Appendix D Transport Noise Assessment

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Transportation Noise Assessment

Lot 51 Raymond Road, Roelands

Reference: 251010878-01A

Prepared for:
Taycot

Reference: 251010878-01A

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Date	Rev	Description	Author	Verified
31-Oct-25	0	Issued to Client	Terry George	Rob Connolly
2-Dec-25	A	Updated following comments from MRWA	Terry George	-

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1. INTRODUCTION

It is proposed to subdivide land at Lot 51 Raymond Road, Roelands (refer *Figure 1-1*) with the proposed subdivision plan shown in *Figure* 1-2. The site adjoins Wilman Widandi Highway (WWH) to the east, which is considered a 'Strategic Freight/Major Traffic Route' and Raymond Road to the north, which is considered an 'Other Significant Freight / Traffic Route' as shown on PlanWA Maps. As such, a noise assessment is required in accordance with *State Planning Policy No. 5.4 Road and Rail Noise*, being the subject of this report.

Figure 1-1: Subdivision Location (Source: DPLH PlanWA)

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

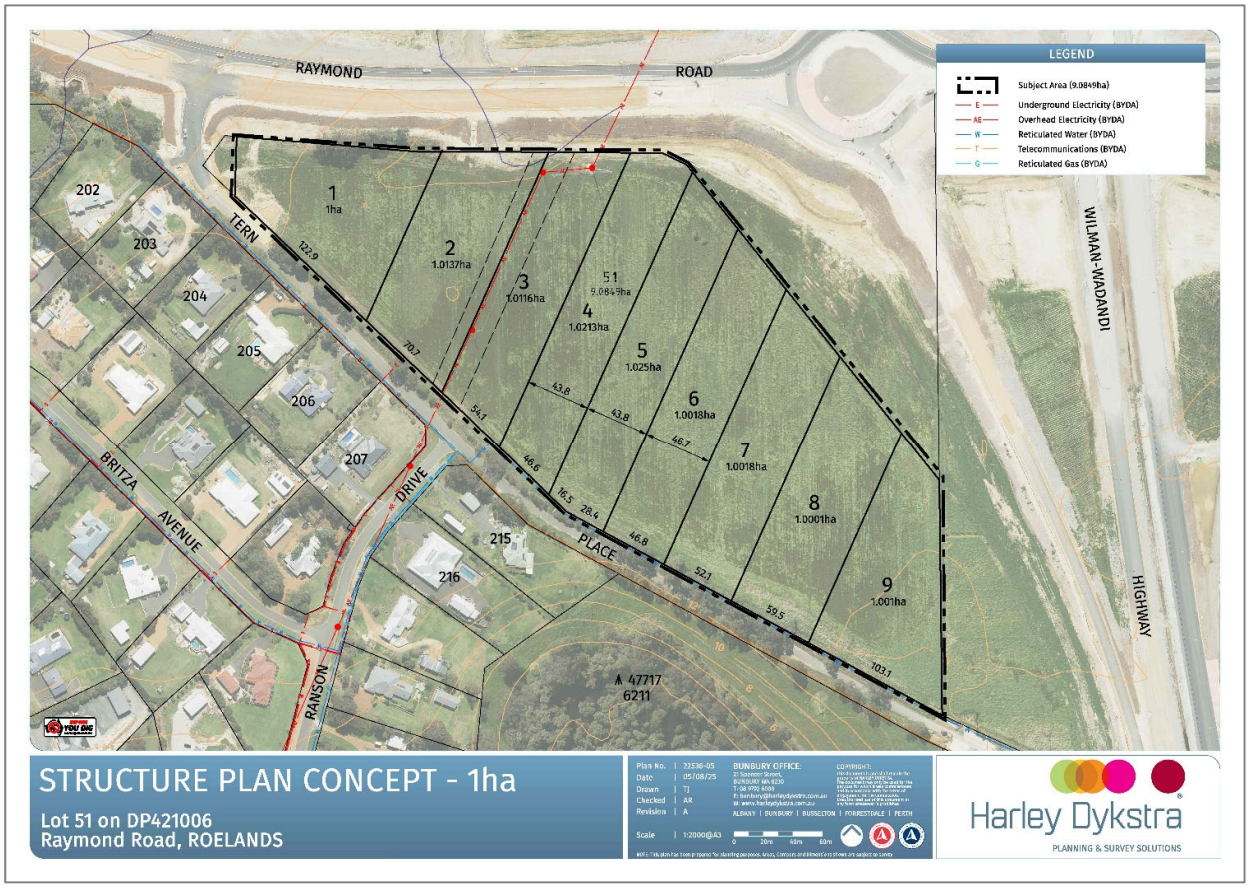


Figure 1-2: Subdivision Layout

2. CRITERIA

The criteria relevant to this project 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 2-1 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

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.

[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 modelling has been undertaken in accordance with the requirements of SPP 5.4 and associated Guidelines, noting Lloyd George Acoustics (LGA) was involved in the Bunbury Outer Ring Road (BORR) project (now Wilman Widandi Highway) with Southwest Gateway Alliance (SWGA). As such, the same noise model has been used as a basis for the proposed subdivision.

3.1. Site Measurements

Noise monitoring was not undertaken for this project specifically, however was undertaken in July/August 2025 for the SWGA that constructed Wilman Widandi Highway and upgraded Raymond Road. Monitoring locations relevant to this site were undertaken in free-field alongside Raymond Road (1 Britzna Avenue, Roelands) and closer to the WWH northbound off ramp. As the monitoring was not undertaken for this project, specifics are not provided although some comments are made.

3.2. Noise Modelling

The computer program *SoundPLAN 8.1* 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;
- Adjustments of -0.8 dB and -1.7 dB have been applied to the predicted levels for the 'free-field' and 'at façade' 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 metres above ground floor level for single storey buildings and 4.2 metres above ground floor level for possible first floors of double storey buildings. The noise is predicted at 1-metre from an assumed building façade, resulting in a + 2.5 dB correction due to reflected noise.

Various input data are included in the modelling and these are discussed in *Section 3.2.1* to *Section 3.2.5*.

3.2.1. Ground Topography

Topographical data was on file for the BORR/WWH project. Lots will remain at existing levels, however a pad will likely be required at the house, expected to be 500mm to 900mm above existing ground. As such, existing ground for the subject site has been increased by 900mm to be conservative, noting both Raymond Road and WWH are higher than the subject site.

3.2.2. Road Surface

The corrections applied for different road surface finishes are provided in *Table 3-1*.

Table 3-1: 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

Raymond Road is Dense Graded Asphalt and WWH is 14mm Chip Seal with on/off ramps transitioning between the two road surface types.

3.2.3. Vehicle Speed

Raymond Road has a posted speed of 80 km/hr with WWH at 110 km/hr. The on/off ramps transition between the two posted speeds.

3.2.4. Traffic Volumes

An assessment of road traffic volumes was undertaken by Transcore for the larger Treendale East Structure Plan area (*Treendale East Structure Plan, Transport Impact Assessment*; September 2025, t21262-rw-r01c). Advice from Main Roads WA for that report was to use existing traffic volumes (May 2025) and apply a 2% and 3% per annum growth rate to determine 2041 traffic volumes. The provided volumes from this report are shown in *Figure 3-2*.

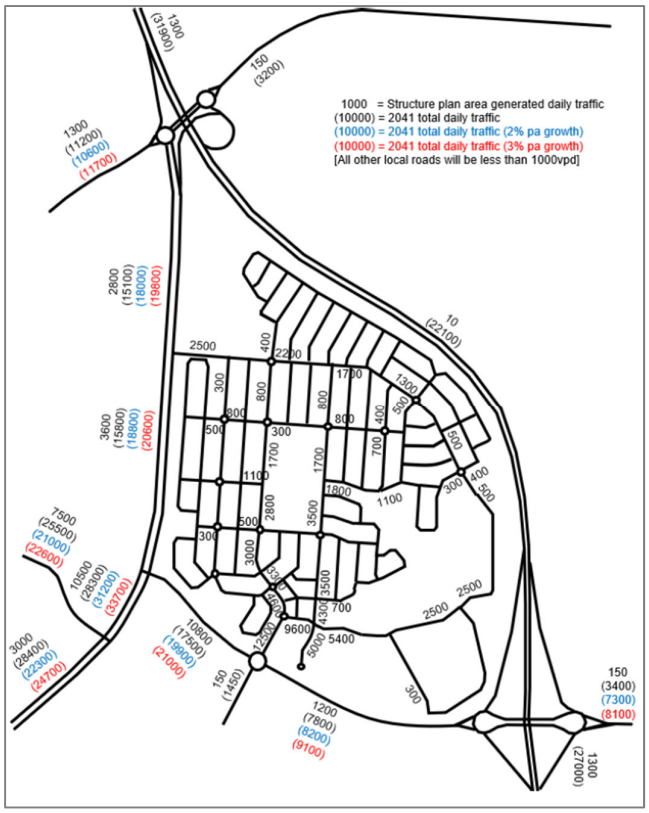


Figure 3-1: Traffic Volumes from Transcore Report

Some data required for noise modelling is not provided so these were determined in a similar way from our involvement in the BORR/WWH project as shown in *Table 3-2*. The percentage heavy vehicles is 15% in all cases.

Table 3-2: 2046 (3% Growth Rate) Traffic Information Used in Noise Modelling

Road	Northbound / Eastbound	Southbound / Westbound
Raymond Road – West of WWH	5,275	5,275
WWH – North of Raymond Interchange	12,810	12,810
WWH – Through Raymond Road Interchange	13,850	13,850
WWH – South of Raymond Road Interchange	15,650	15,650
Interchange – On Ramp to/from Raymond Road	1,050	3,770
Interchange – Off Ramp to/from Raymond Road	1,800	930

3.2.5. Ground Absorption

The ground absorption has been assumed to be 0.0 (0%) for the roads, 0.2 (20%) within the road earthworks and 0.7 (70%) elsewhere, noting that 0.0 represents hard reflective surfaces such as water and 1.0 represents absorptive surfaces such as grass.

4. RESULTS

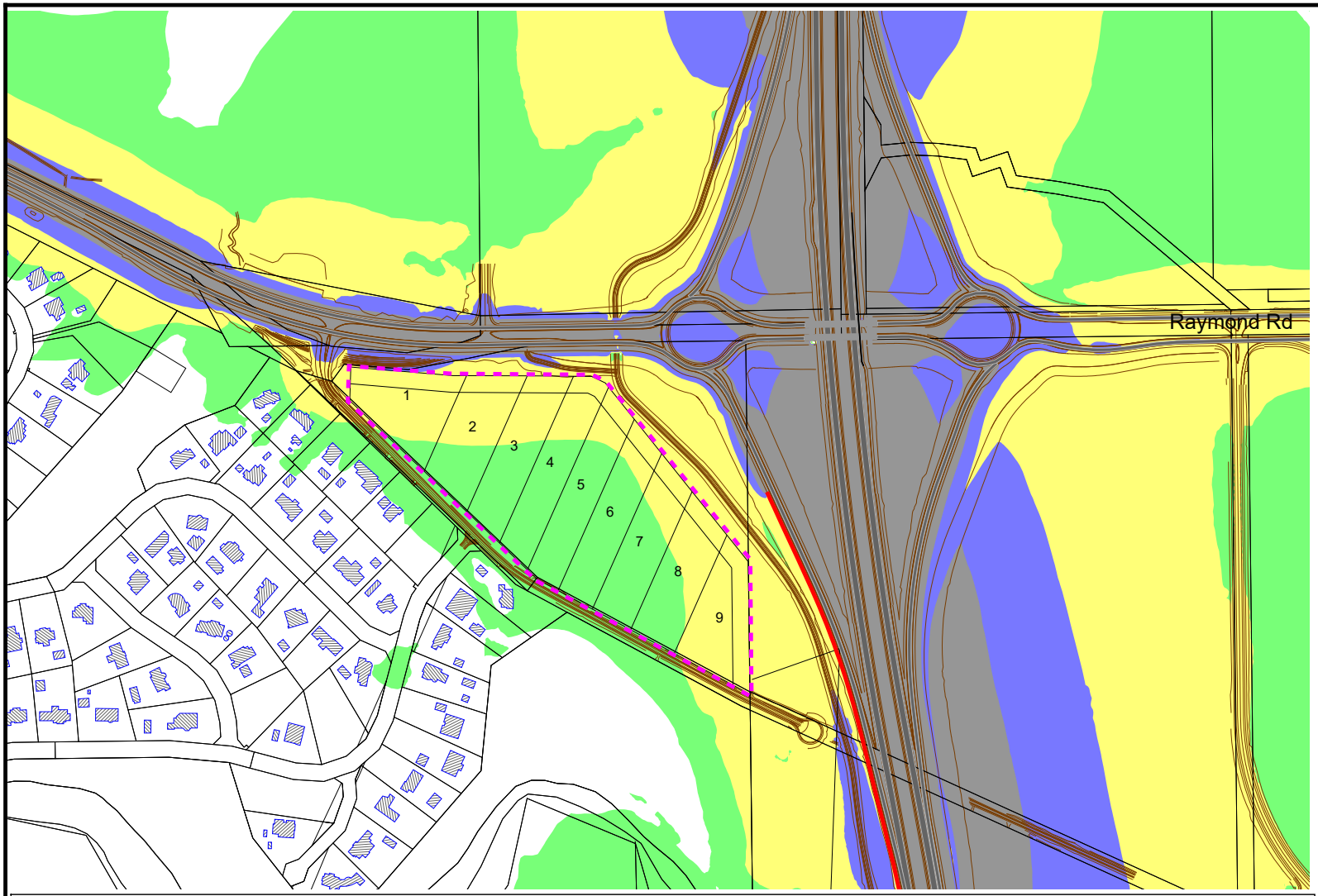
Both noise loggers were set-up on 24 July 2025 and collected on 8 August 2025 with the results summarised in *Table 4-1*. Also shown is a comparison of the 2025 noise model with the monitoring results. For the most part, the model is over-predicting, with the exception of the night-time predicted level at the end of Tern Place. It is expected that over time, the majority of traffic growth will occur during the day so that the difference between the daytime and night-time noise will increase. Nevertheless, the night-time noise levels have been used for assessment purposes with no adjustments applied to the noise model.

Table 4-1: Results of Noise Logging and Model Accuracy

Location	$L_{Aeq(Day)}$			$L_{Aeq(Night)}$		
	Measured	Modelled	Accuracy	Measured	Modelled	Accuracy
Raymond Road (1 Britzna Avenue)	52.4	56.9	+4.5	48.9	51.9	+3.0
WWH NB Off Ramp (Lot 878, End of Tern Place)	52.3	55.0	+2.7	50.4	50.0	-0.4

The results of the noise modelling are provided as noise contour plots at ground floor level and a possible first floor level (double storey house) in *Figure 4-1* and *Figure 4-2* respectively.

Figure 4-1



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

SPP 5.4 (May 2019)

Signs and symbols
- Roads
- Existing Buildings
- Noise Wall
- Road Design
- Subject Site

N

Length Scale 1:7500

0 37.5 75 150 225 300 m

Lot 51 Raymond Road, Roelands - Future Road Traffic Noise Level Contours

$L_{Aeq(Night)}$ Noise Level Contours Based on Future Conditions
Ground Floor Level

SoundPlan v8.1
CoRTN Algorithms

2 December 2025

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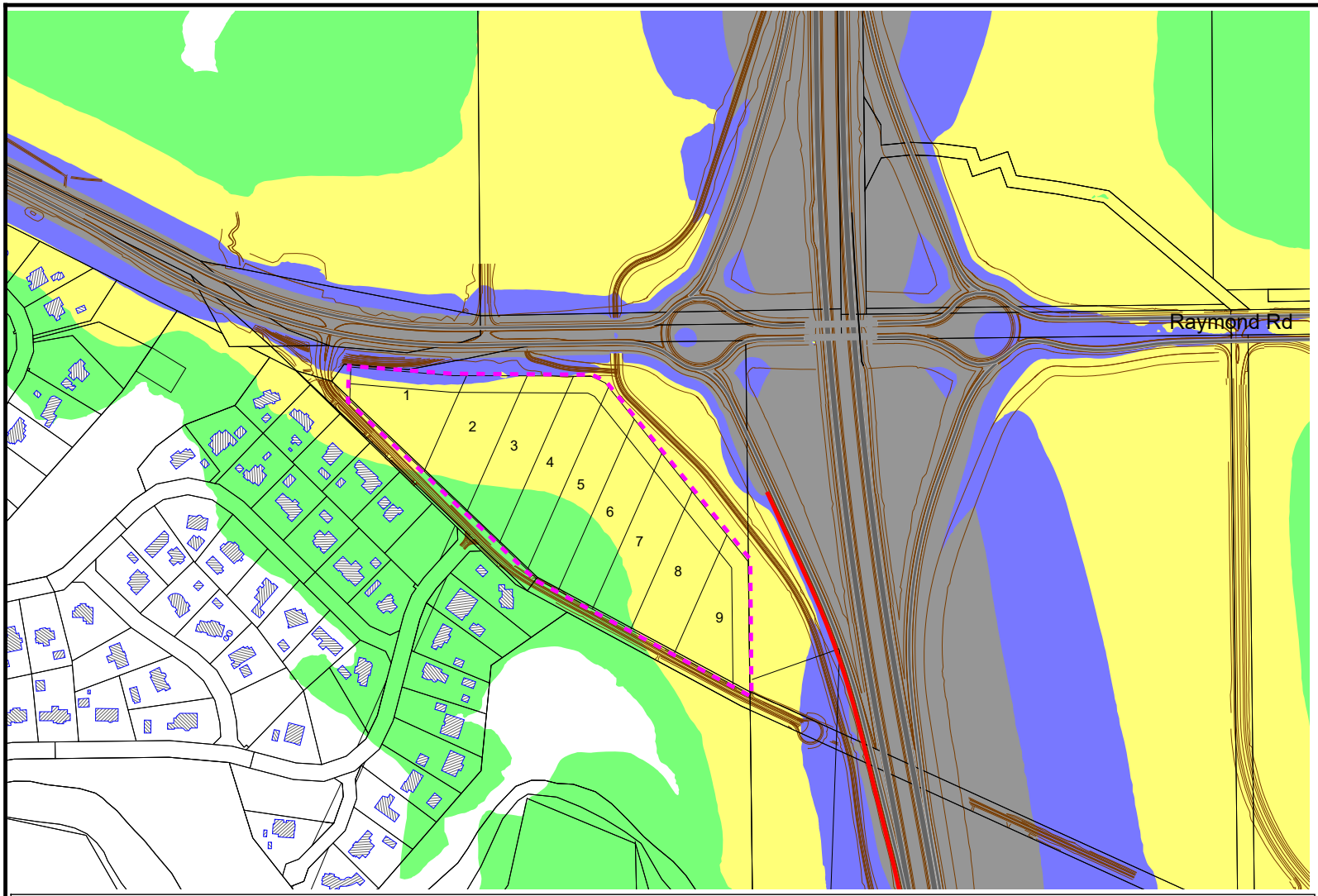
Figure 4-2



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

SPP 5.4 (May 2019)

Signs and symbols
- Roads
- Existing Buildings
- Noise Wall
- Road Design
- Subject Site

N

Length Scale 1:7500

0 37.5 75 150 225 300 m

Lot 51 Raymond Road, Roelands - Future Road Traffic Noise Level Contours

$L_{Aeq(Night)}$ Noise Level Contours Based on Future Conditions
First Floor Level

SoundPlan v8.1
CoRTN Algorithms

2 December 2025

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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
- 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 noise controls are necessary. With reference to *Section 4*, it is evident the outdoor noise target will be exceeded at all lots.

To manage noise, the following is proposed:

- All lots shall have notifications on title advising of the possible noise impacts;
- Where practicable, houses shall be constructed outside of Exposure B (unlikely to be practicable for Lots 1 and 9) by providing acceptable building envelope locations;
- Where a dwelling is constructed within Exposure B (yellow zone on *Figure 4-1* for ground floor and *Figure 4-2* for first floor), Quiet House Package B shall be incorporated, as provided in *Appendix A* taken from the SPP 5.4 Guidelines;
- All other dwellings shall incorporate Quiet House Package A, as provided in *Appendix A* taken from the SPP 5.4 Guidelines;
- Alternatives to the provided Packages can be accepted if supported by a report from a suitably qualified acoustical consultant (member firm of the Association of Australasian Acoustical Consultants (AAAC)) once the specific house plans for the lot are available.

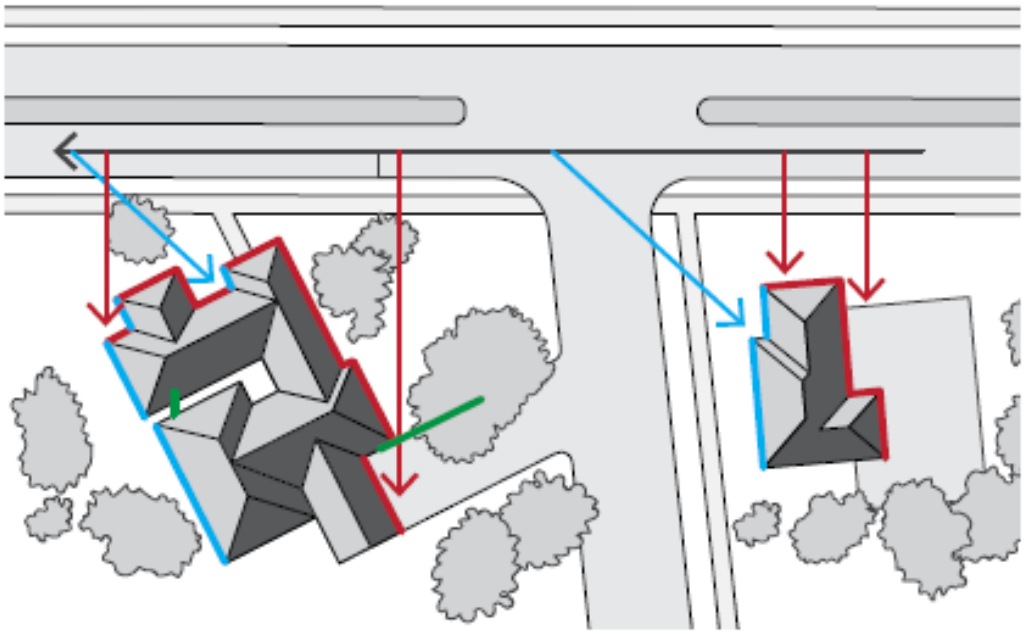
Appendix A – Quiet House Packages

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.

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 $L_{Aeq(Day)}$ & 51-53 dB $L_{Aeq(Night)}$

Element	Orientation	Room	
		Bedroom	Indoor Living and Work Areas
External Glazing	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 11kg/m^3; 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		At least one outdoor living area located on the opposite side of the building from the transport corridor or at least one ground level outdoor living area screened using a solid continuous fence or other structure of minimum 2 metres height above ground level.	

Quiet House Package B

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

Element	Orientation	Room	
		Bedroom	Indoor Living and Work Areas
External Glazing	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 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

Where habitable room windows are openable to satisfy natural ventilation requirements of the NCC, means the occupant has the option to have windows open or closed to satisfy natural ventilation or acoustic requirements.

- Where ducted refrigerated air-conditioning is provided, incorporate fresh air duct intake;
- Evaporative systems require attenuated ceiling air vents to allow closed windows; and
- 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 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_{eq}**

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

- **L_1**

The L_1 level represents the noise level exceeded for 1 percent of the measurement period and is considered to represent the average of the maximum noise levels measured.

- **L_{10}**

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

- **L_{90}**

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

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

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.

- **$L_{A10,18hour}$**

The $L_{A10,18hour}$ level is the arithmetic average of the hourly L_{A10} levels between 6.00am and midnight.

- **$L_{Aeq,24hour}$**

The $L_{Aeq,24hour}$ level is the logarithmic average of the L_{Aeq} levels from over an entire day.

- **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.

- **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:

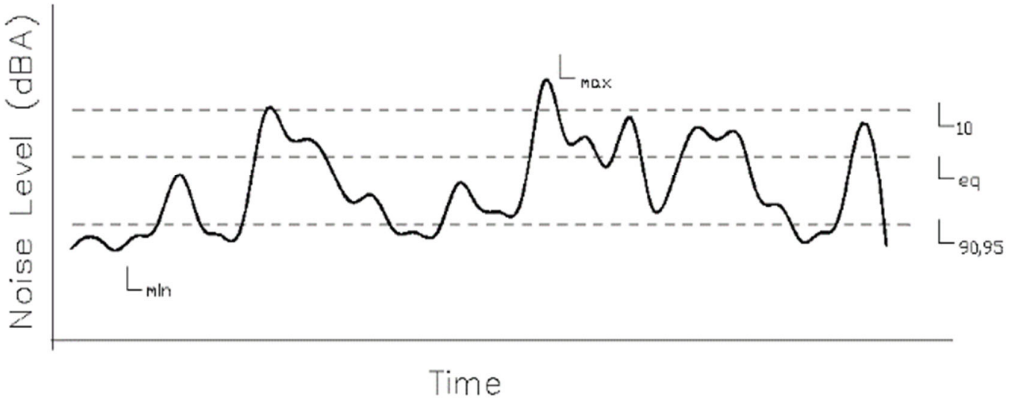
- The noise reduction benefit provided;
- The number of people protected;
- The relative cost vs benefit of mitigation;
- Road conditions (speed and road surface) significantly differ from noise forecast table assumptions;
- Existing and future noise levels, including changes in noise levels;
- Aesthetic 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'**

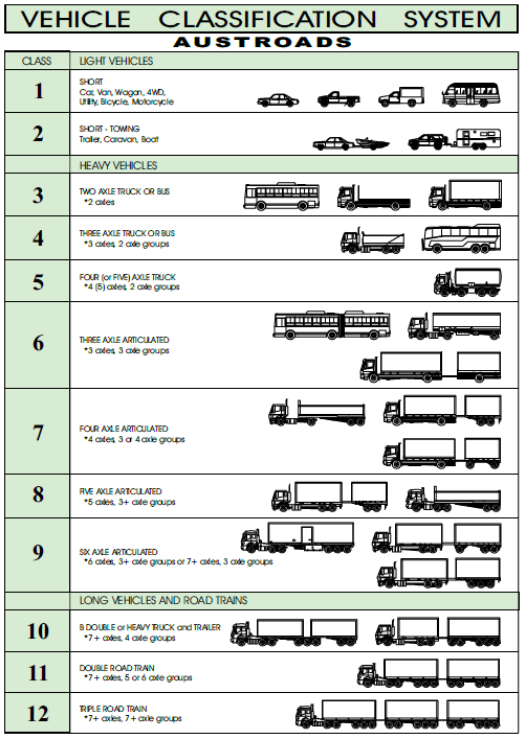
'Practicable' considerations for the purposes of the policy normally relate to the engineering aspects of the noise mitigation measures under evaluation. It is defined as "reasonably practicable having regard to, among other things, local conditions and circumstances (including costs) and to the current 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.

- **Chart of Noise Level Descriptors**



- **Austroads Vehicle Class**



- **Typical Noise Levels**