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Environmental Noise Assessment

**Lot 9190 (#171K) Joseph Banks Boulevard,
Banksia Grove**

Reference: 19055006-01a

Prepared for:
Accord Property



Report: 19014795-01

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1 INTRODUCTION

A commercial development is proposed at Lot 9190 (#171K) Joseph Banks Boulevard, Banksia Grove (refer *Figure 1-1*). Existing noise sensitive premises identified in this assessment are predominantly to the north and west, with land zoned 'mixed use' to the east and commercial to the south.

Plan 1 of City of Wanneroo's Banksia Grove Structure Plan AP 65 (Amendment No. 4) indicates that 2-storey residential units are possible within the future mixed use precinct east of the proposed development (See Appendix C).

The development is to comprise the following elements:

- Service station and convenience store;
- 2x Bulky goods stores, one of which will be a Salvation Army Retail Store.

Noise sources considered were those associated with the mechanical plant, goods deliveries, service station equipment, and car park use. The noise emissions from these items were assessed against the prescribed standards of the *Environmental Protection (Noise) Regulations 1997* by way of noise modelling.

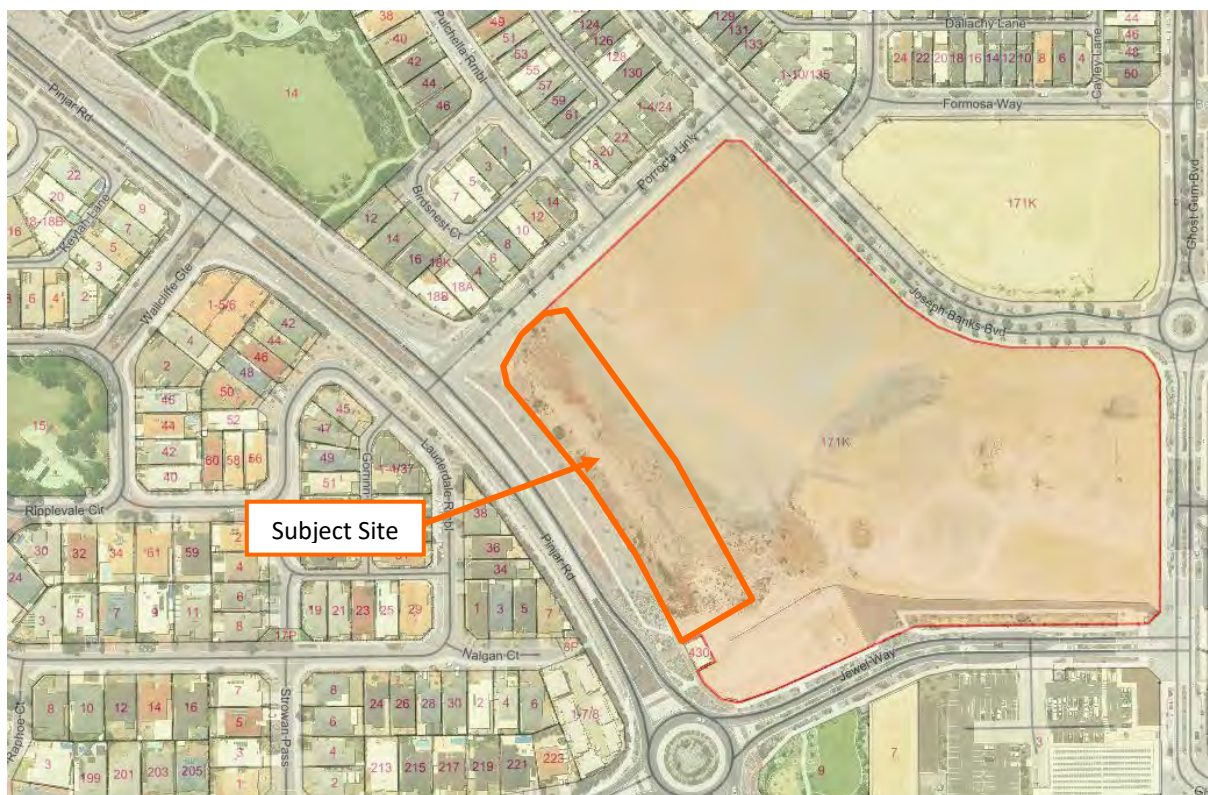


Figure 1-1 Site Locality (Source: City of Wanneroo Maps)

The fuel station's retail store is proposed to operate 24 hours a day, 7-days a week, with the Salvation Army Retail Store and Bulky Goods Store proposed to operate only during daytime hours 7-days a week i.e. 9am-19pm Monday to Sunday. Site drawings used in this assessment are included in *Appendix A* and *Appendix B* shows the zoning maps.

Appendix C shows the map of City of Wanneroo Banksia Grove ASP 65 Structure Plan.

Appendix D 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”.

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 after the adjustments of *Table 2-1* are made to the noise emission as measured at the point of reception.

Table 2-1 Adjustments for Intrusive Characteristics

Tonality	Modulation	Impulsiveness
+ 5 dB	+ 5 dB	+ 10 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	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
Commercial	All hours	60	75	80
Industrial	All hours	65	80	90

The influencing factor was calculated for the nearest noise sensitive premises being to north of the subject site, refer *Figure 2-1*. As per the relevant Structure Plan, the subject site itself is zoned as “Business Centre”, with “Residential” to the West and North (refer *Appendix B*). The influencing factor calculation at the nearest residences is shown in *Table 2-3*.

Pinjar Road carries 13,892 vehicles per day based on a 2017 traffic count summary (Main Roads WA count site #51850). Being located within 100 metres of the nearby noise sensitive receivers, the road is classified as a secondary road under the definition of the Regulations (Schedule 3) and contributes a +2 dB transport factor. The total influencing factor at all nearest noise sensitive premises is therefore +4 dB – refer *Table 2-3*.

Table 2-3 Influencing Factor Calculation – All Residences

Description	Within 100 metre Radius	Within 450 metre Radius	Total
Industrial Land	0 dB	0 dB	0 dB
Commercial Land	1.1 dB	0.9 dB	2 dB
Secondary Road	Pinjar Road	Pinjar Road	2 dB
Total			4 dB



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

Table 2-4 shows the relevant L_{A10} , L_{A1} and L_{Amax} assigned levels (including the influencing factor for residential premises).

Table 2-4 Assigned Noise Levels

Premises Receiving Noise	Time of Day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
All Residences	0700 to 1900 hours Monday to Saturday (Day)	49	59	69
	0900 to 1900 hours Sunday and public holidays (Sunday)	44	54	69
	1900 to 2200 hours all days (Evening)	44	54	59
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays (Night)	39	49	59
Commercial	All hours	60	75	80

It must be noted the assigned noise levels in *Table 2-4* 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 that 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 hours 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 assumed to operate continuously and therefore are to comply with the night-time L_{A10} assigned noise level.
- Loading bay noise, specifically noise from truck mounted refrigeration units are short term, infrequent events, and were therefore assessed against the night-time L_{A1} assigned noise level.
- The main noise source for Standard goods deliveries (i.e. non refrigerated goods) include the stacking of pallets or truck doors closing. These are short term events and were therefore assessed against the night-time L_{Amax} criteria.
- The primary noise sources for the Service Station are the mechanical plant (night-time L_{A10}), car door noise, and the air and water beeper (all three assessed against the night-time L_{Amax}).

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;
- (h) noise emissions from –
 - (i) a reversing alarm fitted to a motor vehicle, mobile plant, or mining or earthmoving equipment; or
 - (ii) a startup or movement alarm fitted to plant,
 - (iii) it is a requirement under another written law that such an alarm be fitted; and

- (iv) it is not practicable to fit an alarm that complies with the written law under which it is required to be fitted and emits noise that complies with these Regulations.

Since the development is open to the public, the service station, 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.

For the purpose of regulation 3(1)(h) above, it is considered that reversing alarms fitted to private and commercial vehicles e.g. goods delivery and garbage trucks, are not exempt under the Regulations, since they are not specifically required under another written law. That is the Worksafe Regulations only require a safe workplace to be provided rather than mandating tonal reversing alarms.

The commonly used fixed noise output tonal reversing alarms also known as 'reversing beeper' emit, by their very nature, tonal and modulating noise at high levels. As such, this type of reversing alarm generally cannot comply with the Regulations even at distant receivers.

Alternative reversing alarms, which can more readily comply with the Regulations, include alarms emitting a broadband signal in-lieu of a tonal 'beep'.

2.1 Waste Collection and Site Cleaning (Specified Works)

Regulation 14A prescribes that the noise emissions from activities such as the collection of waste, landscaped area maintenance and car park cleaning, can be exempt from having to comply with regulation 7, provided they are undertaken in accordance with regulation 14A(2) as follows:

- during daytime hours, defined as:
 - 07:00 to 19:00 Monday to Saturday (excluding public holiday), or
 - 09:00 to 19:00 on a Sunday or public holiday
- in the quietest reasonable and practicable manner; and
- using the quietest equipment reasonably available.

In the case where specified works are to be carried outside daytime hours and their noise emissions are likely not to comply with regulation 7, the works also need to be carried out according to a Noise Management Plan which has been approved by the local government authority CEO.

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 (°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 and Buildings

Topographical data was adapted from *Google Earth*, site photographs and proposed plans. Existing buildings have also been included as these can provide reflection paths and 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 bulky goods store buildings along the west façade and at 0.9-metre higher than the roof.

A 3 metre high solid concrete wall shields future noise sensitive receivers to the Northeast from standard deliveries taking place in the loading bay to Bulky good tenancy (East of proposed retail building). A 2.5 metre high noise barrier with sliding gates is provided to the Salvation Army loading bay to protect nearby premises from delivery noise.

These were incorporated in the model.

Single storey dwellings were modelled as 3.5 metre high buildings, double storey dwellings were modelled as 7 metre high.

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 carpark and road areas, 1 for grassed and sand areas and 0.5 has been used for the remaining built up 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 various plant selections are of a generic nature, including the air compressor and its beeper. 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	
Bulky goods -Roof mounted AC Condenser	83	89	83	80	78	74	64	60	83
Bulky Goods Exhaust Fan	79	77	73	70	61	63	62	52	72
Fuel Bowser	-	65	68	65	67	65	59	50	71
Air Service Alarm	-	-	-	-	-	91	96	92	99
Kitchen Exhaust Fan (RVE0504AP10/17)	74	75	79	80	77	73	68	57	82
Service Station Kitchen Makeup fan (CE506S)	72	73	75	79	79	76	73	57	83
Service Station Toilet Exhaust Fan (TD-500/150)	52	45	58	54	53	57	51	41	63
Service Station – 24kW AC Condenser High Speed	77	77	74	72	70	68	63	56	75
Silenced Tyre Air Compressor	73	72	75	71	67	63	59	51	73
Refrigerated Delivery	101	95	94	92	94	91	88	-	98
Goods Delivery (e.g. pallets stacking)	-	-	87	103	96	92	82	-	102

Description	Octave Band Centre Frequency (Hz)								Overall dB(A)*
	63	125	250	500	1k	2k	4k	8k	
Car Door Closings	71	74	77	81	80	78	72	61	84

*Sound power level of each individual item.

With regards to the above listed noise sources, please note the following:

- Service station mechanical plant sound levels have been sourced from file data for previous similar service station and retail projects. There are 2 AC outdoor condensers floor mounted inside the service yard. All plant including exhaust fans will be roof mounted and were modelled at 0.5 m above roof level, while the silenced compressor is assumed mounted by the most southern car bay on Service Station Car Park area.
- The Service Station mechanical plant will operate at all times, due to the 24-hour nature of the store.
- The bulky goods stores mechanical plant will occasionally operate at night on hot summer days (e.g. on Sunday morning prior to 09.00am) so the rooms are at required temperature by the times the first customers enter the premises.
- The truck mounted refrigeration unit is assumed 2.5 metres above ground level and above the truck cab.
- Three scenarios are considered as follows:
 1. Scenario 1 Night time operations (L_{10}) – All convenience store and service station plant running including all bowsers simultaneously and all bulky goods tenancies mechanical plant running.
 2. Scenario 2 Refrigerated delivery (L_1) – All plant from Scenario 1 running, a refrigerated truck delivery parked inside Service Station service yard, and tyre air compressor in use.
 3. Scenario 3 – (L_{max}) All plant from Scenario 1 and with car doors, air service beeper and standard delivery noise source in Salvation Army Loading Bay and Bulky Goods Loading Bay.
- An image of the noise model overview for is shown in *Figure 3-1*.



Overview of Proposed Site Noise Model

Mixed Use Development, Banksia Grove

Figure 3-1



Signs and symbols

- * Point Source
-  Future Buildings
-  Existing Fences/Walls
- Receiver



30/07/2019

Length Scale 1:1638



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4 RESULTS AND ASSESSMENT

The results of the noise modelling for the three scenarios are summarised in *Sections 4.1 to 4.3*. Results are predicted for the receiver locations as shown in *Figure 3-1*. *Section 4.3* assesses the predicted levels of loading bay noise at the worst case locations.

4.1 Scenario 1 – Mechanical Plant

Table 4-1 provides the results for the night time L_{A10} scenario with all mechanical plant and fuel bowsers in use. Noise from the mechanical plant and fuel bowsers was considered tonal, and as such a +5 dB tonality adjustment may be applicable as shown in *Table 4-1*.

Figure 4-1 provides the noise contour plots for the Night L_{A10} Scenario at 1.5 m above ground level.

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

Location	Predicted Noise Level				Night Assigned Level	Calculated Exceedences
	Service Station Mechanical Plant	Bulky Goods Mechanical Plant	Fuel Bowsers	Combined		
18A Birdsnest Crescent	34	28	31	36+5 = 41	39	+2 dB
18B Birdsnest Crescent	32	29	31	36+5 = 41	39	+2 dB
4 Porrecta Link	35	29	35	38+5 = 43	39	+4 dB
6 Porrecta Link	35	29	34	38+5 = 43	39	+4 dB
8 Porrecta Link	34	31	33	38+5 = 43	39	+4 dB
10 Porrecta Link	35	31	32	38+5 = 43	39	+4 dB
12 Porrecta Link	34	31	32	37+5 = 42	39	+3 dB
14 Porrecta Link	34	29	31	37+5 = 42	39	+3 dB
18 Porrecta Link	32	29	29	35+5 = 40	39	+1 dB
20 Porrecta Link	30	27	27	33+5 = 38	39	Complies
22 Porrecta Link	29	27	19	32+5 = 37	39	Complies
1-4/24 Porrecta Link	29	27	25	32+5 = 37	39	Complies
3-7/135 Joseph Banks Boulevard	21	26	16	27+5 = 33	39	Complies
133 Joseph Banks Boulevard	25	27	19	29+5 = 34	39	Complies
45 Lauderdale Ramble	29	31	28	34+5 = 39	39	Complies

Location	Predicted Noise Level				Night Assigned Level	Calculated Exceedences
	Service Station Mechanical Plant	Bulky Goods Mechanical Plant	Fuel Bowsers	Combined		
1-4/37 Lauderdale Ramble	30	33	28	35+5 = 40	39	+1 dB
38 Lauderdale Ramble	33	34	14	36+5 = 41	39	+2 dB
36 Lauderdale Ramble	33	33	26	36+5 = 41	39	+2 dB
34 Lauderdale Ramble	34	35	24	38+5 = 43	39	+4 dB
7 Nalgan Court	31	35	23	37+5 = 42	39	+3 dB
5 Nalgan Court	33	36	24	38+5 = 43	39	+4 dB
1/8 Nalgan Court	28	33	17	34+5 = 39	39	Complies
2/8 Nalgan Court	19	29	18	30+5 = 35	39	Complies
6/8 Nalgan Court	26	31	16	32+5 = 37	39	Complies
7/8 Nalgan Court	27	32	18	33+5 = 38	39	Complies
Future Residential 1	36	40	33	42+5 = 47	39	+8 dB
Future Residential 2	34	41	39	43+5 = 48	39	+9 dB
Future Residential 3	23	24	39	39+5 = 44	39	+5 dB
Future Residential 4	13	23	40	40+5 = 45	39	+6 dB
Future Commercial	26	32	7	33+5 = 38	60	Complies

The night-time L_{A10} assigned noise level of 39 dB is predicted to be exceeded by 1-4 dB at a number of existing noise sensitive premises,. However, it was predicted that noise levels can comply with the daytime and evening time assigned noise levels at all existing receivers.

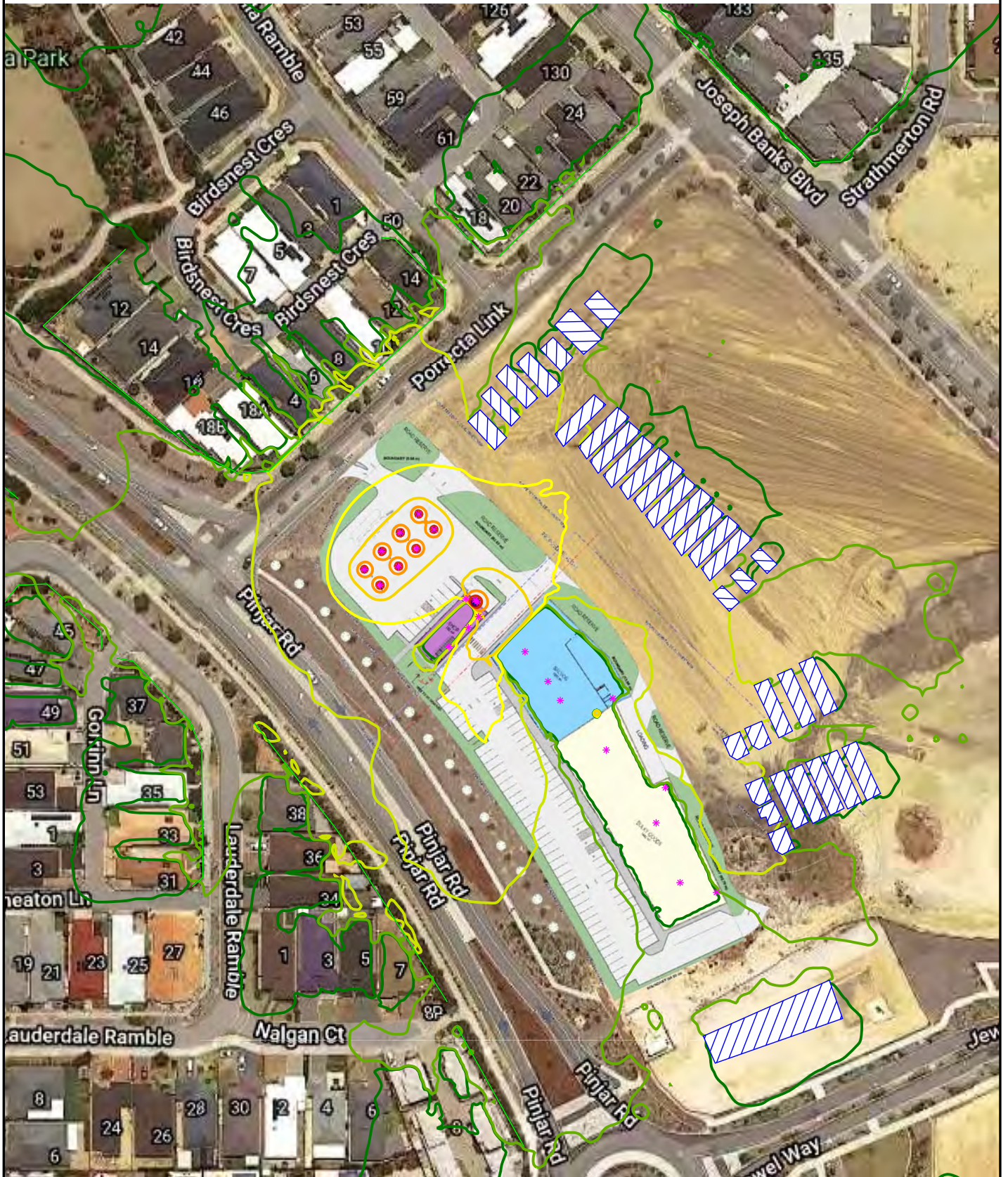
With regards to the future residential receivers, being potential 2-storey buildings to the east of site, noise emissions are predicted to exceed the night time L_{A10} assigned noise levels by up to 9 dB. Noise mitigations are required and are discussed in section 5 of this report. However, the predicted noise levels can comply during the week day daytime period (Monday-Saturday 7am-7pm), but would still exceed during the Evening and Sunday daytime should tonality be present in the noise emissions.

It must be noted this assessment is based on assumptions in relation to the size and type of the AC plant and exhaust fans. Therefore, mechanical plant noise is to be reviewed by a qualified acoustical consultant during detailed design, when plant selection and location becomes known.

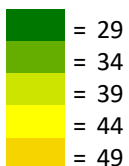
However, based on the modelling carried out, the following is recommended in relation to mechanical plant as it will be expected to be running at night:

- All plant to be the quietest available, and
- Select AC units which can operate on a 'low noise mode' prior to 7am, , and
- Consider providing noise screens or acoustic louvres around plant, and
- Exhaust fans to be located within the ceiling space and ducted to the roof. Roof cowls are then to be located furthest away from sensitive receivers, and
- Allow for silencers in the duct design of exhaust fans, and
- All plant to be mounted on suitable anti-vibration mounts.

As can be seen in *Table 4-1* the noise level at commercial boundaries is readily compliant with the assigned level for all time periods.



dB LA10



Signs and symbols

- * Point Source
- Blue hatched box Future Buildings
- Green line Existing Fences/Walls

29/07/2019



Length Scale 1:1600



4.2 Scenario 2 – Tyre Air compressor and Refrigerated Deliveries to Service Station

The most critical time period would be the night-time as it is initially assumed that refrigerated deliveries can occur at anytime, noting this includes the period between 7am to 9am on Sunday and public holidays. As such, the applicable assigned noise level is 49 dB L_{A1} .

Also considered part of the L_{A1} scenario is the compressor for air service. This is assumed to be installed near the most southern car bay of the Service Station Car park.

The noise emissions of the refrigerated unit are considered to be tonal at most receivers and therefore the predicted noise levels are to be adjusted by +5 dB (refer *Table 2-1*).

Table 4-2 provides the results for the night time L_{A1} scenario *Figure 4-2* provides the noise contour plots for the Night L_{A1} Scenario.

Table 4-2 L_{A1} Predicted Noise Levels: Scenario 2, dB

Location	Predicted Noise Level	Night Assigned Level L_{A1}	Calculated Exceedences
18A Birdsnest Crescent	45+5 = 50	49	+1 dB
18B Birdsnest Crescent	45+5 = 50	49	+1 dB
4 Porrecta Link	50+5 = 55	49	+6 dB
6 Porrecta Link	49+5 = 54	49	+5 dB
8 Porrecta Link	48+5 = 53	49	+4 dB
10 Porrecta Link	51+5 = 56	49	+7 dB
12 Porrecta Link	50+5 = 55	49	+6 dB
14 Porrecta Link	50+5 = 55	49	+6 dB
18 Porrecta Link	42+5 = 47	49	Complies
20 Porrecta Link	41+5 = 46	49	Complies
22 Porrecta Link	40+5 = 45	49	Complies
1-4/24 Porrecta Link	41+5 = 46	49	Complies
3-7/135 Joseph Banks Boulevard	35+5 = 40	49	Complies
133 Joseph Banks Boulevard	39+5 = 44	49	Complies
45 Lauderdale Ramble	32+5 = 37	49	Complies

Location	Predicted	Night Assigned	Calculated
1-4/37 Lauderdale Ramble	31+5 = 36	49	Complies
38 Lauderdale Ramble	32+5 = 37	49	Complies
36 Lauderdale Ramble	27+5 = 33	49	Complies
34 Lauderdale Ramble	29+5 = 34	49	Complies
7 Nalgan Court	27+5 = 32	49	Complies
5 Nalgan Court	28+5 = 33	49	Complies
1/8 Nalgan Court	26+5 = 31	49	Complies
2/8 Nalgan Court	22+5 = 27	49	Complies
6/8 Nalgan Court	22+5 = 27	49	Complies
7/8 Nalgan Court	30+5 = 35	49	Complies
Future Residential 1	57+5 = 62	49	+13 dB
Future Residential 2	56+5 = 61	49	+12 dB
Future Residential 3	40+5 = 45	49	Complies
Future Residential 4	28+5 = 33	49	Complies
Future Commercial	23+5 = 28	75	Complies

At existing residential receivers, *Table 4-2* shows the combined noise emissions from refrigerated deliveries and the air service compressor are predicted to comply during the weekday daytime period, but would exceed the L_{A1} assigned noise level during the Evening and night time periods. For these receivers, a 3 metre high noise wall to the service yard would be sufficient to bring the noise levels to compliance during the evening and night time periods.

However, at the future residential receivers directly North and East of site, the predicted L_{A1} noise levels exceed the Day, Evening and Night time assigned levels. by 13 dB (Night time), +7 dB (Evening and Sunday Daytime), and +3 dB during the daytime for Future residential areas 1. The noise exceedence is caused by the refrigerated deliveries to the convenience shop of the petrol station.

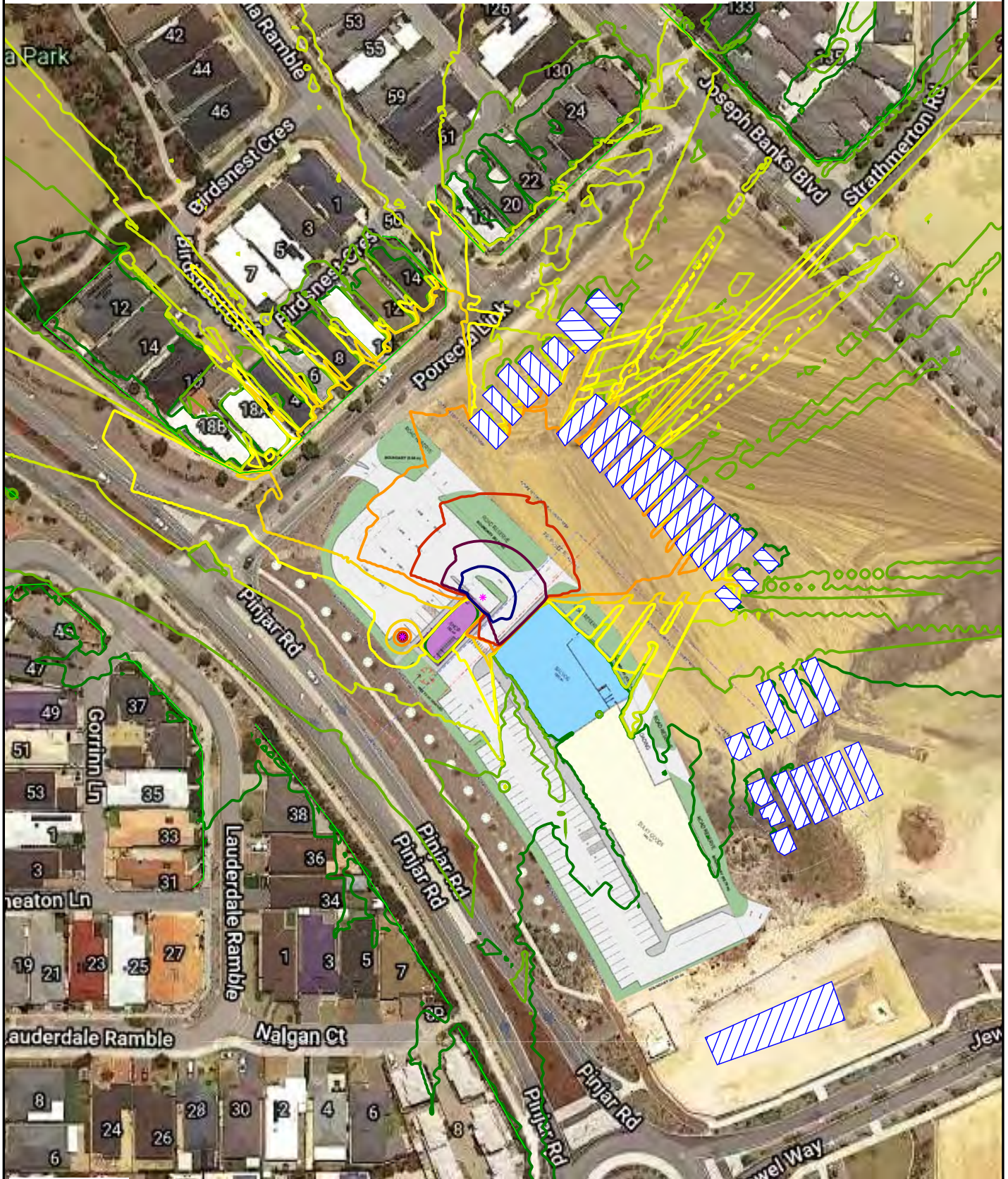
For these future receivers to comply, the following is required:

With the 3 m high wall as described above, weekday daytime compliance is achieved. Therefore, refrigerated deliveries could be restricted to Mon-Sat 7am-7pm.

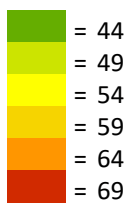
Alternatively, such deliveries could occur at any time provided the truck mounted refrigeration unit is turned off as soon as the truck is parked on site and left off for the duration of the delivery.

Air Service Compressor
Mixed Use Development, Banksia Grove



Figure 4-2



dB L_{A1}



Signs and symbols

- * Point Source
-  Future Buildings
-  Existing Fences/Walls

9/08/2019



Length Scale 1:1600



Lloyd George Acoustics
by Benjamin Hillion
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4.3 Scenario 3 – Car Doors and Standard Deliveries

Table 4-3 provides the results for the night time L_{Amax} scenario. The noise levels predicted include the shielding provided by the 2.5m barrier to the Salvation Army Retail loading bay and the 3 metre wall to the Bulky goods tenancy...

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

Location	Predicted Noise Level			Max	Night Assigned Level	Calculated Exceedences
	Air beeper ¹	Car Doors ²	Standard Deliveries ¹			
18A Birdsnest Crescent	46+5	35+10	33+10	51	59	Complies
18B Birdsnest Crescent	44+5	33+10	32+10	49	59	Complies
4 Porrecta Link	50+5	36+10	34+10	55	59	Complies
6 Porrecta Link	49+5	36+10	35+10	54	59	Complies
8 Porrecta Link	47+5	35+10	35+10	52	59	Complies
10 Porrecta Link	44+5	34+10	37+10	49	59	Complies
12 Porrecta Link	44+5	34+10	38+10	49	59	Complies
14 Porrecta Link	44+5	32+10	38+10	49	59	Complies
18 Porrecta Link	43+5	30+10	38+10	48	59	Complies
20 Porrecta Link	38+5	22+10	35+10	45	59	Complies
22 Porrecta Link	28+5	20+10	34+10	44	59	Complies
1-4/24 Porrecta Link	33+5	22+10	34+10	44	59	Complies
3-7/135 Joseph Banks Boulevard	32+5	21+10	35+10	45	59	Complies
133 Joseph Banks Boulevard	32+5	22+10	34+10	44	59	Complies
45 Lauderdale Ramble	46+5	35+10	30+10	51	59	Complies
1-4/37 Lauderdale Ramble	46+5	33+10	32+10	51	59	Complies
38 Lauderdale Ramble	49+5	36+10	33+10	54	59	Complies
36 Lauderdale Ramble	43+5	35+10	34+10	48	59	Complies
34 Lauderdale Ramble	45+5	35+10	36+10	50	59	Complies

Location	Predicted Noise Level			Max	Night Assigned Level	Calculated Exceedences
	Air beeper ¹	Car Doors ²	Standard Deliveries ¹			
7 Nalgan Court	44+5	37+10	50+10	60	59	1 dB
5 Nalgan Court	46+5	36+10	38+10	51	59	<i>Complies</i>
1/8 Nalgan Court	33+5	35+10	50+10	60	59	1 dB
2/8 Nalgan Court	38+5	32+10	46+10	56	59	<i>Complies</i>
6/8 Nalgan Court	36+5	33+10	50+10	60	59	1 dB
7/8 Nalgan Court	40+5	36+10	50+10	60	59	1 dB
Future Residential 1	48+5	39+10	53+10	63	59	4 dB
Future Residential 2	51+5	37+10	56+10	66	59	7 dB
Future Residential 3	33+5	27+10	58+10	68	59	9 dB
Future Residential 4	20+5	29+10	57+10	67	59	8 dB
Future Commercial	35+5	43+10	65+10	75	80	<i>Complies</i>

1. Noise levels adjusted by +5 for tonality

2. Noise levels adjusted by +10 dB for impulsiveness

"+ 5" in the table has been assumed for potential tonal penalty and "+ 10" for impulsive penalty and included in the maximum, noting that these noises are not cumulative,

The assigned night time noise level of 59 dB L_{Amax} is expected to be complied with at existing noise commercial receivers during Day, Evening and Night time at existing noise sensitive receivers.

The night time L_{Amax} assigned level is predicted to be exceeded by up to 1 dB for 4 of the existing noise sensitive receivers to the southwest of site. However they are expected to comply during Evening and Daytime.

The night time L_{Amax} assigned level is also expected to be exceeded by 4 to 9 dB at Future residential receivers north east of site during Night time. Impacted areas are Future Residential areas 2, 3 and 4. Exceedences are attributable to standard deliveries to Salvation Army Retail Store's Loading Bay. In order to reduce the noise levels so they comply with assigned levels it would be necessary to:

- Provide a 3.5m high solid continuous barrier to Salvation Army Retail Store's loading bay to comply with Day, Evening and Night time L_{Amax} assigned levels. (This design may incorporate sliding doors to allow trucks in and out of the loading bay as long as the bottom of the barrier is rebated and any gaps are backed by solid inserts e.g. fibre cement, safety glass or Perspex). This solution would need to be investigated by the proponent and verified by an acoustical consultant. Or;

- Restrict deliveries to the loading bay to take place Monday to Saturday between 07am to 07pm.

5 RECOMMENDATIONS

The assessment has indicated that the predicted noise emissions associated with the proposed development can comply with the applicable assigned levels determined in accordance with the *Environmental Protection (Noise) Regulations 1997*.

The roof mounted condensers for bulky goods tenancies were identified as potential excessive noise sources and a mitigation solution was developed comprising of:

- Noise screens to be 0.5m higher than mechanical plant's highest point facing north and east. The barrier construction is to be free of gaps and of material with minimum surface mass of 12 kg/m² (e.g. fibre cement) or masonry

The refrigerated deliveries to the Service Station, even when located on the inside of the Service yard were identified as a potential issue. To ensure compliance, noise control options will therefore be required and will need to be verified by an acoustic consultant at detailed design stage.

- To comply with Day, Evening and Night time L_{A1} assigned levels, fully enclosing the service yard with walls and a roof that are free from gaps and an operable door which is to be closed during refrigerated deliveries. Any openings required for ventilation purposes to be acoustically treated. Or,
- To comply with Daytime L_{A1} assigned levels, provide 3 metre solid walls to service yard enclosure free from gaps and ensure refrigerated deliveries only occur during the daytime. Any openings required for ventilation purposes to be acoustically treated. Or,
- Ensure refrigeration compressor is turned off as soon as delivery truck arrives, and remains off for the duration of the delivery.

Noise emissions from standard deliveries (i.e. deliveries excluding refrigerated trucks) in the designated Salvation Army Retail Store Loading Bay were identified as an issue for future noise sensitive receivers. To ensure compliance, noise control options will therefore be required. At this stage such controls include

- to comply with Day, Evening and Night time L_{Amax} assigned levels provide a 3.5m high solid continuous barrier to Salvation Army Retail Store's loading bay (This design may incorporate sliding doors to allow trucks in and out of the loading bay as long as the bottom of the barrier is rebated and any gaps are backed by solid inserts e.g. fibre cement, safety glass or Perspex).

All mechanical plant is to be in line with those assumed in the modelling – refer *Table 3-2*. Verification of final selection and locations of plant is to be undertaken at building permit stage by a suitably qualified acoustical consultant.

In the addition to the above, the following is to be implemented in the design and operation where practicable.

- Mechanical plant that will operate during the night (e.g. refrigeration condensers) to be selected having a low speed option;
- Mechanical plant to be maintained to ensure noise levels do not increase over time;

- Any external music or the like shall be low level and completely inaudible at residences;
- Bin servicing shall occur between 7am and 7pm Mondays to Saturdays. The servicing of bins would fall under regulation 14A and provided it is carried out within the stipulated hours and undertaken as quietly as reasonably practicable, the assigned levels do not apply. Where possible, bins shall be located in areas away from and/or screened from residences;
- Access grates shall be firmly seated in position and fitted with rubber gaskets to avoid excess banging.
- Delivery vehicles to turn off engines whilst unloading.

6 CONCLUSION

The potential noise impacts resulting from the proposed commercial development Lots 9192 (#171K) Joseph Banks Boulevard, Banksia Grove have been assessed against the prescribed standards of the *Environmental Protection (Noise) Regulations 1997*.

Roof located Mechanical Plant

Noise from roof located mechanical plant to retail tenancies is expected to exceed L_{A10} assigned levels at existing and future noise sensitive receivers during the Night time. However it is expected to comply with Day and Evening Assigned levels.

Noise from roof located mechanical plant on retail tenancies is expected to comply with L_{A10} assigned levels at commercial receivers at all times.

Refrigerated Deliveries to Service Station Service Yard

Noise from refrigerated deliveries is expected to exceed L_{A1} assigned levels at existing noise sensitive receivers during the night time. However noise from refrigerated deliveries is expected to comply with L_{A1} assigned levels during the Day and Evening time.

Noise from refrigerated deliveries is expected to exceed L_{A1} assigned levels at future noise sensitive receivers during the Day, Evening and Night time.

Noise from refrigerated deliveries is expected to comply with L_{A1} assigned levels at commercial receivers at all times.

Standard Deliveries

Noise from standard deliveries at Salvation Army Retail Loading Bay is expected to exceed L_{Amax} assigned levels at residential receivers during the Evening and Night time.

It is expected to comply with assigned levels at commercial receivers at all times.

Noise from standard deliveries at Bulky Goods tenancy's loading bay is expected to comply with L_{Amax} assigned levels at commercial receivers at all times.

By implementing the recommendations of *Section 5*, compliance with the assigned levels can be achieved during the proposed operating times, including night time.

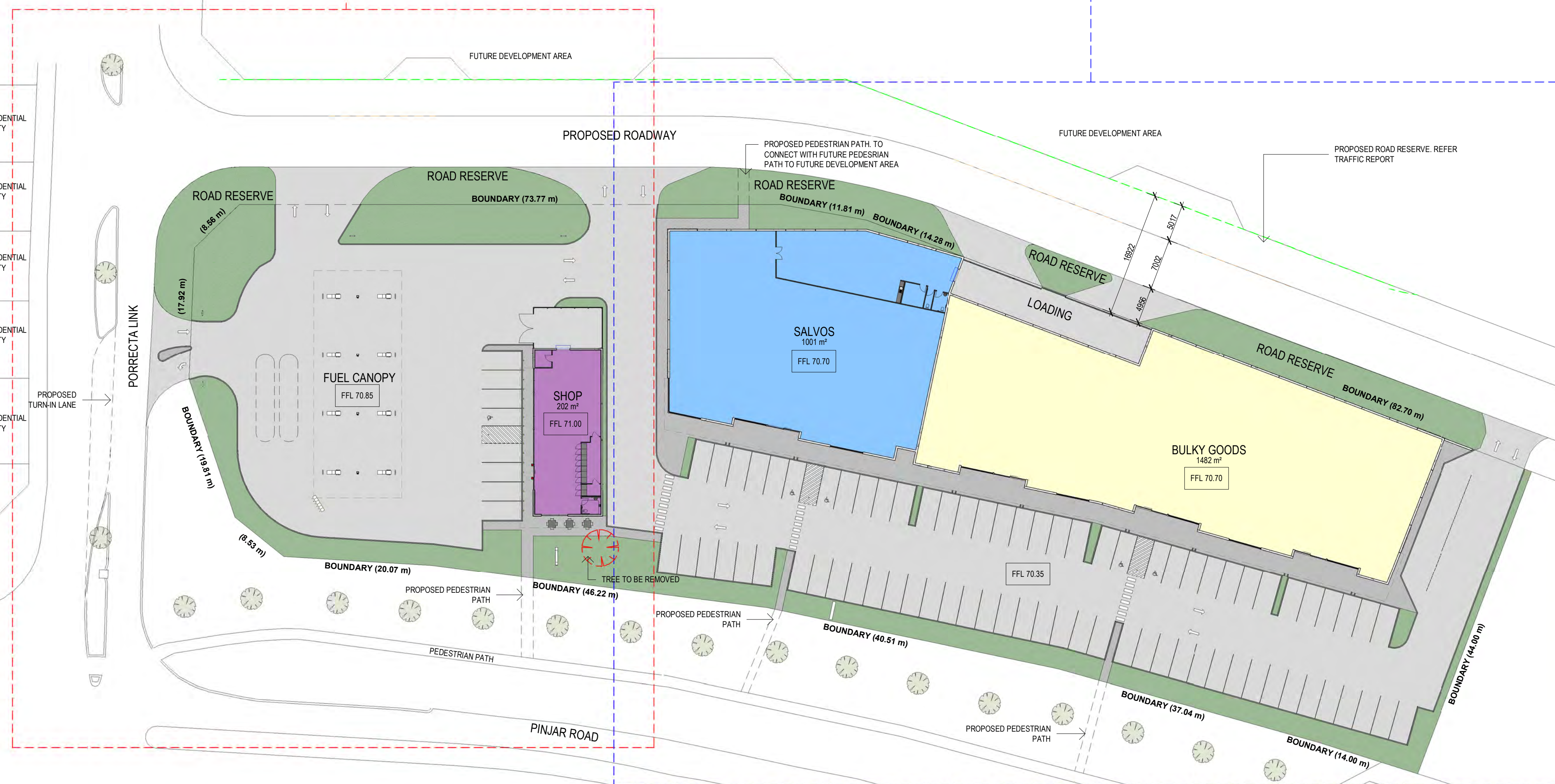
Appendix A

Site Plans

Rev.	Amendment	Date
A	DA ISSUE	07/08/19
B	DA ISSUE	04/09/19
C	DA REVISION	02/10/19
D	REVIEW	24/10/19
E	REVIEW	29/10/19
F	DA ISSUE	04/11/19

PART 1
DWGS 03-08

PART 2
DWGS 09-12



OVERALL SITE PLAN

1:400

SITE AREA	8755m²
LANDSCAPE AREA	1088m²

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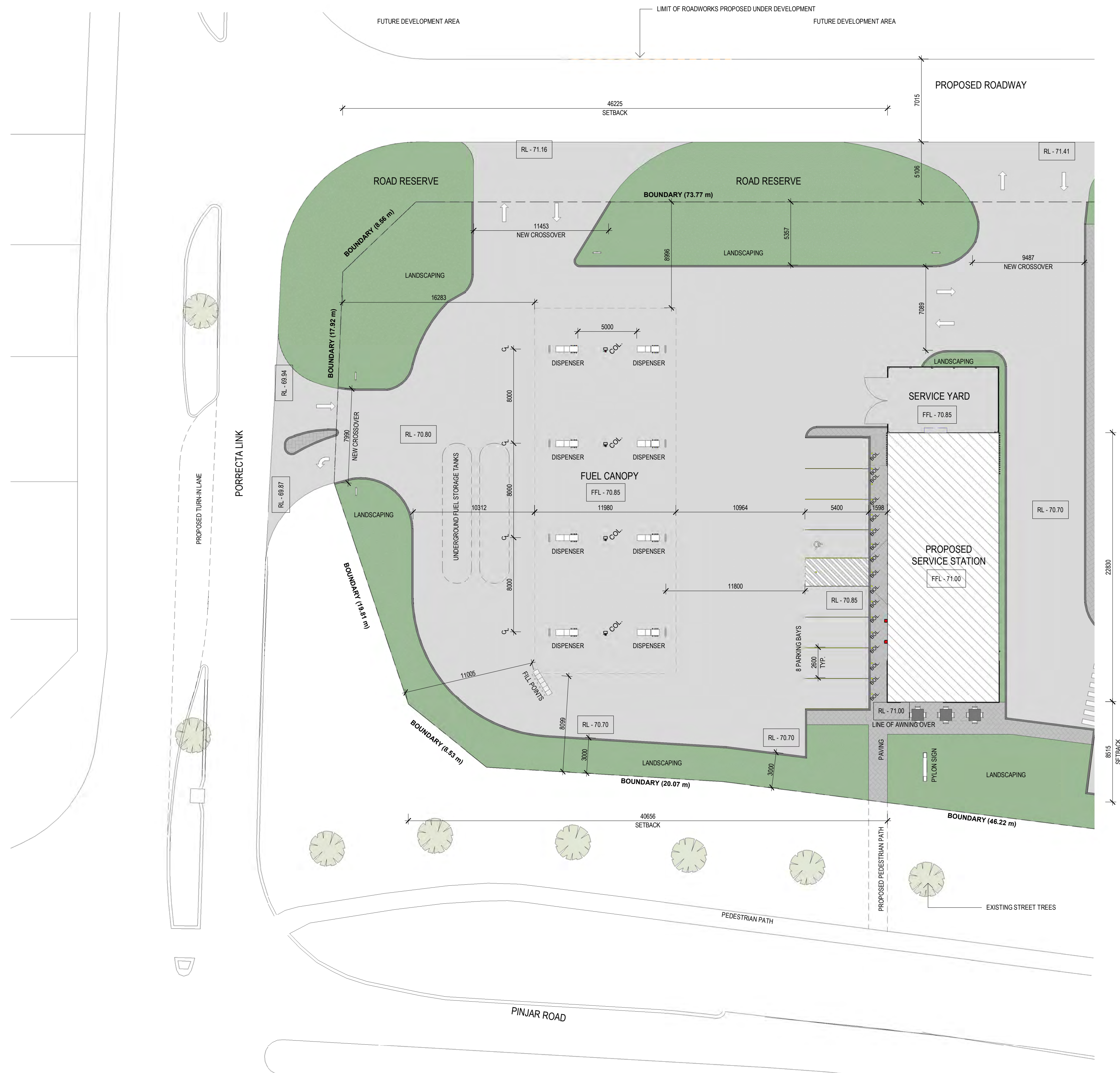
ACCORD PROPERTY

BANKSIA GROVE

OVERALL SITE PLAN

Scale	As indicated	Checked	MJ
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Date	04/11/19		
Job No.	2019028		
Dwg No.	3283 03	Rev.	F A1 SHEET

Rev.	Amendment	Date
A	DA ISSUE	07/08/19
B	DA ISSUE	04/09/19
C	DA REVISION	02/10/19
D	REVIEW	24/10/19
E	REVIEW	29/10/19
F	DA ISSUE	04/11/19



SITE PLAN PART 1

1 : 200

DRAWING CONTINUES ON 3283 09



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BANKSIA GROVE

SITE PLAN PART 1

Scale 1 : 200

Drawn DC

Date 04/11/19

Job No. 2019028

Dwg No. 3283 04

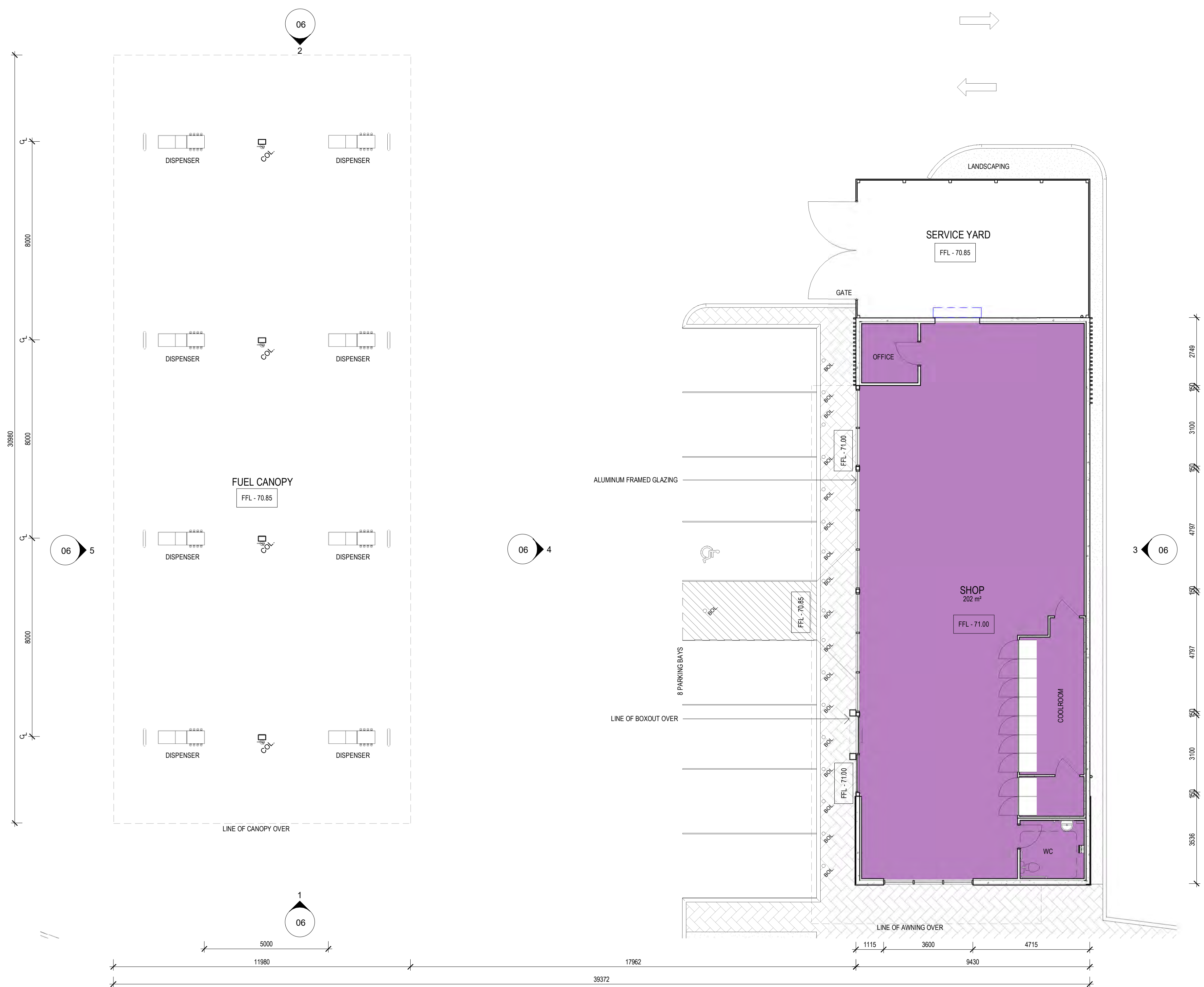
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Rev: F

A1 SHEET



Rev.	Amendment	Date
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B	DA ISSUE	04/09/19
C	DA REVISION	02/10/19
D	REVIEW	24/10/19
E	REVIEW	29/10/19
F	DA ISSUE	04/11/19



FLOOR PLAN PART 1
1 : 100

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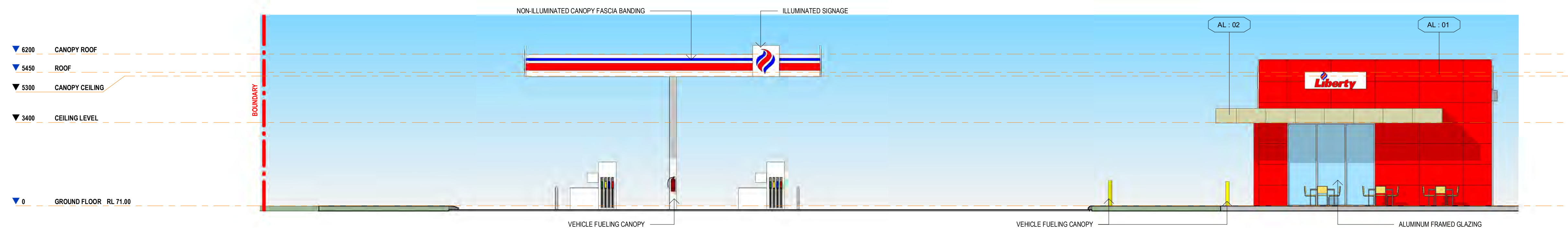
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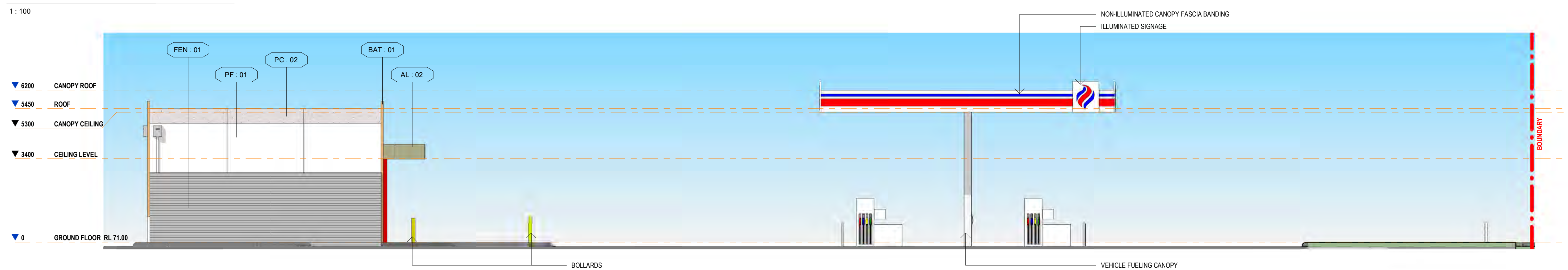
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Job No. 2019028
Dwg No. 3283 05 Rev. F A1 SHEET

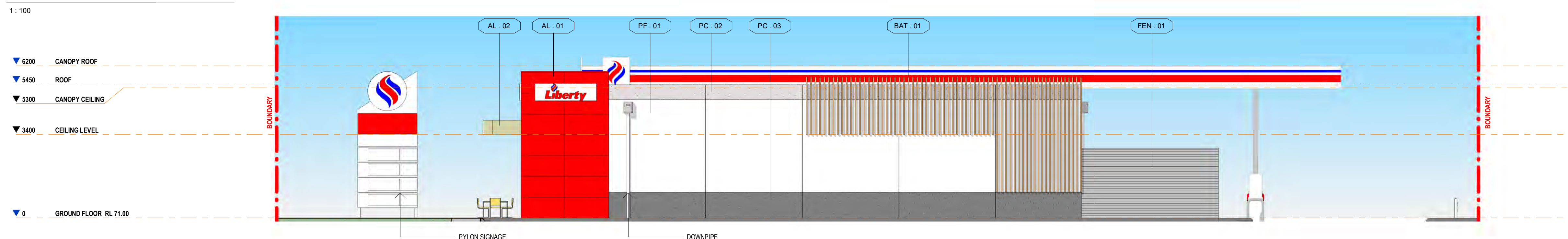
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A	DA ISSUE	07/08/19
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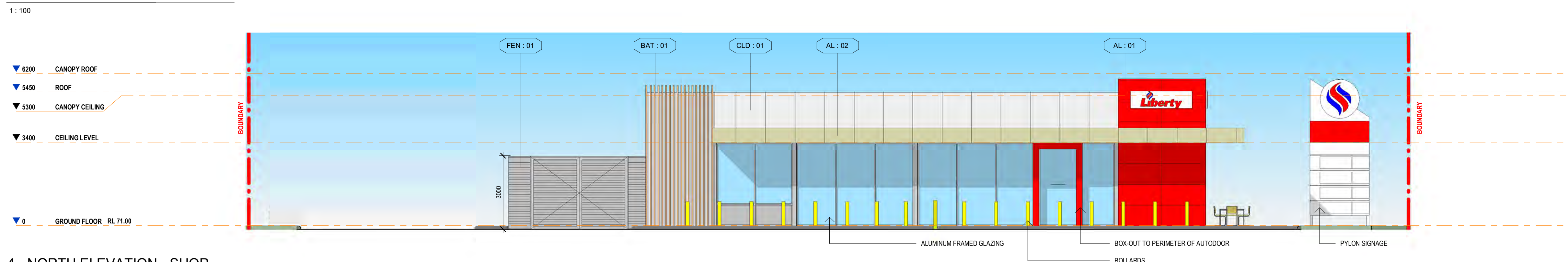
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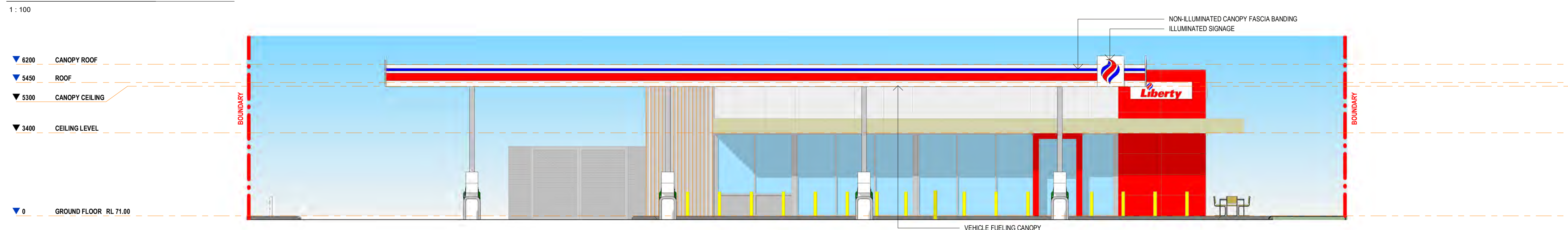
2 - EAST ELEVATION



3 - SOUTH ELEVATION



4 - NORTH ELEVATION - SHOP



5 - NORTH ELEVATION - CANOPY

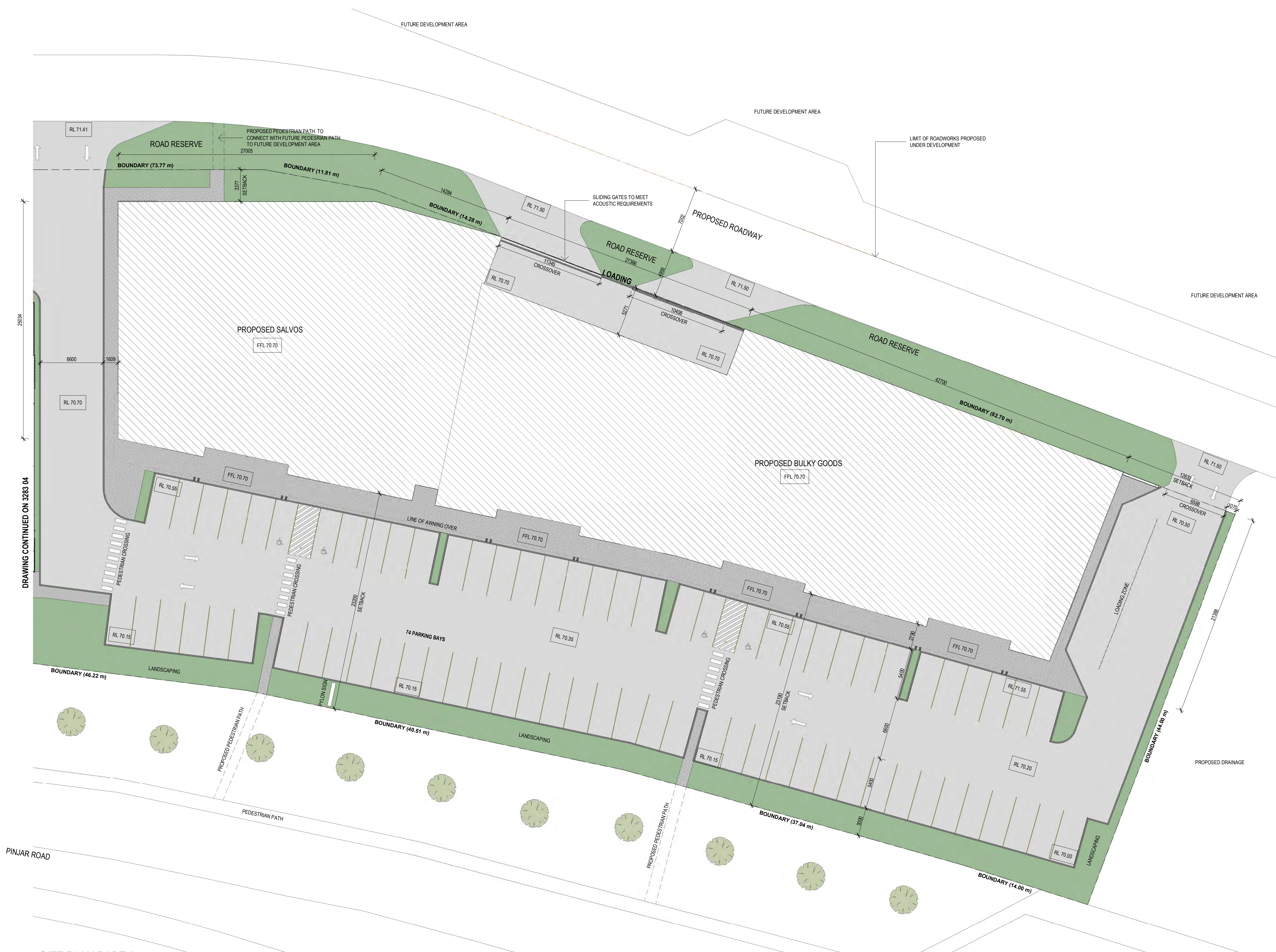
1 : 100

FINISHES LEGEND

- AL : 01 3mm PRE-FINISHED ALUMINUM PANELLING 'RED'
- AL : 02 3mm PRE-FINISHED ALUMINUM PANELLING 'CHAMPAGNE METALLIC'
- PC : 02 HONED PRECAST 'LIGHT'
- PC : 03 HONED PRECAST 'DARK'
- PF : 01 PRECAST, PAINT FINISH 'WHITE'
- CLD : 01 EXPRESSED JOINT OFC. PAINT FINISH - TBC.
- BAT : 01 INNOVWOOD BATTENS TIMBER OR TIMBER LOOK CEDAR
- FEN : 01 3000H COLORBOND FENCING 'WOODLAND GREY' TO ACOUSTIC REPORT REQUIREMENTS

NOTE: FORECOURT CANOPY OFC CLADDING TO BE PAINTED TO SUIT OPERATORS BRANDING

Rev.	Amendment	Date
A	DA ISSUE	07/08/19
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C	DA REVISION	02/10/19
D	REVIEW	24/10/19
E	REVIEW	28/10/19
F	DA ISSUE	04/11/19



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SITE PLAN PART 2

1 : 200

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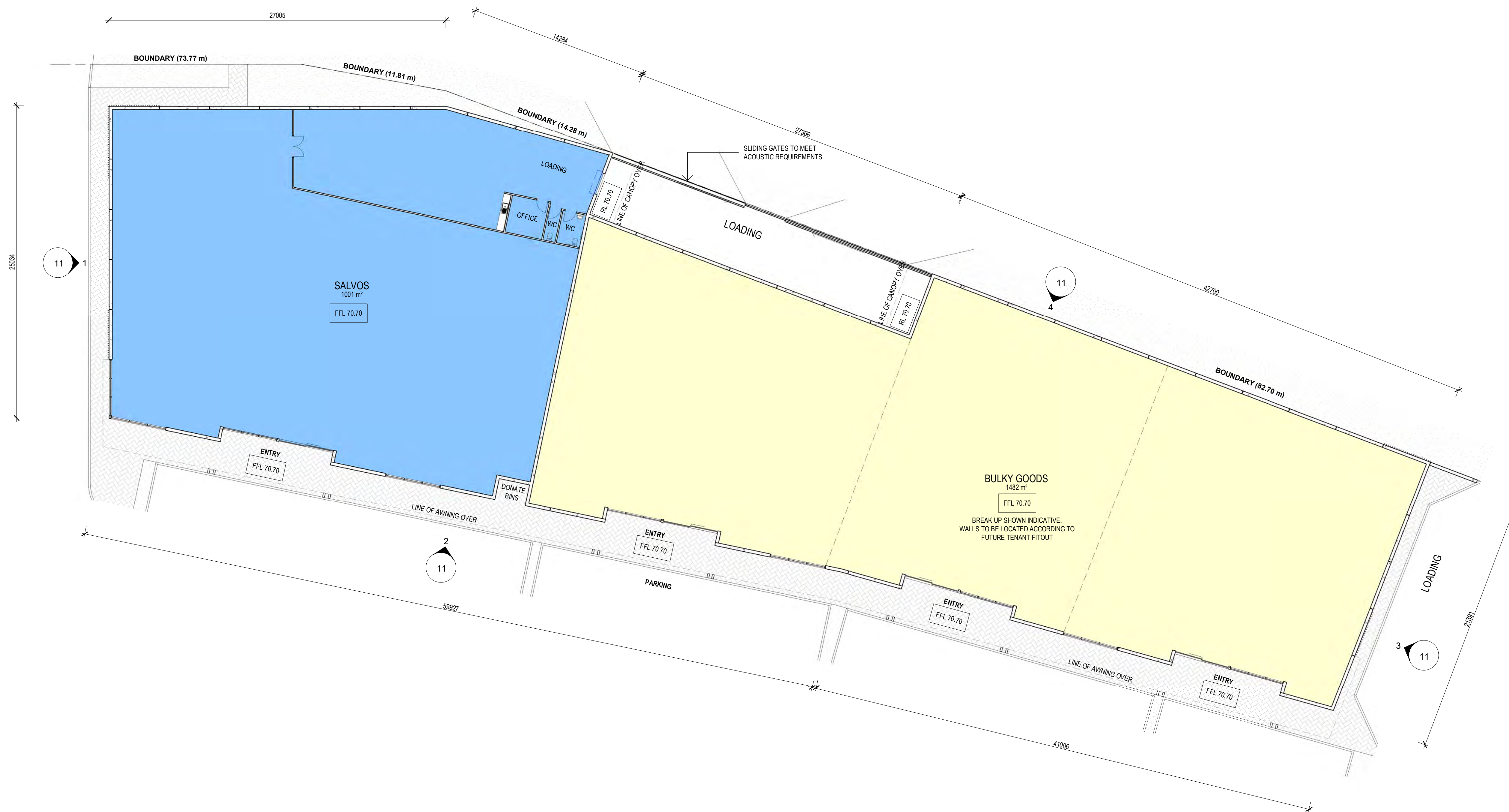
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BANKSIA GROVE

SITE PLAN PART 2

Scale 1 : 200
 Drawn DC Checked MJ
 Date 04/11/19
 Job No. 2019028
 Dwg No. 3283 09 Rev. F A1 SHEET

Rev.	Amendment	Date
A	DA ISSUE	07/08/19
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C	DA REVISION	02/10/19
D	REVIEW	24/10/19
E	REVIEW	28/10/19
F	DA ISSUE	04/11/19



FLOOR PLAN PART 2

1 : 200

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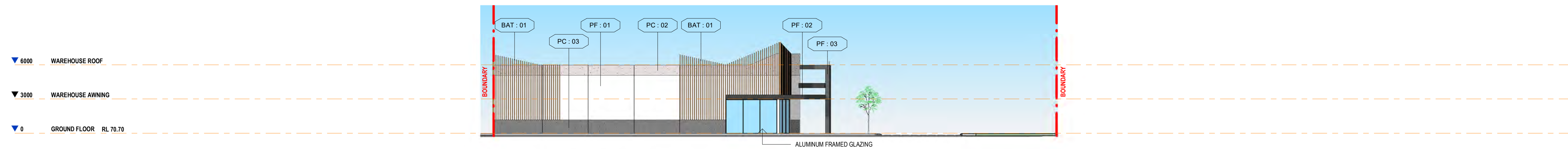
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BANKSIA GROVE

FLOOR PLAN PART 2

Scale 1 : 200
 Drawn DC Checked MJ
 Date 04/11/19
 Job No. 2019028
 Dwg No. 3283 10 Rev: F A1 SHEET

Rev.	Amendment	Date
A	DA ISSUE	07/08/19
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F	DA ISSUE	04/11/19

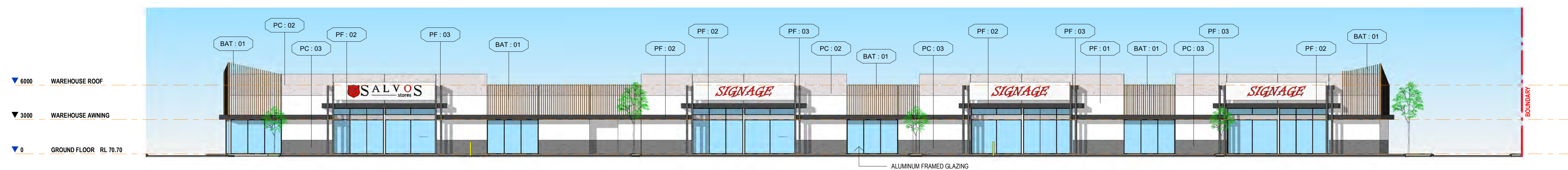


1 - NORTH ELEVATION

1 : 200

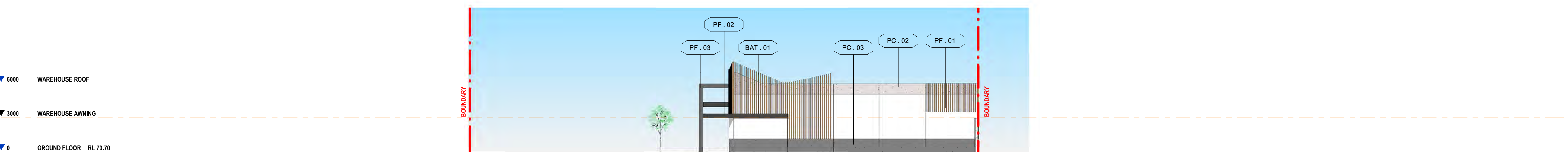
FINISHES LEGEND

- PC : 02 HONED PRECAST ' LIGHT
- PC : 03 HONED PRECAST ' DARK
- PF : 01 PRECAST . PAINT FINISH ' WHITE
- PF : 02 STEEL FASCIA . PAINT FINISH ' BLACK
- PF : 03 STEEL . PAINT FINISH ' CHARCOAL
- BAT : 01 INNOWOOD BATTENS TIMBER OR TIMBER LOOK CEDAR



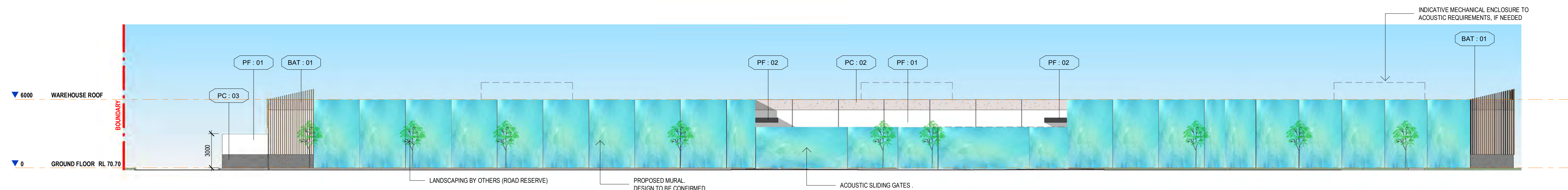
2 - WEST ELEVATION

1 : 200



3 - SOUTH ELEVATION

1 : 200



4 - EAST ELEVATION

1 : 200

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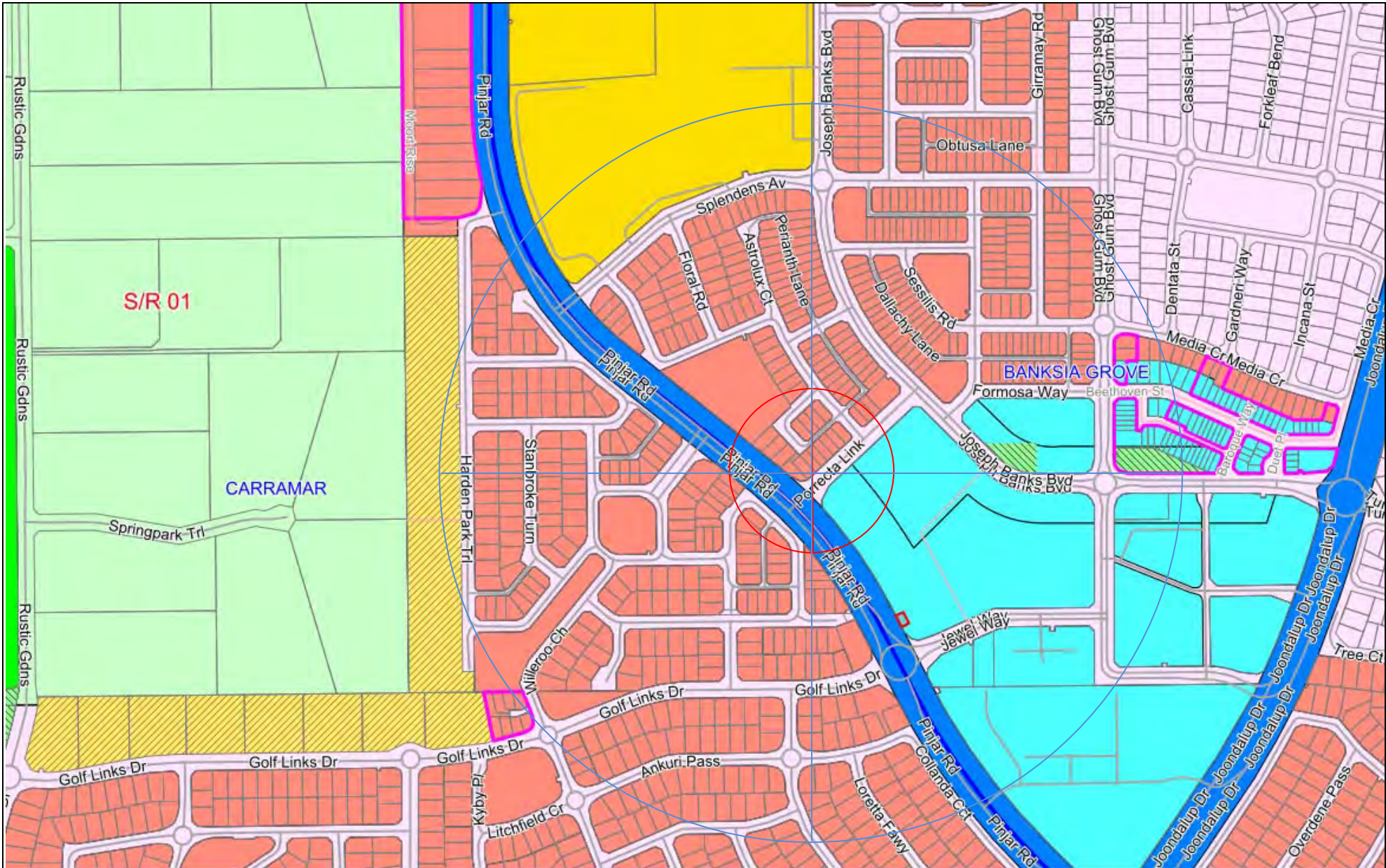
BANKSIA GROVE

ELEVATIONS PART 2

Scale As indicated
Drawn DC Checked MJ
Date 04/11/19
Job No. 2019028
Dwg No. 3283 11 Rev: F A1 SHEET

Appendix B

Zoning Map



City of Wanneroo does not warrant the accuracy of information in this publication and any person using or relying upon such information does so on the basis that City of Wanneroo shall bear no responsibility or liability whatsoever for any errors, faults, defects or omissions in this information. Based on information provided by and with the permission of the Western Australian Land Authority trading as LANDGATE

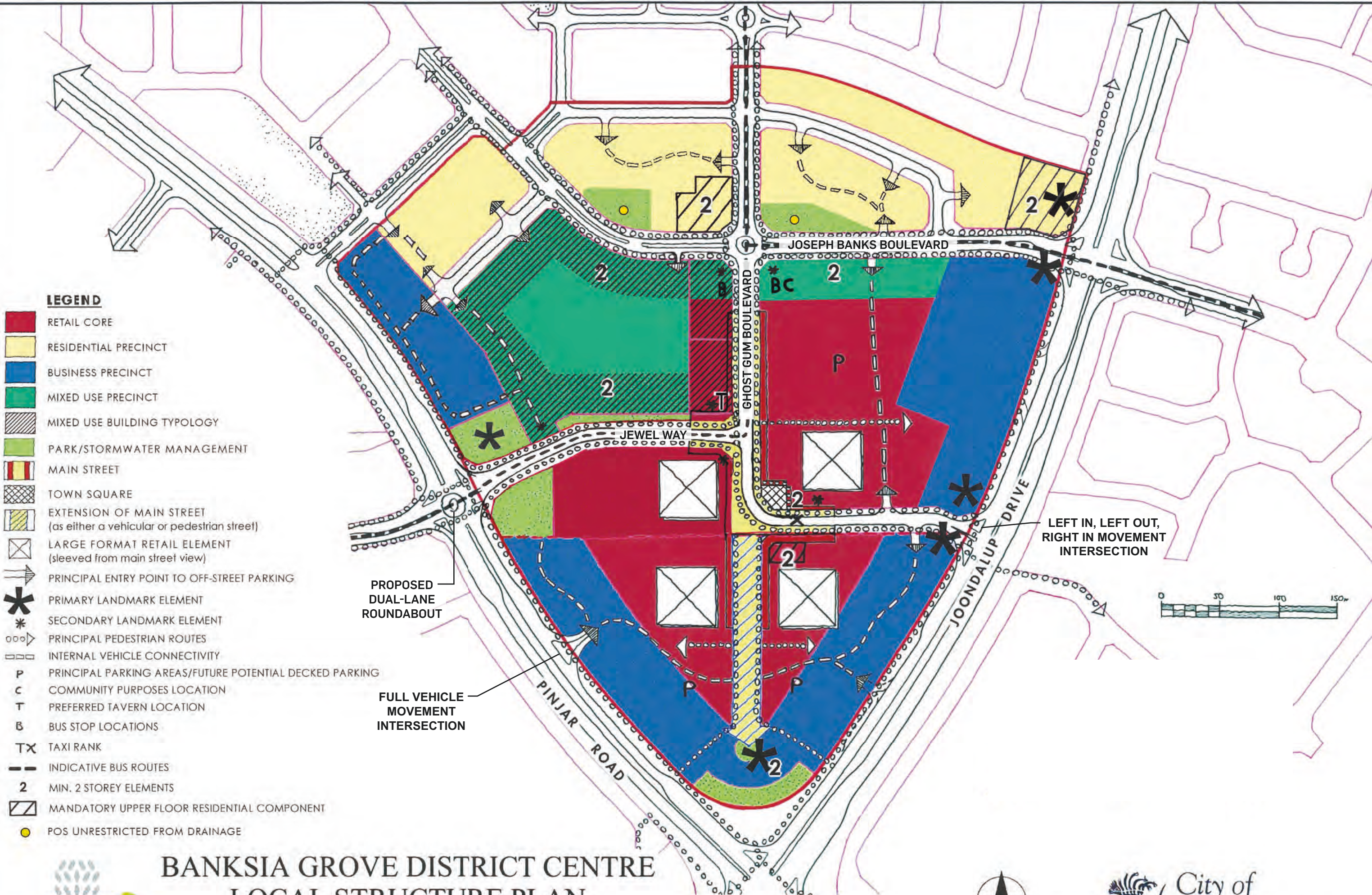
Zoning Map

Scale 1:5380
 Projection: GDA94 / MGA zone 50
 Date: 13/07/2019



Appendix C

Banksia Grove Structure Plan No.65



LEGEND

- RETAIL CORE
- RESIDENTIAL PRECINCT
- BUSINESS PRECINCT
- MIXED USE PRECINCT
- MIXED USE BUILDING TYPOLOGY
- PARK/STORMWATER MANAGEMENT
- MAIN STREET
- TOWN SQUARE
- EXTENSION OF MAIN STREET
(as either a vehicular or pedestrian street)
- LARGE FORMAT RETAIL ELEMENT
(sleeved from main street view)
- PRINCIPAL ENTRY POINT TO OFF-STREET PARKING
- PRIMARY LANDMARK ELEMENT
- SECONDARY LANDMARK ELEMENT
- PRINCIPAL PEDESTRIAN ROUTES
- INTERNAL VEHICLE CONNECTIVITY
- P PRINCIPAL PARKING AREAS/FUTURE POTENTIAL DECKED PARKING
- C COMMUNITY PURPOSES LOCATION
- T PREFERRED TAVERN LOCATION
- B BUS STOP LOCATIONS
- TX TAXI RANK
- INDICATIVE BUS ROUTES
- 2 MIN. 2 STOREY ELEMENTS
- MANDATORY UPPER FLOOR RESIDENTIAL COMPONENT
- POS UNRESTRICTED FROM DRAINAGE

PROPOSED
DUAL-LANE
ROUNDBABOUT

FULL VEHICLE
MOVEMENT
INTERSECTION

LEFT IN, LEFT OUT,
RIGHT IN MOVEMENT
INTERSECTION



**BANKSIA GROVE DISTRICT CENTRE
LOCAL STRUCTURE PLAN
CITY OF WANNEROO
PLAN 1: STRUCTURE PLAN**

AMENDMENT No.4



OCTOBER 2017



Appendix D

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 A₁₀₀ = the percentage of industrial land within
a 100m radius of the premises receiving the noise

% Type A₄₅₀ = the percentage of industrial land within
a 450m radius of the premises receiving the noise

% Type B₁₀₀ = the percentage of commercial land within
a 100m radius of the premises receiving the noise

% Type B₄₅₀ = 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.

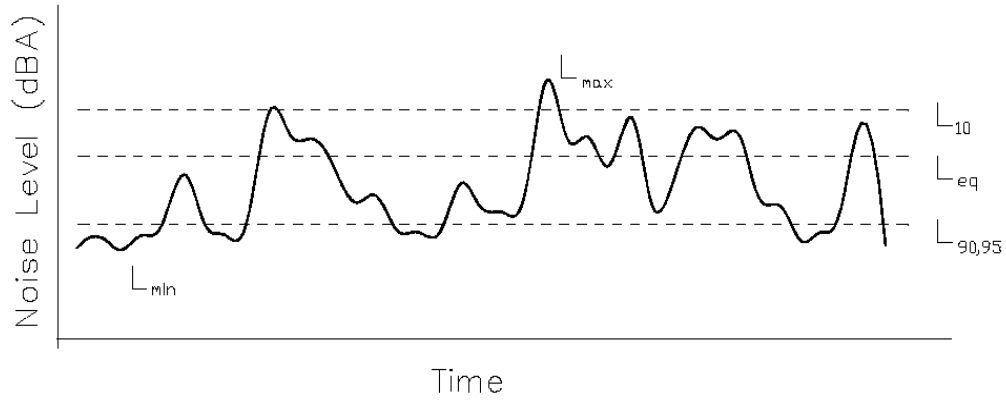
Ambient Noise

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.

Chart of Noise Level Descriptors



Typical Noise Levels

