Solar Access Analysis

for the proposed development at

23-37 Lindfield Avenue, Lindfield

April 10, 2011

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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 study has been undertaken to assess the level of solar access into the Living Areas and associated Private Open Spaces of the proposed development located at 23-37 Lindfield Avenue, Lindfield. The proposed development consists of a mixed-use building with a total of 91 residential units across the 6 residential floors within the proposed development.

The analysis of the solar access is carried out using a solar access meter derived from the solar chart for the Sydney region, provided in R.O. Phillips (1992)[1], and attached in Appendix A of this report. The results for the number of hours of direct solar access for each residential dwelling are accurate to within 15 minutes.

The analysis presented in this report is based on architectural drawings prepared by PTI Architecture, dated April 2011. All living areas are identified by Building letter, level and number (eg: Building A, Level 3, Unit 4 is labeled as A.3.04) in accordance with the aforementioned drawings and unit numbering system attached to Appendix B of this Report. All private open spaces are identified by the living areas that they are attached to in accordance with the aforementioned drawings attached to Appendix B of this report.

2.0 Solar Access Criteria

The number of hours of solar access for each of the residential units of the proposed development are compared to criteria from the State Environmental Planning Policy No. 65 and Residential Flat Design Code.

The State Environmental Planning Policy No. 65 (SEPP65) for the design of quality residential flat development requires that a residential development should be designed in such a way as to optimise the amount of available solar access. The Residential Flat Design Code has the following guidelines, listed as "Rules of Thumb":

> *"**Living rooms** and **private open spaces** for at least 70 percent of apartments in a development should receive a minimum of **three hours** direct sunlight between 9am and 3pm in mid-winter. In dense urban areas a minimum of **two hours** may be acceptable.*
>
> *Limit the number of single-aspect apartments with a southerly aspect (SW-SE) to a maximum of 10 percent of the total units proposed. Developments which seek to vary from the minimum standards must demonstrate how site constraints and orientation prohibit the achievement of these standards and how energy efficiency is addressed."*

[1] R.O Phillips, *Sunshine and Shade in Australia 6th edition*, CSIRO Technical Report 92/2.

3.0 Methodology

The overall solar access to the living areas pertaining to all living spaces within the proposed development has been assessed. The assessment is based on drawings prepared by PTI Architecture, dated April 2011.

The analysis includes the solar access to **Living Areas** and **Private Open Spaces** between the hours **09:00 to 15:00** on **June 21** (winter solstice) relating to the guidelines outlined by **SEPP65.** The requirement for three hours of solar access between the specified times of day applies, however in dense urban areas a minimum of two hours may be acceptable.

For the living areas, solar access is calculated at the centre of the glass line of the main window of the living area (vertically and horizontally). For a window to be considered to have an adequate amount of usable direct solar access, *at least half* of the glass area should be exposed to sunlight. For private open spaces, solar access is calculated at ground level (or floor slab level). To be assessed as being in sunlight, at least half of the ground level area of the private open space must be exposed to direct solar access. If a tenancy has more than one point of analysis (e.g. if a tenancy has more that one window or if a balcony has multiple aspects justifying more points of analysis), the number of hours of solar access that each window provides can be added if the various windows allow solar access at different times of the day. If they both allow solar access at the same time then they cannot be double-counted.

The report will present the results based on both of the minimum requirements of two and three hours as outlined by SEPP65.

3.1 Example of a Solar Access Analysis to the Living Area Glass-Line

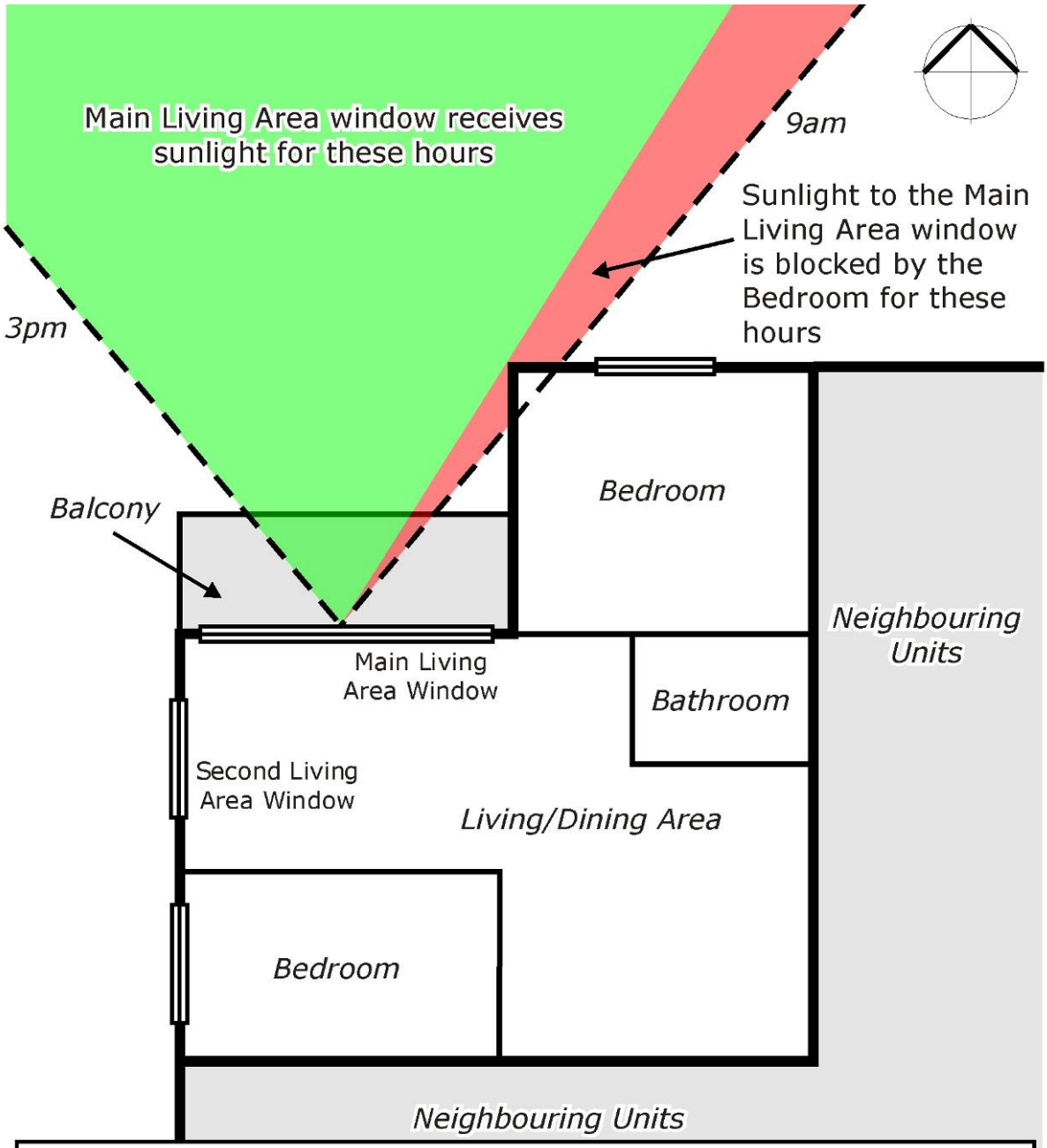
An example of how the solar access to a main living area window of a generic residential apartment is measured is presented in Figure 1. Figure 1 show how the morning sun is blocked by the protruding bedroom at the north-eastern end of the apartment. Once the sun clears the bedroom then the main living area window receives direct solar access for the rest of the day.

An inspection of scaled plan and elevation drawings is required to determine the extent of the window that is exposed to direct sunlight. The requirements for this study are that at least half of the window area should be exposed to direct sunlight.

The second living area window will only receive solar access after midday, although after the 22.5^{o} minimum horizontal angle of incidence rule is applied this secondary Living Area window will only be considered to have usable solar access from 1:30pm to 3pm. However, since the main living area window will also receive solar access for these same hours, the solar access from these two windows cannot be added. Hence for some residential units that may face south, solar access to the main living area may still be possible if there is a second window facing either east or west, for example.

The diagram in Figure 1 does not account for obstructions in the vertical plane, these are accounted for afterwards. The number of hours of solar access calculated is also be corrected for overshadowing by balconies and neighbouring buildings, or any other type of fixed obstruction.

The angular width of the sun path between the hours of 9am and 3pm is determined from the solar chart for the Sydney region, attached in Appendix A of this report. This can also be adjusted for different times of the year. For this study the sun's path on the winter solstice (June 21) is selected for analysis.



Note: This figure shows only obstructions in the horizontal plane from the window. Obstructions in the vertical plane, such as balconies above and surrounding buildings, also need to be accounted for in the assessment.
The percent of area of the window exposed to direct solar access is determined by detailed inspection of scaled plan and elevation drawings.
Solar access to the Living Area from the Second Living Area Window is only available during the afternoon. The Main Living Area Window also allows solar access during these same hours, therefore solar access through the Second Living Area Window is not counted (to avoid double-counting solar access hours).

Figure 1: Example of Solar Access to the Main Window of a Residential Apartment

4.0 Results

The amount of direct solar access, in hours, to the various Living Areas and associated Private Open Spaces of the proposed development for the various criteria described in Section 2 of this report is presented in Table 1. The table presents the results based on the applicable minimum requirements of two and three hours as outlined by SEPP65.

Table 1 outlines the amount and time of direct solar access to these residential dwellings on the winter solstice (June 21), between the hours of 9am and 3pm.

Note that the unit number indicated in Table 1 reflects the Building Letter, the level and the number of the unit (e.g.: Building A, Level 3, Unit 4 is labeled as A.3.04). The unit numbering scheme used in this analysis is also shown in Appendix B of this report.

Table 1: Solar Access for Each Residential Unit

Unit Number	Living Areas		Private Open Spaces	
	Number of Hours	Times of Occurrence	Number of Hours	Times of Occurrence
A.2.01	3	9.00-12.00	4	9.00-13.00
A.2.02	3	9.00-12.00	5	9.00-14.00
A.2.03	2	10.00-12.00	4	9.45-13.45
A.2.04	2.5	10.00-12.30	3.5	10.00-13.30
A.2.05	2	10.45-12.45	3.25	11.00-14.15
A.2.06	2	10.45-12.45	3.25	10.45-14.00
A.2.07	2	10.00-12.00	3	10.00-13.00
A.2.08	0	N/A	0	N/A
A.2.09	0	N/A	0	N/A
A.2.10	0	N/A	0	N/A
A.3.01	3	9.00-12.00	4	9.00-13.00
A.3.02	4	9.00-13.00	5	9.00-14.00
A.3.03	2	10.00-12.00	4.25	9.30-13.45
A.3.04	2.25	9.45-12.00	3	10.00-13.00
A.3.05	2.25	9.45-12.00	3.5	10.00-13.30
A.3.06	2.5	10.00-12.45	4.25	10.00-14.15
A.3.07	3.75	9.00-12.45	4	10.00-14.00
A.3.08	2	10.00-12.00	3	10.00-13.00
A.3.09	0	N/A	0	N/A
A.3.10	0	N/A	0	N/A
A.4.01	3	9.00-12.00	4	9.00-13.00

A.4.02	4	9.00-13.00	5	9.00-14.00
A.4.03	3	9.00-12.00	4.75	9.00-13.45
A.4.04	3	9.00-12.00	4	9.00-13.00
A.4.05	3	9.00-12.00	4.5	9.00-13.30
A.4.06	3.5	9.15-12.45	5	9.15-14.15
A.4.07	3.75	9.00-12.45	4.75	9.15-14.00
A.4.08	3	9.00-12.00	4	9.00-13.00
A.4.09	0	N/A	0	N/A
A.4.10	0	N/A	0	N/A
A.5.01	3	9.00-12.00	6	9.00-15.00
A.5.02	3	9.00-12.00	6	9.00-15.00
A.5.03	3	9.00-12.00	6	9.00-15.00
A.5.04	3	9.00-12.00	6	9.00-15.00
B.2.01	2	10.45-12.45	4.5	10.30-15.00
B.2.02	2	10.30-12.30	4.5	10.30-15.00
B.2.03	2	10.45-12.45	4	11.00-15.00
B.2.04	2	10.30-12.30	4	11.00-15.00
B.2.05	3.5	9.00-12.30	4	11.00-15.00
B.2.06	3	12.00-15.00	4	11.00-15.00
B.2.07	0	N/A	0	N/A
B.2.08	0	N/A	0	N/A
B.2.09	0	N/A	0	N/A
B.2.10	0	N/A	0	N/A
B.2.11	0	N/A	0	N/A
B.3.01	2.25	9.45-12.00	5	10.00-15.00
B.3.02	2	9.30-11.30	2.5	9.30-12.00
B.3.03	3	9.30-12.30	3.5	9.30-13.00
B.3.04	2.5	10.00-12.30	3.25	10.45-14.00
B.3.05	3	10.00-13.00	4	10.00-14.00
B.3.06	3.5	9.00-12.30	5	9.00-14.00
B.3.07	3	12.00-15.00	4	11.00-15.00
B.3.08	0	N/A	0	N/A
B.3.09	0	N/A	0	N/A
B.3.10	0	N/A	0	N/A
B.4.01	3	9.00-12.00	4	9.00-13.00

B.4.02	2.5	9.00-11.30	3	9.00-12.00
B.4.03	3.5	9.00-12.30	4	9.00-13.00
B.4.04	3.5	9.00-12.30	4	10.00-14.00
B.4.05	3.5	9.00-12.30	5	9.00-14.00
B.4.06	3.5	9.00-12.30	5	9.00-14.00
B.4.07	3	12.00-15.00	4	11.00-15.00
B.4.08	0	N/A	0	N/A
B.4.09	0	N/A	0	N/A
B.4.10	0	N/A	0	N/A
B.5.01	3	9.00-12.00	6	9.00-15.00
B.5.02	2.5	9.00-11.30	3	9.00-12.00
B.5.03	3.5	9.00-12.30	4	9.00-13.00
B.5.04	3.5	9.00-12.30	5	9.00-14.00
B.5.05	4	9.00-13.00	5	9.00-14.00
B.5.06	3.5	9.00-12.30	5	9.00-14.00
B.5.07	3	12.00-15.00	4	11.00-15.00
B.5.08	0	N/A	0	N/A
B.5.09	0	N/A	0	N/A
B.6.01	3	9.00-12.00	4	9.00-13.00
B.6.02	2.5	9.00-11.30	3	9.00-12.00
B.6.03	3.5	9.00-12.30	4	9.00-13.00
B.6.04	3.5	9.00-12.30	5	9.00-14.00
B.6.05	3.5	9.00-12.30	5	9.00-14.00
B.6.06	3.5	9.00-12.30	5	9.00-14.00
B.6.07	3	12.00-15.00	4	11.00-15.00
B.6.08	0	N/A	0	N/A
B.6.09	0	N/A	0	N/A
B.7.01	3	9.00-12.00	6	9.00-15.00
B.7.02	2.5	9.00-11.30	3	9.00-12.00
B.7.03	3.5	9.00-12.30	4	9.00-13.00
B.7.04	3.5	9.00-12.30	5	9.00-14.00
B.7.05	4	9.00-13.00	5	9.00-14.00
B.7.06	6	9.00-15.00	5	10.00-15.00
B.7.07	6	9.00-15.00	3	12.00-15.00
B.7.08	6	9.00-15.00	3	12.00-15.00

The results of the analysis are summarized below and in Table 2 for criteria compliant with SEPP65 for **two and three** hours of solar access between 9am and 3pm on June 21.

- The results for **Living Areas** concluded that **64** out of **91** Living Areas had solar access for **2 or more hours**. This equates **70%** of all Living Areas comply with 2 hours of direct solar access between 09:00-15:00 on June 21.
- The results for **Private Open Spaces** concluded that **69** out of **91** Living Areas had solar access for **2 or more hours**. This equates **74%** of all Private Open Spaces comply with 2 hours of direct solar access between 09:00-15:00 on June 21.
- The results for **Living Areas** concluded that **43** out of **91** Living Areas had solar access for **3 or more hours**. This equates **47%** of all Living Areas comply with 3 hours of direct solar access between 09:00-15:00 on June 21.
- The results for **Private Open Spaces** concluded that **68** out of **91** Living Areas had solar access for **3 or more hours**. This equates **73%** of all Private Open Spaces comply with 3 hours of direct solar access between 09:00-15:00 on June 21.

Table 2: Percentage of Lots Complying

Design Code	CASE	Solar Access for a minimum of 2 hours	Solar Access for a minimum of 3 hours
SEPP65	Living Areas	**70%**	**47%**
	Private Open Spaces	**74%**	**73%**

The number of south facing single-aspect units within the development is required to be below 10% of the total number of proposed dwellings. For this development, it is found that **none** of the residential units will have south facing single-aspects.

5.0 Conclusion

A solar access analysis for the Living Areas and associated Private Open Spaces of the proposed development located at 23-37 Lindfield Avenue, Lindfield, has been undertaken. The proposed development consists of a mixed-use building with a total of 91 residential units across the 6 residential floors within the proposed development.

The assessment has been carried out using a solar access meter derived from the solar chart for the Sydney Region, provided in R.O. Phillips (1992)[2], and attached in Appendix A of this report. The results of the study provide the number of hours of direct solar access for each residential dwelling, and are accurate to within 15 minutes.

The requirement for the SEPP65 design code states the living rooms and private open spaces in the development should receive a minimum of **three hours** direct sunlight between 9am and 3pm in mid-winter. In dense urban areas a minimum of **two hours** may be acceptable.

The results of the analysis requirements are summarised as follows:

- No apartments were found to have single-aspect south facing units.
- A total of 70% of all Living Areas comply with 2 hours or more of direct solar access between 09:00-15:00 on June 21.
- A total of 47% of all Living Areas comply with 3 hours or more of direct solar access between 09:00-15:00 on June 21.
- A total of 74% of all Private Open Spaces comply with 2 hours or more of direct solar access between 09:00-15:00 on June 21.
- A total of 73% of all Private Open Spaces comply with 3 hours or more of direct solar access between 09:00-15:00 on June 21.

Based on the above results, the proposed development will satisfy the SEPP65 requirements for solar access to the living areas and private open spaces. This is assuming that the area is designated as a high density urban area.

[2] R.O Phillips, *Sunshine and Shade in Australia 6th edition*, CSIRO Technical Report 92/2.

Appendix A

Solar Chart for the
Sydney Region

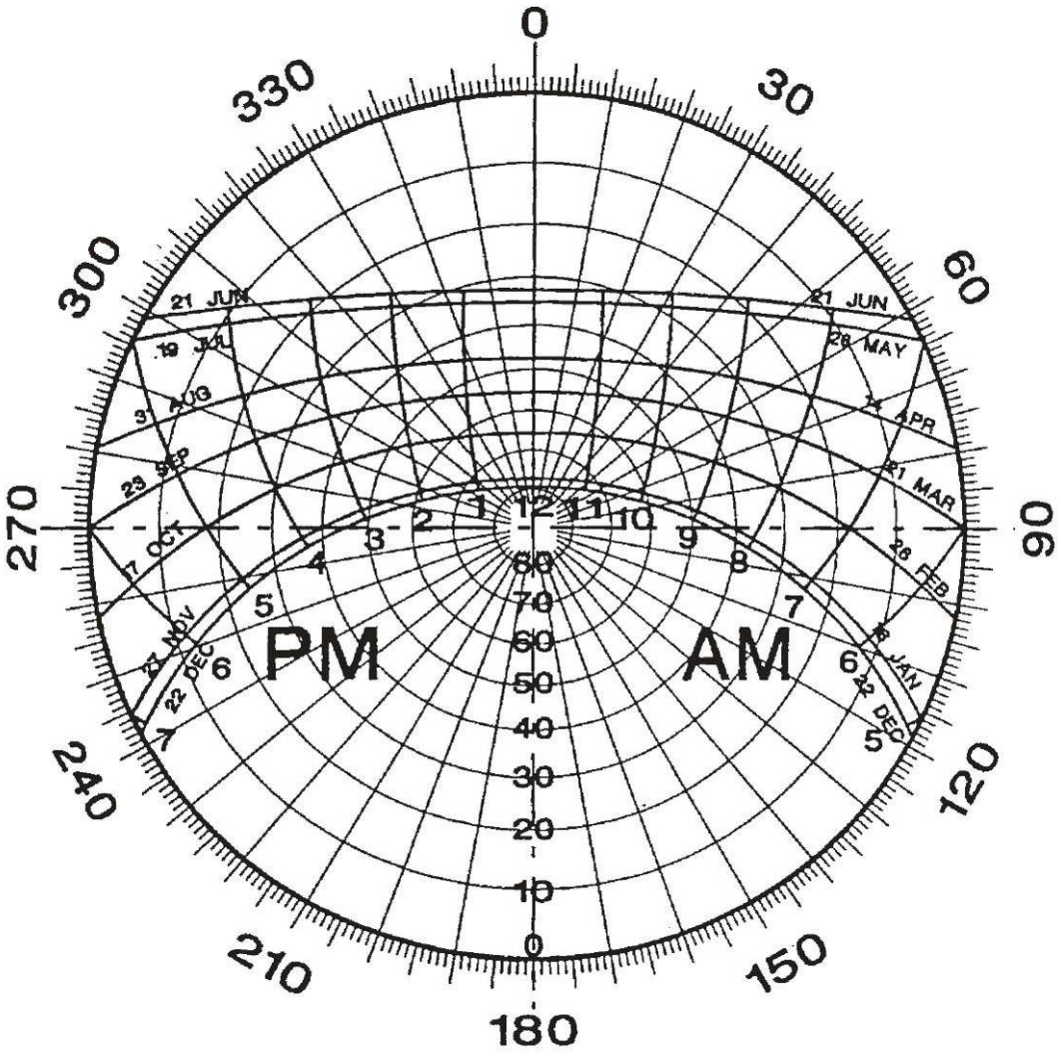
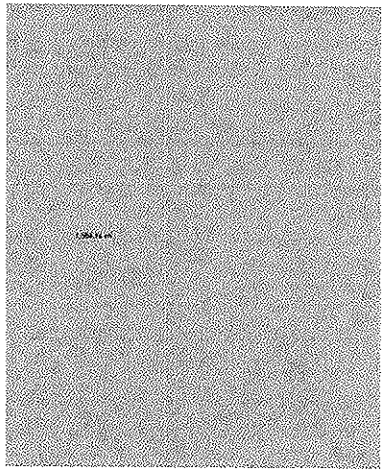
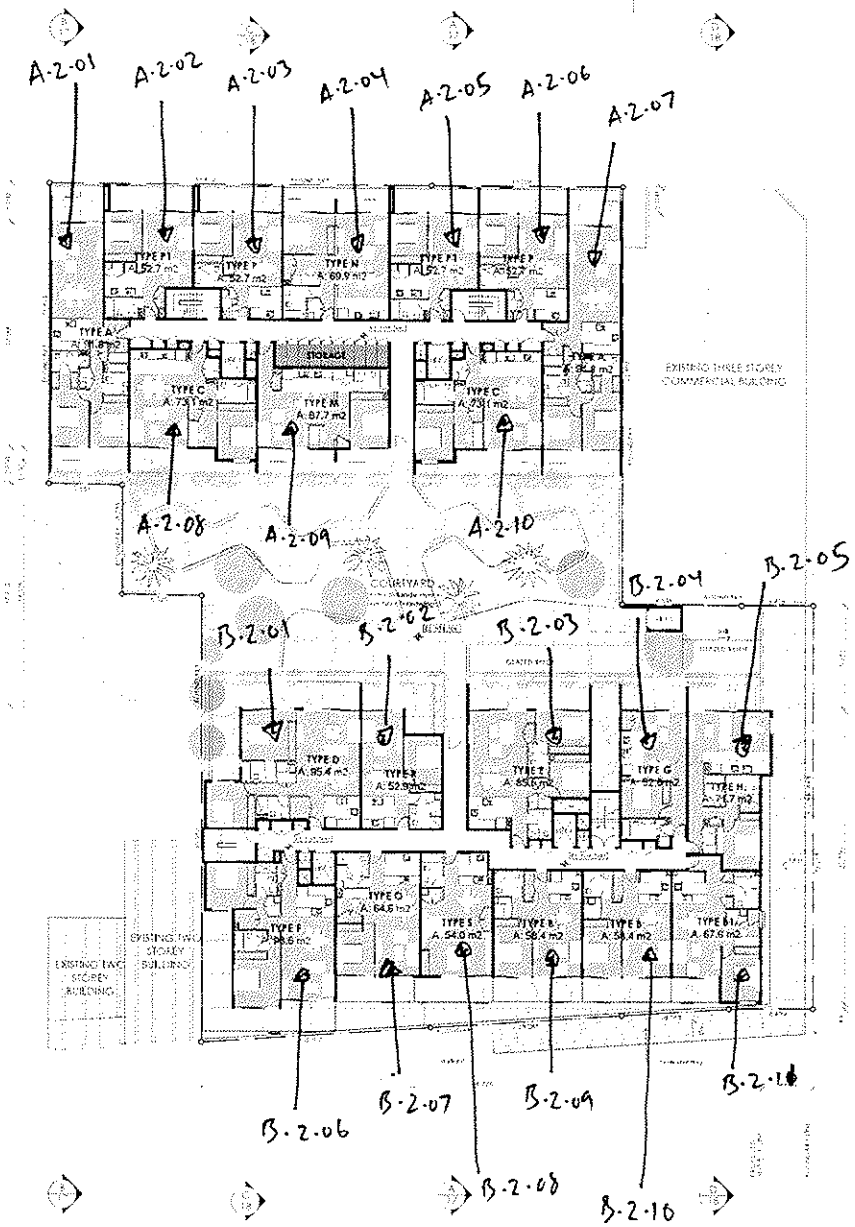


Figure A1: Solar Chart for the Sydney Region

Appendix B

Unit Numbering System





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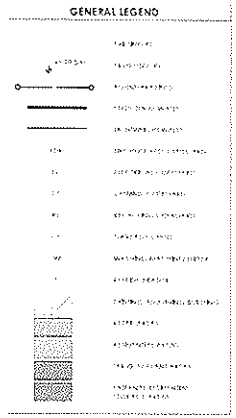

PRELIMINARY

ARCHITECTURE

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LINDFIELD RETAIL &
RESIDENTIAL DEVELOPMENT

LEVEL 2 PLAN

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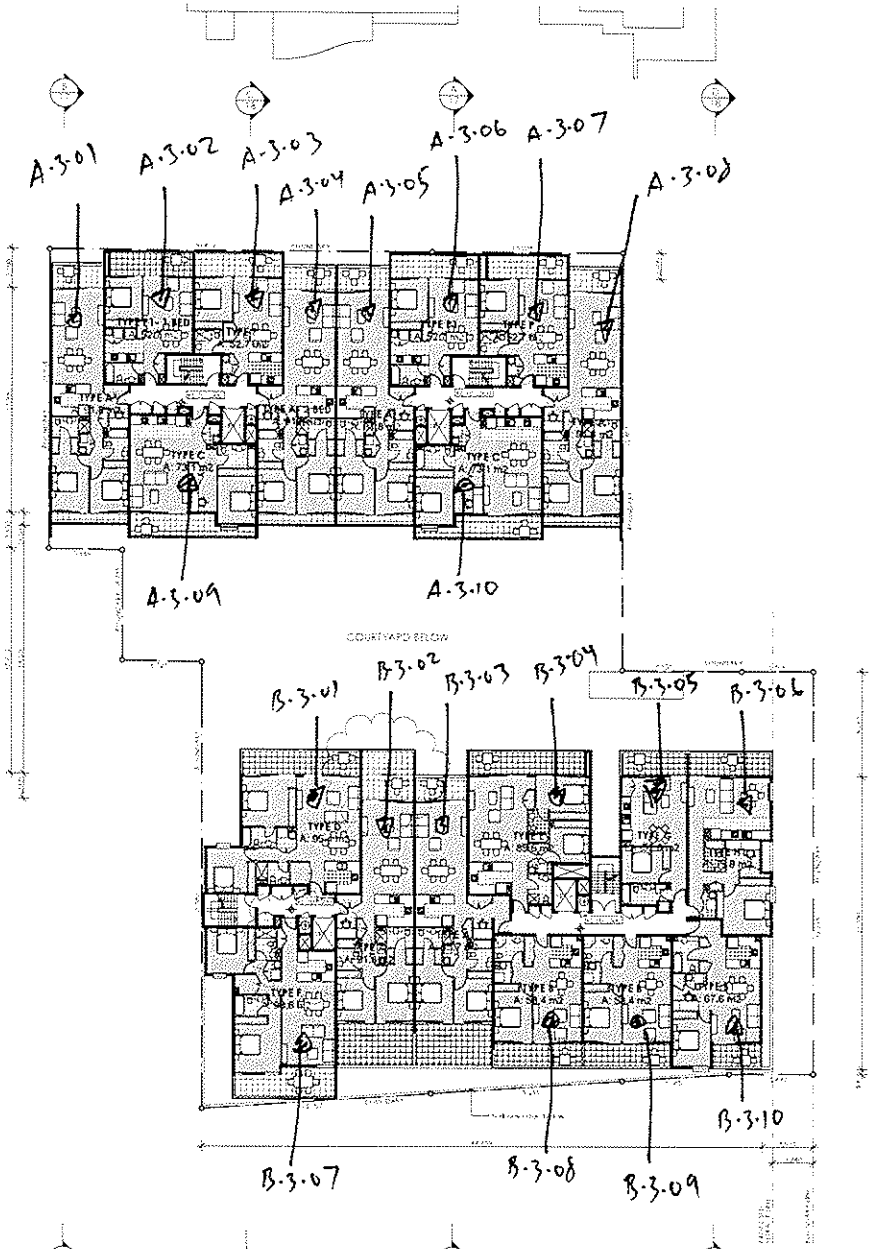

LEVEL 3

GENERAL LEGEND

ARCHITECTURE

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LINDFIELD RETAIL & RESIDENTIAL DEVELOPMENT

LEVEL 3 PLAN

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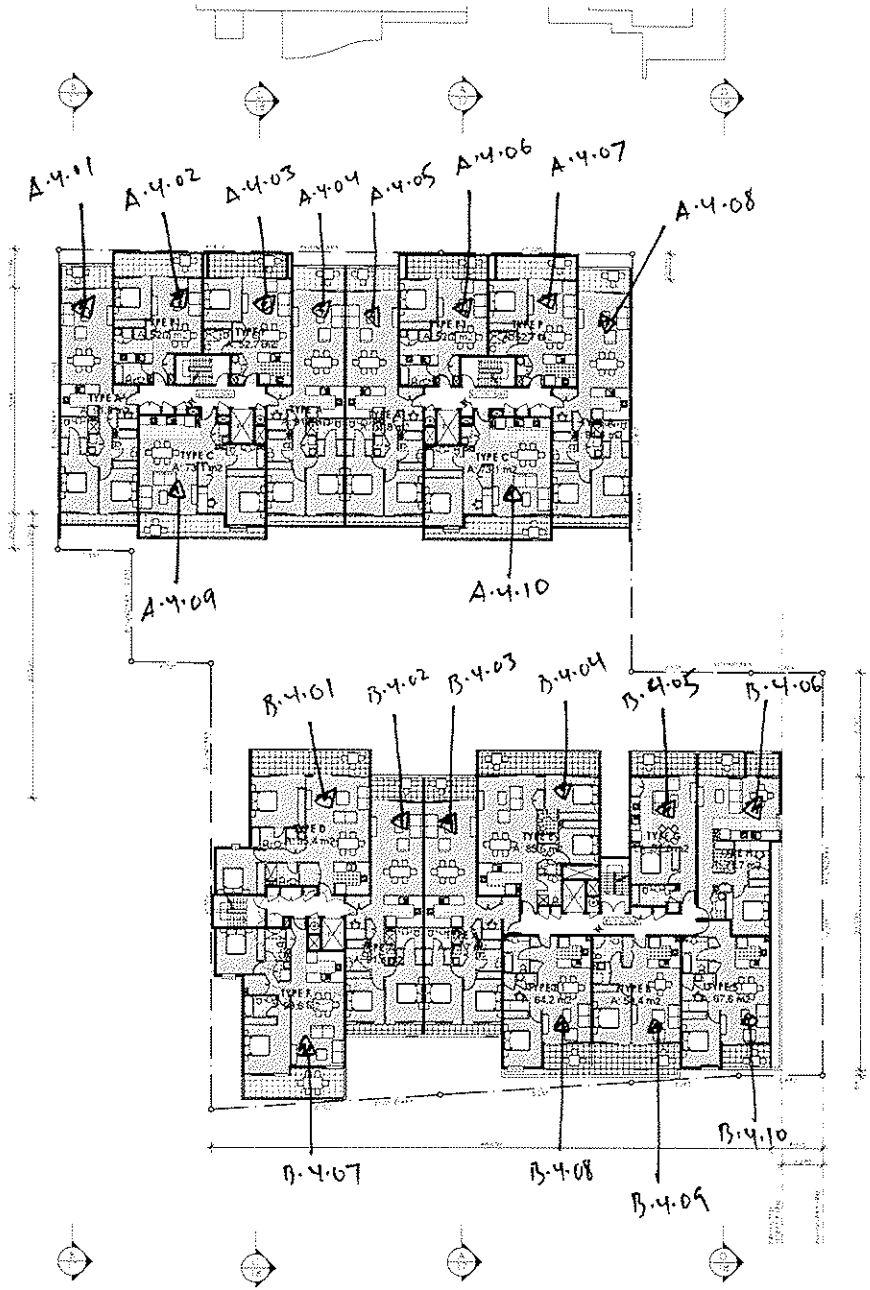

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GENERAL LEGEND

EXISTING THREE STOREY BUILDING

ARCHITECTURE

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LINDFIELD RETAIL & RESIDENTIAL DEVELOPMENT

LEVEL 4 PLAN

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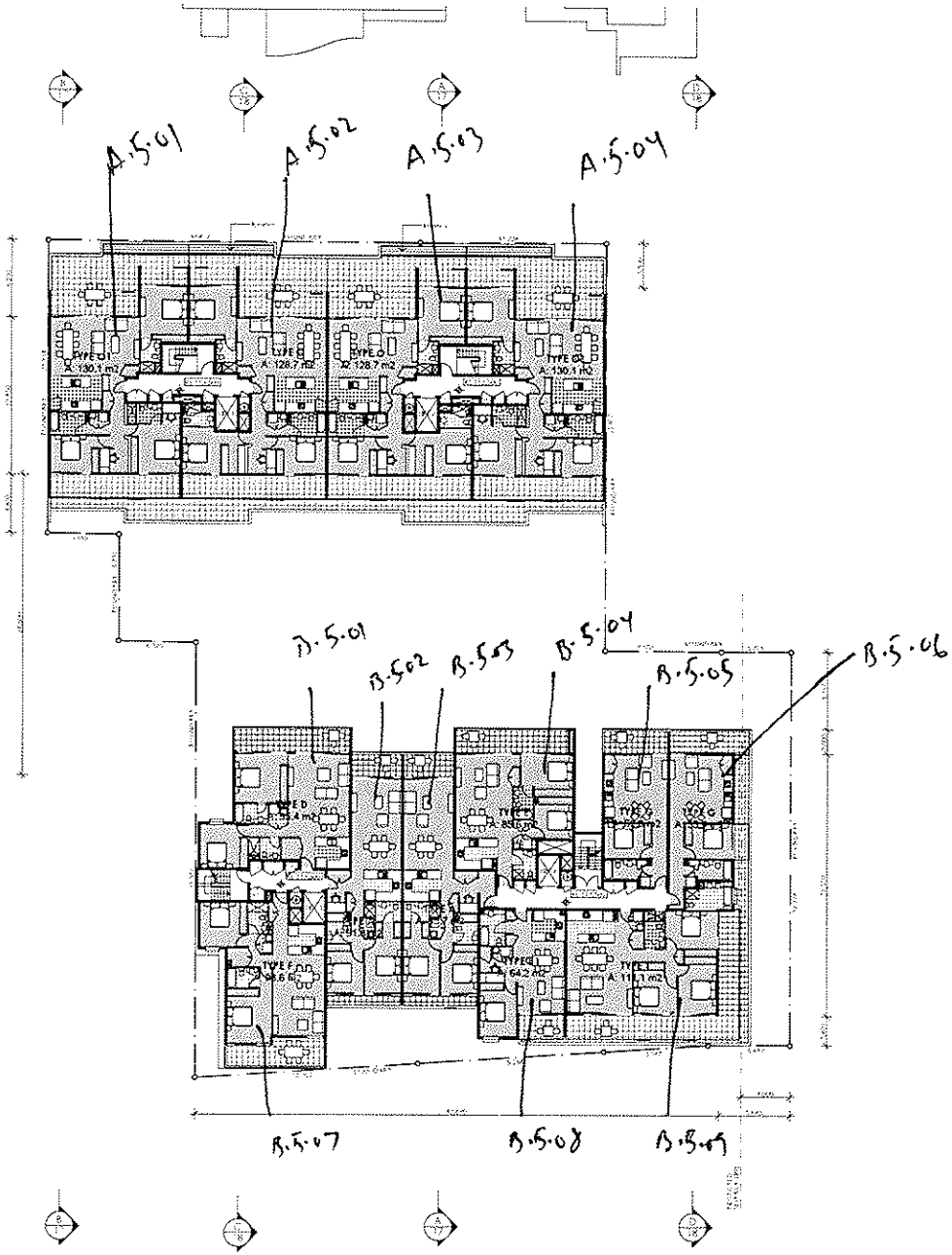

LEVEL 5
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GENERAL LEGEND

NOTE

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RESIDENTIAL DEVELOPMENT

LEVEL 5 PLAN

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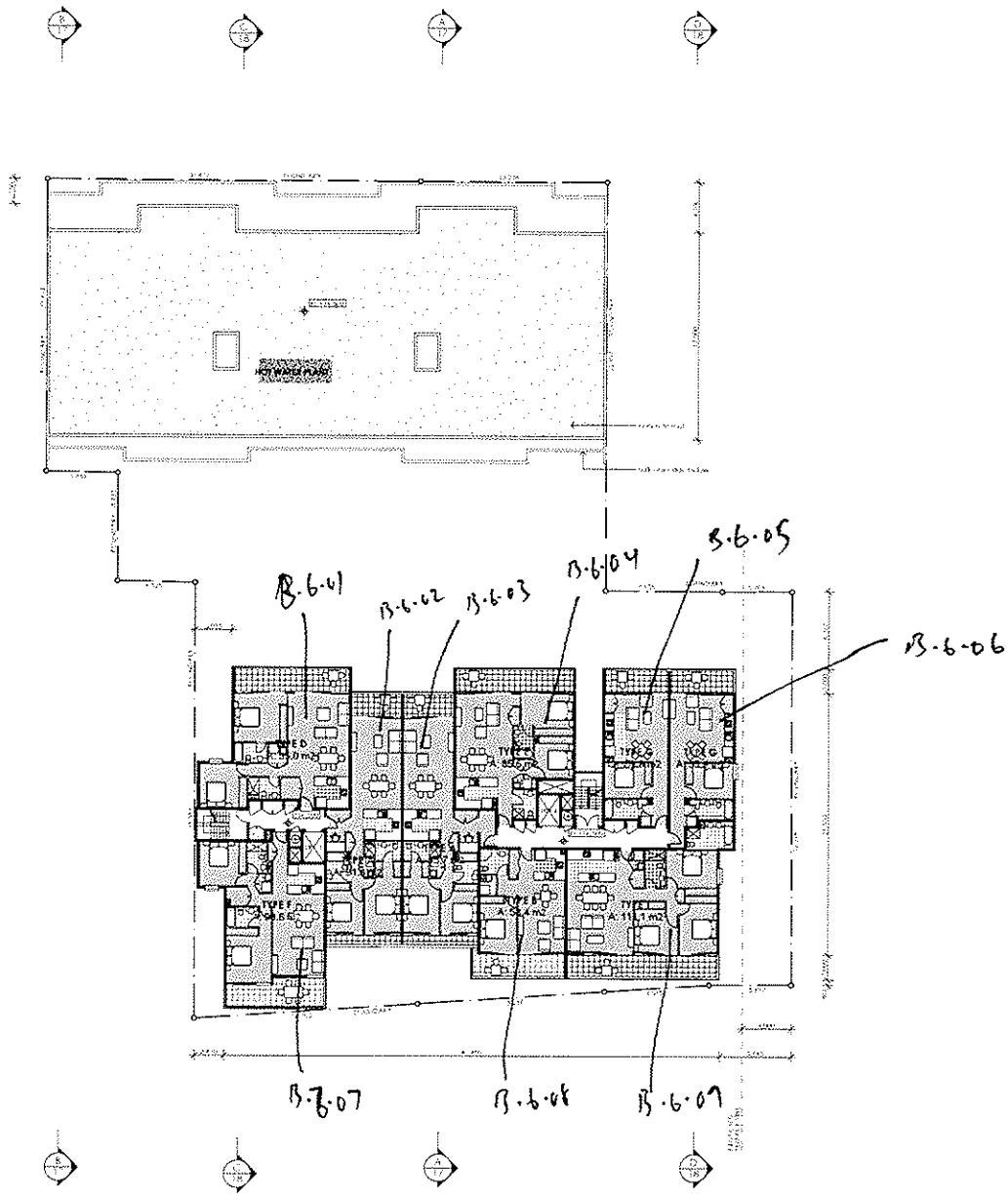

GENERAL LEGEND

NOTE

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LEVEL 6 PLAN

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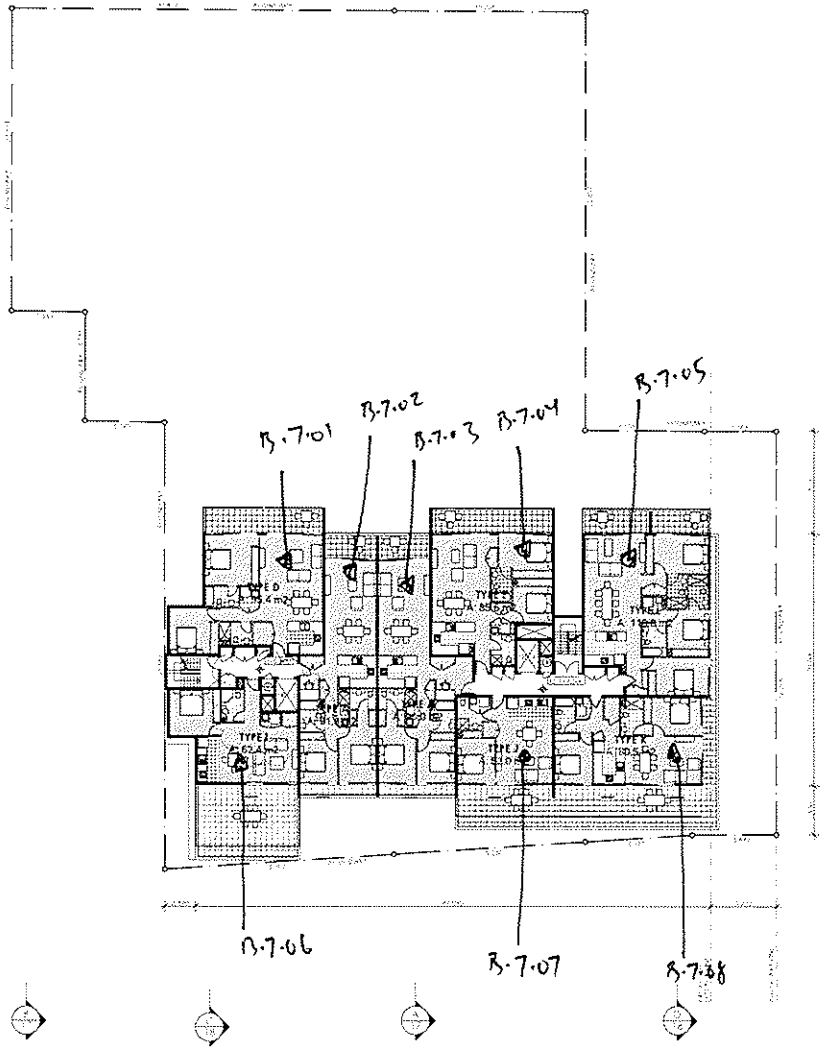

LEVEL 7
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GENERAL LEGEND

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LEVEL 7 PLAN

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