

APPENDIX D

ACOUSTIC ASSESSMENT



**FORMER BUNNINGS SITE
CNR MARMION AVE & NEERABUP RD
CLARKSON**

ACOUSTIC ASSESSMENT

APRIL 2018

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URBIS

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1. INTRODUCTION

Herring Storer Acoustics was commissioned by Urbis to undertake a noise assessment for the proposed development of the former Bunnings Site, located on the north east corner of Marmion Avenue and Neerabup Road, Clarkson. The acoustic review has been undertaken with respect to State Planning Policy 5.4 "*Road and Rail Transport Noise and Freight Considerations in Land Use Planning*" (SPP5.4), as the proposed development could include "noise sensitive" uses.

For this structure plan, the assessment was undertaken with respect to road traffic noise associated with vehicles travelling along both Marmion Avenue and Neerabup Road, Clarkson.

As part of this this assessment, the following was carried out:

- Monitor existing traffic noise levels received with the development from both the Marmion Avenue and Neerabup Road, Clarkson.
- Determine by modelling, the noise that would be received at residences within the residential development from vehicles travelling along both Marmion Avenue and Neerabup Road, Clarkson.
- Assess the predicted noise levels for compliance with the appropriate criteria.
- If exceedances are predicted, comment on possible noise amelioration options for compliance with the appropriate criteria.

We understand that the following 2 concept plans have been developed :

Option 1, with only commercial premises; and

Option 2, with a residential component to the western side.

It is understood that Option 1, with commercial premises only is at this stage the preferred option.

For information, the concept plans are attached in Appendix A.

2. SUMMARY

2.1 OPTION 1 – COMMERCIAL ONLY

The requirements of State Planning Policy 5.4 only apply to noise sensitive premises, such as residential apartments. Thus, if option 1 is implemented and the site is developed as commercial only, then the requirements of SPP 5.4 are not applicable and no further action is required.

2.2 OPTION 2 – MIXTURE OF NOISE SENSITIVE AND COMMERCIAL

If option 2 is implemented, which contains a residential component on the western side of the development, then compliance with the requirements of State Planning Policy 5.4 is required at these noise sensitive premises.

Under the Western Australian Planning Commission (WAPC) Planning Policy 5.4 *“Road and Rail Transport Noise and Freight Considerations in Land Use Planning”* the following external criteria are listed:

“Noise Limits”

$L_{Aeq(Day)}$ of 60 dB(A); and

$L_{Aeq(Night)}$ of 55 dB(A).

As external noise levels exceed the “Noise Target” noise levels, then the residential premises should be designed to comply with the following internal noise levels:

INTERNAL

$L_{Aeq(Day)}$ of 40 dB(A) in living and work areas; and

$L_{Aeq(Night)}$ of 35 dB(A) in bedrooms.

We also note that under the SPP5.4, noise mitigation measures should be implemented with a view to achieve, in at least one outdoor area, the L_{Aeq} of 50 dB(A) noise level for the night period.

Based on the noise modelling undertaken, for residential developments fronting both Marmion Avenue and Neerabup Road, the following “Quiet House” design packages are required :

Northern 2 lots fronting Marmion Avenue - Package C.

Southern 2 lot fronting Marmion Ave and/or Neerabup Rd - Package B.

Information regarding “Quiet House” Design Packages, as outlined in the Implementation Guidelines, are contained in Appendix D. It is noted that “Quiet House” Design Packages attached in Appendix D are “Deemed to Satisfy” constructions and alternative constructions would be acceptable, provided they are supported by an acoustic report prepared by a suitably qualified acoustic consultant. Additionally, given the layouts, noise received at the noise sensitive premises, as shown on Figure C1 in Appendix C, varies and the acoustic requirements would also vary not only between the different residential lots, but also within each lot development. Therefore, with the variation of noise levels received at the possible noise sensitive premises, it is recommended that individual assessments be undertaken for each Lot facing Marmion Avenue and/or Neerabup Road that contain noise sensitive premises.

It is also noted, that additional to the above for those residence / apartments receiving noise levels in excess of the “Noise Targets”, notifications on titles will also be required.

Note: For apartment buildings located on either Marmion Avenue or Neerabup Road, it is noted that if one outdoor living area (ie balcony) for each apartment cannot achieve compliance with the “Target” noise levels, then a communal outdoor area that complies with the “Target” noise levels is required.

3. CRITERIA

3.1 STATE PLANNING POLICY 5.4

The Western Australian Planning Commission (WAPC) released on 22 September 2009 State Planning Policy 5.4 “Road and Rail Transport Noise and Freight Considerations In Land Use Planning” (SPP 5.4). Section 5.3 – Noise Criteria, outlines the acoustic criteria and states:

“5.3 - NOISE CRITERIA

Table 1 sets out the outdoor noise criteria that apply to proposals for new noise-sensitive development or new major roads and railways assessed under this policy.

These criteria do not apply to—

- *Proposals for redevelopment of existing major roads or railways, which are dealt with by a separate approach as described in section 5.4.1; and*
- *Proposals for new freight handling facilities, for which a separate approach is described in section 5.4.2.*
- *The outdoor noise criteria set out in Table 1 apply to the emission of road and rail transport noise as received at a noise-sensitive land use. These noise levels apply at the following locations—*
- *For new road or rail infrastructure proposals, at 1m from the most exposed, habitable façade of the building receiving the noise, at ground floor level only; and*
- *For new noise-sensitive development proposals, at 1m from the most exposed, habitable façade of the proposed building, at each floor level, and within at least one outdoor living area on each residential lot.*

Further information is provided in the guidelines.

TABLE 1: OUTDOOR NOISE CRITERIA

Time of day	Noise Target	Noise Limit
Day (6 am–10 pm)	$L_{Aeq(Day)} = 55 \text{ dB(A)}$	$L_{Aeq(Day)} = 60 \text{ dB(A)}$
Night (10 pm–6 am)	$L_{Aeq(Night)} = 50 \text{ dB(A)}$	$L_{Aeq(Night)} = 55 \text{ dB(A)}$

The 5 dB difference between the outdoor noise target and the outdoor noise limit, as prescribed in Table 1, represents an acceptable margin for compliance. In most situations in which either the noise-sensitive land use or the major road or railway already exists, it should be practicable to achieve outdoor noise levels within this acceptable margin. In relation to greenfield sites, however, there is an expectation that the design of the proposal will be consistent with the target ultimately being achieved. Because the range of noise amelioration measures available for implementation is dependent upon the type of proposal being considered, the application of the noise criteria will vary slightly for each different type. Policy interpretation of the criteria for each type of proposal is outlined in sections 5.3.1 and 5.3.2.

The noise criteria were developed after consideration of road and rail transport noise criteria in Australia and overseas, and after a series of case studies to assess whether the levels were practicable. The noise criteria take into account the considerable body of research into the effects of noise on humans, particularly community annoyance, sleep disturbance, long-term effects on cardiovascular health, effects on children’s learning performance, and impacts on vulnerable groups such as children and the elderly. Reference is made to the World Health Organization (WHO) recommendations for noise policies in their publications on community noise and the Night Noise Guidelines for Europe. See the policy guidelines for suggested further reading.

5.3.1 Interpretation and application for noise-sensitive development proposals

In the application of these outdoor noise criteria to new noise-sensitive developments, the objective of this policy is to achieve –

- *acceptable indoor noise levels in noise-sensitive areas (for example, bedrooms and living rooms of houses, and school classrooms); and*
- *a reasonable degree of acoustic amenity in at least one outdoor living area on each residential lot¹.*

If a noise-sensitive development takes place in an area where outdoor noise levels will meet the noise target, no further measures are required under this policy.

In areas where the noise target is likely to be exceeded, but noise levels are likely to be within the 5dB margin, mitigation measures should be implemented by the developer with a view to achieving the target levels in at least one outdoor living area on each residential lot¹. Where indoor spaces are planned to be facing any outdoor area in the margin, noise mitigation measures should be implemented to achieve acceptable indoor noise levels in those spaces. In this case, compliance with this policy can be achieved for residential buildings through implementation of the deemed-to-comply measures detailed in the guidelines.

In areas where the outdoor noise limit is likely to be exceeded (i.e. above $L_{Aeq(Day)}$ of 60 dB(A) or $L_{Aeq(Night)}$ of 55 dB(A)), a detailed noise assessment in accordance with the guidelines should be undertaken by the developer. Customised noise mitigation measures should be implemented with a view to achieving the noise target in at least one outdoor living or recreation area on each noise-sensitive lot or, if this is not practicable, within the margin. Where indoor spaces will face outdoor areas that are above the noise limit, mitigation measures should be implemented to achieve acceptable indoor noise levels in those spaces, as specified in the following paragraphs.

For residential buildings, acceptable indoor noise levels are $L_{Aeq(Day)}$ of 40 dB(A) in living and work areas and $L_{Aeq(Night)}$ of 35 dB(A) in bedrooms². For all other noise-sensitive buildings, acceptable indoor noise levels under this policy comprise noise levels that meet the recommended design sound levels in Table 1 of Australian Standard AS 2107:2000 Acoustics—Recommended design sound levels and reverberation times for building interiors.

These requirements also apply in the case of new noise-sensitive developments in the vicinity of a major transport corridor where there is no existing railway or major road (bearing in mind the policy's 15-20 year planning horizon). In these instances, the developer should engage in dialogue with the relevant infrastructure provider to develop a noise management plan to ascertain individual responsibilities, cost sharing arrangements and construction time frame.

If the policy objectives for noise-sensitive developments are not achievable, best practicable measures should be implemented, having regard to section 5.8 and the guidelines."

1 For non residential noise-sensitive developments, (e.g. schools and child care centres) consideration should be given to providing a suitable outdoor area that achieves the noise target, where this is appropriate to the type of use.

2 For residential buildings, indoor noise levels are not set for utility spaces such as bathrooms. This policy encourages effective "quiet house" design, which positions these non-sensitive spaces to shield the more sensitive spaces from transport noise (see guidelines for further information).

3.2 APPROPRIATE CRITERIA

Based on the above, the following criteria are proposed for this development:

External

Day	Maximum of 60 dB(A) L_{Aeq}
Night	Maximum of 55 dB(A) L_{Aeq}
Outdoor Living Areas*	Maximum of 55 dB(A) L_{Aeq} (day period)

Internal

Sleeping Areas	35 dB(A) $L_{Aeq(night)}$
Living Areas	40 dB(A) $L_{Aeq(day)}$

*This is a suggested noise level; noise is to be reduced as far as practicably possible. However, for apartment building located on either Marmion Avenue or Neerabup Road, it is noted that if one outdoor living area (ie balcony) for each apartment cannot achieve compliance with the "Target" noise levels, then a communal outdoor area that complies with the "Target" noise levels is required.

4. NOISE MONITORNG

Noise logging was undertaken on the site to determine the existing noise received from vehicles travelling on both Marmion Avenue and Neerabup Road. Monitoring was carried out between Tuesday 15th May 2017 and Monday 22th May 2017.

For information, the logger location is shown on Figure B1, attached in Appendix B.

The results for the noise logging are summarised in Table 4.1. For information, the monitored noise levels are attached in Appendix B, as Graphs 01 and 02.

TABLE 4.1 - SUMMARY OF LOGGED NOISE LEVELS

Parameter	Measured Level dB(A)*	
	Marmion Ave	Neerabup Rd
L_{A10} (18 hour)	59.3	59.6
$L_{Aeq, day}$ (6am to 10pm)	57.8	57.8
$L_{Aeq, night}$ (10pm to 6am)	49.9	51.3

* It is normal practice to quote decibels to the nearest whole number. Fractions are retained here to minimise any cumulative rounding error.

We note that the noise monitoring was undertaken with the existing boundary walls.

From the results of the noise monitoring, the difference between the $L_{Aeq,Day}$ and $L_{Aeq,Night}$ was greater than 5 dB(A). Thus, with the difference being greater than 5 dB(A), the day period is the critical period with regards to compliance with the requirements of SPP 5.4.

The above parameters are :

- L_{A10} The noise level exceeded for 10% of the time (in this instance, the noise level exceeded for 6 minutes in each 1-hour period).
- L_{Aeq} The energy equivalent noise level for the 1-hour period. A single number value that expresses the time-varying sound level for the 1 hour period as though it were a constant sound level with the same total sound energy as the time-varying level.

5. MODELLING

To determine the noise received within the area of the structure plan from vehicles travelling along both the existing Marmion Avenue and Neerabup Road, noise modelling was carried out using SoundPlan, in accordance with the “Implementation Guidelines” for the State Planning Policy 5.4.

Ground contours were as obtained from Google Earth.

Noise modelling was undertaken based on the Concept Plan attached in Appendix A.

The noise model relating to noise emissions from vehicles travelling along both Marmion Avenue and Neerabup Road were calibrated using the monitored noise data listed in Table 4.1.

Based on this calibration, noise modelling for the future traffic noise was based on the parameters listed in Table 5.1.

TABLE 5.1 - NOISE MODELLING INPUT DATA FOR ROAD TRAFFIC

Parameter	Value	
	Marmion Avenue	Neerabup Road
Current Traffic Flow (vpd)	38500	14500
Speed (km/hr)	80	70
Future Heavy Vehicles (%)	8	8

Notes :

- 1 The current road traffic volume and percentage of heavy vehicles were for Marmion Avenue was obtained from the latest data available from the MRWA Metropolitan Traffic Digest. Whereas, the current road traffic volume for Neerabup was as provided by the Traffic consultant for the project. The percentage of heavy vehicles for Neerabup was assumed to be as for Marmion Avenue.
- 2 The standard increase in noise levels for future traffic was taken as 2 dB(A), as per the “Implementation” Guidelines for SPP 5.4.
- 3 The road surface was assumed to remain unchanged.

Given that the developments within the Structure Plan would be multiple storey developments, noise modelling was undertaken to the third floor. This would be the considered the worst case, thus ensuring a conservative approach to the application of the “Quiet” House design requirements. The noise contour plot is attached in Appendix C.

6. DISCUSSION / RECOMMENDATIONS

6.1 OPTION 1 – COMMERCIAL ONLY

The requirements of State Planning Policy 5.4 only apply to noise sensitive premises, such as residential apartments. Thus, if option 1 is implemented and the site is developed as commercial only, then the requirements of SPP 5.4 are not applicable and no further action is required.

6.2 OPTION 2 – MIXTURE OF NOISE SENSITIVE AND COMMERCIAL

If option 2 is implemented, which contains a residential component on the western side of the development, then compliance with the requirements of State Planning Policy 5.4 is required at these noise sensitive premises.

Under the Western Australian Planning Commission (WAPC) Planning Policy 5.4 *“Road and Rail Transport Noise and Freight Considerations in Land Use Planning”* the following external criteria are listed:

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$L_{Aeq(Night)}$ of 55 dB(A).

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Based on the noise modelling undertaken, for residential developments fronting both Marmion Avenue and Neerabup Road, the following “Quiet House” design packages are required :

Northern 2 lots fronting Marmion Avenue - Package C.

Southern 2 lot fronting Marmion Ave and/or Neerabup Rd - Package B.

Information regarding “Quiet House” Design Packages, as outlined in the Implementation Guidelines, are contained in Appendix D. It is noted that “Quiet House” Design Packages attached in Appendix D are “Deemed to Satisfy” constructions and alternative constructions would be acceptable, provided they are supported by an acoustic report prepared by a suitably qualified acoustic consultant. Additionally, given the layouts of the noise sensitive premises, noise received at these premises, as shown on Figure C1 in Appendix C, varies across each development, hence the acoustic requirements would also vary not only for each development, but difference premises within the same developments. Therefore, with the variation of noise levels received at the possible noise sensitive premises, it is recommended that individual assessments be undertaken for each Lot facing Marmion Avenue and/or Neerabup Road that contain noise sensitive premises.

It is also noted, that additional to the above for those residence / apartments receiving noise levels in excess of the “Noise Targets”, notifications on titles will also be required.

APPENDIX A

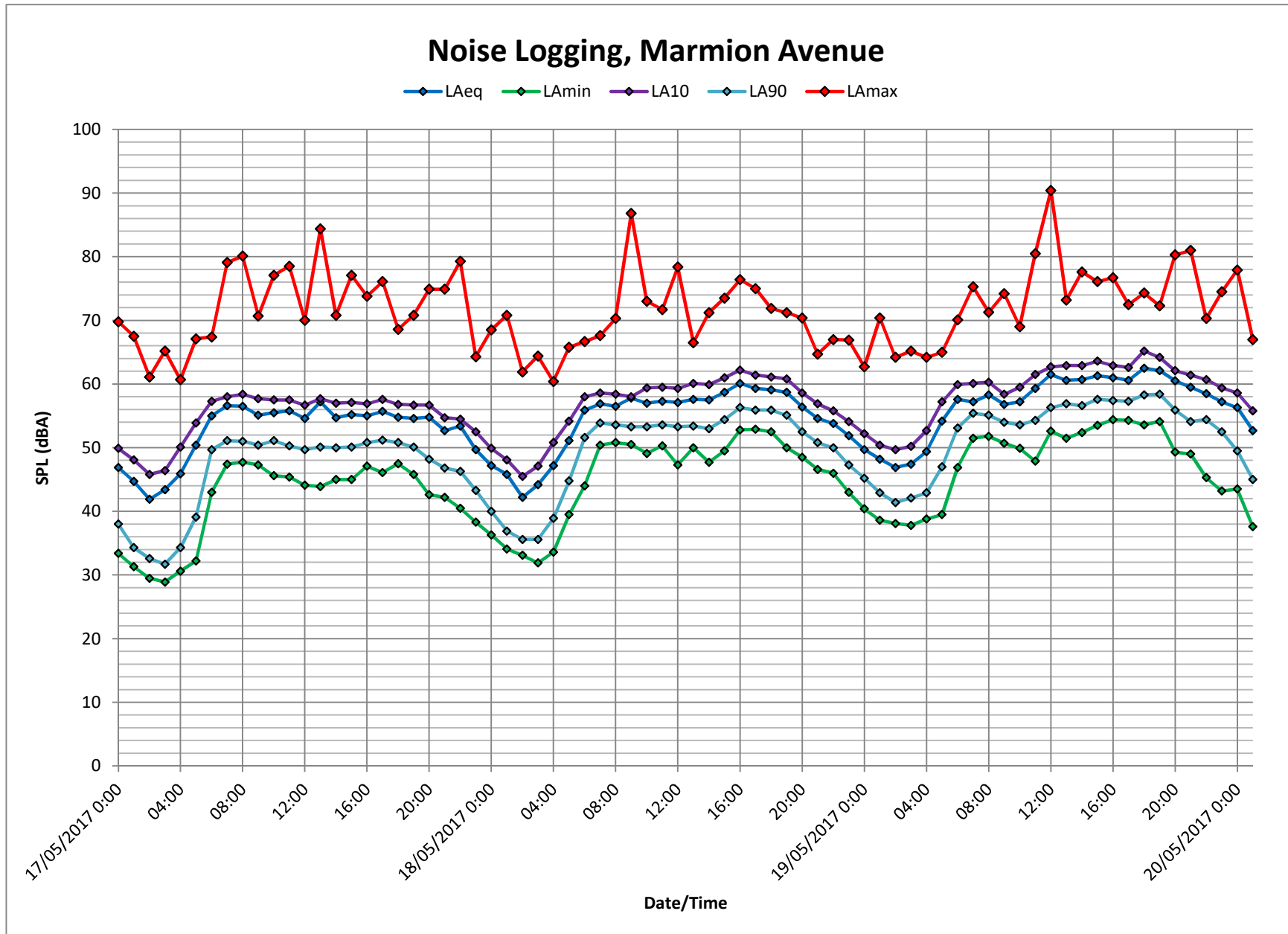
CONCEPT PLAN

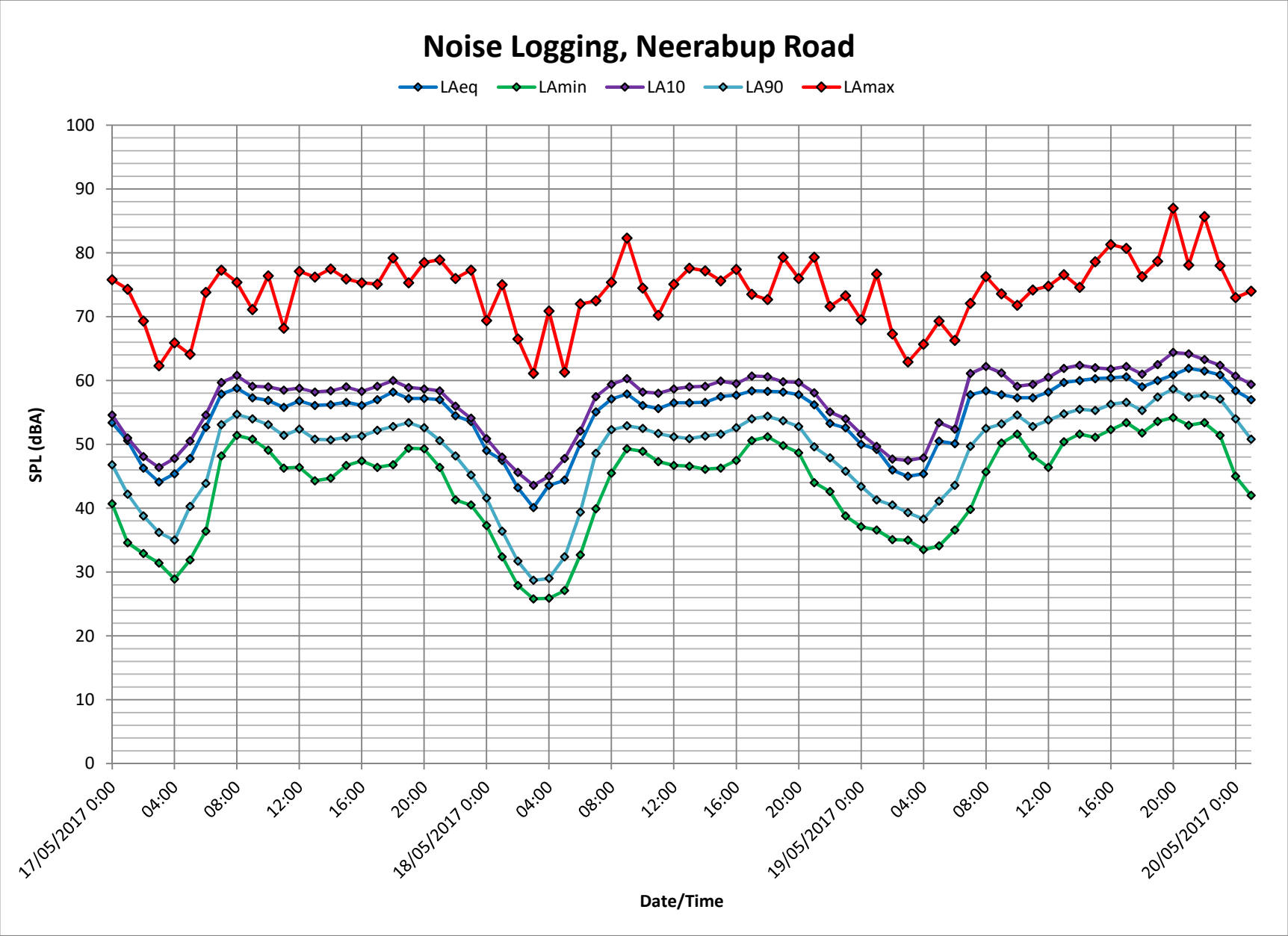




APPENDIX B

NOISE MONITORING RESULTS

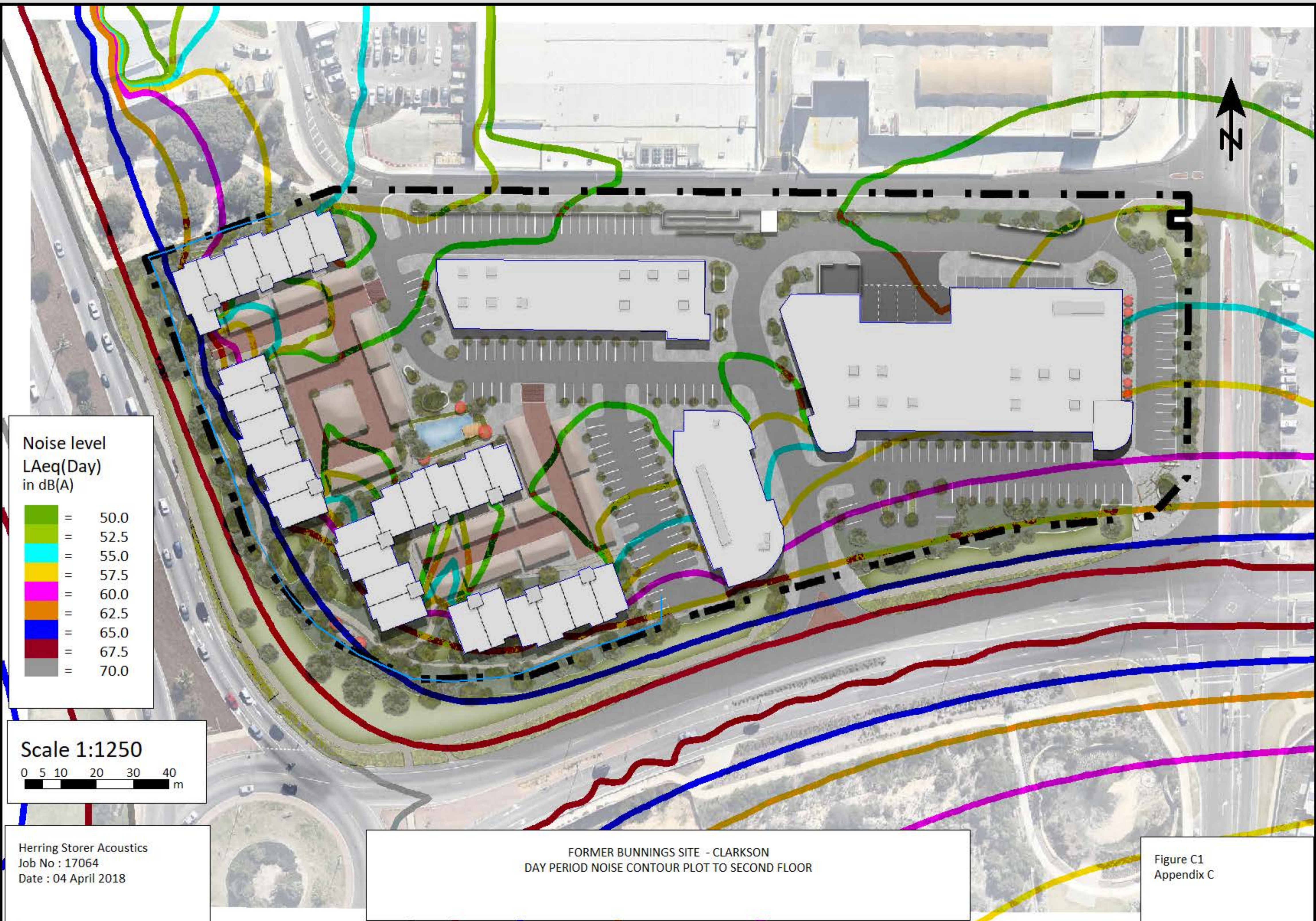




APPENDIX C

ROAD TRAFFIC NOISE

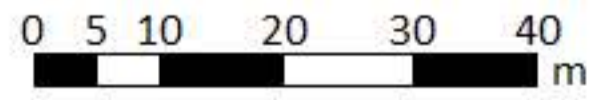
$L_{Aeq(16hr)}$ DAY PERIOD NOISE CONTOURS



Noise level
 $L_{Aeq}(\text{Day})$
 in dB(A)

- = 50.0
- = 52.5
- = 55.0
- = 57.5
- = 60.0
- = 62.5
- = 65.0
- = 67.5
- = 70.0

Scale 1:1250



Herring Storer Acoustics
 Job No : 17064
 Date : 04 April 2018

FORMER BUNNINGS SITE - CLARKSON
 DAY PERIOD NOISE CONTOUR PLOT TO SECOND FLOOR

Figure C1
 Appendix C

APPENDIX D

QUIET HOUSE DESIGN GUIDELINES

Area	Orientation to road or rail corridor	Package A	Package B	Package C
		L _{Aeq} ,Day up to 60dB L _{Aeq} ,Night up to 55dB	L _{Aeq} ,Day up to 63dB L _{Aeq} ,Night up to 58dB	L _{Aeq} ,Day up to 65dB L _{Aeq} ,Night up to 60dB
Bedrooms	Facing	<ul style="list-style-type: none"> Walls to R_w+C_{tr} 45dB Windows and external door systems: Minimum R_w+C_{tr} 28dB (Table 6.4), total glazing area up to 40% of room floor area. [if R_w+C_{tr} 31dB: 60%] [if R_w+C_{tr} 34dB: 80%] Roof and ceiling to R_w+C_{tr} 35dB (1 layer 10mm plasterboard) Mechanical ventilation as per Section 6.3.1 	<ul style="list-style-type: none"> Walls to R_w+C_{tr} 50dB Windows and external door systems: Minimum R_w+C_{tr} 31dB (Table 6.4), total glazing area up to 40% of room floor area. [if R_w+C_{tr} 34dB: 60%] Roof and ceiling to R_w+C_{tr} 35dB (1 layer 10mm plasterboard) Mechanical ventilation as per Section 6.3.1 	<ul style="list-style-type: none"> Walls to R_w+C_{tr} 50dB Windows and external door systems: Minimum R_w+C_{tr} 34dB (Table 6.4), total glazing area limited to 40% of room floor area [if 20% of floor area or less, R_w+C_{tr} 31dB] Roof and ceiling to R_w+C_{tr} 40dB (2 layers 10mm plasterboard) Mechanical ventilation as per Section 6.3.1
	Side-on	•As above, except glazing R _w +C _{tr} values for each package may be 3dB less, or max % area increased by 20%		
	Opposite	• No requirements	• As per Package A 'Side On'	• As per Package A 'Facing'
Indoor living and work Areas	Facing	<ul style="list-style-type: none"> Walls to R_w+C_{tr} 45dB Windows and external door systems: Minimum R_w+C_{tr} 25dB (Table 6.4), total glazing area limited to 40% of room floor area. [if R_w+C_{tr} 28dB: 60%] [if R_w+C_{tr} 31dB: 80%] External doors other than glass doors to R_w+C_{tr} 26dB (Table 6.4) Mechanical ventilation as per Section 6.3.1 	<ul style="list-style-type: none"> Walls to R_w+C_{tr} 50dB Windows and external door systems: Minimum R_w+C_{tr} 28dB (Table 6.4), total glazing area up to 40% of room floor area. [if R_w+C_{tr} 31dB: 60%] [if R_w+C_{tr} 34dB: 80%] External doors other than glass doors to R_w+C_{tr} 26dB (Table 6.4) Mechanical ventilation as per Section 6.3.1 	<ul style="list-style-type: none"> Walls to R_w+C_{tr} 50dB Windows and external door systems: Minimum R_w+C_{tr} 31dB (Table 6.4), total glazing area up to 40% of room floor area. [if R_w+C_{tr} 34dB: 60%] External doors other than glass doors to R_w+C_{tr} 30dB (Table 6.4) Mechanical ventilation as per Section 6.3.1
	Side-on	• As above, except the glazing R _w +C _{tr} values for each package may be 3dB less, or max % area increased by 20%		
	Opposite	• No requirements	• As per Package A 'Side On'	• As per Package A 'Facing'
Other indoor areas	Any	• No requirements	• No requirements	• No requirements
Outdoor living areas	Any (Section 6.2.3)	<ul style="list-style-type: none"> As per Package C, and/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 	<ul style="list-style-type: none"> As per Package C, 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 	<ul style="list-style-type: none"> At least one outdoor living area located on the opposite side of the building from the transport corridor

Alternative constructions are acceptable, provided they are supported by an report prepared by an suitably qualified Acoustical Consultant.

MINIMUM ACOUSTIC RATING OF SELECTED EXTERNAL BUILDING EXTERIOR WALLS

Building Element	Type	$R_w + C_{tr}, dB$	Example Constructions
External wall	Steel framed	45	One row of 92mm studs at 600mm centres with – <ul style="list-style-type: none"> • resilient steel channels fixed to the outside of the studs; and • 9.5mm hardboard or 9mm fibre cement sheeting or 11mm fibre cement weatherboards fixed to the outside of the channels; and • 75mm thick glass or mineral wool insulation with a density of 11kg/m³ or • 75mm thick polyester insulation with a density of 14kg/m³, positioned between the studs; and • two layers of 16mm fire-protective grade plasterboard fixed to the inside face of the studs.
			One row of 92mm studs at 600mm centres with – <ul style="list-style-type: none"> • resilient steel channels fixed to the outside of the studs; and • one layer of 19mm board cladding fixed to the outside of the channels; and • 6mm fibre cement sheets fixed to the inside of the channels; and • 75mm thick glass or mineral wool insulation with a density of 11 kg/m³ or • 75mm thick polyester insulation with a density of 14 kg/m³, positioned between the studs; and • two layers of 16mm fire-protective grade plasterboard fixed to the inside face of the studs.
	Single leaf masonry, brick veneer	45	<ul style="list-style-type: none"> • Single leaf of 150mm brick masonry with 13mm cement render on each face.
		50	Single leaf of 90mm clay brick masonry with – <ul style="list-style-type: none"> • a row of 70mm x 35mm timber studs or 64mm steel studs at 600mm centres; and • a cavity of 25mm between leaves; and • 75mm thick glass or mineral wool insulation with a density of 11kg/m³ or 75mm thick polyester insulation with a density of 14kg/m³ positioned between studs; and • one layer of 10mm plasterboard fixed to the inside face.
			Single leaf of 220mm brick masonry with 13mm cement render on each face.
			150mm thick unlined concrete panel. 200mm thick concrete panel with one layer of 13mm plasterboard or 13mm cement render on each face.
	Double brick	45	Two leaves of 90mm clay brick masonry with a 20mm cavity between leaves.
		50	Two leaves of 90mm clay brick masonry with – <ul style="list-style-type: none"> • a 50mm cavity between leaves; and • 50mm thick glass wool insulation with a density of 11kg/m³ or 50mm thick polyester insulation with a density of 14 kg/m³ in the cavity; and • Where wall ties are required to connect leaves, the ties are of the resilient type.
	Two leaves of 110mm clay brick masonry with – <ul style="list-style-type: none"> • a 50mm cavity between leaves; and • 50mm thick glass wool insulation with a density of 11kg/m³ or 50mm thick polyester insulation with a density of 14 kg/m³ in the cavity. 		

MINIMUM ACOUSTIC RATING OF GLAZED ELEMENTS

Building Element	Type	Airborne weighted sound reduction rating with traffic correction R_w+C_{tr}, dB	Building element Type Airborne weighted sound
Window, uPVC, aluminium or timber frame	Sliding or double hung opening	23	<ul style="list-style-type: none"> • 4mm monolithic glass
		26	<ul style="list-style-type: none"> • Single pane glazing to R_w 33dB • 6mm monolithic or laminated glass • 6mm toughened safety glass • '6-12-6' double insulated glass unit (IGU)
		29	<ul style="list-style-type: none"> • Single pane glazing to R_w 36dB • 10mm monolithic (aka float) glass • 10mm laminated or toughened safety glass • 6mm-12mm-10mm double insulating
	Fixed sash, awning or casement type opening	26	<ul style="list-style-type: none"> • 4mm monolithic glass
		31	<ul style="list-style-type: none"> • Single pane glazing to R_w 33dB • 6mm monolithic or laminated glass • 6mm toughened safety glass • '6-12-6' double insulated glass unit (IGU)
		34	<ul style="list-style-type: none"> • Single pane glazing to R_w 36dB • 10mm monolithic (a.k.a. float) glass • 10mm laminated or toughened safety glass • 6mm-12mm-10mm double insulated glass unit (IGU)
Single external door, aluminium uPVC or timber frame	Fully glazed sliding door	24	<ul style="list-style-type: none"> • 6mm monolithic or laminated • 5 or 6mm toughened safety glass
		27	<ul style="list-style-type: none"> • 10mm monolithic or laminated • 10mm toughened safety glass
	Fully glazed hinged door	28	<ul style="list-style-type: none"> • Certified R_w 31dB acoustically rated door and frame including seals • 6mm monolithic or laminated • 5 or 6mm toughened safety glass
		31	<ul style="list-style-type: none"> • Certified R_w 34dB acoustically rated door and frame including seals • 10mm monolithic or laminated • 10mm toughened safety glass
	Solid core timber frame, side hinged	26	<ul style="list-style-type: none"> • Certified R_w 28dB acoustically rated door and frame system including seals • 35mm solid core timber
		30	<ul style="list-style-type: none"> • Certified R_w 32dB acoustically rated door and frame system including seals • 40mm solid core timber without glass insert • 40mm solid core timber with not less than 6mm