

FLAGSTONE DEVELOPMENT

Acoustic Report - Stage 1H

Prepared for: Peet Flagstone City Pty Ltd

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BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with the Client. Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

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SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
620.10512-R03-v1.0	6 February 2018	S Walker	R Grant [RPEQ 12407]	S Walker

EXECUTIVE SUMMARY

The Flagstone City Development is a new residential and commercial masterplan development delivered under the Urban Land Development Authority (ULDA) Greater Flagstone Urban Development Area Development Scheme. The development at Flagstone City is to be undertaken in accordance with condition 31 of the Development Approval which relates to acoustic requirements. The condition requires an acoustic compliance assessment for all lots within 100 m of Road01, the North-South Arterial road and the rail corridor. With respect to complying with Condition 31, the Economic Development of Queensland (EDQ) requires the design and construction of applicable residential developed to be consistent with the Queensland Development Code (QDC), specifically *Mandatory Part 4.4 Buildings in a Transport Corridor* (MP4.4).

Under the QDC, a residential building in a Transport Noise Corridor needs to achieve certain levels of noise reduction. For the purpose of determining the noise reduction requirements for residential property at the Flagstone City Development, the EDQ has defined Road01, the North-South Arterial road and the rail corridor as Transport Noise Corridors.

The noise reduction is dependent upon the highest MP4.4 Noise Category which all or each part of the building sits. The required noise reduction can be achieved through incorporating appropriate building materials to the building envelope (e.g. windows, walls, roof, floors and entry doors). To assist the building construction, MP4.4 provides acceptable forms of construction for the external elements of the residential building to achieve the minimum noise reduction required for each Noise Category.

This report has been prepared by SLR Consulting Australia Ltd (SLR), on behalf of Peet Flagstone City Ltd (PEET), to provide an assessment of the future transport noise levels from the Transport Noise Corridors within, and adjacent to, the Flagstone City Development.

Detailed in this report are the forecast MP4.4 Noise Categories for each of the lots within Stage 1H. It is to be noted that due to the current designation of Road B and Trailblazer Drive, which are the nearest roads to this stage, the residential buildings in Stage 1H does not require adherence to MP4.4.

The presented Noise Categories are just for information purposes and to assist consideration of noise mitigation in the design and construction of residential buildings at these stages. If MP4.4 applied, the lots in Stage 1H that are within Noise Category 0 would not require acoustic treatment and lots which are within Noise Category 1 can often readily achieve the noise reductions with standard building constructions (other than relatively minor improvements to glazing).

It is noteworthy that the shape and form of individual buildings were not known at time of the assessment. As such these buildings, which could screen road traffic noise, are not included in the calculated transport noise levels and for this reason, the Noise Categories are considered a conservative assessment of transport noise.

In this regard, there is potential for the Noise Categories to change once the building design for properties becomes known and buildings are constructed at the Flagstone City Development and this could reduce the noise mitigation requirements. It is recommended that further assessment is considered for lots in Category 2 and above once the building design is known.

Information presented in this report is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid. No warranties or guarantees are expressed or should be inferred by any third parties. This report supersedes any previous transport noise assessments and reports prepared by SLR for Stage 1H.

Further information on transport noise corridors and the requirements of QDC can be obtained from the Queensland Government Department of Housing and Public Works.

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1 Introduction

The Flagstone City Development is a new residential and commercial masterplan development delivered under the Urban Land Development Authority (ULDA) Greater Flagstone Urban Development Area Development Scheme.

Where applicable, residential buildings in the Flagstone City Development are required to be designed and constructed in accordance with the Queensland Development Code (QDC), specifically *Mandatory Part 4.4 Buildings in a Transport Corridor* (MP4.4) of the QDC.

This report provides calculated transport noise levels at the lot configurations for Stage 1H within the Flagstone City Development. As detailed below, the lots in Stage 1H do not currently require adherence to MP4.4 and this acoustic report has been prepared to provide information that can assist the design and construction of residential buildings in these stages.

2 Requirements of the Queensland development code

Condition 31 of the Development Approval for the Flagstone City Development requires a compliance assessment for transport noise management at residential lots. Condition 31 is reproduced below.

Compliance Assessment – Noise Management

Submit to EDQ Development Assessment DSDIP for compliance assessment a Noise Mitigation Report, certified by a RPEQ, for all lots with 100 m from Road01, the future North-South Arterial road and the railway corridor achieving a ≤ 35 dBA for 1 hour max, over a 24-hour period for all habitable rooms.

Where a ≤ 35 dBA for 1 hour max, over a 24-hour period for all habitable rooms cannot be achieved, the Noise Mitigation Report is to provide the proposed noise mitigation measures. If any noise barriers are proposed, the detailed design/ construction plans certified by a RPEQ are to be provided.

SLR has been advised that Economic Development Queensland (EDQ) consider the acceptable forms of building construction in MP4.4 as appropriate noise mitigation measures referenced in Condition 31. MP4.4 does not provide internal noise criteria but the minimum building constructions in MP4.4 would typically achieve an internal transport noise level of approximately 35 dBA within habitable rooms.

MP4.4 applies to residential buildings that are constructed within designated Transport Noise Corridors. SLR was advised that EDQ consider, for the purpose of assessing transport noise, the roads currently called 'Roads 01' and the 'North-South Arterial road' and the Sydney to Brisbane rail line to be Transport Noise Corridors applicable to the Flagstone City Development.

This assessment considers the Stage 1H lot configurations adjacent to Road B (refer **Appendix A**). Road B has been defined by EDQ as not requiring an assessment under MP4.4. The rail corridor is at least 1 km from these stages and, at this distance, would not trigger the consideration of noise mitigation under MP4.4. Accordingly, compliance to MP4.4 is not required and this report has been prepared only to assist the design and construction of residential buildings.

When building in a Transport Noise Corridor, the residential buildings need to achieve certain levels of noise reduction, which is dependent upon the highest MP4.4 Noise Category which all or each part of the building sits. The noise reduction can be achieved through incorporating appropriate building materials to the building envelope to achieve the required noise reduction at habitable rooms.

MP4.4 provides acceptable forms of construction for the external elements of the building to assist in achieving a building design and construction which meets the required noise reduction for each Noise Category. The acceptable forms of construction in MP4.4 are provided in **Appendix B** of this report.

The MP4.4 Noise Categories, transport noise reductions for habitable rooms and minimum sound reductions (R_w) for building components are shown in **Table 1**.

Table 1 QDC MP4.4 Noise categories for road traffic noise and railway noise

Noise Category	Transport Noise Level ¹	Minimum Transport noise reduction for habitable rooms ²	Building external envelope component	Minimum R_w required for each component
4	Road traffic noise ≥73 dBA LA10(18hour) Railway noise ≥85 dBA LAmax	40 dBA	Glazing	43
			External Walls	52
			Roof	45
			Floors	51
			Entry doors	35
3	Road traffic noise 68 – 72 dBA LA10(18hour) Railway noise 80 – 84 dBA LAmax	35 dBA	Glazing	38
				35
			External walls	47
			Roof	41
			Floors	45
2	Road traffic noise 63 – 67 dBA LA10(18hour) Railway noise 75 – 79 dBA LAmax	30 dBA	Glazing	35
				32
			External walls	41
			Roof	38
			Floors	45
1	Road traffic noise 58 – 62 dBA LA10(18hour) Railway noise 70 – 74 dBA LAmax	25 dBA	Glazing	27
				24
			External walls	35
			Roof	35
			Entry doors	28
0	Road traffic noise ≤57 dBA LA10(18hour) Railway noise ≤69 dBA LAmax	No additional acoustic treatment required – standard building assessment provisions apply.		

Note 1 dBA is an abbreviation for decibels on the A-weighted scale.

Note 2 A habitable room is defined by the Building Code of Australia to be a room used for normal domestic activities, including: bedrooms, living rooms, lounge rooms, music rooms, television rooms, kitchens, dining rooms, sewing rooms, studies, playrooms, family rooms, home theatres and sunrooms.

Note 3 The R_w is a measure of the sound insulation properties of a specific building material element.

3 Assessment of Transport Noise

3.1 Methodology

A transport noise prediction model for the road network at Flagstone has been developed utilising the SoundPLAN noise prediction software. The SoundPLAN software is widely used in Australia and internationally to calculate road traffic noise levels in accordance with recognised transport noise assessment methodologies. The SoundPLAN noise prediction model for the Flagstone City Development incorporated the following datasets which were made available to SLR by PEET.

- Detailed designs for the lot configurations, road network and civil earthworks at the Flagstone City Development.
- Road traffic volumes for the year 2028 which are adopted as a 10 year planning horizon from the anticipated year of construction (refer **Appendix C**).
- To calculate the required road traffic noise levels over the 18-hour period between 6.00 am and midnight, the 18-hour traffic volume was assumed to be 94% of the total traffic volume for the 24-hour period. The 94% ratio was referenced from existing traffic volumes for similar roads in south-east Queensland.
- All road surfaces were assumed to be dense grade asphalt (DGA).

The noise prediction model calculated road traffic noise levels using the Calculation of Road Traffic Noise¹ methodology and the Code of Practice published by Transport and Main Roads².

The MP4.4 Noise Categories are based on transport noise levels calculated at 1 m from the facade of a building and, as there are no buildings in the noise prediction model, the calculated road traffic noise levels were adjusted by +2.5 dBA to account for the reflected sound at 1 m from a building façade.

3.2 Transport Noise Assessment

Road traffic noise levels for the year 2027/28 have been predicted at Stage 1H and presented consistent with the MP4.4 Noise Categories.

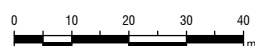
The calculated transport noise contours for the MP4.4 Noise Categories across each residential lots are detailed in the following figures.

- **Figure 1** presents the Noise Categories at 1.8 m for single storey dwellings at Stage 1H.
- **Figure 2** presents the Noise Categories at 4.6 m for two storey dwellings at Stage 1H.

The contours assume the potential residential building can be constructed at any location within the lot. The adopted 1.8 m and 4.6 m contour heights have been referenced from the Code of Practice which nominates standard building heights in lieu of the known building design.

¹ UK Department of Transport (1988). Calculation of Road Traffic Noise (CoRTN 88).

² Department of Transport and Main Roads. Transport Noise Management Code of Practice, Volume 1 Road Traffic Noise, dated November 2013.



3.3 QDC MP4.4 Noise Categories

The assessed Noise Categories for each lot at Stage 1H are detailed in **Table 2**. The Noise Category for each lot has been determined as the highest Noise Category for road traffic noise that has been predicted at part or all of the lot. Noise Categories have been presented for either a single storey (low set) or two storey (high set) dwelling.

The minimum acceptable forms of building construction that apply for each Noise Category are referenced in **Appendix B**. As noted previously in this report the lots at Stage 1H do not require adherence to MP4.4, the Noise Categories are presented for reference only.

Table 2 MP4.4 Noise Categories for Stage 1H

Lot	Predicted QDC MP4.4 Noise Category	
	Low set dwelling	High set dwelling
201	2	2
202	2	2
203	2	2
204	2	2
207	0	0
208	0	0
209	0	0
210	0	0
211	0	0
212	0	0
213	0	0
214	0	0
215	0	0
216	0	0
219	0	0
220	0	0
221	0	0
222	0	0
225	0	0
226	0	0
227	0	0
228	0	0
229	0	0
312	2	2
313	2	2

Lot	Predicted QDC MP4.4 Noise Category	
	Low set dwelling	High set dwelling
722	2	2
314	2	2
315	2	2
316	2	2

4 Discussion and Recommendations

The predicted Noise Categories presented in this report provide advice on the application of MP4.4 at individual lots. The shape and form of individual buildings was not known at time of the assessment and these buildings, which could screen road noise, are not included in the calculated transport noise levels. For this reason the Noise Categories are considered a conservative assessment of transport noise.

It is recommended that lots assessed in this report to be within Noise Category 2 or above and may experience screening of road traffic noise from the building on the lot and adjacent buildings, undergo further assessment to confirm if a lower Noise Category is applicable and a reduction in the MP4.4 construction requirements can be adopted. This can only be done during the building certification stage where the specific design of the dwelling and neighbouring properties is known.

Noise Category 1 is deemed to be a standard building construction (other than for some relatively minor improvement to glazing requirements), and for this reason further detailed assessment of transport noise at lots currently assessed as Noise Category 1 is unlikely to result in significant changes to the building construction.

When considering the individual building components it is noteworthy that the building design and construction can apply materials other than those presented in MP4.4; as long as the materials, in combination, achieve the minimum R_w value applicable to the individual building components and the Noise Category.

Furthermore, it may be possible to refine the MP4.4 accepted forms of constructions based on the actual building dimensions, preferred construction materials, and the predicted noise levels based on the methodology contained within Australian Standard 3671:1989 *Acoustics – Road traffic noise intrusion – Building siting and construction* (AS 3671).

5 Conclusion

This report provides calculated MP4.4 Noise Categories for the proposed residential lots at Stage 1H. The calculated Noise Categories for either single storey or double storey buildings at each lot in Stage 1H are provided in **Table 2**.

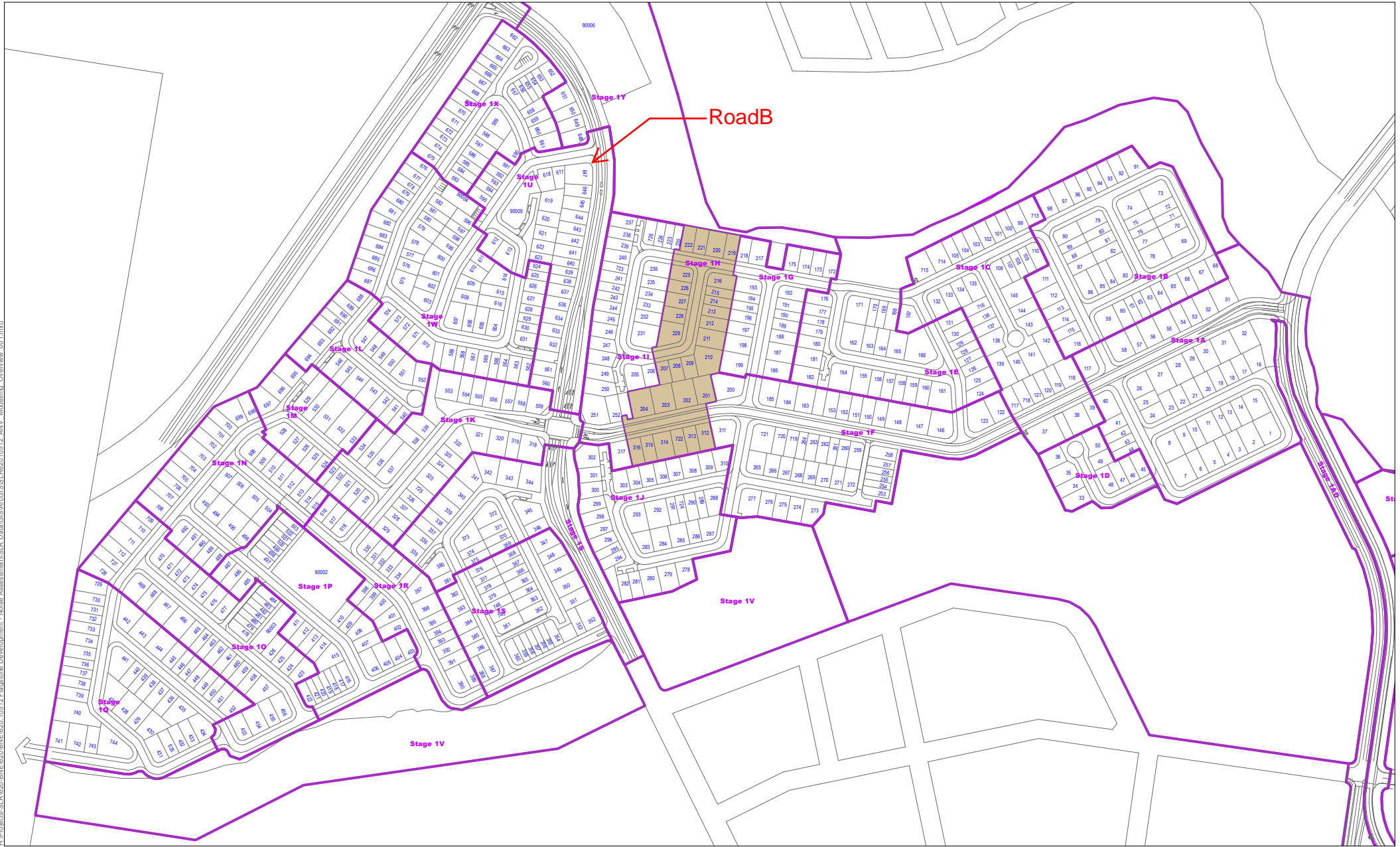
Because EDQ has defined Road B as not being a future Transport Noise Corridor, the Noise Categories and associated noise mitigation advice in this report are only to assist the consideration of noise mitigation in the design and construction of residential buildings at Stage 1H. It is not a requirement for the building design and construction of dwellings in Stage 1H to comply with MP4.4 at the time of this report.

The Noise Categories can be referenced when considering acceptable forms of building construction to control the intrusion of transport noise within habitable rooms. Examples of acceptable forms of construction for the building components as described in MP4.4 are shown in **Appendix B**.

It is important to note the Noise Categories have been predicted with reference to forecast future road traffic for the year 2028 and without the inclusion of building structures in the noise model. On this basis it is recommended that dwellings proposed to be built on lots located behind or adjacent to developed lots, and have been assessed in this report at Noise Category 2 or above, undergo further detailed assessment of transport noise to potentially refine the potential decisions on the building design and construction.

APPENDIX A

Lot Configurations for Stage 1H



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LEGEND

Other Stages

Stage 1H

Flagstone

PEET

0 150
Metres



PEET

Flagstone Noise Assessment - Stage 1H

**Proposed Development
Extents for Stage 1H**

FIGURE OVERVIEW

APPENDIX B

QDC MP4.4 Acceptable Forms of Construction

Schedule 1

Noise category	Minimum <i>transport noise reduction</i> (dB (A)) required for <i>habitable rooms</i>	Component of building's <i>external envelope</i>	Minimum R_w required for each component
Category 4	40	Glazing	43
		External walls	52
		Roof	45
		Floors	51
		Entry doors	35
Category 3	35	Glazing	38 (where total area of glazing for a <i>habitable room</i> is greater than 1.8m ²)
			35 (where total area of glazing for a <i>habitable room</i> is less than or equal to 1.8m ²)
		External walls	47
		Roof	41
		Floors	45
		Entry doors	33

Noise category	Minimum transport noise reduction (dB (A)) required for habitable rooms	Component of building's external envelope	Minimum R_w required for each component
Category 2	30	Glazing	35 (where total area of glazing for a <i>habitable room</i> is greater than 1.8m ²)
			32 (where total area of glazing for a <i>habitable room</i> is less than or equal to 1.8m ²)
		External walls	41
		Roof	38
		Floors	45
		Entry doors	33
Category 1	25	Glazing	27 (where total area of glazing for a <i>habitable room</i> is greater than 1.8m ²)
			24 (where total area of glazing for a <i>habitable room</i> is less than or equal to 1.8m ²)
		External walls	35
		Roof	35
		Entry Doors	28
Category 0	No additional acoustic treatment required – standard building assessment provisions apply.		

Schedule 2

Component of building's external envelope	Minimum R_w	Acceptable forms of construction
Glazing	43	Double glazing consisting of two panes of minimum 5mm thick glass with at least 100mm air gap and full perimeter <i>acoustically rated seals</i> .
	38	Minimum 14.38mm thick laminated glass, with full perimeter <i>acoustically rated seals</i> ; OR Double glazing consisting of one pane of minimum 5mm thick glass and one pane of minimum 6mm thick glass with at least 44mm air gap, and full perimeter <i>acoustically rated seals</i>
	35	Minimum 10.38mm thick laminated glass, with full perimeter <i>acoustically rated seals</i> .
	32	Minimum 6.38mm thick laminated glass with full perimeter <i>acoustically rated seals</i> .
	27	Minimum 4mm thick glass with full perimeter <i>acoustically rated seals</i>
	24	Minimum 4mm thick glass with standard weather seals

Component of building's external envelope	Minimum R_w	Acceptable forms of construction
External walls	52	Two leaves of clay brick masonry, at least 270mm in total, with subfloor vents fitted with noise attenuators.
	47	<p>Two leaves of clay brick masonry at least 110mm thick with:</p> <ul style="list-style-type: none"> (i) cavity not less than 50mm between leaves; and (ii) 50mm thick mineral insulation or 50mm thick glass wool insulation with a density of 11kg/m³ or 50mm thick polyester insulation with a density of 20kg/m³ in the cavity. <p>OR</p> <p>Two leaves of clay brick masonry at least 110mm thick with:</p> <ul style="list-style-type: none"> (i) cavity not less than 50mm between leaves; and (ii) at least 13mm thick cement render on each face <p>OR</p> <p>Single leaf of clay brick masonry at least 110mm thick with:</p> <ul style="list-style-type: none"> (i) a row of at least 70mm x 35mm timber studs or 64mm steel studs at 600mm centres, spaced at least 20mm from the masonry wall; and (ii) Mineral insulation or glass wool insulation at least 50mm thick with a density of at least 11 kg/m³ positioned between studs; and (iii) One layer of plasterboard at least 13mm thick fixed to outside face of studs. <p>OR</p> <p>Single leaf of minimum 150mm thick masonry of hollow, dense concrete blocks, with mortar joints laid to prevent moisture bridging.</p>

Component of building's external envelope	Minimum R_w	Acceptable forms of construction
	41	<p>Two leaves of clay brick masonry at least 110mm thick with cavity not less than 50mm between leaves</p> <p>OR</p> <p>Single leaf of clay brick masonry at least 110mm thick with:</p> <ul style="list-style-type: none"> (i) a row of at least 70mm x 35mm timber studs or 64mm steel studs at 600mm centres, spaced at least 20mm from the masonry wall; and (ii) mineral insulation or glass wool insulation at least 50mm thick with a density of at least 11 kg/m³ positioned between studs; and (iii) One layer of plasterboard at least 10mm thick fixed to outside face of studs <p>OR</p> <p>Single leaf of brick masonry at least 110mm thick with at least 13mm thick render on each face</p> <p>OR</p> <p>Concrete brickwork at least 110mm thick</p> <p>OR</p> <p>In-situ concrete at least 100mm thick</p> <p>OR</p> <p>Precast concrete at least 100mm thick and without joints.</p>

Component of building's external envelope	Minimum R_w	Acceptable forms of construction
	35	<p>Single leaf of clay brick masonry at least 110mm thick with:</p> <ul style="list-style-type: none"> (i) a row of at least 70mm x 35mm timber studs or 64mm steel studs at 600mm centres, spaced at least 20mm from the masonry wall; and (ii) One layer of plasterboard at least 10mm thick fixed to outside face of studs <p>OR</p> <p>Minimum 6mm thick fibre cement sheeting or weatherboards or plank cladding externally, minimum 90mm deep timber stud or 92mm metal stud, standard plasterboard at least 13mm thick internally.</p>
Roof	45	<p>Concrete or terracotta tile or sheet metal roof with sarking, <i>acoustically rated plasterboard</i> ceiling at least 13mm thick fixed to ceiling joists, cellulose fibre insulation at least 100mm thick with a density of at least 45kg/m³ in the cavity.</p> <p>OR</p> <p>Concrete or terracotta tile or sheet metal roof with sarking, 2 layers of <i>acoustically rated plasterboard</i> at least 16mm thick fixed to ceiling joists, glass wool insulation at least 50mm thick with a density of at least 11kg/m³ or polyester insulation at least 50mm thick with a density of at least 20kg/m³ in the cavity.</p>
	41	<p>Concrete or terracotta tile or metal sheet roof with sarking, plasterboard ceiling at least 10mm thick fixed to ceiling joists, glass wool insulation at least 50mm thick with a density of at least 11kg/m³ or polyester insulation at least 50mm thick with a density of at least 20kg/m³ in the cavity.</p> <p>OR</p> <p>Concrete suspended slab at least 100mm thick.</p>
	38	<p>Concrete or terracotta tile or metal sheet roof with sarking, plasterboard ceiling at least 10mm thick fixed to ceiling cavity, mineral insulation or glass wool insulation at least 50mm thick with a density of at least 11 kg/m³.</p>

Component of building's external envelope	Minimum R_w	Acceptable forms of construction
	35	Concrete or terracotta tile or metal sheet roof with sarking, plasterboard ceiling at least 10mm thick fixed to ceiling cavity.
Floors	51	Concrete slab at least 150mm thick.
	45	Concrete slab at least 100mm thick OR Tongued and grooved boards at least 19mm thick with: <ul style="list-style-type: none"> (i) timber joists not less than 175mm x 50mm; and (ii) mineral insulation or glass wool insulation at least 75mm thick with a density of at least 11kg/m³ positioned between joists and laid on plasterboard at least 10mm thick fixed to underside of joists; and (iii) mineral insulation or glass wool insulation at least 25mm thick with a density of at least 11kg/m³ laid over entire floor, including tops of joists before flooring is laid; and (iv) secured to battens at least 75mm x 50mm; and (v) the assembled flooring laid over the joists, but not fixed to them, with battens lying between the joists.
Entry Doors	35	Solid core timber not less than 45mm thick, fixed so as to overlap the frame or rebate of the frame by not less than 10mm, with full perimeter <i>acoustically rated seals</i> .
	33	Fixed so as to overlap the frame or rebate of the frame by not less than 10mm, fitted with full perimeter <i>acoustically rated seals</i> and constructed of - <ul style="list-style-type: none"> (i) solid core, wood, particleboard or blockboard not less than 45mm thick; and/or (ii) acoustically laminated glass not less than 10.38mm thick.

Component of building's external envelope	Minimum R_w	Acceptable forms of construction
	28	<p>Fixed so as to overlap the frame or rebate of the frame, constructed of -</p> <ul style="list-style-type: none"> (i) Wood, particleboard or blockboard not less than 33mm thick; or (ii) Compressed fibre reinforced sheeting not less than 9mm thick; or (iii) Other suitable material with a mass per unit area not less than 24.4kg/m²; or (iv) Solid core timber door not less than 35mm thick fitted with full perimeter <i>acoustically rated seals</i>.

Schedule 3

The objective of the *noise assessment* is to clearly demonstrate that the *noise category* that is applicable to a particular part of or entire building, or site. The criteria for determining the relevant *noise category* are given below in Table 1:

Table 1 – Noise category levels

Noise Category	Level of transport noise * ($L_{A10, 18hr}$) for State-controlled roads and designated local government roads	Single event maximum noise* (L_{Amax}) for railway land
Category 4	≥ 73 dB(A)	≥ 85 dB(A)
Category 3	68 - 72 dB(A)	80 – 84 dB(A)
Category 2	63 – 67 dB(A)	75 – 79 dB(A)
Category 1	58 - 62 dB(A)	70 - 74 dB(A)
Category 0	≤ 57 dB(A)	≤ 69 dB(A)

* measured at 1 m from the façade of the proposed or existing building.

APPENDIX C

Road Transport Noise Modelling Data

Road	24-hour traffic volume	18-hour traffic volume	3% heavy vehicles	Traffic speed
North-South Arterial Road	2,740	2,576	77	80 kmh
Road B north of Trailblazer Drive	2,740	2,576	77	60 kmh
Road B south of Trailblazer Drive	5,686	5,345	160	60 kmh
Road01 north of Trailblazer Drive	16,971	15,953	479	60 kmh
Road01 south of Trailblazer Drive	21,316	20,037	601	60 kmh
Trailblazer Drive	4,572	4,298	129	40 kmh

Note Trailblazer Drive was modelled for a comprehensive assessment consistent with previous acoustic reports, however specific traffic noise levels from this road are not deemed to apply to QDC MP4.4.

All noise predictions include a -1.7 dBA correction for Australia road conditions as per the Code of Practice. A Dense Grade Asphalt road pavement surface was modelled which is the default road pavement type in CoRTN and no corrections for pavement type were included.

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