Yanchep Central

Acoustics DA Report

Prepared for: CBRE

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Revision

Revision	Date	Comment	Prepared By	Approved By
001	15/6/2021	Draft DA Report	MXC	IK
002	22/6/2021	DA Report	MXC	IK

Contents

Executive Summary

Stantec has been engaged by FRP Capital to provide acoustic services for the proposed commercial development within the existing Yanchep Central shopping centre. This report has been prepared as part of supporting documentation pertaining to the development application for the project.

The noise assessment has been carried out in accordance with the regulations and guidelines below:

- Western Australian Environmental Protection (Noise) Regulation 1997 (EPNR); and
- Australian and New Zealand Standard AS 2107:2016 — Acoustics – Recommended design sound levels and reverberation times for building interiors (AS2107).

As part of the assessment, several components of the development have been identified to have noise impacts on the existing environment including:

- Supermarket;
  - Mechanical services including the refrigeration condensers;
  - Trucks entering and exiting the loading dock;
  - Compactor
  - Cars moving through/door slams at Click and Collect bays.
- Childcare centre;
  - Outdoor children play areas;
  - Trucks entering and exiting the loading dock
- Fast food restaurants;
  - Cars moving;
  - Mechanical services including the refrigeration condensers and kitchen exhaust fans;
- Petrol station;
  - Cars moving and door slams;
  - Fuel tanker moving; and
  - Mechanical services including the refrigeration condenser.

A detailed 3D noise model using the software package SoundPLAN 8.2 was developed and assessed for noise emissions for various times of the day which considers the built form of the buildings as well as assumed noise inputs. Based on the predicted results and assumptions stated in the report, the following items below have been predicted to exceed the EPNR noise criteria. The recommended noise mitigation treatments have been provided

- Supermarket:
  - Provide a solid noise barrier with a minimum surface of 15kg/m^2 to the eastern facing side of the plant deck extending 200mm above the refrigeration condenser unit.
- Childcare Centre:
  - Provide a solid noise barrier with a minimum surface of 15kg/m^2 extending 1300mm above the ground to the bounding perimeter of the outdoor play area.

- Fast Food Restaurants:
  - The sound power levels of the refrigeration condenser and kitchen exhaust fans will need to be selected to have a limit of 82dB(A) and 80 dB(A) respectively.

With the inclusion of treatments summarised above, it is expected that the noise impact from the proposed new developments will achieve compliance to the EPNR criteria during all times of the day

Additional advice has also been provided in regards to the noise impact from the supermarket loading dock on the childcare centre in the form of solid façade wall constructions.

1. Introduction

FRP Capital has engaged Stantec to provide acoustic services for the proposed new developments within the existing Yanchep Central shopping centre.

The project involves several components that could have the potential of noise impacts on the surrounding environment. This includes a new supermarket, childcare centre, petrol station and two new fast-food restaurants as illustrated in Figure 1. The nearest noise sensitive receivers are located to the west of Marmion Avenue as well as the potential future receivers along the East side of Kakuda Rd. The major transport corridor servicing the development is Marmion Avenue, west of the project site.

This report has been prepared as part of supporting documentation pertaining to the development application for the project and provides noise control measures to achieve compliance to the regulations and Australian Standards listed below:

- Western Australian Environmental Protection (Noise) Regulation 1997 (EPNR); and
- Australian and New Zealand Standard AS 2107:2016 — Acoustics – Recommended design sound levels and reverberation times for building interiors (AS2107).

1.1 Study Inputs

Acoustic assessment and preparation of this report has been based on the received documentation provided in Table 1.

Table 1: Received Documentation

Date	Detail	Prepared By	Format
7th May 2021	*"A-SK-02_Yanchep Masterplan_D.pdf"*	TRCB	PDF
22nd February 2021	*"A_210222_Yanchep Central_Building_RVT20_detached"*	TRCB	RVT
April 2021	*"Ä-SK-02_Yanchep Masterplan_D"*	TRCB	PDF

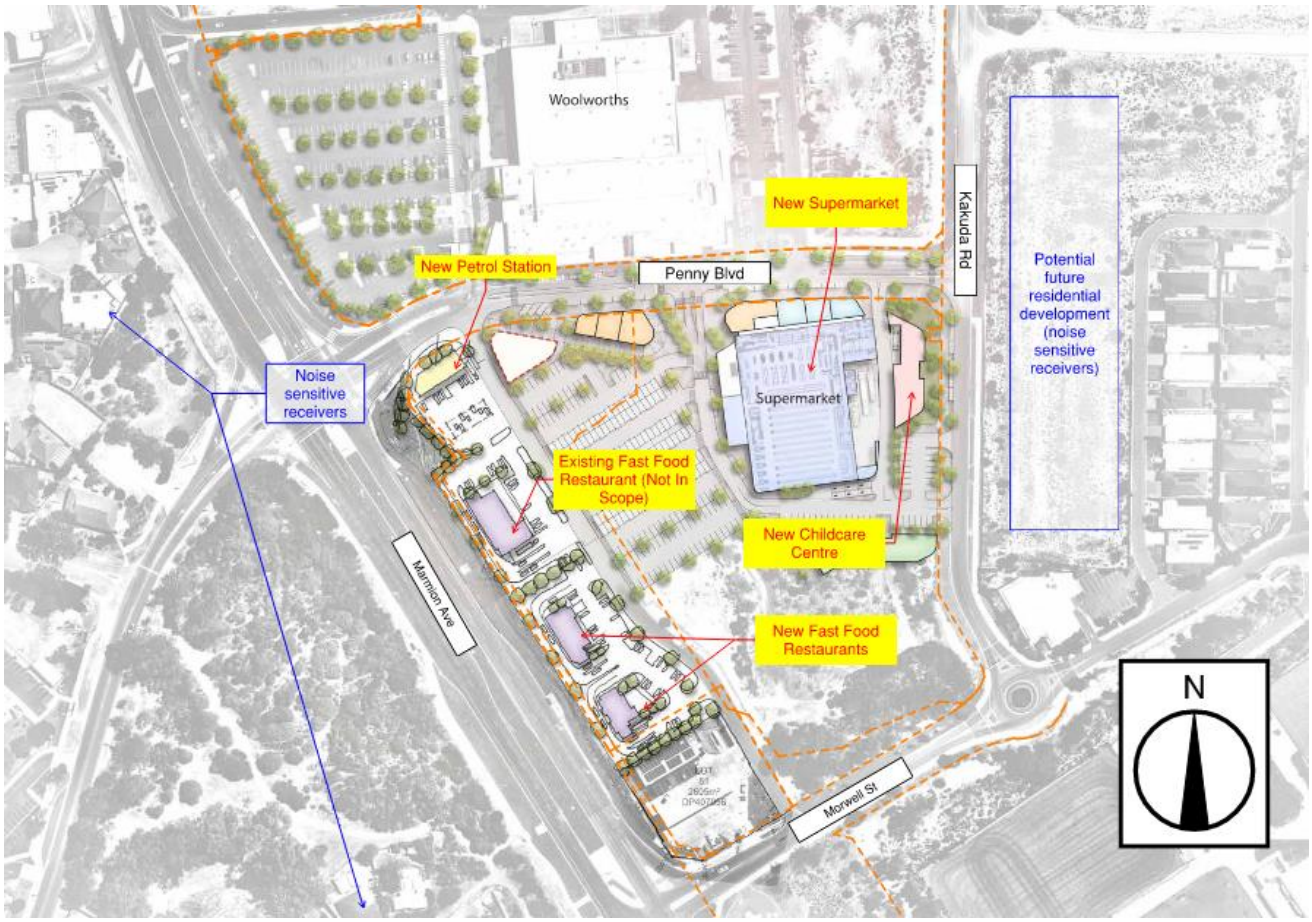


Figure 1: Project Overview

Source: Nearmaps

2. Acoustic Criteria

2.1 Environmental Protection (Noise) Regulation 1997

Environmental noise impacts resulting from the development are addressed through the Environmental Protection Act 1986 with the prescribed standards detailed in the Environmental Protection (Noise) Regulations 1997 (EPNR). Compliance to relevant noise limits outlined in the regulation is compulsory. This section discusses the relevant noise criteria at nearest noise sensitive receivers.

The regulations are based on maximum allowable noise level received at the boundary of the nearest noise sensitive receiver/s and is termed 'assigned noise level'. To determine the assigned noise levels, the influencing factor (IF) must be determined. This factor considers the amount of industrial and commercial land within a 100 metre radius and a 450 metre radius. In addition, a Transport Factor (TF) is to be determined and included into the calculation of the IF, as per the method described in the EPNR.

Traffic counts, obtained from Main Roads Western Australia (MRWA), have been presented in Table 2.

Table 2: Traffic vehicle counts (MWRA)

Location	EPNR Classification [1)]	2015/16	2016/17	2017/18	2019/20	2020/21
Marmion Avenue (North of Romeo Rd)	Major road	—	—	23,086	—	19,014

1) As defined by the EPNR. Secondary roads have between 6000-15000 vehicles per day. Major roads have greater than 15000 vehicles per day.

The City of Wanneroo District Planning Scheme No. 2, accessed via the Department of Planning, were used to determine land usage around the nearest noise sensitive receiver.

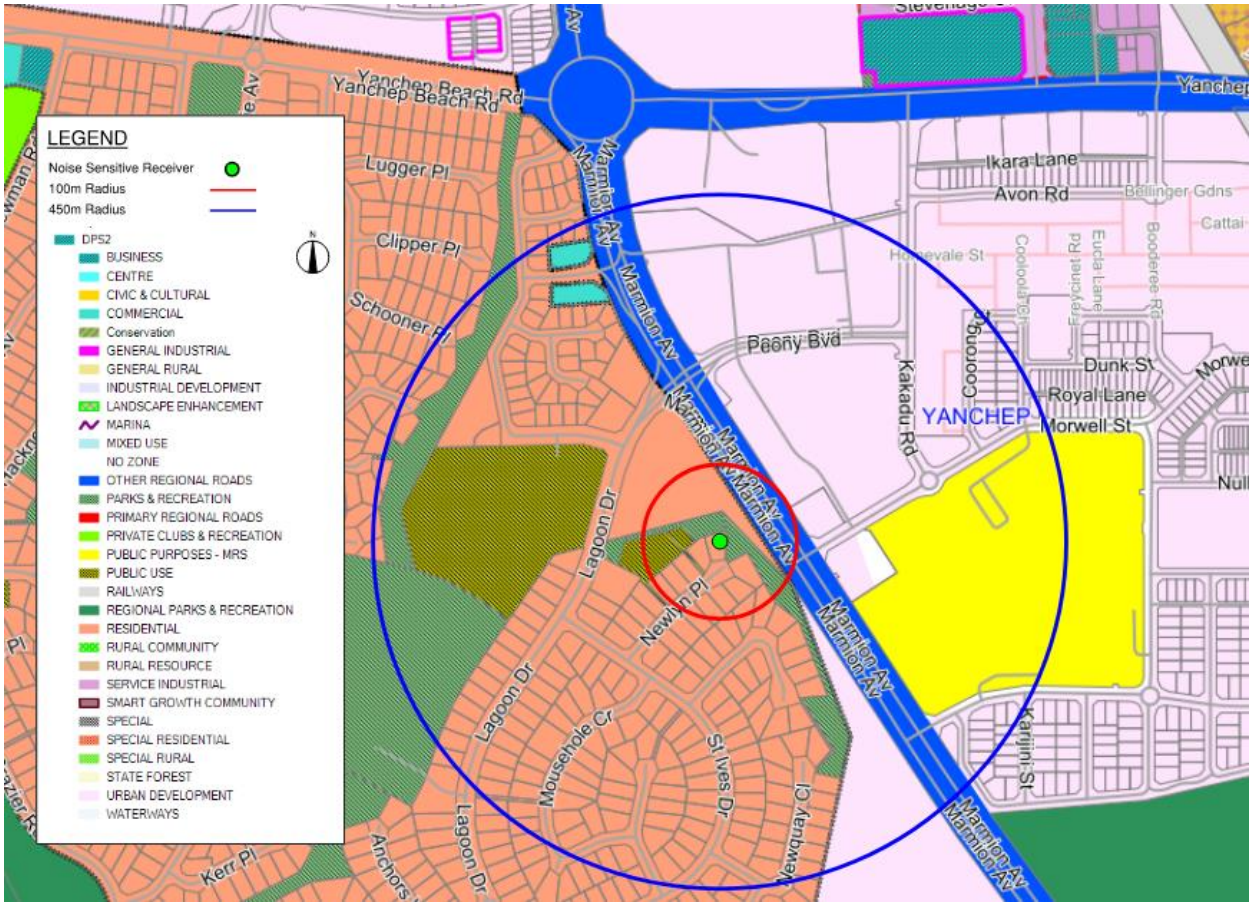
The nearest noise sensitive receiver to the project site is located at 21 Newlyn Place, which is zoned as residential. The influencing factor that results from the identifying the required details at this location is 8 dB. This is based on;

- A transport factor of 6 — Marmion Avenue (major road) within 100m radius;
- Commercial areas — 38% within 450 m radius; and.

In addition, the future development along the eastern side of of Kakadu Rd has also been considered as nearest sensitive receivers. Under the DRPS 2, this area is zoned under the *"Urban Development"* category, which can used for the purpose of residential and commercial developments.

The assigned noise levels obtained from calculating the influencing factor indicate the permissible levels of noise to be received at the noise sensitive premises during defined times of the day.

The IF map used from this location is presented in Figure 2. A summary of the noise levels have been provided in Table 3.



Source: Department of Planning – Western Australian Planning Commission

Figure 2: Land uses surrounding nearest noise sensitive receiver to determine influencing factor

Table 3: Assigned noise levels

Type of premises receiving noise	Time of day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Noise sensitive premises: Highly sensitive areas	0700 to 1900 hours Monday to Saturday	53	63	73
	0900 to 1900 hours Sunday & public holidays	48	58	73
	1900 to 2200 hours all days	48	58	63
	2200 hours on any day to 0700 hours Monday to Saturday, and 0900 hours Sunday & public holidays	43	53	63
Noise sensitive premises: any area other than highly sensitive areas	All Hours	60	75	80
Commercial premises	All Hours	60	75	80
Industrial and utility premises	All Hours	65	80	90

2.1.1 Noise Character Adjustment

The regulation also requires that the noise character must be “free” of annoying characteristics, namely, tonality, modulation and impulsiveness. If these characteristics cannot be reasonable and practicably removed, a series of adjustments to the measured levels are required, outlined in Table 4.

Table 4: Noise character adjustment

Adjustment where noise emission is not music (Cumulative to a maximum of 15 dB)			**Adjustment where noise emission is music**	
Where tonality is present	Where modulation is present	Where impulsiveness is present	Where impulsiveness is not present	Where impulsiveness is present
+ 5 dB	+ 5 dB	+ 10 dB	+ 10 dB	+ 15 dB

2.1.2 Noise Emissions from Mechanical Plant

The EPNR assigned noise levels only apply to the noise receiving premises and do not apply to noise within the site of the proposed development. It is important that noise emissions from the redevelopment do not present any form of tonality, modulation or impulsiveness.

Given the data available from air conditioning unit manufacturers is generally limited to broadband data or in 1/1 octaves, it is not possible to objectively determine tonality as described in the noise regulations. One-third octave band data is required and this information is not typically available. In such cases, a 5 dB penalty will be applied to noise levels generated from mechanical service equipment.

2.2 Internal Noise Levels and Reverberation

Internal noise level design targets described in this section have been obtained from the Australian Standard AS 2107:2016 “Acoustics — Recommended design sound levels and reverberation times for building interiors” (AS2107). The criteria outlined in AS2107 determine the suitable background noise level range ($L_{Aeq,t}$) to optimise the acoustic amenity in areas commonly occupied.

Table 5 provides the relevant internal noise level for noise intrusion design of the Childcare Centre (refer Section 4 for details)

Table 5: Recommended internal noise levels and reverberation times, as per AS2107

Type of occupancy / activity	Recommended design sound level. dB(A)
Childcare Centre	35 – 45 (1)

Notes: 1) Based on recommended noise levels for teaching spaces.

3. Noise Emission Assessment

Noise emissions assessment was conducted to assess the noise impact from the proposed development at the nearest sensitive receivers. A 3D noise model was developed using the noise modelling software package SoundPLAN 8.2 and used to predict the noise emission levels.

The model was based on information provided by the client, proposed architectural layouts and assumptions of the traffic movement for the proposed development. The following components have been included in the noise emission assessment, with details regarding specific noise sources provided in Table 7

- Supermarket;
- Childcare centre;
- Fast food restaurants; and
- Petrol station.

3.1 Operating Hours

For the purpose of this assessment, the assumed operating hours detailed in Table 6 have been assumed as worst case scenario:

Table 6 : Tenancy Operating Hours

Tenancy	Operating Hours
Supermarket	– Weekday (Monday to Friday) – 8 AM to 9 PM – Saturday – 8AM to 5 PM – Sunday – 11 AM to 5 PM
Childcare Centre	– Weekday (Monday to Friday) – 8 AM to 5 PM
Fast food restaurant	– 24 hours a day, 7 days a week
Petrol station	

3.2 Assessment Parameters

A summary of the modelled noise sources and the respective operating periods have been provided in Table 7. In addition, the applicable assessment statistic as per the EPNR regulations is also stated.

The EPNR noise criteria is stated in the form of L_{A10}, L_{A1} and L_{Amax} statistics.

- L_{A10} refers to sound pressure level that is exceeded for 10% of the time for which the sound is measured and is generally used to assess noise sources that occurs longer than 24 minutes of any representative 4 hours period.
- L_{A1} refers to sound pressure level that is exceeded for 1% of the time for which the sound is measured and is typically used to assess noise sources that occur for periods shorter than 24 minutes of any representative 4 hours period.
- L_{Amax} refers to the maximum noise levels measured and is used to assess noise sources that have very short periods, usually with a high peak followed by a very quick decay.

Typically, the activities below maybe assessed to the L_{A1} criteria as per the EPNR. However, as a worst case scenario these have been assessed to the L_{A10} criteria (detailed in Section 3.4), these activities have been assessed to the L_{A10} criteria as worst case:

- Truck entering and exiting the loading docks

Noise emission from the car doors closing and the petrol station tanker refuelling activities are considered to be of extremely short duration. Therefore, it is appropriate to assess the noise emission levels to the L_{Amax} criteria in the EPNR.

Table 7: Summary of Noise Sources

Component	Noise sources	Assessment Statistic	Day	Evening / Day -Sunday &PH	Night
Supermarket	Truck entering and exiting the loading docks	L_{A1}(1)	✓	✓	✓
	Refrigeration Condensers	L_{A10}	✓	✓	✓
	Compactor	L_{A10}	✓	✗	✗
	Cars moving through Click and Collect	L_{A10}	✓	✗	✗
	Cars door slam at Click and Collect bays	L_{Amax}	✓	✗	✗
Childcare	Children Activities	L_{A10}	✓	✗	✗
	Truck entering and exiting the loading docks	L_{A1}(1)	✓	✗	✗
Fast Food Restaurant	Cars / Drive Through	L_{A10}	✓	✓	✓
	Refrigeration Condensers	L_{A10}	✓	✓	✓
	Kitchen Exhaust Fan	L_{A10}	✓	✓	✓
Petrol Station	Cars / Drive Through	L_{A10}	✓	✓	✓
	Cars Door Slam	L_{Amax}	✓	✓	✓
	Fuel Tanker	L_{A10}	✓	✓	✓
	Fuel Tanker Refuelling	L_{Amax}	✓	✓	✓
	Refrigeration Condensers	L_{A10}	✓	✓	✓

Notes:

1) These activities have been assessed to the L_{A10} criteria as worst case.

3.3 Noise Model Inputs

3.3.1 Propagation Standards

The ISO 9613-2:1998 industry noise propagation standard was used for the noise model predictions with a reflection order of 3. The noise model has taken into account noise source levels, distance from the source to receivers, and screening effects due to existing, proposed buildings and ground topology.

3.3.2 Ground Condition

To suit the current conditions of the project location, a ground condition of 0.6 has been used in the model, which is in between a soft ground condition (1) and a reflective ground condition (0).

3.3.3 Sound Power Level

The sound power levels used in the model have been summarised in Table 8.

Table 8: Sound Power Levels of Noise Sources

Noise Source	Sound Power Level, dB(A)
Large sized loading trucks (supermarket)	102[(1) (3)]
Small to medium sized loading trucks (Childcare)	99[(1) (3)]
Truck Unloading Activities (all trucks)	94[(1)]
Fuel tanker driving	105[(1) (3)]
Fuel tanker refuelling	105[(1)]
Cars taking off/moving	94[(2) (3)]
Supermarket Refrigeration Unit	90[(1)]
Supermarket Air Handling Unit	88[(1)]
Fast Food Refrigeration Unit	87[(1)]
Petrol Station Refrigeration Unit	87[(1)]
Fast Food Kitchen Extract Fan	85[(1)]

Notes:

1. *Noise levels obtained from previous measurements of similar noise sources on Stantec projects.*
2. *Noise levels obtained from SoundPLAN 8.2 system library ("Hessische Landesanstalt für Umwelt: Technischer Bericht Nr. L 4054 zur Untersuchung der Geräuschemissionen und -immissionen von Tankstellen, Erich Krämer", 1999)*
3. *Modelled as a moving point source at a speed of 20km/h*

3.3.3.1 Childcare Centre

Heights of Children

Average heights of children in the age group of 0-3 years old were assessed at 0.5m high and children in the age group 3-6 years old were assessed at 0.8m high

Typical sound levels of groups of children

The AAAC *"Guideline for Child Care Centre Acoustic Assessment"* provides recommendations for assessment methods of noise assessments used to accompany a Development Application for childcare centres. The guideline also states typical recommendations for noise control methods when designing a childcare centre.

The typical ranges of sound power levels for groups of children playing were determined as per the *AAAC guideline* Section 6.0. As the example sound power levels in the *AAAC guideline* is given as ranges, the midpoint of the sound power level range was used in the noise assessment.

Based on the feedback from the client, the childcare centre is expected to occupy 80 children depending on the age groups supervision requirements.

It has been assumed that the groups of children will be rotated between indoor and outdoor play. For the purpose of this assessment, a **worst case of 50% of the total number of children (e.g. 40 children) has been assumed to be occupying the outdoor play area at any one time**. Refer to Figure 3 for specific locations of play areas of different ages that has been included in the noise model.

Sound power level data of varying age groups were taken from AAAC *"Guideline for Child Care Centre Acoustic Assessment"* and presented in Table 9. The sound power levels are typically provided as a range. For the purposes of this modelling, mid-point sound power levels were used. In addition, based on the above stated group of children, sound levels were adjusted for the noise model.

Table 9: Effective Sound Power Levels for Groups of Children

Example Group Types	Sound Power Level L_{Aeq} dB(A)
10 children aged 0 to 2 years	79
10 children aged 2 to 3 years	84
20 children aged 3 to 6 years	90

3.4 Noise Model Results

The predicted noise levels at the nearest sensitive receivers due to the carpark, fast food restaurant, petrol station and loading docks have been summarised in Table 10.

Table 10: Predicted Noise Emission Levels

Component	Noise sources	Most Stringent Applicable Noise Criteria (EPNR)	Predicted Noise Levels at Worst Case Location	Compliance (Y/N)
Supermarket	Loading Dock	***Night: L_{A10} 43 dB(A)***	L_{A10} 38 dB(A) (2)	Y
	Mechanical equipment (1)		L_{A10} 53 dB(A) (2)	**N (Exceeds by 10 dB)**
	Compactor	***Day: L_{A10} 53 dB(A)***	L_{A10} 47 dB(A) (2)	Y
	Cars moving through Click and Collect		L_{A10} 29 dB(A) (2)	Y
	Cars door slam at Click and Collect	***Day: L_{Amax} 73 dB(A)***	L_{Amax} 54 dB(A) (2)	Y
Childcare	Children outdoor play areas	***Day: L_{A10} 53 dB(A)***	L_{A10} 57 dB(A) (2)	**N (Exceeds by 4 dB)**
	Loading Dock		L_{A10} 31 dB(A) (2)	Y
Fast Food Restaurant	Cars / Drive Through	***Night: L_{A10} 43 dB(A)***	L_{A10} 29 dB(A) (3)	Y
	Mechanical Equipment (1)		L_{A10} 52 dB(A) (3)	**N (Exceeds by 9 dB)**
Petrol Station	Cars	***Night: L_{A10} 43 dB(A)***	L_{A10} 19 dB(A) (4)	Y
	Fuel Tanker		L_{A10} dB(A) (4)	Y
	Mechanical Equipment (1)		L_{A10} 42 dB(A) (4)	Y
	Car Door Slam	***Night: L_{Amax} 63 dB(A)***	L_{Amax} 47 dB(A) (4)	Y
	Fuel Tanker Refuelling		L_{Amax} 55 dB(A) (4)	Y

Notes:

1) *Mechanical services equipment Includes tonality correction of +5 dB.*
2) *Worst case nearest sensitive receiver located along Kakadu Rd.*
3) *Worst case nearest sensitive receiver located at 21 Newlyn Pl.*
4) *Worst case nearest sensitive receiver located at 7 Lagoon Dr.*

As indicated in Table 10, there are a number of items that have been predicted to exceed the environmental noise regulations including:

Area	**Noise Source**
Childcare centre –	Children's activities
Supermarket mechanical equipment –	Refrigeration condensers
Fast food restaurant –	Refrigeration condensers and kitchen extract fans

3.5 Recommended Treatments

This section provides noise mitigation treatment recommendations to control the noise impact from the proposed commercial development on the nearest sensitive receivers.

3.5.1 Solid Barriers

Solid noise barriers will be required to the following areas in order to achieve compliance to the EPNR criteria:

- **Childcare centre**: Minimum 1300mm high noise barrier to the fence boundary as indicated in Figure 3. This is dependant on the location of children age groups. The assumed configuration of play areas between the different age groups have been illustrated in Figure 3. Once detailed layouts are available indicating the play areas, this will need to be reviewed and may require additional treatment recommendation.
- **Supermarket refrigeration condensers**: Solid noise barrier to be provided on the Eastern facing section extending from the roof to at least 200mm above the refrigeration condenser units as illustrated in Figure 4.

All noise barriers shall be continuous throughout (i.e. no gaps), and of a solid construction with a minimum surface mass of 15kg/m^2. This can be provided in the form of 9mm fibre cement sheeting.

3.5.2 Limiting Sound Power Levels

As the sound data for the refrigeration condensers and kitchen exhaust fans for the fast food restaurants have been assumed based on similar projects Stantec have worked on, the predicted noise levels from these units may not reflect the actual units that will be installed.

The sound power levels for the refrigeration condensers and kitchen exhaust fans shall be selected to have the maximum limits as below:

- **Fast Food Restaurants**
  - **Refrigeration Condensers**: L_{Aeq} 82 dB(A)
  - **Kitchen Exhaust Fans**: L_{Aeq} 80 dB(A)

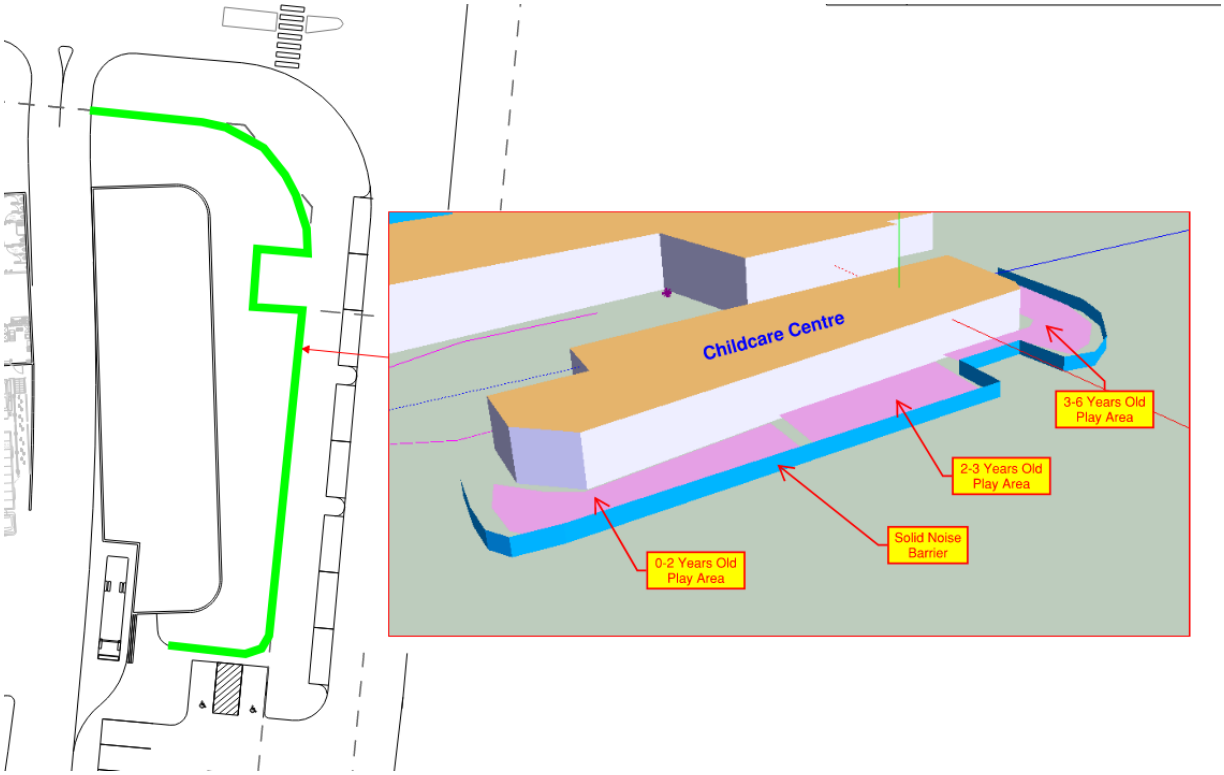


Figure 3: Childcare Solid Fence Location

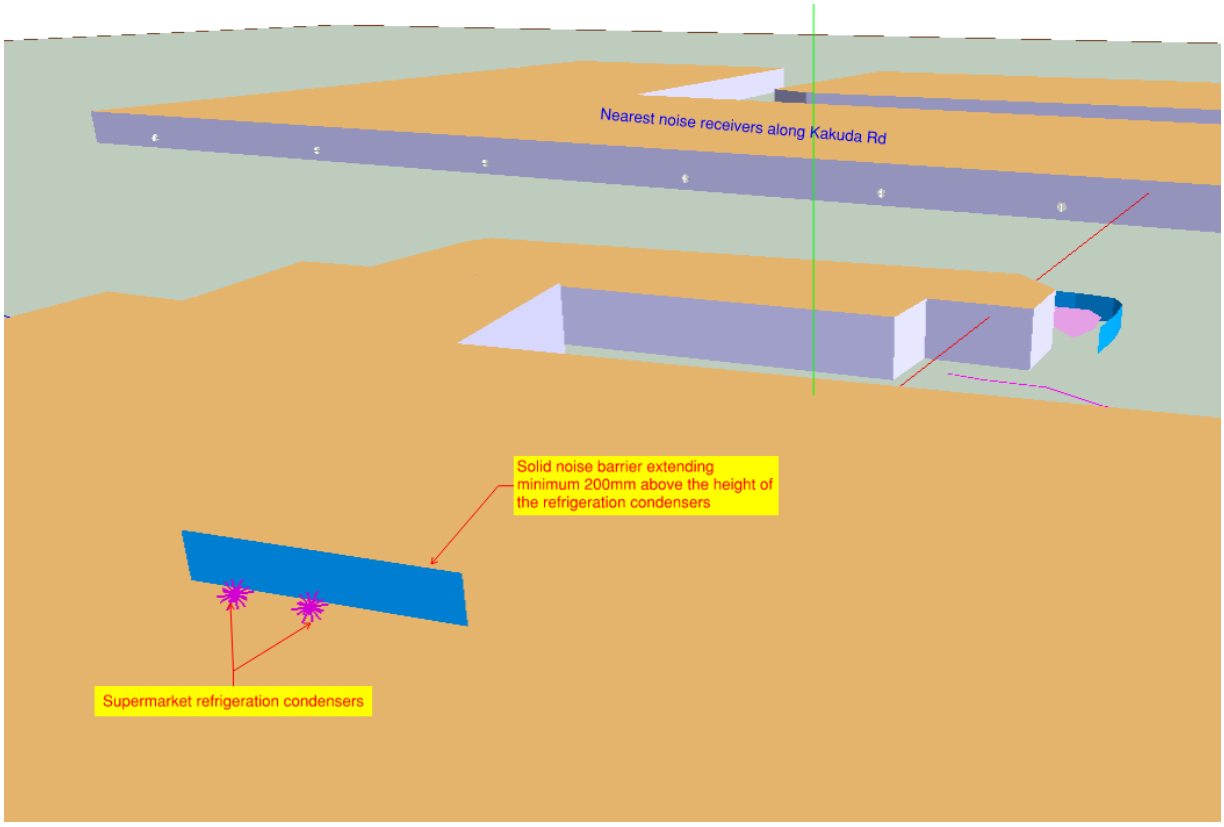


Figure 4: Solid Noise Barrier to Supermarket Condensers

3.6 Noise Model Results with Treatments

As a result of the recommended noise mitigation treatments indicated in Section 3.5 the predicted noise levels at the nearest sensitive receives have been provided in Table 11.

Table 11: Predicted Noise Emission Levels after Treatments

Component	Noise sources	Most Stringent Applicable Noise Criteria (EPNR)	Predicted Noise Levels at Worst Case Location	Compliance (Y/N)
Supermarket	Loading Dock	***Night: L_{A10} 43 dB(A)***	L_{A10} 38 dB(A) (2)	Y
	Mechanical equipment (1)		L_{A10} 43 dB(A) (2)	Y
	Compactor	***Day: L_{A10} 53 dB(A)***	L_{A10} 47 dB(A) (2)	Y
	Cars moving through Click and Collect		L_{A10} 29 dB(A) (2)	Y
	Cars door slam at Click and Collect	***Day: L_{Amax} 73 dB(A)***	L_{Amax} 54 dB(A) (2)	Y
Childcare	Children Activities	***Day: L_{A10} 53 dB(A)***	L_{A10} 53 dB(A) (2)	Y
	Loading Dock		L_{A10} 31 dB(A) (2)	Y
Fast Food Restaurant	Cars / Drive Through	***Night: L_{A10} 43 dB(A)***	L_{A10} 29 dB(A) (3)	Y
	Mechanical equipment (1)		L_{A10} 42 dB(A) (3)	Y
Petrol Station	Cars	***Night: L_{A10} 43 dB(A)***	L_{A10} 19 dB(A) (4)	Y
	Fuel Tanker		L_{A10} 33 dB(A) (4)	Y
	Mechanical equipment (1)		L_{A10} 42 dB(A) (4)	Y
	Car Door Slam	***Night: L_{Amax} 63 dB(A)***	L_{Amax} 47 dB(A) (4)	Y
	Fuel Tanker Refuelling		L_{Amax} 55 dB(A) (4)	Y

Notes:

1) *Mechanical services equipment Includes tonality correction of +5 dB.*
2) *Worst case nearest sensitive receiver located along Kakadu Rd.*
3) *Worst case nearest sensitive receiver located at 21 Newlyn Pl.*
4) *Worst case nearest sensitive receiver located at 7 Lagoon Dr.*

Overall, with the provision of noise mitigation treatments detailed in Section 3.5, it is expected that the noise impact from the proposed Yanchep Central commercial development will achieve compliance to the EPNR regulations at all times of the day.

4. Childcare Centre – Loading Dock Impact Assessment

Noise impact from the supermarket loading dock on the childcare centre have been addressed to achieve appropriate internal noise levels as per the AS2107.

Based on information from the architects, there are no windows proposed to the western facades of the childcare centre (illustrated in Figure 5). This shall be retained during the later stages of design and it is not recommended that any windows are provided to these facades. Any changes shall be reviewed for approval by the acoustic engineer.

As a minimum the solid external façade will require the following acoustic performance:

- **Minimum R_w 50 performance:**
  - Example lightweight construction:
    - 92mm steel studs (0.55 BMT) at 600mm centres with;
    - 100mm glass wool insulation within the stud cavity; and
    - 2 layers of 13mm standard plasterboard (or 2 x 6mm fibre cement with min surface mass of 11.3kg/m^2) on either side of the of the stud.
  - Example masonry construction:
    - 150mm thick concrete panel (minimum surface area of 351kg/m^2).

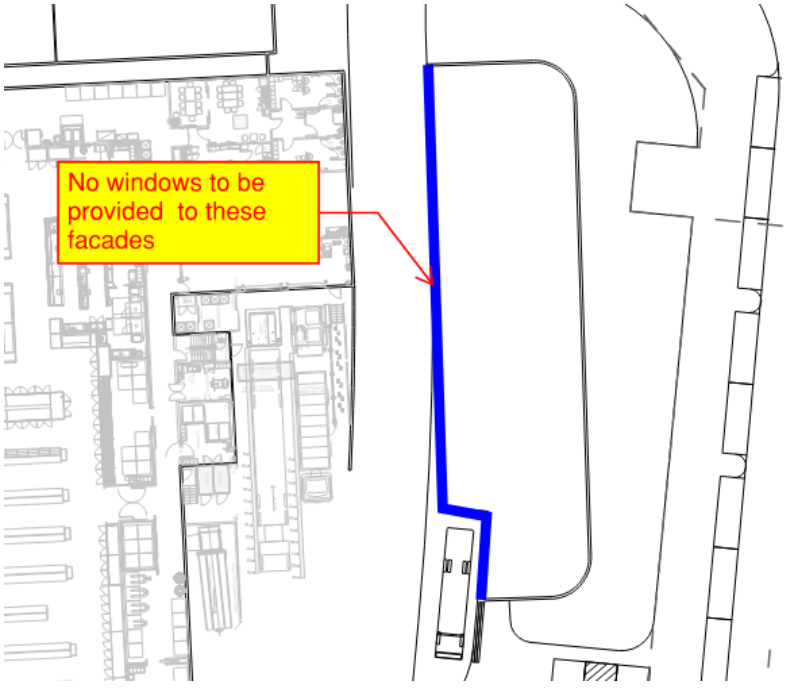


Figure 5: Solid External Façade (Childcare Centre)

5. Conclusion

An acoustic assessment has been carried out for the proposed new developments within the Yanchep Central precinct in order to determine the noise impact on the surrounding nearest noise sensitive receivers. Noise emitting sources from the proposed development were identified and assessed for compliance to the EPNR criteria.

Noise emission from the following components have been assessed against the L_{A10} noise criteria of the EPNR:

- Supermarket;
  - Mechanical services including the refrigeration condensers;
  - Trucks entering and exiting the loading dock
  - Compactor;
  - Cars moving through/door slams at Click and Collect bays;
- Childcare centre;
  - Outdoor children play areas;
  - Trucks entering and exiting the loading dock
- Fast food restaurants;
  - Cars moving;
    - Mechanical services including the refrigeration condensers and kitchen exhaust fans;
- Petrol station;
  - Cars moving;
  - Fuel tanker moving; and
  - Mechanical services including the refrigeration condenser.

Events such as car door slams and the petrol station tanker refuelling have been assessed to the L_{Amax} criteria in the EPNR.

Based on the predicted results and assumptions stated in the report, the following items below have been predicted to exceed the EPNR noise criteria. The recommended noise mitigation treatments have been provided

- Supermarket:
  - Provide a solid noise barrier with a minimum surface of 15kg/m^2 to the eastern facing side of the plant deck extending 200mm above the refrigeration condenser unit.
- Childcare Centre:
  - Provide a solid noise barrier with a minimum surface of 15kg/m^2 extending 1300mm above the ground to the bounding perimeter of the outdoor play area.
- Fast Food Restaurants:
  - The sound power levels of the refrigeration condenser and kitchen exhaust fans will need to be selected to have a limit of 82dB(A) and 80 dB(A) respectively.

With the inclusion of treatments summarised above, it is expected that the noise impact from the proposed new developments will achieve compliance to the EPNR criteria during all times of the day.

Additional advice has also been provided in regard to the noise impact from the supermarket loading dock on the childcare centre in the form of solid façade wall constructions.

Appendix A Glossary of Acoustic Terms

NOISE	
Acceptable Noise Level:	The acceptable LAeq noise level from industrial sources, recommended by the EPA (Table 2.1, INP). Note that this noise level refers to all industrial sources at the receiver location, and not only noise due to a specific project under consideration.
Adverse Weather:	Weather conditions that affect noise (wind and temperature inversions) that occur at a particular site for a significant period of time. The previous conditions are for wind occurring more than 30% of the time in any assessment period in any season and/or for temperature inversions occurring more than 30% of the nights in winter).
Acoustic Barrier:	Solid walls or partitions, solid fences, earth mounds, earth berms, buildings, etc. used to reduce noise.
Ambient Noise:	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.
Assessment Period:	The period in a day over which assessments are made.
Assessment Location	The position at which noise measurements are undertaken or estimated.
Background Noise:	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation, when extraneous noise is removed. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L90 noise level.
Decibel [dB]:	The units of sound pressure level.
dB(A):	A-weighted decibels. Noise measured using the A filter.
Extraneous Noise:	Noise resulting from activities that are not typical of the area. Atypical activities include construction, and traffic generated by holidays period and by special events such as concert or sporting events. Normal daily traffic is not considered to be extraneous.
Free Field:	An environment in which there are no acoustic reflective surfaces. Free field noise measurements are carried out outdoors at least 3.5m from any acoustic reflecting structures other than the ground
Frequency:	Frequency is synonymous to pitch. Frequency or pitch can be measured on a scale in units of Hertz (Hz).
Impulsive Noise:	Noise having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.
Intermittent Noise:	Level that drops to the background noise level several times during the period of observation.
LAmax	The maximum A-weighted sound pressure level measured over a period.
LAmin	The minimum A-weighted sound pressure level measured over a period.
LA1	The A-weighted sound pressure level that is exceeded for 1% of the time for which the sound is measured.
LA10	The A-weighted sound pressure level that is exceeded for 10% of the time for which the sound is measured.
LA90	The A-weighted level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
LAeq	The A-weighted “equivalent noise level” is the summation of noise events and integrated over a selected period of time.

LAeqT	The constant A-weighted sound which has the same energy as the fluctuating sound of the traffic, averaged over time T.
Reflection:	Sound wave changed in direction of propagation due to a solid object met on its path.
R-w:	The Sound Insulation Rating R-w is a measure of the noise reduction performance of the partition.
SEL:	Sound Exposure Level is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain Leq sound levels over any period of time and can be used for predicting noise at various locations.
Sound Absorption:	The ability of a material to absorb sound energy through its conversion into thermal energy.
Sound Level Meter:	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound Pressure Level:	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone.
Sound Power Level:	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.
Tonal noise:	Containing a prominent frequency and characterised by a definite pitch.

Appendix B Noise Contours

Yanchep Central

301250349
6/22/2021
MXC

Noise Contours at 1.5 meters

Day (Treated)

Noise level
in dB(A)

	< 43.0
43.0 <=	< 44.0
44.0 <=	< 45.0
45.0 <=	< 46.0
46.0 <=	< 47.0
47.0 <=	< 48.0
48.0 <=	< 49.0
49.0 <=	< 50.0
50.0 <=	< 51.0
51.0 <=	< 52.0
52.0 <=	< 53.0
53.0 <=	< 54.0
54.0 <=	< 55.0
55.0 <=	< 56.0
56.0 <=	

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Noise Contours at 1.5 meters

Evening/Night/Sunday and P
(Treated)

Noise level
in dB(A)

	< 43.0
43.0 <=	< 44.0
44.0 <=	< 45.0
45.0 <=	< 46.0
46.0 <=	< 47.0
47.0 <=	< 48.0
48.0 <=	< 49.0
49.0 <=	< 50.0
50.0 <=	< 51.0
51.0 <=	< 52.0
52.0 <=	< 53.0
53.0 <=	< 54.0
54.0 <=	< 55.0
55.0 <=	< 56.0
56.0 <=	

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Noise Contours at 1.5 meters

All Periods
LAmax Assessment

Noise level
in LAmax dB(A)

	< 50.0
50.0 <=	< 51.0
51.0 <=	< 52.0
52.0 <=	< 53.0
53.0 <=	< 54.0
54.0 <=	< 55.0
55.0 <=	< 56.0
56.0 <=	< 57.0
57.0 <=	< 58.0
58.0 <=	< 59.0
59.0 <=	< 60.0
60.0 <=	< 61.0
61.0 <=	< 62.0
62.0 <=	< 63.0
63.0 <=	

Stantec

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community in mind

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