Vipac Engineers and Scientists Limited
42/34 Ralph Street, Alexandria, NSW, 2015 Australia
Private Bag 16, Port Melbourne, VIC 3207, Australia
t. +61 2 9422 4222 | **e.** sydney@vipac.com.au
w. www.vipac.com.au | A.B.N. 33 005 453 627 | A.C.N. 005 453 627

McCloy Group

Singleton Bypass - Traffic Noise Assessment

Maison Dieu Road, Singleton - Residential Subdivision

20E-21-0464-TRP-26833-1-draft

19 August 2024

Job Title:	Singleton Bypass – Traffic Noise Assessment
Report Title:	Maison Dieu Road, Singleton – Residential Subdivision
Document Reference:	20E-21-0464-TRP-26833-1

Prepared For:	**Prepared By:**
	Vipac Engineers and Scientists Limited 42/34 Ralph Street, Alexandria, NSW, 2015 Australia
Contact: Sam Rowe **Tel:** 02 4945 7500	**Tel:** +61 2 9422 4222

Author:	Cikai Lin 19 August 2024	Project Engineer
Reviewer:	Vasos Alexandrou 19 Aug 2024	Director
Issued By:	Vasos Alexandrou	

Revision History:

Rev. #	*Comments / Details of change(s) made*	*Date*	*Revised by:*
Rev. 00	Original issue	21/12/21	
Rev. 01	Revised Traffic Noise Assessment	19/8/24	CL

Table of Contents

1 Introduction

Vipac Engineers & Scientist Ltd. (Vipac) was commissioned by McCloy Group to undertake a review of a road traffic noise assessment for a proposed subdivision located at Maison Dieu Road, Singleton, NSW. The purpose of this assessment is to verify a traffic noise assessment conducted by AECOM for Transport for NSW, report *'Noise and Vibration Technical Report – Singleton Bypass – Concept Design and Environmental Assessment, job #60558931, dated 14 November 2019'*, (herein known as '**AECOM Noise Report'**) in regard to the Singleton Bypass which will be constructed through the DA approved residential subdivision.

Furthermore, this report provides information for the minimum building construction requirements for the residential dwellings within the subdivision, such that they adhere to relevant acoustic requirements once the Singleton Bypass is constructed. This assessment will focus on:

- A review of the AECOM Noise Report and traffic volumes for the purpose of a detailed 3D traffic noise model for the proposed residential subdivision site.
- The establishment and recommendation of various acoustic criteria for the site. This includes maintaining satisfactory noise amenity for future occupants of the development.
- Road Traffic Noise: Assessing existing and future road traffic noise from Singleton Bypass, New England Highway and Maison Dieu Road, adjacent to the proposed subdivision.

The assessment has been carried out in accordance with the Singleton Shire Council (DCP), relevant Australian Standards, State Environmental Planning Policy Infrastructure 2007 and relevant publications of the NSW Office of Environment and Heritage (OEH) as listed in Appendix A.

Acoustic terminologies can also be found in Appendix B.

2 Site Location

The site subject of this report includes land identified as 3 Maison Dieu Road, Gowrie (Singleton). The real property description is Lot 1221 DP 599260 and Lot 203 DP1155403. These two lots are commonly identified as The Fairways urban release area. The land has a land use history of a golf course. As will be identified below the Singleton bypass affects Lot 1221 the main lot of the estate. Lot 203 is a smaller lot in the south western corner.
It is also noted that there is a proposed urban release area adjoining The Fairways to the south which is referred to in the Singleton Development Control Plan (DCP) as Settlers Rise.

- Figure 2-1 outlines the LEP Zoning Map.
- Figure 2-2 outlines the DCP Staging Plan.
- Figure 2-3 outlines the subdivision plans dated 17.06.24.
- Figure 2-4 outlines - Computer Render of the proposed upgrade to the intersection of Maison Dieu Road and New England Highway
- The ground terrain contours provided by McCloy Group have been reproduced in Appendix E for reference. These terrain heights were used in the future traffic noise model (year 2036).

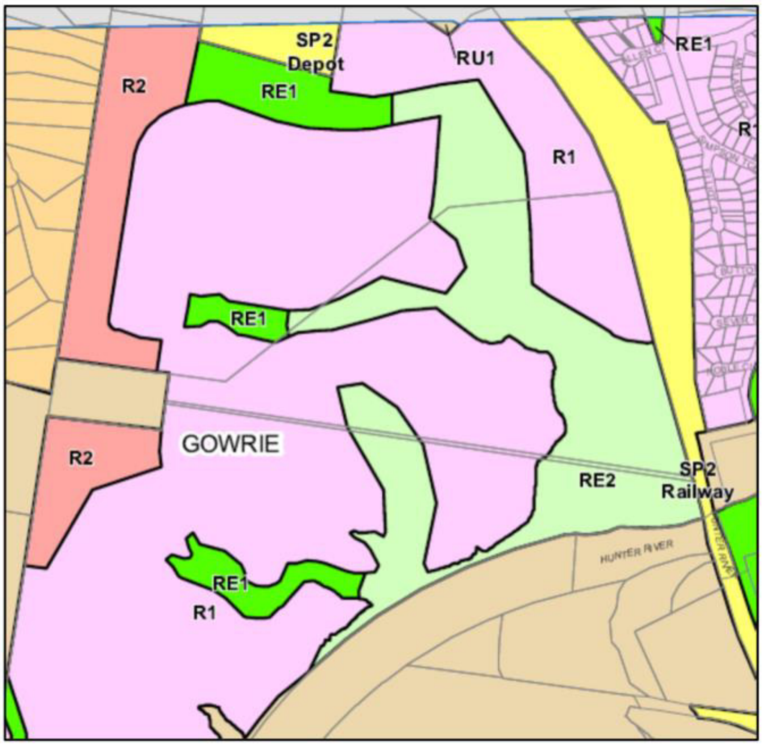


Figure 2-1: LEP Zoning Map

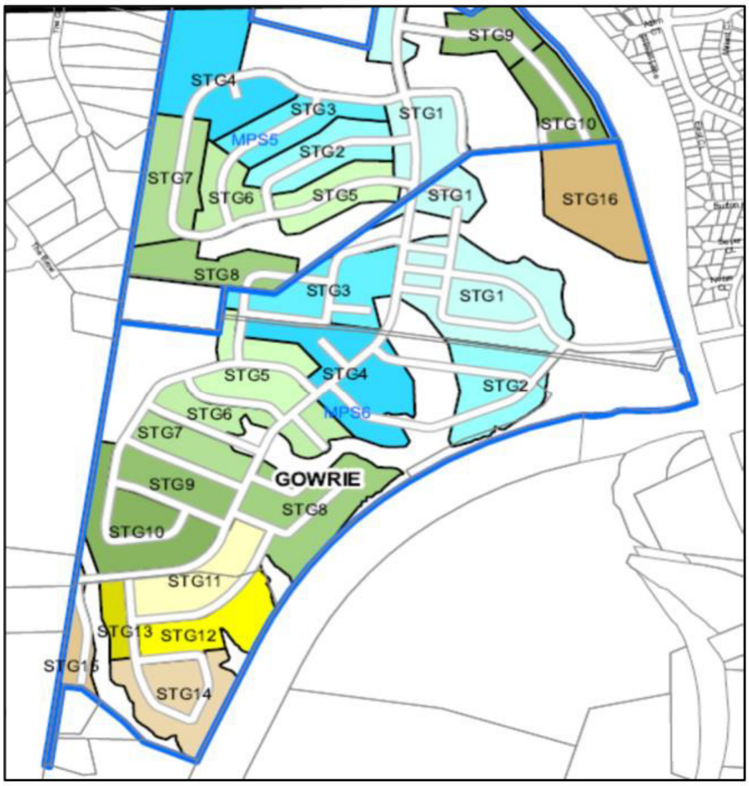


Figure 2-2: Indicative Staging Plan as Identified in Singleton DCP

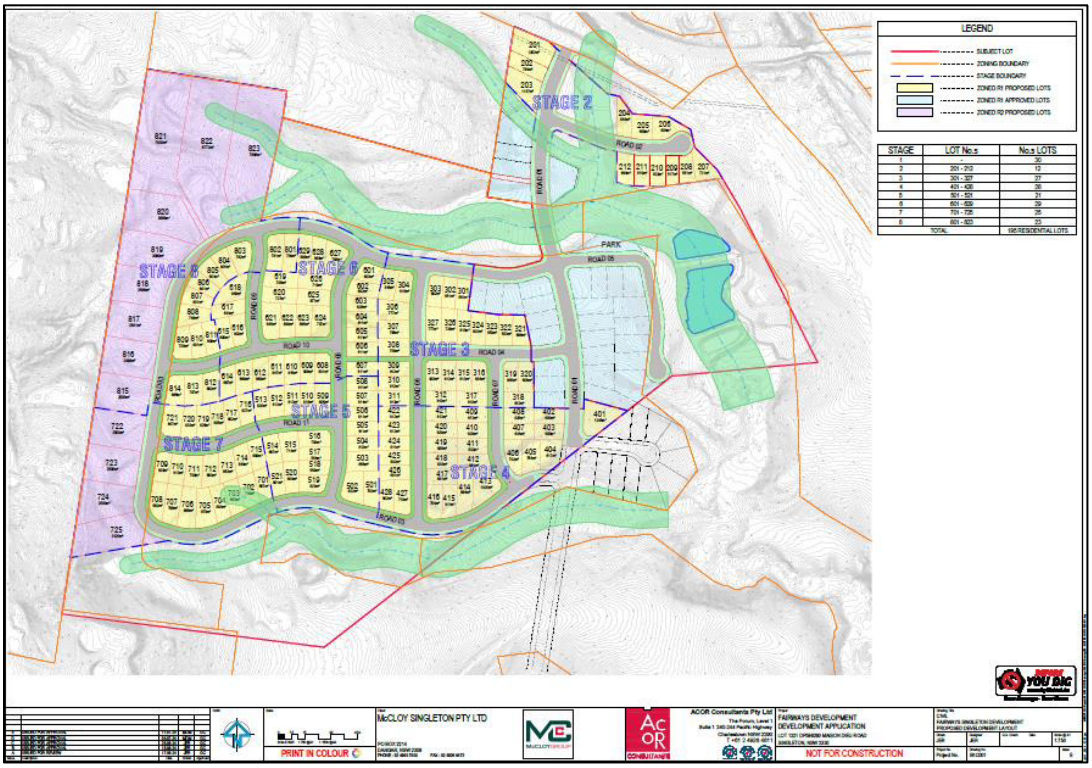


Figure 2-3: Subdivision Plan

Figure 2-4: Computer Render - Proposed upgrade to the intersection of Maison Dieu Road and New England Highway

3 Noise Monitoring Program – AECOM 2019

Noise monitoring was conducted by AECOM as summarised in the AECOM Noise Report, dated 14th November 2019. The noise monitoring results from this assessment are reproduced below for reference and for the purpose of noise model calibration and verification.

3.1 Measurement Results

Noise Logger Report

L4 - 3 Maison Dieu Road, Gowrie

AECOM

Item	Information
Logger Type	Rion NL52
Serial number	553966
Address	L4 - 3 Maison Dieu Road, Gowrie
Location	In Field
Facade / Free Field	Free Field
Environment	Freight train pass-by 71dB(A), carriages 54dB(A). Distant road traffic noise from New England Highway can be heard between coal trains which are both controlling background levels. Light winds. Bird noise also audible from nearby trees. Dog barking barely audible. Whipper snipper audible.

Measured noise levels

Logging Date	L_{Aeq} Day	Eve	Night	ABL Day	Eve	Night	$L_{Aeq,15hr}$	$L_{Aeq,9hr}$
Thu Mar 8 2018	56	53	55	-	-	-	54	55
Fri Mar 9 2018	54	52	54	-	-	33	54	54
Sat Mar 10 2018	52	54	53	-	-	32	53	53
Sun Mar 11 2018	51	54	55	34	39	27	52	55
Mon Mar 12 2018	55	53	56	36	38	34	55	56
Tue Mar 13 2018	53	53	54	-	-	32	53	54
Wed Mar 14 2018	53	55	55	38	39	32	54	55
Thu Mar 15 2018	54	-	56	-	-	-	54	56
Summary	**54**	**53**	**55**	**36**	**39**	**32**	**54**	**55**

Note: Results denoted with '-' do not contain enough valid data for a value to be calculated. The data has been excluded either manually or automatically as a result of adverse weather conditions.

Logger Location	Logger Deployment Photo
	

Measurement results obtained from the noise loggers have been analysed in accordance with the procedures set out in the NSW Industrial Noise Policy (INP) for determining existing background noise levels of the surrounding area. These background noise levels will form the fundamental basis for the establishment of associated operational and construction noise criteria.

A copy of the noise logging graphs from this location have been reproduced in Appendix C for reference.

4 Noise Criteria

4.1 Singleton – Development Control Plan

According to the Singleton Development Control Plan, new site developments must ensure appropriate noise and vibration attenuation measures are incorporated into residential developments, particularly buildings near rail and/or busy road traffic. The proposed buildings must comply with the Environment Protection Authority criteria and the current relevant Australian Standards for noise and vibration and quality assurance.

4.1.1 Infrastructure SEPP

The Infrastructure SEPP's publication 'Development near Rail Corridors and Busy Roads – Interim guidelines' will be used to assess the proposed development. Table 4-1 outlines the indoor noise criteria for residential dwellings near busy roads and rail lines.

Table 4-1 Indoor Noise Criteria

Type of occupancy	Noise Level dB(A)	Applicable time period
Sleeping areas (bedroom)	35	Night Time (10pm to 7am)
Other habitable rooms (excludes garages, bathrooms and hallways)	40	At any time

5 Road Traffic Noise Assessment

This section provides an outline of the methodology undertaken to assess the road traffic noise from the proposed Singleton Bypass at Maison Dieu Road (adjacent to the subject site) and its impact on the proposed subdivision lots. This section includes all assumptions and calibration details in relation to the road traffic noise model, an outline of the considered noise prediction scenarios and the road traffic noise impact results for 2022 and 2032.

The road traffic noise impact assessment was undertaken utilising SoundPLAN computer noise modelling software, and the calculations were in accordance with the 'Calculation of Road Traffic Noise' (CoRTN).

5.1 Traffic Data

The traffic noise assessment presented in this report, takes into account the average daily traffic (ADT) and heavy vehicle percentage estimation as outlined within AECOM Noise Report, dated 14 November 2019, Appendix D. Table 5-1 provides a summary of the relevant road traffic information for this assessment.

Table 5-1: Traffic Volumes (ADT)

Year & Scenario	Location	Direction	Day: 0700 – 2200hrs			Night – 2200 - 0700hrs			ADT
			Traffic Volume	Vehicle Speed km/h	Heavy Vehicle %	Traffic Volume	Vehicle Speed km/h	Heavy Vehicle %	
Opening Year 2026	Maison Dieu Road West	Northbound	2280	60	8%	148	60	8%	4856
		Southbound	2280	60	8%	148	60	8%	
Design Year 2036	Maison Dieu Road West	Northbound	2402	60	9%	151	60	9%	5106
		Southbound	2402	60	9%	151	60	9%	
Opening Year 2026	N.E. Hwy Bypass	Northbound	4643	60	10%	796	60	13%	10,878
		Southbound	4643	60	10%	796	60	13%	
Design Year 2036	N.E. Hwy Bypass	Northbound	5159	60	10%	883	60	13%	6,042
		Southbound	5159	60	10%	883	60	13%	

The ADT reflects the overall road traffic and is not divided by the north and southbound traffic or the day and night-time traffic flow.

Table 5-2 presents a copy of the assumptions used within the road traffic noise model for the year opening year 2026 and design year 2036 as per AECOM noise assessment. The same assumptions were used in the model for this report for the subdivision.

Table 5-2: Parameters & assumptions used in the Calculation of Traffic Noise

Parameter	Comment
Traffic volumes and mix	The number of vehicles using the road and the percentage of heavy vehicles. A higher percentage of heavy vehicles would increase the road traffic noise levels. The mix of heavy vehicles ie. double or triple axles would also affect the road traffic noise levels. Existing traffic volumes were obtained from traffic count data recorded at various locations along the proposed alignment. Predicted traffic volumes for the year of opening (2026) and for the design year (2036) for the 'do minimum' and design scenarios were sourced from traffic modelling undertaken by AECOM. In accordance with the Austroads vehicle classification, light vehicles are considered to be Class 1 and 2 and Heavy vehicles are Class 3 through to 12.
Traffic speeds	An increase in speed generally causes an increase in road traffic noise. Traffic speeds have been based on posted road speeds for existing roads and proposed speeds for the new ramps (60 km/h) and main carriageways (100 km/h during the daytime and 110 km/h during the night-time).
Traffic noise source heights	Road traffic noise is generally considered to generated at three main source heights: • Light vehicles: 0.5 metres. • Truck tyres and engines: 1.5 metres. • Truck exhausts: 3.6 metres. Corrections were made to the road traffic noise model to take account of the relative source contributions of the truck tyres and engines (-0.6 dB(A)) and truck exhausts (-8.6 dB(A)) compared with light vehicle sources.
Roadway gradient	Road traffic noise levels vary dependent on the gradient of the roadway compared with a flat roadway. CoRTN calculates this variation, however it does not take into account noise from heavy vehicle engine braking. According to literature, similar A-weighted noise levels would be generated

Parameter	Comment
	when heavy vehicles, with appropriately fitted OEM mufflers, use engine brakes as when under full throttle conditions. However, engine braking noise emitted from heavy vehicles without appropriate mufflers would be significantly higher than A-weighted levels emitted under full throttle conditions. Given that all heavy vehicles should be fitted with OEM mufflers (Roads and Maritime estimate 95% of trucks are) the noise levels predicted by CoRTN are considered to adequately represent typical road traffic noise levels.
Road surface	Road surface characteristics would determine the level of road/tyre interfacial noise created. DGA surfaces were modelled for all road surfaces. Corrections were applied to the road traffic noise model to account for the proposed road surfaces in accordance with direction provided by Roads and Maritime. The following corrections were applied: DGA: 0 dB(A)
Ground absorption	Road traffic noise levels reduce with increasing distance from the noise source along the ground. A ground absorption factor of 0.75 was applied.
Terrain	Natural topographical features such as hills and valleys can shield sensitive receivers from road traffic noise. These effects are taken account of in the model which incorporates one metre terrain contours.
Buildings	The height of receiver buildings in the operational study area affects the road traffic noise exposure. It can also affect the amount of acoustic shielding provided to other nearby buildings. The height of all buildings within the operational study area was determined through a ground-truthing exercise and the heights were then included in the road traffic noise model.
Noise barriers	No existing noise barriers were identified for this proposal
Facade	A correction of 2.5 dB(A) was added to all road traffic noise levels to take account of façade reflection effects in accordance with the NSW *Road Noise Policy*. Noise levels have been calculated and assessed at each façade of each sensitive receiver location. Only the noise level at the most affected façade for each receiver is presented in this report.
Road network	All existing and proposed major roads were included in the noise model. For this proposal, noise levels at sensitive receiver locations are predominantly controlled by the main alignment of the proposal roads and other arterial roads. This was verified by attended noise measurements throughout the study extent of the proposal. On this basis local roads have been excluded in the noise modelling.

5.2 Traffic Noise Model Calibration

The SoundPLAN road traffic noise model was calibrated with the noise monitoring data; the noise logger was located at location 'L4 – 3 Maison Dieu Road, Gowrie', as per the location presented in Section 3.1.

The predicted $L_{Aeq(15hr)}$, and $L_{Aeq(9hr)}$ road traffic noise was compared with the $L_{Aeq(15hr)}$ and $L_{Aeq(9hr)}$ calculated from the logging data, and a calibration constant was determined. Table 5-3 shows the measured and predicted values used to calculate the calibration constants.

It should be notated that for road noise assessments, measured $L_{A10(18hr)}$ are compared with predicted $L_{A10(18hr)}$ for the purpose of noise model calibration. As $L_{A10(18hr)}$ noise levels were not provided by AECOM, $L_{Aeq(15hr)}$ and $L_{Aeq(9hr)}$ noise model calibration has been assessed.

Table 5-3: Measured and Predicted Road Traffic Noise Comparison

Result Type	$LAeq_{(15hr)}$ dB(A) – Noise Logger Location (Day)	$LAeq_{(9hr)}$ dB(A) – Noise Logger Location (Night)
Measured L_{AEQ}	54.0	55.0
SoundPLAN (CoRTN Model)	55.2	55.0
Difference	+1.2	0

Typically, the acceptable difference between measured and predicted value is within 2.5 dB(A). In this case the model calibration satisfies the EPA road traffic noise criteria.

5.3 Noise Parameter Conversion

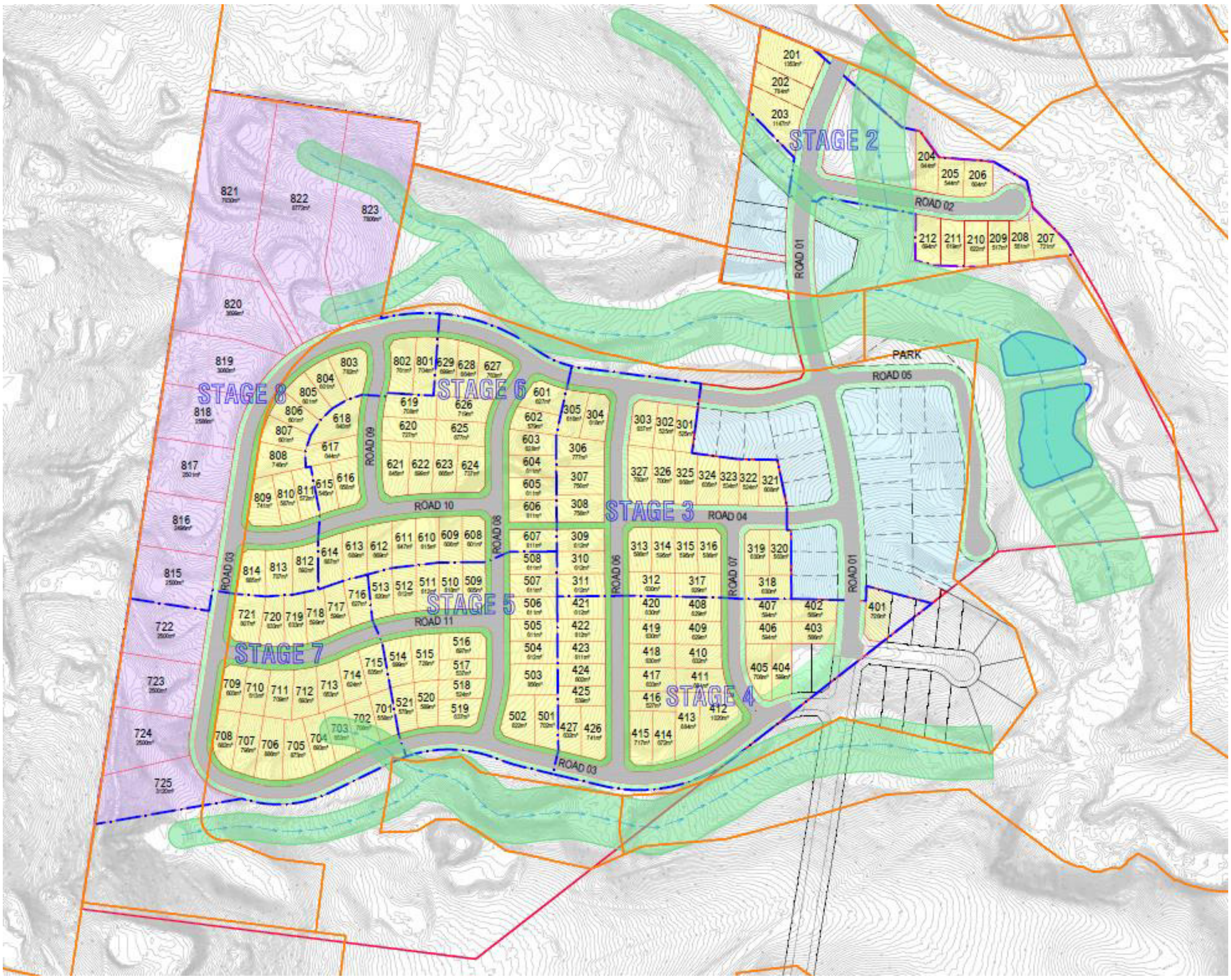
The CoRTN method predicts the $L_{A10,18hr}$ statistics. To determine the other required noise parameters, the noise logging data was used to calculate differences between noise parameters, L_{Aeq} and L_{A10}. The total noise source adjustment in the model to predict noise parameters, which include the model calibration and the noise parameter conversion, correction factors are presented in Table 5-4, as per the AEOCOM Noise Report for consistency. Note, that as previously stated +2.5dbA is added for façade reflection.

Table 5-4: Parameters Corrections (AEOCOM Noise Report) – dB(A)

Standard corrections	CoRTN provides L_{A10} road traffic noise levels. The industry standard correction of -3 dB(A) was applied to convert the L_{A10} levels to L_{Aeq} road traffic noise levels to allow assessment of the results against the *Road Noise Policy* and *Noise Criteria Guideline* criteria. An adjustment of -1.7 dB(A) has been applied to daytime and 0 dB(A) to night-time noise levels to achieve validation. Roads and Maritime requested a +1 dB(A) correction be applied to Build night-time levels to account for any uncertainties regarding future heavy vehicle mixes.

5.4 Road Traffic Noise Prediction Scenarios

For the purpose of this road traffic noise impact assessment, the Subdivision has been divided into seven (7) areas with similar exposure to the road traffic noise from the future Singleton Bypass (design year 2036).



categorises the proposed lots according to the similar noise exposure and will be referenced within the road traffic noise assessment.

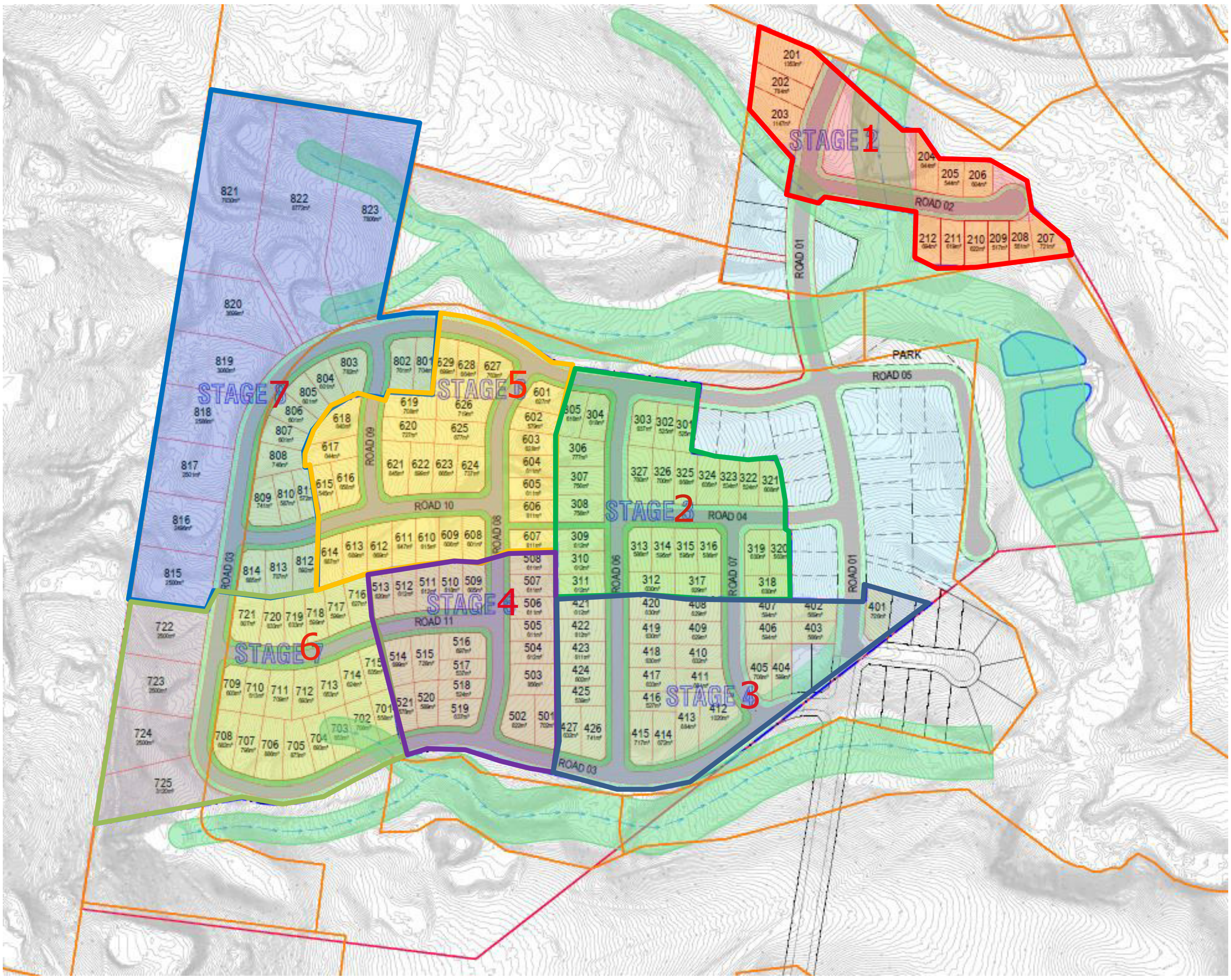


Figure 5-1 Assigned Area Locations

5.5 Results

Table 5-5 presents the predicted traffic noise levels at 1.5m (ground floor) and 4.5m (1st floor) above ground level based on the CoRTN noise modelling methodology for the 'design year' 2036, respectively. The following road traffic noise predictions are represented in $L_{Aeq15hours}$ for day time and $L_{Aeq9\ hours}$ for night time. A façade reflection of +2.5 dB(A) has been applied to all results presented. Noise contour maps of each road traffic noise scenarios are provided in Appendix D.

Table 5-5: Predicted Traffic Noise Level – 2036 (Design Year)

Area	Level	Daytime L_{Aeq}, dB	Night-time L_{Aeq}, dB
Area 1	Ground Floor	68	67
	1st Floor	70	69
Area 2	Ground Floor	55	55
	1st Floor	56	56
Area 3	Ground Floor	54	53
	1st Floor	55	54
Area 4	Ground Floor	52	51
	1st Floor	55	55
Area 5	Ground Floor	55	54
	1st Floor	56	55
Area 6	Ground Floor	50	49
	1st Floor	54	53
Area 7	Ground Floor	51	51
	1st Floor	54	53

Noise modelling was undertaken for existing traffic volumes (Year 2019) for noise model calibration and future traffic volumes (Year 2036) which is known as the 'Design Year' in the AECOM Noise report as outlined above. All noise prediction scenarios may comply with the proposed dwelling internal noise standards (as outlined in Section 4.1), provided the façade of the residential dwellings are fitted with sufficient noise insulation as discussed in section 6.

6 Internal Steady State Noise

Further to the road traffic noise predictions, it is also recommended that dwellings in the subdivision be constructed to ensure that each dwelling satisfies the internal noise level requirement as outlined within Section 4.1.1.

At this early stage of the development, detailed information concerning the proposed residential buildings, such as architectural drawings, is understandably absent. Consequently, specific recommendations pertaining to minimum acoustic specifications of individual building components are unable to be provided.

However, indicative noise insulation recommendations based on the predicted road traffic noise level for the year 2036 and typical room sizes, outlined within Section 6.1 have been provided. The following glazing, wall and ceiling recommendations should only serve as a guideline.

Note that: During construction certification stages, all dwellings located within Areas 1 to 5 will require sound insulation treatment to be designed. Therefore, proposed concept dwelling designs within Areas 1 to 5 must be forwarded to a suitably qualified acoustics consultant to be assessed in accordance with AS3671 – Road traffic noise intrusion, Building siting and construction. This process is likely to incur additional costing to the individual lot detailed design process.

6.1 Assumptions for Sound Insulation Requirements

The façade requirements for a typical bedroom and living space are determined in accordance with the methodology set out in AS3671. The acoustic calculations for the recommended facade are based on various factors including, the predicted road traffic noise in 2027, indoor design sound level criteria, reverberation time, and the room and partition dimensions.

Table 6-1 provides typical room features (i.e. reverb time, room dimension and partition surface area) which will be used to determine the glazing, wall and ceiling acoustic performance requirements for the dwellings within the subdivision lot.

Table 6-1: Typical Room Features

Space	Assumed Reverb Time (seconds)	Assumed Room Dimension (m)	Window/Door	Assumed Window/Door Surface area (m)
Master Bedroom	0.5	**Length:** 4m **Width:** 3m **Height:** 2.7m	Window	1.5m x 1m
			Sliding Door	2.4m x 1.5m
Bedroom	0.5	**Length:** 3m **Width:** 3m **Height:** 2.7m	Window	1.5m x 1m
Living Space	1	**Length:** 6m **Width:** 4m **Height:** 2.7m	Window	3m x 1m
			Sliding Door	2.4m x 3m

6.2 Acoustic Glazing Requirement

The required glazing performances for the dwellings within each subdivision area have been provided within Table 6-2. It should be noted, the following recommended acoustic performance requirements are based on standard designs, and it is recommended that each individual lot assesses its design for a more accurate assessment. These values can be used as a guide however.

Table 6-2: Minimum Required Glazing Performances (R_W)

Area	Level	Space	Window/Door	Minimum Requirement R_w
1	GF	Master Bedroom	Window	34
			Sliding Door	38
		Bedroom	Window	34
		Living Space	Window	33
			Sliding Door	37
	L1	Master Bedroom	Window	37
			Sliding Door	41
		Bedroom	Window	37
		Living Space	Window	36
			Sliding Door	40
2	GF	Master Bedroom	Window	22
			Sliding Door	26
		Bedroom	Window	21
		Living Space	Window	20
			Sliding Door	24
	L1	Master Bedroom	Window	24
			Sliding Door	28
		Bedroom	Window	24
		Living Space	Window	23
			Sliding Door	27
3	GF & L1	Master Bedroom	Window	23
			Sliding Door	27
		Bedroom	Window	23
		Living Space	Window	22
			Sliding Door	25
4	GF & L1	Master Bedroom	Window	23
			Sliding Door	27
		Bedroom	Window	23
		Living Space	Window	22
			Sliding Door	25
5	GF & L1	Master Bedroom	Window	24
			Sliding Door	28
		Bedroom	Window	24
		Living Space	Window	23
			Sliding Door	26

Area	Level	Space	Window/Door	Minimum Requirement R_w
6	GF & L1	Master Bedroom	Window	22
			Sliding Door	26
		Bedroom	Window	22
		Living Space	Window	21
			Sliding Door	25
7	GF & L1	Master Bedroom	Window	22
			Sliding Door	26
		Bedroom	Window	22
		Living Space	Window	21
			Sliding Door	24

Note:
GF = Ground Floor
L1= 1st Floor

6.2.1 Typical Glazing Systems

The following glazing recommendation applies to all noise prediction scenarios. Certified Laboratory test certificates should be supplied for the proposed window glazing and door assemblies at the subsequent Construction Certificate stage for review.

Table 6-3 provides typical Weighted Sound Reduction Index (R_w) values for various windows and doors; however this table should only be used as a guide for window R_w values only, and acoustically tested windows with Weighted Sound Reduction Index values should be used.

Table 6-3: Typical Window Reduction Weighting (R_w) Value

Glazing	Minimum R_w/STC rating	Window Seals
4mm float window	24	Standard Weather Seals
4mm float window	27	Acoustic Seals
6mm float window	29	Acoustic Seals
6.38mm laminated window	31	Acoustic Seals
7.52 mm laminated window	32	Acoustic Seals
10.38mm laminated window	35	Acoustic Seals
14.38mm laminated window	37	Acoustic Seals
5mm window + 6mm window with a 44 mm air gap	38	Acoustic Seals
5mm window + 6.38mm laminated with a 60mm air gap	40	Acoustic Seals
10mm window + 5mm window with a 90mm air gap	42	Acoustic Seals

6.2.2 Frame

There are several different materials commonly used for window frames, however, the type of material does not usually have a significant influence on noise reduction properties. The effect of perimeter window seals are the critical issue in window frames.

The window should be well sealed between the frame and the supporting wall as sound can flank around the window when not properly sealed. This also improves thermal efficiency and prevents moisture ingress.

6.2.3 Seals

All glazing should be well sealed (air tight) when closed with good seals such as **Q-LON**® acoustic seals (or equivalent) around the top and bottom sliders.

Any air gap will significantly reduce the performance of the glazing in terms of the ability to attenuate noise. Mohair type seals are not considered as acoustic seals. All of the above calculation results assume that the glass is properly sealed airtight.

6.3 Wall Requirement Guideline

The following acoustic wall recommendation applies to all noise prediction scenarios. The wall of all dwellings should achieve a minimum of R_w 45. A typical wall that exceeds the established R_w value may have the following construction:

- 110mm brick wall
- 90mm deep timber stud or 92mm metal stud
- 10mm standard plasterboard internally

6.4 Roof Requirement Guideline

Dwellings within Area 1, 2 & 3 should have a roof system with a minimum acoustic performance of R_w. 44. Dwellings within Areas 4 to 8 should have a roof system with a minimum acoustic performance of R_w 40.

6.5 Ventilation Requirement

The ventilation conditions are extracted from the Australian Standard 2021 and outlines:

An acoustically insulated building must be kept virtually airtight to exclude external noise. Therefore, mechanical ventilation or air conditioning is needed to provide fresh air and to control odours. Requirements for acceptable indoor-air quality are given in AS 1668.2. Recommended design sound levels for different area of occupancy in buildings are given in AS 2107.

Notes:
1. The requirement of AS 1668 should be viewed as applying also to Class 1 building as defined by the Building Code of Australia.
2. In domestic situations, the minimum requirements set out in AS 1668 are not always adequate to remove kitchen cooking odours or to control damping in older residences.

Rising damp can cause several fungal growths when an insulated house is left closed for a prolonged period. A time clock controlled ventilation cycle of one hour per 24 hours has been found to provide adequate prevention in Singleton.

Special attention should be given to the detailing of ducts in any uninsulated ceiling space to prevent external noise penetrating the occupied spaces by the way of the air ducts.

The Acoustic Design should take account of any additional noise from the ventilation system in the treated space. Because an insulated house has an unnaturally low ambient internal noise level during quiet period, some occupants can be usually sensitive to mechanical plant or diffusor noise.

6.6 Acoustic Sealants

Where acoustic constructions are provided, all joints should be overlapped and penetrations and gaps are to be fully sealed with acoustic sealant similar to:

- Bostik Fireban 1 or Seal’n’Flex;
- Hilti CP606 Firestop;
- CSR Gyprock Firemastic;
- Sika Firerate;

- Ramset Blaze Brake 201;
- Any other acoustic sealant that is polyurethane (non-hardening) with a minimum specific gravity s.g > 1.5.

Vipac can review any proposed alternatives.

6.7 Gaps and Seals

Junctions are required to be sealed airtight in order to achieve the required acoustic ratings between spaces. General guidelines for acoustic seals are as follows:

- All junctions and penetrations should be sealed air tight and seals are to extend continuously along the length of the junction — to both sides of the partition;
- For wall where more than one layer of wall lining is required, all linings should be overlapped to minimise potential gaps between linings;
- It is recommended that plasterboard or other wall linings are cut such that the junction is as close a flush fit as possible. The maximum gap between joints in wall linings should not exceed 3mm.

For air gaps, the following detailing should be applied to maintain an adequate airtight seal through acoustic rated elements. For the following air gaps, the following details are recommended:

- Gaps < 5mm – hard pack with glass wool insulation (minimum 32kg/m^3) and apply mastic.
- Gaps > 5mm and up to 20mm: Pack with backing rods and dense insulation (50mm, 48kg/m^3 glass wool) to seal and mastic.
- Gaps > 20mm – pack with insulation, and patch with Plasterboard (the same thickness and number of layers as the base partition (applied either side) leaving small gap (~5mm), which can be sealed with mastic.
- Recommended Mastic Sealants, are as follows:
  - Sikaflex "Pro;
  - Bostik "Fireban One";
  - Gyprock "Seal 'n Flex".

7 Conclusion & Discussion

Based on the traffic noise modelling as per the 'Design Year 2036' traffic volumes and road layouts provided by AEOCOM it is concluded that additional architectural upgrades will be required for the majority of lots within the proposed residential subdivision. Without the adjacent location of the Singleton Bypass the houses within the residential subdivision, architectural upgrades for traffic noise mitigation purposes is not likely to be required.

In order to calculate additional costing per lot, internal costing calculations in conjunction with 'the builder' should be calculated based on the recommendations outlined in Section 6.1 of this report.

Appendix A : References

[1]. AECOM for Transport for NSW, report 'Noise and Vibration Technical Report – Singleton Bypass – Concept Design and Environmental Assessment, job #60558931, dated 14 November 2019'

[2]. Environmental Protection Authority (EPA) (Office of Environment and Heritage, OEH) Industrial Noise Policy (INP), January 2000.

[3]. Environmental Protection Authority (NSW EPA) Office of Environment & Heritage (OEH): Road Noise Policy.

[4]. State Environmental Planning Policy (infrastructure) 2007 under the Environmental Planning and Assessment Act 1979

[5]. NSW Department of Planning (DoP) 2008 Development near Rail Corridors and Busy Roads – Interim Guideline

[6]. Australian/New Zealand Standard AS/NZS2107 – 2016 Acoustics - Recommended Design Sound Levels and Reverberation Times for Building Interiors.

[7]. Building Code of Australia (BCA) / National Construction Code (NCC) 2016: Part F5 – Sound Transmission and Insulation.

[8]. Lorient Acoustic Sealing Systems For Door Assemblies

[9]. RAVEN Product Catalogue 115

[10]. CSR The Red Book - Fire & Acoustic Design Guide Nov 2011

[11]. Department of Transport (Welsh Office) CoRTN - Calculation of Road Traffic Noise (DoT Welsh Office HMSO) 1988.

[12]. Environmental Protection Authority (NSW EPA) Environmental Criteria for Road Traffic Noise, 1999.

[13]. Environmental Health Risk Assessment: Guideline for Assessing Human Health Risk from Environmental Hazard (2012).

[14]. Environmental Protection Authority (EPA) NSW Environmental Criteria for Road Traffic Noise, May 1999.

[15]. Roads and Maritime Services (RMS) (Roads and Traffic Authority (RTA)) Environmental Noise Management Manual, December 2001.

[16]. Roads and Maritime Services (RMS) Noise Criteria Guideline (RMS NCG), April 2015.

[17]. Roads and Maritime Services (RMS) Noise Mitigation Guideline (RMS NMG), April 2015.

Appendix B : Terminology

Decibel, dB:

Unit of acoustic measurement. Measurements of power, pressure and intensity. Expressed in dB relative to standard reference levels.

dBA:

Unit of acoustic measurement weighted to approximate the sensitivity of human hearing to sound frequency.

Sound Pressure Level, L_p (dB), of a sound:

20 times the logarithm to the base 10 of the ratio of the r.m.s. sound pressure to the reference sound pressure of 20 micro Pascals. Sound pressure level is measured using a microphone and a sound level meter, and varies with distance from the source and the environment.

Sound Power Level, L_W (dB), of a source:

10 times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power of 1 Pico Watt. Sound power level cannot be directly measured using a microphone. Sound power level does not change with distance. The sound power level of a machine may vary depending on the actual operating load.

Ambient Sound:

Of an environment: the all-encompassing sound associated with that environment, being a composite of sounds from many sources, near and far.

Percentile Level - L_{90}, L_{10}, etc:

A statistical measurement giving the sound pressure level which is exceeded for the given percentile of an observation period, e.g. L_{90} is the level which is exceeded for 90% of a measurement period. L_{90} is commonly referred to as the "background" sound level.

$L_{AEQ,T}$:

Equivalent continuous A-weighted sound pressure level. The value of the A-weighted sound pressure level of a continuous steady sound that, within a measurement time interval T, has the same A-weighted sound energy as the actual time-varying sound.

L_{max}:

The maximum noise level over the measurement period for a given time weighting e.g. slow, fast or impulse.

Rating Background Level – RBL:

Method for determining the existing background noise level which involves calculating the tenth percentile from the L_{A90} measurements. This value gives the Assessment Background Noise Level (ABL). Rating Background Level is the median of the overall ABL.

R_w – Weighted Sound Reduction Index:

A new single number quantity for airborne sound insulation rating which replaces STC. STC has been traditionally used for the classification of partitions and to define acoustical requirements in the Building Code of Australia.

For majority of partitions, the value for R_w will be similar to the value for STC. Partitions with particularly poor performance at 100Hz may have lower values for R_w than for STC. Conversely, partitions with poor performance at 4kHz may have higher values for R_w than for STC.

Ctr – Adaptation factor:

Ctr is a spectrum adaptation factor which has been chosen in the BCA to take into account lower frequency level sounds. For an airborne sound insulation, the Ctr factor and the Rw of building element will need to be considered. Ctr is a negative number which means that Rw + Ctr of a building element will be less than the Rw of the building element. For example a wall system may have an Rw of 55 but would have an Rw + Ctr of 50 if the Ctr value was –5.

Weighted Standardised Level Difference, DnT,w:

A term used in combination with Ctr to describe the airborne sound insulation rating of a building element when tested on site. A higher DnT,w means a higher difference between the sound levels in the originating (source) room and the receiving room and thus a higher standard of insulation. The higher the Dntw + Ctr of a building element, the better the performance of the building element in terms of airborne sound insulation.

Weighted Normalised Impact Sound Level, L'n,w :

A term used to describe the impact sound insulation of the floor. In the BCA, the use of parameter L'n,w plus spectrum adaptation term CI will be used to quantify the floor impact sound insulation ratings. The lower the L'n,w + CI of a floor, the better the performance of the floor in terms of impact sound insulation.

Weighted Standardised Impact Sound Level, L'nT,w:

A term used in combination with a spectrum adaptation CI to describe the impact sound insulation rating of a floor when tested on site. Similar to the L'n,w, it measures adequateness of a floor in controlling impact sound.

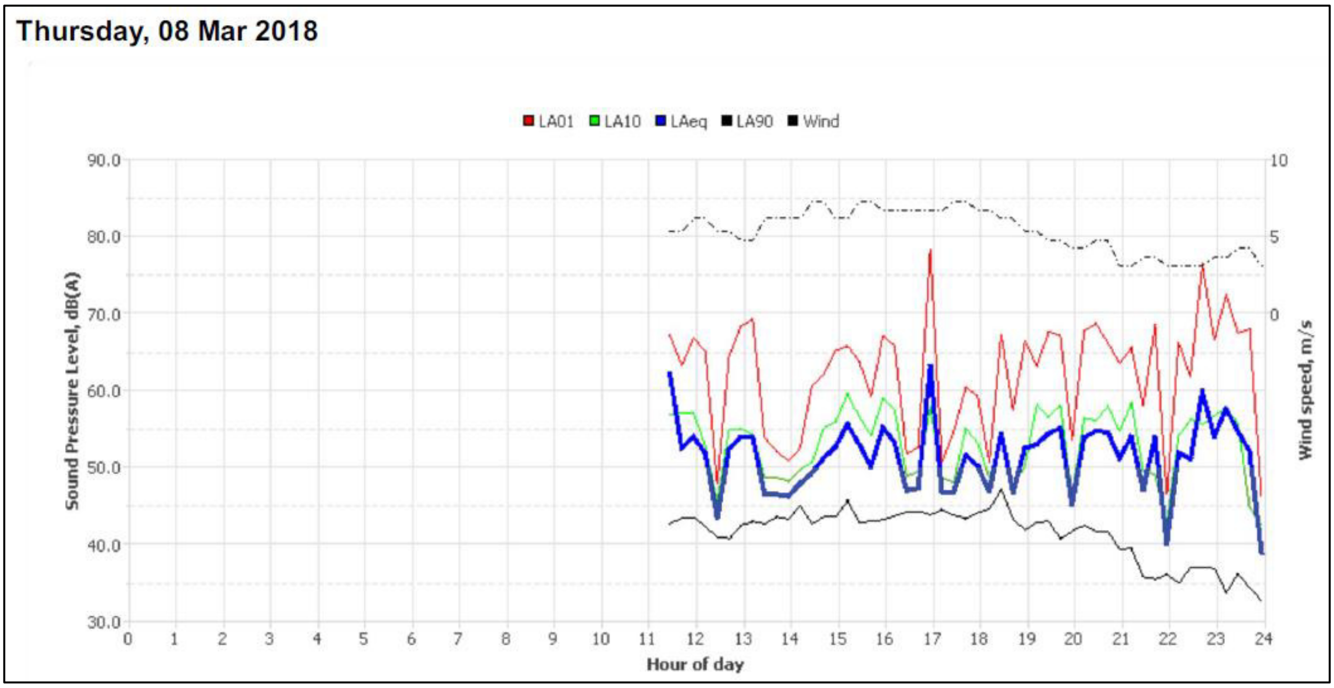
Reverberation Time:

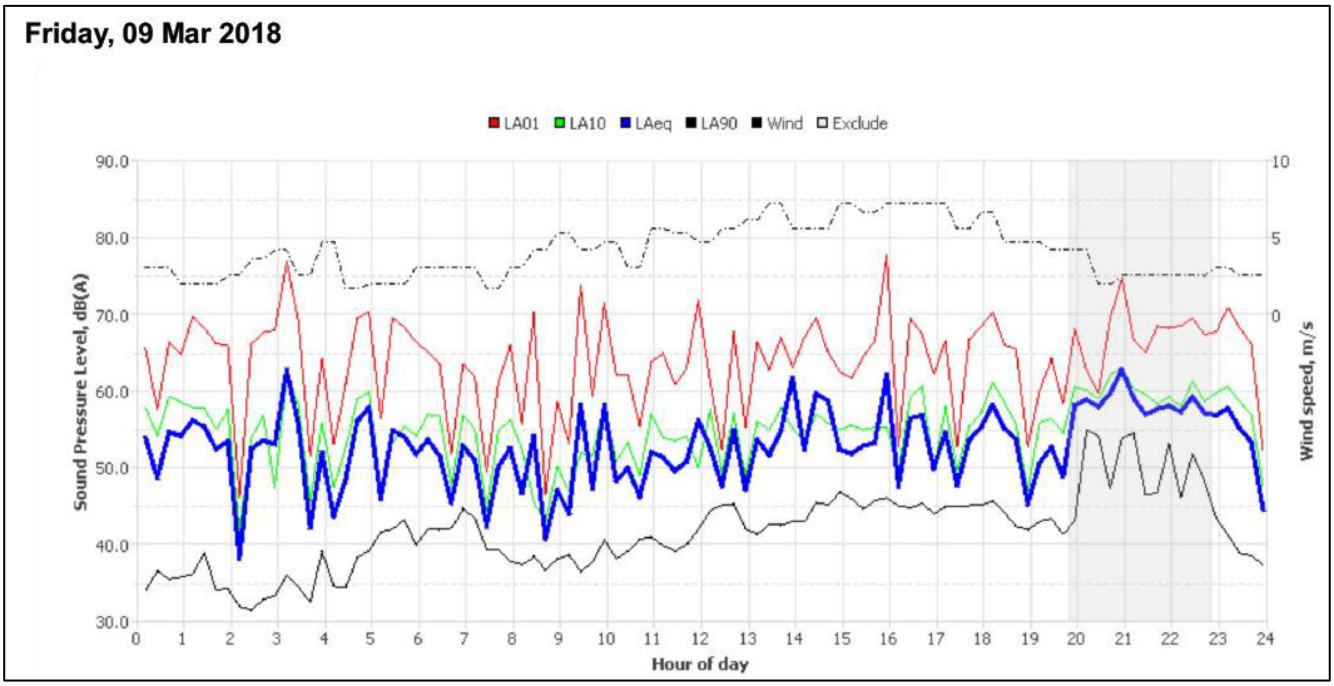
The reverberation time of a room is the time it takes for sound to decay by 60 dB once the source of sound has stopped. Reverberation time is the basic acoustical property of a room which depends only on its dimensions and the absorptive properties of its surfaces and contents. Reverberation has an important impact on speech intelligibility.

Noise Reduction Coefficient (NRC):

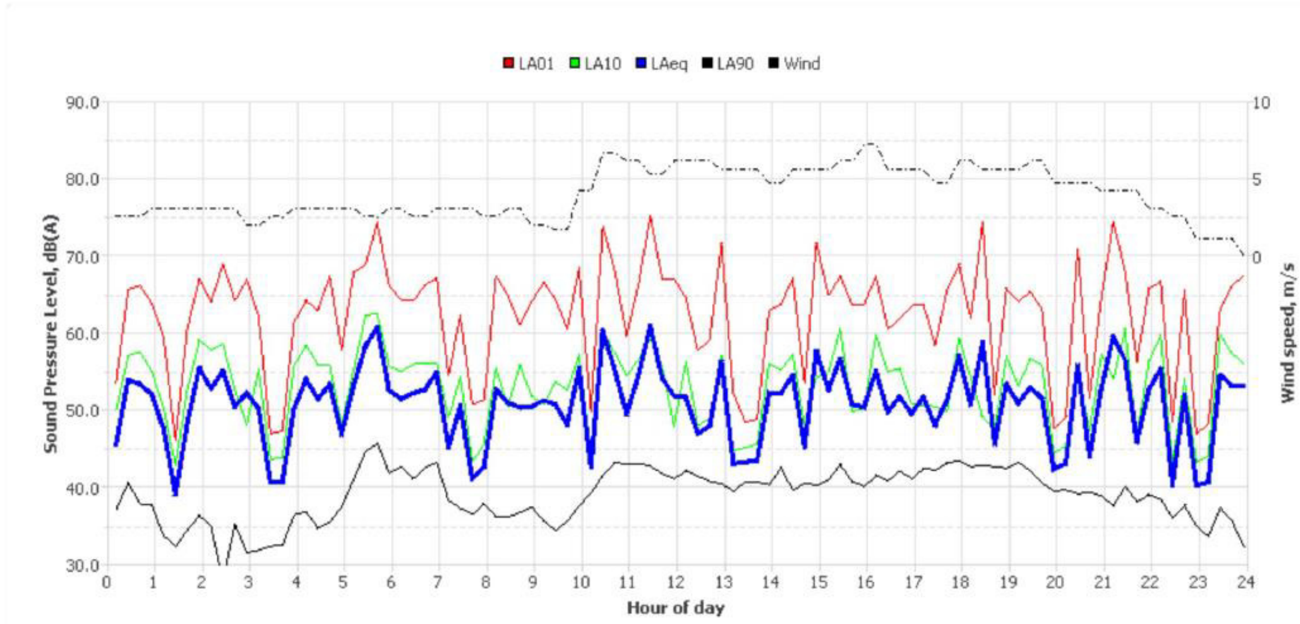
The NRC of an acoustical material is the arithmetic average to the nearest multiple of 0.05 of its absorption coefficients at 4 octave bands with centre frequencies of 250, 500, 1000, 2000 Hertz. The NRC rating can be viewed as a percentage (example: .80 = 80%) of what sound waves that come in contact with the acoustical material are absorbed by the material and not reflected back within the room.

Appendix C : Noise Survey Graphs

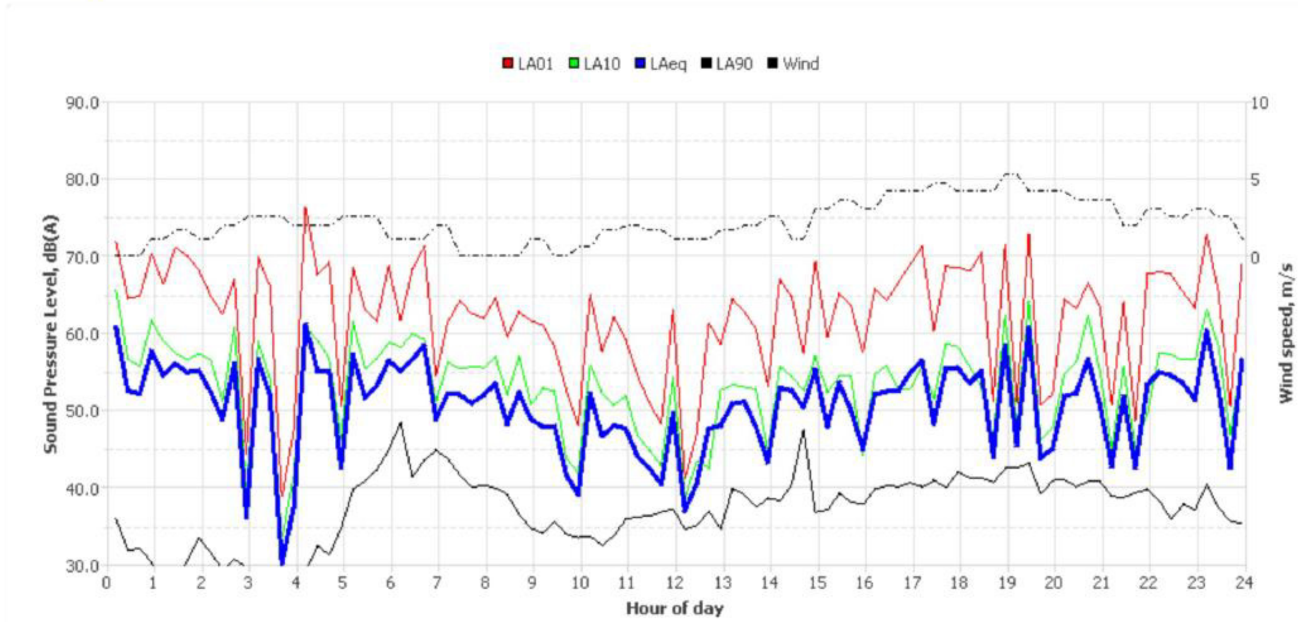


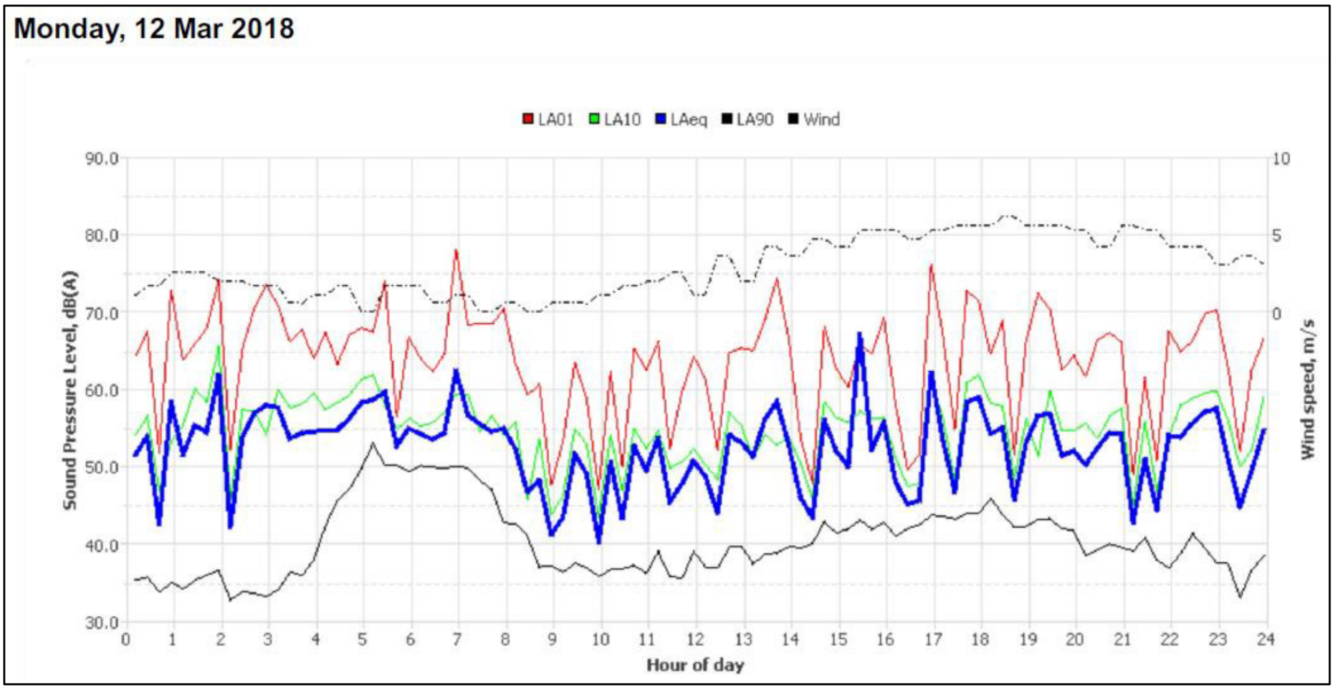


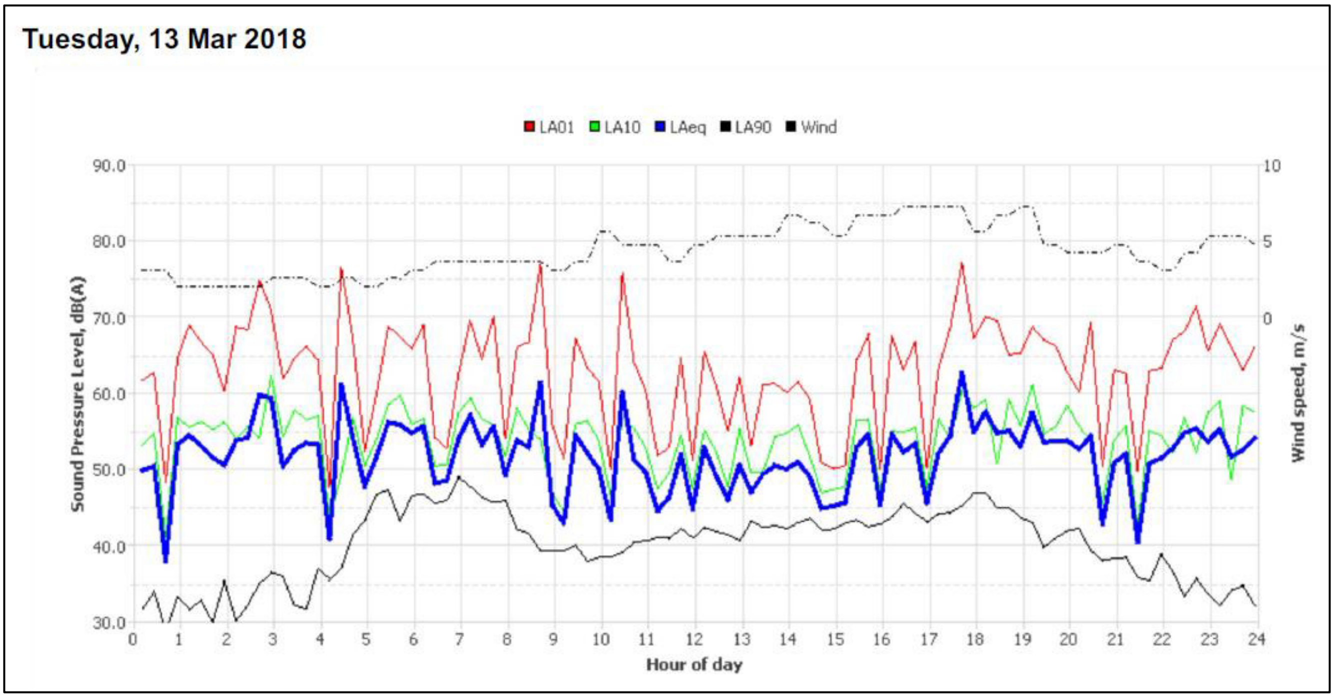
Saturday, 10 Mar 2018

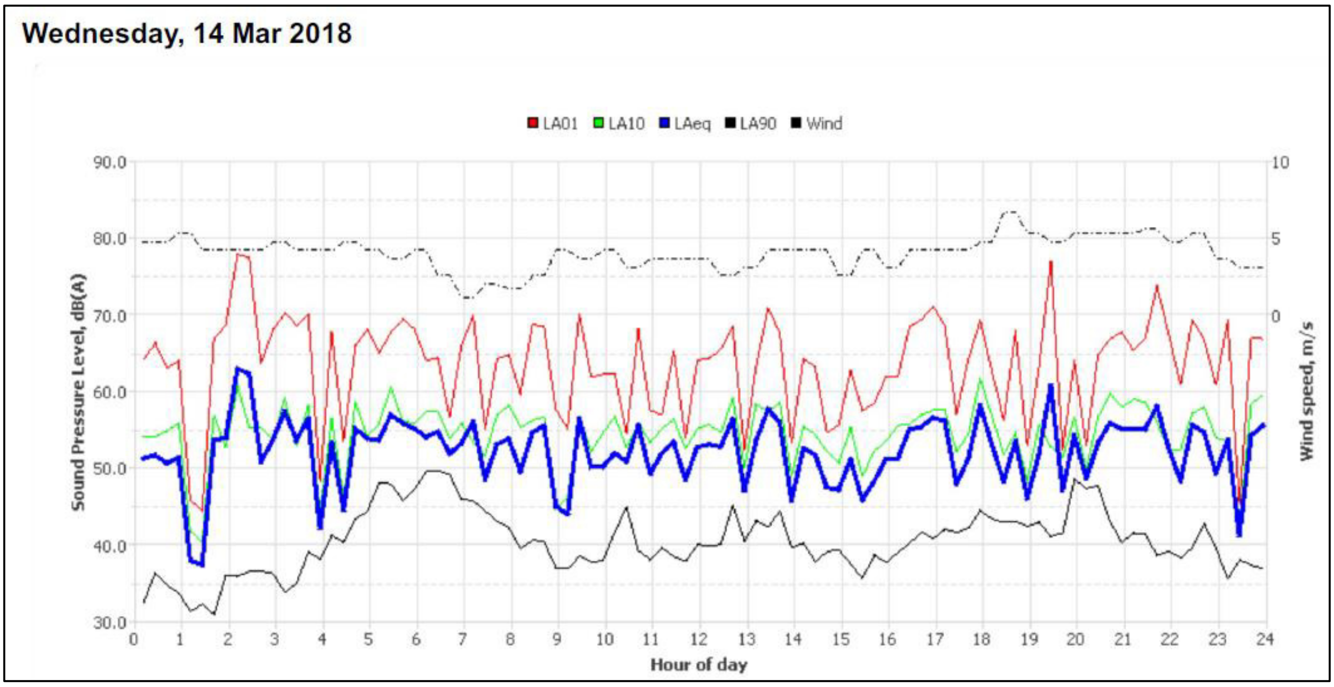


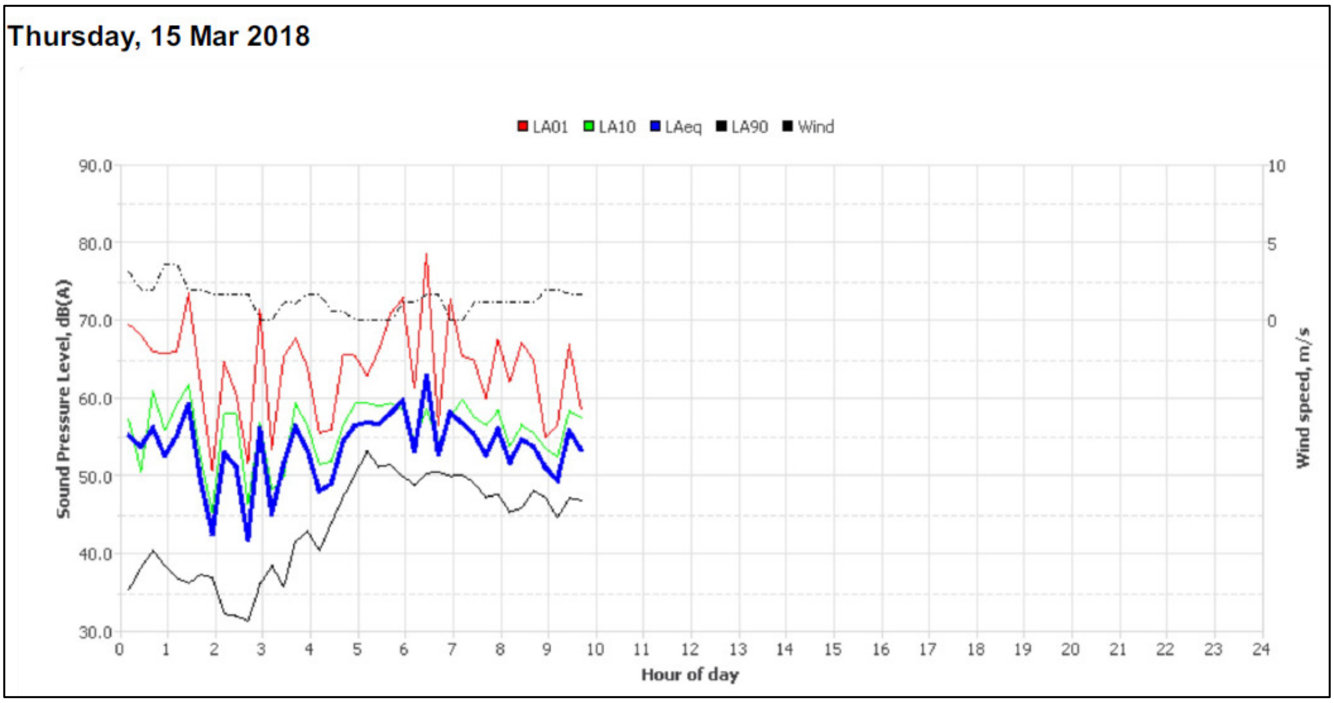
Sunday, 11 Mar 2018



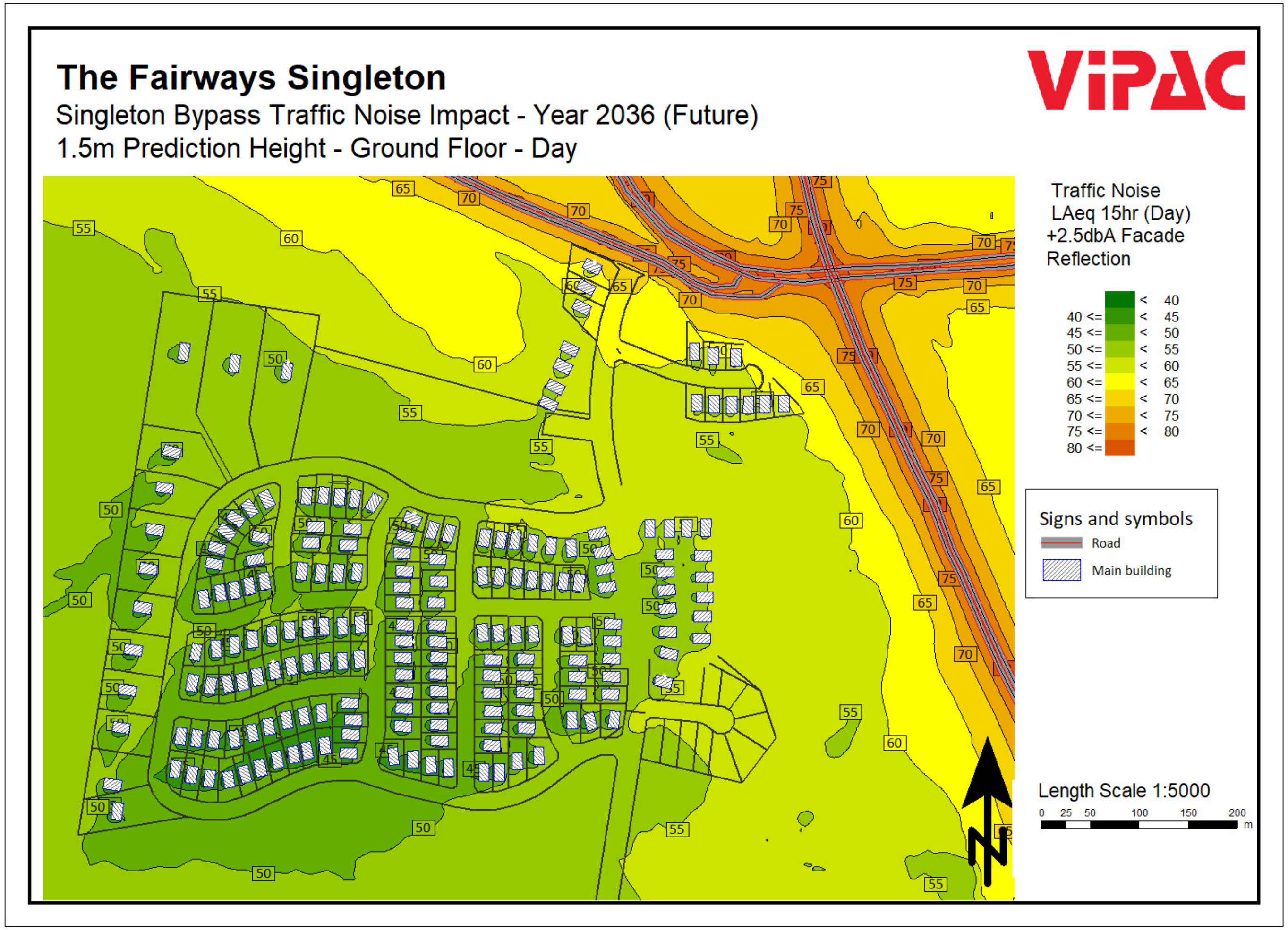

Monday, 12 Mar 2018
LA01
LA10
LAeq
LA90
Wind
Sound Pressure Level, dB(A)
Wind speed, m/s
Hour of day
90.0
80.0
70.0
60.0
50.0
40.0
30.0
10
5
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

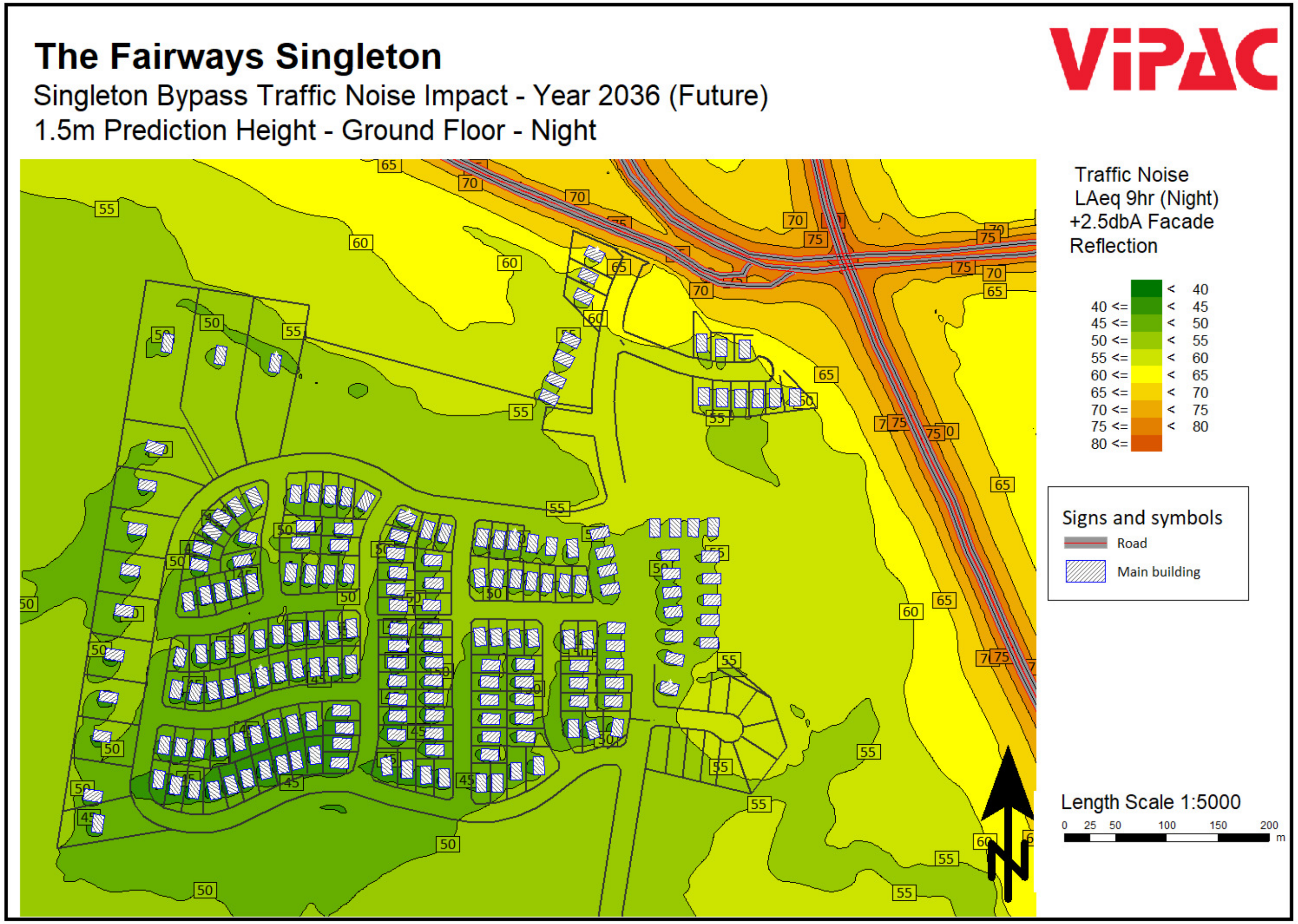

Tuesday, 13 Mar 2018
LA01
LA10
LAeq
LA90
Wind
Sound Pressure Level, dB(A)
Wind speed, m/s
Hour of day
90.0
80.0
70.0
60.0
50.0
40.0
30.0
10
5
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

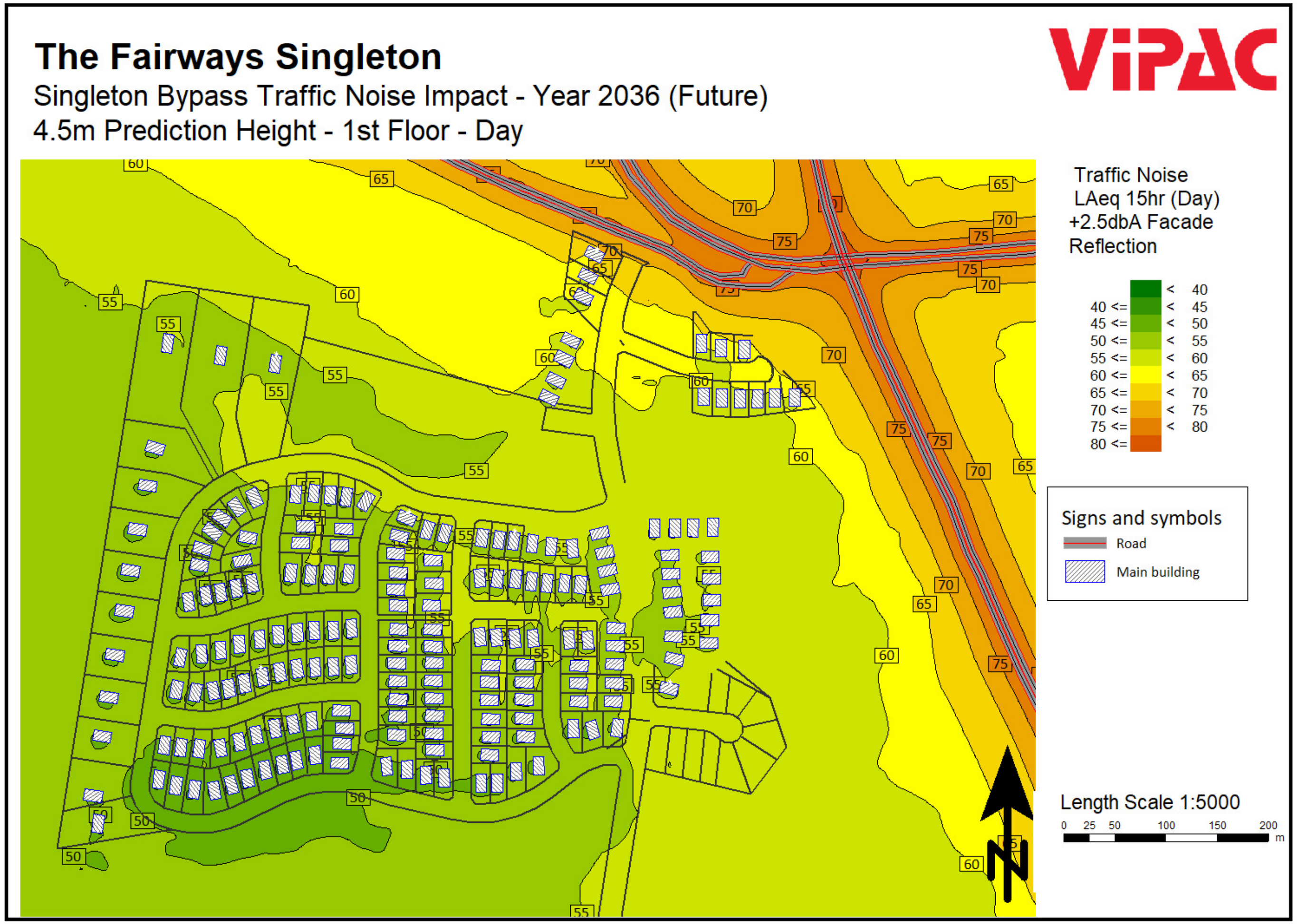

Wednesday, 14 Mar 2018
LA01
LA10
LAeq
LA90
Wind
Sound Pressure Level, dB(A)
Wind speed, m/s
Hour of day

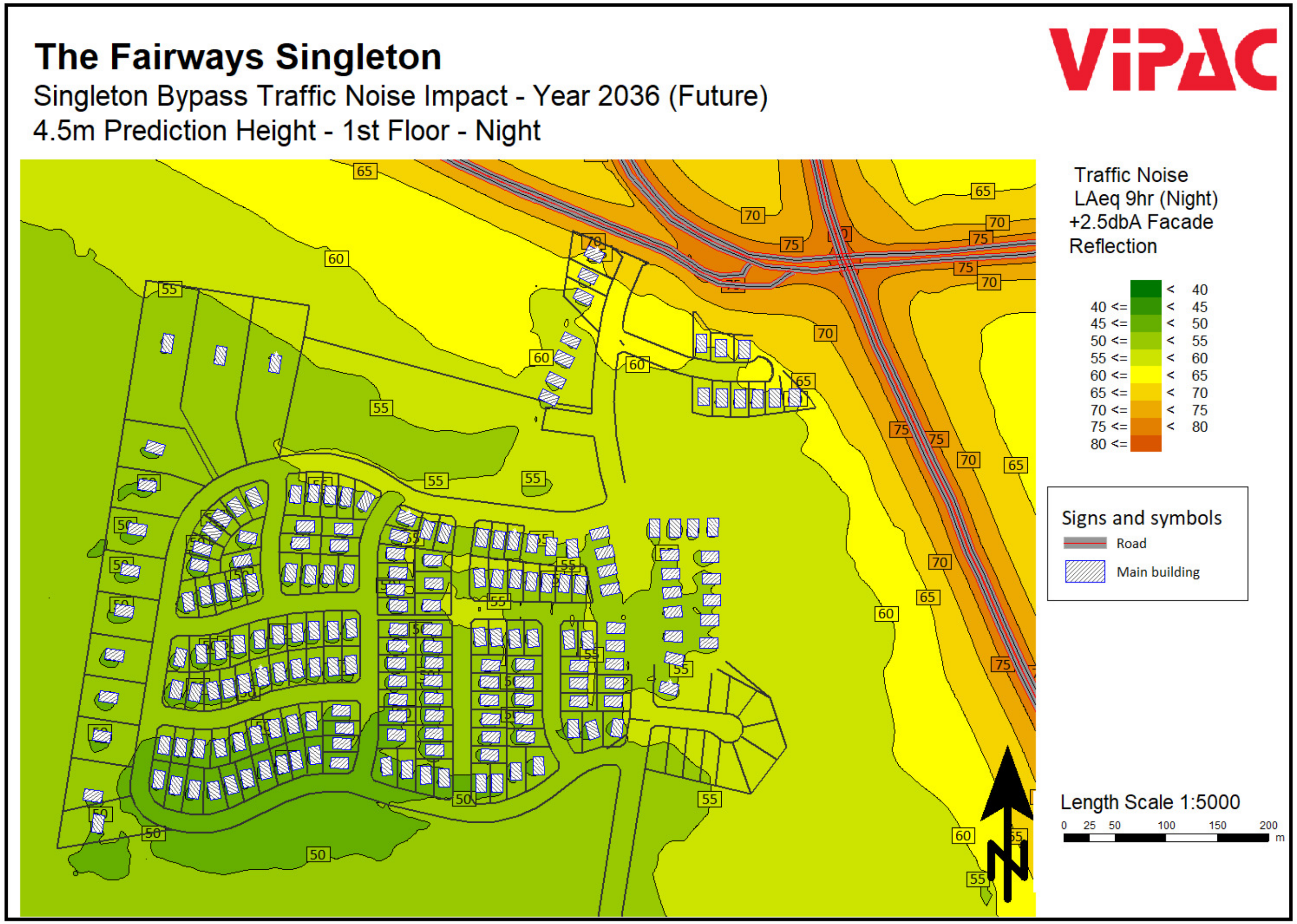

Thursday, 15 Mar 2018
LA01
LA10
LAeq
LA90
Wind
Sound Pressure Level, dB(A)
Wind speed, m/s
Hour of day

Appendix D Road Traffic Noise Contours




The Fairways Singleton
Singleton Bypass Traffic Noise Impact - Year 2036 (Future)
1.5m Prediction Height - Ground Floor - Night
VIPAC
Traffic Noise
LAeq 9hr (Night)
+2.5dbA Facade
Reflection
< 40
40 <= < 45
45 <= < 50
50 <= < 55
55 <= < 60
60 <= < 65
65 <= < 70
70 <= < 75
75 <= < 80
80 <=
Signs and symbols
Road
Main building
Length Scale 1:5000
0 25 50 100 150 200 m


The Fairways Singleton
Singleton Bypass Traffic Noise Impact - Year 2036 (Future)
4.5m Prediction Height - 1st Floor - Day
Traffic Noise
LAeq 15hr (Day)
+2.5dbA Facade
Reflection
< 40
40 <= < 45
45 <= < 50
50 <= < 55
55 <= < 60
60 <= < 65
65 <= < 70
70 <= < 75
75 <= < 80
80 <=
Signs and symbols
Road
Main building
Length Scale 1:5000
0 25 50 100 150 200
m


The Fairways Singleton
Singleton Bypass Traffic Noise Impact - Year 2036 (Future)
4.5m Prediction Height - 1st Floor - Night
VIPAC
Traffic Noise
LAeq 9hr (Night)
+2.5dbA Facade
Reflection
< 40
40 <= < 45
45 <= < 50
50 <= < 55
55 <= < 60
60 <= < 65
65 <= < 70
70 <= < 75
75 <= < 80
80 <=
Signs and symbols
Road
Main building
Length Scale 1:5000
0 25 50 100 150 200 m
N

Appendix E Terrain Contours

The ground terrain contours provided by The Client for use in the traffic noise model have been reproduced below for reference.

-End of Report-