

PLANS AND DOCUMENTS
referred to in the PDA
DEVELOPMENT APPROVAL

Approval no: DEV2018/988

Date: 30 July 2019



Queensland
Government

Rail and Road Traffic Noise Assessment

Lot 24 Bushman Drive and 68 Wyatt
Road, Jimboomba

H076_CEB06678



Prepared for
Pacifiq

5 March 2019

Document Information

Prepared for Pacifiq
Project Name Lot 24 Bushman Drive and 68 Wyatt Road, Jimboomba
File Reference pr_H076_CEB06678__RTN RAIL_04PL.doc
Job Reference H076_CEB06678
Date 5 March 2019

Contact Information

Cardno QLD Pty Ltd
Trading as Cardno
ABN 57 051 074 992

L11 Green Square North Tower
515 St Pauls Terrace
Fortitude Valley QLD 4006L11 Green Square North Tower

Telephone: 07 3369 9822
Facsimile: 07 3369 9722
International: +61 7 3369 9822

paul.lonard@cardno.com.au
julie.mcdonagh@cardno.com.au

Document Control

Version	Date	Author	Author Initials	Reviewer	Reviewer Initials
02	9/11/2018	Paul Lonard	PL	Julie McDonagh	JM
03	15/11/2018	Paul Lonard	PL	Julie McDonagh	JM
04	5/03/2019	Paul Lonard	PL	Julie McDonagh	JM

© Cardno 2019 Copyright in the whole and every part of this document belongs to Cardno and may not be used, sold, transferred, copied or reproduced in whole or in part in any manner or form or in or on any media to any person other than by agreement with Cardno.

This document is produced by Cardno solely for the benefit and use by the client in accordance with the terms of the engagement. Cardno does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by any third party on the content of this document.

Executive Summary

This revised noise impact assessment was conducted on behalf of Pacifiq for a proposed residential subdivision located at Lot 24 Bushman Drive and 68 Wyatt Road Jimboomba. Rail and road traffic noise levels were assessed to the proposed residential allotments to determine any acoustic treatment requirements for future 1 to 3 storey dwellings.

Cardno prepared an acoustic assessment (Cardno ref: pr_H076_CEB06678_RTN RAIL_03PL) in support of the initial application. Economic Development Queensland (EDQ) responded in turn with a letter outlining further issues (EDQ ref: DEV2018/988, 7 December 2018). Item 8 of the letter requested one minor clarification as follows;

8. Acoustic

Confirm if an acoustic barrier is required for the lots (lots 138-143) adjoining the railway corridor.

In response to the above, the initial assessment determined an acoustic barrier was not required for compliance with the applicable noise criteria, therefore a barrier was not included in the rail noise model or recommendations section of the submitted report.

The outcome of this updated report is the same as the previously submitted assessment, however figures and model outputs have been updated to reflect some minor amendments to the proposed lot boundaries which were required to address other issues. Therefore the following conclusions from the previous assessment remain unchanged;

Assessment Conclusions

The assessment has resulted in the following conclusions;

- > Based upon the predicted rail noise levels, lots nearest to the rail corridor will require acoustic treatments to comply with the EDQ internal noise objective, with QDC MP4.4 noise categories specified on the basis of the predicted Transport Noise Reduction (TNR).
- > Based on the predicted road traffic noise level, lots in the vicinity of the future Flinders Lake Drive will require acoustic treatments to comply with the EDQ internal noise objective, with QDC MP4.4 noise categories specified on the basis of the predicted TNR.
- > Noise categories for dwellings have been recommended on the condition that 2.0 metre high acoustic barriers are constructed as detailed in the recommendations section of this report.
- > Further assessments should be undertaken for the proposed mixed use lots 401 and 402 once development plans are available in order to provide detailed recommendations.
- > QDC nominates acceptable forms of construction for each noise category. Alternative building systems can be used, provided it can be demonstrated they achieve the required weighted sound reduction index (Rw).

Table of Contents

Executive Summary	iii
1 Introduction	1
1.1 Site Location	1
1.2 Site Environment	2
1.3 Proposal Details	2
2 Noise Monitoring	3
2.1 Rail Noise Monitoring	3
2.1.2 Weather Conditions	4
2.2 Road Traffic Noise Modelling	4
2.2.2 Weather Conditions	5
2.3 Equipment Calibration	5
2.4 Measurement Parameters	5
3 Measured Levels	7
3.1 Rail Noise	7
3.2 Road Traffic Noise	8
4 Criteria	12
4.1 Road Traffic and Rail Noise	12
4.2 Queensland Development Code Mandatory Part 4.4 (QDC MP4.4)	12
5 Rail Noise Impact Assessment	13
5.1 Noise Model Inputs & Assumptions	13
5.2 Rail Volumes	13
5.3 Rail Model Scenarios	13
5.4 Scenario 1-Model Verification	13
5.5 Scenario 2 -Predicted Rail Noise Levels – No Mitigation	14
6 Road Traffic Noise	17
6.1 Noise Model Inputs & Assumptions	17
6.2 Traffic Volumes	17
6.3 Model Scenarios	18
6.4 Scenario 1-Model Verification	18
6.5 Scenario 2 -Predicted Road Traffic Noise Levels – No Mitigation	19
6.6 Scenario 3 -Predicted Road Traffic Noise Levels – With Mitigation	21
7 Recommendations	24
7.1 Acoustic Barriers	24
7.2 Building Façade Treatments	24
7.2.1 Recommended QDC MP 4.4 Noise Categories	24
7.2.2 Glazing	25
7.2.3 External Walls	25
7.2.4 Roof/Ceiling	26
7.2.5 External Doors	27
7.2.6 Exposed Floors	27
7.3 Alternative Ventilation	27
8 Conclusion	28

Appendices

Appendix A	Recommended Acoustic Barrier
Appendix B	Transport Noise Corridor Search

Tables

Table 2-1	Summary of Rail Monitoring Equipment and Calibration	3
Table 2-2	Summary of Traffic Noise Monitoring Equipment and Calibration	4
Table 3-1	Measured Rail Noise Levels	7
Table 3-2	Measured Traffic Noise Levels	8
Table 4-1	QDC requirements	12
Table 5-1	Rail Noise Modelling Inputs and Assumptions	13
Table 5-2	Model Verification Results	13
Table 5-3	Recommended QDC MP 4.4 Noise Categories – Rail Noise	16
Table 6-1	Road Traffic Noise Modelling Inputs and Assumptions	17
Table 6-2	Bushman Drive Traffic Volumes	17
Table 6-3	Model Verification Results	18
Table 6-1	Applicable QDC MP 4.4 Noise Categories – Road Traffic Noise	23
Table 7-1	Recommended QDC MP 4.4 Noise Categories – Rail and Road Traffic Noise	24
Table 7-2	QDC MP 4.4 Acceptable Glazing	25
Table 7-3	QDC MP 4.4 Acceptable Wall Construction	25
Table 7-4	QDC MP 4.4 Acceptable Roof/Ceiling Construction	26
Table 7-5	QDC MP 4.4 Acceptable External Door Construction	27
Table 7-6	QDC MP 4.4 Acceptable Exposed Floor Construction	27

Figures

Figure 1-1	Subject Site Location	1
Figure 2-1	Rail Noise Logger Location	3
Figure 2-2	Noise Logger Locations	5
Figure 3-1	Measured Rail Noise Levels 17-18 October 2018	8
Figure 3-2	Measured Road Traffic Noise Levels – Logger 1	9
Figure 3-3	24 hour Averaged Measured Road Traffic Noise Levels – Logger 1	9
Figure 3-4	Measured Road Traffic Noise Levels –Logger 2	10
Figure 3-5	24 hour Averaged Measured Road Traffic Noise Levels – Logger 2	10
Figure 3-6	Measured Road Traffic Noise Levels –Logger 3	11
Figure 3-7	24 hour Averaged Measured Road Traffic Noise Levels – Logger 3	11
Figure 5-1	Predicted Rail Noise Level – Ground Floor Level	14
Figure 5-2	Predicted Rail Noise Level – First Floor Level	15
Figure 5-3	Predicted Rail Noise Level – Second Floor Level	15
Figure 6-1	Predicted Road Traffic Noise Levels – Ground Floor Level	19

Figure 6-2 Predicted Road Traffic Noise Levels – First Floor Level	20
Figure 6-3 Predicted Road Traffic Noise Levels – Second Floor Level	20
Figure 6-4 Predicted Road Traffic Noise Levels with 2.0m Acoustic Barrier – Ground Floor Level	21
Figure 6-5 Predicted Road Traffic Noise Levels with 2.0m Acoustic Barrier – First Floor Level	22
Figure 6-6 Predicted Road Traffic Noise Levels with 2.0m Acoustic Barrier – Second Floor Level	22
Figure A8-1 Recommended Acoustic Barrier	1

1 Introduction

This noise impact assessment was conducted on behalf of Pacifiq for a proposed residential subdivision located at Lot 24 Bushman Drive and 68 Wyatt Road Jimboomba.

In undertaking the assessment, unattended monitoring was conducted to measure noise from the Bushman Drive and the Brisbane-Sydney Rail Line. SoundPLAN 8.0 noise modelling software was used to predict rail and road traffic noise levels impacting the site. Acoustic treatments have been recommended in cases where the predicted noise levels exceed the criteria.

1.1 Site Location

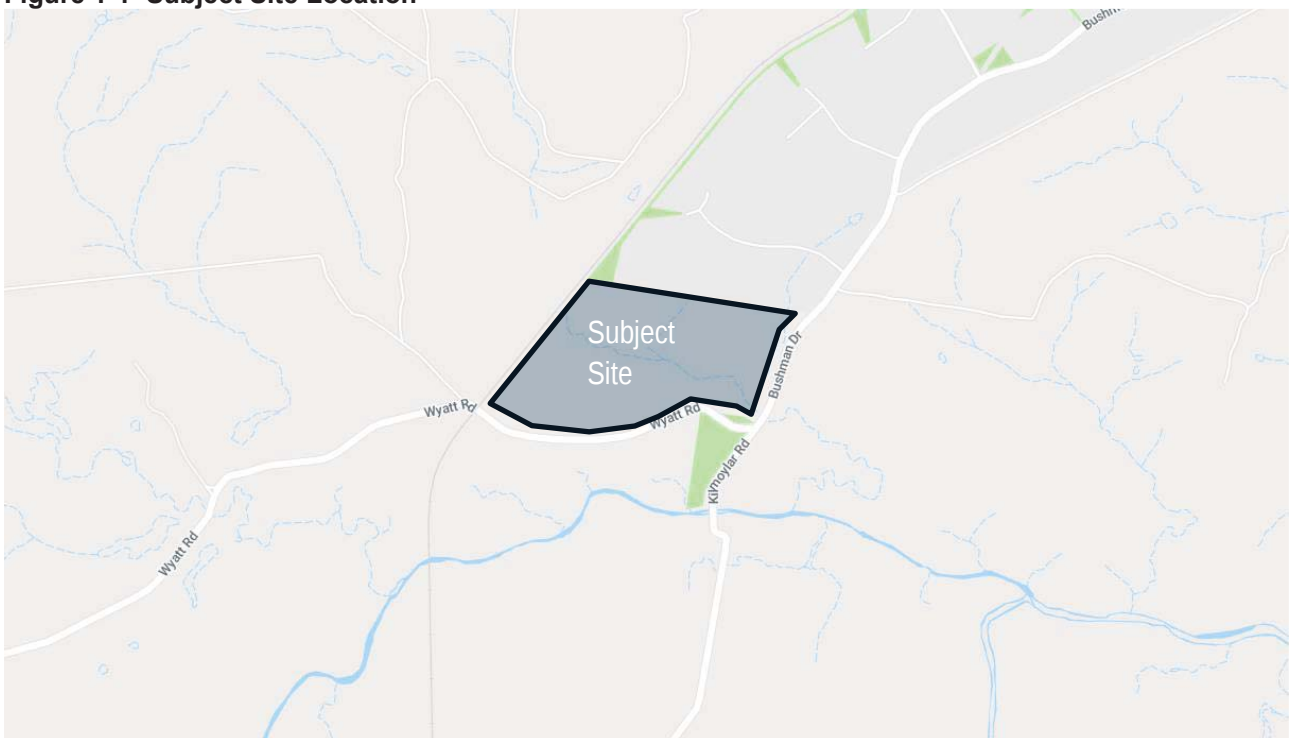
The site is described as follows:

Lot 24 on SP142997 and Lot 1 on RP49296

Lot 24 Bushman Drive and 68 Wyatt Road Jimboomba

The site location is shown in Figure 1-1:

Figure 1-1 Subject Site Location



1.2 Site Environment

The site is located in proximity to the following land uses:

- > Bushman Drive bounds the site to the east, separating the proposed subdivision from undeveloped rural land located within the Greater Flagstone PDA.
- > Wyatt Road bounds the site to the south, separating the proposal from undeveloped rural land located outside of the Greater Flagstone PDA.
- > The Brisbane-Sydney Rail Line bounds the site to the west, separating the proposal from undeveloped rural land located within the Greater Flagstone PDA. The rail line currently carries less than 15 trains per day.
- > Existing residential land uses bound the site to the north.

1.3 Proposal Details

The proposal is to construct a residential subdivision consisting of the following;

- > A total of 309 residential lots catering for predominately 1 to 2 storey dwellings, with some lots allowing for 3 storey dwellings;
- > Two lots on the western portion of the site will likely include mixed use developments. The lots will be separated by open space, which may be used for access to a future passenger rail station.
- > The centre of the site will consist of open space.
- > Two lots are proposed for future commercial development.
- > Site access will be via the proposed new road Flinders Lakes Drive.

2 Noise Monitoring

2.1 Rail Noise Monitoring

Unattended noise monitoring was conducted for a continuous period between the 16 and 19 October 2018 to measure noise from the Brisbane-Sydney Rail Line. The noise monitor was configured to measure rail noise levels as follows:

- > 'A' weighting
- > 'Fast' response
- > Measurement descriptors L_{Amax} , L_{Aeq} , L_{A1} , L_{A10} , L_{A90}

Table 2-1 presents a summary of the equipment used for rail noise monitoring and the calibration results.

Table 2-1 Summary of Rail Monitoring Equipment and Calibration

Location	Calibration (ref: 114 dB @ 1000 Hz) before/after measurement	Manufacturer – Model – Logger Serial Number
68 Wyatt Road	114.2/ 114.2	ARL – Ngara – 878073

The noise monitoring location is presented in Figure 2-2:

Figure 2-1 Rail Noise Logger Location



2.1.2 Weather Conditions

The environmental conditions during the measurement period were taken from the Bureau of Meteorology, Beaudesert weather station:

Conditions:	Mostly fine, with some shower/rain periods
Wind:	2 – 13 km/h predominantly from the northeast
Humidity:	59 – 85%
Temperature:	17 – 28°C

2.2 Road Traffic Noise Modelling

Noise monitoring was conducted for a continuous period between the 8 and 16 October 2018 to measure traffic noise along Bushman Drive.

- > **Logger 1** was located at 64 Bushman Drive in a free field location. The microphone was 1.4 metres above ground level and approximately 13 metres from the centreline of Bushman Drive
- > **Logger 2** was located at 207 Bushman Drive in a free field location. The microphone was 1.4 metres above ground level and approximately 11 metres from the centreline of Bushman Drive.
- > **Logger 3** was located at 322 Bushman Drive in a free field location. The microphone was 1.4 metres above ground level and approximately 23 metres from the centreline of Bushman Drive.

The unattended noise monitors were configured to measure noise levels as follows:

- > 'A' weighting
- > 'Fast' response
- > 15 minute statistical intervals
- > Measurement descriptors L_{Amax} , L_{Aeq} , L_{A1} , L_{A10} , L_{A90}

Road traffic noise monitoring was conducted in accordance with Australian Standard AS 2702 – 1984, *Acoustics- Methods for the Measurement of Road Traffic Noise*.

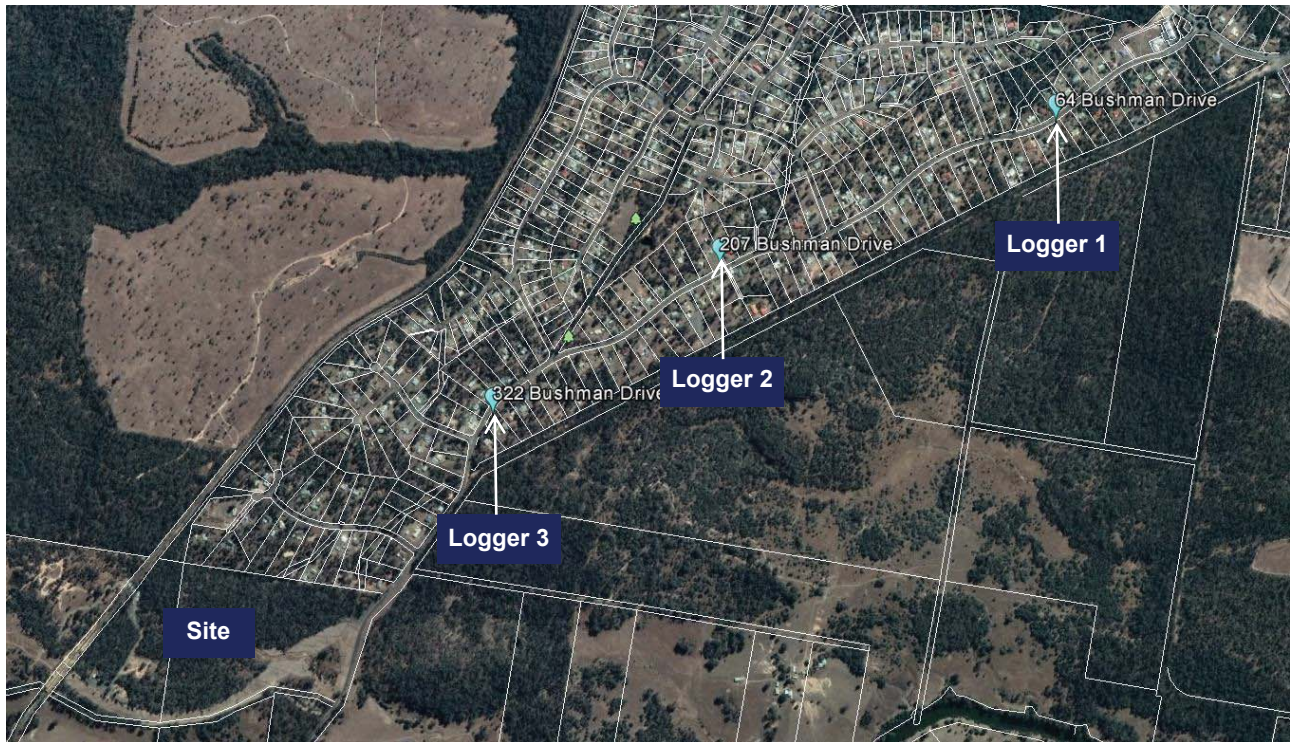
Table 2-2 presents a summary of the equipment used for road traffic noise monitoring and the calibration results.

Table 2-2 Summary of Traffic Noise Monitoring Equipment and Calibration

Logger	Location	Calibration (ref: 114 dB @ 1000 Hz) before/after measurement	Manufacturer – Model – Logger Serial Number
Logger 1	64 Bushman Drive	114.1 / 114.3	Rion – NL-21 – 509345
Logger 2	207 Bushman Drive	114.0 / 114.0	Rion – NL-21 – 776884
Logger 3	322 Bushman Drive	114.1 / 114.0	Rion – NL-21 – 276274

The noise monitoring locations are presented in Figure 2-2:

Figure 2-2 Noise Logger Locations



2.2.2 Weather Conditions

The environmental conditions during the measurement period were taken from the Bureau of Meteorology, Beaudesert weather station:

Conditions:	Mostly fine, with some shower/rain periods on the 11 to 16 October
Wind:	0 – 15 km/h predominantly from the south
Humidity:	36 – 100%
Temperature:	11 – 31°C

2.3 Equipment Calibration

Calibration of the measuring equipment was carried out before and after the measurements, and it was noted the maximum variation was by less than +/-0.3 dB(A) during the course of the monitoring for all equipment used.

All measurement equipment, including sound level meter and acoustic calibrators, carry current NATA laboratory certification.

2.4 Measurement Parameters

As noise varies with time, the use of statistical descriptors is necessary to understand and describe these variations. For road traffic noise, modelling predictions are commonly expressed as an 18 hour noise statistics between 6am and midnight. The common descriptors used to describe road traffic noise are described as follows:

- L_{Amax} : the A-weighted maximum noise level measured during the measurement period.
- L_{A1} : the A-weighted noise level exceeded for 1% of the measurement period.
- L_{A10} : the noise A-weighted level exceeded for 10% of the measurement period, generally referred to as the average of the maximums.

- L_{A90} : the A-weighted noise level exceeded for 90% of the measurement period, generally referred to as the average minimum sound pressure level or background noise level (refer AS 1055.1 – 1997).
- L_{Aeq} : the equivalent continuous noise level over the measurement period, generally referred to as the energy averaged sound pressure level over the measurement period.

3 Measured Levels

3.1 Rail Noise

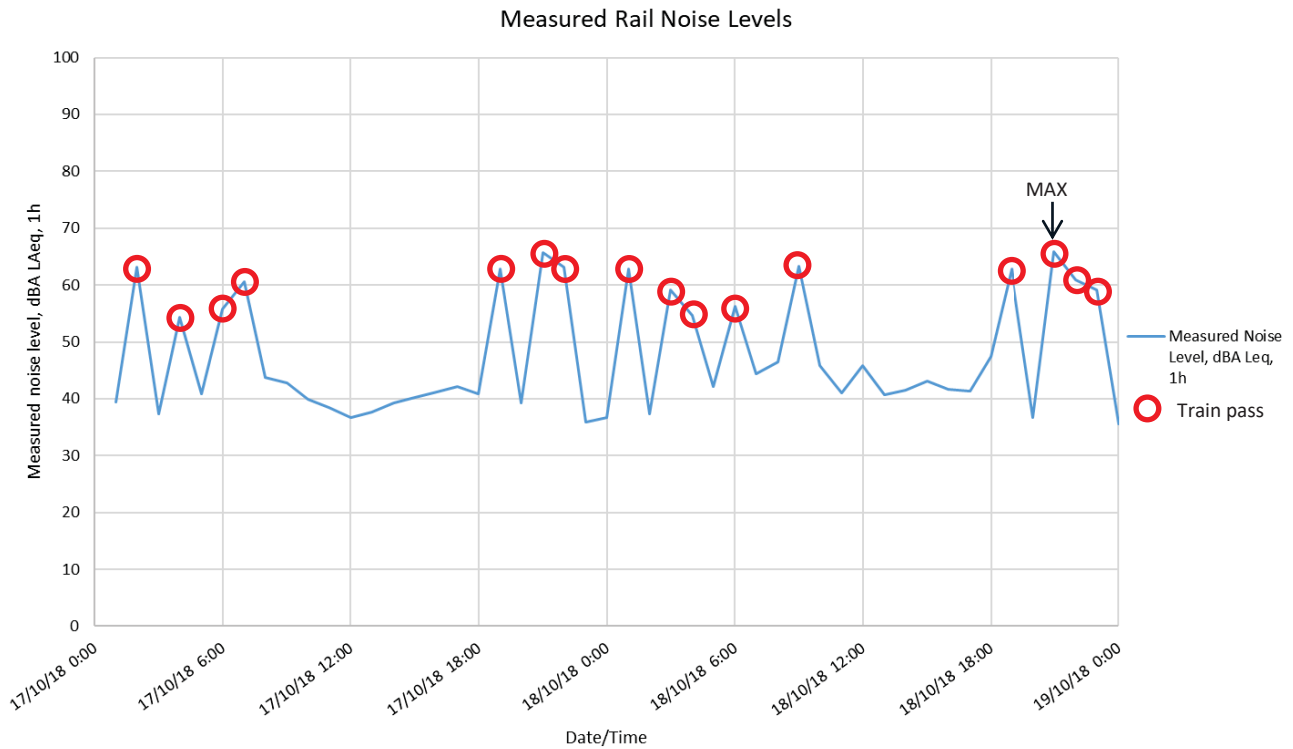
The measured rail noise levels are presented in Table 3-2. The ARL Ngara recorded audio files, which were reviewed to confirm train passby times, and if there were any false readings from extraneous noise (e.g. birds).

Table 3-1 Measured Rail Noise Levels

Date	Train Pass Time	Leq, 1hour	Leq Time Period
17/10/2018	1:11	63.1	1am-2am
	3:35	54.3	3am-4am
	5:52	55.7	5am-6am
	6:13	60.6	6am-7am
	18:52	62.8	6pm-7pm
	20:02	65.7	8pm-9pm
	20:43		
	21:21	63.1	9pm-10pm
18/10/2018	0:40	62.8	0am-1am
	2:00	59.1	2am-3am
	3:27	54.6	3am-4am
	5:38	56.3	5am-6am
	8:09	63.3	8am-9am
	18:38	62.9	6pm-7pm
	20:06	65.9	8pm-9pm
	20:33		
	21:16	60.9	9pm-10pm
	10:25	59.1	10pm-11pm
L _{Aeq} , 1h max		65.9	N/A

A total of 18 trains (i.e. diesel passenger and freight) were recorded over the 48 hour period. Graphical representation of the measured rail noise levels are presented in Figure 3-1.

Figure 3-1 Measured Rail Noise Levels 17-18 October 2018



3.2 Road Traffic Noise

The measured road traffic noise levels are presented in Table 3-2. Weather affected data was omitted from the analysis.

Table 3-2 Measured Traffic Noise Levels

Measurement Descriptor	Measured Road Traffic Noise Level, dB(A) L _{10, 18h}		
	Logger 1 64 Bushman Dr	Logger 2 207 Bushman Dr	Logger 3 322 Bushman Dr
Tuesday 9/10/2018	65.6	57.2	54.0
Wednesday 10/10/2018	65.5	57.2	54.4
Average	65.6	57.2	54.2

Graphical representation of the measured traffic noise levels are presented in Figure 3-2 to Figure 3-7.

Figure 3-2 Measured Road Traffic Noise Levels – Logger 1

Noise Survey: 64 Bushman Drive Jimboomba

8-16 October 2018

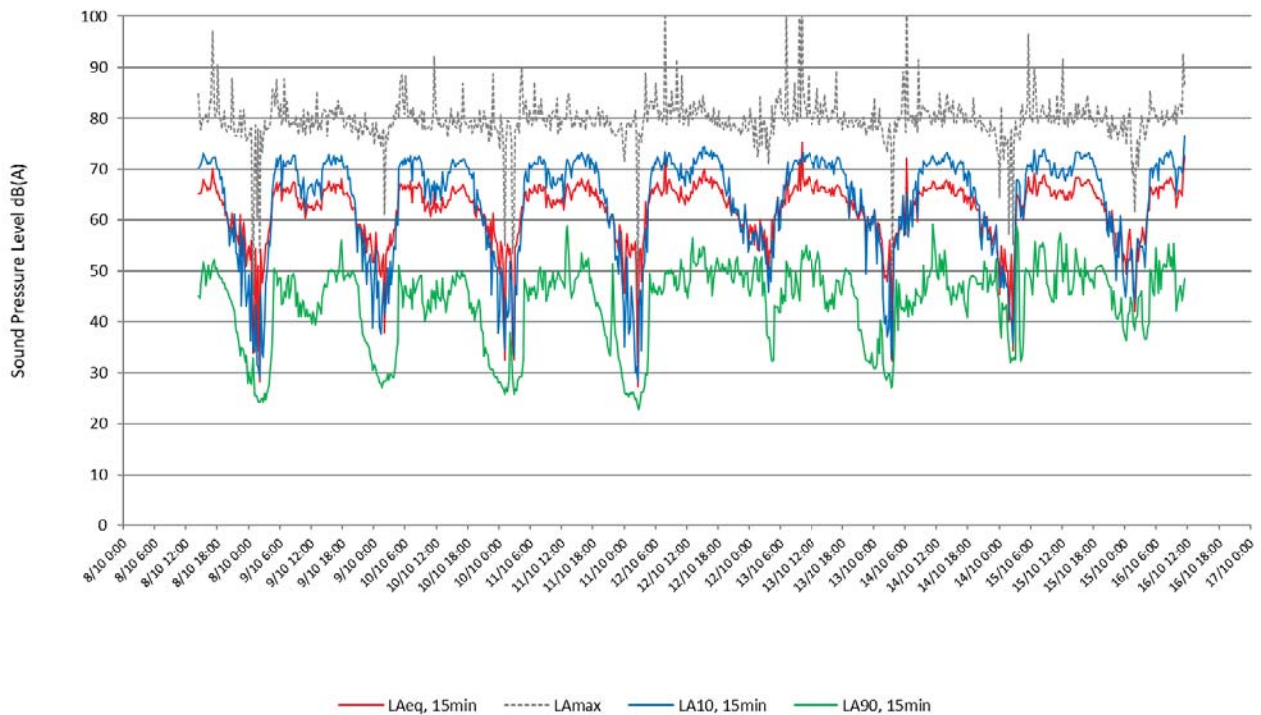


Figure 3-3 24 hour Averaged Measured Road Traffic Noise Levels – Logger 1

Noise Survey: 64 Bushman Drive Jimboomba

15 minute averages 9-10 October 2018

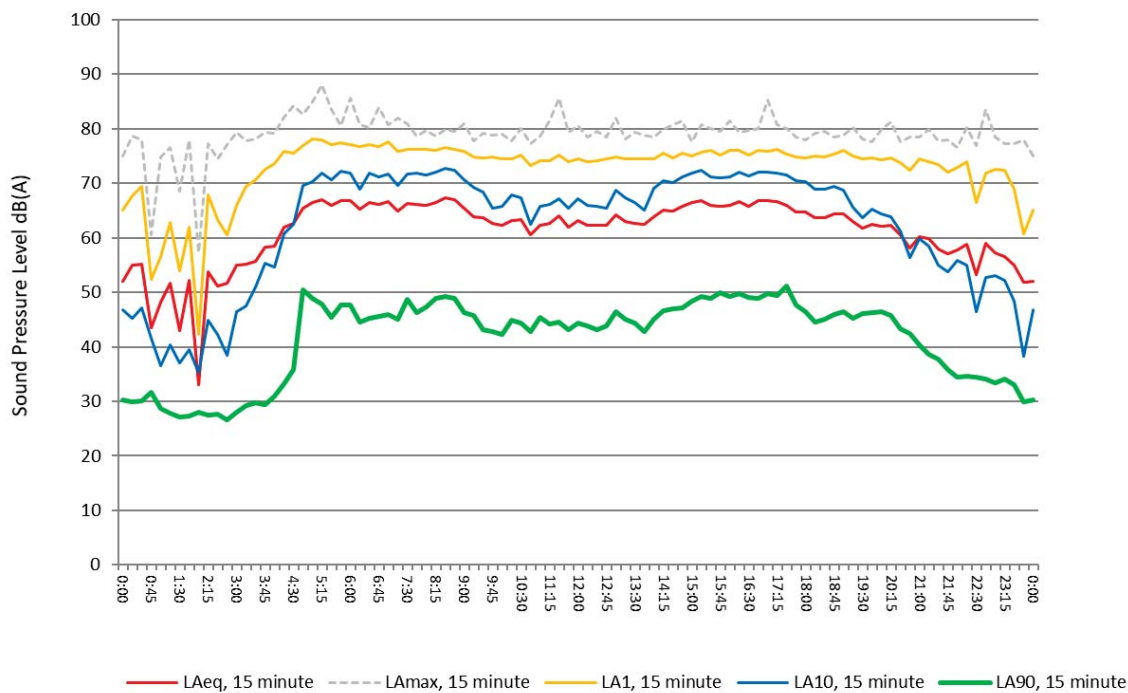


Figure 3-4 Measured Road Traffic Noise Levels –Logger 2

Noise Survey: 207 Bushman Drive Jimboomba

8-16 October 2018

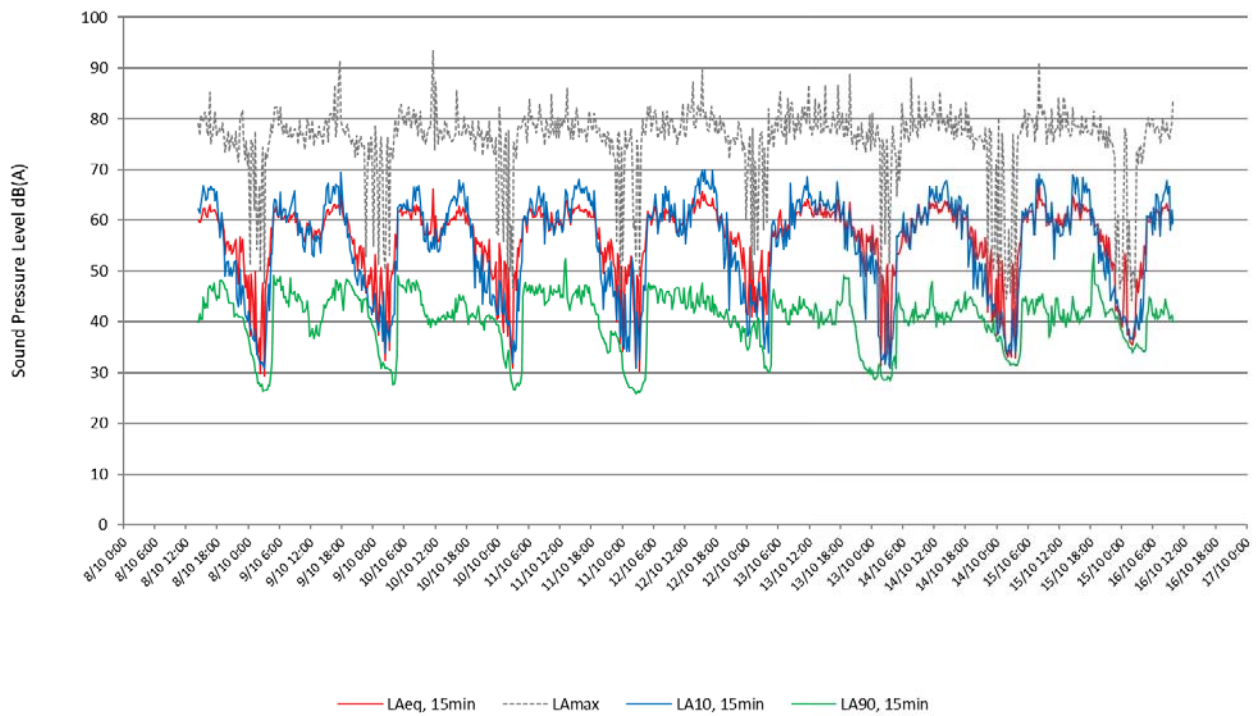


Figure 3-5 24 hour Averaged Measured Road Traffic Noise Levels – Logger 2

Noise Survey: 207 Bushman Drive Jimboomba

15 minute averages 9-10 October

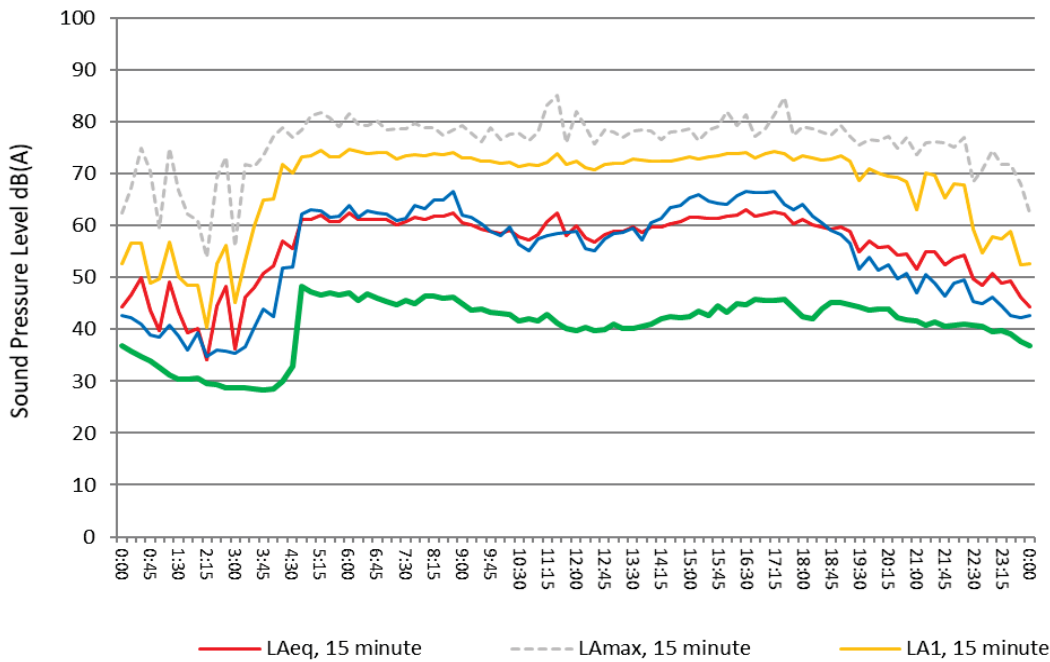


Figure 3-6 Measured Road Traffic Noise Levels –Logger 3

Noise Survey: 322 Bushman Drive Jimboomba

8-16 October 2018

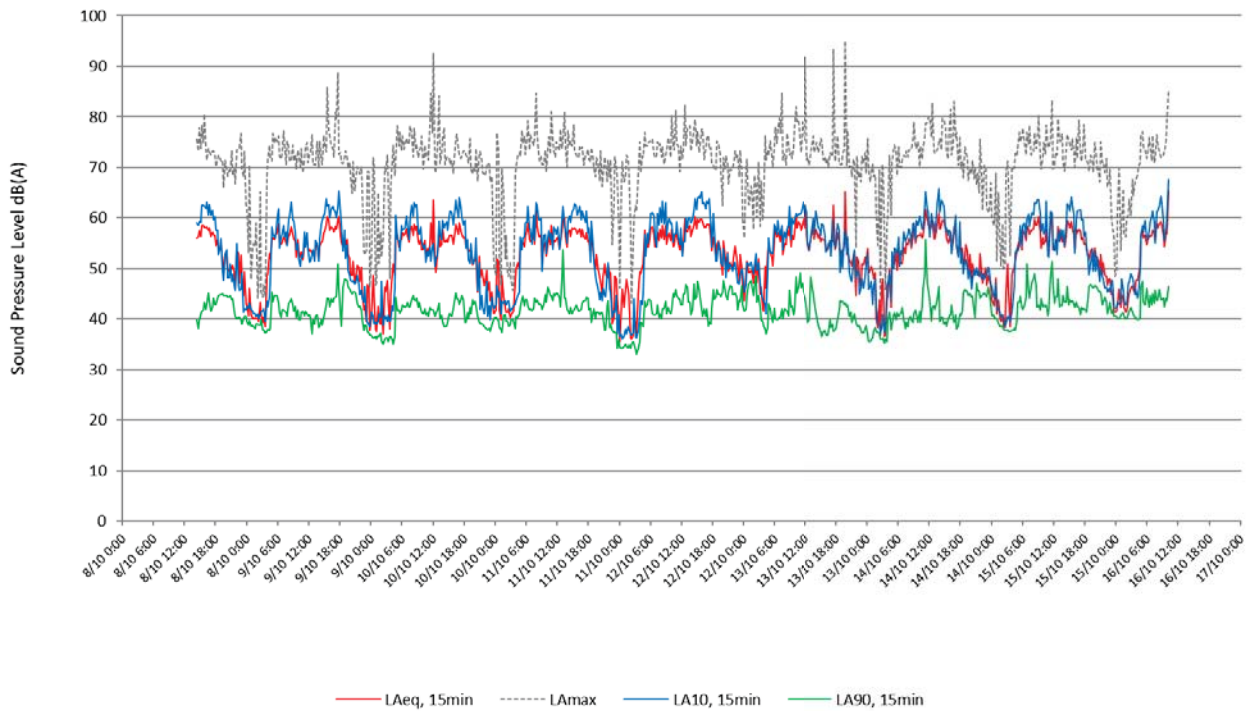
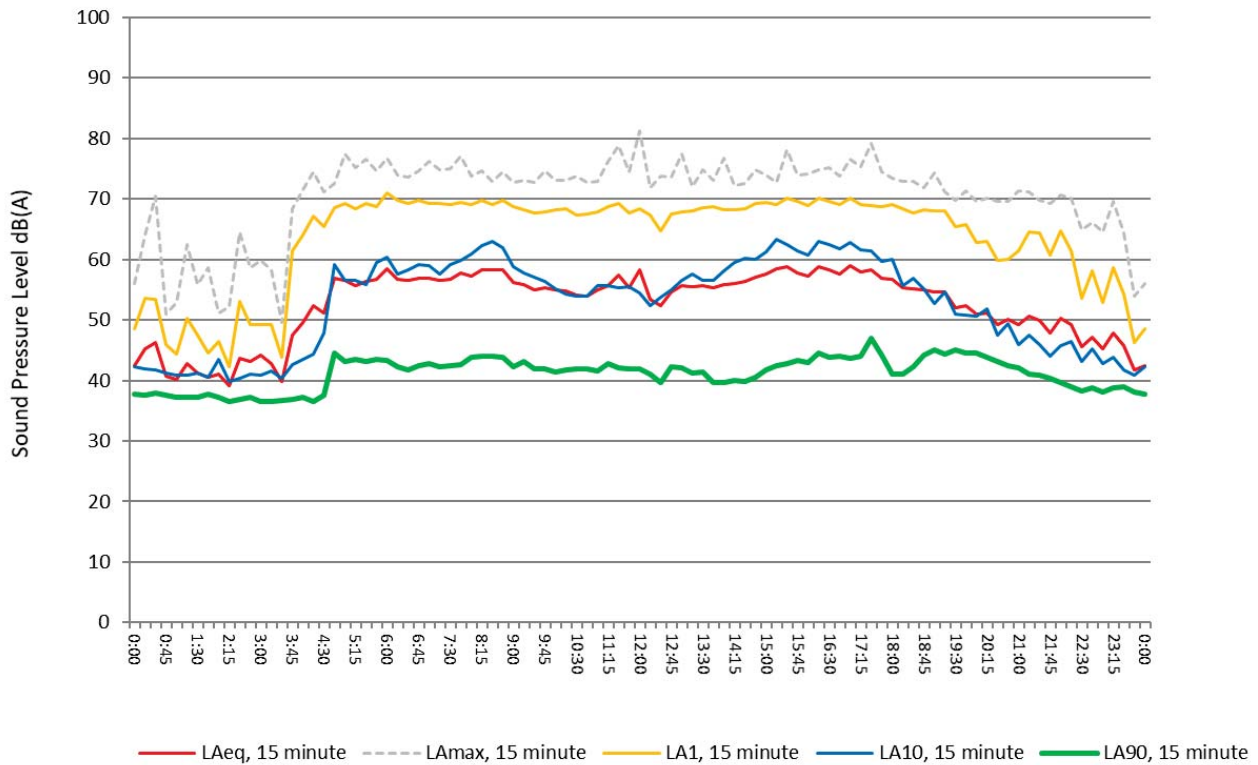


Figure 3-7 24 hour Averaged Measured Road Traffic Noise Levels – Logger 3

Noise Survey: 322 Bushman Drive Jimboomba

15 minute averages 9-10 October 2018



4 Criteria

4.1 Road Traffic and Rail Noise

Road traffic and rail noise has been assessed in accordance with the requirements applicable to previous approvals within the Greater Flagstone PDA. The following condition was taken from the Development Approval for the Flagstone Whole of Site MCU (ref: DEV2012/209/15) as follows;

Condition 31

Submit to EDQ Development Assessment, DSDMIP for compliance assessment a Noise Mitigation Report, certified by a RPEQ, for all lots with 100m from Road 01, the future North-South Arterial road and the railway corridor achieving a $\leq 35\text{dB(A)}$ for 1 hour max, over a 24 hour period for all habitable rooms.

Where a $\leq 35\text{dBA}$ 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.

It is assumed the 35dB(A) for 1 hour max, over a 24 hour period is equivalent to the maximum $L_{Aeq, 1h}$ over a 24 hour period. The SLR report further notes that they were advised by EDQ that;

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 dB(A) within habitable rooms.

Refer to Section 4.2 for a review of QDC MP 4.4 requirements.

4.2 Queensland Development Code Mandatory Part 4.4 (QDC MP4.4)

Class 1-4 buildings located within designated Transport Noise Corridors are required to comply with *Queensland Development Code Mandatory Part 4.4 – Buildings in a Transport Noise Corridor* (QDC MP 4.4).

A noise affected property search was conducted on the Department of Housing and Public Works website, which found that the subject site was not currently located with a designated Transport Noise Corridor, for road or rail. The search results are presented in Appendix B.

Although the site is not located within a designated transport noise corridor, EDQ may accept application of the code as an acceptable solution to achieving the internal noise objective nominated in Section 4.1. Refer to Table 4-1 for QDC requirements and the recommended external level for rail noise.

Table 4-1 QDC requirements

Noise Category	QDC Minimum transport noise reduction (dBA) required for habitable rooms	Level of transport noise * (LA10, 18hr) for State controlled roads and designated local government roads	Recommended External Rail Noise Level to Achieve 35 dBA $L_{Aeq, 1hr}$ (internal)
Category 4	40	$\geq 73\text{ dBA}$	75
Category 3	35	68 – 72 dBA	70
Category 2	30	63 – 67 dBA	65
Category 1	25	58 – 62 dBA	60
Category 0	N/A	$\leq 57\text{ dBA}$	N/A

5 Rail Noise Impact Assessment

SoundPLAN 8.0 computer modelling software was used to predict noise levels from the Brisbane-Sydney rail corridor impacting the proposed subdivision.

5.1 Noise Model Inputs & Assumptions

Table 5-1 details the modelling inputs and assumptions used in the prediction of rail noise levels.

Table 5-1 Rail Noise Modelling Inputs and Assumptions

Input Parameter	Source Reference
Ground elevation geometry	GIS data and proposed finished earthworks levels
Rail alignment	Current site plan and aerial photo
Rail volumes	Refer to Section 5.2
Rail traffic speeds	100km/h
Ground absorption	Predominately soft ground
Façade reflections	+2.5 dBA
Receiver Height	1.8, 4.6, and 7.4 metres above ground level, accounting for 1-3 storey dwellings.

5.2 Rail Volumes

Rail volumes were determined during unattended noise monitoring, during which there was found to be an average of 9 trains per day including diesel freight and passenger trains.

5.3 Rail Model Scenarios

To determine any requirements for acoustic treatments to the development, noise models were created for the following scenarios;

1. **Model Verification:** Existing rail noise model based on the modelling inputs supplied for 2018.
2. **Predicted Rail, $L_{Aeq, 1 \text{ hour max}}$:** Current rail volumes were used to determine the predicted rail noise impacts at ground, first and second floor receiver locations.

5.4 Scenario 1-Model Verification

Verification of the SoundPLAN 8.0 modelling program was undertaken prior to the prediction of rail noise impacts. An iteration of the model was developed using current rail volumes and site conditions to predict the $L_{Aeq, 1 \text{ hour max}}$ for comparison to the measured $L_{Aeq, 1 \text{ hour max}}$.

Table 5-2 Model Verification Results

Measured Noise Level dB(A) $L_{Aeq, 1 \text{ hour max}}$	Predicted Noise Level, dB(A) $L_{Aeq, 1 \text{ hour max}}$	Difference
65.9	66.0	0.1

The SoundPLAN 8.0 rail noise model is over predicting by 0.1 dB(A), which is within the allowable tolerance of +/- 2.0 dB(A).

5.5 Scenario 2 -Predicted Rail Noise Levels – No Mitigation

Predicted rail noise levels for the ground to second floor levels are presented in Figure 5-1 to Figure 5-3 respectively.

Figure 5-1 Predicted Rail Noise Level – Ground Floor Level

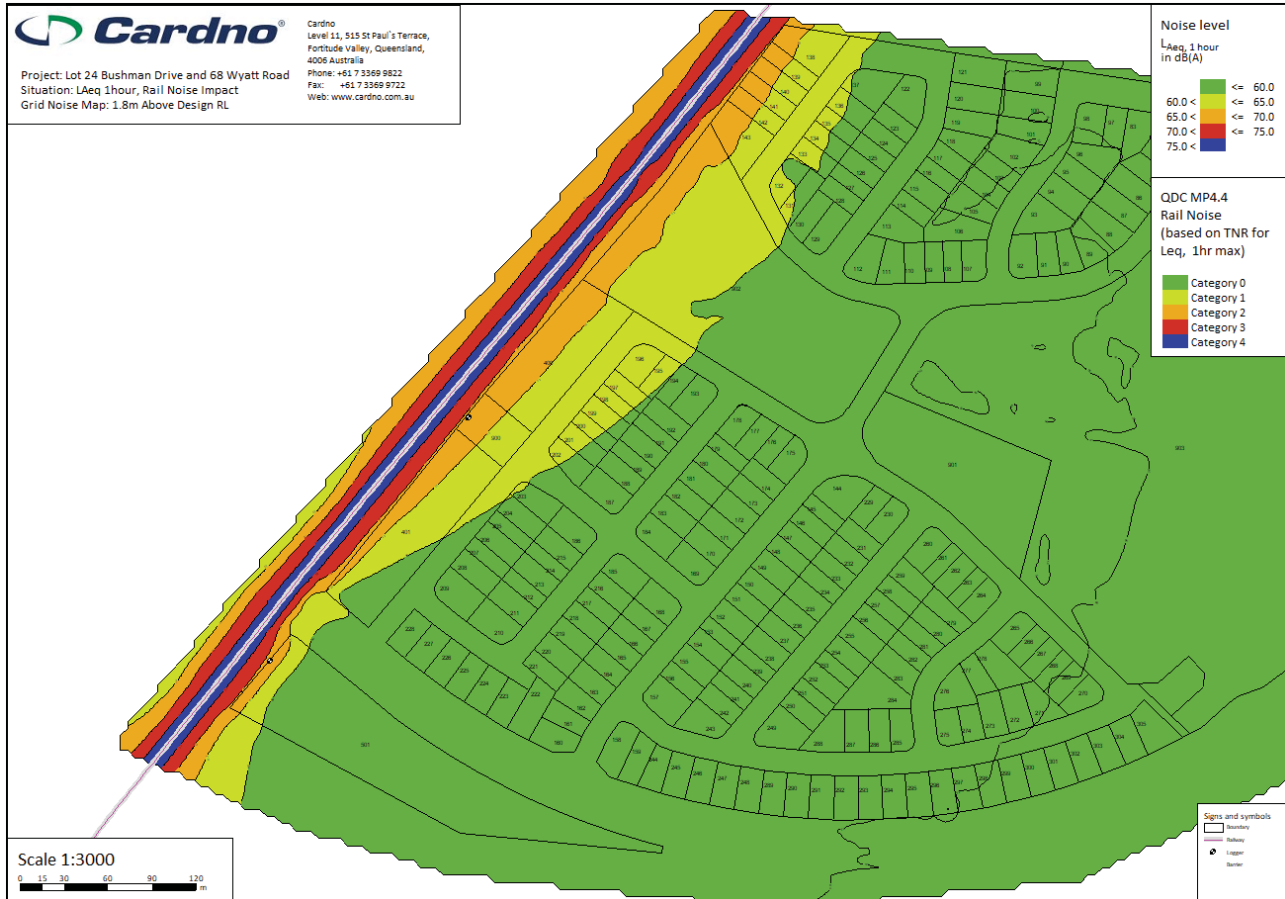


Figure 5-2 Predicted Rail Noise Level – First Floor Level

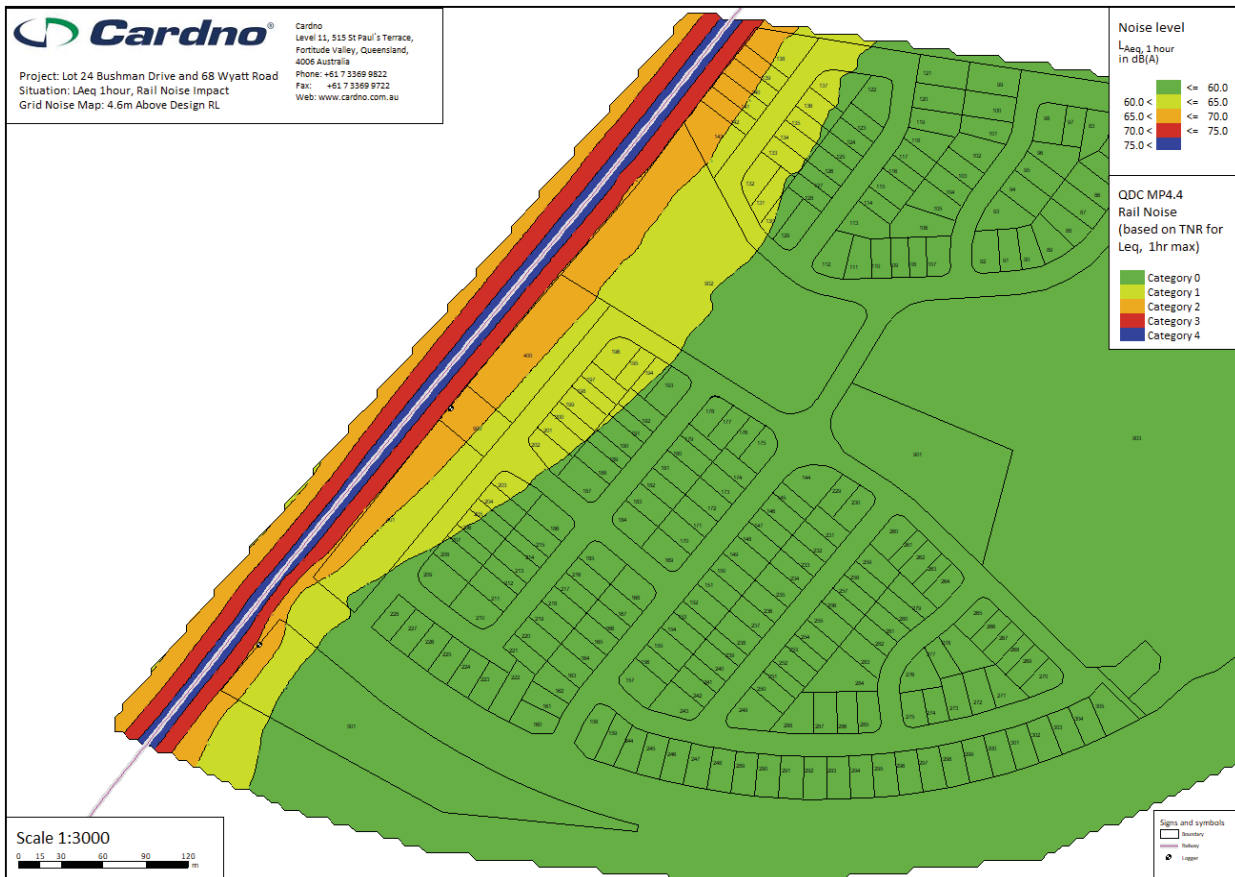
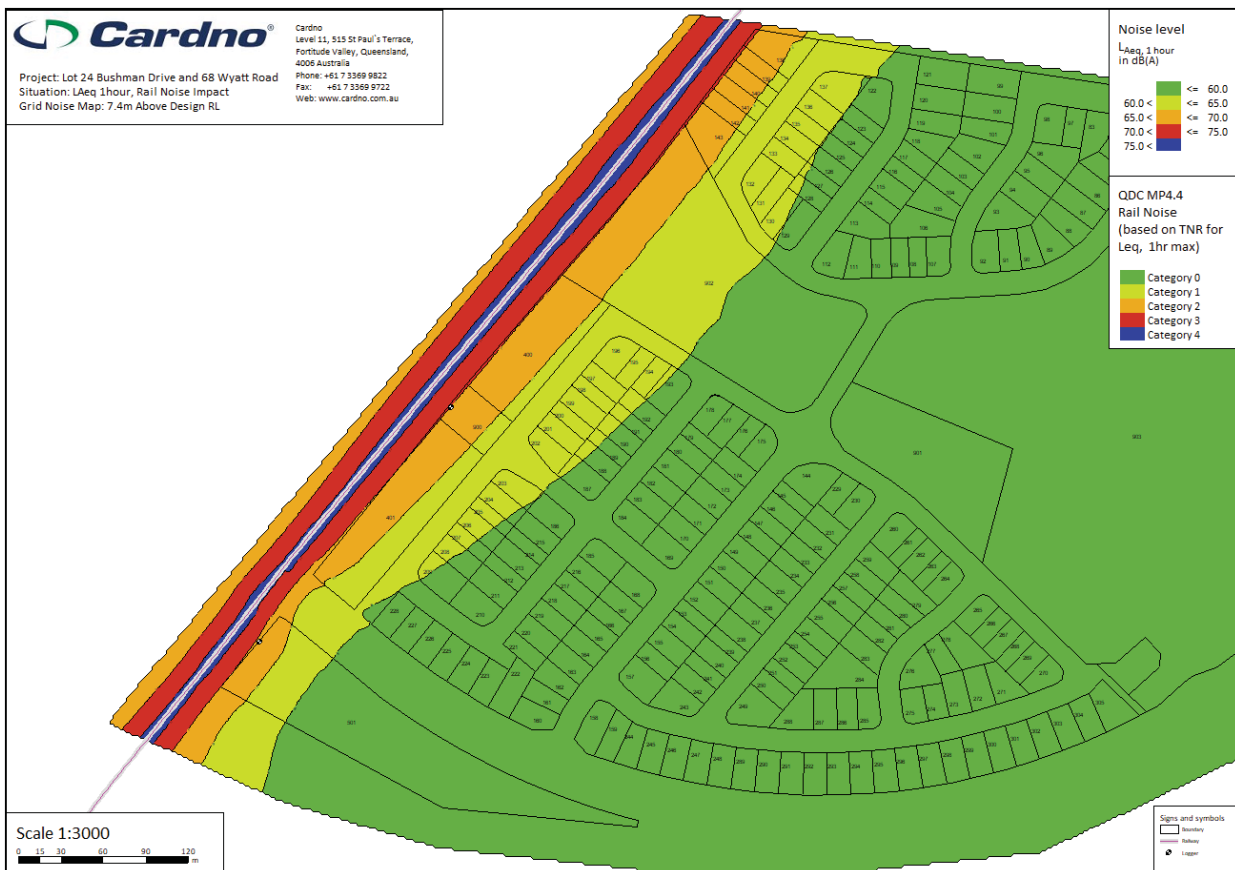


Figure 5-3 Predicted Rail Noise Level – Second Floor Level



Based on the predicted Transport Noise Reduction (TNR) requirements and inclusion of the acoustic barriers recommended in Section 7.1, the resulting noise categories are presented in Table 5-3.

Table 5-3 Recommended QDC MP 4.4 Noise Categories – Rail Noise

QDC Noise Category	Transport Noise Reduction (TNR)	Ground Floor Locations	First Floor Locations	⁽²⁾ Second Floor Locations
4	40	Nil	Nil	
3	35	Nil	Nil	
2	30	Lots 138-143, ⁽¹⁾ 401-402	Lots 138-143, ⁽¹⁾ 401-402	Lots 143, ⁽¹⁾ 401-402
1	25	Lots 131-137, 195-204	Lots 130-137, 190-192, 194-208	Lots 132, 137, 186-187, 193, 196, 202-203,
0	N/A	All remaining locations		

⁽¹⁾ The acoustic requirements for the proposed mixed use lots 401 and 402 should be reviewed once building plans are available to determine any requirements for upper floor levels.

⁽²⁾ Only applies to locations with 3 storey height limits as nominated on the plan of development.

Refer to Section 7 for recommendations regarding acoustic treatment.

6 Road Traffic Noise

SoundPLAN 8.0 computer modelling software was used to predict noise levels from the future road Flinders Lakes Drive impacting the proposed subdivision.

6.1 Noise Model Inputs & Assumptions

Table 6-1 details the model inputs and assumptions used in the prediction of traffic noise levels.

Table 6-1 Road Traffic Noise Modelling Inputs and Assumptions

Input Parameter	Source Reference
Ground elevation geometry	GIS data and proposed finished earthworks levels
Road Alignment	Proposed earthworks plan
Traffic volumes	Refer to Section 6.2
Percentage of Heavy Vehicles	Refer to Section 6.2
Road traffic speeds	60 km/h
Road Surface	Modelling has assumed a pavement surface of dense grade asphalt indicating a correction factor of 0 dBA to be applied to all modelling scenarios
Ground Absorption	Predominately soft ground
Façade correction	+ 2.5 dB(A)
Receiver Height	1.8, 4.6, and 7.4 metres above ground level, accounting for 1-3 storey dwellings.

6.2 Traffic Volumes

Current and future traffic volumes were obtained from Cardno (Traffic and Transport) and are presented in Table 6-2.

Table 6-2 Bushman Drive Traffic Volumes

Bushman Drive Segment (Northeast to Southwest)	Existing Volume	
	18hr volume	% HV
Homestead Dr to Shearer Ct	3,209	4.9
Shearer Ct to Drover Cres	2,602	5.5
Drover Cres to Drover Cres	1,680	6.8
Drover Cres to Whittling Ct	891	10.3
Whittling Ct to Blacksmith Ct	747	11.9
Blacksmith Ct to Wyatt Rd	580	12.7
Future Road	Future Volume	
Flinders Lake Drive	20,220	3.0

Note that Flinders Lakes Drive is not yet constructed, however the road will be a continuation of Bushman Drive.

6.3 Model Scenarios

To determine any requirements for acoustic treatments, noise models were created for the following scenarios;

1. **Model Verification:** Existing road traffic noise model based on current traffic conditions for comparison to the measured levels.
2. **Predicted Road Traffic Noise Level $L_{10, 18h}$, No Mitigation:** Future traffic volumes for Flinders Lakes Drive were used to predict traffic noise impacts at ground and first floor receiver locations.
3. **Predicted Road Traffic Noise Level $L_{10, 18h}$, With Mitigation:** Future traffic volumes for Flinders Lakes Drive were used to predict traffic noise impacts at ground and first floor receiver locations. The model includes acoustic barriers as recommended in Section 7.1 to reduce requirements for upgraded dwelling construction.

6.4 Scenario 1-Model Verification

Verification of the modelling program, SoundPLAN 8.0, was undertaken prior to the prediction of future traffic noise levels. An iteration of the model was developed using current traffic volumes and site conditions to generate a predicted $L_{A10, 18h}$ for comparison to the measured $L_{A10, 18h}$.

Table 6-3 Model Verification Results

Location	Measured Noise Level dB(A) $L_{A10, 18h}$	Predicted Noise Level dB(A) $L_{A10, 18h}$	Accuracy
64 Bushman Drive	65.5	63.1	-2.4
207 Bushman Drive	57.2	60.0	+2.8
322 Bushman Drive	54.2	53.3	+0.8

Due to predicted noise levels exceeding the CoRTN allowable tolerance of ± 2 dB(A), corrections to model would usually be applied. However the noise monitor nearest to the site requires no correction and considering Flinders Lake Drive is yet to be constructed, no corrections were applied to the model.

6.5 Scenario 2 -Predicted Road Traffic Noise Levels – No Mitigation

Predicted road traffic noise levels for the ground to second floor levels are presented in Figure 6-1 to Figure 6-3 respectively.

Figure 6-1 Predicted Road Traffic Noise Levels – Ground Floor Level

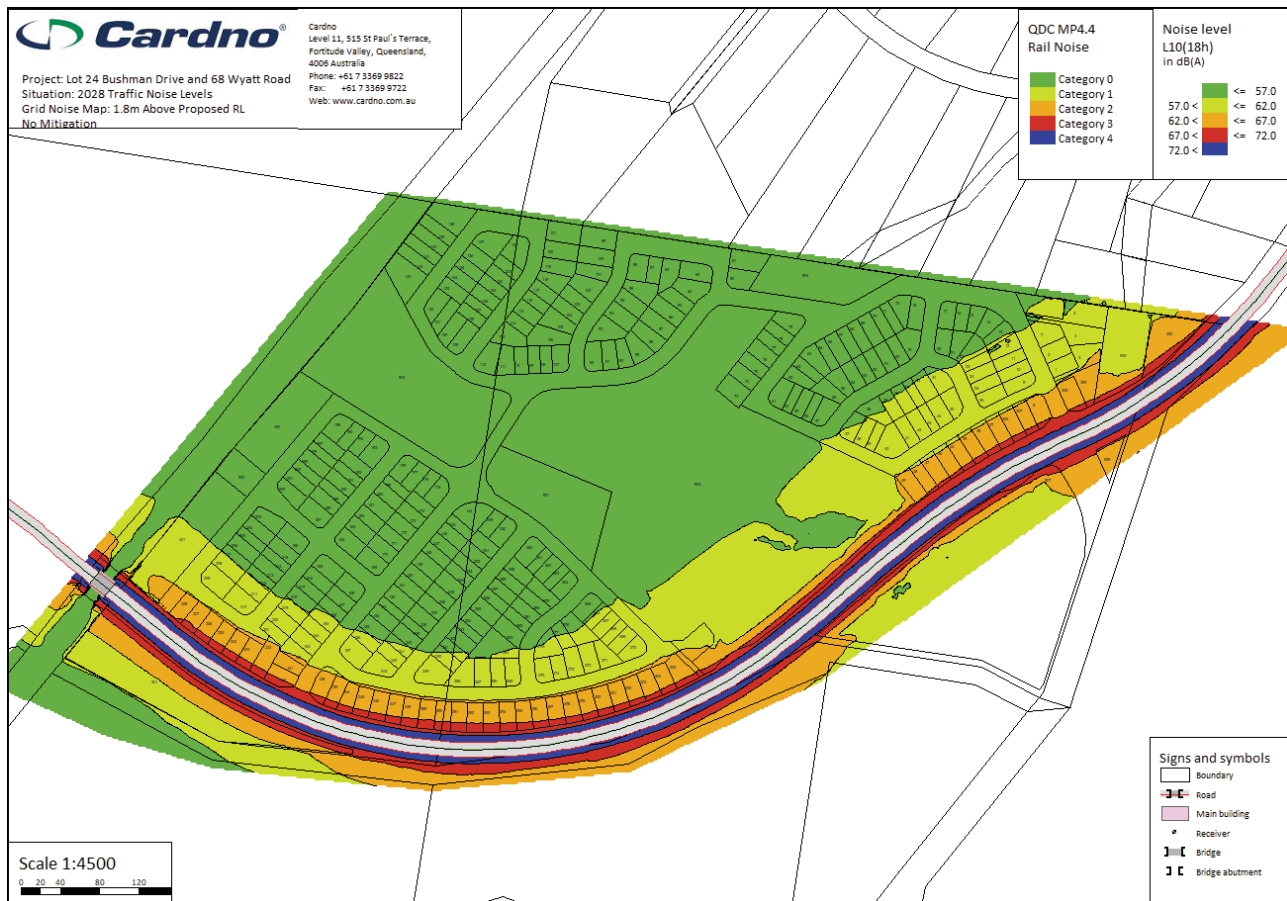


Figure 6-2 Predicted Road Traffic Noise Levels – First Floor Level

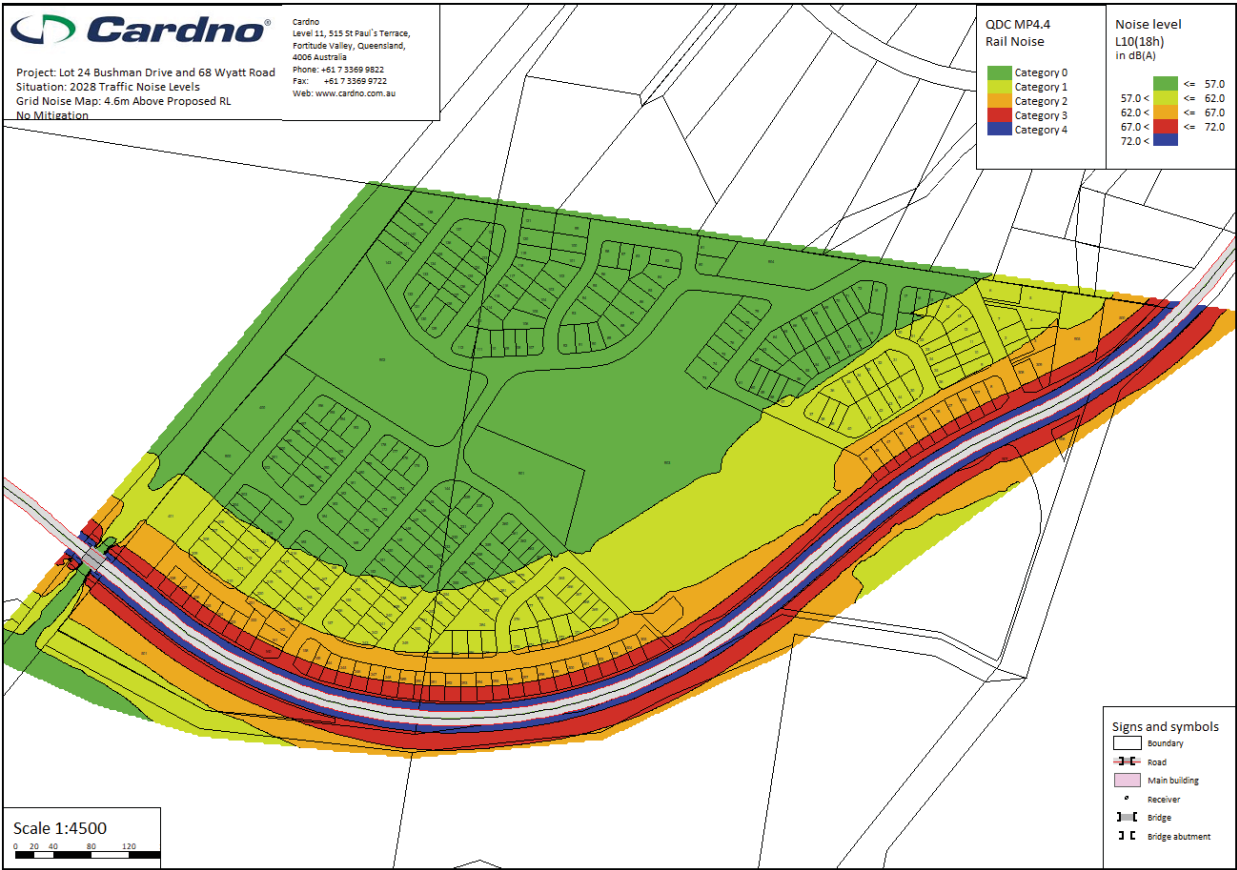
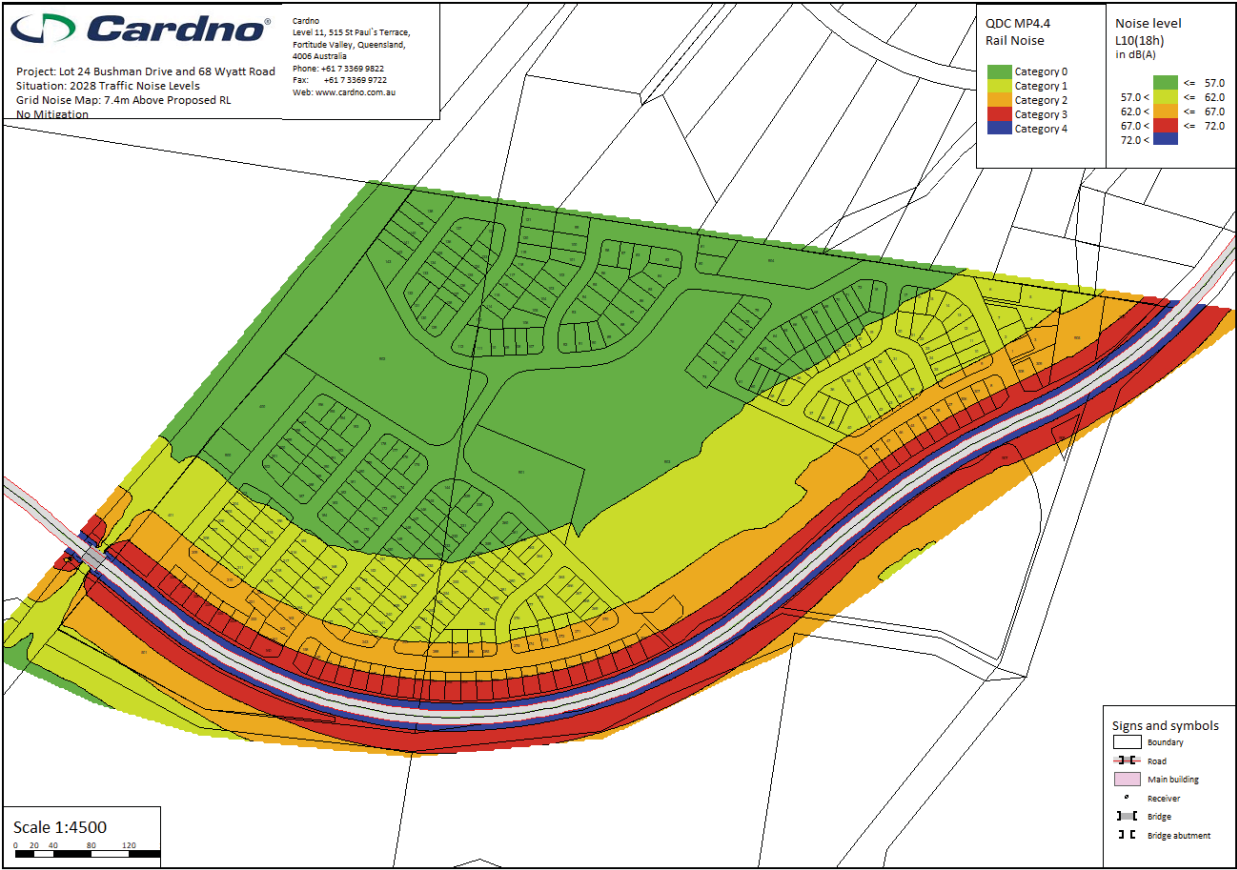


Figure 6-3 Predicted Road Traffic Noise Levels – Second Floor Level



To reduce requirements relating to Noise Category 3 construction for single storey dwellings, further modelling was conducted incorporating acoustic barriers, with the results presented in Section 6.6.

6.6 Scenario 3 -Predicted Road Traffic Noise Levels – With Mitigation

Predicted road traffic noise levels for the ground to second floor levels are presented in Figure 6-4 to Figure 6-6 respectively and assume the acoustic barrier recommended in Section 7.1 has been incorporated into the development.

Figure 6-4 Predicted Road Traffic Noise Levels with 2.0m Acoustic Barrier – Ground Floor Level

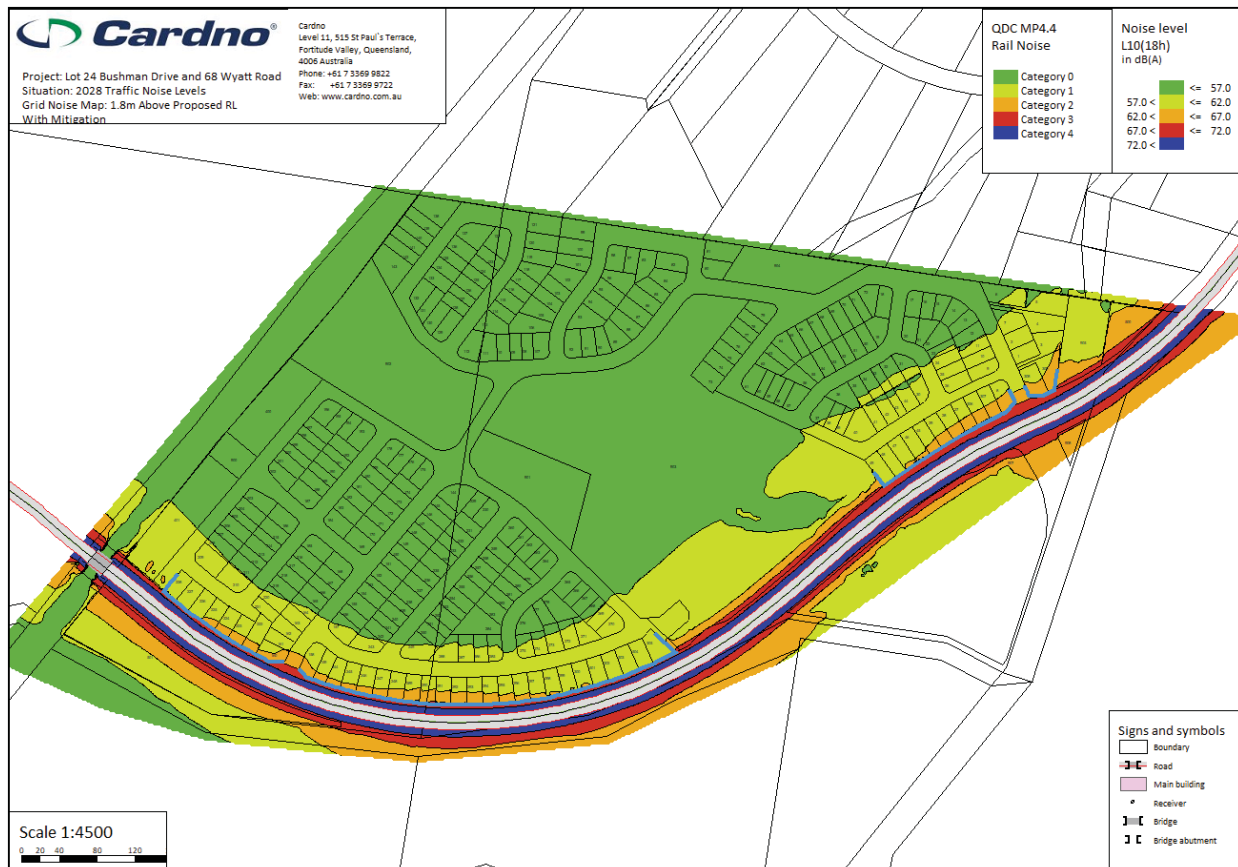


Figure 6-5 Predicted Road Traffic Noise Levels with 2.0m Acoustic Barrier – First Floor Level

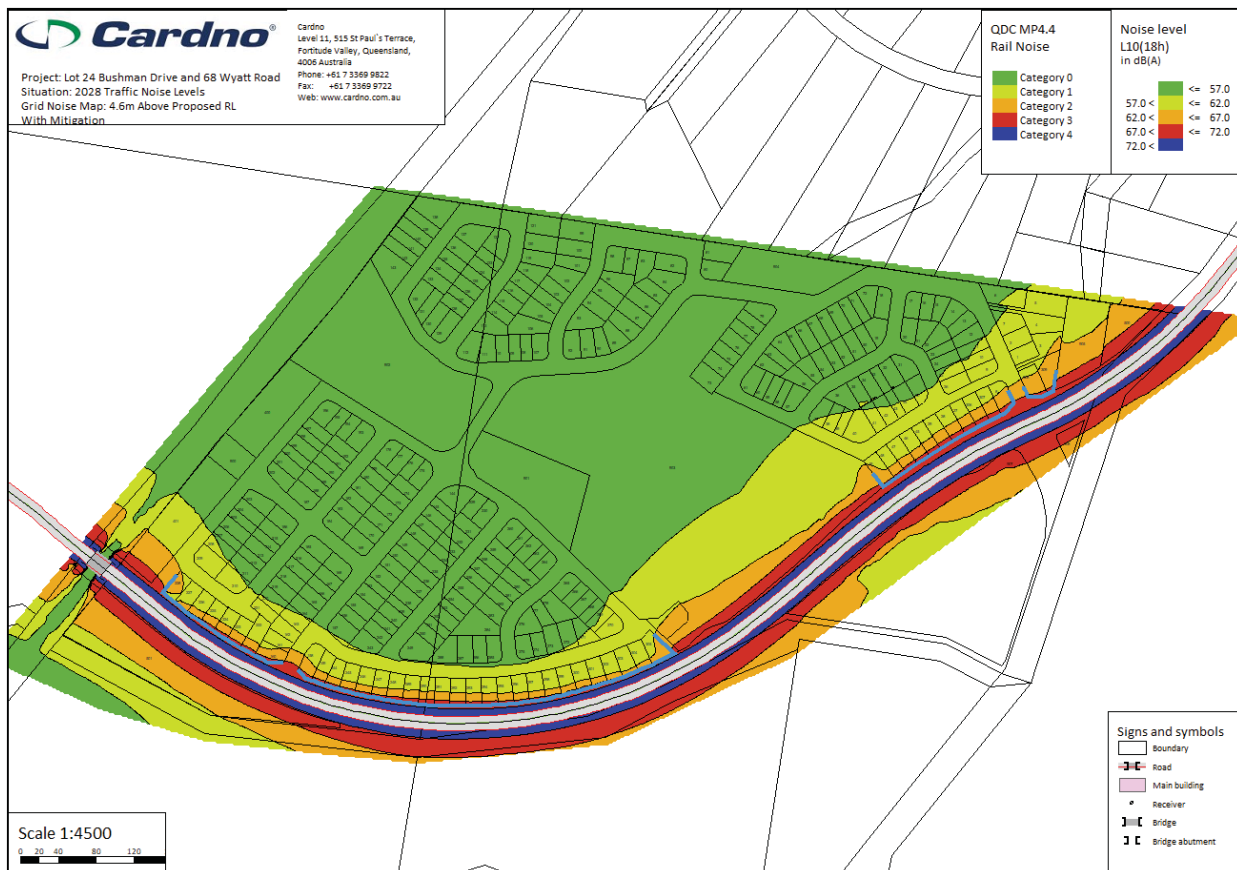
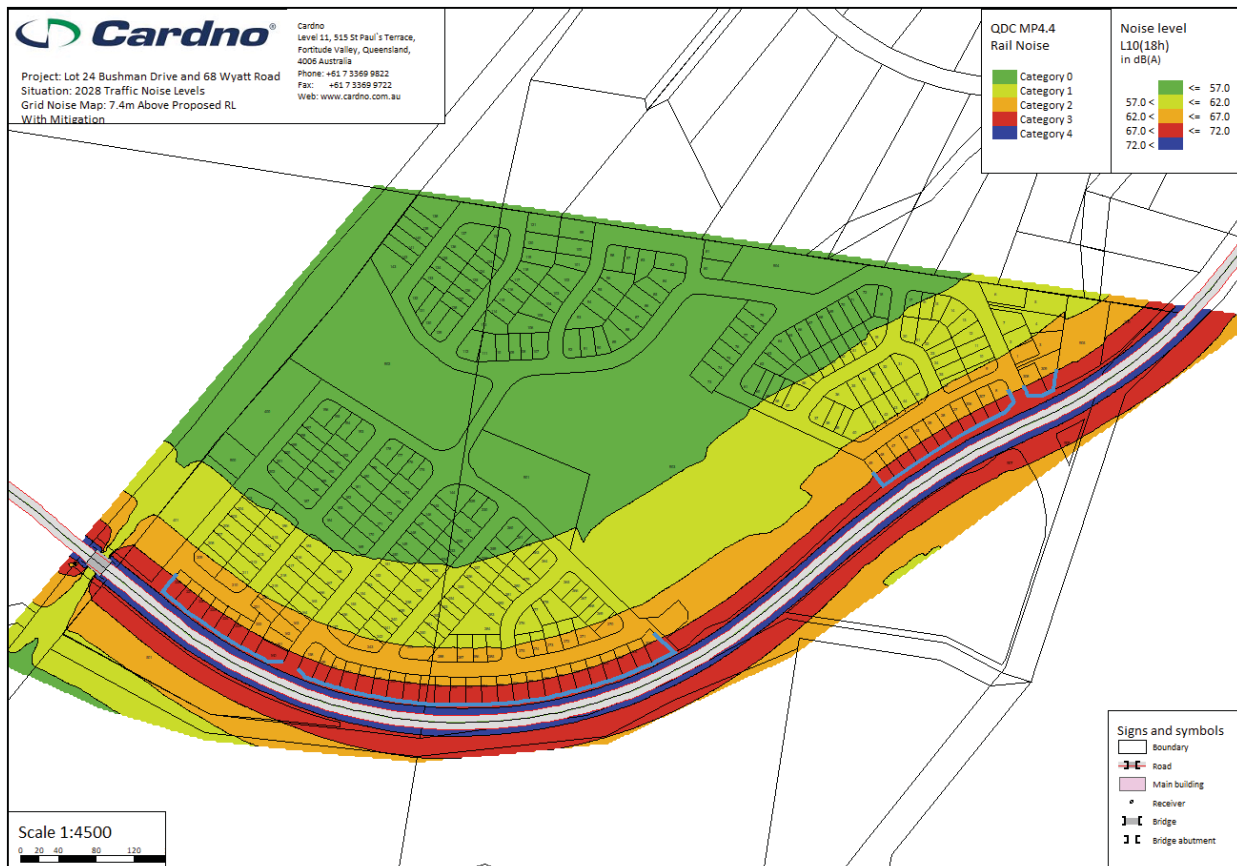


Figure 6-6 Predicted Road Traffic Noise Levels with 2.0m Acoustic Barrier – Second Floor Level



Based on the predicted traffic noise levels and inclusion of the acoustic barriers recommended in Section 7.1, the resulting noise categories are presented in Table 6-1.

Table 6-1 Applicable QDC MP 4.4 Noise Categories – Road Traffic Noise

QDC Noise Category	Transport Noise Reduction	Ground Floor Locations	First Floor Locations	⁽²⁾ Second Floor Locations
4	40	Nil	Nil	Nil
3	35	Nil	Lots 8, 27-29, 45-49, 158-160, 222-228, 244-248, 289-309, ⁽¹⁾ 401	Lots 8, 49, 158, 305-306, ⁽¹⁾ 401
2	30	Lots 27-29, 45-47, 158-160, 222-225, 244-248, 289-300, 306-309, ⁽¹⁾ 401	Lots 1,3, 9, 161-162,	Lots 157, 243, 249, 270
1	25	Lots 1-7, 9-11, 23-26, 30-35, 37-44, 157, 161-164, 208-210, 220-221, 226-228, 242-243, 249, 268-275, 285-288, 301-305	Lots 2, 4-7, 9-14, 21-26, 30-44, 155-157, 163-166, 207-212, 218-221, 240-243, 249-251, 266-278, 284-288,	Lots 37, 40, 57, 168, 185, 186, 203, 264, 265, 276
0	N/A	All remaining locations		

⁽¹⁾ The acoustic requirements for the proposed mixed use lot 401 should be reviewed once building plans are available to determine requirements for upper floor levels.

⁽²⁾ Only applies to locations with 3 storey height limits as nominated on the plan of development.

Refer to Section 7 for recommendations regarding acoustic treatment.

7 Recommendations

7.1 Acoustic Barriers

To reduce road traffic noise levels, we recommend the construction of 2.0 metre high noise barriers as detailed in Appendix A. The design and construction of the noise barriers should be free of gaps or holes, including along the base of the barrier. The selected barrier material(s) should achieve a minimum surface density of 12.5 kg/m². Small drainage holes may be present at the base, provided the openings do not exceed 1% of the total surface area. Suitable materials may include the following:

- > Toughened safety glass;
- > Overlapped timber palings with a 40mm overlap;
- > Concrete;
- > Masonry;
- > Fibre cement sheet;
- > Earth mounding;
- > A combination of the above.

7.2 Building Façade Treatments

7.2.1 Recommended QDC MP 4.4 Noise Categories

To predict compliance with EDQ internal noise objectives, QDC MP 4.4. was applied to determine acoustic treatments to future dwelling facades. Based on the higher EDQ requirements for either rail and road traffic noise, a summary of the recommended noise categories is provided in Table 7-1.

Table 7-1 Recommended QDC MP 4.4 Noise Categories – Rail and Road Traffic Noise

QDC Noise Category	Transport Noise Reduction	Ground Floor Locations	First Floor Locations	⁽²⁾ Second Floor Locations
4	40	Nil	Nil	Nil
3	35	Nil	Lots 8, 27-29, 45-49, 158-160, 222-228, 244-248, 289-309, ⁽¹⁾ 401	8, 49, 158, 305-306, ⁽¹⁾ 401
2	30	Lots 27-29, 45-47, 138-143, 158-160, 222-225, 244-248, 289-300, 306-309, ⁽¹⁾ 401-402	Lots 1,3, 9, 138-143, 161-162, ⁽¹⁾ 402	143, 157, 243, 249, 270, ⁽¹⁾ 402
1	25	Lots 1-7, 9-11, 23-26, 30-35, 37-44, 131-137, 157, 161-164, 195-204, 208-210, 220-221, 226-228, 242-243, 249, 268-275, 285-288, 301-305	Lots 2, 4-7, 9-14, 21-26, 30-44, 130-137, 155-157, 163-166, 190-192, 194-212, 218-221, 240-243, 249-251, 266-278, 284-288,	37, 40, 57, 132, 137, 168, 185-187, 193, 196, 202, 203, 264, 265, 276
0	N/A	All remaining locations		

⁽¹⁾ The acoustic requirements for the proposed mixed use lots should be reviewed once building plans are available to determine requirements for upper floor levels.

⁽²⁾ Only applies to locations with 3 storey height limits as nominated on the plan of development.

7.2.2 Glazing

Based on the recommended noise categories nominated in Table 7-1, QDC MP 4.4 nominates glazing treatments as presented in Table 7-2.

Table 7-2 QDC MP 4.4 Acceptable Glazing

Noise Category	Rw Requirement	QDC Acceptable Glazing	Acoustic Seals?
3	38 (where total area of glazing for a habitable room is greater than 1.8m ²)	14.38mm Laminate	Yes
	35 (where total area of glazing for a habitable room is less than or equal to 1.8m ²)	10.38mm Laminate	Yes
2	35 (where total area of glazing for a habitable room is greater than 1.8m ²)	10.38mm Laminate	Yes
	32 (where total area of glazing for a habitable room is less than or equal to 1.8m ²)	6.38mm Laminate	Yes
1	27 (where total area of glazing for a habitable room is greater than 1.8m ²)	4mm Float	Yes
	24 (where total area of glazing for a habitable room is less than or equal to 1.8m ²)	4mm Float	No
0	N/A	N/A	N/A

7.2.3 External Walls

Based on the recommended noise categories presented in Table 7-1, QDC nominates acceptable wall treatment as presented in Table 7-3.

Table 7-3 QDC MP 4.4 Acceptable Wall Construction

Noise Category	Rw Requirement	QDC Acceptable Wall Construction
3	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/m³ or 50mm thick polyester insulation with a density of 20kg/m³ in the cavity. OR Two leaves of clay brick masonry at least 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/m³ 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.
2	41	Two leaves of clay brick masonry at least 110mm thick with cavity not less than 50mm between leaves OR

Noise Category	Rw Requirement	QDC Acceptable Wall Construction
		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/m³ 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.
1	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.
0	N/A	N/A

Note that alternative systems are acceptable provided they meet the minimum Rw requirement.

7.2.4 Roof/Ceiling

Based on the recommended noise categories presented in Table 7-1, QDC nominates acceptable roof/ceilings treatments as presented in Table 7-4.

Table 7-4 QDC MP 4.4 Acceptable Roof/Ceiling Construction

Noise Category	Rw Requirement	QDC Acceptable Roof/Ceiling Construction
3	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/m³ or polyester insulation at least 50mm thick with a density of at least 20kg/m³ in the cavity. OR Concrete suspended slab at least 100mm thick.
2	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/m³.
1	35	Concrete or terracotta tile or metal sheet roof with sarking, plasterboard ceiling at least 10mm thick fixed to ceiling cavity.
0	N/A	N/A

Note that alternative systems are acceptable provided they meet the minimum Rw requirement.

7.2.5 External Doors

Based on the recommended noise categories presented in Table 7-1, QDC nominates acceptable external door treatments as presented in Table 7-5.

Table 7-5 QDC MP 4.4 Acceptable External Door Construction

Noise Category	Rw Requirement	QDC Acceptable External Door Construction
2-3	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.
1	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.
0	N/A	N/A

Note that alternative systems are acceptable provided they meet the minimum Rw requirement.

7.2.6 Exposed Floors

Based on the applicable noise categories presented in Table 7-1, QDC nominates acceptable exposed floor treatments as presented in Table 7-6.

Table 7-6 QDC MP 4.4 Acceptable Exposed Floor Construction

Noise Category	Rw Requirement	QDC Acceptable Exposed Floor Construction
2-3	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.
1	N/A	N/A
0	N/A	N/A

Note that alternative systems are acceptable provided they meet the minimum Rw requirement.

7.3 Alternative Ventilation

Facade glazing will need to be closed in order to exclude noise, therefore provision of mechanical ventilation such as air conditioning or alternative ventilation may be required for habitable rooms requiring Noise Category 1 to 3 construction.

8 Conclusion

A full rail and road traffic noise assessment for the proposed subdivision located at Lot 24 Bushman Drive and 68 Wyatt Road Jimboomba was conducted. Provided the recommendations in Section 7 are implemented, compliance with the criteria in Section 4 are predicted to be achieved.

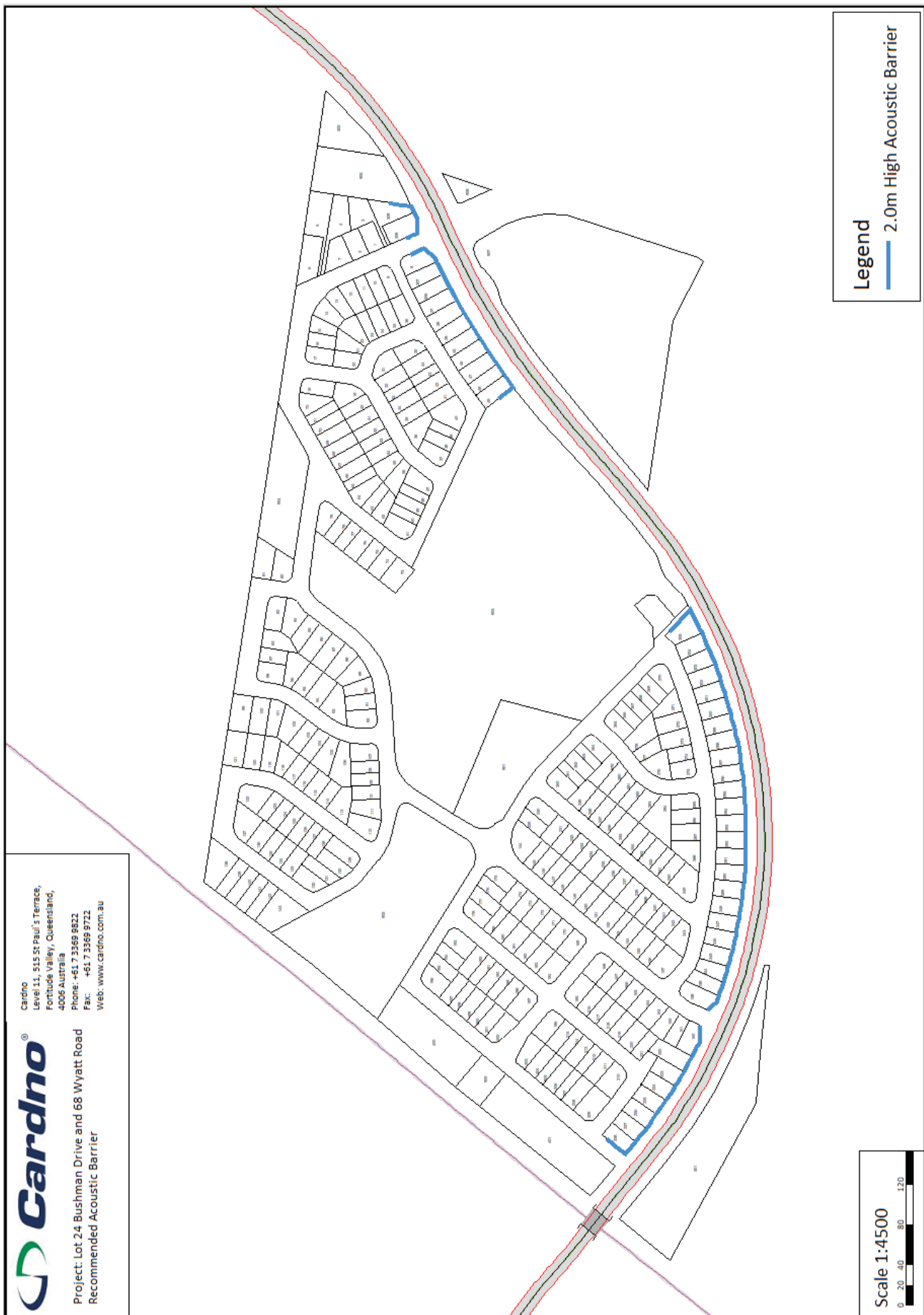
Lot 24 Bushman Drive
and 68 Wyatt Road,
Jimboomba

APPENDIX A

RECOMMENDED ACOUSTIC BARRIER



Figure A8-1 Recommended Acoustic Barrier



Lot 24 Bushman Drive
and 68 Wyatt Road,
Jimboomba

APPENDIX B

TRANSPORT NOISE
CORRIDOR
SEARCH



Legend

Cadastral (10k)

 Cadastral (10k)

Noise corridor centreline - local government road

 Noise corridor centreline - local government road

Noise corridor centreline - State-controlled road

 Noise corridor centreline - State-controlled road

Noise corridor - local government road

 Cat 1: 58 dB(A) - 62 dB(A)

 Cat 2: 63 dB(A) - 67 dB(A)

 Cat 3: 68 dB(A) - 72 dB(A)

 Cat 4: Noise Level $\geq$ 73 dB(A)

Noise corridor - State-controlled road (MANDATORY area)

 Cat D: Noise Level $\leq$ 57 dB(A)

 Cat 1: 58 dB(A) - 62 dB(A)

 Cat 2: 63 dB(A) - 67 dB(A)

 Cat 3: 68 dB(A) - 72 dB(A)

 Cat 4: Noise Level $\geq$ 73 dB(A)

Noise corridor - State-controlled road (VOLUNTARY area)

 Cat D: Noise Level $\leq$ 57 dB(A)

 Cat 1: 58 dB(A) - 62 dB(A)

 Cat 2: 63 dB(A) - 67 dB(A)

 Cat 3: 68 dB(A) - 72 dB(A)

 Cat 4: Noise Level $\geq$ 73 dB(A)

Noise corridor - rail network

 Cat 1: 70 dB(A) - 74 dB(A)

 Cat 2: 75 dB(A) - 79 dB(A)

 Cat 3: 80 dB(A) - 84 dB(A)

 Cat 4: Noise Level $\geq$ 85 dB(A)



Date: 10/10/2018

State Planning Policy
Making or amending a local planning instrument
and designating land for community infrastructure

Department of State
Development, Manufacturing,
Infrastructure and Planning

© The State of Queensland 2018.

Disclaimer:
This map has been prepared with due care based on the best available information at the time of publication. However, the State of Queensland (acting through the department) makes no representations, either express or implied, that the map is free from errors, inaccuracies or omissions. Reliance on information contained in this map is the sole responsibility of the user. The State disclaims responsibility for any loss, damage or inconvenience caused as a result of reliance on information or data contained in this map.