Very Good

B.3.07	NO	NO	YES	YES	Good
B.3.08	NO	NO	YES	NO	Below Average
B.3.09	NO	NO	YES	NO	Below Average
B.3.10	YES	NO	YES	YES	Very Good
B.4.01	YES	YES	NO	YES	Very Good
B.4.02	YES	YES	YES	NO	Very Good
B.4.03	YES	YES	YES	NO	Very Good
B.4.04	YES	YES	NO	NO	Very Good
B.4.05	YES	YES	NO	NO	Very Good
B.4.06	YES	YES	YES	NO	Very Good
B.4.07	NO	NO	YES	YES	Good
B.4.08	NO	NO	YES	YES	Good
B.4.09	NO	NO	YES	NO	Below Average
B.4.10	YES	NO	YES	YES	Very Good
B.5.01	YES	YES	NO	YES	Very Good
B.5.02	YES	YES	YES	NO	Very Good
B.5.03	YES	YES	YES	NO	Very Good
B.5.04	YES	YES	NO	NO	Very Good
B.5.05	YES	YES	NO	NO	Very Good
B.5.06	YES	YES	YES	NO	Very Good
B.5.07	YES	NO	YES	YES	Very Good
B.5.08	NO	NO	YES	YES	Good
B.5.09	YES	NO	YES	NO	Very Good
B.6.01	YES	YES	NO	YES	Very Good
B.6.02	YES	YES	YES	NO	Very Good
B.6.03	YES	YES	YES	NO	Very Good
B.6.04	YES	YES	NO	NO	Very Good
B.6.05	YES	YES	NO	NO	Very Good
B.6.06	YES	YES	YES	NO	Very Good
B.6.07	YES	NO	YES	YES	Very Good
B.6.08	NO	NO	YES	NO	Below Average
B.6.09	YES	NO	YES	NO	Very Good
B.7.01	YES	YES	NO	YES	Very Good
B.7.02	YES	YES	YES	NO	Very Good
B.7.03	YES	YES	YES	NO	Very Good

B.7.04	YES	YES	NO	NO	Very Good
B.7.05	YES	YES	YES	NO	Very Good
B.7.06	YES	NO	YES	YES	Very Good
B.7.07	NO	NO	YES	NO	Below Average
B.7.08	YES	NO	YES	NO	Very Good

The results for the natural ventilation characteristics of the various residential units for the proposed development indicate that 60% (55 out of 91) of the residential units of the development would meet the SEPP65 requirements to be considered cross ventilated apartments.

The development has been further assessed to consider other design aspects which can generate natural ventilation through a unit to meet the requirements for natural ventilation. This review included taking into account wind tunnel test results for other developments previously investigated where single aspect units were able to meet the requirements for natural ventilation. These also considered the effect of the orientation and external façade profile. It has been found from wind tunnel modelling of similar apartment configurations, that certain configurations of single aspect units are able to meet the requires for natural ventilation.

Based on our experience in the field of natural ventilation for residential apartments, including verification through wind tunnel testing, it is expected that 67% (61 out of 91) of the residential apartments will display natural ventilation characteristics. This is due to the effective design of the development including a stepped façade profile as well as the orientation of these residential apartments facing the predominant wind directions for Sydney.

6.0 Conclusion

An assessment of the natural ventilation characteristics of the various residential units of the proposed development located at 23-37 Lindfield Avenue, Lindfield, has been undertaken. The conclusions of this report are drawn from our extensive experience in this field and are based on an examination of the architectural drawings prepared by PTI Architecture, dated April 2011. No wind tunnel tests have been undertaken for the subject development. As such, this report addresses only the general wind effects and any localised effects that are identifiable by visual inspection. Any recommendations in this report are made only in-principle and are based on our extensive experience in the study of wind-driven natural ventilation effects.

The results of the study are compared to the wind-driven natural ventilation criteria detailed in the State Environmental Planning Policy No. 65 (SEPP65), which requires that at least 60% of the residential units within a development should achieve effective natural ventilation.

The results for the natural ventilation characteristics of the various residential units for the proposed development indicated that 60% (55 units) will comply with the requirements stipulated under SEPP65. This is based on a visual inspection of the natural ventilation characteristics of the residential units of the development. Hence, based on a visual assessment of the proposed development, there are a sufficient number of residential units which will satisfy the natural ventilation provisions in SEPP65. This assessment has been made in principle based off our extensive experience and knowledge in the performance of residential units with wind-driven natural ventilation.

The development was further assessed to consider other design aspects which can generate natural ventilation through a unit to meet the requirements for natural ventilation. This review included taking into account wind tunnel test results for other developments previously investigated where single aspect units were able to meet the requirements for natural ventilation. These also considered the effect of the orientation and external façade profile. It has been found from wind tunnel modelling of similar apartment configurations, that certain configurations of single aspect units are able to meet the requires for natural ventilation.

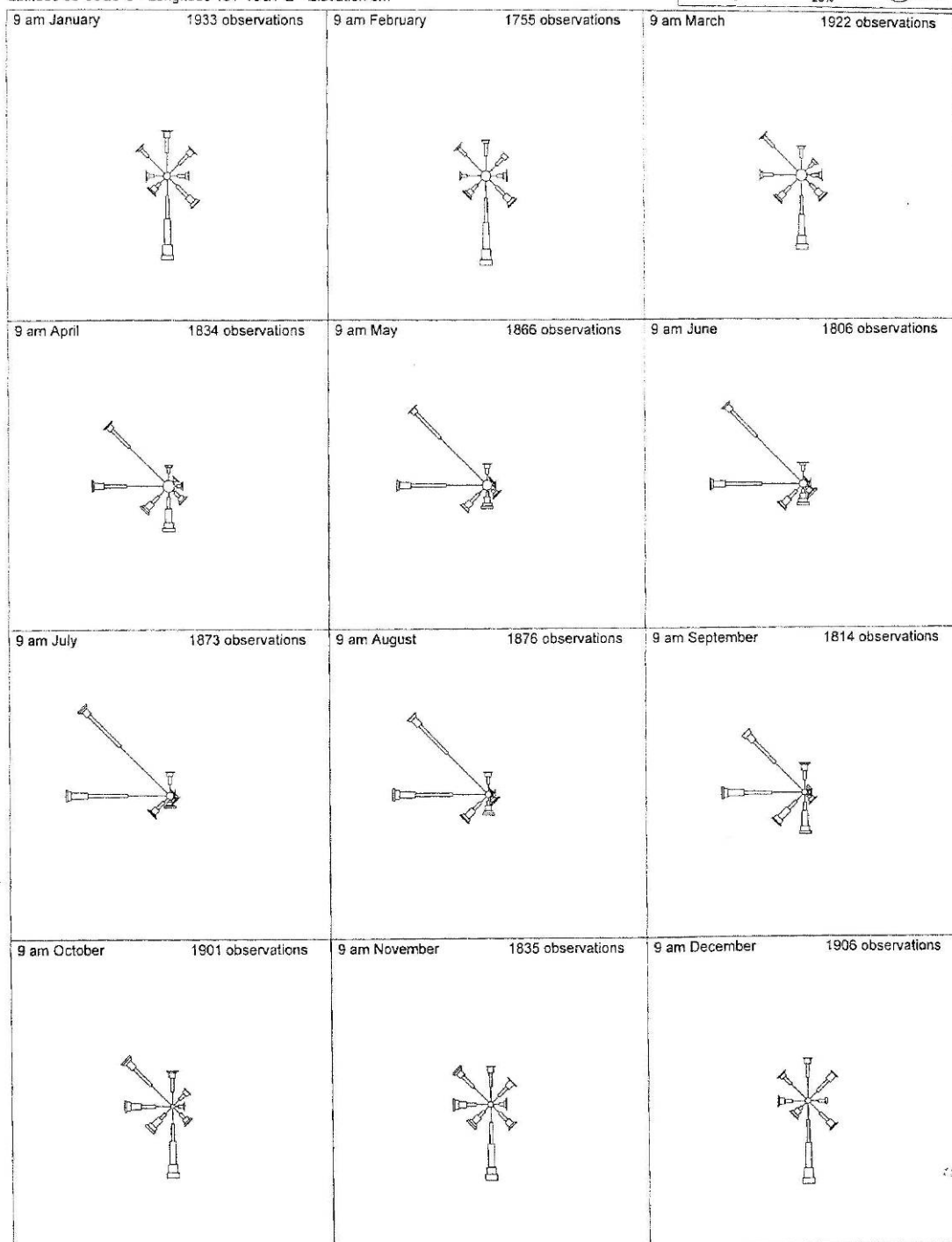
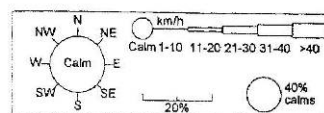
Should the units possession a stepped façade profile provide adequate wind-driven natural ventilation characteristics, the percentage of residential units that will perform on par with at least one deemed to comply unit within the development achieve 67.0% (61 units). The natural ventilation performance for these units will require verification through wind tunnel modelling.

Appendix A

Wind Roses for Sydney
Kingsford Smith Airport, 1939-2000

Wind Roses using available data between 1939 and 2000 for SYDNEY AIRPORT AMO

Site Number 066037 • Locality: SYDNEY AIRPORT • Opened Jan 1929 • Still Open
Latitude 33°56'28"S • Longitude 151°10'21"E • Elevation 6m

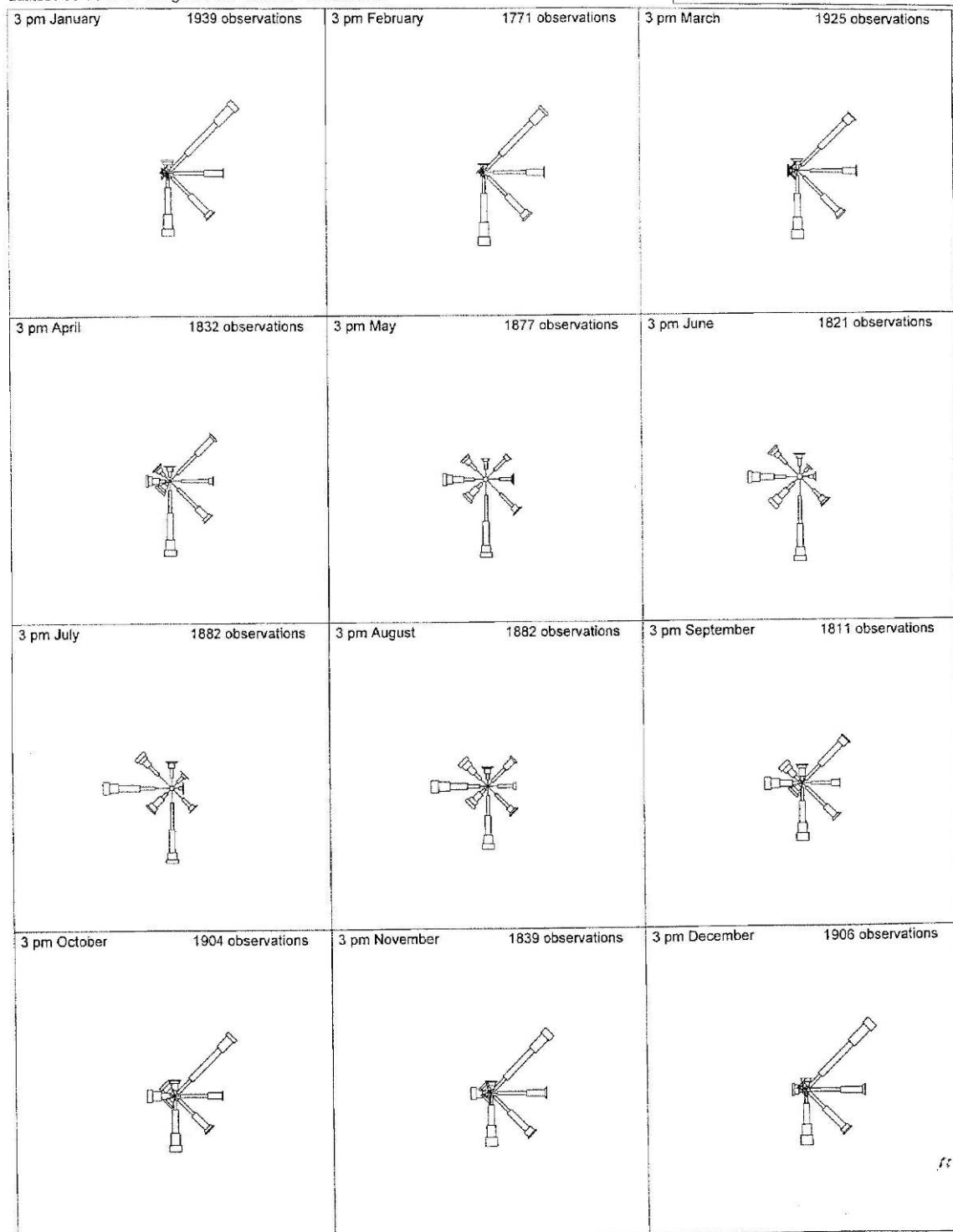
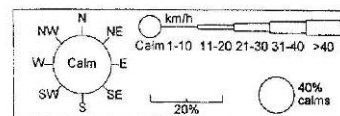


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Wind Roses using available data between 1939 and 2000 for SYDNEY AIRPORT AMO

Site Number 066037 • Locality: SYDNEY AIRPORT • Opened Jan 1929 • Still Open
Latitude 33°56'28"S • Longitude 151°10'21"E • Elevation 6m

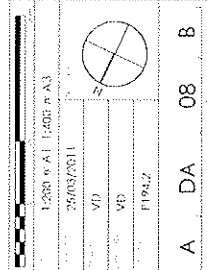
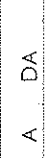


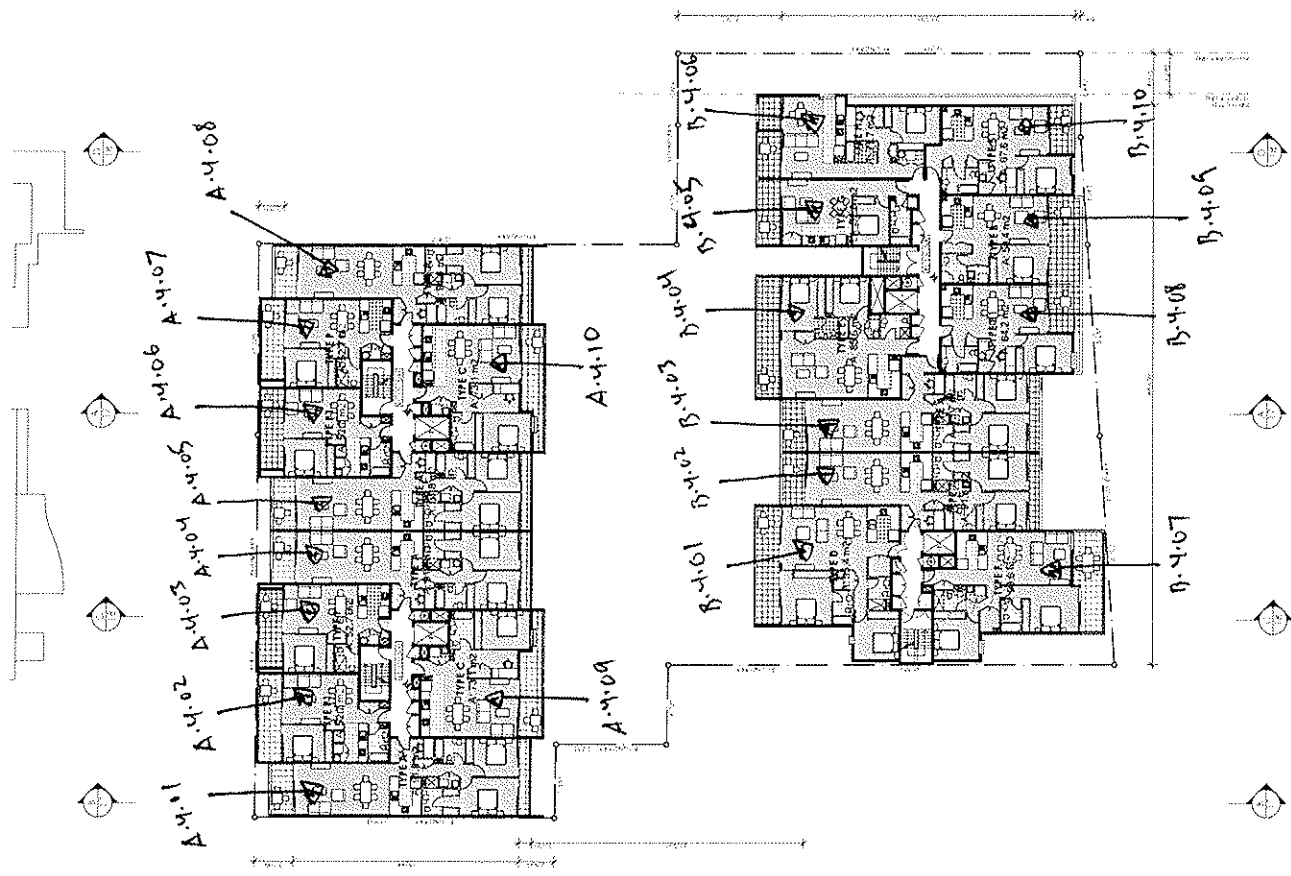
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Appendix B

Unit Numbering System





ARCHITECTURE

ANKA PROPERTY GROUP

LINDFIELD RETAIL & RESIDENTIAL DEVELOPMENT

LEVEL 4 PLAN



CONFIDENTIAL

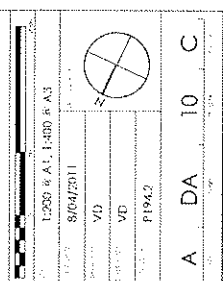
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TITLE

1. Project Name: **UNFIELD RETAIL & RESIDENTIAL DEVELOPMENT**

2. Project Location: **10000 B. A. I. 10000 B. A. I.**

3. Project Owner: **ANKA PROPERTY GROUP**

4. Project Architect: **PTC ARCHITECTURE**

5. Project Engineer: **PTC ARCHITECTURE**

6. Project Designer: **PTC ARCHITECTURE**

7. Project Draftsman: **PTC ARCHITECTURE**

8. Project Date: **10/01/2011**

9. Project Scale: **1:200**

10. Project Sheet: **LEVEL 6 PLAN**

1. Project Name	UNFIELD RETAIL & RESIDENTIAL DEVELOPMENT
2. Project Location	10000 B. A. I. 10000 B. A. I.
3. Project Owner	ANKA PROPERTY GROUP
4. Project Architect	PTC ARCHITECTURE
5. Project Engineer	PTC ARCHITECTURE
6. Project Designer	PTC ARCHITECTURE
7. Project Draftsman	PTC ARCHITECTURE
8. Project Date	10/01/2011
9. Project Scale	1:200
10. Project Sheet	LEVEL 6 PLAN

ANKA PROPERTY GROUP

UNFIELD RETAIL & RESIDENTIAL DEVELOPMENT

LEVEL 6 PLAN

1:200

10/01/2011

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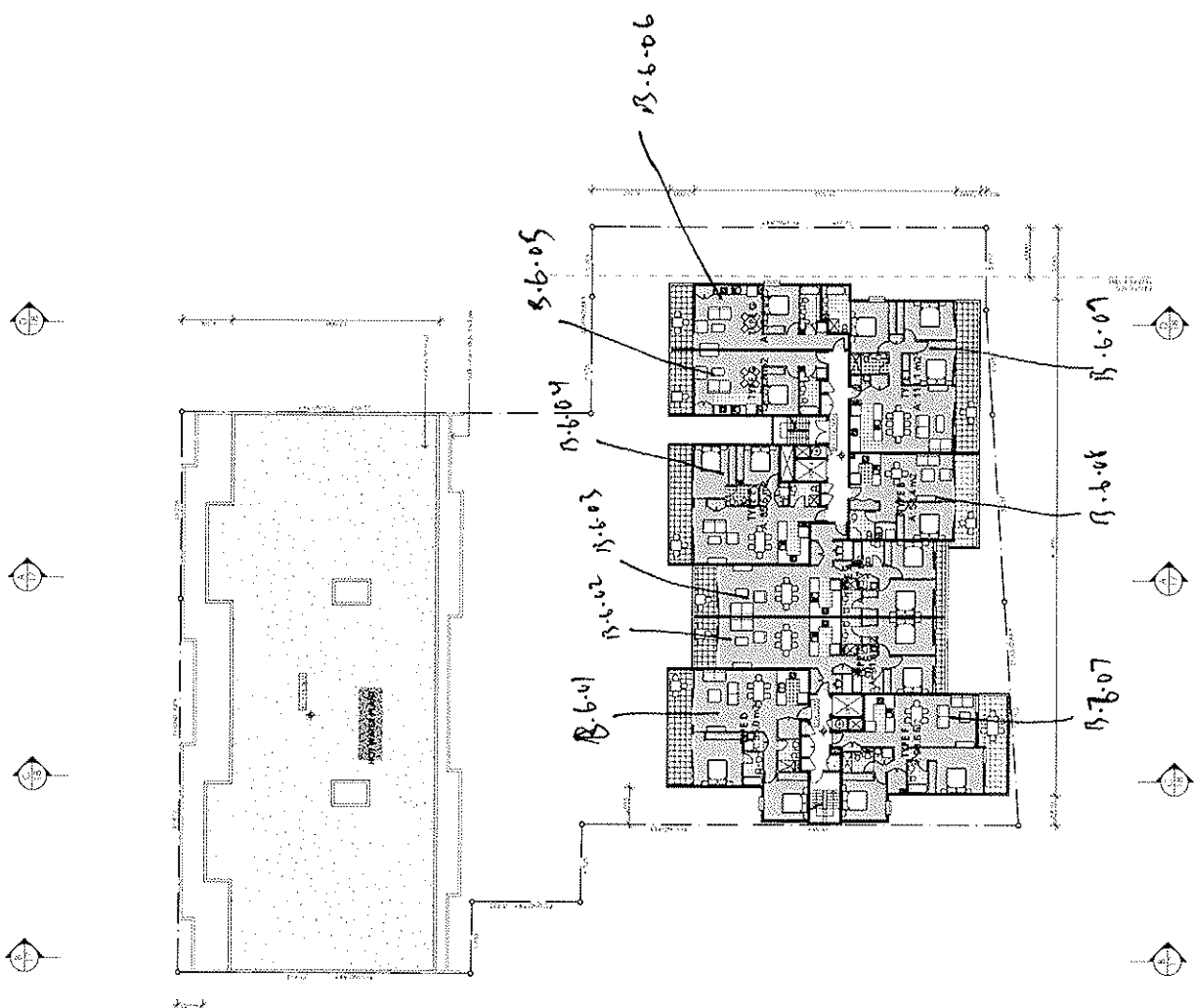
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GENERAL LEGEND

1. Project Name	UNFIELD RETAIL & RESIDENTIAL DEVELOPMENT
2. Project Location	10000 B. A. I. 10000 B. A. I.
3. Project Owner	ANKA PROPERTY GROUP
4. Project Architect	PTC ARCHITECTURE
5. Project Engineer	PTC ARCHITECTURE
6. Project Designer	PTC ARCHITECTURE
7. Project Draftsman	PTC ARCHITECTURE
8. Project Date	10/01/2011
9. Project Scale	1:200
10. Project Sheet	LEVEL 6 PLAN



LEVEL 6
1:200

1. The architect shall be responsible for obtaining all necessary permits and approvals from the relevant authorities.
 2. The architect shall ensure that the design complies with all applicable building codes and standards.
 3. The architect shall coordinate with the structural engineer and other consultants to ensure the design is feasible and constructible.
 4. The architect shall provide a detailed construction program and schedule.
 5. The architect shall monitor the construction process to ensure it is in accordance with the design and specifications.
 6. The architect shall provide a final as-built drawing set upon completion of the project.
 7. The architect shall be responsible for the overall quality and coordination of the project.
 8. The architect shall ensure that the project is completed within the agreed budget and timeline.
 9. The architect shall provide a comprehensive report on the project's progress and any issues encountered.
 10. The architect shall ensure that the project is completed to the satisfaction of the client.

REVISIONS
 1. 01/10/2021: Initial design and specifications.
 2. 15/10/2021: Revised design and specifications.
 3. 20/10/2021: Final design and specifications.

GENERAL LEGEND
 1. 01/10/2021: Initial design and specifications.
 2. 15/10/2021: Revised design and specifications.
 3. 20/10/2021: Final design and specifications.

ANKA PROPERTY GROUP
 LINDFIELD RETAIL & RESIDENTIAL DEVELOPMENT
 LEVEL 7 PLAN

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