Acoustic Report

'Altitude Aspire' Residential Subdivision
Fraser Drive Terranora

ROAD TRAFFIC NOISE IMPACT ASSESSMENT

Prepared for:
Newland Developers Pty Ltd

8 April 2013

Reference: 11GCA0048 R01 7

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Document Status

Rev No.	Author	Reviewed / Approved		Description	Date
		Name	Signature		
1	J Fox	D Dadd		Issued to client	27/02/2012
2	J Fox	D Dadd		Issued to client	06/03/2012
4	J Fox	D Dadd		Amended lot numbering	29/03/2012
6	J Fox	D Dadd		DRAFT	18/02/2013
7	J Fox	D Dadd		Acoustic report	08/04/2013

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1. Introduction

TTM have been engaged by Newland Developers Pty Ltd to prepare a road traffic noise assessment of the 'Altitude Aspire' residential subdivision located at Fraser Drive Terranora.

This report is a revision of the TTM acoustic report (*ttm ref: 11GCA0048 R01_4*) dated 29 March 2012. The revised report reflects the final site layout and earthwork design levels. Also considered are issues raised by Tweed Shire Council, State Agencies and members of the community in their submissions lodged during the exhibition period.

This acoustic report is based on future traffic noise levels with no acoustic barriers along the Fraser Drive frontage. Full compliance cannot be achieved through the use of practical barrier heights and therefore recommendations are based on achieving the noise reduction through future building design and treatment.

The assessment is based on the following:

- Noise criteria contained in the *Environmental Criteria for Road Traffic Noise*. Refer to Section 4 for further details;
- Development plans shown in Appendix A;
- Site inspection, noise measurements, analysis and calculations conducted by TTM.

The assessment includes the following:

- Description of the development site and proposal;
- Details of measured existing road traffic noise levels;
- Statement of assessment criteria relating to road traffic noise;
- Prediction of future road traffic noise levels at the development;
- Details of recommendations to be incorporated into the development to achieve predicted compliance.

2. Site Description

2.1 Subject Site

The 'Altitude Aspire' site is located along Fraser Drive at Terranora as indicated in Figure 1. The topography of the site and surrounds is moderately undulating. The surrounding land uses are predominately residential.

Figure 1: Site Locality

2.2 Proposal

The proposal is for a residential subdivision to be known as 'Altitude Aspire'. The assessment is based on the development plans shown in Appendix A.

2.3 Acoustic Environment

The subject site is primarily affected by road traffic noise from Fraser Drive which is controlled by the Tweed Shire Council. Fraser Drive is an asphalt paved two lane carriageway with posted speed limits between 60-80km/h. Fraser Drive is considered to be a collector road for the purposes of assessment under the *Environmental Criteria for Road Traffic Noise*.

3. Methodology

3.1 Measurement Equipment

The following equipment was used to measure road traffic noise levels:

- ARL EL315 Environmental Noise Logger (SN# 15-203-512);
- Rion NC73 Acoustical Calibrator (SN# 10697023).

The EL315 environmental noise monitor was calibrated before and after the monitoring session, with no significant drift from the reference signal recorded.

3.2 Unattended Noise Monitoring

Additional noise monitoring was undertaken to re-measure the existing road traffic noise levels on Fraser Drive. The noise monitor was placed south of the site approximately 10m from the nearest lane of Fraser Drive. The microphone was in a free-field position, approximately 3.2m above road height, with an unobstructed line of sight to the road. Noise monitoring was conducted between Wednesday 1/02/2012 and Monday 6/02/2012. The noise monitoring position is shown in Figure 1.

The environmental noise monitor was set to measure noise levels in 'A'-weight, 'Fast' response, over 15 minute statistical intervals. The statistical interval was chose to allow application of *AS/NSZ 2107:2000 Acoustics – Recommended Design Sound Levels and Reverberation Times for Building Interiors*.

Figure 2: Noise Monitoring Position

4. Noise Assessment Criteria

We refer to the following documents for the assessment of road traffic noise at the site:

- *Environmental Criteria for Road Traffic Noise*;
- *NSW Road Noise Policy*;
- State Environmental Planning Policy (Infrastructure) 2007 (*Infrastructure SEPP*); and
- *Development near Rail Corridors and Busy Roads*.

4.1 Environmental Criteria for Road Traffic Noise

In accordance with transitional arrangements 'Part 3A and State Significant Development Projects' the *Environmental Criteria for Road Traffic Noise* (ECRTN) is to be used for this assessment rather than the *NSW Road Noise Policy.*

Development Type 5 from Table 1 '*Road traffic noise criteria for proposed road or residential land use developments*' of ECRTN states new residential developments affected by traffic noise from collector roads be assessed to the following levels:

- 60 dB(A) L_{eq} (1 hour) (7am – 10pm); and
- 55 dB(A) L_{eq} (1 hour) (10pm – 7am).

The above levels include a 2.5dB(A) allowance for noise reflected from building facades. This equates to a free-field criteria of 57.5 dB(A) and 52.5 dB(A) $L_{eq\ (1\ hour)}$ for day and night periods respectively. The free-field criteria can be directly compared to the predicted road traffic noise levels presented in Section 6.4.

4.2 Acoustic Assessment of Noise Affected Dwellings

We recommend that further assessment of noise affected lots is in accordance with the Infrastructure SEPP. The Infrastructure SEPP specifies internal noise levels for dwellings as follows:

1. Bedrooms - 35 dB(A) during the night period (10pm – 7am);
2. Other Habitable rooms - 40 dB(A) for other habitable rooms at all times.

The *Development near Rail Corridors and Busy Roads* guideline supports the provisions of the Infrastructure SEPP and suggests that architectural design, building orientation and good internal layout can achieve acceptable acoustic amenity near busy transport corridors.

5. Measured Noise Levels

5.1 Unattended Road Traffic Noise Monitoring

Table 1 and Table 2 present the measured existing road traffic noise levels in proximity to the development site.

Table 1: Measured Road Traffic Noise Levels – Thursday 2/02/12

Road Traffic Noise Descriptor	Time Period	Measured Level dB(A)
$L_{10\ (18\ hour)}$	6am – midnight	61.4
Highest 10th percentile $L_{eq\ (1\ hour)}$ Day	between 7am – 10pm	61.5
Highest 10th percentile $L_{eq\ (1\ hour)}$ Night	between 10pm – 7am	58.3
$L_{eq\ (24\ hour)}$	Midnight to midnight	58.5
$L_{eq\ (15\ hour)}$	7am – 10pm	59.7
$L_{eq\ (9\ hour)}$	10pm – 7am	55.0

Table 2: Measured Road Traffic Noise Levels – Friday 3/02/12

Road Traffic Noise Descriptor	Time Period	Measured Level dB(A)
$L_{10\ (18\ hour)}$	6am – midnight	61.7
Highest 10th percentile $L_{eq\ (1\ hour)}$ Day	between 7am – 10pm	61.8
Highest 10th percentile $L_{eq\ (1\ hour)}$ Night	between 10pm – 7am	58.3
$L_{eq\ (24\ hour)}$	Midnight to midnight	58.3
$L_{eq\ (15\ hour)}$	7am – 10pm	59.6
$L_{eq\ (9\ hour)}$	10pm – 7am	54.3

Noise data used for this assessment is taken from measurements on Thursday 2/02/2012. Based on the measured levels, the L_{eq} Day (1 hour) = $L_{10\ (18\ hour)}$ – 0 dB(A) and the L_{eq} Night (1 hour) = $L_{10\ (18\ hour)}$ – 3 dB(A).

Graphical presentation of the measured noise levels is shown in Appendix B.

6. Road Traffic Noise Assessment

6.1 Traffic Volumes

The existing traffic volumes and percentage heavy vehicles for Fraser Drive were obtained from Tweed Heads Shire Council (January 2012). Council advised that a 10 year growth rate could be estimated by calculating the growth between year 2006 and 2011 counts. The growth rate was found to be 4.9% compound increase per annum, and this has been applied to calculate the 2023 volume.

Table 3: Traffic Volumes – Fraser Drive

Year	Traffic Volume (AADT)	Heavy Vehicles (%)
2006 (surveyed)	4,375	2
2011 (surveyed)	5,556	2
2023 (projected)	9,866	2

6.2 Noise Model

6.2.1 Noise Modelling Parameters

Road traffic noise predictions were conducted using SoundPLAN, a CoRTN based modelling program. The basis of the SoundPLAN Model is as follows, with results presented in Appendix C.

- Angle Increment: 1^0
- Road Surface Type: Asphalt
- Fraser Drive Speed Limits: 60km/h – 80km/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: +2.5dB

*The 60km/h speed limit is taken to be between Terranora Road to just north of Glen Ayr Drive. An 80km/h speed limit applies north of Glen Ayr Drive.

6.2.2 Noise Model Verification

To verify the road traffic noise prediction model, the $L_{10,18hr}$ traffic noise level at the monitoring location was calculated (using SoundPLAN) and compared to the measured noise level as presented in Table 4.

Table 4: Comparison of Measured and Predicted Traffic Noise Levels

Measured $L_{10,\ 18\ hour}$	Predicted $L_{10,\ 18\ hour}$	Required Correction
61.4	62.0	0

As the modelled level is within the allowable tolerance of 2 dB(A) of the measured level, no correction is required to the model. It should be noted that CoRTN calculation methodology tends to over-predict.

6.3 Modelled Road Traffic Noise Levels

The modelled road traffic noise levels with no acoustic barriers are detailed in Section 6.4 below.

6.4 Predicted Noise Levels – No Acoustic Barriers

The following section presents the predicted free-field road traffic noise levels at the development with no acoustic barriers. Pad levels are based upon the proposed earthwork design for the development. Noise levels were predicted from the approximate centre of each lot. The description "G" and "F" in the tables means "ground" and "first" floor levels.

Table 5: Predicted Noise Levels – Stage 1

Lot / Floor Level	Pad Level (m AHD)	Predicted $L_{eq,\ 1\ hour}$ Day (7am – 10pm)	Predicted $L_{eq,\ 1\ hour}$ Night (10pm – 7am)	Further Assessment Needed:
101 G	50.7	52.2	49.2	-
101 F	50.7	53.4	50.4	-
102 G	48.5	51.5	48.5	-
102 F	48.5	52.5	49.5	-
103 G	45.7	50.7	47.7	-
103 F	45.7	51.6	48.6	-
104 G	42.7	50.0	47.0	-
104 F	42.7	50.8	47.8	-
105 G	40.1	49.4	46.4	-

105 F	40.1	50.2	47.2	-
106 G	37.2	48.8	45.8	-
106 F	37.2	49.5	46.5	-
107 G	34.5	48.3	45.3	-
107 F	34.5	49.0	46.0	-
108 G	32.0	47.8	44.8	-
108 F	32.0	48.6	45.6	-
109 G	29.6	47.4	44.4	-
109 F	29.6	48.1	45.1	-
110 G	27.3	47.0	44.0	-
110 F	27.3	47.7	44.7	-
111 G	24.9	46.5	43.5	-
111 F	24.9	47.2	44.2	-
112 G	22.9	47.1	44.1	-
112 F	22.9	47.8	44.8	-
113 G	25.5	47.6	44.6	-
113 F	25.5	48.3	45.3	-
114 G	28.0	48.0	45.0	-
114 F	28.0	48.7	45.7	-
115 G	30.8	48.5	45.5	-
115 F	30.8	49.2	46.2	-
116 G	33.4	49.1	46.1	-
116 F	33.4	49.8	46.8	-
117 G	36.3	49.7	46.7	-
117 F	36.3	50.4	47.4	-
118 G	39.3	50.4	47.4	-
118 F	39.3	51.2	48.2	-
119 G	42.1	51.1	48.1	-

119 F	42.1	52.0	49.0	-
120 G	45.1	51.9	48.9	-
120 F	45.1	53.1	50.1	-
121 G	47.5	52.7	49.7	-
121 F	47.5	54.1	51.1	-
122 G	54.3	56.7	53.7	Yes
122 F	54.3	60.1	57.1	Yes
123 G	55.6	56.2	53.2	Yes
123 F	55.6	59.6	56.6	Yes
124 G	56.5	55.4	52.4	-
124 F	56.5	58.9	55.9	Yes
125 G	57.7	55.0	52.0	-
125 F	57.7	58.5	55.5	Yes
126 G	59.0	54.9	51.9	-
126 F	59.0	58.5	55.5	Yes
127 G	60.0	54.8	51.8	-
127 F	60.0	58.8	55.8	Yes
128 G	60.7	54.5	51.5	-
128 F	60.7	58.5	55.5	Yes
129 G	62.1	55.1	52.1	-
129 F	62.1	59.7	56.7	Yes
130 G	63.2	55.5	52.5	-
130 F	63.2	60.0	57.0	Yes
131 G	64.7	56.5	53.5	Yes
131 F	64.7	60.3	57.3	Yes
132 G	65.8	57.1	54.1	Yes
132 F	65.8	60.2	57.2	Yes
133 G	67.1	57.3	54.3	Yes

133 F	67.1	60.3	57.3	Yes
134 G	68.5	57.7	54.7	Yes
134 F	68.5	60.8	57.8	Yes
135 G	69.4	57.6	54.6	Yes
135 F	69.4	60.6	57.6	Yes
136 G	70.6	57.6	54.6	Yes
136 F	70.6	60.5	57.5	Yes

Noise levels are predicted to be above the criteria at Stage 1 lots in some instances. Details of the acoustic requirements for these lots is outlined in Section 7.

Table 6: Predicted Noise Levels – Stage 2

Lot / Floor Level	**Pad Level (m AHD)**	**Predicted $L_{eq,\ 1\ hour}$ Day (7am – 10pm)**	**Predicted $L_{eq,\ 1\ hour}$ Night (10pm – 7am)**	**Further Assessment Needed:**
201 G	49.6	58.1	55.1	Yes
201 F	49.6	62.4	59.4	Yes
202 G	50.2	58.0	55.0	Yes
202 F	50.2	62.1	59.1	Yes
203 G	50.6	58.0	55.0	Yes
203 F	50.6	62.4	59.4	Yes
204 G	51.2	58.0	55.0	Yes
204 F	51.2	62.7	59.7	Yes
205 G	52.1	58.1	55.1	Yes
205 F	52.1	62.8	59.8	Yes
206 G	52.8	57.8	54.8	Yes
206 F	52.8	61.9	58.9	Yes
207 G	53.8	57.8	54.8	Yes
207 F	53.8	61.7	58.7	Yes

208 G	44.6	52.8	49.8	-
208 F	44.6	54.2	51.2	-
209 G	42.1	51.8	48.8	-
209 F	42.1	53.0	50.0	-
210 G	39.6	51.1	48.1	-
210 F	39.6	52.0	49.0	-
211 G	36.6	50.3	47.3	-
211 F	36.6	51.1	48.1	-
212 G	33.8	49.7	46.7	-
212 F	33.8	50.5	47.5	-
213 G	31.1	49.1	46.1	-
213 F	31.1	49.8	46.8	-
214 G	28.3	48.5	45.5	-
214 F	28.3	49.3	46.3	-
215 G	25.6	47.9	44.9	-
215 F	25.6	48.7	45.7	-
216 G	23.1	47.4	44.4	-
216 F	23.1	48.3	45.3	-
217 G	20.7	47.1	44.1	-
217 F	20.7	47.8	44.8	-
218 G	17.6	46.7	43.7	-
218 F	17.6	47.5	44.5	-
219 G	18.8	46.7	43.7	-
219 F	18.8	47.5	44.5	-
220 G	18.8	47.4	44.4	-
220 F	18.8	48.2	45.2	-
221 G	18.4	47.5	44.5	-
221 F	18.4	48.3	45.3	-

222 G	18.3	47.7	44.7	-
222 F	18.3	48.6	45.6	-
223 G	18.9	48.2	45.2	-
223 F	18.9	49.0	46.0	-
224 G	22.6	48.6	45.6	-
224 F	22.6	49.4	46.4	-
225 G	25.2	49.1	46.1	-
225 F	25.2	50.0	47.0	-
226 G	27.8	49.6	46.6	-
226 F	27.8	50.6	47.6	-
227 G	30.2	50.2	47.2	-
227 F	30.2	51.1	48.1	-
228 G	32.8	50.9	47.9	-
228 F	32.8	51.8	48.8	-
229 G	35.2	51.3	48.3	-
229 F	35.2	52.3	49.3	-
230 G	37.9	52.1	49.1	-
230 F	37.9	53.3	50.3	-
231 G	40.4	53.0	50.0	-
231 F	40.4	54.3	51.3	-
232 G	42.9	54.1	51.1	-
232 F	42.9	55.8	52.5	-
233 G	43.4	53.6	50.6	-
233 F	43.4	55.3	52.3	-
234 G	40.6	52.5	49.5	-
234 F	40.6	53.9	50.9	-
235 G	38.1	51.7	48.7	-
235 F	38.1	52.8	49.8	-

236 G	35.5	50.9	47.9	-
236 F	35.5	51.9	48.9	-
237 G	33.1	50.4	47.4	-
237 F	33.1	51.4	48.4	-
238 G	30.4	49.8	46.8	-
238 F	30.4	50.7	47.7	-
239 G	28.1	49.3	46.3	-
239 F	28.1	50.1	47.1	-
240 G	25.6	48.7	45.7	-
240 F	25.6	49.6	46.6	-
241 G	22.6	48.1	45.1	-
241 F	22.6	49.0	46.0	-

Noise levels are predicted to be above the criteria at Stage 2 lots in some instances. Details of the acoustic requirements for these lots is outlined in Section 7.

Table 7: Predicted Noise Levels – Stage 3

Lot / Floor Level	Pad Level (m AHD)	Predicted $L_{eq,\ 1\ hour}$ Day (7am – 10pm)	Predicted $L_{eq,\ 1\ hour}$ Night (10pm – 7am)	Further Assessment Needed:
301 G	47.9	60.2	57.2	Yes
301 F	47.9	63.6	60.6	Yes
302 G	48.6	58.7	55.7	Yes
302 F	48.6	62.8	59.8	Yes
303 G	41.2	54.9	51.9	-
303 F	41.2	56.5	53.5	Yes
304 G	37.8	53.3	50.3	-
304 F	37.8	54.6	51.6	-
305 G	34.2	52.2	49.2	-
305 F	34.2	53.4	50.4	-
306 G	30.7	51.2	48.2	-
306 F	30.7	52.3	49.3	-
307 G	27.8	50.5	47.5	-
307 F	27.8	51.8	48.8	-
308 G	25.3	50.1	47.1	-
308 F	25.3	51.1	48.1	-
309 G	22.8	49.7	46.7	-
309 F	22.8	50.5	47.5	-
310 G	20.8	49.4	46.4	-
310 F	20.8	50.0	47.0	-
311 G	17.7	48.8	45.8	-
311 F	17.7	49.6	46.6	-

Noise levels are predicted to be above the criteria at Stage 3 lots in some instances. Details of the acoustic requirements for these lots is outlined in Section 7.

Table 8: Predicted Noise Levels – Stage 4

Lot / Floor Level	Pad Level (m AHD)	Predicted $L_{eq,\ 1\ hour}$ Day (7am – 10pm)	Predicted $L_{eq,\ 1\ hour}$ Night (10pm – 7am)	Further Assessment Needed:
401 G	66.8	50.3	47.3	-
401 F	66.8	51.9	48.9	-
402 G	66.2	51.1	48.1	-
402 F	66.2	52.9	49.9	-
403 G	65.2	51.8	48.8	-
403 F	65.2	53.7	50.7	-
404 G	63.7	52.0	49.0	-
404 F	63.7	53.9	50.9	-
405 G	62.6	52.2	49.2	-
405 F	62.6	54.1	51.1	-
406 G	61.5	52.3	49.3	-
406 F	61.5	54.2	51.2	-
407 G	59.8	51.9	48.9	-
407 F	59.8	53.6	50.6	-
408 G	58.7	51.9	48.9	-
408 F	58.7	53.6	50.6	-
409 G	57.8	52.1	49.1	-
409 F	57.8	53.7	50.7	-
410 G	54.3	50.8	47.8	-
410 F	54.3	52.0	49.0	-
411 G	50.8	49.6	46.6	-
411 F	50.8	50.7	47.7	-
412 G	47.2	48.6	45.6	-
412 F	47.2	49.6	46.6	-

413 G	51.3	49.2	46.2	-
413 F	51.3	50.2	47.2	-
414 G	52.3	48.9	45.9	-
414 F	52.3	50.1	47.1	-
415 G	53.3	48.5	45.5	-
415 F	53.3	49.8	46.8	-
416 G	54.3	48.1	45.1	-
416 F	54.3	49.5	46.5	-
417 G	55.3	47.5	44.5	-
417 F	55.3	48.9	45.9	-
418 G	56.3	47.3	44.3	-
418 F	56.3	48.7	45.7	-
419 G	56.3	46.9	43.9	-
419 F	56.3	48.2	45.2	-
420 G	54.2	46.2	43.2	-
420 F	54.2	47.2	44.2	-
421 G	51.9	45.8	42.8	-
421 F	51.9	46.7	43.7	-
422 G	49.3	45.5	42.5	-
422 F	49.3	46.2	43.2	-
423 G	47.2	45.3	42.3	-
423 F	47.2	45.9	42.9	-
424 G	45.6	45.3	42.3	-
424 F	45.6	45.9	42.9	-
425 G	44.2	45.9	42.9	-
425 F	44.2	46.6	43.6	-
426 G	43.8	46.4	43.4	-
426 F	43.8	47.0	44.0	-

427 G	42.9	46.6	43.6	-
427 F	42.9	47.2	44.2	-
428 G	41.6	46.6	43.6	-
428 F	41.6	47.3	44.3	-
429 G	40.2	46.7	43.7	-
429 F	40.2	47.4	44.4	-
430 G	38.1	46.6	43.6	-
430 F	38.1	47.4	44.4	-
431 G	34.2	46.4	43.4	-
431 F	34.2	47.2	44.2	-
432 G	37.8	47.1	44.1	-
432 F	37.8	47.8	44.8	-
433 G	40.9	47.7	44.7	-
433 F	40.9	48.5	45.5	-
434 G	43.4	48.3	45.3	-
434 F	43.4	49.1	46.1	-
435 G	44.8	48.0	45.0	-
435 F	44.8	48.8	45.8	-
436 G	46.3	47.9	44.9	-
436 F	46.3	48.7	45.7	-
437 G	47.4	47.6	44.6	-
437 F	47.4	48.3	45.3	-
438 G	48.2	47.2	44.2	-
438 F	48.2	48.0	45.0	-
439 G	47.4	46.4	43.4	-
439 F	47.4	47.2	44.2	-
440 G	53.4	51.9	48.9	-
440 F	53.4	53.2	50.2	-

441 G	51.3	51.2	48.2	-
441 F	51.3	52.3	49.3	-
442 G	48.9	50.6	47.6	-
442 F	48.9	51.5	48.5	-
443 G	46.2	49.8	46.8	--
443 F	46.2	50.7	47.7	-
444 G	43.2	49.2	46.2	-
444 F	43.2	50.0	47.0	-
445 G	40.3	48.6	45.6	-
445 F	40.3	49.4	46.4	-
446 G	37.6	48.1	45.1	-
446 F	37.6	48.8	45.8	-
447 G	35.2	47.6	44.6	-
447 F	35.2	48.3	45.3	-
448 G	33.1	47.3	44.3	-
448 F	33.1	48.0	45.0	-
449 G	30.7	46.9	43.9	-
449 F	30.7	47.5	44.5	-
450 G	28.3	46.3	43.3	-
450 F	28.3	47.0	44.0	-
451 G	32.4	45.1	42.1	-
451 F	32.4	45.8	42.8	-

No further acoustic treatment is needed for lots within Stage 4.

Table 9: Predicted Noise Levels – Stage 5

Lot / Floor Level	Pad Level (m AHD)	Predicted $L_{eq,\ 1\ hour}$ Day (7am – 10pm)	Predicted $L_{eq,\ 1\ hour}$ Night (10pm – 7am)	Further Assessment Needed:
501 G	84.3	50.6	47.6	-
501 F	84.3	52.0	49.0	-
502 G	82.3	49.0	46.0	-
502 F	82.3	49.9	46.9	-
503 G	76.8	50.9	47.9	-
503 F	76.8	52.2	49.2	-
504 G	74.4	48.6	45.6	-
504 F	74.4	49.9	46.9	-
505 G	72.4	47.5	44.5	-
505 F	72.4	48.7	45.7	-
506 G	71.3	46.8	43.8	-
506 F	71.3	47.8	44.8	-
507 G	69.2	46.8	43.8	-
507 F	69.2	47.6	44.6	-
508 G	66.8	46.5	43.5	-
508 F	66.8	47.1	44.1	-
509 G	64.2	46.2	43.2	-
509 F	64.2	46.8	43.8	-
510 G	61.6	45.9	42.9	-
510 F	61.6	46.4	43.4	-
511 G	58.5	45.4	42.4	-
511 F	58.5	46.0	43.0	-
512 G	56.7	45.2	42.2	-
512 F	56.7	45.8	42.8	-

513 G	55.2	45.0	42.0	-
513 F	55.2	45.4	42.4	-
514 G	45.7	45.1	42.1	-
514 F	45.7	45.6	42.6	-
515 G	43.3	45.4	42.4	-
515 F	43.3	45.9	42.9	-
516 G	39.9	45.3	42.3	-
516 F	39.9	45.9	42.9	-
517 G	48.8	45.1	42.1	-
517 F	48.8	45.6	42.6	-
518 G	51.4	45.3	42.3	-
518 F	51.4	45.9	42.9	-
519 G	53.5	45.5	42.5	-
519 F	53.5	46.3	43.3	-
520 G	56.5	45.9	42.9	-
520 F	56.5	46.8	43.8	-
521 G	58.8	46.3	43.3	-
521 F	58.8	47.4	44.4	-
522 G	62.0	47.1	44.1	-
522 F	62.0	48.1	45.1	-
523 G	64.5	48.2	45.2	-
523 F	64.5	49.4	46.4	-
524 G	65.9	49.1	46.1	-
524 F	65.9	50.5	47.5	-

No further acoustic treatment is needed for lots within Stage 5.

Table 10: Predicted Noise Levels – Stage 6

Lot / Floor Level	Pad Level (m AHD)	Predicted $L_{eq,\ 1\ hour}$ Day (7am – 10pm)	Predicted $L_{eq,\ 1\ hour}$ Night (10pm – 7am)	Further Assessment Needed:
601 G	26.2	46.0	43.0	-
601 F	26.2	46.7	43.7	-
602 G	24.7	45.7	42.7	-
602 F	24.7	46.2	43.2	-
603 G	22.8	45.8	42.8	-
603 F	22.8	46.3	43.3	-
604 G	22.2	46.0	43.0	-
604 F	22.2	46.6	43.6	-
605 G	20.7	46.0	43.0	-
605 F	20.7	46.6	43.6	-
606 G	19.4	46.0	43.0	-
606 F	19.4	46.6	43.6	-
607 G	22.9	46.2	43.2	-
607 F	22.9	46.9	43.9	-
608 G	19.9	46.6	43.6	-
608 F	19.9	47.3	44.3	-
609 G	19.6	46.6	43.6	-
609 F	19.6	47.4	44.4	-

No further acoustic treatment is needed for lots within Stage 6.

Table 11: Predicted Noise Levels – Stage 7

Lot / Floor Level	Pad Level (m AHD)	Predicted $L_{eq,\ 1\ hour}$ Day (7am – 10pm)	Predicted $L_{eq,\ 1\ hour}$ Night (10pm – 7am)	Further Assessment Needed:
701 G	18.7	45.7	42.7	-
701 F	18.7	46.0	43.0	-
702 G	23.3	45.1	42.1	-
702 F	23.3	45.4	42.4	-
703 G	27.8	45.6	42.6	-
703 F	27.8	45.8	42.8	-
704 G	25.7	45.6	42.6	-
704 F	25.7	45.8	42.8	-
705 G	26.4	45.7	42.7	-
705 F	26.4	46.0	43.0	-
706 G	26.8	45.8	42.8	-
706 F	26.8	46.1	43.1	-
707 G	27.2	46.0	43.0	-
707 F	27.2	46.2	43.2	-
708 G	26.2	45.9	42.9	-
708 F	26.2	46.2	43.2	-
709 G	25.8	46.0	43.0	-
709 F	25.8	46.2	43.2	-
710 G	24.2	45.8	42.8	-
710 F	24.2	46.1	43.1	-
711 G	23.3	46.0	43.0	-
711 F	23.3	46.3	43.3	-
712 G	16.2	45.9	42.9	-
712 F	16.2	46.1	43.1	-

713 G	9.5	46.1	43.1	-
713 F	9.5	46.5	43.5	-

No further acoustic treatment is needed for lots within Stage 7.

Table 12: Predicted Noise Levels – Stage 8

Lot / Floor Level	Pad Level (m AHD)	Predicted $L_{eq, 1\ hour}$ Day (7am – 10pm)	Predicted $L_{eq, 1\ hour}$ Night (10pm – 7am)	Further Assessment Needed:
801 G	28.3	45.8	42.8	-
801 F	28.3	46.1	43.1	-
802 G	30.6	45.8	42.8	-
802 F	30.6	46.0	43.0	-
803 G	32.8	45.7	42.7	-
803 F	32.8	45.9	42.9	-
804 G	35.7	45.6	42.6	-
804 F	35.7	45.8	42.8	-
805 G	36.7	45.4	42.4	-
805 F	36.7	45.6	42.6	-
806 G	39.3	45.4	42.4	-
806 F	39.3	45.6	42.6	-
807 G	42.3	45.5	42.5	-
807 F	42.3	45.7	42.7	-
808 G	40.2	45.8	42.8	-
808 F	40.2	45.9	42.9	-
809 G	38.2	45.8	42.8	-
809 F	38.2	46.0	43.0	-
810 G	36.4	45.9	42.9	-
810 F	36.4	46.1	43.1	-

811 G	32.7	46.0	43.0	-
811 F	32.7	46.2	43.2	-
812 G	35.3	46.1	43.1	-
812 F	35.3	46.3	43.3	-
813 G	35.2	46.0	43.0	-
813 F	35.2	46.3	43.3	-
814 G	35.3	45.9	42.9	-
814 F	35.3	46.1	43.1	-
815 G	36.7	45.8	42.8	-
815 F	36.7	46.0	43.0	-
816 G	38.4	45.7	42.7	-
816 F	38.4	46.0	43.0	-
817 G	44.2	45.5	42.5	-
817 F	44.2	45.6	42.6	-
818 G	48.7	45.2	42.2	-
818 F	48.7	45.4	42.4	-
819 G	53.2	45.0	42.0	-
819 F	53.2	45.2	42.2	-
820 G	56.3	44.8	41.8	-
820 F	56.3	44.9	41.9	-
821 G	52.3	44.8	41.8	-
821 F	52.3	44.9	41.9	-
822 G	49.8	44.8	41.8	-
822 F	49.8	44.9	41.9	-
823 G	46.8	44.7	41.7	-
823 F	46.8	44.9	41.9	-
824 G	42.7	44.9	41.9	-
824 F	42.7	45.1	42.1	-

825 G	45.0	44.9	41.9	-
825 F	45.0	45.1	42.1	-
826 G	47.8	45.1	42.1	-
826 F	47.8	45.2	42.2	-
827 G	49.3	45.1	42.1	-
827 F	49.3	45.3	42.3	-
828 G	46.9	45.2	42.2	-
828 F	46.9	45.3	42.3	-
829 G	45.9	45.3	42.3	-
829 F	45.9	45.5	42.5	-
830 G	44.6	45.5	42.5	-
830 F	44.6	45.7	42.7	-
831 G	42.5	45.6	42.6	-
831 F	42.5	45.8	42.8	-
832 G	40.6	45.6	42.6	-
832 F	40.6	45.8	42.8	-
833 G	29.2	45.8	42.8	-
833 F	29.2	46.0	43.0	-
834 G	29.1	45.8	42.8	-
834 F	29.1	46.0	43.0	-
835 G	33.5	45.6	42.6	-
835 F	33.5	45.8	42.8	-
836 G	34.8	45.4	42.4	-
836 F	34.8	45.6	42.6	-
837 G	36.4	45.3	42.3	-
837 F	36.4	45.5	42.5	-
838 G	38.3	45.1	42.1	-
838 F	38.3	45.3	42.3	-

839 G	40.4	45.0	42.0	-
839 F	40.4	45.2	42.2	-
840 G	44.7	44.9	41.9	-
840 F	44.7	45.0	42.0	-
841 G	43.5	44.9	41.9	-
841 F	43.5	45.0	42.0	-

No further acoustic treatment is needed for lots within Stage 8.

Table 13: Predicted Noise Levels – Stage 9

Lot / Floor Level	**Pad Level (m AHD)**	**Predicted $L_{eq,\ 1\ hour}$ Day (7am – 10pm)**	**Predicted $L_{eq,\ 1\ hour}$ Night (10pm – 7am)**	**Further Assessment Needed:**
901 G	27.3	45.9	42.9	-
901 F	27.3	46.2	43.2	-
902 G	28.3	45.9	42.9	-
902 F	28.3	46.1	43.1	-
903 G	29.3	45.9	42.9	-
903 F	29.3	46.1	43.1	-
904 G	30.7	45.5	42.5	-
904 F	30.7	45.7	42.7	-
905 G	31.7	45.3	42.3	-
905 F	31.7	45.5	42.5	-
906 G	33.7	45.3	42.3	-
906 F	33.7	45.5	42.5	-
907 G	35.3	45.1	42.1	-
907 F	35.3	45.3	42.3	-
908 G	37.2	45.0	42.0	-
908 F	37.2	45.2	42.2	-

909 G	40.2	44.9	41.9	-
909 F	40.2	45.0	42.0	-
910 G	41.4	44.8	41.8	-
910 F	41.4	45.0	42.0	-
911 G	37.3	44.8	41.8	-
911 F	37.3	45.0	42.0	-
912 G	32.7	44.7	41.7	-
912 F	32.7	44.8	41.8	-
913 G	31.6	44.7	41.7	-
913 F	31.6	45.0	42.0	-
914 G	30.2	44.9	41.9	-
914 F	30.2	45.2	42.2	-
915 G	29.1	45.1	42.1	-
915 F	29.1	45.4	42.4	-
916 G	28.1	45.2	42.2	-
916 F	28.1	45.5	42.5	-
917 G	27.1	45.4	42.4	-
917 F	27.1	45.7	42.7	-
918 G	26.0	45.6	42.6	-
918 F	26.0	45.8	42.8	-
919 G	28.2	45.6	42.6	-
919 F	28.2	45.8	42.8	-
920 G	29.8	45.5	42.5	-
920 F	29.8	45.8	42.8	-
921 G	31.3	45.3	42.3	-
921 F	31.3	45.6	42.6	-
922 G	33.4	45.3	42.3	-
922 F	33.4	45.5	42.5	-

923 G	34.8	45.1	42.1	-
923 F	34.8	45.2	42.2	-
924 G	36.3	44.9	41.9	-
924 F	36.3	45.1	42.1	-
925 G	21.8	45.9	42.9	-
925 F	21.8	46.1	43.1	-
926 G	25.8	45.1	42.1	-
926 F	25.8	45.3	42.3	-
927 G	19.5	44.9	41.9	-
927 F	19.5	45.2	42.2	-

No further acoustic treatment is needed for lots within Stage 9.

Table 14: Predicted Noise Levels – Stage 11

Lot / Floor Level	Pad Level (m AHD)	Predicted $L_{eq,\ 1\ hour}$ Day (7am – 10pm)	Predicted $L_{eq,\ 1\ hour}$ Night (10pm – 7am)	Further Assessment Needed:
1101 G	77.3	52.8	49.8	-
1101 F	77.3	54.3	51.3	-
1102 G	79.2	54.9	51.9	-
1102 F	79.2	56.6	53.6	Yes
1103 G	81.6	58.4	55.4	Yes
1103 F	81.6	59.9	56.9	Yes
1104 G	81.5	61.8	58.8	Yes
1104 F	81.5	63.4	60.4	Yes
1105 G	74.6	60.6	57.6	Yes
1105 F	74.6	62.9	59.9	Yes
1106 G	73.0	56.5	53.5	Yes
1106 F	73.0	59.1	56.1	Yes
1107 G	71.2	54.3	51.3	-
1107 F	71.2	56.3	53.3	Yes

Noise levels are predicted to be above the criteria at Stage 11 lots in some instances. Details of the acoustic requirements for these lots is outlined in Section 7.

7. Recommendations

Road traffic noise levels in this report were modelled with no acoustic barriers. Previous modelling undertaken with the inclusion of acoustic barriers along the Fraser Drive frontage indicated that noise levels in some instances were still predicted to be above the criteria, by using practical barrier heights (between 1.8m – 2.2m high). Due to responses received by Council and public submitters relating to visual issues associated with barriers, we suggest that inclusion of acoustic fences is not practical if full compliance cannot be achieved. Therefore the recommendations contained in this final report are based on no acoustic barriers.

The following recommendations should be implemented for predicted compliance with the noise criteria.

7.1 Acoustic Assessment of Noise Affected Lots

Individual dwellings on noise affected lots will require further acoustic assessment in accordance with the internal sound requirements of the *Infrastructure SEPP*.

Table 15 presents the lots requiring further assessment once the architectural plans are available for each dwelling. Refer to Section 6.4 for the predicted noise levels.

The internal design criteria is 35 dB(A) L_{eq} for bedrooms during the night period and 40 dB(A) L_{eq} for other habitable rooms at all times.

Table 15: Lots Requring Further Acoustic Assessment

Lot	Acoustic Assessment Required for the Ground Floor of Dwelling	Acoustic Assessment Required for the First Floor of Dwelling
122	Yes	Yes
123	Yes	Yes
124	No	Yes
125	No	Yes
126	No	Yes
127	No	Yes
128	No	Yes
129	No	Yes
130	No	Yes

Lot	Acoustic Assessment Required for the Ground Floor of Dwelling	Acoustic Assessment Required for the First Floor of Dwelling
131	Yes	Yes
132	Yes	Yes
133	Yes	Yes
134	Yes	Yes
135	Yes	Yes
136	Yes	Yes
201	Yes	Yes
202	Yes	Yes
203	Yes	Yes
204	Yes	Yes
205	Yes	Yes
206	Yes	Yes
207	Yes	Yes
301	Yes	Yes
302	Yes	Yes
303	No	Yes
1102	No	Yes
1103	Yes	Yes
1104	Yes	Yes
1105	Yes	Yes
1106	Yes	Yes
1107	No	Yes

Should any three storey dwellings be proposed on noise affected lots we recommend that noise levels for the third floor level are modelled as part of the individual noise assessment.

7.2 Proposed Restriction on Use Under Section 88B of the Conveyancing Act, 1919-1964

To ensure that purchasers of noise affected lots are aware of the need to obtain their own Acoustic Assessment to accompany a Development Application or Complying Development Certificate Application, the following Restriction on Use is proposed:

Future dwellings on noise affected lots identified in the acoustic report prepared by TTM (ttm ref: 11GCA0048 R01_7) dated April 2013 are to be designed in accordance with the procedures of Australian Standard AS3671:1989 'Acoustics – Road Traffic Noise Intrusion – Building Siting and Construction' to achieve the internal sound levels outlined in SEPP (Infrastructure) 2007 – Regulation 102, which are reproduced in Section 4.2 of the TTM report.

Purchasers of noise affected lots will be responsible for obtaining an Acoustic Assessment from an Acoustic Consultant and shall construct their dwellings in accordance with the recommendations contained in the Assessment Report.

7.3 Expected Dwelling Acoustic Building Treatments

The required acoustic treatment for a dwelling on a noise affected lot will vary depending on the noise impact level, orientation of rooms, and surface area of glazing compared to floor area. Purchasers of noise affected lots will be responsible for obtaining an Acoustic Assessment from an Acoustic Consultant and shall construct their dwellings in accordance with the recommendations contained in the Assessment Report.

Table 16 provides an indication of the required acoustic treatments for a dwelling based on the highest predicted noise level at the development and potential house design.

Table 16: Indicative R_W Requirements

Room Type	Area of Glazing (m^2)	Floor Area (m^2)	Glazing R_W	Wall R_W	Ceiling/Roof R_W
Living	5.0	35.0	29	38	37
	10.0	35.0	32	38	37
	15.0	35.0	34	37	37
	20.0	35.0	35	36	37
Bedroom	1.0	9.0	28	39	38
	2.0	9.0	31	39	38
	4.0	9.0	34	38	38
	8.0	9.0	37	36	38

Table 17 presents the indicative acoustic treatments based on the R_W requirements listed in Table 16.

Table 17: Indicative Acoustic Treatments Based on R_W Requirement

R_W	Indicative Glazing Treatment	Indicative Wall Treatment	Indicative Ceiling/Roof Treatment
27	4mm, with acoustic seals	-	-
28	5mm, with acoustic seals	-	-
29	6mm, with acoustic seals	-	-
30-31	6.38mm laminate, with acoustic seals	-	-
32-35	10.38mm laminate, with acoustic seals	Standard	Standard
37	11.52mm laminate glass with acoustic seals, OR a double glazed solution	-	-
40	n/a	Standard with insulation for lightweight walls	Standard with insulation

8. Conclusion

A road traffic noise assessment has been conducted of the Altitude Aspire residential subdivision at Fraser Drive Terranora.

To minimise adverse impacts on the landscape and scenic quality of the locality, it is not proposed to erect an acoustic fence on the Fraser Drive frontage of the site.

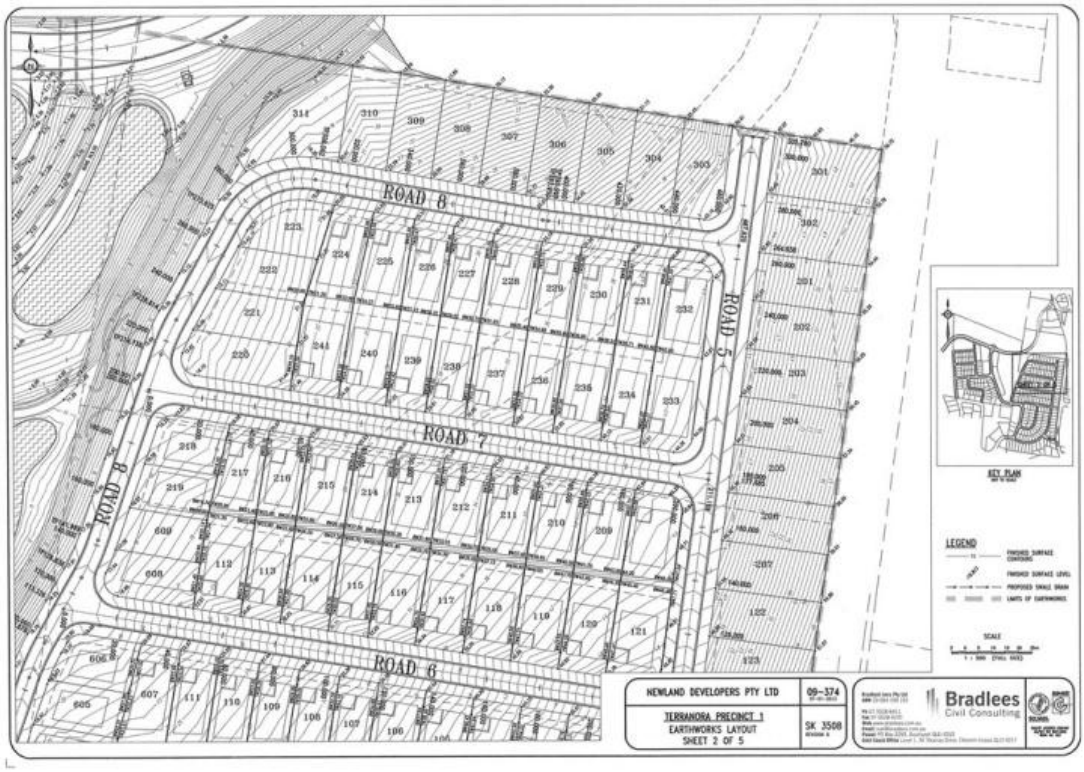
Future road traffic noise levels are predicted to be above the criteria in some instances, for lots fronting Fraser Drive. Given that full noise compliance cannot be achieved using practical barrier heights, it is recommended that the required noise attenuation is achieved through individual building design and treatment.

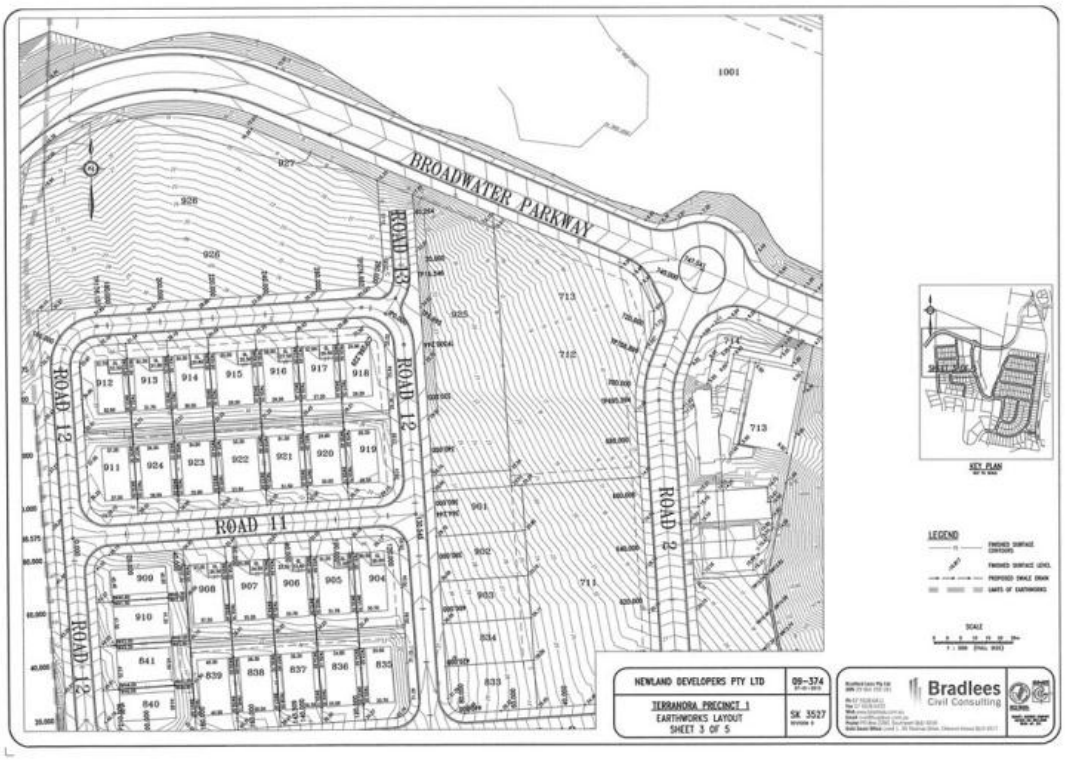
Recommendations have been specified to undertake individual assessment of noise affected lots once building plans are available to ensure dwellings are designed in accordance with the internal noise levels outlined in the *Infrastructure SEPP*.

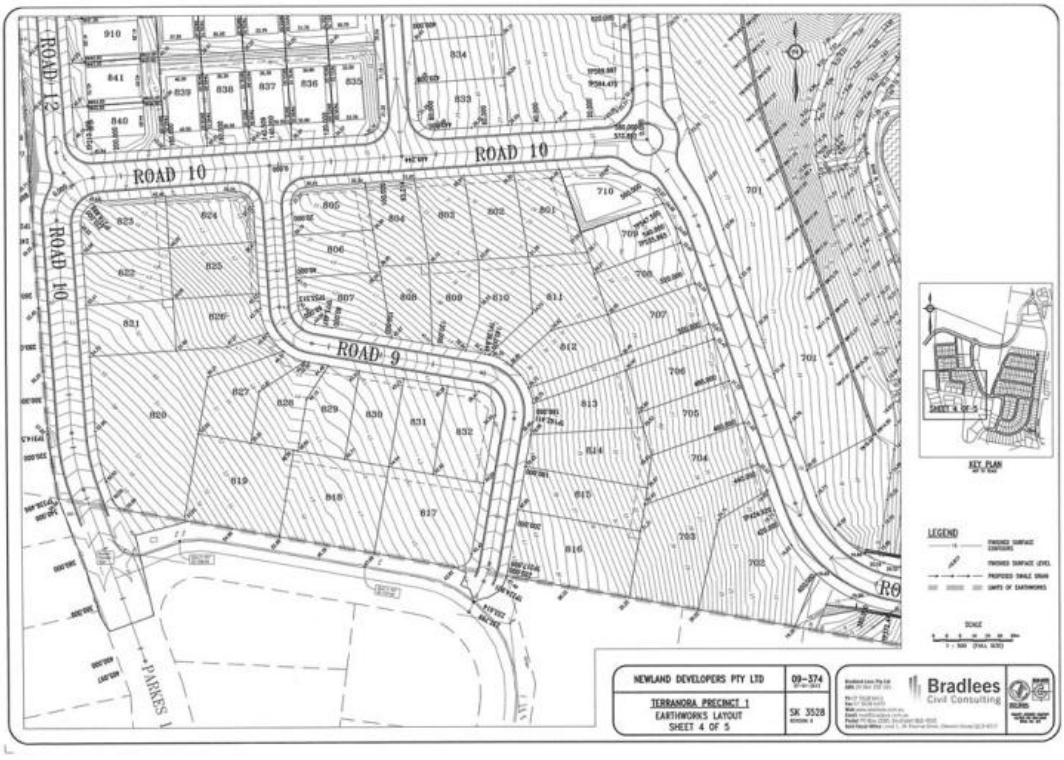
If you should have any further questions, please do not hesitate to contact us.

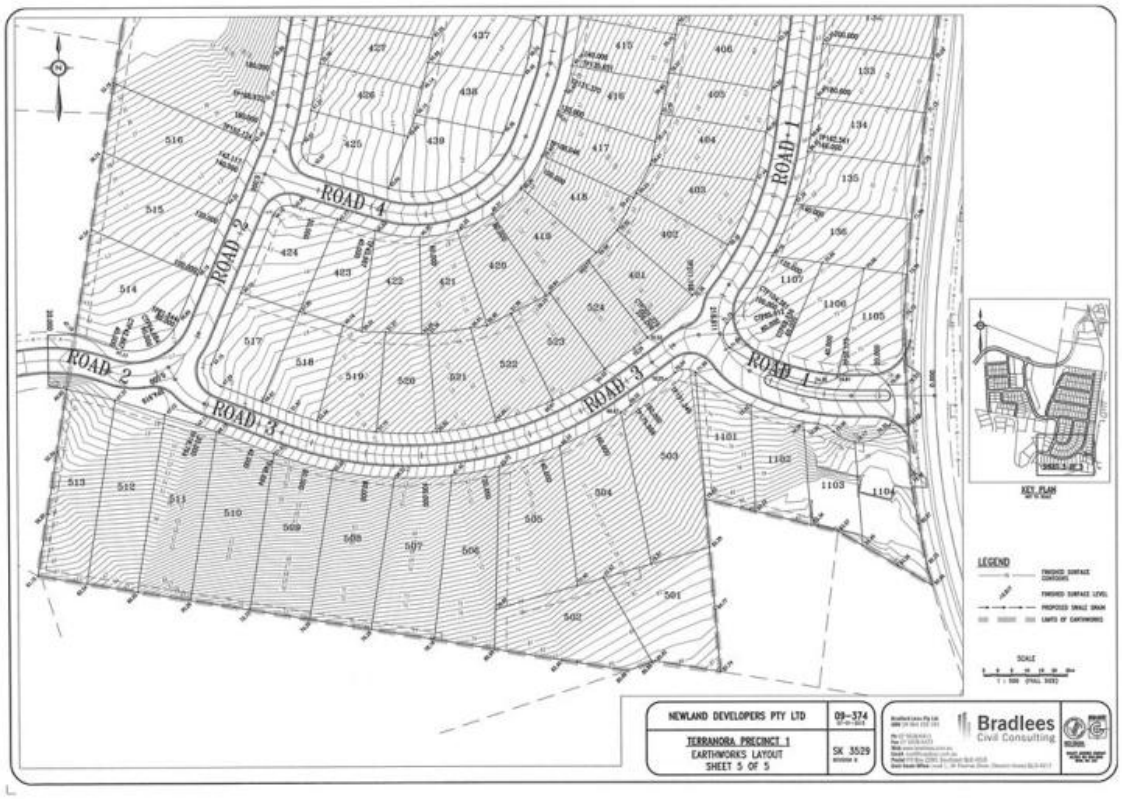
Appendix A

DEVELOPMENT PLANS



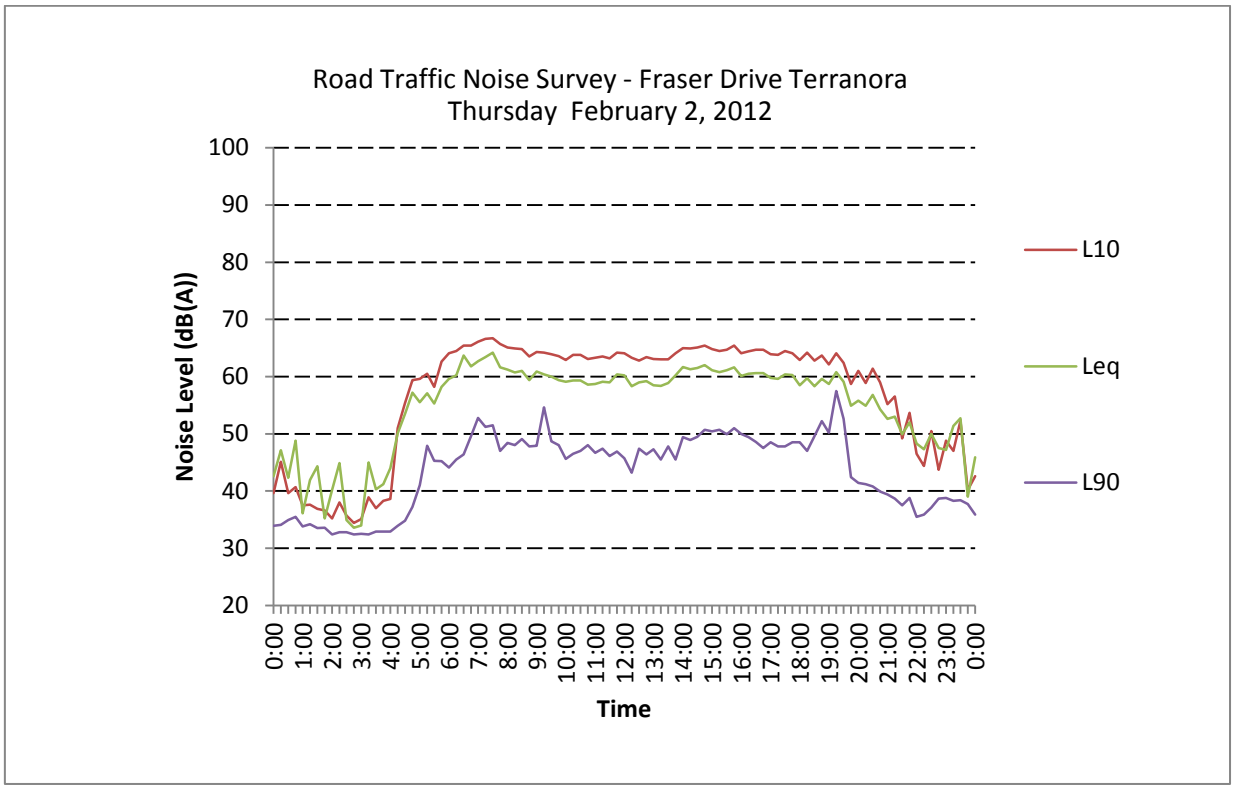


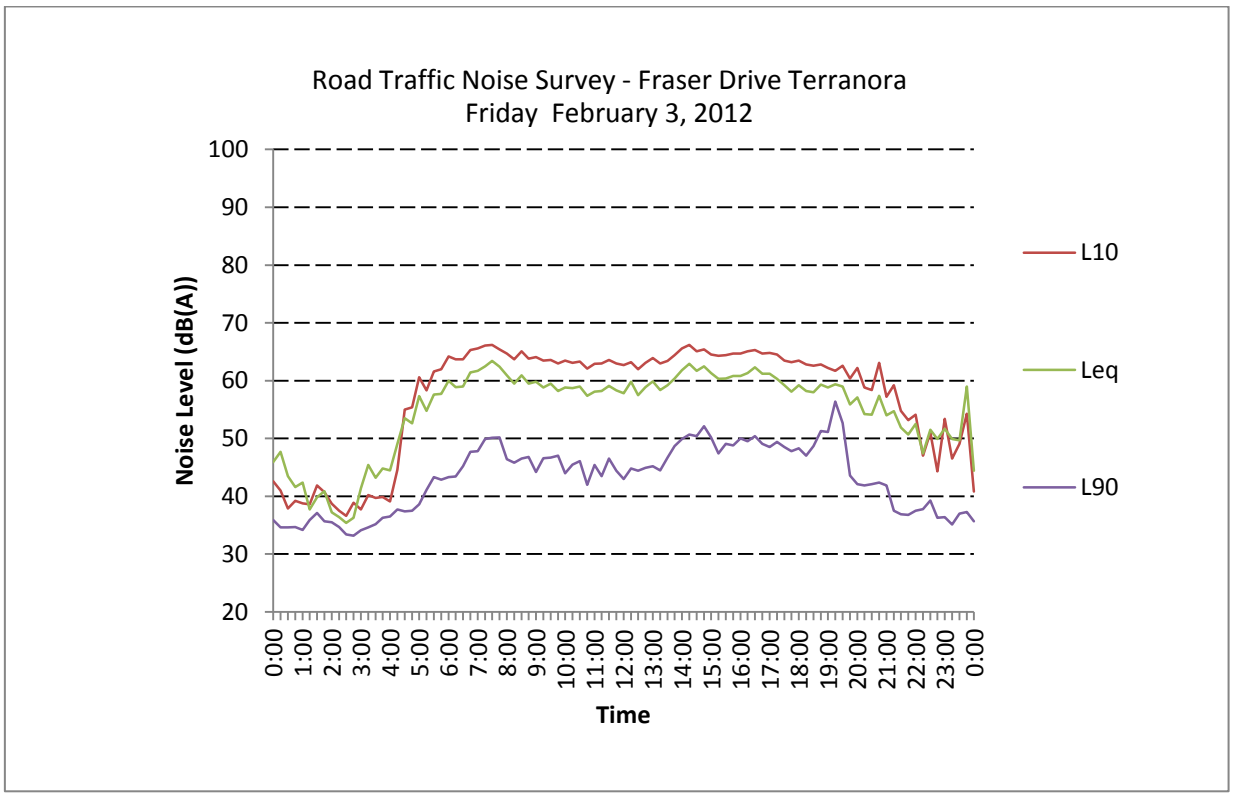




Appendix B

NOISE MONITORING GRAPHS





Appendix C

SOUNDPLAN MODEL OUTPUTS

Altitude Aspire
Assessed receiver levels - "M02 Model Verification.sit"
"RDGM0001.dgm"

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Name	Floor	L10(18h) dB(A)
Logger	1. Floor	62.0
Old logger	1. Floor	70.3

Altitude Aspire
Road traffic noise assessment -
M07 Future Prediction - Receiver Points - No Barriers

Location	Floor level	Natural Surface Level RL m	LA10 (18 hour) (Free Field) dB(A)
101	Level 1	50.71	52.2
101	Level 2	50.71	53.4
102	Level 1	48.50	51.5
102	Level 2	48.50	52.5
103	Level 1	45.68	50.7
103	Level 2	45.68	51.6
104	Level 1	42.69	50.0
104	Level 2	42.69	50.8
105	Level 1	40.09	49.4
105	Level 2	40.09	50.2
106	Level 1	37.16	48.8
106	Level 2	37.16	49.5
107	Level 1	34.48	48.3
107	Level 2	34.48	49.0
108	Level 1	32.04	47.8
108	Level 2	32.04	48.6
109	Level 1	29.60	47.4
109	Level 2	29.60	48.1
110	Level 1	27.33	47.0
110	Level 2	27.33	47.7
111	Level 1	24.91	46.5
111	Level 2	24.91	47.2
112	Level 1	22.87	47.1
112	Level 2	22.87	47.8
113	Level 1	25.47	47.6
113	Level 2	25.47	48.3
114	Level 1	28.00	48.0
114	Level 2	28.00	48.7
115	Level 1	30.79	48.5
115	Level 2	30.79	49.2
116	Level 1	33.40	49.1
116	Level 2	33.40	49.8
117	Level 1	36.26	49.7
117	Level 2	36.26	50.4
118	Level 1	39.28	50.4
118	Level 2	39.28	51.2
119	Level 1	42.12	51.1
119	Level 2	42.12	52.0

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SoundPLAN 6.5

Altitude Aspire
Road traffic noise assessment -
M07 Future Prediction - Receiver Points - No Barriers

Location	Floor level	Natural Surface Level RL m	LA10 (18 hour) (Free Field) dB(A)
120	Level 1	45.11	51.9
120	Level 2	45.11	53.1
121	Level 1	47.50	52.7
121	Level 2	47.50	54.1
122	Level 1	54.30	56.7
122	Level 2	54.30	60.1
123	Level 1	55.61	56.2
123	Level 2	55.61	59.6
124	Level 1	56.52	55.4
124	Level 2	56.52	58.9
125	Level 1	57.67	55.0
125	Level 2	57.67	58.5
126	Level 1	59.00	54.9
126	Level 2	59.00	58.5
127	Level 1	60.03	54.8
127	Level 2	60.03	58.8
128	Level 1	60.68	54.5
128	Level 2	60.68	58.5
129	Level 1	62.09	55.1
129	Level 2	62.09	59.7
130	Level 1	63.22	55.5
130	Level 2	63.22	60.0
131	Level 1	64.71	56.5
131	Level 2	64.71	60.3
132	Level 1	65.82	57.1
132	Level 2	65.82	60.2
133	Level 1	67.07	57.3
133	Level 2	67.07	60.3
134	Level 1	68.50	57.7
134	Level 2	68.50	60.8
135	Level 1	69.43	57.6
135	Level 2	69.43	60.6
136	Level 1	70.60	57.6
136	Level 2	70.60	60.5
201	Level 1	49.56	58.1
201	Level 2	49.56	62.4
202	Level 1	50.19	58.0
202	Level 2	50.19	62.1

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Altitude Aspire
Road traffic noise assessment -
M07 Future Prediction - Receiver Points - No Barriers

Location	Floor level	Natural Surface Level RL m	LA10 (18 hour) (Free Field) dB(A)
203	Level 1	50.61	58.0
203	Level 2	50.61	62.4
204	Level 1	51.24	58.0
204	Level 2	51.24	62.7
205	Level 1	52.08	58.1
205	Level 2	52.08	62.8
206	Level 1	52.78	57.8
206	Level 2	52.78	61.9
207	Level 1	53.81	57.8
207	Level 2	53.81	61.7
208	Level 1	44.64	52.8
208	Level 2	44.64	54.2
209	Level 1	42.08	51.8
209	Level 2	42.08	53.0
210	Level 1	39.60	51.1
210	Level 2	39.60	52.0
211	Level 1	36.62	50.3
211	Level 2	36.62	51.1
212	Level 1	33.77	49.7
212	Level 2	33.77	50.5
213	Level 1	31.11	49.1
213	Level 2	31.11	49.8
214	Level 1	28.33	48.5
214	Level 2	28.33	49.3
215	Level 1	25.57	47.9
215	Level 2	25.57	48.7
216	Level 1	23.09	47.4
216	Level 2	23.09	48.3
217	Level 1	20.69	47.1
217	Level 2	20.69	47.8
218	Level 1	17.57	46.7
218	Level 2	17.57	47.5
219	Level 1	18.79	46.7
219	Level 2	18.79	47.5
220	Level 1	18.81	47.4
220	Level 2	18.81	48.2
221	Level 1	18.36	47.5
221	Level 2	18.36	48.3

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Altitude Aspire
Road traffic noise assessment -
M07 Future Prediction - Receiver Points - No Barriers

Location	Floor level	Natural Surface Level RL m	LA10 (18 hour) (Free Field) dB(A)
222	Level 1	18.30	47.7
222	Level 2	18.30	48.6
223	Level 1	18.90	48.2
223	Level 2	18.90	49.0
224	Level 1	22.56	48.6
224	Level 2	22.56	49.4
225	Level 1	25.23	49.1
225	Level 2	25.23	50.0
226	Level 1	27.75	49.6
226	Level 2	27.75	50.6
227	Level 1	30.23	50.2
227	Level 2	30.23	51.1
228	Level 1	32.78	50.9
228	Level 2	32.78	51.8
229	Level 1	35.19	51.3
229	Level 2	35.19	52.3
230	Level 1	37.86	52.1
230	Level 2	37.86	53.3
231	Level 1	40.35	53.0
231	Level 2	40.35	54.3
232	Level 1	42.91	54.1
232	Level 2	42.91	55.8
233	Level 1	43.42	53.6
233	Level 2	43.42	55.3
234	Level 1	40.58	52.5
234	Level 2	40.58	53.9
235	Level 1	38.11	51.7
235	Level 2	38.11	52.8
236	Level 1	35.46	50.9
236	Level 2	35.46	51.9
237	Level 1	33.05	50.4
237	Level 2	33.05	51.4
238	Level 1	30.43	49.8
238	Level 2	30.43	50.7
239	Level 1	28.09	49.3
239	Level 2	28.09	50.1
240	Level 1	25.57	48.7
240	Level 2	25.57	49.6

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Altitude Aspire
Road traffic noise assessment -
M07 Future Prediction - Receiver Points - No Barriers

Location	Floor level	Natural Surface Level RL m	LA10 (18 hour) (Free Field) dB(A)
241	Level 1	22.63	48.1
241	Level 2	22.63	49.0
301	Level 1	47.89	60.2
301	Level 2	47.89	63.6
302	Level 1	48.63	58.7
302	Level 2	48.63	62.8
303	Level 1	41.21	54.9
303	Level 2	41.21	56.5
304	Level 1	37.79	53.3
304	Level 2	37.79	54.6
305	Level 1	34.22	52.2
305	Level 2	34.22	53.4
306	Level 1	30.74	51.2
306	Level 2	30.74	52.3
307	Level 1	27.80	50.5
307	Level 2	27.80	51.8
308	Level 1	25.30	50.1
308	Level 2	25.30	51.1
309	Level 1	22.75	49.7
309	Level 2	22.75	50.5
310	Level 1	20.77	49.4
310	Level 2	20.77	50.0
311	Level 1	17.65	48.8
311	Level 2	17.65	49.6
401	Level 1	66.79	50.3
401	Level 2	66.79	51.9
402	Level 1	66.20	51.1
402	Level 2	66.20	52.9
403	Level 1	65.17	51.8
403	Level 2	65.17	53.7
404	Level 1	63.69	52.0
404	Level 2	63.69	53.9
405	Level 1	62.62	52.2
405	Level 2	62.62	54.1
406	Level 1	61.51	52.3
406	Level 2	61.51	54.2
407	Level 1	59.80	51.9
407	Level 2	59.80	53.6

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Altitude Aspire
Road traffic noise assessment -
M07 Future Prediction - Receiver Points - No Barriers

Location	Floor level	Natural Surface Level RL m	LA10 (18 hour) (Free Field) dB(A)
408	Level 1	58.71	51.9
408	Level 2	58.71	53.6
409	Level 1	57.76	52.1
409	Level 2	57.76	53.7
410	Level 1	54.33	50.8
410	Level 2	54.33	52.0
411	Level 1	50.79	49.6
411	Level 2	50.79	50.7
412	Level 1	47.23	48.6
412	Level 2	47.23	49.6
413	Level 1	51.25	49.2
413	Level 2	51.25	50.2
414	Level 1	52.34	48.9
414	Level 2	52.34	50.1
415	Level 1	53.32	48.5
415	Level 2	53.32	49.8
416	Level 1	54.30	48.1
416	Level 2	54.30	49.5
417	Level 1	55.33	47.5
417	Level 2	55.33	48.9
418	Level 1	56.25	47.3
418	Level 2	56.25	48.7
419	Level 1	56.27	46.9
419	Level 2	56.27	48.2
420	Level 1	54.18	46.2
420	Level 2	54.18	47.2
421	Level 1	51.85	45.8
421	Level 2	51.85	46.7
422	Level 1	49.32	45.5
422	Level 2	49.32	46.2
423	Level 1	47.22	45.3
423	Level 2	47.22	45.9
424	Level 1	45.57	45.3
424	Level 2	45.57	45.9
425	Level 1	44.20	45.9
425	Level 2	44.20	46.6
426	Level 1	43.82	46.4
426	Level 2	43.82	47.0

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Altitude Aspire
Road traffic noise assessment -
M07 Future Prediction - Receiver Points - No Barriers

Location	Floor level	Natural Surface Level RL m	LA10 (18 hour) (Free Field) dB(A)
427	Level 1	42.86	46.6
427	Level 2	42.86	47.2
428	Level 1	41.63	46.6
428	Level 2	41.63	47.3
429	Level 1	40.19	46.7
429	Level 2	40.19	47.4
430	Level 1	38.12	46.6
430	Level 2	38.12	47.4
431	Level 1	34.18	46.4
431	Level 2	34.18	47.2
432	Level 1	37.76	47.1
432	Level 2	37.76	47.8
433	Level 1	40.87	47.7
433	Level 2	40.87	48.5
434	Level 1	43.37	48.3
434	Level 2	43.37	49.1
435	Level 1	44.81	48.0
435	Level 2	44.81	48.8
436	Level 1	46.26	47.9
436	Level 2	46.26	48.7
437	Level 1	47.41	47.6
437	Level 2	47.41	48.3
438	Level 1	48.20	47.2
438	Level 2	48.20	48.0
439	Level 1	47.41	46.4
439	Level 2	47.41	47.2
440	Level 1	53.37	51.9
440	Level 2	53.37	53.2
441	Level 1	51.27	51.2
441	Level 2	51.27	52.3
442	Level 1	48.88	50.6
442	Level 2	48.88	51.5
443	Level 1	46.17	49.8
443	Level 2	46.17	50.7
444	Level 1	43.20	49.2
444	Level 2	43.20	50.0
445	Level 1	40.32	48.6
445	Level 2	40.32	49.4

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Altitude Aspire
Road traffic noise assessment -
M07 Future Prediction - Receiver Points - No Barriers

Location	Floor level	Natural Surface Level RL m	LA10 (18 hour) (Free Field) dB(A)
446	Level 1	37.63	48.1
446	Level 2	37.63	48.8
447	Level 1	35.23	47.6
447	Level 2	35.23	48.3
448	Level 1	33.09	47.3
448	Level 2	33.09	48.0
449	Level 1	30.66	46.9
449	Level 2	30.66	47.5
450	Level 1	28.29	46.3
450	Level 2	28.29	47.0
451	Level 1	32.38	45.1
451	Level 2	32.38	45.8
501	Level 1	84.30	50.6
501	Level 2	84.30	52.0
502	Level 1	82.33	49.0
502	Level 2	82.33	49.9
503	Level 1	76.84	50.9
503	Level 2	76.84	52.2
504	Level 1	74.36	48.6
504	Level 2	74.36	49.9
505	Level 1	72.42	47.5
505	Level 2	72.42	48.7
506	Level 1	71.33	46.8
506	Level 2	71.33	47.8
507	Level 1	69.23	46.8
507	Level 2	69.23	47.6
508	Level 1	66.76	46.5
508	Level 2	66.76	47.1
509	Level 1	64.19	46.2
509	Level 2	64.19	46.8
510	Level 1	61.56	45.9
510	Level 2	61.56	46.4
511	Level 1	58.50	45.4
511	Level 2	58.50	46.0
512	Level 1	56.73	45.2
512	Level 2	56.73	45.8
513	Level 1	55.24	45.0
513	Level 2	55.24	45.4

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Altitude Aspire
Road traffic noise assessment -
M07 Future Prediction - Receiver Points - No Barriers

Location	Floor level	Natural Surface Level RL m	LA10 (18 hour) (Free Field) dB(A)
514	Level 1	45.73	45.1
514	Level 2	45.73	45.6
515	Level 1	43.32	45.4
515	Level 2	43.32	45.9
516	Level 1	39.89	45.3
516	Level 2	39.89	45.9
517	Level 1	48.76	45.1
517	Level 2	48.76	45.6
518	Level 1	51.39	45.3
518	Level 2	51.39	45.9
519	Level 1	53.51	45.5
519	Level 2	53.51	46.3
520	Level 1	56.45	45.9
520	Level 2	56.45	46.8
521	Level 1	58.84	46.3
521	Level 2	58.84	47.4
522	Level 1	62.02	47.1
522	Level 2	62.02	48.1
523	Level 1	64.46	48.2
523	Level 2	64.46	49.4
524	Level 1	65.94	49.1
524	Level 2	65.94	50.5
601	Level 1	26.23	46.0
601	Level 2	26.23	46.7
602	Level 1	24.68	45.7
602	Level 2	24.68	46.2
603	Level 1	22.78	45.8
603	Level 2	22.78	46.3
604	Level 1	22.17	46.0
604	Level 2	22.17	46.6
605	Level 1	20.73	46.0
605	Level 2	20.73	46.6
606	Level 1	19.37	46.0
606	Level 2	19.37	46.6
607	Level 1	22.89	46.2
607	Level 2	22.89	46.9
608	Level 1	19.86	46.6
608	Level 2	19.86	47.3

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Altitude Aspire
Road traffic noise assessment -
M07 Future Prediction - Receiver Points - No Barriers

Location	Floor level	Natural Surface Level RL m	LA10 (18 hour) (Free Field) dB(A)
609	Level 1	19.61	46.6
609	Level 2	19.61	47.4
701	Level 1	18.69	45.7
701	Level 2	18.69	46.0
702	Level 1	23.28	45.1
702	Level 2	23.28	45.4
703	Level 1	27.81	45.6
703	Level 2	27.81	45.8
704	Level 1	25.74	45.6
704	Level 2	25.74	45.8
705	Level 1	26.35	45.7
705	Level 2	26.35	46.0
706	Level 1	26.78	45.8
706	Level 2	26.78	46.1
707	Level 1	27.20	46.0
707	Level 2	27.20	46.2
708	Level 1	26.19	45.9
708	Level 2	26.19	46.2
709	Level 1	25.82	46.0
709	Level 2	25.82	46.2
710	Level 1	24.23	45.8
710	Level 2	24.23	46.1
711	Level 1	23.26	46.0
711	Level 2	23.26	46.3
712	Level 1	16.16	45.9
712	Level 2	16.16	46.1
713	Level 1	9.50	46.1
713	Level 2	9.50	46.5
801	Level 1	28.25	45.8
801	Level 2	28.25	46.1
802	Level 1	30.59	45.8
802	Level 2	30.59	46.0
803	Level 1	32.75	45.7
803	Level 2	32.75	45.9
804	Level 1	35.73	45.6
804	Level 2	35.73	45.8
805	Level 1	36.68	45.4
805	Level 2	36.68	45.6

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Altitude Aspire
Road traffic noise assessment -
M07 Future Prediction - Receiver Points - No Barriers

Location	Floor level	Natural Surface Level RL m	LA10 (18 hour) (Free Field) dB(A)
806	Level 1	39.33	45.4
806	Level 2	39.33	45.6
807	Level 1	42.25	45.5
807	Level 2	42.25	45.7
808	Level 1	40.24	45.8
808	Level 2	40.24	45.9
809	Level 1	38.16	45.8
809	Level 2	38.16	46.0
810	Level 1	36.36	45.9
810	Level 2	36.36	46.1
811	Level 1	32.70	46.0
811	Level 2	32.70	46.2
812	Level 1	35.28	46.1
812	Level 2	35.28	46.3
813	Level 1	35.22	46.0
813	Level 2	35.22	46.3
814	Level 1	35.26	45.9
814	Level 2	35.26	46.1
815	Level 1	36.68	45.8
815	Level 2	36.68	46.0
816	Level 1	38.35	45.7
816	Level 2	38.35	46.0
817	Level 1	44.24	45.5
817	Level 2	44.24	45.6
818	Level 1	48.73	45.2
818	Level 2	48.73	45.4
819	Level 1	53.22	45.0
819	Level 2	53.22	45.2
820	Level 1	56.32	44.8
820	Level 2	56.32	44.9
821	Level 1	52.33	44.8
821	Level 2	52.33	44.9
822	Level 1	49.75	44.8
822	Level 2	49.75	44.9
823	Level 1	46.75	44.7
823	Level 2	46.75	44.9
824	Level 1	42.72	44.9
824	Level 2	42.72	45.1

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Altitude Aspire
Road traffic noise assessment -
M07 Future Prediction - Receiver Points - No Barriers

Location	Floor level	Natural Surface Level RL m	LA10 (18 hour) (Free Field) dB(A)
825	Level 1	45.03	44.9
825	Level 2	45.03	45.1
826	Level 1	47.77	45.1
826	Level 2	47.77	45.2
827	Level 1	49.30	45.1
827	Level 2	49.30	45.3
828	Level 1	46.85	45.2
828	Level 2	46.85	45.3
829	Level 1	45.85	45.3
829	Level 2	45.85	45.5
830	Level 1	44.55	45.5
830	Level 2	44.55	45.7
831	Level 1	42.50	45.6
831	Level 2	42.50	45.8
832	Level 1	40.55	45.6
832	Level 2	40.55	45.8
833	Level 1	29.23	45.8
833	Level 2	29.23	46.0
834	Level 1	29.11	45.8
834	Level 2	29.11	46.0
835	Level 1	33.50	45.6
835	Level 2	33.50	45.8
836	Level 1	34.81	45.4
836	Level 2	34.81	45.6
837	Level 1	36.39	45.3
837	Level 2	36.39	45.5
838	Level 1	38.28	45.1
838	Level 2	38.28	45.3
839	Level 1	40.37	45.0
839	Level 2	40.37	45.2
840	Level 1	44.69	44.9
840	Level 2	44.69	45.0
841	Level 1	43.50	44.9
841	Level 2	43.50	45.0
901	Level 1	27.25	45.9
901	Level 2	27.25	46.2
902	Level 1	28.32	45.9
902	Level 2	28.32	46.1

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Altitude Aspire
Road traffic noise assessment -
M07 Future Prediction - Receiver Points - No Barriers

Location	Floor level	Natural Surface Level RL m	LA10 (18 hour) (Free Field) dB(A)
903	Level 1	29.25	45.9
903	Level 2	29.25	46.1
904	Level 1	30.73	45.5
904	Level 2	30.73	45.7
905	Level 1	31.72	45.3
905	Level 2	31.72	45.5
906	Level 1	33.71	45.3
906	Level 2	33.71	45.5
907	Level 1	35.25	45.1
907	Level 2	35.25	45.3
908	Level 1	37.17	45.0
908	Level 2	37.17	45.2
909	Level 1	40.23	44.9
909	Level 2	40.23	45.0
910	Level 1	41.43	44.8
910	Level 2	41.43	45.0
911	Level 1	37.27	44.8
911	Level 2	37.27	45.0
912	Level 1	32.66	44.7
912	Level 2	32.66	44.8
913	Level 1	31.60	44.7
913	Level 2	31.60	45.0
914	Level 1	30.22	44.9
914	Level 2	30.22	45.2
915	Level 1	29.08	45.1
915	Level 2	29.08	45.4
916	Level 1	28.07	45.2
916	Level 2	28.07	45.5
917	Level 1	27.09	45.4
917	Level 2	27.09	45.7
918	Level 1	26.00	45.6
918	Level 2	26.00	45.8
919	Level 1	28.18	45.6
919	Level 2	28.18	45.8
920	Level 1	29.79	45.5
920	Level 2	29.79	45.8
921	Level 1	31.30	45.3
921	Level 2	31.30	45.6

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Altitude Aspire
Road traffic noise assessment -
M07 Future Prediction - Receiver Points - No Barriers

Location	Floor level	Natural Surface Level RL m	LA10 (18 hour) (Free Field) dB(A)
922	Level 1	33.37	45.3
922	Level 2	33.37	45.5
923	Level 1	34.78	45.1
923	Level 2	34.78	45.2
924	Level 1	36.29	44.9
924	Level 2	36.29	45.1
925	Level 1	21.80	45.9
925	Level 2	21.80	46.1
926	Level 1	25.75	45.1
926	Level 2	25.75	45.3
927	Level 1	19.47	44.9
927	Level 2	19.47	45.2
1101	Level 1	77.25	52.8
1101	Level 2	77.25	54.3
1102	Level 1	79.23	54.9
1102	Level 2	79.23	56.6
1103	Level 1	81.63	58.4
1103	Level 2	81.63	59.9
1104	Level 1	81.54	61.8
1104	Level 2	81.54	63.4
1105	Level 1	74.62	60.6
1105	Level 2	74.62	62.9
1106	Level 1	73.00	56.5
1106	Level 2	73.00	59.1
1107	Level 1	71.23	54.3
1107	Level 2	71.23	56.3