BGMA Pty Ltd

ABN 55 101 186 805
Consulting Acoustical Engineers
Unit 21 / 12 Meadow Crescent,
Meadowbank NSW 2114
Ph: 02 98090745
Mob: 0405 493 726
E-mail: bgma1@bigpond.com

ACOUSTICS ASSESSMENT

Child Care Centre

No. 9 Dunmore Street

Croydon Park NSW

Report: **BGMA 230214 B**

Date: **February 2024**

Prepared For: **Algeo Construction Group**

Prepared By: **Brian Marston**

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BGMA Pty Ltd

Introduction

BGMA Pty Ltd, acoustical consultants, have been engaged to prepare an acoustic assessment of the proposed development at **No. 9 Dunmore Street, Croydon Park NSW**. This report replaces previous report prepared in February 2023 (BGMA report 230214).

This revised child care centre is designed to accommodate thirty-two (32) children consisting of ten (10) "Infants", eight (8) "Toddlers", and fourteen (14) "Pre-Schoolers".

I have assumed that the centre will operate from 7:00 am to 6:00 pm (Monday to Friday) with first 'drop-off' no earlier than 7:00 am & and last 'pick-up' no later than 6:00 pm.

Area Description

The proposed child care centre is to be located on the western side of Dunmore Street about 135 metres south of the intersection of Dunmore Street with Georges River Road.

The alignment of Georges River Road is about 105 metres to the north-north-west. Brighton Avenue, a second major road, running north-south, is about 145 metres to the east. Dunmore Street has a substantially lower level of through-traffic.

Nearest Potentially Affected Residences

The side boundaries for this site are 45.72 metres long with the site being 15.24 meters wide (150 ft by 50 ft)).

The proposed child care centre building will be on two levels.

The front façade of the child care centre building is 17.66 metres from the front boundary.

The rear façade of the building is 39.69 metres from the front boundary, and 6.03 metres from the rear boundary.

The lower level of the child care centre will have a floor level at an RL elevation of 15.48 metres.

The upper level will have will have a floor level is at an RL elevation of 18.48 metres, with the eaves & internal ceiling at an RL elevation of 21.18 metres with roof ridge at 22.55 metres.

The nearest residence to the north (No. 7 Dunmore Street) extends between about 6 metre & 23.5 metres from the front boundary, at about 1.5 metres from the boundary.

The main body of the residence sits between about 6 metres & 15.5 metres from the front boundary. The rear façade of this residence is about 22 metres from the rear boundary.

The eaves of this residence are at an RL elevation of about 19 metres.

The recent removal of obscuring vegetation has exposed side facing windows with RL elevations between about 17.0 metres & 18.8 metres.

The front façade will extend 11 metres in front of the front façade of the child care centre, with the rear of the main body of the residence still to the fore of the front façade of the child care centre.

This northern site also has 'granny flat,' at the rear, extending between about 31.5 metre & 44.5 metres from the front boundary, 1.2 metres off the rear boundary, at 7 metres from the boundary.

The eaves of this small residence would be at an RL elevation of about 19 metres.

The rear façade of the child care centre is 6 metres from the rear boundary.

The nearest residence to the south (No. 11 Dunmore Street) extends between about 12 metre & 36 metres from the front boundary, at about 1.5 metres from the boundary.

The main body of the residence sits between about 15 metres & 29 metres from the front boundary.

The eaves of this residence are at an RL elevation of 20.3 metres.

The front façade extends 2 metres in front of the front façade of the child care centre building.

The top edges of windows in the north facing façade area listed as being up to RL elevations of about 17.2 metres & 20 metres.

The front façade extends 2 metres in front of the front façade of the child care centre building.

The nearest residence to the west (No. 10 Clyde Street) is about 15 metres from the rear boundary.

The potentially worst effected window faces the site at an RL elevation of between about 19.15 metres to 20.35 metres.

Building Description

The site is a rectangle 15.24 metres wide by 45.72 metres deep.

The building fits within an area 10.48 metres wide by 22.06 metres wide.

For the rear 6.215 metres of the building, this rear section is full width, at 10.48 metres wide. The building then tapers from 10.48 metres wide, down to 4.875 metres wide at the front.

The rear of the building is 6.03 metres from the rear boundary.

Along the southern side of the building, for the rear 8.175 metres, the wall is 1.69 metres from the southern boundary. The remainder of the southern wall is 1 metre from the southern boundary. This rear section is - 4.76 metres boundary to the north.

Upstairs, at the rear, the internal space extends 4.72 metres from the rear façade, across the rear, and 4.476 metres from the southern façade, leaving an open balcony area facing north.

The separation from the northern boundary expands out from 4.72 metres out to 8.53 metres over the 16.24 metres, toward the front.

The pitched roof over the child care centre is L-shaped providing an open-air balcony area of 58.6 square metres.

The eaves are at an RL elevation of 21.18 metres, and the ridge line is at an RL elevation of 22.55 metres. With a lower-level floor RL elevation at 15.48 metres, the eaves are at 5.7 metres higher, and the ridge line is 1.37 metres higher.

The entrance is at the eastern end facing the car park & the street.

Stepping into the reception area, a corridor extends west.

Moving passed the reception area, on the southern side of the corridor, the corridor provides access to the administration office, then the kitchen, each with windows to the south.

A 'cross-corridor' door, and the rest of the corridor gives access to a lift, and stairwell access to the upper level.

Opposite the stairs (northern side of the corridor) is the door to the **"Pre-Schoolers"** internal activity area (14 children – floor area 45.6 square metres). Access to the ground-level external activity area, is via two sliding glass doors in the skew northern wall.

The external activity area on the northern side of the building is about 115.5 square metres.

At the western end of the corridor is the door to the **"Infants"** internal activity area (10 "Infants" – floor area 40.2 square metres), which spans the rear of the building, with a 6-cot cot room in the south west corner. Access to the ground-level external activity area, is via two sliding glass doors in the rear facing western wall and one in the northern wall.

The external activity area on the western side of the building is about 92 square metres.

Between the "Pre-Schoolers" internal activity area and the "Infants" internal activity area is a shared toilet & nappy room (northern side) with swing door access to the northern outside area.

The lift and stairwell provide access to the upper level and a short east-west corridor.

To the east, on the southern side of the corridor is access to a toilet. At the eastern end of the corridor is a staffroom.

To the west is access to the **"Toddlers"** elevated internal activity area (8 "Toddlers" – floor area 43 square metres). This lies above the "Infants" internal activity area.

Opposite the lift (northern side of the corridor) is the door to the "Toddlers" external activity area. This lies above the "Infants" internal activity area (floor area 58.6 square metres).

The "Toddlers" internal activity area accesses the external activity area, via east-facing and north facing two sliding glass doors.

The following Sound Power Levels have been recommended for children in external activity areas:

- 10 children 0 to 2 years ("Infants") Sound Power Level of 77 to 80 dB(A)
- 10 children 2 to 3 years ("Toddlers") Sound Power Level of 83 to 87 dB(A)
- 10 children 3 to 6 years ("Pre-Schooler") Sound Power Level of 84 to 90 dB(A)

The calculated Sound Power Level produced by the children in the external activity area would be as follows:

- Ten (10) "Infants" could potentially generate a total Sound Power Level up to 80 dB(A) in the (ground level) external activity area to the west.
- Eight (8) "Toddlers" could potentially generate a total Sound Power Level up to 86 dB(A) on the *elevated* external activity area.
- Fourteen (14) "Pre-Schoolers" could potentially generate a total Sound Power Level up to 91.5 dB(A) in the (ground level) external activity area to the north.

For calculation purposes, we are required to assume 'worst case'.

The area occupied by the building & the external activity areas, stops 18.5 metres short of the front boundary.

In this area between the building and the front boundary is pedestrian access across the site and along the northern boundary, and parking (and parking access) for five (5) vehicles.

The edges of the parking spaces are between 0.4 metres from the southern boundary and 2.5 metres from the northern boundary. The driveway entrance to the carpark is 6 metre wide, 2 metres from the southern boundary and 7.42 metres from the northern boundary.

Aircraft Noise

The site is affected by aircraft noise.

Under a 'spread the noise' policy, departing aircraft follow one of three flight paths.

The direct flight path heads north at 12.5 degrees west of 'true north'. It doesn't impact on the site.

The other flight paths track west, at about 64 degrees west of 'true north'.

The nearest flight path passes about 400 metres to the south-south-west of the site.

The second flight path passes about 2,335 metres to the north-north-east.

Several aircraft were observed following this second flight path during on-site measurement period.

According to Standards Australia standard *AS 2021:2015 "Acoustics -Aircraft Noise Intrusion -Building Siting and Construction*", the site will be exposed to an $L_{Amax(slow)}$ noise level of 78 dB(A) from the south-south-west. This makes the perpendicular at about 20 degrees to the alignment of the rear boundary.

Roof top $L_{Amax(slow)}$ noise exposure of 77.7 dB(A); southern side wall $L_{Amax(slow)}$ noise exposure of 73.2 dB(A) to 75 dB(A); elsewhere $L_{Amax(slow)}$ noise exposure of 70 dB(A).

Effect of Aircraft Noise on Construction

The building was reviewed in accordance with the requirements of *AS 2021:2015*.

For the "Infants" internal activity area, the walls require a minimum Rw rating of 30. The west facing door requires a minimum Rw rating of 34. The north facing door requires a minimum Rw rating of 32.

For the cot room, the southern wall requires a minimum Rw rating of 40, and west facing door requires a minimum Rw rating of 31.

For the shared toilet, the northern wall requires a minimum Rw rating of 26, and the roof/ceiling requires a minimum Rw rating of 36. The north facing door requires a minimum Rw rating of 20.

For the "Pre-Schoolers" internal activity area, the walls require a minimum Rw rating of 36 and the roof/ceiling requires a minimum Rw rating of 47. The north facing doors require a minimum Rw rating of 34. The east facing window requires a minimum Rw rating of 24.

Around the administration area & amenities area, the wall construction appears to be externally clad with brickwork, with the proposed wall construction having an Rw rating of about 45.

Around reception, the walls require a minimum Rw rating of 37. The south facing window requires a minimum Rw rating of 31. Around the Admin Office, the wall requires a minimum Rw rating of 37. The east facing doors and the south facing window require a minimum Rw rating of 30. Around kitchen, the wall requires a minimum Rw rating of 33. The south facing window require a minimum Rw rating of 30.

Upstairs, the wall constructions appear to be light-weight construction.

Around the staff room, the walls require a minimum Rw rating of 35 to the east, 38 to the north, and 42 to the south. The east facing window and the north facing window require a minimum Rw rating of 32. The roof/ceiling requires a minimum Rw rating of 48.

Around the toilet, the south facing wall requires a minimum Rw rating of 38. The south facing window requires a minimum Rw rating of 27. The roof/ceiling requires a minimum Rw rating of 42.

Around the lobby, the south facing wall requires a minimum Rw rating of 30. The north facing wall requires a minimum Rw rating of 32. The south facing windows require a minimum Rw rating of 33. The north facing window require a minimum Rw rating of 30. The south facing door requires a minimum Rw rating of 25. The roof/ceiling requires a minimum Rw rating of 44.

Around the "Toddlers" internal activity room, the walls require a minimum Rw rating of 27 to the east, 36 to the west, 29 to the north, and 42 to the south. The west facing window require a Rw rating of 34. The north facing doors and the east facing doors require a minimum Rw rating of 34. The roof/ceiling requires a minimum Rw rating of 50.

Around the toilet off the "Toddlers" internal activity room, the walls require a minimum Rw rating of 34 to the east, 33 to the west, and 38 to the north. The west facing window require a Rw rating of 32. The north facing window requires a Rw rating of 30. The east facing door requires a minimum Rw rating of 30. The roof/ceiling requires a minimum Rw rating of 46.

The floor of the upstairs external activity area needs an Rw rating of 47.

The pitched roof/ceiling of the upstairs area requires a Rw rating of 48 over the staff room, 50 over the internal activity area and 46 over the external activity area toilet. Over the lobby and the toilet area, the required Rw rating is 43.

The roof/ceiling construction can be readily achieved with a construction, such as CSR 6413, with cladding with Anticon above, and a double layers of 10 mm Gyprock Superchek Plasterboard below with the plasterboard direct fixed to the joists below, plus 185 Gold Batts 3.5 or 215 Gold Batts 4.1 located between the joists (provided it achieves BASIX & fire requirements).

Any glazing with Rw rating over 27, but less than 36, is likely to be of a single layer of laminated glass.

Noise Criteria - General

I have assumed that the child care centre will operate 7:00 am to 6:00 pm, Monday to Friday inclusive.

The noise criteria must cover the noise emissions from the child care centre to other premises, and from external noise to the child care centre.

For private residences unaffected by traffic noise, the NSW **Noise Policy for Industry** (October 2017) indicates a recommended 'free-field' $L_{Aeq,1hr}$ noise limit of 55 dB(A) in suburban areas.

Within childcare centres, it is recommended that 'sleeping areas' have a $L_{Aeq,T}$ noise level of 35 dB(A) or less and that other areas have a $L_{Aeq,T}$ noise level of 40 dB(A) or less.

A 'Sleep disturbance' criterion indicates that internal L_{Amax} levels of 50 to 55 dB(A) are acceptable in sleeping areas.

For aircraft noise intrusion, the internal $L_{Amax(slow)}$ noise level is 50 dB(A).

A $L_{Aeq,T}$ internal noise intrusion limit of 35 dB(A) applies to the cot room with an L_{Amax} limit of 50 dB(A).

Elsewhere, the $L_{Aeq,T}$ internal noise intrusion limit would be 40 dB(A) with $L_{Amax(fast)}$ limit of 55 dB(A). For aircraft noise intrusion, the internal $L_{Amax(slow)}$ noise limit is 50 dB(A).

Environmental Background Noise Levels

Attended noise levels were obtained at site on Friday 10th June March from 2:00 pm to 3:00 pm. Over many years of environmental noise measurement, I have found the environmental 'background' noise level, at this time of day, truly representative of the 'background' across the operating hours of child care centres.

The monitor was located in front of the site, 2 metres from the front boundary and 2.5 metres from the kerb, about 7.75 metres from the centreline of Dunmore Street.

Noise levels were measured using a 01dB-Stell "Symphonie" (S/N #01481) attached to an Acer Aspire 3681 WXM1 portable computer (model ZR1; S/N LXAP0506063604D772500). The microphone and pre-amp were 01dB-Stell pre-amplifier (S/N 011280) and microphone (S/N 18528). Calibration was checked with a Svantek SV 30A acoustical calibrator (S/N 7942). No significant system drift was observed.

There was no rain or wind during the measurement period and thus the measurements were not impacted by meteorological contamination. The attended noise monitoring permitted the identification of extraneous noise sources and the removal of same in accordance with AS 1055.

The following is a table of the measured environmental noise levels.

Table 1 — Measured Environmental Noise Levels

Time Intervals	Standard Noise Descriptors for 15-minute Measurement Periods in dB(A)					
	L_{Aeq}	L_{Amax}	L_{A01}	L_{A10}	L_{A90}	L_{Amin}
2:00 pm – 2:15 pm	56.0	77.6	68.2	59.9	43.2	38.6
2:15 pm – 2:30 pm	56.8	75.4	69.1	59.4	42.7	38.3
2:30 pm – 2:45 pm	54.7	76.6	67.3	55.9	43.2	38.5
2:45 pm – 3:00 pm	55.8	76.3	68.5	56.5	43.8	41.6
1 hour	55.9	77.6	68.4	57.8	43.2	38.3

There was very little variation period to period for each of the descriptors.

The L_{Amax} noise levels were associated with larger vehicles passing the site at up to 77.6 dB(A) at 7.75 metres for a Sound Power Level of 95 dB(A). Smaller sedan type vehicles were generally 68.4 dB(A) at 7.75 metres for a Sound Power Level of 85 dB(A).

The $L_{Aeq,15min}$ noise levels was 56 dB(A) at 7.75 metres.

As the $L_{Aeq,15min}$ noise levels were dominated by the noise of passing traffic, the $L_{Aeq,15min}$ noise levels can be adjusted by distance from the street.

Along Dunmore Street, the residences are typically setback about 6 metres from their front boundaries and about 15.75 metres from the centreline of Dunmore Street, where most of the traffic drives. The revised $L_{Aeq,15min}$ noise level becomes 53 dB(A) in line with the typical 6 metre setback.

For private residences unaffected by high levels of traffic noise, the NSW *Noise Policy for Industry* (Oct 2017) indicates a recommended 'free-field' $L_{Aeq,1hr}$ noise limit of 55 dB(A) in suburban areas.

The 'project' amenity 'free-field' $L_{Aeq,1hr}$ noise limit is therefore 50 dB(A) in this suburban area.

The $L_{A90,15min}$ noise level was 43 dB(A) and showed a variation of only ± 0.5 dB(A). The $L_{A90,15min}$ noise level indicates the environmental 'background' across this entire area.

The $L_{A90,15min}$ noise level is 43 dB(A) producing an Intrusiveness $L_{Aeq,15min}$ noise limit of 48 dB(A).

Between the project amenity 'free-field' $L_{Aeq,1hr}$ noise limit of 50 dB(A) and the 'intrusiveness' noise limit of 48 dB(A), the 'free-field' $L_{Aeq,1hr}$ noise limit becomes 48 dB(A).

Vehicle Movement

From the information provided, the child care centre requires six (6) staff directly supervising the children, plus an additional two (2) for kitchen and admin/reception. These will arrive either by foot, drop-off or self-drive.

The arrival & departure of thirty-two (32) children will generate traffic noise.

According to the RTA NSW "Guide to Traffic Generation", the amount of traffic generated by a child care centre is:

- 0.8 trips per child per hour between 7:00 a.m. and 9:00 a.m.
- 0.3 trips per child per hour between 2:30 p.m. and 4:00 p.m.
- 0.7 trips per child per hour between 4:00 p.m. and 6:00 a.m.

A trip is either a vehicle entering the site, or a vehicle leaving the site.

For 33 children, the 'hourly peak' traffic generation could be:

- 13 vehicles per hour (7:00 am to 9:00 am)
- 5 vehicles per hour (2:30 pm to 4:00 pm)
- 11 vehicles per hour (4:00 pm to 6:00 pm)

For childcare centres, drop-offs and pick-up times tend to be staggered across the above periods due to the varying needs of the parents and guardians. Actual vehicle numbers may be less due to some arriving / departing by other modes of transport. During drop-off & sign-in, vehicles are likely to be parked for 10 to 15 minutes.

Each of the places closest to child care centre entrance will thus have up to 4 to 6 vehicles per hour. With four standard parking spaces on site, the car park should be able to handle 12 to 18 vehicles per hour.

The entrance doorway to the child care centre is between about 4.75 metres from the southern boundary. The centreline of the (1) disabled visitor parking space about 3.5 metres from the northern boundary, and the centrelines of the remaining four (4) visitor parking spaces between about 1.8 metres and 9 metres of the southern boundary.

Measurements indicate that from a vehicle during pick-up or drop off, the Single Event Level (SEL) Sound Power Level is 97 dB(A) for arrival and departure.

*An SEL is **NOT** a measure of instantaneous noise level. It is the acoustic energy content of an event, 'normalised' to a 1-second period for engineering calculation purposes.*

Based on the above, the calculated worst case 'free field' $L_{Aeq,1hr}$ (childcare traffic) exposure could be 41 to 42 dB(A) to the nearest residential facade to the south and 37 to 39 dB(A) to the nearest residential façade to the north. Close to the front façade of the child care centre, the 'free field' $L_{Aeq,1hr}$ traffic noise would be 49 dB(A) against a 'free field' $L_{A90,1hr}$ environmental "background" level of 43 dB(A).

In traffic noise assessment, there needs to be 300 or more traffic by-pass events for there to be a pseudo-constant L_{Aeq} noise level. Assessment car park movement by L_{Aeq} noise level is not really a valid approach.

The L_{Amax} noise levels of passing larger vehicles would be 58 dB(A) and 49 dB(A) from passing smaller sedan type vehicles.

The morning & late afternoon traffic movements (associated with the childcare centre) are likely to coincide with morning & afternoon peak periods.

Vehicles moving at 20 kph or less would typically produce transient L_{Amax} noise levels of up to 60 to 65 dB(A) at 5 metres from the vehicle.

'Start up' noise is typically 60 to 65 dB(A) at 5 metres from the vehicle. Door closure (when entering into or alighting from a vehicle) typically produces a transient L_{Amax} noise levels of 70 to 75 dB(A) at 5 metres from the vehicle door.

Passing traffic would produce traffic L_{Amax} noise levels of 49 dB(A) (smaller vehicles) to 58 dB(A) (larger vehicles) down the side of the nearest residence.

Without any barrier, vehicle start-up & movement in the car park could produce transient L_{Amax} noise levels up to 66 dB(A) with car door closure noise up to 76 dB(A) to the nearest residences.

With a barrier (2.7 metres high) in place, vehicle start-up & movement in the car park could be reduced to transient L_{Amax} noise levels of about 59 dB(A) with unrestricted car doors closure noises of up to 69 dB(A). [This minimum height may be superseded by other requirements].

With the above barrier in place, single vehicle movement noise would be similar to that of the louder passing traffic, and, if the driver arrives before 7:00 am, the driver would need to take extra care in gentle door closure on alighting.

Clients arriving after 7:00 am would not be a source of 'sleep disturbance' even if the residences have bedrooms overlooking the car park.

Noise Emissions – Internal Activity Areas

Before addressing the noise levels in the external activity areas, it is necessary to address the internal noise levels within the internal activity areas.

Noise measurements of children inside an operating "play centre" were obtained with young children allowed to play freely, unconstrained with minimal supervision, to provide baseline spectral data. The children were generally at a distance of between 2 and 5 metres.

These noise levels would be akin to those normally encountered INSIDE a child care centre during noisier activities.

L_{A01} noise levels are the A-weighted noise level exceeded for 1% of the time, approximating "typical" maximum noise levels. L_{A10} noise levels are the A-weighted environmental noise level exceeded for 10% of the time, and approximate the average of the maximum noise levels. L_{A90} noise levels are the A-weighted noise level exceeded for 90% of the time, and approximate the average of the minimum noise levels recorded. L_{Aeq} noise levels are the A-weighted continuous noise level that would contain the same average energy as the varying sound level across the measurement period

These results are summarised, on an octave band basis.

Measured Sound Pressure Levels of Unrestrained Young Children at Play

	Octave Band Centre Frequencies Plus A-weighted Level								
	63	125	250	500	1000	2000	4000	8000	A
Descriptors	Linear Sound Pressure Levels plus the Overall A-weighted Sound Level								
$L_{01,\ 15\ min}$	73	73	71	72	79	79	70	61	83
$L_{10,\ 15\ min}$	66	66	63	66	71	70	62	52	75
$L_{90,\ 15\ min}$	55	56	55	57	58	56	51	41	62
$L_{Eq,\ 15\ min}$	64	64	62	63	68	68	61	50	73

The $L_{A01,15min}$ noise levels occur for nine seconds or less, in each 15-minute period.

Even the $L_{A10,15min}$ noise levels only occur for 90 seconds in each 15-minute period.

The measurements were analysed on a one-third-octave band centre-frequency basis to assess potential noise emission tonality. The spectrums were found to be non-tonal, according to the recognised EPA procedure.

These measurements were taken within a play area where children were permitted to play, without close supervision. ***These noise levels are provided as 'worst case'***.

The $L_{Aeq,15min}$ noise spectrum in the table above would be representative of the noise emissions normally encountered INSIDE a child care centre during noisier activities.

These internal $L_{Aeq,15min}$ noise levels have been confirmed by review of research papers relating to child care centre operations elsewhere.

These noise levels are likely to occur occasionally inside the internal activity rooms, within the childcare centre building. These noise levels are NOT likely to occur outside in the external activity areas of the childcare centre, due to the level of professional supervision required.

In accordance with current trends in noise assessment, the assessment is carried out on a $L_{Aeq,15min}$ basis, utilising a L_{Aeq} noise level of 73 dB(A), as the general internal reverberant sound level.

Noise Emissions from the Building

Noise from Internal Activity Rooms and associated External Activity Areas

The external noise emissions from the "Infants" are dominated by either, the noise breakout from the "Infants" internal activity area (via the doors & windows), or the noise emissions from the ground level external activity area across the rear of the site.

The external noise emissions from the "Pre-Schoolers" are dominated by either, the noise breakout from the "Pre-Schoolers" internal activity area (via the doors & windows), or the noise emissions from the ground level external activity area on the norther side of the building.

The external noise emissions from the "Toddlers" are dominated by either, the noise breakout from the "Toddlers" internal activity area (via the doors & windows), or the noise emissions from the elevated external activity area.

An internal $L_{Aeq,15min}$ noise level of 73 dB(A) is used to calculate external noise levels from each of the internal activity rooms (with doors and or windows fully open). The Rw rating for the external walls & roof construction and for the doors and windows are taken from the minimum required Rw ratings for aircraft noise exclusion.

When outside, the sum total Sound Power Level produced by the children (in the external activity area) is taken as 80 dB(A) for the "Infants", as 86 dB(A) for the "Toddlers" and as 91.5 dB(A) for the "Pre-Schoolers".

Noise from "Toddlers" Internal Activity Rooms and Associated External Activity Areas

The external activity area of the "Toddlers" is semi-enclosed with overhanging eaves and a barrier along one side 1.6 metres tall. This makes this a reverberant space with a reverberation time of about 0.3 seconds and room-radius of about 2.325 metres. I have assumed that this area is covered with 'soft fall' matting.

With the doors open, the reverberant sound pressure levels within this space could be as high as 69 dB(A). With no boundary noise barrier, the noise level to the residence to the north-east is likely to be 46 dB(A).

With the children outside, the reverberant sound pressure level within this space could be as high as 73.5 dB(A).

With no boundary noise barrier, the noise level to the 'granny flat to the north and to the residence to the north-east is likely to be **50.5** dB(A). The noise from the open doors is likely to be **45.5** dB(A).

The noise level to the residence across the southern boundary is likely to be **43** dB(A) due to the barrier effect of the roof ridge. The noise from the open doors is likely to be **38.5** dB(A).

The noise level to the residence across the western boundary is likely to be **32** dB(A) due to the barrier effect of the roof ridge. The noise from the open doors is likely to be **27** dB(A).

The 'free-field' $L_{Aeq,1hr}$ noise limit is 48 dB(A).

The "Toddlers" internal activity area has three small windows & one large window facing west. With the three small windows open, the sound pressure level would be 54 dB(A) to the southern boundary and 49 dB(A) to the western boundary. With the large window open to 50%, the sound pressure level would be 44 dB(A) to the southern boundary and 47 dB(A) to the western boundary.

The 'free-field' $L_{Aeq,1hr}$ noise limit is 48 dB(A).

The west facing windows are elevated and would need to be closed so as not to adversely impact on the boundary noise limits. They would also need to be closed so as not to exceed internal aircraft noise limits.

Noise from "Infants" Internal Activity Rooms and Associated External Activity Areas

The "Infants" internal activity area has one sliding glass door to the north & two sliding glass doors to the west. Fully open each door, each would have an open area of 4.2 square metres. For an internal $L_{Aeq,15min}$ sound level of 73 dB(A), each door would cause a sound pressure level of 56 to 57 dB(A) to the nearest boundary.

The 'free-field' $L_{Aeq,1hr}$ noise limit is 48 dB(A).

The doors would need to be closed, so as not to adversely impact on the boundary noise limits.

They would also need to be closed so as not to exceed internal aircraft noise limits.

The external activity area for the "Infants" is the area across the rear of the site (6 metres by 15.24 metres). The sound power allocated to this area due to infant vocalisation is 80 dB(A) from ten (10) infants.

The sound pressure level to the northern & southern boundary would be 58 dB(A). The sound pressure level to the western boundary would be 61 dB(A).

Potentially impacted residences are the 'granny flat' to the north (7 metres from the boundary) and a residence to the west 15 metres from the boundary).

The sound pressure level to these nearest residences, even without any barrier, would be 49 dB(A) to the 'granny flat' & 47 dB(A) to the western residence.

The 'free-field' $L_{Aeq,1hr}$ noise limit is 48 dB(A).

A standing person 3 metres beyond a barrier, 1.8 metres high, would be exposed to 40 dB(A) to the west and 45 dB(A) to the north & south. With a barrier 1.8 metres high, this would not impact residents standing outside on the other side of the northern, southern & western boundaries.

Any 'line-of sight' barrier will reduce these levels by 5 dB(A) to nearby residences.

For 'infants' external activity vocalisation noise, a barrier, 2.7 metres high, will be required across the western boundary.

The 'free-field' $L_{Aeq,1hr}$ noise limit is 48 dB(A).

Noise from "Pre-Schoolers" Internal Activity Rooms and Associated External Activity Areas

The "Pre-Schoolers" internal activity area has two sliding glass doors facing to the north-north-east.

Fully open each door, each would have an open area of 4.2 square metres. For an internal $L_{Aeq,15min}$ sound level of 73 dB(A), each door would cause a sound pressure level of 52 to 55 dB(A) to the nearest boundary.

With a barrier 1.8 metres high, this would not impact residents standing outside on the other side of the northern boundary.

The 'free-field' $L_{Aeq,1hr}$ noise limit is 48 dB(A).

The external activity area for the "Pre-Schoolers" is the area to the north of the building. The sound power allocated to this area due to infant vocalisation is 91.5 dB(A) from fourteen (14) pre-schoolers.

The sound pressure level would be 59 dB(A) to the western boundary [limit plus 11 dB], and 68 dB(A) to the northern boundary.

The external activity area is at an RL elevation of 15.5 metres.

The residence immediately across the northern boundary has an eaves height of 19 metres. The eaves of this building are 3.5 metres above the ground level of the external activity area. With no barrier to reduce noise levels, the sound pressure level to this residence would be 64 dB(A).

The next residence to the north has an eaves height of about 23.5 metres. The eaves of this building are 8 metres above the ground level of the external activity area. With no barrier to reduce noise levels, the sound pressure level to this residence would be 56 dB(A).

The residence to the west has a possible eaves height of about 20.5 metres. The eaves of this building are 5 metres above the ground level of the external activity area. With no barrier to reduce noise levels, the sound pressure level to this residence would be 53 dB(A).

The 'free-field' $L_{Aeq,1hr}$ noise limit is 48 dB(A).

The top of a noise barrier will need to be 3.5 metres above the RL level of the child care centre ground level to address noise emissions to the north and to the west.

The barrier will need to extend about 35 metres to the east, stopping 11 metres short of the front boundary. It will also need to extend south about 5 metres from the north-east corner across the rear boundary.

Traffic Noise Impacting External Activity Area

The $L_{Aeq,15min}$ traffic noise level exposure from Dunmore Street would be 'free field' sound pressure level of 48 dB(A) at the front boundary of the external activity area. The L_{Amax} traffic noise level exposure at the front boundary of the external activity area would be only 68 dB(A)

The limit for $L_{Aeq,15min}$ noise exposure due to passing traffic is 55 dB(A).

Heating, Cooling and Ventilation

Councils will often express a concern that doors & closed windows will impair internal ventilation.

While 'natural ventilation' & 'cross ventilation' are desirable attributes, the acoustic limits are a legal requirement.

Provision of air movement within a space can be addressed by ceiling fans, if required. Provision of fresh air can be addressed by alternate mechanical means, if not available by other means.

Air conditioners address "thermal comfort levels". "Ventilation" addresses air exchange rates within a space.

Ducted air-conditioning systems often include both thermal comfort, air flow & air exchange.

While the child care centre should be able to operate with doors open (noise emissions from inside to outside), with the appropriate barriers, the doors & windows **will need to be closed** to exclude aircraft noise.

The doors are likely to be closed, at most times, to address adverse weather conditions and to control the movement of children within & around the centre.

Air conditioning of internal spaces is likely to occur, taking into consideration the winter time & summer time temperatures experienced across this area.

The drawings supplied indicate an external air-conditioning heat exchanger(s) on the southern side of the child care centre building toward the western end.

> *External air-conditioning heat-exchangers **should not be** installed along the southern side of the child care centre building, due to the close proximity of that nearest neighbour at No. 11 Dunmore Street.*
>
> Where buildings are in close proximity, a noise source located between two closely spaced buildings can lead to considerable acoustic build-up in the gap between the buildings.
>
> *Commercial-grade air-conditioning heat-exchangers have (individually) a Rated Sound Power Levels up to 80 dB(A) but would each cause a sound pressure level of 71 to 72 dB(A) anywhere between the two buildings.*
>
> *Residential-type air-conditioning heat-exchangers tend to be quieter (individually) with Rated Sound Power Levels down to 70 dB(A) but would each cause a sound pressure level of 61 to 62 dB(A) anywhere between the two buildings.*

For a Rated Sound Power Level of 70 dB(A), an external air conditioning condenser unit located at ground level against a wall, fronting a wide-open area, will produce a sound pressure level of 65 dB(A) at 1 metre and only require a distance of 7.5 metres to fall below 48 dB(A).

The drawings supplied also indicate a "hot water" system.

Gas or electric hot-water systems tend to be rather quiet, but extreme care should be exercised in installing heat-pump hot-water systems.

> *Residential heat-pump hot-water systems typically have Rated Sound Power Levels of about 60 to 65 dB(A). A heat-pump hot-water system on the southern side of the child care centre building, would most likely produce sound pressure levels of 53 to 58 dB(A) anywhere between the two buildings along the southern boundary.*

Any external mechanical noise source will need to be located, so as to comply with Council noise limits.

Boundary Fences

Due to the slope of the street and the close proximity of No. 7 Dunmore Street across the northern boundary, an acoustic barrier is required along the northern boundary, and along part of the western boundary.

The remainder of the rear boundary and southern boundary require only a 1.8 metres high barrier.

> An **acoustic barrier (3.5 metres high)** is required for the first 35 metres of the northern (side) boundary, starting at the north west corner of the site.
>
> An **acoustic barrier (3.5 metres high)** is required for the first 5 metres along the rear boundary, from the north west corner of the site.
>
> An **acoustic barrier (2.7 metres high)** is required for the remainder of the rear boundary, and also extend along the southern side of the western external activity area, with a return to the side of the building.

Acoustic barriers can take several forms but need to be of solid, well-sealed, construction.

The barrier can be continuous top-to-bottom, or of mixed construction.

> *It is a general requirement to provide an opaque barrier between properties (to a minimum height 1.8 metres). Where an acoustic barrier needs to be of greater height, glass or acrylic should be considered (minimum thickness 6 mm) to retain a neighbour's visual amenity.*

The upper portion can be angled at 45 degrees to minimise the visual impact to neighbours, but this should be done without diminishing the height required. When an angled top is used, care is required to avoid "solar glare" due to reflected sunlight.

Noise Management Plan

Each child care centre should have a Noise Management Plan, where there is a perceived potential that noise emissions from the child care centre may cause disturbance to neighbours.

Such Noise Management Plans provide guidance to parents and guardians on how they should behave when visiting the centre.

Such Noise Management Plans provide guidance to staff and operators on how the centre should operate.

Such Noise Management Plans provide guidance to operator should interact with the local community and Local Council.

Appendix A contains an example Noise Management Plan that can be used in the development of an overall Operating Manual for the centre.

Discussion

This report is based on plans provided by Ellis Studio Architects (dated 09/11/2023).

Due to the close proximity of the residence at No. 7 Dunmore Street, and the elevated window heights of residences at No. 10 Clyde Street, and No. 7 Dunmore Street & No. 5 Dunmore Street, it is necessary to specify tall acoustic barriers on both the northern and western boundaries.

The neighbour to the south, at No. 11 Dunmore Street, is shielded by the barrier effect of the child care centre building.

Mechanical noise emissions need to be considered along with noise emissions due to child vocalisation.

The air conditioning unit will need to be relocated and the new location acoustically assessed. Should heat-pump hot-water system be installed, this will also need to be acoustically assessed.

Neither should be permitted in the narrow gap between the southern side of the child care centre and the residence at No. 11 Dunmore Street.

The ventilation engineer should be made aware of the boundary line noise limit, and the requirements to keep doors and windows closed for exclusion of aircraft noise.

The acoustic performances of the external building elements are controlled by the proximity of flight paths associated with Kingsford Smith Airport. The minimum required Rw ratings for walls, roof sections, doors and windows are included earlier within this report.

Appropriate wall and roof constructions can be obtained from material suppliers such as CSR, Boral and James Hardies.

Glazing (windows & sliding glass doors) should be obtained from suppliers fully conversant with the acoustic performance of their fully assembled door and/or window units.

No glass door or window should be selected on glass thickness alone.

BGMA Pty Ltd is of the professional opinion that the proposed child care centre will not adversely impact on any of the surrounding residences, provided that the recommendations contained within this report are implemented.

Brian Marston MAAS
Principal Acoustic Consultant
BGMA Pty Ltd

Professional Affiliations & Qualifications

A practicing Acoustical Consultant		since 1981
Full member	*Institution of Engineers Australia (IEAust)* & CPEng	since 1986
Full member	*Australian Acoustical Society (AAS)*	since 1988
Full Member	*Acoustical Society of America (ASA)*	since 2007

A member of the international professional body of acoustical consultants, the *National Council of Acoustical Consultants* since 1999

APPENDIX A

NOISE MANAGEMENT PLAN FOR CHILD CARE CENTRE

The childcare centre should not become a source of 'offensive noise' impacting adversely on the acoustic amenity of neighbouring premises.

Children

No children should be left unattended in the car park. Any visitor to the child care centre should refrain from loud conversation on the car park area.

Time out-of-doors is an essential component of the child's experience of the Centre.

Whilst active play is encouraged; screaming & shouting is not. This type of behaviour can be intimidating to other children, and can be disturbing to neighbours.

Children who persist in such behaviour may need to be excluded from outdoor activities.

A crying or distressed child will be attended to immediately (without delay). The child will be taken to a quiet area to be comforted and to be assessed for any injury, or other cause of distress.

When children are in the external activity areas, each group will be fully supervised at all times by required number of teachers / carers per group as dictated by current regulations.

Musical instruments likely to generate excessive noise will not be permitted in the external activity areas.

Each age group ("Infants"; "Toddlers"; "Pre-Schoolers") will be maintained separate from other age groups.

Staff

Centre management of the centre recognise the importance of ensuring all staff members are properly trained.

In-house training will include familiarisation with the procedures and requirements set out in the Noise Management Plan.

Recent graduates and relieving teachers (who may lack experience in the operation of the centre) will be supervised by permanent staff members.

Staff will be instructed to engage the children in educational play activities that the children will find both mentally and physically stimulating, at all times.

Staff will be instructed to refrain from encouraging activities that may result in excessively noisy play and running.

All temporary & permanent staff will be required to read the Noise Management Plan before starting work and to comply with it at all times.

Management

Centre management will maintain a Log of any, and all, noise complaints received.

Any complaints received shall be logged with details of the nature of the complaint, time of the event and contact details of the complainant.

Centre management will endeavour to respond to any noise complaint as quickly as possible, and will advised the complainant within 48 hours of what, if any, actions have been undertaken as a result of reviewing the complaint. These actions will be recorded in the Log.

The Log will be located in the Manager's office and will be accessible to Council at any time within normal operating hours.

Centre management will provide Council and the occupants of the building with name(s) and contact details (phone number) of designated person (or persons) responsible for the addressing noise complaints.

At least one designated responsible person shall be available on site at all times during operational hours.

Centre management will provide Council, and other occupants of the building with an Activity Schedule.

A laminated copy of the Noise Management Plan will be displayed in the entry foyer.

All staff (temporary and permanent) will be required to read the Noise Management Plan.

All parents / guardians will be required to read the section of the Noise Management Plan relating to their Children.

Continued attendance at the Centre will be contingent on the parent and / or guardian abiding by the requirements of the Noise Management Plan.

Any visitor to the child care centre will need to comply with NSW Department of Education & Communities guidelines and be accompanied by an Authorised Supervisor of the centre should they need to visit any area other than the reception area.

Should noise complaints persist, the Centre will engage the services of a recognised Acoustical Consultant (being a full and current member of the Australian Acoustical Society) to monitor noise levels and provide advice on any additional noise mitigation measures (if required).

Such a reporting will form part of the Log and be freely available to Council and to the Complainant.

Attended noise monitoring may require access to the complainant premises.

Investigation of any noise complaint requiring the services of a recognised Acoustical Consultant will be contingent on this permission for access being given. Complainants should be made aware that this will be a requirement of the investigation of their complaint.

Centre Management is committed to being a responsible and good neighbour to local residents.