

Transportation Noise Assessment

Lot 28 (#157) Barfield Road, Hammond Park

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10-Nov-21	0	Issued to Client	Terry George	Matt Moyle
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1 INTRODUCTION

It is proposed to subdivide Lot 28 (#157) Barfield Road, Hammond Park into residential lots. The location of the overall lot is shown in *Figure 1-1*, with the proposed subdivision plan shown in *Figure 1-2*. This report considers the impact of future road traffic noise from the Kwinana Freeway to the proposed subdivision.



Figure 1-1 Proposed Subdivision Location

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

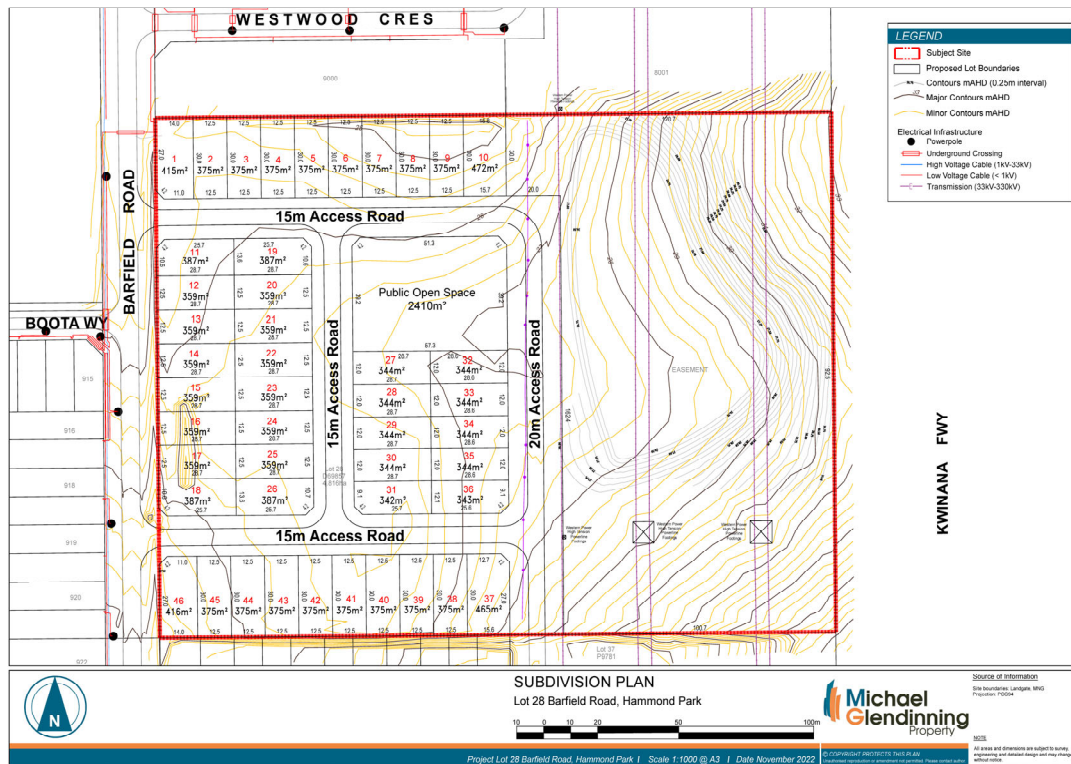


Figure 1-2 Proposed Subdivision

2 CRITERIA

The criteria relevant to this assessment 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). 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 2-1 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 2-1 Noise Targets for Noise-Sensitive Land-Use

Outdoor Noise Target		Indoor Noise Target	
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, habitable¹ facade of the 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 is undertaken.

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

- indoor noise levels specified in *Table 2-1* in noise-sensitive areas (e.g. bedrooms and living rooms of houses and school classrooms); and
- a reasonable degree of acoustic amenity for outdoor living areas on each residential lot. For non-residential noise-sensitive developments, for example schools and childcare centres, the design of outdoor areas should take into consideration the noise target.

It is recognised that in some instances, it may not be reasonable and/or practicable to meet the outdoor noise targets. Where transport noise is above the noise targets, measures are expected to be implemented that balance reasonable and practicable considerations with the need to achieve acceptable noise protection outcomes.

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

Noise measurements and modelling have been undertaken generally in accordance with the requirements of SPP 5.4 and associated Guidelines² as described in *Section 3.1* and *Section 3.2*.

3.1 Site Measurements

Noise monitoring was undertaken alongside Kwinana Freeway in order to:

- Quantify the existing noise levels;
- Determine the differences between different acoustic parameters ($L_{A10,18\text{hour}}$, $L_{Aeq(\text{Day})}$ and $L_{Aeq(\text{Night})}$); and
- Calibrate the noise model for existing conditions.

The instrument used was an ARL Type 316 noise data logger (S/N: 15-301-468), located 25 metres from the edge of the northbound on-road, with the microphone 1.4 metres above ground level (refer *Figure 3-1*). This monitoring was undertaken for a subdivision to the south, however is still valid for this site as a point of calibration. The logger was programmed to record hourly L_{A1} , L_{A10} , L_{A90} , and L_{Aeq} levels. This instrument complies with the instrumentation requirements of *Australian Standard 2702-1984 Acoustics – Methods for the Measurement of Road Traffic Noise*. The logger was field calibrated before and after the measurement session and found to be accurate to within ± 1 dB. Lloyd George Acoustics also holds current laboratory calibration certificate for the loggers.



Figure 3-1 Photograph and Location of Noise Logger

² Road and Rail Noise Guidelines, September 2019

3.2 Noise Modelling

The computer programme *SoundPLAN 7.3* 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 Classes 1 & 2) with non-heavy vehicles having a source height of 0.5 metres above road level and heavy vehicles having two sources, at heights of 1.5 metres and 3.6 metres above road level, to represent the engine and exhaust respectively. By splitting the noise source into three, allows for less barrier attenuation for high level sources where barriers are to be considered;
- Note that a -8.0 dB correction is applied to the exhaust and -0.8 dB to the engine (based on Transportation Noise Reference Book, Paul Nelson, 1987), so as to provide consistent results with the CoRTN algorithms for the no barrier scenario;
- Adjustments of -0.8 dB and -1.7 dB have been applied to the predicted levels for the 'free-field' and 'at facade' cases respectively, based on the findings of *An Evaluation of the U.K. DoE Traffic Noise Prediction*; Australian Road Research Board, Report 122 ARRB – NAASRA Planning Group (March 1983).

Predictions are made at heights of 1.4 m above ground floor level, representing single storey houses. The noise is predicted at 1.0 metre from an assumed building facade resulting in a +2.5 dB correction due to reflected noise.

Various input data are included in the modelling such as ground topography, road design, traffic volumes etc. These model inputs are discussed in the following sections.

3.2.1 Ground Topography

Topographical and road design data for this project was on file from the previous projects in the area.

Buildings have also been included as these can provide barrier attenuation when located between a source and receiver, in much the same way as a hill or wall provides noise shielding. All buildings are assumed to be single storey with a height of 3.5 metres.

Indicative design levels were provided in May 2021 by Development Engineering Consultants and have been incorporated into the noise model.

3.2.2 Traffic Data

Traffic data includes:

- Road Surface – The noise relationship between different road surface types is shown in *Table 3-1*.

Table 3-1 Noise Relationship Between Different Road Surfaces

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 and future road surface for Kwinana Freeway is open graded asphalt and is expected to remain unchanged into the future.

- Vehicle Speed – The existing and future posted speeds for the main carriageways of Kwinana Freeway are 100km/hr.
- Traffic Volumes – Existing (2016) and forecast (2041) traffic volumes were provided by Main Roads WA (Thomas Ng, Traffic Modelling Analyst, Reference: #42030). More recent traffic data was also obtained from the Main Roads WA Traffic Map site. *Table 3-2* provides the traffic volume input data in the model.

Table 3-2 Traffic Information Used in the Modelling

Road	Scenario			
	Existing - 2020/21		Future - 2041	
	Northbound	Southbound	Northbound	Southbound
Kwinana Freeway – north of ramps	50,773 (16.0)	49,803 (12.5)	78,300 (11.0)	82,700 (10.0)
Kwinana Freeway – south of ramps	45,428 (13.6)	45,614 (13.1)	72,400 (9.0)	74,100 (9.0)
Ramps – north of Rowley Road	5,345 (36.4)	4,189 (6.0)	5,900 (25.0)	8,600 (20)

Numbers in brackets are % heavy vehicles.

3.2.3 Ground Attenuation

Ground absorption values vary from 0 to 1, with 0 representing hard, reflective surfaces such as water or bitumen and 1 representing absorptive surfaces such as grass. The ground attenuation has been assumed to be 0.2 (20%) within the road reserve, and 0.6 (60%) elsewhere across the study area, except for public open space, which was set to 1.00 (100%).

4 RESULTS

4.1 Noise Measurements

The results of the noise monitoring are summarised in *Table 4-1* and shown graphically in *Figure 4-1*.

Table 4-1 Measured Average Noise Levels

Date	Average Weekday Noise Level, dB			
	L _{A10,18hour}	L _{Aeq,24hour}	L _{Aeq (Day)}	L _{Aeq (Night)}
<i>Wednesday 13 October 2021</i>	72.0	70.5	70.9	69.7
Thursday 14 October 2021	70.4	68.3	69.1	66.4
Friday 15 October 2021	70.9	68.7	69.6	65.9
<i>Saturday 16 October 2021</i>	69.7	66.7	67.8	63.0
<i>Sunday 17 October 2021</i>	69.0	66.1	67.5	60.5
Monday 18 October 2021	69.9	67.7	68.6	65.4
<i>Tuesday 19 October 2021</i>	72.9	70.8	71.4	69.5
<i>Wednesday 20 October 2021</i>	72.1	69.5	70.3	67.1
Thursday 21 October 2021	70.6	68.6	69.2	67.3
Weekday Average	70.4	68.3	69.1	66.2

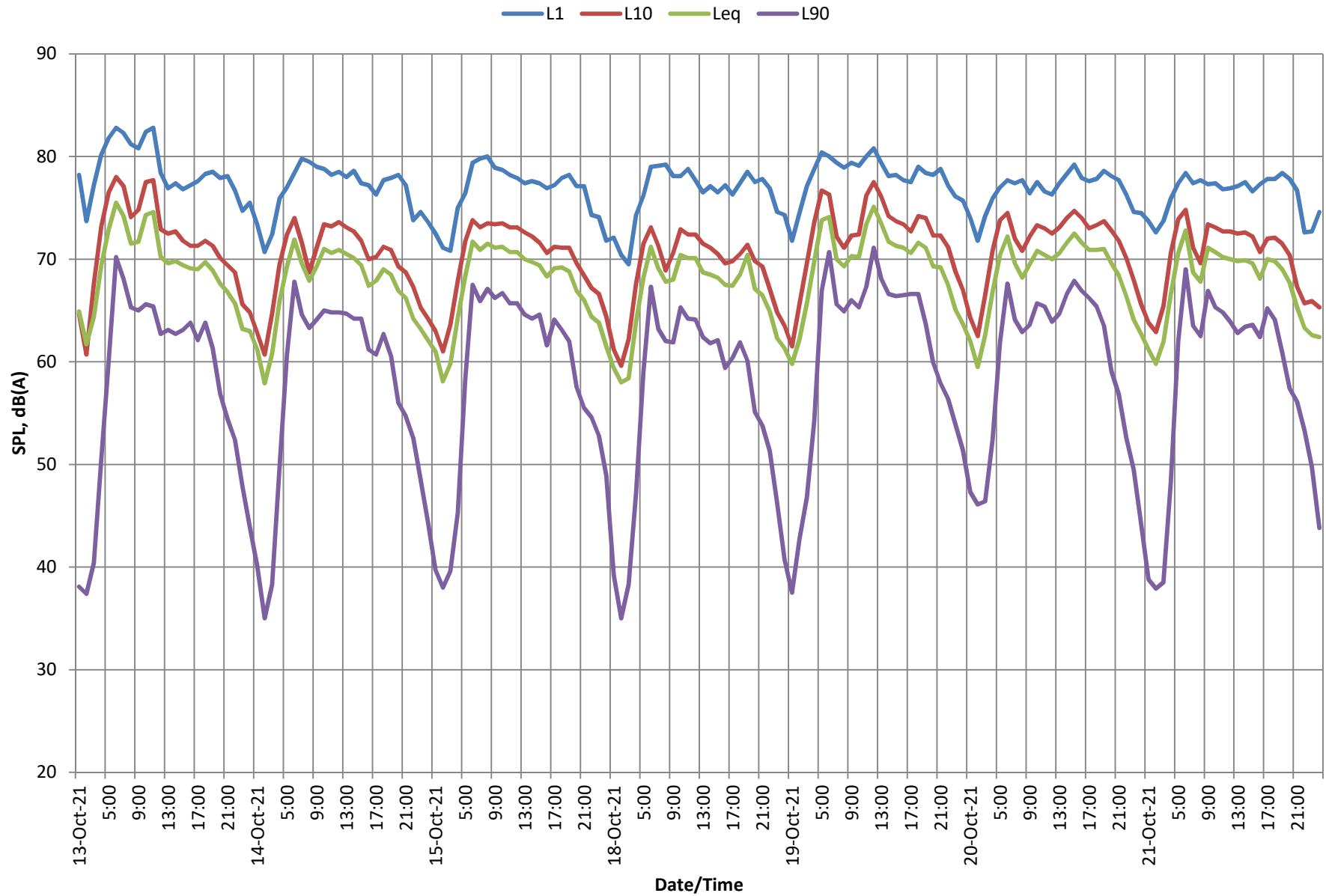
* Those shown in shaded italics are not used in average due to poor weather or not being a weekday.

The average difference between the weekday L_{Aeq(Day)} and L_{Aeq(Night)} is 2.9 dB and this conversion has been used in the modelling. This same difference has been assumed to exist in future years. As such, it is the L_{Aeq(Night)} noise levels that will dictate compliance, since these are within 5 dB of the daytime levels.

4.2 Noise Modelling

The noise model is initially set-up and calibrated for existing conditions. It is then updated to reflect future conditions incorporating the proposed development and future traffic volumes with the results provided in *Figure 4-2* as an L_{Aeq(Night)} noise level contour plot.

Figure 4-1: Noise Monitoring Alongside Kwinana Freeway



Lot 28 Barfield Road, Hammond Park - Proposed Subdivision LAeq(Night) Noise Level Contours - Future

Figure 4-2

Noise levels
 $L_{Aeq(night)}$ dB

<= 50	
<= 51	Exposure A
<= 52	
<= 53	
<= 54	Exposure B
<= 55	
<= 56	
<= 57	
<= 58	Exposure C
<= 59	
<= 60	
<= 61	
> 61	Exposure D+

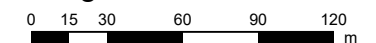


Signs and symbols

- Road Lanes
- Building
- Subject Site

1 December 2022

Length Scale 1:3000



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5 ASSESSMENT

The objectives of SPP 5.4 are to achieve:

- indoor noise levels specified in *Table 2-1* in noise-sensitive areas (e.g. bedrooms and living rooms of houses and school classrooms); and
- a reasonable degree of acoustic amenity for outdoor living areas on each residential lot.

Where the outdoor noise targets of *Table 2-1* are achieved, no further controls are necessary.

With reference to the predicted noise levels in *Section 4.2*, it is evident the outdoor noise target will be exceeded at some lots. As such, the following is recommended:

- Where lots are above the outdoor noise target (refer *Figure 5-1*), the following Packages (refer *Appendix A*) are required:
 - Package A where noise levels are between 51 dB and 53 dB $L_{Aeq(Night)}$;
 - Package B where noise levels are between 54 dB and 57 dB $L_{Aeq(Night)}$;

Alternative constructions from the deemed to satisfy packages may be acceptable if supported by a report undertaken by a suitably qualified acoustical consultant (member from of the Association of Australasian Acoustical Consultants (AAAC)), once the lots specific building plans are available.

- All affected lots are to have notifications on lot titles as per SPP 5.4 requirements – refer *Appendix A*.
- Where a dwelling is to be more than one storey, a specific house assessment is to be undertaken by a suitably qualified acoustical consultant.

With regard to the northeast and southeast most lots, these are within Exposure B and therefore will be required to:

- Provide an outdoor living area that is screened by the house from the road (i.e. outdoor living area on west side); or
- Screen the outdoor living area using a 2.4 metre high wall. Wall to be of a material having a minimum surface mass of 15 kg/m².

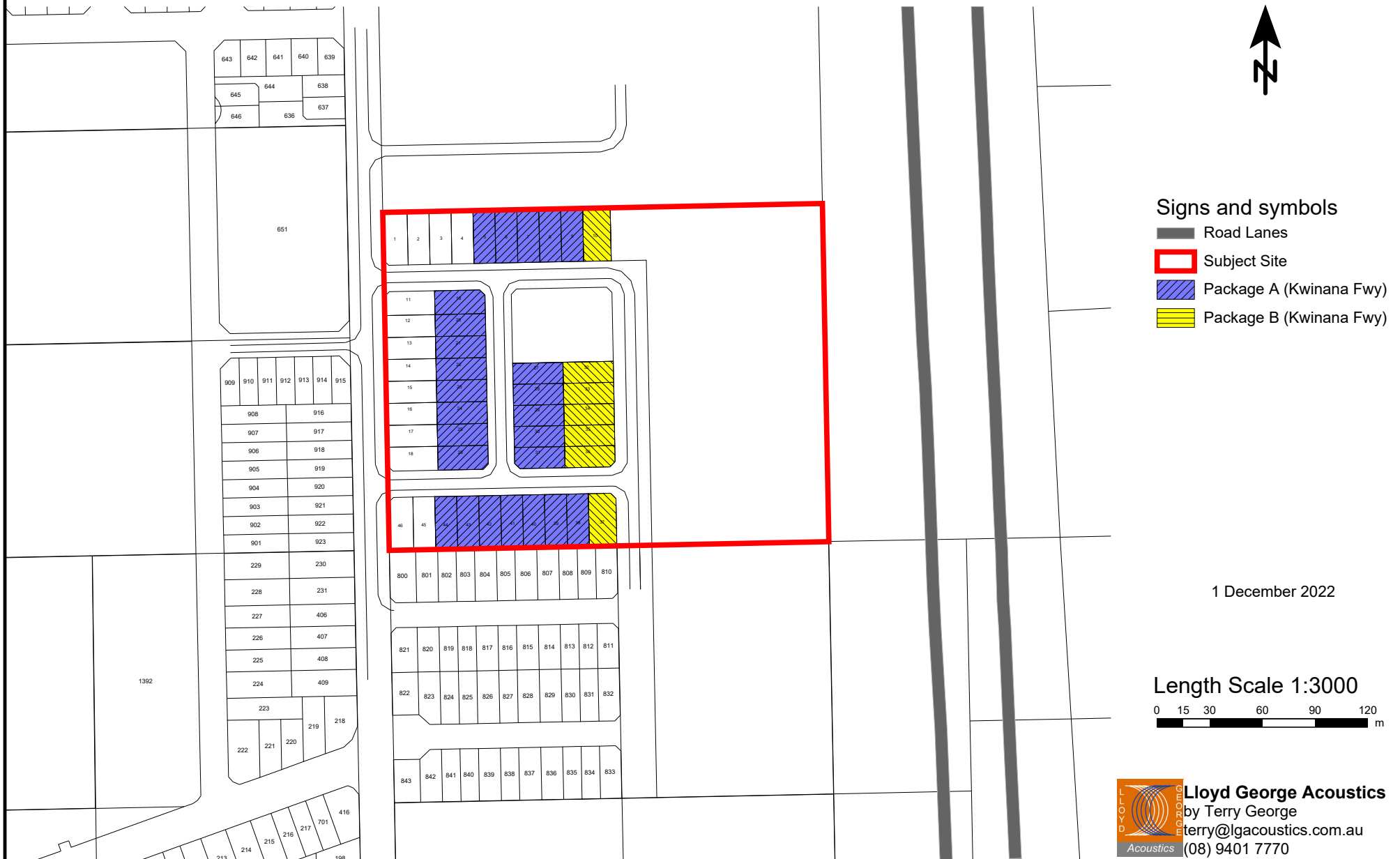
The lots between the northeast and southeast most lots that are also Exposure B, front the local road so will naturally have their outdoor living area on the side of the house opposite the corridor.

With regard to Lots within Exposure A, noise levels are only marginally above the outdoor noise target and therefore, whilst preference can be given to locating the outdoor living area on the opposite side of the dwelling to the corridor, this is not considered mandatory.

For all affected houses, it is recommended that purchasers be encouraged to undertake a house specific assessment. This is undertaken once the plans become available for the proposed dwelling. The advantage of this is the costs associated with the Package A and Package B upgrades can be significantly minimised. For instance, the Package B lots that face towards the Freeway will have a garage and likely one room at the front. Whilst the construction requirements to this front room will unlikely change from that nominated in Package B, it's likely that the requirements to the sides and rear of the dwelling would be significantly less due to additional screening from neighbouring dwellings not envisaged in the default packages. For the Package A lots, it is likely that only 1 or 2 façades are resulting in the dwelling being noise affected and hence, the construction requirements could again be reduced once the house plans are available.

Lot 28 Barfield Road, Hammond Park - Proposed Subdivision
Proposed Noise Mitigation

Figure 5-1



Appendix A

Quiet House Packages

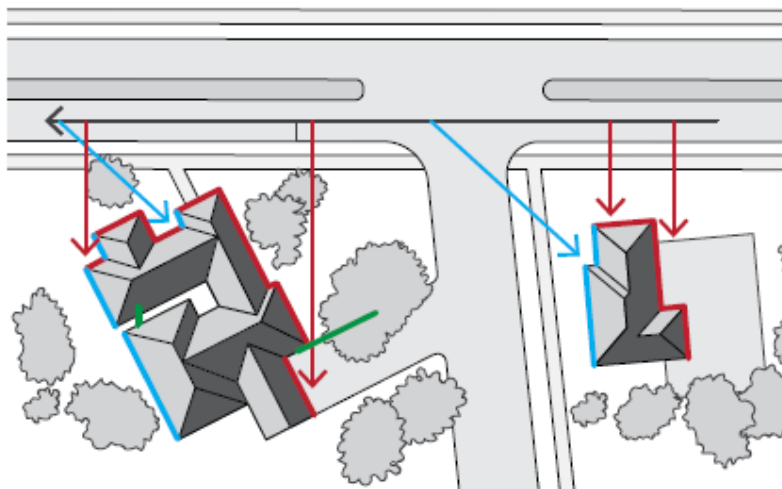
The packages and information provided on the following pages are taken from *Road and Rail Noise Guidelines* (September 2019).

Where outdoor and indoor noise levels received by a noise-sensitive land-use and/or development exceed the policy's noise target, implementation of quiet house requirements is an acceptable solution.

The quiet house packages are not the only solution to achieving acceptable internal transport noise levels. A suitably qualified acoustical engineer or consultant may also determine more tailored acoustic design requirements for buildings in a transport noise corridor by carrying out acoustic design in accordance with relevant industry standards. This includes the need to meet the relevant design targets specified in AS/NZS 2107:2016 for road traffic noise.

With regards to the packages, the following definitions are provided:

- **Facing** the transport corridor (red): Any part of a building façade is 'facing' the transport corridor if any straight line drawn perpendicular (at a 90 degree angle) to its nearest road lane or railway line intersects that part of the façade without obstruction (ignoring any fence).
- **Side-on** to transport corridor (blue): Any part of a building façade that is not 'facing' is 'side-on' to the transport corridor if any straight line, at any angle, can be drawn from it to intersect the nearest road lane or railway line without obstruction (ignoring any fence).
- **Opposite** to transport corridor (green): Neither 'side on' nor 'facing', as defined above.



Quiet House Package A

56-58 dB $L_{Aeq}(\text{Day})$ & 51-53 dB $L_{Aeq}(\text{Night})$

Element	Orientation	Room	
		Bedroom	Indoor Living and Work Areas
External Windows	Facing	- Up to 40% floor area ($R_w + C_{tr} \geq 28$): - Sliding or double hung with minimum 10mm single or 6mm-12mm-10mm double insulated glazing; - Sealed awning or casement windows with minimum 6mm glass. - Up to 60% floor area ($R_w + C_{tr} \geq 31$): - Sealed awning or casement windows with minimum 6mm glass.	- Up to 40% floor area ($R_w + C_{tr} \geq 25$): - Sliding or double hung with minimum 6mm single or 6mm-12mm-6mm double insulated glazing; - Up to 60% floor area ($R_w + C_{tr} \geq 28$); - Up to 80% floor area ($R_w + C_{tr} \geq 31$).
	Side On	As above, except $R_w + C_{tr}$ values may be 3 dB less or max % area increased by 20%.	
	Opposite	No specific requirements	
External Doors	Facing	Fully glazed hinged door with certified $R_w + C_{tr} \geq 28$ rated door and frame including seals and 6mm glass.	- Doors to achieve $R_w + C_{tr} \geq 25$: 35mm Solid timber core hinged door and frame system certified to $R_w 28$ including seals; - Glazed sliding door with 10mm glass and weather seals.
	Side On	As above, except $R_w + C_{tr}$ values may be 3 dB less.	
	Opposite	No specific requirements	
External Walls	All	$R_w + C_{tr} \geq 45$: - Two leaves of 90mm thick clay brick masonry with minimum 20mm cavity; or - Single leaf of 150mm brick masonry with 13mm cement render on each face; or - One row of 92mm studs at 600mm centres with: - Resilient steel channels fixed to the outside of the studs; and 9.5mm hardboard or fibre cement sheeting or 11mm fibre cement weatherboards fixed to the outside; 75mm thick mineral wool insulation with a density of at least 11kgkg/m³; and 2 x 16mm fire-rated plasterboard to inside.	
Roofs and Ceilings	All	$R_w + C_{tr} \geq 35$: - Concrete or terracotta tile or metal sheet roof with sarking and at least 10mm plasterboard.	
Outdoor Living Areas		Where practicable, located outdoor living area on side of house opposite to corridor.	

Quiet House Package B

59-62 dB $L_{Aeq}(\text{Day})$ & 54-57 dB $L_{Aeq}(\text{Night})$

Element	Orientation	Room	
		Bedroom	Indoor Living and Work Areas
External Windows	Facing	- Up to 40% floor area ($R_w + C_{tr} \geq 31$): - Fixed sash, awning or casement with minimum 6mm glass or 6mm-12mm-6mm double insulated glazing. - Up to 60% floor area ($R_w + C_{tr} \geq 34$): - Fixed sash, awning or casement with minimum 10mm glass or 6mm-12mm-10mm double insulated glazing.	- Up to 40% floor area ($R_w + C_{tr} \geq 28$): - Sliding or double hung with 6mm-12mm-10mm double insulated glazing; - Sealed awning or casement windows with minimum 6mm glass. - Up to 60% floor area ($R_w + C_{tr} \geq 31$); - Up to 80% floor area ($R_w + C_{tr} \geq 34$).
	Side On	As above, except $R_w + C_{tr}$ values may be 3 dB less or max % area increased by 20%.	
	Opposite	As above, except $R_w + C_{tr}$ values may be 6 dB less or max % area increased by 20%.	
External Doors	Facing	Fully glazed hinged door with certified $R_w + C_{tr} \geq 31$ rated door and frame including seals and 10mm glass.	- Doors to achieve $R_w + C_{tr} \geq 28$: 40mm Solid timber core hinged door and frame system certified to $R_w 32$ including seals; - Fully glazed hinged door with certified $R_w + C_{tr} \geq 28$ rated door and frame including seals and 6mm glass.
	Side On	As above, except $R_w + C_{tr}$ values may be 3 dB less or max % area increased by 20%.	
	Opposite	As above, except $R_w + C_{tr}$ values may be 6 dB less or max % area increased by 20%.	
External Walls	All	$R_w + C_{tr} \geq 50$: - Two leaves of 90mm thick clay brick masonry with minimum 50mm cavity between leaves and 25mm glasswool or polyester (24kg/m³). Resilient ties used where required to connect leaves. - Two leaves of 110mm clay brick masonry with minimum 50mm cavity between leaves and 25mm glasswool or polyester insulation (24kg/m³). - Single leaf of 220mm brick masonry with 13mm cement render on each face. 150mm thick unlined concrete panel or 200mm thick concrete panel with one layer of 13mm plasterboard or 13mm cement render on each face. - Single leaf of 90mm clay brick masonry with: - A row of 70mm x 35mm timber studs or 64mm steel studs at 600mm centres; - A cavity of 25mm between leaves; 50mm glasswool or polyester insulation (11kg/m³) between studs; and - One layer of 10mm plasterboard fixed to the inside face.	
Roofs and Ceilings	All	$R_w + C_{tr} \geq 35$: - Concrete or terracotta tile or metal sheet roof with sarking and at least 10mm plasterboard ceiling with R3.0+ fibrous insulation.	
Outdoor Living Areas		At least one outdoor living area located on the opposite side of the building from the transport corridor and/or at least one ground level outdoor living area screened using a solid continuous fence or other structure of minimum 2.4 metres height above ground level.	

Mechanical Ventilation requirements

In implementing the acceptable treatment packages, the following mechanical ventilation / air-conditioning considerations are required:

- Acoustically rated openings and ductwork to provide a minimum sound reduction performance of R_w 40 dB into sensitive spaces;
- Evaporative systems require attenuated ceiling air vents to allow closed windows;
- Refrigerant based systems need to be designed to achieve National Construction Code fresh air ventilation requirements;
- Openings such as eaves, vents and air inlets must be acoustically treated, closed or relocated to building sides facing away from the corridor where practicable.

Notification

Notifications on title advise prospective purchasers of the potential for noise impacts from major transport corridors and help with managing expectations.

The Notification is to state as follows:

This lot is in the vicinity of a transport corridor and is affected, or may in the future be affected, by road and rail transport noise. Road and rail transport noise levels may rise or fall over time depending on the type and volume of traffic.

Appendix B

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 and sound power 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.

L_1

An L_1 level is the noise level which is exceeded for 1 per cent of the measurement period and is considered to represent the average of the maximum noise levels measured.

L_{10}

An L_{10} level is the noise level which is exceeded for 10 per cent of the measurement period and is considered to represent the “intrusive” noise level.

L_{90}

An L_{90} level is the noise level which is exceeded for 90 per cent of the measurement period and is considered to represent the “background” noise level.

L_{eq}

The L_{eq} level represents the average noise energy during a measurement period.

$L_{A10,18hour}$

The $L_{A10,18\text{ hour}}$ level is the arithmetic average of the hourly L_{A10} levels between 6.00 am and midnight. The CoRTN algorithms were developed to calculate this parameter.

$L_{Aeq,24hour}$

The $L_{Aeq,24\text{ hour}}$ level is the logarithmic average of the hourly L_{Aeq} levels for a full day (from midnight to midnight).

$L_{Aeq,8hour} / L_{Aeq}(\text{Night})$

The $L_{Aeq}(\text{Night})$ level is the logarithmic average of the hourly L_{Aeq} levels from 10.00 pm to 6.00 am on the same day.

$L_{Aeq,16hour} / L_{Aeq}(\text{Day})$

The $L_{Aeq}(\text{Day})$ level is the logarithmic average of the hourly L_{Aeq} levels from 6.00 am to 10.00 pm on the same day. This value is typically 1-3 dB less than the $L_{A10,18hour}$.

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.

About the Term 'Reasonable'

An assessment of reasonableness should demonstrate that efforts have been made to resolve conflicts without comprising on the need to protect noise-sensitive land-use activities. For example, have reasonable efforts been made to design, relocate or vegetate a proposed noise barrier to address community concerns about the noise barrier height? Whether a noise mitigation measure is reasonable might include consideration of:

- The noise reduction benefit provided;
- The number of people protected;
- The relative cost vs benefit of mitigation;
- Road conditions (speed and road surface) significantly differ from noise forecast table assumptions;
- Existing and future noise levels, including changes in noise levels;
- Aesthetic amenity and visual impacts;
- Compatibility with other planning policies;
- Differences between metropolitan and regional situations and whether noise modelling requirements reflect the true nature of transport movements;
- Ability and cost for mobilisation and retrieval of noise monitoring equipment in regional areas;
- Differences between Greenfield and infill development;
- Differences between freight routes and public transport routes and urban corridors;
- The impact on the operational capacity of freight routes;
- The benefits arising from the proposed development;
- Existing or planned strategies to mitigate the noise at source.

About the Term 'Practicable'

'Practicable' considerations for the purposes of the policy normally relate to the engineering aspects of the noise mitigation measures under evaluation. It is defined as "reasonably practicable having regard to, among other things, local conditions and circumstances (including costs) and to the current state of technical knowledge" (*Environmental Protection Act 1986*). These may include:

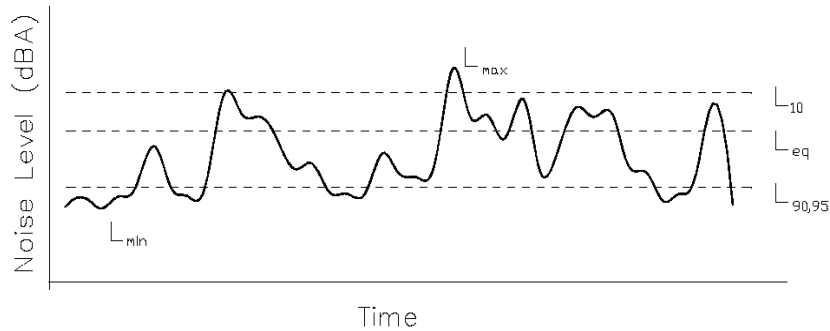
- Limitations of the different mitigation measures to reduce transport noise;
- Competing planning policies and strategies;
- Safety issues (such as impact on crash zones or restrictions on road vision);
- Topography and site constraints (such as space limitations);
- Engineering and drainage requirements;
- Access requirements (for driveways, pedestrian access and the like);
- Maintenance requirements;
- Bushfire resistance or BAL ratings;
- Suitability of the building for acoustic treatments.

R_w

This is the weighted sound reduction index and is similar to the previously used STC (Sound Transmission Class) value. 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 -14 dB.

Chart of Noise Level Descriptors**Austroads Vehicle Class**

VEHICLE CLASSIFICATION SYSTEM AUSTROADS	
CLASS	LIGHT VEHICLES
1	SHORT Car, Van, Wagon, 4WD, Utility, Bicycle, Motorcycle
2	SHORT - TOWING Trailer, Caravan, Boat
HEAVY VEHICLES	
3	TWO AXLE TRUCK OR BUS *2 axle
4	THREE AXLE TRUCK OR BUS *3 axles, 2 axle groups
5	FOUR (or FIVE) AXLE TRUCK *4 (5) axles, 2 axle groups
6	THREE AXLE ARTICULATED *3 axles, 3 axle groups
7	FOUR AXLE ARTICULATED *4 axles, 3 or 4 axle groups
8	FIVE AXLE ARTICULATED *5 axles, 3+ axle groups
9	SIX AXLE ARTICULATED *6 axles, 3+ axle groups or 7+ axles, 3 axle groups
LONG VEHICLES AND ROAD TRAINS	
10	8 DOUBLE or HEAVY TRUCK and TRAILER *7+ axles, 4 axle groups
11	DOUBLE ROAD TRAIN *7+ axles, 5 or 6 axle groups
12	TRIPLE ROAD TRAIN *7+ axles, 7+ axle groups

Typical Noise Levels

