Road Traffic Noise Assessment

Proposed Southlakes Estate, Dubbo, NSW.

Prepared for : Maas Group Properties

February 2017

Muller Acoustic Consulting

Document Information

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1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has been engaged by Maas Group Properties to prepare a Road Traffic Noise Assessment for the proposed residential Southlakes Estate subdivision (the 'project') Dubbo, NSW. The assessment has been completed to identify potential lots that may require noise attenuation measures to satisfy relevant internal noise criteria. It is acknowledged that several key aspects of this assessment are based on preliminary information which is yet to be finalised. Therefore, this report should be considered as a preliminary feasibility assessment for this stage of the development.

The assessment quantifies future road noise levels at several lots fronting the proposed Southern Distributor to address Dubbo Regional Council's (DRC's) request for additional information.

It is noted that the historic noise assessment report titled *'Noise and Vibration Impact Assessment, Proposed South Keswick Quarry Project'* (Muller Acoustic Consulting Pty Ltd, 2016) (the 'historic assessment') provides an assessment of future operational noise emissions associated with the proposed South Keswick Quarry. Notwithstanding, preliminary lot layouts for the Southlakes Estate subdivision were not available at the time of the assessment. Therefore, Section 6 of this assessment provides a qualitative assessment of extractive industry noise to the proposed Southlakes Estate subdivision incorporating the recently released preliminary lot layouts.

Council's request pertaining to noise emissions is reproduced below:

'4. Noise Impacts

As you are aware, Council is currently undertaking assessment of a development application for an extractive industry (quarry), which is within close proximity to the eastern section of the subject site. In the consideration of the further densification of development on the land, Council is required to consider the acoustic impacts on residential development, and in particular any impacts this quarry proposal may have on residential development.

In addition, and as previously discussed with you and your consultants, the Dubbo Transportation Strategy to 2045 includes a proposal for the Southern Distributor road to traverse through the subject land. Ultimately, when developed, this road will provide an important link to the Mitchell Highway and has the potential to carry a range of traffic including heavy vehicle traffic.

As your Planning Proposal includes the further densification of land adjacent to the proposed location of the Southern Distributor road, consideration of the acoustic impacts on future residential development is required with the Planning Proposal. In particular, this consideration must include whether any particular acoustic design requirements or setbacks may be required for development immediately to the north. It should also be noted that the consideration of acoustic impacts may also result in changes being required to your proposed density arrangements for the land.'

As such, the assessment has been undertaken in general accordance with the following policies and guidelines:

- Environment Protection Authority (EPA) 2000, NSW Industrial Noise Policy (INP);
- Department of Planning (DPI) 2008, Development Near Rail Corridors and Busy Roads – Interim Guideline;
- Standards Australia AS 1055.1:1997 — Acoustics — Description and measurement of environmental noise — General Procedures;
- Australian Standard AS:3671-1980 Acoustics — road traffic noise intrusion — building site and construction; and
- Standards Australia AS 2107:2000 — Acoustics — Recommended design sound levels and reverberation times for building interiors.

A glossary of terms, definitions and abbreviations used in this report is provided in **Appendix A**.

Technical Note: The EPA's Road Noise Policy (RNP) (EPA, 2011) is designed to quantify the noise intrusion from the road network on existing receptors. As this project is related to the construction of a new subdivision, the RNP is not applicable to this assessment.

2 Noise Policy and Guidelines

2.1 Development Near Rail Corridors and Busy Roads – Interim Guidelines

Guidance for the specification of internal noise levels of habitable rooms is prescribed in Department of Planning's (DoP) Development near Rail Corridors and Busy Roads – Interim Guidelines (2008) ('the guideline').

The guideline outlines internal criterion levels for Clause 102 (Road) of the State Environmental Planning Policy (SEPP) for Infrastructure (Infrastructure SEPP):

"If the development is for the purpose of a building for residential use, the consent authority must be satisfied that appropriate measures will be taken to ensure that the following LAeq levels are not exceeded:

- *in any bedroom in the building : 35 dBA at any time 10pm–7am; and*
- *anywhere else in the building (other than a garage, kitchen, bathroom or hallway): 40dBA at any time."*

Table 3.1 of the guideline clarifies that the above noise criteria are to be determined as an $LA_{eq(15hr)}$ for the day and $LA_{eq(9hr)}$ for the night period.

The guideline assists in the planning, design and assessment of development in, or adjacent to, rail corridors and busy roads and supports the Infrastructure SEPP. The guidelines are mandatory for residential developments proposed adjacent to busy roads with an Annual Average Daily Traffic (AADT) of greater than 40,000 vehicles or for projects where traffic noise impacts are anticipated.

Traffic volumes from the Dubbo Road Transportation Strategy 2045 (Dubbo City Council, 2012) predicts traffic volumes above 30,000 vehicles per day for the Southern Distributor and associated Freightway Ring Road.

Therefore, this assessment has adopted a hypothetical 30,000 vehicles per day for the Southern Distributor.

2.1.1 Road Noise Screening Test

Section 5.3.2 of the guideline provides screening tests for single and dual occupancy dwellings. The screening tests provide varying categories of noise control treatments for dwellings taking into consideration distance to the road and amount of traffic. The guideline presents two screen tests for a 60/70 km/hr zone and 100/110 km/hr zone that are reproduced in **Figure 1** and **Figure 2** respectively. The screening tests have been adopted in this assessment to provide guidance on building categories for the project.

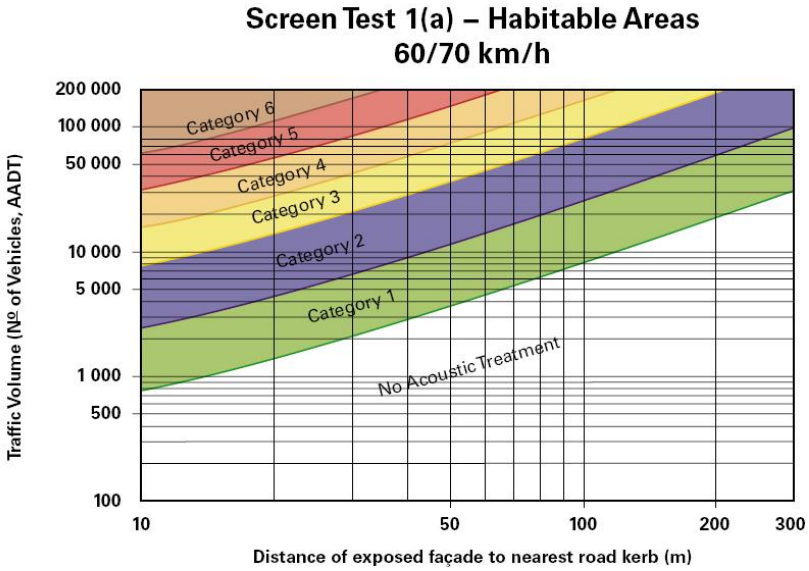

Figure 1 Screen test for habitable areas of single/dual occupancy dwellings adjacent to 60/70 km/hr zones.

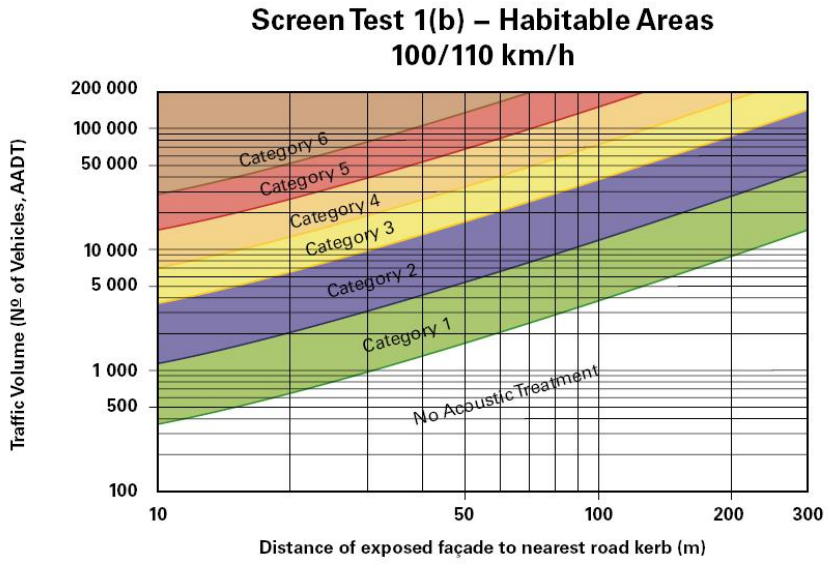

Figure 2 Screen test for habitable areas of single/dual occupancy dwellings adjacent to 100/110 km/hr zones.

3 Noise Assessment Methodology

3.1 Calculation of Road Traffic Noise

A theoretical assessment of road traffic noise was carried out to predict levels at the hypothetical ground floor façade of the proposed dwellings within the project site using the Calculation of Road Traffic Noise (CRTN) algorithm, as developed by the UK Department of Transport. This method incorporates consideration of traffic flow volume, average speed, percentage of heavy vehicles, and road gradient and includes attenuation via spherical spreading (or cylindrical in the case of a line source such as a road), soft ground, atmospheric absorption and screening from buildings or barriers. Hourly AADT distributions are required for modelling, however were not available for this assessment. Therefore, hourly flow distributions of the AADT were assumed as 80% for day and 20% for night. These are typical industry accepted proportions. Heavy traffic volumes were assumed to be 100% for both day and night periods.

Table 1 summarises the calculation parameters adopted for this assessment.

Table 1 Calculation Parameters – Southern Distributor

Assessment Period	AADT Volume[1]	% Heavy Vehicles	Speed Limit (km/hr)
Day	24000	100	80
Night	6000	100	80

Note 1: Dubbo Road Transportation Strategy to 2045 (Dubbo Regional Council, 2012).

3.2 Indicative Attenuation Levels

The Environmental Noise Management Manual (ENMM) (2001) provides a summary of indicative attenuation from standard building types. The indicative attenuation levels are summarised in **Table 2**, which provides typical performance of buildings with respect to noise reduction. A light frame residence with single glazing would be expected to provide a reduction of 20dBA from external to internal with windows closed. Where windows are closed, the fresh air requirements outlined in the Building Code of Australia are to be satisfied.

Table 2 Indicative Building Noise Attenuation

Building Type	Windows	Internal noise reduction, dBA
All	Open	10
Light frame	Single glazed (closed)	20
Masonry	Single glazed (closed)	25
	Double glazed (closed)	30

Note: Sourced from ENMM, 2001.

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4 Results

4.1 Road Noise Prediction Results

The subdivision plans and indicative position of the Southern Distributor (Geolyse Pty Ltd) (**Appendix B**) for the proposed project have been reviewed and incorporated into the assessment.

The initial calculation scenario for this assessment includes 'free field' predictions to day and night road noise levels. **Figure 3** and **Figure 4** presents the 'free field' noise contours for each modelled day $LA_{eq(15hr)}$ and night $LA_{eq(9hr)}$ assessment periods.

Figure 3 - Road Noise Levels, Day (LAeq15hr).

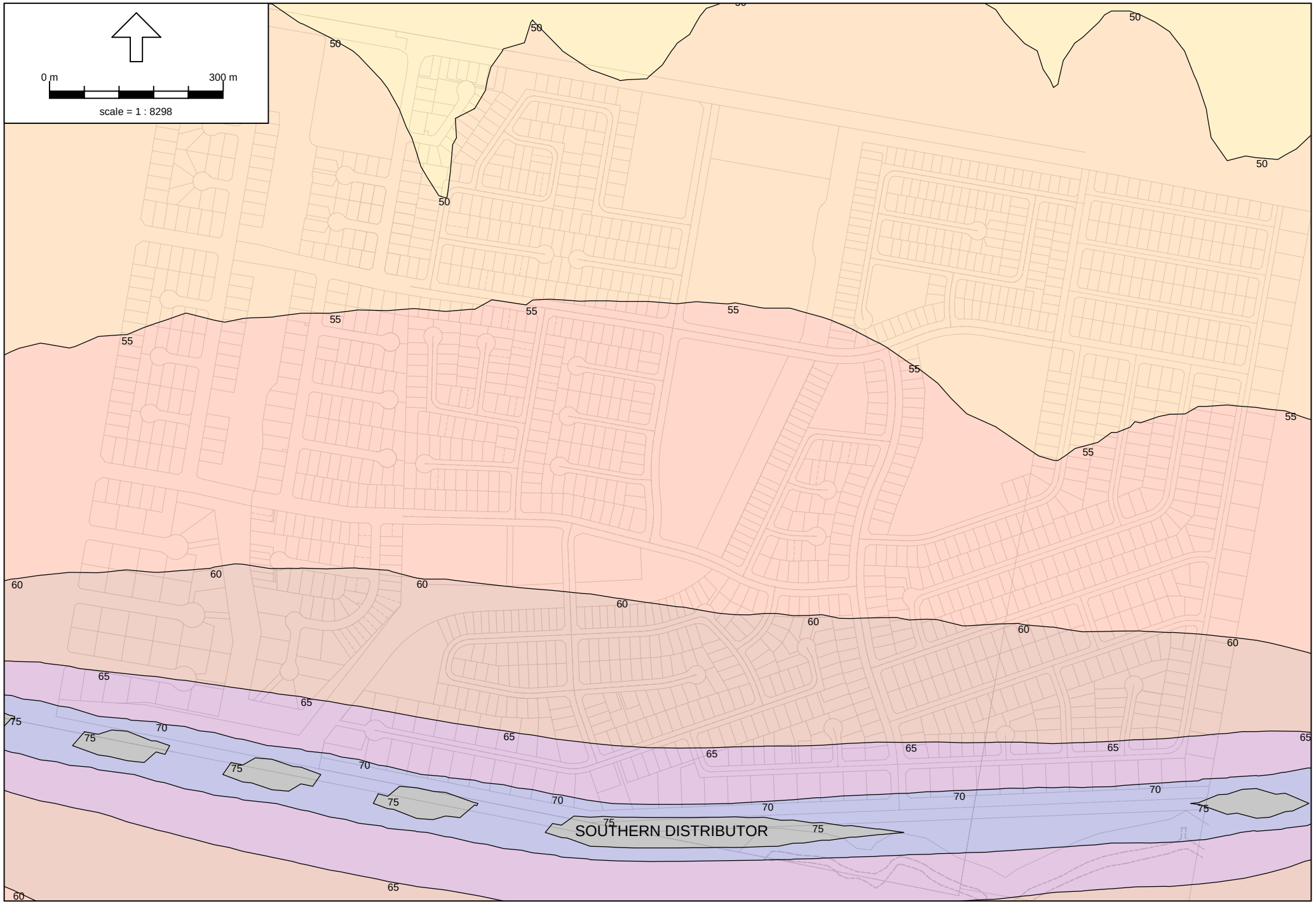

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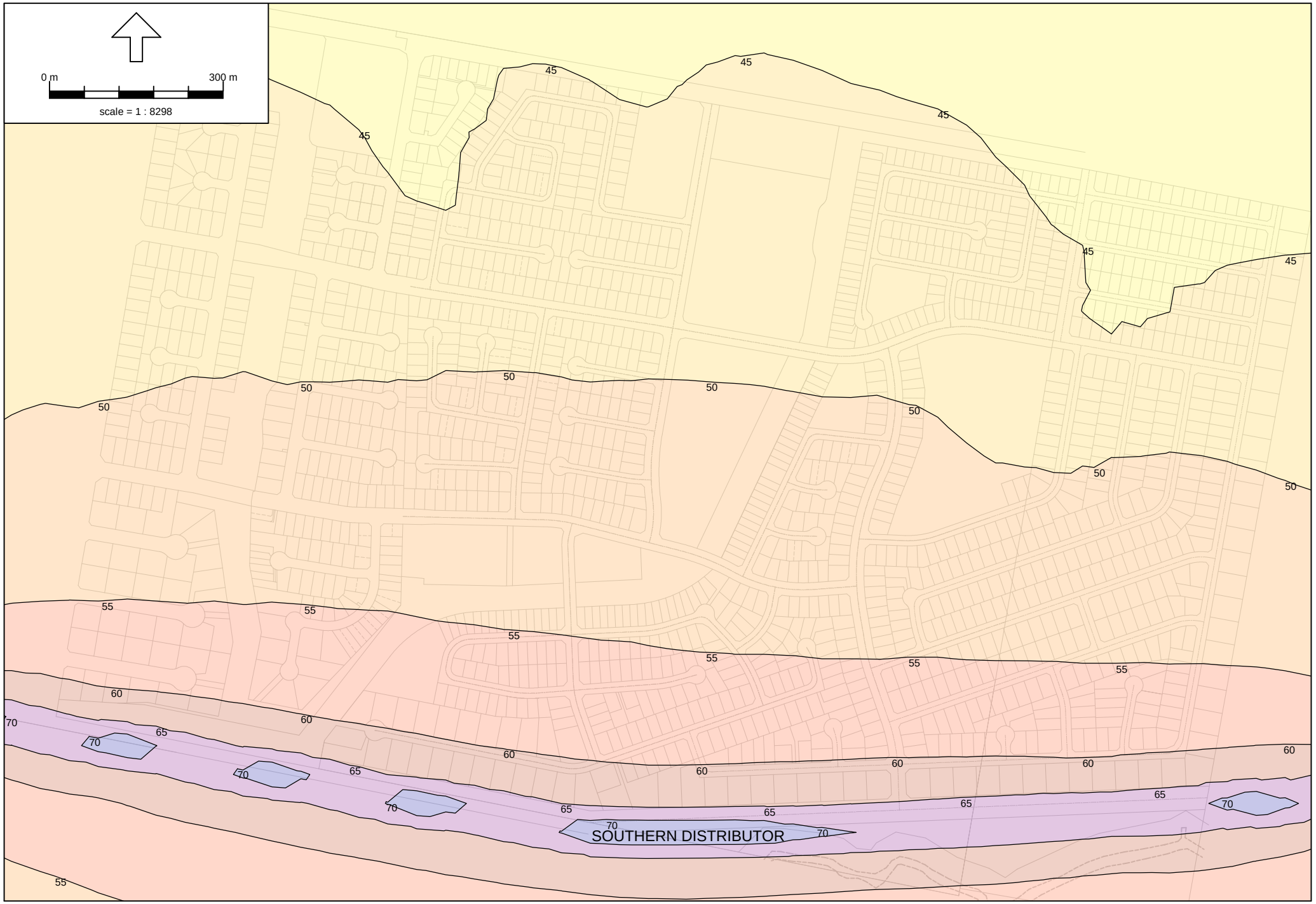
Figure 4 - Road Noise Levels, Night (LAeq9hr).



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5 Recommendations

A review of modelling results identifies the Southern Distributor as a significant contributor to noise levels at potential dwellings within the southern project boundary, especially during the day period. Notwithstanding several lots along the southern boundary were identified to exceed the relevant internal noise criteria. Therefore, the following noise controls should be considered to ameliorate noise levels, it is noted that one or a combination of controls may be considered:

- Dwellings along the southern boundary of the project site should be constructed of materials that provide improved attenuation compared to standard materials; or/and
- Construction of a noise barrier or earth mound along the southern project boundary (or a combination of earth mound and barrier).

It is noted that for this assessment the location of the Southern Distributor is indicative only as the final position and alignment is still being finalised. Furthermore, the model has assumed the Southern Distributor to be situated at the existing ground level, although the final elevation may be situated within a cutting. Additionally, the model has not included attenuation associated with dwellings that will be constructed at the project site, generally the dwellings fronting the Southern Distributor will provide a level of attenuation to remaining lots within the development. Therefore, results of the modelling should be considered conservative.

Two noise control scenarios where included in this assessment:

- Scenario 1 – represents a 'no build' situation, where no barriers are present along the southern project boundary. This scenario would rely on at dwelling treatments to achieve internal noise criteria as per the guideline.
- Scenario 2 – represents noise levels from the Southern Distributor with a 2.8m barrier situated along the southern boundary. The barrier should consist of impervious materials that have a surface density of 20kg/m^2, and not contain any gaps (ie lapped and capped timber, earth mound or equivalent).

Figure 5 and **Figure 6** presents the 'free field' acoustic treatment zone (orange band) for Scenario 1 (ie no barrier).

Figure 7 and **Figure 8** present the 'free field' acoustic treatment zone (orange band) for Scenario 2 (ie 2.8m barrier).

It is evident when comparing the results of each scenario that construction of a barrier along the southern project boundary significantly reduces the number of receivers that would require at dwelling treatments.

As this assessment has relied on preliminary information, the precise number of exceedances may be quantified in more detail at a later stage of the development and noise control measures may be specifically tailored to the project. This may include refinement of any potential barriers, including specific location and optimal height. Additionally, the assessment could take into consideration the final position and elevation of the Southern Distributor along with contemporary traffic flows available.

Figure - 5 Road Noise Levels, Day (LAeq15hr) - Noise Treatment Zone (without barrier).

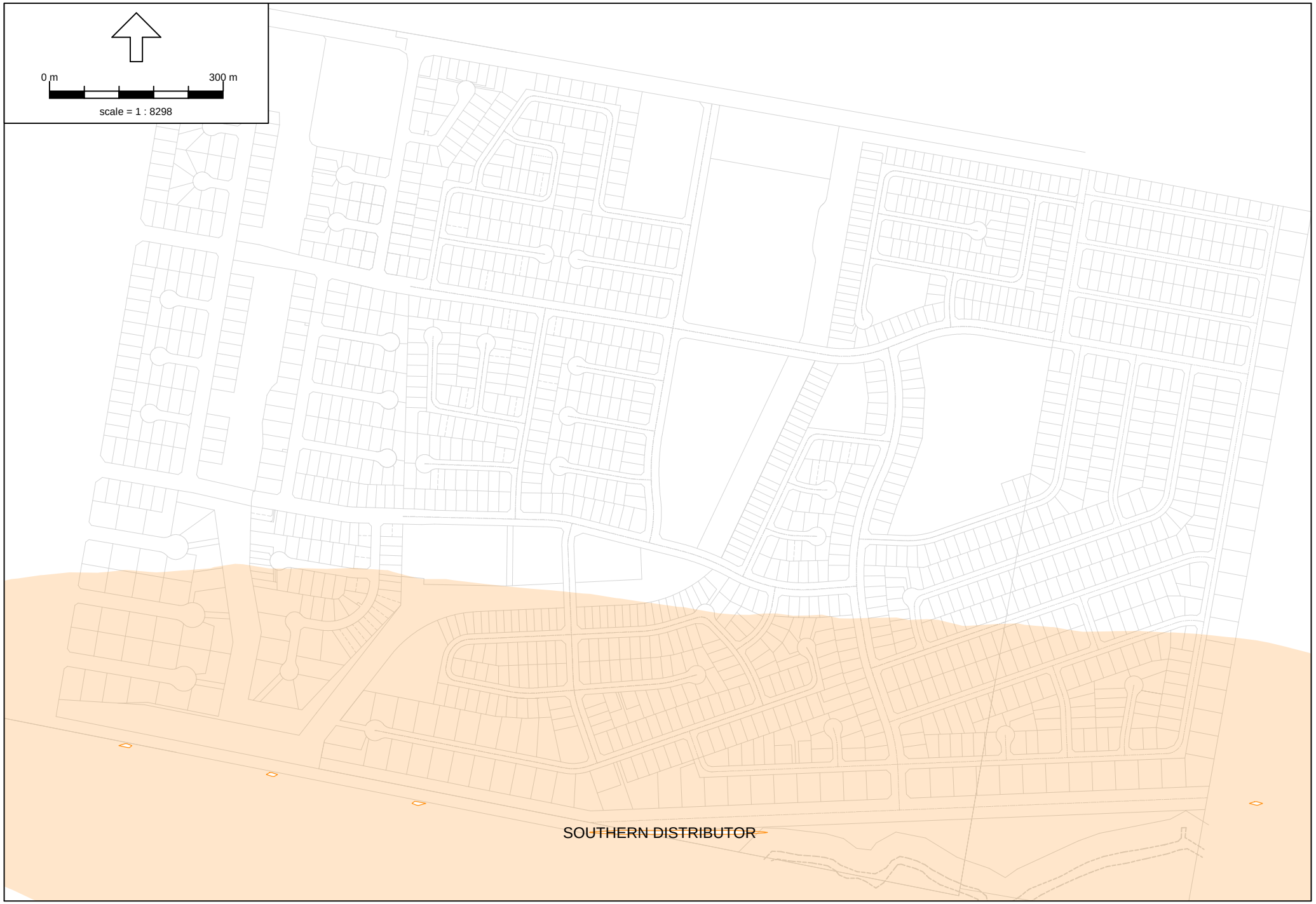

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Figure 6 - Road Noise Levels, Night (LAeq9hr) - Noise Treatment Zone (without barrier).

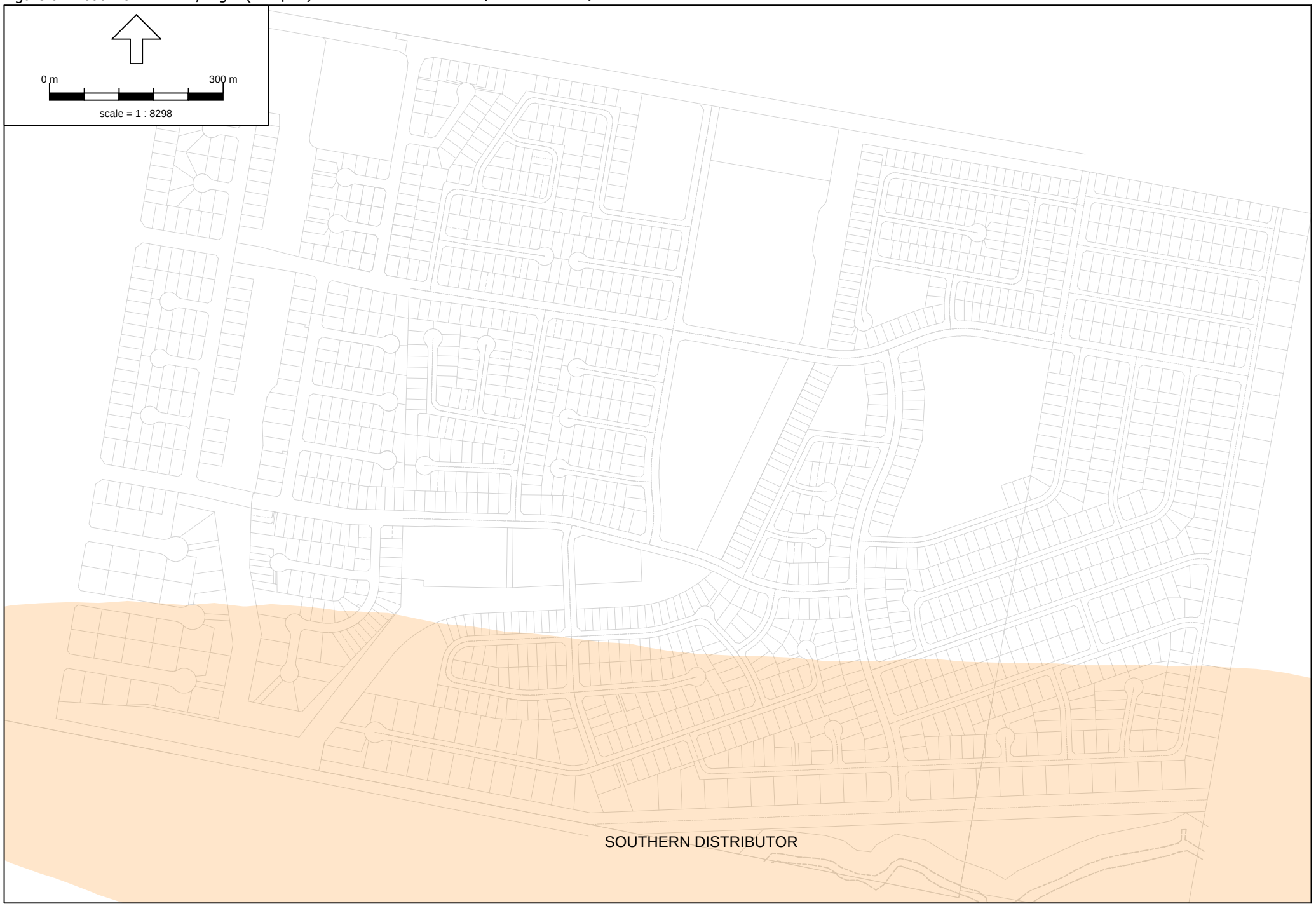

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Figure 7 - Road Noise Levels, Day (LAeq15hr) - Noise Treatment Zone (with 2.8m barrier)

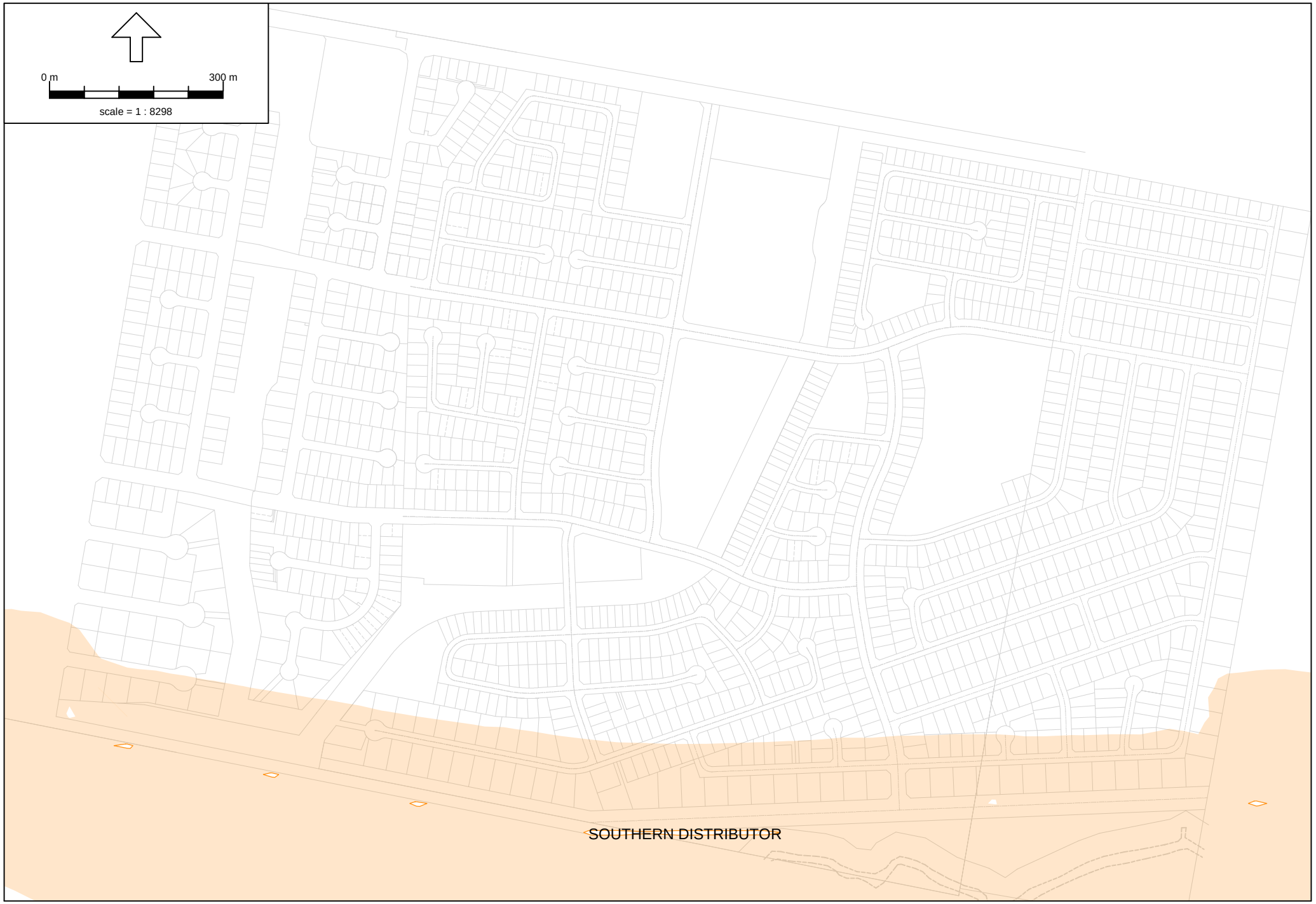

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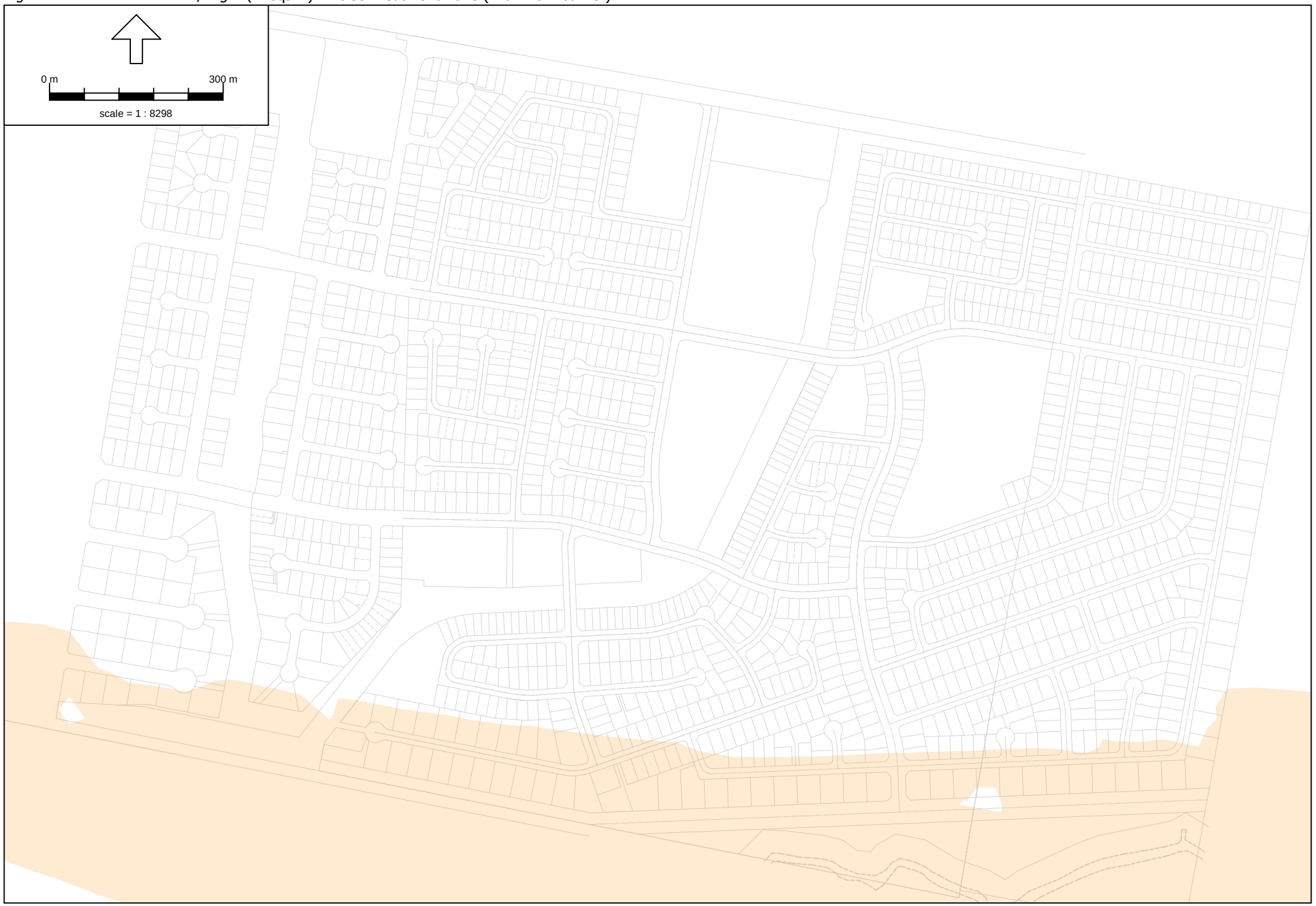
Figure 8 - Road Noise Levels, Night (LAeq9hr) - Noise Treatment Zone (with 2.8m barrier)



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6 Discussion

6.1 Road Noise and at Dwelling Treatments

As windows must remain closed for effective noise reduction, alternative means of internal ventilation (eg air conditioning or wall ventilators) must be considered to allow windows to remain fully closed (refer to BCA requirements).

Standard domestic glass is usually inadequate acoustically and can reduce the acoustic attenuation performance of the overall building facade. Upgrade options include thicker laminated glass or double-glazed laminated windows with an air gap between panels. The frames and air gaps should be adequately sealed to optimise noise reduction. This is especially pertinent to dwellings of two storey construction. It is recommended that for buildings where noise modelling identifies exceedances of internal noise criteria, are to be constructed adopting materials that meet (or exceed) Category 3 glazing specifications as per Appendix C of the guideline (see **Appendix C**). In particular, this includes:

- Windows/Sliding Doors: Openable with minimum 6.38mm laminated glass and full perimeter acoustic seals.

As windows must remain closed for effective noise reduction, alternative means of internal ventilation (eg air conditioning or wall ventilators) must be considered to allow windows to remain fully closed (refer to BCA requirements).

6.2 Road Noise and Lot Density Arrangements

It is noted that Dubbo Regional Council's (DRC's) request for additional information states that *'consideration of acoustic impacts may also result in changes being required to your proposed density arrangements for the land.'*

In most cases, increased housing density (ie smaller lots) and/or increasing the building heights of dwellings fronting major roadways provides effective noise attenuation to remaining lots within subdivision developments. This is due to the dwellings effectively forming a 4m to 6m barrier between the noise source and ensuing lots.

Where larger lots front a roadway, the number of dwellings adjacent to the road is reduced and the open spaces between dwellings allow for the propagation of road noise further into the development.

Therefore, it is recommended that the development consider the balance between having less dwellings fronting the Southern Distributor (ie larger lots) against the additional attenuation benefits that smaller lots (ie denser housing) may provide to the overall development.

Notwithstanding, it is recommended that building orientation within each lot, and the location of habitable rooms (e.g. sleeping areas) should be optimised wherever practicable to locate dwellings and/or sleeping areas as far from the Southern Distributor as possible.

6.3 Potential Industrial Noise Impacts

A qualitative review of South Keswick Quarry emissions from the historic noise assessment (Muller Acoustic Consulting Pty Ltd, 2016) has been completed. The review included superimposing the revised project lot layout over operational noise contours for the South Keswick Quarry project. Additionally, the model incorporated the quarries RL300 western boundary earth mound. The comparison identified that several lots adjoining Sheraton Road (directly opposite the proposed quarry) are predicted to receive noise levels of between 33dBA to 34dBA, $LA_{eq(15min)}$. This satisfies the PSNL of 35dBA, $LA_{eq(15\text{-}min)}$.

7 Conclusion

MAC has completed an assessment of potential road traffic noise impacts for the proposed residential subdivision to be established at Southlakes Estate, Dubbo, NSW. The assessment has quantified future road noise levels from the proposed Southern Distributor to the project as per requirements of Dubbo Regional Council's (DRC's) request for additional information.

Noise predictions identified that several lots near the Southern Distributor will experience road noise levels that would exceed recommended internal noise criteria. Hence, future dwellings within the vicinity of the southern project boundary would be required to be constructed using glazing materials equivalent up to Category 3 of the guideline. Noise modelling identifies that the number of at dwelling treatments would be significantly reduced if a barrier was constructed along the southern boundary of the project site.

It is recommended that a more detailed assessment be completed when more contemporary data for the Southern Distributor is available. Notwithstanding, the development of the Southlakes Estate is a feasible option with respect to traffic noise emissions albeit with the inclusion of several noise control measures outlined in this report.

Therefore, based on the findings of this report, with the inclusion of several noise control measures, there are no noise related issues which would prevent Council approving the proposed project.

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Appendix A – Glossary of Terms

A number of technical terms have been used in this report and are explained in **Table A1**.

Table A1 Glossary of Terms

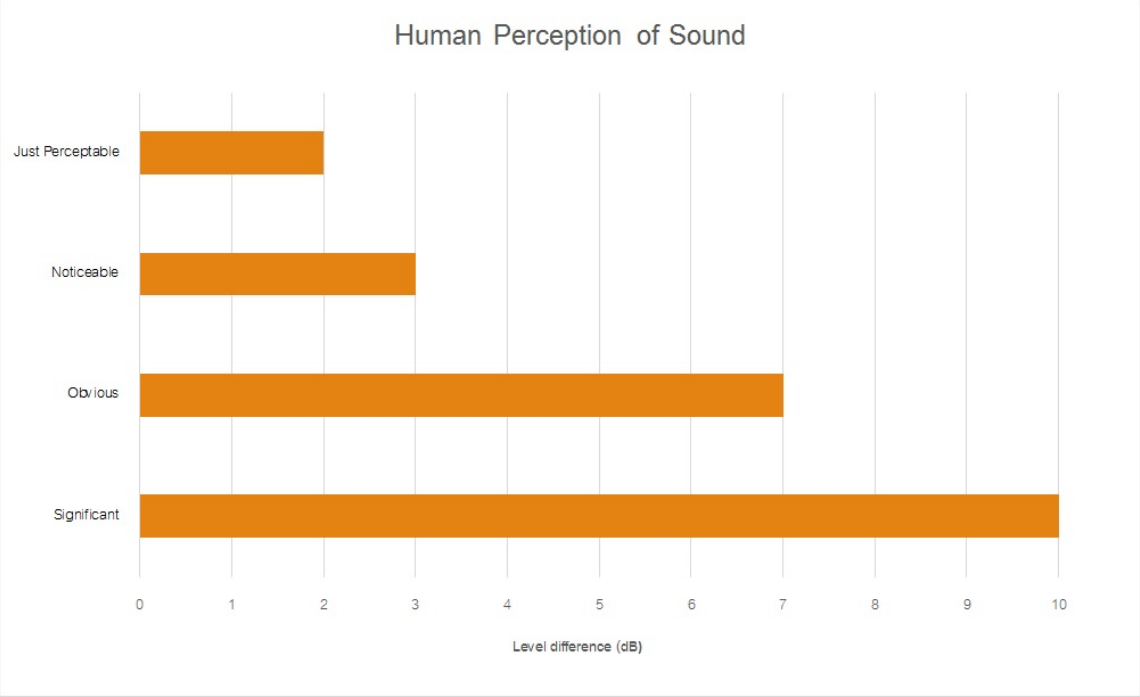
Term	Description
1/3 Octave	Single octave bands divided into three parts
Octave	A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit.
ABL	Assessment Background Level (ABL) is defined in the INP as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured LA90 statistical noise levels.
Ambient Noise	The noise associated with a given environment. Typically a composite of sounds from many sources located both near and far where no particular sound is dominant.
A Weighting	A standard weighting of the audible frequencies designed to reflect the response of the human ear to noise.
dBA	Noise is measured in units called decibels (dB). There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear.
dB(Z), dB(L)	Decibels Linear or decibels Z-weighted.
Hertz (Hz)	The measure of frequency of sound wave oscillations per second - 1 oscillation per second equals 1 hertz.
LA10	A noise level which is exceeded 10 % of the time. It is approximately equivalent to the average of maximum noise levels.
LA90	Commonly referred to as the background noise, this is the level exceeded 90 % of the time.
LAeq	The summation of noise over a selected period of time. It is the energy average noise from a source, and is the equivalent continuous sound pressure level over a given period.
LAmax	The maximum root mean squared (rms) sound pressure level received at the microphone during a measuring interval.
RBL	The Rating Background Level (RBL) is an overall single figure background level representing each assessment period over the whole monitoring period. The RBL is used to determine the intrusiveness criteria for noise assessment purposes and is the median of the ABL's.
Sound power level (LW)	This is a measure of the total power radiated by a source. The sound power of a source is a fundamental location of the source and is independent of the surrounding environment. Or a measure of the energy emitted from a source as sound and is given by : = 10.log10 (W/Wo) Where : W is the sound power in watts and Wo is the sound reference power at 10-12 watts.

Table A2 provides a list of common noise sources and their typical sound level.

Table A2 Common Noise Sources and Their Typical Sound Pressure Levels (SPL), dBA

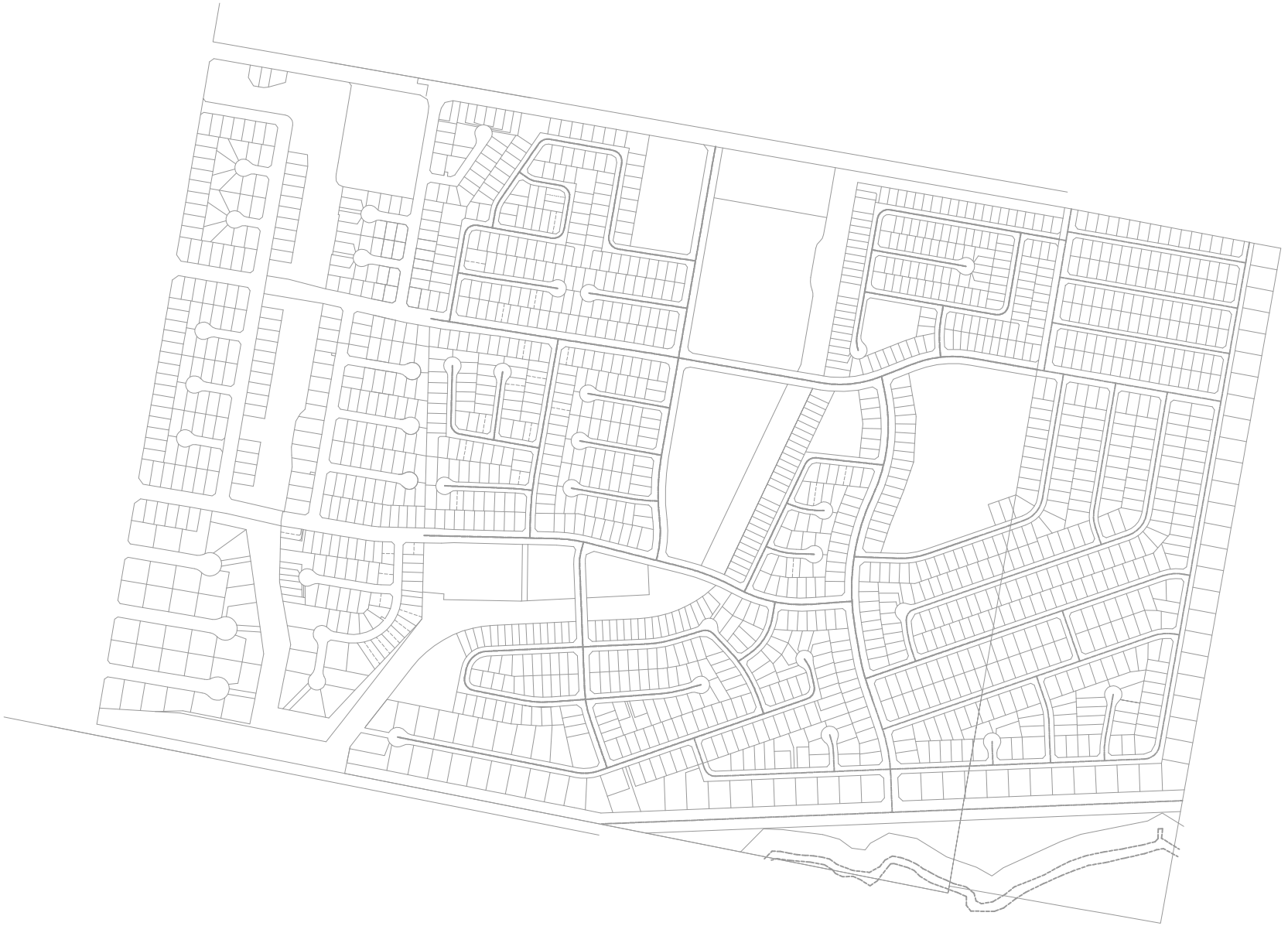
Source	Typical Sound Level
Threshold of pain	140
Jet engine	130
Hydraulic hammer	120
Chainsaw	110
Industrial workshop	100
Lawn-mower (operator position)	90
Heavy traffic (footpath)	80
Elevated speech	70
Typical conversation	60
Ambient suburban environment	40
Ambient rural environment	30
Bedroom (night with windows closed)	20
Threshold of hearing	0

Figure A1 – Human Perception of Sound

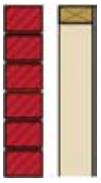
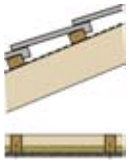
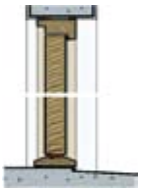


Appendix B – Project Plans

Appendix B - Proposed Southlakes Estate, Dubbo NSW - Lot Layout (Geolyse Pty Ltd, 2016).



Appendix C – Category 3 Building Materials

Category No.	Building Element	Standard Constructions	sample
3	**Windows/Sliding Doors**	Openable with minimum 6.38mm laminated glass and full perimeter acoustic seals	
	Frontage Facade	**Brick Veneer Construction:** 110mm brick, 90mm timber stud or 92mm metal stud, minimum 50mm clearance between masonry and stud frame, 10mm standard plasterboard internally.	
		Double Brick Cavity Construction: 2 leaves of 110mm brickwork separated by 50mm gap	
	Roof	Pitched concrete or terracotta tile or sheet metal roof with sarking, 1 layer of 13mm sound-rated plasterboard fixed to ceiling joists, R2 insulation batts in roof cavity.	
	Entry Door	45mm solid core timber door fitted with full perimeter acoustic seals	
	Floor	Concrete slab floor on ground	

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