



**Residential Subdivision
Stage 1 and Stage 2
Corner Mount Lindesay Highway and Cryna Street,
Beaudesert**

Environmental Noise Assessment Report

Peet No. 117 Pty Limited

Reference: 14GCA0177 Ro1_2 Stage 1 & 2
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1. Introduction

1.1. Background

TTM was engaged by Peet No. 117 Pty Limited to undertake a revised environmental noise assessment for Stage 1 and Stage 2 of the residential subdivision on land fronting the Mount Lindesay Highway and Cryna Road, Beaudesert.

The revised report is based upon an amended lot layout and earthwork design levels. Previous versions of the acoustic report were based upon natural ground levels and as a result of noise modelling with the earthwork design the height of the acoustic barrier fronting the Mount Lindesay Highway (Telemon Street) has been reduced.

1.2. References

The assessment is based on the following:

- a. Noise criteria:
 - i. Department of Transport and Main Roads *Policy for Development on Land Affected by Environmental Emissions from Transport and Transport Infrastructure* Version 2.
 - ii. *Queensland Development Code MP4.4 Buildings in a Transport Noise Corridor*.
 - iii. *Environmental Protection (Noise) Policy 2008* (EPP2008).
- b. Overall Layout plan by RPS (ref: 22501, Revision O).
- c. Noise measurements, analysis and calculations conducted by TTM.

1.3. Scope

The assessment includes the following:

- i. Description of the development site and proposal;
- ii. Measurement of the existing noise environment at the site.
- iii. Statement of assessment criteria for road traffic noise and noise impacting the development.
- iv. Prediction of road traffic noise on the development.
- v. Prediction of environmental noise levels at the development.
- vi. Details of noise control recommendations to be incorporated to achieve predicted compliance.

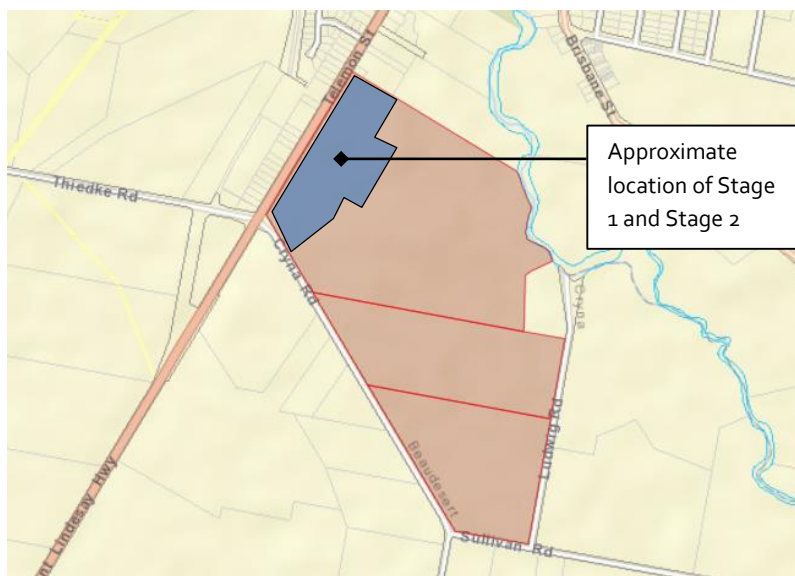
2. Site Description

2.1. Site Location

The site is comprised of a number of lots including Lot 3 RP114435, Lot 6 RP54315, Lot 315 W312435, Lot 2 RP89883, Lots 1 & 2 RP7549, Lots 7, 152 & 153 W312421.

The subject site is bound by Telemon Street (currently the Mount Lindesay Highway) to the west, commercial premises to the north, Ludwig Road to the east and Cryna Road to the south. Stage 1 and Stage 2 are located along the western boundary adjacent to Telemon Street. The site and approximate location of the subdivision staging is shown in Figure 1.

Figure 1: Site Locality



2.2. Proposed Development

The current proposal is for the residential subdivision of Stage 1 and Stage 2. Access to the site is proposed from Telemon Street. The development plan is shown in Appendix A.

2.3. Acoustic Environment

2.3.1. Road Traffic Noise

The site is primarily affected by road traffic noise from Telemon Street (i.e. Mount Lindesay Highway) which is controlled by the Department of Transport and Main Roads (TMR). Telemon Street is a two lane carriageway with a posted speed limit of 60-80km/h in proximity to the site. The noise assessment has considered worst case by assuming Telemon Street will remain as a state controlled road.

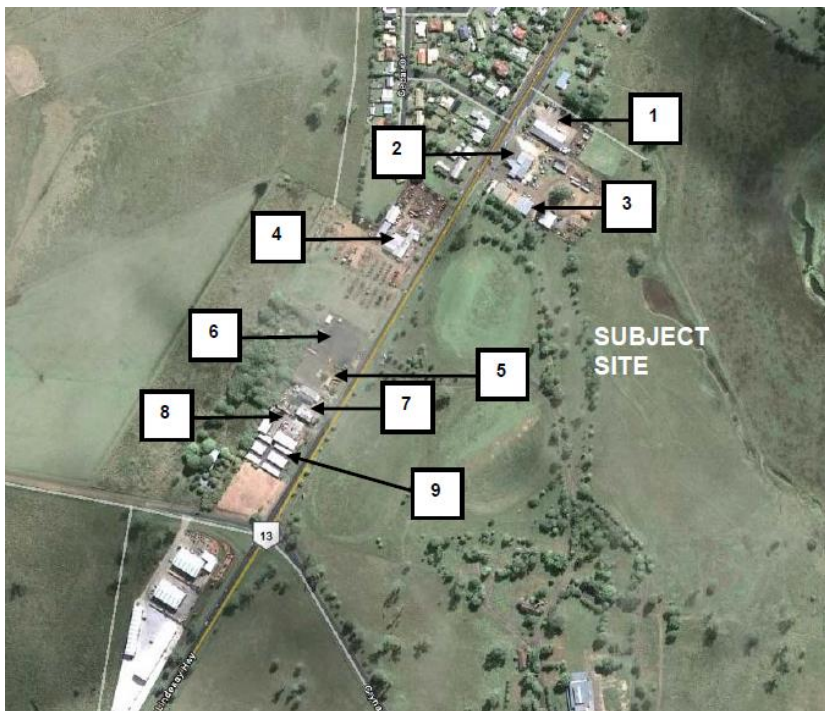
Cryna Road is incorporated into the noise assessment to reflect the year 2030 scenario inclusive of traffic generated by the development. Cryna Road is a two lane Council controlled road.

2.3.2. Surrounding Commercial Premises

Commercial and industrial uses are located adjacent north of Stage 1 and across Telemon Street. The surrounding premises identified during previous sites visits were as follows:

1. Elders Sales Centre.
2. Caltex petrol station, Ward's Driveway Mechanical Repairs, Simmo's Industrial Supplies.
3. John Deere sales and service centre.
4. Dover and Sons Farm Equipment.
5. RACQ.
6. Gee Bros Transport.
7. Jasper Panel Works.
8. Beaudesert Gates and Steel.
9. Beaudesert Mini Storage.

Figure 2: Surrounding Commercial Uses



3. Noise Measurements

3.1. Equipment

The following equipment was used to measure existing noise levels:

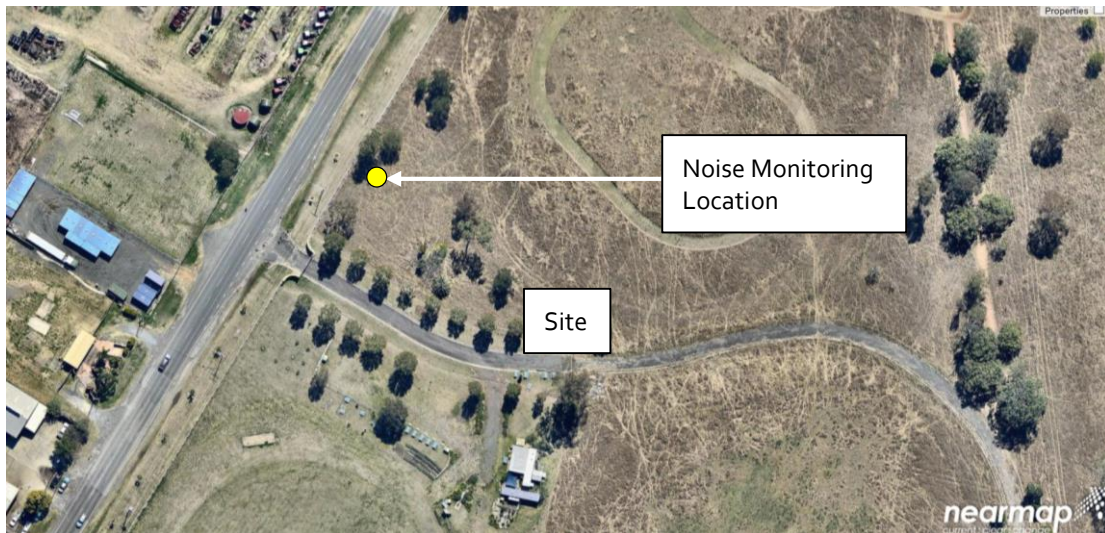
- ARL EL316 Environmental Noise Monitor (SN 16-306-013).
- RION NC73 Acoustical Calibrator (SN 10847023).

All equipment was calibrated by a NATA accredited laboratory. The equipment was calibrated before and after the measurement session. No significant drift from the reference signal was recorded.

3.2. Unattended Noise Monitoring

Unattended noise monitoring was performed to establish the existing road traffic and ambient noise levels between Monday 12 July 2010 and Wednesday 21 July 2010. The noise monitor was placed on the subject site (Lot 2 RP7549) approximately 27m from the nearest lane of the Mount Lindsay Highway. The microphone was in a free-field position, approximately 1.4m above ground level and had an unobstructed line of sight to the road. The monitoring location is shown in Figure 3 below.

Figure 3: Noise Monitoring Location



The monitor was set to measure statistical noise levels in 'A' weighting, 'Fast' response, over 15 minute intervals. Noise measurements were conducted in accordance with Australian Standard *AS1055:1997 Acoustics – Description and Measurement of Environmental Noise*.

Road traffic noise levels were measured in accordance with Australian Standard *AS2702:1984 Acoustics – Methods for the measurement of road traffic noise (AS2702)*.

Weather during the noise monitoring period was generally fine. The temperature range was between 0-24°C for the entire measurement period (source: Bureau of Meteorology, Beaudesert 2010).

3.3. Attended Noise Measurement

Noise source levels have been obtained from attended noise measurements conducted on-site, or taken from previous similar investigations. Noise levels were measured between 20m - 60m from the source.

Measured noise sources included truck movement, forklift use, angle grinders, spray guns, drop saw, and tools falling on concrete floors. Noise measurements were performed with a Casella CEL593 Sound Level Meter approximately 1.5m above ground level.

Noise measurements were conducted generally in accordance with Australian Standard *AS1055:1997 Acoustics – Description & Measurement of Environmental Noise*.

3.4. Results of Measurements

3.4.1. Road Traffic Noise Levels

Table 1 presents the measured road traffic noise levels at the noise monitoring location.

Table 1: Measured Road Traffic Noise Levels

Day and Date	Road Traffic Noise Descriptor	Time Period	Measured Level, dB(A)
Tuesday, 13/07/2010	L _{A10,18hr}	6am to midnight	59
	L _{A10,12hr}	6am to 6pm	61
	Noisiest daytime L _{Aeq,1 hr}	5pm to 6pm	60
	Noisiest night time L _{Aeq,1 hr}	5am to 6am	56
	L _{Aeq,24 hr}	Midnight to midnight	56
	L _{Ago, 8 hour}	10pm to 6am	34
	L _{Ago, 18 hour}	6am to midnight	42

3.4.2. Ambient Noise Levels

Table 2 presents the measured ambient noise levels. The measurements are based on the unattended noise monitoring data shown graphically in Appendix B, and are a 10th percentile average of all non-weather affected periods.

Table 2: Measured Ambient Noise Levels

Time Period	Measured Noise Levels, L _{A90} dB(A)
Daytime (7am – 6pm)	42
Evening (6pm – 10pm)	34
Night time (10pm – 7am)	32

The data presented above was used to determine the assessment criteria for the development.

4. Noise Criteria

4.1. Road Traffic Noise

4.1.1. Department of Transport and Main Roads

The road traffic noise criteria for land affected by emissions from transport activities are contained in Module 1.1 of the *State Development Assessment Provisions (SDAP)* and TMR's *Policy for Development on Land Affected by Environmental Emissions from Transport and Transport Infrastructure, Version 2*. The criteria are reproduced in Table 3.

Table 3: Road Traffic Noise Emission Criteria for New Sensitive Land Uses

Development Type	Location	Environmental Noise Criteria
Accommodation activities / residential care facilities	External (All facades)	≤ 60 dB(A) L_{10} (18h) façade corrected (where the measured L_{90} (8h) free field between 10pm and 6am ≤ 40 dB(A))
		≤ 63 dB(A) L_{10} (18h) façade corrected (where the measured L_{90} (8h) free field between 10pm and 6am > 40 dB(A))
	External (Recreation areas)	≤ 57 dB(A) L_{10} (18h) free field (where the measured L_{90} (18h) free field between 6am and 12 midnight ≤ 45 dB(A))
		≤ 60 dB(A) L_{10} (18h) free field (where the measured L_{90} (18h) free field between 6am and midnight > 45 dB(A))
	Internal (Habitable rooms all times)	≤ 35 dB(A) L_{eq} (1hr) (maximum hour over 24 hours)

4.1.2. Queensland Development Code MP4.4

The *Queensland Development Code Part MP 4.4 - 'Buildings in a Transport Noise Corridor'* August 2015 (QDC) specifies Noise Categories to ensure that habitable rooms of residential buildings are adequately protected from transport noise.

The Noise Categories list the minimum acoustic R_w ratings for each building component to comply with the indoor sound levels as outlined in Australian Standard AS2107. Details regarding the noise categories and acceptable forms of construction can be found within Schedule 1 and 2 of the QDC document. The triggers for each noise category are summarised in Table 4.

Table 4: Road Traffic Noise Category Levels – QDC MP4.4 (Schedule 3)

Noise Category	Level of Transport Noise* $L_{A10,18\text{Hour}}$ for State-Controlled Roads and Designated Local Government Roads
Category 4	≥ 73 dB(A)
Category 3	68 – 72 dB(A)
Category 2	63 – 67 dB(A)
Category 1	58 – 62 dB(A)
Category 0	≤ 57 dB(A)

* Measured at 1 metre from the façade of the proposed or existing building.

The noise categories presented in Table 4 were obtained from QDC and are applied to dwellings located within transport noise corridors.

4.2. Environmental Noise

Noise emissions from offsite activities are assessed against the *Environmental Protection (Noise) Policy 2008* (EPP 2008). Details of the criteria and established noise limits are presented in the following sections.

4.2.1. EPP 2008 - Acoustic Quality Objectives

Table 5 below presents the acoustic quality objectives at noise sensitive receptors as detailed in Schedule 1 of the EPP2008.

Table 5: Acoustic Quality Objectives at Noise Sensitive Properties

Sensitive Receiver	Time of Day	Acoustic Quality Objectives, dB(A)		
		$L_{Aeq,adj,1hr}$	$L_{A10,adj,1hr}$	$L_{A1,adj,1hr}$
Dwelling (Outdoors)	Day and Evening (7am – 10pm)	50	55	65
Dwelling (Indoors)	Day and Evening (7am – 10pm)	35	40	45
	Night (10pm – 7am)	30	35	40

4.2.2. EPP 2008 - Background Creep

This criterion is to prevent background noise progressively increasing or creeping higher over time with the establishment of new developments in a locality. EPP2008 states that:

1. This section states the management intent for an activity involving noise.
2. To the extent that it is reasonable to do so, noise from an activity must not be—
 - a. for noise that is continuous noise measured by $L_{A90,T}$ —more than nil dB(A) greater than the existing acoustic environment measured by L_{A90,T_i} or

- b. for noise that varies over time measured by $L_{Aeq,adj,T}$ —more than 5dB(A) greater than the existing acoustic environment measured by $L_{A90,T}$.

In accordance with the Environmental Protection Regulation 2008, the time period (T) is considered to be a time interval of at least 15 minutes, or if the noise continues for less than 15 minutes, the duration of the noise source.

The Background Creep criteria for steady-state and transient noise sources are follows;

Table 6: Background Creep Noise Limits at Noise Sensitive Properties

Time Period	Steady-State Noise Emission Criteria, dB(A)	Time Varying Noise Emission Criteria, dB(A)
	$L_{A90,T}$	$L_{Aeq,T}$
Day (7am – 6pm)	42	47
Evening (6pm – 10pm)	34	39
Night (10pm – 7am)	32	37

The above steady-state criterion levels are quoted as a measured level, not a component level; hence, all plant proposed must be included in assessment. By designing plant noise to a measured level rather than a component level, the additive effect of multiple plant is taken into account.

5. Analysis - Road Traffic Noise

5.1. TMR Assessment Criteria

Based on the measured background noise levels detailed in Table 1 and the criteria outlined in Section 4.1, the following TMR external road traffic noise limits apply to the development:

- Facades: - An external noise level of 60 dB(A) $L_{A10(18 \text{ hour})}$ façade corrected.
- Recreation Areas: - An external noise level of 57 dB(A) $L_{A10(18 \text{ hour})}$ free-field.

5.2. Traffic Volumes

The existing traffic volume for verification of the noise model was obtained from Main Roads Traffic Census website. The traffic count was taken 450m north of Cryna Road in 2009.

Projected traffic volumes, presented in Table 7, were provided by *Pekol Traffic & Transport* and are inclusive of traffic generated by the development. The 2030 percentage heavy vehicles inclusive of the proposed development were calculated by *Pekol Traffic & Transport*.

Table 7: Traffic Volumes used in the Noise Model

Road	Traffic Volumes (AADT)		Heavy Vehicles (%)
	2009	2030	
Mount Lindesay Hwy (north of Cryna Road)	5,145	8,015	6.0
Mount Lindesay Hwy (south of Cryna Road)	-	5,715	3.0
Cryna Road	-	2,190	9.4

The 18 hour traffic volumes used in the noise model are taken to be 95% of the AADT.

5.3. Noise Model

5.3.1. Noise Modelling Parameters

Road traffic noise predictions were conducted using 'SoundPLAN v7.4', a CoRTN based modelling program. The basis of the 'SoundPLAN' model is as follows:

Table 8: Noise Modelling Parameters

Description	Value
Noise modelling standard	CoRTN
Angle Increment	1°
Noise contour grid spacing	2m squares
Road surface type	Impervious (+0 dB(A))

Description	Value
Ground surface	Earthwork design provided by ADG Engineers.
Mount Lindesay Highway speed limit	60 km/h, 80 km/h further south
Cryna Road speed limit	60 km/h
Noise source height above grade	0.5m
Ground floor receiver height	1.8m above assumed pad level
First floor receiver height	4.6m above assumed pad level
Façade correction	+2.5 dB(A)

5.3.2. Noise Model Verification

To verify the road traffic noise model, the $L_{A10, 18\text{hour}}$ noise levels were modelled and compared to the measured levels as presented in Table 9. As the noise monitor was in free-field location, the predicted noise level is also shown as free-field.

Table 9: Comparison of Measured and Predicted Road Traffic Noise Levels

Location	Measured $L_{A10, 18\text{ hour}}$	Predicted $L_{A10, 18\text{ hour}}$	Required Correction
Mount Lindesay Hwy	59	60	0

As the modelled levels are within the allowable tolerance of 2 dB(A) of the measured level, no correction is required to the model.

5.4. Predicted Road Traffic Noise Levels

Modelling was conducted to determine road traffic noise levels at the development in the planning horizon. The predicted noise levels take into account the 2030 traffic volumes, current site layout, earthwork contour design, and the proposed acoustic barriers detailed in Section 6. Noise contour outputs are shown in the following sections while the single receiver point calculations are shown in Appendix C.

Figure 4 presents the road traffic noise levels without acoustic barriers at Stage 1 and 2 compared to TMR's external outdoor recreation area criteria.

Figure 4: Stage 1 and 2 - Road Traffic Noise Levels at Ground Floor – No acoustic barrier



Figure 4 above indicates road traffic noise levels at the first row of lots are predicted to exceed TMR's outdoor recreation area criteria. Therefore, acoustic barriers (1.8m high) were modelled to reduce traffic noise at these lots. The results are presented in Figure 5.

Figure 5: Stage 1 and 2 - Road Traffic Noise Levels at Ground Floor – With acoustic barrier



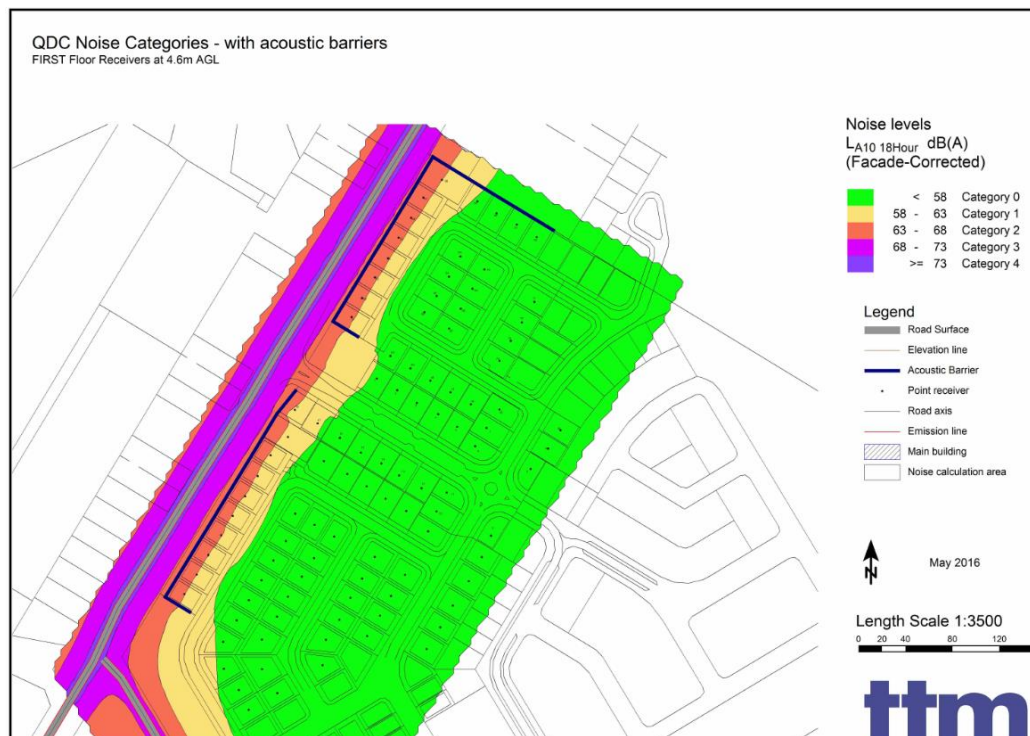
With the inclusion of a 1.8m high barrier along the Mount Lindesay Highway frontage noise levels are predicted to comply with TMR's criteria.

Based on inclusion of the acoustic barriers, the building treatment requirements in terms of QDC MP4.4 are presented in Figure 6 and Figure 7 below.

Figure 6: Stage 1 and 2 – QDC MP4.4 Noise Levels at Ground Floor – With acoustic barrier



Figure 7: Stage 1 and 2 – QDC MP4.4 Noise Levels at First Floor – With acoustic barrier



With the inclusion of the acoustic barrier, QDC MP4.4 building treatments at ground floor of dwellings will be Noise Category 1 or less, and building treatments at first floor of dwellings will be Noise Category 2 or less.

6.2. Noise Source Levels

Based on observations and measurements taken on-site, Table 10 present the potential noise sources and the respective measured noise levels in $L_{Aeq,T}$, $L_{A10,T}$ and $L_{A1,T}$. Noise levels of activities were measured between 20m - 60m and have been corrected back to a noise source level at 1m. The noise sources are dependent on the type of businesses located within the nominated commercial areas.

Table 10: Typical Offsite Noise Sources

Noise Location	Noise Source Description	Noise Level at 1m, dB(A)			Measured Duration (s)
		$L_{Aeq,T}$	$L_{A10,T}$	$L_{A1,T}$	
Businesses north of Stage 1	Truck manoeuvring/passbys	80	82	83	30
	Forklift operation	76	80	82	25
	Conversations	72	74	75	300
	Angle grinder	85	87	88	20
	John Deere compressor	90	91	93	20
	Drop saw	86*	88*	89*	7
	Spray gun	82	84	87	10
	Dropping tools	85*	88*	90*	2
	Hammering	87*	89*	91*	5
Businesses across Telemon Street	Single event car door closure	75*	77*	77*	2
	Single event car bypass	69	75	75	6
	Truck manoeuvring/passbys	80	82	83	30
	Forklift operation	76	80	82	25
	Conversations	72	74	75	300
	Angle grinder	85	87	88	20
	Spray gun	82	84	87	10
	Dropping tools	85*	88*	90*	2
	Hammering	87*	89*	91*	5

* Includes 2 dB(A) adjustment to account for impulsiveness characteristics in accordance with AS1055.

Includes 5 dB(A) adjustment to account for tonal noise characteristics in accordance with AS1055.

6.3. Noise Prediction Parameters

The following parameters were used for noise calculations based on the observed operations of the surrounding businesses:

- Car movements predicted from the smash repair business.
- Truck movement predicted from the nearest relevant location. Calculations are based on 3 movements occurring in any 15 minute period.

- Forklift operation predicted from nearest relevant location. Calculations are based on 2 events occurring in any 15 minute period.
- Voice predicted from outside the nearest workshed relative to the receiver. Calculations are based on a 5 minute conversation occurring in any 15 minute period.
- Angle grinding and hammering predicted from the nearest relevant location. Calculations are based on 2 events in any 15 minute period.
- The John Deere compressor is located on the site boundary with Stage 1. Calculations are based on 1 event in any 15 minute period.
- Drop saws and spray guns predicted from inside the relevant workshops. Calculations are based on 2 events in any 15 minute period.

Noise levels for voice are based on published data contained in Harris CM, Handbook of Acoustical measurements and Noise Control – 3rd ed. Ch 16.3, Mc Graw-Hill Inc. The average A-Weighted Sound Levels (long term averages) of speech for different individual vocal efforts under quiet conditions at a distance of 1 metre are as follows:

Table 11: Voice (Conversation) Noise Levels

Vocal Effort	Male, dB(A)	Female, dB(A)
Casual	53	50
Normal	58	55
Raised	65	62
Loud	75	72

The voice levels used for assessment are from the 'Loud' category with an associated noise level of 75 dB(A) for an individual male.

6.4. Predicted Noise Levels - Acoustic Quality Objectives

6.4.1. No Acoustic Treatment

Table 12 presents the predicted acoustic quality objective noise levels without any acoustic treatment.

Table 12: Acoustic Quality Objective Predictions – No Acoustic Treatment

Receiver	Noise Source	Predicted Noise Level, dB(A)					
		L _{Aeq, 1hr}		L _{A10, 1 hr}		L _{A1, 1hr}	
		Outdoors	Indoors	Outdoors	Indoors	Outdoors	Indoors
	Criteria	50	30	55	35	65	40
1	Truck bypass	38	28	41	31	42	32
	Forklift operation	37	27	n/a*	n/a*	43	33
	Voice	39	29	41	31	42	32

Receiver	Noise Source	Predicted Noise Level, dB(A)					
		L _{Aeq, 1hr}		L _{A10, 1 hr}		L _{A1, 1hr}	
		Outdoors	Indoors	Outdoors	Indoors	Outdoors	Indoors
	Criteria	50	30	55	35	65	40
	Angle grinder	36	26	n/a*	n/a*	39	29
	Compressor	48	38	n/a*	n/a*	54	44
	Drop saw	40	30	n/a*	n/a*	43	33
	Spray gun	38	28	n/a*	n/a*	43	33
	Dropping tools	39	29	n/a*	n/a*	44	34
	Hammering	33	23	n/a*	n/a*	37	27
2	Car door closure	31	21	n/a*	n/a*	33	23
	Car bypass	26	16	n/a*	n/a*	32	22
	Truck bypass	34	24	36	26	37	27
	Forklift operation	30	20	n/a*	n/a*	36	26
	Voice	35	25	37	27	38	28
	Angle grinder	38	28	n/a*	n/a*	41	31
	Spray gun	32	22	n/a*	n/a*	37	27
	Dropping tools	34	24	n/a*	n/a*	39	29
	Hammering	34	24	n/a*	n/a*	38	28

Notes:

1. The indoor noise levels are based on receiver windows open.

* The duration of noise is likely to be less than the time required to assess the L_{A10} during a 1 hour period. Hence noise is not assessable under these descriptors in this instance.

The summary of noise predictions is as follows;

- Receiver 1: Without acoustic treatment, noise levels are predicted to be above the internal criteria. Therefore an acoustic barrier would be recommended to reduce noise to acceptable levels.
- Receiver 2: Noise levels are predicted to comply with day and evening criteria.

6.4.2. With Acoustic Treatment

Table 13 present the predicted noise levels with the inclusion of acoustic barriers. Details of the acoustic barriers are listed in Section 7.

Table 13: Acoustic Quality Objective Predictions – With Acoustic Barriers

Receiver	Noise Source	Predicted Noise Level, dB(A)					
		L _{Aeq, 1hr}		L _{A10, 1 hr}		L _{A1, 1hr}	
		Outdoors	Indoors	Outdoors	Indoors	Outdoors	Indoors
	Criteria	50	30	55	35	65	40
1	Truck bypass	33	23	35	25	36	26
	Forklift operation	29	19	n/a*	n/a*	35	25
	Voice	33	23	35	25	36	26
	Angle grinder	31	21	n/a*	n/a*	34	24
	Compressor	31	21	n/a*	n/a*	37	27
	Drop saw	33	23	n/a*	n/a*	36	26
	Spray gun	31	21	n/a*	n/a*	36	26
	Dropping tools	29	19	n/a*	n/a*	34	24
	Hammering	28	18	n/a*	n/a*	32	22
2	Car door closure	25	15	n/a*	n/a*	27	17
	Car bypass	20	10	n/a*	n/a*	26	16
	Truck bypass	28	18	30	20	31	21
	Forklift operation	24	14	n/a*	n/a*	30	20
	Voice	30	20	32	22	33	23
	Angle grinder	33	23	n/a*	n/a*	36	26
	Spray gun	27	17	n/a*	n/a*	32	22
	Dropping tools	29	19	n/a*	n/a*	34	24
	Hammering	29	19	n/a*	n/a*	33	23

Notes:

1. The indoor noise levels are based on receiver windows open.

* The duration of noise is likely to be less than the time required to assess the L_{A10} during a 1 hour period. Hence noise is not assessable under these descriptors in this instance.

The summary of noise predictions is as follows;

- Receiver 1: With the inclusion of an acoustic barrier noise levels are predicted to comply with all criteria.
- Receiver 2: Noise was assessed by incorporating shielding from the recommended traffic noise barrier. With the inclusion of an acoustic barrier noise levels are predicted to comply with all criteria.

6.5. Predicted Noise Levels - Background Creep

Table 14 present the predicted background creep noise levels. Given that acoustic barriers are required to reduce traffic noise and to achieve compliance with Acoustic Quality Objectives, the Background Creep predictions are also inclusive of the recommended barriers.

Table 14: Background Creep Predictions

Receiver	Noise Source	Predicted Noise Level L_{Aeq} dB(A)	Complies with Criteria: (Yes/No)		
			Day 47 dB(A)	Evening 39 dB(A)	Night 37 dB(A)
1	Truck bypass	32	✓	✓	✓
	Forklift operation	29	✓	✓	✓
	Voice	33	✓	✓	✓
	Angle grinder	31	✓	✓	✓
	Compressor	34	✓	✓	✓
	Drop saw	33	✓	✓	✓
	Spray gun	31	✓	✓	✓
	Dropping tools	29	✓	✓	✓
	Hammering	28	✓	✓	✓
2	Car door closure	16	✓	✓	✓
	Car bypass	13	✓	✓	✓
	Truck bypass	24	✓	✓	✓
	Forklift operation	24	✓	✓	✓
	Voice	30	✓	✓	✓
	Angle grinder	33	✓	✓	✓
	Spray gun	27	✓	✓	✓
	Dropping tools	28	✓	✓	✓
	Hammering	28	✓	✓	✓

With the inclusion of the acoustic barriers, all individual noise sources are predicted to comply with the Background Creek criteria during the day, evening and night periods.

6.6. Potential Future Growth of Commercial Premises

Future growth of surrounding commercial areas may include longer operating hours or increased noise generation. This report has assessed the potential commercial noise sources against the night criteria and with the inclusion of the recommended barriers detailed in Section 7 noise levels are predicted to comply with the criteria.

7. Recommendations

The following recommendations should be implemented for predicted compliance with the noise criteria detailed in Section 4.

7.1. Road Traffic Noise

7.1.1. Acoustic Barriers

Acoustic barriers are required to achieve compliance at outdoor recreation areas of noise affected lots within Stage 1 and 2. The recommended location and extent of the acoustic barrier is shown in Figure 9.

Barrier recommendations are as follows:

- The acoustic barriers should be minimum 1.8m high relative to finished lot levels.
- The barrier shall be constructed of a material with a surface mass greater than 15kg/m^2 in accordance with Main Roads Technical Specification MRTS15.
- Suitable materials may include earth mound, lapped timber palings, steel, fibre cement sheeting, plywood, glass, masonry, or a combination of materials.
- No gaps or holes should be evident in the barrier construction.

Figure 9: Recommended acoustic barriers to reduce road traffic noise



7.1.2. Building Treatments

The QDC MP4.4 requires that habitable rooms in residential buildings located in a transport noise corridor are adequately protected from transport noise to safeguard occupant's health and amenity.

In order to achieve the performance requirements of the QDC MP4.4, the external building envelope of habitable rooms must comply with the minimum R_w for each building component specified in Schedule 1 to achieve a minimum transport noise reduction level for the relevant noise category by either one of the following:

- a. Using materials specified in Schedule 2 of the QDC MP4.4;

OR

- b. Using materials with manufacturer's specifications that, in combination, achieve the minimum R_w value for the relevant building component and applicable noise category.

For application of Point (b), possible alternative constructions can be determined by the glazier (for glazing) and construction manuals such as 'The Red Book' by CSR (for walls and roof/ceiling).

The Noise Categories applicable to Stage 1 and 2 of the development are listed in Table 15. Lots not described in the table below are predicted to be Noise Category 0 at both floors and do not require acoustic treatment.

Table 15: QDC Noise Categories – Stage 1 and 2

Lot Number	QDC MP4.4 Noise Category	
	Ground Floor	First Floor
17	0	1
18	1	2
51	1	2
52	1	2
53	1	2
54	1	2
55	1	2
56	1	2
57	1	2
58	1	2
59	0	1
79	1	2
80	1	2
81	1	2
82	1	2
83	1	2

Lot Number	QDC MP4.4 Noise Category	
	Ground Floor	First Floor
84	1	2
85	1	2
86	1	2
87	1	2

The construction requirements for each noise category are outlined in QDC MP4.4. An extract of that document is provided in Appendix D.

7.2. Environmental Noise

Additional acoustic barriers are required to reduce noise from the neighbouring commercial premises north of Stage 1. The acoustic barrier recommendations are as follows:

- A minimum 2.1m high acoustic barrier should be constructed on the northern boundary of Lots 58-62.
- The barrier height should be relative to the finished building pad levels of each allotment.
- The barrier shall be constructed of a material with a surface mass greater than 15kg/m². Suitable materials may include earth mound, lapped timber palings, steel, fibre cement sheeting, plywood, masonry, or a combination of materials.
- No gaps or holes should be evident in the barrier construction.

Figure 10: Recommended acoustic barriers to reduce commercial noise



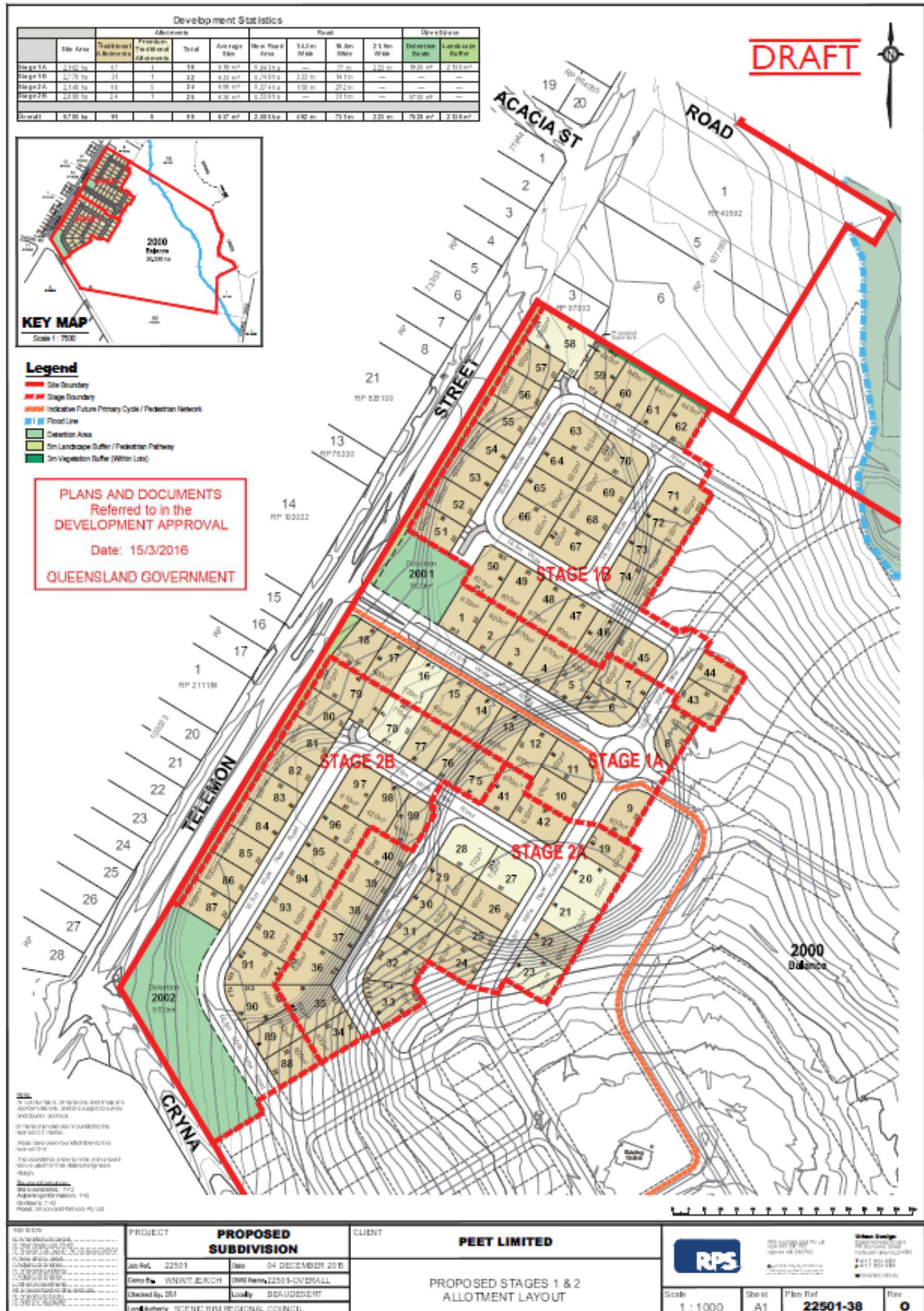
Any two storey dwellings proposed on Lots 58-62 would require an acoustic assessment of the upper floor to ensure an acceptable level of internal amenity is achieved due to noise from the nearby industrial premises.

8. Conclusion

A revised environmental noise assessment was conducted of Stage 1 and Stage 2 of the proposed residential subdivision on land fronting the Mount Lindesay Highway and Cryna Road, Beaudesert.

With inclusion of the recommendations detailed in Section 7, the development is predicted to comply with the noise criteria outlined in Section 4.

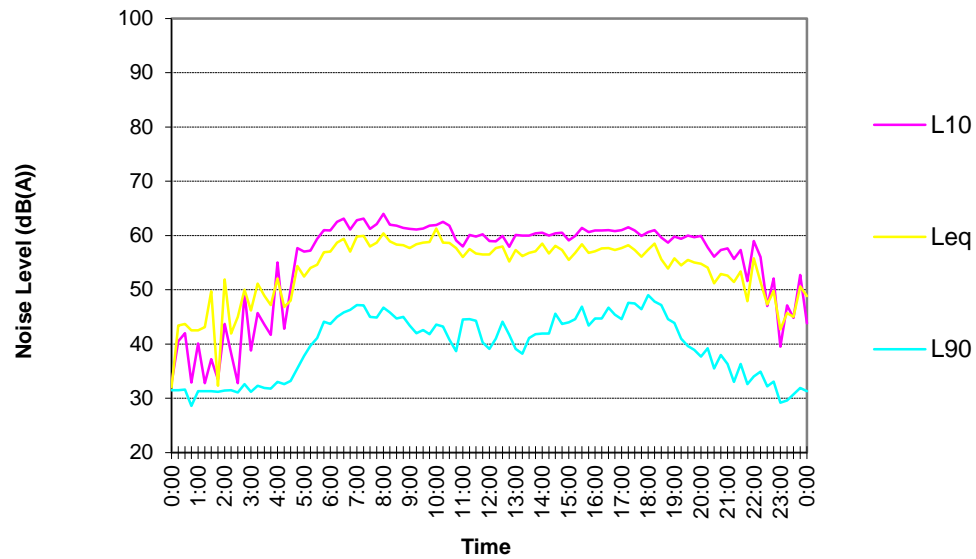
Appendix A Development Plan



Appendix B Unattended Noise Monitoring Graphs

Road Traffic Noise Survey - Mount Lindesay Highway, Beaudesert

Tuesday July 13, 2010



Appendix C SoundPLAN Noise Modelling Results

Cryna Road Subdivision Beaudesert Assessed receiver levels - "M03 Model Verification.sit" "RDGM0001.dgm"	21
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Name	Floor	L10(18h) dB(A)
Logger	1. Floor	60.0

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**Cryna Road Subdivision Beaudesert
M09 - Stage 1 & 2 - with barriers - Receivers**

Receiver	Floor	Ground Height m	L10(18h) Free-Field dB(A)
1	GF 1.FL	54.26 54.26	53.2 54.8
2	GF 1.FL	55.00 55.00	51.5 53.1
3	GF 1.FL	56.03 56.03	50.5 51.9
4	GF 1.FL	57.00 57.00	49.7 50.9
5	GF 1.FL	57.74 57.74	48.9 50.1
6	GF 1.FL	58.50 58.50	48.1 49.3
7	GF 1.FL	58.39 58.39	48.2 49.3
8	GF 1.FL	59.05 59.05	46.3 47.5
9	GF 1.FL	59.19 59.19	46.0 47.3
10	GF 1.FL	58.50 58.50	47.8 49.0
11	GF 1.FL	58.50 58.50	47.9 49.1
12	GF 1.FL	57.77 57.77	48.6 49.8
13	GF 1.FL	57.23 57.23	49.5 50.8
14	GF 1.FL	56.27 56.27	50.1 51.6
15	GF 1.FL	55.28 55.28	50.9 52.5
16	GF 1.FL	54.27 54.27	52.1 53.9
17	GF 1.FL	52.95 52.95	53.5 55.8
18	GF 1.FL	52.25 52.25	54.9 59.7
19	GF 1.FL	59.76 59.76	46.0 47.3
20	GF 1.FL	60.27 60.27	46.0 47.3
21	GF	60.74	46.1

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**Cryna Road Subdivision Beaudesert
M09 - Stage 1 & 2 - with barriers - Receivers**

Receiver	Floor	Ground Height m	L10(18h) Free-Field dB(A)
	1.FL	60.74	47.5
22	GF	60.76	45.9
	1.FL	60.76	47.4
23	GF	61.25	45.9
	1.FL	61.25	47.6
24	GF	61.00	48.6
	1.FL	61.00	49.8
25	GF	60.74	48.4
	1.FL	60.74	49.6
26	GF	60.25	48.2
	1.FL	60.25	49.4
27	GF	59.50	47.8
	1.FL	59.50	49.1
28	GF	57.40	48.2
	1.FL	57.40	49.7
29	GF	57.42	48.0
	1.FL	57.42	49.7
30	GF	57.42	48.0
	1.FL	57.42	49.8
31	GF	58.24	48.7
	1.FL	58.24	50.2
32	GF	58.23	48.9
	1.FL	58.23	50.5
33	GF	58.50	48.7
	1.FL	58.50	50.5
34	GF	59.16	52.0
	1.FL	59.16	53.1
35	GF	57.75	52.3
	1.FL	57.75	53.5
36	GF	57.50	52.3
	1.FL	57.50	53.6
37	GF	57.50	51.7
	1.FL	57.50	53.0
38	GF	57.50	51.4
	1.FL	57.50	52.8
39	GF	57.50	51.1
	1.FL	57.50	52.5
40	GF	57.25	50.8
	1.FL	57.25	52.2
41	GF	57.77	48.5
	1.FL	57.77	49.8

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**Cryna Road Subdivision Beaudesert
M09 - Stage 1 & 2 - with barriers - Receivers**

Receiver	Floor	Ground Height m	L10(18h) Free-Field dB(A)
42	GF 1.FL	58.50 58.50	47.5 48.8
43	GF 1.FL	58.96 58.96	46.3 47.5
44	GF 1.FL	58.52 58.52	46.3 47.4
45	GF 1.FL	57.88 57.88	48.1 49.2
46	GF 1.FL	56.31 56.31	48.4 49.7
47	GF 1.FL	55.60 55.60	49.1 50.5
48	GF 1.FL	54.75 54.75	49.9 51.4
49	GF 1.FL	54.30 54.30	51.1 52.7
50	GF 1.FL	53.71 53.71	52.7 54.4
51	GF 1.FL	52.50 52.50	55.1 61.2
52	GF 1.FL	52.82 52.82	55.1 61.7
53	GF 1.FL	52.81 52.81	54.7 61.5
54	GF 1.FL	53.00 53.00	54.7 61.1
55	GF 1.FL	53.50 53.50	55.7 62.1
56	GF 1.FL	53.68 53.68	55.9 62.0
57	GF 1.FL	54.00 54.00	56.7 62.1
58	GF 1.FL	54.00 54.00	56.7 60.5
59	GF 1.FL	54.27 54.27	52.8 55.2
60	GF 1.FL	54.75 54.75	52.0 53.8
61	GF 1.FL	55.24 55.24	51.2 52.6
62	GF	55.50	50.3

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**Cryna Road Subdivision Beaudesert
M09 - Stage 1 & 2 - with barriers - Receivers**

Receiver	Floor	Ground Height m	L10(18h) Free-Field dB(A)
	1.FL	55.50	51.6
63	GF	54.05	51.1
	1.FL	54.05	53.3
64	GF	53.74	50.8
	1.FL	53.74	52.9
65	GF	53.30	50.5
	1.FL	53.30	52.7
66	GF	53.26	50.7
	1.FL	53.26	52.9
67	GF	54.58	50.2
	1.FL	54.58	51.8
68	GF	54.89	50.4
	1.FL	54.89	52.0
69	GF	55.00	50.5
	1.FL	55.00	52.0
70	GF	55.00	50.6
	1.FL	55.00	52.2
71	GF	55.55	48.6
	1.FL	55.55	49.9
72	GF	55.29	48.3
	1.FL	55.29	49.7
73	GF	55.29	48.2
	1.FL	55.29	49.6
74	GF	55.44	48.2
	1.FL	55.44	49.5
75	GF	57.00	49.2
	1.FL	57.00	50.6
76	GF	56.27	50.0
	1.FL	56.27	51.4
77	GF	55.50	50.8
	1.FL	55.50	52.4
78	GF	54.74	51.9
	1.FL	54.74	53.8
79	GF	54.50	55.1
	1.FL	54.50	58.8
80	GF	54.30	54.8
	1.FL	54.30	59.4
81	GF	54.30	55.4
	1.FL	54.30	59.8
82	GF	53.86	56.7
	1.FL	53.86	60.4

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**Cryna Road Subdivision Beaudesert
M09 - Stage 1 & 2 - with barriers - Receivers**

Receiver	Floor	Ground Height m	L10(18h) Free-Field dB(A)
83	GF	52.94	55.9
	1.FL	52.94	60.3
84	GF	54.00	57.1
	1.FL	54.00	60.8
85	GF	53.81	55.2
	1.FL	53.81	60.6
86	GF	53.79	54.6
	1.FL	53.79	60.4
87	GF	53.79	55.0
	1.FL	53.79	60.8
88	GF	55.50	52.1
	1.FL	55.50	53.8
89	GF	54.77	52.1
	1.FL	54.77	54.0
90	GF	54.73	53.3
	1.FL	54.73	55.0
91	GF	54.24	53.1
	1.FL	54.24	54.9
92	GF	54.25	52.1
	1.FL	54.25	54.1
93	GF	54.25	51.5
	1.FL	54.25	53.5
94	GF	54.48	51.3
	1.FL	54.48	53.3
95	GF	54.60	51.2
	1.FL	54.60	53.2
96	GF	54.82	51.2
	1.FL	54.82	53.2
97	GF	54.74	51.4
	1.FL	54.74	53.4
98	GF	55.24	50.4
	1.FL	55.24	52.2
99	GF	56.25	49.7
	1.FL	56.25	51.3

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Appendix D Extract from QDC MP4.4

Schedule 1

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 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

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QUEENSLAND DEVELOPMENT CODE MP 4.4 – BUILDINGS IN A TRANSPORT NOISE CORRIDOR

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.		

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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	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 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/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.

QUEENSLAND DEVELOPMENT CODE MP 4.4 – BUILDINGS IN A TRANSPORT NOISE CORRIDOR

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>

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QUEENSLAND DEVELOPMENT CODE MP 4.4 – BUILDINGS IN A TRANSPORT NOISE CORRIDOR

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 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>
	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>

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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 <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 - (i) solid core, wood, particleboard or blockboard not less than 45mm thick; and/or (ii) acoustically laminated glass not less than 10.38mm thick.

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QUEENSLAND DEVELOPMENT CODE MP 4.4 – BUILDINGS IN A TRANSPORT NOISE CORRIDOR

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 <i>acoustically rated seals</i> .

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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* ($L_{A10,1500}$) 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 building.

Noise assessment requirements – State-controlled Roads and Local Government roads:

A *noise assessment* for State-controlled roads and Local Government roads must be undertaken in accordance with the Transport Noise Management Code of Practice Volume 1 – Road Traffic Noise (Department of Transport and Main Roads, 2013).

In addition, the *noise assessment* must contain the following information as a minimum:

1) Background Information and Existing Acoustic Environment

- A brief description of the project.
- A brief description of the current noise environment.
- Documentation of noise monitoring equipment and procedures.
- A site plan showing:
 - Location of transport noise corridor;