

# Environmental Noise Assessment

**Mixed-Use Development,  
Lot 9633 Fomiatti Street, Ashby**

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**Prepared for:**  
Endeavour Properties c/- Planning Solutions

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### Lloyd George Acoustics Pty Ltd

ABN: 79 125 812 544

PO Box 717  
Hillarys WA 6923

[www.lgacoustics.com.au](http://www.lgacoustics.com.au)

T: 9401 7770

Contacts	Daniel Lloyd	Terry George	Matt Moyle	Olivier Mallié	Ben Hillion
E:	<a href="mailto:daniel@lgacoustics.com.au">daniel@lgacoustics.com.au</a>	<a href="mailto:terry@lgacoustics.com.au">terry@lgacoustics.com.au</a>	<a href="mailto:matt@lgacoustics.com.au">matt@lgacoustics.com.au</a>	<a href="mailto:olivier@lgacoustics.com.au">olivier@lgacoustics.com.au</a>	<a href="mailto:ben@lgacoustics.com.au">ben@lgacoustics.com.au</a>
M:	0439 032 844	0400 414 197	0412 611 330	0439 987 455	0457 095 555

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Date:	Rev	Description	Prepared By	Verified
28-Oct-19	0	Issued to Client	Olivier Mallié	Terry George
31-Dec-19	A	Issued to Client	Olivier Mallié	-



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B	East Wanneroo Structure Plan
C	Terminology

# 1 INTRODUCTION

It is proposed to develop the land located at Lot 9633 Fomiatti Street in Ashby (refer *Figure 1.1*) into a mixed-use residential/commercial development, and commercial tenancies and self storage units on adjacent Lot 3 (proposed). The proposed development will consist of the following:

- Lot 9633 building: six storey mixed-use development with:
  - Ground floor commercial tenancies,
  - Floors 1 to 5 residential apartments, and
  - Undercroft car parking.
- Proposed Lot 3 building: ground level self-storage units and seven commercial tenancies, with dedicated parking on the east side of the building.

The project is located within Cell 1 of the East Wanneroo Structure Plan (refer *Appendix B*). Established residential premises are located to the south, along Hollosy Way and an approved three storey residential development to the north (Lots 82 and 83 Ficus Lane). A proposed childcare centre will also be located on the adjacent lot to the south. The closest noise sensitive receivers are therefore the approved three storey residential apartments to the north and the proposed childcare centre to the south.

This report assesses noise emissions from mechanical services for the mixed-use development (Lot 9633) and the commercial tenancies and self-storage units (Lot 3), and car doors closing in the lot car park against the *Environmental Protection (Noise) Regulations 1997* (the Noise Regulations). In addition, based on previous works carried out by Lloyd George Acoustics in the area, the noise impacts from the proposed childcare centre on the residential component of the proposed mixed-use development were considered.

The proposed development plans are provided in *Appendix A*.

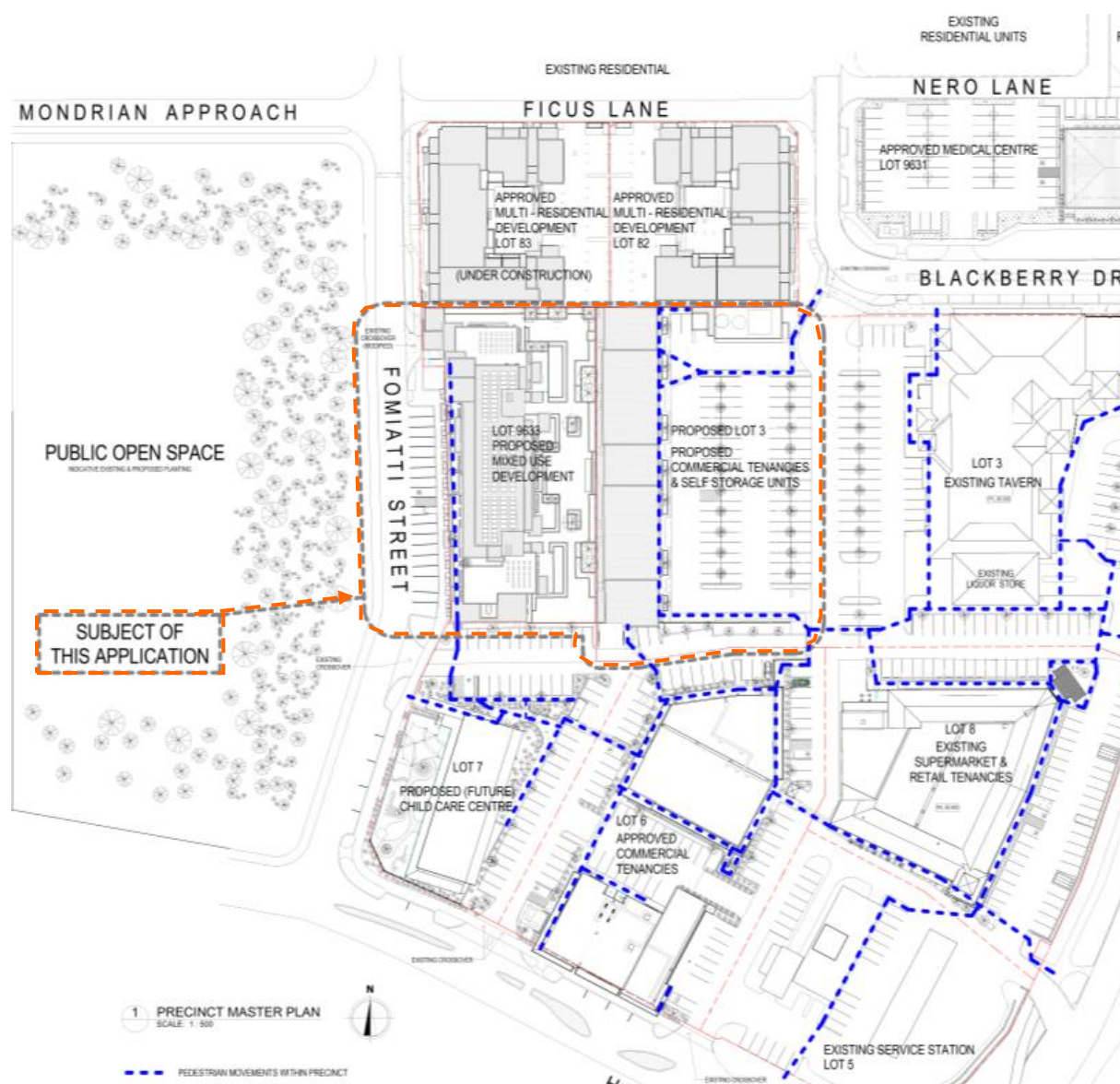


Figure 1-1 Project Locality (Oldfield Knott Architects)

Appendix C contains a description of some of the terminology used throughout this report.

## 2 CRITERIA

Environmental noise in Western Australia is governed by the *Environmental Protection Act 1986*, through the *Environmental Protection (Noise) Regulations 1997* (the Regulations).

Regulation 7 defines the prescribed standard for noise emissions as follows:

“7. (1) Noise emitted from any premises or public place when received at other premises –

- (a) Must not cause or significantly contribute to, a level of noise which exceeds the assigned level in respect of noise received at premises of that kind; and
- (b) Must be free of –
  - i. tonality;
  - ii. impulsiveness; and
  - iii. modulation,
 when assessed under regulation 9”

A “...noise emission is taken to significantly contribute to a level of noise if the noise emission ... exceeds a value which is 5 dB below the assigned level...”

Tonality, impulsiveness and modulation are defined in Regulation 9. Noise is to be taken to be free of these characteristics if:

- (a) The characteristics cannot be reasonably and practicably removed by techniques other than attenuating the overall level of noise emission; and
- (b) The noise emission complies with the standard prescribed under regulation 7 after the adjustments of *Table 2-1* are made to the noise emission as measured at the point of reception.

**Table 2-1 Adjustments Where Characteristics Cannot Be Removed**

Where Noise Emission is Not Music			Where Noise Emission is Music	
Tonality	Modulation	Impulsiveness	No Impulsiveness	Impulsiveness
+ 5 dB	+ 5 dB	+ 10 dB	+ 10 dB	+ 15 dB

Note: The above are cumulative to a maximum of 15dB.

The baseline assigned levels (prescribed standards) are specified in Regulation 8 and are shown in *Table 2-2*.

**Table 2-2 Baseline Assigned Noise Levels**

Premises Receiving Noise	Time Of Day	Assigned Level (dB)		
		L <sub>A10</sub>	L <sub>A1</sub>	L <sub>Amax</sub>
Noise sensitive premises: highly sensitive area <sup>1</sup>	0700 to 1900 hours Monday to Saturday (Day)	45 + influencing factor	55 + influencing factor	65 + influencing factor
	0900 to 1900 hours Sunday and public holidays (Sunday)	40 + influencing factor	50 + influencing factor	65 + influencing factor
	1900 to 2200 hours all days (Evening)	40 + influencing factor	50 + influencing factor	55 + influencing factor
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays (Night)	35 + influencing factor	45 + influencing factor	55 + influencing factor
Noise sensitive premises: any area other than highly sensitive area	All hours	60	75	80

1. **highly sensitive area** means that area (if any) of noise sensitive premises comprising —
- (a) a building, or a part of a building, on the premises that is used for a noise sensitive purpose; and
  - (b) any other part of the premises within 15 metres of that building or that part of the building.

The influencing factor, applicable at the closest noise sensitive premises has been calculated as 2 dB for Lots 82 and 83 Ficus Lane, and 3 dB for Lot 9633 and the childcare centre, as shown in *Table 2-3*, and based on the land uses shown in *Figure 2-1*.

**Table 2-3 Influencing Factor Calculation**

Description	Within 100 metre Radius	Within 450 metre Radius	Total
Industrial Land	0 %	0 %	0 dB
Commercial Land	32 and 52 %	7 %	2.0 and 3.0 dB
Transport Factor			0 dB
Total			2 and 3 dB

*Table 2-4* shows the assigned noise levels including the influencing factor and transport factor at the receiving locations.

Table 2-4 Assigned Noise Levels

Premises Receiving Noise	Time Of Day	Assigned Level (dB)		
		L <sub>A10</sub>	L <sub>A1</sub>	L <sub>Amax</sub>
<b>Lots 82 and 83 and Childcare Centre</b> Highly sensitive area <sup>1</sup>	0700 to 1900 hours Monday to Saturday (Day)	47	57	67
	0900 to 1900 hours Sunday and public holidays (Sunday)	42	52	67
	1900 to 2200 hours all days (Evening)	42	52	57
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays (Night)	37	47	57
<b>Lot 9633</b> Highly sensitive area <sup>1</sup>	0700 to 1900 hours Monday to Saturday (Day)	48	58	68
	0900 to 1900 hours Sunday and public holidays (Sunday)	43	53	68
	1900 to 2200 hours all days (Evening)	43	53	58
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays (Night)	38	48	58

1. **highly sensitive area** means that area (if any) of noise sensitive premises comprising —
- (a) a building, or a part of a building, on the premises that is used for a noise sensitive purpose; and
  - (b) any other part of the premises within 15 metres of that building or that part of the building.

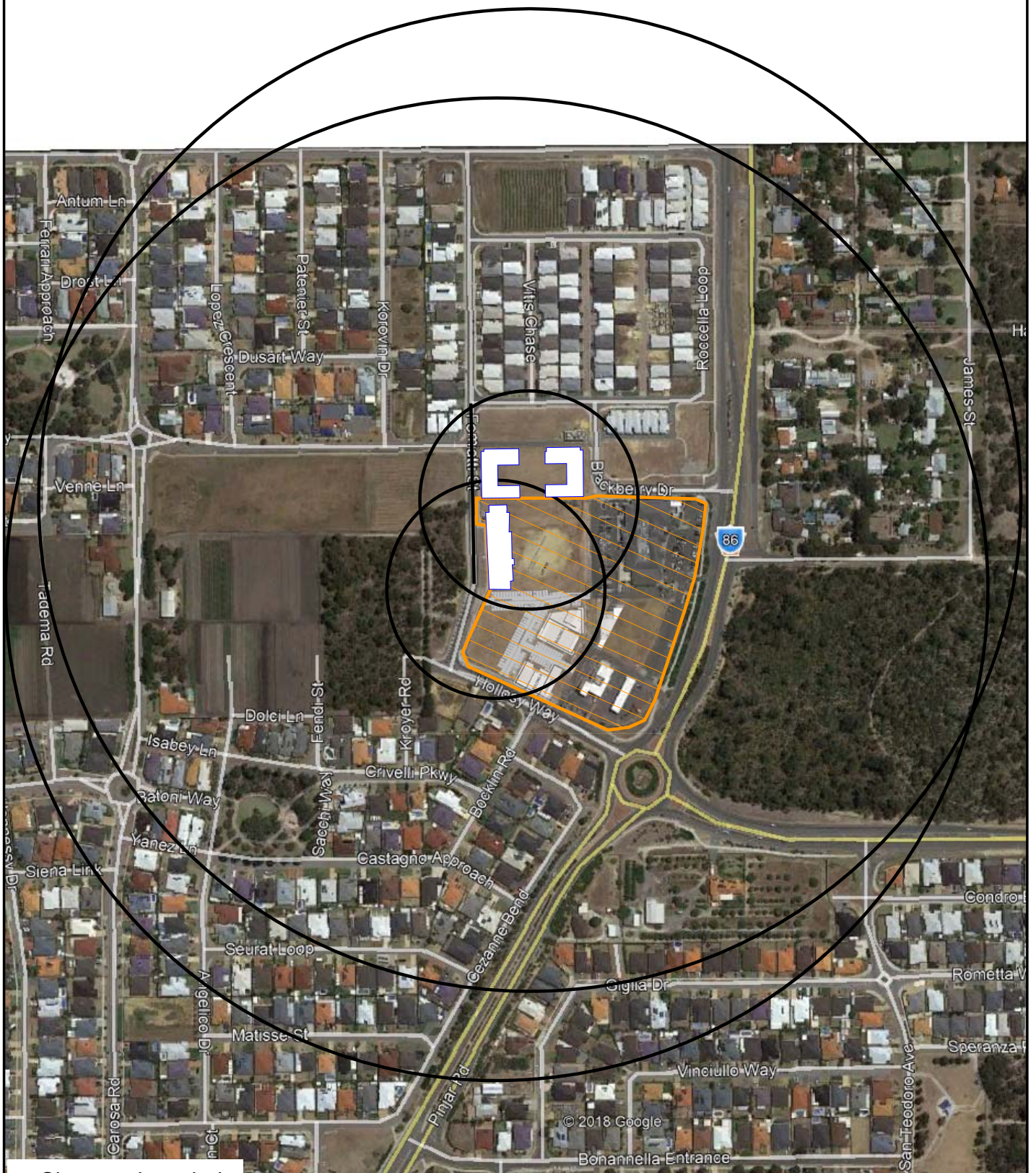
It must be noted the assigned noise levels above apply outside the receiving premises and at a point at least 3 metres away from any substantial reflecting surfaces. Where this was not possible to be achieved due to the close proximity of existing buildings and/or fences, the noise emissions were assessed at a point within 1 metre from building facades and a -2 dB adjustment was made to the predicted noise levels to account for reflected noise.

In the case of this development, it is noted there is no land associated with the sensitive use and, therefore, based on regulation 19(2)(b), the noise emissions from surrounding premises could also be assessed inside the premises receiving the noise e.g. bedroom. In accordance with regulation 19(4), adjustments of 10 dB and 15 dB are to be made where the assessment is made indoors and the windows are open or closed respectively.



Mixed Use Development Lot 9633 Fomiatti Street, Ashby  
Land Use Map for Influencing Factor Calculation

**Figure 2-1**



**Signs and symbols**

- IF Circles
- Commercial Uses



21-Oct-19

Length Scale 1:5000

0 25 50 100 150 m



**Lloyd George Acoustics**  
by Olivier Mallié  
olivier@lgacoustics.com.au  
0439 987 455



## 3 METHODOLOGY

Computer modelling has been used to predict noise levels at each nearby receiver. The software used was *SoundPLAN 8.1* with the ISO 9613 (ISO 171534-3 improved method) algorithms selected. These algorithms have been selected as they include the influence of wind. Input data required in the model are:

- Meteorological Information;
- Topographical data;
- Ground Absorption; and
- Source sound power levels.

### 3.1 Meteorological Information

Meteorological information utilised is provided in *Table 3-1* and is considered to represent worst-case conditions for noise propagation. At wind speeds greater than those shown, sound propagation may be further enhanced, however background noise from the wind itself and from local vegetation is likely to be elevated and dominate the ambient noise levels.

**Table 3-1 Modelling Meteorological Conditions**

Parameter	Night (1900-0700)	Day (0700-1900)
Temperature (°C)	15	20
Humidity (%)	50	50
Wind Speed (m/s)	Up to 5	Up to 5
Wind Direction*	All	All

\* Note that the modelling package used allows for all wind directions to be modelled simultaneously.

It is generally considered that compliance with the assigned noise levels needs to be demonstrated for 98% of the time, during the day and night periods, for the month of the year in which the worst-case weather conditions prevail. In most cases, the above conditions occur for more than 2% of the time and therefore must be satisfied.

### 3.2 Topographical Data

Topographical data was based on that publicly available from *GoogleEarth* in the form of spot heights, noting the topography is relatively flat but gently sloping up in an eastward direction. This results in some differences in elevation between sources and some receivers.

### 3.3 Ground Absorption

Ground absorption varies from a value of 0 to 1, with 0 being for an acoustically reflective ground (e.g. water or bitumen) and 1 for acoustically absorbent ground (e.g. grass). In this instance, a value of 0 has been used for the proposed lots and roads and 1 for grasses areas (e.g. public open space, parks, childcare outdoor play area).

### 3.4 Buildings and Receivers

Surrounding existing and future buildings were included in the noise model, as these can provide noise shielding as well as reflection paths.

Buildings and boundary walls were modelled based on the development plans provided (Oldfield Knott Architects, Ashby Village, Revision C, dated August 2019).

The childcare centre building was modelled at 6.5 metres high.

All proposed fences, boundary walls and/or acoustic screens have also been incorporated, including:

- Acoustic screens around the Lot 3 roof mounted AC units. Screens are of solid construction e.g. Con-Form *Acousti+* panels or equivalent, with no gaps between panels and to the underside, and at least 1.5 metres higher than the highest point of the unit, and
- Acoustic screens around the level 5 north plant deck at Lot 9633. The screens are solid walls (e.g. Con-Form *Acousti+* panels or equivalent) with no gaps between panels and to the underside, and at least 2.1 metres high from slab level. Acoustic louvres may be incorporated where required for ventilation. Such openings and any access doors are to be located on the west or east side.

All glazing on the south facade on levels 1 to 4 is noted to be acoustically rated  $R_w$  (Ctr) 31 (-3).

Figure 3-1 and Figure 3-2 show a different view of the 3D noise model based on the information above in relation to topography and building heights. Also shown are the various noise sources (e.g. AC plant and car doors) as pink dots.

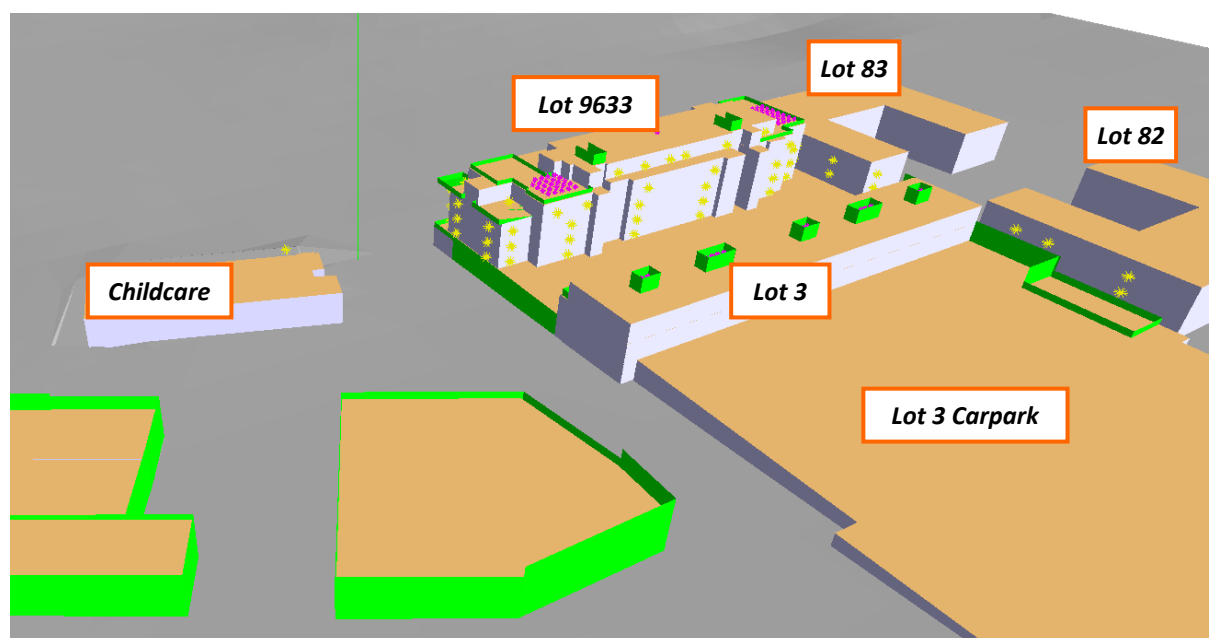


Figure 3-1 South east Elevation of 3D Noise Model

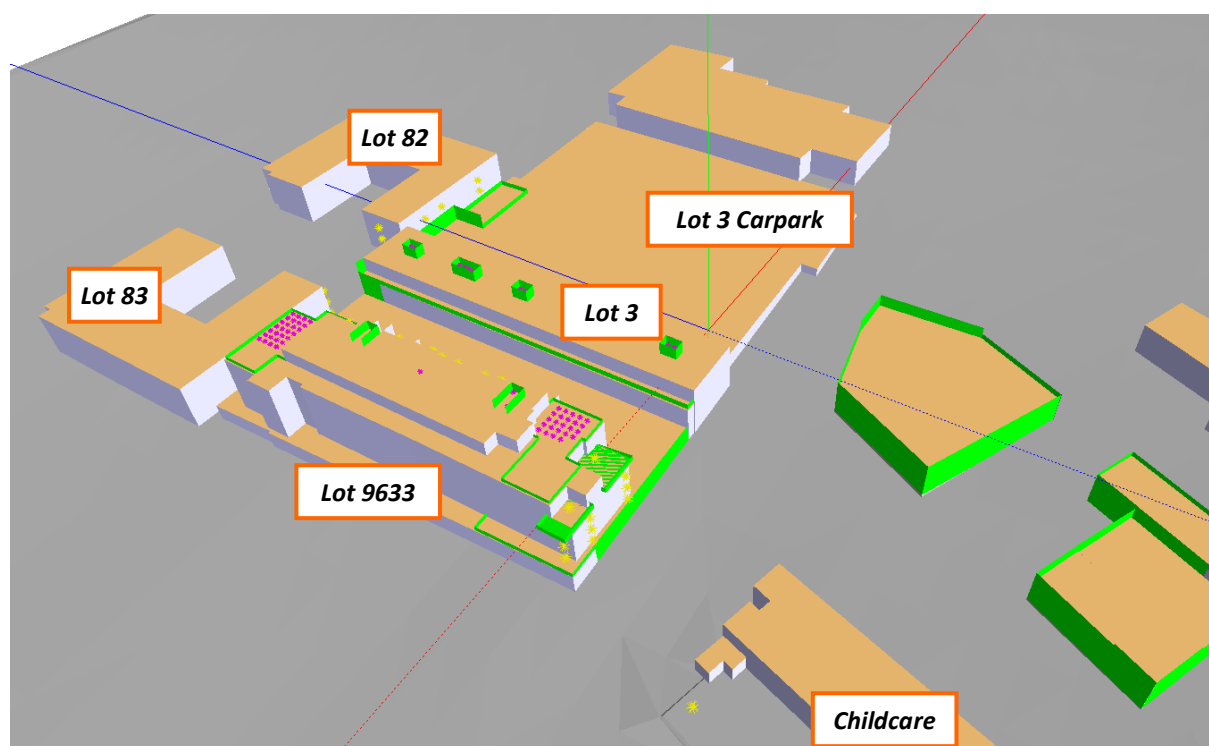


Figure 3-2 South west Elevation of 3D Noise Model

### 3.5 Source Sound Levels

The sound power levels used in the modelling are provided in *Table 3-2*.

It is noted that AC plant for the commercial tenancies at Lot 9633 is located in a dedicated plant room, located within the undercroft car park. As such noise emissions from this plant were not considered significant.

Table 3-2 Source Sound Power Levels, dB

Description	Octave Band Centre Frequency (Hz)								Overall dB(A)
	63	125	250	500	1k	2k	4k	8k	
Lot 9633 plant deck AC unit	-	69	69	67	65	62	58	54	<b>70</b>
Lot 9633 Commercial Tenancies Exhaust Fans (each)	79	69	79	67	67	66	67	65	<b>75</b>
Lot 3 AC unit	-	72	72	70	68	65	61	57	<b>73</b>
Child Play 2-3 years old (12 kids), L <sub>10</sub>	48	57	67	74	80	79	72	64	<b>84</b>
Child Play 2-3 years old (20 kids), L <sub>10</sub>	50	59	69	76	82	81	74	66	<b>86</b>
Child Play 3 years old or over (20 kids), L <sub>10</sub>	54	63	73	80	86	85	78	70	<b>90</b>

Description	Octave Band Centre Frequency (Hz)								Overall dB(A)
	63	125	250	500	1k	2k	4k	8k	
Child Play 3 years old or over (22 kids), $L_{10}$	55	64	74	81	87	86	79	71	<b>91</b>
Closing Car Door, $L_{max}$	71	74	77	81	80	78	72	61	<b>84</b>

The following is noted in relation to the *Table 3-2* source levels:

- AC plant was modelled as a point source located 0.8 metres above ground or roof level, with the source sound level taken from previous similar projects.
- Lot 9633 exhaust fans were modelled as point sources located approximately 0.8 metres above roof level, with the source sound level taken from previous similar projects.
- Child Play source levels were taken from Lloyd George Acoustics assessment report 19044958-01 dated 23 July 2019. Child play noise is considered to be daytime only i.e. no outdoor child play before 7am.
- Car doors closing were modelled as a point source 1.0 metre above ground level. Since noise from a car door closing is a short term event, only the  $L_{Amax}$  level is applicable but may occur prior to 7.00am.

## 4 RESULTS

The noise levels from various scenarios were predicted at the closest receivers as follows:

- Scenario 1 – Daytime mechanical plant noise to surrounding receivers. This includes AC plant and exhaust fan on the plant deck and roof of Lot 9633, and Lot 3 AC units on roof. For the purpose of this assessment it is noted that at the receivers at Lot 9633 only the noise levels from Lot 3 AC plant are presented.
- Scenario 2 – Night-time AC plant noise to surrounding receivers. This includes AC plant on the plant deck at Lot 9633 only, as Lot 3 plant is expected to be turned off at night-time.
- Scenario 3 – Car doors closing in Lot 3 (Commercial & Self-storage) car park and car park to the south.
- Scenario 4 – Outdoor child play at proposed childcare centre noise to Lot 9633. All 74 children (Activity rooms 1 to 4) are outside with all of Activity 1 children (22x) in the northern half of the play area (reference Lloyd George Acoustics assessment report No. 19044958-01 dated 23 July 2019).

The results of the noise modelling for each scenario above are presented in *Table 4-1* with the levels in **bold** identifying the highest noise level at the same group of receivers. *Figure 4-1* to *Figure 4-4* also show the predicted noise levels as contour maps at the floor level generally resulting in the highest noise levels as follows:

- *Figure 4-1* and *Figure 4-2* – Scenario 1 noise levels at floor levels 2 and 4 respectively.
- *Figure 4-3* – Scenario 2 noise levels at floor level 2,

- Figure 4-4 – Scenario 3 noise levels at floor level 2, and
- Figure 4-5 – Scenario 4 noise levels at floor level 3.

**Table 4-1 Predicted Noise Levels**

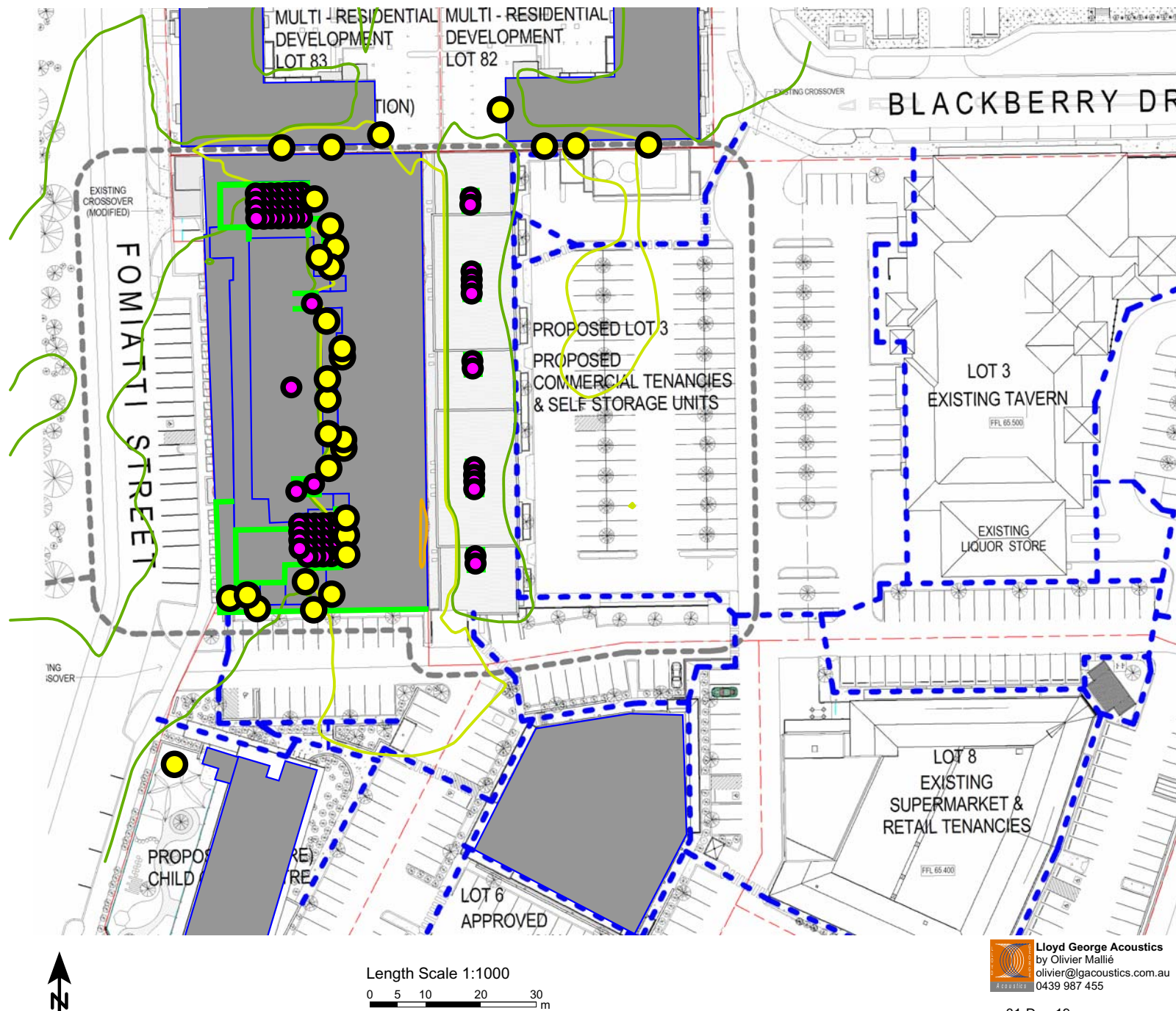
Receiver	Floor Level	Facade Orientation	Scenario 1 dB L <sub>A10</sub>	Scenario 2 dB L <sub>A10</sub>	Scenario 3 dB L <sub>Amax</sub>	Scenario 4 dB L <sub>A10</sub>
Childcare Centre	GF	n/a	<b>29</b>	27	n/a	n/a
Lot 82	GF	W	30	28	22	17
Lot 82	FL 1	W	32	30	23	16
Lot 82	FL 2	W	34	31	29	16
Lot 82	GF	S	29	26	38	<b>21</b>
Lot 82	FL 1	S	34	29	48	19
Lot 82	FL 2	S	35	<b>32</b>	<b>51</b>	20
Lot 82	GF	S	28	22	34	20
Lot 82	FL 1	S	30	24	38	18
Lot 82	FL 2	S	35	29	50	17
Lot 82	GF	S	28	22	35	20
Lot 82	FL 1	S	31	25	42	18
Lot 82	FL 2	S	<b>35</b>	30	51	17
Lot 83	GF	E	32	28	24	21
Lot 83	FL 1	E	33	30	27	18
Lot 83	FL 2	E	35	31	29	17
Lot 83	GF	S	36	35	24	22
Lot 83	FL 1	S	37	36	28	20
Lot 83	FL 2	S	37	36	<b>30</b>	20
Lot 83	GF	S	36	35	20	<b>24</b>
Lot 83	FL 1	S	37	36	20	21
Lot 83	FL 2	S	<b>37</b>	<b>37</b>	22	22
Lot 9633_Type A Beds	FL 1	E	36	n/a	27	21
Lot 9633_Type A Beds	FL 2	E	36	n/a	29	22

Receiver	Floor Level	Facade Orientation	Scenario 1 dB L <sub>A10</sub>	Scenario 2 dB L <sub>A10</sub>	Scenario 3 dB L <sub>Amax</sub>	Scenario 4 dB L <sub>A10</sub>
Lot 9633_Type A Beds	FL 3	E	34	n/a	29	19
Lot 9633_Type B	FL 1	E	34	n/a	28	21
Lot 9633_Type B	FL 2	E	35	n/a	30	22
Lot 9633_Type B	FL 3	E	<b>35</b>	n/a	33	21
Lot 9633_Type B Bed1	FL 4	E	36	n/a	32	22
Lot 9633_Type B Bed2	FL 4	E	35	n/a	30	19
Lot 9633_Type C Beds	FL 4	E	38	n/a	39	36
Lot 9633_Type C Beds	FL 1	E	37	n/a	34	31
Lot 9633_Type C Beds	FL 2	E	37	n/a	37	36
Lot 9633_Type C Beds	FL 3	E	38	n/a	40	37
Lot 9633_Type H Beds	FL 4	E	37	n/a	41	36
Lot 9633_Type H Beds	FL 1	E	37	n/a	36	32
Lot 9633_Type H Beds	FL 2	E	38	n/a	39	37
Lot 9633_Type H Beds	FL 3	E	37	n/a	42	37
Lot 9633_Type I Beds	FL 1	E	36	n/a	40	30
Lot 9633_Type I Beds	FL 2	E	36	n/a	42	35
Lot 9633_Type I Beds	FL 3	E	37	n/a	45	36
Lot 9633_Type J Bed 2	FL 1	S	27	n/a	<b>58</b>	45
Lot 9633_Type J Bed 2	FL 2	S	27	n/a	<b>58</b>	48
Lot 9633_Type J Bed 2	FL 3	S	26	n/a	55	49
Lot 9633_Type J Beds	FL 1	E	33	n/a	46	32
Lot 9633_Type J Beds	FL 2	E	33	n/a	55	37
Lot 9633_Type J Beds	FL 3	E	33	n/a	54	40
Lot 9633_Type J Dining	FL 1	S	16	n/a	54	50
Lot 9633_Type J Dining	FL 2	S	17	n/a	57	<b>51</b>
Lot 9633_Type J Dining	FL 3	S	17	n/a	55	<b>51</b>
Lot 9633_Type J Living	FL 1	W	16	n/a	45	47

Receiver	Floor Level	Facade Orientation	Scenario 1 dB L <sub>A10</sub>	Scenario 2 dB L <sub>A10</sub>	Scenario 3 dB L <sub>Amax</sub>	Scenario 4 dB L <sub>A10</sub>
Lot 9633_Type J Living	FL 2	W	16	n/a	54	49
Lot 9633_Type J Living	FL 3	W	16	n/a	52	49
Lot 9633_Type O Balcony	FL 4	W	29	n/a	38	39
Lot 9633_Type O Bed1	FL 4	E	36	n/a	51	31
Lot 9633_Type O Bed2	FL 4	E	36	n/a	45	35
Lot 9633_Type P Balcony	FL 4	S	20	n/a	38	43
Lot 9633_Type Q Beds	FL 5	E	37	n/a	33	29
Lot 9633_Type R Bed 2	FL 5	E	38	n/a	38	37
Lot 9633_Type R Bed 3	FL 5	E	38	n/a	37	36
Lot 9633_Type S Bed1	FL 5	E	38	n/a	39	36
Lot 9633_Type S Bed 2	FL 5	E	38	n/a	39	37
Lot 9633_Type S Bed 3	FL 5	E	<b>38</b>	n/a	40	36

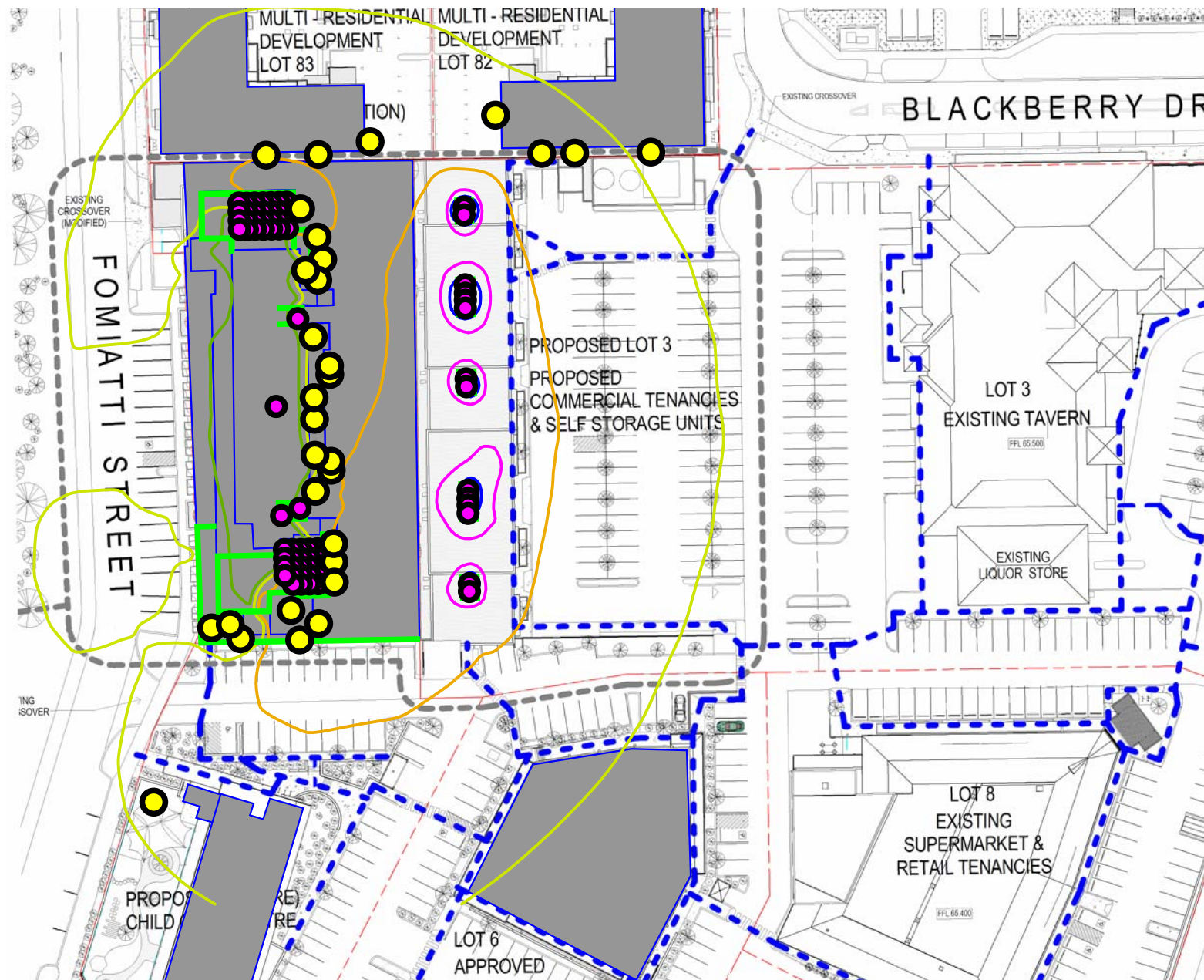


**Figure 4-1**





**Figure 4-2**



Noise Level  
dB L<sub>A10</sub>



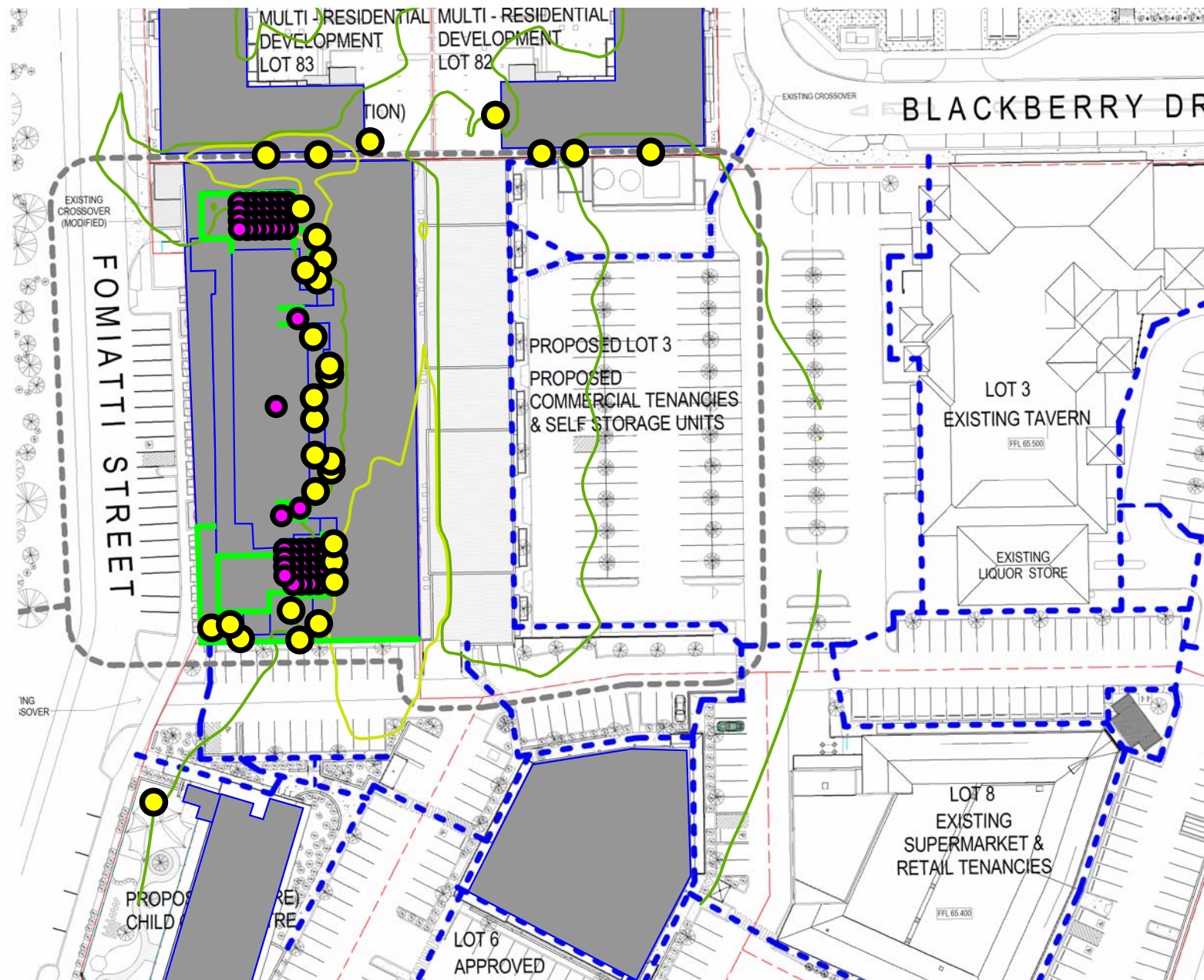
Signs and symbols



Length Scale 1:1000



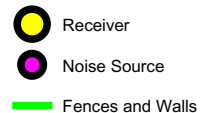
**Figure 4-3**



Noise Level  
 dB L<sub>A10</sub>



Signs and symbols

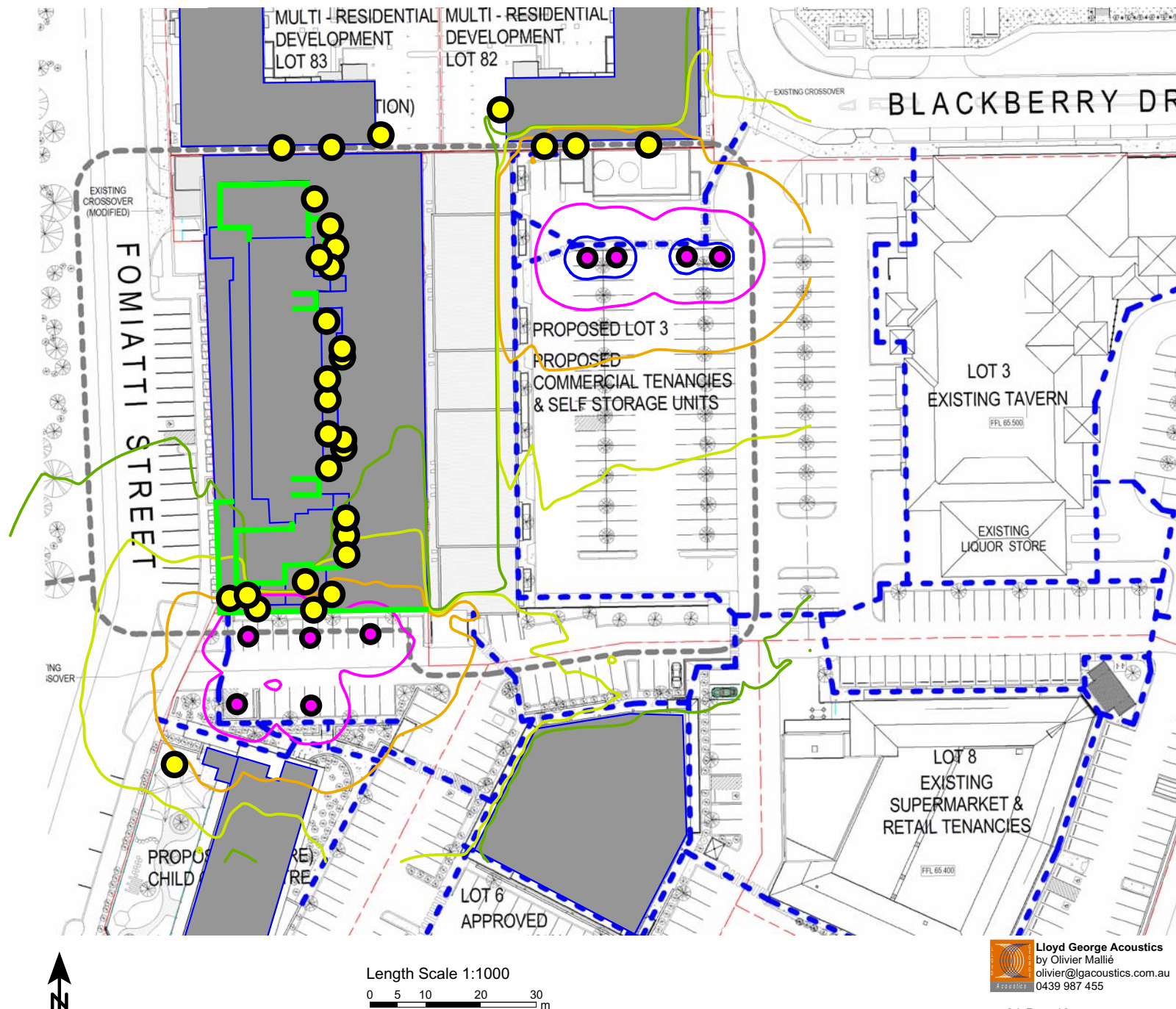


Length Scale 1:1000

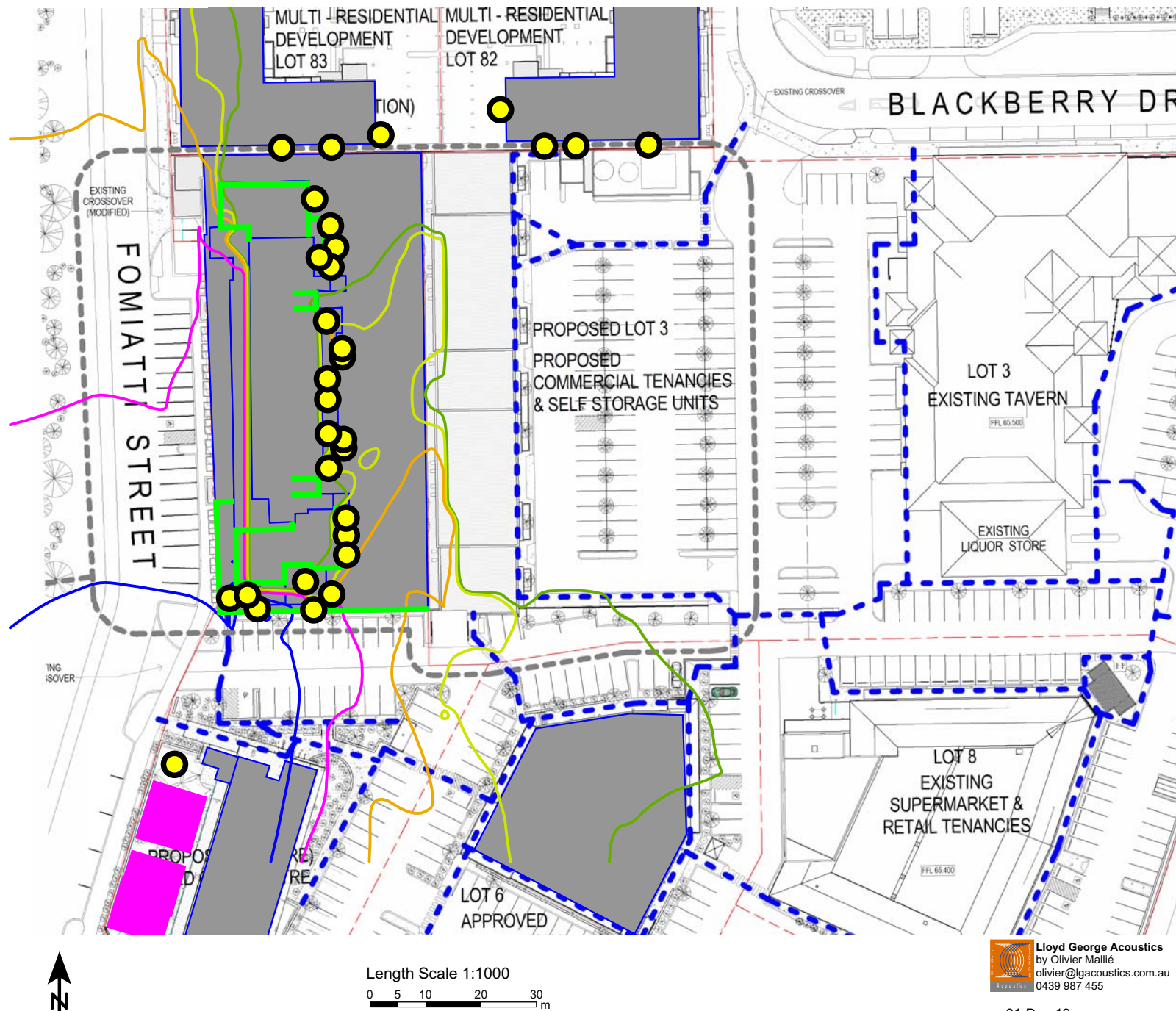




**Figure 4-4**



**Figure 4-5**



## 5 ASSESSMENT

### 5.1 Scenario 1 – Daytime Plant Noise

For this scenario all the mechanical plant at Lot 9633 (level 5 plant decks and exhaust fans), and all the AC plant at Lot 3 are assumed to operate at maximum capacity. Given the nature of the noise sources and the separation distances involved, it is likely that tonality will be present in the noise emissions at all nearby receivers. Therefore the predicted noise levels are to be adjusted by +5 dB (refer *Table 2-1*).

The most critical daytime period was considered to be the Sunday and Evening time periods as these periods have the lowest daytime assigned noise level and the commercial tenancies at Lot 3 could be open e.g. cafe/restaurant, doctor's surgery, etc. From *Table 4-1*, the highest predicted noise levels at each group of receivers were identified and *Table 5-1* summaries the assessment of the overall noise levels as a worst-case scenario (i.e. all tenancies operate on a Sunday).

**Table 5-1 Assessment of Scenario 1 Noise Levels (Sunday and Evening)**

Receiver	Period <sup>1</sup>	Assigned Noise Level <sup>2</sup>	Predicted Noise Level <sup>3</sup>	Adjusted Noise Level <sup>4</sup>	Calculated Exceedance
Lot 82	Sunday or Evening	42 dB L <sub>A10</sub>	35 dB L <sub>A10</sub>	40 dB L <sub>A10</sub>	-
Lot 83	Sunday or Evening	42 dB L <sub>A10</sub>	37 dB L <sub>A10</sub>	42 dB L <sub>A10</sub>	-
Lot 9633	Sunday or Evening	43 dB L <sub>A10</sub>	38 dB L <sub>A10</sub>	43 dB L <sub>A10</sub>	-
Childcare Centre	Sunday or Evening	42 dB L <sub>A10</sub>	29 dB L <sub>A10</sub>	34 dB L <sub>A10</sub>	-

Notes:

1. Periods are as defined in *Table 2-4*.
2. The assigned noise level is as defined in *Table 2-4*.
3. From *Table 4-1*.
4. Daytime noise is adjusted by + 5 dB for tonality.

From the above assessment it can be seen that compliance can be achieved during the Sunday daytime period.

The above is to be reviewed during detailed design once all AC plant details and plant selection has been finalised.

It is further noted that on floor level 5 at Lot 9633, bedrooms are located on the north side of the building and with external glazing facing directly towards the plant deck. As such, the plant deck enclosure is to include 2.1 metre high noise screens to the south side of the plant deck to minimise noise impacts to these internal sensitive receivers e.g. Bed 3 of Apartment Type Q.

### 5.2 Scenario 2 – Night-time Plant Noise

During the night-time period, only the AC plant at Lot 9633 was assumed to be operational. Given the nature of the noise sources and the separation distances involved, tonality may be present in the noise emissions at all nearby receivers. Therefore the predicted noise levels are to be adjusted by +5 dB (refer *Table 2-1*).



From *Table 4-1*, the highest predicted noise levels at each group of receiver were identified and *Table 5-2* summaries the assessment of the predicted noise levels.

**Table 5-2 Assessment of Scenario 2 Noise Levels (Night-time)**

Receiver	Period <sup>1</sup>	Assigned Noise Level <sup>2</sup>	Predicted Noise Level <sup>3</sup>	Adjusted Noise Level <sup>4</sup>	Calculated Exceedance
Lot 82	Night	37 dB L <sub>A10</sub>	32 dB L <sub>A10</sub>	37 dB L <sub>A10</sub>	-
Lot 83	Night	37 dB L <sub>A10</sub>	37 dB L <sub>A10</sub>	42 dB L <sub>A10</sub>	5 dB
Childcare Centre	Night	37 dB L <sub>A10</sub>	29 dB L <sub>A10</sub>	34 dB L <sub>A10</sub>	-

Notes:

1. Periods are as defined in *Table 2-4*.
2. The assigned noise level is as defined in *Table 2-4*.
3. From *Table 4-1*.
4. Night-time noise is adjusted by + 5 dB for tonality.

From the above assessment it can be seen that an exceedance of 5 dB may be possible at Lot 83 receivers but only if a tonal adjustment is made. This is a conservative assessment as not all units are expected to run simultaneously and at full capacity. During detailed design, the following is to be reviewed/implemented to ensure compliance at all times:

- Select AC plant which can run in 'night-time' or 'quiet mode' at night-time,
- Ensure AC plant is located as close as possible to the acoustic screens.

It must also be noted all the above, including the plant deck layout, will be reviewed during detailed design, once all plant selection has been finalised.

### 5.3 Scenario 3 – Car Doors Closing

For this scenario, car doors closing were modelled on the car park east of Lot 3 and the closest car bays to the south of Lot 9633 (e.g. childcare centre drop-off). Given the nature of the noise sources and the separation distances involved, it is likely the noise emission from a car door closing will be impulsive and, therefore, the predicted noise levels are to be adjusted by +10 dB (refer *Table 2-1*).

It is understood the childcare centre to the south is proposed to open from 06.30am and therefore children drop-off and staff could arrive before 7.00am. However, it was considered that the commercial tenancies at Lot 3 would only be occupied during the daytime at this stage e.g. cafe/restaurant, doctor's surgery, etc. From *Table 4-1*, the highest predicted noise levels at each group of receiver were identified and *Table 5-3* summaries the assessment of the overall noise levels as a worst-case scenario (i.e. all tenancies operate on a Sunday).

**Table 5-3 Assessment of Scenario 3 Noise Levels**

Receiver	Period <sup>1</sup>	Assigned Noise Level <sup>2</sup>	Predicted Noise Level <sup>3</sup>	Adjusted Noise Level <sup>4</sup>	Calculated Exceedance
Lot 82	Sunday	67 dB L <sub>Amax</sub>	51 dB L <sub>Amax</sub>	61 dB L <sub>Amax</sub>	-
Lot 83	Sunday	67 dB L <sub>Amax</sub>	30 dB L <sub>Amax</sub>	40 dB L <sub>Amax</sub>	-
Lot 9633 (south)	Night	58 dB L <sub>Amax</sub>	58 dB L <sub>Amax</sub>	68 dB L <sub>Amax</sub>	10 dB
Lot 9633 (west)	Night	58 dB L <sub>Amax</sub>	54 dB L <sub>Amax</sub>	64 dB L <sub>Amax</sub>	6 dB
Lot 9633 (east)	Night	58 dB L <sub>Amax</sub>	55 dB L <sub>Amax</sub>	65 dB L <sub>Amax</sub>	7 dB

Notes:

1. Periods are as defined in Table 2-4.
2. The assigned noise level is as defined in Table 2-4.
3. From Table 4-1.
4. Daytime noise is adjusted by + 5 dB for tonality.

From the above assessment it can be seen that compliance can be achieved at the receivers at Lots 82 and 83. However, it can also be seen that should the Lot 3 car park be used outside of daytime hours e.g. prior to 9.00am on Sunday or after 7.00pm on any day, the level of exceedance would be up to 4 dB at Lot 82 receivers. Therefore noise mitigations would be required, such as:

- Depending on which commercial tenancy at Lot 3 is open, it may be possible to restrict access to parts of the car park e.g. park close to Tenancies T4 to T7.

At the receivers at Lot 9633, exceedences up to 10 dB were predicted. However, given the glazing to the south facade is acoustically rated, and based on the plans and elevations provided, internal noise levels below 30 dB(A) were predicted in all affected rooms. Therefore, compliance can be achieved when assessed inside the premises and with all external glazing closed (refer Section 2).

Nonetheless, with such an approach, it is also recommended notifications on title be provided advising of the mixed use nature and potential for noise impacts, and for the childcare centre visitors and staff to be encouraged to park in the parking bays to the west or east of the childcare centre only. This would then allow for the scenario of an open window or the like.

## 5.4 Scenario 4 – Childcare Centre Noise

It is understood the childcare centre would open from 6.30am Monday to Friday however, outdoor child play will not commence before 7.00am. As such the critical assigned noise level is the daytime L<sub>A10</sub> of 48 dB at the receivers at Lot 9633. Noise from child play is not considered to contain annoying characteristics within the definition of the Regulations therefore no adjustments are made to the predicted noise levels.

From the results in Table 4-1 it is noted that only the southernmost apartments on levels 1 to 3 (apartment type J) are most exposed, with noise levels above 48 dB L<sub>A10</sub> predicted at the south and west facades. Table 5-4 summaries the assessment of outdoor play noise levels at the most exposed receivers only against the daytime L<sub>A10</sub> assigned noise level.

From the assessment in Table 5-4 it can be seen that exceedences of 1-3 dB are predicted at the south window of the Living area, while marginal compliance is achieved elsewhere. As the receivers

are all elevated, in this case the noise emissions could be assessed inside the premises, in accordance with Regulation 19(2)(b). Based on the acoustic rating of the glazing and the plans and elevations provided, internal noise levels below 23 dB(A) were predicted in all affected rooms. Therefore, compliance can be achieved when assessed inside the premises and with all external glazing closed (refer *Section 2*).

Nonetheless, with such an approach, it is also recommended notifications on title be provided advising of the mixed use nature and potential for noise impacts. This would then allow for the scenario of an open window or the like.

**Table 5-4 Assessment of Scenario 4 Noise Levels (Daytime)**

Receiver	Floor	Facade Orientation	Assigned Noise Level <sup>1</sup>	Predicted Noise Level <sup>2</sup>	Adjusted Noise Level <sup>3</sup>	Calculated Exceedance
Lot 9633_Type J Bed 2	FL 2	S	48 dB L <sub>A10</sub>	48 dB L <sub>A10</sub>	48 dB L <sub>A10</sub>	-
Lot 9633_Type J Bed 2	FL 3	S	48 dB L <sub>A10</sub>	49 dB L <sub>A10</sub>	49 dB L <sub>A10</sub>	1 dB
Lot 9633_Type J Dining	FL 1	S	48 dB L <sub>A10</sub>	50 dB L <sub>A10</sub>	50 dB L <sub>A10</sub>	2 dB
Lot 9633_Type J Dining	FL 2	S	48 dB L <sub>A10</sub>	51 dB L <sub>A10</sub>	51 dB L <sub>A10</sub>	3 dB
Lot 9633_Type J Dining	FL 3	S	48 dB L <sub>A10</sub>	51 dB L <sub>A10</sub>	51 dB L <sub>A10</sub>	3 dB
Lot 9633_Type J Living	FL 1	W	48 dB L <sub>A10</sub>	47 dB L <sub>A10</sub>	47 dB L <sub>A10</sub>	-
Lot 9633_Type J Living	FL 2	W	48 dB L <sub>A10</sub>	49 dB L <sub>A10</sub>	49 dB L <sub>A10</sub>	1 dB
Lot 9633_Type J Living	FL 3	W	48 dB L <sub>A10</sub>	49 dB L <sub>A10</sub>	49 dB L <sub>A10</sub>	1 dB

Notes:

1. The assigned noise level is as defined in *Table 2-4*.
2. From *Table 4-1*.
3. No adjustments for annoying characteristics.



## 6 CONCLUSIONS

It is proposed to develop the land located at Lot 9633 Fomiatti Street in Ashby (refer *Figure 1.1*) into a mixed-use residential/commercial development, and commercial tenancies and self storage units on adjacent Lot 3 (proposed). The proposed development will consist of the following:

- Lot 9633 building: six storey mixed-use development with:
  - Ground floor commercial tenancies,
  - Floors 1 to 5 residential apartments, and
  - Undercroft car parking.
- Proposed Lot 3 building: ground level self-storage units and seven commercial tenancies, with dedicated parking on the east side of the building.

Based on the modelling and assessments carried out, the noise emissions from the mechanical plant can comply with the *Environmental Protection (Noise) Regulations 1997*.

As this is development approval stage only, details of all the AC plant are not known, as well as the nature of the commercial tenancies at Lot 3. Therefore, the following is to be reviewed during detailed design:

- All AC plant to be selected to be the quietest available,
- Residential AC units on the northern plant deck to be able to operate on a 'night-time' mode,
- Layout of plant deck i.e. locate AC plant or screen as close to each other as possible, and
- Design of the northern acoustic screens to be reviewed based on final equipment selection.

The noise emissions from car doors closing in the Lot 3 car park were also assessed as potentially requiring mitigation, with options including:

- Depending on the opening hours of the individual commercial tenancy at Lot 3, it may be possible to restrict access to parts of the car park e.g. park close to Tenancies T4 to T7, outside of daytime hours.

Finally, it is understood that a childcare centre development is proposed on the opposite lot to the south of Lot 9633. However, the assessment indicates that the noise emissions associated with outdoor child play and car doors closing were predicted to comply with the assigned noise levels when assessed within the premises and with windows closed.

**Appendix A**

**Development Plans**





FLOOR PLAN - LEVEL 1 RESIDENTIAL  
SCALE: 1 : 100 at B1

ACOUSTIC ATTENUATION NOTES

REFER ENVIRONMENTAL NOISE ASSESSMENT ("ENA") REF 1909164-01  
PREPARED BY LLOYD GEORGE ACOUSTICS.

ALL GLAZING ASSEMBLIES TO THE SOUTHERN FACADE OF LEVELS 1 - 4  
ARE TO BE RATED (WIND) 31(-)3 MINIMUM AS STATED IN THE ENA.

NORTHERN AIR CONDITIONING PLANT DECK OF LEVEL 5 TO BE  
SCREENED WITH AN APPROPRIATELY RATED ACOUSTIC SCREENING  
SYSTEM TO COMPLY WITH THE REQUIREMENTS OF THE ENA.

BUSHFIRE PROTECTION NOTES

REFER BUSHFIRE MANAGEMENT PLAN REF 19PER-14382 PREPARED  
BY ECOLOGICAL AUSTRALIA

APPLICABLE BAL-RATED CONTOUR AS ADVISED  
BY ECOLOGICAL AUSTRALIA

CONSTRUCTION OF BUILDING ELEMENTS WILL COMPLY WITH THE  
REQUIREMENTS OF AS 3958-2009 ("THE STANDARD") INCLUDING BUT  
NOT LIMITED TO:

**BAL-12.5 ZONE** SECTIONS 3 AND 5 OF THE STANDARD  
APPLICABLE TO LEVELS 1 TO 5 NORTHERN AND SOUTHERN  
FACADES AND LEVEL 5 WESTERN FACADE

**BAL-19 ZONE** SECTIONS 3 AND 6 OF THE STANDARD  
APPLICABLE TO LEVELS 1 TO 4 NORTHERN, SOUTHERN AND  
WESTERN FACADES

**BAL-29 ZONE** DOES NOT INTERSECT RESIDENTIAL COMPONENT  
OF BUILDING

**BAL-40 ZONE** DOES NOT INTERSECT BUILDING

**BAL-FZ ZONE** DOES NOT INTERSECT BUILDING

NOTE: ALL OPENABLE PARTS OF RESIDENTIAL WINDOWS EXPOSED TO  
BUSHFIRE ATTACK WILL HAVE FIRED STAINLESS STEEL MESH  
SCREENING COMPLIANT WITH CLAUSE 5.5.14 OF THE STANDARD

LEGEND

CROSS-FLOW VENTILATION PATH

PREDOMINANT COOLING BREEZES  
COME FROM THE SOUTH WEST  
(WIND ROSE SHOWN AT 3PM  
AVERAGE FROM THE BUREAU OF  
METEOROLOGY)

ALL AREAS SHOWN ARE APPROXIMATE NETT ONLY AND ARE  
SUBJECT TO FINAL SURVEY

APARTMENT CROSS-FLOW VENTILATION CALCULATIONS: No. %

TOTAL NUMBER OF APARTMENTS	51
CROSS-FLOW TO LIVING AREAS	36 70%
CROSS-FLOW TO AT LEAST ONE BEDROOM	33 65%

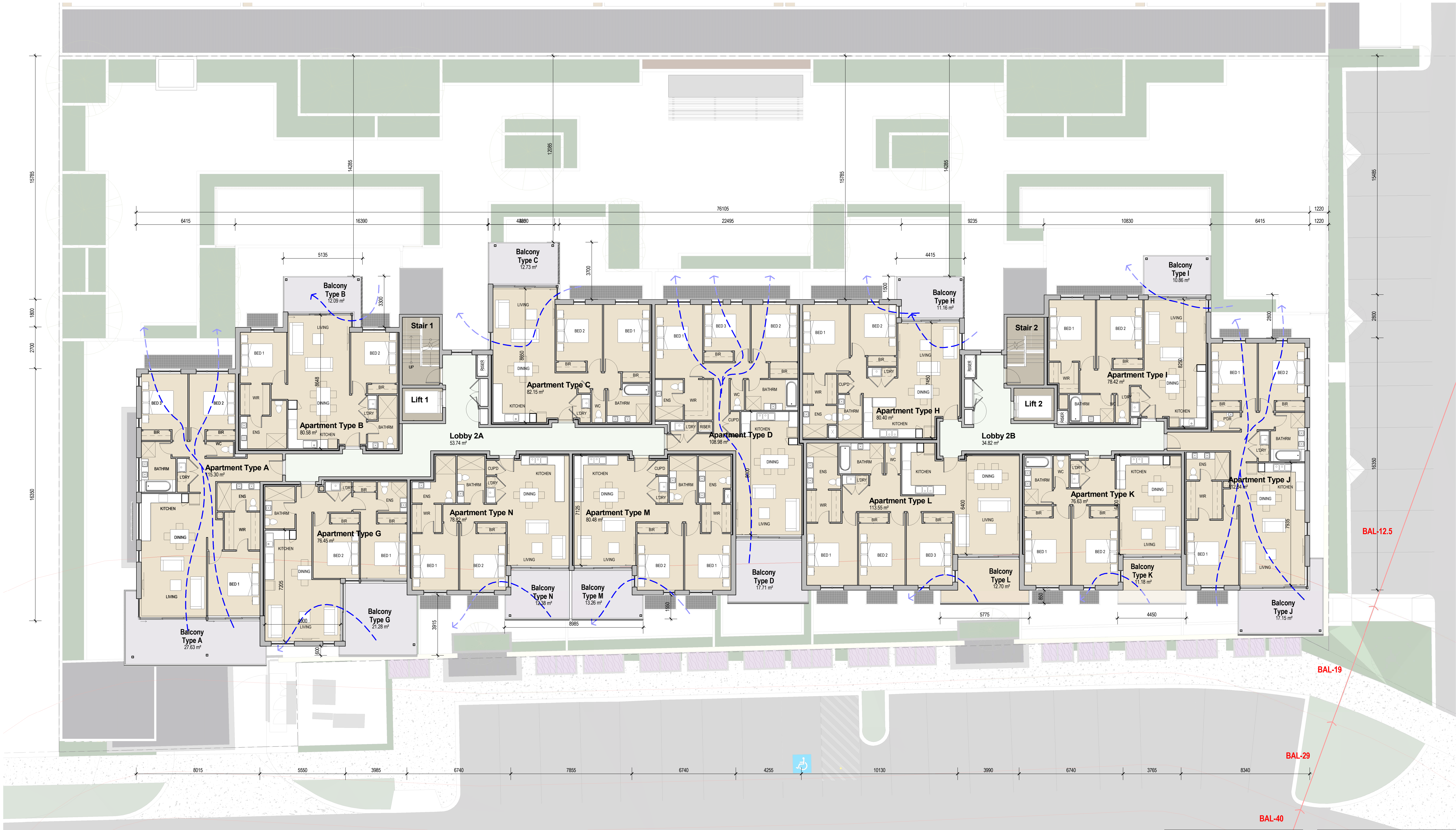
LEVEL 1 ROOM SCHEDULE

NAME	AREA (Nett)	No. OF BEDROOMS	NAT. VENT. LIVING	NAT. VENT. BED
Lobby 1A	53.73 m <sup>2</sup>			
Lobby 1B	34.58 m <sup>2</sup>			
Terrace Type E	25.13 m <sup>2</sup>			
TOTAL COMMON AREA	86.32 m <sup>2</sup>			
Landscaped Terrace	1004.00 m <sup>2</sup>			
TOTAL LANDSCAPED TERRACE	1004.00 m <sup>2</sup>			
Gardener St	1.61 m <sup>2</sup>			
Gardener St	1.61 m <sup>2</sup>			
Stair 1	15.32 m <sup>2</sup>			
Stair 2	15.27 m <sup>2</sup>			
TOTAL SERVICE	33.80 m <sup>2</sup>			
Apartment Type A	114.53 m <sup>2</sup>	3	Yes	Yes
Terrace Type A	96.52 m <sup>2</sup>			
TOTAL TYPE A	211.05 m <sup>2</sup>			
Apartment Type B	81.27 m <sup>2</sup>	2	Yes	No
Terrace Type B	50.11 m <sup>2</sup>			
TOTAL TYPE B	131.38 m <sup>2</sup>			
Apartment Type C	82.15 m <sup>2</sup>	2	Yes	No
Terrace Type C	37.28 m <sup>2</sup>			
TOTAL TYPE C	119.43 m <sup>2</sup>			
Apartment Type D	108.99 m <sup>2</sup>	3	Yes	Yes
Terrace 1 Type D	27.90 m <sup>2</sup>			
Terrace 2 Type D	16.89 m <sup>2</sup>			
TOTAL TYPE D	153.77 m <sup>2</sup>			

LEVEL 1 ROOM SCHEDULE

NAME	AREA (Nett)	No. OF BEDROOMS	NAT. VENT. LIVING	NAT. VENT. BED
Apartment Type E	87.55 m <sup>2</sup>	2	No	No
Terrace Type E	25.13 m <sup>2</sup>			
TOTAL TYPE E	112.68 m <sup>2</sup>			
Apartment Type F	85.61 m <sup>2</sup>	2	No	No
Terrace Type F	27.01 m <sup>2</sup>			
TOTAL TYPE F	112.61 m <sup>2</sup>			
Apartment Type G	76.45 m <sup>2</sup>	2	Yes	No
Terrace Type G	22.22 m <sup>2</sup>			
TOTAL TYPE G	98.67 m <sup>2</sup>			
Apartment Type H	80.40 m <sup>2</sup>	2	Yes	Yes
Terrace Type H	43.11 m <sup>2</sup>			
TOTAL TYPE H	123.51 m <sup>2</sup>			
Apartment Type I	78.42 m <sup>2</sup>	2	Yes	No
Terrace Type I	45.18 m <sup>2</sup>			
TOTAL TYPE I	123.60 m <sup>2</sup>			
Apartment Type J	113.34 m <sup>2</sup>	3	Yes	Yes
Terrace Type J	45.67 m <sup>2</sup>			
TOTAL TYPE J	159.01 m <sup>2</sup>			
Apartment Type K	76.63 m <sup>2</sup>	2	No	Yes
Terrace Type K	30.87 m <sup>2</sup>			
TOTAL TYPE K	107.50 m <sup>2</sup>			
Apartment Type L	113.55 m <sup>2</sup>	3	No	Yes
Terrace Type L	40.08 m <sup>2</sup>			
TOTAL TYPE L	153.64 m <sup>2</sup>			
GRAND TOTAL (Nett)	2732.95 m <sup>2</sup>			





FLOOR PLAN - LEVEL 2 RESIDENTIAL  
SCALE: 1 : 100 at B1

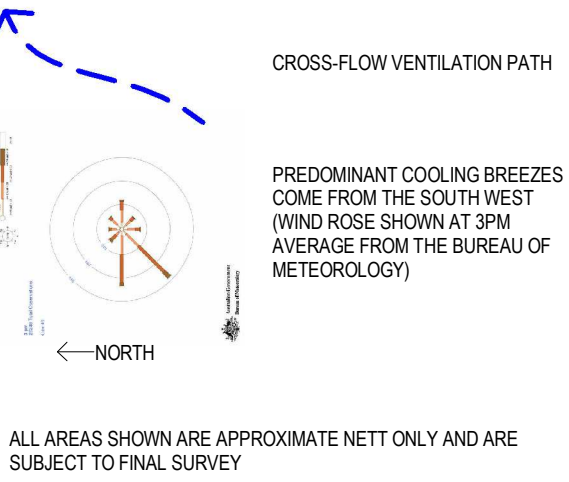
ACOUSTIC ATTENUATION NOTES

REFER ENVIRONMENTAL NOISE ASSESSMENT ("ENA") REF 19095164-01 PREPARED BY LLOYD GEORGE ACOUSTICS.  
ALL GLAZING ASSEMBLIES TO THE SOUTHERN FACADE OF LEVELS 1 - 4 ARE TO BE RATED Rw(C) 31(-3) MINIMUM AS STATED IN THE ENA.  
NORTHERN AIR CONDITIONING PLANT DECK OF LEVEL 5 TO BE SCREENED WITH AN APPROPRIATELY RATED ACOUSTIC SCREENING SYSTEM TO COMPLY WITH THE REQUIREMENTS OF THE ENA.  
Calculating...

BUSHFIRE PROTECTION NOTES

REFER BUSHFIRE MANAGEMENT PLAN REF 19PER-14382 PREPARED BY ECOLOGICAL AUSTRALIA.  
APPLICABLE BAL-RATED CONTOUR AS ADVISED BY ECOLOGICAL AUSTRALIA.  
CONSTRUCTION OF BUILDING ELEMENTS WILL COMPLY WITH THE REQUIREMENTS OF AS 3959-2009 (THE STANDARD) INCLUDING BUT NOT LIMITED TO:  
BAL-12.5 ZONE SECTIONS 3 AND 5 OF THE STANDARD APPLICABLE TO LEVELS 1 TO 5 NORTHERN AND SOUTHERN FACADES AND LEVEL 5 WESTERN FACADE.  
BAL-19 ZONE SECTIONS 3 AND 6 OF THE STANDARD APPLICABLE TO LEVELS 1 TO 4 NORTHERN, SOUTHERN AND WESTERN FACADES.  
BAL-29 ZONE DOES NOT INTERSECT RESIDENTIAL COMPONENT OF BUILDING.  
BAL-40 ZONE DOES NOT INTERSECT BUILDING.  
BAL-FZ ZONE DOES NOT INTERSECT BUILDING.  
NOTE: ALL OPENABLE PARTS OF RESIDENTIAL WINDOWS EXPOSED TO BUSHFIRE ATTACK WILL HAVE FIXED STAINLESS STEEL MESH SCREENS COMPLIANT WITH CLAUSE 5.5.1A OF THE STANDARD.

LEGEND



LEVEL 2 ROOM SCHEDULE				
NAME	AREA (Net)	No. OF BEDROOMS	NAT. VENT. LIVING	NAT. VENT. BED
Lobby 2A	53.74 m²			
Lobby 2B	34.82 m²			
Stair 1	10.59 m²			
Stair 2	10.59 m²			
TOTAL COMMON AREA	109.71 m²			
Apartment Type A	115.30 m²	3	Yes	Yes
Balcony Type A	27.63 m²			
TOTAL TYPE A	143.32 m²			
Apartment Type B	80.58 m²	2	Yes	No
Balcony Type B	12.09 m²			
TOTAL TYPE B	92.67 m²			
Apartment Type C	82.15 m²	2	Yes	No
Balcony Type C	12.73 m²			
TOTAL TYPE C	94.88 m²			
Apartment Type D	108.98 m²	3	Yes	Yes
Balcony Type D	17.71 m²			
TOTAL TYPE D	126.69 m²			
Apartment Type E	76.45 m²	2	Yes	No
Balcony Type E	12.38 m²			
TOTAL TYPE E	88.83 m²			
Apartment Type F	80.40 m²	2	Yes	Yes
Balcony Type F	11.16 m²			
TOTAL TYPE F	91.56 m²			

LEVEL 2 ROOM SCHEDULE				
NAME	AREA (Net)	No. OF BEDROOMS	NAT. VENT. LIVING	NAT. VENT. BED
TOTAL TYPE H	91.56 m²			
Apartment Type I	78.42 m²	2	Yes	No
Balcony Type I	10.86 m²			
TOTAL TYPE I	89.28 m²			
Apartment Type J	112.84 m²	3	Yes	Yes
Balcony Type J	17.27 m²			
TOTAL TYPE J	130.12 m²			
Apartment Type K	76.63 m²	2	No	Yes
Balcony Type K	11.18 m²			
TOTAL TYPE K	87.81 m²			
Apartment Type L	113.55 m²	3	No	Yes
Balcony Type L	12.70 m²			
TOTAL TYPE L	126.26 m²			
Apartment Type M	80.48 m²	2	No	Yes
Balcony Type M	13.26 m²			
TOTAL TYPE M	93.74 m²			
Apartment Type N	78.82 m²	2	No	Yes
Balcony Type N	12.38 m²			
TOTAL TYPE N	91.20 m²			
GRAND TOTAL (Net)	1374.58 m²			





## FLOOR PLAN - LEVEL 3 RESIDENTIAL

SCALE: 1 : 100 at B1

### ACOUSTIC ATTENUATION NOTES

REFER ENVIRONMENTAL NOISE ASSESSMENT (ENR) REF 19095164-01 PREPARED BY LLOYD GEORGE ACOUSTICS.

ALL GLAZING ASSEMBLIES TO THE SOUTHERN FACADE OF LEVELS 1 - 4 ARE TO BE RATED Rw(C) 31(-3) MINIMUM AS STATED IN THE ENA.

NORTHERN AIR CONDITIONING PLANT DECK OF LEVEL 5 TO BE SCREENED WITH AN APPROPRIATELY RATED ACOUSTIC SCREENING SYSTEM TO COMPLY WITH THE REQUIREMENTS OF THE ENA.

### BUSHFIRE PROTECTION NOTES

REFER BUSHFIRE MANAGEMENT PLAN REF 19PER-14382 PREPARED BY ECOLOGICAL AUSTRALIA

APPLICABLE BAL-RATED CONTOUR AS ADVISED BY ECOLOGICAL AUSTRALIA

CONSTRUCTION OF BUILDING ELEMENTS WILL COMPLY WITH THE REQUIREMENTS OF AS 3959-2009 (THE STANDARD) INCLUDING BUT NOT LIMITED TO:

**BAL-12.5 ZONE** SECTIONS 3 AND 5 OF THE STANDARD APPLICABLE TO LEVELS 1 TO 5 NORTHERN AND SOUTHERN FACADES AND LEVEL 5 WESTERN FACADE

**BAL-19 ZONE** SECTIONS 3 AND 6 OF THE STANDARD APPLICABLE TO LEVELS 1 TO 4 NORTHERN, SOUTHERN AND WESTERN FACADES

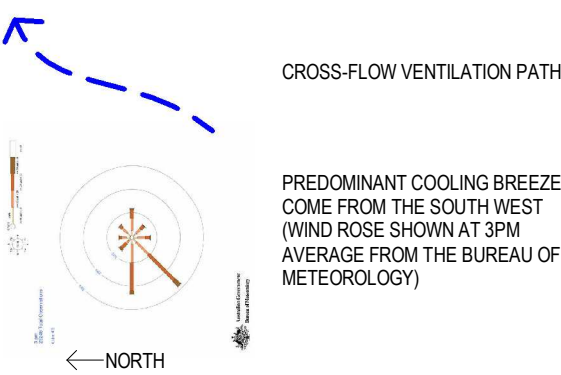
**BAL-29 ZONE** DOES NOT INTERSECT RESIDENTIAL COMPONENT OF BUILDING

**BAL-40 ZONE** DOES NOT INTERSECT BUILDING

**BAL-FZ ZONE** DOES NOT INTERSECT BUILDING

NOTE: ALL OPENABLE PARTS OF RESIDENTIAL WINDOWS EXPOSED TO BUSHFIRE ATTACK WILL HAVE FIXED STAINLESS STEEL MESH SCREENS COMPLIANT WITH CLAUSE 5.5.1A OF THE STANDARD.

### LEGEND



ALL AREAS SHOWN ARE APPROXIMATE NETT ONLY AND ARE SUBJECT TO FINAL SURVEY

APARTMENT CROSS-FLOW VENTILATION CALCULATIONS: No. %

TOTAL NUMBER OF APARTMENTS 51

CROSS-FLOW TO LIVING AREAS 36 70%

CROSS-FLOW TO AT LEAST ONE BEDROOM 33 65%

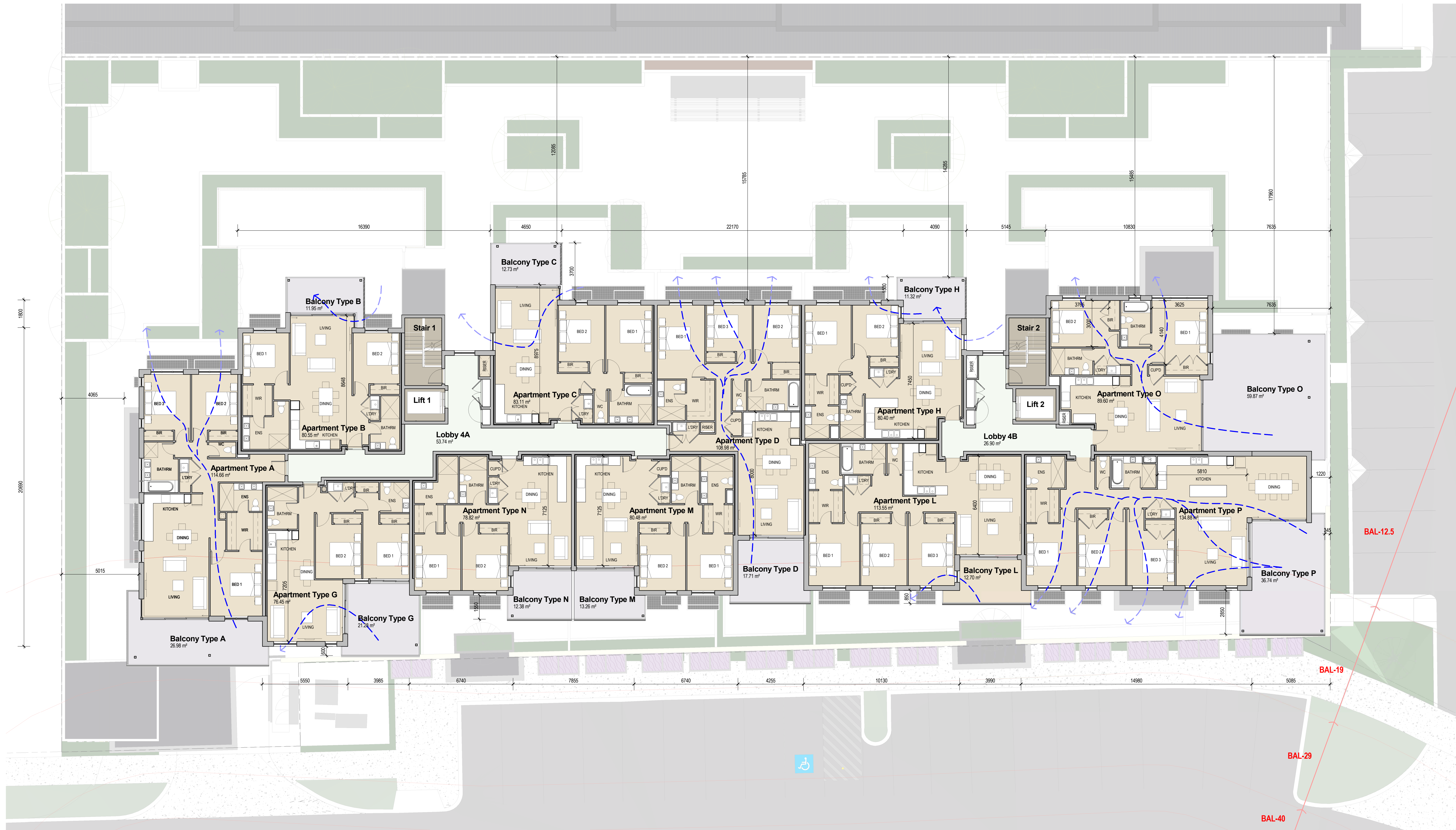
### LEVEL 3 ROOM SCHEDULE

NAME	AREA (Net)	No. OF BEDROOMS	NAT. VENT. LIVING	NAT. VENT. BED
Lobby 3A	53.74 m <sup>2</sup>			
Lobby 3B	34.82 m <sup>2</sup>			
Stair 1	10.59 m <sup>2</sup>			
Stair 2	10.59 m <sup>2</sup>			
TOTAL COMMON AREA	109.71 m <sup>2</sup>			
Apartment Type A	115.30 m <sup>2</sup>	3	Yes	Yes
Balcony Type A	27.63 m <sup>2</sup>			
TOTAL TYPE A	142.92 m <sup>2</sup>			
Apartment Type B	80.58 m <sup>2</sup>	2	Yes	No
Balcony Type B	12.09 m <sup>2</sup>			
TOTAL TYPE B	92.67 m <sup>2</sup>			
Apartment Type C	82.15 m <sup>2</sup>	2	Yes	No
Balcony Type C	12.73 m <sup>2</sup>			
TOTAL TYPE C	94.88 m <sup>2</sup>			
Apartment Type D	108.96 m <sup>2</sup>	3	Yes	Yes
Balcony Type D	17.71 m <sup>2</sup>			
TOTAL TYPE D	126.69 m <sup>2</sup>			
Apartment Type E	78.45 m <sup>2</sup>	2	Yes	No
Balcony Type E	21.28 m <sup>2</sup>			
TOTAL TYPE E	99.73 m <sup>2</sup>			
Apartment Type F	80.40 m <sup>2</sup>	2	Yes	Yes
Balcony Type F	10.86 m <sup>2</sup>			
TOTAL TYPE F	91.26 m <sup>2</sup>			

### LEVEL 3 ROOM SCHEDULE

NAME	AREA (Net)	No. OF BEDROOMS	NAT. VENT. LIVING	NAT. VENT. BED
Balcony Type H	11.16 m <sup>2</sup>			
TOTAL TYPE H	91.56 m <sup>2</sup>			
Apartment Type I	78.42 m <sup>2</sup>	2	Yes	No
Balcony Type I	10.86 m <sup>2</sup>			
TOTAL TYPE I	89.28 m <sup>2</sup>			
Apartment Type J	112.84 m <sup>2</sup>	3	Yes	Yes
Balcony Type J	17.27 m <sup>2</sup>			
TOTAL TYPE J	130.12 m <sup>2</sup>			
Apartment Type K	76.63 m <sup>2</sup>	2	No	Yes
Balcony Type K	11.18 m <sup>2</sup>			
TOTAL TYPE K	87.81 m <sup>2</sup>			
Apartment Type L	113.55 m <sup>2</sup>	3	No	Yes
Balcony Type L	12.70 m <sup>2</sup>			
TOTAL TYPE L	126.26 m <sup>2</sup>			
Apartment Type M	80.48 m <sup>2</sup>	2	No	Yes
Balcony Type M	13.26 m <sup>2</sup>			
TOTAL TYPE M	93.74 m <sup>2</sup>			
Apartment Type N	78.82 m <sup>2</sup>	2	No	Yes
Balcony Type N	12.38 m <sup>2</sup>			
TOTAL TYPE N	91.20 m <sup>2</sup>			
GRAND TOTAL (Net)	1374.58 m <sup>2</sup>			





## FLOOR PLAN - LEVEL 4 RESIDENTIAL

SCALE: 1 : 100 at B1

### ACOUSTIC ATTENUATION NOTES

REFER ENVIRONMENTAL NOISE ASSESSMENT (ENAS) REF 19095164-01 PREPARED BY LLOYD GEORGE ACOUSTICS.

ALL GLAZING ASSEMBLIES TO THE SOUTHERN FACADE OF LEVELS 1 - 4 ARE TO BE RATED RW(C) 31(-3) MINIMUM AS STATED IN THE ENA.

NORTHERN AIR CONDITIONING PLANT DECK OF LEVEL 5 TO BE SCREENED WITH AN APPROPRIATELY RATED ACOUSTIC SCREENING SYSTEM TO COMPLY WITH THE REQUIREMENTS OF THE ENA.

### BUSHFIRE PROTECTION NOTES

REFER BUSHFIRE MANAGEMENT PLAN REF 19PBR-14382 PREPARED BY ECOLOGICAL AUSTRALIA

APPLICABLE BAL-RATED CONTOUR AS ADVISED BY ECOLOGICAL AUSTRALIA

CONSTRUCTION OF BUILDING ELEMENTS WILL COMPLY WITH THE REQUIREMENTS OF AS 3958-2009 (THE STANDARD) INCLUDING BUT NOT LIMITED TO:

**BAL-12.5 ZONE** SECTIONS 3 AND 5 OF THE STANDARD APPLICABLE TO LEVELS 1 TO 5 NORTHERN AND SOUTHERN FACADES AND LEVEL 5 WESTERN FACADE

**BAL-19 ZONE** SECTIONS 3 AND 6 OF THE STANDARD APPLICABLE TO LEVELS 1 TO 4 NORTHERN, SOUTHERN AND WESTERN FACADES

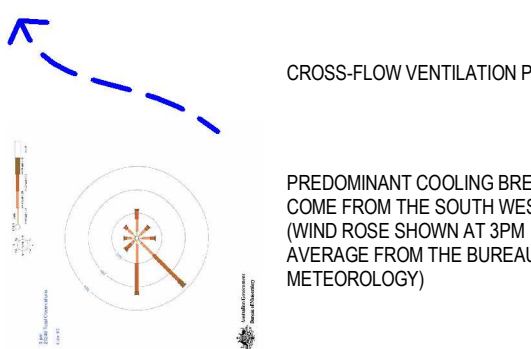
**BAL-29 ZONE** DOES NOT INTERSECT RESIDENTIAL COMPONENT OF BUILDING

**BAL-40 ZONE** DOES NOT INTERSECT BUILDING

**BAL-FZ ZONE** DOES NOT INTERSECT BUILDING

NOTE: ALL OPENABLE PARTS OF RESIDENTIAL WINDOWS EXPOSED TO BUSHFIRE ATTACK WILL HAVE FIXED STAINLESS STEEL MESH SCREENS COMPLIANT WITH CLAUSE 5.5.14 OF THE STANDARD.

### LEGEND



ALL AREAS SHOWN ARE APPROXIMATE NETT ONLY AND ARE SUBJECT TO FINAL SURVEY

APARTMENT CROSS-FLOW VENTILATION CALCULATIONS: No. %

TOTAL NUMBER OF APARTMENTS 51

CROSS-FLOW TO LIVING AREAS 36 70%

CROSS-FLOW TO AT LEAST ONE BEDROOM 33 65%

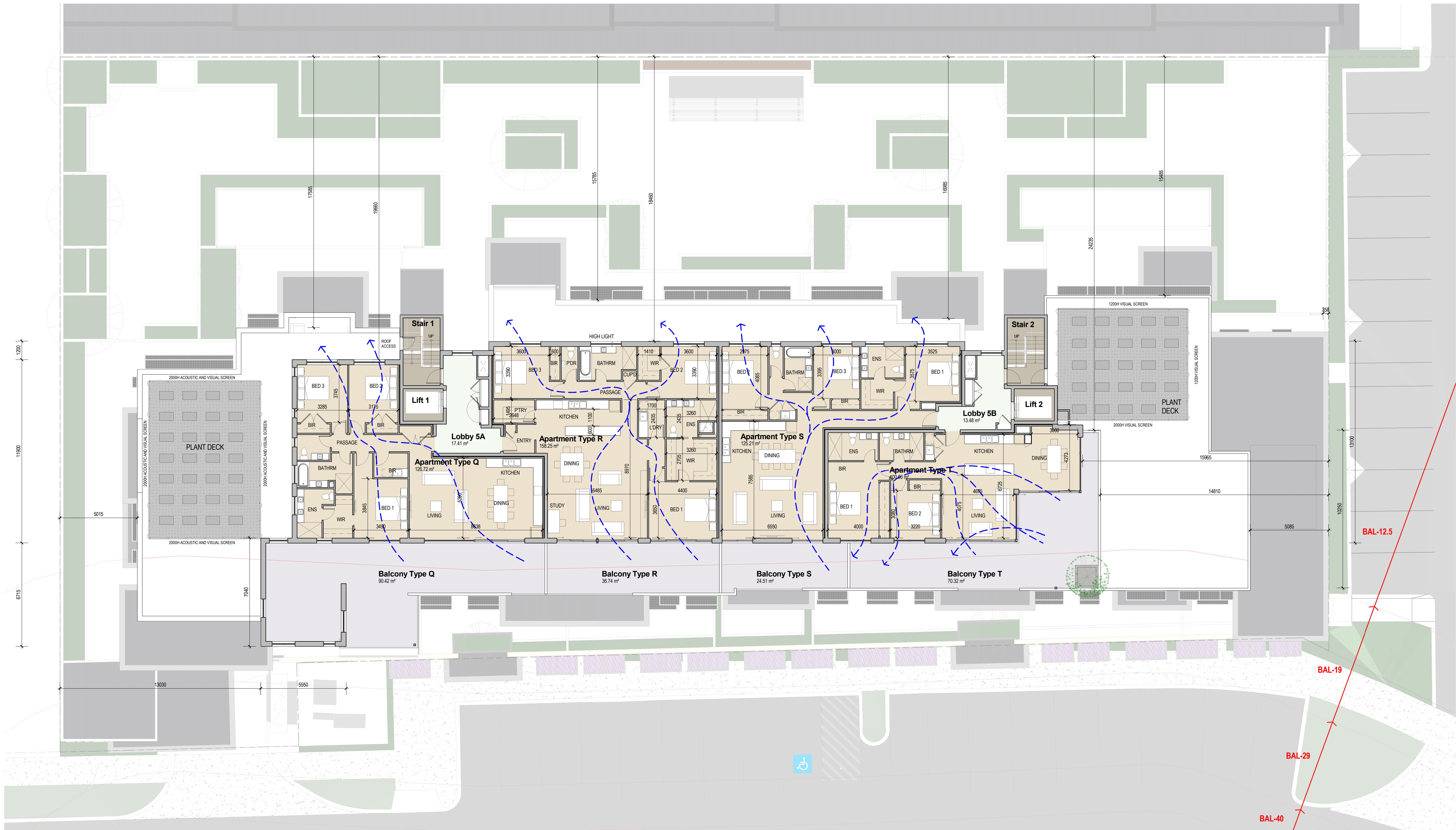
### LEVEL 4 ROOM SCHEDULE

NAME	AREA (Nett)	No. OF BEDROOMS	NAT. VENT. LIVING	NAT. VENT. BED
Lobby 4A	53.74 m <sup>2</sup>			
Lobby 4B	26.90 m <sup>2</sup>			
Stair 1	10.59 m <sup>2</sup>			
Stair 2	10.59 m <sup>2</sup>			
TOTAL COMMON AREA	101.79 m <sup>2</sup>			
Apartment Type A	114.66 m <sup>2</sup>	3	Yes	Yes
Balcony Type A	26.95 m <sup>2</sup>			
TOTAL TYPE A	141.64 m <sup>2</sup>			
Apartment Type B	80.55 m <sup>2</sup>	2	Yes	No
Balcony Type B	11.95 m <sup>2</sup>			
TOTAL TYPE B	92.50 m <sup>2</sup>			
Apartment Type C	83.11 m <sup>2</sup>	2	Yes	No
Balcony Type C	12.73 m <sup>2</sup>			
TOTAL TYPE C	95.84 m <sup>2</sup>			
Apartment Type D	108.98 m <sup>2</sup>	3	Yes	Yes
Balcony Type D	17.71 m <sup>2</sup>			
TOTAL TYPE D	126.69 m <sup>2</sup>			
Apartment Type G	76.45 m <sup>2</sup>	2	Yes	No
Balcony Type G	21.28 m <sup>2</sup>			
TOTAL TYPE G	97.73 m <sup>2</sup>			

### LEVEL 4 ROOM SCHEDULE

NAME	AREA (Nett)	No. OF BEDROOMS	NAT. VENT. LIVING	NAT. VENT. BED
Apartment Type H	80.40 m <sup>2</sup>	2	Yes	Yes
Balcony Type H	11.32 m <sup>2</sup>			
TOTAL TYPE H	91.72 m <sup>2</sup>			
Apartment Type L	113.55 m <sup>2</sup>	2	No	Yes
Balcony Type L	12.70 m <sup>2</sup>			
TOTAL TYPE L	126.26 m <sup>2</sup>			
Apartment Type M	80.48 m <sup>2</sup>	2	No	Yes
Balcony Type M	13.26 m <sup>2</sup>			
TOTAL TYPE M	93.74 m <sup>2</sup>			
Apartment Type N	78.82 m <sup>2</sup>	3	No	Yes
Balcony Type N	12.38 m <sup>2</sup>			
TOTAL TYPE N	91.20 m <sup>2</sup>			
Apartment Type O	89.60 m <sup>2</sup>	2	Yes	Yes
Balcony Type O	59.87 m <sup>2</sup>			
TOTAL TYPE O	149.47 m <sup>2</sup>			
Apartment Type P	134.88 m <sup>2</sup>	2	Yes	Yes
Balcony Type P	36.74 m <sup>2</sup>			
TOTAL TYPE P	171.62 m <sup>2</sup>			
GRAND TOTAL (Nett)	1380.20 m <sup>2</sup>			





FLOOR PLAN - LEVEL 5 RESIDENTIAL

SCALE: 1 : 100 at B1

ACOUSTIC ATTENUATION NOTES

REFER ENVIRONMENTAL NOISE ASSESSMENT ("ENA") REF 1909164-01 PREPARED BY LLOYD GEORGE ACOUSTICS.

ALL GLAZING ASSEMBLIES TO THE SOUTHERN FACADE OF LEVELS 1 - 4 ARE TO BE RATED Rw(C) 31(-3) MINIMUM AS STATED IN THE ENA.

NORTHERN AIR CONDITIONING PLANT DECK OF LEVEL 5 TO BE SCREENED WITH AN APPROPRIATELY RATED ACOUSTIC SCREENING SYSTEM TO COMPLY WITH THE REQUIREMENTS OF THE ENA.

BUSHFIRE PROTECTION NOTES

REFER BUSHFIRE MANAGEMENT PLAN REF 19PER-14382 PREPARED BY ECOLOGICAL AUSTRALIA.

APPLICABLE BAL-RATED CONTOUR AS ADVISED BY ECOLOGICAL AUSTRALIA.

CONSTRUCTION OF BUILDING ELEMENTS WILL COMPLY WITH THE REQUIREMENTS OF AS 3695-2009 ("THE STANDARD") INCLUDING BUT NOT LIMITED TO:

**BAL-12.5 ZONE** SECTIONS 3 AND 5 OF THE STANDARD APPLICABLE TO LEVELS 1 TO 5 NORTHERN AND SOUTHERN FACADES AND LEVEL 5 WESTERN FACADE

**BAL-19 ZONE** SECTIONS 3 AND 6 OF THE STANDARD APPLICABLE TO LEVELS 1 TO 4 NORTHERN, SOUTHERN AND WESTERN FACADES

**BAL-29 ZONE** DOES NOT INTERSECT RESIDENTIAL COMPONENT OF BUILDING

**BAL-40 ZONE** DOES NOT INTERSECT BUILDING

**BAL-FZ ZONE** DOES NOT INTERSECT BUILDING

**NOTE:** ALL OPENABLE PARTS OF RESIDENTIAL WINDOWS EXPOSED TO BUSHFIRE ATTACK WILL HAVE FIXED STAINLESS STEEL MESH SCREENS COMPLIANT WITH CLAUSE 5.5.1A OF THE STANDARD.

LEGEND

CROSS-FLOW VENTILATION PATH

PREDOMINANT COOLING BREEZES COME FROM THE SOUTH WEST (WIND ROSE SHOWN AT 3PM AVERAGE FROM THE BUREAU OF METEOROLOGY)

ALL AREAS SHOWN ARE APPROXIMATE NETT ONLY AND ARE SUBJECT TO FINAL SURVEY

**APARTMENT CROSS-FLOW VENTILATION CALCULATIONS: No. %**

TOTAL NUMBER OF APARTMENTS 51

CROSS-FLOW TO LIVING AREAS 36 70%

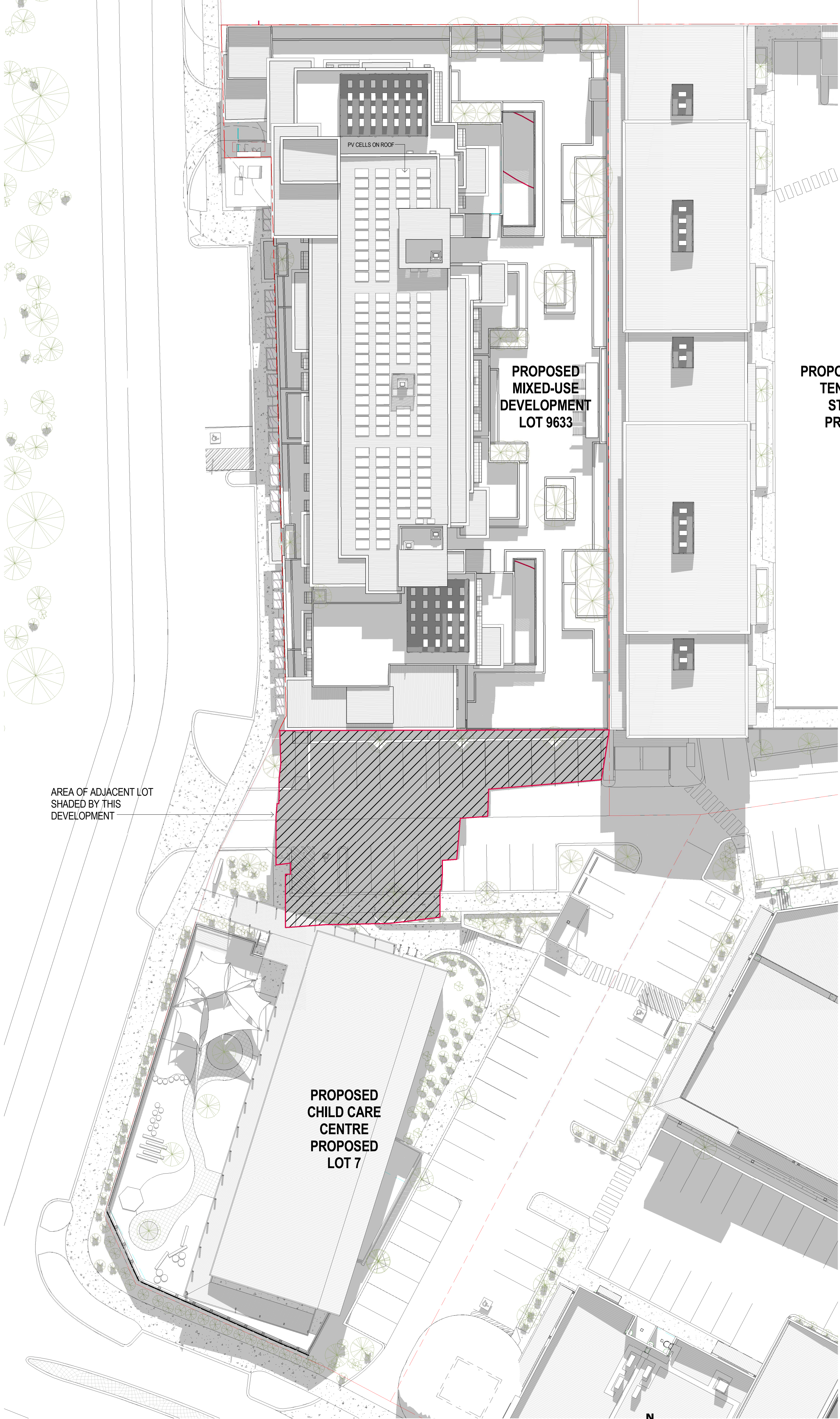
CROSS-FLOW TO AT LEAST ONE BEDROOM 33 65%

LEVEL 5 ROOM SCHEDULE

NAME	AREA (Nett)	No. OF BEDROOMS	NAT. VENT. LIVING	NAT. VENT. BED
Lobby 5A	17.41 m <sup>2</sup>			
Lobby 5B	13.48 m <sup>2</sup>			
Stair 1	10.56 m <sup>2</sup>			
Stair 2	10.56 m <sup>2</sup>			
TOTAL COMMON AREA	52.00 m <sup>2</sup>			
Apartment Type Q	126.72 m <sup>2</sup>	2	Yes	Yes
Balcony Type Q	90.42 m <sup>2</sup>			
TOTAL TYPE Q	217.13 m <sup>2</sup>			
Apartment Type R	158.25 m <sup>2</sup>	3	Yes	Yes
Balcony Type R	36.74 m <sup>2</sup>			
TOTAL TYPE R	194.99 m <sup>2</sup>			
Apartment Type S	125.21 m <sup>2</sup>	3	Yes	Yes
Balcony Type S	24.51 m <sup>2</sup>			
TOTAL TYPE S	149.72 m <sup>2</sup>			
Apartment Type T	100.60 m <sup>2</sup>	2	Yes	Yes
Balcony Type T	70.32 m <sup>2</sup>			
TOTAL TYPE T	170.92 m <sup>2</sup>			
GRAND TOTAL (Nett)	784.75 m <sup>2</sup>			



ROOF PLAN AND SHADOW DIAGRAM  
SCALE: 1 : 250 at B1



PROPOSED COMMERCIAL  
TENANCIES & SELF  
STORAGE UNITS  
PROPOSED LOT 3

**SHADOW CALCULATIONS**

LOT 7 PROPERTY AREA (PROPOSED) 3,311sqm

AREA OF LOT SHADED AT 12:00 NOON  
ON 21 DECEMBER 574.5 sqm

PERCENTAGE OF LOT SHADED 17.35%

SHADOW PROJECTED ONTO  
PROPOSED FINISHED GROUND  
LEVELS (AHD) OF LOT 7.

Rev.	Date	Issued By	Revision Description
F	15-11-2019	RC	CLIENT AND CONSULTANT REVIEW
E	11-11-2019	RC	CLIENT REVIEW
D	05-08-2019	RC	DESIGN REVIEW PANEL SUBMISSION
C	12-06-2019	RC	DESIGN REVIEW PANEL APPLICATION
B	31-05-2019	RC	REVISED DESIGN FOR REVIEW

Project Name  
**PROPOSED MIXED USE DEVELOPMENT, Lot  
9633 Fomiatti Street, ASHBY WA 6065 for  
Endeavour Properties Pty Ltd**

Drawing Name  
**ROOF PLAN AND SHADOW DIAGRAM**

Reduction 25mm on B1 | Scale

Project Number  
**06177D**

Date  
**February 2019**

Drawing No.  
**P(D)206**

Rev.  
**F**

Drawn **RC** | Checked **FI**  
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**Appendix B**

**East Wanneroo Structure Plan**



Includes Amendments 1 - 14 & 16 - 19, 22 - 26  
Includes Agreed Detailed Area Plans





## **Appendix C**

# **Terminology**

The following is an explanation of the terminology used throughout this report.

***Decibel (dB)***

The decibel is the unit that describes the sound pressure and sound power levels of a noise source. It is a logarithmic scale referenced to the threshold of hearing.

***A-Weighting***

An A-weighted noise level has been filtered in such a way as to represent the way in which the human ear perceives sound. This weighting reflects the fact that the human ear is not as sensitive to lower frequencies as it is to higher frequencies. An A-weighted sound level is described as  $L_A$  dB.

***Sound Power Level ( $L_w$ )***

Under normal conditions, a given sound source will radiate the same amount of energy, irrespective of its surroundings, being the sound power level. This is similar to a 1kW electric heater always radiating 1kW of heat. The sound power level of a noise source cannot be directly measured using a sound level meter but is calculated based on measured sound pressure levels at known distances. Noise modelling incorporates source sound power levels as part of the input data.

***Sound Pressure Level ( $L_p$ )***

The sound pressure level of a noise source is dependent upon its surroundings, being influenced by distance, ground absorption, topography, meteorological conditions etc and is what the human ear actually hears. Using the electric heater analogy above, the heat will vary depending upon where the heater is located, just as the sound pressure level will vary depending on the surroundings. Noise modelling predicts the sound pressure level from the sound power levels taking into account ground absorption, barrier effects, distance etc.

***$L_{ASlow}$***

This is the noise level in decibels, obtained using the A frequency weighting and the S (Slow) time weighting as specified in IEC 61672-1:2002. Unless assessing modulation, all measurements use the slow time weighting characteristic.

***$L_{AFast}$***

This is the noise level in decibels, obtained using the A frequency weighting and the F (Fast) time weighting as specified in IEC 61672-1:2002. This is used when assessing the presence of modulation only.

***$L_{APeak}$***

This is the greatest absolute instantaneous sound pressure in decibels using the A frequency weighting as specified in IEC 61672-1:2002.

***$L_{Amax}$***

An  $L_{Amax}$  level is the maximum A-weighted noise level during a particular measurement.

***$L_{A1}$***

An  $L_{A1}$  level is the A-weighted noise level which is exceeded for one percent of the measurement period and is considered to represent the average of the maximum noise levels measured.

***$L_{A10}$***

An  $L_{A10}$  level is the A-weighted noise level which is exceeded for 10 percent of the measurement period and is considered to represent the “intrusive” noise level.

**$L_{Aeq}$**

The equivalent steady state A-weighted sound level (“equal energy”) in decibels which, in a specified time period, contains the same acoustic energy as the time-varying level during the same period. It is considered to represent the “average” noise level.

**$L_{A90}$**

An  $L_{A90}$  level is the A-weighted noise level which is exceeded for 90 percent of the measurement period and is considered to represent the “background” noise level.

**One-Third-Octave Band**

Means a band of frequencies spanning one-third of an octave and having a centre frequency between 25 Hz and 20 000 Hz inclusive.

**$L_{Amax}$  assigned level**

Means an assigned level which, measured as a  $L_{A\ Slow}$  value, is not to be exceeded at any time.

**$L_{A1}$  assigned level**

Means an assigned level which, measured as a  $L_{A\ Slow}$  value, is not to be exceeded for more than 1% of the representative assessment period.

**$L_{A10}$  assigned level**

Means an assigned level which, measured as a  $L_{A\ Slow}$  value, is not to be exceeded for more than 10% of the representative assessment period.

**Tonal Noise**

A tonal noise source can be described as a source that has a distinctive noise emission in one or more frequencies. An example would be whining or droning. The quantitative definition of tonality is:

the presence in the noise emission of tonal characteristics where the difference between -

- (a) the A-weighted sound pressure level in any one-third octave band; and
- (b) the arithmetic average of the A-weighted sound pressure levels in the 2 adjacent one-third octave bands,

is greater than 3 dB when the sound pressure levels are determined as  $L_{Aeq,T}$  levels where the time period T is greater than 10% of the representative assessment period, or greater than 8 dB at any time when the sound pressure levels are determined as  $L_{A\ Slow}$  levels.

This is relatively common in most noise sources.

**Modulating Noise**

A modulating source is regular, cyclic and audible and is present for at least 10% of the measurement period. The quantitative definition of modulation is:

a variation in the emission of noise that —

- (a) is more than 3 dB  $L_{A\ Fast}$  or is more than 3 dB  $L_{A\ Fast}$  in any one-third octave band;
- (b) is present for at least 10% of the representative.



### **Impulsive Noise**

An impulsive noise source has a short-term banging, clunking or explosive sound. The quantitative definition of impulsiveness is:

a variation in the emission of a noise where the difference between  $L_{A \text{ peak}}$  and  $L_{A \text{ Max slow}}$  is more than 15 dB when determined for a single representative event;

### **Major Road**

Is a road with an estimated average daily traffic count of more than 15,000 vehicles.

### **Secondary / Minor Road**

Is a road with an estimated average daily traffic count of between 6,000 and 15,000 vehicles.

### **Influencing Factor (IF)**

$$= \frac{1}{10} (\% \text{ Type A}_{100} + \% \text{ Type A}_{450}) + \frac{1}{20} (\% \text{ Type B}_{100} + \% \text{ Type B}_{450})$$

where :

% Type A<sub>100</sub> = the percentage of industrial land within  
a 100m radius of the premises receiving the noise

%TypeA<sub>450</sub> = the percentage of industrial land within  
a 450m radius of the premises receiving the noise

% Type B<sub>100</sub> = the percentage of commercial land within  
a 100m radius of the premises receiving the noise

%TypeB<sub>450</sub> = the percentage of commercial land within  
a 450m radius of the premises receiving the noise

+ Traffic Factor (maximum of 6 dB)

= 2 for each secondary road within 100m

= 2 for each major road within 450m

= 6 for each major road within 100m

### **Representative Assessment Period**

Means a period of time not less than 15 minutes, and not exceeding four hours, determined by an inspector or authorised person to be appropriate for the assessment of a noise emission, having regard to the type and nature of the noise emission.

### **Background Noise**

Background noise or residual noise is the noise level from sources other than the source of concern. When measuring environmental noise, residual sound is often a problem. One reason is that regulations often require that the noise from different types of sources be dealt with separately. This separation, e.g. of traffic noise from industrial noise, is often difficult to accomplish in practice. Another reason is that the measurements are normally carried out outdoors. Wind-induced noise, directly on the microphone and indirectly on trees, buildings, etc., may also affect the result. The character of these noise sources can make it difficult or even impossible to carry out any corrections.

### **Ambient Noise**

Means the level of noise from all sources, including background noise from near and far and the source of interest.

### **Specific Noise**

Relates to the component of the ambient noise that is of interest. This can be referred to as the noise of concern or the noise of interest.

**Peak Component Particle Velocity (PCPV)**

The maximum instantaneous velocity in mm/s of a particle at a point during a given time interval and in one of the three orthogonal directions (x, y or z) measured as a peak response. Peak velocity is normally used for the assessment of structural damage from vibration.

**Peak Particle Velocity (PPV)**

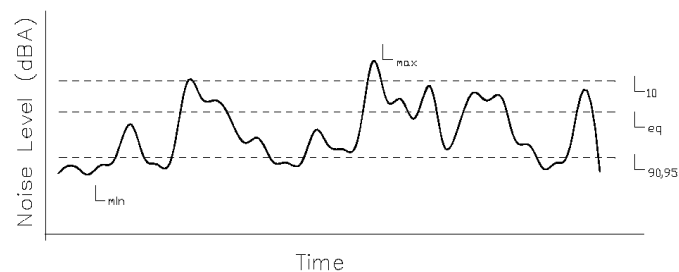
The maximum instantaneous velocity in mm/s of a particle at a point during a given time interval and is the vector sum of the PCPV for the x, y and z directions measured as a peak response. Peak velocity is normally used for the assessment of structural damage from vibration.

**RMS Component Particle Velocity (PCPV)**

The maximum instantaneous velocity in mm/s of a particle at a point during a given time interval and in one of the three orthogonal directions (x, y or z) measured as a root mean square (rms) response. RMS velocity is normally used for the assessment of human annoyance from vibration.

**Peak Particle Velocity (PPV)**

The maximum instantaneous velocity in mm/s of a particle at a point during a given time interval and is the vector sum of the PCPV for the x, y and z directions measured as a root mean square (rms) response. RMS velocity is normally used for the assessment of human annoyance from vibration.

**Chart of Noise Level Descriptors****Typical Noise Levels**