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Noise Assessment – Childcare Centre

Lot 56 & 57 (#147) Burswood Road, Burswood

Reference: 24018685-01A

Prepared for:
Elven Property

Reference: 24018685-01A

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EXECUTIVE SUMMARY

Lloyd George Acoustics was engaged by Elven Property to undertake a noise assessment for a proposed childcare centre (CCC) to be located at Lot 56 & 57 (#147) Burswood Road, Burswood. This report considered noise emissions from the proposed childcare centre to surrounding properties, as well as the impact of road traffic noise to the childcare centre.

With regard to the noise emission assessment, this was undertaken using noise modelling and considered child play, mechanical plant and car door closings. The noise from all children playing outside and car door closings is predicted to be compliant. Mechanical plant noise was also calculated to be compliant, however once the plant has been designed and selected, this should be further reviewed to ensure compliance prior to Building Permit.

Predicted noise levels from road traffic, at the facade of the CCC Building, are above the outdoor noise target of *State Planning Policy No. 5.4 Road and Rail Noise*. During detailed design and prior to Building Permit, glazing construction shall be reviewed for sensitive areas within the CCC, in order to achieve acceptable internal noise levels. Noise levels to the outdoor play areas are generally considered compliant with the majority below the outdoor noise target.

1. INTRODUCTION

Lloyd George Acoustics was engaged by Elven Property to undertake a noise assessment for a proposed childcare centre (CCC) to be located at Lot 56 & 57 (#147) Burswood Road, Burswood (refer *Figure* 1-1) with the site plan shown in *Figure 1-2* and full Development Application (DA) plans provided in *Appendix A*. The purpose of this report is to consider noise emissions from the proposed childcare centre to surrounding properties, as well as the impact of road traffic noise to the childcare centre.

Figure 1-1: Subject Site Location (Source: DPLH PlanWA)

The proposed childcare centre will be open Monday to Friday, 6.30am to 6.30pm and consist of the following:

- Four internal teaching spaces located on the first floor capable of accommodating up to 85 children, grouped as follows:
  - Activity 1 & 2: Each with 20 places for children aged 0-2 years;
  - Activity 3: 25 places for children aged 3+ years;
  - Activity 4: 20 places for children aged 2-3 years.
- Outdoor play area located on the first floor (not used prior to 7.00am);
- Amenities and associated mechanical plant such as:
  - Kitchen exhaust fan assumed to be located on roof above;
  - Various exhaust fans (toilets, laundry, nappy room) assumed to be located on the roof above;
  - Air-conditioning (AC) plant, assumed to located on the roof;
- Car parking on the ground floor of the lot.

Figure 1-2: Proposed Site Plan

With regard to noise emissions, consideration is given to noise from child play, mechanical services and closing car doors at neighbouring properties, against the prescribed standards of the *Environmental Protection (Noise) Regulations 1997*.

With regard to road traffic noise impacts, the childcare centre is considered noise sensitive and is located within approximately 162 metres from Great Eastern Highway. This road is considered a 'Strategic Freight/Major Traffic Route' in accordance with the PlanWA Maps and as such, a noise assessment is required against *State Planning Policy No. 5.4 Road and Rail Noise*.

Appendix C contains a description of some of the terminology used throughout this report.

2. CRITERIA

2.1. Environmental Noise

Environmental noise in Western Australia is governed by the *Environmental Protection Act 1986*, through the *Environmental Protection (Noise) Regulations 1997* (the Regulations).

2.1.1. Regulations 7, 8 & 9

This group of regulations defines the prescribed standard for noise emissions applicable to child play, mechanical services and car door closing as follows:

*"**7. Prescribed standard for noise emissions***

(1) Noise emitted from any premises or public place when received at other premises –

(a) must not cause, or significantly contribute to, a level of noise which exceeds the assigned level in respect of noise received at premises of that kind; and

(b) must be free of –

(i) tonality; and

(ii) impulsiveness; and

(iii) modulation,

when assessed under regulation 9.

(2) For the purposes of subregulation (1)(a), a noise emission is taken to significantly contribute to a level of noise if the noise emission … exceeds a value which is 5 dB below the assigned level at the point of reception."

Tonality, impulsiveness and modulation are defined in regulation 9 (refer *Appendix C*). Under regulation 9(3), *"Noise is taken to be free of the characteristics of tonality, impulsiveness and modulation if -*

(a) the characteristics cannot be reasonably and practicably removed by techniques other than attenuating the overall level of noise emission; and

(b) the noise emission complies with the standard prescribed under regulation 7(1)(a) after the adjustments in the table [Table 2-1] … are made to the noise emission as measured at the point of reception."

Table 2-1 Adjustments Where Characteristics Cannot Be Removed

Where Noise Emission is Not Music*			Where Noise Emission is Music	
Tonality	Modulation	Impulsiveness	No Impulsiveness	Impulsiveness
+ 5 dB	+ 5 dB	+ 10 dB	+ 10 dB	+ 15 dB

* These adjustments are cumulative to a maximum of 15 dB.

The assigned levels (prescribed standards) for all premises are specified in regulation 8(3) and are shown in *Table 2-2*. The L_{A10} assigned level is applicable to noises present for more than 10% of a representative assessment period, generally applicable to "steady-state" noise sources. The L_{A1} is for short-term noise sources present for less than 10% and more than 1% of the time. The L_{Amax} assigned level is applicable for incidental noise sources, present for less than 1% of the time.

Table 2-2 Baseline Assigned Levels

Premises Receiving Noise	Time Of Day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Noise sensitive premises: highly sensitive area[1]	0700 to 1900 hours Monday to Saturday (Day)	45 + influencing factor	55 + influencing factor	65 + influencing factor
	0900 to 1900 hours Sunday and public holidays (Sunday)	40 + influencing factor	50 + influencing factor	65 + influencing factor
	1900 to 2200 hours all days (Evening)	40 + influencing factor	50 + influencing factor	55 + influencing factor
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays (Night)	35 + influencing factor	45 + influencing factor	55 + influencing factor
Noise sensitive premises: any area other than highly sensitive area	All hours	60	75	80
Commercial Premises	All hours	60	75	80
Industrial and Utility Premises	All hours	65	80	90

1. ***highly sensitive area*** means that area (if any) of noise sensitive premises comprising —
   (a) a building, or a part of a building, on the premises that is used for a noise sensitive purpose; and
   (b) any other part of the premises within 15 metres of that building or that part of the building.

The influencing factor (IF), in relation to noise received at noise sensitive premises, has been calculated as 11 dB, as determined in *Appendix B*. *Table 2-3* shows the assigned levels including the influencing factor and transport factor at the receiving locations.

Table 2-3 Assigned Levels

Premises Receiving Noise	Time Of Day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
+11 dB IF Noise sensitive premises: highly sensitive area[1]	0700 to 1900 hours Monday to Saturday (Day)	56	66	76
	0900 to 1900 hours Sunday and public holidays (Sunday)	51	61	76
	1900 to 2200 hours all days (Evening)	51	61	66
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays (Night)	46	56	66
Commercial Premises	All hours	60	75	80

It must be noted the assigned levels above apply outside the receiving premises and at a point at least 3 metres away from any substantial reflecting surfaces.

The assigned levels are statistical levels and therefore the period over which they are determined is important. The Regulations define the Representative Assessment Period (RAP) as "*a period of time of not less than 15 minutes, and not exceeding 4 hours*, *determined by* an *inspector* or *authorised person to be appropriate for the assessment of a noise emission, having regard to the type and nature of the noise emission"*. An inspector or authorised person is a person appointed under Sections 87 & 88 of the *Environmental Protection Act 1986* and include Local Government Environmental Health Officers and Officers from the Department of Water Environmental Regulation. Acoustic consultants or other environmental consultants are not appointed as an inspector or authorised person. Therefore, whilst this assessment is based on a 4-hour RAP, which is assumed to be appropriate given the nature of the operations, this is to be used for guidance only.

2.1.2. Regulation 3

"3. Regulations do not apply to certain noise emissions

(1) Nothing in these regulations applies to the following noise emissions –

(a) Noise emissions from the propulsion and braking systems of motor vehicles operating on a road;"

The childcare centre car park is considered a road and therefore vehicle noise (propulsion and braking) is not assessed. Noise from vehicle car doors however are assessed, since these are not part of the propulsion or braking system.

2.1.3. Regulation 14A

"14A. Waste Collection and Other Works

(2) Regulation 7 does not apply to noise emitted in the course of carrying out class 1 works if –

(a) The works are carried out in the quietest reasonable and practicable manner; and

(b) The equipment used to carry out the works is the quietest reasonably available;

class 1 works means specified works carried out between -

(a) 0700 hours and 1900 hours on any day that is not a Sunday or a public holiday; or

(b) 0900 hours and 1900 hours on a Sunday or public holiday.

specified works means -

(a) The collection of waste; or

(b) The cleaning of a road or the drains for a road; or

(c) The cleaning of public places, including footpaths, cycle paths, car parks and beaches;"

In the case where specified works are to be carried out outside of class 1, a noise management plan is to be prepared and approved by the CEO.

2.2. Road Traffic Noise

The criteria for road traffic noise is provided in *State Planning Policy No. 5.4 Road and Rail Noise* (hereafter referred to as SPP 5.4) produced by the Western Australian Planning Commission (WAPC). SPP 5.4 is supported by the *Road and Rail Noise Guidelines* (the Guidelines) and the Department of Planning, Lands and Heritage mapping. The objectives of SPP 5.4 are to:

- Protect the community from unreasonable levels of transport noise;
- Protect strategic and other significant freight transport corridors from incompatible urban encroachment;
- Ensure transport infrastructure and land-use can mutually exist within urban corridors;
- Ensure that noise impacts are addressed as early as possible in the planning process; and
- Encourage best practice noise mitigation design and construction standards.

Table 2-4 sets out noise targets that are to be achieved by proposals under which SPP 5.4 applies. Where the targets are exceeded, an assessment is required to determine the likely level of transport noise and management/mitigation required.

Table 2-4: Noise Targets for Noise Sensitive Land-Use

Scenario	Outdoor Noise Target		Indoor Noise Target	
Noise-sensitive land-use and/or development	55 dB $L_{Aeq(Day)}$	50 dB $L_{Aeq(Night)}$	40 dB $L_{Aeq(Day)}$ (Living and Work Areas)	35 dB $L_{Aeq(Night)}$ (Bedrooms)

Notes:

- Day period is from 6am to 10pm and night period from 10pm to 6am.
- The outdoor noise target is to be measured at 1-metre from the most exposed, habitable[1] facade of a noise sensitive building.
- For all noise-sensitive land-use and/or development, indoor noise targets for other room usages may be reasonably drawn from Table 1 of Australian Standard/New Zealand Standard AS/NZS 2107:2016 *Acoustics – Recommended Design Sound Levels and Reverberation Times for Building Interiors* (as amended) for each relevant time period.
- Outdoor targets are to be met at all outdoor areas as far as is reasonable and practicable to do so using the various noise mitigation measures outlined in the Guidelines.

The application of SPP 5.4 is to consider anticipated traffic volumes for the next 20 years from when the noise assessment has been undertaken.

In the application of the noise targets, the objective is to achieve:

- Indoor noise levels as specified in *Table 2-4* in noise-sensitive areas (e.g. activity and cot rooms); and
- A reasonable degree of acoustic amenity for outdoor play areas.

[1] *A habitable room is defined in State Planning Policy 3.1 as a room used for normal domestic activities that includes a bedroom, living room, lounge room, music room, sitting room, television room, kitchen, dining room, sewing room, study, playroom, sunroom, gymnasium, fully enclosed swimming pool or patio.*

3. METHODOLOGY

3.1. Environmental Noise Modelling

Computer modelling has been used to predict the noise emissions from the development to all nearby receivers. The software used was *SoundPLAN 9.0* with the ISO 9613 algorithms (ISO 17534-3 improved method) selected, as they include the influence of wind and are considered appropriate given the relatively short source to receiver distances. Input data required in the model are listed below and discussed in *Section 3.1.1* to *Section 3.1.4*:

- Meteorological Information;
- Topographical data;
- Ground Absorption; and
- Source sound power levels.

3.1.1. Meteorological Conditions

Meteorological information utilised is provided in *Table 3-1* and is considered to represent worst-case conditions for noise propagation. At wind speeds greater than those shown, sound propagation may be further enhanced, however background noise from the wind itself and from local vegetation is likely to be elevated and dominate the ambient noise levels.

Table 3-1: Modelling Meteorological Conditions

Parameter	Day (7.00am to 7.00pm)	Night (7.00pm to 7.00am)
Temperature (°C)	20	15
Humidity (%)	50	50
Wind Speed (m/s)	Up to 5	Up to 5
Wind Direction*	All	All

* The modelling package allows for all wind directions to be modelled simultaneously.

Alternatives to the above default conditions can be used where one year of weather data is available and the analysis considers the worst 2% of the day and night for the month of the year in which the worst-case weather conditions prevail (source: *Draft Guideline on Environmental Noise for Prescribed Premises*, May 2016). In most cases, the default conditions occur for more than 2% of the time and therefore must be satisfied.

3.1.2. Topographical Data

Topographical data was adapted from publicly available information (e.g. *Google*) in the form of spot heights and combined with the site plan.

Surrounding existing buildings were also incorporated in the noise model, as these can provide noise shielding as well as reflection paths. A six storey residential building located at 153-157 Burswood Road is currently under construction. The receiver locations and building design has been included in the model based on a prior noise assessment conducted for this property.

The childcare centre building is incorporated in the noise model as per the *Appendix A* plans. This includes a 9.5-metre wall on the northeast and southwest sides of the Childcare building.

Figure 3-1 shows a 2D overview of the noise model with the location of all relevant receivers identified. Pink dots represent point sources in the noise model (car doors, mechanical plant) with the pink polygon representing child play.

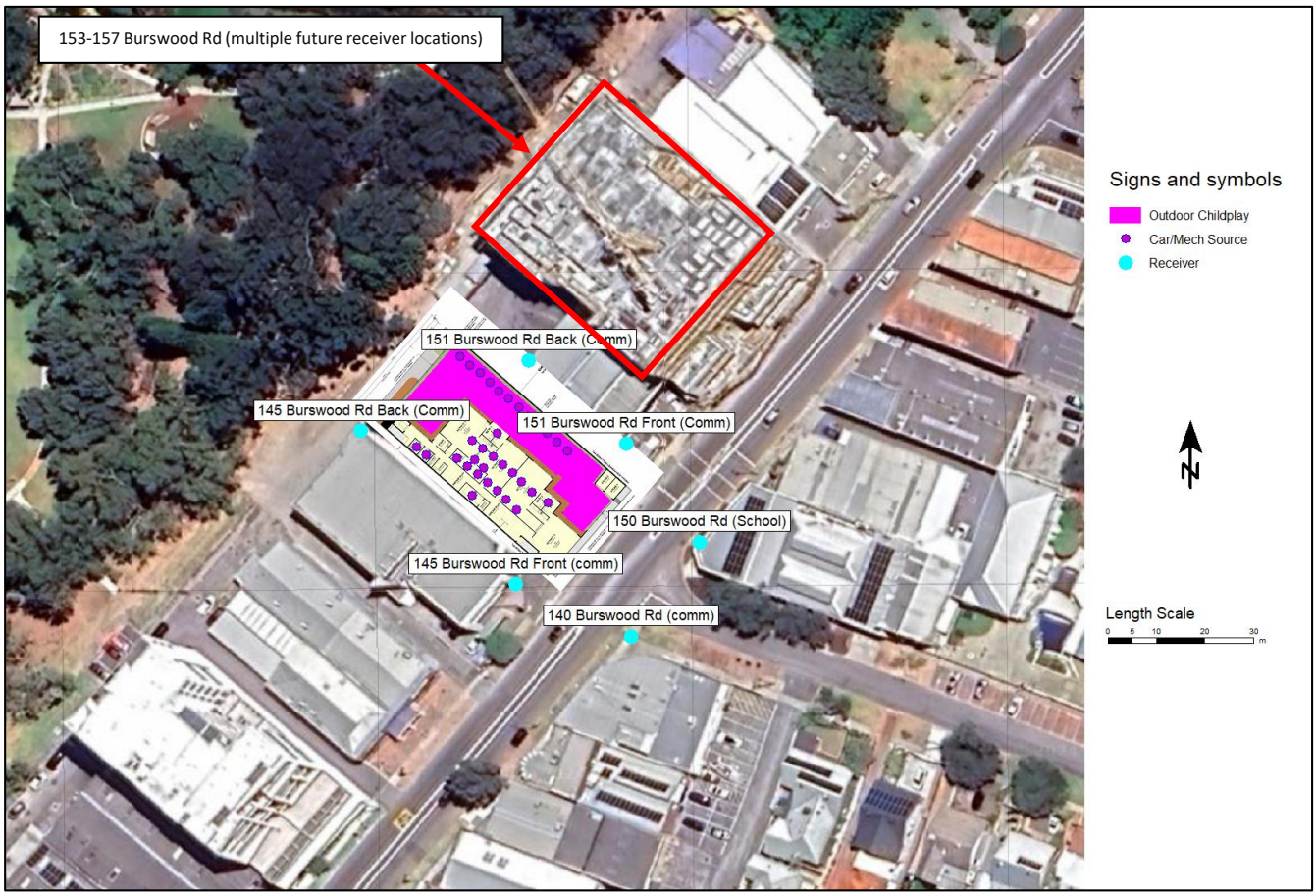


Figure 3-1: Overview of Noise Model

3.1.3. Ground Absorption

The ground absorption has been assumed to be 0.1 (10%) for the roads, 0.5 (50%) outside of the roads and 1.0 (100%) for the play areas, noting that 0.0 represents hard reflective surfaces such as water and 1.0 represents absorptive surfaces such as grass.

3.1.4. Source Sound Levels

The source sound power levels used in the modelling are provided in *Table 3-2*.

Table 3-2: Source Sound Power Levels, dB

Description	Octave Band Centre Frequency (Hz)								Overall dB(A)
	63	125	250	500	1k	2k	4k	8k	
Babies Play Aged 0-2 Years (10 kids), L_{10}	54	60	66	72	74	71	67	64	**78**
Toddler Play Aged 2-3 Years (10 kids), L_{10}	61	67	73	79	81	78	74	70	**85**
Kindy Play Aged 3+ Years (10 kids), L_{10}	64	70	75	81	83	80	76	72	**87**
AC Plant, double fan unit (each), L_{10}	72	74	68	69	63	61	53	47	**70**
General Exhaust Fans (each), L_{10}	60	65	62	63	60	61	56	53	**67**
Kitchen Exhaust Fan, L_{10}	50	64	61	70	69	66	62	50	**73**
Closing Car Door (each), L_{max}	71	74	77	81	80	78	72	61	**84**

The following is noted in relation to *Table 3-2*:

- Child play source levels are based on *Guideline for Childcare Centre Acoustic Assessments Version 3.0* produced by the Association of Australasian Acoustical Consultants (AAAC) published September 2020. Where the number of children for individual play areas is specified in the plans, these have been adjusted from the reference source levels using appropriate acoustical calculations. Outdoor child play was modelled as area sources at 1.0-metre above ground level. The sound power levels used in the model were scaled as follows:
  - 40 children aged 0-2 years = 84 dB(A);
  - 20 children aged 2-3 years = 88 dB(A);
  - 25 children aged 3+ years = 91 dB(A).
- Based on the AAAC Guideline 3.0, source sound power levels for AC condensing units were assumed. Medium sized (double fan) outdoor units were deemed appropriate with two (2) modelled as point sources 1.0-metre above the roof.
- Other mechanical plant includes four (4) exhaust fans (toilets and laundry) and one kitchen exhaust fan. All were modelled as point sources approximately 0.5-metres above roof level and above the area serviced.
- Car doors closing were modelled as a point source 1.0-metre above ground level. Since noise from a car door closing is a short term event, only the L_{Amax} level is applicable.

3.2. Transportation Noise

A combination of noise measurements and modelling have been undertaken in accordance with the requirements of SPP 5.4 and associated Guidelines, as described in *Section 3.2.1* and *Section 3.2.2*.

3.2.1. Transportation Site Measurements

Noise monitoring was undertaken on site using a Brüel & Kjær 2250 (S/N: 3024760) sound level meter (refer *Figure 3-2*). This meter complies with the instrumentation requirements of *Australian Standard 2702-1984 Acoustics – Methods for the Measurement of Road Traffic Noise*. The meter was field calibrated before and the after the measurement session and found to be accurate to within ± 1 dB. Lloyd George Acoustics holds current laboratory calibration certificates for the meter.

The microphone was approximately 1.4-metres above existing ground level and approximately 98-metres from the edge of Great Eastern Highway main carriageway and 67-metres from the edge of the CCC lot (refer *Figure 3-3*). This location was chosen to ensure the dominant noise source was from the Great Eastern Highway main carriageway. The measurements were recorded on 15 March 2024, between 12.00pm to 1.00pm.

Figure 3-2: Photograph of Sound Level Meter on Site

Figure 3-3: Measurement Location

From the one-hour measurement, a relationship between noise levels and the hourly traffic volumes can then be derived to determine the existing $L_{Aeq(Day)}$ and $L_{Aeq(Night)}$ at the measurement location.

3.2.2. Transportation Noise Modelling

The computer program *SoundPLAN 8.2* was utilised incorporating the *Calculation of Road Traffic Noise* (CoRTN) algorithms, modified to reflect Australian conditions. The modifications included the following:

- Vehicles were separated into heavy (Austroads Class 3 upwards) and non-heavy (Austroads Class 1 and 2) with non-heavy vehicles having a source height of 0.5-metres above road level and heavy vehicles having two source heights at 1.5-metres and 3.6-metres above road level;
- A -0.8 dB correction has been applied to the lower level heavy vehicle noise source and -8.0 dB to the higher level noise source based on the *Transportation Noise Reference Book*; Paul Nelson (1987), so as to provide consistent results with the CoRTN algorithms.

Predictions are made at heights of 1.4-metres above floor level and at 1.0-metre from various rooms of the proposed building, resulting in a + 2.5 dB correction due to reflected noise. For the outdoor play areas, this correction is not applicable and the height above ground level is 1.0-metres, to reflect the height of the children.

Various input data are included in the modelling and these are discussed in *Section 3.2.2.1* to *Section 3.2.2.3*, noting that some inputs are common to both environmental noise and road traffic noise (topography and ground absorption).

3.2.2.1. Road Surface

The corrections applied for different road surface finishes are provided in *Table 3-3*.

Table 3-3: Noise Relationship Between Different Road Surfaces

Chip Seal				Asphalt			
14mm	10mm	5mm	Slurry	Dense Graded	Novachip	Stone Mastic	Open Graded
+3.5 dB	+2.5 dB	+1.5 dB	+1.0 dB	0.0 dB	-0.2 dB	-1.5 dB	-2.5 dB

The existing road surface is dense graded asphalt and assumed to remain unchanged into the future.

3.2.2.2. Vehicle Speed

The existing posted speed is 60 km/hr and assumed to remain unchanged into the future.

3.2.2.3. Traffic Volumes

Existing traffic volumes for Great Eastern Highway were obtained from Main Roads WA Traffic Map. A modelled Validation Plot and Forecast 2041 traffic volumes were obtained from Main Roads WA (Thomas Ng, Traffic Modelling Analyst, Reference: #42815). This 2041 traffic volume was then forecast to 2043 using an estimated 3% increase in traffic per year. The validation plot allows the forecast volumes to be calibrated with *Table 3-4* providing the traffic volumes used in the noise modelling. Note that the percentage heavy vehicles are assumed to be the same in the future as existing.

Table 3-4: Traffic Information Used in Noise Modelling

Parameter	Scenario			
	Existing – 2020/21		Future – 2044	
	Northbound	Southbound	Northbound	Southbound
24-hour Volume	11,221	18,649	35,841	38,245
% Heavy	5	7	5	7

4. RESULTS AND ASSESSMENT

4.1. Environmental Noise

4.1.1. Outdoor Child Play Noise

The childcare development will host up to 85 children. It is noted play time is generally staggered and therefore not all children would be playing outside at once for extended periods of time. However, noise levels were conservatively predicted for all children playing simultaneously, as a worst-case scenario with the results provided and assessed in *Table 4-1*. The critical assigned level is during the day, as whilst the childcare centre will open at 6.30am, child play will not commence until after 7.00am. Noise from child play is not considered to contain annoying characteristics within the definition of the Regulations and therefore no adjustments are made to the predicted noise levels. A noise contour plot is also provided in *Figure 4-1* showing noise levels at ground floor.

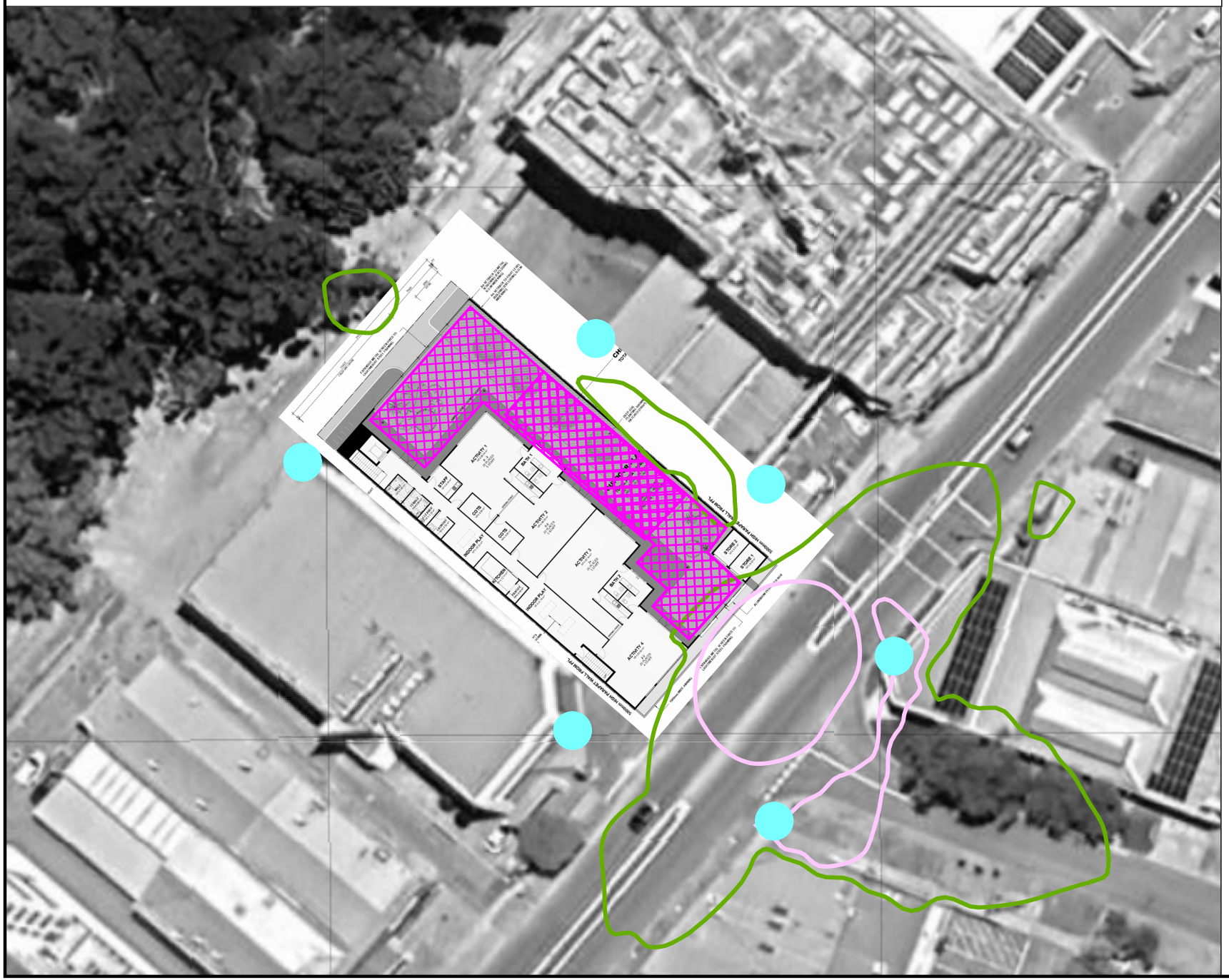
Table 4-1: Child Play Noise Predicted Levels and Assessment, dB L_{A10}

Receiver	Babies (0-2 yo)	Toddler (2-3 yo)	Kindy (3+ yo)	Total	Assigned Level	Assessment
150 Burswood Rd (school)	33	47	50	52	**56**	*Complies*
153-157 Burswood Rd* (future residence)	43	47	50	52	**56**	*Complies*
140 Burswood Rd (comm)	35	47	50	52	**60**	*Complies*
145 Burswood Rd (comm)*	40	29	32	41	**60**	*Complies*
151 Burswood Rd (comm)	34	35	38	41	**60**	*Complies*

*The highest noise level from predictions at multiple receivers were used in the assessment

Based on a conservative scenario of all 85 children playing outside simultaneously, the assessment demonstrates compliance is achieved during the day.

Figure 4-1 Child Play Noise Contour Plot (1.4m AGL), dB L_{A10}



Predicted Noise level

	= 46
	= 51
	= 56
	= 61
	= 66

Legend

- Receiver
- Outdoor Childplay
- Car/Mech Source

N

Scale 1:600

0 4 8 16 24 m

Project No:
Consultant:
Date: 19/03/2024
Algorithm: ISO 9613
SoundPLAN Version: 9.0

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4.1.2. Mechanical Plant Noise

Mechanical plant noise consists of the outdoor AC condensing units and exhaust fans. Predicted and assessed noise levels are provided in *Table 4-2*. The critical assigned level is during the night, as the plant may operate prior to 7.00am. An adjustment of + 5 dB is included for tonality, since this may be present for such noise sources. A noise contour plot is also provided in *Figure 4-2* showing noise levels at ground floor.

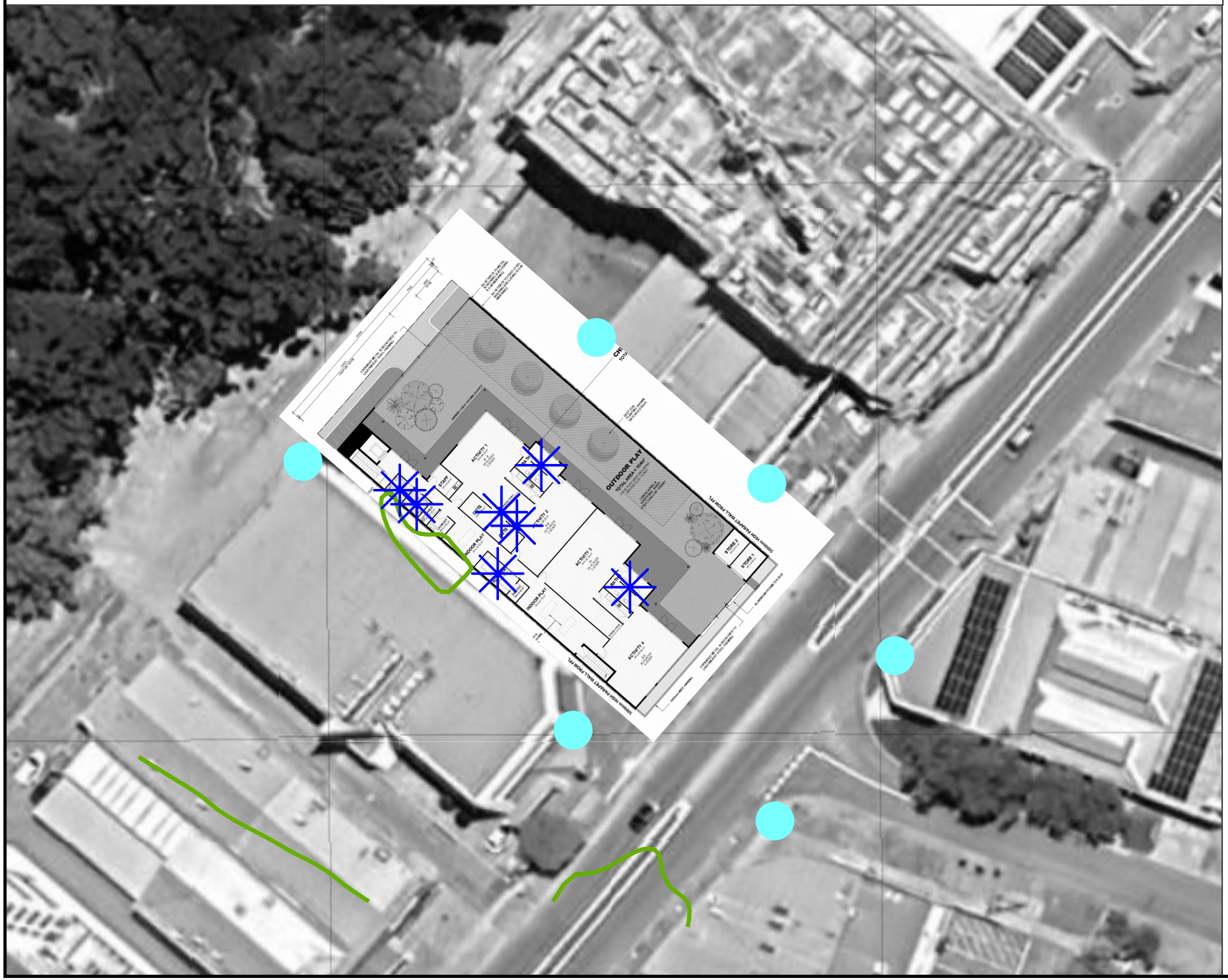
Table 4-2: Mechanical Plant Noise Predicted Levels and Assessment, dB L_{A10}

Receiver	AC	Exhaust Fans	Total	Total Adjusted	Assigned Level	Assessment
150 Burswood Rd (school)	24	26	28	**33**	**46**	*Complies*
153-157 Burswood Rd* (future residence)	34	36	38	**43**	**46**	*Complies*
140 Burswood Rd (comm)	22	26	27	**32**	**60**	*Complies*
145 Burswood Rd (comm)*	19	23	24	**29**	**60**	*Complies*
151 Burswood Rd (comm)	19	21	23	**28**	**60**	*Complies*

*The highest noise level from predictions at multiple receivers were used in the assessment

The calculations show compliance at all receiver locations. It must be noted that the assessment is based on assumptions in relation to the number, location, size and type of mechanical plant. Therefore, once the mechanical plant has been designed and selected, noise is to be reviewed by a suitably qualified acoustical consultant.

Figure 4-2 Mechanical Plant Noise Contour Plot (1.4m AGL), dB L_{A10}



Predicted Noise level

	= 31
	= 36
	= 41
	= 46
	= 51

Legend

- Receiver
- Car/Mech Source

N

Scale 1:600

0 4 8 16 24 m

Project No:
Consultant:
Date: 19/03/2024
Algorithm: ISO 9613
SoundPLAN Version: 9.0

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4.1.3. Car Door Closing Noise

Predicted and assessed noise levels for car doors closing are provided in *Table 4-3* being the maximum noise level from the worst-case car bay for each receiver. The critical assigned level is during the night, as car door closings will occur prior to 7.00am. An adjustment of + 10 dB is included for impulsiveness, since this may be present for such noise sources. A noise contour plot is also provided in *Figure 4-3* showing noise levels at ground floor.

Table 4-3: Car Door Closing Noise Predicted Levels and Assessment, dB L_{Amax}

Receiver	Car Door	Total Adjusted	Assigned Level	Assessment
150 Burswood Rd (school)	23	33	**66**	*Complies*
153-157 Burswood Rd* (future residence)	26	36	**66**	*Complies*
140 Burswood Rd (comm)	20	30	**80**	*Complies*
145 Burswood Rd (comm)*	42	52	**80**	*Complies*
151 Burswood Rd (comm)	33	43	**80**	*Complies*

*The highest noise level from predictions at multiple receivers were used in the assessment

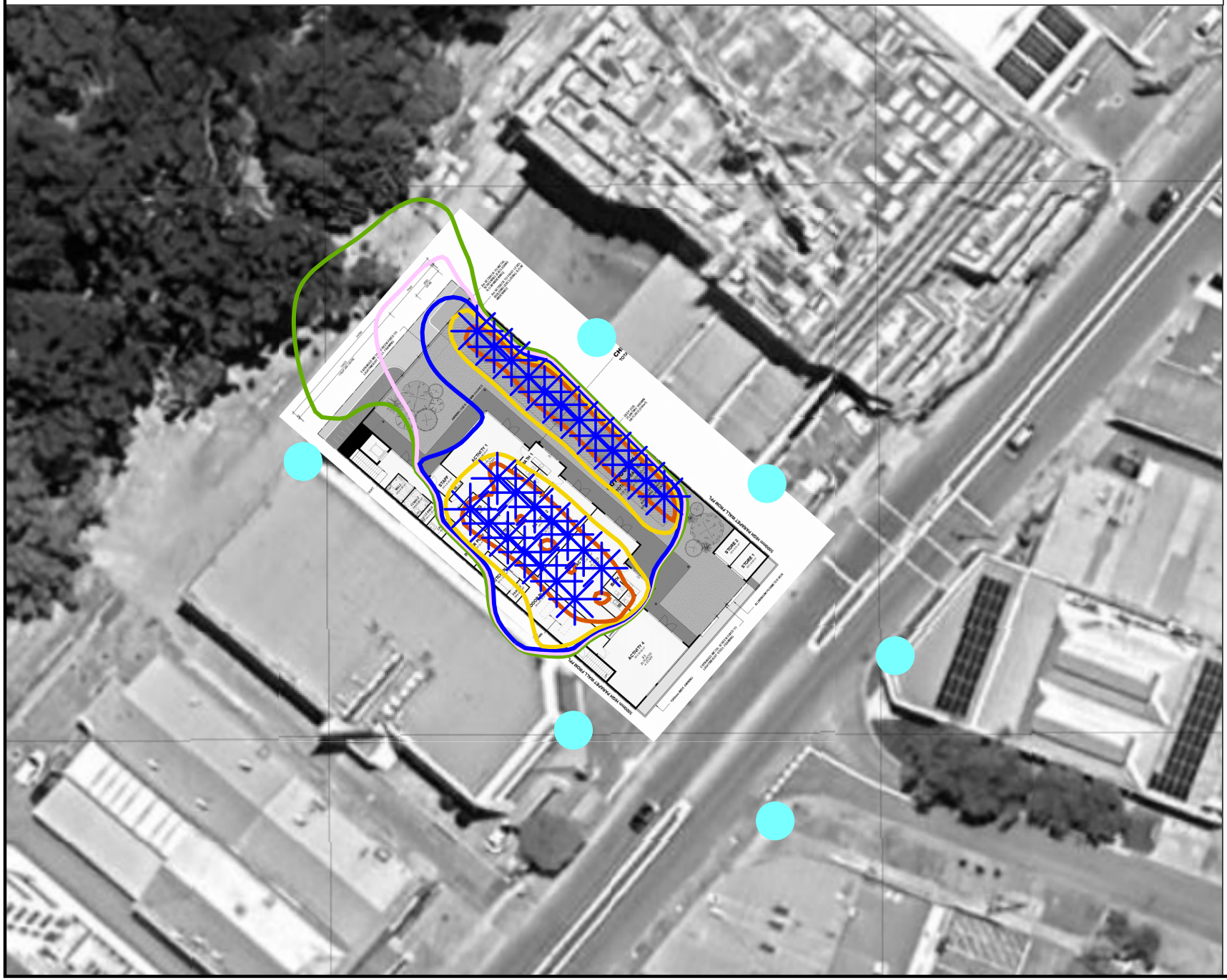
Noise from car doors is predicted to comply at all nearest receivers during the critical night period.

4.1.4. Indoor Child Play

An assessment of noise levels from indoor child play was carried out and the resulting noise levels at all locations were predicted to be well below that of outdoor child play considered in *Section 4.1.1*. This assessment was carried out based on the following considerations:

- Internal noise levels within activity rooms would not exceed those from outdoor play for each age group, regardless of windows being open or closed; and
- Any music played within the internal activity areas would be 'light' music with no significant bass content and played at a relatively low level.

Figure 4-3 Car Door Noise Contour Plot (1.4m AGL), dB L_{Amax}



Predicted Noise level

	= 51
	= 56
	= 61
	= 66
	= 71

Legend

- Receiver
- Car/Mech Source

N

Scale 1:600

0 4 8 16 24 m

Project No:
Consultant:
Date: 19/03/2024
Algorithm: ISO 9613
SoundPLAN Version: 9.0

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PO Box 717
HILLARYS WA 6923
(08) 9401 7770

4.2. Transportation Noise

The results of the hourly noise level measurements, in free-field conditions, were:

- 15 March 2024: 12.00pm to 1.00pm – 53.8 dB $L_{Aeq,1hour}$.

Combining the measured noise level with the corresponding hourly traffic volume, as shown in *Figure 4-4*, results in 53.9 $L_{Aeq(Day)}$.

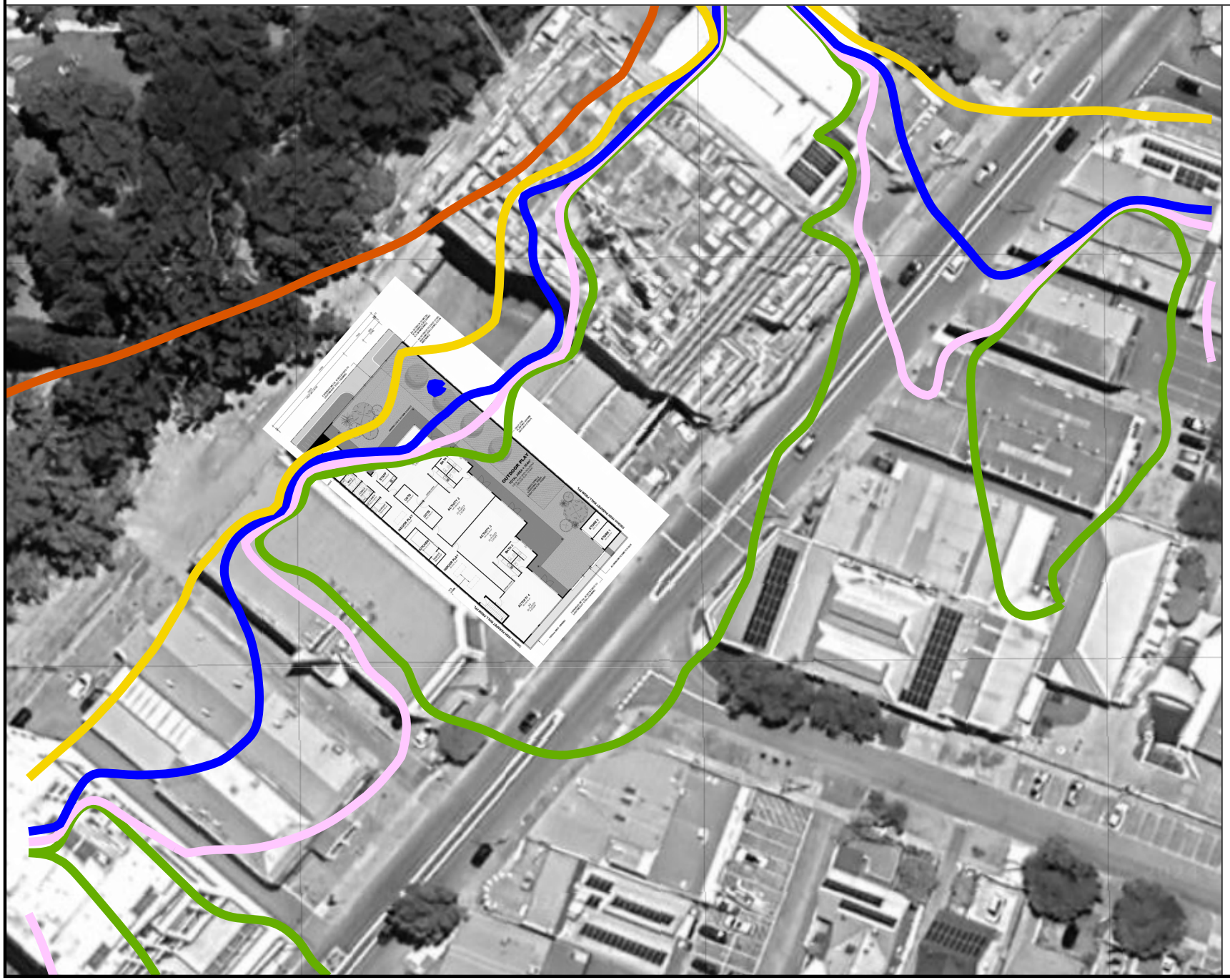
Figure 4-4: Noise Level Relationship to Hourly Traffic Volumes

The noise model is initially calibrated for existing daytime conditions and then modified for future conditions, including increased traffic and the inclusion of the proposed development. The results of this modelling are presented in *Figure 4-5* and *Figure 4-6* as noise contour plots. These are effectively the same plot with *Figure 4-5* including the facade reflection, appropriate for building upgrade design, and *Figure 4-6* without the facade correction, appropriate for assessment to the outdoor play areas.

From *Figure 4-5*, it can be seen that noise levels at the CCC building will be within Exposure A. As such, some facade upgrades will be required to achieve compliant internal noise levels, to be further reviewed at detailed design.

From *Figure 4-6*, it can be seen that the majority of the outdoor play area, where the facade reflection is not applicable, is below the outdoor noise target and therefore considered compliant with SPP 5.4.

Figure 4-5 Future Road Traffic Noise Contours with Façade Correction (Upper Floor)



Predicted Noise level

- = 51
- = 53
- = 55
- = 57
- = 59

N

Scale 1:500

0 5 10 20 30 m

Project No:
Consultant:
Date: 19/03/2024
Algorithm: ISO 9613
SoundPLAN Version: 9.0

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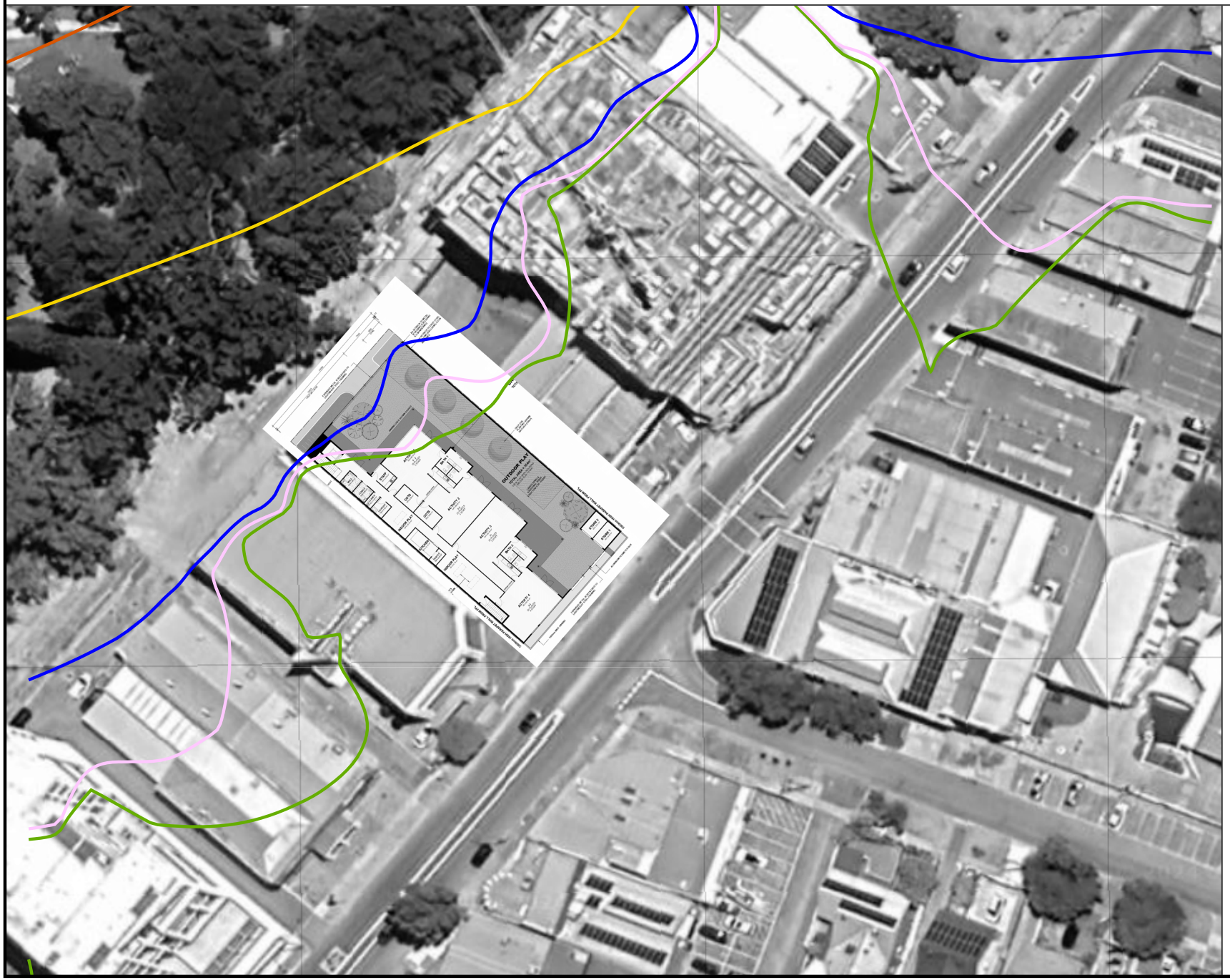
Figure 4-6 Future Road Traffic Noise Contours No Facade Correction (Upper Floor)



Predicted Noise level

- = 51
- = 53
- = 55
- = 57
- = 59

N

Scale 1:500

0 5 10 20 30 m

Project No:
Consultant:
Date: 19/03/2024
Algorithm: ISO 9613
SoundPLAN Version: 9.0

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(08) 9401 7770

5. RECOMMENDATIONS

5.1. Environmental Noise

5.1.1. Child Play

The predicted noise from all children playing outside is predicted to be compliant.

Whilst not necessarily required for compliance, to further minimise noise impacts as part of best practice, the following are provided:

- The behaviour and 'style of play' of children should be monitored to prevent particularly loud activity e.g. loud banging/crashing of objects, 'group' shouts/yelling;
- Favour soft finishes in the outdoor play area to minimise impact noise (e.g. soft grass, sand pit(s), rubber mats) over timber or plastic;
- Favour soft balls and rubber wheeled toys;
- Crying children should be taken inside to be comforted;
- Child play to be staggered;
- No amplified music to be played outside;
- Any music played within the internal activity areas to be 'light' music with no significant bass content and played at a relatively low level;
- Car park drainage grates or similar to be plastic or metal with rubber gasket and secured to avoid excess banging.

5.1.2. Mechanical Plant

For mechanical plant, the following are recommended:

- Once the mechanical plant has been designed and selected, the noise levels shall be reviewed prior to Building Permit;
- All exhaust fans shall be located inside the ceiling void and shall be axial fan type, allowing the incorporation of an attenuator if required;
- All fans shall be variable speed drive so that maximum speed is only occurring when necessary with demand;
- Air-conditioning shall have a ‘night’ / ‘quiet’ mode option, in case required for prior to 7.00am operation, subject to final detailed analysis;
- All plant shall be selected taking into consideration noise levels. That is, when comparing manufacturers of equivalent equipment, select the quieter model;
- All plant is to be appropriately vibration isolated to 95% isolation efficiency.

5.1.3. Car Doors

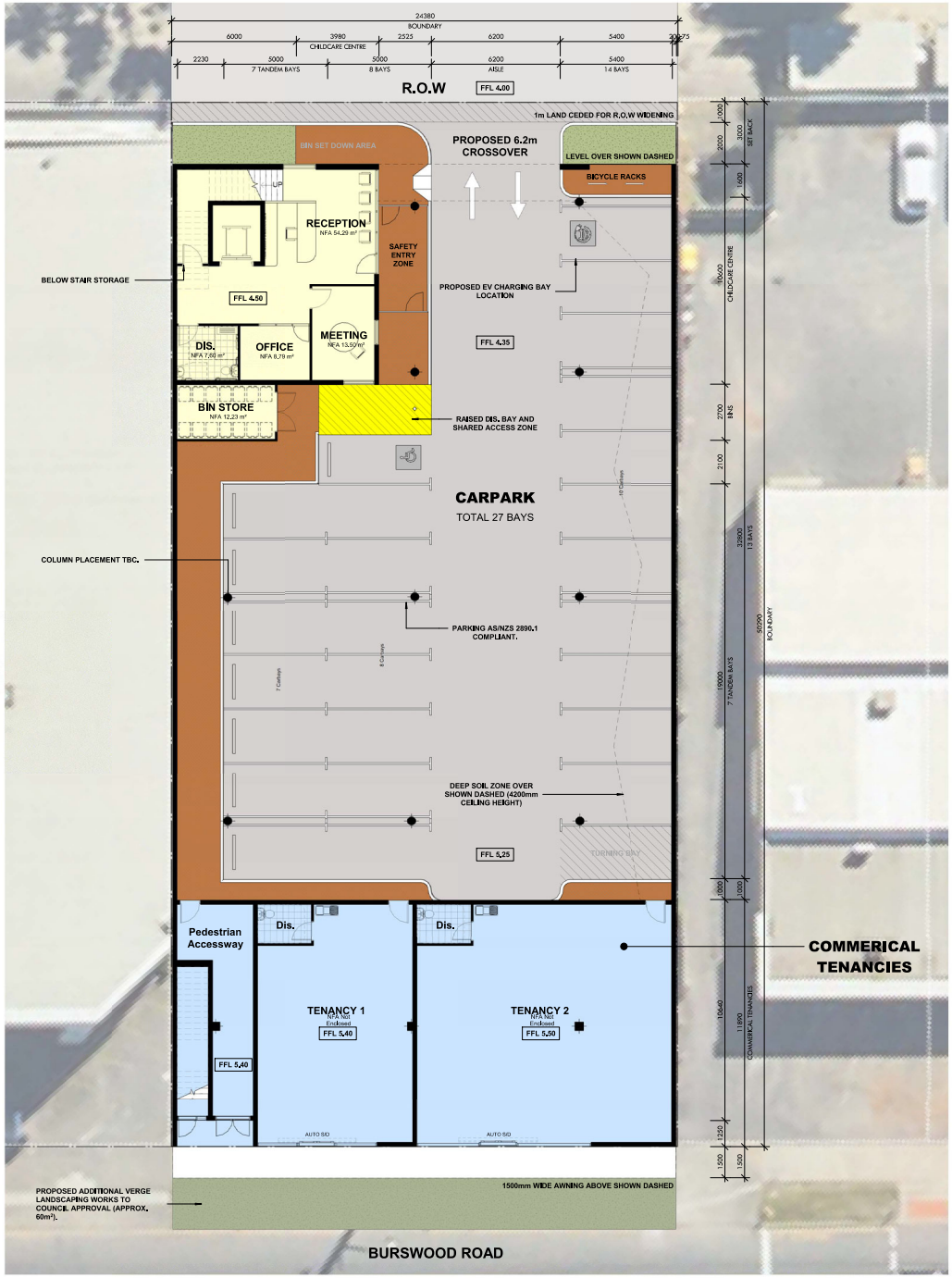
The predicted noise from car door closings is predicted to be compliant.

5.2. Transportation Noise

Predicted noise levels from road traffic, at the facade of the CCC Building, are above the outdoor noise target of *State Planning Policy No. 5.4 Road and Rail Noise*. During detailed design and prior to Building Permit, glazing construction shall be reviewed for sensitive areas within the CCC, in order to achieve acceptable internal noise levels.

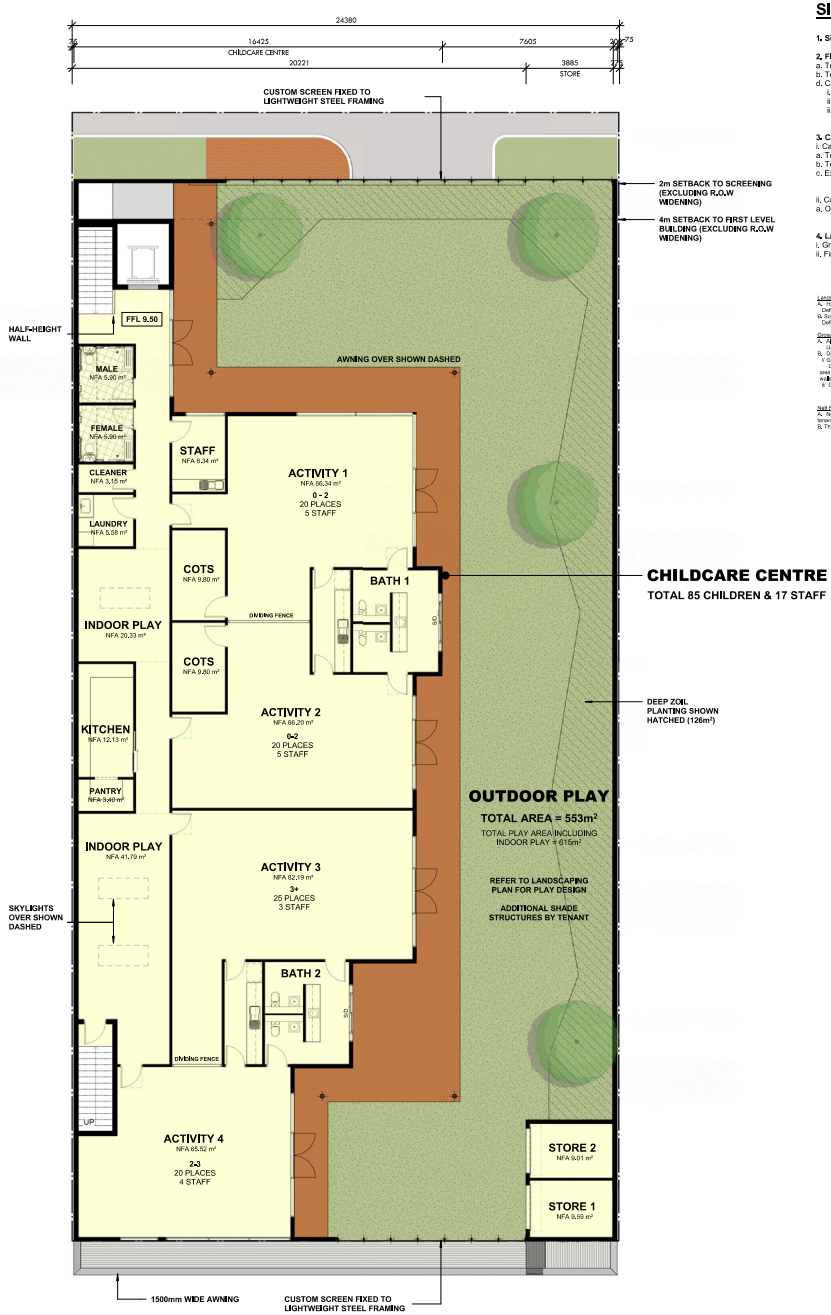
Noise levels to the outdoor play areas are generally considered compliant with the majority below the outdoor noise target.

Appendix A – Development Plans



SITE PLAN & GROUND FLOOR PLAN

SCALE: 1 : 100



FIRST FLOOR PLAN

SCALE: 1 : 100

SITE CRITERIA

1. Site Area
Total 1226m²

2. Floor Area (GFA)
a. Tenancy 1 85m²
b. Tenancy 2 141m²
d. Child Care
i. Ground Floor 116m²
ii. First Floor 535m²
ii. Store 20m²
Total 897m²

3. Carparking
i. Cars Required
a. Tenancy 1 & 2 225m² @ 1/40 6 Cars
b. Tenancy 3 85 kids @ 1/5 kids 17 Cars
c. Existing Lease 5 Cars
Total Cars Required 28 Cars

ii. Cars Provided
a. On Grade 28 Cars
Total Cars Provided 28 Cars

4. Landscaping
i. Ground Floor 21m²
ii. First Floor (incl. 126m2/10.3% Deep Soil) 426m²
Total 447m² (36.5%)

Landscaping
A. Hard Landscaping
Defined as paved walkways either open or covered.
B. Soft Landscaping
Defined as vegetative landscaping.

Gross Floor Area - GFA
A. All Floor Areas on this plan are shown as GROSS FLOOR AREA.
B. Definition of Gross Floor Area is as Net Floor Area
C. Definition of Gross Floor Area is defined as:
i. GROSS FLOOR AREA OF TENANCY:
Gross Floor Area of an individual Tenancy is defined as the area contained between the centre line of common tenancy walls and the outside edge of external walls.
ii. GROSS FLOOR AREA OF A BUILDING:
Gross Floor Area of a Building is defined as the total area contained between the outside edge of external walls

Net Floor Area - NFA
A. Net Floor Area of a Tenancy on this plan is defined as the area between external or tenancy dividing walls.
B. This area is inclusive of toilets if the toilets are exclusive to the Tenancy.

PRELIMINARY

meyer shircore architects

PROPOSED CHILDCARE CENTRE

LOCATION : 147-147 BURSWOOD ROAD, BURSWOOD
FOR : ELVEN PROPERTY

0 1 2 3 4 5 10

DATE: MAR 2024
REVISION: SK012
SHEET: A - 1000
SCALE: 1 : 100 @B1
PROJECT NUMBER 22-8926

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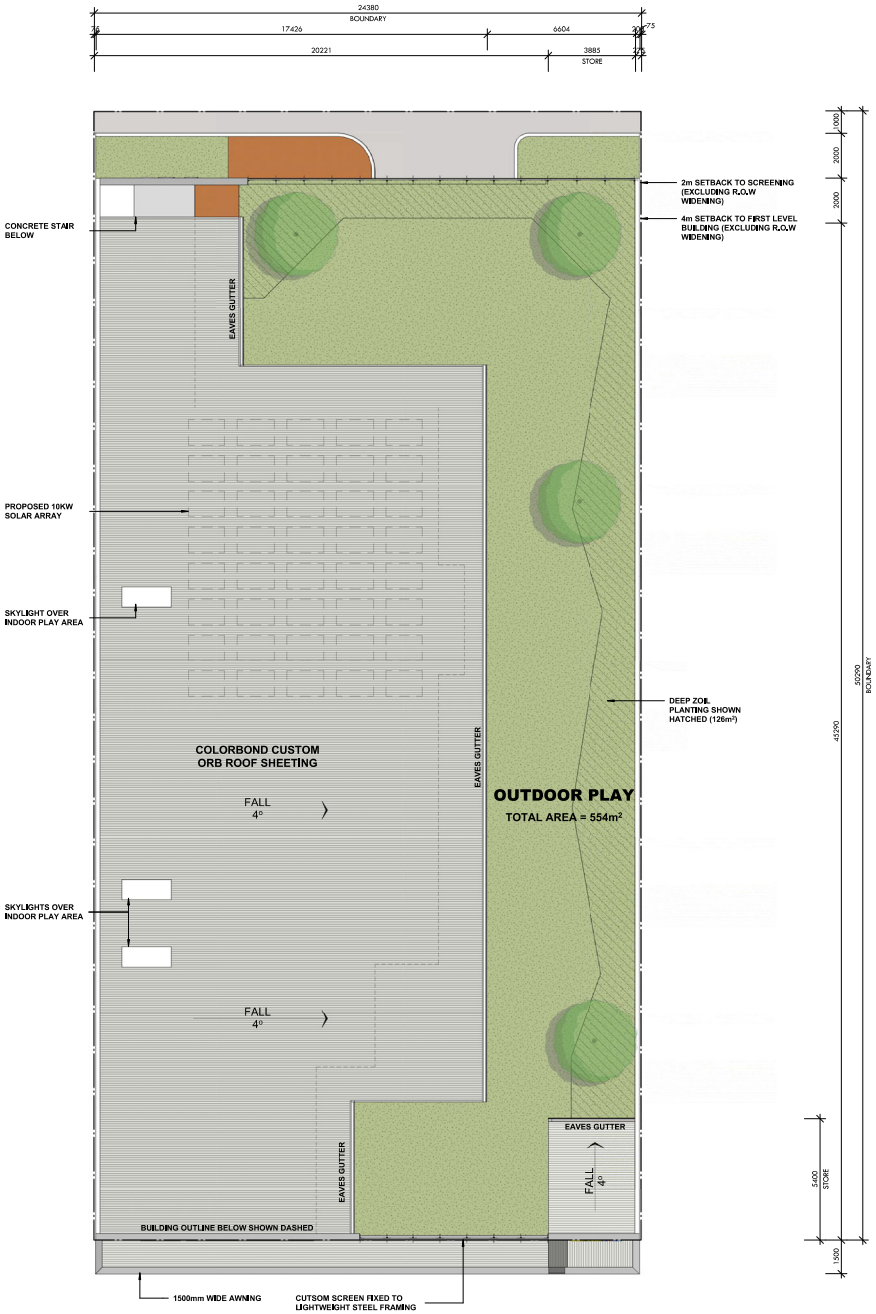
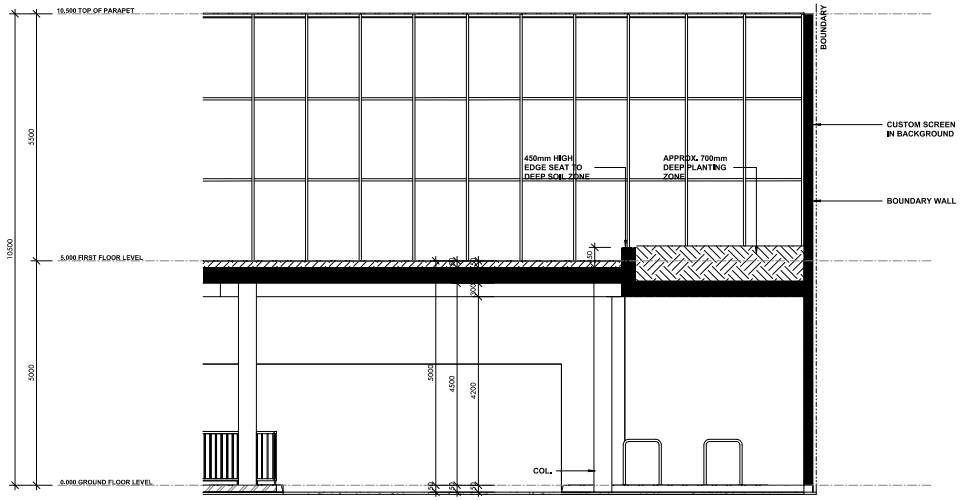
t: 08 9381 8511 e: mail@meyershircore.com.au



ROOF PLAN
SCALE: 1 : 100



DEEP SOIL ZONE SECTION
SCALE: 1 : 50

PRELIMINARY

meyer shircore architects

PROPOSED CHILDCARE CENTRE

LOCATION : 147-147 BURSWOOD ROAD, BURSWOOD
FOR : ELVEN PROPERTY

DATE: MAR 2024
REVISION: SK012
SHEET: A - 2000
SCALE: As indicated@B1

PROJECT NUMBER
22-8926

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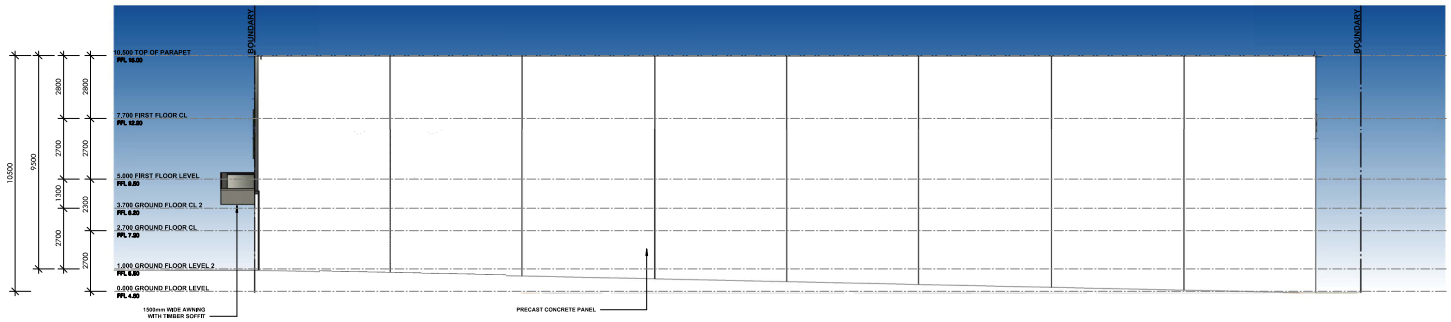
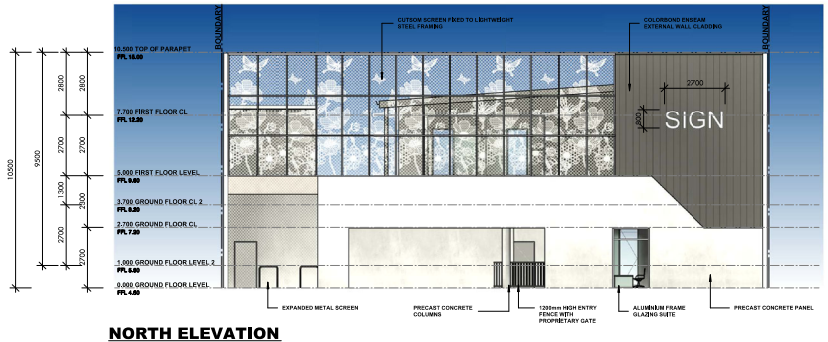
SOUTH ELEVATION (BURSWOOD ROAD)

SCALE: 1 : 100



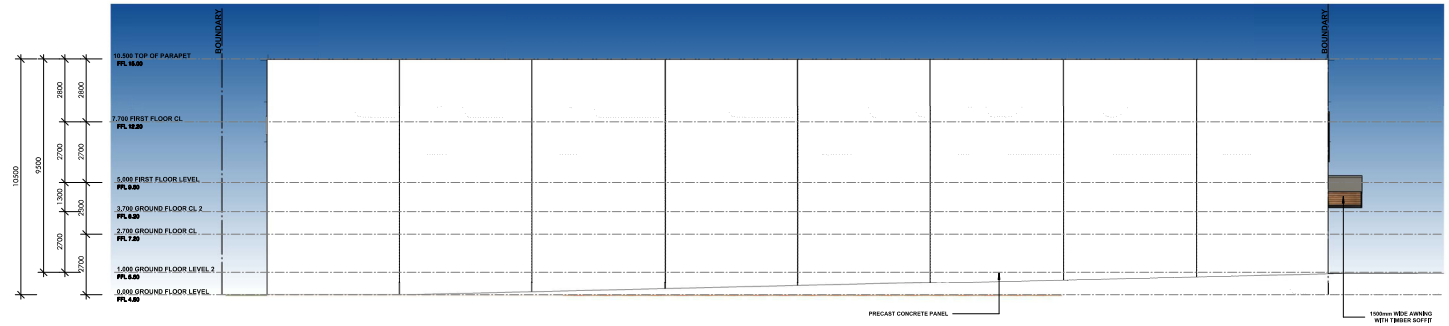
EAST ELEVATION

SCALE: 1 : 100



NORTH ELEVATION

SCALE: 1 : 100



WEST ELEVATION

SCALE: 1 : 100

PRELIMINARY

meyer shircore architects

PROPOSED CHILDCARE CENTRE

LOCATION : 147-147 BURSWOOD ROAD, BURSWOOD

FOR : ELVEN PROPERTY

DATE: MAR 2024

REVISION: SK012

SHEET: A - 3000

SCALE: 1 : 100 @B1

PROJECT NUMBER

22-8926

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Appendix B – Influencing Factor Calculation

The assigned levels combine a baseline assigned level with an influencing factor, with the latter increasing the assigned level on the basis of the existence of significant roads and commercial or industrial zoned land within an inner circle (100 metre radius) and an outer circle (450 metre radius) of the noise sensitive premises. The calculation for the influencing factor is:

$$= \frac{1}{10}(\%\ \text{Type A}_{100} + \%\ \text{Type A}_{450}) + \frac{1}{20}(\%\ \text{Type B}_{100} + \%\ \text{Type B}_{450})$$

where:

$\%\ \text{Type A}_{100}$ = the percentage of industrial land within a 100m radius of the premises receiving the noise

$\%\ \text{Type A}_{450}$ = the percentage of industrial land within a 450m radius of the premises receiving the noise

$\%\ \text{Type B}_{100}$ = the percentage of commercial land within a 100m radius of the premises receiving the noise

$\%\ \text{Type B}_{450}$ = the percentage of commercial land within a 450m radius of the premises receiving the noise

+ Transport Factor (maximum of 6 dB)

= 2 for each secondary road (6,000 to 15,000 vpd) within 100m

= 2 for a major road (>15,000 vpd) within 450m

= 6 for a major road within 100m

The nearest noise sensitive premise used for the influencing calculations has been identified as 157 Burswood Road.

Table B-1 shows the percentage of industrial and commercial land within the inner (100 metre radius) and outer (450 metre radius) circles of the noise sensitive premises.

Table B-1: Percentage of Land Types within 100m and 450m Radii

Receiver	Land Type	Within 100m	Within 450m
157 Burswood Road	Type A - Industrial and Utility	0	0
	Type B – Commercial	67	23

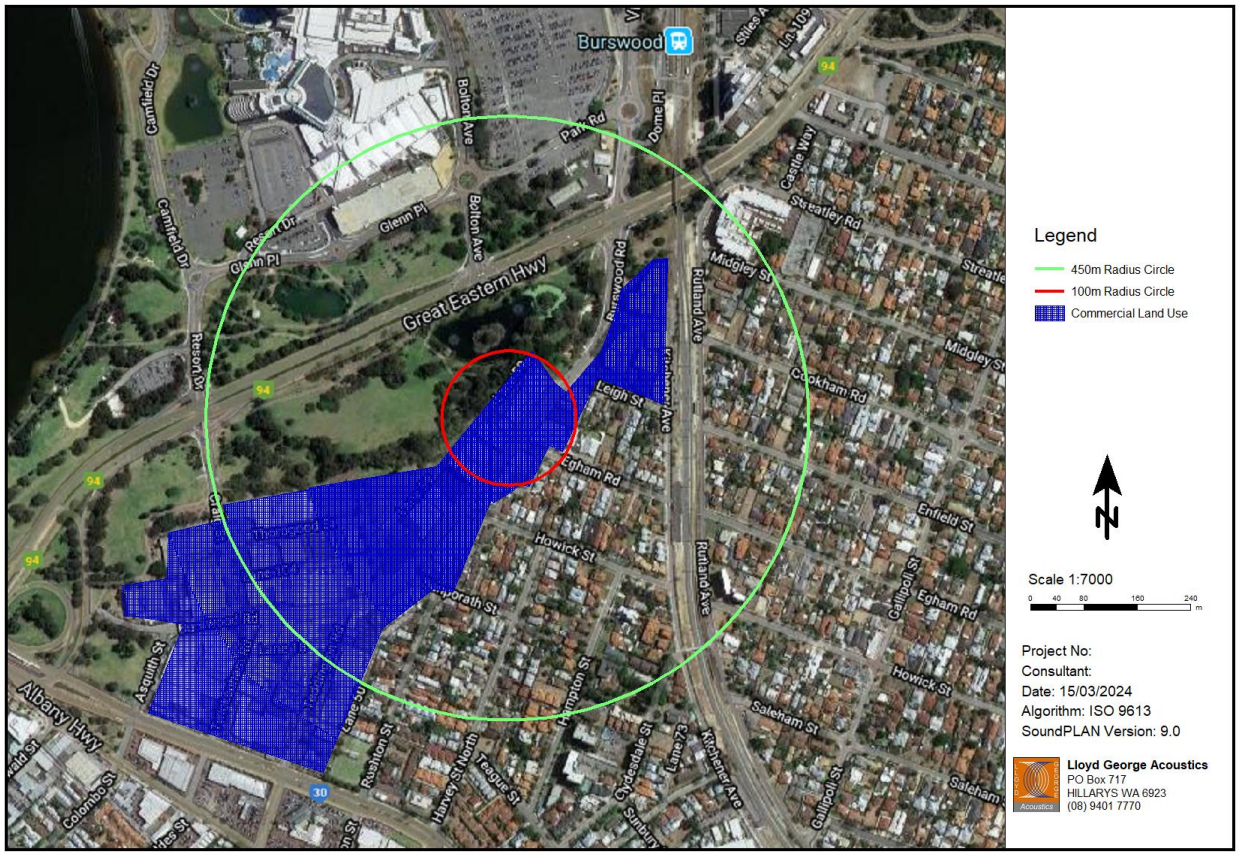


Figure B-1: Land Types within 100m and 450m Radii

From the Main Roads WA Traffic intersection count, *Table B-2* shows the relevant roads and their traffic counts within the inner (100 metre radius) and outer (450 metre radius) circles.

Table B-2: Relevant Roads within 100m and 450m Radii

Receiver	Within 100m		Within 450m
	Major Road (+ 6 dB)	Secondary Road (+ 2 dB)	Major Road Not Within 100m (+ 2 dB)
157 Burswood Road	Burswood Road (16,600 2023 LM01167)	-	-

Table B-3 combines the percentage land types and Transport Factor to calculate the influencing factor.

Table B-3: Influencing Factor Calculation, dB

Receiver	Industrial Land	Commercial Land	Transport Factor	Total
157 Burswood Road	0	4.5	6.0	**11**

The influencing factor calculated in *Table B-3* is combined with those baseline assigned levels of *Table 2-2*, resulting in the project assigned levels provided in *Table 2-3*.

Appendix C – Terminology

The following is an explanation of the terminology used throughout this report:

- **Decibel (dB)**

The decibel is the unit that describes the sound pressure levels of a noise source. It is a logarithmic scale referenced to the threshold of hearing.

- **A-Weighting**

An A-weighted noise level has been filtered in such a way as to represent the way in which the human ear perceives sound. This weighting reflects the fact that the human ear is not as sensitive to lower frequencies as it is to higher frequencies. An A-weighted sound level is described as L_A, dB.

- **Sound Power Level (L_w)**

Under normal conditions, a given sound source will radiate the same amount of energy, irrespective of its surroundings, being the sound power level. This is similar to a 1kW electric heater always radiating 1kW of heat. The sound power level of a noise source cannot be directly measured using a sound level meter but is calculated based on measured sound pressure level at known distances. Noise modelling incorporates source sound power levels as part of the input data.

- **Sound Pressure Level (L_p)**

The sound pressure level of a noise source is dependent upon its surroundings, being influenced by distance, ground absorption, topography, meteorological conditions etc. and is what the human ear actually hears. Using the electric heater analogy above, the heat will vary depending upon where the heater is located, just as the sound pressure level will vary depending on the surroundings. Noise modelling predicts the sound pressure level from the sound power levels taking into account ground absorption, barrier effects, distance etc.

- **L_{ASlow}**

This is the noise level in decibels, obtained using the A-frequency weighting and the S (slow) time weighting. Unless assessing modulation, all measurements use the slow time weighting characteristic.

- **L_{AFast}**

This is the noise level in decibels, obtained using the A-frequency weighting and the F (fast) time weighting. This is used when assessing the presence of modulation.

- **L_{APeak}**

This is the greatest absolute instantaneous sound pressure level in decibels using the A-frequency weighting.

- **L_{Amax}**

An L_{Amax} level is the maximum A-weighted noise level during a particular measurement.

- **L_{A1}**

The L_{A1} level is the A-weighted noise level exceeded for 1 percent of the measurement period and is considered to represent the average of the maximum noise levels measured.

- **L_{A10}**

The L_{A10} level is the A-weighted noise level exceeded for 10 percent of the measurement period and is considered to represent the "intrusive" noise level.

- **L_{A90}**

The L_{A90} level is the A-weighted noise level exceeded for 90 percent of the measurement period and is considered to represent the "background" noise level.

- **L_{Aeq}**

The equivalent steady state A-weighted sound level ("equal energy") in decibels which, in a specified time period, contains the same acoustic energy as the time-varying level during the same period. It is considered to represent the "average" noise level.

- **One-Third-Octave Band**

Means a band of frequencies spanning one-third of an octave and having a centre frequency between 25 Hz and 20000 Hz inclusive.

- **Representative Assessment Period**

Means a period of time not less than 15 minutes, and not exceeding four hours, determined by an inspector or authorised person to be appropriate for the assessment of a noise emission, having regard to the type and nature of the noise emission.

- **L_{Amax} assigned level**

Means an assigned level, which, measured as a L_{ASlow} value, is not to be exceeded at any time.

- **L_{A1} assigned level**

Means an assigned level, which, measured as a L_{ASlow} value, is not to be exceeded for more than 1 percent of the representative assessment period.

- **L_{A10} assigned level**

Means an assigned level, which, measured as a L_{ASlow} value, is not to be exceeded for more than 10 percent of the representative assessment period.

- **$L_{Aeq(Day)}$**

The $L_{Aeq(Day)}$ level is the logarithmic average of the L_{Aeq} levels from 6.00am to 10.00pm.

- **$L_{Aeq(Night)}$**

The $L_{Aeq(Night)}$ level is the logarithmic average of the L_{Aeq} levels from 10.00pm to 6.00am.

- **Tonal Noise**

A tonal noise source can be described as a source that has a distinctive noise emission in one or more frequencies. An example would be whining or droning. The quantitative definition of tonality is:

– the presence in the noise emission of tonal characteristics where the difference between -

(a) the A-weighted sound pressure level in any one-third octave band; and

(b) the arithmetic average of the A-weighted sound pressure levels in the 2 adjacent one-third octave bands,

is greater than 3 dB when the sound pressure levels are determined as $L_{Aeq,T}$ levels where the time period T is greater than 10% of the representative assessment period, or greater than 8 dB at any time when the sound pressure levels are determined as $L_{A\ Slow}$ levels.

This is relatively common in most noise sources.

- **Modulating Noise**

A modulating source is regular, cyclic and audible and is present for at least 10% of the measurement period. The quantitative definition of modulation is:

– a variation in the emission of noise that —

(a) is more than 3 dB $L_{A\ Fast}$ or is more than 3 dB $L_{A\ Fast}$ in any one-third octave band; and

(b) is present for at least 10% of the representative assessment period; and

(c) is regular, cyclic and audible.

- **Impulsive Noise**

An impulsive noise source has a short-term banging, clunking or explosive sound. The quantitative definition of impulsiveness means:

– a variation in the emission of a noise where the difference between L_{Apeak} and L_{Amax} is more than 15 dB when determined for a single representative event.

- **Major Road**

Is a road with an estimated average daily traffic count of more than 15,000 vehicles.

- **Secondary / Minor Road**

Is a road with an estimated average daily traffic count of between 6,000 and 15,000 vehicles.

- **Noise-sensitive land use and/or development**

Land-uses or development occupied or designed for occupation or use for residential purposes (including dwellings, residential buildings or short-stay accommodation), caravan park, camping ground, educational establishment, child care premises, hospital, nursing home, corrective institution or place of worship.

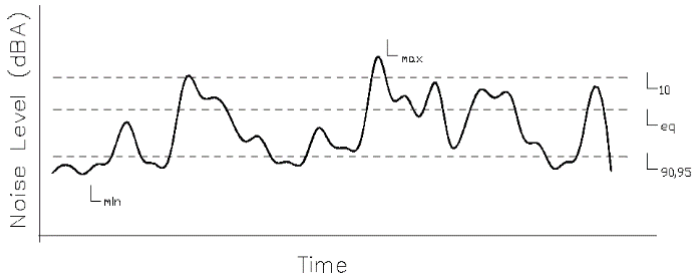
- **R_w**

This is the weighted sound reduction index. It is a single number rating determined by moving a grading curve in integral steps against the laboratory measured transmission loss until the sum of the deficiencies at each one-third-octave band, between 100 Hz and 3.15 kHz, does not exceed 32 dB. The higher the R_w value, the better the acoustic performance.

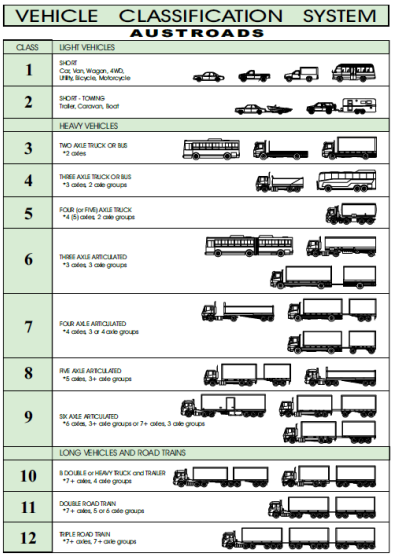
- **C_{tr}**

This is a spectrum adaptation term for airborne noise and provides a correction to the R_w value to suit source sounds with significant low frequency content such as road traffic or home theatre systems. A wall that provides a relatively high level of low frequency attenuation (i.e. masonry) may have a value in the order of – 4 dB, whilst a wall with relatively poor attenuation at low frequencies (i.e. stud wall) may have a value in the order of -12 dB.

- **Chart of Noise Level Descriptors**



- **Austroads Vehicle Class**



- **Typical Noise Levels**