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Environmental Noise Impact Assessment

Proposed Child Care Centre

97-99 Victoria Street, Werrington, NSW

REPORT No
7227-1.1R Rev A

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1.0 EXECUTIVE SUMMARY

A new child care centre (the Centre) is proposed to be constructed at 97-99 Victoria Street, Werrington, NSW. The proposal involves the demolition of two existing single storey residential dwellings and the construction of a new single storey child care centre facility with a basement level car park.

Four outdoor play areas, eight indoor play rooms, associated offices and kitchen facilities are proposed contained within two separate buildings.

The basement level car park will have capacity for 20 vehicles.

The Centre will have a total capacity for 78 children comprising:

- 0-2 years old – 8 children; and
- 2-3 years old – 30 children; and
- 3-5 years old – 40 children.

The proposed hours of operation for the Centre are:

- Monday to Friday: 7:00 am – 6:00 pm.

The subject site is bounded on the north, east and west boundaries by single storey residential premises. Single storey dwellings are located on the opposite side of Victoria Street to the south.

The various receptor locations nearby that may be affected by noise generating facets of the Centre are as follows:

- Children playing both outside and inside;
- Traffic generated by the development; and
- Mechanical plant serving the Centre.

Penrith City Council requires an acoustic assessment to accompany the development application to demonstrate that the noise impact from the Centre will not adversely affect the acoustic amenity of residential and commercial premises nearby.

Acceptable noise limits have been derived from the Association of Australasian Acoustical Consultants *Guideline for Child Care Centres Acoustic Assessmen*t (the Guideline) and the Environmental Protection Authority's (EPA) *Noise Policy for Industry* (NPI) and *Road Noise Policy* (RNP).

Noise levels from the Centre's activities have been modelled to the nearest existing residential premises. Recommendations are made in Section 8 of this report to reduce the noise emission to within the acceptable limits as established in Section 5.

2.0 CONSULTING BRIEF

Day Design Pty Ltd was engaged by ArtMade Architects to assess the potential environmental noise impact from a proposed Child Care Centre to be constructed at 97-99 Victoria Street, Werrington, NSW. This commission involves the following:

Scope of Work:

- Inspect the site and environs
- Measure the background noise levels at critical locations and times
- Establish acceptable noise level criterion
- Prepare a site plan identifying the development and nearby noise sensitive locations
- Quantify noise emissions from the proposed Child Care Centre
- Calculate the level of noise emission, taking into account building envelope transmission loss, screen walls and distance attenuation
- Provide recommendations for noise control (if necessary)
- Prepare an Environmental Noise Impact Report.

3.0 SITE AND DEVELOPMENT DESCRIPTION

3.1 Site Description

The site is located on the north side of Victoria Street, on land zoned *R3 – Medium Density Residential* under Penrith Local Environment Plan 2010.

The subject site is bounded on the north, east and west boundaries by single storey residential premises. Single storey dwellings are located on the opposite side of Victoria Street to the south.

The nearest noise sensitive receptors are shown in Figure 1 and in Table 1.

Table 1 Noise Sensitive Receptors

Receptor	Address	Direction From Site	Building type
R1 - Residential	101 Victoria Street	West	Single Storey
R2 - Residential	68 Gibson Street	Northwest	Single Storey
R3 - Residential	82 Albert Street	North	Single Storey
R4 - Residential	95 Victoria Street	West	Single Storey
R4 - Residential	106 Victoria Street	South	Single Storey

3.2 Development Description

The proposal involves the demolition of two existing single storey residential dwellings and the construction of a new single storey child care centre facility with a basement level car park.

Four outdoor play areas, eight indoor play rooms, associated offices and kitchen facilities are proposed contained within two separate buildings.

The basement level car park will have capacity for 20 vehicles.

The Centre will have a total capacity of 78 children comprising:

- 0-2 years old – 8 children; and
- 2-3 years old – 30 children; and
- 3-5 years old – 40 children.

The proposed hours of operation for the Centre are:

- Monday to Friday: 7:00 am – 6:00 pm.

Figure 1 Location Plan - 97-99 Victoria Street, Werrington, NSW.

4.0 MEASURED NOISE LEVELS

4.1 Long Term Noise Monitoring

The L_{90} background noise level is a statistical measure of the sound pressure level that is exceeded for 90% of the measurement period (typically 15 minutes).

The Rating Background Level (RBL) is defined by the NSW EPA as the median value of the (lower) tenth percentile of L_{90} ambient background noise levels for day, evening or night periods, measured over a number of days during the proposed days and times of operation.

Two environmental noise loggers were placed to measure the existing background noise levels in the area. One logger was placed approximately 1.5 metres above ground level at Location 'A' within the rear yard of the subject site. Another logger was placed approximately 1.5 metres above ground floor level at Location 'B', on the opposite side of Victoria Street as shown in Figure 1.

The loggers gathered noise data over a period of 7 days between Thursday 13 May and Friday 21 May 2021. Details of instrumentation used during the noise surveys can be seen in the attached Appendix A.

The results of the background noise survey at the logger position is shown in the attached Appendix B and Table 2. While the Centre is not proposed to operate during the evening and night time periods, noise levels during these times are shown to provide a complete overview of the current acoustic environment.

Table 2 Ambient Background Levels – Victoria Street, Werrington

Location	Time Period	L_{90} Rating Background Level - dBA	Existing L_{eq} Noise Levels - dBA
Location 'A'- Ground Floor Level, Rear Yard	**Shoulder Period (6:30 am – 7 am)**	**42**	**N/A**
	Day (7 am to 6 pm)	**38**	**59**
	Evening (6 pm to 10 pm)	*39*	*49*
	Night (10 pm to 7 am)	*33*	*47*
Location 'B'- Ground Floor Level, Front Yard	**Shoulder Period (6:30 am – 7 am)**	**48**	**N/A**
	Day (7 am to 6 pm)	**48**	**64**
	Evening (6 pm to 10 pm)	*45*	*63*
	Night (10 pm to 7 am)	*36*	*59*

Meteorological conditions during the measurement surveys typically consisted of clear skies with temperatures ranging from 4°C to 21°C. Atmospheric conditions were generally considered ideal for noise monitoring. Therefore, noise level measurements were considered reliable and considered to be representative of the background noise levels at all nearby receptor locations during proposed operational hours.

5.0 NOISE CRITERIA

5.1 NSW DoPE –Child Care Planning Guide

The NSW Department of Planning and Environment (DoPE) published the Child Care Planning Guideline (CCPG) in August 2017 as a supplement to the State Environmental Planning Policy (SEPP) (Educational Establishments and Child Care Facilities) 2017.

The SEPP states that

> "*a consent authority must take into consideration this Guideline (CCPG) when assessing a development application (DA) for a centre-based child care facility.*"

The SEPP also determines that the Guideline

> "*will take precedence over a Development Control Plan (DCP), with some exceptions, where the two overlap in relation to a child care facility."*

The Guideline was introduced to

> *'assist industry to deliver early childhood education facilities that are of the highest standards'* and *'to align NSW planning controls with the National Quality Framework for early education and care, creating more certainty for developers and operators seeking service approval'.*

Section 3, Matters for Consideration, Subsection 3.5 Visual and acoustic privacy, contains the following for consideration:

'Objective: To minimise the impact of child care facilities on the acoustic privacy of neighboring residential developments.

C23

A new development, or development that includes alterations to more than 50 percent of the existing floor area, and is adjacent to residential accommodation should:

- *Provide an acoustic fence along any boundary where the adjoining property contains a residential use (An acoustic fence is one that is a solid, gap free fence)*
- *Ensure that mechanical plant or equipment is screened by solid, gap free material and constructed to reduce noise levels eg acoustic fence, building or enclosure.*

C24

A suitably qualified acoustic professional should prepare an acoustic report which will cover the following matters:

- *Identify an appropriate noise level for a child care facility located in residential and other zones*
- *Determine an appropriate background noise level for outdoor play area during times they are proposed to be in use*
- *Determine the appropriate height of any acoustic fence to enable the noise criteria to be met.'*

Subsection 3.6 Noise and air pollution, contains the following for consideration:

'***Objective: To ensure that outside levels on the facility are minimized to acceptable levels.***

C25

Adopt design solutions to minimise the impacts of noise, such as:

- *creating physical separation between buildings and the noise source*
- *orienting the facility perpendicular to the noise source and where possible buffered by other uses*
- *using landscaping to reduce the perception of noise*
- *limiting the number and size of openings facing noise sources*
- *using double or acoustic glazing, acoustic louvres or enclosed balconies (wintergardens)*
- *using materials with mass and/or sound insulation or absorption properties, such as solid balcony balustrades, external screens and soffits*
- *locating cot rooms, sleeping areas and play areas away from external noise sources.*

5.2 AAAC – Guideline for Child Care Centres Acoustic Assessment

The Association of Australasian Acoustical Consultants (AAAC) published a guideline relating to the assessment of noise from Child Care Centres called *"Guideline for Child Care Centre Acoustic Assessment"*, first in May 2008, again in October 2013 and most recently updated in September 2020.

Section 3 of the AAAC Guideline states the following in relation to noise attenuation and generation for Child Care Centres:

3.2 Criteria - Residential Receptors

3.2.1 Outdoor Play Area

The noise impact from children at play in a child care centre differs from the domestic situation in that it is a business carried out for commercial gain, the number of children can be far greater than in a domestic situation and the age range of the children at the centre does not significantly vary over time as it would in a domestic situation. However, the noise from children is vastly different, in both character and duration, from industrial, commercial or even domestic machine noise. The sound from children at play, in some circumstances, can be pleasant, with noise emission generally only audible during the times the children play outside. Night time, weekend or public holiday activity is not typical and child care centres have considerable social and community benefit.

Base Criteria *– With the development of child care centres in residential areas, the background noise level within these areas can at certain times, be low. Thus, a base criterion of a contributed* $L_{eq,15min}$ *45 dB(A) for the assessment of outdoor play is recommended in locations where the background noise level is less than 40 dB(A).*

Background Greater Than 40 dB(A) *– The contributed $L_{eq,15min}$ noise level emitted from an outdoor play and internal activity areas shall not exceed the background noise level by more than 5 or 10 dB at the assessment location, depending on the usage of the outdoor play area. AAAC members regard that a total time limit of approximately 2 hours outdoor play per morning and afternoon period should allow an emergence above the background of 10 dB (ie background +10 dB if outdoor play is limited to 2 hours in the morning and 2 hours in the afternoon).*

Up to 4 hours (total) per day *– If outdoor play is limited to no more than 2 hours in the morning and 2 hours in the afternoon, the contributed $L_{eq,15min}$ noise level emitted from the outdoor play shall not exceed the background noise level by more than 10 dB at the assessment location.*

More than 4 hours (total) per day *– If outdoor play is not limited to no more than 2 hours in the morning and 2 hours in the afternoon, the contributed $L_{eq,\ 15min}$ noise level emitted from the outdoor play area shall not exceed the background noise level by more than 5 dB at the assessment location.*

The assessment location is defined as the most affected point on or within any residential receiver property boundary. Examples of this location may be:

- *1.5 m above ground level;*
- *On a balcony at 1.5 m above floor level;*
- *Outside a window on the ground or higher floors.*

3.2.2 Indoor Play Area, Mechanical Plant, Pick up and Drop off

The cumulative $L_{eq,\ 15\ minute}$ noise emission level resulting from the use and operation of the child care centre, with the exception of noise emission from outdoor play discussed above, shall not exceed the background noise level by more than 5 dB at the assessment location as defined above. This includes the noise emission resulting from:

- *Indoor play;*
- *Mechanical plant;*
- *Drop off and pick up;*
- *Other activities/operations (not including outdoor play).*

5.1 Road, Rail Traffic and Industry

The $L_{Aeq,1hr}$ noise level from road traffic, rail or industry at any location within the outdoor play or activity area during the hours when the Centre is operating should not exceed 55 dB(A).

The $L_{Aeq,1hr}$ noise level from road traffic, rail or industry at any location within the indoor activity or sleeping areas of the Centre during the hours when the centre is operating shall be capable (ie with doors and/or windows closed) of achieving 40 dB(A) within indoor activity areas and 35 dB(A) in sleeping areas.

5.3 NSW Environment Protection Authority

5.3.1 Sleep Disturbance

Given the proposed operating hours of the Centre (7 am to 6 pm), it follows that a number of staff will arrive prior to 7 am. As such, the potential for sleep disturbance, from maximum noise level events from vehicles arriving during the shoulder period of 6:30 am and 7 am, has been considered.

The Noise Policy for Industry provides the following guidance (NPI, Section 2.5) for setting appropriate trigger levels for sleep disturbance:

> *'Sleep disturbance is considered to be both awakenings and disturbance to sleep stages. Where the subject development/premises night-time noise levels at a residential location exceed:*
>
> - $L_{Aeq,15min}$ *40 dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or*
> - L_{AFmax} *52 dB(A) or the prevailing RBL plus 15 dB, whichever is the greater,*
>
> *a detailed maximum noise level event assessment should be undertaken.'*

Additionally, Section 5.4 of the NSW Road Noise Policy provides the following advice with regard to sleep disturbance:

> *'From the research on sleep disturbance to date it can be concluded that:*
>
> - *Maximum internal noise levels below 50 – 55 dBA are unlikely to awaken people from sleep*
> - *One or two noise events per night, with maximum internal levels of 65 – 70 dBA are not likely to affect health and wellbeing significantly.*

5.4 Road Traffic Noise Criteria

The NSW Road Noise Policy (RNP), in Section 2.3.1, sets out road traffic noise assessment criteria for residential and non-residential land uses in Tables 3 and 4 of the policy. The relevant information in those tables is extracted and reproduced in Table 3 below.

Table 3 Road Traffic Noise Assessment Criteria - Residential

Road Category	Type of project/land use	Assessment Criteria – dB(A)	
		Day (7 am – 10 pm)	Night (10 pm – 7 am)
Local roads	1. Existing residences affected by **additional traffic** on existing local roads generated by land use developments	$L_{Aeq,\ (1\ hour)}$ 55 dB (external)	$L_{Aeq,\ (1\ hour)}$ 50 dB (external)

The noise criterion in Table 3 above is to be assessed at 1 metre from the nearest affected façade, as outlined in Table 7 of the RNP.

5.5 Project Specific Noise Criteria

Based on measurements of the existing acoustic environment and the relevant planning instruments and legislation, the noise criteria at each receptor applicable at each location is as shown in the following sections.

5.5.1 Residential and Commercial Receptors

For residential premises:

- **45 dBA** $L_{eq,\ 15\ minute}$ for outdoor play all day at ground floor level within rear yards.
- **53 dBA** $L_{eq,\ 15\ minute}$ for outdoor play all day at ground floor level within front yards or at facades facing Victoria Street.
- **43 dBA** $L_{eq,\ 15\ minute}$ for the cumulative impact of indoor play, use of the carpark and the operation of mechanical plant at ground floor level within rear yards.
- **53 dBA** $L_{eq,\ 15\ minute}$ for the cumulative impact of indoor play, use of the car park and the operation of mechanical plant at ground floor level within front yards or at facades facing Victoria Street.

Compliance with the residential noise criteria is assessed at 3 metres inside the adjacent property boundary at ground floor level or outside the most affected first floor window.

5.5.2 Sleep Disturbance

Consideration has been given to sleep disturbance caused by noise generated by vehicles of staff arriving prior to 7 am.

For all residential facades facing Victoria Street:

- **63 dBA** L_{Amax} between 6.30 am and 7 am.
- **50 – 55 dBA** L_{Amax} internal level between 6.30 am and 7 am (staff arriving).

5.5.3 On-Road Traffic Noise Criterion

The following criterion will be applied for residential and non-residential receptors for additional on – road traffic noise generated by the use of the Centre:

- **55 dBA** (external) $L_{eq,\ 1\ hour}$ 1 metre from the nearest residential façade between 7 am and 10 pm.

5.5.4 External Noise Within Indoor Play and Sleeping Areas

With external windows and/doors closed the indoor play areas shall be capable of achieving:

- **40 dBA** (internal) $L_{eq,\ 1\ hour}$ for activity areas, when in use; and
- **35 dBA** (internal) $L_{eq,\ 1\ hour}$ for sleeping areas, when in use.

5.5.5 External Noise Within Outdoor Play Areas

The following criterion will be applied within any point of any outdoor play area within the Centre for external noise intrusion:

- **55 dBA** $L_{eq,\ 1\ hour}$ when in use.

6.0 CHILD CARE CENTRE NOISE EMISSION

The noise impacts to the nearby noise sensitive areas have been assessed from noise generated by the Centre as follows:

- Up to 78 children playing both outside and inside;
- Traffic generated by the use of the Centre; and
- Mechanical plant.

We have considered the noise impact at each of the residential receptor locations as outlined in Table 1. Noise modeling is based on architectural drawings provided by ArtMade Architects, as shown in Appendix C.

All distances used in noise calculations are approximate and are based on individual noise generating facets within the Centre, as shown in Appendix C, to the assessment location at each receptor. All residential receptor locations listed in Table 1, at which noise levels have been assessed, are representative of all adjacent residential receptors in the immediate area. Compliance at these nearest representative locations will ensure compliance at every other adjacent receptor.

6.1 Indoor and Outdoor Play Areas

The AAAC has presented a range of A-weighted SWL's per child in its '*Guideline for Child Care Centre Acoustic Assessment*'. The logarithmic average of the full range of A-weighted SWL's for children has been used to represent the noise emission from a typical group of mixed aged children engaged in free play.

Where passive/quiet activities are engaged in by children, the noise generated by children is generally 6 dB lower than active play. Passive activities include arts and crafts, block play, reading stories or any other kind of focused activity where minimal levels of noise are generated.

The AAAC sound power levels for each age group are presented in Table 4 and used in this assessment.

Table 4 Children at Play Indoor and Outdoor $L_{eq,\ 15\ min}$ Sound Power Levels

Number and Age of Children	Sound Power Levels (dB) at Octave Band Centre Frequencies (Hz)								
	dBA	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
10 children, 0 to 2 years	**78**	54	60	66	72	74	71	67	64
10 children, 2 to 3 years	**85**	61	67	73	79	81	78	74	70
10 children, 3 to 5 years	**87**	64	70	75	81	83	80	76	72

6.2 Car Park Noise Emission

Based on the RTA's '*Guide to Traffic Generating Developments*' prediction of 0.8 peak (morning 7 am – 9 am) vehicle trips per child for Child Care Centres (Long-day care), we have assumed, as a worst case scenario, a flow of cars equivalent to 62 trips in 1 hour arriving or leaving the car park in the morning peak. This is equivalent to 16 vehicle trips in a 15 minute period.

The SEL and L_{Amax} sound power level and spectra of vehicle noise is shown in Table 5. These levels are based on previous measurements by Day Design.

For the assessment of sleep disturbance we have assumed that staff vehicles will arrive at the Child Care Centre between 6:30 am and 7:00 am, enter the car park from the driveway on the northeast side of the subject site and park in the designated staff parking spaces at ground level.

For the assessment of vehicular activity from within the car park area we have assumed vehicles will travel at a rate of 10km/h. For additional noise generated by on-road traffic, we have assumed vehicles will travel at a rate of 30km/h as they approach or leave the Centre on Victoria Street.

Table 5 Sound Power Levels of Car Park Noise

Description	Sound Power Levels (dB) at Octave Band Centre Frequencies (Hz)								
	dBA	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
SEL sound power level of car drive-by at approximately 10 km/h	**82**	86	82	78	77	78	73	70	64
SEL sound power level of car drive-by at approximately 30 km/h	**87**	93	86	84	82	83	76	69	63
L_{Amax} of car turning into driveway	**92**	98	92	90	88	88	83	80	76

6.3 Mechanical Plant

It is anticipated that air conditioning will serve the various areas of the Centre. At the time of preparing this noise impact assessment report specific items of plant had not yet been selected.

It is anticipated that outdoor air conditioning condenser units will be installed at ground level on the west and east sides of the of the north building outside Indoor Playrooms 4 and 8 and on the west side of the south building outside Indoor Playroom 3.

Sound power levels used in the calculation of the noise contribution from the mechanical plant are shown in Table 6.

Table 6 $L_{eq,\ 15\ min}$ Sound Power Level – Mechanical Plant

Description	Sound Power Levels (dB) at Octave Band Centre Frequencies (Hz)								
	dBA	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Typical Outdoor Condenser Unit[1]	**70**	76	71	71	70	64	60	54	46

[1] *Spectral sound power level based on Actron SRC260C outdoor condenser unit.*

7.0 CALCULATED NOISE LEVELS AT RECEPTOR LOCATIONS

Knowing the sound power level of a noise source (See Tables 4 to 6), the sound pressure level (as measured with a sound level meter) can be calculated at a remote location using suitable formulae to account for distance losses, sound barriers, etc.

The following noise level calculations are shown for the ground and first floor levels of the nearest residential dwellings and commercial premises. The calculated noise level at the receptor locations from the various noise producing facets of the Centre are shown in Tables 7 to 11.

7.1 Cumulative Noise Level –Indoor Play, Car Park and Mechanical Plant

Calculations assume all 78 children are playing inside and are distributed evenly throughout the indoor play areas and that noise controls specified in Section 8.1 have been implemented into the management of each indoor play area.

Calculations also assume that boundary fences have been constructed in accordance with the recommendations specified in Section 8.2.

As specific items of mechanical plant have not yet been selected, noise level calculations for mechanical plant assume the sound power levels shown in Table 6.

Cumulative noise levels for indoor play, car park use and mechanical plant are shown in Tables 7 and 8 at the nearest affected point at ground floor level within the front and/or rear yard where applicable.

Table 7 Cumulative $L_{eq,\ 15\ minute}$ Noise Levels - Indoor Play, Car Park and Mechanical Plant (R1)

Receptor Location	Calculated Noise Level - $L_{eq,\ 15\ min}$	Noise Criterion - $L_{eq,\ 15\ min}$	Compliance (Yes/No)
R1 – Residence			
- Indoor play areas	Front – 34 dBA		
	Rear – 37 dBA		
- Car park	Front – 22 dBA		
	Rear – 10 dBA		
- Mechanical plant	Front – 38 dBA		
	Rear – 38 dBA		
Cumulative Noise Level	Front – 40 dBA	Front – 53 dBA	Yes
	Rear – 41 dBA	Rear – 43 dBA	Yes

Table 8 Cumulative $L_{eq,\ 15\ minute}$ Noise Levels - Indoor Play, Car Park and Mechanical Plant (R2 - R4)

Receptor Location	Calculated Noise Level - $L_{eq,\ 15\ min}$	Noise Criterion - $L_{eq,\ 15\ min}$	Compliance (Yes/No)
R2 – Residence			
- Indoor play areas	Rear – 34 dBA		
- Car park	Rear – 9 dBA		
- Mechanical plant	Rear – 30 dBA		
Cumulative Noise Level	Rear – 36 dBA	Rear – 43 dBA	Yes
R3 – Residence			
- Indoor play areas	Rear – 32 dBA		
- Car park	Rear – 11 dBA		
- Mechanical plant	Rear – 20 dBA		
Cumulative Noise Level	Rear – 32 dBA	Rear – 43 dBA	Yes
R4 – Residence			
- Indoor play areas	Front – 38 dBA		
	Rear – 37 dBA		
- Car park	Front – 46 dBA		
	Rear – 25 dBA		
- Mechanical plant	Front – 10 dBA		
	Rear – 38 dBA		
Cumulative Noise Level	Front – 46 dBA	Front – 53 dBA	Yes
	Rear – 41 dBA	Rear – 43 dBA	Yes

Table 9 Cumulative $L_{eq,\ 15\ minute}$ Noise Levels - Indoor Play, Car Park and Mechanical Plant (R5)

Receptor Location	Calculated Noise Level - $L_{eq,\ 15\ min}$	Noise Criterion - $L_{eq,\ 15\ min}$	Compliance (Yes/No)
R5 – Residence			
- Indoor play areas	Rear – 21 dBA		
- Car park	Rear – 32 dBA		
- Mechanical plant	Rear – 18 dBA		
Cumulative Noise Level	Rear – 32 dBA	Rear – 53 dBA	Yes

The calculated cumulative $L_{eq,\ 15\ minute}$ levels of noise from the general operation of the Centre is summarised in Tables 7 to 9 at each receptor location. With the aforementioned assumptions, the calculated cumulative levels of noise from the Centre indicate that the noise criteria is met at all receptor locations.

7.2 Outdoor Play Areas

The calculated $L_{eq,\ 15\ min}$ noise levels from activity in the outdoor play area for each receptor, are shown in Table 10. Using AAAC sound power levels for children in active play and passive play activities, as established in Table 4, the calculated noise levels at each receptor location was determined by evenly distributing children into groups at separate locations across the outdoor play areas, as can be seen in Appendix C.

Calculations also assume that the noise control recommendations specified in Section 8 have been implemented into the design and management of the Centre, including boundary fences and management of child numbers in the outdoor play areas.

Table 10 Calculated L_{eq} Noise Levels - Outdoor Play

Receptor Location	Calculated Noise Level - $L_{eq,\ 15\ min}$	Noise Criterion - $L_{eq,\ 15\ min}$	Compliance (Yes/No)
R1 – Residence	Front – 53 dBA	Front – 53 dBA	Yes
	Rear – 45 dBA	Rear – 45 dBA	Yes
R2 – Residence	Rear – 45 dBA	Rear – 45 dBA	Yes
R3 – Residence	Rear – 45 dBA	Rear – 45 dBA	Yes
R4 – Residence	Front – 48 dBA	Front – 53 dBA	Yes
	Rear – 45 dBA	Rear – 45 dBA	Yes
R5 – Residence	Rear – 40 dBA	Rear – 45 dBA	Yes

The calculated $L_{eq,\ 15\ minute}$ levels of noise from children playing outdoors are summarised in Table 10 at the receptor locations. With the aforementioned assumptions, the calculated levels of noise from the use of the outdoor play area indicate that the noise criteria is met at all receptor locations.

7.3 On – Road Traffic

The external $L_{eq,\ 1\ hour}$ traffic noise levels associated with additional on – road traffic throughout the day have been calculated at the front facades of the nearest residential receptor locations, 'R1', 'R4' and 'R5'. Calculations assume additional traffic will be travelling on Victoria Street. $L_{eq,\ 1\ hour}$ noise levels at receptor locations 'R1', 'R4' and 'R5' are shown in Table 11.

The front facades of receptors 'R1', 'R4' and 'R5' are the closest and most exposed to additional traffic generated from the Centre. It is reasonable to assume that compliance at these locations will ensure compliance at all other receptor locations which are further away and shielded from the road by buildings and other structures.

Calculations consider distance attenuation only and assume a worst case scenario with all traffic from the Centre moving past these receptors exclusively. It is likely that traffic flow will be split between east and west. As such, calculated traffic noise levels are likely to be lower in practice for 'R1', 'R4' and 'R5'.

Table 11 Calculated $L_{eq,\ 1\ hour}$ Noise Levels - Additional On – Road Traffic

Receptor Location	Calculated Noise Level $L_{eq,\ 1\ hour}$	Noise Criterion $L_{eq,\ 1\ hour}$	Compliance (Yes/No)
R1 – Residence (front façade)	41 dBA	55 dBA	Yes
R4 – Residence (front façade)	41 dBA	55 dBA	Yes
R5 – Residence (front façade)	41 dBA	55 dBA	Yes

The calculated external $L_{eq,\ 1\ hour}$ noise levels of noise from additional on-road traffic at the nearest residential locations, 'R1', 'R4' and 'R5', are well below the noise criteria established in Section 5 and is therefore acceptable.

7.4 Sleep Disturbance

It is proposed that the Centre will accept children from 7 am. A number of staff will arrive and park within the ground floor car park, prior to 7 am to prepare for the arrival of the children, with more staff and parents arriving after 7 am.

The calculated L_{max} noise level at the nearest façade of the most affected residential receptor location, 'R4', is shown in Table 12.

Calculations also assume that a 1.5 metre high boundary fence is in place along the east and west boundaries of the subject site as shown in Appendix C.

Given that this receptor is the closest and most exposed to L_{max} noise events from the Centre, compliance at this receptor location ensures compliance at all other receptors which are further away and/or shielded by buildings and other structures.

Table 12 Calculated L_{max} Noise Levels - (R4)

Receptor Location	Calculated Noise Level - L_{max}	Noise Criterion - L_{max}	Compliance (Yes/No)
R4 – Residence	58 dBA	63 dBA	Yes

It can be seen from Table 12 that the L_{Amax} noise level at the nearest residential receptor locations are below the sleep disturbance noise criterion established in Section 5 and is therefore acceptable.

7.5 Road Traffic Noise Intrusion

7.5.1 Outdoor Play Areas

The outdoor play areas are exposed to road traffic noise emission from Victoria Street, particularly Outdoor Play Areas 1 and 3. The level of noise intrusion from road traffic noise within Outdoor Play Areas 1-4 is shown in Table 13 based on L_{eq} noise levels measured at Location B (refer Table 2). Calculations assume noise controls have been satisfactorily implemented into the design of Outdoor Play Areas as specified in Section 8.

Table 13 Calculated $L_{eq,\ 1\ hour}$ Noise Levels – Outdoor Play Areas

Location	Calculated Noise Level – $L_{eq,\ 1\ hour}$	Noise Criterion - $L_{eq,\ 1\ hour}$	Compliance (Yes/No)
Outdoor Play Area 1	55 dBA	55 dBA	Yes
Outdoor Play Area 2	51 dBA	55 dBA	Yes
Outdoor Play Area 3	39 dBA	55 dBA	Yes
Outdoor Play Area 4	35 dBA	55 dBA	Yes

With the aforementioned assumptions, it can be seen from Table 13 that the external noise criterion for outdoor play areas is met within Outdoor Play Areas 1-4 and is acceptable.

7.5.2 Indoor Play Areas

The south facing facades of Indoor Playrooms 1-3, 7 and 8 are particularly exposed to road traffic noise emission from Victoria Street. The level of noise intrusion from road traffic noise within Indoor Playrooms 1-3, 7 and 8 is shown in Table 14 based on L_{eq} noise levels measured at Location B (refer Table 2). Calculations assume noise controls have been satisfactorily implemented into the design of the Indoor Playrooms as specified in Section 8.

Indoor Playrooms 4-6 are further from the road and shielded from road traffic noise emission from Victoria Street by the building. As such, compliance within Indoor Playrooms 1-3, 7 and 8 ensures compliance in the remaining Indoor Playrooms 4-6.

Table 14 Calculated $L_{eq,\ 1\ hour}$ Noise Levels – Indoor Play Areas

Location	Calculated Noise Level – $L_{eq,\ 1\ hour}$	Noise Criterion - $L_{eq,\ 1\ hour}$	Compliance (Yes/No)
Indoor Playrooms 1-3	28 dBA	35 dBA	Yes
Indoor Playrooms 7 & 8	25 dBA	35 dBA	Yes

With the aforementioned assumptions, it can be seen from Table 14 that the internal noise criterion for indoor play and sleeping areas is met within all Indoor Playrooms.

8.0 NOISE CONTROL RECOMMENDATIONS

8.1 Management Plan

We recommend the Child Care Centre's management implement a Noise Management Plan that should include, but not be limited to the following:

- Ensuring all staff and parents are provided with a copy of the Centre's Noise Management Plan and its implications for them during their time at the Centre
- Neighbours should be provided with the name and contact details of the Centre Director, and the invitation to contact that person at any time the Centre is operating.
- Staff arriving prior to 7 am should park in the dedicated Staff parking spaces.
- South facing external windows to Indoor Playrooms 1-3, 7 and 8 should be closed when the rooms are in use to reduce road traffic noise intrusion. North facing windows may be left open when in use.
- All north facing external windows to Indoor Playrooms 4-6 may be left open when in use. South facing windows may be left open when in use.
- Windows and doors for all Indoor Playrooms should be closed when children are sleeping.
- Facilitating children's small group play when outside and encouraging educators to engage in children's play and facilitate friendships between children.
- Crying children should be comforted as quickly as possible and moved indoors.

8.1.1 Outdoor Play Areas

Outdoor play areas 1-4 (OP1 – OP4) are shown marked up on the architectural drawings Children can utilise the outdoor play area as follows:

- Up to 8 children, 0-2 years old within OP3; ***and***
- Up to 20 children, 2-3 years old in OP1; ***and***
- Up to 20 children, 2-5 years old, within OP2; ***or***
- Up to 20 children, 3-5 years old, within OP4.
- All remaining children to be inside.

It should be noted that a dedicated Quiet Play Area within OP4 is indicated on the drawings. Up to 20 children may utilise OP4 in accordance with the management plan outlined above. Of these 20 children, a maximum of 10 may engage in active or passive play activities in the east half of the outdoor play area.

A maximum of 10 children may also utilise the west half of the outdoor play area (dedicated Quiet Play Area), however activities in this area must be restricted to passive play activities only. Staff to child ratios shall be maintained in accordance with the requirements stipulated in the National Quality Framework (NQF).

8.2 Sound Barrier Fences

The sound barrier fences, as shown in Appendix C, should be constructed from an impervious material such as masonry, lapped-and-capped timber, clear polycarbonate, toughened glass, a proprietary modular system or a combination, free from holes or gaps.

We recommend that the use of Colorbond or sheet metal fencing be avoided for outdoor play areas where the fence may be impacted with balls and other items during outdoor play activities.

8.2.1 Outdoor Play Areas

In order to meet the established noise criteria for all receptor locations with up to 48 children engaged in active and passive play within the outdoor play area for more than 4 hours per day, we recommend the following fence heights are constructed:

- Construct sound barrier fences along the south and east boundaries of Outdoor Play Area 1 to a minimum height of 1.5 metres above finished surface level (FSL) of the outdoor play area. Minimum Top Of Wall (TOW) height 46.25.
- Construct the west boundary wall of Outdoor Play Area 2 to a minimum height of 2.7 metres above the FSL of the outdoor play area (Min. TOW 47.45).
- Construct sound barrier fences along the west boundary of the Quiet Play Area of Outdoor Play Area 4 to a minimum height of 2.1 metres above the FSL of the outdoor play area (Min. TOW 46.85).
- Construct sound barrier fences along the north boundary of Quiet Play Area of Outdoor Play Area 4 to a minimum height of 2.1 metres above the FSL of the outdoor play area (Min. TOW 46.85).
- Construct sound barrier fences along the west boundary of Outdoor Play Area 4 (lowered Amphitheatre area) to a minimum height of 2.7 metres above the FSL of the outdoor play area. (Min. TOW 46.85)
- Construct sound barrier fences along the north and east boundaries of Outdoor Play Area 4 (lowered Amphitheatre area) to a minimum height of 2.4 metres above the FSL of the outdoor play area. (Min. TOW 46.55)
- Construct sound barrier fences along the east boundary of Outdoor Play Area 4 to a minimum height of 1.8 metres above the FSL of the outdoor play area. (Min. TOW 46.55).

It should be noted that while the lowered Amphitheatre section of Outdoor Play Area 4 requires fences to be up to 2.7 metres in height, this is inclusive of the 600 mm level drop between the upper and lower sections as it is measured from the finished surface level where children are playing. The visible portion of these fences, when viewed from the adjacent residential premises, will be the same as the 2.1 metre sections as shown in Appendix C. Similarly, the visible portion of the 2.4 metre high sections (inclusive of the 600 mm level drop) will be the same as the 1.8 metre sections.

Acoustic fences and their required heights are shown in Appendix C. Acoustic fences should be constructed from any solid material such as lapped and capped timber, masonry, fibre cement etc, with no holes or gaps. We recommend that Colorbond or sheet metal is avoided for outdoor play areas where fences are likely to be impacted by balls and other items which may create additional noise.

8.2.2 Site Boundary Fences

Site boundary fences should be constructed along the east and west boundaries of the subject site from the 9.1 metre front setback line to the rear building line to a minimum height of 1.8 metres above ground level, as shown in Appendix C.

Site boundary fences should be constructed should be constructed on the west side of the site and east side of the site along the driveway from the 2 metre landscape setback line to the 9.1 metre front setback line, to a minimum height of 1.5 metres above ground level.

8.3 Building Construction

We recommend all south facing windows and glazed doors to Indoor Playrooms 1-3, 7 and 8 are constructed from a minimum 5 mm thick glass with acoustic seals. All other windows and glazed doors may be of standard construction.

External walls and roofs may be of standard construction.

8.4 Mechanical Plant

Outdoor air conditioning condenser units are proposed for the Centre and our calculations assume a worst case scenario in which outdoor air conditioning condenser units will be installed at ground level on the west and east sides of the of the north building outside Indoor Playrooms 4 and 8 and on the west side of the south building outside Indoor Playroom 3.

In this location, we recommend that the maximum sound power level for each external condenser unit is 70 dBA or less.

Rooms are to be ventilated to the standards set out in clause F4.5 of the Building Code of Australia and Australian Standards AS1668.2:1991.

We recommend that a review of mechanical plant be conducted at Construction Certificate stage when items of mechanical plant and installation locations have been finalised.

8.5 Landscaping

Landscaping between the noise source and the receptors, in the form of trees and tall shrubs that provide visual screening of the noise source, will not reduce noise levels appreciably. However, they tend to make intrusive noise psychologically less offensive.

8.6 Construction Disclaimer

Recommendations made in this report are intended to resolve acoustical problems only. We make no claims of expertise in other areas of building construction and therefore the recommended noise controls should be implemented into the building design in consultation with other specialists to ensure they meet the structural, fire, thermal or other aspects of building construction.

We encourage clients to check with us before using materials or equipment that are alternative to those specified in our Acoustical Report.

9.0 CONCLUSION

Day Design Pty Ltd was engaged by ArtMade Architects to assess the potential environmental noise impact from a proposed Child Care Centre to be constructed at 97-99 Victoria Street, Werrington, NSW.

Measurements and calculations show that, provided the noise control recommendations made in Section 8 of this report are implemented, the level of noise emitted by the proposed Child Care Centre at 97-99 Victoria Street, Werrington, NSW, will meet the acceptable noise level requirements of the Association of Australasian Acoustical Consultants *Guideline for Child Care Centres Acoustic Assessmen*t and the Environmental Protection Authority's *Noise Policy for Industry* and *Road Noise Policy,* as detailed in Section 5 of this report, and is considered acceptable.

Alexander Mendoza, MDesSc (Audio and Acoustics), MAAS
Acoustical Consultant
for and on behalf of Day Design Pty Ltd

AAAC MEMBERSHIP

Day Design Pty Ltd is a member company of the Association of Australasian Acoustical Consultants, and the work herein reported has been performed in accordance with the terms of membership.

APPENDICES

Appendix A – Instrumentation
Appendix B – Ambient Noise Survey
Appendix C – Sound Barrier Fence Heights & Architectural Drawings
AC108-1 to 4 – Glossary of Acoustical Terms

NOISE SURVEY INSTRUMENTATION

Noise level measurements and analysis in this report were made with instrumentation as follows:

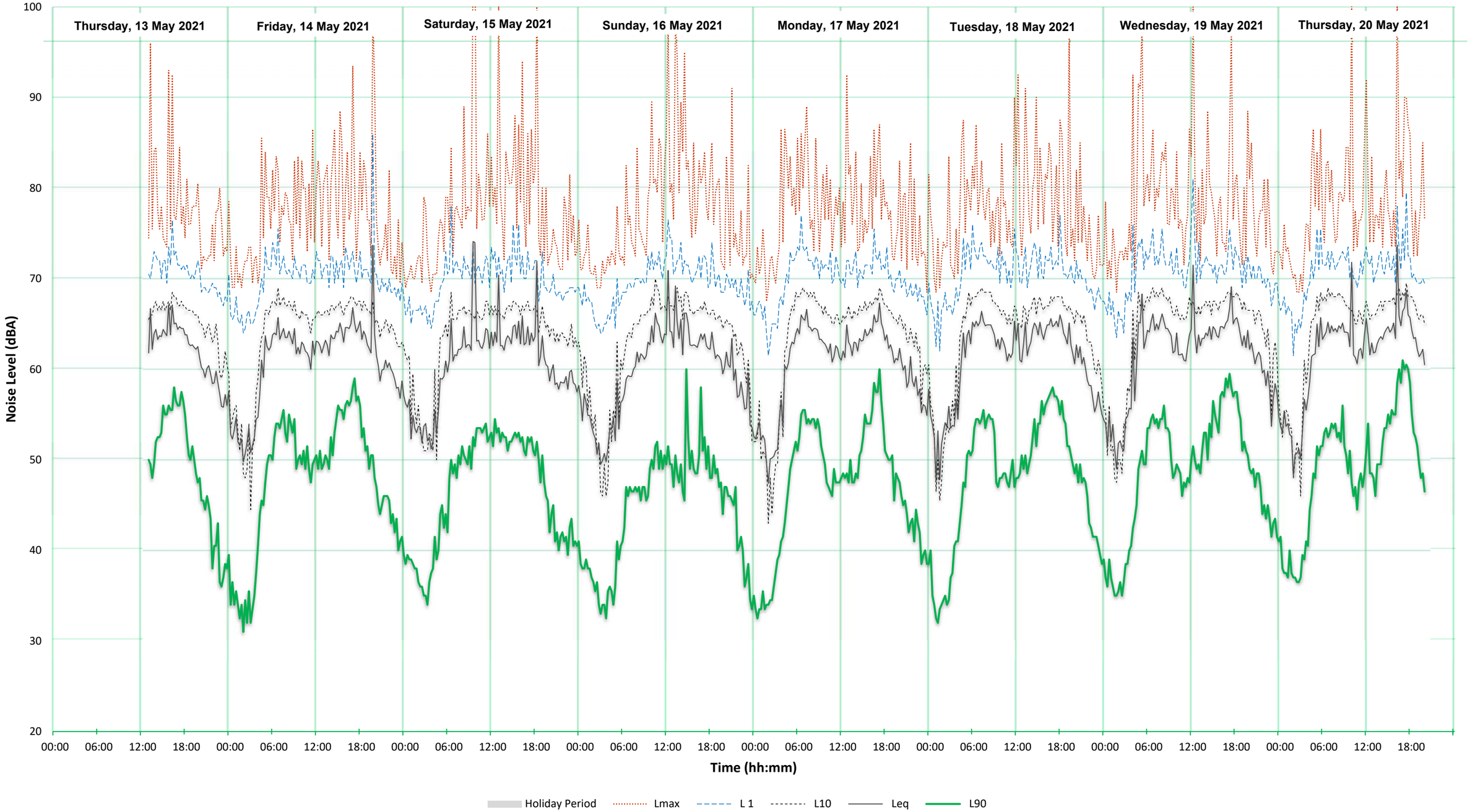
Table A1 Noise Survey Instrumentation

Description	Model No	Serial No
Infobyte Noise Logger (Type 2)	iM4	111
Condenser Microphone 0.5" diameter	MK 250	9261
Infobyte Noise Logger (Type 2)	iM4	118
Condenser Microphone 0.5" diameter	MK 250	118

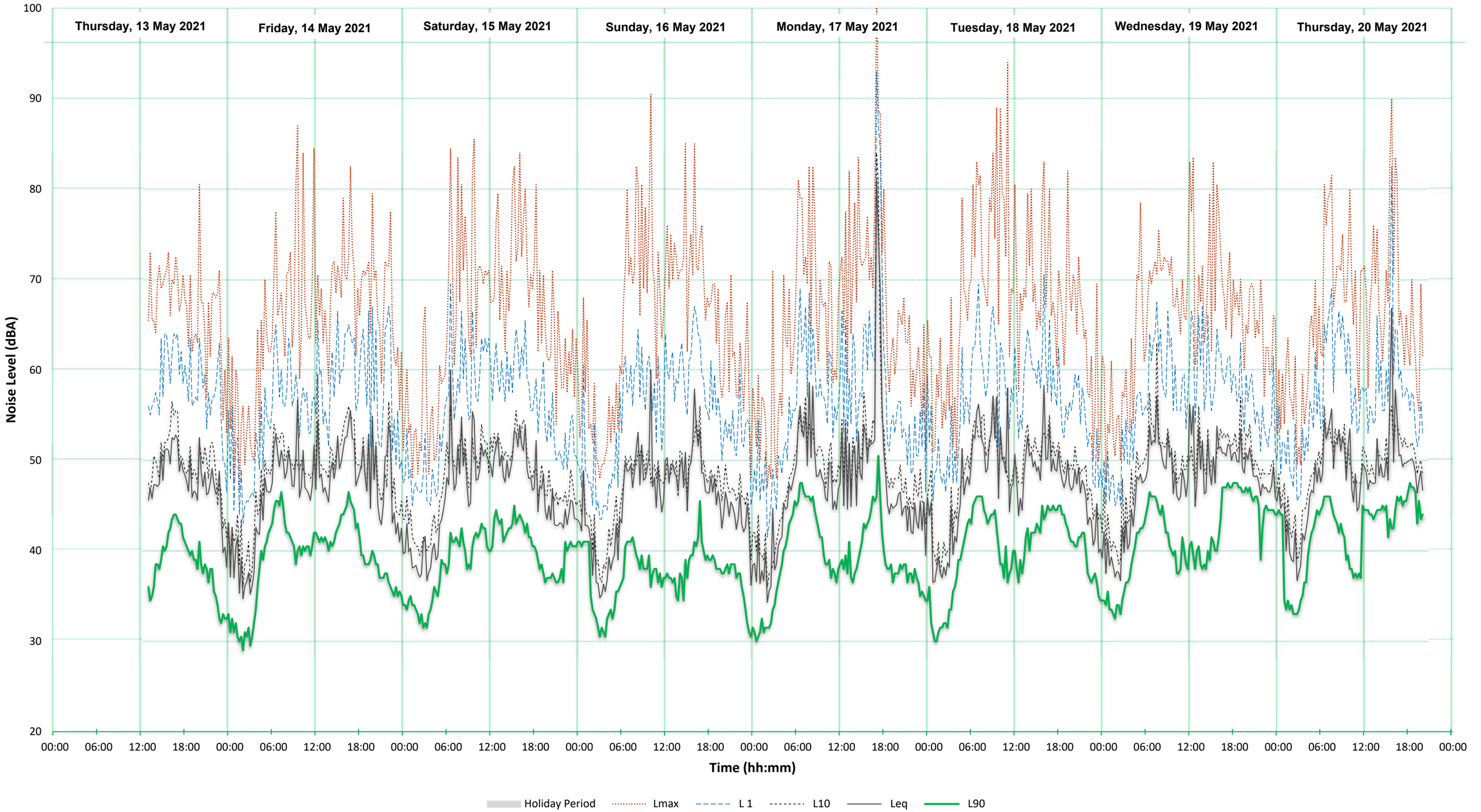
An environmental noise logger is used to continuously monitor ambient noise levels and provide information on the statistical distribution of noise during an extended period of time. The Infobyte Noise Monitor iM4 are either a Type 1 (#111) or Type 2 (#118) precision environmental noise monitor meeting all the applicable requirements of AS1259 for an integrating-averaging sound level meter.

All instrument systems had been laboratory calibrated using instrumentation traceable to Australian National Standards and certified within the last two years thus conforming to Australian Standards. The measurement system was also field calibrated prior to and after noise surveys. Calibration drift was found to be less than 1 dB during unattended measurements. No adjustments for instrument drift during the measurement period were warranted.

Located at Front Yard 110 Victoria Street, Werrington, NSW



Located at Back Yard 99 Victoria Street, Werrington, NSW



97-99 VICTORIA ST
WERRINGTON, NSW 2747

CHILDCARE CENTRE
DEVELOPMENT APPLICATION

ARCHITECTURAL DRAWING LIST - DA		
Sheet Number	Sheet Name	Current Revision
A00 SERIES - COVER PAGE & GENERAL INFORMATION		
A00.00	COVER PAGE	B
A02 SERIES - SITE PLAN / DEMOLITION		
A02.01	SITE PLAN / DEMOLITION	B
A03 SERIES - FLOOR PLANS		
A03.01	BASEMENT FLOOR PLAN	B
A03.02	GROUND FLOOR PLAN & FENCE/BARRIER DIAGRAM	B
A04 SERIES - ELEVATIONS		
A04.01	EXTERNAL ELEVATIONS	B
A05 SERIES - BUILDING SECTIONS		
A05.01	SECTIONS, EXTERNAL FINISHES & FENCE DETAILS	B
A06 SERIES - SHADOW DIAGRAMS		
A06.01	SHADOW DIAGRAMS	B
A06.02	OUTDOOR PLAY SOLAR CALC	B

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B	01.09.21	COUNCIL RFI
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PROJECT

CHILDCARE CENTRE

PROJECT ADDRESS

97-99 VICTORIA STREET, WERINGTON 2747

SHEET NAME

COVER PAGE

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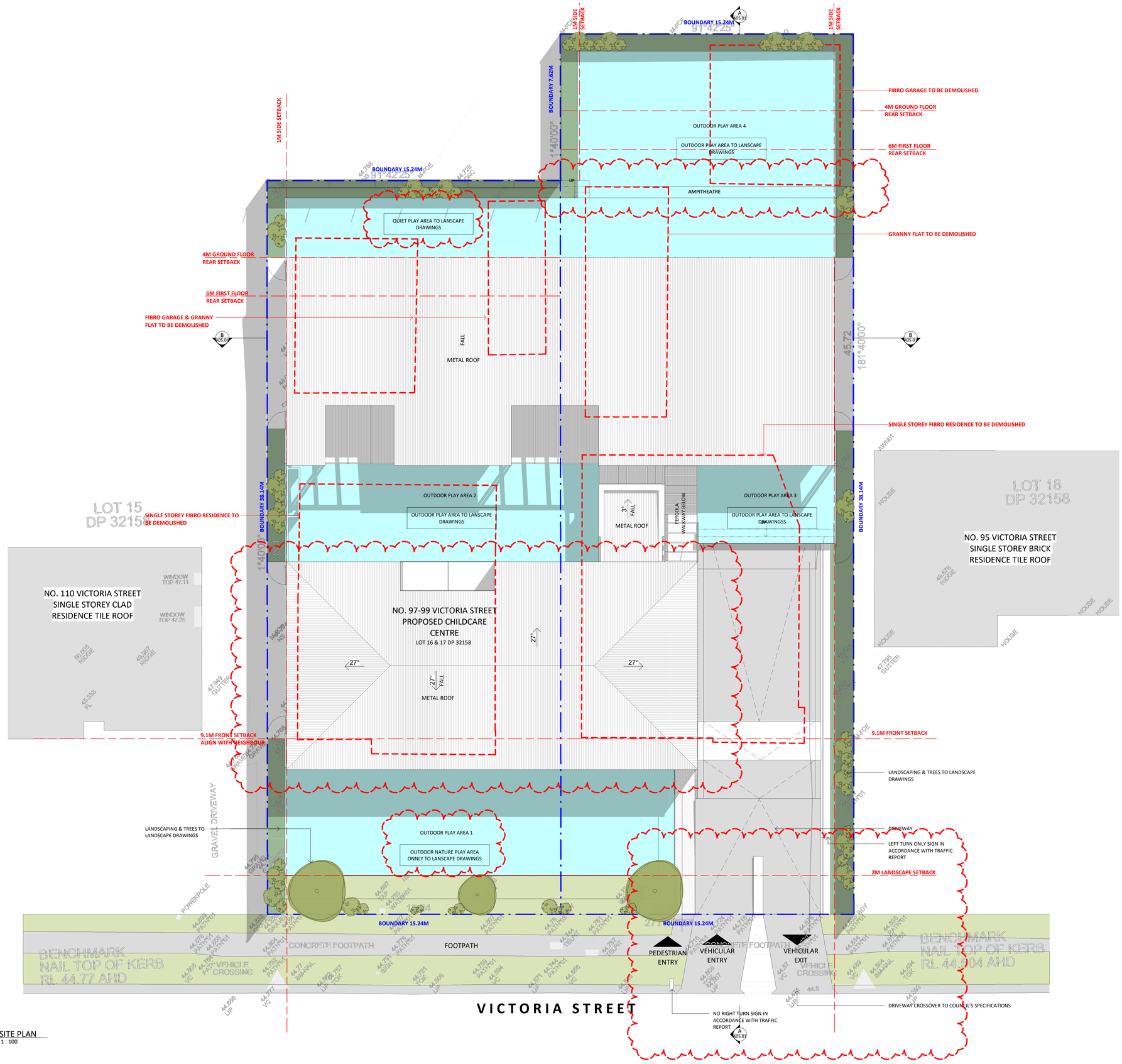
Project number	Sheet No.	Issue	Phase
21621	A00.00	B	DA

Sheet Size	Scale	L.G.A.
A1	N T S	PENRITH

Drawn By	Checked By	Date
SH	AS/SS	01.09.21



0 1 2 3 4 5
1 : 100

SITE CALCULATIONS

TOTAL SITE AREA:	1,277.4 M²
PERMITTED BUILDING HEIGHT	= 8.5 M
MIN REQUIRED LANDSCAPE	= 40% (510.96M²)
PROPOSED LANDSCAPE	= 44.5% (568.8M²)

LANDSCAPE LEGEND

- EXISTING TREE / TREE TO BE RETAINED
- TREE TO BE REMOVED
- NEW TREE
- LANDSCAPING
- LANDSCAPE BUFFER
- TURF
- PAVING
- LINE OF STRUCTURAL ROOT ZONE (SRZ)
- LINE OF TREE EXCLUSION ZONE (TEZ)
- LINE OF TREE PROTECTION ZONE (TPZ)

NOTE: REFER TO ARBORIST REPORT FOR FURTHER DETAILS

GENERAL NOTES

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- REFER TO SW ENG. DRAWINGS FOR DRAINAGE DESIGN.
- KITCHEN AREA TO COMPLY IN ACCORDANCE WITH AS4674, NSW FOOD ACT 2003, FOOD REGULATION 2015 AND FOOD STANDARD CODES 3.2.2 AND 3.2.3.

ABBREVIATIONS

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PROJECT
CHILDCARE CENTRE

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97-99 VICTORIA STREET, WERINGTON 2747

SHEET NAME
SITE PLAN / DEMOLITION

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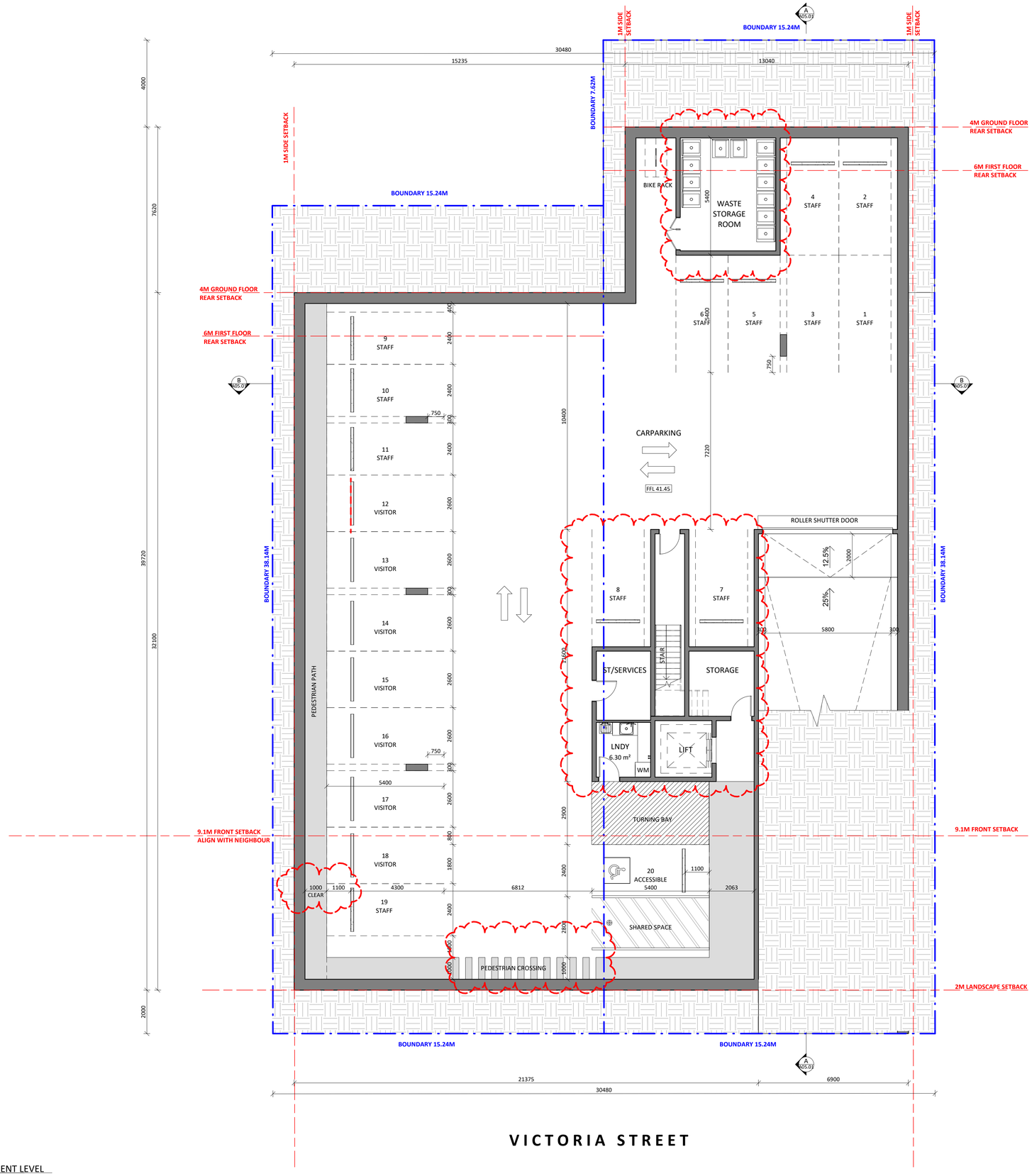
Project number	Sheet No.	Issue	Phase
21621	A02.01	B	DA

Sheet Size	Scale	L.G.A.
A1	As indicated	PENRITH

Drawn By	Checked By	Date
SH	AS/SS	01.09.21



1 BASEMENT LEVEL
1 : 100

0 1 2 3 4 5
1 : 100

SITE CALCULATIONS

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A	03.06.21	ISSUED FOR DEVELOPMENT APPLICATION

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- KITCHEN AREA TO COMPLY IN ACCORDANCE WITH AS4674, NSW FOOD ACT 2003, FOOD REGULATION 2015 AND FOOD STANDARD CODES 3.2.2 AND 3.2.3.

INDOOR PLAYROOM SCHEDULE					
ROOM	AGE	NO. CHLDRN	NO. STAFF	UNENCUMBERED REQ AREA	UNENCUMBERED AREA
PLAYROOM 1	AGE 2-3	10	2	32.5 m²	33.05 m²
PLAYROOM 2	AGE 2-3	10	2	32.5 m²	33.40 m²
PLAYROOM 3	AGE 2-3	10	2	32.5 m²	33.05 m²
PLAYROOM 4	AGE 3-5	10	1	32.5 m²	33.00 m²
PLAYROOM 5	AGE 3-5	10	1	32.5 m²	35.10 m²
PLAYROOM 6	AGE 3-5	10	1	32.5 m²	33.40 m²
PLAYROOM 7	AGE 3-5	10	1	32.5 m²	32.95 m²
PLAYROOM 8	AGE 0-2	8	2	26 m²	26.55 m²
TOTAL		78	12	253.5 m²	260.50 m²

OUTDOOR PLAY AREA SCHEDULE				
AREA	AGE	NO. CHLDRN	UNENCUMBERED REQ AREA	UNENCUMBERED AREA
OUTDOOR PLAY AREA 1	AGE 2-3	22	154 m²	154.10 m²
OUTDOOR PLAY AREA 2	AGE 2-5	19	133 m²	133.00 m²
OUTDOOR PLAY AREA 3	AGE 0-2	8	56 m²	56.25 m²
OUTDOOR PLAY AREA 4	AGE 3-5	29	203 m²	206.70 m²
TOTAL		78	546 m²	550.10 m²

PARKING SCHEDULE	
PARKING	NO. SPACES
ACCESSIBLE	1
STAFF	12
VISITOR	7
TOTAL	20

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SHEET NAME
BASEMENT FLOOR PLAN

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Project number	Sheet No.	Issue	Phase
21621	A03.01	B	DA

Sheet Size	Scale	L.G.A.
A1	As indicated	PENRITH

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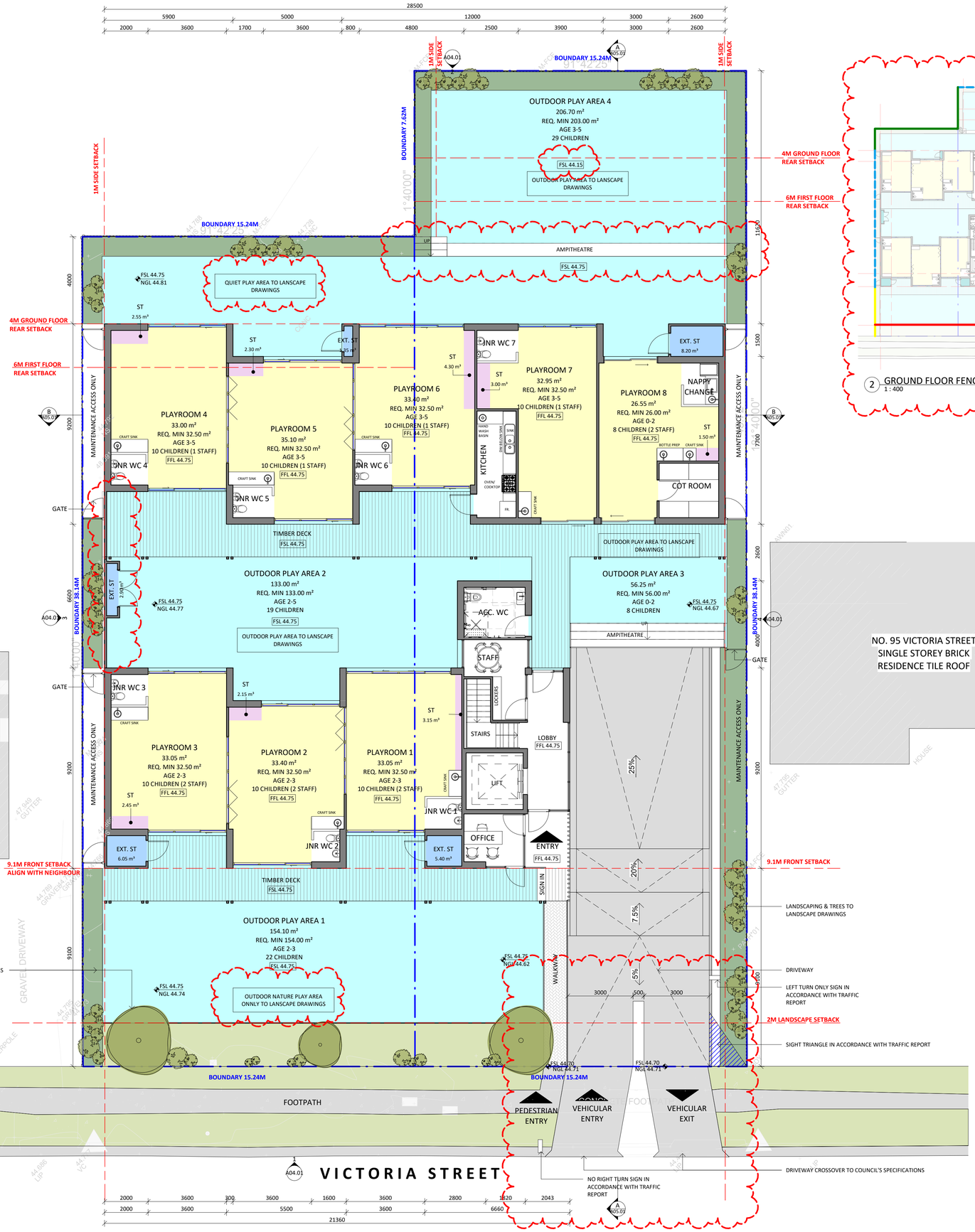
SH	AS/SS	01.09.21



1 GROUND FLOOR PLAN
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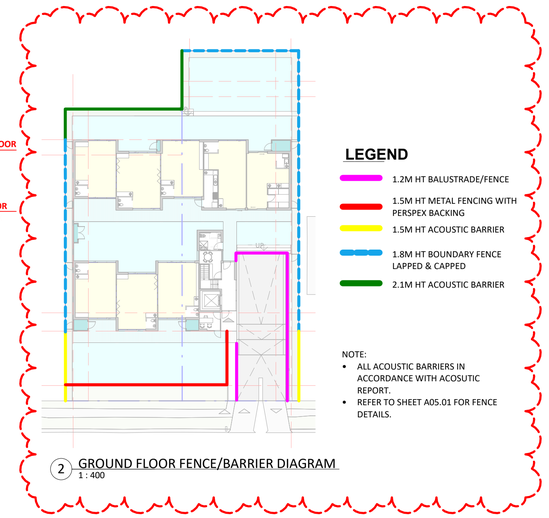

2 GROUND FLOOR FENCE/BARRIER DIAGRAM
1 : 400

0 1 2 3 4 5
1 : 100

SITE CALCULATIONS

TOTAL SITE AREA:	1,277.4 M²
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INTERNAL STORAGE SCHEDULE

NAME	NO. Children	REQ VOL	VOL
ST	78	15.60 m³	21.45 m³
TOTAL			21.45 m³

EXTERNAL STORAGE SCHEDULE

NAME	NO. Children	REQ VOL	VOL
EXT. ST	78	23.40 m³	23.84 m³
TOTAL			23.84 m³

GENERAL NOTES

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PLAYROOM 4	AGE 3-5	10	1	32.5 m²	33.00 m²
PLAYROOM 5	AGE 3-5	10	1	32.5 m²	35.10 m²
PLAYROOM 6	AGE 3-5	10	1	32.5 m²	33.40 m²
PLAYROOM 7	AGE 3-5	10	1	32.5 m²	32.95 m²
PLAYROOM 8	AGE 0-2	8	2	26 m²	26.55 m²
TOTAL		78	12	253.5 m²	260.50 m²

OUTDOOR PLAY AREA SCHEDULE

AREA	AGE	NO. CHLDRN	UNENCUMBERED REQ AREA	UNENCUMBERED AREA
OUTDOOR PLAY AREA 1	AGE 2-3	22	154 m²	154.10 m²
OUTDOOR PLAY AREA 2	AGE 2-5	19	133 m²	133.00 m²
OUTDOOR PLAY AREA 3	AGE 0-2	8	56 m²	56.25 m²
OUTDOOR PLAY AREA 4	AGE 3-5	29	203 m²	206.70 m²
TOTAL		78	546 m²	550.10 m²

PARKING SCHEDULE

PARKING	NO. SPACES
ACCESSIBLE	1
STAFF	12
VISITOR	7
TOTAL	20

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PROJECT
CHILDCARE CENTRE

PROJECT ADDRESS
97-99 VICTORIA STREET, WERINGTON 2747

SHEET NAME
GROUND FLOOR PLAN & FENCE/BARRIER DIAGRAM

ISSUED FOR DEVELOPMENT APPLICATION

Project number	Sheet No.	Issue	Phase
21621	A03.02	B	DA

Sheet Size	Scale	L.G.A.
A1	As indicated	PENRITH

Drawn By	Checked By	Date
SH	AS/SS	01.09.21

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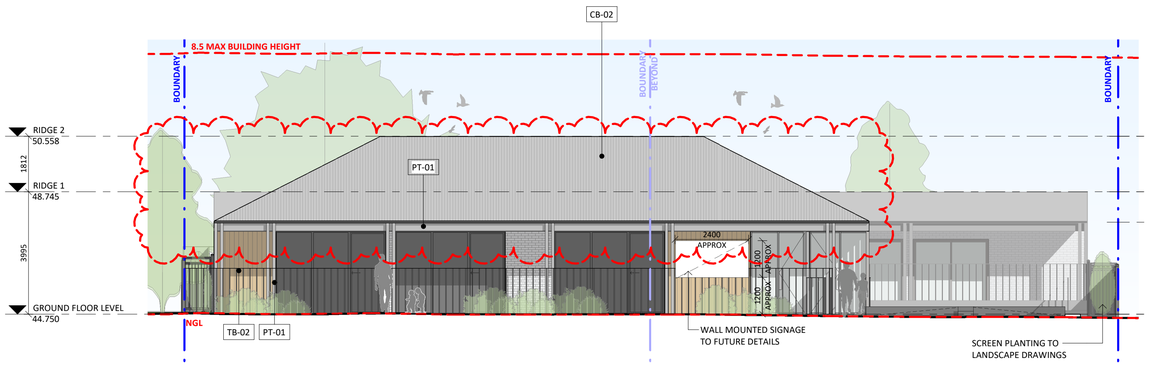

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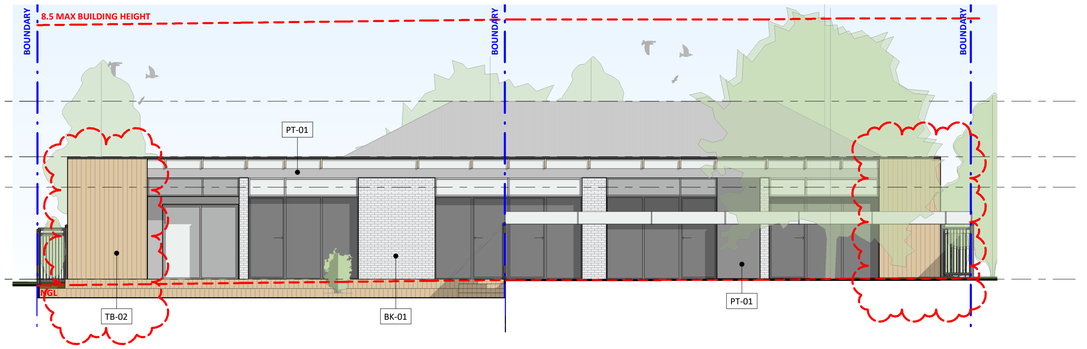

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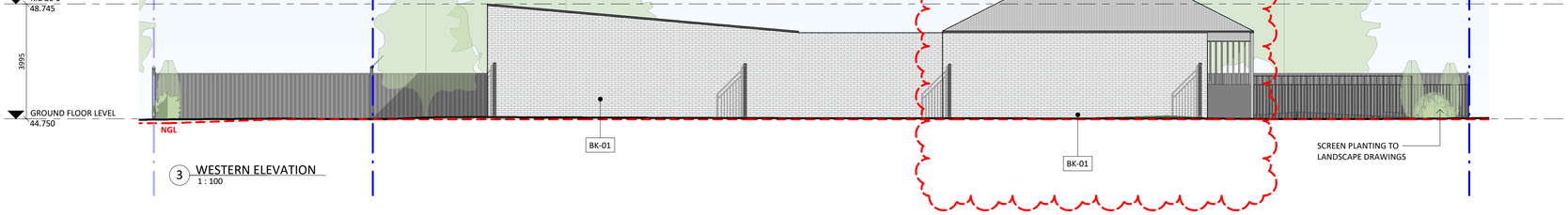

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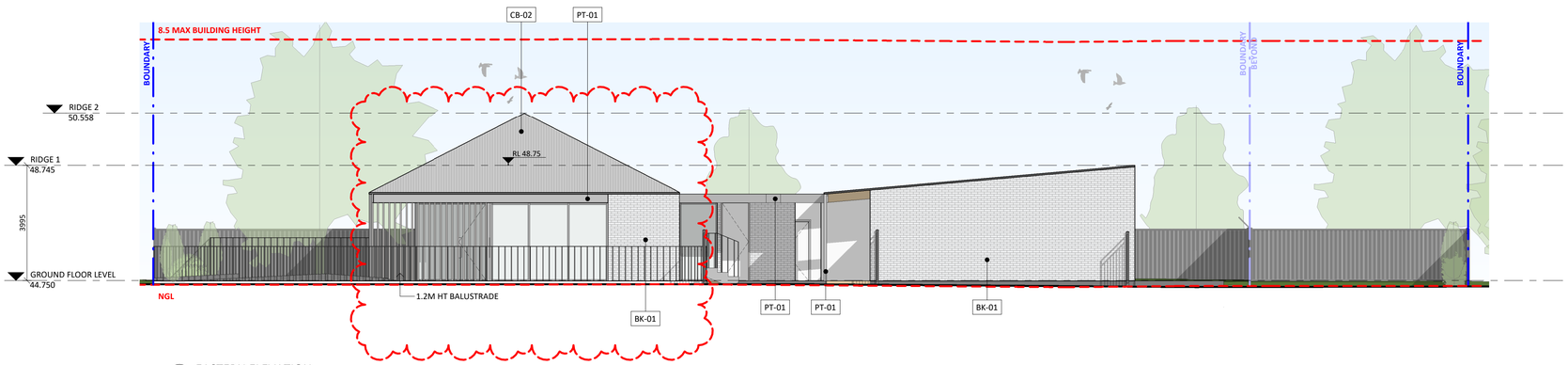

4 EASTERN ELEVATION
1 : 100

EXTERNAL FINISHES

BK-01	BRICK BAGGED DULUX COLOUR: TBC OR SIMILAR
CB-01	GARAGE DOOR COLORBOND COLOUR: SHALE GREY OR SIMILAR
CB-02	ROOF,GUTTER, DOWNPIPES COLORBOND COLOUR: SHALE GREY OR SIMILAR
PC-01	ALUMINIUM WINDOW & DOOR FRAMES DURALLOY POWDERCOAT COLOUR: OYSTER OR SIMILAR
PT-01	RENDER & PAINT DULUX COLOUR: SHALE GREY OR SIMILAR
TB-01	EXPOSED TIMBER RAFTERS COLOUR: LIGHT TIMBER OR SIMILAR
TB-02	ALUM CLADDING COLOUR: TIMBER APPEARANCE

ISSUE	DATE	DESCRIPTION
B	01.09.21	COUNCIL RFI
A	03.06.21	ISSUED FOR DEVELOPMENT APPLICATION

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PROJECT
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PROJECT ADDRESS
97-99 VICTORIA STREET, WERINGTON 2747

SHEET NAME
EXTERNAL ELEVATIONS

ISSUED FOR DEVELOPMENT APPLICATION

Project number	Sheet No.	Issue	Phase
21621	A04.01	B	DA

Sheet Size	Scale	L.G.A.
A1	1 : 100	PENRITH

Drawn By	Checked By	Date
SH	AS/SS	01.09.21

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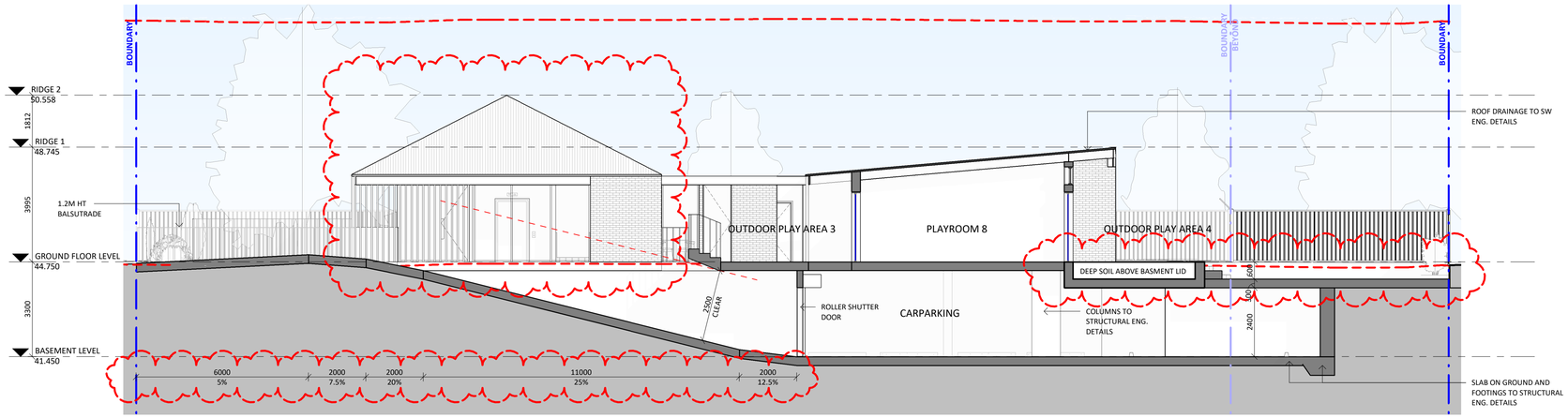

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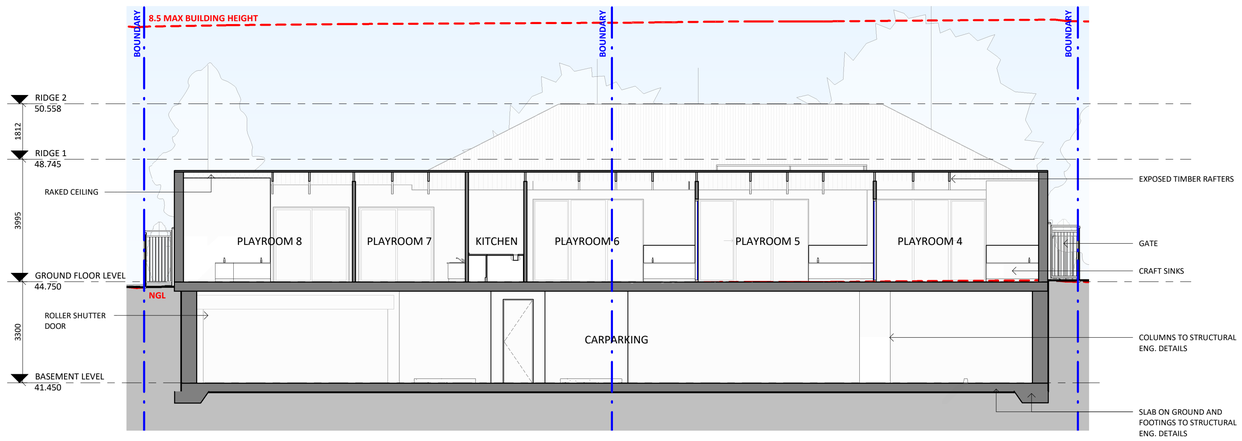

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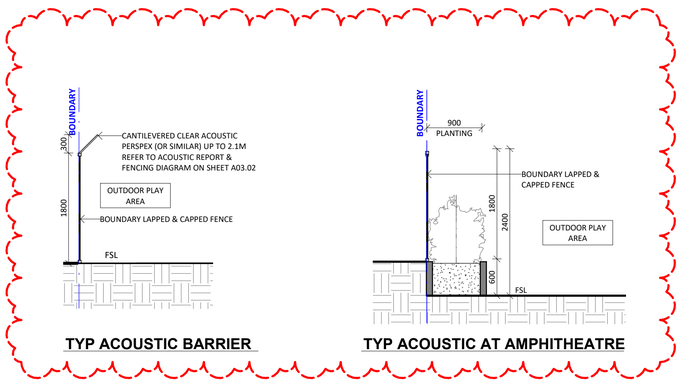

TYP ACOUSTIC BARRIER

TYP ACOUSTIC AT AMPHITHEATRE

EXTERNAL FINISHES

BK-01	BRICK BAGGED DULUX COLOUR: TBC OR SIMILAR
CB-01	GARAGE DOOR COLORBOND COLOUR: SHALE GREY OR SIMILAR
CB-02	ROOF,GUTTER, DOWNPIPES COLORBOND COLOUR: SHALE GREY OR SIMILAR
PC-01	ALUMINIUM WINDOW & DOOR FRAMES DURALLOY POWDERCOAT COLOUR: OYSTER OR SIMILAR
PT-01	RENDER & PAINT DULUX COLOUR: SHALE GREY OR SIMILAR
TB-01	EXPOSED TIMBER RAFTERS COLOUR: LIGHT TIMBER OR SIMILAR
TB-02	ALUM CLADDING COLOUR: TIMBER APPEARANCE

ARTIST IMPRESSION

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PROJECT
CHILDCARE CENTRE

PROJECT ADDRESS
97-99 VICTORIA STREET, WERINGTON 2747

SHEET NAME
SECTIONS, EXTERNAL FINISHES & FENCE DETAILS

ISSUED FOR DEVELOPMENT APPLICATION

Project number	Sheet No.	Issue	Phase
21621	A05.01	B	DA

Sheet Size	Scale	L.G.A.
A1	As indicated	PENRITH

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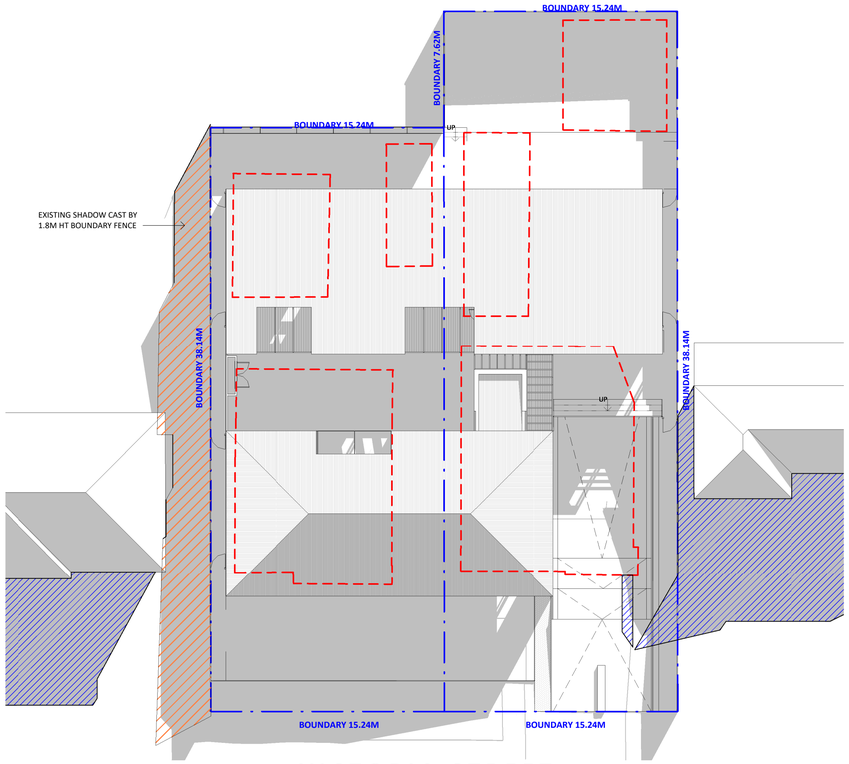
SH	AS/SS	01.09.21



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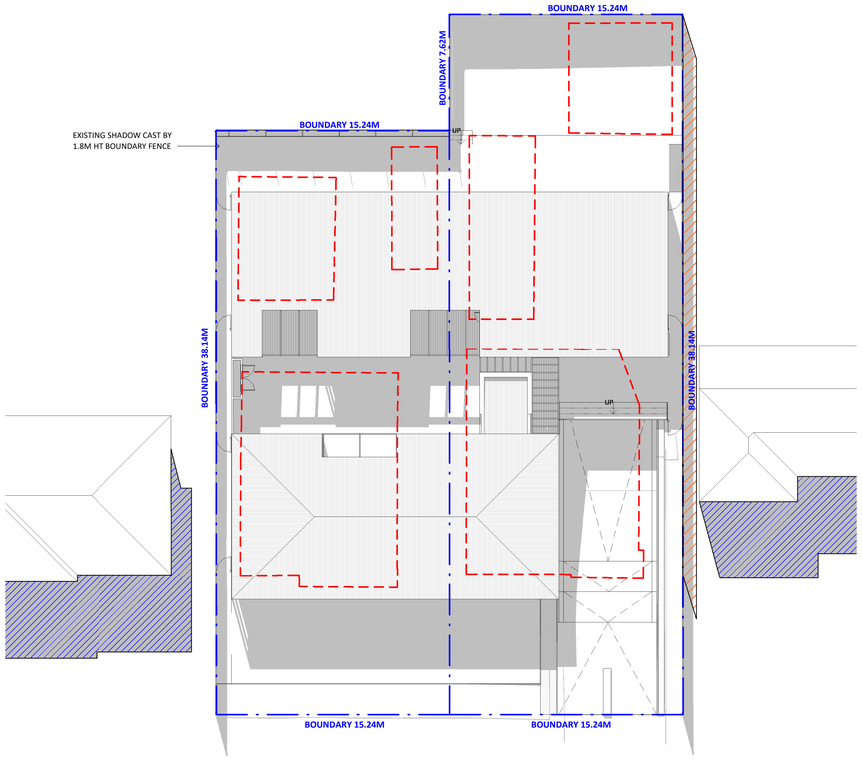

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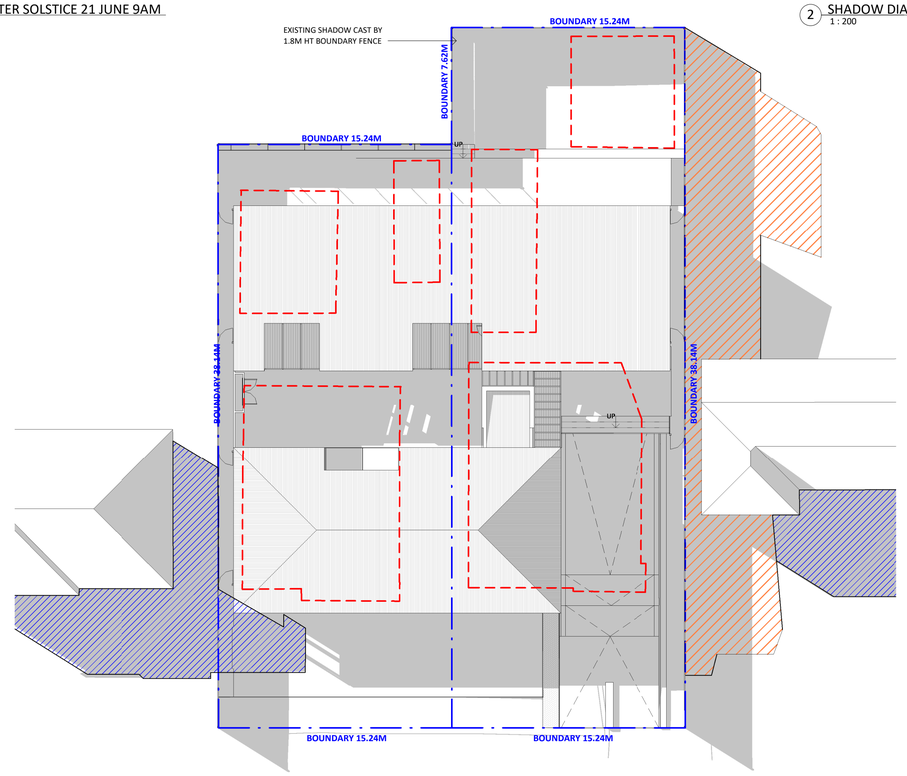

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1 : 200

0 1 2 4 6 8 10
1 : 200

SHADOW LEGEND

- EXISTING SHADOW CAST ON NEIGHBOURS
- EXISTING NEIGHBOUR SHADOW
- NEW SHADOW

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B	01.09.21	COUNCIL RFI
A	03.06.21	ISSUED FOR DEVELOPMENT APPLICATION

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PROJECT

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PROJECT ADDRESS

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SHADOW DIAGRAMS

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Project number	Sheet No.	Issue	Phase
21621	A06.01	B	DA

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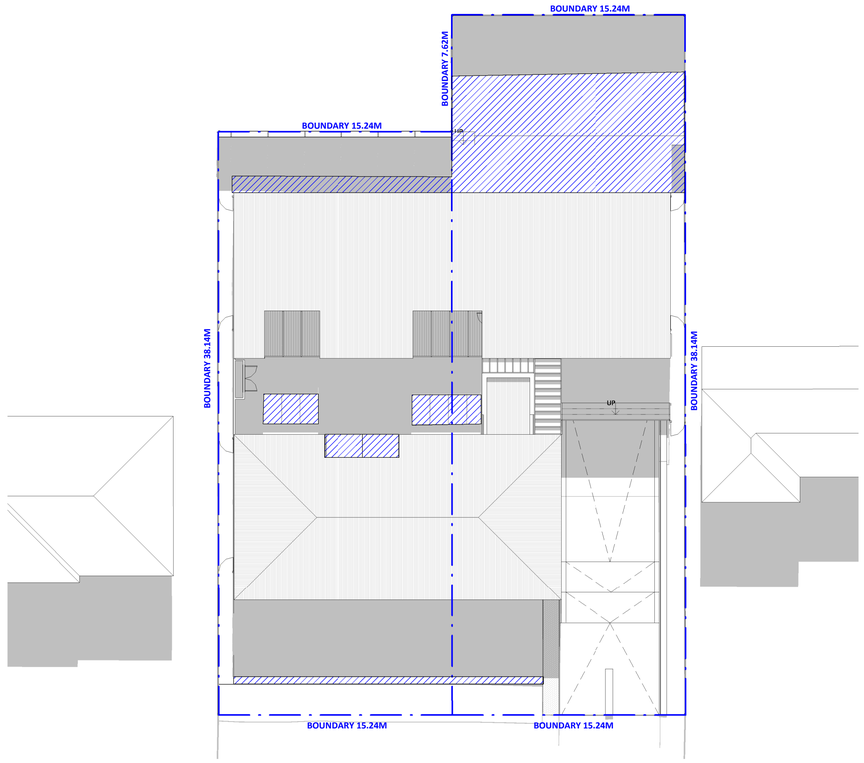
Drawn By	Checked By	Date
SH	AS/SS	01.09.21



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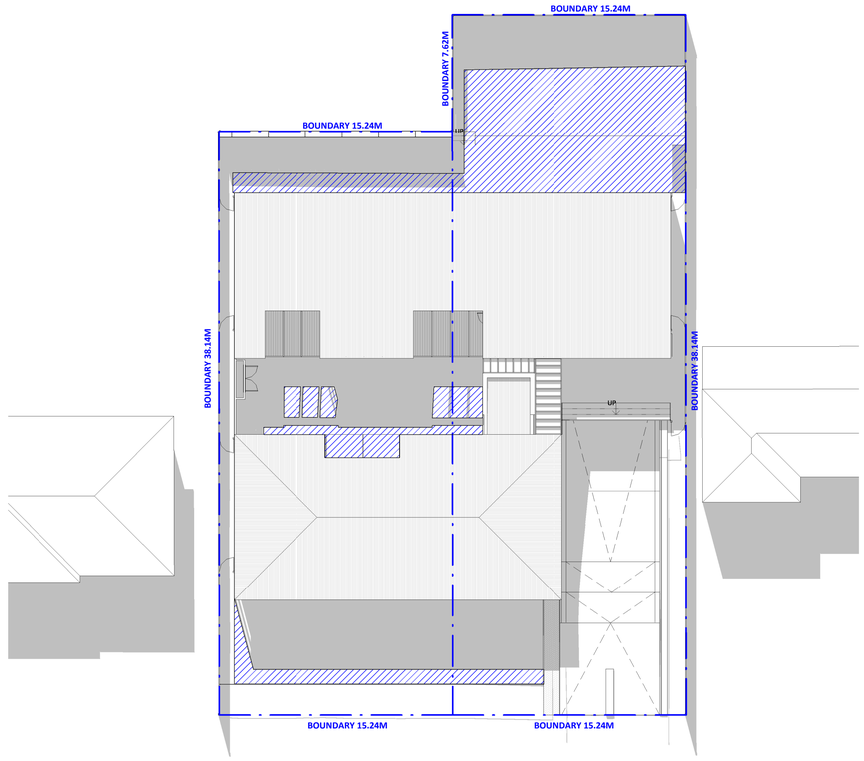

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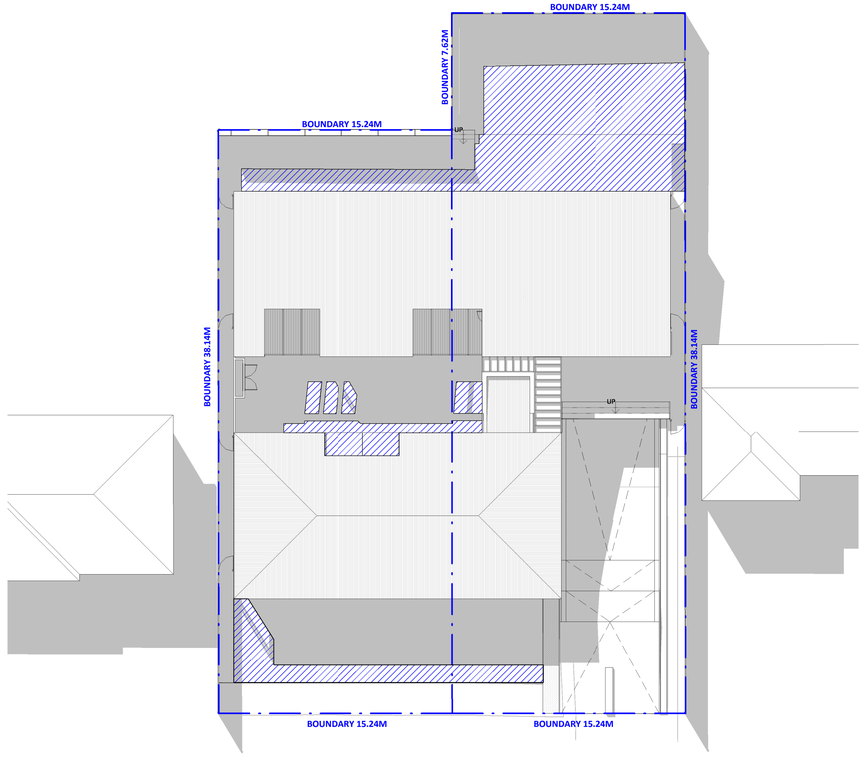

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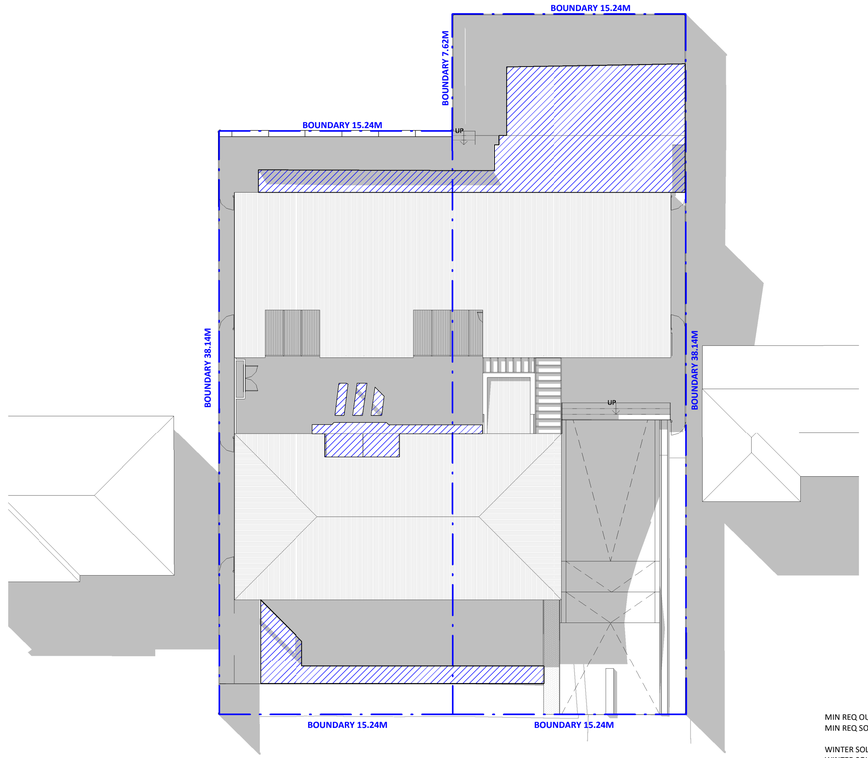

4 WINTER SOLSTICE_OUTDOOR SOLAR ACCESS 2PM
1 : 200

0 1 2 4 6 8 10
1 : 200

B	01.09.21	COUNCIL RFI
ISSUE	DATE	DESCRIPTION

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PROJECT
CHILDCARE CENTRE

PROJECT ADDRESS
97-99 VICTORIA STREET, WERINGTON 2747

SHEET NAME
OUTDOOR PLAY SOLAR CALC

MIN REQ OUTDOOR PLAY AREA	= 546M²
MIN REQ SOLAR TO OUTDOOR PLAY AREA	= 30% (163.8M²)
WINTER SOLSTICE 11AM	= 30% (165M²)
WINTER SOLSTICE 12PM	= 34% (186M²)
WINTER SOLSTICE 1PM	= 34% (189M²)
WINTER SOLSTICE 2PM	= 31% (169M²)

ISSUED FOR DEVELOPMENT APPLICATION

Project number	Sheet No.	Issue	Phase
21621	A06.02	B	DA

Sheet Size	Scale	L.G.A.
A1	1 : 200	PENRITH

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SH	AS/SS	01.09.21

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GLOSSARY OF ACOUSTICAL TERMS

ACOUSTICAL – Pertaining to the science of sound, including the generation, propagation, effects and control of both noise and vibration.

AMBIENT NOISE – The ambient noise level at a particular location is the overall environmental noise level caused by all noise sources in the area, both near and far, including road traffic, factories, wind in the trees, birds, insects, animals, etc.

AUDIBLE – means that a sound can be heard. However, there are a wide range of audibility grades, varying from "barely audible" to "just audible", "clearly audible" and "prominent". Chapter 83 of the NSW Environment Protection Authority – Environmental Noise Control Manual (1985) states:
"noise from a particular source might be offensive if it is clearly audible, distinct from the prevailing background noise and of a volume or character that a reasonable person would be conscious of the intrusion and find it annoying or disruptive".

It follows that the word "audible" in an environmental noise context means "clearly audible".

BACKGROUND NOISE LEVEL – Silence does not exist in the natural or the built-environment, only varying degrees of noise. The Background Noise Level is the average minimum dBA level of noise measured in the absence of the noise under investigation and any other short-term noises such as those caused by cicadas, lawnmowers, etc. It is quantified by the L_{A90} or the dBA noise level that is exceeded for 90 % of the measurement period (usually 15 minutes).

- **Assessment Background Level (ABL)** is the single figure background level representing each assessment period – day, evening and night (ie three assessment background levels are determined for each 24hr period of the monitoring period). Determination of the assessment background level is by calculating the tenth percentile (the lowest tenth percent value) of the background levels (L_{A90}) for each period (refer: NSW Industrial Noise Policy, 2000).
- **Rating Background Level (RBL)** as specified by the Environment Protection Authority is the overall single figure (L_{A90}) background noise level representing an assessment period (day, evening or night) over a monitoring period of (normally) three to seven days.

  The RBL for an assessment period is the median of the daily lowest tenth percentile of L_{90} background noise levels.

  If the measured background noise level is less than 30 dBA, then the Rating Background Level (RBL) is considered to be 30 dBA.

DECIBEL – The human ear has a vast sound-sensitivity range of over a thousand billion to one. The decibel is a logarithmic unit that allows this same range to be compressed into a somewhat more comprehensible range of 0 to 120 dB. The decibel is ten times the logarithm of the ratio of a sound level to a reference sound level. See also Sound Pressure Level and Sound Power Level.

Decibel noise levels cannot be added arithmetically since they are logarithmic numbers. If one machine is generating a noise level of 50 dBA, and another similar machine is placed beside it, the level will increase to 53 dBA, not 100 dBA. Ten similar machines placed side by side increase the sound level by 10 dBA, and one hundred machines increase the sound level by 20 dBA.

dBA – The human ear is less sensitive to low frequency sound than high frequency sound. We are most sensitive to high frequency sounds, such as a child's scream. Sound level meters have an inbuilt weighting network, termed the dBA scale, that approximates the human loudness response at quiet sound levels (roughly approximates the 40 phon equal loudness contour).

However, the dBA sound level provides a poor indication of loudness for sounds that are dominated by low frequency components (below 250 Hz). If the difference between the "C" weighted and the "A" weighted sound level is 15 dB or more, then the NSW Industrial Noise Policy recommends a 5 dBA penalty be applied to the measured dBA level.

dBC – The dBC scale of a sound level meter is similar to the dBA scale defined above, except that at high sound intensity levels, the human ear frequency response is more linear. The dBC scale approximates the 100 phon equal loudness contour.

EQUIVALENT CONTINUOUS NOISE LEVEL, L_{Aeq} – Many noises, such as road traffic or construction noise, vary continually in level over a period of time. More sophisticated sound level meters have an integrating electronic device inbuilt, which average the A weighted sound pressure levels over a period of time and then display the energy average or L_{Aeq} sound level. Because the decibel scale is a logarithmic ratio the higher noise levels have far more sound energy, and therefore the L_{Aeq} level tends to indicate an average which is strongly influenced by short term, high level noise events. Many studies show that human reaction to level-varying sounds tends to relate closely to the L_{Aeq} noise level.

FREE FIELD – This is a sound field not subject to significant reflection of acoustical energy. A free field over a reflecting plane is usually outdoors with the noise source resting on hard flat ground, and not closer than 6 metres to any large flat object such as a fence or wall; or inside an anechoic chamber.

FREQUENCY – The number of oscillations or cycles of a wave motion per unit time, the SI unit being the Hertz, or one cycle per second.

IMPACT ISOLATION CLASS (IIC) – The American Society for Testing and Materials (ASTM) has specified that the IIC of a floor/ceiling system shall be determined by operating an ISO 140 Standard Tapping Machine on the floor and measuring the noise generated in the room below. The IIC is a number found by fitting a reference curve to the measured octave band levels and then deducting the sound pressure level at 500 Hz from 110 decibels. Thus the higher the IIC, the better the impact sound isolation.

IMPACT SOUND INSULATION ($L_{nT,w}$) – Australian Standard AS ISO 717.2 – 2004 has specified that the Impact Sound Insulation of a floor/ceiling system be quantified by operating an ISO 140 Standard Tapping Machine on the floor and measuring the noise generated in the room below. The Weighted Standardised Impact Sound Pressure Level ($L_{nT,w}$) is the sound pressure level at 500 Hz for a reference curve fitted to the measured octave band levels. Thus the lower $L_{nT,w}$ the better the impact sound insulation.

IMPULSE NOISE – An impulse noise is typified by a sudden rise time and a rapid sound decay, such as a hammer blow, rifle shot or balloon burst.

INTRUSIVE NOISE LEVEL, L_{Aeq} – The level of noise from a factory, place of entertainment, etc. in NSW is assessed on the basis of the average maximum noise level, or the $L_{Aeq\ (15\ min)}$. This is the energy average A weighted noise level measured over any 15 minute period.

LOUDNESS – The degree to which a sound is audible to a listener is termed the loudness. The human ear perceives a 10 dBA noise level increase as a doubling of loudness and a 20 dBA noise increase as a quadrupling of the loudness.

MAXIMUM NOISE LEVEL, L_{Amax} – The rms maximum sound pressure level measured on the "A" scale of a sound level meter during a noise survey is the L_{Amax} noise level. It may be measured using either the Fast or Slow response time of the meter. This should be stated.

NOISE RATING NUMBERS – A set of empirically developed equal loudness curves has been adopted as Australian Standard AS1469-1983. These curves allow the loudness of a noise to be described with a single NR number. The Noise Rating number is that curve which touches the highest level on the measured spectrum of the subject noise. For broadband noise such as fans and engines, the NR number often equals the dBA level minus five.

NOISE – Noise is unwanted sound. Sound is wave motion within matter, be it gaseous, liquid or solid. "Noise includes sound and vibration".

NOISE REDUCTION COEFFICIENT – See: "Sound Absorption Coefficient".

OFFENSIVE NOISE - (Reference: Dictionary of the Protection of the Environment Operations Act 1997). *"Offensive Noise means noise:*

(a) that, by reason of its level, nature, character or quality, or the time at which it is made, or any other circumstances:

(i) is harmful to (or likely to be harmful to) a person who is outside the premise from which it is emitted, or

(ii) interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted, or

(b) that is of a level, nature, character or quality prescribed by the regulations or that is made at a time, or in other circumstances prescribed by the regulations."

PINK NOISE – Pink noise is a broadband noise with an equal amount of energy in each octave or third octave band width. Because of this, Pink Noise has more energy at the lower frequencies than White Noise and is used widely for Sound Transmission Loss testing.

REVERBERATION TIME, T_{60} – The time in seconds, after a sound signal has ceased, for the sound level inside a room to decay by 60 dB. The first 5 dB decay is often ignored, because of fluctuations that occur while reverberant sound conditions are being established in the room. The decay time for the next 30 dB is measured and the result doubled to determine the T_{60}. The Early Decay Time (EDT) is the slope of the decay curve in the first 10 dB normalised to 60 dB.

SOUND ABSORPTION COEFFICIENT, α – α Sound is absorbed in porous materials by the viscous conversion of sound energy to heat energy as the sound waves pass through it. Sound is similarly absorbed by the flexural bending of internally damped panels. The fraction of incident energy that is absorbed is termed the Sound Absorption Coefficient, α. An absorption coefficient of 0.9 indicates that 90 % of the incident sound energy is absorbed. The average α from 250 to 2000 Hz is termed the Noise Reduction Coefficient (NRC).

SOUND ATTENUATION – If an enclosure is placed around a machine, or a silencer is fitted to a duct, the noise emission is reduced or attenuated. An enclosure that attenuates the noise level by 30 dBA, reduces the sound energy by one thousand times.

SOUND EXPOSURE LEVEL (SEL) – The total sound energy of a single noise event condensed into a one second duration or in other words it is an L_{eq} (1 sec).

SOUND PRESSURE LEVEL, L_p – The level of sound measured on a sound level meter and expressed in decibels, dB, dBA, dBC, etc. $L_p = 20 \times \log (P/P_o)$ ... dB

where P is the rms sound pressure in Pascal and P_o is a reference sound pressure of 20 µPa. L_p varies with distance from a noise source.

SOUND POWER LEVEL, L_w – The Sound Power Level of a noise source is an absolute that does not vary with distance or with a different acoustic environment.

$L_w = L_p + 10 \log A$ ... dB, re: 1pW,
where A is the measurement noise-emission area in square metres in a free field.

SOUND TRANSMISSION CLASS (STC) – An internationally standardised method of rating the sound transmission loss of partition walls to indicate the decibels of noise reduction of a human voice from one side to the other. (Refer: Australian Standard AS1276 – 1979)

SOUND TRANSMISSION LOSS – The amount in decibels by which a random sound is reduced as it passes through a sound barrier. A method for the measurement of airborne Sound Transmission Loss of a building partition is given in Australian Standard AS1191 - 2002.

STATISTICAL EXCEEDENCE SOUND LEVELS, L_{A90}, L_{A10}, L_{A1}, etc – Noise which varies in level over a specific period of time (usually 15 minutes) may be quantified in terms of various statistical descriptors:

The L_{A90} is the dBA level exceeded for 90 % of the time. In NSW the L_{A90} is measured over periods of 15 minutes, and is used to describe the average minimum or background noise level.

The L_{A10} is the dBA level that is exceeded for 10 % of the time. In NSW the L_{A10} measured over a period of 10 to 15 minutes. It was until recently used to describe the average maximum noise level, but has largely been replaced by the L_{Aeq} for describing level-varying noise.

The L_{A1} is the dBA level that is exceeded for 1 % of the time. In NSW the L_{A1} may be used for describing short-term noise levels such as could cause sleep arousal during the night.

STEADY NOISE – Noise, which varies in level by 6 dBA or less, over the period of interest with the time-weighting set to "Fast", is considered to be "steady". (Refer AS 1055.1 1997)

WEIGHTED SOUND REDUCTION INDEX, R_w – This is a single number rating of the airborne sound insulation of a wall, partition or ceiling. The sound reduction is normally measured over a frequency range of 100 to 3,150 Hertz and averaged in accordance with ISO standard weighting curves (Refer AS/NZS 1276.1:1999).

Internal partition wall $R_w + C$ ratings are frequency weighted to simulate insulation from human voice noise. The $R_w + C$ is always similar in value to the STC rating value. External walls, doors and windows may be $R_w + C_{tr}$ rated to simulate insulation from road traffic noise. This is normally a lower number than the STC rating value.

WHITE NOISE – White noise is broadband random noise whose spectral density is constant across its entire frequency range. The sound power is the same for equal bandwidths from low to high frequencies. Because the higher frequency octave bands cover a wider spectrum, white noise has more energy at the higher frequencies and sounds like a hiss.