REPORT

7-9 BANKSIA ROAD

GREENACRE, NSW 2190

NOISE IMPACT ASSESSMENT
RWDI # 2505923
21 November 2024

SUBMITTED TO

Jesse Lockhart-Krause
Director
Jesse@lockhartkrause.com.au

Lockhart-Krause Architects
Level 16, 9 Castlereagh St
Sydney, NSW 2000

SUBMITTED BY

Alex Jang
Project Engineer
Alex.Jang@rwdi.com

Remi Larmandieu
Associate Principal
Remi.Larmandieu@rwdi.com

Joseph Gallace
Project Manager
Joseph.Gallace@rwdi.com

RWDI Australia Pty Ltd (RWDI)
ABN: 86 641 303 871

DOCUMENT CONTROL

Version	Status	Date	Prepared By	Reviewed By
A	Draft	12 November 2024	Alex Jang	Remi Larmandieu
B	Final	21 November 2024	Alex Jang	Remi Larmandieu

NOTE

All materials specified by RWDI Australia Pty Ltd (RWDI) have been selected solely on the basis of acoustic performance. Any other properties of these materials, such as fire rating, chemical properties etc. should be checked with the suppliers or other specialised bodies for fitness for a given purpose.

The information contained in this document produced by RWDI is solely for the use of the client identified on the front page of this report. Our client becomes the owner of this document upon full payment of our **Tax Invoice** for its provision. This document must not be used for any purposes other than those of the document's owner. RWDI undertakes no duty to or accepts any responsibility to any third party who may rely upon this document.

RWDI

RWDI is a team of highly specialised consulting engineers and scientists working to improve the built environment through three core areas of practice: building performance, climate engineering and environmental engineering. More information is available at www.rwdi.com.

AAAC

This firm is a member firm of the Association of Australasian Acoustical Consultants and the work here reported has been carried out in accordance with the terms of that membership.

QUALITY ASSURANCE

RWDI Australia Pty Ltd operates a Quality Management System which complies with the requirements of AS/NZS ISO 9001:2015. This management system has been externally certified by SAI Global and Licence No. QEC 13457 has been issued for the following scope: The provision of consultancy services in acoustic engineering, air quality and wind engineering; and the sale, service, support and installation of acoustic monitoring and related systems and technologies.

GLOSSARY OF ACOUSTIC TERMS

Most environments are affected by environmental noise which continuously varies, largely as a result of road traffic. To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors, which are demonstrated in the graph below, are here defined.

Maximum Noise Level (L_{Amax}) – The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

L_{A1} – The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.

L_{A10} – The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.

ABL – The Assessment Background Level is the single figure background level representing each assessment period (daytime, evening and night time) for each day. It is determined by calculating the 10th percentile (lowest 10th percent) background level (L_{A90}) for each period.

RBL – The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period – daytime, evening and night time.

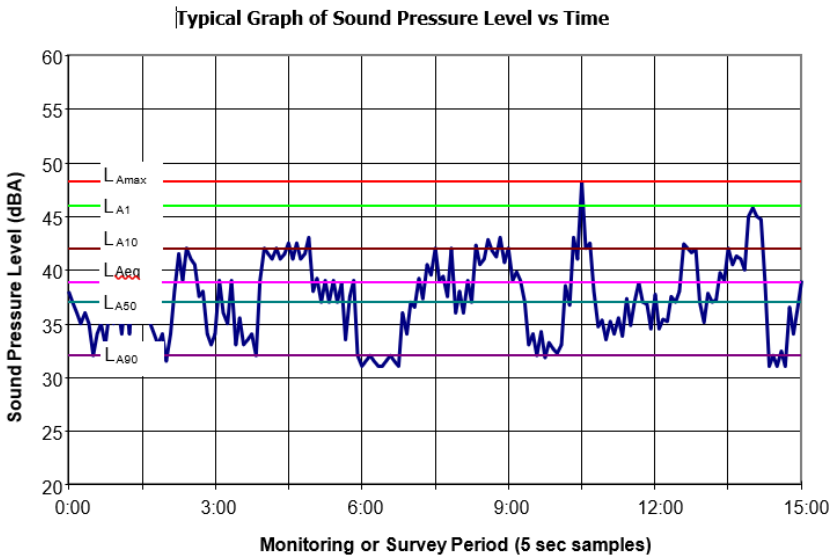


TABLE OF CONTENTS

1 INTRODUCTION

RWDI Australia Pty Ltd (RWDI) was commissioned to prepare a Noise Impact Assessment (NIA) for the proposed development at 7-9 Banksia Road, Greenacre NSW. The proposed development includes the demolition of existing buildings, construction of a new building which would be for use as a Childcare Centre.

Noise from the operation of the childcare centre includes noise from external traffic noise, children playing outdoors, mechanical plant and vehicle noise. The *Canterbury-Bankstown Development Control Plan 2023 for Centre-Based Child Care Facilities*, and other appropriate NSW guidelines are used to assess childcare centre noise emissions.

1.1 Project Description

It is proposed that the childcare centre would accommodate 115 children: 20x 0-2 years old, 50 x 2-3 years old, 22 x 3-4 years old, and 23 x 4-5 years old. The childcare centre would operate between 7:30am and 6pm. Indicative outdoor play times are expected to be 7:45 to 9:00 am, 10:15 to 2:00pm and 3:00 to 5:00pm.

Figure 1-1 and **Figure 1-2** present the proposed site layout of the development.

Figure 1-1: Proposed Site Layout - Ground Floor

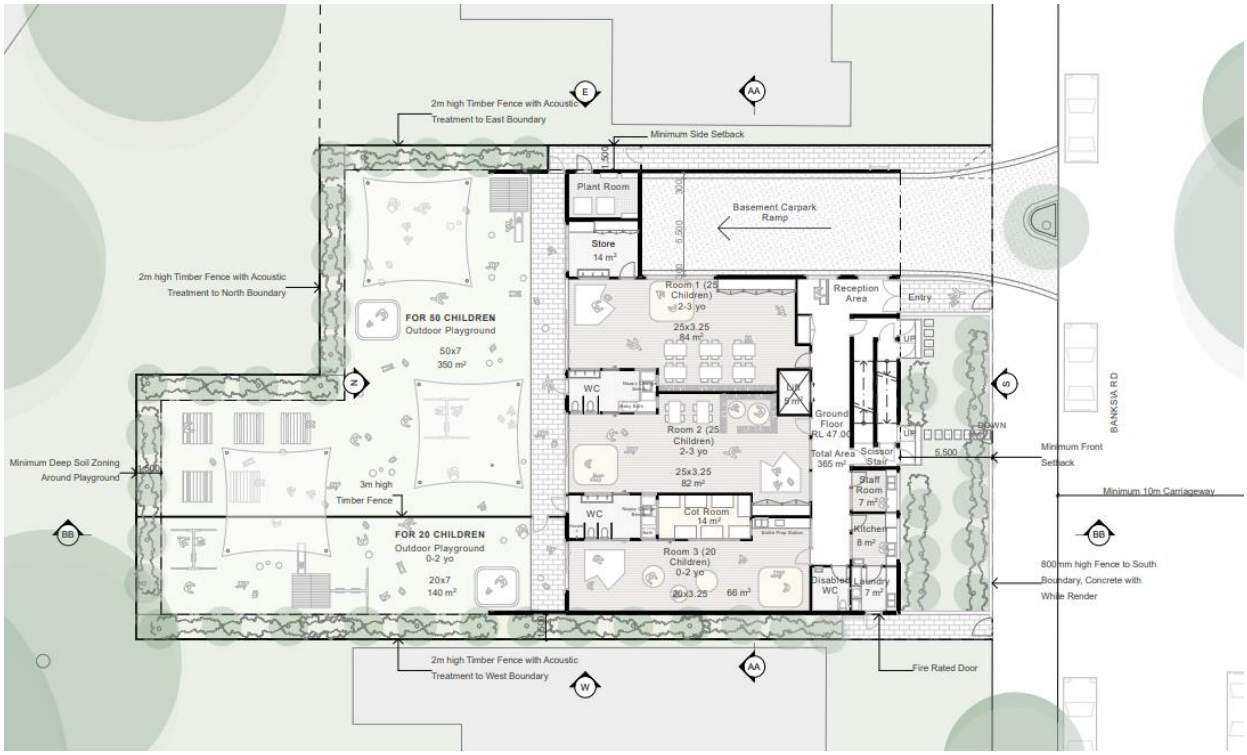
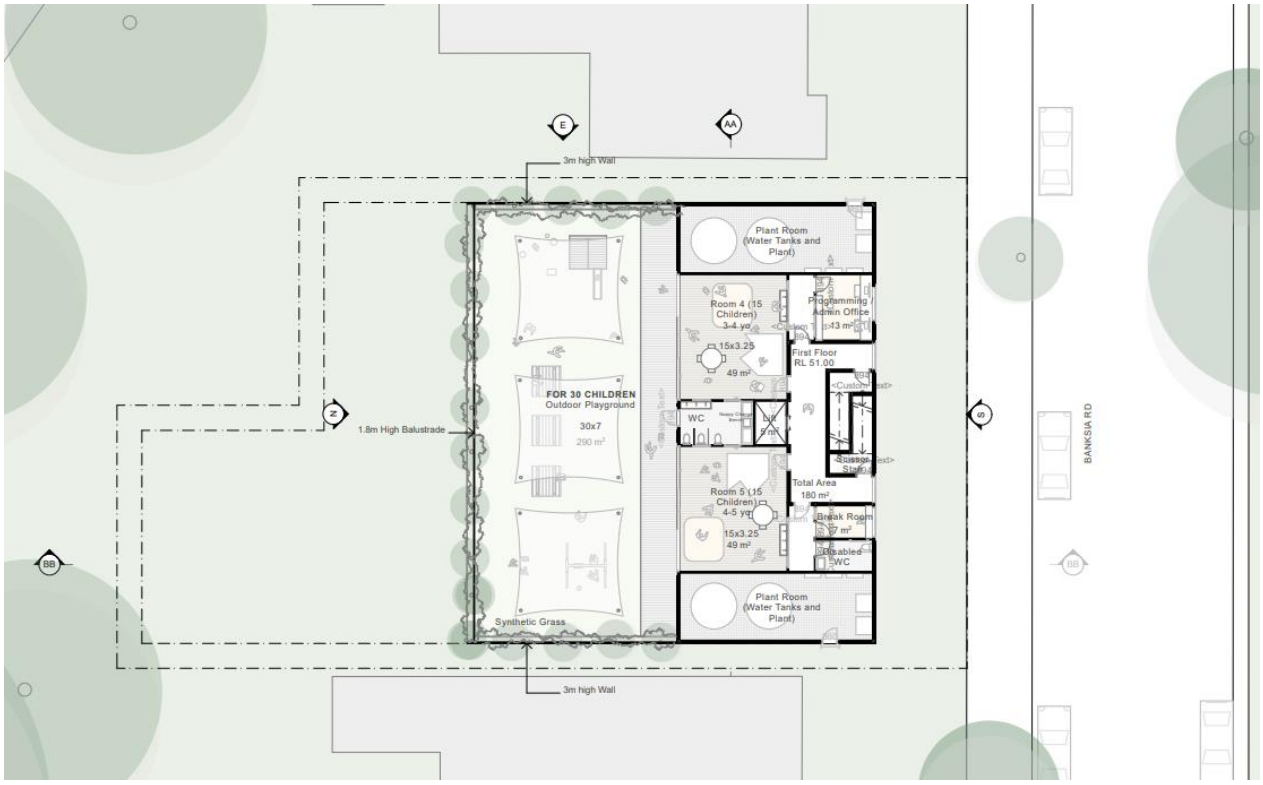


Figure 1-2: Proposed Site Layout - First Floor



1.2 Site Location

The site is located at 7-9 Banksia Road, Greenacre NSW within the Canterbury-Bankstown Council and is legally described as Lot. A DP365724 and Lot. A DP419336. **Figure 1-3**Error! Reference source not found. presents the project location and surrounding land zoning.

The Project Site is an irregularly shaped block with frontage of approximately 28 m along Banksia Road. The Site is on land zoned R2 – Low Density Residential, with other R2 zoned land on either side of the Site parallel to Banksia Road. North of the project site is land zoned SP2 - Infrastructure, which currently consists of the Greenacre Civic Centre Reserve. Land to the east of the Site is designated as B2 – Local Centre. Land to the south of the site is designated as R3 – Medium Density Residential.

Figure 1-3: Site Location and Surrounding Land Zoning

2 EXISTING NOISE ENVIRONMENT

2.1 Representative Receivers

Representative receivers have been selected for this assessment. The receivers are presented in **Figure 2-1** and **Table 2-1** summarises the receivers and their land use.

Figure 2-1: Locations of Representative Receivers

Table 2-1: Summary of Representative Receivers

Receiver ID	Address	Receiver Type
R1	11 Banksia Road, Greenacre	Residential
R2	5 Banksia Road, Greenacre	Residential
R3	8-14 Banksia Road, Greenacre	Residential
R4	Banksia Road, Greenacre	Park (Passive)
R5	134 Waterloo Road, Greenacre	Commercial
R6	128 Waterloo Road, Greenacre	Commercial

2.2 Existing Background Noise Levels

Unattended noise monitoring was completed to understand the existing noise environment surrounding the site. Noise monitoring was conducted on site.

The noise monitoring was completed in accordance with Australian Standard AS 1055-2018 "*Acoustics – Description and measurement of environmental noise*". All acoustic instrumentation utilised complies with AS IEC 61672.1-2004 *"Electroacoustics – Sound level meters – Specifications".* Monitoring was also conducted with reference to Fact Sheet A of the *NPfI* and EPA's *Approved methods for measurement and analysis of environmental noise in NSW* (NSW EPA, 2022).

Unattended noise monitoring was conducted by RWDI between 16 October and 25 October 2024 at 9 Banksia Road, Greenacre (Location L1 in **Figure 2-1**). The measured data was processed according to the *NPfI* requirements. **Table 2-2** presents the Rating Background Levels (RBLs) (see Glossary of Acoustic Terms) for the daytime, evening, and night-time periods. RBL data affected by adverse meteorological conditions or extraneous noise was removed from the data prior to processing. Full noise monitoring plots are provided in **Appendix A**.

Table 2-2: Measured Background Noise Levels, dBA

Location	Assessment Period[1]	RBL (dBA)
L1	Day	43
	Evening	42
	Night	36

Note 1: Day: 7am - 6pm, evening: 6pm - 10pm, night 10pm - 7am.

Additional attended noise monitoring was conducted at several locations location to capture specific noise levels around the development. **Table 2-3** below summarises the measured noise levels.

Table 2-3: Attended Noise Monitoring Results – 16 October 2024, dBA

Location	Time	L_{Aeq}	L_{A90}	Comments
L2	7:02am – 7:17am	56	43	Road Traffic Noise from Banksia Road and Waterloo Road.
L3	7:19am – 7:34am	65	55	Road Traffic Noise from Waterloo Road.
L4	8:05am – 8:10am	48	42	Road Traffic Noise from Banksia Road and Birdsong.

3 OPERATIONAL NOISE CRITERIA

3.1 Noise from Children – Council DCP

The *Canterbury-Bankstown Development Control Plan 2023 for Centre-Based Child Care Facilities* has been used to assess noise from outdoor areas. It states the following:

Acoustic privacy

5.1 Air conditioning, mechanical ventilation or any other continuous noise source must not exceed the ambient level at any specified boundary by more than 5dB(A).

5.2 The location and design of child care facilities must consider the projection of noise from various activities to avoid any adverse impacts on the residential amenity of adjoining land.

For the purpose of this clause, Council requires applications to submit an Acoustic Report prepared by a suitably qualified acoustic consultant to determine:

a) existing noise levels at the identified sensitive receiver locations;
b) likely noise levels to emanate from the child care facility at the identified sensitive receiver locations;
c) whether the development must apply measures to ensure the noise of children playing in outdoor areas does not exceed 10dB(A) above the background noise level;
d) whether the location and setbacks of the development are sufficient to protect the acoustic privacy of adjacent dwellings;
e) whether the location of outdoor areas should avoid living areas and bedrooms of adjacent dwellings; and
f) whether the development must install certain noise attenuation measures to protect the acoustic privacy of adjacent dwellings.

3.1.1 Outdoor

The resulting project noise trigger levels (PNTLs) are shown in **Table 3-1**.

Table 3-1: Project Noise Trigger Levels, dBA

Receivers	Time of Day	RBL	PNTLs	Noise Descriptor
All Receivers	Day	43	Noise from Children -- 53 dBA Noise from mechanical plant -- 48 dBA	$L_{Aeq,15min}$
	Evening	42	Noise from Children -- 52 dBA Noise from mechanical plant -- 47 dBA	$L_{Aeq,15min}$

3.2 Car park noise

The *Noise Policy for Industry (NPfI)* guideline is considered appropriate to develop noise criteria to assess the impact from the noise emissions associated with the car park that may impact the surrounding receivers.

The emission of noise and potential noise impact from the proposed car park is to be assessed with respect to the site-specific noise trigger levels based on the *NPfI*. The assessment procedure has two components: intrusiveness and amenity.

3.2.1 Intrusiveness noise level

For assessing intrusiveness, the background noise level (L_{A90}) is measured and the RBL is determined. The intrusiveness of an industrial noise source may generally be considered acceptable if the equivalent continuous noise level (L_{Aeq}) of the source (measured over a 15-minute period) does not exceed the background noise level (RBL) by more than 5 dBA.

The intrusiveness noise levels for the surrounding residential receivers are presented in **Table 3-2**. Measured background noise levels at location L1 was most representative of the surrounding residential receivers.

Table 3-2: Project Intrusiveness Noise Level

Receiver	Time of Day	Intrusiveness Noise Level $L_{Aeq,15min}$ dBA
All Receivers	Day	48
	Evening	47
	Night	41

3.2.2 Amenity noise level

The project amenity trigger level sets limits on the total noise level from all industrial noise sources affecting a receiver. Different amenity noise levels apply for different types of receivers (e.g. residential, commercial, industrial – or for areas specifically reserved for passive recreation) and different areas (e.g. urban, suburban, rural). The amenity noise level applies to the $L_{Aeq,period}$ during the full day (or evening or night). To ensure that industrial noise levels remain within the recommended amenity noise levels for an area, a project amenity noise level applies for each new source of industrial noise. This is calculated as the recommended amenity noise level for the receiver type minus 5 dBA. Where noise sources are not continuous for the whole period it is allowable to add 3 dB to convert from a period level to a 15-minute level.

Table 3-3 below presents the relevant project amenity noise levels, determined in accordance with the *NPfI*. The residential receivers have been classified as suburban receivers.

Table 3-3: Project Amenity Noise Level

Noise Amenity Area	Time of Day	Recommended Amenity Noise Level $L_{Aeq,period}$ dBA	Project Amenity Trigger Level[1] $L_{Aeq,15min}$ dBA
All Receivers (Suburban)	Day	60	58
	Evening	50	48
	Night	45	43

3.3 Noise Intrusion to Childcare Centres

The AAAC childcare centre guideline also presents recommendations for external noise impact upon children in childcare centres:

The $L_{Aeq,1hr}$ intrusive noise level from road traffic or industry at any location within an outdoor play area should not exceed 55dBA.

The $L_{Aeq,1hr}$ intrusive noise level from road traffic or industry within the indoor play or sleeping areas should not exceed 40dBA.

3.4 Road Traffic Noise

Additional traffic movements will result from both the construction and the operational phases of the Project.

The *RNP* is considered by RWDI to be the most suitable guideline to assess potential impacts at residences from both construction and operational traffic noise.

It is noted that the *RNP* is normally applied to developments which result in indefinite increases in road traffic noise rather than temporary increases associated with construction projects, however the *ICNG* does not include criteria to assess off-site construction traffic noise.

It has been assumed that during construction and following opening of these facilities that all traffic from the site will be via Banksia Road. Based on this approach, the impact of the traffic generated by this proposal will potentially impact residential receivers located along some sections of Banksia Road.

Considering the variety of development categories within the *RNP*, the relevant criteria are summarised in **Table 3-4** and apply to all traffic along Banksia Road.

Table 3-4: Road Traffic Noise Criteria – Residences

Type of Development	Assessment Criteria	
	Day (7am–10pm)	Night (10pm–7am)
6. Existing residences affected by additional traffic on existing local roads generated by land use	$L_{Aeq,1\ hour}$ 55 (external)	$L_{Aeq,9\ hour}$ 50 (external)

Type of Development	Assessment Criteria	
	Day (7am–10pm)	Night (10pm–7am)
developments		

In addition, for existing residences and other sensitive land uses affected by additional traffic on existing roads and where the criterion is exceeded, any increase in the total traffic noise level should preferably be limited to 2 dB. The *RNP* considers that a 2 dB increase is typically not noticeable.

It is worthy to note that the EPA defines periods for on-site noise differently to that defined for road traffic (along the road network). For road traffic noise along the road network, the daytime period is defined as the time between 7.00am and 10.00pm and night-time is between 10.00pm and 7.00am.

4 NOISE ASSESSMENT

4.1 External Traffic Noise Intrusion

With regards to noise intrusion (road traffic primarily) into the proposed childcare centre, the AAAC Guidelines state the following:

- The noise level $L_{Aeq,\ 1\ hour}$ from road, rail traffic or industry at any location within the outdoor play or activity area during the hours when the Centre is operating shall not exceed 55 dBA.
- The noise level $L_{Aeq,\ 1\ hour}$ from road, rail traffic or industry at any location within the indoor play or sleeping areas of the Centre during the hours when the centre is operating shall not exceed 40 dBA.

Based on our monitoring detailed in Section 2, external traffic noise would require mitigation to achieve the above external and internal noise levels.

The following treatments will ensure that compliance with the above noise levels is achieved:

4.1.1 Indoor play areas

- Standard glazing (4mm float) is recommended for indoor play areas; and
- Mechanical ventilation is provided.

4.2 Childcare Centre Noise Assessment

4.2.1 Outdoor Play

Table 4-1 is based on the AAAC's recommended sound power levels for lots of 10 children playing for various age groupings. The recommended sound power levels were adjusted according to the proposed number of children in the childcare centre.

Table 4-1: Outdoor Play Sound Power Level, $L_{Aeq,15min}$

Number and Age of Children	dBA	Sound Power Levels in Octave Bands (dB)							
		63	125	250	500	1000	2000	4000	8000
20 Children – 0 to 2 years	81	57	63	69	75	77	74	70	67
50 Children – 2 to 3 years	92	68	74	80	86	88	85	81	77
45 Children – 3 to 5 years	94	71	77	82	88	90	87	83	79

Predictions were completed in CadnaA, a noise modelling application, to determine noise levels from outdoor play at the surrounding sensitive receivers. Predictions have assumed that a 2 m solid boundary fence extends around the outdoor play areas. **Table 4-2** presents the predicted noise levels from outdoor play with all play areas fully occupied.

The model indicated exceedances at the 11 Banksia Road, Greenacre residence The most affected point of the residence is expected to be the openable window located on the 2nd storey of the residence, towards the northeastern corner of the residence, as shown in the photo below:

Figure 4-1: Photo of the site boundary and neighbouring property

Exceedances of up to 9dBA are predicted with the current proposal with outdoor play areas operating at full capacity. Exceedances are only predicted on the second storey of the 11 Banksia Road residence.

The following mitigation measures were considered to address these exceedances:

- Only half of the children of all age groups can play outdoors at any given time;
- Play areas need to be supervised at all times by qualified staff.
- The outdoor play areas need to be arranged as follows with the addition of the 3m high fencing in between the 2 ground floor playgrounds. See the following proposed layout below:

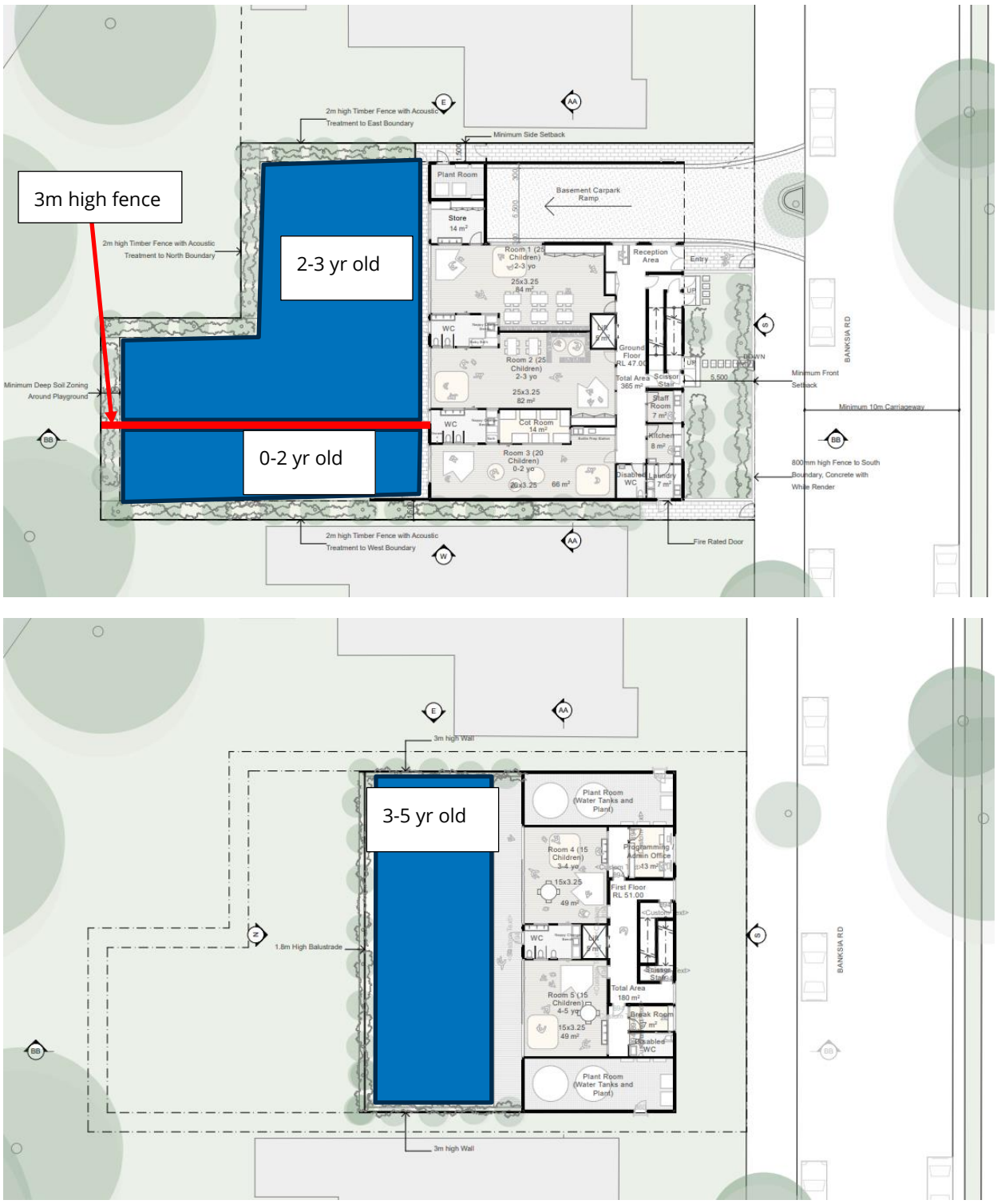


Figure 4-2: Proposed outdoor play areas (indicative)

Predicted levels with these mitigation measures have been presented below, considering the implementation of those measures:

Table 4-2: Predicted Noise Levels from Outdoor Play, dBA $L_{Aeq,15min}$

Receiver	Predicted Noise Level, dBA $L_{eq\ 15min}$	Noise Limit (RBL+10) dBA $L_{eq\ 15min}$
R1[1] – second storey	53	53 – daytime
R1[2] – backyard	43	53 - daytime
R2[1] – ground floor	50	53 - daytime
R2[2] – backyard	45	53 – daytime
R3	31	53 – daytime
R4	45	53 – daytime
R5	31	53 – daytime

Note 1: Noise level predicted for first floor window (worst case)

Table 4-2 indicates that noise levels from outdoor play will comply with the noise limit at all receivers.

4.2.2 Car Park Noise

Thirty car parking spaces are proposed for the site. Entry and exit to the site will be via Banksia Road. It has been assumed that there will be up to 2 movements per parking space per hour in and out of the car park per peak hour.

Car park noise emissions have been predicted using CadnaA. Car park source noise levels were determined based on the methodology outlined in *"Recommendations for the Calculation of Sound Emissions of Parking Areas, Motorcar centres and Bus Stations as well as of Multi-Storey Car Parks and Underground Car Parks 6th Edition"* (*BayLfU*) for at-underground car parks. Predictions have been completed for 60 movements within an hour and considered noise from the opening of the car park ramp as well as the driveway leading up to the opening.

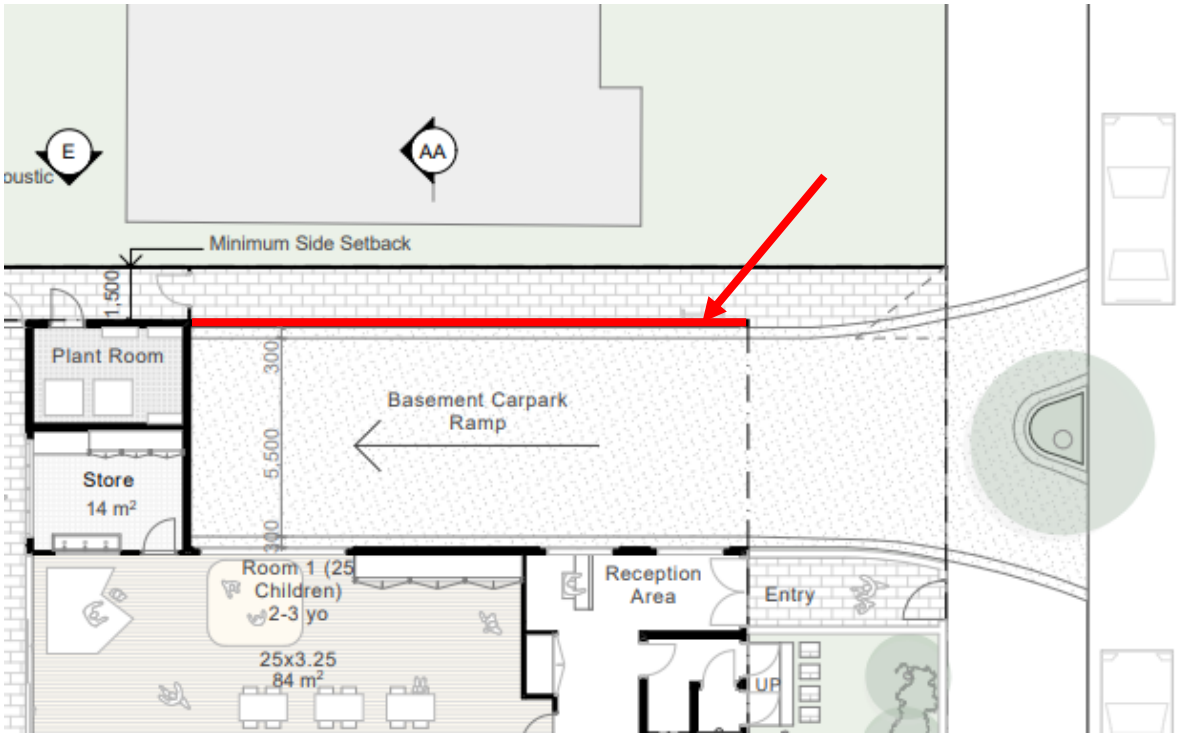
Table 4-3 presents the predicted noise levels and indicates that the received noise levels from the usage of the car park during the peak period complies with relevant noise goals.

Table 4-3: Predicted Noise Level from Childcare Car Parking, $L_{Aeq,15min}$

Receiver	Predicted Noise Level	Day PNTL
R1	27	48
R2	45	48
R3	40	48

Table 4-3 indicates that noise levels from the car park ramp will comply with the noise limit at all receivers. Even though compliance with acoustic requirements can be achieved, additional lining should be added under the soffit above the car park ramp to keep noise from the car park ramp within acceptable levels. Further mitigation should also be considered by implementing a solid wall to the side of the car park ramp, as shown in **Figure 4-3**.

Figure 4-3: Basement Car Park Ramp Wall Location



4.2.3 Mechanical Plant Noise

Mechanical plant services and design has not been completed at this stage. Mechanical plant associated with the proposed development would be limited to rooftop mechanical ventilation and lift plant.

Through inspection of the proposed architectural drawings, all mechanical plant would likely be installed on the roof of the building. A preliminary review indicates that there is sufficient separation and opportunity to provide conventional mitigation measures to achieve these trigger levels.

Mechanical plant serving the proposed development will require review to determine potential noise impacts prior to issue of a construction certificate. Upon final selection, noise emissions from plant to be installed should be compared with the project noise trigger levels listed in **Table 3-1**. Considerations must be made such that the total noise emissions from mechanical plant and other operational noise sources does not exceed the project noise trigger level.

4.3 Additional Road Traffic Noise Assessment

No traffic report was available for this assessment. Assuming the new development will generate up to 60 movements during the peak hour due to the operation of the childcare centre. It has been assumed that 50% of traffic would travel westbound into the residential area and 50% of the traffic would travel eastbound to join Waterloo Road.

The additional traffic from the site would result in less than 1dB increase on Banksia Road. This increase is negligible and will not be perceptible to the average person.

5 CONCLUSION

RWDI Australia Pty Ltd (RWDI) has completed a noise impact assessment (NIA) for the proposed development at 7-9 Banksia Rd, Greenacre. The proposed development includes the demolition of existing buildings, construction of a new building which would be for use as a childcare centre.

The noise impact assessment has considered noise relating to the operation of the proposed childcare centre including noise from external traffic noise, children playing outdoors, mechanical plant, and on-site vehicle noise. The assessment has confirmed that noise from external traffic noise, mechanical plant, and on-site vehicle noise will comply with the relevant noise goals provided mitigation measures and building controls are implemented.

6 STATEMENT OF LIMITATIONS

This report entitled *7-9 Banksia Rd, Greenacre Noise Impact Assessment* was prepared by RWDI Australia Pty Ltd ("RWDI") for *Lockhart-Krause Architects* ("Client"). The findings and conclusions presented in this report have been prepared for the Client and are specific to the project described herein ("Project"). The conclusions and recommendations contained in this report are based on the information available to RWDI when this report was prepared. Because the contents of this report may not reflect the final design of the Project or subsequent changes made after the date of this report, RWDI recommends that it be retained by Client during the final stages of the project to verify that the results and recommendations provided in this report have been correctly interpreted in the final design of the Project.

The conclusions and recommendations contained in this report have also been made for the specific purpose(s) set out herein. Should the Client or any other third party utilize the report and/or implement the conclusions and recommendations contained therein for any other purpose or project without the involvement of RWDI, the Client or such third party assumes any and all risk of any and all consequences arising from such use and RWDI accepts no responsibility for any liability, loss, or damage of any kind suffered by Client or any other third party arising therefrom.

Finally, it is imperative that the Client and/or any party relying on the conclusions and recommendations in this report carefully review the stated assumptions contained herein and to understand the different factors which may impact the conclusions and recommendations provided.