Traffic Noise Impact Assessment

160-224 Daleys Road, Ripley

Orchard (Daleys) Developments Pty Ltd

Project No.: ATP190214

Project Name: 160-224 Daleys Road, Ripley

Document No.: ATP190214-R-TNIA-04

July 2020

Document Control Record

Prepared by:	Sam Fraser
Position:	Senior Engineer – Acoustics
Signed:	
Date:	17 July 2020

Approved by:	Sasho Temelkoski RPEQ 13551
Position:	Managing Director
Signed:	
Date:	17 July 2020

REVISION STATUS

Revision No.	Description of Revision	Date	Approved
0	Issue 1	12 February 2020	Sasho Temelkoski
1	Issue 2	22 May 2020	Sasho Temelkoski
2	Issue 3	2 July 2020	Sasho Temelkoski
3	Issue 4	17 July 2020	Sasho Temelkoski

Recipients are responsible for eliminating all superseded documents in their possession.

atf ATP Engineering Trust
ABN: 95 634 079 845

Gold Coast
34 Lakefront Crescent
Varsity Lakes, QLD 4227
Ph: (07) 5593 0487

Brisbane
Studio 5, 33 Vulture Street
West End QLD 4101
Ph: 0499 015 150

Perth
Suite 59, 102 Railway Street
West Perth WA 6005
Ph: (08) 9265 1400

E-mail: admin@atpconsulting.com.au
Internet: www.atpconsulting.com.au

Executive Summary

ATP Consulting Engineers (ATP) was engaged by Orchard (Daleys) Developments Pty Ltd to prepare a traffic noise impact assessment (TNIA) in support of a DA application for the proposed residential development at 160-224 Daleys Road in Ripley.

This report addresses the noise impact from State-controlled Cunningham Highway, which runs along the northern boundary of the proposed development.

This is Issue 4 of the report which addresses the comments from Economic Development Queensland (EDQ), as presented by Ipswich City Council (ICC) in the email correspondence dated 16 July 2020. The report includes clarification about the earthworks model which has been used and shows pad levels on the noise barrier figures. It should be noted that the previous report referred to an earthworks model dated 25 June 2020, however this was an error. The latest model is actually dated 17 April 2020 (Project number 18-0016, drawing numbers P102 to 107, Revision 2).

Previously, Issue 3 of the report addressed the comments from Department of Transport and Main Roads (TMR) and EDQ, as presented by ICC in the information request dated 23 June 2020.

Previously, Issue 2 of the report addressed the comments from TMR and EDQ, as presented by ICC in the information request dated 1 April 2020 and e-mail correspondence dated 1 May 2020. It also addressed the issues raised in telephone conversation on 11 May 2020 with acoustic consultant working on behalf of TMR.

Without noise control measures, the proposed development will be impacted by road traffic noise from Cunningham Highway, as per the traffic flows predicted within a 10-year planning horizon to year 2035.

This assessment has considered two noise barrier options:

Scenario 1 (Recommended):

1.0 m high earth mound and 2.0-5.5 m high noise barrier to achieve compliance with the private open spaces traffic noise criterion of ≤ 60 dB(A) $L_{10,18hr}$ (free-field) at the ground level of all allotments.

Scenario 2 (Not recommended):

1.0 m high earth mound and 2.0-7.0 m high noise barriers to achieve compliance with the private open spaces traffic noise criterion of ≤ 60 dB(A) $L_{10,18hr}$ (free-field) and facade traffic noise criterion of ≤ 60 dB(A) $L_{10,18hr}$ (facade corrected) at the ground level of all allotments.

Acceptable Height of Noise Barrier

Scenario 2 is not appropriate due to the excessive height of the noise barrier (up to 7.0 m high). Refer to Section 6.1 of this report for detailed discussion about acceptable height of noise barrier on this project.

Noise barrier up to 7.0 m high is not an acceptable solution for several reasons:

- Exceeds TMR's design guidelines for maximum height of noise barriers which is 6.0 m (Hall, 2006).
- The 7.0 m high noise barrier would have adverse effects on visual amenity and would not comply with the aesthetic requirements of MRTS15 Noise Fences or Chapter 7 "*Integrated noise barrier design*" of the TMR CoP Vol. 1.
- It is not technically feasible, reasonable or cost effective to construct a noise barrier to achieve compliance with the facade noise criterion. Where compliance with the facade noise criterion cannot be achieved, the development must as a minimum achieve compliance with the internal noise criteria. This approach is discussed in the TMR document SDAP *Supporting Information – Environmental emissions in a state-controlled road environment*, as well as Chapter 6 of the TMR CoP Vol. 1.
- Due to the site topography relative to Cunningham Highway the effectiveness of the noise barrier is limited, particularly on the eastern side of the development. In accordance with good engineering practice and cost-benefit analysis, further increase in the height of the noise barrier is not justified if there is no significant reduction in the traffic noise levels.
- With the recommended noise barrier (Scenario 1) in place, the calculated traffic noise levels at the ground floor facades correspond to QDCMP4.4 Noise Category 1 and 0. The construction requirements for Noise Category 1 are relatively minor and can be readily implemented, while under Noise Category 0 there is no need for acoustic upgrade to the facades. There is limited benefit in further increasing the height of the noise barrier.

Recommended Noise Mitigation Strategy

The proposed development must be constructed with the following traffic noise mitigation measures, corresponding to Scenario 1 of this report:

(i) A 2.0-5.5 m high noise barrier located on top of the earth mound along the northern allotment boundaries of the lots adjacent to Cunningham Highway, with returns along the full length of the western boundary of Lot 501 and the eastern boundary of Lot 778.

(ii) Proposed development constructed as per the finished surface levels included in the TIN bulk earthworks model of the proposed development by Peak Urban dated 17 April 2020 (Project number 18-0016, drawing numbers P102 to 107, Revision 2). The bulk earthworks model defines finished surface levels (FSL) for the allotments and includes a 1.0 m high earth mound located on the northern lot boundaries of the allotments adjacent to Cunningham Highway.

(iii) Architectural treatment to the building facades of the future dwellings affected by traffic noise. The buildings must be built to comply with acceptable forms of construction from QDC MP4.4, or to be subject of floor plan specific acoustic design as per AS 3671-1989.

The noise barrier must be constructed in accordance with the alignment and RLs presented in Section 4.3.1 of this report (Scenario 1).

The noise barrier must be built to comply with:

- Department of Transport and Main Roads (TMR) Technical Specification *Transport and Main Roads Specifications MRTS15 Noise Fences*, dated March 2019; and
- TMR *Road Traffic Noise Management: Code of Practice*, Chapter 7: Integrated Noise Barrier Design.

The results of the noise propagation modelling confirm that the recommended noise barrier will ensure compliance with the private open spaces traffic noise criterion of ≤ 60 dB(A) $L_{10,18hr}$ (free-field) at the ground level of all allotments.

Whilst the private open spaces criterion will be achieved with the recommended noise barrier, there is a requirement for compliance with QDC MP4.4. The future dwellings, low-set or high-set, which are affected by traffic noise of ≥58dB(A) $L_{10,18hr}$ (facade adjusted), must be constructed as per acceptable forms of construction specified in Schedule 2 of QDC MP4.4.

The future dwellings listed in Table 6.1 of this report are impacted by traffic noise that corresponds with Noise Categories 1, 2 or 3 of QDC MP4.4, therefore architectural treatment is required to the building facades.

There are two options available for architectural treatment to the building facades, as follows:

- **Option 1:** Implementation of the 'acceptable forms of construction' specified in Queensland Development Code (QDC) Mandatory Part 4.4 (*Buildings in a Transport Noise Corridor*) as per the noise categories presented in Table 6.1 of this report.
- **Option 2:** Floor plan specific acoustic design, in accordance with AS3671-1989, to ensure compliance with the internal noise criteria.

Provided the recommended planning and design traffic noise control measures are implemented in the construction of the residential development at 160-224 Daleys Road in Ripley, the road traffic noise from Cunningham Highway will not impose any further constraints on the development.

Table of Contents

Tables

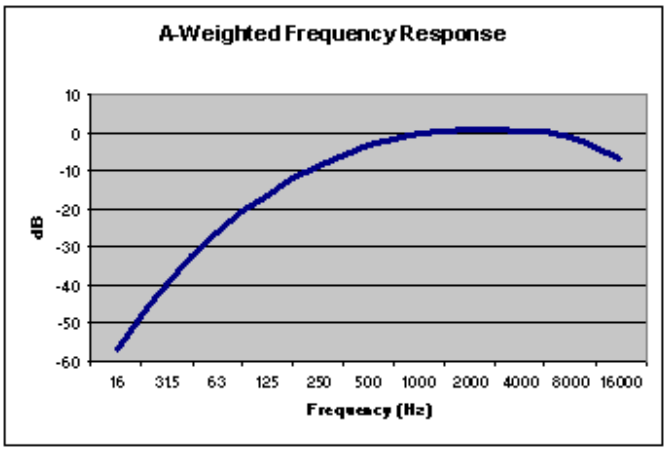
Figures

Appendices

Acoustics Glossary

A-weighting

The A-weighting filter suppresses low frequency sounds and some of the higher frequency sounds to which the human ear is less sensitive. It is a correction to sound pressure levels to mimic the response of the human ear at low sound pressure levels. The A-weighted sound pressure level correlates well with the perceived loudness at low sound levels. The A-weighted sound pressure level is used extensively for general purpose noise measurements.



AADT

Annual average daily traffic. The total traffic flow over a 24-hour period along a specific segment of road.

Broadband sound

Sound distributed across the whole audible frequency range.

dB(A)

The A-weighted sound pressure level.

Façade adjusted

The noise level at 1m from a building façade is calculated by adding 2.5dB to the free-field noise level to account for sound reflected from the building façade. The external noise levels at the buildings façades are “façade-adjusted”.

Fast time-weighting

The Fast (“F”) time-weighting is defined in AS 1259.1-1990. Instruments with F time weighting use a time constant of 125 milliseconds in their exponential averaging circuit.

Free-field

Noise level without any reflected sound from buildings or other hard, reflective surfaces (except for the ground plane).

Hz (Hertz)

Hertz is the standard measure of the frequency of oscillations in a wave motion. The frequency is most often measured in cycles per second (cps) or Hertz (Hz). Frequency of 1 Hz is one cycle per second.

Impulsive noise and impulsiveness adjustment

Noise having a high peak of short duration or a sequence of such peaks. Impulsive noise is present if the difference in A-weighted maximum noise levels between fast response and impulse response is greater than 2dB. Impulsiveness adjustment (penalty) of up to 5dB should be applied to the component noise level.

$L_{Aeq,T}$

“Average-energy” sound level used in situations where sound varies over time. $L_{Aeq,T}$ is the A-weighted sound pressure level that has the same energy as the fluctuating sound over the time period T sec.

$L_{A01,T}$	Measure of the maximum sound level. $L_{A01,T}$ is a statistical parameter that is the A-weighted sound pressure level that is exceeded for 1% of the measurement time T.
$L_{A10,T}$	$L_{A10,T}$ is a statistical parameter that is the A-weighted sound pressure level that is exceeded for 10% of the measurement time T. Used as a traffic noise descriptor in Queensland.
$L_{A10,18hr}$	The arithmetic average of the 18 individual $L_{A10,1hr}$ values between 6:00am and 12:00am (midnight). It is a derived descriptor which is used as a main traffic noise descriptor in the Calculation of Road Traffic Noise (CoRTN) procedure developed by the UK Department of Environment, Welsh Office, HMSO, 1988.
$L_{A90,T}$	Background sound level. $L_{A90,T}$ is a statistical parameter that is the A-weighted sound pressure level that is exceeded for 90% of the measurement time T.
Noise	Unwanted sound.
Octave bands and 1/3 octave bands	A range of frequencies whose upper frequency limit is twice that of its lower frequency limit. In acoustics, the audible spectrum (20Hz to 20kHz) is divided into 10 parts (octaves) with centre frequencies of 31.5Hz, 63Hz, 125Hz, 250Hz, 500Hz, 1kHz, 2kHz, 4kHz, 8kHz and 16kHz. For more detailed frequency analysis, octave bands are further divided into more discrete bands. For examples, 1/3 octaves bands are is where each octave band is divided into three parts. IEC 61260:1995, *Electroacoustics — Octave-band and fractional-octave band filters*
Rating background level (RBL)	The overall single-figure background level representing each assessment period (e.g. standard hours, non-standard hours). The RBL is the background noise level for each work period using the tenth percentile method of measured $L_{A90,15\text{-minute}}$.
Sound power	The sound energy radiated per unit time by a sound source in all directions, measured in Watts (W).
Sound Power Level, L_w (SWL)	The sound power level in decibels (dB) is 10 times the base 10 logarithm of the ratio of the sound power in W to the reference sound power of 1×10^{-12} W (hearing threshold).
Sound pressure	The difference between the pressure caused by a sound wave and the ambient pressure of the medium the sound wave is passing through. Measured in Pascals (Pa).
Sound Pressure Level, L_p (SPL)	The sound power level in decibels (dB) is 20 times the base 10 logarithm of the ratio of the sound pressure in Pa to the reference sound pressure of 2×10^{-5} Pa (hearing threshold).
Tonal noise, tonality and tonality adjustment	Tonal noise is characterised by one or more distinct frequency components (“tones”) that emerge audibly from the total sound. In accordance with the *NSW EPA Noise Policy For Industry* (2017), tonal noise is assessed with one-third octave band analysis using the “objective method for assessing the audibility of tones in noise – simplified method” (ISO 1996.2:2007 – Annex D). Tonal noise is penalised by the addition of up to 5dB to the component noise level.
Weighted Sound Reduction Index (R_w)	A single-number quantity which characterises the airborne sound insulation of a material or building element over a range of frequencies.

1. Introduction

1.1 Project Background

ATP Consulting Engineers (ATP) was engaged by Orchard (Daleys) Developments Pty Ltd to prepare a traffic noise impact assessment (TNIA) in support of a DA application for the proposed residential development at 160-224 Daleys Road in Ripley.

This report addresses the noise impact from State-controlled Cunningham Highway, which runs along the northern boundary of the proposed development.

This is Issue 4 of the report which addresses the comments from Economic Development Queensland (EDQ), as presented by Ipswich City Council (ICC) in the email correspondence dated 16 July 2020. The report includes clarification about the earthworks model which has been used and shows pad levels on the noise barrier figures. It should be noted that the previous report referred to an earthworks model dated 25 June 2020, however this was an error. The latest model is actually dated 17 April 2020 (Project number 18-0016, drawing numbers P102 to 107, Revision 2).

Previously, Issue 3 of the report addressed the comments from Department of Transport and Main Roads (TMR) and EDQ, as presented by ICC in the information request dated 23 June 2020.

Previously, Issue 2 of the report addressed the comments from TMR and EDQ, as presented by ICC in the information request dated 1 April 2020 and e-mail correspondence dated 1 May 2020. It also addressed the issues raised in telephone conversation on 11 May 2020 with acoustic consultant working on behalf of TMR.

1.2 Study Objectives

Study objectives are as follows:

- Site-specific noise measurements using automated noise logger to obtain data on the existing traffic and background noise levels over a typical seven-day period.
- Consideration of the relevant performance outcomes and traffic noise criteria applicable to the proposed development.
- Development of a 3D model (using SoundPLAN software) of the proposed development and the immediate surroundings with consideration of the existing and future (within a 10-year planning horizon) traffic on Cunningham Highway.
- Assessment of traffic noise levels ($L_{10,18hr}$) from Cunningham Highway, within a 10-year planning horizon (2035), considering the traffic noise impact on the facades and the private open spaces of the future dwellings.
- Recommendation of traffic noise mitigation measures based on appropriate screening from traffic noise of the ground floor outdoor private open spaces and acoustic design of the traffic noise affected dwellings on the allotments within the zone of traffic noise impact from Cunningham Highway.

1.3 Site Description

The proposed development is located at 160-224 Daleys Road in Ripley. The development site is described as Lots 3, 5 and 6 on RP180932, covering a total area of 34.156 Ha, within the Ipswich City Council (ICC) local government area.

The site is currently undeveloped and is bordered by Daleys Road to the east, Cunningham Highway to the north and Deebing Creek to the west.

The location of the proposed development is presented in Figure 1.1.

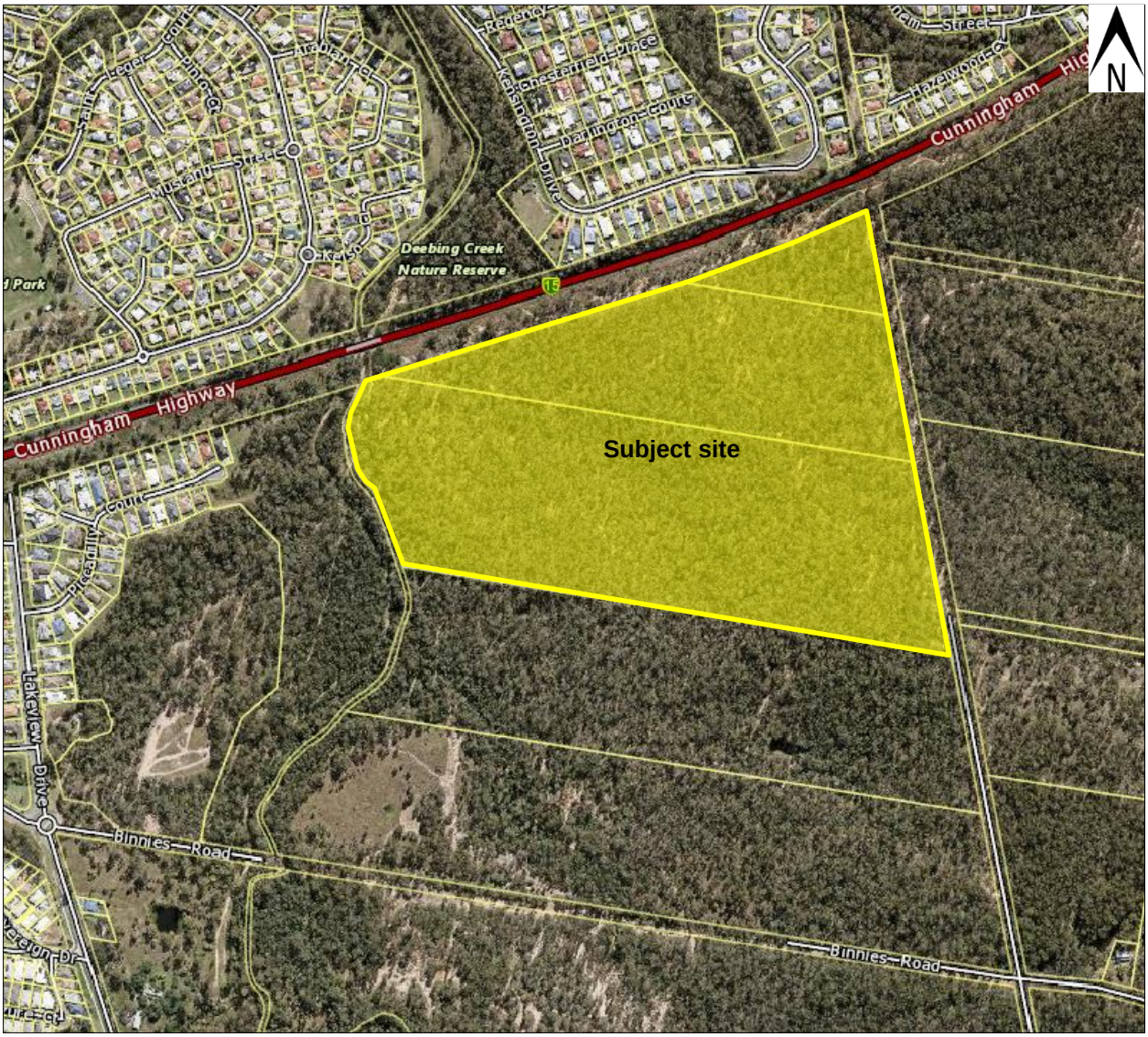


Figure 1.1 Site location

1.4 Proposed Development

The proposed development comprises of 439 residential allotments and is accessed off Daleys Road. The layout of the proposed development is presented in Appendix A.

2. Existing Noise Amenity

2.1 Site-specific Noise Measurements

Noise monitoring was carried out at 160-224 Daleys Road in Ripley to obtain information about the existing traffic and background noise levels.

The noise measurement methodology is summarised in Table 2.1.

Table 2.1 Noise measurements

Relevant legislation, standards and guidelines	The noise measurements were carried out in accordance with: • Australian Standard AS 1055:2018 (*Acoustics – Description and measurement of environmental noise*); and • Australian Standard AS 2702-1984 (*Acoustics – Methods for measurement of road traffic noise*).
Measurement location	The noise monitoring was carried out at two locations at the development site at 160-224 Daleys Road, Ripley, as detailed below: • Location 1: Northern boundary of Lot 3 on RP180932; and • Location 2: Northern boundary of Lot 5 on RP180932. The noise measurement locations are presented in Figure 2.1, as well as in photos presented in Appendix B.
Measurement period	Continuous noise monitoring was carried out 24 hours a day from 23 February to 3 March 2019.
Measurement equipment	The following noise measurement equipment was used: • Location 1: Environmental noise logger – ARL Ngara (serial no. 87811c); • Location 2: Environmental noise logger – ARL Ngara (serial no. 87811D); and • Calibration – RION NC-74 Sound Level Calibrator (serial no. 34615224). The noise measurement instruments conform to Australian Standard AS IEC61672.1-2004. Calibration was performed during set up and download of the data from the noise logger. The calibration drift was <0.1 dB(A).
Meteorological conditions	No periods of inclement weather were encountered during the monitoring period. Full meteorological data for the monitoring period is presented in Appendix C.
Analysis of data	The noise measurement data was analysed to determine the following noise descriptors: • **$L_{10,18hr}$:** L_{10} is the level of noise exceeded for 10% of any time period; $L_{10,18hr}$ is the typical traffic noise descriptor, and is the arithmetic average of 18 hourly $L_{10,1hr}$ levels over consecutive hours between 6am and 12am.

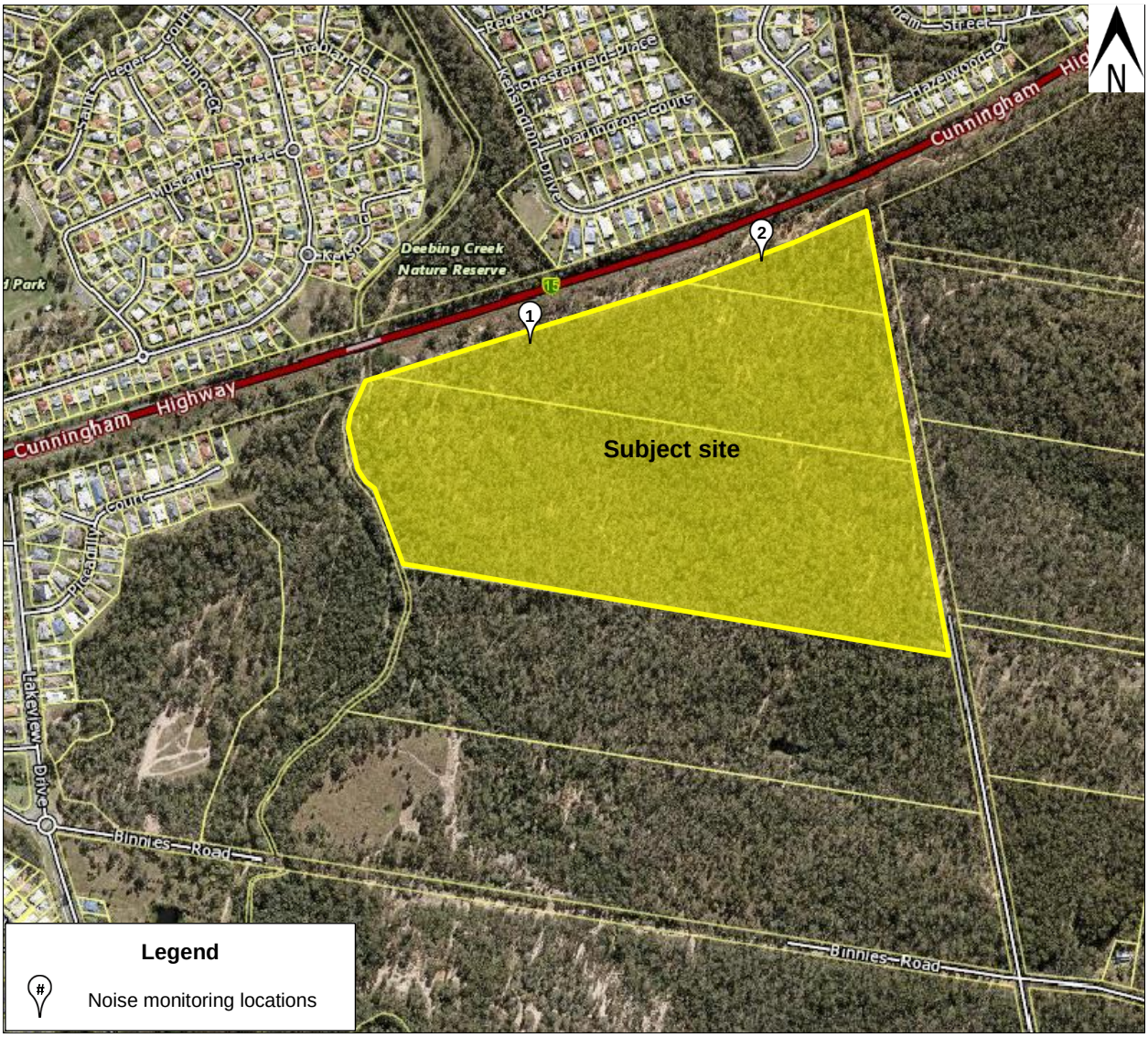


Figure 2.1 Noise measurement locations

2.2 Measurement Results

The results of the noise measurements undertaken from 23 February to 3 March 2019 at 160-224 Daleys Road in Ripley are presented in Table 2.2 and Appendix D.

Table 2.2 Noise measurement results

Date	Traffic noise levels, dB(A)					
	Location 1			Location 2		
	$L_{10,18hr}$ (6am-12am)	$L_{90,18hr}$ (6am-12am)	$L_{90,8hr}$ (10pm-6am)	$L_{10,18hr}$ (6am-12am)	$L_{90,18hr}$ (6am-12am)	$L_{90,8hr}$ (10pm-6am)
23 Feb (Sat)	—	—	35.6	—	—	33.5
24 Feb (Sun)	61.6	48.8	35.1	60.5	45.3	31.0
25 Feb (Mon)	63.8	51.7	36.5	63.1	49.9	33.2
26 Feb (Tue)	64.7	53.7	40.1	64.2	52.6	39.8
27 Feb (Wed)	64.9	53.3	38.2	64.1	51.6	35.3
28 Feb (Thu)*	65.3	53.7	37.2	64.4	52.0	35.0
1 Mar (Fri)	64.2	54.0	36.9	63.9	52.5	34.5
2 Mar (Sat)	63.4	53.1	35.2	62.5	51.3	33.6
3 Mar (Sun)	—	—	—	—	—	—
Arithmetic Mean	**64.0**	**52.6**	**36.9**	**63.2**	**50.7**	**34.5**
Weekdays Only	**64.6**	**53.3**	**37.8**	**63.9**	**51.7**	**35.5**

3. Traffic Noise Criteria

The proposed development is located adjacent to the Cunningham Highway which is a State-controlled Transport Noise Corridor under administration by Department of Transport and Main Roads (TMR). Traffic noise impact was carried out as per the requirements of TMR's *Transport Noise Management Code of Practice, Volume 1 – Road Traffic Noise* (CoP Vol. 1, November 2013).

The relevant traffic noise criteria are provided in the following documents:

- Department of State Development, Manufacturing, Infrastructure and Planning (DSDMIP), *State Development Assessment Provisions (SDAP) version 2.6 (February 2020), State code 1: Development in state-controlled road environment*; and
- Department of Transport and Main Roads (TMR), *Policy for Development on Land Affected by Environmental Emissions from Transport and Transport Infrastructure Version 4 (October 2017)*.

The applicable criteria from the TMR Policy and the SDAP are presented in Table 3.1.

Table 3.1 External noise criteria for new residential development

Transport infrastructure	Development type	Location within development	Environmental criteria
State-controlled Road	Accommodation activities[1]	All facades	≤60dB(A) $L_{10,18hr}$ facade corrected (measured $L_{90,8hr}$ free field between 10pm and 6am ≤ 40dB(A))
			≤63dB(A) $L_{10,18hr}$ facade corrected (measured $L_{90,8hr}$ free field between 10pm and 6am > 40dB(A))
		Outdoor spaces for passive recreation	≤57dB(A) $L_{10,18hr}$ free field (measured $L_{90,18hr}$ free field between 6am and 10pm ≤ 45dB(A))
			≤60dB(A) $L_{10,18hr}$ free field (measured $L_{90,18hr}$ free field between 6am and 10pm > 45dB(A))

The noise criteria for accommodation activities depends on the background noise levels at the site. The existing background noise levels at the subject site are less than 40dB(A) $L_{90,8hr}$ between 10pm and 6am, and greater than 45dB(A) $L_{90,18hr}$ between 6am and 12am.

Therefore, the applicable traffic noise criteria are:

- Building façades (facade adjusted): ≤60dB(A) $L_{10,18hr}$; and
- Private open spaces (free-field): ≤60dB(A) $L_{10,18hr}$.

In case of exceedance of the external traffic noise criteria, architectural treatment has to be applied to the external facade of the building to protect the internal noise amenity of the residential dwellings.

[1] Includes caretaker's accommodation, community residence, dual occupancy, dwelling house, dwelling unit, multiple dwelling, relocatable home park, residential care facility, resort complex, retirement facility, rooming accommodation, short-term accommodation and tourist park.

The architectural treatments are specified in *Mandatory Part 4.4 (Buildings in a Transport Noise Corridor)* of the *Queensland Development Code.* Depending on the calculated 10-year planning horizon road traffic noise, under the *MP4.4*, there are five road traffic noise categories and corresponding acceptable form of construction, as presented in Table 3.2.

Table 3.2 QDC MP4.4 noise categories

Noise category	Level of transport noise* $L_{A10,18hr}$ for State-controlled 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 1m from building facade*

QDC MP4.4 specifies acceptable forms of construction for the external walls, windows and roof/ceiling.

The noise categories applicable to the proposed development will be determined in this report.

As an alternative to the deemed-to-comply construction specifications from QDC MP4.4, the buildings can be constructed as per the advice of a qualified acoustical engineer. The engineer can carry out floor plan specific acoustic design in accordance with AS 3671-1989 and provide acoustic design specifications for the external walls, windows and roof/ceiling.

The building should be constructed with material that have sufficient sound attenuation properties to prevent traffic noise ingress. The sound attenuation properties are expressed in terms of weighted sound reduction index (R_w) for the construction components (i.e. external walls; roof/ceilings; windows/doors) of the proposed dwellings. The R_w are determined based on design calculations in accordance with AS3671-1989, to allow specific acoustic design specifications to be provided for each of the construction components.

4. Traffic Noise Calculation Methodology

Traffic noise levels at the proposed development, within a planning horizon of 10 years following completion of the development (year 2035), were calculated using SoundPLAN noise propagation modelling software. SoundPLAN calculates traffic noise as per the procedure specified in the UK Department of Transport Welsh Office *Method of Calculation of Road Traffic Noise* (CoRTN). CoRTN is an accepted traffic noise calculation procedure applied widely in Australia.

4.1 Modelling Assumptions

The assumptions and data used in development of the traffic noise propagation model are presented in Table 4.1.

Table 4.1 Data and assumptions – Traffic noise model

Terrain	• The model uses the finished surface levels (TIN bulk earthworks model) of the proposed development by Peak Urban dated 17 April 2020. The earthworks drawings by Peak Urban (Project number 18-0016, drawing numbers P102 to 107, Revision 2, dated 17 April 2020) are presented in Appendix E. The earthworks model includes 1.0m high earth mound located on the northern lot boundaries of the lots adjacent to Cunningham Highway. • Department of Natural Resources and Mines Airborne Laser Scanning (LiDAR) 1 metre data was used to determine the existing ground surface levels outside the boundaries of the proposed development. • Ground surface absorption factor of 0 was applied to all paved surfaces and 1 for all grassed areas.
Development layout	• The model uses the lot boundaries as per the earthworks drawings by Peak Urban dated 17 April 2020 (Project number 18-0016, drawing numbers P102 to 107, Revision 2).
Buildings	• Physical buildings at the proposed development are not included in the model. As such, there is no screening of traffic noise by buildings.

Road traffic	• Traffic volumes for Cunningham Highway were sourced from the AADT Segment Report for Road Section 17B – Cunningham Highway (Ipswich – Warwick) – Traffic Year 2018, sourced from TMR's Traffic Analysis and Reporting System (TARS) on 7 February 2020. The AADT Segment Report is presented in Appendix F. The data for Segment Site 135782, located 800m west of Ripley Road is as follows:
	  ○ 2018 AADT of 20,110 vehicles per day;
	  ○ 16.47% heavy vehicles; and
	  ○ 10-year annual growth rate of 3.36% per annum.
	• Future traffic volumes were calculated based on 3.36% growth per annum.
	• Cunningham Highway is one lane in either direction as it passes the development site.
	• Speed limit on the Cunningham Highway is 100 km/h.
	• The pavement surface type on the Cunningham Highway is Stone Mastic asphalt. In accordance with the TMR CoP Vol. 1, Stone mastic asphalt requires a pavement surface correction factor of minus 1 dB(A).
	• The CoRTN procedure requires traffic volume data input for 18 hours. Traffic volume for 18-hour period (6:00am to midnight) was considered as 94% of the 24 hour AADT, as per the procedure of the TMR CoP Vol. 1.

Calculation receivers	• 1m grid spacing was used for calculation of noise contour maps. • Free-field and facade-adjusted noise contour maps were generated:

	○ Free-field: No adjustment for facade reflection. Represents the traffic noise levels that are applicable to private open spaces ○ Facade-adjusted: +2.5dB(A) facade adjustment has been applied to the calculated noise levels to account for noise reflection from building facades. Represents the traffic noise levels that are applicable to building facades. • Traffic noise levels have been calculated at three different heights: ○ 1.5m above ground level (Ground floor private open spaces) ○ 1.8m above ground level (Ground floor building facades) ○ 4.6m above ground level (First floor building facades) • CoRTN Calibration Factors for Australian conditions have been considered in this assessment, as per the procedure from the TMR CoP Vol. 1[2]: ○ Adjustment of -1.7 dB has been applied to the calculated facade traffic noise levels; ○ Adjustment of -0.7 dB has been applied to the calculated free-field traffic noise levels.
Calculation procedure	• CoRTN '88.
Noise mitigation measures	• The following modelling scenarios were considered: ○ Scenario 1 – Noise barrier strategy with noise barrier ranging from 2.0 to 5.5m high (Recommended strategy). ○ Scenario 2 – Noise barrier strategy with noise barrier ranging from 2.0 to 7.0m high (Not recommended due to excessive height of noise barrier). • The recommended noise control measures are discussed in Section 6 of this report.

The finished surface levels (pad levels) of the allotments at the northern portion of the development, closest to Cunningham Highway, are presented in Table 4.2 and in the noise barrier mark-up figures (refer to Figures 4.2 to 4.5 and Figures 4.7 to 4.11 of this report).

Table 4.2 Finished surface levels of allotments

Lot No.	RL, m Centre of lot	Lot No.	RL, m Centre of lot	Lot No.	RL, m Centre of lot
312	42.02	434	40.81	513	46.38
313	41.24	448	40.78	514	47.47
314	41.16	449	39.07	515	47.72
315	41.71	450	39.23	516	49.66
316	43.57	451	39.31	517	49.64
317	44.46	452	39.42	518	48.45
318	45.38	453	39.57	519	47.32
319	46.38	454	41.43	520	46.06
320	47.51	501	35.19	521	44.83
401	37.64	502	35.65	522	43.67
402	38.49	503	36.63	523	42.69
403	39.37	504	37.45	524	39.80
404	40.32	505	38.14	525	40.49
405	41.21	506	39.03	526	40.31
428	40.95	507	40.05	527	39.58
429	38.38	508	41.04	528	38.75
430	38.50	509	41.96	529	39.16
431	38.54	510	42.98	530	39.58
432	38.70	511	44.00	531	39.97
433	38.69	512	45.03	532	40.71

[2] Source: Australian Road Research Board, 1982, *An Evaluation of the UK DoE Traffic Noise Prediction* (Report No. 122, ARRB – NAASRA Planning Group). Referenced in the TMR CoP Vol. 1.

Lot No.	RL, m Centre of lot
533	42.24
534	43.36
535	44.69
536	46.14
537	44.59
538	43.54
539	42.52
540	41.70
541	40.56
542	39.63
543	38.78
544	38.09
545	37.27
546	35.05
547	35.03
548	35.12
549	35.48
550	36.08
632	48.70
633	49.83
634	51.05
635	50.80
636	56.41
637	56.20
638	55.78
639	55.01
640	54.19
641	54.71
642	55.85
643	56.82
644	57.47

Lot No.	RL, m Centre of lot
645	57.96
646	51.58
647	52.43
648	53.95
649	54.64
650	55.77
651	56.17
652	54.37
653	53.23
654	52.10
655	50.88
656	49.91
657	48.89
658	48.76
659	49.96
660	51.06
661	52.20
662	53.40
663	54.44
737	57.20
738	56.50
739	55.77
740	55.03
741	55.01
742	54.67
743	54.53
744	54.35
745	52.98
746	52.69
747	52.42
748	52.26

Lot No.	RL, m Centre of lot
749	51.91
750	51.60
751	51.68
752	51.81
753	51.94
754	52.05
755	52.73
756	53.45
757	54.53
758	58.10
759	56.35
760	56.33
761	56.07
762	55.51
763	54.84
764	53.80
765	52.51
766	50.96
767	52.42
768	53.65
769	54.57
770	55.17
771	55.12
772	55.01
773	54.96
774	54.49
775	53.57
776	52.54
777	51.59
778	50.46

4.2 Model Validation (Year 2019)

The noise data collected during the monitoring period (as presented in Table 2.2) was used to validate the accuracy of the SoundPLAN model prior to undertaking calculations of the future road traffic noise levels within a 10-year planning horizon, after the development is fully established.

The traffic flow data considered in the SoundPLAN validation model is presented in Table 4.3.

Table 4.3 Traffic flow data, Year 2019

Road	Traffic volumes		Heavy vehicles (%)
	2018 AADT	2019 AADT	
Cunningham Highway	20,110	20,786	16.47%

The results of the SoundPLAN model validation are presented in Table 4.4 and in Appendix G.

Table 4.4 SoundPLAN validation results

Location	Traffic noise level $L_{10,18hr}$ dB(A)*			Difference dB(A)
	Measured	Calculated	Calculated (rounded)	
Location 1	64.6	64.0	64	-0.6
Location 2	63.9	63.5	64	-0.4
				Average difference -0.5 dB(A)

**Free field*

The average difference between the measured and calculated traffic noise levels is -0.5 dB(A). In accordance with Section 4.4.2 of the TMR CoP Vol.1, if the average difference between existing measured and calculated noise descriptors values is positive (i.e. average measured values exceed the calculated values), then the calculated values shall be adjusted upwards by this average difference before determining the predicted values. Therefore, the calculated noise levels will be adjusted by +0.5 dB(A) in this assessment.

4.3 10 Year Planning Horizon (Year 2035)

The road traffic noise calculations were carried out for a planning horizon of 2035. The traffic flow data considered in the SoundPLAN 2035 model, is presented in Table 4.5.

Table 4.5 Traffic flow data, Year 2035

Road	Traffic volumes		Heavy vehicles (%)
	2018 AADT	2035 AADT (10-year planning horizon)	
Cunningham Highway	20,110	35,270	16.47%

Noise contour maps (SoundPLAN grid noise maps) were developed for the entirety of the development site at 160-244 Daleys Road in Ripley considering the bulk earthworks terrain model, to determine the extent of traffic noise impacts and the required noise mitigation measures.

4.3.1 Scenario 1 – Noise Barrier 2.0 to 5.5 m High

Scenario 1 includes the following noise mitigation measures:

(i) 1.0m high earth mound located on the northern lot boundaries of the lots adjacent to Cunningham Highway; and

(ii) A noise barrier located on top of the earth mound at the northern lot boundaries of the lots adjacent to Cunningham Highway, with returns along the full length of the western boundary of Lot 501 and the eastern boundary of Lot 778.

The height of the noise barrier has been optimised to achieve compliance with the private open spaces traffic noise criterion of ≤ 60 dB(A) $L_{10,18hr}$ (free-field) at the ground level of all allotments.

The height of the noise barrier ranges from 2.0 to 5.5 m high above the proposed surface levels. The noise barrier height varies depending on location, owing to site topography relative to Cunningham Highway.

Excerpt from the 3D SoundPLAN noise propagation model for Scenario 1 is presented in Figure 4.1.

Figure 4.1 3D traffic noise model – SoundPLAN excerpt – Scenario 1

The RLs at the base and top of the proposed noise barrier are presented in Table 4.6. It should be noted that the RLs at the base of the noise barrier are the finished surface levels as per the TIN bulk earthworks model of the proposed development by Peak Urban dated 17 April 2020 (Project number 18-0016, drawing numbers P102 to 107, Revision 2). The TIN model includes 1.0m high earth mound located on the northern lot boundaries of the lots adjacent to Cunningham Highway.

Table 4.6 Noise barrier RLs – Scenario 1

x, m (Easting)	y, m (Northing)	Lot No.	RL, m Centre of lot	RL, m Base of noise barrier	Height of noise barrier, m	RL, m Top of noise barrier
476489.81	6940089.73	Lot 501	35.19	34.50	2.00	36.50
476487.23	6940098.10	Lot 501	35.19	35.04	2.00	37.04
476484.64	6940106.47	Lot 501	35.19	35.10	2.50	37.60

x, m (Easting)	y, m (Northing)	Lot No.	RL, m Centre of lot	RL, m Base of noise barrier	Height of noise barrier, m	RL, m Top of noise barrier
476482.06	6940114.85	Lot 501	35.19	35.15	2.50	37.65
476479.48	6940123.22	Lot 501	35.19	35.62	2.50	38.12
476489.04	6940126.17	Lot 501	35.19	35.93	2.50	38.43
476498.61	6940129.11	Lot 502	35.65	36.34	3.00	39.34
476505.29	6940131.18	Lot 502	35.65	36.62	3.00	39.62
476511.97	6940133.24	Lot 503	36.63	37.13	3.00	40.13
476519.62	6940135.60	Lot 503	36.63	37.46	3.00	40.46
476527.26	6940137.96	Lot 504	37.45	38.00	3.00	41.00
476533.95	6940140.02	Lot 504	37.45	38.34	3.00	41.34
476540.64	6940142.08	Lot 505	38.14	38.80	3.00	41.80
476547.33	6940144.14	Lot 505	38.14	39.10	3.00	42.10
476554.02	6940146.20	Lot 506	39.03	39.55	3.00	42.55
476561.66	6940148.56	Lot 506	39.03	39.91	3.00	42.91
476569.30	6940150.92	Lot 507	40.05	40.49	3.00	43.49
476576.95	6940153.28	Lot 507	40.05	40.90	3.00	43.90
476584.59	6940155.64	Lot 508	41.04	41.54	2.50	44.04
476591.28	6940157.70	Lot 508	41.04	41.97	2.50	44.47
476597.97	6940159.76	Lot 509	41.96	42.54	2.50	45.04
476604.66	6940161.83	Lot 509	41.96	42.98	2.50	45.48
476611.35	6940163.89	Lot 510	42.98	43.55	2.50	46.05
476618.04	6940165.95	Lot 510	42.98	43.99	2.50	46.49
476624.73	6940168.02	Lot 511	44.00	44.57	2.50	47.07
476631.42	6940170.08	Lot 511	44.00	45.02	2.50	47.52
476638.12	6940172.14	Lot 512	45.03	45.59	2.50	48.09
476645.75	6940174.50	Lot 512	45.03	46.11	2.50	48.61
476653.39	6940176.86	Lot 513	46.38	46.65	2.50	49.15
476661.04	6940179.21	Lot 513	46.38	47.33	2.50	49.83
476668.69	6940181.57	Lot 514	47.47	47.99	2.50	50.49
476676.33	6940183.93	Lot 514	47.47	48.57	2.50	51.07
476683.97	6940186.28	Lot 658	48.76	49.17	2.00	51.17
476691.62	6940188.64	Lot 658	48.76	49.86	2.00	51.86
476699.26	6940191.00	Lot 659	49.96	50.49	2.00	52.49
476705.95	6940193.06	Lot 659	49.96	51.09	2.00	53.09
476712.64	6940195.13	Lot 660	51.06	51.67	2.00	53.67
476719.33	6940197.19	Lot 660	51.06	52.27	2.00	54.27
476726.01	6940199.26	Lot 661	52.20	52.85	2.00	54.85
476732.71	6940201.32	Lot 661	52.20	53.45	2.00	55.45
476739.40	6940203.39	Lot 662	53.40	54.05	2.00	56.05
476747.47	6940205.88	Lot 662	53.40	54.73	2.00	56.73
476754.56	6940208.50	Lot 663	54.44	55.30	2.00	57.30

x, m (Easting)	y, m (Northing)	Lot No.	RL, m Centre of lot	RL, m Base of noise barrier	Height of noise barrier, m	RL, m Top of noise barrier
476761.14	6940210.94	Lot 663	54.44	55.81	2.00	57.81
476767.72	6940213.37	Lot 772	55.01	56.29	3.00	59.29
476774.29	6940215.81	Lot 772	55.01	56.57	3.00	59.57
476780.86	6940218.24	Lot 773	54.96	56.66	4.00	60.66
476787.46	6940220.65	Lot 773	54.96	56.70	4.00	60.70
476794.06	6940223.06	Lot 774	54.49	56.46	5.00	61.46
476800.57	6940225.48	Lot 774	54.49	56.02	5.00	61.02
476807.08	6940227.90	Lot 775	53.57	55.51	5.50	61.01
476813.71	6940230.37	Lot 775	53.57	54.96	5.50	60.46
476820.35	6940232.83	Lot 776	52.54	54.38	5.50	59.88
476826.92	6940235.29	Lot 776	52.54	53.80	5.50	59.30
476833.49	6940237.76	Lot 777	51.59	53.14	5.50	58.64
476840.05	6940240.15	Lot 777	51.59	52.41	5.50	57.91
476846.62	6940242.55	Lot 778	50.46	51.69	5.50	57.19
476853.32	6940244.98	Lot 778	50.46	50.87	4.00	54.87
476859.99	6940240.45	Lot 778	50.46	50.53	4.00	54.53
476866.74	6940235.77	Lot 778	50.46	50.45	4.00	54.45
476874.29	6940230.55	Lot 778	50.46	50.99	2.00	52.99
476877.35	6940220.66	Lot 778	50.46	50.91	2.00	52.91
476880.52	6940210.23	Lot 778	50.46	50.83	2.00	52.83

The noise barrier must be constructed so that the RL at the top of the noise barrier is equal to or greater than the RLs shown in Table 4.6.

Detailed design of the noise barrier must be carried out to ensure that the noise barrier complies with the requirements of MRTS15 Noise Fences and TMR CoP Vol. 1, Chapter 7: *Integrated Noise Barrier Design*. For example, MRTS15 has aesthetic requirements such as maximum stepping height of 600 mm. These requirements must be taken into consideration at detailed design stage. The height of the noise barrier can be modified as required to meet the other design requirements, provided that the minimum RLs at each segment as shown in Table 4.6 are achieved.

The alignment of the noise barrier is presented in Figure 4.2.

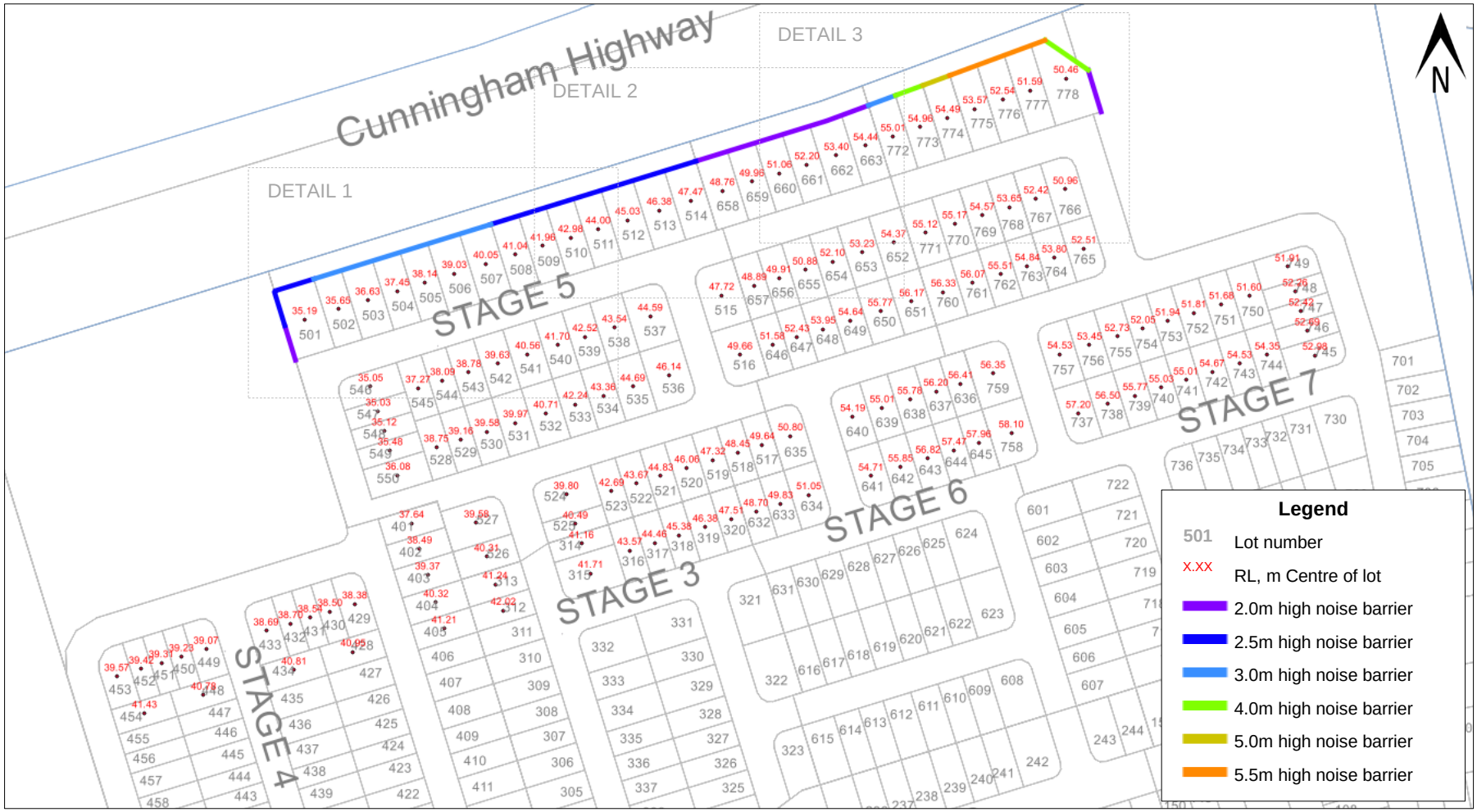


Figure 4.2 Noise barrier alignment – Scenario 1

Detail views showing the alignment and RLs of the top of the noise barrier is presented in Figures 4.3 to 4.5.

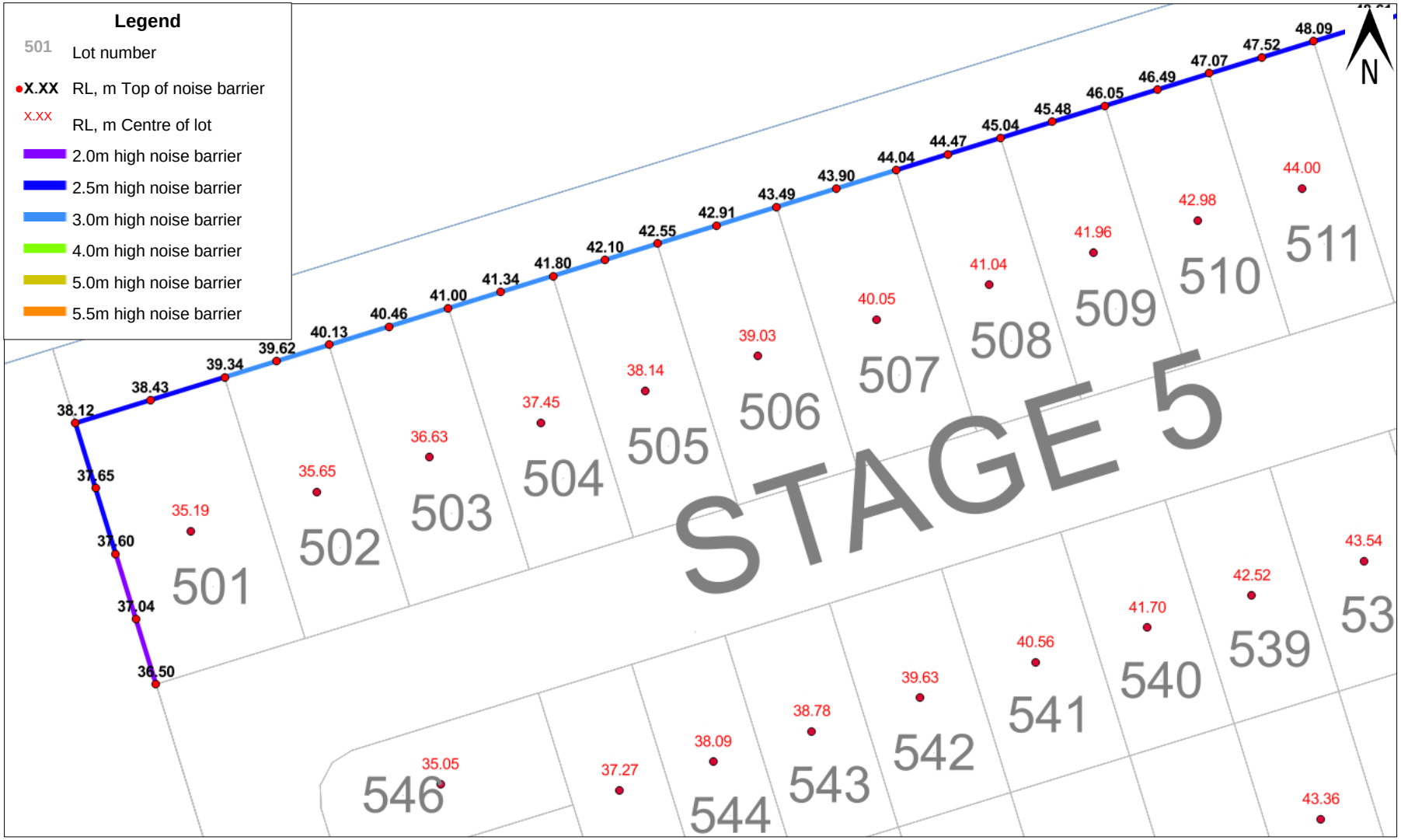


Figure 4.3 Noise barrier alignment – Scenario 1 – Detail 1

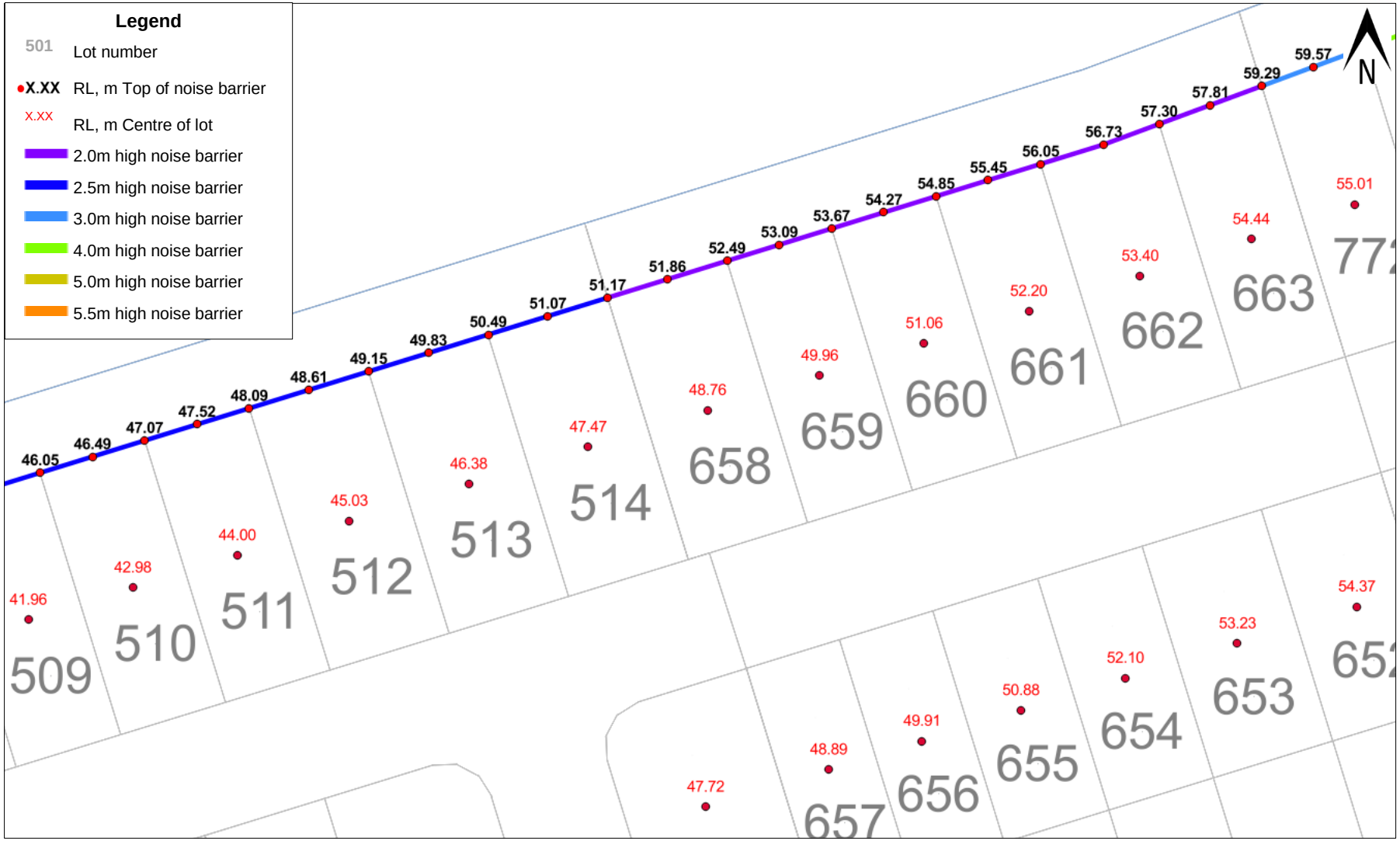


Figure 4.4 Noise barrier alignment – Scenario 1 – Detail 2

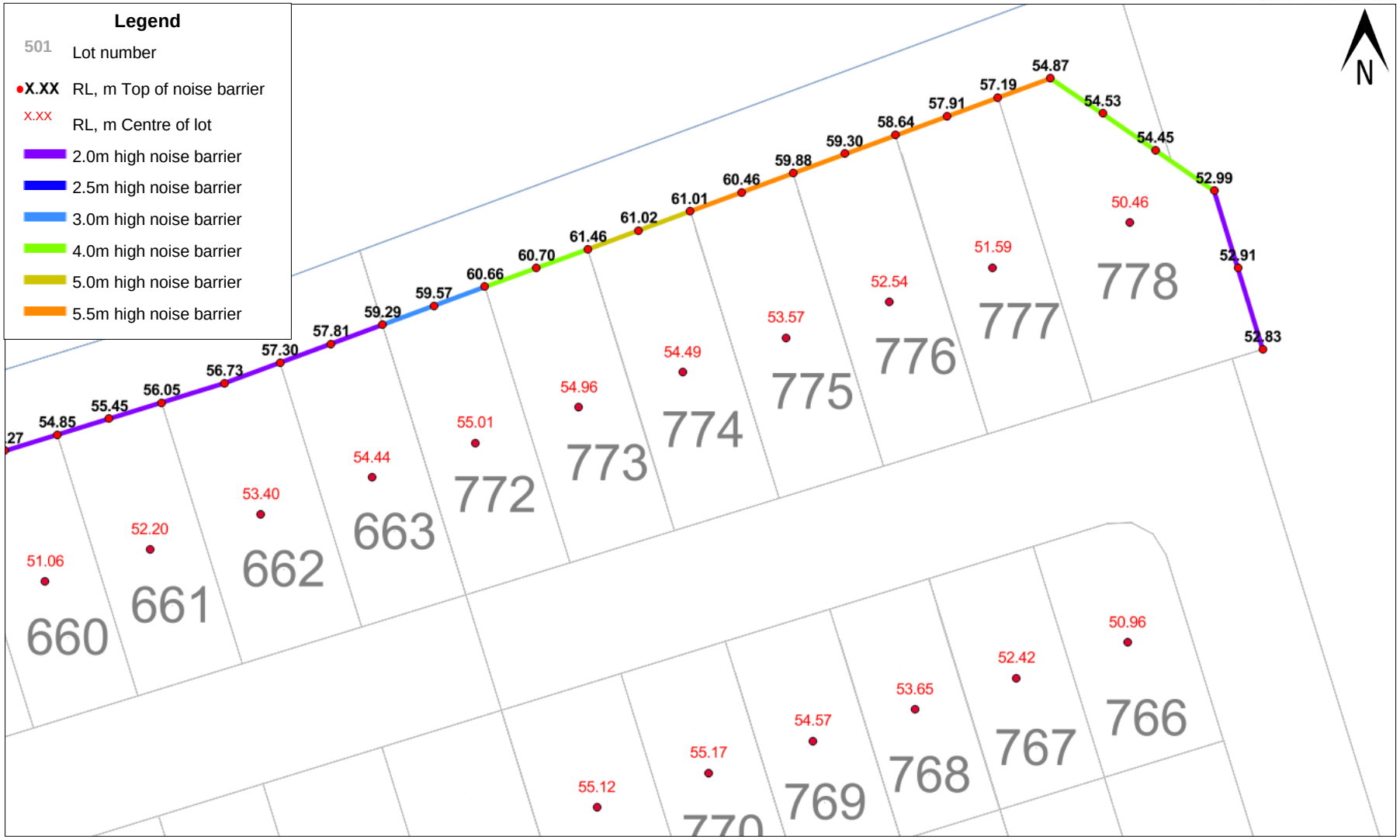


Figure 4.5 Noise barrier alignment – Scenario 1 – Detail 3

4.3.2 Scenario 2 – Noise Barriers 2.0 to 7.0 m High

Scenario 2 includes the following noise mitigation measures:

(i) 1.0m high earth mound located on the northern lot boundaries of the lots adjacent to Cunningham Highway;

(ii) A primary noise barrier located on the northern lot boundaries of the lots adjacent to Cunningham Highway, with returns along the full length of the western boundary of Lot 501 and the eastern boundary of Lot 778. The height of the primary noise barrier ranges from 2.0 to 7.0 m high depending on the location, owing to site topography relative to Cunningham Highway.

(iii) Two secondary noise barriers:

- Secondary noise barrier with height of 2.0 m located at the north-eastern corner of Lot 765; and
- Secondary noise barrier with height of 2.5 to 3.0 m located at the boundary of the detention basin, in front of Lots 749 and 750.

The height of the noise barriers have been optimised to achieve compliance with the private open spaces traffic noise criterion of ≤ 60 dB(A) $L_{10,18hr}$ (free-field) and facade traffic noise criterion of ≤ 60 dB(A) $L_{10,18hr}$ (facade corrected) at the ground floor levels of all future dwellings on all allotments.

Scenario 2 is not recommended due to excessive height of the noise barrier and it is presented in this report only to demonstrate the noise barrier requirements to achieve full compliance with the facade and private open space criteria.

Refer to detailed discussion in Section 6 of this report explaining why Scenario 2 is not an appropriate solution and why Scenario 1 is the recommended solution.

Excerpt from the 3D SoundPLAN noise propagation model for Scenario 2 is presented in Figure 4.6.

Figure 4.6 3D traffic noise model – SoundPLAN excerpt – Scenario 2

The RLs at the base and top of the proposed noise barrier are presented in Table 4.7. It should be noted that the RLs at the base of the noise barrier are the finished surface levels as per the TIN bulk earthworks model of the proposed development by Peak Urban dated 17 April 2020 (Project number 18-0016, drawing numbers P102 to 107, Revision 2). The TIN model includes 1.0m high earth mound located on the northern lot boundaries of the lots adjacent to Cunningham Highway.

Table 4.7 Noise barrier RLs – Scenario 2

x, m (Easting)	y, m (Northing)	Lot No.	RL, m Centre of lot	RL, m Base of noise barrier	Height of noise barrier, m	RL, m Top of noise barrier
Primary noise barrier:						
476489.81	6940089.73	Lot 501	35.19	34.50	3.00	37.50
476487.23	6940098.10	Lot 501	35.19	35.04	3.00	38.04
476484.64	6940106.47	Lot 501	35.19	35.10	3.50	38.60
476482.06	6940114.85	Lot 501	35.19	35.15	3.50	38.65
476479.48	6940123.22	Lot 501	35.19	35.62	3.50	39.12
476489.04	6940126.17	Lot 501	35.19	35.93	3.50	39.43

x, m (Easting)	y, m (Northing)	Lot No.	RL, m Centre of lot	RL, m Base of noise barrier	Height of noise barrier, m	RL, m Top of noise barrier
476498.61	6940129.11	Lot 502	35.65	36.34	3.80	40.14
476505.29	6940131.18	Lot 502	35.65	36.62	3.80	40.42
476511.97	6940133.24	Lot 503	36.63	37.13	3.80	40.93
476519.62	6940135.60	Lot 503	36.63	37.46	3.80	41.26
476527.26	6940137.96	Lot 504	37.45	38.00	3.80	41.80
476533.95	6940140.02	Lot 504	37.45	38.34	3.80	42.14
476540.64	6940142.08	Lot 505	38.14	38.80	3.80	42.60
476547.33	6940144.14	Lot 505	38.14	39.10	3.80	42.90
476554.02	6940146.20	Lot 506	39.03	39.55	3.80	43.35
476561.66	6940148.56	Lot 506	39.03	39.91	3.80	43.71
476569.30	6940150.92	Lot 507	40.05	40.49	3.80	44.29
476576.95	6940153.28	Lot 507	40.05	40.90	3.80	44.70
476584.59	6940155.64	Lot 508	41.04	41.54	3.80	45.34
476591.28	6940157.70	Lot 508	41.04	41.97	3.80	45.77
476597.97	6940159.76	Lot 509	41.96	42.54	3.80	46.34
476604.66	6940161.83	Lot 509	41.96	42.98	3.80	46.78
476611.35	6940163.89	Lot 510	42.98	43.55	3.80	47.35
476618.04	6940165.95	Lot 510	42.98	43.99	3.80	47.79
476624.73	6940168.02	Lot 511	44.00	44.57	3.80	48.37
476631.42	6940170.08	Lot 511	44.00	45.02	3.80	48.82
476638.12	6940172.14	Lot 512	45.03	45.59	3.80	49.39
476645.75	6940174.50	Lot 512	45.03	46.11	3.80	49.91
476653.39	6940176.86	Lot 513	46.38	46.65	3.80	50.45
476661.04	6940179.21	Lot 513	46.38	47.33	3.80	51.13
476668.69	6940181.57	Lot 514	47.47	47.99	3.80	51.79
476676.33	6940183.93	Lot 514	47.47	48.57	3.80	52.37
476683.97	6940186.28	Lot 658	48.76	49.17	3.00	52.17
476691.62	6940188.64	Lot 658	48.76	49.86	3.00	52.86
476699.26	6940191.00	Lot 659	49.96	50.49	3.00	53.49
476705.95	6940193.06	Lot 659	49.96	51.09	3.00	54.09
476712.64	6940195.13	Lot 660	51.06	51.67	3.00	54.67
476719.33	6940197.19	Lot 660	51.06	52.27	3.00	55.27
476726.01	6940199.26	Lot 661	52.20	52.85	3.00	55.85
476732.71	6940201.32	Lot 661	52.20	53.45	3.00	56.45
476739.40	6940203.39	Lot 662	53.40	54.05	3.00	57.05
476747.47	6940205.88	Lot 662	53.40	54.73	3.00	57.73
476754.56	6940208.50	Lot 663	54.44	55.30	4.00	59.30
476761.14	6940210.94	Lot 663	54.44	55.81	4.00	59.81
476767.72	6940213.37	Lot 772	55.01	56.29	6.00	62.29
476774.29	6940215.81	Lot 772	55.01	56.57	6.00	62.57

x, m (Easting)	y, m (Northing)	Lot No.	RL, m Centre of lot	RL, m Base of noise barrier	Height of noise barrier, m	RL, m Top of noise barrier
476780.86	6940218.24	Lot 773	54.96	56.66	7.00	63.66
476787.46	6940220.65	Lot 773	54.96	56.70	7.00	63.70
476794.06	6940223.06	Lot 774	54.49	56.46	7.00	63.46
476800.57	6940225.48	Lot 774	54.49	56.02	7.00	63.02
476807.08	6940227.90	Lot 775	53.57	55.51	7.00	62.51
476813.71	6940230.37	Lot 775	53.57	54.96	7.00	61.96
476820.35	6940232.83	Lot 776	52.54	54.38	7.00	61.38
476826.92	6940235.29	Lot 776	52.54	53.80	7.00	60.80
476833.49	6940237.76	Lot 777	51.59	53.14	7.00	60.14
476840.05	6940240.15	Lot 777	51.59	52.41	7.00	59.41
476846.62	6940242.55	Lot 778	50.46	51.69	7.00	58.69
476853.32	6940244.98	Lot 778	50.46	50.87	7.00	57.87
476859.99	6940240.45	Lot 778	50.46	50.53	7.00	57.53
476866.74	6940235.77	Lot 778	50.46	50.45	7.00	57.45
476874.29	6940230.55	Lot 778	50.46	50.99	6.00	56.99
476877.35	6940220.66	Lot 778	50.46	50.91	5.00	55.91
476880.52	6940210.23	Lot 778	50.46	50.83	5.00	55.83
Secondary noise barriers:						
476867.95	6940157.33	Lot 765	52.51	52.62	2.00	54.62
476875.30	6940159.61	Lot 765	52.51	52.55	2.00	54.55
476877.63	6940151.92	Lot 765	52.51	52.49	2.00	54.49
476936.45	6940148.46	Lot 750	51.60	51.19	2.50	53.69
476943.14	6940150.53	Lot 750	51.60	51.12	2.50	53.62
476949.83	6940152.59	Lot 749	51.91	51.05	3.00	54.05
476956.30	6940154.58	Lot 749	51.91	51.02	3.00	54.02
476962.88	6940156.62	Lot 749	51.91	51.03	3.00	54.03
476969.46	6940158.66	Lot 749	51.91	51.07	3.00	54.07
476976.04	6940160.70	Lot 749	51.91	51.13	3.00	54.13

The noise barriers must be constructed so that the RL at the top of the noise barriers is equal to or greater than the RLs shown in Table 4.7. Detailed design of the noise barriers must be carried out to ensure that the noise barriers comply with the requirements of MRTS15 Noise Fences and TMR CoP Vol. 1, Chapter 7: *Integrated Noise Barrier Design*. For example, MRTS15 has aesthetic requirements such as maximum stepping height of 600 mm. These requirements must be taken into consideration at the detailed design stage. The height of the noise barriers can be modified as required to meet the other design requirements, provided that the minimum RLs at each segment as shown in Table 4.7 are achieved.

The alignment of the noise barrier is presented in Figure 4.7.

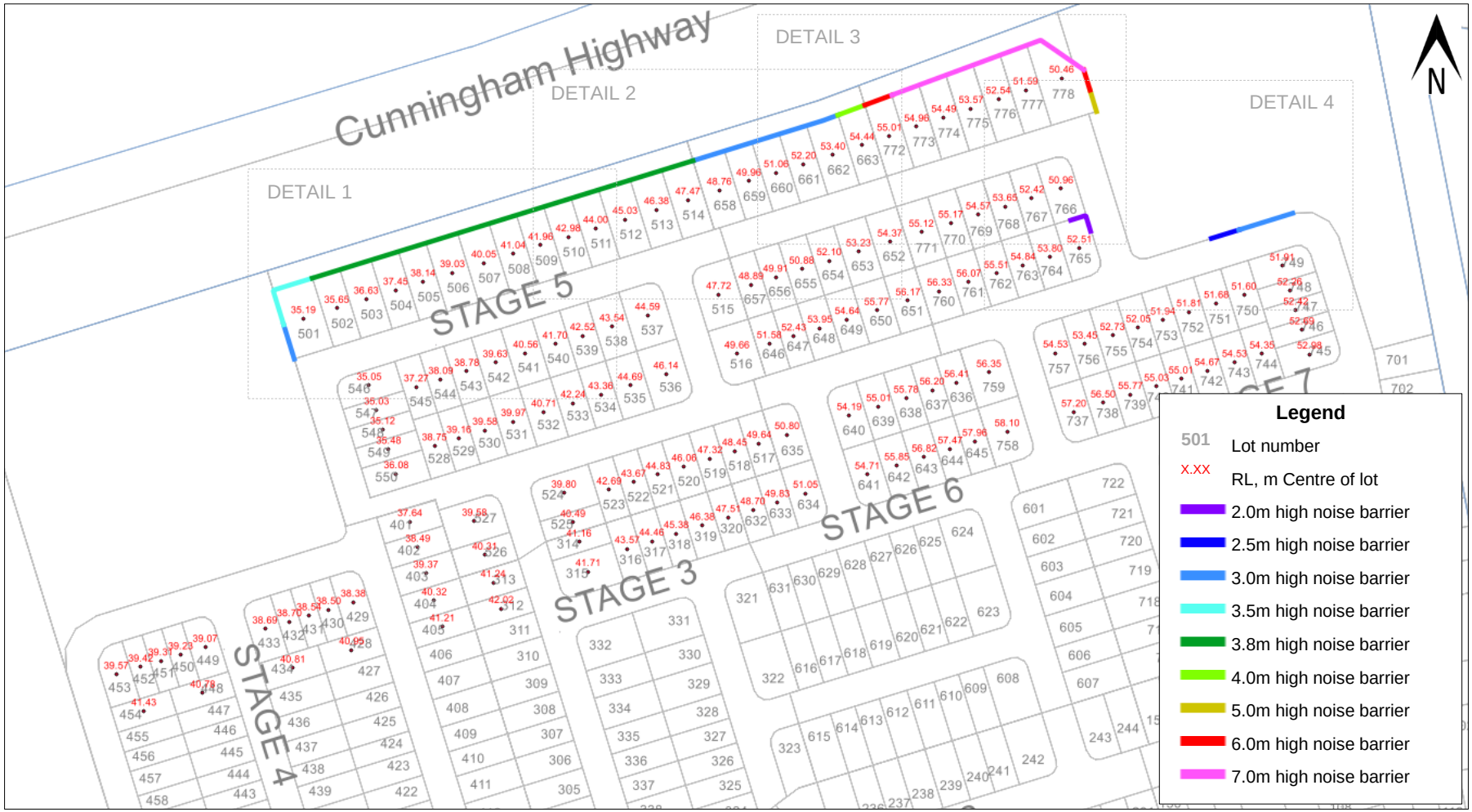


Figure 4.7 Noise barrier alignment – Scenario 2

Detail views showing the alignment and RLs of the top of the noise barrier is presented in Figures 4.8 to 4.11.

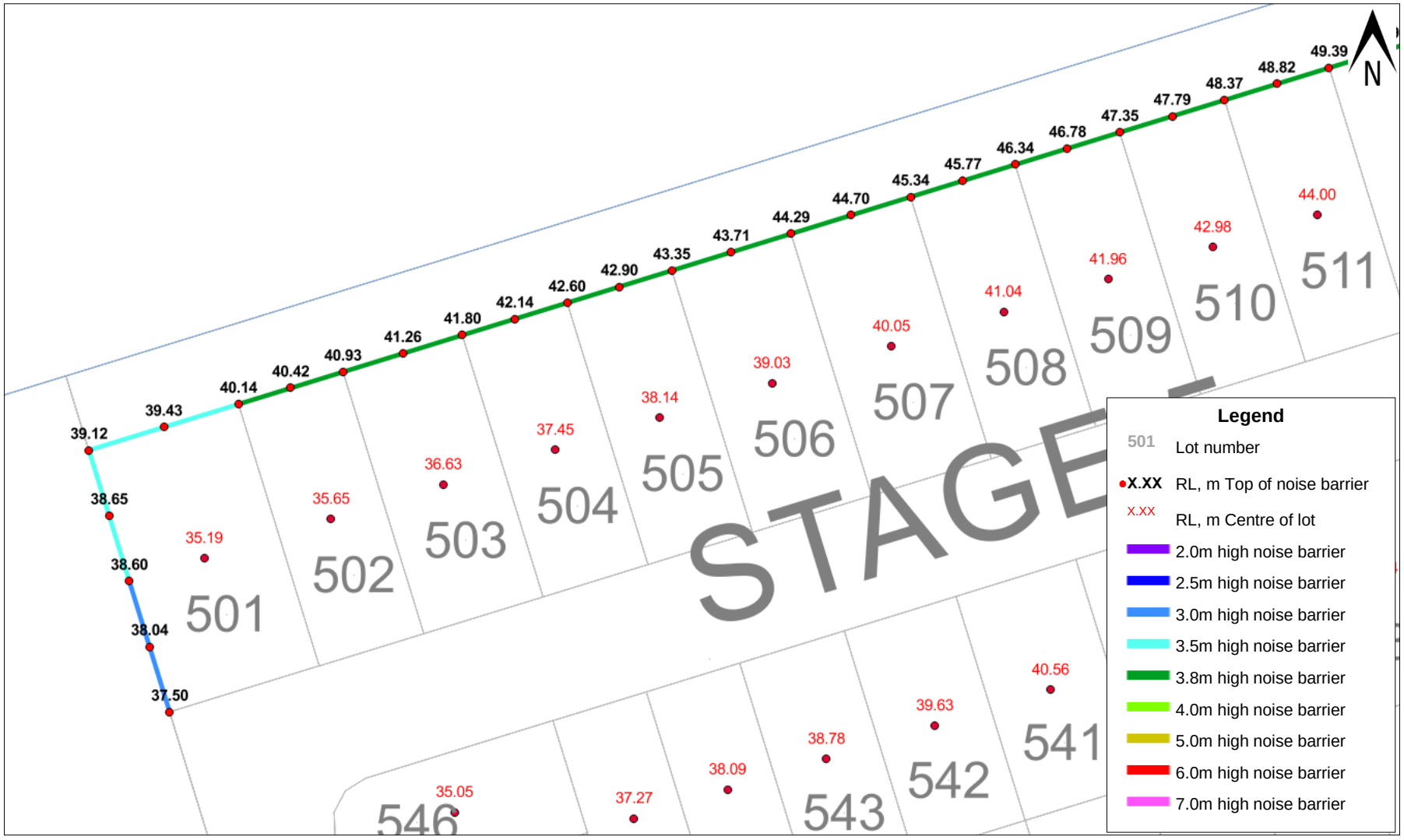


Figure 4.8 Noise barrier alignment – Scenario 2 – Detail 1

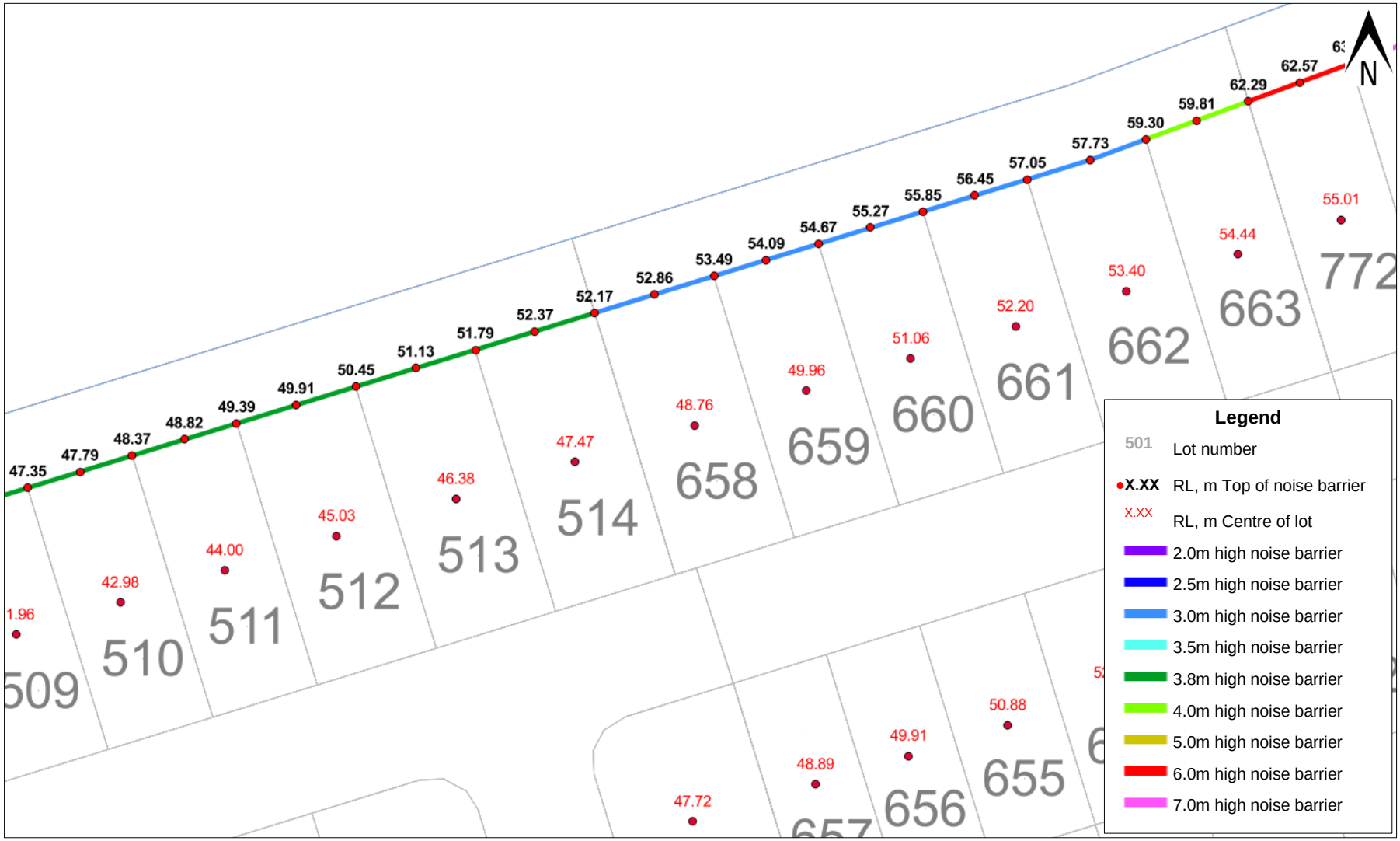


Figure 4.9 Noise barrier alignment – Scenario 2 – Detail 2

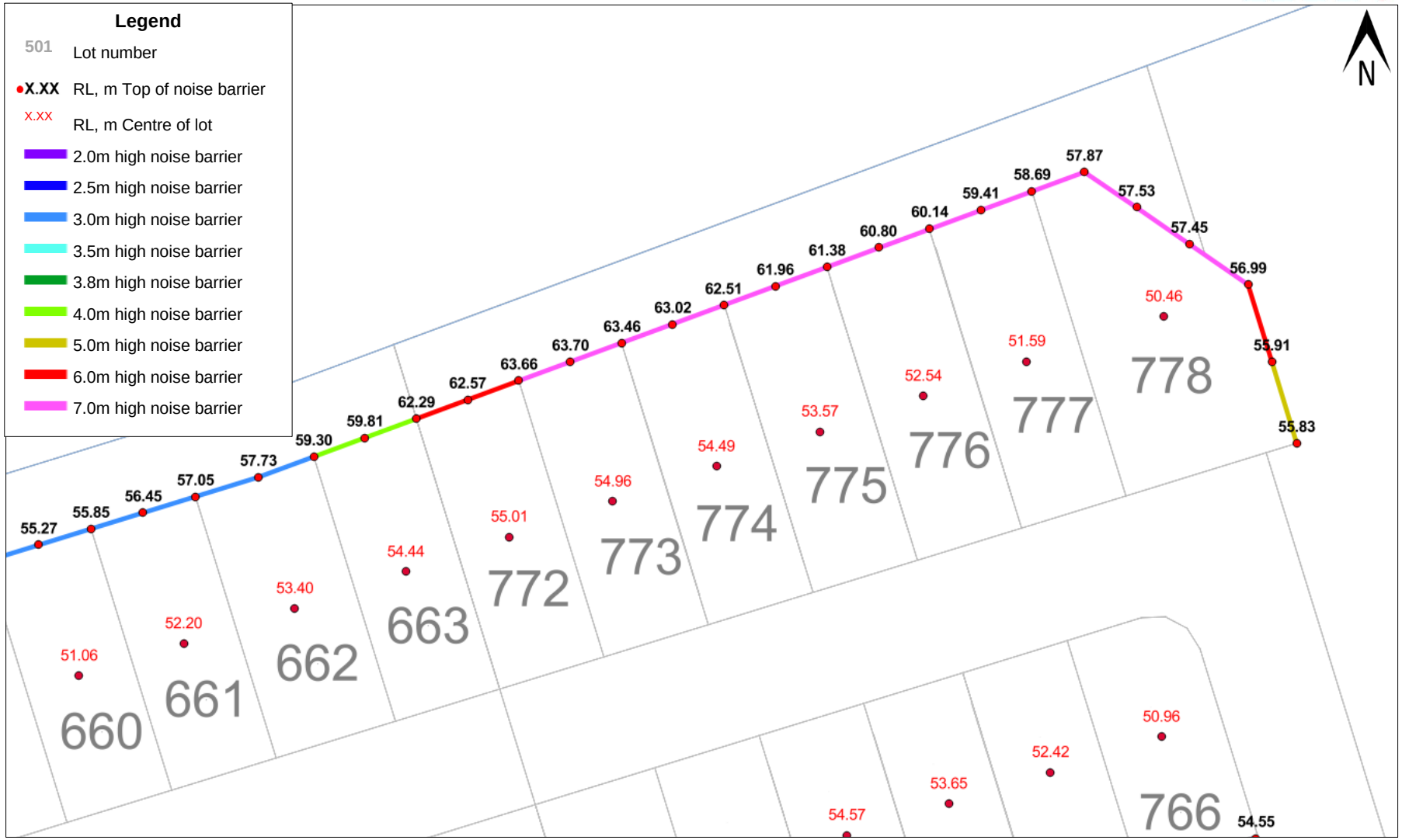


Figure 4.10 Noise barrier alignment – Scenario 2 – Detail 3

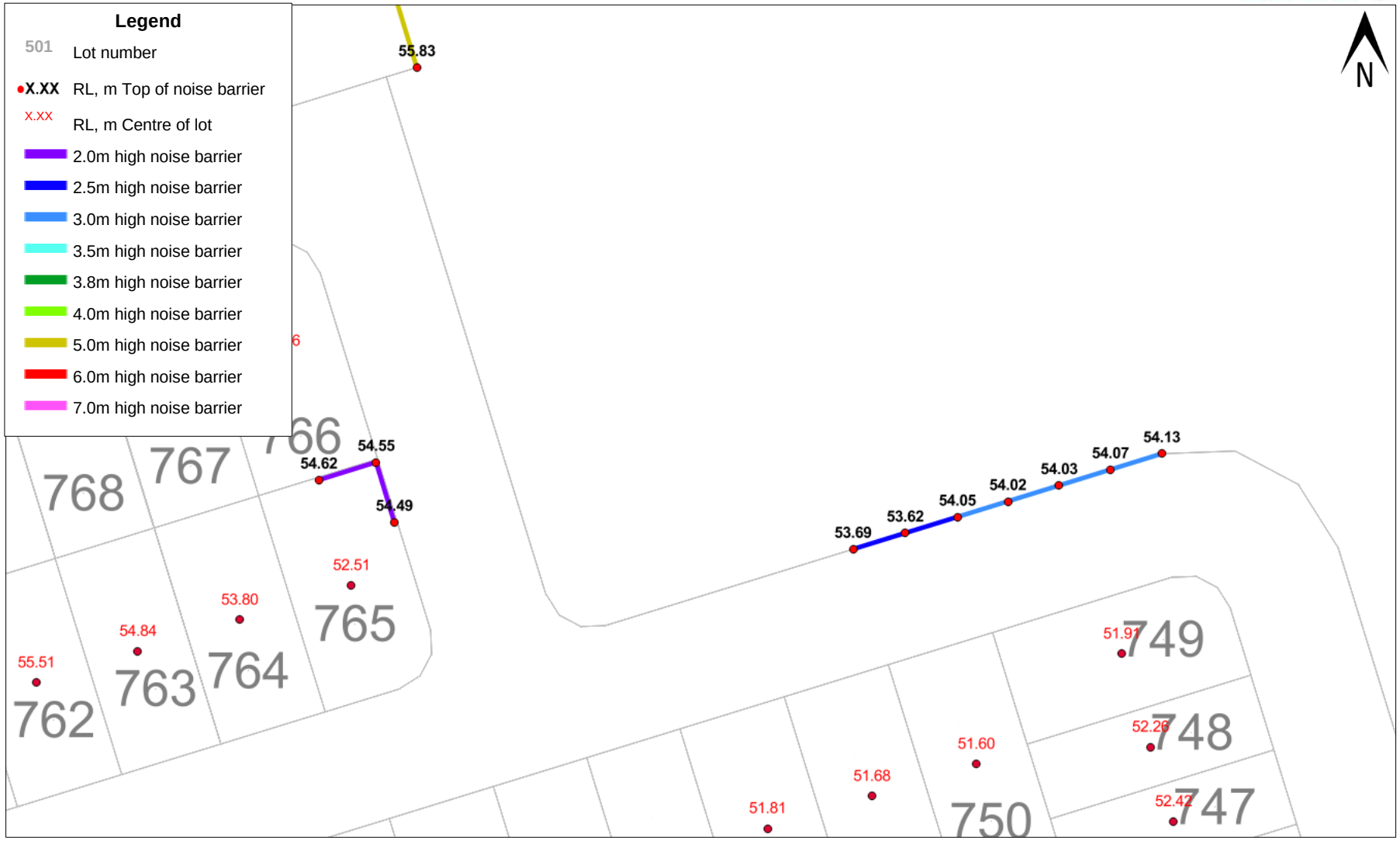


Figure 4.11 Noise barrier alignment – Scenario 2 – Detail 4

5. Calculated Traffic Noise Levels

The road traffic noise levels were calculated at heights representative of the ground and upper floors of the future dwellings and the private open spaces on the ground floors of the future dwellings.

The calculated noise levels were then assessed against the traffic noise criteria (≤60dB(A) $L_{10,18hr}$ facade adjusted for building facades; and ≤60dB(A) $L_{10,18hr}$ free-field for private open spaces).

The traffic noise levels are represented as noise contours and are also tabulated relative to compliance with the traffic noise criteria as per SDAP State Code 1. In addition, the corresponding QDC MP4.4 Noise Categories are tabulated and presented as noise contour maps.

5.1 Scenario 1 – Noise Barrier 2.0 to 5.5 m High

Summary of the results for Scenario 1 is presented in Table 5.1.

Table 5.1 Traffic noise calculation results (Year 2035) – Scenario 1

Stage	Lot no.	Building façades (facade-adjusted)				Private open spaces (free-field)
		Ground floor		Upper floor		
		Compliance with ≤60dB(A) criterion	Noise Category QDC MP4.4	Compliance with ≤60dB(A) criterion	Noise Category QDC MP4.4	Compliance with ≤60dB(A) criterion
Stage 1	101	Yes	Category 0	Yes	Category 0	Yes
Stage 1	102	Yes	Category 0	Yes	Category 0	Yes
Stage 1	103	Yes	Category 0	Yes	Category 0	Yes
Stage 1	104	Yes	Category 0	Yes	Category 0	Yes
Stage 1	105	Yes	Category 0	Yes	Category 0	Yes
Stage 1	106	Yes	Category 0	Yes	Category 0	Yes
Stage 1	107	Yes	Category 0	Yes	Category 0	Yes
Stage 1	108	Yes	Category 0	Yes	Category 0	Yes
Stage 1	109	Yes	Category 0	Yes	Category 0	Yes
Stage 1	110	Yes	Category 0	Yes	Category 0	Yes
Stage 1	111	Yes	Category 0	Yes	Category 0	Yes
Stage 1	112	Yes	Category 0	Yes	Category 0	Yes
Stage 1	113	Yes	Category 0	Yes	Category 0	Yes
Stage 1	114	Yes	Category 0	Yes	Category 0	Yes
Stage 1	115	Yes	Category 0	Yes	Category 0	Yes
Stage 1	116	Yes	Category 0	Yes	Category 0	Yes
Stage 1	117	Yes	Category 0	Yes	Category 0	Yes
Stage 1	118	Yes	Category 0	Yes	Category 0	Yes
Stage 1	119	Yes	Category 0	Yes	Category 0	Yes
Stage 1	120	Yes	Category 0	Yes	Category 0	Yes
Stage 1	121	Yes	Category 0	Yes	Category 0	Yes
Stage 1	122	Yes	Category 0	Yes	Category 0	Yes
Stage 1	123	Yes	Category 0	Yes	Category 0	Yes
Stage 1	124	Yes	Category 0	Yes	Category 0	Yes
Stage 1	125	Yes	Category 0	Yes	Category 0	Yes

Stage	Lot no.	Building façades (facade-adjusted)				Private open spaces (free-field)
		Ground floor		Upper floor		
		Compliance with ≤60dB(A) criterion	Noise Category QDC MP4.4	Compliance with ≤60dB(A) criterion	Noise Category QDC MP4.4	Compliance with ≤60dB(A) criterion
Stage 1	126	Yes	Category 0	Yes	Category 0	Yes
Stage 1	127	Yes	Category 0	Yes	Category 0	Yes
Stage 1	128	Yes	Category 0	Yes	Category 0	Yes
Stage 1	129	Yes	Category 0	Yes	Category 0	Yes
Stage 1	130	Yes	Category 0	Yes	Category 0	Yes
Stage 1	131	Yes	Category 0	Yes	Category 0	Yes
Stage 1	132	Yes	Category 0	Yes	Category 0	Yes
Stage 1	133	Yes	Category 0	Yes	Category 0	Yes
Stage 1	134	Yes	Category 0	Yes	Category 0	Yes
Stage 1	135	Yes	Category 0	Yes	Category 0	Yes
Stage 1	136	Yes	Category 0	Yes	Category 0	Yes
Stage 1	137	Yes	Category 0	Yes	Category 0	Yes
Stage 1	138	Yes	Category 0	Yes	Category 0	Yes
Stage 1	139	Yes	Category 0	Yes	Category 0	Yes
Stage 1	140	Yes	Category 0	Yes	Category 0	Yes
Stage 1	141	Yes	Category 0	Yes	Category 0	Yes
Stage 1	142	Yes	Category 0	Yes	Category 0	Yes
Stage 1	143	Yes	Category 0	Yes	Category 0	Yes
Stage 1	144	Yes	Category 0	Yes	Category 0	Yes
Stage 1	145	Yes	Category 0	Yes	Category 0	Yes
Stage 1	146	Yes	Category 0	Yes	Category 0	Yes
Stage 1	147	Yes	Category 0	Yes	Category 0	Yes
Stage 1	148	Yes	Category 0	Yes	Category 0	Yes
Stage 1	149	Yes	Category 0	Yes	Category 0	Yes
Stage 1	150	Yes	Category 0	Yes	Category 0	Yes
Stage 1	151	Yes	Category 0	Yes	Category 0	Yes
Stage 1	152	Yes	Category 0	Yes	Category 0	Yes
Stage 1	153	Yes	Category 0	Yes	Category 0	Yes
Stage 1	154	Yes	Category 0	Yes	Category 0	Yes
Stage 1	155	Yes	Category 0	Yes	Category 0	Yes
Stage 1	156	Yes	Category 0	Yes	Category 0	Yes
Stage 1	157	Yes	Category 0	Yes	Category 0	Yes
Stage 1	158	Yes	Category 0	Yes	Category 0	Yes
Stage 1	159	Yes	Category 0	Yes	Category 0	Yes
Stage 1	160	Yes	Category 0	Yes	Category 0	Yes
Stage 2	201	Yes	Category 0	Yes	Category 0	Yes
Stage 2	202	Yes	Category 0	Yes	Category 0	Yes
Stage 2	203	Yes	Category 0	Yes	Category 0	Yes
Stage 2	204	Yes	Category 0	Yes	Category 0	Yes
Stage 2	205	Yes	Category 0	Yes	Category 0	Yes

Stage	Lot no.	Building façades (facade-adjusted)				Private open spaces (free-field)
		Ground floor		Upper floor		
		Compliance with ≤60dB(A) criterion	Noise Category QDC MP4.4	Compliance with ≤60dB(A) criterion	Noise Category QDC MP4.4	Compliance with ≤60dB(A) criterion
Stage 2	206	Yes	Category 0	Yes	Category 0	Yes
Stage 2	207	Yes	Category 0	Yes	Category 0	Yes
Stage 2	208	Yes	Category 0	Yes	Category 0	Yes
Stage 2	209	Yes	Category 0	Yes	Category 0	Yes
Stage 2	210	Yes	Category 0	Yes	Category 0	Yes
Stage 2	211	Yes	Category 0	Yes	Category 0	Yes
Stage 2	212	Yes	Category 0	Yes	Category 0	Yes
Stage 2	213	Yes	Category 0	Yes	Category 0	Yes
Stage 2	214	Yes	Category 0	Yes	Category 0	Yes
Stage 2	215	Yes	Category 0	Yes	Category 0	Yes
Stage 2	216	Yes	Category 0	Yes	Category 0	Yes
Stage 2	217	Yes	Category 0	Yes	Category 0	Yes
Stage 2	218	Yes	Category 0	Yes	Category 0	Yes
Stage 2	219	Yes	Category 0	Yes	Category 0	Yes
Stage 2	220	Yes	Category 0	Yes	Category 0	Yes
Stage 2	221	Yes	Category 0	Yes	Category 0	Yes
Stage 2	222	Yes	Category 0	Yes	Category 0	Yes
Stage 2	223	Yes	Category 0	Yes	Category 0	Yes
Stage 2	224	Yes	Category 0	Yes	Category 0	Yes
Stage 2	225	Yes	Category 0	Yes	Category 0	Yes
Stage 2	226	Yes	Category 0	Yes	Category 0	Yes
Stage 2	227	Yes	Category 0	Yes	Category 0	Yes
Stage 2	228	Yes	Category 0	Yes	Category 0	Yes
Stage 2	229	Yes	Category 0	Yes	Category 0	Yes
Stage 2	230	Yes	Category 0	Yes	Category 0	Yes
Stage 2	231	Yes	Category 0	Yes	Category 0	Yes
Stage 2	232	Yes	Category 0	Yes	Category 0	Yes
Stage 2	233	Yes	Category 0	Yes	Category 0	Yes
Stage 2	234	Yes	Category 0	Yes	Category 0	Yes
Stage 2	235	Yes	Category 0	Yes	Category 0	Yes
Stage 2	236	Yes	Category 0	Yes	Category 0	Yes
Stage 2	237	Yes	Category 0	Yes	Category 0	Yes
Stage 2	238	Yes	Category 0	Yes	Category 0	Yes
Stage 2	239	Yes	Category 0	Yes	Category 0	Yes
Stage 2	240	Yes	Category 0	Yes	Category 0	Yes
Stage 2	241	Yes	Category 0	Yes	Category 0	Yes
Stage 2	242	Yes	Category 0	Yes	Category 0	Yes
Stage 2	243	Yes	Category 0	Yes	Category 0	Yes
Stage 2	244	Yes	Category 0	Yes	Category 0	Yes
Stage 3	301	Yes	Category 0	Yes	Category 0	Yes

Stage	Lot no.	Building façades (facade-adjusted)				Private open spaces (free-field)
		Ground floor		Upper floor		
		Compliance with ≤60dB(A) criterion	Noise Category QDC MP4.4	Compliance with ≤60dB(A) criterion	Noise Category QDC MP4.4	Compliance with ≤60dB(A) criterion
Stage 3	302	Yes	Category 0	Yes	Category 0	Yes
Stage 3	303	Yes	Category 0	Yes	Category 0	Yes
Stage 3	304	Yes	Category 0	Yes	Category 0	Yes
Stage 3	305	Yes	Category 0	Yes	Category 0	Yes
Stage 3	306	Yes	Category 0	Yes	Category 0	Yes
Stage 3	307	Yes	Category 0	Yes	Category 0	Yes
Stage 3	308	Yes	Category 0	Yes	Category 0	Yes
Stage 3	309	Yes	Category 0	Yes	Category 0	Yes
Stage 3	310	Yes	Category 0	Yes	Category 1	Yes
Stage 3	311	Yes	Category 0	Yes	Category 1	Yes
Stage 3	312	Yes	Category 1	Yes	Category 1	Yes
Stage 3	313	Yes	Category 1	Yes	Category 1	Yes
Stage 3	314	Yes	Category 0	Yes	Category 1	Yes
Stage 3	315	Yes	Category 0	Yes	Category 1	Yes
Stage 3	316	Yes	Category 0	Yes	Category 1	Yes
Stage 3	317	Yes	Category 0	Yes	Category 1	Yes
Stage 3	318	Yes	Category 0	Yes	Category 1	Yes
Stage 3	319	Yes	Category 0	Yes	Category 1	Yes
Stage 3	320	Yes	Category 0	Yes	Category 1	Yes
Stage 3	321	Yes	Category 0	Yes	Category 0	Yes
Stage 3	322	Yes	Category 0	Yes	Category 0	Yes
Stage 3	323	Yes	Category 0	Yes	Category 0	Yes
Stage 3	324	Yes	Category 0	Yes	Category 0	Yes
Stage 3	325	Yes	Category 0	Yes	Category 0	Yes
Stage 3	326	Yes	Category 0	Yes	Category 0	Yes
Stage 3	327	Yes	Category 0	Yes	Category 0	Yes
Stage 3	328	Yes	Category 0	Yes	Category 0	Yes
Stage 3	329	Yes	Category 0	Yes	Category 0	Yes
Stage 3	330	Yes	Category 0	Yes	Category 0	Yes
Stage 3	331	Yes	Category 0	Yes	Category 0	Yes
Stage 3	332	Yes	Category 0	Yes	Category 0	Yes
Stage 3	333	Yes	Category 0	Yes	Category 0	Yes
Stage 3	334	Yes	Category 0	Yes	Category 0	Yes
Stage 3	335	Yes	Category 0	Yes	Category 0	Yes
Stage 3	336	Yes	Category 0	Yes	Category 0	Yes
Stage 3	337	Yes	Category 0	Yes	Category 0	Yes
Stage 3	338	Yes	Category 0	Yes	Category 0	Yes
Stage 3	339	Yes	Category 0	Yes	Category 0	Yes
Stage 3	340	Yes	Category 0	Yes	Category 0	Yes
Stage 4	401	Yes	Category 1	Yes	Category 1	Yes

Stage	Lot no.	Building façades (facade-adjusted)				Private open spaces (free-field)
		Ground floor		Upper floor		
		Compliance with ≤60dB(A) criterion	Noise Category QDC MP4.4	Compliance with ≤60dB(A) criterion	Noise Category QDC MP4.4	Compliance with ≤60dB(A) criterion
Stage 4	402	Yes	Category 1	Yes	Category 1	Yes
Stage 4	403	Yes	Category 1	Yes	Category 1	Yes
Stage 4	404	Yes	Category 1	Yes	Category 1	Yes
Stage 4	405	Yes	Category 1	Yes	Category 1	Yes
Stage 4	406	Yes	Category 0	Yes	Category 1	Yes
Stage 4	407	Yes	Category 0	Yes	Category 1	Yes
Stage 4	408	Yes	Category 0	Yes	Category 1	Yes
Stage 4	409	Yes	Category 0	Yes	Category 0	Yes
Stage 4	410	Yes	Category 0	Yes	Category 0	Yes
Stage 4	411	Yes	Category 0	Yes	Category 0	Yes
Stage 4	412	Yes	Category 0	Yes	Category 0	Yes
Stage 4	413	Yes	Category 0	Yes	Category 0	Yes
Stage 4	414	Yes	Category 0	Yes	Category 0	Yes
Stage 4	415	Yes	Category 0	Yes	Category 0	Yes
Stage 4	416	Yes	Category 0	Yes	Category 0	Yes
Stage 4	417	Yes	Category 0	Yes	Category 0	Yes
Stage 4	418	Yes	Category 0	Yes	Category 0	Yes
Stage 4	419	Yes	Category 0	Yes	Category 0	Yes
Stage 4	420	Yes	Category 0	Yes	Category 0	Yes
Stage 4	421	Yes	Category 0	Yes	Category 0	Yes
Stage 4	422	Yes	Category 0	Yes	Category 0	Yes
Stage 4	423	Yes	Category 0	Yes	Category 1	Yes
Stage 4	424	Yes	Category 0	Yes	Category 1	Yes
Stage 4	425	Yes	Category 0	Yes	Category 1	Yes
Stage 4	426	Yes	Category 1	Yes	Category 1	Yes
Stage 4	427	Yes	Category 1	Yes	Category 1	Yes
Stage 4	428	Yes	Category 1	Yes	Category 1	Yes
Stage 4	429	Yes	Category 1	Yes	Category 1	Yes
Stage 4	430	Yes	Category 1	Yes	Category 1	Yes
Stage 4	431	Yes	Category 1	No	Category 1	Yes
Stage 4	432	Yes	Category 1	No	Category 1	Yes
Stage 4	433	Yes	Category 1	No	Category 1	Yes
Stage 4	434	Yes	Category 1	Yes	Category 1	Yes
Stage 4	435	Yes	Category 1	Yes	Category 1	Yes
Stage 4	436	Yes	Category 1	Yes	Category 1	Yes
Stage 4	437	Yes	Category 1	Yes	Category 1	Yes
Stage 4	438	Yes	Category 0	Yes	Category 1	Yes
Stage 4	439	Yes	Category 0	Yes	Category 1	Yes
Stage 4	440	Yes	Category 0	Yes	Category 1	Yes
Stage 4	441	Yes	Category 0	Yes	Category 1	Yes

Stage	Lot no.	Building façades (facade-adjusted)				Private open spaces (free-field)
		Ground floor		Upper floor		
		Compliance with ≤60dB(A) criterion	Noise Category QDC MP4.4	Compliance with ≤60dB(A) criterion	Noise Category QDC MP4.4	Compliance with ≤60dB(A) criterion
Stage 4	442	Yes	Category 0	Yes	Category 1	Yes
Stage 4	443	Yes	Category 1	Yes	Category 1	Yes
Stage 4	444	Yes	Category 1	Yes	Category 1	Yes
Stage 4	445	Yes	Category 1	Yes	Category 1	Yes
Stage 4	446	Yes	Category 1	Yes	Category 1	Yes
Stage 4	447	Yes	Category 1	Yes	Category 1	Yes
Stage 4	448	Yes	Category 1	Yes	Category 1	Yes
Stage 4	449	Yes	Category 1	No	Category 1	Yes
Stage 4	450	Yes	Category 1	No	Category 1	Yes
Stage 4	451	Yes	Category 1	No	Category 1	Yes
Stage 4	452	Yes	Category 1	No	Category 1	Yes
Stage 4	453	Yes	Category 1	No	Category 1	Yes
Stage 4	454	Yes	Category 1	Yes	Category 1	Yes
Stage 4	455	Yes	Category 1	Yes	Category 1	Yes
Stage 4	456	Yes	Category 1	Yes	Category 1	Yes
Stage 4	457	Yes	Category 1	Yes	Category 1	Yes
Stage 4	458	Yes	Category 1	Yes	Category 1	Yes
Stage 4	459	Yes	Category 0	Yes	Category 1	Yes
Stage 4	460	Yes	Category 0	Yes	Category 1	Yes
Stage 4	461	Yes	Category 0	Yes	Category 0	Yes
Stage 5	501	No	Category 1	No	Category 3	Yes
Stage 5	502	No	Category 1	No	Category 3	Yes
Stage 5	503	No	Category 1	No	Category 3	Yes
Stage 5	504	No	Category 1	No	Category 3	Yes
Stage 5	505	No	Category 1	No	Category 3	Yes
Stage 5	506	No	Category 1	No	Category 3	Yes
Stage 5	507	No	Category 1	No	Category 3	Yes
Stage 5	508	No	Category 1	No	Category 3	Yes
Stage 5	509	No	Category 1	No	Category 3	Yes
Stage 5	510	No	Category 1	No	Category 3	Yes
Stage 5	511	No	Category 1	No	Category 3	Yes
Stage 5	512	No	Category 1	No	Category 3	Yes
Stage 5	513	No	Category 1	No	Category 3	Yes
Stage 5	514	No	Category 1	No	Category 3	Yes
Stage 5	515	Yes	Category 1	No	Category 1	Yes
Stage 5	516	Yes	Category 1	No	Category 1	Yes
Stage 5	517	Yes	Category 1	Yes	Category 1	Yes
Stage 5	518	Yes	Category 1	Yes	Category 1	Yes
Stage 5	519	Yes	Category 1	Yes	Category 1	Yes
Stage 5	520	Yes	Category 1	Yes	Category 1	Yes

Stage	Lot no.	Building façades (facade-adjusted)				Private open spaces (free-field)
		Ground floor		Upper floor		
		Compliance with ≤60dB(A) criterion	Noise Category QDC MP4.4	Compliance with ≤60dB(A) criterion	Noise Category QDC MP4.4	Compliance with ≤60dB(A) criterion
Stage 5	521	Yes	Category 1	Yes	Category 1	Yes
Stage 5	522	Yes	Category 1	Yes	Category 1	Yes
Stage 5	523	Yes	Category 0	Yes	Category 1	Yes
Stage 5	524	Yes	Category 0	Yes	Category 1	Yes
Stage 5	525	Yes	Category 0	Yes	Category 1	Yes
Stage 5	526	Yes	Category 1	Yes	Category 1	Yes
Stage 5	527	Yes	Category 1	Yes	Category 1	Yes
Stage 5	528	No	Category 1	No	Category 1	Yes
Stage 5	529	Yes	Category 1	No	Category 1	Yes
Stage 5	530	Yes	Category 1	No	Category 1	Yes
Stage 5	531	Yes	Category 1	No	Category 1	Yes
Stage 5	532	Yes	Category 1	No	Category 1	Yes
Stage 5	533	Yes	Category 1	No	Category 1	Yes
Stage 5	534	Yes	Category 1	No	Category 1	Yes
Stage 5	535	Yes	Category 1	No	Category 1	Yes
Stage 5	536	Yes	Category 1	No	Category 1	Yes
Stage 5	537	Yes	Category 1	No	Category 1	Yes
Stage 5	538	Yes	Category 1	No	Category 1	Yes
Stage 5	539	Yes	Category 1	No	Category 1	Yes
Stage 5	540	Yes	Category 1	No	Category 1	Yes
Stage 5	541	Yes	Category 1	No	Category 1	Yes
Stage 5	542	Yes	Category 1	No	Category 1	Yes
Stage 5	543	No	Category 1	No	Category 1	Yes
Stage 5	544	No	Category 1	No	Category 1	Yes
Stage 5	545	No	Category 1	No	Category 1	Yes
Stage 5	546	No	Category 1	No	Category 2	Yes
Stage 5	547	Yes	Category 1	No	Category 1	Yes
Stage 5	548	Yes	Category 1	No	Category 1	Yes
Stage 5	549	Yes	Category 1	No	Category 1	Yes
Stage 5	550	Yes	Category 1	No	Category 1	Yes
Stage 6	601	Yes	Category 1	Yes	Category 1	Yes
Stage 6	602	Yes	Category 0	Yes	Category 1	Yes
Stage 6	603	Yes	Category 0	Yes	Category 1	Yes
Stage 6	604	Yes	Category 0	Yes	Category 0	Yes
Stage 6	605	Yes	Category 0	Yes	Category 0	Yes
Stage 6	606	Yes	Category 0	Yes	Category 0	Yes
Stage 6	607	Yes	Category 0	Yes	Category 0	Yes
Stage 6	608	Yes	Category 0	Yes	Category 0	Yes
Stage 6	609	Yes	Category 0	Yes	Category 0	Yes
Stage 6	610	Yes	Category 0	Yes	Category 0	Yes

Stage	Lot no.	Building façades (facade-adjusted)				Private open spaces (free-field)
		Ground floor		Upper floor		
		Compliance with ≤60dB(A) criterion	Noise Category QDC MP4.4	Compliance with ≤60dB(A) criterion	Noise Category QDC MP4.4	Compliance with ≤60dB(A) criterion
Stage 6	611	Yes	Category 0	Yes	Category 0	Yes
Stage 6	612	Yes	Category 0	Yes	Category 0	Yes
Stage 6	613	Yes	Category 0	Yes	Category 0	Yes
Stage 6	614	Yes	Category 0	Yes	Category 0	Yes
Stage 6	615	Yes	Category 0	Yes	Category 0	Yes
Stage 6	616	Yes	Category 0	Yes	Category 0	Yes
Stage 6	617	Yes	Category 0	Yes	Category 0	Yes
Stage 6	618	Yes	Category 0	Yes	Category 0	Yes
Stage 6	619	Yes	Category 0	Yes	Category 0	Yes
Stage 6	620	Yes	Category 0	Yes	Category 0	Yes
Stage 6	621	Yes	Category 0	Yes	Category 0	Yes
Stage 6	622	Yes	Category 0	Yes	Category 1	Yes
Stage 6	623	Yes	Category 0	Yes	Category 1	Yes
Stage 6	624	Yes	Category 1	Yes	Category 1	Yes
Stage 6	625	Yes	Category 1	Yes	Category 1	Yes
Stage 6	626	Yes	Category 0	Yes	Category 1	Yes
Stage 6	627	Yes	Category 0	Yes	Category 1	Yes
Stage 6	628	Yes	Category 0	Yes	Category 1	Yes
Stage 6	629	Yes	Category 0	Yes	Category 0	Yes
Stage 6	630	Yes	Category 0	Yes	Category 0	Yes
Stage 6	631	Yes	Category 0	Yes	Category 0	Yes
Stage 6	632	Yes	Category 0	Yes	Category 1	Yes
Stage 6	633	Yes	Category 0	Yes	Category 1	Yes
Stage 6	634	Yes	Category 0	Yes	Category 1	Yes
Stage 6	635	Yes	Category 1	Yes	Category 1	Yes
Stage 6	636	Yes	Category 1	No	Category 1	Yes
Stage 6	637	Yes	Category 1	No	Category 1	Yes
Stage 6	638	Yes	Category 1	No	Category 1	Yes
Stage 6	639	Yes	Category 1	No	Category 1	Yes
Stage 6	640	Yes	Category 1	No	Category 1	Yes
Stage 6	641	Yes	Category 1	Yes	Category 1	Yes
Stage 6	642	Yes	Category 1	Yes	Category 1	Yes
Stage 6	643	Yes	Category 1	Yes	Category 1	Yes
Stage 6	644	Yes	Category 1	Yes	Category 1	Yes
Stage 6	645	Yes	Category 1	Yes	Category 1	Yes
Stage 6	646	No	Category 1	No	Category 1	Yes
Stage 6	647	No	Category 1	No	Category 1	Yes
Stage 6	648	No	Category 1	No	Category 1	Yes
Stage 6	649	No	Category 1	No	Category 1	Yes
Stage 6	650	No	Category 1	No	Category 1	Yes

Stage	Lot no.	Building façades (facade-adjusted)				Private open spaces (free-field)
		Ground floor		Upper floor		
		Compliance with ≤60dB(A) criterion	Noise Category QDC MP4.4	Compliance with ≤60dB(A) criterion	Noise Category QDC MP4.4	Compliance with ≤60dB(A) criterion
Stage 6	651	No	Category 1	No	Category 1	Yes
Stage 6	652	No	Category 1	No	Category 1	Yes
Stage 6	653	No	Category 1	No	Category 1	Yes
Stage 6	654	No	Category 1	No	Category 1	Yes
Stage 6	655	Yes	Category 1	No	Category 1	Yes
Stage 6	656	Yes	Category 1	No	Category 1	Yes
Stage 6	657	Yes	Category 1	No	Category 1	Yes
Stage 6	658	No	Category 1	No	Category 3	Yes
Stage 6	659	No	Category 1	No	Category 3	Yes
Stage 6	660	No	Category 1	No	Category 3	Yes
Stage 6	661	No	Category 1	No	Category 3	Yes
Stage 6	662	No	Category 1	No	Category 3	Yes
Stage 6	663	No	Category 1	No	Category 3	Yes
Stage 7	701	Yes	Category 1	Yes	Category 1	Yes
Stage 7	702	Yes	Category 1	Yes	Category 1	Yes
Stage 7	703	Yes	Category 0	Yes	Category 1	Yes
Stage 7	704	Yes	Category 0	Yes	Category 0	Yes
Stage 7	705	Yes	Category 0	Yes	Category 0	Yes
Stage 7	706	Yes	Category 0	Yes	Category 0	Yes
Stage 7	707	Yes	Category 0	Yes	Category 0	Yes
Stage 7	708	Yes	Category 0	Yes	Category 0	Yes
Stage 7	709	Yes	Category 0	Yes	Category 0	Yes
Stage 7	710	Yes	Category 0	Yes	Category 0	Yes
Stage 7	711	Yes	Category 0	Yes	Category 0	Yes
Stage 7	712	Yes	Category 0	Yes	Category 0	Yes
Stage 7	713	Yes	Category 0	Yes	Category 0	Yes
Stage 7	714	Yes	Category 0	Yes	Category 0	Yes
Stage 7	715	Yes	Category 0	Yes	Category 0	Yes
Stage 7	716	Yes	Category 0	Yes	Category 0	Yes
Stage 7	717	Yes	Category 0	Yes	Category 0	Yes
Stage 7	718	Yes	Category 0	Yes	Category 0	Yes
Stage 7	719	Yes	Category 0	Yes	Category 0	Yes
Stage 7	720	Yes	Category 0	Yes	Category 1	Yes
Stage 7	721	Yes	Category 0	Yes	Category 1	Yes
Stage 7	722	Yes	Category 0	Yes	Category 1	Yes
Stage 7	723	Yes	Category 0	Yes	Category 1	Yes
Stage 7	724	Yes	Category 0	Yes	Category 1	Yes
Stage 7	725	Yes	Category 0	Yes	Category 1	Yes
Stage 7	726	Yes	Category 0	Yes	Category 1	Yes
Stage 7	727	Yes	Category 0	Yes	Category 1	Yes

Stage	Lot no.	Building façades (facade-adjusted)				Private open spaces (free-field)
		Ground floor		Upper floor		
		Compliance with ≤60dB(A) criterion	Noise Category QDC MP4.4	Compliance with ≤60dB(A) criterion	Noise Category QDC MP4.4	Compliance with ≤60dB(A) criterion
Stage 7	728	Yes	Category 0	Yes	Category 1	Yes
Stage 7	729	Yes	Category 0	Yes	Category 0	Yes
Stage 7	730	Yes	Category 1	Yes	Category 1	Yes
Stage 7	731	Yes	Category 0	Yes	Category 1	Yes
Stage 7	732	Yes	Category 0	Yes	Category 1	Yes
Stage 7	733	Yes	Category 0	Yes	Category 1	Yes
Stage 7	734	Yes	Category 0	Yes	Category 1	Yes
Stage 7	735	Yes	Category 0	Yes	Category 1	Yes
Stage 7	736	Yes	Category 0	Yes	Category 1	Yes
Stage 7	737	Yes	Category 1	Yes	Category 1	Yes
Stage 7	738	Yes	Category 1	Yes	Category 1	Yes
Stage 7	739	Yes	Category 1	Yes	Category 1	Yes
Stage 7	740	Yes	Category 1	Yes	Category 1	Yes
Stage 7	741	Yes	Category 1	Yes	Category 1	Yes
Stage 7	742	Yes	Category 1	Yes	Category 1	Yes
Stage 7	743	Yes	Category 1	Yes	Category 1	Yes
Stage 7	744	Yes	Category 1	Yes	Category 1	Yes
Stage 7	745	Yes	Category 1	Yes	Category 1	Yes
Stage 7	746	Yes	Category 1	Yes	Category 1	Yes
Stage 7	747	Yes	Category 1	No	Category 1	Yes
Stage 7	748	Yes	Category 1	No	Category 1	Yes
Stage 7	749	No	Category 1	No	Category 1	Yes
Stage 7	750	No	Category 1	No	Category 1	Yes
Stage 7	751	No	Category 1	No	Category 1	Yes
Stage 7	752	Yes	Category 1	No	Category 1	Yes
Stage 7	753	Yes	Category 1	No	Category 1	Yes
Stage 7	754	Yes	Category 1	No	Category 1	Yes
Stage 7	755	Yes	Category 1	No	Category 1	Yes
Stage 7	756	Yes	Category 1	No	Category 1	Yes
Stage 7	757	Yes	Category 1	No	Category 1	Yes
Stage 7	758	Yes	Category 1	Yes	Category 1	Yes
Stage 7	759	Yes	Category 1	No	Category 1	Yes
Stage 7	760	No	Category 1	No	Category 1	Yes
Stage 7	761	No	Category 1	No	Category 1	Yes
Stage 7	762	No	Category 1	No	Category 1	Yes
Stage 7	763	No	Category 1	No	Category 1	Yes
Stage 7	764	No	Category 1	No	Category 1	Yes
Stage 7	765	No	Category 1	No	Category 1	Yes
Stage 7	766	No	Category 1	No	Category 2	Yes
Stage 7	767	No	Category 1	No	Category 2	Yes

Stage	Lot no.	Building façades (facade-adjusted)				Private open spaces (free-field)
		Ground floor		Upper floor		
		Compliance with ≤60dB(A) criterion	Noise Category QDC MP4.4	Compliance with ≤60dB(A) criterion	Noise Category QDC MP4.4	Compliance with ≤60dB(A) criterion
Stage 7	768	No	Category 1	No	Category 2	Yes
Stage 7	769	No	Category 1	No	Category 2	Yes
Stage 7	770	No	Category 1	No	Category 2	Yes
Stage 7	771	No	Category 1	No	Category 2	Yes
Stage 7	772	No	Category 1	No	Category 3	Yes
Stage 7	773	No	Category 1	No	Category 2	Yes
Stage 7	774	No	Category 1	No	Category 2	Yes
Stage 7	775	No	Category 1	No	Category 2	Yes
Stage 7	776	No	Category 1	No	Category 2	Yes
Stage 7	777	No	Category 1	No	Category 2	Yes
Stage 7	778	No	Category 1	No	Category 3	Yes
Stage 8	801	Yes	Category 0	Yes	Category 0	Yes
Stage 8	802	Yes	Category 0	Yes	Category 0	Yes
Stage 8	803	Yes	Category 0	Yes	Category 0	Yes
Stage 8	804	Yes	Category 0	Yes	Category 0	Yes
Stage 8	805	Yes	Category 0	Yes	Category 0	Yes
Stage 8	806	Yes	Category 0	Yes	Category 0	Yes
Stage 8	807	Yes	Category 0	Yes	Category 0	Yes
Stage 8	808	Yes	Category 0	Yes	Category 0	Yes
Stage 8	809	Yes	Category 0	Yes	Category 0	Yes
Stage 8	810	Yes	Category 0	Yes	Category 0	Yes
Stage 8	811	Yes	Category 0	Yes	Category 0	Yes
Stage 8	812	Yes	Category 0	Yes	Category 0	Yes
Stage 8	813	Yes	Category 0	Yes	Category 0	Yes
Stage 8	814	Yes	Category 0	Yes	Category 0	Yes
Stage 8	815	Yes	Category 0	Yes	Category 0	Yes
Stage 8	816	Yes	Category 0	Yes	Category 0	Yes
Stage 8	817	Yes	Category 0	Yes	Category 0	Yes
Stage 8	818	Yes	Category 0	Yes	Category 0	Yes
Stage 8	819	Yes	Category 0	Yes	Category 0	Yes
Stage 8	820	Yes	Category 0	Yes	Category 0	Yes
Stage 8	821	Yes	Category 0	Yes	Category 0	Yes
Stage 8	822	Yes	Category 0	Yes	Category 0	Yes
Stage 8	823	Yes	Category 0	Yes	Category 0	Yes
Stage 8	824	Yes	Category 0	Yes	Category 0	Yes
Stage 8	825	Yes	Category 0	Yes	Category 0	Yes
Stage 8	826	Yes	Category 0	Yes	Category 0	Yes
Stage 8	827	Yes	Category 0	Yes	Category 0	Yes
Stage 8	828	Yes	Category 0	Yes	Category 0	Yes

Noise contours showing the propagation of traffic noise across the development site are presented in Appendix H.

5.2 Scenario 2 – Noise Barriers 2.0 to 7.0 m High

Summary of the results for Scenario 2 is presented in Table 5.2.

Table 5.2 Traffic noise calculation results (Year 2035) – Scenario 2

Stage	Lot no.	Building façades (facade-adjusted)				Private open spaces (free-field)
		Ground floor		Upper floor		
		Compliance with ≤60dB(A) criterion	Noise Category QDC MP4.4	Compliance with ≤60dB(A) criterion	Noise Category QDC MP4.4	Compliance with ≤60dB(A) criterion
Stage 1	101	Yes	Category 0	Yes	Category 0	Yes
Stage 1	102	Yes	Category 0	Yes	Category 0	Yes
Stage 1	103	Yes	Category 0	Yes	Category 0	Yes
Stage 1	104	Yes	Category 0	Yes	Category 0	Yes
Stage 1	105	Yes	Category 0	Yes	Category 0	Yes
Stage 1	106	Yes	Category 0	Yes	Category 0	Yes
Stage 1	107	Yes	Category 0	Yes	Category 0	Yes
Stage 1	108	Yes	Category 0	Yes	Category 0	Yes
Stage 1	109	Yes	Category 0	Yes	Category 0	Yes
Stage 1	110	Yes	Category 0	Yes	Category 0	Yes
Stage 1	111	Yes	Category 0	Yes	Category 0	Yes
Stage 1	112	Yes	Category 0	Yes	Category 0	Yes
Stage 1	113	Yes	Category 0	Yes	Category 0	Yes
Stage 1	114	Yes	Category 0	Yes	Category 0	Yes
Stage 1	115	Yes	Category 0	Yes	Category 0	Yes
Stage 1	116	Yes	Category 0	Yes	Category 0	Yes
Stage 1	117	Yes	Category 0	Yes	Category 0	Yes
Stage 1	118	Yes	Category 0	Yes	Category 0	Yes
Stage 1	119	Yes	Category 0	Yes	Category 0	Yes
Stage 1	120	Yes	Category 0	Yes	Category 0	Yes
Stage 1	121	Yes	Category 0	Yes	Category 0	Yes
Stage 1	122	Yes	Category 0	Yes	Category 0	Yes
Stage 1	123	Yes	Category 0	Yes	Category 0	Yes
Stage 1	124	Yes	Category 0	Yes	Category 0	Yes
Stage 1	125	Yes	Category 0	Yes	Category 0	Yes
Stage 1	126	Yes	Category 0	Yes	Category 0	Yes
Stage 1	127	Yes	Category 0	Yes	Category 0	Yes
Stage 1	128	Yes	Category 0	Yes	Category 0	Yes
Stage 1	129	Yes	Category 0	Yes	Category 0	Yes
Stage 1	130	Yes	Category 0	Yes	Category 0	Yes
Stage 1	131	Yes	Category 0	Yes	Category 0	Yes
Stage 1	132	Yes	Category 0	Yes	Category 0	Yes
Stage 1	133	Yes	Category 0	Yes	Category 0	Yes
Stage 1	134	Yes	Category 0	Yes	Category 0	Yes
Stage 1	135	Yes	Category 0	Yes	Category 0	Yes
Stage 1	136	Yes	Category 0	Yes	Category 0	Yes

Stage	Lot no.	Building façades (facade-adjusted)				Private open spaces (free-field)
		Ground floor		Upper floor		
		Compliance with ≤60dB(A) criterion	Noise Category QDC MP4.4	Compliance with ≤60dB(A) criterion	Noise Category QDC MP4.4	Compliance with ≤60dB(A) criterion
Stage 1	137	Yes	Category 0	Yes	Category 0	Yes
Stage 1	138	Yes	Category 0	Yes	Category 0	Yes
Stage 1	139	Yes	Category 0	Yes	Category 0	Yes
Stage 1	140	Yes	Category 0	Yes	Category 0	Yes
Stage 1	141	Yes	Category 0	Yes	Category 0	Yes
Stage 1	142	Yes	Category 0	Yes	Category 0	Yes
Stage 1	143	Yes	Category 0	Yes	Category 0	Yes
Stage 1	144	Yes	Category 0	Yes	Category 0	Yes
Stage 1	145	Yes	Category 0	Yes	Category 0	Yes
Stage 1	146	Yes	Category 0	Yes	Category 0	Yes
Stage 1	147	Yes	Category 0	Yes	Category 0	Yes
Stage 1	148	Yes	Category 0	Yes	Category 0	Yes
Stage 1	149	Yes	Category 0	Yes	Category 0	Yes
Stage 1	150	Yes	Category 0	Yes	Category 0	Yes
Stage 1	151	Yes	Category 0	Yes	Category 0	Yes
Stage 1	152	Yes	Category 0	Yes	Category 0	Yes
Stage 1	153	Yes	Category 0	Yes	Category 0	Yes
Stage 1	154	Yes	Category 0	Yes	Category 0	Yes
Stage 1	155	Yes	Category 0	Yes	Category 0	Yes
Stage 1	156	Yes	Category 0	Yes	Category 0	Yes
Stage 1	157	Yes	Category 0	Yes	Category 0	Yes
Stage 1	158	Yes	Category 0	Yes	Category 0	Yes
Stage 1	159	Yes	Category 0	Yes	Category 0	Yes
Stage 1	160	Yes	Category 0	Yes	Category 0	Yes
Stage 2	201	Yes	Category 0	Yes	Category 0	Yes
Stage 2	202	Yes	Category 0	Yes	Category 0	Yes
Stage 2	203	Yes	Category 0	Yes	Category 0	Yes
Stage 2	204	Yes	Category 0	Yes	Category 0	Yes
Stage 2	205	Yes	Category 0	Yes	Category 0	Yes
Stage 2	206	Yes	Category 0	Yes	Category 0	Yes
Stage 2	207	Yes	Category 0	Yes	Category 0	Yes
Stage 2	208	Yes	Category 0	Yes	Category 0	Yes
Stage 2	209	Yes	Category 0	Yes	Category 0	Yes
Stage 2	210	Yes	Category 0	Yes	Category 0	Yes
Stage 2	211	Yes	Category 0	Yes	Category 0	Yes
Stage 2	212	Yes	Category 0	Yes	Category 0	Yes
Stage 2	213	Yes	Category 0	Yes	Category 0	Yes
Stage 2	214	Yes	Category 0	Yes	Category 0	Yes
Stage 2	215	Yes	Category 0	Yes	Category 0	Yes
Stage 2	216	Yes	Category 0	Yes	Category 0	Yes

Stage	Lot no.	Building façades (facade-adjusted)				Private open spaces (free-field)
		Ground floor		Upper floor		
		Compliance with ≤60dB(A) criterion	Noise Category QDC MP4.4	Compliance with ≤60dB(A) criterion	Noise Category QDC MP4.4	Compliance with ≤60dB(A) criterion
Stage 2	217	Yes	Category 0	Yes	Category 0	Yes
Stage 2	218	Yes	Category 0	Yes	Category 0	Yes
Stage 2	219	Yes	Category 0	Yes	Category 0	Yes
Stage 2	220	Yes	Category 0	Yes	Category 0	Yes
Stage 2	221	Yes	Category 0	Yes	Category 0	Yes
Stage 2	222	Yes	Category 0	Yes	Category 0	Yes
Stage 2	223	Yes	Category 0	Yes	Category 0	Yes
Stage 2	224	Yes	Category 0	Yes	Category 0	Yes
Stage 2	225	Yes	Category 0	Yes	Category 0	Yes
Stage 2	226	Yes	Category 0	Yes	Category 0	Yes
Stage 2	227	Yes	Category 0	Yes	Category 0	Yes
Stage 2	228	Yes	Category 0	Yes	Category 0	Yes
Stage 2	229	Yes	Category 0	Yes	Category 0	Yes
Stage 2	230	Yes	Category 0	Yes	Category 0	Yes
Stage 2	231	Yes	Category 0	Yes	Category 0	Yes
Stage 2	232	Yes	Category 0	Yes	Category 0	Yes
Stage 2	233	Yes	Category 0	Yes	Category 0	Yes
Stage 2	234	Yes	Category 0	Yes	Category 0	Yes
Stage 2	235	Yes	Category 0	Yes	Category 0	Yes
Stage 2	236	Yes	Category 0	Yes	Category 0	Yes
Stage 2	237	Yes	Category 0	Yes	Category 0	Yes
Stage 2	238	Yes	Category 0	Yes	Category 0	Yes
Stage 2	239	Yes	Category 0	Yes	Category 0	Yes
Stage 2	240	Yes	Category 0	Yes	Category 0	Yes
Stage 2	241	Yes	Category 0	Yes	Category 0	Yes
Stage 2	242	Yes	Category 0	Yes	Category 0	Yes
Stage 2	243	Yes	Category 0	Yes	Category 0	Yes
Stage 2	244	Yes	Category 0	Yes	Category 0	Yes
Stage 3	301	Yes	Category 0	Yes	Category 0	Yes
Stage 3	302	Yes	Category 0	Yes	Category 0	Yes
Stage 3	303	Yes	Category 0	Yes	Category 0	Yes
Stage 3	304	Yes	Category 0	Yes	Category 0	Yes
Stage 3	305	Yes	Category 0	Yes	Category 0	Yes
Stage 3	306	Yes	Category 0	Yes	Category 0	Yes
Stage 3	307	Yes	Category 0	Yes	Category 0	Yes
Stage 3	308	Yes	Category 0	Yes	Category 0	Yes
Stage 3	309	Yes	Category 0	Yes	Category 0	Yes
Stage 3	310	Yes	Category 0	Yes	Category 0	Yes
Stage 3	311	Yes	Category 0	Yes	Category 0	Yes
Stage 3	312	Yes	Category 1	Yes	Category 1	Yes

Stage	Lot no.	Building façades (facade-adjusted)				Private open spaces (free-field)
		Ground floor		Upper floor		
		Compliance with ≤60dB(A) criterion	Noise Category QDC MP4.4	Compliance with ≤60dB(A) criterion	Noise Category QDC MP4.4	Compliance with ≤60dB(A) criterion
Stage 3	313	Yes	Category 1	Yes	Category 1	Yes
Stage 3	314	Yes	Category 0	Yes	Category 0	Yes
Stage 3	315	Yes	Category 0	Yes	Category 0	Yes
Stage 3	316	Yes	Category 0	Yes	Category 0	Yes
Stage 3	317	Yes	Category 0	Yes	Category 0	Yes
Stage 3	318	Yes	Category 0	Yes	Category 0	Yes
Stage 3	319	Yes	Category 0	Yes	Category 0	Yes
Stage 3	320	Yes	Category 0	Yes	Category 0	Yes
Stage 3	321	Yes	Category 0	Yes	Category 0	Yes
Stage 3	322	Yes	Category 0	Yes	Category 0	Yes
Stage 3	323	Yes	Category 0	Yes	Category 0	Yes
Stage 3	324	Yes	Category 0	Yes	Category 0	Yes
Stage 3	325	Yes	Category 0	Yes	Category 0	Yes
Stage 3	326	Yes	Category 0	Yes	Category 0	Yes
Stage 3	327	Yes	Category 0	Yes	Category 0	Yes
Stage 3	328	Yes	Category 0	Yes	Category 0	Yes
Stage 3	329	Yes	Category 0	Yes	Category 0	Yes
Stage 3	330	Yes	Category 0	Yes	Category 0	Yes
Stage 3	331	Yes	Category 0	Yes	Category 0	Yes
Stage 3	332	Yes	Category 0	Yes	Category 0	Yes
Stage 3	333	Yes	Category 0	Yes	Category 0	Yes
Stage 3	334	Yes	Category 0	Yes	Category 0	Yes
Stage 3	335	Yes	Category 0	Yes	Category 0	Yes
Stage 3	336	Yes	Category 0	Yes	Category 0	Yes
Stage 3	337	Yes	Category 0	Yes	Category 0	Yes
Stage 3	338	Yes	Category 0	Yes	Category 0	Yes
Stage 3	339	Yes	Category 0	Yes	Category 0	Yes
Stage 3	340	Yes	Category 0	Yes	Category 0	Yes
Stage 4	401	Yes	Category 1	Yes	Category 1	Yes
Stage 4	402	Yes	Category 1	Yes	Category 1	Yes
Stage 4	403	Yes	Category 1	Yes	Category 1	Yes
Stage 4	404	Yes	Category 1	Yes	Category 1	Yes
Stage 4	405	Yes	Category 0	Yes	Category 1	Yes
Stage 4	406	Yes	Category 0	Yes	Category 1	Yes
Stage 4	407	Yes	Category 0	Yes	Category 1	Yes
Stage 4	408	Yes	Category 0	Yes	Category 0	Yes
Stage 4	409	Yes	Category 0	Yes	Category 0	Yes
Stage 4	410	Yes	Category 0	Yes	Category 0	Yes
Stage 4	411	Yes	Category 0	Yes	Category 0	Yes
Stage 4	412	Yes	Category 0	Yes	Category 0	Yes

Stage	Lot no.	Building façades (facade-adjusted)				Private open spaces (free-field)
		Ground floor		Upper floor		
		Compliance with ≤60dB(A) criterion	Noise Category QDC MP4.4	Compliance with ≤60dB(A) criterion	Noise Category QDC MP4.4	Compliance with ≤60dB(A) criterion
Stage 4	413	Yes	Category 0	Yes	Category 0	Yes
Stage 4	414	Yes	Category 0	Yes	Category 0	Yes
Stage 4	415	Yes	Category 0	Yes	Category 0	Yes
Stage 4	416	Yes	Category 0	Yes	Category 0	Yes
Stage 4	417	Yes	Category 0	Yes	Category 0	Yes
Stage 4	418	Yes	Category 0	Yes	Category 0	Yes
Stage 4	419	Yes	Category 0	Yes	Category 0	Yes
Stage 4	420	Yes	Category 0	Yes	Category 0	Yes
Stage 4	421	Yes	Category 0	Yes	Category 0	Yes
Stage 4	422	Yes	Category 0	Yes	Category 0	Yes
Stage 4	423	Yes	Category 0	Yes	Category 0	Yes
Stage 4	424	Yes	Category 0	Yes	Category 1	Yes
Stage 4	425	Yes	Category 0	Yes	Category 1	Yes
Stage 4	426	Yes	Category 0	Yes	Category 1	Yes
Stage 4	427	Yes	Category 1	Yes	Category 1	Yes
Stage 4	428	Yes	Category 1	Yes	Category 1	Yes
Stage 4	429	Yes	Category 1	Yes	Category 1	Yes
Stage 4	430	Yes	Category 1	Yes	Category 1	Yes
Stage 4	431	Yes	Category 1	Yes	Category 1	Yes
Stage 4	432	Yes	Category 1	Yes	Category 1	Yes
Stage 4	433	Yes	Category 1	No	Category 1	Yes
Stage 4	434	Yes	Category 1	Yes	Category 1	Yes
Stage 4	435	Yes	Category 1	Yes	Category 1	Yes
Stage 4	436	Yes	Category 1	Yes	Category 1	Yes
Stage 4	437	Yes	Category 0	Yes	Category 1	Yes
Stage 4	438	Yes	Category 0	Yes	Category 1	Yes
Stage 4	439	Yes	Category 0	Yes	Category 0	Yes
Stage 4	440	Yes	Category 0	Yes	Category 0	Yes
Stage 4	441	Yes	Category 0	Yes	Category 0	Yes
Stage 4	442	Yes	Category 0	Yes	Category 1	Yes
Stage 4	443	Yes	Category 0	Yes	Category 1	Yes
Stage 4	444	Yes	Category 0	Yes	Category 1	Yes
Stage 4	445	Yes	Category 1	Yes	Category 1	Yes
Stage 4	446	Yes	Category 1	Yes	Category 1	Yes
Stage 4	447	Yes	Category 1	Yes	Category 1	Yes
Stage 4	448	Yes	Category 1	Yes	Category 1	Yes
Stage 4	449	Yes	Category 1	No	Category 1	Yes
Stage 4	450	Yes	Category 1	No	Category 1	Yes
Stage 4	451	Yes	Category 1	No	Category 1	Yes
Stage 4	452	Yes	Category 1	No	Category 1	Yes

Stage	Lot no.	Building façades (facade-adjusted)				Private open spaces (free-field)
		Ground floor		Upper floor		
		Compliance with ≤60dB(A) criterion	Noise Category QDC MP4.4	Compliance with ≤60dB(A) criterion	Noise Category QDC MP4.4	Compliance with ≤60dB(A) criterion
Stage 4	453	Yes	Category 1	No	Category 1	Yes
Stage 4	454	Yes	Category 1	Yes	Category 1	Yes
Stage 4	455	Yes	Category 1	Yes	Category 1	Yes
Stage 4	456	Yes	Category 1	Yes	Category 1	Yes
Stage 4	457	Yes	Category 1	Yes	Category 1	Yes
Stage 4	458	Yes	Category 0	Yes	Category 1	Yes
Stage 4	459	Yes	Category 0	Yes	Category 1	Yes
Stage 4	460	Yes	Category 0	Yes	Category 0	Yes
Stage 4	461	Yes	Category 0	Yes	Category 0	Yes
Stage 5	501	Yes	Category 1	No	Category 3	Yes
Stage 5	502	Yes	Category 1	No	Category 3	Yes
Stage 5	503	Yes	Category 1	No	Category 3	Yes
Stage 5	504	Yes	Category 1	No	Category 3	Yes
Stage 5	505	Yes	Category 1	No	Category 3	Yes
Stage 5	506	Yes	Category 1	No	Category 3	Yes
Stage 5	507	Yes	Category 1	No	Category 3	Yes
Stage 5	508	Yes	Category 1	No	Category 3	Yes
Stage 5	509	Yes	Category 1	No	Category 3	Yes
Stage 5	510	Yes	Category 1	No	Category 3	Yes
Stage 5	511	Yes	Category 1	No	Category 3	Yes
Stage 5	512	Yes	Category 1	No	Category 3	Yes
Stage 5	513	Yes	Category 1	No	Category 3	Yes
Stage 5	514	Yes	Category 1	No	Category 3	Yes
Stage 5	515	Yes	Category 1	No	Category 1	Yes
Stage 5	516	Yes	Category 1	No	Category 1	Yes
Stage 5	517	Yes	Category 0	Yes	Category 1	Yes
Stage 5	518	Yes	Category 0	Yes	Category 1	Yes
Stage 5	519	Yes	Category 0	Yes	Category 1	Yes
Stage 5	520	Yes	Category 0	Yes	Category 1	Yes
Stage 5	521	Yes	Category 0	Yes	Category 1	Yes
Stage 5	522	Yes	Category 0	Yes	Category 1	Yes
Stage 5	523	Yes	Category 0	Yes	Category 1	Yes
Stage 5	524	Yes	Category 0	Yes	Category 1	Yes
Stage 5	525	Yes	Category 0	Yes	Category 0	Yes
Stage 5	526	Yes	Category 1	Yes	Category 1	Yes
Stage 5	527	Yes	Category 1	Yes	Category 1	Yes
Stage 5	528	Yes	Category 1	No	Category 1	Yes
Stage 5	529	Yes	Category 1	No	Category 1	Yes
Stage 5	530	Yes	Category 1	No	Category 1	Yes
Stage 5	531	Yes	Category 1	Yes	Category 1	Yes

Stage	Lot no.	Building façades (facade-adjusted)				Private open spaces (free-field)
		Ground floor		Upper floor		
		Compliance with ≤60dB(A) criterion	Noise Category QDC MP4.4	Compliance with ≤60dB(A) criterion	Noise Category QDC MP4.4	Compliance with ≤60dB(A) criterion
Stage 5	532	Yes	Category 1	Yes	Category 1	Yes
Stage 5	533	Yes	Category 1	Yes	Category 1	Yes
Stage 5	534	Yes	Category 1	Yes	Category 1	Yes
Stage 5	535	Yes	Category 1	Yes	Category 1	Yes
Stage 5	536	Yes	Category 1	Yes	Category 1	Yes
Stage 5	537	Yes	Category 1	No	Category 1	Yes
Stage 5	538	Yes	Category 1	No	Category 1	Yes
Stage 5	539	Yes	Category 1	No	Category 1	Yes
Stage 5	540	Yes	Category 1	No	Category 1	Yes
Stage 5	541	Yes	Category 1	No	Category 1	Yes
Stage 5	542	Yes	Category 1	No	Category 1	Yes
Stage 5	543	Yes	Category 1	No	Category 1	Yes
Stage 5	544	Yes	Category 1	No	Category 1	Yes
Stage 5	545	Yes	Category 1	No	Category 1	Yes
Stage 5	546	Yes	Category 1	No	Category 1	Yes
Stage 5	547	Yes	Category 1	No	Category 1	Yes
Stage 5	548	Yes	Category 1	No	Category 1	Yes
Stage 5	549	Yes	Category 1	No	Category 1	Yes
Stage 5	550	Yes	Category 1	No	Category 1	Yes
Stage 6	601	Yes	Category 0	Yes	Category 1	Yes
Stage 6	602	Yes	Category 0	Yes	Category 1	Yes
Stage 6	603	Yes	Category 0	Yes	Category 0	Yes
Stage 6	604	Yes	Category 0	Yes	Category 0	Yes
Stage 6	605	Yes	Category 0	Yes	Category 0	Yes
Stage 6	606	Yes	Category 0	Yes	Category 0	Yes
Stage 6	607	Yes	Category 0	Yes	Category 0	Yes
Stage 6	608	Yes	Category 0	Yes	Category 0	Yes
Stage 6	609	Yes	Category 0	Yes	Category 0	Yes
Stage 6	610	Yes	Category 0	Yes	Category 0	Yes
Stage 6	611	Yes	Category 0	Yes	Category 0	Yes
Stage 6	612	Yes	Category 0	Yes	Category 0	Yes
Stage 6	613	Yes	Category 0	Yes	Category 0	Yes
Stage 6	614	Yes	Category 0	Yes	Category 0	Yes
Stage 6	615	Yes	Category 0	Yes	Category 0	Yes
Stage 6	616	Yes	Category 0	Yes	Category 0	Yes
Stage 6	617	Yes	Category 0	Yes	Category 0	Yes
Stage 6	618	Yes	Category 0	Yes	Category 0	Yes
Stage 6	619	Yes	Category 0	Yes	Category 0	Yes
Stage 6	620	Yes	Category 0	Yes	Category 0	Yes
Stage 6	621	Yes	Category 0	Yes	Category 0	Yes

Stage	Lot no.	Building façades (facade-adjusted)				Private open spaces (free-field)
		Ground floor		Upper floor		
		Compliance with ≤60dB(A) criterion	Noise Category QDC MP4.4	Compliance with ≤60dB(A) criterion	Noise Category QDC MP4.4	Compliance with ≤60dB(A) criterion
Stage 6	622	Yes	Category 0	Yes	Category 0	Yes
Stage 6	623	Yes	Category 0	Yes	Category 0	Yes
Stage 6	624	Yes	Category 0	Yes	Category 1	Yes
Stage 6	625	Yes	Category 0	Yes	Category 1	Yes
Stage 6	626	Yes	Category 0	Yes	Category 0	Yes
Stage 6	627	Yes	Category 0	Yes	Category 0	Yes
Stage 6	628	Yes	Category 0	Yes	Category 0	Yes
Stage 6	629	Yes	Category 0	Yes	Category 0	Yes
Stage 6	630	Yes	Category 0	Yes	Category 0	Yes
Stage 6	631	Yes	Category 0	Yes	Category 0	Yes
Stage 6	632	Yes	Category 0	Yes	Category 0	Yes
Stage 6	633	Yes	Category 0	Yes	Category 1	Yes
Stage 6	634	Yes	Category 0	Yes	Category 1	Yes
Stage 6	635	Yes	Category 0	Yes	Category 1	Yes
Stage 6	636	Yes	Category 1	Yes	Category 1	Yes
Stage 6	637	Yes	Category 1	Yes	Category 1	Yes
Stage 6	638	Yes	Category 1	Yes	Category 1	Yes
Stage 6	639	Yes	Category 1	Yes	Category 1	Yes
Stage 6	640	Yes	Category 1	Yes	Category 1	Yes
Stage 6	641	Yes	Category 1	Yes	Category 1	Yes
Stage 6	642	Yes	Category 1	Yes	Category 1	Yes
Stage 6	643	Yes	Category 1	Yes	Category 1	Yes
Stage 6	644	Yes	Category 1	Yes	Category 1	Yes
Stage 6	645	Yes	Category 1	Yes	Category 1	Yes
Stage 6	646	Yes	Category 1	No	Category 1	Yes
Stage 6	647	Yes	Category 1	No	Category 1	Yes
Stage 6	648	Yes	Category 1	No	Category 1	Yes
Stage 6	649	Yes	Category 1	No	Category 1	Yes
Stage 6	650	Yes	Category 1	No	Category 1	Yes
Stage 6	651	Yes	Category 1	No	Category 1	Yes
Stage 6	652	Yes	Category 1	No	Category 1	Yes
Stage 6	653	Yes	Category 1	No	Category 1	Yes
Stage 6	654	Yes	Category 1	No	Category 1	Yes
Stage 6	655	Yes	Category 1	No	Category 1	Yes
Stage 6	656	Yes	Category 1	No	Category 1	Yes
Stage 6	657	Yes	Category 1	No	Category 1	Yes
Stage 6	658	Yes	Category 1	No	Category 3	Yes
Stage 6	659	Yes	Category 1	No	Category 3	Yes
Stage 6	660	Yes	Category 1	No	Category 3	Yes
Stage 6	661	Yes	Category 1	No	Category 3	Yes

Stage	Lot no.	Building façades (facade-adjusted)				Private open spaces (free-field)
		Ground floor		Upper floor		
		Compliance with ≤60dB(A) criterion	Noise Category QDC MP4.4	Compliance with ≤60dB(A) criterion	Noise Category QDC MP4.4	Compliance with ≤60dB(A) criterion
Stage 6	662	Yes	Category 1	No	Category 3	Yes
Stage 6	663	Yes	Category 1	No	Category 3	Yes
Stage 7	701	Yes	Category 1	Yes	Category 1	Yes
Stage 7	702	Yes	Category 1	Yes	Category 1	Yes
Stage 7	703	Yes	Category 0	Yes	Category 1	Yes
Stage 7	704	Yes	Category 0	Yes	Category 0	Yes
Stage 7	705	Yes	Category 0	Yes	Category 0	Yes
Stage 7	706	Yes	Category 0	Yes	Category 0	Yes
Stage 7	707	Yes	Category 0	Yes	Category 0	Yes
Stage 7	708	Yes	Category 0	Yes	Category 0	Yes
Stage 7	709	Yes	Category 0	Yes	Category 0	Yes
Stage 7	710	Yes	Category 0	Yes	Category 0	Yes
Stage 7	711	Yes	Category 0	Yes	Category 0	Yes
Stage 7	712	Yes	Category 0	Yes	Category 0	Yes
Stage 7	713	Yes	Category 0	Yes	Category 0	Yes
Stage 7	714	Yes	Category 0	Yes	Category 0	Yes
Stage 7	715	Yes	Category 0	Yes	Category 0	Yes
Stage 7	716	Yes	Category 0	Yes	Category 0	Yes
Stage 7	717	Yes	Category 0	Yes	Category 0	Yes
Stage 7	718	Yes	Category 0	Yes	Category 0	Yes
Stage 7	719	Yes	Category 0	Yes	Category 0	Yes
Stage 7	720	Yes	Category 0	Yes	Category 0	Yes
Stage 7	721	Yes	Category 0	Yes	Category 0	Yes
Stage 7	722	Yes	Category 0	Yes	Category 1	Yes
Stage 7	723	Yes	Category 0	Yes	Category 0	Yes
Stage 7	724	Yes	Category 0	Yes	Category 0	Yes
Stage 7	725	Yes	Category 0	Yes	Category 0	Yes
Stage 7	726	Yes	Category 0	Yes	Category 0	Yes
Stage 7	727	Yes	Category 0	Yes	Category 0	Yes
Stage 7	728	Yes	Category 0	Yes	Category 0	Yes
Stage 7	729	Yes	Category 0	Yes	Category 0	Yes
Stage 7	730	Yes	Category 0	Yes	Category 1	Yes
Stage 7	731	Yes	Category 0	Yes	Category 1	Yes
Stage 7	732	Yes	Category 0	Yes	Category 1	Yes
Stage 7	733	Yes	Category 0	Yes	Category 1	Yes
Stage 7	734	Yes	Category 0	Yes	Category 1	Yes
Stage 7	735	Yes	Category 0	Yes	Category 1	Yes
Stage 7	736	Yes	Category 0	Yes	Category 1	Yes
Stage 7	737	Yes	Category 1	Yes	Category 1	Yes
Stage 7	738	Yes	Category 1	Yes	Category 1	Yes

Stage	Lot no.	Building façades (facade-adjusted)				Private open spaces (free-field)
		Ground floor		Upper floor		
		Compliance with ≤60dB(A) criterion	Noise Category QDC MP4.4	Compliance with ≤60dB(A) criterion	Noise Category QDC MP4.4	Compliance with ≤60dB(A) criterion
Stage 7	739	Yes	Category 1	Yes	Category 1	Yes
Stage 7	740	Yes	Category 1	Yes	Category 1	Yes
Stage 7	741	Yes	Category 1	Yes	Category 1	Yes
Stage 7	742	Yes	Category 1	Yes	Category 1	Yes
Stage 7	743	Yes	Category 1	Yes	Category 1	Yes
Stage 7	744	Yes	Category 1	Yes	Category 1	Yes
Stage 7	745	Yes	Category 1	Yes	Category 1	Yes
Stage 7	746	Yes	Category 1	Yes	Category 1	Yes
Stage 7	747	Yes	Category 1	Yes	Category 1	Yes
Stage 7	748	Yes	Category 1	No	Category 1	Yes
Stage 7	749	Yes	Category 1	No	Category 1	Yes
Stage 7	750	Yes	Category 1	No	Category 1	Yes
Stage 7	751	Yes	Category 1	No	Category 1	Yes
Stage 7	752	Yes	Category 1	No	Category 1	Yes
Stage 7	753	Yes	Category 1	No	Category 1	Yes
Stage 7	754	Yes	Category 1	Yes	Category 1	Yes
Stage 7	755	Yes	Category 1	Yes	Category 1	Yes
Stage 7	756	Yes	Category 1	Yes	Category 1	Yes
Stage 7	757	Yes	Category 1	Yes	Category 1	Yes
Stage 7	758	Yes	Category 1	Yes	Category 1	Yes
Stage 7	759	Yes	Category 1	Yes	Category 1	Yes
Stage 7	760	Yes	Category 1	No	Category 1	Yes
Stage 7	761	Yes	Category 1	No	Category 1	Yes
Stage 7	762	Yes	Category 1	No	Category 1	Yes
Stage 7	763	Yes	Category 1	No	Category 1	Yes
Stage 7	764	Yes	Category 1	No	Category 1	Yes
Stage 7	765	Yes	Category 1	No	Category 1	Yes
Stage 7	766	Yes	Category 1	No	Category 1	Yes
Stage 7	767	Yes	Category 1	No	Category 1	Yes
Stage 7	768	Yes	Category 1	No	Category 1	Yes
Stage 7	769	Yes	Category 1	No	Category 1	Yes
Stage 7	770	Yes	Category 1	No	Category 1	Yes
Stage 7	771	Yes	Category 1	No	Category 1	Yes
Stage 7	772	Yes	Category 1	No	Category 1	Yes
Stage 7	773	Yes	Category 1	No	Category 1	Yes
Stage 7	774	Yes	Category 1	No	Category 1	Yes
Stage 7	775	Yes	Category 1	No	Category 1	Yes
Stage 7	776	Yes	Category 0	No	Category 1	Yes
Stage 7	777	Yes	Category 0	Yes	Category 1	Yes
Stage 7	778	Yes	Category 0	Yes	Category 1	Yes

Stage	Lot no.	Building façades (facade-adjusted)				Private open spaces (free-field)
		Ground floor		Upper floor		
		Compliance with ≤60dB(A) criterion	Noise Category QDC MP4.4	Compliance with ≤60dB(A) criterion	Noise Category QDC MP4.4	Compliance with ≤60dB(A) criterion
Stage 8	801	Yes	Category 0	Yes	Category 0	Yes
Stage 8	802	Yes	Category 0	Yes	Category 0	Yes
Stage 8	803	Yes	Category 0	Yes	Category 0	Yes
Stage 8	804	Yes	Category 0	Yes	Category 0	Yes
Stage 8	805	Yes	Category 0	Yes	Category 0	Yes
Stage 8	806	Yes	Category 0	Yes	Category 0	Yes
Stage 8	807	Yes	Category 0	Yes	Category 0	Yes
Stage 8	808	Yes	Category 0	Yes	Category 0	Yes
Stage 8	809	Yes	Category 0	Yes	Category 0	Yes
Stage 8	810	Yes	Category 0	Yes	Category 0	Yes
Stage 8	811	Yes	Category 0	Yes	Category 0	Yes
Stage 8	812	Yes	Category 0	Yes	Category 0	Yes
Stage 8	813	Yes	Category 0	Yes	Category 0	Yes
Stage 8	814	Yes	Category 0	Yes	Category 0	Yes
Stage 8	815	Yes	Category 0	Yes	Category 0	Yes
Stage 8	816	Yes	Category 0	Yes	Category 0	Yes
Stage 8	817	Yes	Category 0	Yes	Category 0	Yes
Stage 8	818	Yes	Category 0	Yes	Category 0	Yes
Stage 8	819	Yes	Category 0	Yes	Category 0	Yes
Stage 8	820	Yes	Category 0	Yes	Category 0	Yes
Stage 8	821	Yes	Category 0	Yes	Category 0	Yes
Stage 8	822	Yes	Category 0	Yes	Category 0	Yes
Stage 8	823	Yes	Category 0	Yes	Category 0	Yes
Stage 8	824	Yes	Category 0	Yes	Category 0	Yes
Stage 8	825	Yes	Category 0	Yes	Category 0	Yes
Stage 8	826	Yes	Category 0	Yes	Category 0	Yes
Stage 8	827	Yes	Category 0	Yes	Category 0	Yes
Stage 8	828	Yes	Category 0	Yes	Category 0	Yes

Noise contours showing the propagation of traffic noise across the development site are presented in Appendix I.

6. Discussion and Recommendations

Traffic noise propagation modelling was carried out considering the future traffic flows on Cunningham Highway for a planning horizon of 2035. The results of the noise propagation modelling indicate that, without noise mitigation measures, the development will be impacted by traffic noise from Cunningham Highway.

This assessment has considered two noise barrier options:

Scenario 1 (Recommended):

1.0 m high earth mound and 2.0-5.5 m high noise barrier to achieve compliance with the private open spaces traffic noise criterion of ≤ 60 dB(A) $L_{10,18hr}$ (free-field) at the ground level of all allotments.

Scenario 2 (Not recommended):

1.0 m high earth mound and 2.0-7.0 m high noise barriers to achieve compliance with the private open spaces traffic noise criterion of ≤ 60 dB(A) $L_{10,18hr}$ (free-field) and facade traffic noise criterion of ≤ 60 dB(A) $L_{10,18hr}$ (facade corrected) at the ground level of all allotments.

6.1 Acceptable Height of Noise Barrier

Scenario 2 is not appropriate due to the excessive height of the noise barrier. The noise barrier considered in Scenario 2 includes 103 m long section (between Lots 773 and 778) with height of 7.0 m above the proposed surface levels. There is also 14 m long section (at Lot 772) and 10.4 m long section (at Lot 778) with height of 6.0 m above the proposed surface levels.

The excessive noise barrier height of up to 7.0 m is a result of the following factors:

(i) Compliance with the facade noise criterion (which in this assessment is more onerous than the private open space criterion[3]); and

(ii) Unfavourable site topography relative to Cunningham Highway.

Noise barrier up to 7.0 m high is not an acceptable solution as it contravenes TMR's design guidelines for maximum height of noise barriers. TMR's design guidelines for noise barriers adjacent to existing roads states that "*the maximum preferred height of a noise fence above the existing or proposed ground level shall be 6.0 metres*" (Hall, 2006).

Section 6.4 "Aesthetic requirements" of MRTS15 Noise Fences states that "*Noise fences shall achieve aesthetically pleasing outcomes and be visually integrated with the adjacent natural or built environments in which they are situated*".

[3] In accordance with Section 3 of this report, the lower facade noise criterion of ≤ 60 dB(A) $L_{10,18hr}$ (facade corrected) is applicable because the measured $L_{90,8hr}$ free field between 10pm and 6am was ≤ 40dB(A). It should be noted that the facade noise criterion is equivalent to ≤ 57 dB(A) $L_{10,18hr}$ (free-field), so the facade criterion it is more stringent than the private open space noise criterion of ≤ 60 dB(A) $L_{10,18hr}$ (free-field).

Chapter 7 “Integrated noise barrier design” of the TMR CoP Vol. 1 states that: “*Integrated noise barrier design is an interactive process where social, economic, visual amenity and technical factors are considered to arrive at a preferred noise attenuation strategy”.*

The noise barrier considered in Scenario 2 is not acceptable as it would have adverse effects on visual amenity. A 7.0 m high noise barrier would dominate the landscape of the development, road corridor and the aesthetics of the local area. The noise barrier would also cause overshadowing effects on the future dwellings, which is exacerbated by the fact that the noise barrier is positioned on the lot boundaries, in close proximity to the outdoor living areas and facades of the future dwellings.

Aside from visual amenity concerns, there are additional reasons why 7.0 m high noise barrier is not appropriate:

(i) The primary objective of the noise barrier is to ensure compliance with the private open spaces noise criterion. The recommended noise barrier (Scenario 1) reduces the traffic noise levels to comply with the private open spaces noise criterion.

(ii) The future dwellings will be constructed to comply with the internal noise criterion.

(iii) With the recommended noise barrier (Scenario 1) in place, the calculated traffic noise levels at the ground floor facades correspond to QDCMP4.4 Noise Category 1 and 0. The construction requirements for Noise Category 1 are relatively minor and can be readily implemented, while under Noise Category 0 there is no need for acoustic upgrade to the facades.

(iv) Further increase in the height of the noise barrier is not justified, as the noise levels are already reduced to an acceptably low level (Noise Category 1). There is limited benefit in increasing the height of the noise barrier further to meet the facade traffic noise criterion of ≤ 60 dB(A) $L_{10,18hr}$ (facade corrected). Even if the traffic noise levels are reduced to 60 dB(A) $L_{10,18hr}$, some allotments will still be subject to construction requirements under QDC Noise Category 1. It should be noted that Category 1 is applicable to dwellings affected by traffic noise in the range 58 to 62 dB(A) $L_{10,18hr}$ (facade corrected).

(v) Due to the site topography relative to Cunningham Highway the effectiveness of the noise barrier is limited, particularly on the eastern side of the development. In accordance with good engineering practice and cost-benefit analysis, further increase in the height of the noise barrier is not justified if there is no significant reduction in the traffic noise levels. In this case, there is no significant reduction in the traffic noise levels with the increase in noise barrier height and residual acoustic treatments are still applicable.

(vi) A 7.0 m high noise barrier is unprecedented for roads with similar characteristics to Cunningham Highway.

For further information, please refer to this extract from the TMR document SDAP *Supporting Information – Environmental emissions in a state-controlled road environment* (presented in Appendix J of this report):

"*The impact of noise originating from state-controlled roads external to buildings is a prime concern. These areas are the building facades, outdoor areas for passive recreation, outdoor education areas and outdoor play areas. The external criteria are therefore referred to as the 'primary noise criteria', while the internal criteria are referred to as the 'secondary noise criteria'.*"

"*Where a new sensitive development is proposed on land in proximity to a state-controlled road and the application is referred to the state for assessment, the state will seek to ensure that the primary noise criteria are achieved in the first instance.*"

"*The primary noise criteria **[external noise criteria]** in SDAP can be achieved using noise barriers, earth mounds, separation distances/setbacks, topography and site design (building location and orientation) (see section 7.2 of the Environmental Emissions Policy for more information on these strategies).*"

"*However, near a state-controlled road, when a new sensitive development is proposed and a noise barrier is technically feasible and reasonable, it will always be the Department of Transport and Main Roads (TMR) preferred method for achieving the primary noise criteria. This means that the state will require the proponent of a development near a state-controlled road to provide a noise barrier as a condition of development approval where it is both technically feasible and reasonable.*"

"*Where an application cannot demonstrate compliance with the primary noise criteria **[external noise criteria]**, the state will take into consideration whether the secondary criteria can be achieved with recommended noise attenuation treatments.*"

"*An application which demonstrates compliance with the secondary noise criteria **[internal noise criteria]** must still demonstrate that significant adverse impacts on the development's outdoor space for passive recreation, outdoor education areas and outdoor play areas will be attenuated to the maximum extent practicable and explain why further attenuation measures to achieve the primary criteria were not considered to be reasonable, feasible or cost effective to the satisfaction of the state.*"

"*the state may require the proponent of a development near a state-controlled road to provide a noise barrier as a condition of development approval where it is both technically feasible and reasonable. In addition to reducing noise impacts in private open space, outdoor education areas and passive recreation areas, provision of a noise barrier will likely reduce the noise category that applies to the development under QDC MP4.4. For example, a noise barrier may reduce the noise category from a category 4 to a category 1 which means cheaper building materials can be used to meet the requirements of QDC MP4.4.*"

Compliance with the external noise criteria at the private open spaces (outdoor living areas) will be achieved using the noise barrier as recommended in Scenario 1. Compliance with the external noise criteria at the facades is not achieved at all allotments, because it is not technically feasible, reasonable or cost effective to construct a noise barrier to achieve compliance with the facade noise criterion, as the noise barrier would need to be 7.0 m high in places.

The recommended noise barrier as per Scenario 1 (up to 5.5 m high in places) is more reasonable to build; complies with the maximum height restrictions for noise barriers; has lesser impacts on visual amenity; ensures compliance with the private open spaces criteria at all allotments; and provides acceptable noise reduction to QDC Noise Category 1 at the ground floor facades. Compliance with the internal noise criteria will readily be achieved by building the houses to comply with QDC MP4.4 acceptable forms of construction for Noise Category 1.

The information contained in the SDAP *Supporting information* document also appears in Chapter 6 "Road traffic noise attenuation strategy" of the TMR CoP Vol. 1.

"Strategy decision flow chart for development" of the TMR CoP Vol. 1 is reproduced in Figure 6.1.

The flow chart in Figure 6.1 includes a statement "*Does the development design support the use of landscaped earth mound and noise fence combination?*" For the proposed development at 160-224 Daleys Road in Ripley, the answer is "yes". Following the flow chart, the next question is "*Do all buildings comply?*". The response is "no" as there is not a practical noise barrier to meet the facade noise criterion at all allotments. The flow chart then leads to the statement "*A noise barrier with assistance of acoustic design of buildings (internal and external)*". This is the noise mitigation strategy that ATP recommends for the proposed development at 160-224 Daleys Road.

The next part of the flow chart addresses private open spaces. The query is "*For each dwelling, is the predicted noise level in any private open space greater than the Primary Criteria?*". With the recommended noise barrier as per Scenario 1, the response to this query is "no", because the noise barrier ensures compliance with the private open spaces criterion at all allotments.

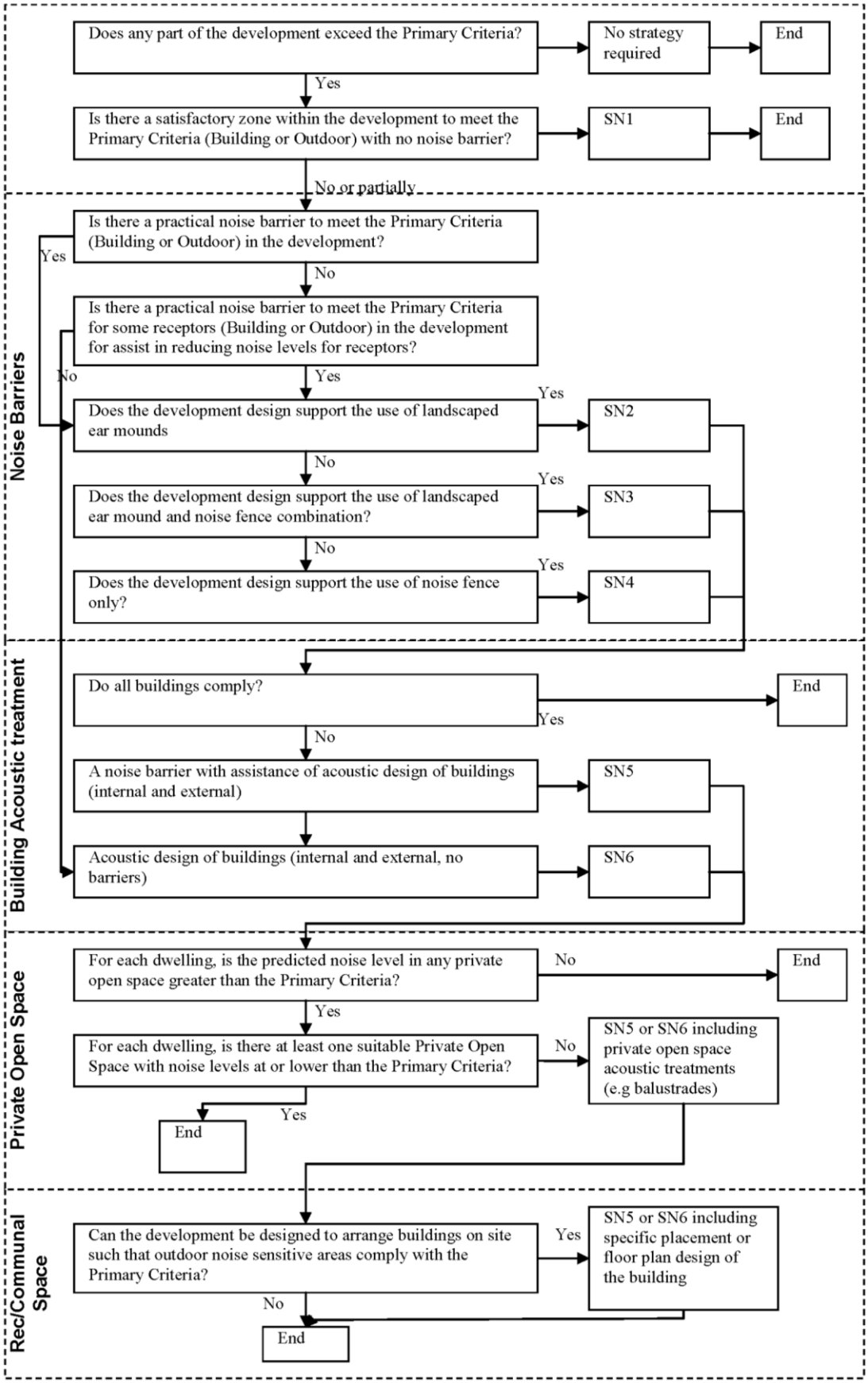


Figure 6.1 TMR CoP Vol. 1 – Strategy flow chart for development

6.2 Recommended Noise Mitigation Strategy

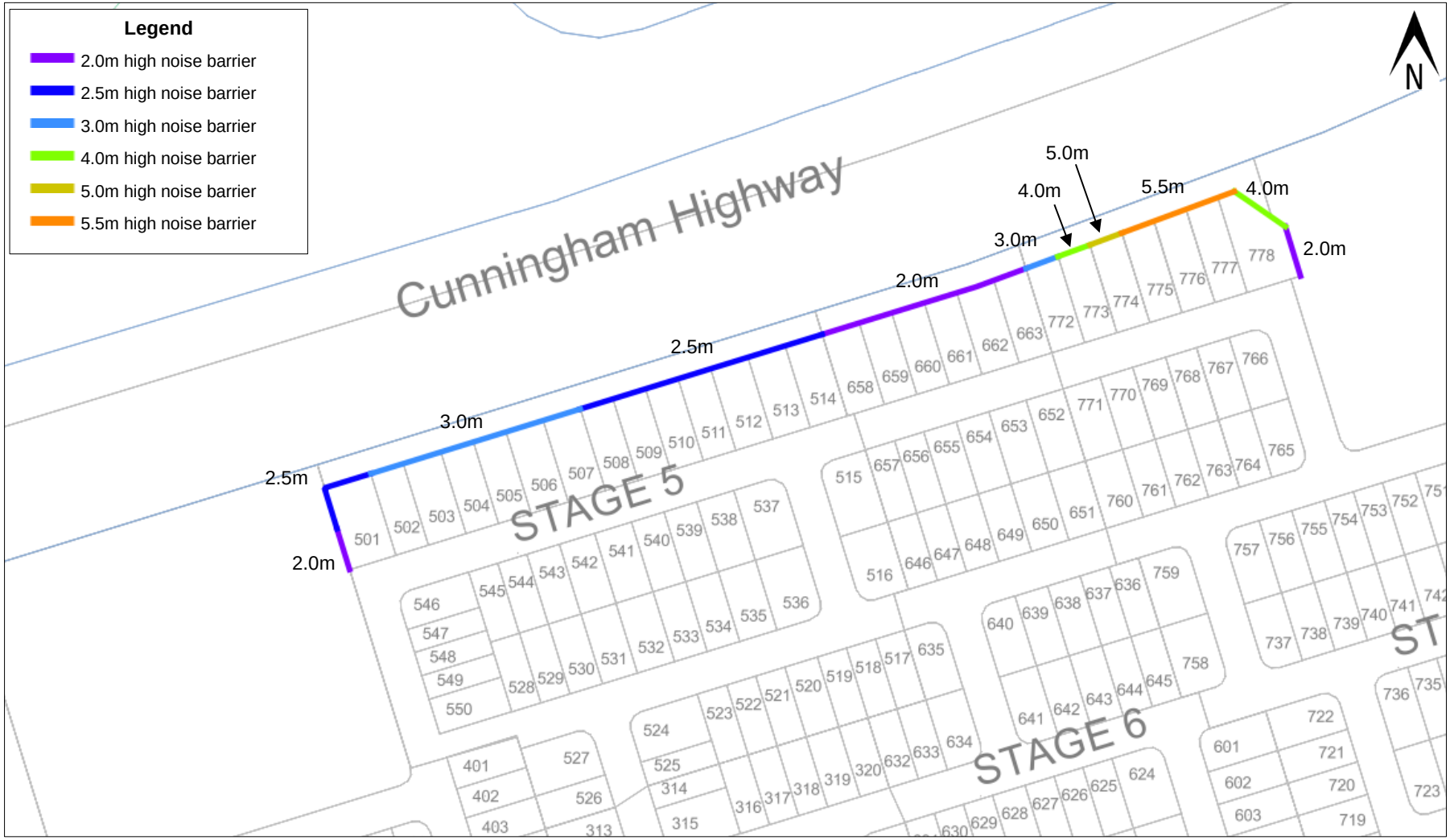
The proposed development must be constructed with the following traffic noise mitigation measures, corresponding to Scenario 1 of this report:

(i) A 2.0-5.5 m high noise barrier located on top of the earth mound along the northern allotment boundaries of the lots adjacent to Cunningham Highway, with returns along the full length of the western boundary of Lot 501 and the eastern boundary of Lot 778.

(ii) Proposed development constructed as per the finished surface levels included in the TIN bulk earthworks model of the proposed development by Peak Urban dated 17 April 2020 (Project number 18-0016, drawing numbers P102 to 107, Revision 2). The bulk earthworks model defines finished surface levels (FSL) for the allotments and includes a 1.0 m high earth mound located on the northern lot boundaries of the allotments adjacent to Cunningham Highway.

(iii) Architectural treatment to the building facades of the future dwellings affected by traffic noise. The buildings must be built to comply with acceptable forms of construction from QDC MP4.4, or to be subject of floor plan specific acoustic design as per AS 3671-1989.

The noise barrier must be constructed in accordance with the alignment and RLs presented in Section 4.3.1 of this report (Scenario 1). The proposed noise barrier ranges in height from 2.0-5.5m as per Figure 6.2.



Refer to Section 4.3.1 of this report for RLs at the base and top of the noise barrier.

Figure 6.2 Recommended noise barrier height and alignment

The noise barrier must be built to comply with:

- Department of Transport and Main Roads (TMR) Technical Specification *Transport and Main Roads Specifications MRTS15 Noise Fences*, dated March 2019; and
- TMR *Road Traffic Noise Management: Code of Practice*, Chapter 7: *Integrated Noise Barrier Design.*

The results of the noise propagation modelling, presented in Section 5.1 of this report, confirm that the recommended noise barrier will ensure compliance with the private open spaces traffic noise criterion of ≤ 60 dB(A) $L_{10,18hr}$ (free-field) at the ground level of all allotments.

Whilst the private open spaces criterion will be achieved with the recommended noise barrier, there is a requirement for compliance with QDC MP4.4. The future dwellings, low-set or high-set, which are affected by traffic noise of ≥58dB(A) $L_{10,18hr}$ (facade adjusted), must be constructed as per acceptable forms of construction specified in Schedule 2 of QDC MP4.4.

The allotments subject of QDC MP4.4 noise categories are summarised in Table 6.1. It should be noted that there are no acoustic design requirements for Noise Category 0.

Table 6.1 QDC MP4.4 Noise Categories

Stage	Lot no.	Noise Category QDC MP4.4	
		Ground floor	Upper floor
Stage 3	310	Category 0	Category 1
Stage 3	311	Category 0	Category 1
Stage 3	312	Category 1	Category 1
Stage 3	313	Category 1	Category 1
Stage 3	314	Category 0	Category 1
Stage 3	315	Category 0	Category 1
Stage 3	316	Category 0	Category 1
Stage 3	317	Category 0	Category 1
Stage 3	318	Category 0	Category 1
Stage 3	319	Category 0	Category 1
Stage 3	320	Category 0	Category 1
Stage 4	401	Category 1	Category 1
Stage 4	402	Category 1	Category 1
Stage 4	403	Category 1	Category 1
Stage 4	404	Category 1	Category 1
Stage 4	405	Category 1	Category 1
Stage 4	406	Category 0	Category 1
Stage 4	407	Category 0	Category 1
Stage 4	408	Category 0	Category 1
Stage 4	423	Category 0	Category 1
Stage 4	424	Category 0	Category 1
Stage 4	425	Category 0	Category 1
Stage 4	426	Category 1	Category 1

Stage	Lot no.	Noise Category QDC MP4.4	
		Ground floor	Upper floor
Stage 4	427	Category 1	Category 1
Stage 4	428	Category 1	Category 1
Stage 4	429	Category 1	Category 1
Stage 4	430	Category 1	Category 1
Stage 4	431	Category 1	Category 1
Stage 4	432	Category 1	Category 1
Stage 4	433	Category 1	Category 1
Stage 4	434	Category 1	Category 1
Stage 4	435	Category 1	Category 1
Stage 4	436	Category 1	Category 1
Stage 4	437	Category 1	Category 1
Stage 4	438	Category 0	Category 1
Stage 4	439	Category 0	Category 1
Stage 4	440	Category 0	Category 1
Stage 4	441	Category 0	Category 1
Stage 4	442	Category 0	Category 1
Stage 4	443	Category 1	Category 1
Stage 4	444	Category 1	Category 1
Stage 4	445	Category 1	Category 1
Stage 4	446	Category 1	Category 1
Stage 4	447	Category 1	Category 1
Stage 4	448	Category 1	Category 1
Stage 4	449	Category 1	Category 1
Stage 4	450	Category 1	Category 1
Stage 4	451	Category 1	Category 1
Stage 4	452	Category 1	Category 1
Stage 4	453	Category 1	Category 1
Stage 4	454	Category 1	Category 1
Stage 4	455	Category 1	Category 1
Stage 4	456	Category 1	Category 1
Stage 4	457	Category 1	Category 1
Stage 4	458	Category 1	Category 1
Stage 4	459	Category 0	Category 1
Stage 4	460	Category 0	Category 1
Stage 5	501	Category 1	Category 3
Stage 5	502	Category 1	Category 3
Stage 5	503	Category 1	Category 3
Stage 5	504	Category 1	Category 3
Stage 5	505	Category 1	Category 3
Stage 5	506	Category 1	Category 3
Stage 5	507	Category 1	Category 3

Stage	Lot no.	Noise Category QDC MP4.4	
		Ground floor	Upper floor
Stage 5	508	Category 1	Category 3
Stage 5	509	Category 1	Category 3
Stage 5	510	Category 1	Category 3
Stage 5	511	Category 1	Category 3
Stage 5	512	Category 1	Category 3
Stage 5	513	Category 1	Category 3
Stage 5	514	Category 1	Category 3
Stage 5	515	Category 1	Category 1
Stage 5	516	Category 1	Category 1
Stage 5	517	Category 1	Category 1
Stage 5	518	Category 1	Category 1
Stage 5	519	Category 1	Category 1
Stage 5	520	Category 1	Category 1
Stage 5	521	Category 1	Category 1
Stage 5	522	Category 1	Category 1
Stage 5	523	Category 0	Category 1
Stage 5	524	Category 0	Category 1
Stage 5	525	Category 0	Category 1
Stage 5	526	Category 1	Category 1
Stage 5	527	Category 1	Category 1
Stage 5	528	Category 1	Category 1
Stage 5	529	Category 1	Category 1
Stage 5	530	Category 1	Category 1
Stage 5	531	Category 1	Category 1
Stage 5	532	Category 1	Category 1
Stage 5	533	Category 1	Category 1
Stage 5	534	Category 1	Category 1
Stage 5	535	Category 1	Category 1
Stage 5	536	Category 1	Category 1
Stage 5	537	Category 1	Category 1
Stage 5	538	Category 1	Category 1
Stage 5	539	Category 1	Category 1
Stage 5	540	Category 1	Category 1
Stage 5	541	Category 1	Category 1
Stage 5	542	Category 1	Category 1
Stage 5	543	Category 1	Category 1
Stage 5	544	Category 1	Category 1
Stage 5	545	Category 1	Category 1
Stage 5	546	Category 1	Category 2
Stage 5	547	Category 1	Category 1
Stage 5	548	Category 1	Category 1

Stage	Lot no.	Noise Category QDC MP4.4	
		Ground floor	Upper floor
Stage 5	549	Category 1	Category 1
Stage 5	550	Category 1	Category 1
Stage 6	601	Category 1	Category 1
Stage 6	602	Category 0	Category 1
Stage 6	603	Category 0	Category 1
Stage 6	622	Category 0	Category 1
Stage 6	623	Category 0	Category 1
Stage 6	624	Category 1	Category 1
Stage 6	625	Category 1	Category 1
Stage 6	626	Category 0	Category 1
Stage 6	627	Category 0	Category 1
Stage 6	628	Category 0	Category 1
Stage 6	632	Category 0	Category 1
Stage 6	633	Category 0	Category 1
Stage 6	634	Category 0	Category 1
Stage 6	635	Category 1	Category 1
Stage 6	636	Category 1	Category 1
Stage 6	637	Category 1	Category 1
Stage 6	638	Category 1	Category 1
Stage 6	639	Category 1	Category 1
Stage 6	640	Category 1	Category 1
Stage 6	641	Category 1	Category 1
Stage 6	642	Category 1	Category 1
Stage 6	643	Category 1	Category 1
Stage 6	644	Category 1	Category 1
Stage 6	645	Category 1	Category 1
Stage 6	646	Category 1	Category 1
Stage 6	647	Category 1	Category 1
Stage 6	648	Category 1	Category 1
Stage 6	649	Category 1	Category 1
Stage 6	650	Category 1	Category 1
Stage 6	651	Category 1	Category 1
Stage 6	652	Category 1	Category 1
Stage 6	653	Category 1	Category 1
Stage 6	654	Category 1	Category 1
Stage 6	655	Category 1	Category 1
Stage 6	656	Category 1	Category 1
Stage 6	657	Category 1	Category 1
Stage 6	658	Category 1	Category 3
Stage 6	659	Category 1	Category 3
Stage 6	660	Category 1	Category 3

Stage	Lot no.	Noise Category QDC MP4.4	
		Ground floor	Upper floor
Stage 6	661	Category 1	Category 3
Stage 6	662	Category 1	Category 3
Stage 6	663	Category 1	Category 3
Stage 7	701	Category 1	Category 1
Stage 7	702	Category 1	Category 1
Stage 7	703	Category 0	Category 1
Stage 7	720	Category 0	Category 1
Stage 7	721	Category 0	Category 1
Stage 7	722	Category 0	Category 1
Stage 7	723	Category 0	Category 1
Stage 7	724	Category 0	Category 1
Stage 7	725	Category 0	Category 1
Stage 7	726	Category 0	Category 1
Stage 7	727	Category 0	Category 1
Stage 7	728	Category 0	Category 1
Stage 7	730	Category 1	Category 1
Stage 7	731	Category 0	Category 1
Stage 7	732	Category 0	Category 1
Stage 7	733	Category 0	Category 1
Stage 7	734	Category 0	Category 1
Stage 7	735	Category 0	Category 1
Stage 7	736	Category 0	Category 1
Stage 7	737	Category 1	Category 1
Stage 7	738	Category 1	Category 1
Stage 7	739	Category 1	Category 1
Stage 7	740	Category 1	Category 1
Stage 7	741	Category 1	Category 1
Stage 7	742	Category 1	Category 1
Stage 7	743	Category 1	Category 1
Stage 7	744	Category 1	Category 1
Stage 7	745	Category 1	Category 1
Stage 7	746	Category 1	Category 1
Stage 7	747	Category 1	Category 1
Stage 7	748	Category 1	Category 1
Stage 7	749	Category 1	Category 1
Stage 7	750	Category 1	Category 1
Stage 7	751	Category 1	Category 1
Stage 7	752	Category 1	Category 1
Stage 7	753	Category 1	Category 1
Stage 7	754	Category 1	Category 1
Stage 7	755	Category 1	Category 1

Stage	Lot no.	Noise Category QDC MP4.4	
		Ground floor	Upper floor
Stage 7	756	Category 1	Category 1
Stage 7	757	Category 1	Category 1
Stage 7	758	Category 1	Category 1
Stage 7	759	Category 1	Category 1
Stage 7	760	Category 1	Category 1
Stage 7	761	Category 1	Category 1
Stage 7	762	Category 1	Category 1
Stage 7	763	Category 1	Category 1
Stage 7	764	Category 1	Category 1
Stage 7	765	Category 1	Category 1
Stage 7	766	Category 1	Category 2
Stage 7	767	Category 1	Category 2
Stage 7	768	Category 1	Category 2
Stage 7	769	Category 1	Category 2
Stage 7	770	Category 1	Category 2
Stage 7	771	Category 1	Category 2
Stage 7	772	Category 1	Category 3
Stage 7	773	Category 1	Category 2
Stage 7	774	Category 1	Category 2
Stage 7	775	Category 1	Category 2
Stage 7	776	Category 1	Category 2
Stage 7	777	Category 1	Category 2
Stage 7	778	Category 1	Category 3

Once the development is established, the future buildings will provide additional traffic noise reduction thus further reducing the traffic noise levels at the interior of the development.

The future dwellings listed in Table 6.1 are impacted by traffic noise that corresponds with Noise Categories 1, 2 or 3 of QDC MP4.4, therefore architectural treatment is required to the building facades.

There are two options available for architectural treatment to the building facades, as follows:

- **Option 1:** Implementation of the ‘acceptable forms of construction’ specified in Queensland Development Code (QDC) Mandatory Part 4.4 (*Buildings in a Transport Noise Corridor*) as per the noise categories presented in Table 6.1 of this report.
- **Option 2:** Floor plan specific acoustic design, in accordance with AS3671-1989, to ensure compliance with the internal noise criteria.

Provided the recommended planning and design traffic noise control measures are implemented in the construction of the residential development at 160-224 Daleys Road in Ripley, the road traffic noise from Cunningham Highway will not impose any further constraints on the development.

7. Conclusions

Based on the results of the traffic noise impact assessment for the proposed development at 160-224 Daleys Road in Ripley, the following is concluded:

- Without noise control measures, the proposed development will be impacted by road traffic noise from Cunningham Highway, as per the traffic flows predicted within a 10-year planning horizon to year 2035.
- The proposed development must be constructed with the following traffic noise mitigation measures, corresponding to Scenario 1 of this report:
    - A 2.0-5.5 m high noise barrier located on top of the earth mound along the northern allotment boundaries of the lots adjacent to Cunningham Highway, with returns along the full length of the western boundary of Lot 501 and the eastern boundary of Lot 778.
    - Proposed development constructed as per the finished surface levels included in the TIN bulk earthworks model of the proposed development by Peak Urban dated 17 April 2020 (Project number 18-0016, drawing numbers P102 to 107, Revision 2). The bulk earthworks model defines finished surface levels (FSL) for the allotments and includes a 1.0 m high earth mound located on the northern lot boundaries of the allotments adjacent to Cunningham Highway.
    - Architectural treatment to the building facades of the future dwellings affected by traffic noise. The buildings must be built to comply with acceptable forms of construction from QDC MP4.4, or to be subject of floor plan specific acoustic design as per AS 3671-1989.
- The noise barrier must be constructed in accordance with the alignment and RLs presented in Section 4.3.1 of this report (Scenario 1).
- The noise barrier must be built to comply with:
    - Department of Transport and Main Roads (TMR) Technical Specification *Transport and Main Roads Specifications MRTS15 Noise Fences*, dated March 2019; and
    - TMR *Road Traffic Noise Management: Code of Practice*, Chapter 7: Integrated Noise Barrier Design.
- The results of the noise propagation modelling confirm that the recommended noise barrier will ensure compliance with the private open spaces traffic noise criterion of ≤ 60 dB(A) $L_{10,18hr}$ (free-field) at the ground level of all allotments.
- Whilst the private open spaces criterion will be achieved with the recommended noise barrier, there is a requirement for compliance with QDC MP4.4. The future dwellings, low-set or high-set, which are affected by traffic noise of ≥58dB(A) $L_{10,18hr}$ (facade adjusted), must be constructed as per acceptable forms of construction specified in Schedule 2 of QDC MP4.4.

- The future dwellings listed in Table 6.1 are impacted by traffic noise that corresponds with Noise Categories 1, 2 or 3 of QDC MP4.4, therefore architectural treatment is required to the building facades.

- There are two options available for architectural treatment to the building facades, as follows:

    - **Option 1:** Implementation of the 'acceptable forms of construction' specified in Queensland Development Code (QDC) Mandatory Part 4.4 (*Buildings in a Transport Noise Corridor*) as per the noise categories presented in Table 6.1 of this report.

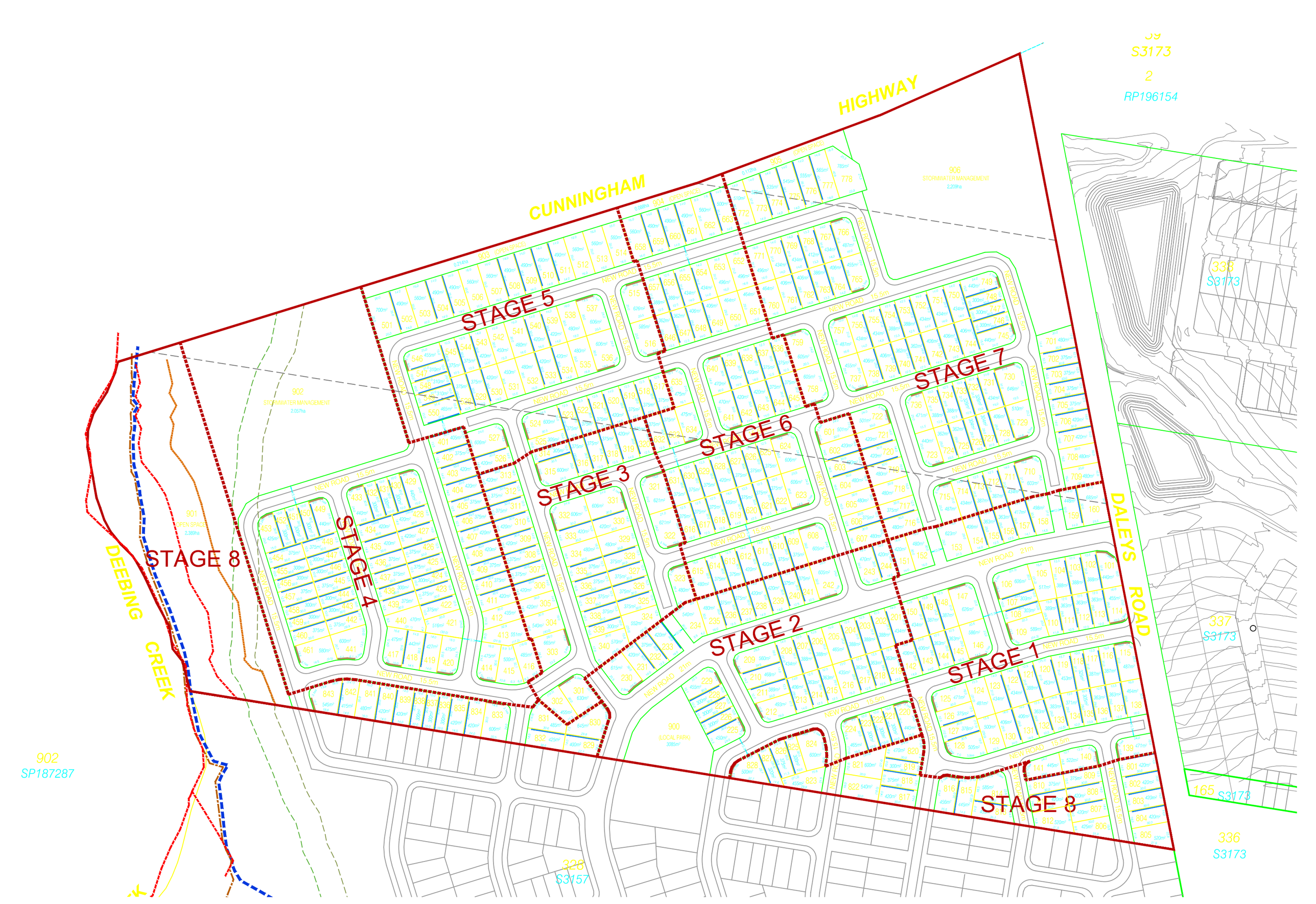
    - **Option 2:** Floor plan specific acoustic design, in accordance with AS3671-1989, to ensure compliance with the internal noise criteria.

Provided the recommended planning and design traffic noise control measures are implemented in the construction of the residential development at 160-224 Daleys Road in Ripley, the road traffic noise from Cunningham Highway will not impose any further constraints on the development.

8. References

- Australian Standard AS1055.1-2018 (*Acoustics - Description and Measurement of Environmental Noise*)
- Australian Standard AS2702-1984 (*Acoustics – Methods for the measurement of road traffic noise*)
- Australian Standard AS/NZS2107-2016 (*Acoustics – Recommended design sound levels and reverberation times for building interiors*)
- Australian Standard AS3671-1989 (*Acoustics – Road Traffic Noise Intrusion – Building sitting and construction*)
- Australian Standard AS/NZS IEC61672.1-2019 (*Electroacoustics - Sound level meters – Specifications*)
- Hall, A., 2006, *Introduction to the Revised – Queensland Department of Main Roads Traffic Noise Management: Code of Practice*, Proceedings of ACOUSTICS 2006
- Ipswich City Council, *Ipswich Planning Scheme*
- Department of Environment and Heritage Protection, 2013, *Noise Measurement Manual*
- Department of State Development, Manufacturing, Infrastructure and Planning (DSDMIP), 2020, *State Development Assessment Provisions* (Version 2.6)
- Department of Transport and Main Roads, 2013, *Transport Noise Management: Code of Practice, Volume 1 – Road Traffic Noise*
- Department of Transport and Main Roads, 2013, *SDAP Supporting Information – Environmental emissions in a state-controlled road environment*
- Department of Transport and Main Roads (TMR), Technical Specification *Transport and Main Roads Specifications MRTS15 Noise Fences*, March 2019
- Department of Transport and Main Roads, 2017*, Development Affected by Environmental Emissions from Transport Policy* (Version 4)

Appendix A – Development Layout


CUNNINGHAM HIGHWAY
DEEBING CREEK
DALEYS ROAD
STAGE 1
STAGE 2
STAGE 3
STAGE 4
STAGE 5
STAGE 6
STAGE 7
STAGE 8
STAGE 8
NEW ROAD 15.5m
NEW ROAD 21m
902 STORMWATER MANAGEMENT 2.057ha
903 (OPEN SPACE) 0.214ha
904 (OPEN SPACE) 0.088ha
905 (OPEN SPACE) 0.117ha
906 STORMWATER MANAGEMENT 2.209ha
901 OPEN SPACE 2.388ha
900 (LOCAL PARK) 3085m²
902 SP187287
326 S3157
336 S3173
337 S3173
338 S3173
165 S3173
2 RP196154
S3173

Appendix B – Site Photos

Photo 1: Noise logger at location 1 – Northern boundary of Lot 3 on RP180932

Photo 2: Noise logger at location 2 – Northern boundary of Lot 5 on RP180932

Photo 3: Traffic flow along Cunningham Highway viewed from northern boundary of site

Photo 4: Traffic flow along Cunningham Highway viewed from northern boundary of site

Appendix C – Meteorological Data

Amberley, Queensland
February 2019 Daily Weather Observations

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	Fr	20.4	34.5	0			ENE	54	14:13	29.2	52	2	E	7	1014.3	33.1	33	2	E	28	1012.0
2	Sa	20.8	33.3	0.8			ENE	52	14:19	26.4	73		E	15	1015.1	30.7	42	1	E	30	1012.4
3	Su	19.1	31.1	0			E	48	10:39	26.3	63	5	SE	20	1014.9	30.2	39	2	E	24	1012.4
4	Mo	19.0	32.3	3.0			NE	46	14:01	23.2	82	6	E	9	1013.9	30.9	44	3	ENE	28	1010.6
5	Tu	19.2	33.2	0.2			E	50	18:05	27.9	58	8	SE	17	1012.0	30.1	46	8	E	30	1009.1
6	We	21.6	30.3	9.8			ESE	50	12:09	24.5	82	8	ESE	15	1013.1	29.2	52	8	ESE	33	1010.3
7	Th	21.4	30.9	4.4			ESE	44	12:43	26.3	76	8	SE	20	1013.3	27.9	48	8	E	28	1010.6
8	Fr	20.6	32.2	0			ENE	39	12:45	25.9	69	8	S	9	1009.7	29.9	49	8	E	22	1005.5
9	Sa	19.0	35.1	0			ENE	37	15:42	28.2	65	5	NNE	6	1005.3	34.1	44	1	ENE	20	1000.2
10	Su	20.5	35.0	1.0			ENE	50	17:07	27.7	69		WNW	6	1004.7	33.4	44		ENE	24	1001.7
11	Mo	23.1	35.1	0.2			ENE	46	17:23	26.6	65	8	NE	9	1009.4	34.1	40	1	ENE	22	1003.0
12	Tu	20.6	38.7	0			NE	41	16:05	29.6	59	3	NNW	17	1006.3	37.1	31		N	15	999.8
13	We	21.5	41.3	0			ENE	39	14:27	30.7	59		NNE	9	1005.2	38.9	30		ENE	28	1000.0
14	Th	24.8	33.2	0			SE	43	17:11	30.1	52	8	SSE	19	1011.8	30.5	50	8	SE	28	1012.3
15	Fr	18.8	34.0	0			E	39	14:37	27.3	48	1	SE	19	1018.9	31.5	37	6	E	20	1014.7
16	Sa	16.1	31.2	0			ESE	41	14:47	27.1	49	8	S	19	1018.0	28.3	51	8	ESE	22	1014.2
17	Su	17.3	33.3	0			ENE	44	17:12	27.6	44	3	ESE	22	1014.7	31.9	32	1	NE	22	1009.7
18	Mo	17.1	33.3	0.2			E	41	16:31	27.6	48	7	ENE	11	1012.2	32.1	37		ENE	22	1007.4
19	Tu	15.8	37.1	0			ENE	44	17:50	26.6	60		NW	9	1009.1	36.4	29		NE	15	1003.3
20	We	21.0	36.3	0			E	44	17:16	28.7	57	2	ESE	17	1008.8	35.4	35		E	20	1003.6
21	Th	21.0	35.7	0			ESE	48	13:35	29.2	55	5	S	11	1008.0	34.0	41	2	ESE	30	1004.8
22	Fr	23.7	31.7	0			SSE	72	13:03	29.0	48	3	S	37	1009.3	30.4	33	1	S	43	1008.2
23	Sa	19.7	32.7	0			SSE	59	15:06	26.9	45	1	S	39	1013.4	31.6	27	1	SSE	39	1012.5
24	Su	19.7	32.2	0			SE	56	12:29	26.0	50	4	S	31	1019.4	29.5	35	3	SE	33	1017.6
25	Mo	17.8	30.2	0			ESE	50	12:07	25.3	50	4	S	26	1022.5	27.5	44	8	ESE	30	1020.1
26	Tu	19.2	28.7	0			SE	41	00:21	25.1	49	8	ESE	13	1021.2	27.1	47	8	NE	24	1018.0
27	We	17.6	30.6	0			ENE	48	13:18	26.8	46	8	ENE	19	1020.3	27.5	48	7	E	30	1017.7
28	Th	19.4	28.1	1.2			E	41	11:01	20.5	81	8	ENE	11	1022.5	26.4	50	8	ENE	24	1019.2
Statistics for February 2019																					
Mean		19.9	33.3							27.0	59	5		16	1013.1	31.4	40	4		26	1009.7
Lowest		15.8	28.1							20.5	44	1	#	6	1004.7	26.4	27	1	#	15	999.8
Highest		24.8	41.3	9.8			SSE	72		30.7	82	8	S	39	1022.5	38.9	52	8	S	43	1020.1
Total				20.8																	

Observations were drawn from Amberley AMO {station 040004}
Some cloud observations are from automated equipment; these are somewhat different to those made by a human observer and may not appear every day.

IDCJDW4002.201902 Prepared at 13:01 UTC on 2 Mar 2019

Amberley, Queensland
March 2019 Daily Weather Observations

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	Fr	20.0	29.4	2.0			E	41	16:02	24.9	63	8	SE	15	1022.2	27.1	51	8	ENE	24	1019.5
2	Sa	18.8	29.9	1.2			ESE	46	15:20	20.4	89	8		Calm	1022.2	27.4	54	6	E	30	1018.4
3	Su	18.7	29.6	2.4			E	52	15:16	24.1	77	8	SE	13	1021.3	28.6	50	5	ESE	30	1018.0
4	Mo	18.0	30.8	1.4			ESE	43	15:11	27.1	57	5	E	24	1020.8	30.1	42	6	E	28	1016.9
5	Tu	17.7		0						26.9	58	6	ESE	19	1018.4	30.6	38		NNE	20	1014.0
Statistics for the first 5 days of March 2019																					
Mean		18.6	29.9							24.7	68	7		14	1021.0	28.8	47	6		26	1017.4
Lowest		17.7	29.4							20.4	57	5		Calm	1018.4	27.1	38	5	NNE	20	1014.0
Highest		20.0	30.8	2.4			E	52		27.1	89	8	E	24	1022.2	30.6	54	8	#	30	1019.5
Total				7.0																	

Observations were drawn from Amberley AMO {station 040004}
Some cloud observations are from automated equipment; these are somewhat different to those made by a human observer and may not appear every day.

IDCJDW4002.201903 Prepared at 06:26 UTC on 5 Mar 2019

Appendix D – Traffic Noise Measurement Results

Unattended Noise Measurements
Daleys Road, Ripley - Location 1

Noise Levels - 18hr Day (Traffic Noise)

Logger Location - Northern boundary of Lot 3 on RP80932

ARL Environmental Noise Logger	
Logger Serial Number	87811c
Measurement Title	20190223_104757
Measurement started at	23/02/2019 - 10:47:58
Measurement stopped at	03/03/2019 - 11:55:28
Frequency Weighting	A
Time Averaging	Fast
Statistical Interval	15 min
Pre-measurement Ref.	94.0
Post-measurement Ref.	94.0
Engineering Units	dB SPL

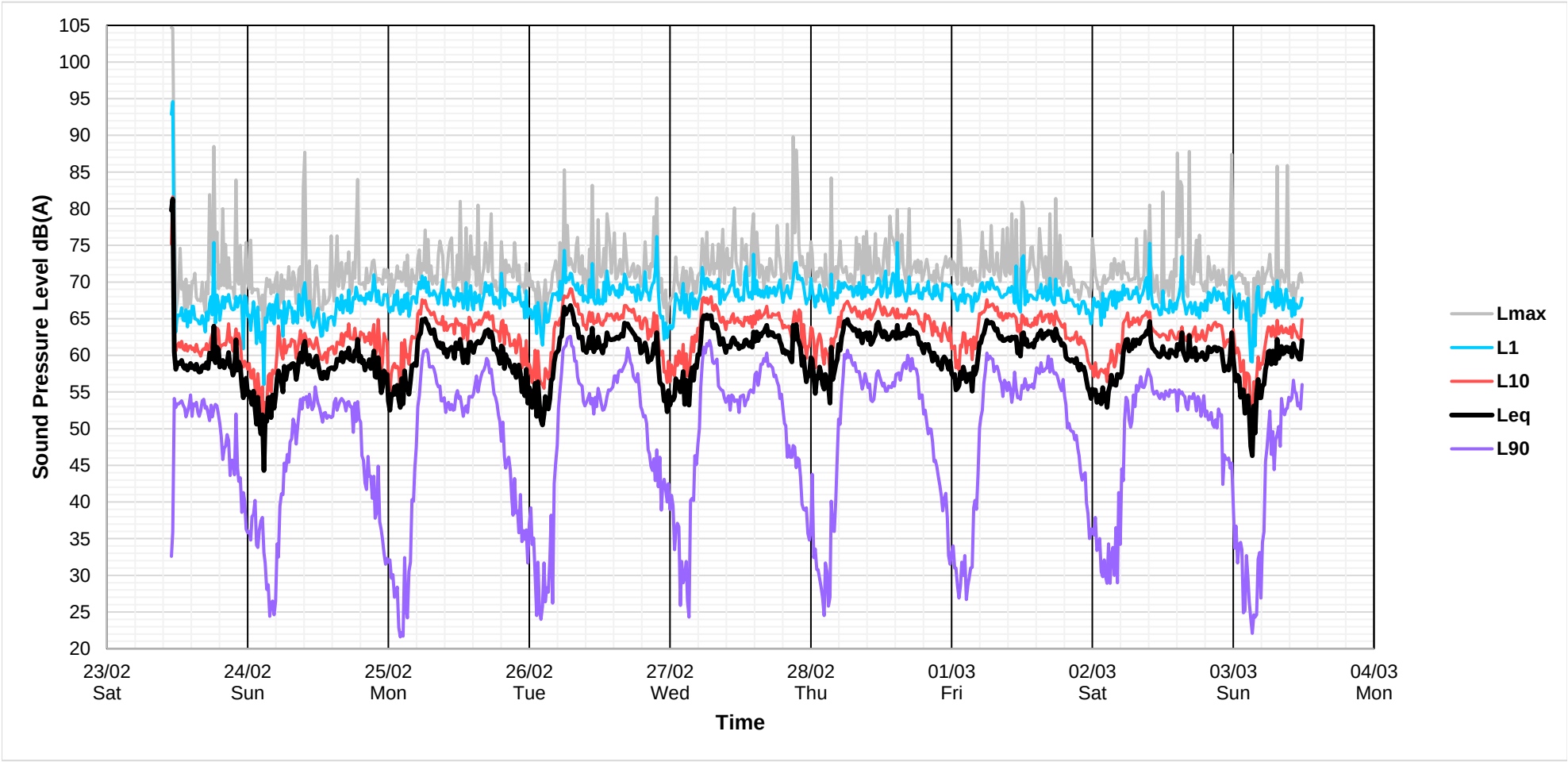
		$L_{A10,T}$			$L_{Aeq,T}$		$L_{A90,T}$	
Date	**Day**	**18hr day 6am-12am**	**1hr max 6am-12am**	**Time for 1hr max**	**18hr day 6am-12am**	**8hr night 10pm-6am**	**18hr day 6am-12am**	**8hr night 10pm-6am**
23/02/2019	Saturday	—	—	—	—	54.4	—	35.6
24/02/2019	Sunday	61.6	62.9	17:00	58.7	57.0	48.8	35.1
25/02/2019	Monday	63.8	66.9	06:00	60.7	56.2	51.7	36.5
26/02/2019	Tuesday	64.7	68.3	07:00	61.6	56.7	53.7	40.1
27/02/2019	Wednesday	64.9	67.4	06:00	61.9	58.5	53.3	38.2
28/02/2019	Thursday	65.3	67.0	11:00	62.1	58.5	53.7	37.2
1/03/2019	Friday	64.2	67.0	06:00	61.4	56.3	54.0	36.9
2/03/2019	Saturday	63.4	65.7	09:00	60.8	55.8	53.1	35.2
Average		**64.0**	**66.4**		**61.0**	**56.7**	**52.6**	**36.9**
Average (weekdays only)		**64.6**	**67.3**		**61.6**	**57.2**	**53.3**	**37.8**

Note

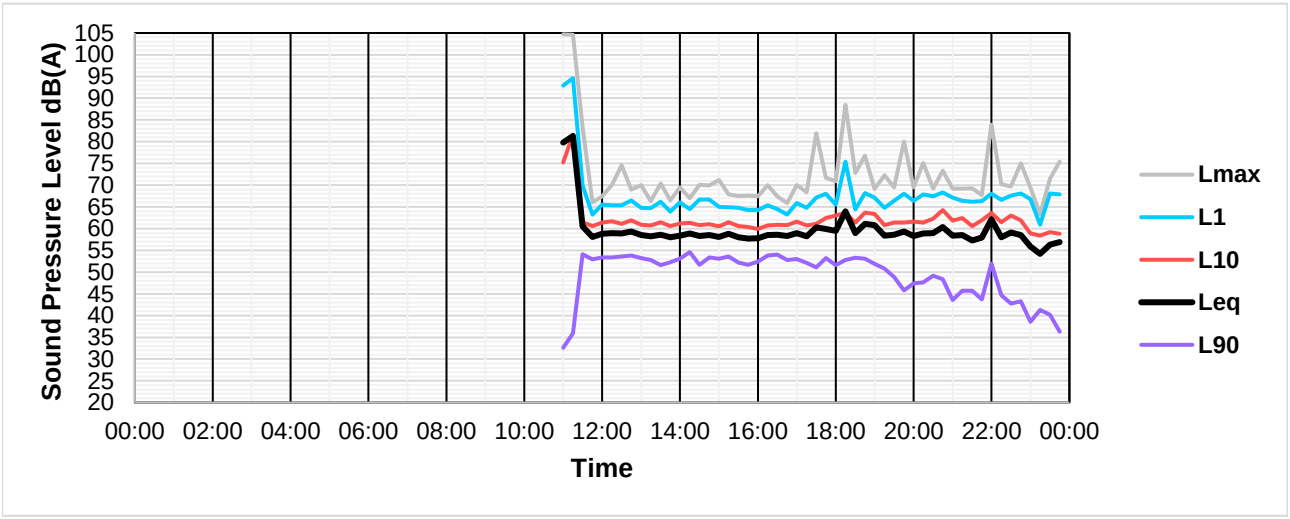
— No noise data available

Rainfall recorded on this day

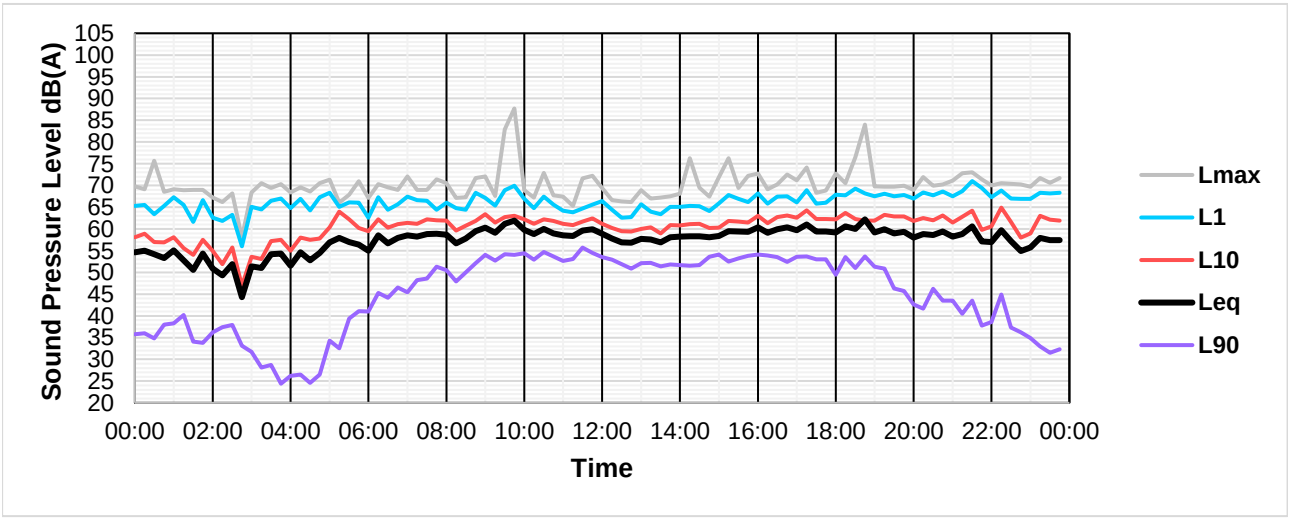
Unattended Noise Measurements - Location 1
23 February to 3 March 2019



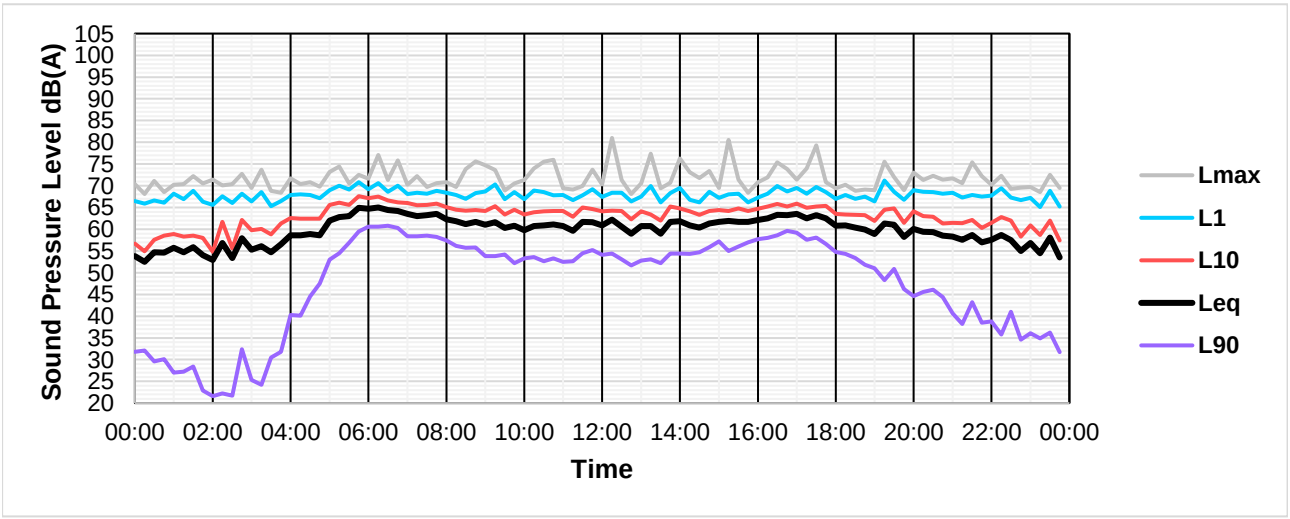
Unattended Noise Measurements - Location 1
Saturday 23 February 2019



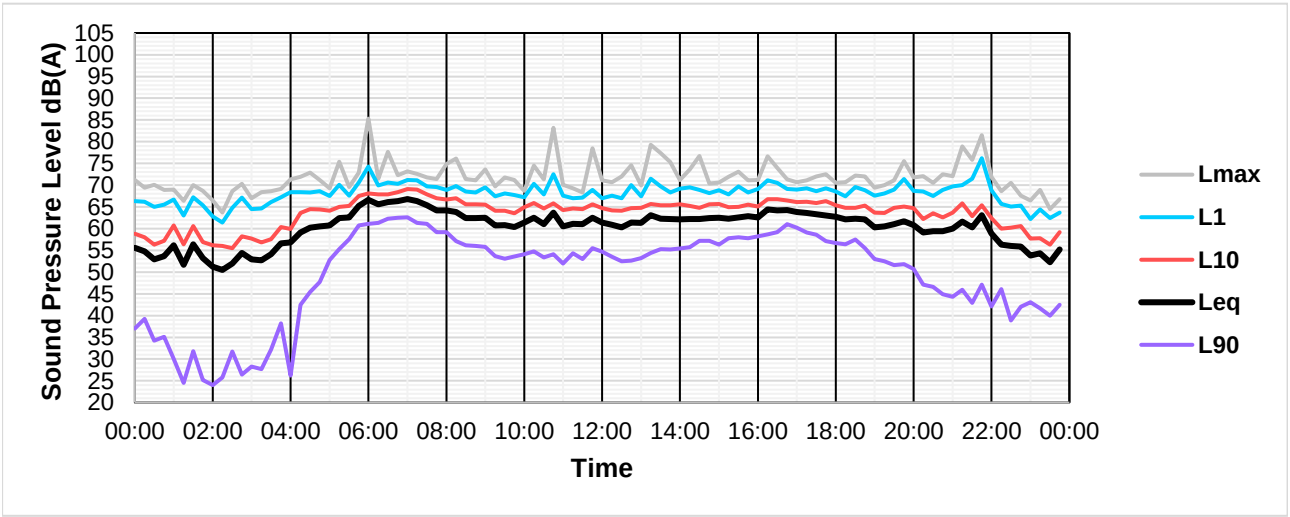
Unattended Noise Measurements - Location 1
Sunday 24 February 2019



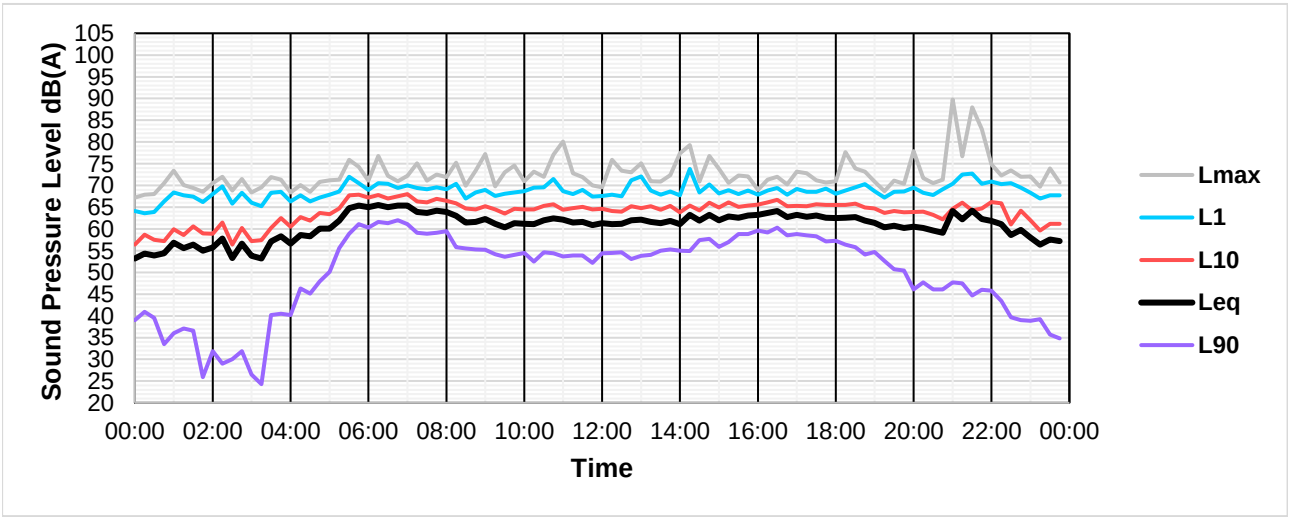
Unattended Noise Measurements - Location 1
Monday 25 February 2019



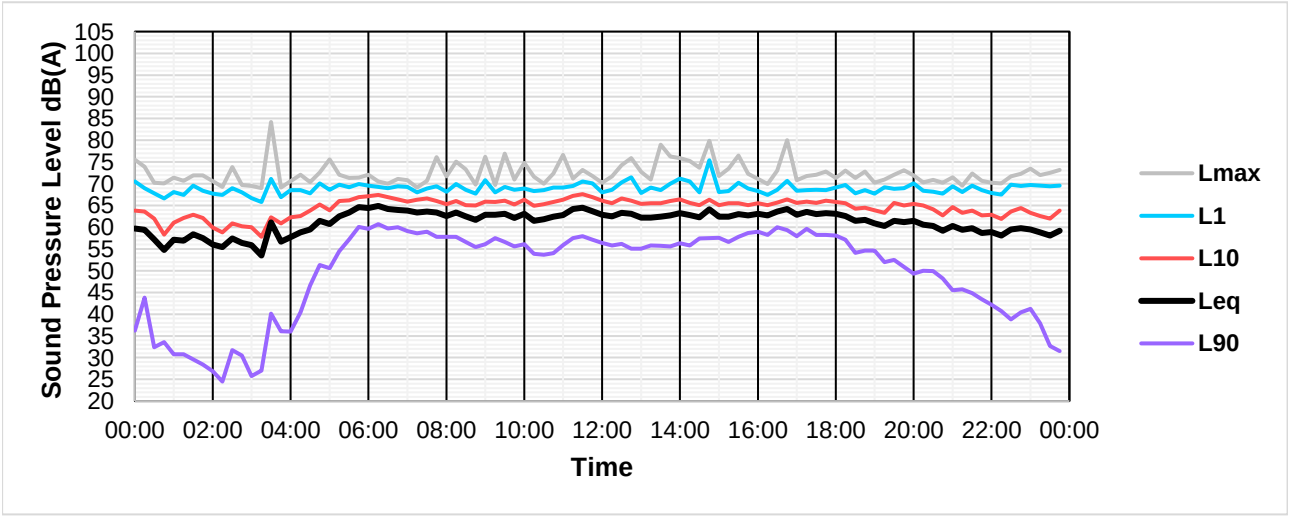
Unattended Noise Measurements - Location 1
Tuesday 26 February 2019



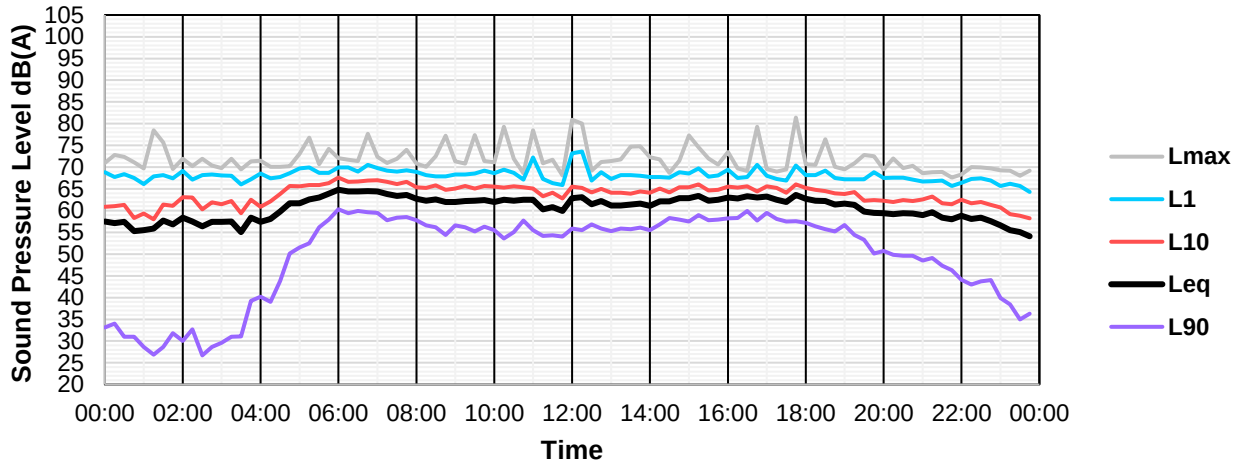
Unattended Noise Measurements - Location 1
Wednesday 27 February 2019



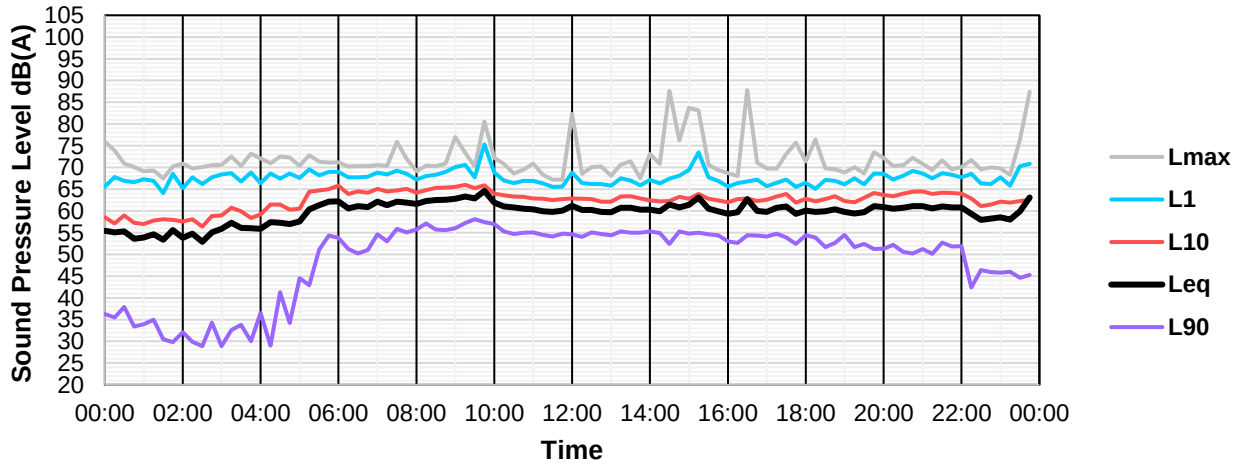
Unattended Noise Measurements - Location 1
Thursday 28 February 2019



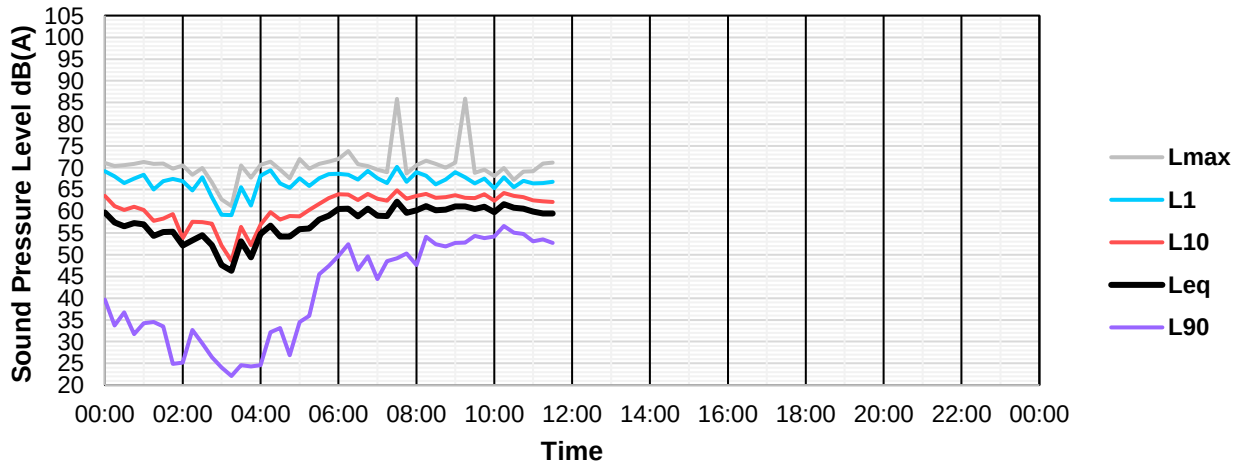
Unattended Noise Measurements - Location 1
Friday 1 March 2019



Unattended Noise Measurements - Location 1
Saturday 2 March 2019



Unattended Noise Measurements - Location 1
Sunday 3 March 2019



Unattended Noise Measurements
Daleys Road, Ripley - Location 2

Noise Levels - 18hr Day (Traffic Noise)

Logger Location - Northern boundary of Lot 5 on RP80932

ARL Environmental Noise Logger	
Logger Serial Number	87811D
Measurement Title	20190223_103822
Measurement started at	23/02/2019 - 10:38:24
Measurement stopped at	03/03/2019 - 11:41:26
Frequency Weighting	A
Time Averaging	Fast
Statistical Interval	15 min
Pre-measurement Ref.	94.0
Post-measurement Ref.	94.0
Engineering Units	dB SPL

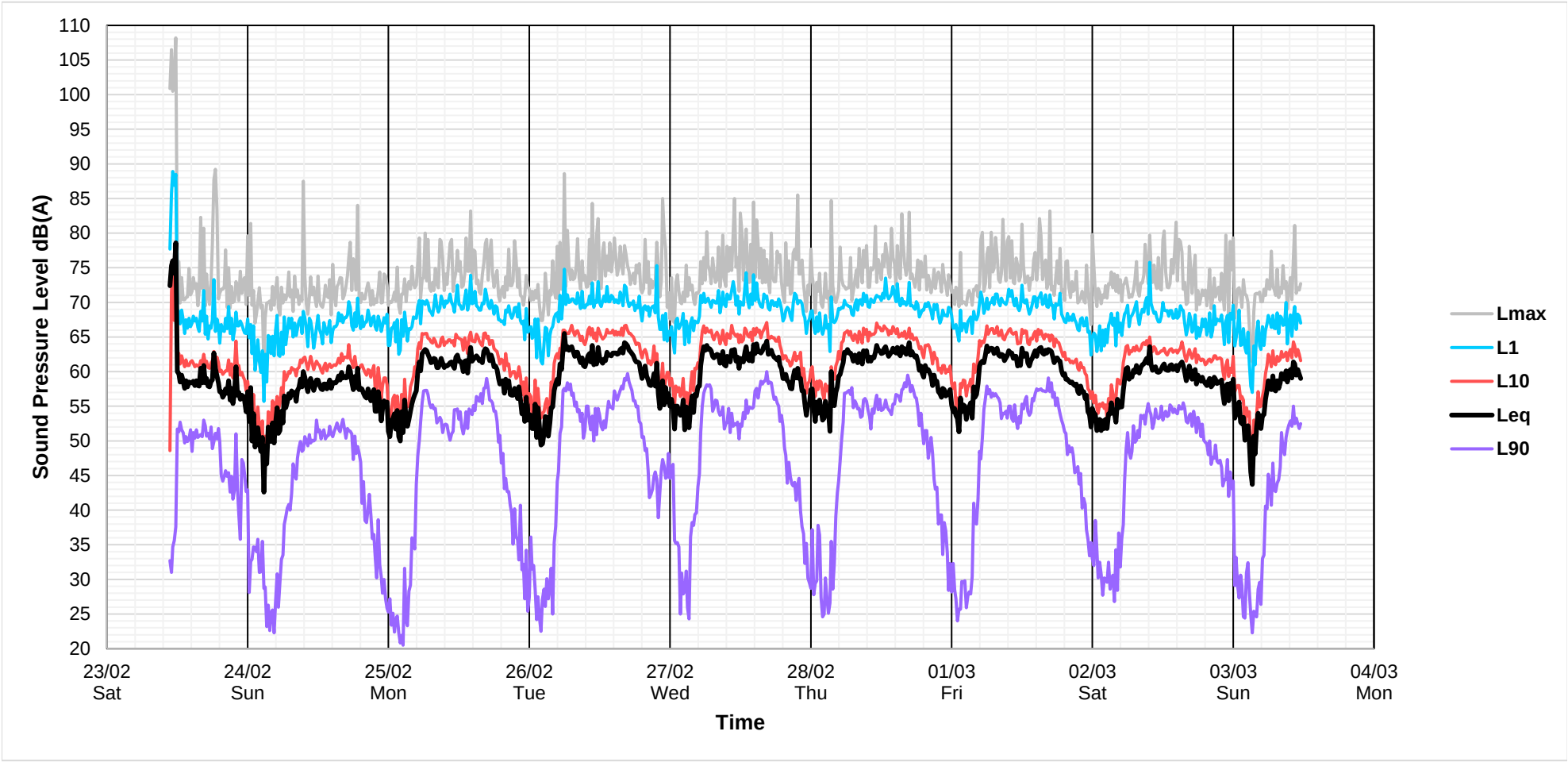
		$L_{A10,T}$			$L_{Aeq,T}$		$L_{A90,T}$	
Date	**Day**	**18hr day 6am-12am**	**1hr max 6am-12am**	**Time for 1hr max**	**18hr day 6am-12am**	**8hr night 10pm-6am**	**18hr day 6am-12am**	**8hr night 10pm-6am**
23/02/2019	Saturday	—	—	—	—	52.6	—	33.5
24/02/2019	Sunday	60.5	62.3	17:00	57.5	54.8	45.3	31.0
25/02/2019	Monday	63.1	65.3	06:00	60.2	54.8	49.9	33.2
26/02/2019	Tuesday	64.2	66.1	16:00	61.3	55.9	52.6	39.8
27/02/2019	Wednesday	64.1	66.1	16:00	61.2	56.4	51.6	35.3
28/02/2019	Thursday	64.4	66.4	11:00	61.4	56.5	52.0	35.0
1/03/2019	Friday	63.9	66.0	06:00	61.0	54.6	52.5	34.5
2/03/2019	Saturday	62.5	64.3	09:00	59.7	53.6	51.3	33.6
Average		**63.2**	**65.2**		**60.3**	**54.9**	**50.7**	**34.5**
Average (weekdays only)		**63.9**	**66.0**		**61.0**	**55.6**	**51.7**	**35.5**

Note

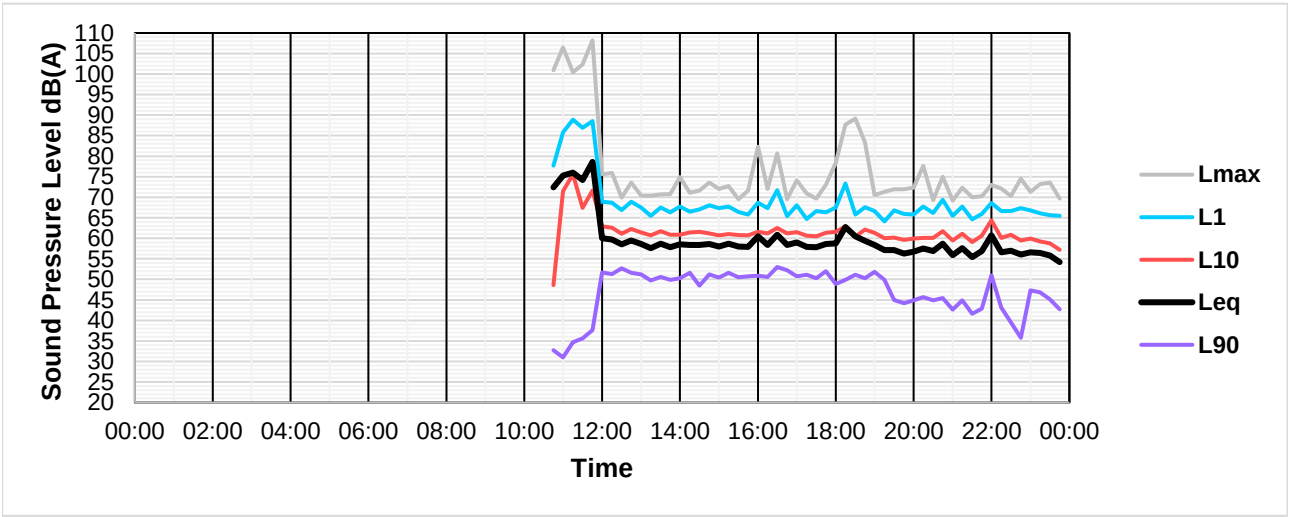
— No noise data available

Rainfall recorded on this day

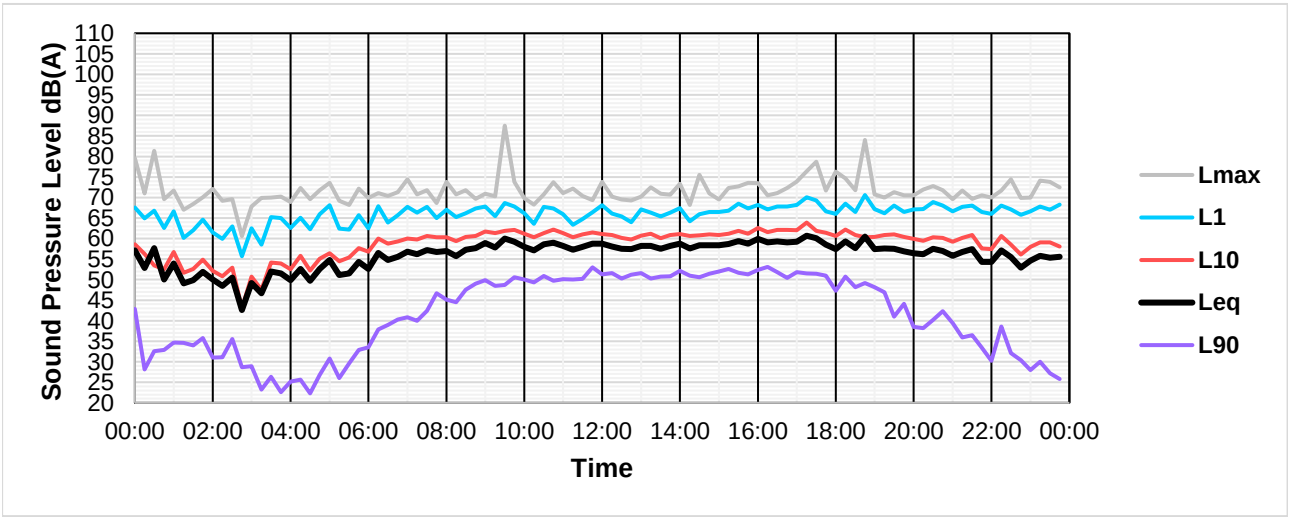
Unattended Noise Measurements - Location 2
23 February to 3 March 2019



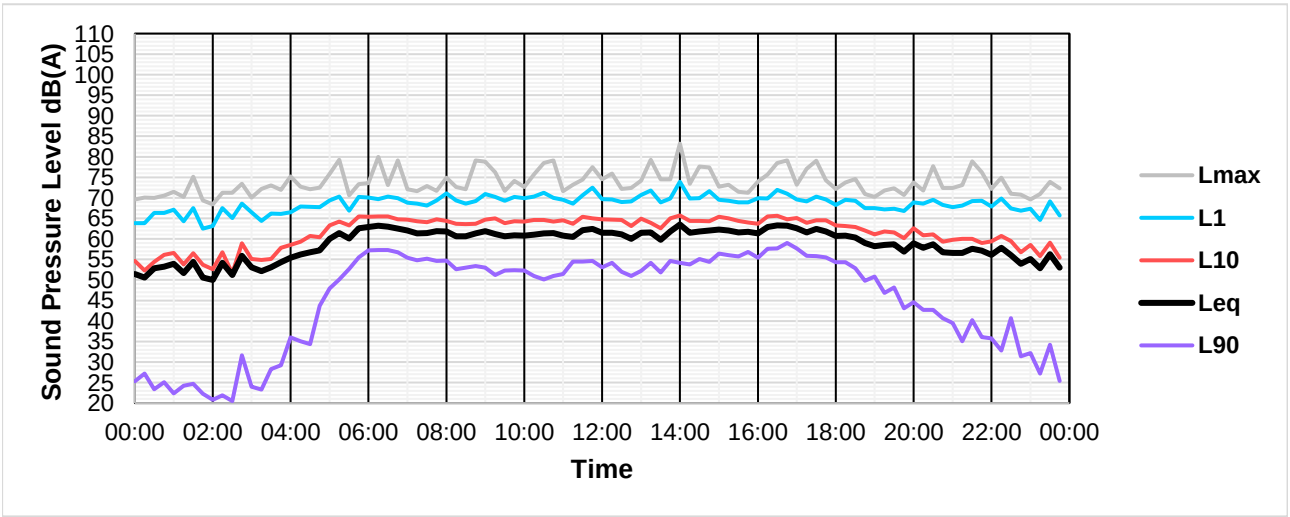
Unattended Noise Measurements - Location 2
Saturday 23 February 2019



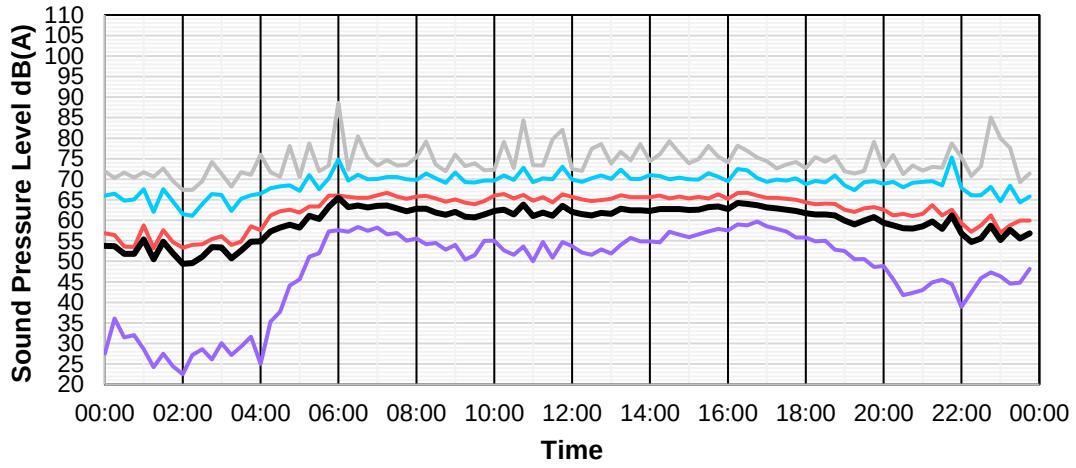
Unattended Noise Measurements - Location 2
Sunday 24 February 2019



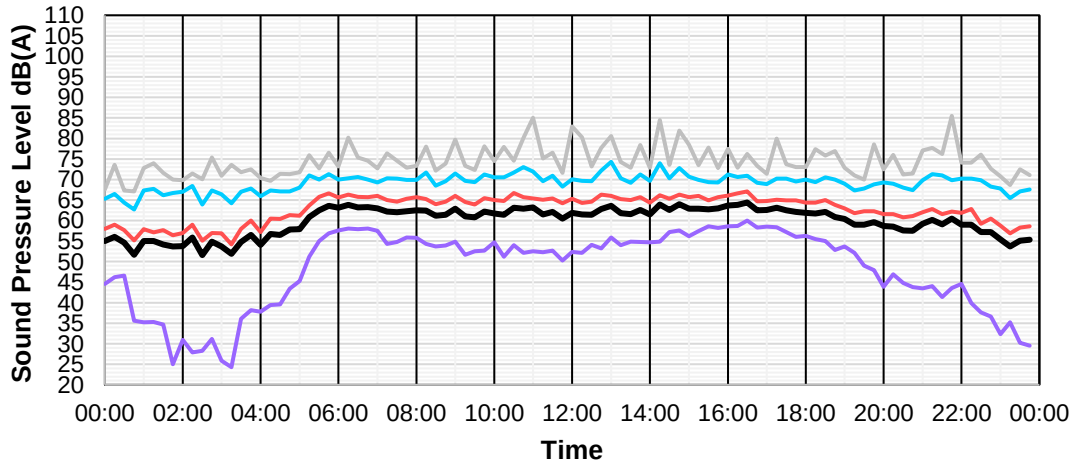
Unattended Noise Measurements - Location 2
Monday 25 February 2019



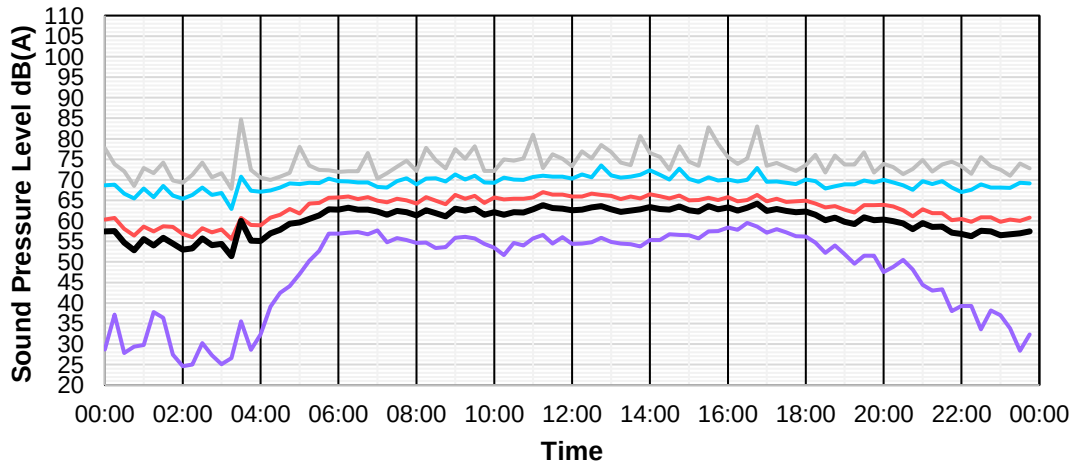
Unattended Noise Measurements - Location 2
Tuesday 26 February 2019



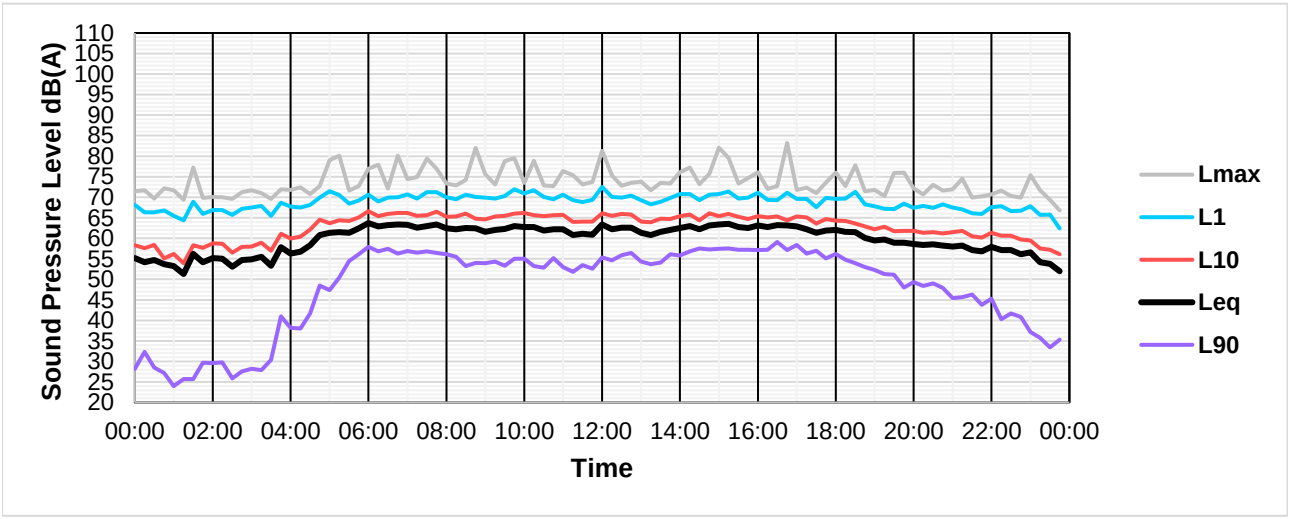
Unattended Noise Measurements - Location 2
Wednesday 27 February 2019



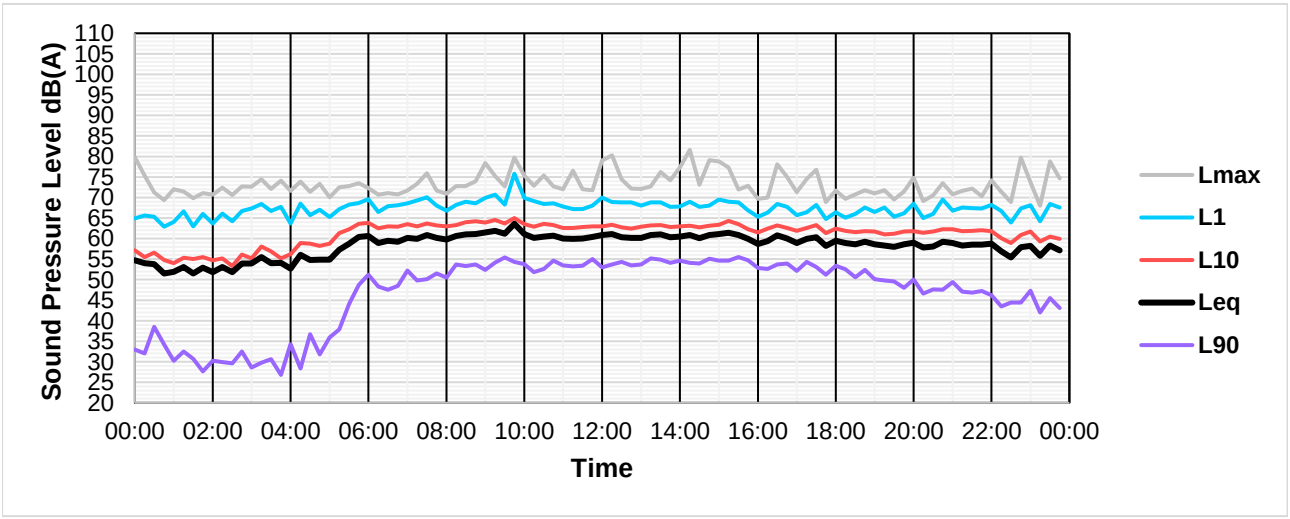
Unattended Noise Measurements - Location 2
Thursday 28 February 2019



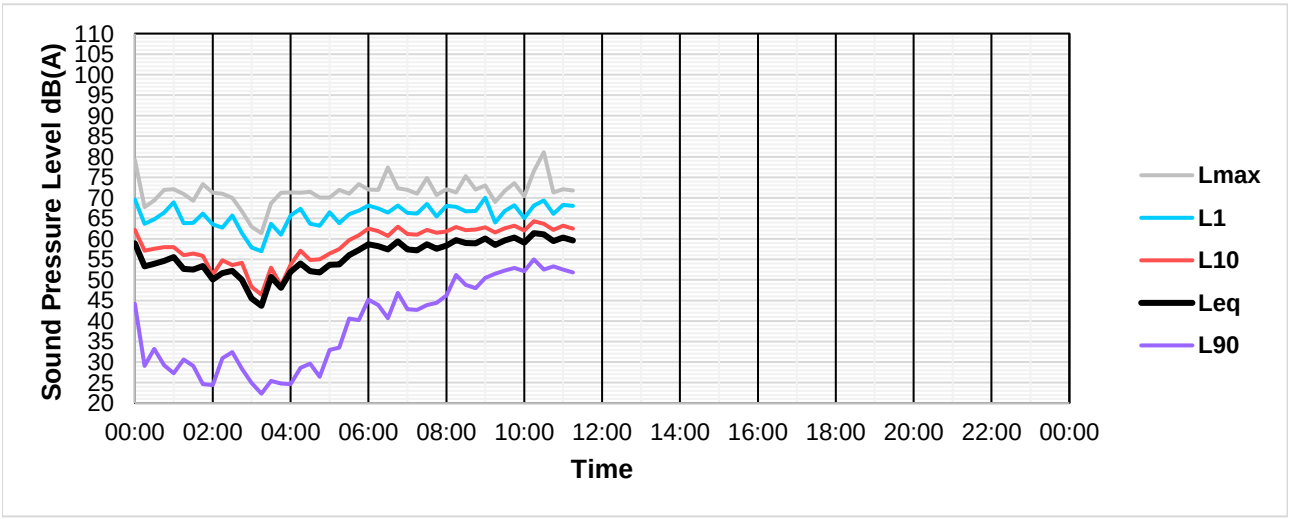
Unattended Noise Measurements - Location 2
Friday 1 March 2019



Unattended Noise Measurements - Location 2
Saturday 2 March 2019



Unattended Noise Measurements - Location 2
Sunday 3 March 2019



Appendix E – Earthworks Drawings

- **Existing contour plan**
  (Peak Urban, project number 18-0016, drawing number SK235, Revision P1, dated 17 July 2020)

- **Proposed earthworks drawings**
  (Peak Urban, project number 18-0016, drawing numbers P102 to 107, Revision 2, dated 17 April 2020)

- **Existing contour plan**
  (Peak Urban, project number 18-0016, drawing number SK235, Revision P1, dated 17 July 2020)

REV	DATE	DESIGN	DRAWN	REVISION DETAILS
P1	17.07.20	ANC	ANC	ISSUE FOR DISCUSSION

DRAWN

DESIGN

STATUS
NOT FOR CONSTRUCTION

APPROVED
TROY SCHULTZ RPEQ 20631

FOR AND ON BEHALF OF PEAKURBAN PTY LTD

PEAKURBAN
DEVELOPMENT ENGINEERS + ADVISORS

ENQUIRIES@PEAKURBAN.COM.AU

SCALE
1:1500 30 20 10 0 30 60 A1
1:3000 A3

CLIENT
ORCHARD PROPERTY GROUP

ASSOCIATED CONSULTANT

PROJECT NAME
BINNIES ROAD, RIPLEY

DRAWING TITLE
INTERNAL DEVELOPMENT EXISTING CASE LAYOUT PLAN

PROJECT No.	DRAWING No.	REVISION
18-0016	SK325	P1

- **Proposed earthworks drawings**
  (Peak Urban, project number 18-0016, drawing numbers P102 to 107, Revision 2, dated 17 April 2020)

REFER SHEET P103 FOR CONTINUATION

REFER SHEET P105 FOR CONTINUATION

LEGEND

- PROPOSED AREA OF WORKS
- PROPOSED STAGE BOUNDARY
- PROPOSED SINGLE TIER RETAINING WALL (1.5m MAX)
- PROPOSED TWO TIER RETAINING WALL (1.5 TO 3m MAX)
- VEGETATION BOUNDARY
- 20m OFFSET FROM VEGETATION BOUNDARY
- 24.0 PROPOSED SURFACE CONTOUR
- 24.0 EXISTING SURFACE CONTOUR
- 24.60 PROPOSED FINISHED SURFACE LEVEL (FSL)
- 24.60 EXISTING SURFACE LEVEL (ESL)
- PROPOSED AREA OF CUT
- PROPOSED AREA OF FILL
- INDICATIVE DRIVEWAY LOCATIONS
- EXISTING TREE TO REMAIN - REFER VMP
- EXISTING TREE TO BE REMOVED - REFER VMP

DALEYS ROAD

N

STAGE 1

STAGE 2

STAGE 8

ROAD 11

ROAD 12

ROAD 13

ROAD 14

ROAD 16

ROAD 22

B P109

D P109

A P109

REV	DATE	DESIGN	DRAWN	REVISION DETAILS
1	14.02.20	ANC	SC	ORIGINAL ISSUE
2	17.04.20	ANC	ANC	UPDATED RETAINING WALLS AND SECTIONS MARKERS

DRAWN

DESIGN

STATUS
FOR DEVELOPMENT APPLICATION
NOT FOR CONSTRUCTION

APPROVED
RYAN ASHWORTH RPEQ 19674

FOR AND ON BEHALF OF PEAKURBAN PTY LTD

PEAKURBAN
DEVELOPMENT ENGINEERS + ADVISORS

ENQUIRIES@PEAKURBAN.COM.AU

SCALE
1:500 10 5 0 10 20 A1
1:1000 A3

CLIENT
ORCHARD (DALEYS) DEVELOPMENTS PTY LTD

ASSOCIATED CONSULTANT
LANDPARTNERS

PROJECT NAME
DALEYS ROAD, RIPLEY INTERNAL SUBDIVISION

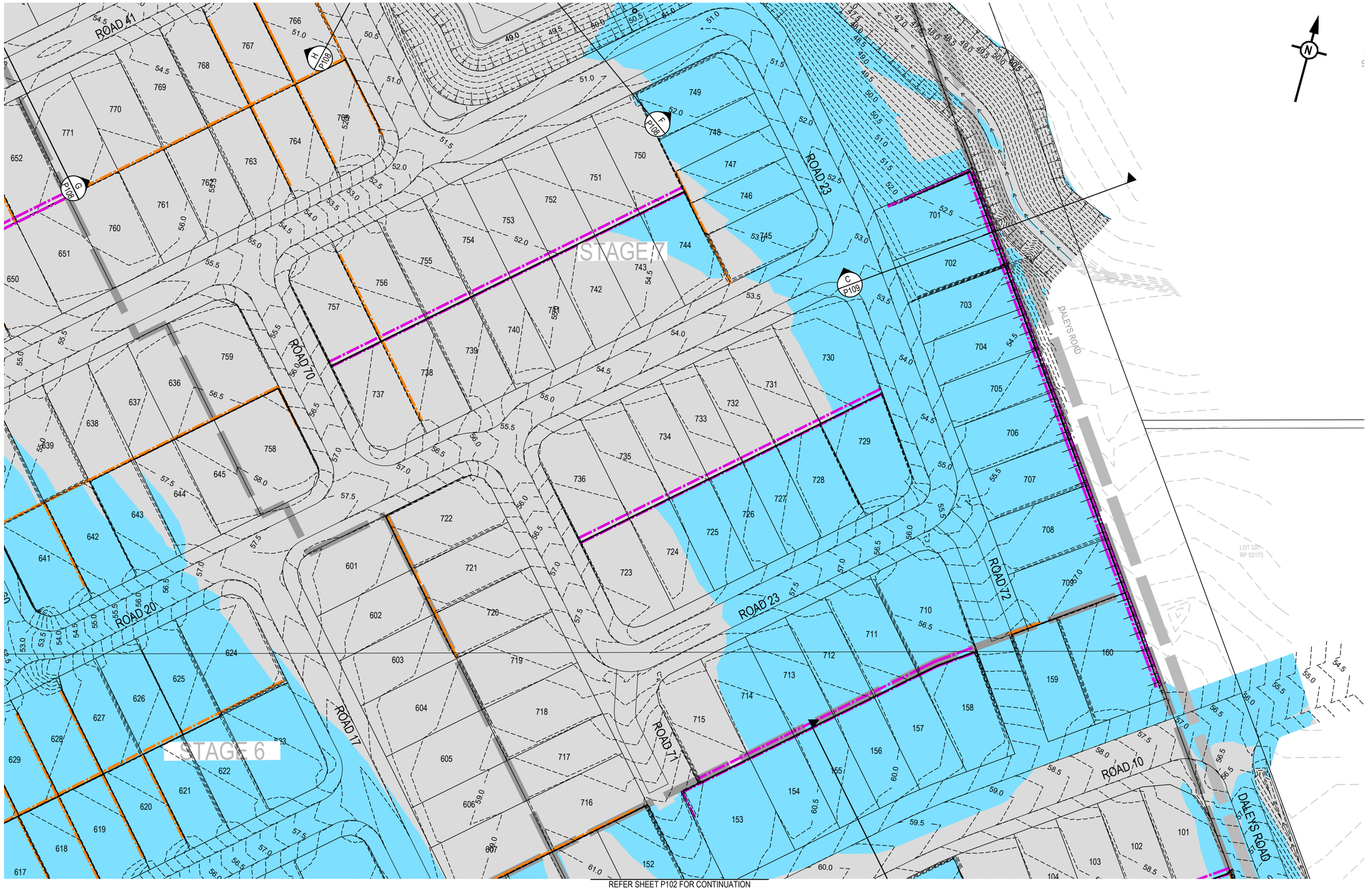
DALEYS ROAD
RIPLEY QLD 4306

CONCEPT BULK EARTHWORKS PLAN - SHEET 1 OF 6

PROJECT No.	DRAWING No.	REVISION
18-0016	P102	2

REFER SHEET P104 FOR CONTINUATION

REFER SHEET P105 FOR CONTINUATION



REFER SHEET P102 FOR CONTINUATION

REV	DATE	DESIGN	DRAWN	REVISION DETAILS
1	14.02.20	ANC	SC	ORIGINAL ISSUE
2	17.04.20	ANC	ANC	UPDATED RETAINING WALLS AND SECTIONS MARKERS

DRAWN

DESIGN

STATUS
FOR DEVELOPMENT APPLICATION
NOT FOR CONSTRUCTION

APPROVED
RYAN ASHWORTH RPEQ 19674

FOR AND ON BEHALF OF PEAKURBAN PTY LTD

PEAKURBAN
DEVELOPMENT ENGINEERS + ADVISORS
ENQUIRIES@PEAKURBAN.COM.AU

SCALE
1:500 10 5 0 10 20 A1
1:1000 A3

CLIENT
ORCHARD (DALEYS) DEVELOPMENTS PTY LTD

ASSOCIATED CONSULTANT
LANDPARTNERS

PROJECT NAME
DALEYS ROAD, RIPLEY
INTERNAL SUBDIVISION

DALEYS ROAD
RIPLEY QLD 4306

CONCEPT BULK EARTHWORKS PLAN - SHEET 2 OF 6

PROJECT No.	DRAWING No.	REVISION
18-0016	P103	2

REFER SHEET P106 FOR CONTINUATION

CUNNINGHAM HIGHWAY
CUNNINGHAM HIGHWAY

MONTEREA ROAD

DALEYS ROAD

ROAD 41

MAINTAIN EXISTING OVERLAND FLOW PATH

H P108

F P108

REFER SHEET P103 FOR CONTINUATION

REV	DATE	DESIGN	DRAWN	REVISION DETAILS
1	14.02.20	ANC	SC	ORIGINAL ISSUE
2	17.04.20	ANC	ANC	UPDATED RETAINING WALLS AND SECTIONS MARKERS

DRAWN

DESIGN

STATUS
FOR DEVELOPMENT APPLICATION
NOT FOR CONSTRUCTION

APPROVED
RYAN ASHWORTH RPEQ 19674

FOR AND ON BEHALF OF PEAKURBAN PTY LTD

PEAKURBAN
DEVELOPMENT ENGINEERS + ADVISORS

ENQUIRIES@PEAKURBAN.COM.AU

SCALE
1:500 10 5 0 10 20 A1
1:1000 A3

CLIENT
ORCHARD (DALEYS) DEVELOPMENTS PTY LTD

ASSOCIATED CONSULTANT
LANDPARTNERS

PROJECT NAME
DALEYS ROAD, RIPLEY INTERNAL SUBDIVISION

DALEYS ROAD
RIPLEY QLD 4306

CONCEPT BULK EARTHWORKS PLAN - SHEET 3 OF 6

PROJECT No.	DRAWING No.	REVISION
18-0016	P104	2

REFER SHEET P106 FOR CONTINUATION

REFER SHEET P107 FOR CONTINUATION

REFER SHEET P102 FOR CONTINUATION

REV	DATE	DESIGN	DRAWN	REVISION DETAILS
1	14.02.20	ANC	SC	ORIGINAL ISSUE
2	17.04.20	ANC	ANC	UPDATED RETAINING WALLS AND SECTIONS MARKERS

DRAWN

DESIGN

STATUS
FOR DEVELOPMENT APPLICATION
NOT FOR CONSTRUCTION

APPROVED
RYAN ASHWORTH RPEQ 19674

FOR AND ON BEHALF OF PEAKURBAN PTY LTD

PEAKURBAN
DEVELOPMENT ENGINEERS + ADVISORS
ENQUIRIES@PEAKURBAN.COM.AU

SCALE
1:500 10 5 0 10 20 A1
1:1000 A3

CLIENT
ORCHARD (DALEYS) DEVELOPMENTS PTY LTD

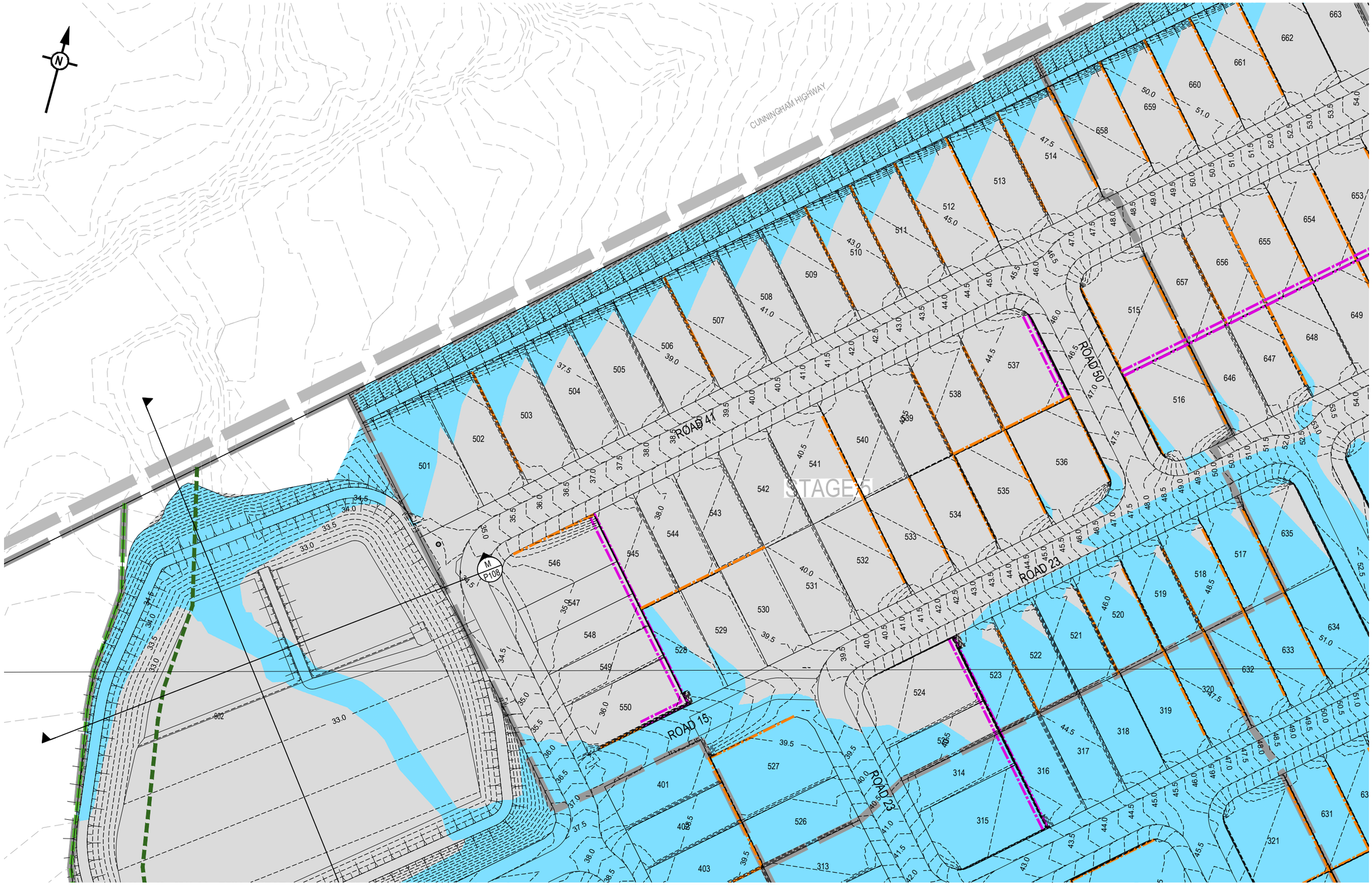
ASSOCIATED CONSULTANT
LANDPARTNERS

PROJECT NAME
DALEYS ROAD, RIPLEY INTERNAL SUBDIVISION

DALEYS ROAD
RIPLEY QLD 4306

CONCEPT BULK EARTHWORKS PLAN - SHEET 4 OF 6

PROJECT No.	DRAWING No.	REVISION
18-0016	P105	2



REV	DATE	DESIGN	DRAWN	REVISION DETAILS
1	14.02.20	ANC	SC	ORIGINAL ISSUE
2	17.04.20	ANC	ANC	UPDATED RETAINING WALLS AND SECTIONS MARKERS

DRAWN

DESIGN

STATUS
FOR DEVELOPMENT APPLICATION
NOT FOR CONSTRUCTION

APPROVED
RYAN ASHWORTH RPEQ 19674

FOR AND ON BEHALF OF PEAKURBAN PTY LTD

PEAKURBAN
DEVELOPMENT ENGINEERS + ADVISORS
ENQUIRIES@PEAKURBAN.COM.AU

SCALE
1:500 10 5 0 10 20 A1
1:1000 A3

CLIENT
ORCHARD (DALEYS) DEVELOPMENTS PTY LTD

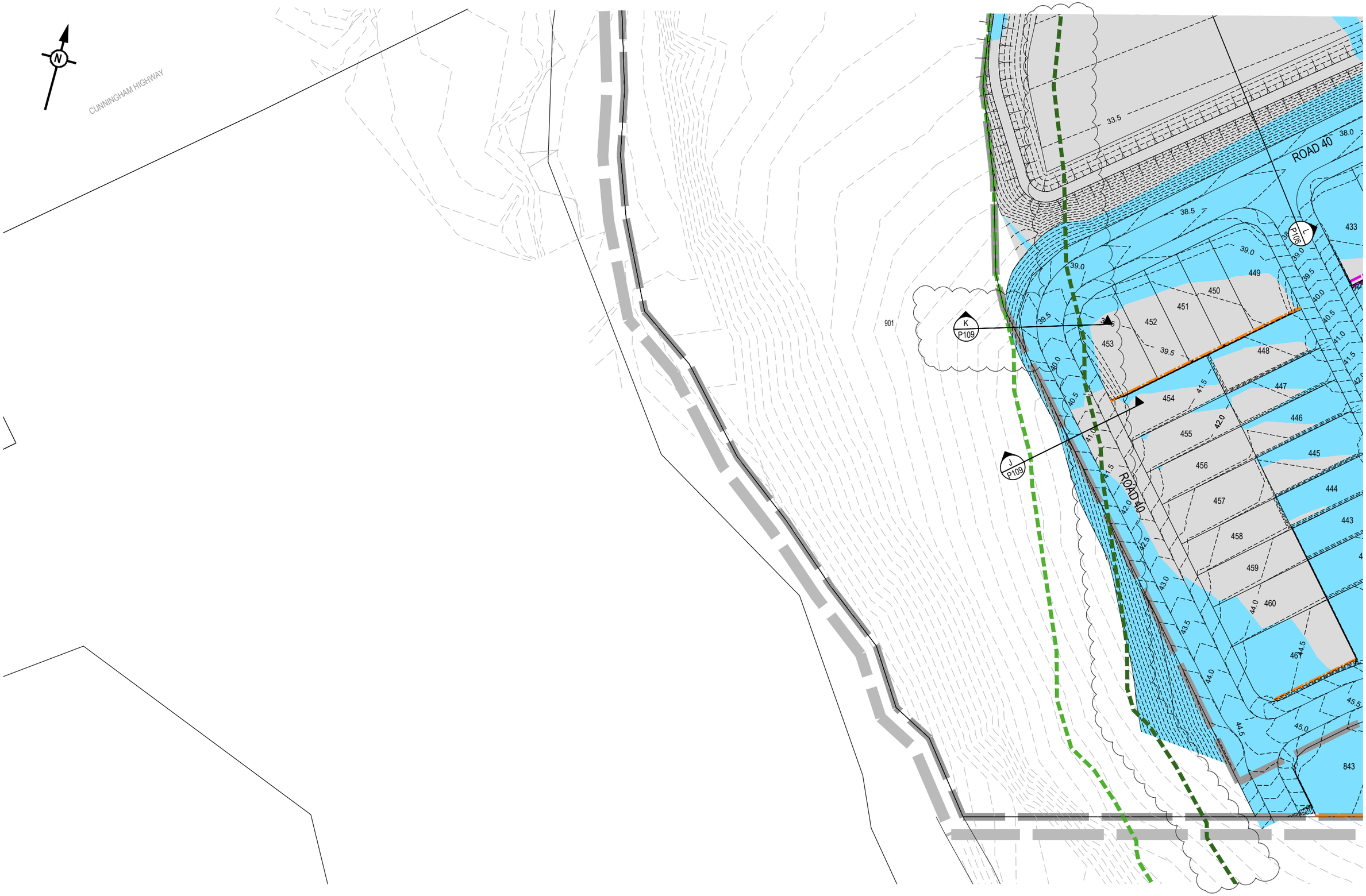
ASSOCIATED CONSULTANT
LANDPARTNERS

PROJECT NAME
DALEYS ROAD, RIPLEY INTERNAL SUBDIVISION

DALEYS ROAD
RIPLEY QLD 4306

CONCEPT BULK EARTHWORKS PLAN - SHEET 5 OF 6

PROJECT No.	DRAWING No.	REVISION
18-0016	P106	2



REV	DATE	DESIGN	DRAWN	REVISION DETAILS
1	14.02.20	ANC	SC	ORIGINAL ISSUE
2	17.04.20	ANC	ANC	UPDATED RETAINING WALLS AND SECTIONS MARKERS

DRAWN

DESIGN

STATUS
FOR DEVELOPMENT APPLICATION
NOT FOR CONSTRUCTION

APPROVED
RYAN ASHWORTH RPEQ 19674

FOR AND ON BEHALF OF PEAKURBAN PTY LTD

PEAKURBAN
DEVELOPMENT ENGINEERS + ADVISORS

ENQUIRIES@PEAKURBAN.COM.AU

SCALE
1:500 10 5 0 10 20 A1
1:1000 A3

CLIENT
ORCHARD (DALEYS) DEVELOPMENTS PTY LTD

ASSOCIATED CONSULTANT
LANDPARTNERS

PROJECT NAME
DALEYS ROAD, RIPLEY INTERNAL SUBDIVISION

DALEYS ROAD
RIPLEY QLD 4306

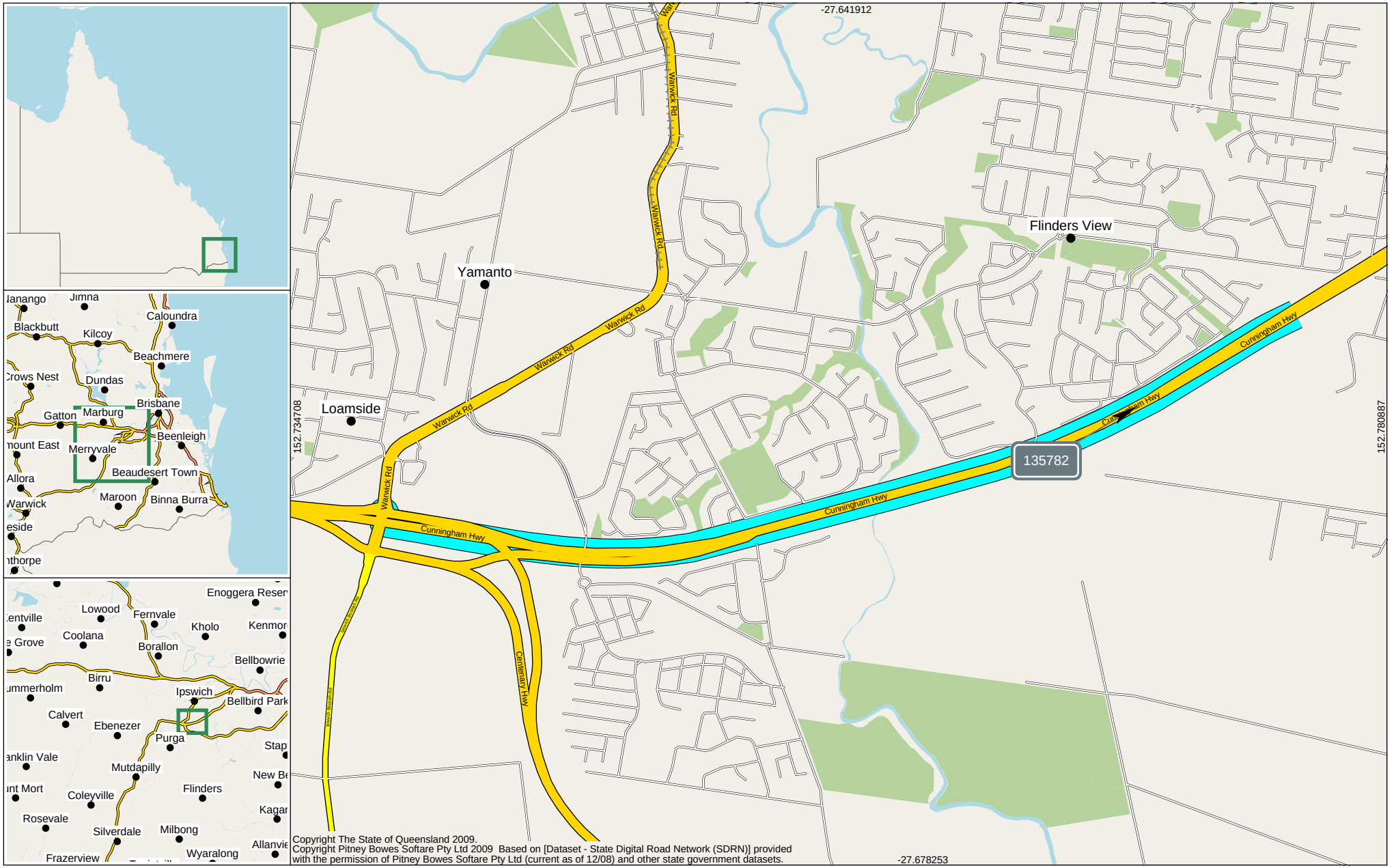
CONCEPT BULK EARTHWORKS PLAN - SHEET 6 OF 6

PROJECT No.	DRAWING No.	REVISION
18-0016	P107	2

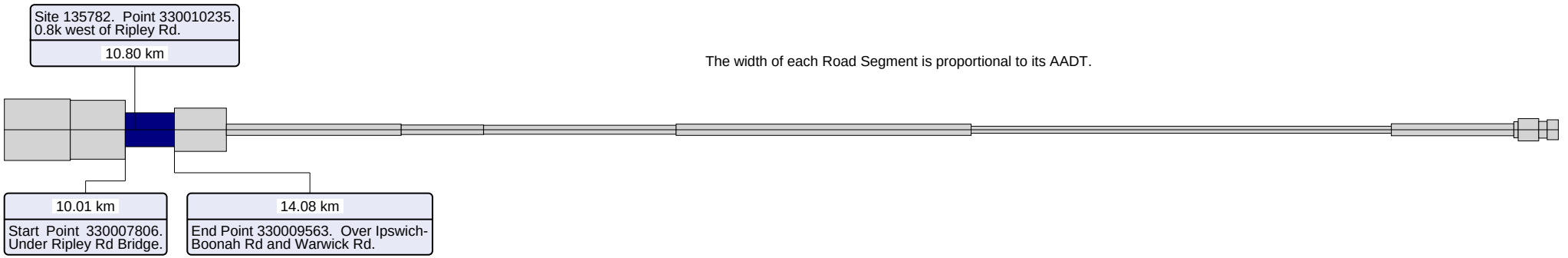
Appendix F – AADT Segment Report

Area 406 - Metropolitan District
Road Segment from 10.010km to 14.080km

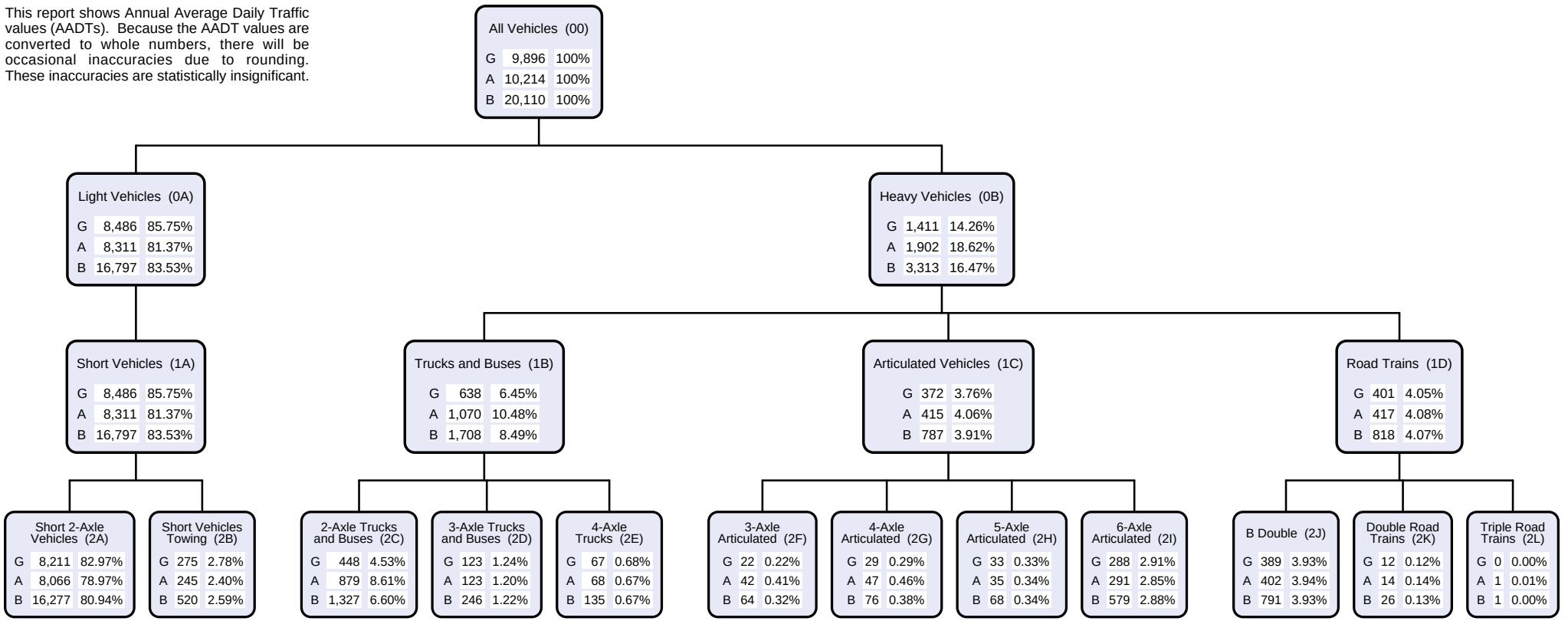
Road Section 17B - CUNNINGHAM HIGHWAY (IPSWICH - WARWICK)
Segment Site 135782 Traffic Year 2018 Data Collection Year 2017



Area 406 - Metropolitan District
Road Section 17B - CUNNINGHAM HIGHWAY (IPSWICH - WARWICK)
Road Segment from 10.010km to 14.080km
Segment Site 135782 Traffic Year 2018 Data Collection Year 2017



This report shows Annual Average Daily Traffic values (AADTs). Because the AADT values are converted to whole numbers, there will be occasional inaccuracies due to rounding. These inaccuracies are statistically insignificant.



AADT Segment Annual Volume Report
Provides summary data for the selected AADT Segment of a Road Section. Summary data is presented as both directional information and a combined bi-directional figure. The data is then broken down by Traffic Class, when available. The report also includes maps displaying the location of both the AADT Segment and the traffic count site.

Annual Average Daily Traffic (AADT)
Annual Average Daily Traffic (AADT) is the number of vehicles passing a point on a road in a 24 hour period, averaged over a calendar year.

AADT Segments
The State declared road network is broken into Road Sections and then further broken down into AADT Segments. An AADT Segment is a sub-section of the declared road network where traffic volume is similar along the entire AADT Segment.

Area
For administration purposes the Department of Transport and Main Roads has divided Queensland into 12 Districts. The Area field in TSDM reports displays the District Name and Number.

District Name	District
Central West District	401
Darling Downs District	402
Far North District	403
Fitzroy District	404
Mackay/Whitsunday District	405
Metropolitian District	406
North Coast District	407
North West District	409
Northern District	408
South Coast District	410
South West District	411
Wide Bay/Burnett District	412

AADT Values
AADT values are displayed by direction of travel as:

- G Traffic flow in gazettal direction
- A Traffic flow against gazettal direction
- B Traffic flow in both directions

Data Collection Year
Is the most recent year that data was collected at the data collection site.

Please Note:
Due to location and/or departmental policy, some sites are not counted every year.

Gazettal Direction
Is the direction of the traffic flow. It can be easily recognised by referring to the name of the road eg. Road Section: 10A Brisbane - Gympie denotes that the gazettal direction is from Brisbane to Gympie.

Maps
Display the selected location from a range of viewing levels, the start and end position details for the AADT Segment and the location of the traffic count site.

Road Section
Is the Gazetted road from which the traffic data is collected. Each Road Section is given a code, allocated sequentially in Gazettal Direction. Larger roads are broken down into sections and identified by an ID code with a suffix for easier data collection and reporting (eg. 10A, 10B, 10C). Road Sections are then broken into AADT Segments which are determined by traffic volume.

Segment Site
Is the unique identifier for the traffic count site representing the traffic flow within the AADT Segment.

Site
The physical location of a traffic counting device. Sites are located at a specified Through Distance along a Road Section.

Site Description
The description of the physical location of the traffic counting device.

Start and End Point
The unique identifier for the Through Distance along a Road Section.

Vehicle Class
Traffic is categorised as per the Austroads Vehicle Classification scheme. Traffic classes are in the following hierarchical format:

Volume or All Vehicles
00 = 0A + 0B

Light Vehicles
0A = 1A
1A = 2A + 2B

Heavy Vehicles
0B = 1B + 1C + 1D
1B = 2C + 2D + 2E
1C = 2F + 2G + 2H + 2I
1D = 2J + 2K + 2L

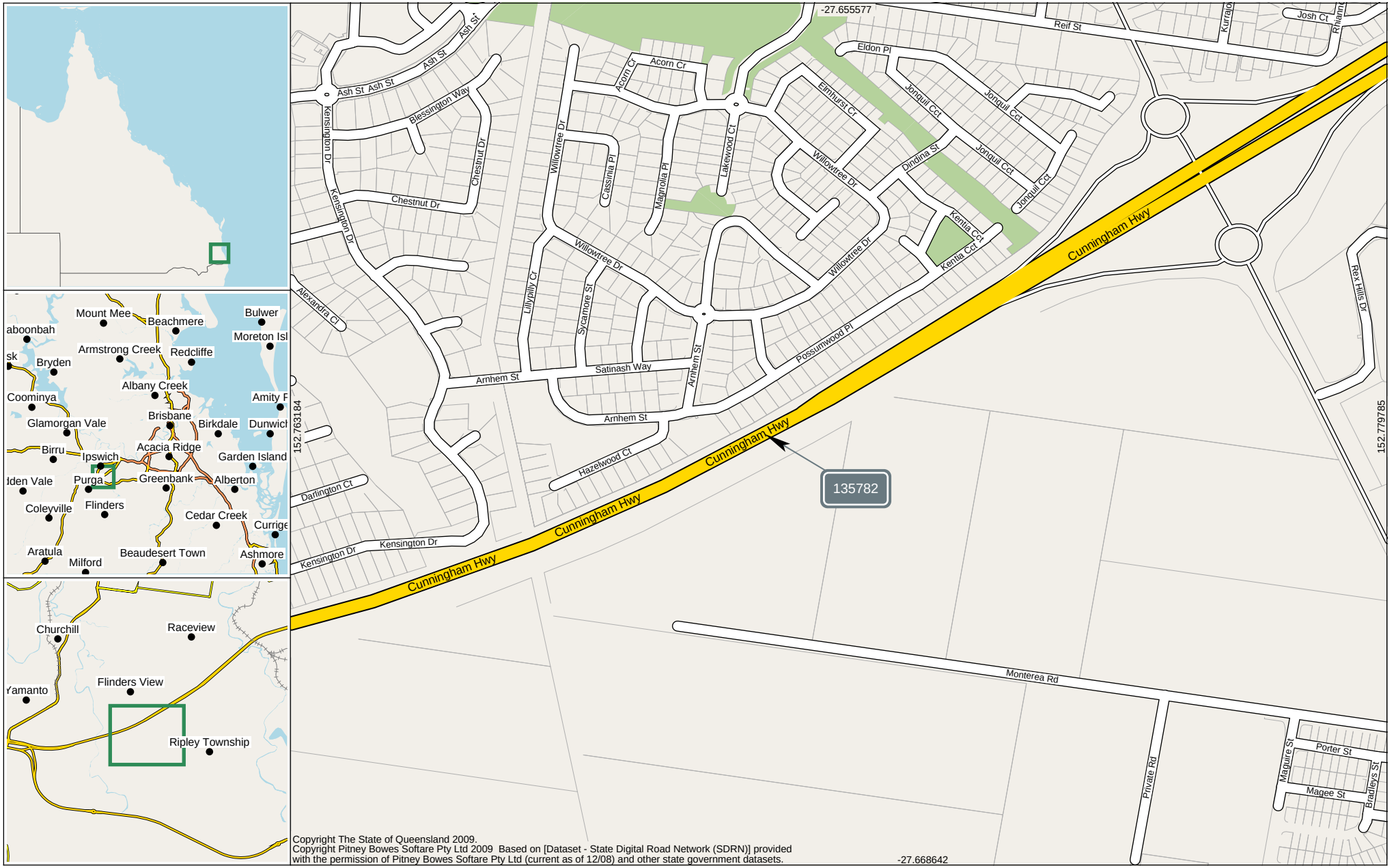
The following classes are the categories for which data can be captured:

Volume
00 All vehicles

2-Bin
0A Light vehicles
0B Heavy vehicles

4-Bin
1A Short vehicles
1B Truck or bus
1C Articulated vehicles
1D Road train

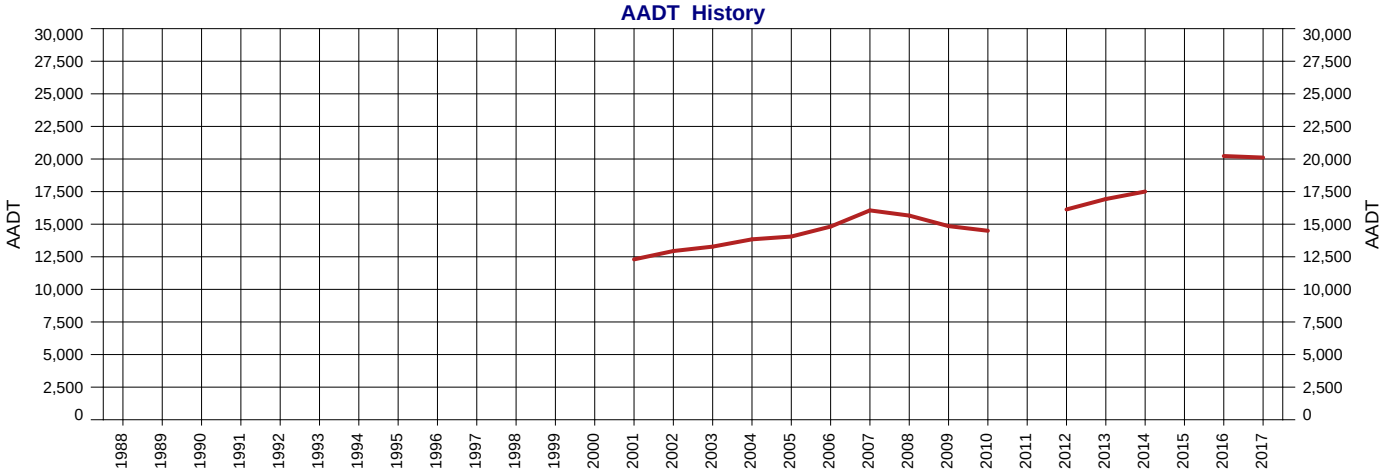
12-Bin
2A Short 2 axle vehicles
2B Short vehicles towing
2C 2 axle truck or bus
2D 3 axle truck or bus
2E 4 axle truck
2F 3 axle articulated vehicle
2G 4 axle articulated vehicle
2H 5 axle articulated vehicle
2I 6 axle articulated vehicle
2J B double
2K Double road train
2L Triple road train



Area	406 - Metropolitan District
Road Section	17B - CUNNINGHAM HIGHWAY (IPSWICH - WARWICK)
Site	135782 - 0.8k West of Ripley Rd
Thru Dist	10.8
Type	C - Coverage
Stream	TB - Bi-directional traffic flow

Year	2017	Growth last Year	-0.58%
AADT	20,110	Growth last 5 Yrs	4.41%
Avg Week Day	21,718	Growth last 10 Yrs	3.36%
Avg Weekend Day	14,278		

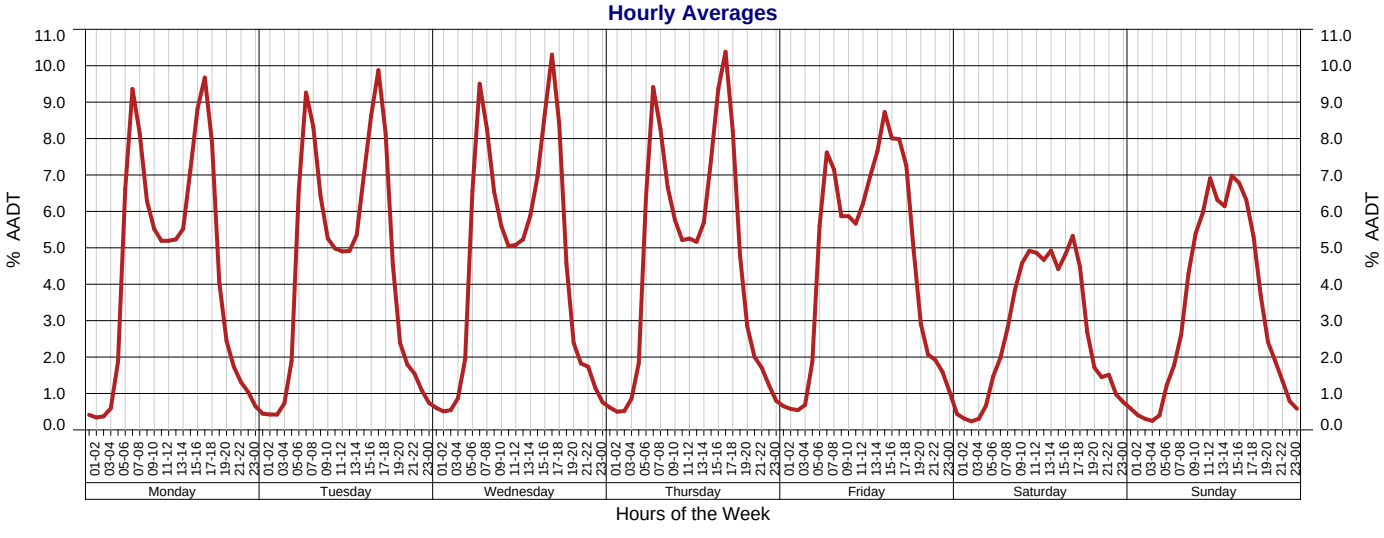
AADT History



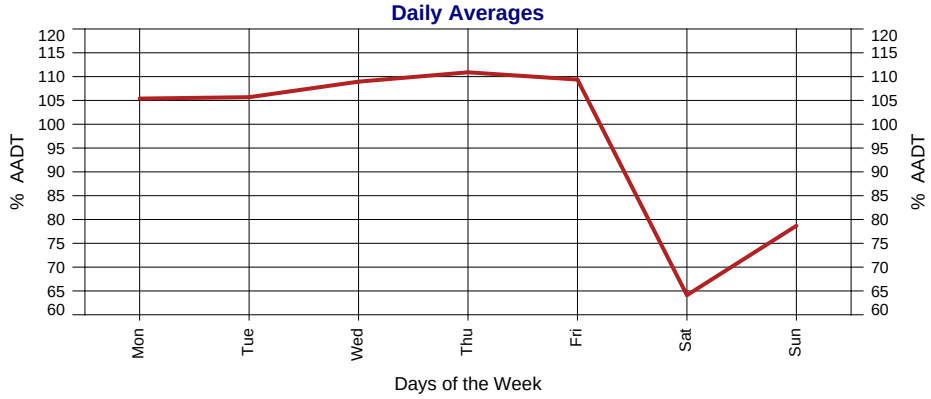
Year	AADT	1-Year Growth	5-Year Growth	10-Year Growth
2017	20,110	-0.58%	4.41%	3.36%
2016	20,228			3.72%
2015				
2014	17,504	3.39%	3.93%	2.34%
2013	16,930	4.96%	2.84%	2.23%
2012	16,130		1.12%	1.91%
2011				
2010	14,496	-2.40%	-0.76%	
2009	14,853	-5.16%	0.68%	
2008	15,661	-2.47%	3.20%	
2007	16,058	8.38%	4.90%	
2006	14,817	5.44%	3.68%	
2005	14,053	1.55%		
2004	13,839	4.22%		
2003	13,279	2.61%		

Year	AADT	1-Year Growth	5-Year Growth	10-Year Growth
2002	12,941	5.20%		
2001	12,301			
2000				
1999				
1998				
1997				
1996				
1995				
1994				
1993				
1992				
1991				
1990				
1989				
1988				

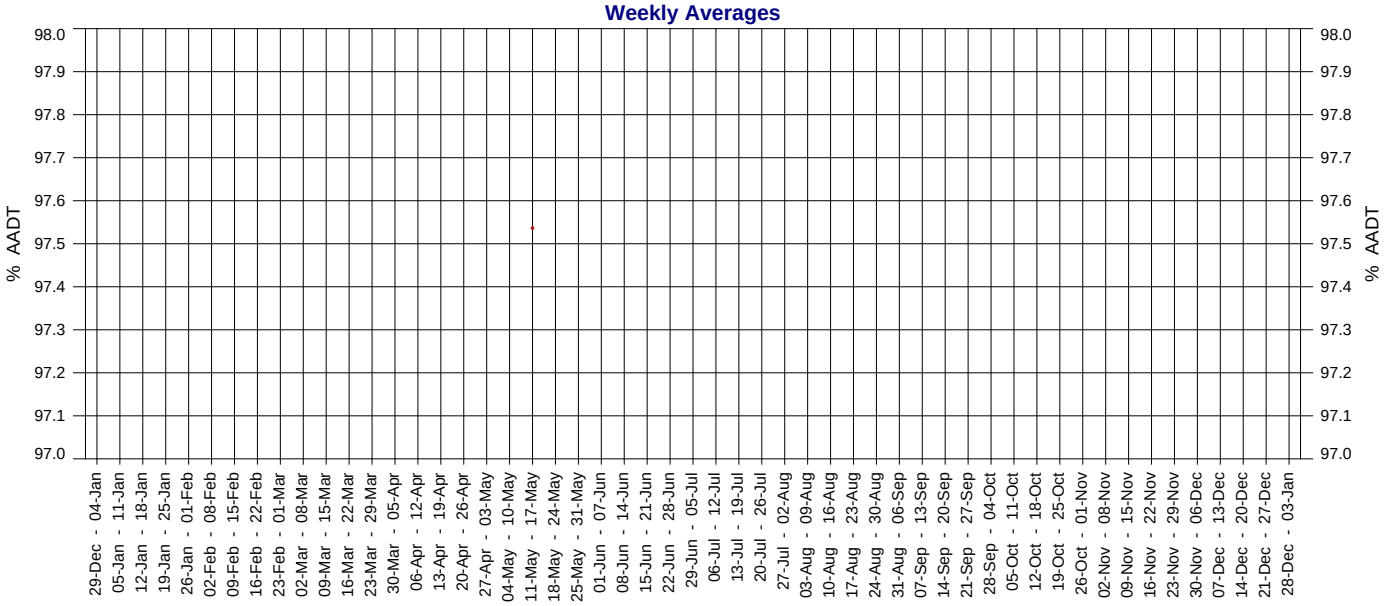
Hourly Averages



Daily Averages



Weekly Averages



2017 Calendar

January

M	T	W	T	F	S	S
30	31					1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29

February

M	T	W	T	F	S	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28					

March

M	T	W	T	F	S	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

April

M	T	W	T	F	S	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

May

M	T	W	T	F	S	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

June

M	T	W	T	F	S	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

July

M	T	W	T	F	S	S
31					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

August

M	T	W	T	F	S	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

September

M	T	W	T	F	S	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

October

M	T	W	T	F	S	S
30	31					1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29

November

M	T	W	T	F	S	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

December

M	T	W	T	F	S	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

Days on which traffic data was collected.

Annual Volume Report
Displays AADT history with hourly, daily and weekly patterns by Stream in addition to annual data for AADT figures with 1 year, 5 year and 10 year growth rates.

Annual Average Daily Traffic (AADT)
Annual Average Daily Traffic (AADT) is the number of vehicles passing a point on a road in a 24 hour period, averaged over a calendar year.

AADT History
Displays the years when traffic data was collected at this count site.

Area
For administration purposes the Department of Transport and Main Roads has divided Queensland into 12 Districts. The Area field in TSDM reports displays the District Name and Number.

District Name	District
Central West District	401
Darling Downs District	402
Far North District	403
Fitzroy District	404
Mackay/Whitsunday District	405
Metropolitian District	406
North Coast District	407
North West District	409
Northern District	408
South Coast District	410
South West District	411
Wide Bay/Burnett District	412

Avg Week Day
Average daily traffic volume during the week days, Monday to Friday.

Avg Weekend Day
Average daily traffic volume during the weekend, Saturday and Sunday.

Calendar
Days on which traffic data was collected are highlighted in green.

Gazettal Direction
The Gazettal Direction is the direction of the traffic flow. It can be easily recognised by referring to the name of the road eg. Road Section: 10A Brisbane - Gympie denotes that the gazettal direction is from Brisbane to Gympie.

- G Traffic flowing in Gazettal Direction
- A Traffic flowing against Gazettal Direction
- B The combined traffic flow in both Directions

Growth Percentage
Represents the increase or decrease in AADT, using a exponential fit over the previous 1, 5 or 10 year period.

Hour, Day & Week Averages
The amount of traffic on the road network will vary depending on the time of day, the day of the week and the week of the year. The ebb and flow of traffic travelling through a site over a period of time forms a pattern. The Hour, Day and Week Averages are then used in the calculation of AADT.

Road Section
Is the Gazetted road from which the traffic data is collected. Each Road Section is given a code, allocated sequentially in Gazettal Direction. Larger roads are broken down into sections and identified by an ID code with a suffix for easier data collection and reporting (eg. 10A, 10B, 10C). Road Sections are then broken into AADT Segments which are determined by traffic volume.

Site
The unique identifier and description of the physical location of a traffic counting device. Sites are located at a Through Distance along a Road Section.

Stream
The lane in which the traffic is travelling in. This report provides data for the combined flow of traffic in both directions.

Thru Dist or TDist
The distance from the beginning of the Road Section, in kilometres.

Type
There are two types of traffic counting sites, Permanent and Coverage. Permanent means the traffic counting device is in place 24/7. Coverage means the traffic counting device is in place for a specified period of time.

Year
Is the current year for the report. Where an AADT Year record is missing a traffic count has not been conducted, for that year.

Appendix G – Validation of CoRTN Traffic Noise Model

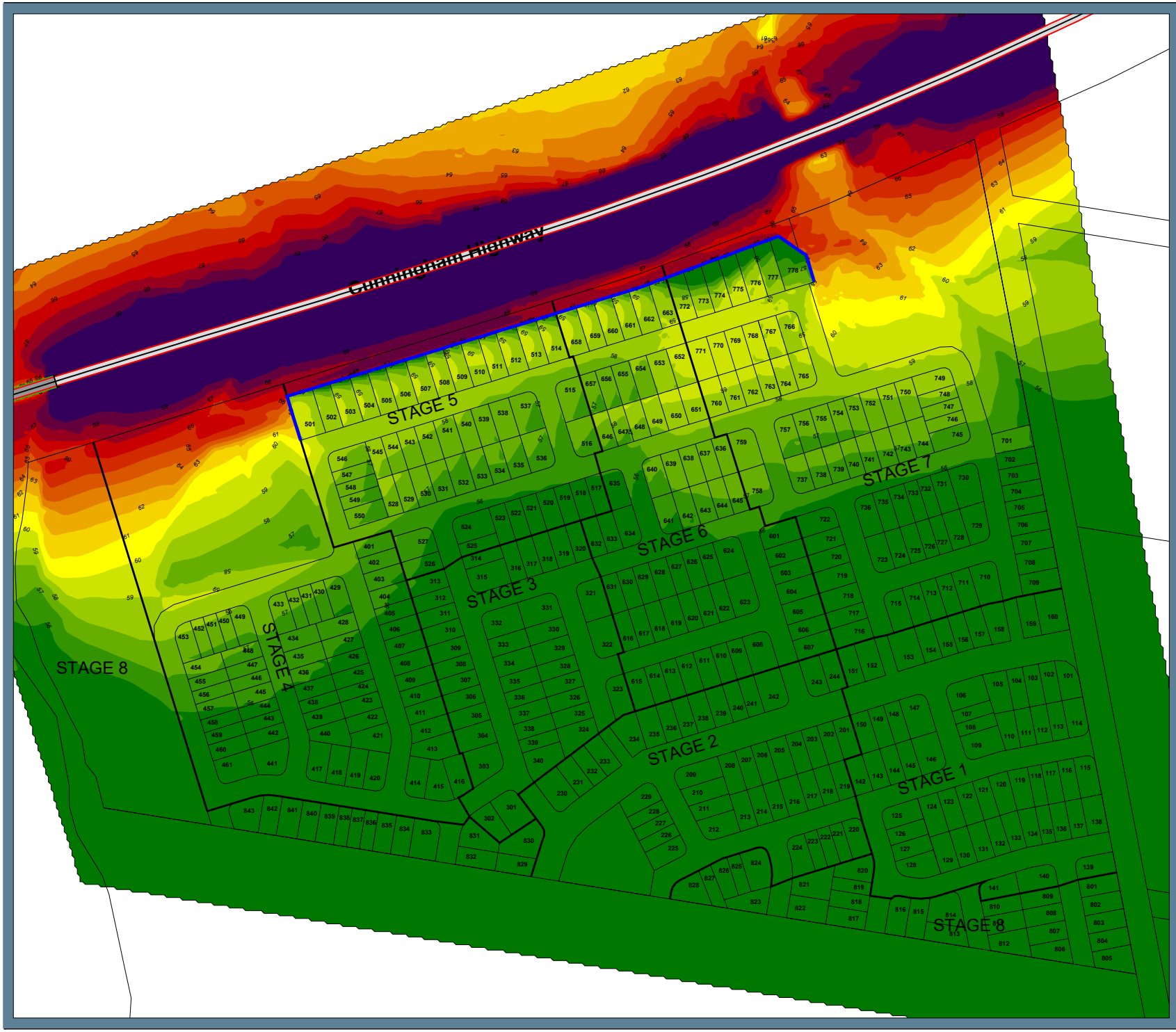
TNIA Daleys Road in Ripley

Assessed receiver levels

2020-05-21_TNIA Validation 2019_Stone Mastic

Receiver	Location	L10(18h) dB(A)
Noise logger - Location 1	GF	64.0
Noise logger - Location 2	GF	63.5

Appendix H – Traffic Noise Contours 2035 – Scenario 1



CONSULTING ENGINEERS

ATP190214

160-224 Daleys Road, Ripley

Traffic Noise Modelling
Year 2035

Scenario 1 - Noise Barrier
2.0 to 5.5 m High

Ground Floor Private Open Spaces
(1.5m AGL)

Traffic noise level
Facade adjusted
$L_{10(18hr)}$ dB(A)

	<=	56
56 <	<=	57
57 <	<=	58
58 <	<=	59
59 <	<=	60
60 <	<=	61
61 <	<=	62
62 <	<=	63
63 <	<=	64
64 <	<=	65
65 <	<=	66
66 <	<=	67
67 <	<=	68
68 <	<=	69
69 <		

Legend

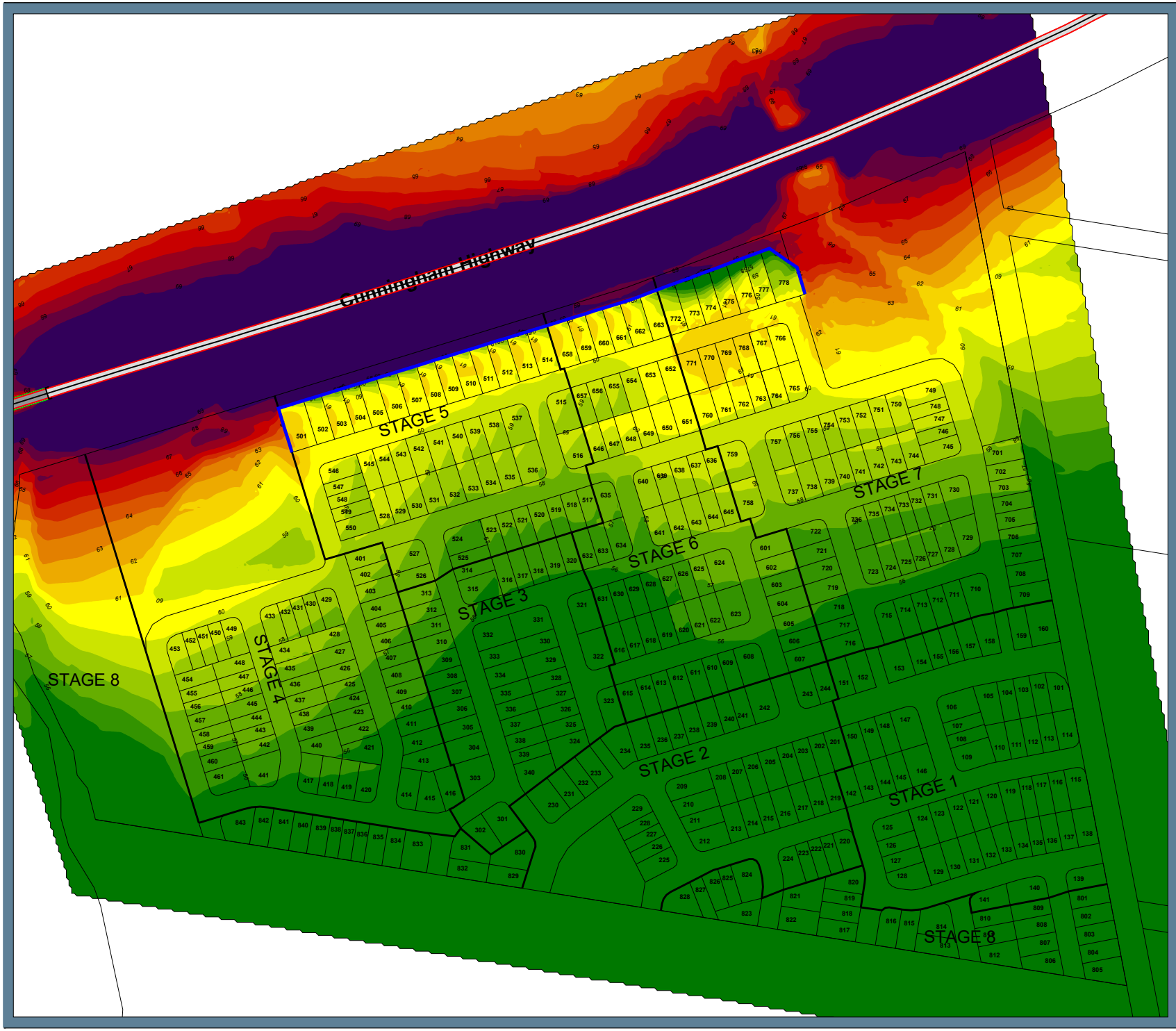
- Road noise emission line
- Road surface
- Noise barrier

SCALE @ A4 1:4000

0 15 30 60 90 120 150 180 m

N

Grid Spacing: 2m
Project Engineer: Sam Fraser
Created: 2/07/2020
Processed with SoundPLAN 8.2



ATP CONSULTING ENGINEERS

ATP190214

160-224 Daleys Road, Ripley

Traffic Noise Modelling
Year 2035

Scenario 1 - Noise Barrier
2.0 to 5.5 m High

Ground Floor Facades
(1.8m AGL)

Traffic noise level
Facade adjusted
$L_{10(18hr)}$ dB(A)

	<=	56
56 <	<=	57
57 <	<=	58
58 <	<=	59
59 <	<=	60
60 <	<=	61
61 <	<=	62
62 <	<=	63
63 <	<=	64
64 <	<=	65
65 <	<=	66
66 <	<=	67
67 <	<=	68
68 <	<=	69
69 <		

Legend

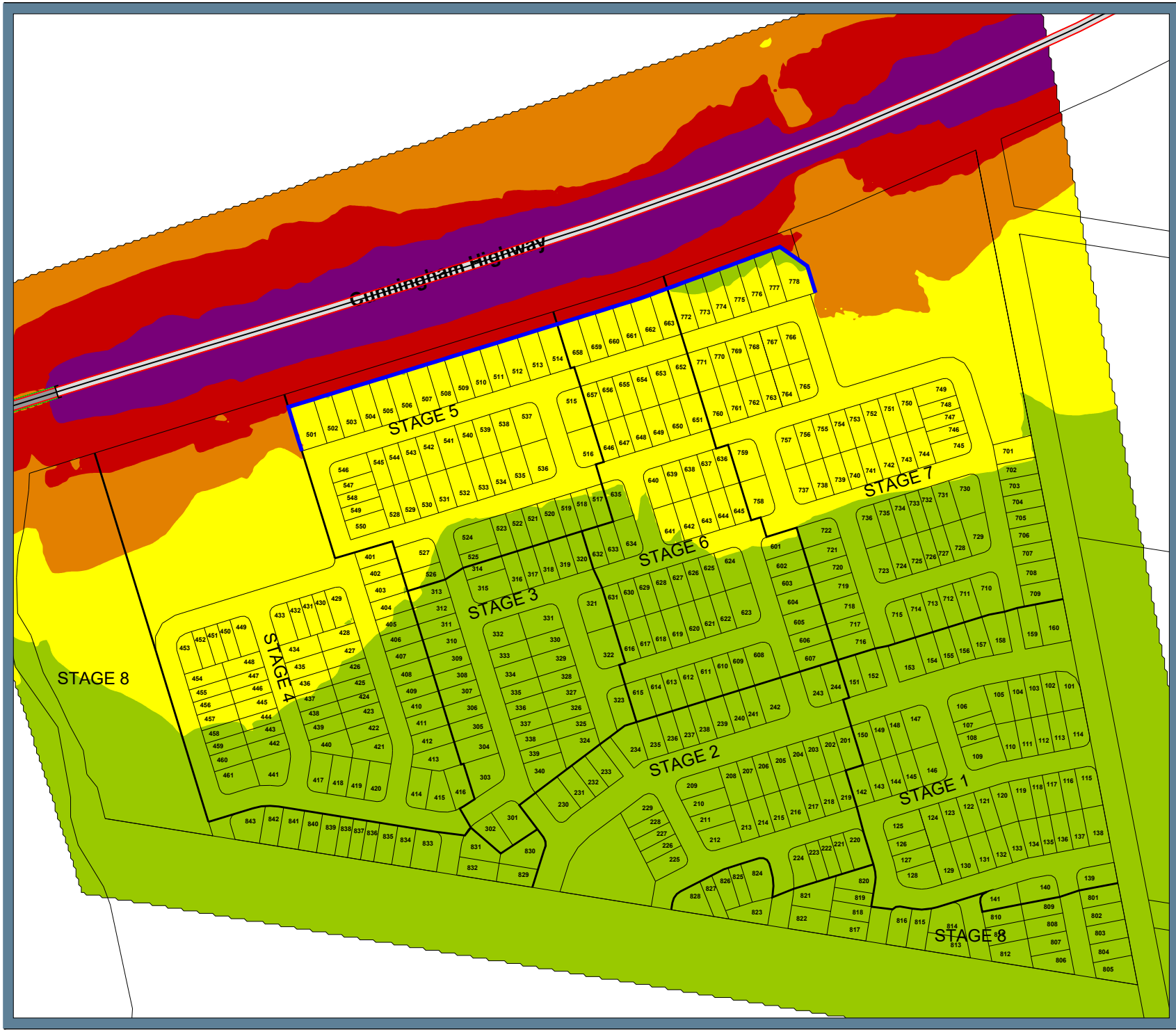
- Road noise emission line
- Road surface
- Noise barrier

SCALE @ A4 1:4000

0 15 30 60 90 120 150 180 m

N

Grid Spacing: 2m
Project Engineer: Sam Fraser
Created: 2/07/2020
Processed with SoundPLAN 8.2



ATP CONSULTING ENGINEERS

ATP190214

160-224 Daleys Road, Ripley

Traffic Noise Modelling
Year 2035

Scenario 1 - Noise Barrier
2.0 to 5.5 m High

Ground Floor Facades
(1.8m AGL)

QDC MP4.4 Noise Category

- Category 0
- Category 1
- Category 2
- Category 3
- Category 4

Legend

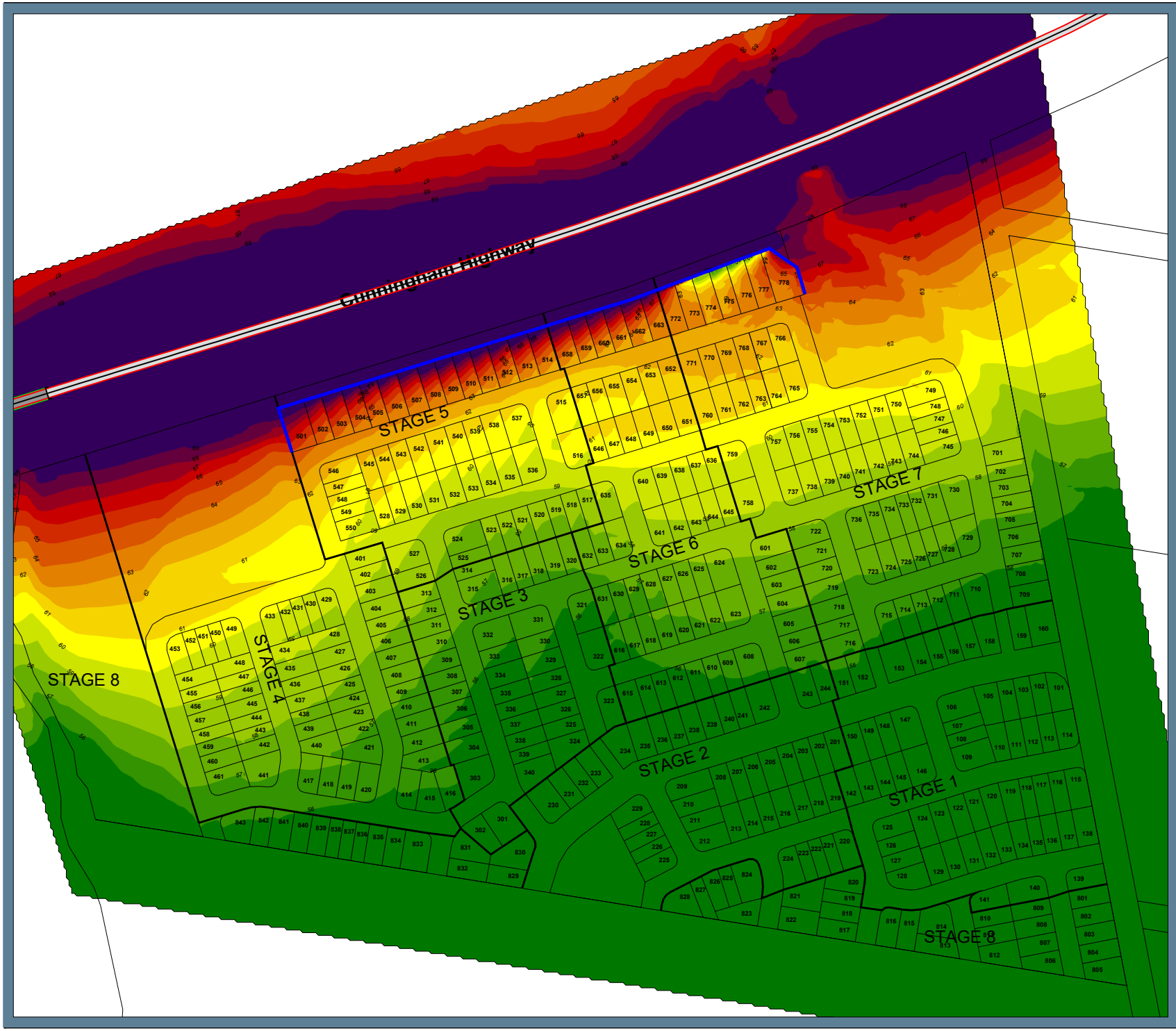
- Road noise emission line
- Road surface
- Noise barrier

SCALE @ A4 1:4000

0 15 30 60 90 120 150 180 m

N

Grid Spacing: 2m
Project Engineer: Sam Fraser
Created: 2/07/2020
Processed with SoundPLAN 8.2



ATP CONSULTING ENGINEERS

ATP190214

160-224 Daleys Road, Ripley

Traffic Noise Modelling
Year 2035

Scenario 1 - Noise Barrier
2.0 to 5.5 m High

First Floor Facades
(4.6m AGL)

Traffic noise level
Facade adjusted
$L_{10(18hr)}$ dB(A)

	<=	56
56 <	<=	57
57 <	<=	58
58 <	<=	59
59 <	<=	60
60 <	<=	61
61 <	<=	62
62 <	<=	63
63 <	<=	64
64 <	<=	65
65 <	<=	66
66 <	<=	67
67 <	<=	68
68 <	<=	69
69 <		

Legend

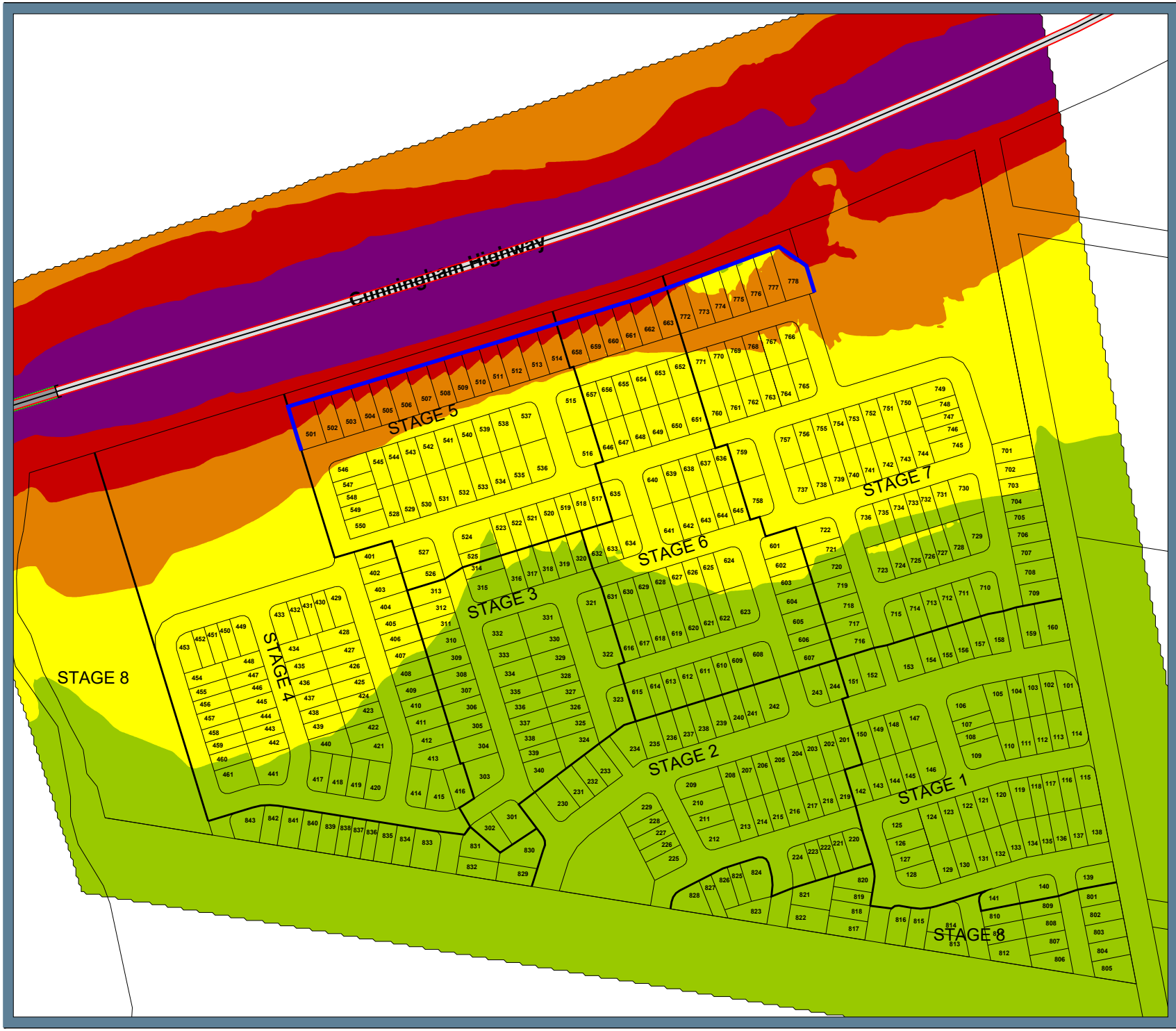
- Road noise emission line
- Road surface
- Noise barrier

SCALE @ A4 1:4000

0 15 30 60 90 120 150 180 m

N

Grid Spacing: 2m
Project Engineer: Sam Fraser
Created: 2/07/2020
Processed with SoundPLAN 8.2



CONSULTING ENGINEERS

ATP190214

160-224 Daleys Road, Ripley

Traffic Noise Modelling
Year 2035

Scenario 1 - Noise Barrier
2.0 to 5.5 m High

First Floor Facades
(4.6m AGL)

QDC MP4.4 Noise Category

- Category 0
- Category 1
- Category 2
- Category 3
- Category 4

Legend

- Road noise emission line
- Road surface
- Noise barrier

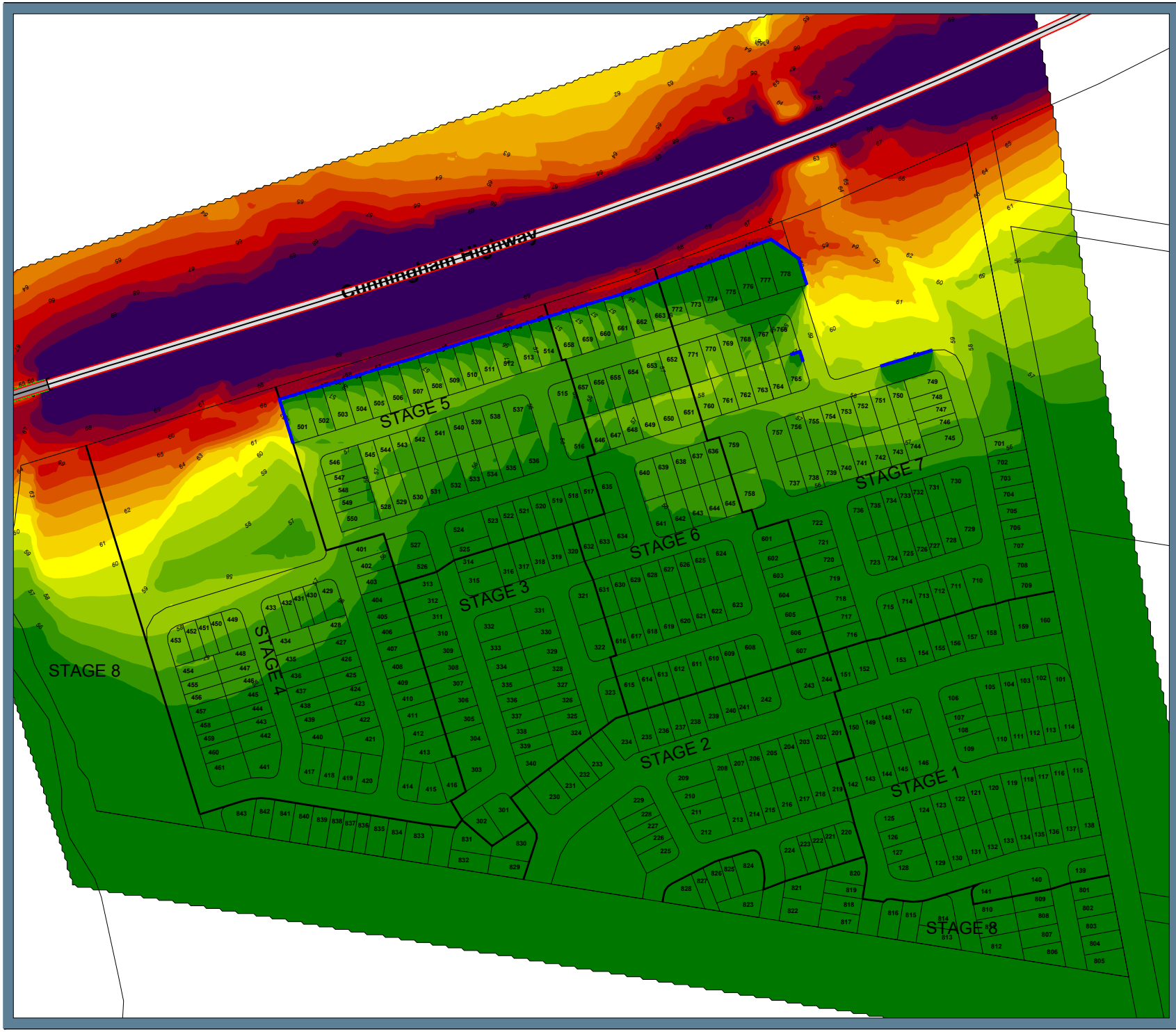
SCALE @ A4 1:4000

0 15 30 60 90 120 150 180 m

N

Grid Spacing: 2m
Project Engineer: Sam Fraser
Created: 2/07/2020
Processed with SoundPLAN 8.2

Appendix I – Traffic Noise Contours 2035 – Scenario 2



ATP CONSULTING ENGINEERS

ATP190214

160-224 Daleys Road, Ripley

Traffic Noise Modelling
Year 2035

Scenario 2 - Noise Barrier
2.0 to 7.0 m High

Ground Floor Private Open Spaces
(1.5m AGL)

Traffic noise level
Free field
$L_{10(18hr)}$ dB(A)

	<=	56
56 <	<=	57
57 <	<=	58
58 <	<=	59
59 <	<=	60
60 <	<=	61
61 <	<=	62
62 <	<=	63
63 <	<=	64
64 <	<=	65
65 <	<=	66
66 <	<=	67
67 <	<=	68
68 <	<=	69
69 <		

Legend

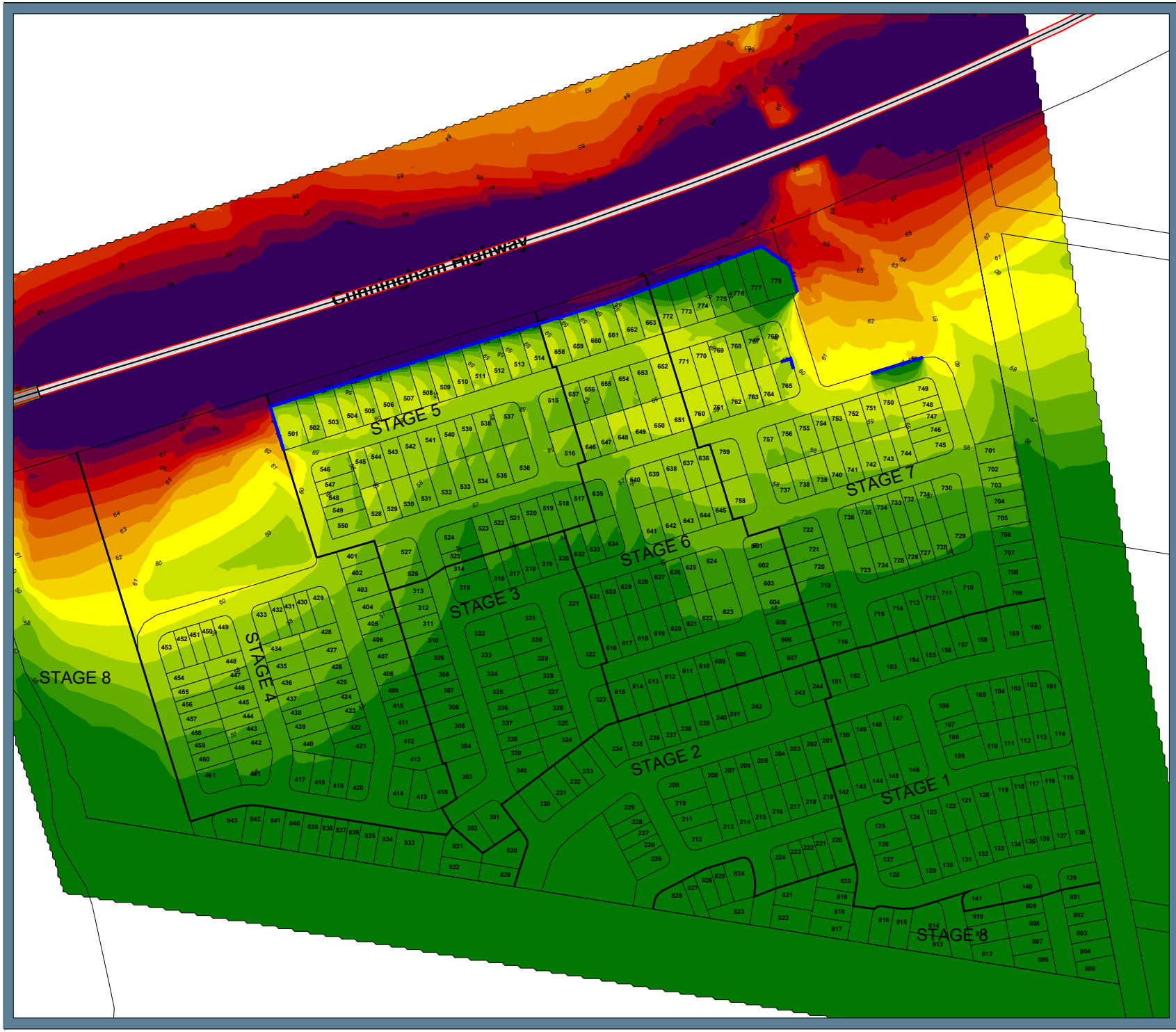
- Road noise emission line
- Road surface
- Noise barrier

SCALE @ A4 1:4000

0 15 30 60 90 120 150 180 m

N

Grid Spacing: 2m
Project Engineer: Sam Fraser
Created: 2/07/2020
Processed with SoundPLAN 8.2



CONSULTING ENGINEERS

ATP190214

160-224 Daleys Road, Ripley

Traffic Noise Modelling
Year 2035

Scenario 2 - Noise Barrier
2.0 to 7.0 m High

Ground Floor Facades
(1.8m AGL)

Traffic noise level
Facade adjusted
$L_{10(18hr)}$ dB(A)

	<=	56
56 <	<=	57
57 <	<=	58
58 <	<=	59
59 <	<=	60
60 <	<=	61
61 <	<=	62
62 <	<=	63
63 <	<=	64
64 <	<=	65
65 <	<=	66
66 <	<=	67
67 <	<=	68
68 <	<=	69
69 <		

Legend

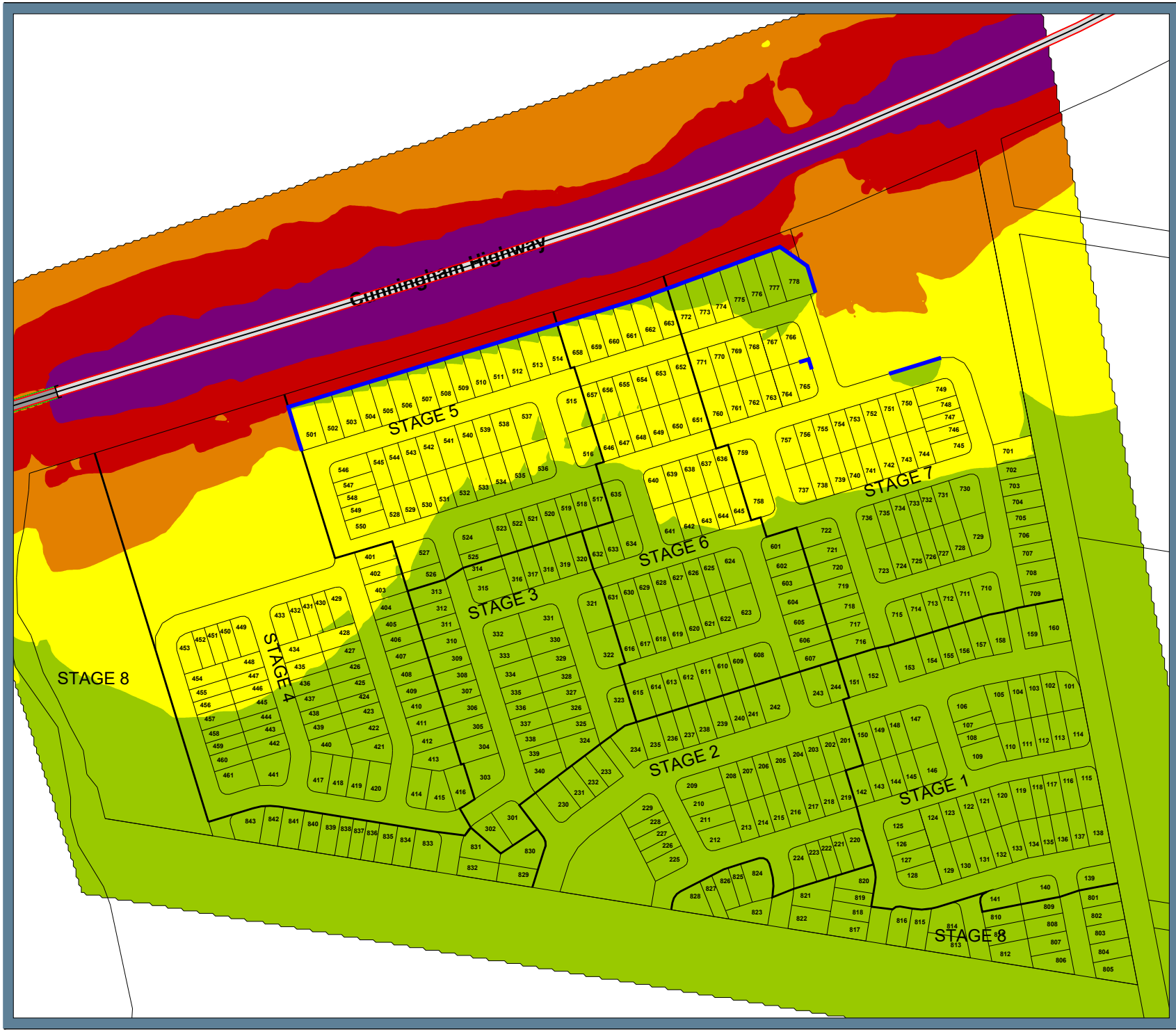
- Road noise emission line
- Road surface
- Noise barrier

SCALE @ A4 1:4000

0 15 30 60 90 120 150 180 m

N

Grid Spacing: 2m
Project Engineer: Sam Fraser
Created: 2/07/2020
Processed with SoundPLAN 8.2



ATP CONSULTING ENGINEERS

ATP190214

160-224 Daleys Road, Ripley

Traffic Noise Modelling
Year 2035

Scenario 2 - Noise Barrier
2.0 to 7.0 m High

Ground Floor Facades
(1.8m AGL)

QDC MP4.4 Noise Category

- Category 0
- Category 1
- Category 2
- Category 3
- Category 4

Legend

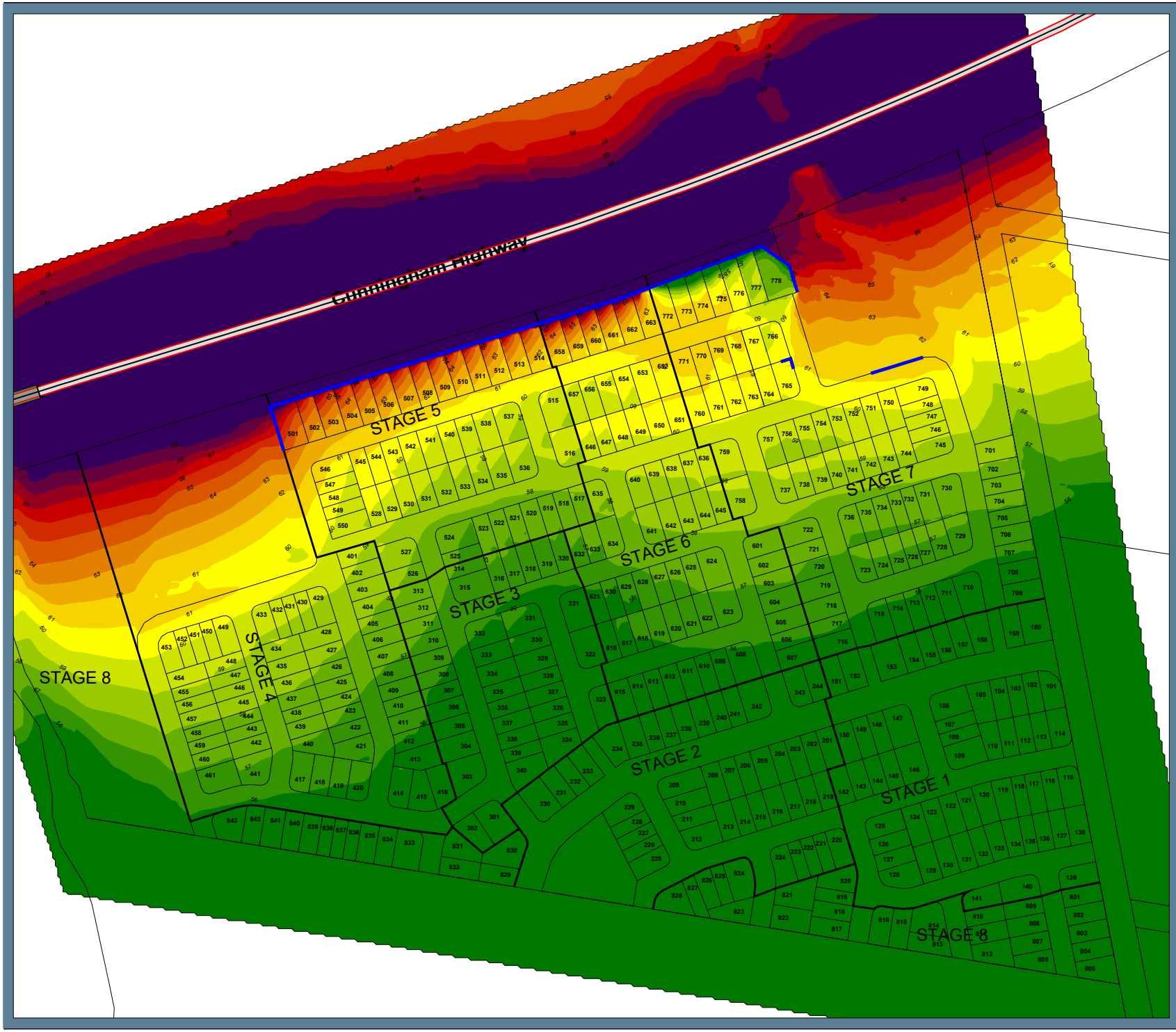
- Road noise emission line
- Road surface
- Noise barrier

SCALE @ A4 1:4000

0 15 30 60 90 120 150 180 m

N

Grid Spacing: 2m
Project Engineer: Sam Fraser
Created: 2/07/2020
Processed with SoundPLAN 8.2



ATP CONSULTING ENGINEERS

ATP190214

160-224 Daleys Road, Ripley

Traffic Noise Modelling
Year 2035

Scenario 2 - Noise Barrier
2.0 to 7.0 m High

First Floor Facades
(4.6m AGL)

Traffic noise level
Facade adjusted
$L_{10(18hr)}$ dB(A)

	<=	56
56 <	<=	57
57 <	<=	58
58 <	<=	59
59 <	<=	60
60 <	<=	61
61 <	<=	62
62 <	<=	63
63 <	<=	64
64 <	<=	65
65 <	<=	66
66 <	<=	67
67 <	<=	68
68 <	<=	69
69 <		

Legend

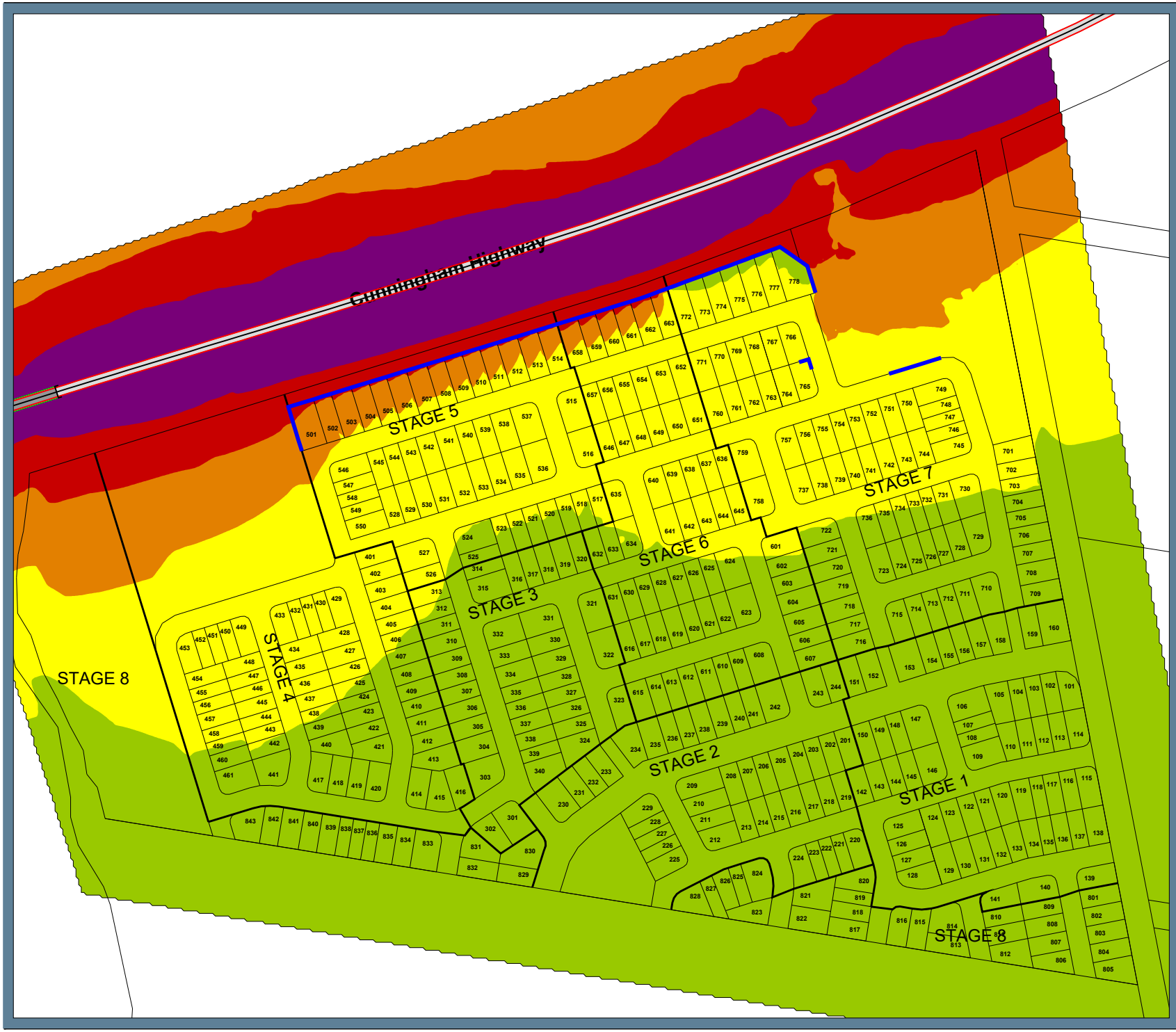
- Road noise emission line
- Road surface
- Noise barrier

SCALE @ A4 1:4000

0 15 30 60 90 120 150 180 m

N

Grid Spacing: 2m
Project Engineer: Sam Fraser
Created: 2/07/2020
Processed with SoundPLAN 8.2



CONSULTING ENGINEERS

ATP190214

160-224 Daleys Road, Ripley

Traffic Noise Modelling
Year 2035

Scenario 2 - Noise Barrier
2.0 to 7.0 m High

First Floor Facades
(4.6m AGL)

QDC MP4.4 Noise Category

- Category 0
- Category 1
- Category 2
- Category 3
- Category 4

Legend

- Road noise emission line
- Road surface
- Noise barrier

SCALE @ A4 1:4000

0 15 30 60 90 120 150 180 m

N

Grid Spacing: 2m
Project Engineer: Sam Fraser
Created: 2/07/2020
Processed with SoundPLAN 8.2

Appendix J – SDAP Supporting Information

SDAP Supporting Information

Environmental emissions in a state-controlled road environment

Purpose

This document provides explanatory guidance to support the state's requirements to mitigate impacts from environmental emissions in proximity to a state-controlled road, as stated in *State Code 1: Development in a state-controlled road environment* of the State Development Assessment Provisions (SDAP).

Noise

The content in this section supports the performance outcomes outlined in:

State code 1: Development in a state-controlled road environment:

- Table 1.2.2: Environmental emissions
  - Noise (**PO23-PO27**)

What is the issue?

Road transport infrastructure and vehicles using state-controlled roads generate noise. Noise can have an adverse impact on the health, wellbeing and quality of life of communities located in the vicinity of a state-controlled road if development is not located, designed and constructed to reduce people's exposure to noise from road transport operations and infrastructure.

What is the objective?

The objective of the provisions is to ensure that development affected by noise from state-controlled roads is designed and constructed in a way that reduces the community's exposure to adverse noise impacts.

How to achieve the performance outcome

Performance outcomes 23-27

Applicants proposing new sensitive uses are responsible for ensuring significant noise impacts on the proposed development are mitigated to appropriate levels. Sensitive uses are accommodation activities, educational establishments, child care centres and hospitals.

To demonstrate compliance with the performance outcomes, specific information about the proposed development and surrounding acoustical environment should be provided with a development application in order for the State Assessment and Referral Agency (SARA) to determine whether the development can mitigate noise to acceptable levels for residents, visitors, workers and patrons.

The type of information that needs to be provided with a development application depends on the extent to which the proposed development is likely to be affected by noise generated by road transport operations and infrastructure. The state has sought to minimise the costs of demonstrating compliance with noise criteria by only requiring detailed noise assessment reports to be prepared when there is a medium to high probability of the development being impacted by noise from road transport operations and infrastructure.

Table 1 identifies the likelihood of a development being adversely impacted by noise (based on the type and location of the proposed development) and the corresponding level of information, which must be provided with a development application.

Table 1 Noise information required as part of a development application

Probability of Impact	Development Proposed	Information Required
Low	Development not involving a sensitive use.	Standard information
	Development involving a sensitive use located on land adjacent to a state-controlled road but not in a Transport Noise Corridor declared under the *Building Act 1975*.	
Medium	Development involving a sensitive use that is: • located on land adjacent to a state-controlled road and in a Transport Noise Corridor declared under the *Building Act 1975*, and • the level of impact does not exceed the relevant criteria for the development listed in the Department of Main Roads' (TMR) *Environmental Emissions Policy*.	A report outlining the noise assessment findings and conclusions. (Noise Assessment Report - Part A).
High	Development involving a sensitive use that is: • located on land adjacent to a state-controlled road and in a Transport Noise Corridor declared under the *Building Act 1975*, and • the level of impact will exceed the relevant noise criteria for the development listed in the Environmental Emissions Policy.	A report detailing the noise attenuation measures required as per the results of Part A. (Noise Assessment Report - Part A and Part B).

For **low impact** development the application should include the following supporting information:

- the type of development proposed (i.e. whether the development is a sensitive use)
- the intensity of development proposed (e.g. maximum floor area, maximum building height)
- the location of development on the subject site
- building layouts showing sensitive areas and uses and their distance from a state-controlled road
- contours for the subject site and transport corridor showing any physical embankments/buildings/existing noise barriers located between the state-controlled road and the proposed buildings
- the volume of traffic using the state-controlled road daily.

For **medium impact** development an application should be supported by a Noise Assessment Report – Part A, prepared by an appropriately qualified acoustic consultant and certified by a Registered Professional Engineer of Queensland (RPEQ), and which demonstrates the relevant noise criteria will not be exceeded and therefore no attenuation measures are required. Note, where the Noise Assessment Report – Part A demonstrates the relevant noise criteria will be exceeded, a Noise Assessment Report Part B will need to be prepared. Guidance on preparing a noise assessment report is provided in Appendix 1.

For **high impact** development an application should be supported by a Noise Assessment Report Part A and Part B, prepared by an appropriately qualified acoustic consultant and certified by a RPEQ, and which demonstrates that noise attenuation treatments can be included in the development to ensure that noise levels are reduced to an acceptable level. Guidance on preparing a noise assessment report is provided in Appendix 1.

Application of noise criteria in development assessment

The performance outcomes in SDAP include three types of criteria for noise generated by road transport operations and infrastructure:

a) external (facade corrected) noise criteria for buildings

b) external (free field) noise criteria for outdoor spaces for passive recreation, outdoor education areas and outdoor play areas, and

c) internal noise criteria.

The impact of noise originating from state-controlled roads external to buildings is a prime concern. These areas are the building facades, outdoor areas for passive recreation, outdoor education areas and outdoor play areas. The external criteria are therefore referred to as the 'primary noise criteria', while the internal criteria are referred to as the 'secondary noise criteria'.

Where a new sensitive development is proposed on land in proximity to a state-controlled road and the application is referred to the state for assessment, the state will seek to ensure that the primary noise criteria are achieved in the first instance.

In some circumstances, where the noise criteria for building facades (facade corrected) can be achieved, the criteria for outdoor areas for passive recreation, outdoor education areas and outdoor play areas may be achieved simultaneously. This is because the building facade criteria is always more stringent than the criteria for outdoor spaces for passive recreation, outdoor education areas and outdoor play areas. The logic follows that if the more stringent criteria can be achieved, the less stringent criteria is likely to be achieved also.

The state will only apply noise criteria for outdoor space for passive recreation, outdoor education areas and passive recreation areas where these types of open space are included in a development proposal.

The primary noise criteria in SDAP can be achieved using noise barriers, earth mounds, separation distances/setbacks, topography and site design (building location and orientation) (see section 7.2 of the *Environmental Emissions Policy* for more information on these strategies).

However, near a state-controlled road, when a new sensitive development is proposed and a noise barrier is technically feasible and reasonable, it will always be the Department of Transport and Main Roads (TMR) preferred method for achieving the primary noise criteria. This means that the state will require the proponent of a development near a state-controlled road to provide a noise barrier as a condition of development approval where it is both technically feasible and reasonable.

Where an applicant can demonstrate that the primary noise criteria can be achieved with recommended noise attenuation treatments, compliance with the secondary noise criteria in SDAP will not be assessed by the State.

Where an application cannot demonstrate compliance with the primary noise criteria, the state will take into consideration whether the secondary criteria can be achieved with recommended noise attenuation treatments. In some circumstances the secondary criteria will not be achievable without the use of noise barriers, earth mounds and/or separation distances/setbacks to reduce the impact of noise emissions at the building facade.

An application which demonstrates compliance with the secondary noise criteria must still demonstrate that significant adverse impacts on the development's outdoor space for passive recreation, outdoor education areas and outdoor play areas will be attenuated to the maximum extent practicable and explain why further attenuation measures to achieve the primary criteria were not considered to be reasonable, feasible or cost effective to the satisfaction of the state.

Interaction with the Queensland Development Code for Building in a Transport Noise Corridor

The *Queensland Development Code Mandatory Part 4.4 Building in a Transport Noise Corridor* (QDC MP4.4) addresses internal noise impacts on residential development (i.e. habitable rooms of Class 1, 2, 3, and 4 buildings) within a Transport Noise Corridor.

The Department of Infrastructure, Local Government and Planning's State Planning Policy Interactive Mapping System can be used to determine if a property is located in a designated Transport Noise Corridor.

Where a Class 1, 2, 3 or 4 building is proposed in a Transport Noise Corridor, all building work must be carried out in accordance with the requirements of QDC MP4.4.

Compliance with QDC MP4.4 does not address the state's requirement to comply with the primary criteria listed in Table 3 of the Environmental Emissions Policy. Where a development involving a Class 1, 2, 3 or 4 building is proposed in a Transport Noise Corridor and the application is referred to the state for assessment, the state will seek to ensure that the primary noise criteria listed in Table 3 of the Environmental Emissions Policy are achieved.

In seeking this objective, the state may require the proponent of a development near a state-controlled road to provide a noise barrier as a condition of development approval where it is both technically feasible and reasonable. In addition to reducing noise impacts in private open space, outdoor education areas and passive recreation areas, provision of a noise barrier will likely reduce the noise category that applies to the development under QDC MP4.4. For example, a noise barrier may reduce the noise category from a category 4 to a category 1 which means cheaper building materials can be used to meet the requirements of QDC MP4.4.

The state will not assess compliance with the secondary noise criteria for a Class 1, 2, 3 or 4 building in a Transport Noise Corridor under any circumstances, as the building must comply with QDC MP4.4.

Vibration

The content in this section supports the performance outcome outlined in:

State code 1: Development in a state-controlled road environment:

- Table 1.2.2: Environmental emissions
  - Vibration (**PO28**)

What is the issue?

The operation of state-controlled roads has the potential to generate vibration which can have an adverse impact on the treatment of patients in hospitals. In particular, patient care areas in hospitals must be located, designed and constructed to reduce or mitigate exposure to vibration from state-controlled roads and road transport infrastructure.

What is the objective?

The objective of the provisions is to ensure that patient care areas in hospitals are developed in a way that reduces these area's exposure to adverse vibration impacts from state-controlled roads.

How to achieve the performance outcome

Performance outcome 28

An acceptable outcome has been provided for this performance outcome. An application can demonstrate compliance with the acceptable outcome by providing a RPEQ certified vibration assessment report which demonstrates that the vibration dose values in patient care areas of hospitals does not exceed the levels specified in the acceptable outcomes.

If an application does not comply with the acceptable outcome, details of the alternative means of minimising vibration impacts from state-controlled roads in patient care areas should be provided.

Air and light

The content in this section supports the performance outcomes outlined in:

State code 1: Development in a state-controlled road environment

- Table 1.2.2: Environmental emissions
  - Air and light (**PO29-PO31**)

What is the issue?

Air and light emissions from state-controlled roads have the potential to have an adverse impact on the health, wellbeing and quality of life of nearby communities. In particular, development should be located, designed and constructed to reduce or mitigate the community's exposure to air and light emissions emanating from state-controlled roads and road transport infrastructure.

What is the objective?

The objective of the provisions is to ensure that sensitive developments affected by air and light from state-controlled roads are developed in a way that reduces the community's exposure to adverse air quality and light impacts.

How to achieve the performance outcomes

Performance outcomes 29-30

Acceptable outcomes have been provided for these performance outcomes. An application can demonstrate it has complied with the acceptable outcomes by providing the following information as part of the application:

- for accommodation activities:
  - a site plan which clearly identifies the outdoor space for passive recreation for each dwelling and any shielding buildings and structures. It should be noted that not all outdoor spaces for passive recreation need to be shielded from a state-controlled road. If the application demonstrates that each dwelling has access to an outdoor space for passive recreation which is shielded from the state-controlled road which can include access to private, communal or public open space then the application will comply with the acceptable outcome.
- for education establishments and child care centres:
  - a site plan which clearly identifies the location of all outdoor education area and/or outdoor play areas and any shielding buildings and structures.
- for accommodation activities, education establishments and child care centres:
  - a structural design or information which demonstrates that a fence or other structure provided to shield the outdoor space is solid and gap-free.

Performance outcome 31

Acceptable outcomes have been provided for this performance outcome. An application can demonstrate it has complied with the acceptable outcomes by providing the following information as part of the application:

- building layout plans and designs demonstrating that the number of windows or transparent/translucent panels facing a state-controlled road have been minimised, and/or
- that windows for habitable rooms do not face a state-controlled road, and/or

- windows facing a state-controlled road include treatments, such as blinds or curtains that enable light from a state-controlled road to be blocked during the night time hours.

Contact details

Please contact your local Transport and Main Roads office for more information. The contact details for your local Transport and Main Roads office are listed at www.tmr.qld.gov.au/About-us/Contact-us/In-person/Roads-offices.

Appendix 1: Noise Assessment

Where development includes a sensitive land use and is likely to be impacted by noise from a state-controlled road, an applicant should provide a noise assessment report demonstrating that:

- relevant noise criteria will not be exceeded and therefore no attenuation measures are required, or
- noise attenuation treatments can be included in a development to ensure that noise levels are reduced to an acceptable level.

A noise assessment report seeks to ensure that any sensitive development achieves acceptable noise levels for residents and visitors by ensuring development mitigates the adverse impacts from noise generated by a state-controlled road.

A noise assessment report should adequately document and present all the data inputs, assumptions and assessment results, and noise attenuation strategies/options considered as part of the assessment. In order to limit the expense of preparing reports, a noise assessment report has been split into two parts:

- **Noise Assessment Report – Part A** is to present the noise assessment findings. The findings and conclusion of Part A will determine whether noise attenuation measures will be required for the development
- **Noise Assessment Report – Part B** is to detail the noise attenuation measures required as per the results of Part A and will only need to be provided when measured noise levels exceed the relevant noise criteria for the development in *State code 1: Development in a State-controlled road environment*.

Where it is obvious that a development will require noise attenuation measures, it is suggested a full noise assessment report (i.e. Part A and Part B) be prepared at the same time. Matters that the noise assessment report should consider are outlined as follows:

Noise Assessment Report Part A – Review of noise impacts

Development details

The following information is to be provided:

- description of the subject site including real property description/s and a locality plan
- architectural drawings illustrating the proposed development including building and open space layout plans, noise sensitive areas and uses, the setback distances for building facades (noise sensitive locations), proposed lot numbers (if applicable)
- drawings showing site contours and earthworks (cut and fill) information to clarify the existing topography and proposed finished levels
- confirmation of the extent and height of any existing noise barriers and their location in relation to the proposed development.

Noise measurement

The following information is to be provided:

- a summary of the noise measurement results including a layout plan depicting the site locations and positions of the noise measurements conducted for the assessment, the time of day and weekday the measurements took place
- measurement data sheets and site attendance records/site notes taken by the consultant measuring noise at each measurement site:
    - all results of measurements, calculations and predictions are to be presented in a tabular format

- tabulation of calculated noise levels for all noise sensitive receptors (without noise attenuation treatments)
- noise contours or plans showing specific areas where noise criteria are exceeded:
    - the noise level exposures can be produced as noise level contours or presented in a format depicting areas where the specified noise criteria are exceeded or where the noise levels of noise sensitive receptors fall within a certain noise level range. Which format to adopt will depend on the number of factors/options/criteria considered in the noise assessment and the type of development proposal being assessed
    - when presenting noise contours, the figure should make clear whether the noise levels are facade corrected or free field based on a grid assessment. This assessment will determine the relative accuracy of the contours compared with the facade calculations and the receptor height assumed. The maximum grid spacing shall be a 10 metre by 10 metre square depending on the accuracy required. Reference to grid spacing assessment is to be noted in the title block for each figure.

Acoustic assessment

For acoustic assessment, the following information should be provided:

- description of the investigation process in determining the noise exceedance:
    - careful interrogation of noise level contours needs to be undertaken in conjunction with the tabulated noise levels in order to clearly identify whether any of the criteria levels are exceeded
- documentation of all noise model input data and assessment criteria adopted. The source and date of collection of all data used should be clearly documented. Data more than 12 months old cannot be used in the acoustical assessment
- all acoustical assessments undertaken as part of the noise assessment report must take the following into account:
    - for reconfiguration proposals the assumed location of residential building facades is to be the minimum setback distance required by the relevant local government planning scheme for detached and duplex housing. For other noise sensitive developments, the assumed facade location is to be as per the relevant planning scheme. In these situations, a ‘facade correction’ of 2.5dB(A) should be added to the free field measurement of 1 metre from the assumed facade to determine the facade corrected noise level
    - the receptor height used in the acoustical assessment should be 1.5 metres above the finished floor level/s. In the case of multi-level buildings, all floor levels are to be assessed. For residential reconfigurations, where the finished floor level is not known, the receptor heights should be assumed at 1.8 metres and 4.6 metres above an assumed building pad level, for the ground and first floors (first and second storey) respectively. It is essential that both low and high-set residential buildings be considered in the assessment.

Recommendation

The noise assessment report Part A must clearly articulate whether noise generated from the transport corridor exceeds the relevant noise criteria as outlined in SDAP. If levels are exceeded, the report must recommend that attenuation measures are to be provided by the development.

Certification

The noise assessment report Part A is to be prepared by a qualified acoustic consultant and certified by a RPEQ.

Attachments

Attachments to include where applicable are:

- all field measurement results
- all input and output data and analysis including modelling data files in electronic format
- supplementary reports and references
- any other explanatory and general notes.

Noise Assessment Report Part B – Noise attenuation measures

If the noise assessment report Part A recommends that noise attenuation measures are necessary, these measures should be presented as per the requirements of Part B.

Attenuation

Part B should provide full details of the preferred noise attenuation strategies and clearly demonstrate that the proposed measures will reduce noise to acceptable levels including:

- description of the investigation process in determining the preferred noise attenuation strategies/options
- description and layout plans of all existing and recommended noise attenuation treatment/options, including the length, height and location of proposed noise barriers
- layout plans showing the length, height and location of all existing and recommended noise attenuation treatment options. These should include:
    - the maximum height above proposed finished ground levels in Reduced Levels (RLs) on Australian Height Datum (AHD) of any proposed noise attenuation structures, which are required to meet the TMR's noise criteria
    - the maximum height above proposed finished ground levels in RLs on AHD of any proposed noise attenuation structures, which are required to meet the TMR's noise criteria for the ground level (first storey) of any noise sensitive receiver (if different from above)
    - the maximum height above proposed finished ground levels in RLs on AHD of any proposed noise attenuation structures which are required to meet the TMR's noise criteria for the first floor level (second storey) of any noise sensitive receiver
    - if the proposed noise attenuating structure(s) include/s an earth mound/s, the footprint extent of any earth mound/s
    - the layout of the proposed development.
- supporting analysis, calculations and model outputs substantiating the ability of the proposed treatments to attenuate noise to acceptable levels.

Recommendations and conclusions

The noise assessment report Part B must clearly demonstrate and subsequently recommend that the development provide noise attenuation measures to ensure noise generated from the transport corridor meets acceptable noise criteria as outlined in SDAP.

Certification

The noise assessment report Part B is to be prepared by a qualified acoustic consultant and certified by a RPEQ.

Attachments

Attachments to include where applicable:

- all input and output data and analysis including modelling data files in electronic format
- supplementary reports and references
- any other explanatory and general notes.