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Environmental Noise Assessment

Mixed Commercial Development

31 Lampeter Road, Butler

Reference: 19024854-01

Prepared for:

AJ Holdings Aus Pty Ltd c/- Planning Solutions

Report: 19024854-01

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Date:	Rev	Description	Prepared By	Verified
28-Nov-19	0	Issued to Client	Matt Moyle	Terry George

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1 INTRODUCTION

Lloyd George Acoustics was commissioned by Planning Solutions to undertake a noise assessment for a proposed Mixed Commercial development Lot 3030 (#31) Lampeter Road, Butler (subject site) – refer *Figure 1-1*. The development consists of the following elements:

- A 24/7 Recreation Gym Tenancy;
- Retail Shop Tenancies;
- Cafe/Restaurant Tenancies;
- Up to three (3) Alfresco Dining Areas;
- Mechanical plant situated on the roof top; and
- A single large asphalt car park in the southern site area.

The most critical noise sensitive premises identified in this assessment are residences to the immediate south and a childcare centre to the east. There are nearby commercial premises noted, which are less sensitive to noise. The subject site is amongst uses associated with an Urban Centre or a Mixed Use zone.

Noise sources considered were those associated with mechanical plant, alfresco dining and vehicle noise in parking areas. Noise from this equipment was assessed against the prescribed standards of the *Environmental Protection (Noise) Regulations 1997* by way of noise modelling.

Figure 1-1 Project Locality

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_{A10}	L_{A1}	L_{Amax}
Noise sensitive premises: highly sensitive area[1]	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
Commercial	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 noise sensitive premises has been calculated as 5 dB for all noise sensitive locations, as shown in *Figure 2-1* and *Table 2-3*. The transport factor has been calculated as **2 dB**, due to Butler Boulevard being considered a secondary road (> 6,000 vehicles per day – based on signal lane counts at Exmouth Drive interchange being approximately 7,000 vpd) within 100 metres of the noise sensitive premises.

As per the relevant Structure Plan map, the subject site itself is within Precinct B, which encourages a mix of office, commercial, consultancy, retail and residential type uses (refer *Appendix A*). The influencing factor calculation at the nearest residences is shown in *Table 2-3*. *Table 2-4* shows the assigned noise levels including the influencing factor and transport factor at the receiving locations.

Table 2-3 Influencing Factor Calculation

Description	Within 100 metre Radius	Within 450 metre Radius	Total
Industrial Land	0 %	0 %	0 dB
Commercial Land	25-30 %	25 %	2.5 dB
Transport Factor			**2 dB**
Total			**5 dB**

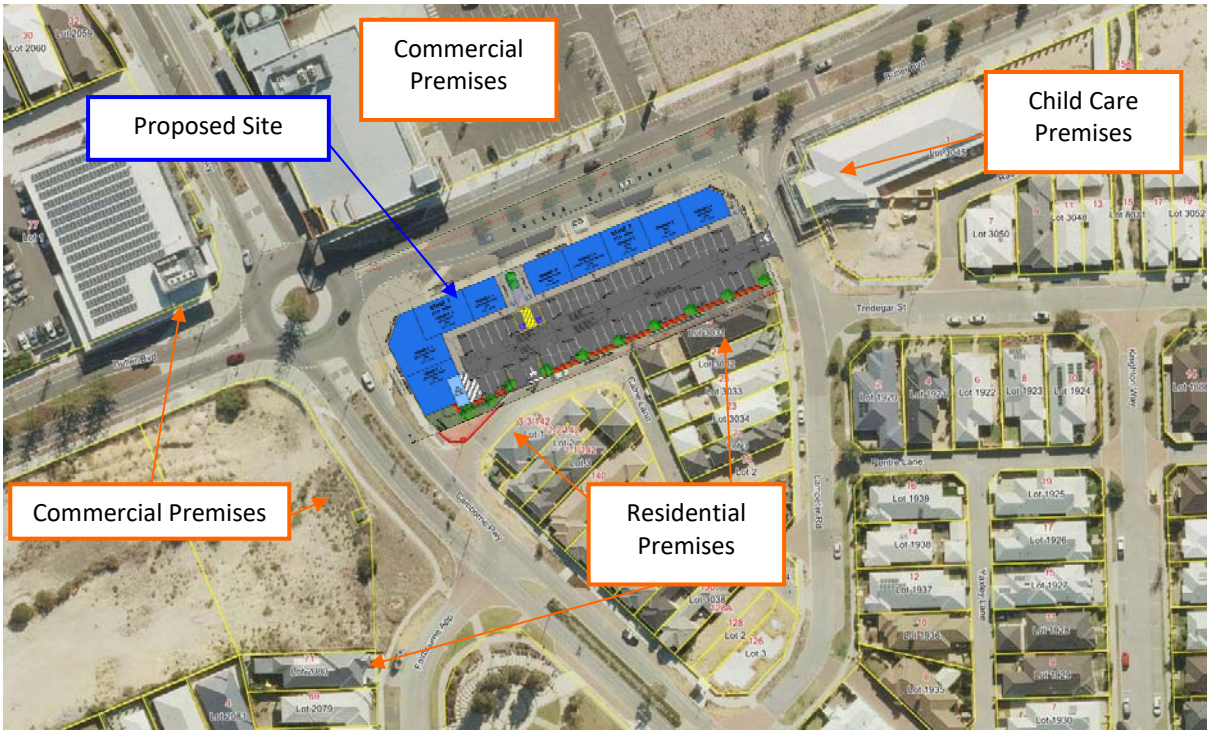


Figure 2-1 Locality of Subject Site and Nearby Receivers (City of Wanneroo Maps)

Table 2-4 Assigned Noise Levels

Premises Receiving Noise	Time Of Day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Noise sensitive premises: highly sensitive area[1]	0700 to 1900 hours Monday to Saturday (Day)	50	60	70
	0900 to 1900 hours Sunday and public holidays (Sunday)	45	55	70
	1900 to 2200 hours all days (Evening)	45	55	60
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays (Night)	40	50	60
Noise sensitive premises: any area other than highly sensitive area	All hours	60	75	80
Commercial	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.

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.

It is noted the assigned noise levels are statistical levels and therefore the period over which they are determined is important. The Regulations define the Representative Assessment Period (RAP) as *a period of time of not less than 15 minutes, and not exceeding 4 hours*, which is 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. An *inspector* or *authorised person* is a person appointed under Sections 87 & 88 of the *Environmental Protection Act 1986* and include Local Government Environmental Health Officers and Officers from the Department of Environment Regulation. Acoustic consultants or other environmental consultants are not appointed as an *inspector* or *authorised person*. Therefore, whilst this assessment is based on a 4 hour RAP, which is assumed to be appropriate given the nature of the operations, this is to be used for guidance only.

For the proposed development operations, the following comments are provided:

- Mechanical plant such as air-conditioning, exhaust fans and refrigeration plant are to comply with the most critical evening/Sunday and night L_{A10} assigned noise levels.
- Alfresco dining noise is assessable, with the critical period being evenings and Sundays. The proposed operational hours of these retail/cafe tenancies will be between 7am and 10pm.
- The gym tenancy is assumed as a 24/7 facility, furthermore staff are assumed to come and go prior to 7am and after 10pm at times. Therefore car park noise in the form of car doors (Night L_{Amax}) requires assessment.

Under regulation 3, nothing in the Noise Regulations applies to the following relevant noise emissions –

(a) noise emissions from the propulsion and braking systems of motor vehicles operating on a road;

(b) noise emissions from a safety warning device, other than a reversing alarm, fitted to a motor vehicle operating on a road;

(c) noise emissions –

(i) from a safety warning device fitted to a building as a requirement of the Building Code as defined in the *Building Regulations 2012* regulation 3; or

if every reasonable and practicable measure has been taken to reduce the effect of the noise emission consistent with providing an audible warning to people;

Since the development is open to the public, the car park and associated like areas are considered to be a road and therefore vehicle noise (propulsion and braking) is not strictly assessed. Vehicle door closing noise is assessable in any parts of the car park, as this does not form part of the 'propulsion or braking' systems.

Regulation 14A provides requirements for the collection of waste stating that this activity can also be exempt from having to comply with Regulation 7 prescribed standards provided it is undertaken between 7am and 7pm Mondays to Saturdays and undertaken in the quietest reasonable manner.

3 METHODOLOGY

Computer modelling was undertaken, using the software *SoundPLAN 8.1* with the ISO 9613 algorithms (ISO 17354 compliant) 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	Day (0700-1900)	Night (1900-0700)
Temperature (^{o}C)	20	15
Humidity (%)	50	50
Wind Speed (m/s)	Up to 5 m/s	Up to 5 m/s
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 adapted from *Google Earth* and proposed plans. Existing buildings have also been included as these can provide barrier attenuation when located between a source and receiver, much the same as a hill. Based on elevation view drawings, parapets are assumed to be atop the buildings and at 1-metre higher than the roof. Plans are included in *Appendix B*.

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 0.0 has been used for the car park and road areas, and 0.7 has been used for the remaining areas.

3.4 Source Sound Levels

The sound power levels used in the modelling are provided in *Table 3-2*. Note that as the development is at DA stage, the plant selections are of a generic nature based on file data. A detailed review of these elements should be carried out at building permit stage when final selection of plant is known.

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	
Tenancies 1, 2, 3, 4, 5 & 9 (per tenancy)									
Actron Condensing Unit – L_{A10}	-	71	71	70	67	62	61	55	**72**
Kitchen Exhaust Fan – L_{A10}	72	81	79	79	72	67	61	51	**79**
Toilet Exhaust Fan – L_{A10}	63	64	70	64	67	63	55	50	**70**
Tenancies 6, 7 & 8 (per tenancy)									
Actron Condensing Unit 2x – L_{A10}	-	71	71	70	67	62	61	55	**72**
Toilet Exhaust Fan – L_{A10}	63	64	70	64	67	63	55	50	**70**
Miscellaneous									
Car Doors Closing – L_{Amax}	99	97	92	84	81	75	73	-	**88**
Alfresco Dining Noise – L_{A10}	65	76	80	82	75	72	69	58	**82**

With regards to the above, please note the following:

- Each tenancy is assumed to have a set of rooftop mechanical plant, where a cafe/restaurant is specified, a kitchen exhaust fan is included;
- Each external plant item is modelled as a point source, 1-metre above roof level in approximate locations above tenancies/shops.
- Parapets are assumed atop outer edges buildings of 1-metre heights.
- The alfresco dining noise source is based on 30 seated patrons occupying an outdoor area, of which 50% are assumed to be talking simultaneously at a voice level of 70 dB L_{Aw} per person. Source modelled as an area source at 1.2-metres above local floor level. No music is assumed to be played in the outdoor dining areas.
- An image of the noise model overview, showing all noise sources, is presented in *Figure 3-1*.

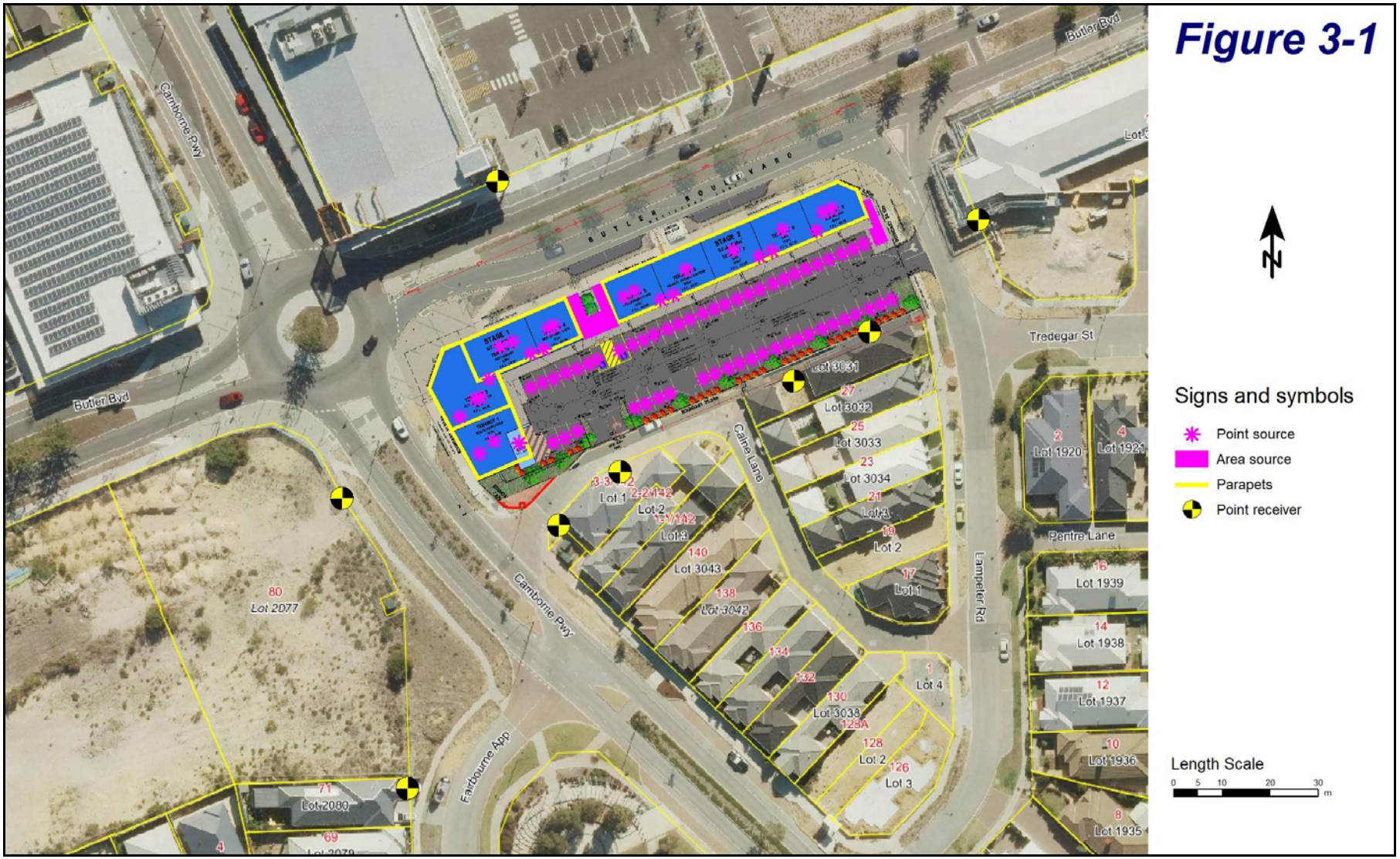


Figure 3-1 2D Image of Noise Model

4 RESULTS AND ASSESSMENT

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

1. Night L_{A10} Noise – Gym mechanical plant noise;
2. Evening/Sunday L_{A10} Noise – All tenancies mechanical plant running and alfresco dining noise in all areas.
3. Night L_{Amax} Noise – All plant from Scenario 1 and with car door noise sources in each car parking bay.

The above scenarios are modelled since in comparison to the assigned noise levels, they will be the most stringent. For instance, the assigned level for a car door closing is more lenient during the day and similarly, Sunday and evening have lower assigned noise levels than during the day, but with the same plant operating.

4.1 Scenario 1 – Night L_{A10} Gym Noise

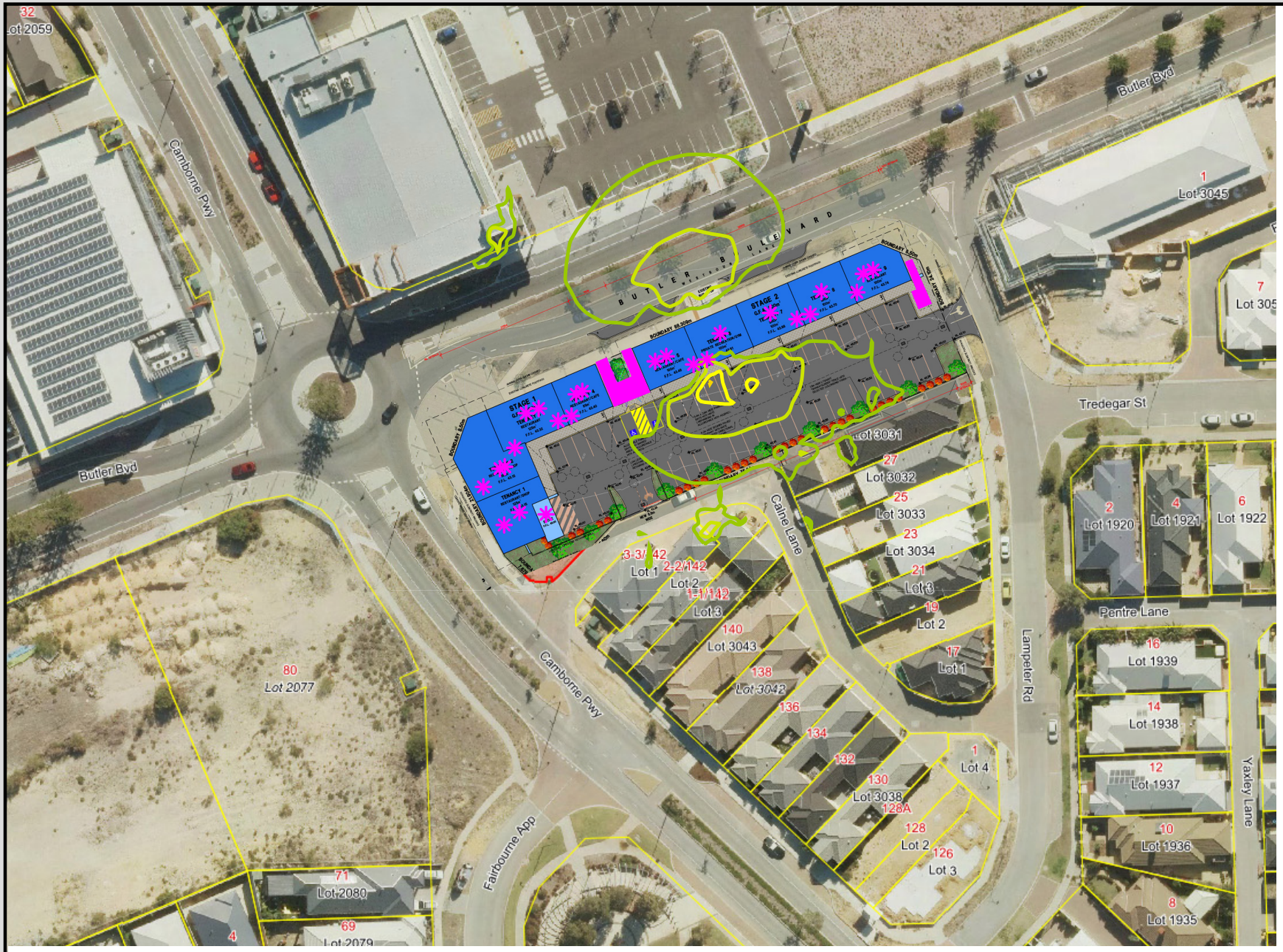
Table 4-1 provides the results for the night time L_{A10} scenario with Gym related mechanical plant in operation. A +5 dB adjustment for tonality is applied to the predicted mechanical plant noise levels.

Table 4-1 Predicted Noise Levels, Scenario 1: Night, dB L_{A10}

Location	Predicted Noise Level Worst-Case Downwind	Critical Assigned Level	Calculated Exceedence
	Mechanical Plant		
80 Butler Bvd (West)	15 + 5	60	*Complies*
150 Camborne Pky	25 + 5	60	*Complies*
1 Tredegar St CCC	21 + 5	40	*Complies*
29 Lampeter Road	25 + 5	40	*Complies*
3/142 Camborne Pky	19 + 5	40	*Complies*
71 Fairbourne App	14 + 5	40	*Complies*

Gym related mechanical plant noise is demonstrated to be compliant during the critical night period at all receivers.

Figure 4-1



31 Lampeter Road, Butler - Mixed Commercial Development

L_{A10} Noise Level Contours - Scenario 1 - Ground Floor Predicted Noise Levels

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4.2 Scenario 2 – Evening/Sunday L_{A10} Noise

Table 4-2 provides the results for the Sunday/evening time L_{A10} scenario with all mechanical plant in operation and alfresco dining noise present in designated areas.

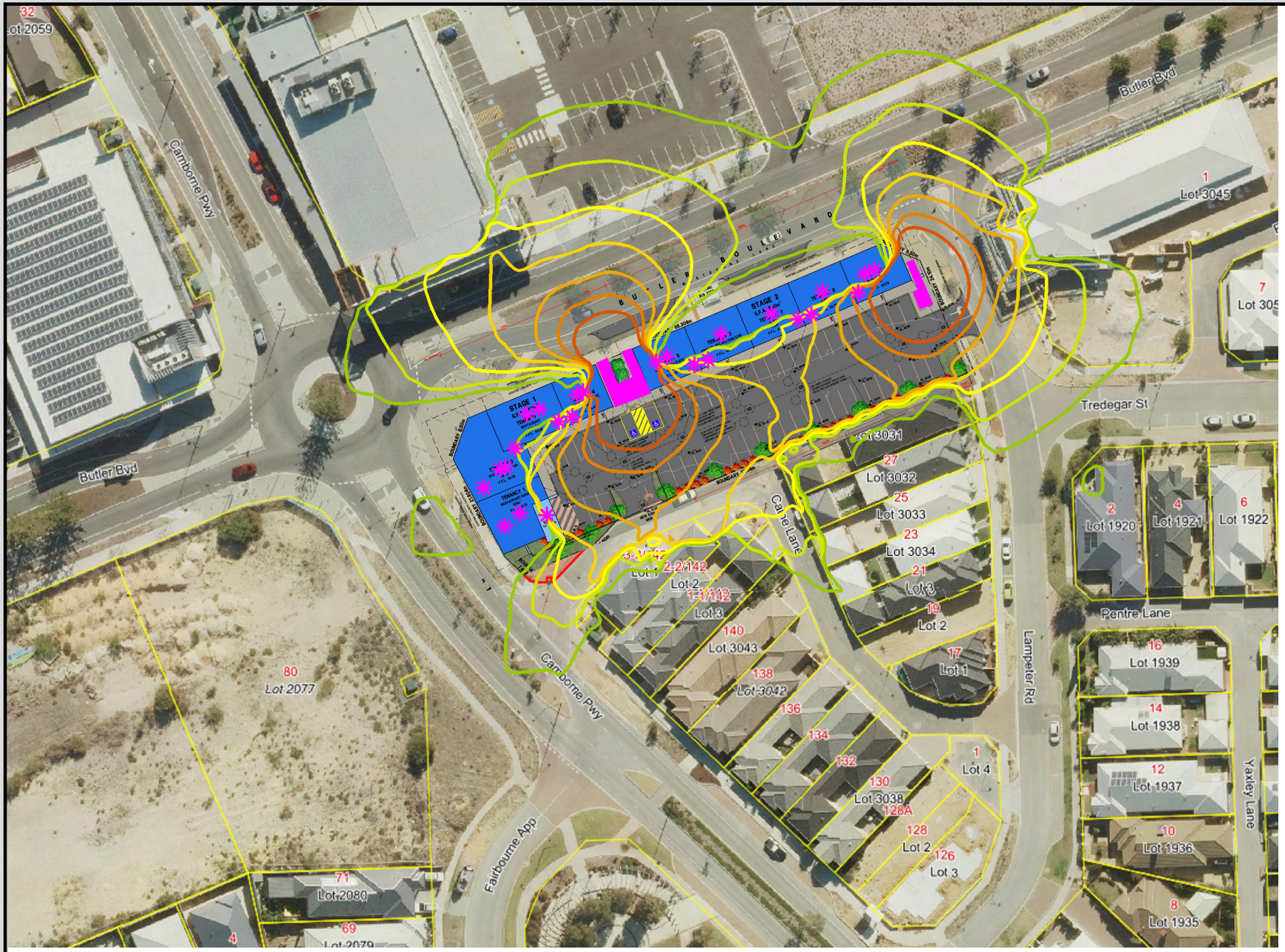
Table 4-2 Predicted Noise Levels, Scenario 2: Evening, dB L_{A10}

Location	Predicted Noise Level Worst-Case Downwind			Critical Assigned Level	Calculated Exceedence
	Mechanical Plant	Alfresco Dining	Combined		
80 Butler Bvd (West)	38	26	38 + 5	60	*Complies*
150 Camborne Pky	41	42	44 + 5	60	*Complies*
1 Tredegar St CCC	35	45	45 + 5	45	*+5*
29 Lampeter Road	37	39	41 + 5	45	*+1*
3/142 Camborne Pky	42	39	43 + 5	45	*+3*
71 Fairbourne App	31	31	34 + 5	45	*Complies*

Noise from mechanical plant may be considered tonal and therefore attracts a +5 dB penalty. As such, the combined noise level is calculated to exceed at several locations. The highest exceedence is at 1 Tredegar Street, which is a childcare centre. Given the nature of such an establishment, it is unlikely that it will operate (in a noise sensitive manner) on Sundays or after 7pm on other days. Compliance with the day time assigned level is achieved at this location, which is the most applicable time period.

The locations of 29 Lampeter Road and 3/142 Camborne Parkway are both calculated to exceed the evening and Sunday assigned levels by 1 and 3 dB, respectively. The exceedence is due to rooftop mechanical plant noise.

Figure 4-2



31 Lampeter Road, Butler - Mixed Commercial Development

L_{A10} Noise Level Contours - Scenario 2 - Ground Floor Predicted Noise Levels

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4.3 Scenario 3 – Night L_{Amax} Noise

Table 4-3 provides the results for the night time L_{Amax} scenario with gym plant in operation and car park noise present in designated parking areas. Note that car door closing noise is considered to be impulsive and therefore attracts a +10 dB adjustment to predicted levels as shown in *Table 4-3*.

Table 4-3 Predicted Noise Levels, Scenario 3: Night, L_{Amax} dB

Location	Predicted Noise Level Worst-Case Downwind	Critical Assigned Level	Calculated Exceedence
	Car Door Noise		
80 Butler Bvd (West)	37 + 10	80	*Complies*
150 Camborne Pky	45 + 10	80	*Complies*
1 Tredegar St CCC	50 + 10	60	*Complies*
29 Lampeter Road	55 + 10	60	*+5*
3/142 Camborne Pky	50 + 10	60	*Complies*
71 Fairbourne App	40 + 10	60	*Complies*

Noise from car doors closing in the car park during the night period is demonstrated to exceed at 29 Lampeter Road by a factor of 5 dB. Presently a 1.8m *Colorbond* type fence exists between this residence and the car park. To achieve the required 5 dB reduction, additional barrier height and mass should be investigated at building permit stage once final ground levels and retaining are designed.

Alternatively, noise may be manageable by restricting parking along the southern portion of the site by staff and gym patrons prior to 7am and after 10pm.

5 RECOMMENDATIONS

To achieve compliance for the L_{A10} scenario, a 3 dB reduction overall is requiredto rooftop mechanical plant on Tenancy 1.

The above noise reductions are considered practicably achievable by ensuring plant is kept as far away from sensitive receivers and located behind local screens where practicable. Confirmation of compliance should be verified by a suitably qualified acoustical consultant when detailed mechanical plant design is completed (e.g. building permit stage).

To achieve compliance for the L_{Amax} scenario, a 5 dB reduction is. This reduction is considered practicably achievable by constructing a more significant noise barrier to the effect of reducing overall levels. The eventual barrier surface mass and design height of the barrier should be confirmed at building permit stage when final ground levels and retaining walls are known in detail. Alternatively, car door noise may be manageable by restricting parking along the southern portion of the site by staff and gym patrons prior to 7am and after 10pm.

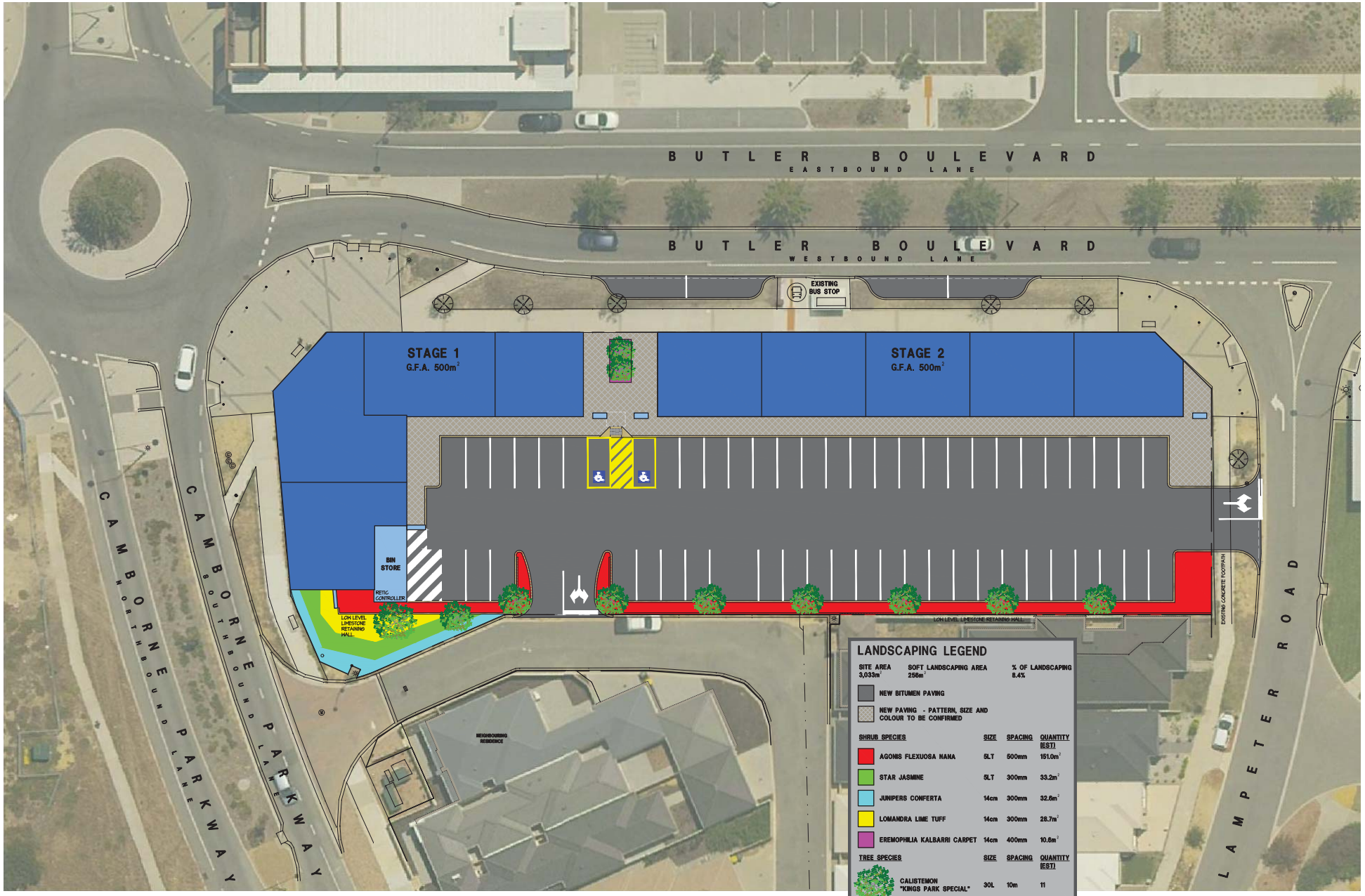
Appendix A

Zoning Map

Camborne Pwy
Earlston Lane
Billericay Cct
Brixham Vsta
Ellon Lane
Hollington Blvd
Melksham Way
Wilton Pwy
Mansfield Av
Ongar Rd
Windermere Ch
Maltby Lane
Altrincham Gr
Ulverston Way
Sparkwell Lane
Benfleet Dr
Haverhill Rd
Brackley Way
Butler Blvd
Millom St
Abingdon Way
Acle Lane
Bridport Lane
Carmathen Av
Arthog St
Prenton St
Fairbourne App
Menai Lane
Ammanford Cr
Lampeter Rd
Knighton Way
Tywyn Lane
Whitland St
Yaxley Lane
Tredegar St
Raunds Lane
Bruton Lane
Exmouth Dr
Butler
Delvin Lane
Caistor Way
Blackrock Av
Bruff Lane
Randstone Pde
Boncath Rd
Goodwick St
Bodorgan Av
Craven Lane
Bovey Lane
Uppingham Way
Fintona Cr
Crolly Lane
Larkhall Way
Mannion Av
Oceania Av
19K
1K

Appendix B

Proposed Site Plans



LANDSCAPING LEGEND

SITE AREA	SOFT LANDSCAPING AREA	% OF LANDSCAPING
3,033m²	256m²	8.4%

NEW BITUMEN PAVING

NEW PAVING - PATTERN, SIZE AND COLOUR TO BE CONFIRMED

SHRUB SPECIES	SIZE	SPACING	QUANTITY (EST)
AGONIS FLEXUOSA NANA	5LT	500mm	151.0m²
STAR JASMINE	5LT	300mm	33.2m²
JUNIPERS CONFERTA	14cm	300mm	32.6m²
LOMANDRA LIME TUFF	14cm	300mm	28.7m²
EREMOPHILIA KALBARRI CARPET	14cm	400mm	10.6m²

TREE SPECIES	SIZE	SPACING	QUANTITY (EST)
CALISTEMON "KINGS PARK SPECIAL"	30L	10m	11

LANDSCAPING NOTES

- FINAL DENSITY, SPECIES AND PLANTING LOCATION OF SHRUBS AND GROUNDCOVERS ARE TO BE CONFIRMED BY CONTRACTOR WITH THE SUPERINTENDENT PRIOR TO PLANTING.
- FINAL LOCATIONS OF TREE PLANTINGS TO BE DETERMINED BY ACTUAL SERVICE LOCATIONS AND ARE TO BE CONFIRMED ON SITE.
- PLANTS TO BE OFFSET 1m FROM KERBLINE TO ALLOW FOR OVERHANG IF ABLE.
- GROUNDCOVERS ARE TO BE PLANTED IN GROUPS OF 3 & 5.
- SQUARE SHOULDER CONCRETE KERBING TO DEFINE GARDEN AREAS.
- RETICULATION CONTROLLER FIXED IN SERVICE AREA WITH WATERPROOF GPO.
- ALL GARDEN AREAS SUPPLIED WITH JUNGLE MULCH - 80mm MIN.
- IRRIGATION TO ALL GARDEN AREAS WITH 13mm COMMERCIAL BORE DRIP LINE, PVC MAINLINES/ LATERAL LINES

PLAN SUPPLIED BY

PANORAMIC Gardens & Turf Management

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P.O. Box 507 Wanneroo 6946

PROPOSED SITE PLAN

SCALE 1:200

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BUILDING DESIGNERS

166 STIRLING HIGHWAY
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DEVELOPMENT APPLICATION

HINDLEY & ASSOCIATES P/L AS TRUSTEE FOR HINDLEY TRUST
ACN No. 088 989 904

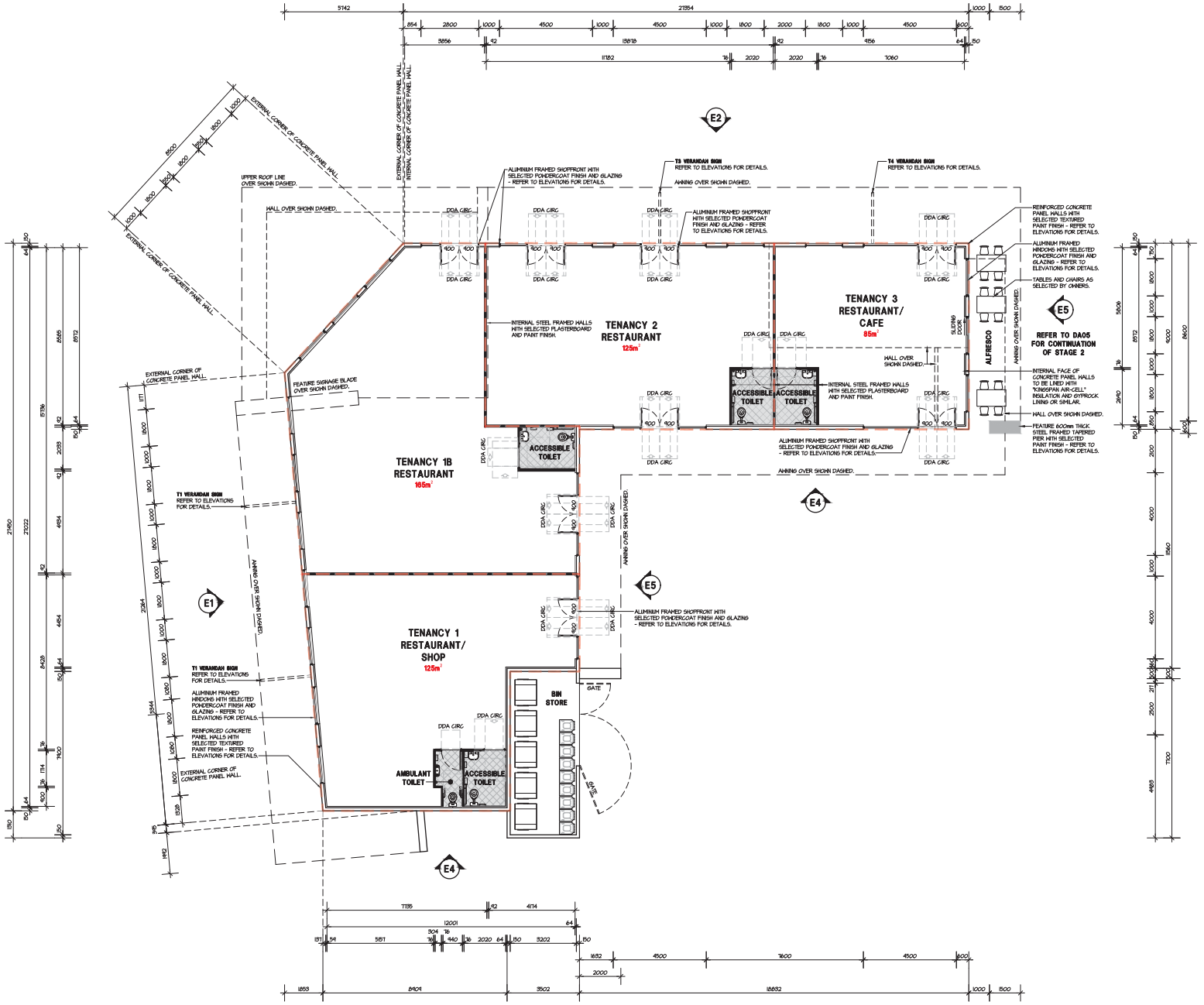
BUILDING DESIGNERS ASSOCIATION OF WA INC

NO:	DATE:	REVISION:	DRAWN:	CHECK:
PRE	22.01.19	PRELIMINARY ISSUE	CPH	CPH
A	05.07.19	DEVELOPMENT APPLICATION ISSUE	CPH	CPH

A1 SHEET

PROPOSED MIXED USE DEVELOPMENT
LOT 3030 BUTLER BOULEVARD
BUTLER
for AJ HOLDINGS AUS PTY LTD

Date	22.01.19
Design	CPH
Drawn	CPH
Checked	CPH
Scale	1:200
Job No.	0879
Dwg	DA03
Rev	A



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PRE	22.01.19	PRELIMINARY ISSUE	CPH	CPH
A	05.07.19	DEVELOPMENT APPLICATION ISSUE	CPH	CPH
B	17.09.19	TENANCY LAYOUT ALTERED	CPH	CPH

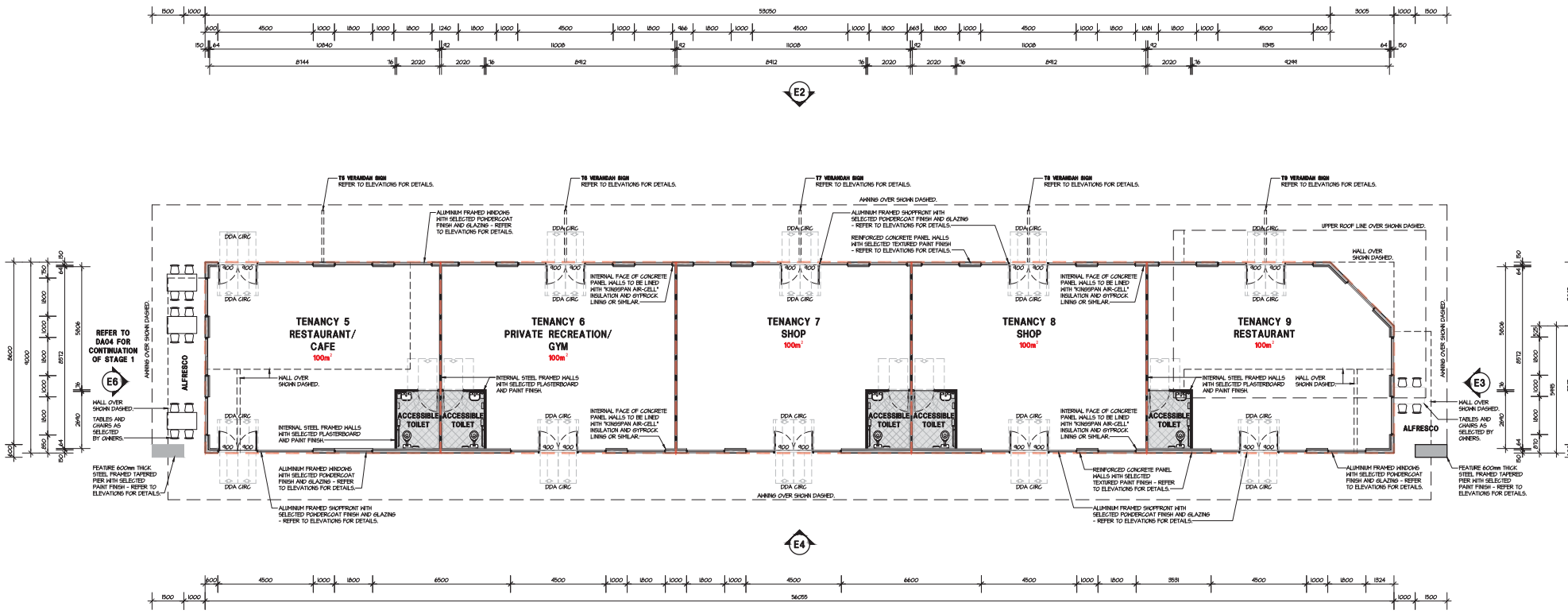
A1 SHEET

STAGE 1 - FLOOR PLAN

SCALE 1:100

PROPOSED MIXED USE DEVELOPMENT
LOT 3030 BUTLER BOULEVARD
BUTLER
for AJ HOLDINGS AUS PTY LTD

Date	22.01.19
Design	CPH
Drawn	CPH
Checked	CPH
Scale	1:100
Job No.	0679
Dwg	DA04
Rev	B



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A	05.07.19	DEVELOPMENT APPLICATION ISSUE	CPH	CPH
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-				
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-				

A1 SHEET

STAGE 2 - FLOOR PLAN

SCALE 1:100

PROPOSED MIXED USE DEVELOPMENT
LOT 3030 BUTLER BOULEVARD
BUTLER
for AJ HOLDINGS AUS PTY LTD

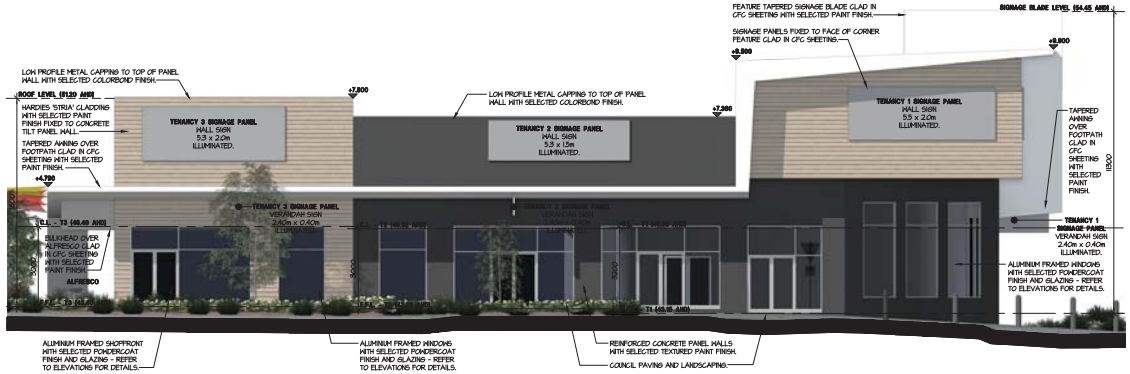
Date	22.01.19
Design	CPH
Drawn	CPH
Checked	CPH
Scale	1:100
Job No.	0679
Dwg	DA05
Rev	A

E1 - WEST ELEVATION

SCALE 1:100

E2 - NORTH ELEVATION - PART 1

SCALE 1:100



E2 - NORTH ELEVATION - PART 2

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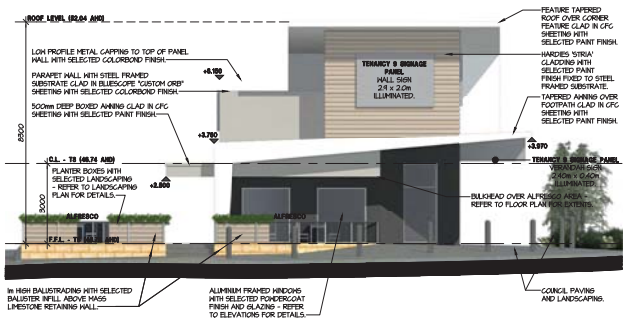

E3 - WEST ELEVATION

SCALE 1:100

HINDLEY & ASSOCIATES PTY LTD
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DEVELOPMENT APPLICATION

HINDLEY & ASSOCIATES P/L AS TRUSTEE FOR HINDLEY TRUST ACN No. 088 989 904

BUILD NO DESIGNERS ASSOCIATION OF WA INC

NO:	DATE:	REVISION:	DRAWN:	CHECK:
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A	05.07.19	DEVELOPMENT APPLICATION ISSUE	CPH	CPH
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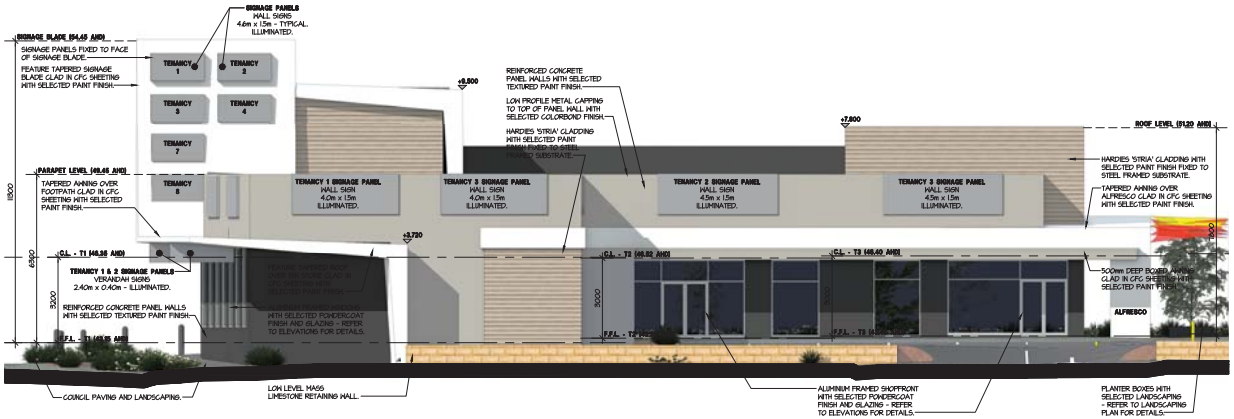
A1 SHEET

PROPOSED MIXED USE DEVELOPMENT
LOT 3030 BUTLER BOULEVARD
BUTLER
for AJ HOLDINGS AUS PTY LTD

Date	17.01.19
Design	CPH
Drawn	CPH
Checked	CPH
Scale	1:100
Job No.	0679
Dwg	DA06
Rev	A



E4 - SOUTH ELEVATION - PART 1

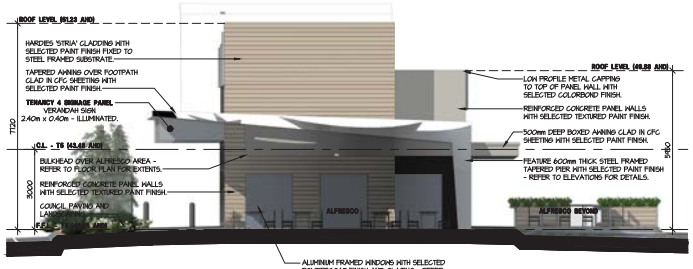
SCALE 1:100

E4 - SOUTH ELEVATION - PART 2

SCALE 1:100

E5 - EAST ELEVATION

SCALE 1:100



E6 - WEST ELEVATION

SCALE 1:100

HINDLEY & ASSOCIATES PTY LTD
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DEVELOPMENT APPLICATION

HINDLEY & ASSOCIATES P/L
AS TRUSTEE FOR
HINDLEY TRUST
ACN No. 088 989 904

BUILD NO DESIGNERS ASSOCIATION OF WA INC

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A1 SHEET

PROPOSED MIXED USE DEVELOPMENT
LOT 3030 BUTLER BOULEVARD
BUTLER
for AJ HOLDINGS AUS PTY LTD

Date	- 17.01.19
Design	- CPH
Drawn	- CPH
Checked	- CPH
Scale	- 1:100
Job No.	- 0679
Dwg	- DA07
Rev	- A

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 $L_{A\ peak}$ and $L_{A\ Max\ slow}$ 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:

$\%\ \text{Type A}_{100}$ = the percentage of industrial land within a 100m radius of the premises receiving the noise

$\%\ \text{Type A}_{450}$ = the percentage of industrial land within a 450m radius of the premises receiving the noise

$\%\ \text{Type B}_{100}$ = the percentage of commercial land within a 100m radius of the premises receiving the noise

$\%\ \text{Type B}_{450}$ = 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.

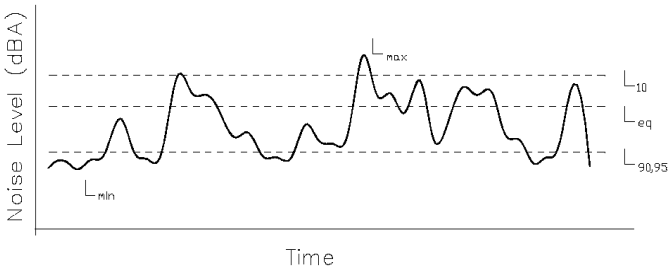
RMS Component Particle Velocity (PCPV)

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