25 September 2017

620.10512.00900 Flagstone Stage 1K & 1U.docx

Peet Flagstone City Pty Ltd
Level 2, 167 Eagle Street
Brisbane QLD 4000

Attention: Stephanie Clark

Dear Stephanie

Flagstone Development - Noise Assessment for Stage 1K and 1U

SLR Consulting Australia Pty Ltd (SLR) has been commissioned by Peet Flagstone City Pty Ltd (Peet) to conduct an assessment of road traffic noise for Stage 1K and 1U of the proposed Flagstone City Development.

The road traffic noise assessment has been undertaken with regard to the *Queensland Development Code – Buildings in a Transport Noise Corridor* (QDC MP4.4). The table below summarises the QDC MP4.4 Noise Category in each stage whether a low set or high set property is constructed.

QDC MP4.4 Category	Stage 1K		Stage 1U	
	Low Set	High Set	Low Set	High Set
Category 3	2	2	18	18
Category 2	1	4	8	13
Category 1	18	25	7	2

It is to be noted that the shape and form of individual buildings has not been advised at time of the assessment. As such these buildings, which could screen road traffic noise, are not included in the noise model and the noise predictions are considered a conservative assessment of road traffic noise.

It is recommended that further assessment is undertaken for Lots assessed to be in Category 2 and above once the building design is known to confirm QDC MP4.4 construction requirements.

The enclosed report details the road traffic assessment methodology, predicted QDC MP4.4 noise categories and recommended building components for the applicable noise category. Should you have any questions, or require additional assistance, please contact the undersigned via the details provided.

Yours sincerely

STEVEN WALKER
Principal Consultant - Acoustics & Vibration

Checked/
Authorised by: BH

1 Introduction

In 2012, SLR has carried out an acoustic assessment[1] for the Flagstone City Development Project (the Project); however refinement of the proposed lot configurations for Stage 1K and Stage 1U has taken place warranting revision of the road traffic noise assessment.

The road traffic noise assessment has been based on the road configuration and road traffic volumes (year 2051) from the 2012 assessment. The findings of the original acoustic assessment determined that noise from the Sydney to Brisbane rail line, to the east of the Project, would achieve the relevant rail noise criteria throughout Stage 1K and Stage 1U. The Flagstone Sewage Treatment Plant (STP) is located at least 1 km from Stage 1K and Stage 1U and noise emissions from the STP would also achieve the assessment criteria at the proposed lots in Stage 1K and Stage 1U.

In this regard, further consideration of noise from the rail Line and the STP has not been required for this assessment.

2 Development Description

The subject site is the centre of the city of Greater Flagstone and will incorporate the main city centre for the region located next to the existing Sydney to Brisbane Line (future integrated transport site for passenger bus and rail). The general lot configuration of Stage 1K and Stage 1U, within the Flagstone City Development, is shown on **Figure 1**.

3 Road Traffic Noise Categories

Residential buildings within the Flagstone development are required to be designed and constructed in accordance with the *Queensland Development Code – Buildings in a Transport Noise Corridor* (QDC MP4.4). Note that QDC MP4.4 applies only at the building approval and construction phase.

The noise reduction performance to be achieved through the various components of a proposed residential dwelling is measured in terms of the R_w value. The minimum R_w values to be achieved for each component of the buildings external envelope, for each of the QDC MP4.4 noise categories, are shown in **Table 1**.

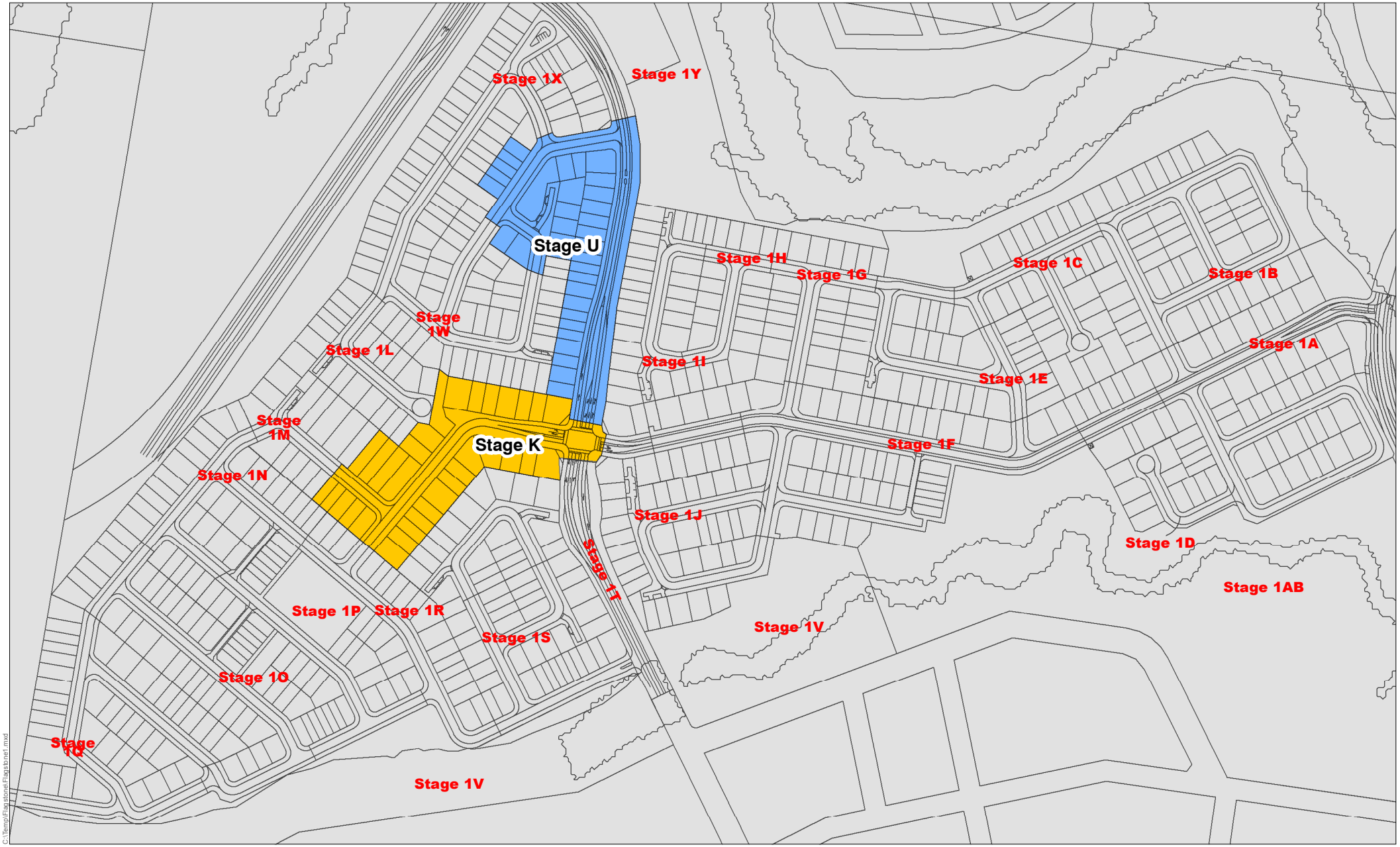
Table 1 QDC MP4.4 Noise Category Levels and Minimum Noise Reduction Performance

Noise Category	Transport Noise Level[1] for State-Controlled Roads,	Minimum Transport Noise Reduction For Habitable Rooms	Building External Envelope Component	Minimum Rw required for each component	
4	≥73 dBA LA10(18hour)	40 dBA	Glazing	43	
			External Walls	52	
			Roof	45	
			Floors	51	
			Entry doors	35	
3	68 – 72 dBA LA10(18hour)	35 dBA	Glazing	38	where total area of glazing for a habitable room is greater than 1.8m^2
				35	where total area of glazing for a habitable room is less than or equal to than 1.8m^2
			External walls	47	
			Roof	41	

[1] SLR Consulting Australia , 2012. Flagstone Development Noise Assessment, document 620.10512-R1, dated 13 August 2012.

Noise Category	Transport Noise Level[1] for State-Controlled Roads,	Minimum Transport Noise Reduction For Habitable Rooms	Building External Envelope Component	Minimum Rw required for each component	
			Floors	45	
			Entry doors	33	
2	63 – 67 dBA LA10(18hour)	30 dBA	Glazing	35	where total area of glazing for a habitable room is greater than 1.8m^2
				32	where total area of glazing for a habitable room is less than or equal to than 1.8m^2
			External walls	41	
			Roof	38	
			Floors	45	
			Entry doors	33	
1	58 – 62 dBA LA10(18hour)	25 dBA	Glazing	27	where total area of glazing for a habitable room is greater than 1.8m^2
				24	where total area of glazing for a habitable room is less than or equal to than 1.8m^2
			External walls	35	
			Roof	35	
			Entry doors	28	
0	≤ 57 dBA LA10(18hour)	No additional acoustic treatment required – standard building assessment provisions apply.			

Note Transport noise is assessed at 1 m from the façade of the proposed or existing building.



C:\Temp\Flagstone\Flagstone1.mxd

SLR

Level 2, 15 ASTOR TERRACE
SPRING HILL
QUEENSLAND 4004
AUSTRALIA
T: 61 7 3858 4800
F: 61 7 3858 4801
www.slrconsulting.com

Project No.:	620.11512
Date:	25-Sep-2017
Drawn by:	Ben Hinze
Scale:	1:5,000
Sheet Size:	A4
Projection:	GDA 1994 MGA Zone 56

LEGEND

- Stage K Extents
- Stage U Extents
- Proposed Road Alignment and Lot Configuration

Flagstone PEET

N W E S

0 50 100 150
Meters

PEET

Flagstone Noise Assessment - Stage 1K & 1U

Proposed Development Extents for Stages 1K and 1U

FIGURE 1

4 Assessment of Road Traffic Noise

4.1 Methodology

The road traffic noise assessment methodology for Stage 1K and Stage 1U of the Flagstone development is identical to that detailed in the original acoustic assessment in 2012. Based on information supplied by PEET, the current assessment has only been updated for the most recent lot configuration as well as updated 3-D topography of the local terrain.

Additional notes on the application of MP4.4 to this project

QDC MP4.4 provides noise categories based on road traffic noise levels forecast 1 m from the facade of a building. The higher the noise category, the more substantial the acoustic design and construction requirements will be in order to achieve an acceptable amenity within the residence.

Consistent with the 2012 noise assessment, noise barriers have not been included in the design to mitigate road traffic noise as they are not considered to be in-line with the Flagstone City Development design requirements. Alternative mitigation methods such as building treatments are to be investigated as the preferred option.

QDC MP4.4 provides acceptable forms of construction to achieve the minimum R_w performance for each component of the building's external envelope. Those constructions have been reproduced in **Appendix B**.

It is noted that for construction purposes, where more than one noise category for a common facade is triggered, a consistent construction detail for a building component based upon the higher required R_w performance should be used.

It is acceptable to use materials other than those presented in QDC MP4.4 with manufacturer's specifications that, in combination, achieve the minimum R_w value for the relevant building component and applicable noise category.

It may also be possible to further refine the QDC 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).

It is highly likely that, where a dwelling falls with a noise category 2 or higher, an alternative solution (to adopting the QDC MP4.4 noise category/constructions) will result in a reduced R_w requirement and subsequently a reduced construction cost to the applicant/developer.

4.2 Assessment

Year 2051 road traffic noise levels have been predicted at Stage 1K and Stage 1U and presented consistent with the QDC MP4.4 noise categories. The QDC MP4.4 noise category for each residential lot is detailed in the following table and figures:

- **Figure 2** and **Figure 3** presents the noise categories calculated at 1.8 m (low set) and 4.6 m (high set) above pad level for Stage 1K.
- **Figure 4** and **Figure 5** presents the noise categories calculated at 1.8 m (low set) and 4.6 m (high set) above pad level for Stage 1U.

The building design and construction of the dwellings was not known at the time of the assessment, as such the noise model did not take into account potential road traffic noise shielding from future residential buildings within the development.

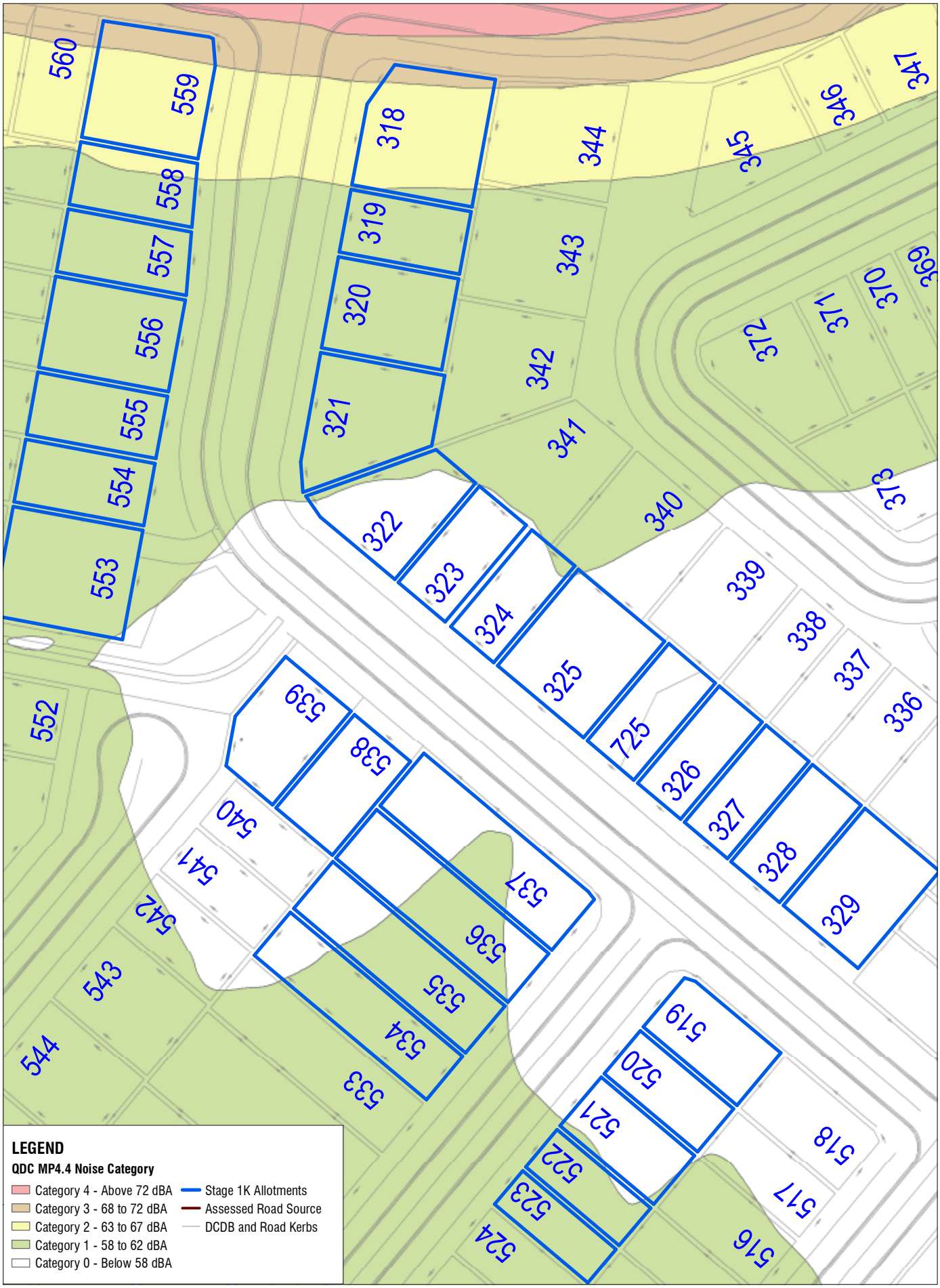
It is recommended that dwellings proposed to be built on lots located behind developed lots more exposed to the road network undergo further assessment to confirm if a lower noise category is applicable and therefore a reduction in QDC MP4.4 construction requirements.

Table 2 Predicted QDC MP4.4 Noise Category at each Lot - Stage 1K

Lot	QDC MP4.4 Noise Category	
	Low Set Dwelling	High Set Dwelling
318	3	3
319	1	2
320	1	2
321	1	1
322	1	1
323	1	1
324	1	1
325	0	1
725	0	1
326	0	1
327	0	1
328	0	1
329	0	1
519	0	1
520	0	1
521	1	1
522	1	1
523	1	1
534	1	1
535	1	1
536	1	1
537	1	1
538	0	1
539	0	1
553	1	1
554	1	1
555	1	1
556	1	1
557	1	2
558	2	2
559	3	3

Table 3 Predicted QDC MP4.4 Noise Category at each Lot - Stage 1U

Lot	QDC MP4.4 Noise Category	
	Low Set Dwelling	High Set Dwelling
560	3	3
561	3	3
591	2	2
592	1	2
593	1	2
594	1	2
595	1	2
90005	1	2
612	1	1
613	1	1
617	2	2
618	2	2
619	2	2
620	2	2
621	2	2
622	2	2
623	2	2
632	3	3
633	3	3
634	3	3
635	3	3
636	3	3
637	3	3
638	3	3
639	3	3
640	3	3
641	3	3
642	3	3
643	3	3
644	3	3
645	3	3
646	3	3
647	3	3



C:\Temp\Flagstone\Flagstone 2.mxd

SLR
L2 15 ASTOR TERRACE
SPRING HILL
QUEENSLAND 4000
AUSTRALIA
T: 61 7 3858 4800
F: 61 7 3858 4801
www.slrconsulting.com

Project No.:	620.11512
Date:	22-Sep-2017
Drawn by:	BH
Scale:	1:1,050
Sheet Size:	A4
Projection:	GDA 1994 MGA Zone 56

N E S W

0 10 20 30 40 m

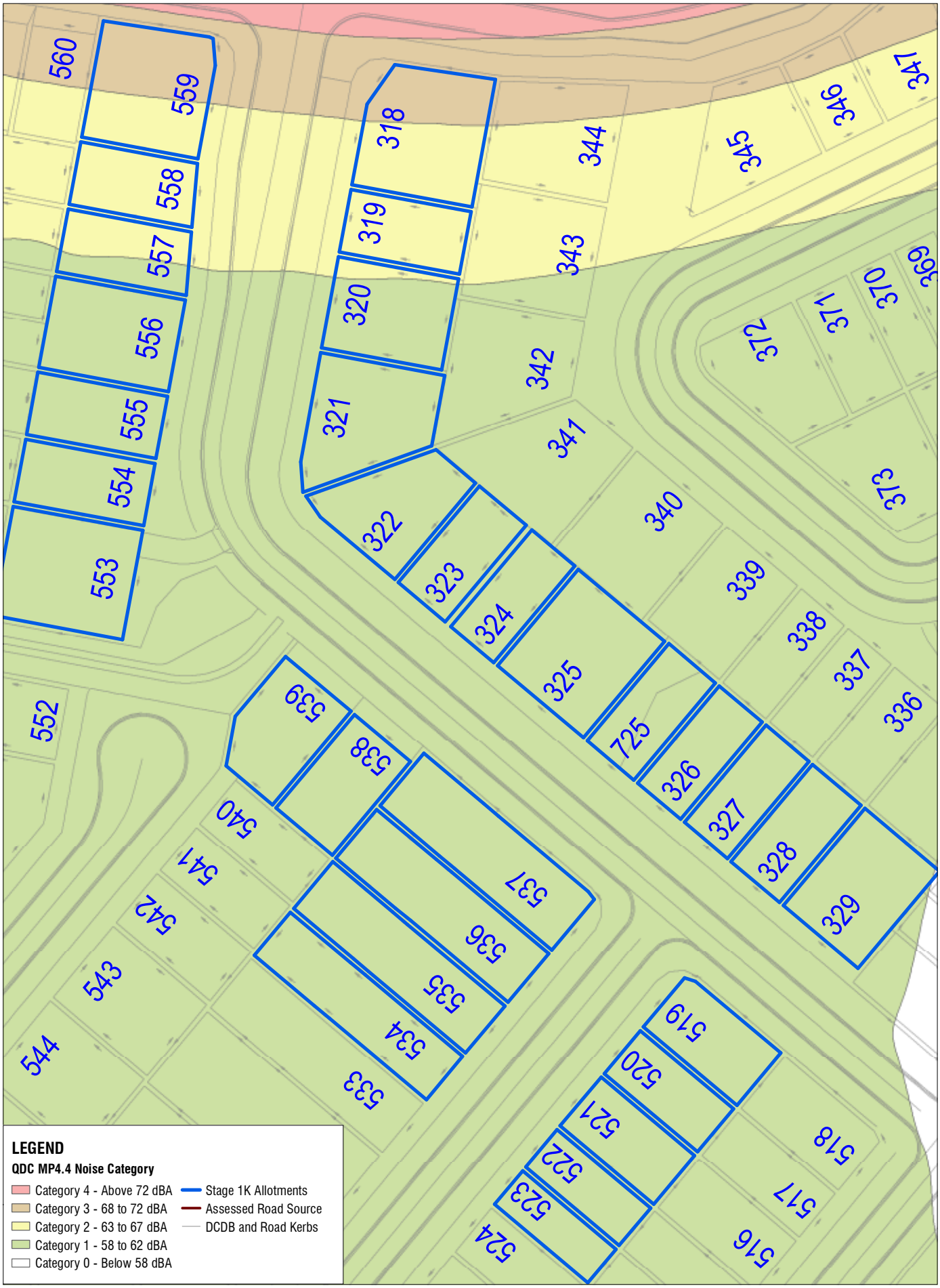
Flagstone
PEET

PEET

Flagstone Noise Assessment - Stage 1K & 1U

Stage 1K Allotment Layout with Calculated QDC MP4.4 Noise Categories Facade Corrected - Ground Floor

FIGURE 2



C:\Temp\Flagstone\Flagstone 2.mxd

SLR
L2 15 ASTOR TERRACE
SPRING HILL
QUEENSLAND 4000
AUSTRALIA
T: 61 7 3858 4800
F: 61 7 3858 4801
www.slrconsulting.com

Project No.:	620.11512
Date:	22-Sep-2017
Drawn by:	BH
Scale:	1:1,050
Sheet Size:	A4
Projection:	GDA 1994 MGA Zone 56

N E S W

0 10 20 30 40 m

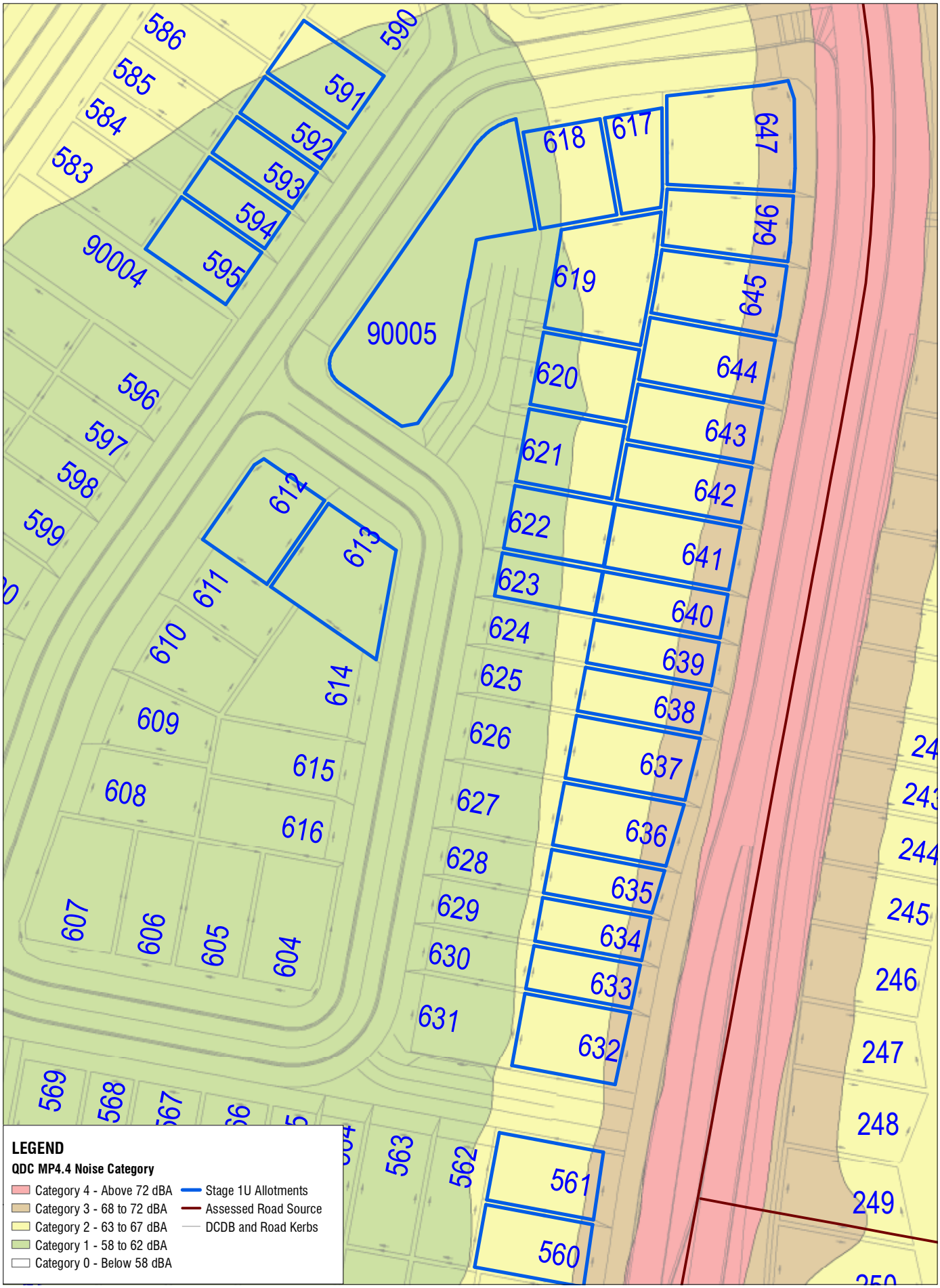
Flagstone
PEET

PEET

Flagstone Noise Assessment - Stage 1K & 1U

Stage 1K Allotment Layout with Calculated QDC MP4.4 Noise Categories Facade Corrected - First Floor

FIGURE 3



C:\Temp\Flagstone\Flagstone 2.mxd

SLR
L2 15 ASTOR TERRACE
SPRING HILL
QUEENSLAND 4000
AUSTRALIA
T: 61 7 3858 4800
F: 61 7 3858 4801
www.slrconsulting.com

Project No.:	620.11512
Date:	22-Sep-2017
Drawn by:	BH
Scale:	1:1,050
Sheet Size:	A4
Projection:	GDA 1994 MGA Zone 56

N
W
E
S

0 10 20 30 40 m

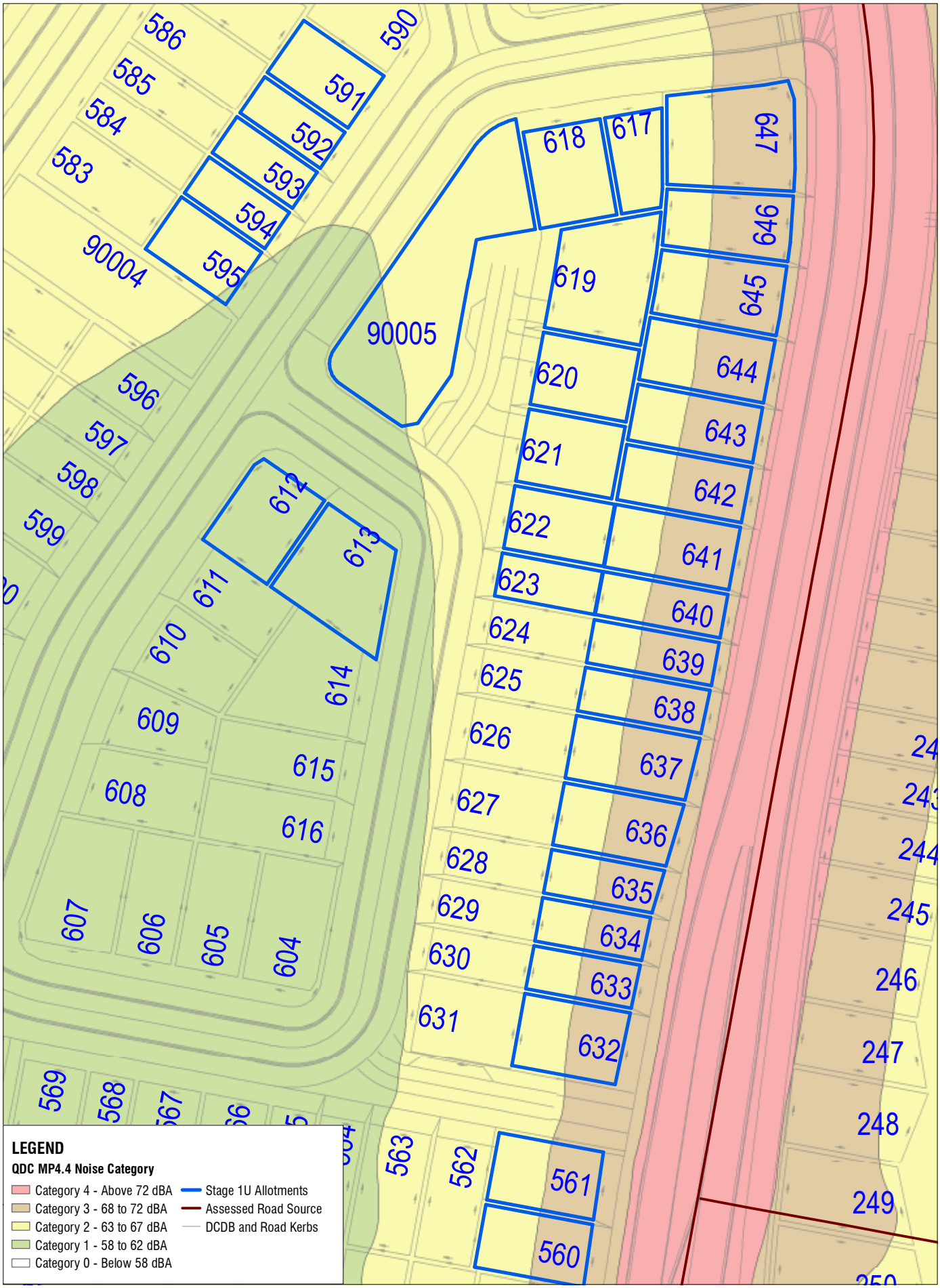
Flagstone
PEET

PEET

Flagstone Noise Assessment - Stage 1K & 1U

Stage 1U Allotment Layout with Calculated QDC MP4.4 Noise Categories Facade Corrected - Ground Floor

FIGURE 4



LEGEND

QDC MP4.4 Noise Category

- Category 4 - Above 72 dBA
- Category 3 - 68 to 72 dBA
- Category 2 - 63 to 67 dBA
- Category 1 - 58 to 62 dBA
- Category 0 - Below 58 dBA
- Stage 1U Allotments
- Assessed Road Source
- DCDB and Road Kerbs

C:\Temp\Flagstone\Flagstone 2.mxd

SLR

L2 15 ASTOR TERRACE
SPRING HILL
QUEENSLAND 4000
AUSTRALIA
T: 61 7 3858 4800
F: 61 7 3858 4801
www.slrconsulting.com

Project No.:	620.11512
Date:	22-Sep-2017
Drawn by:	BH
Scale:	1:1,050
Sheet Size:	A4
Projection:	GDA 1994 MGA Zone 56

N, W, E, S

0 10 20 30 40 m

Flagstone

PEET

PEET

Flagstone Noise Assessment - Stage 1K & 1U

Stage 1U Allotment Layout with Calculated QDC MP4.4 Noise Categories Facade Corrected - First Floor

FIGURE 5

5 Conclusion

This report describes the results of a road traffic noise assessment undertaken for Stage 1K and Stage 1U of the proposed Flagstone City Development in accordance with the QDC MP4.4.

The Flagstone City Development 3D SoundPLAN noise model was updated, with provided final lot configurations to predict the road traffic noise levels at the site for the planning horizon (year 2051) traffic volumes.

Based on the noise modelling, the predicted noise levels and the subsequent corresponding noise categories at the future development lots have been identified. The minimum noise reduction performance of each building component for the noise categories have been presented in **Table 1**.

Examples of acceptable forms of construction for the building components as described in QDC MP4.4 are shown in **Appendix B**. It is acknowledged that other acceptable forms of construction, which may result in reduced construction costs, could be determined using AS 3671.

At this stage of the development, the shape and form of residential dwellings is unknown and therefore building structures are not included in the noise model. Consequently, it is recommended that dwellings proposed to be built on lots located behind developed lots that would screen road traffic noise, and are currently assessed at Category 2 or above, undergo further assessment to confirm if a lower noise category is applicable and therefore a reduction in QDC MP4.4 construction requirements.

Category 1 is deemed to be a standard building construction, and for this reason further assessment on Lots currently assessed as Category 1 is unlikely to result in significant changes to the building construction.

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 *acoustically rated seals*.
	38	Minimum 14.38mm thick laminated glass, with full perimeter *acoustically rated seals*; 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 *acoustically rated seals*
	35	Minimum 10.38mm thick laminated glass, with full perimeter *acoustically rated seals*.
	32	Minimum 6.38mm thick laminated glass with full perimeter *acoustically rated seals*.
	27	Minimum 4mm thick glass with full perimeter *acoustically rated seals*
	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	Two leaves of clay brick masonry at least 110mm thick with: (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/m^3 or 50mm thick polyester insulation with a density of 20kg/m^3 in the cavity. OR Two leaves of clay brick masonry at last 110mm thick with: (i) cavity not less than 50mm between leaves; and (ii) at least 13mm thick cement render on each face OR Single leaf of clay brick masonry at least 110mm thick with: (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/m^3 positioned between studs; and (iii) One layer of plasterboard at least 13mm thick fixed to outside face of studs. OR Single leaf of minimum 150mm thick masonry of hollow, dense concrete blocks, with mortar joints laid to prevent moisture bridging.

Component of building's *external envelope*	Minimum R_w	Acceptable forms of construction
	41	Two leaves of clay brick masonry at least 110mm thick with cavity not less than 50mm between leaves OR Single leaf of clay brick masonry at last 110mm thick with: (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/m^3 positioned between studs; and (iii) One layer of plasterboard at least 10mm thick fixed to outside face of studs OR Single leaf of brick masonry at least 110mm thick with at least 13mm thick render on each face OR Concrete brickwork at least 110mm thick OR In-situ concrete at least 100mm thick OR Precast concrete at least 100mm thick and without joints.

Component of building's *external envelope*	Minimum R_w	Acceptable forms of construction
	35	Single leaf of clay brick masonry at least 110mm thick with: (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 OR 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.
Roof	45	Concrete or terracotta tile or sheet metal roof with sarking, *acoustically rated plasterboard* ceiling at least 13mm thick fixed to ceiling joists, cellulose fibre insulation at least 100mm thick with a density of at least 45kg/m^3 in the cavity. OR Concrete or terracotta tile or sheet metal roof with sarking, 2 layers of *acoustically rated plasterboard* at least 16mm thick fixed to ceiling joists, glass wool insulation at least 50mm thick with a density of at least 11kg/m^3 or polyester insulation at least 50mm thick with a density of at least 20kg/m^3 in the cavity.
	41	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/m^3 or polyester insulation at least 50mm thick with a density of at least 20kg/m^3 in the cavity. OR Concrete suspended slab at least 100mm thick.
	38	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/m^3.

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: (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/m^3 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/m^3 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 *acoustically rated seals*.
	33	Fixed so as to overlap the frame or rebate of the frame by not less than 10mm, fitted with full perimeter *acoustically rated seals* and constructed of - (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	Fixed so as to overlap the frame or rebate of the frame, constructed of - (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/m^2; or (iv) Solid core timber door not less than 35mm thick fitted with full perimeter *acoustically rated seals*.