

Noise Assessment

Proposed Tavern
Lot 1, Muir Street
Medowie, NSW.



Document Information

Noise Assessment

Proposed Tavern

Lot 1, Muir Street, Medowie, NSW

Prepared for: Muir Point Pty Ltd

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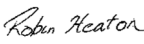

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1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has been commissioned by Muir Point Pty Ltd to prepare a Noise Assessment (NA) to address potential noise emissions associated with the proposed Tavern (the 'project') to be established at Lot 1 Muir Street, Medowie, NSW.

The project will consist of a dining and lounge area, sports lounge with TAB and gaming lounge within one proposed building. Several other commercial premises are approved to be located to the south and east of the project site although are subject to separate Development Approvals. The NA has quantified potential operational noise emissions pertaining to customer vehicles, delivery/collection vehicles, customer noise and mechanical plant associated with the proposed buildings. The NA recommends reasonable and feasible noise controls where required.

Relevant guidelines and policies adopted in this assessment are detailed in **Section 3** of this report.

The assessment has been undertaken in accordance with the following documents:

- Environment Protection Authority (EPA), NSW Noise Policy for Industry (NPI) 2017;
- NSW Department of Environment and Climate Change (DECCW) – NSW Interim Construction Noise Guideline (ICNG), 2009;
- Environment Protection Authority (EPA), Noise Guide for Local Government (NGFLG), 2013;
- Australian Standard AS 1055:2018 - Acoustics - Description and measurement of environmental noise - General Procedures; and
- International Standard ISO 9613:1993 - Acoustics - Attenuation of sound during propagation outdoors.

A glossary of terms, definitions and abbreviations used in this report is provided in **Appendix A**.

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2 Project Description

2.1 General

The project is to be established at Lot 1 Muir Street, Medowie, NSW, which is located in a mixed commercial and residential area. The site is bounded to the south by Muir Street, to the east, north and west by semi-rural properties. A Woolworths supermarket and other existing commercial tenancies are located 150 metres to the south of the project site on Ferodale Road, with several other commercial premises proposed to the south and east of the project site. A proposed multistorey commercial building has been approved by Council for construction in the adjacent lot to the east of the project site. This building will provide barrier attenuation to residential receivers beyond, on Medowie Road, although has not been included in the assessment to represent a worst case scenario. Additionally, two residential subdivisions have been approved to the north and south east of the project site. Accordingly, hypothetical receivers have been included in the assessment representative of the proposed future commercial and residential receivers.

The noise environment at receivers surrounding the project is dominated by road traffic from Medowie Road and the nearby commercial buildings during the day, evening and night periods.

The proposal involves the construction of a single building including a dining and lounge area, which will provide indoor and outdoor dining, a sports lounge with TAB and a gaming lounge. The development will also provide ground floor and basement parking, with approximately 66 spaces proposed. Site plans are provided in **Appendix B**.

The proposed hours of operation for the project are 10am to 12am seven days.

2.2 Receiver Review

A review of residential and commercial receivers in close proximity to the project has been completed. The nearest residential receivers to the project are 50m to the east of the project site along Medowie Road. The residential and commercial receptors, MGA(56) coordinates to the project are summarised in **Table 1**. **Figure 1** provides a locality plan identifying the position of these receivers in relation to the project. Receiver heights were set at 1.5m/4m above relative ground height representative of single and double storey dwellings.

Table 1 Receiver Locations

Receiver	MGA56 Coordinates		Receiver Height	Receiver Type
R1	393396	6377257	1.5m	Residential
R2	393466	6377237	1.5m	Residential
R3	393516	6377253	1.5m	Residential
R4	393924	6377261	1.5m	Residential
R5	393918	6377216	1.5m	Residential
R6	393926	6377192	1.5m	Residential
R7	393870	6377170	1.5m	Residential
R8	393923	6377154	1.5m	Residential
R9	393989	6377144	1.5m	Residential
R10	393986	6377124	1.5m	Residential
R11	393981	6377104	1.5m	Residential
R12	393908	6377112	1.5m	Residential
R13	393898	6377087	1.5m	Residential
R14	393977	6377084	1.5m	Residential
R15	393977	6377060	1.5m	Residential
R16	393971	6377032	1.5m	Residential
R17	393899	6377028	1.5/4.0m	Residential
R18	393964	6377014	1.5m	Residential
R19	393964	6376995	1.5m	Residential
R20	393891	6377000	1.5m	Residential
R21	393865	6376951	1.5m	Residential
FR1	393739	6377157	1.5m	Future Residential
FR2	393754	6377154	1.5m	Future Residential
FR3	393794	6377141	1.5m	Future Residential
FR4	393813	6377138	1.5m	Future Residential
FR5	393825	6377136	1.5m	Future Residential
FR6	393840	6377134	1.5m	Future Residential
FR7	393855	6377137	1.5m	Future Residential
FR8	393862	6377130	1.5m	Future Residential
FR9	393863	6377117	1.5m	Future Residential
FR10	393894	6377049	1.5/4.0m	Future Residential
FR11	393876	6377053	1.5/4.0m	Future Residential
FR12	393869	6377046	1.5/4.0m	Future Residential
FR13	393868	6377034	1.5/4.0m	Future Residential
FR14	393864	6377025	1.5/4.0m	Future Residential
C1	393778	6376935	1.5m	Commercial
C2	393725	6376920	1.5m	Commercial
C3	393714	6376981	1.5m	Commercial
FC1	393880	6376972	1.5m	Future Commercial
FC2	393823	6376965	1.5m	Future Commercial

Table 1 Receiver Locations				
Receiver	MGA56 Coordinates		Receiver Height	Receiver Type
FC3	393767	6376975	1.5m	Future Commercial
FC4	393795	6377055	1.5m	Future Commercial
FC5	393852	6377043	1.5m	Future Commercial
FC6	393862	6377093	1.5m	Future Commercial

2.3 Proposed Activities




There are several key activities associated with the project that have the potential to generate acoustic impacts on nearby receivers which include patron noise, light vehicles, truck deliveries and collection (including consumables and waste), mechanical plant noise associated with the operation and children at play (ie playland area). **Table 2** provides a summary of noise sources, assessment period and proposed time of occurrence.

Table 2 Noise Generating Activities		
Activity/Source	Period	Operational
Tavern Premises Operation including Gaming Lounge, patrons, and Mechanical Plant	Day (7am to 6pm)	✓
	Evening (6pm to 10pm)	✓
	Night (10pm to 7am)	✓
Customer light vehicles	Day (7am to 6pm)	✓
	Evening (6pm to 10pm)	✓
	Night (10pm to 7am)	✓
Truck Consumable Deliveries or Waste Collection	Day (7am to 6pm)	✓
	Evening (6pm to 10pm)	X
	Night (10pm to 7am)	X
Children in Play Area	Day (7am to 6pm)	✓
	Evening (6pm to 10pm)	✓
	Night (10pm to 7am)	X



FIGURE 1
LOCALITY PLAN
REF: MAC201049

0 100m

KEY	
	RECEIVER LOCATION
	LOGGER LOCATION
	SITE LOCATION

3 Noise Policy and Guidelines

3.1 Noise Policy for Industry

The EPA released the Noise Policy for Industry (NPI) in October 2017 which provides a process for establishing noise criteria for consents and licenses enabling the EPA to regulate noise emissions from scheduled premises under the Protection of the Environment Operations Act 1997.

The objectives of the NPI are to:

- provide noise criteria that is used to assess the change in both short term and long-term noise levels;
- provide a clear and consistent framework for assessing environmental noise impacts from industrial premises and industrial development proposals;
- promote the use of best-practice noise mitigation measures that are feasible and reasonable where potential impacts have been identified; and
- support a process to guide the determination of achievable noise limits for planning approvals and/or licences, considering the matters that must be considered under the relevant legislation (such as the economic and social benefits and impacts of industrial development).

The policy sets out a process for industrial noise management involving the following key steps:

1. Determine the Project Noise Trigger Levels (PNTLs) (ie criteria) for a development. These are the levels (criteria), above which noise management measures are required to be considered. They are derived by considering two factors: shorter-term intrusiveness due to changes in the noise environment; and maintaining the noise amenity of an area.
2. Predict or measure the noise levels produced by the development with regard to the presence of annoying noise characteristics and meteorological effects such as temperature inversions and wind.
3. Compare the predicted or measured noise level with the PNTL, assessing impacts and the need for noise mitigation and management measures.
4. Consider residual noise impacts - that is, where noise levels exceed the PNTLs after the application of feasible and reasonable noise mitigation measures. This may involve balancing economic, social and environmental costs and benefits from the proposed development against the noise impacts, including consultation with the affected community where impacts are expected to be significant.

5. Set statutory compliance levels that reflect the best achievable and agreed noise limits for the development.
6. Monitor and report environmental noise levels from the development.

3.1.1 Project Noise Trigger Levels

The policy sets out the procedure to determine the PNTLs relevant to an industrial development. The PNTL is the lower (ie, the more stringent) of the **Project Intrusiveness Noise Level (PINL)** and **Project Amenity Noise Level (PANL)** determined in accordance with Section 2.3 and Section 2.4 of the NPI.

3.1.2 Project Intrusiveness Noise Level (PINL)

The PINL ($L_{Aeq}(15min)$) is the RBL + 5dB and seeks to limit the degree of change a new noise source introduces to an existing environment. Hence, when assessing intrusiveness, background noise levels need to be measured.

Background noise levels need to be determined before intrusive noise can be assessed. The NPI states that background noise levels to be measured are those that are present at the time of the noise assessment and without the subject development operating. For the assessment of modifications to existing premises, the noise from the existing premises should be excluded from background noise measurements. It is noted that the exception is where the premises has been operating for a significant period of time and is considered a normal part of the acoustic environment; it may be included in the background noise assessment under the following circumstances:

- the development must have been operating for a period in excess of 10 years in the assessment period/s being considered and is considered a normal part of the acoustic environment; and,
- the development must be operating in accordance with noise limits and requirements imposed in a consent or licence and/or be applying best practice.

Where a project intrusiveness noise level has been derived in this way, the derived level applies for a period of 10 years to avoid continuous incremental increases in intrusiveness noise levels. This approach is consistent with the purpose of the intrusiveness noise level to limit significant change in the acoustic environment. The purpose of the project amenity noise level is to moderate against background noise creep.

3.1.3 Project Amenity Noise Level

The PANL is relevant to a specific land use or locality. To limit continuing increases in intrusiveness levels, the ambient noise level within an area from all combined industrial sources should remain below the recommended amenity noise levels specified in Table 2.2 (of the NPI). The NPI defines two categories of amenity noise levels:

- **Amenity Noise Levels (ANL)** – are determined considering all current and future industrial noise within a receiver area; and
- **Project Amenity Noise Level (PANL)** – is the recommended level for a receiver area, specifically focusing the project being assessed.

Additionally, Section 2.4 of the NPI states: *“to ensure that industrial noise levels (existing plus new) remain within the recommended amenity noise levels for an area, a project amenity noise level applies for each new source of industrial noise as follows”*:

PANL for new industrial developments = recommended **ANL** minus 5dBA.

The following exceptions apply when deriving the PANL:

- areas with high traffic noise levels;
- proposed developments in major industrial clusters;
- existing industrial noise and cumulative industrial noise effects; and
- greenfield sites.

The recommended amenity noise levels as per Table 2.2 of the NPI are reproduced in **Table 3**.

Table 3 Amenity Criteria			
Receiver Type	Noise Amenity Area	Time of day	Recommended amenity noise level dB LAeq
Residential	Urban	Day	60
		Evening	50
		Night	45
Commercial premises	All	When in use	65

Notes: The recommended amenity noise levels refer only to noise from industrial noise sources. However, they refer to noise from all such sources at the receiver location, and not only noise due to a specific project under consideration. The levels represent outdoor levels except where otherwise stated.

Types of receivers are defined as rural residential; suburban residential; urban residential; industrial interface; commercial; industrial – see Table 2.3 and Section 2.7.

Time of day is defined as follows: (These periods may be varied where appropriate, for example, see A3 in Fact Sheet A.) Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

3.1.4 Maximum Noise Level Assessment

The potential for sleep disturbance from maximum noise level events from a project during the night-time period needs to be considered. The NPI considers sleep disturbance to be both awakenings and disturbance to sleep stages.

Where night-time noise levels from a development/premises at a residential location exceed the following criteria, a detailed maximum noise level event assessment should be undertaken:

- LAeq(15min) 40dB or the prevailing RBL plus 5dBA, whichever is the greater, and/or
- LAmax 52dB or the prevailing RBL plus 15dBA, whichever is the greater.

A detailed assessment should cover the maximum noise level, the extent to which the maximum noise level exceeds the rating background noise level, and the number of times this happens during the night-time period.

Other factors that may be important in assessing the impacts on sleep disturbance include:

- how often the events would occur;
- the distribution of likely events across the night-time period and the existing ambient maximum events in the absence of the development;
- whether there are times of day when there is a clear change in the noise environment (such as during early morning shoulder periods); and
- current understanding of effects of maximum noise level events at night.

3.2 Independent Liquor and Gaming Authority (ILGA)

The NSW EPA's Noise Guide for Local Government (NGFLG) (2013) summaries criteria related to licensed premises. The Independent Liquor and Gaming Authority (ILGA) (formerly OLGR) criteria are reproduced from NGFLG below and have been adopted as the principle criteria for residential receivers in this assessment:

'The LA10 noise level emitted from the licensed premises shall not exceed the background noise level in an Octave Band Centre Frequency (31.5Hz – 8kHz inclusive) by more than 5dB between 7:00am and 12:00midnight at the boundary of any affected residence.

The LA10 noise level emitted from the licensed premises shall not exceed the background noise level in an Octave Band Centre Frequency (31.5Hz – 8kHz inclusive) between 12:00midnight and 7:00am at the boundary of any affected residence. Notwithstanding compliance with the above, the noise from the licensed premises shall not be audible within any habitable room in any residential premises between the hours of 12:00midnight and 7:00am.'

3.3 Interim Construction Noise Guideline

The assessment and management of noise from construction work is completed with reference to the Interim Construction Noise Guideline (ICNG). The ICNG is specifically aimed at managing noise from construction work regulated by the EPA and is used to assist in setting statutory conditions in licences or other regulatory instruments. The types of construction regulated by the EPA under the POEO Act (1997), include construction, maintenance and renewal activities carried out by a public authority, such as road upgrades as described in Schedule 1 of the POEO Act.

The ICNG sets out procedures to identify and address the impacts of construction noise on residences and other sensitive land uses. This section provides a summary of noise objectives that are applicable to the assessment. The ICNG provides two methodologies for the assessment of construction noise emissions:

- Quantitative, which is suited to major construction projects with typical durations of more than three weeks; and
- Qualitative, which is suited to short term infrastructure maintenance (< three weeks).

The methodology for a quantitative assessment requires a more complex approach, involving noise emission predictions from construction activities to the nearest relevant receptors. The qualitative assessment methodology is a more simplified approach that relies more on noise management strategies. This study has adopted a quantitative assessment approach.

The quantitative approach includes identification of potentially affected receptors, description of activities involved in the project, derivation of the construction noise management levels, quantification of potential noise impact at receptors and, provides management and mitigation recommendations.

Table 4 summarises the ICNG recommended standard hours for construction.

Table 4 Recommended Hours for Construction																									
Hour Commencing	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	
	AM	AM	AM	AM	AM	AM	AM	AM	AM	AM	AM	AM	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	
Monday	OOH Period 2							Standard Hours												OOH Period 1					
Tuesday																									
Wednesday																									
Thursday																									
Friday																									
Saturday																									
Sunday								OOH Period 1																	
Public Holiday																				OOH Period 2					

The recommended hours do not apply in the event of direction from police, or other relevant authorities, for safety reasons or where required in an emergency to avoid the loss of lives, property and/or to prevent environmental harm. Work conducted outside of standard hours are considered out of hours work (OOH). OOH periods are divided into two categories representing evening and night periods and cover the hours listed below:

Period 1 (evening/low risk period): Monday to Friday – 6pm to 10pm, Saturdays – 1pm to 6pm, Sundays – 8am to 6pm.

Period 2 (night/medium to high risk period): Monday to Friday – 10pm to 7am, Saturdays/Sundays – 6pm to 7am (8am on Sunday mornings).

3.3.1 Construction Noise Management Levels

Section 4 of the ICNG details the quantitative assessment method involving predicting noise levels and comparing them with the Noise Management Level (NML), and are important indicators of the potential level of construction noise impact. **Table 5** provides the ICNG recommended LAeq(15min) NMLs and how they are to be applied.

Table 5 Noise Management Levels

Time of Day	Management Level LAeq(15min) ¹	How to Apply
Recommended standard hours: Monday to Friday 7am to 6pm Saturday 8am to 1pm No work on Sundays or public holidays.	Noise affected RBL + 10 dB.	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured LAeq(15min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of work to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dBA.	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account times identified by the community when they are less sensitive to noise (such as before and after school for work near schools, or mid-morning or mid-afternoon for work near residences; and if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours.	Noise affected RBL + 5 dB.	A strong justification would typically be required for work outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5 dBA above the noise affected level, the proponent should negotiate with the community. For guidance on negotiating agreements see section 7.2.2.

Note 1: The Rating Background Level (RBL) is an overall single figure background level representing each assessment period over the whole monitoring period. The RBL is used to determine the construction noise management levels for noise assessment purposes and is the median of the ABL's.

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4 Noise Criteria

4.1 Background Noise Environment

To quantify the existing background noise environment of the area, unattended noise monitoring was conducted at the undeveloped project site located at 795 Medowie Road, Medowie, NSW, which was representative of the adjacent noise sensitive receivers. The monitoring location is shown in **Figure 1**.

The unattended noise survey was conducted in general accordance with the procedures described in Australian Standard AS 1055:2018, "Acoustics - Description and Measurement of Environmental Noise".

The measurements were carried out using a Svantek 977 noise analyser from Monday 25 February 2019 to Monday 4 March 2019. Observations on-site identified the surrounding locality was typical of an urban environment, with passing traffic and commercial noise audible in the area. Calibration of all instrumentation was checked prior to and following measurements. Drift in calibration did not exceed ± 0.5 dBA. All equipment carried appropriate and current NATA (or manufacturer) calibration certificates.

Data affected by adverse meteorological conditions have been excluded from the results in accordance with methodologies provided in **Fact Sheet A4** of the NPI. Residential receptors situated in surrounding area have been classified under the EPA's urban amenity category. This criterion is used in conjunction with the intrusiveness criteria to determine the limiting criteria. A summary of measured background noise levels and derived intrusive criteria are summarised in **Table 6** and plotted in graph format along with wind speed and rainfall for the monitoring period in **Appendix C**. Calibration certificates of the sound level meters used for this project are available on request.

Table 6 Background Noise Monitoring Summary

Location	Measured background noise level, RBL, dBA			Measured LAeq Noise Level, dBA		
	Day	Evening	Night	Day	Evening	Night
	7am to 6pm	6pm to 10pm	10pm to 7am	7am to 6pm	6pm to 10pm	10pm to 7am
L1	43	40	40	50	50	52

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

Note: Excludes periods of wind or rain affected data. Meteorological data obtained from the Bureau of Meteorology weather station Williamstown AWS 32.79°S 151.84°E 7.5m AMSL.

4.2 Operational Noise Criteria

4.2.1 Intrusiveness Noise Levels

The Project Intrusiveness Noise Levels (PINLs) for the project are presented in **Table 7** and have been determined based on the RBL +5dBA.

Table 7 Intrusiveness Noise Levels			
Receiver	Period ¹	Measured RBL	PINL
		dB LA90	dB LAeq(15min)
Residential Receivers (R1-R21 & FR1-FR14)	Day	43	48
	Evening	40	45
	Night	40	45

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

4.2.2 Project Amenity Noise Levels

The Project Amenity Noise Levels (PANLs) for residential receivers and other sensitive receivers potentially affected by the project are presented in **Table 8**.

Table 8 Amenity Noise Levels and Project Amenity Levels					
Receiver Type	Noise Amenity	Period ¹	Recommended	PANL	PANL
	Area		Amenity Noise Level LAeq(period) ²	LAeq(period) ³	LAeq(15min) ⁴
Residential Receivers (R1-R21 & FR1-FR14)	Urban	Day	60	55	58
		Evening	50	45	48
		Night	45	40	43
Commercial (C1-C3 & FC1-FC6)		When in use	65	60	63

Note 1: Day – the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening – the period from 6pm to 10pm; Night – the remaining periods.

Note 2: Recommended amenity noise levels as per Table 2.2 of the NPI.

Note 3: Project Amenity Noise Level equals the amenity noise level – 5dB as there is other industry in the area.

Note 4: Includes a +3dB adjustment to the amenity period level to convert to a fifteen-minute assessment period as per Section 2.2 of the NPI.

4.2.3 Project Noise Trigger Levels

The Project Noise Trigger Levels (PNTLs) are the lower of either the PINL or the PANL. **Table 9** presents the derivation of the PNTLs in accordance with the methodologies outlined in the NPI.

Table 9 Project Noise Trigger Levels				
Receiver	Period ¹	PINL dB LAeq(15min)	PANL dB LAeq(15min)	PNTL dB LAeq(15min)
Residential (R1-R21 & FR1-FR14)	Day	48	58	48
	Evening	45	48	45
	Night	45	43	43
Commercial (C1-C3 & FC1-FC6)	When in use	N/A	63	63

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

4.3 Maximum Noise Level Assessment Criteria

The maximum noise level screening criteria shown in **Table 10** is based on night time RBLs and trigger values as per Section 2.5 of the NPI and guidance provided in the RNP.

Table 10 Maximum Noise Level Assessment Trigger Levels			
Residential Receivers (R1-R21 & FR1-FR14)			
LAeq(15min)		LAmax	
40dB LAeq(15min) or RBL + 5dB		52dB LAmax or RBL + 15dB	
Trigger	40	Trigger	52
RBL 40+5dB	45	RBL 40+15dB	55
Highest	45	Highest	55

Note 1: As per Section 2.5 of the NPI, the highest of each metric are adopted as the screening criteria.

4.4 Independent Liquor and Gaming Authority (ILGA) Criteria

The relevant ILGA criteria for the period up to midnight has been derived by analysing the single octave LA90 statistical levels from the unattended noise monitoring data. The periods analysed were 10pm to 12am for the period between Tuesday 25 February 2020 and Tuesday 3 March 2020. **Table 11** reproduces the adopted ILGA noise criteria.

Table 11 ILGA Criteria									
LA10 Noise Criteria, Octave Band Centre Frequency (Hz), dBA									
	31.5	63	125	250	500	1 k	2 k	4 k	8 k
Octave Background (LA90)	10	23	25	21	29	33	28	39	32
LA10 criteria (background +5dB)	15	28	30	26	34	38	33	44	37

4.5 Construction Noise Management Levels

The Construction Noise Management Levels established in accordance with the ICNG for the project are presented in **Table 12**.

Table 12 Construction Noise Management Levels			
Location	Period ¹	Rating Background Level (RBL), dB LA90	Noise Management Level dB LAeq(15min) (RBL+10dB)
Residential (R1-R21 & FR1-FR14)	Day	43	53
Commercial (C1-C3 & FC1-FC6)	Day	N/A	70

Note 1: See Table 4 of this report for Recommended Standard Hours for Construction.

5 Noise Assessment Methodology

A computer model was developed to quantify project noise emissions to neighbouring receivers for typical construction activities and operations. DGMR (iNoise, Version 2020.0) noise modelling software was used to quantify noise emissions from typical construction activities and operations. iNoise is a new intuitive and quality assured software for industrial noise calculations in the environment. 3D noise modelling is considered industry best practice for assessing noise emissions from projects.

The model incorporated a three-dimensional digital terrain map giving all relevant topographic information used in the modelling process. Additionally, the model uses relevant noise source data, ground type, attenuation from barrier or buildings and atmospheric information to predict noise levels at the nearest potentially affected receivers.

The model calculation method used to predict noise levels was in accordance with ISO 9613-1 'Acoustics - Attenuation of sound during propagation outdoors. Part 1: Calculation of the absorption of sound by the atmosphere' and ISO 9613-2 'Acoustics - Attenuation of sound during propagation outdoors. Part 2: General method of calculation'. The ISO 9613 standard from 1996 is the most used noise prediction method worldwide. Many countries refer to ISO 9613 in their noise legislation. However, the ISO 9613 standard does not contain guidelines for quality assured software implementation, which leads to differences between applications in calculated results. In 2015 this changed with the release of ISO/TR 17534-3. This quality standard gives clear recommendations for interpreting the ISO 9613 method. iNoise fully supports these recommendations. The models and results for the 19 test cases are included in the software.

5.1 Sound Power Levels

Sound power data for the project were referenced from the MAC noise source data base for similar developments. The sound power levels for noise sources adopted for this assessment are summarised in **Table 13**.

Table 13 Acoustically Significant Sources - Sound Power Levels (re 10-12 Watts)			
Item and number modelled per 15 minutes	Individual Sound Power Level, dB LAeq(15min)	Total source Sound Power Level, dB LAeq(15min)	Source Height
Operation			
Rooftop Extractor Fan (x6)	73	81	0.5m
Truck Deliveries (x1)	92	92	1.5m
External Carpark Car idle, start up and drive off (x10)	73	83	0.5m
Group of 10 children Playing (x1)	87	87	1.5m
Group of 4 External Patrons Talking with low level amplified music (x18)	70	83	1.0m
Gaming Lounge Noise	78	78	1.5m
Internal Music and Patrons- Dining Area	94	94	1.5m
Sleep disturbance assessment (LAmax), Night-time periods (10pm to 7am)			
Customer Yelling		92	1.0m
Car Door Slam		87	1.0m
Construction Fleet			
Combined Construction Fleet		108	1.5m

Table 14 presents the sound power levels for each source included in the ILGA assessment in this report.

Table 14 Sound Power Levels										
Item	Octave Band Sound Power Level									Total dBA
	31.5	63	125	250	500	1000	2000	4000	8000	
ILGA Assessment (dB LA10)										
Gaming Lounge Noise	47	59	64	70	76	75	73	66	69	81
Internal Music/Band Noise	44	76	80	86	89	92	92	88	77	97
Group of 4 External Patrons										
Talking with low level amplified music (x18)	39	54	59	65	70	70	69	64	57	73

5.2 Noise Attenuation Assumptions and Controls

The noise model adopted the following noise controls:

- Loading dock wall (eastern side of the loading bay) as per the site plans in **Appendix B**. The fence should be a minimum of 2.0m above relative ground level and consist of materials with a surface density of at least 10kg/m^2 (such as lapped and capped timber or equivalent) and not contain any gaps;
- Window glazing is assumed to a minimum thickness of 4mm;
- Windows are assumed closed during live internal music performances;
- There will be no external live music performances; and
- It is assumed that any mechanical plant for cooling and refrigeration of the project are located internally in the basement area and are adequately screened to surrounding receivers. Accordingly, mechanical plant for cooling and refrigeration have not been included in the assessment. Note, this assessment has included exhaust / extraction fans associated with the kitchen.

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6 Assessment of Noise Impacts

6.1 Operational Noise Results for Residential Receptors (Combined Sites)

Noise predictions from all sources have been quantified to surrounding receivers to the project and are presented in **Table 15**. The predictions are considered a worse case assessment. Noise levels from combined activities are predicted to satisfy the relevant NPI noise criteria at all assessed receivers during all assessment periods.

Table 15 Combined Noise Predictions – All Receivers

Residential Receivers							
Receiver	Predicted Noise Level dB LAeq(15min)			PNTL dB LAeq(15min)			Compliant
	Day	Evening	Night	Day	Evening	Night	
R1	<35	<35	<35	48	45	43	✓
R2	<35	<35	<35	48	45	43	✓
R3	<35	<35	<35	48	45	43	✓
R4	<35	<35	<35	48	45	43	✓
R5	<35	<35	<35	48	45	43	✓
R6	<35	<35	<35	48	45	43	✓
R7	<35	<35	<35	48	45	43	✓
R8	<35	<35	<35	48	45	43	✓
R9	<35	<35	<35	48	45	43	✓
R10	<35	<35	<35	48	45	43	✓
R11	<35	<35	<35	48	45	43	✓
R12	40	<35	<35	48	45	43	✓
R13	42	<35	<35	48	45	43	✓
R14	<35	<35	<35	48	45	43	✓
R15	<35	<35	<35	48	45	43	✓
R16	<35	<35	<35	48	45	43	✓
R17	44	<35	<35	48	45	43	✓
R18	<35	<35	<35	48	45	43	✓
R19	<35	<35	<35	48	45	43	✓
R20	38	<35	<35	48	45	43	✓
R21	<35	<35	<35	48	45	43	✓
FR1	<35	<35	<35	48	45	43	✓
FR2	<35	<35	<35	48	45	43	✓
FR3	38	38	<35	48	45	43	✓
FR4	38	37	36	48	45	43	✓
FR5	37	36	35	48	45	43	✓
FR6	36	<35	<35	48	45	43	✓
FR7	35	<35	<35	48	45	43	✓
FR8	35	<35	<35	48	45	43	✓

Table 15 Combined Noise Predictions – All Receivers

Residential Receivers							
Receiver	Predicted Noise Level dB LAeq(15min)			PNTL dB LAeq(15min)			Compliant
	Day	Evening	Night	Day	Evening	Night	
FR9	38	<35	<35	48	45	43	✓
FR10	44	35	<35	48	45	43	✓
FR11	48	37	36	48	45	43	✓
FR12	48	37	36	48	45	43	✓
FR13	47	36	35	48	45	43	✓
FR14	46	36	<35	48	45	43	✓
Other Receivers							
Rec	Period	Predicted Noise Level dB LAeq(15min)		PNTL dB LAeq(15min)		Compliant	
C1	When in Use	35		63		✓	
C2	When in Use	<35		63		✓	
C3	When in Use	<35		63		✓	
FC1	When in Use	37		63		✓	
FC2	When in Use	40		63		✓	
FC3	When in Use	<35		63		✓	
FC4	When in Use	40		63		✓	
FC5	When in Use	48		63		✓	
FC6	When in Use	50		63		✓	

6.2 Maximum Noise Levels Assessment Results

In assessing maximum noise events, typical L_{Amax} noise levels from transient events were assessed to the nearest residential receivers. For the maximum noise assessment, sound power levels of 102dBA for delivery impact and 92dBA for customer yelling is adopted for this assessment with the night-time operational scenario adopted for the awakenings assessment.

Predicted noise levels from $L_{Aeq}(15min)$ and L_{Amax} events for assessed receivers are presented in **Table 16**. Results identify that the maximum noise events screening criteria will be satisfied for all assessed receivers.

Table 16 Maximum Noise Levels Assessment (Night)¹

Receiver	Predicted Noise Level			Screening Criteria		Compliant
	dB LAeq(15min)	dB LAmax		dB LAeq(15min)	dB LAmax	
		Yelling Western	Yelling Southern			
		Veranda	Veranda			
R1	<35	<35	<35	45	55	✓
R2	<35	<35	<35	45	55	✓
R3	<35	<35	<35	45	55	✓
R4	<35	<35	<35	45	55	✓
R5	<35	<35	<35	45	55	✓
R6	<35	<35	<35	45	55	✓
R7	<35	<35	<35	45	55	✓
R8	<35	<35	<35	45	55	✓
R9	<35	<35	<35	45	55	✓
R10	<35	<35	<35	45	55	✓
R11	<35	<35	<35	45	55	✓
R12	<35	<35	<35	45	55	✓
R13	<35	<35	36	45	55	✓
R14	<35	<35	<35	45	55	✓
R15	<35	<35	<35	45	55	✓
R16	<35	<35	<35	45	55	✓
R17	37	<35	38	45	55	✓
R18	<35	<35	<35	45	55	✓
R19	<35	<35	<35	45	55	✓
R20	<35	<35	37	45	55	✓
R21	<35	<35	<35	45	55	✓
FR1	<35	44	<35	45	55	✓
FR2	36	47	<35	45	55	✓
FR3	36	49	<35	45	55	✓
FR4	36	<35	<35	45	55	✓
FR5	35	<35	<35	45	55	✓
FR6	<35	<35	<35	45	55	✓
FR7	<35	<35	<35	45	55	✓
FR8	<35	<35	<35	45	55	✓
FR9	<35	<35	<35	45	55	✓
FR10	38	<35	38	45	55	✓
FR11	40	<35	40	45	55	✓
FR12	41	<35	42	45	55	✓
FR13	40	<35	42	45	55	✓
FR14	40	<35	42	45	55	✓

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

6.3 Independent Liquor and Gaming Authority (ILGA) Noise Assessment

Noise assessment calculations have been completed to assess against the ILGA requirements for patron noise, gaming room noise and internal live music performances. Results of the calculations are presented in **Table 17** for the night period for the nearest potentially most affected residential receivers, R13, FR02 and FR12.

Table 17 ILGA Noise Assessment Results

LA10 Noise Criteria, Octave Band Centre Frequency (Hz), dBA									
dBA	31.5	63	125	250	500	1 k	2 k	4 k	8 k
Receiver - R13									
Received level	2	14	15	20	25	25	24	17	11
Criteria	15	28	30	26	34	38	33	44	37
Exceedance	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Receiver - FR02									
Received level	1	13	14	20	23	22	20	12	0
Criteria	15	28	30	26	34	38	33	44	37
Exceedance	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Receiver - FR12									
Received level	4	17	18	22	28	29	29	22	11
Criteria	15	28	30	26	34	38	33	44	37
Exceedance	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

Calculations of noise emissions from the project to the nearest most affected residential receivers are identified to satisfy the ILGA noise criteria.

6.4 Construction Noise Results

Table 18 presents the results of modelled construction noise emissions for each individual building. Predictions identify that levels from construction activities have the potential to be above the relevant noise management levels at several residential receivers. Accordingly, noise controls and management measures are recommended to be implemented during noise intensive construction activities for the site as a best practice measure.

Table 18 Construction Noise Levels – All Receivers			
Receiver	Predicted Noise Level, dB LAeq	Management Level dB LAeq	Compliant
R1	38	53	✓
R2	40	53	✓
R3	43	53	✓
R4	35	53	✓
R5	43	53	✓
R6	37	53	✓
R7	57	53	X
R8	54	53	X
R9	49	53	✓
R10	37	53	✓
R11	45	53	✓
R12	58	53	X
R13	54	53	X
R14	36	53	✓
R15	46	53	✓
R16	50	53	✓
R17	54	53	X
R18	50	53	✓
R19	36	53	✓
R20	54	53	X
R21	51	53	✓
FR1	58	53	X
FR2	59	53	X
FR3	65	53	X
FR4	66	53	X
FR5	66	53	X
FR6	64	53	X
FR7	62	53	X
FR8	62	53	X
FR9	62	53	X
FR10	57	53	X
FR11	59	53	X

Table 18 Construction Noise Levels – All Receivers

Receiver	Predicted Noise Level, dB LAeq	Management Level dB LAeq	Compliant
FR12	59	53	X
FR13	59	53	X
FR14	58	53	X
C1	50	70	✓
C2	49	70	✓
C3	52	70	✓
FC1	56	70	✓
FC2	54	70	✓
FC3	49	70	✓
FC4	63	70	✓
FC5	60	70	✓
FC6	62	70	✓

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

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7 Construction Recommendations

The results of the noise assessment demonstrate that emissions during standard construction hours have the potential to be above the ICNG noise management levels at several of the nearest receivers to the project. Accordingly, it is recommended that noise management and mitigation measures be adopted during noise intensive construction activities to limit impacts on surrounding receivers.

Recommendations for consideration during construction activities for this project may include:

- implement boundary fences/retaining walls as early as possible to maximise their attenuation benefits to surrounding receivers;
- toolbox and induction of personnel prior to shift to discuss noise control measures that may be implemented to reduce noise emissions to the community;
- where possible use mobile screens or construction hording to act as barriers between construction works and receivers;
- all plant should be shut down when not in use. Plant to be parked/started at farthest point from relevant assessment locations;
- operating plant in a conservative manner (no over-revving);
- selection of the quietest suitable machinery available for each activity;
- avoidance of noisy plant/machinery working simultaneously where practicable;
- minimisation of metallic impact noise;
- all plant are to utilise a broadband reverse alarm in lieu of the traditional hi frequency type reverse alarm; and
- undertake letter box drops to notify receivers of potential works.

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8 Discussion and Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has conducted a Noise Assessment (NA) to address potential emissions associated with the proposed Tavern to be established at Lot 1 Muir Street, Medowie, NSW.

The results of the NA demonstrate that cumulative emissions from the project would satisfy the relevant NPI and ILGA criteria at all receivers for all assessment periods based on the noise controls and assumptions outlined in **Section 5.2** of this report.

Furthermore, sleep disturbance is not anticipated, as emissions from impact noise are predicted to remain below the EPA for maximum noise level screening criteria.

Construction noise emissions are predicted to be above the relevant noise management levels during construction works at several residential receivers. Accordingly, noise control and management measures as per **Section 7** of this report be adopted where feasible during noise intensive periods to minimise noise impacts.

Based the Noise Assessment results, it is recommended Council approve the development based on noise attenuation assumptions (**Section 5.2**) and referenced architectural plans for the development provided in this report.

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Appendix A – Glossary of Terms

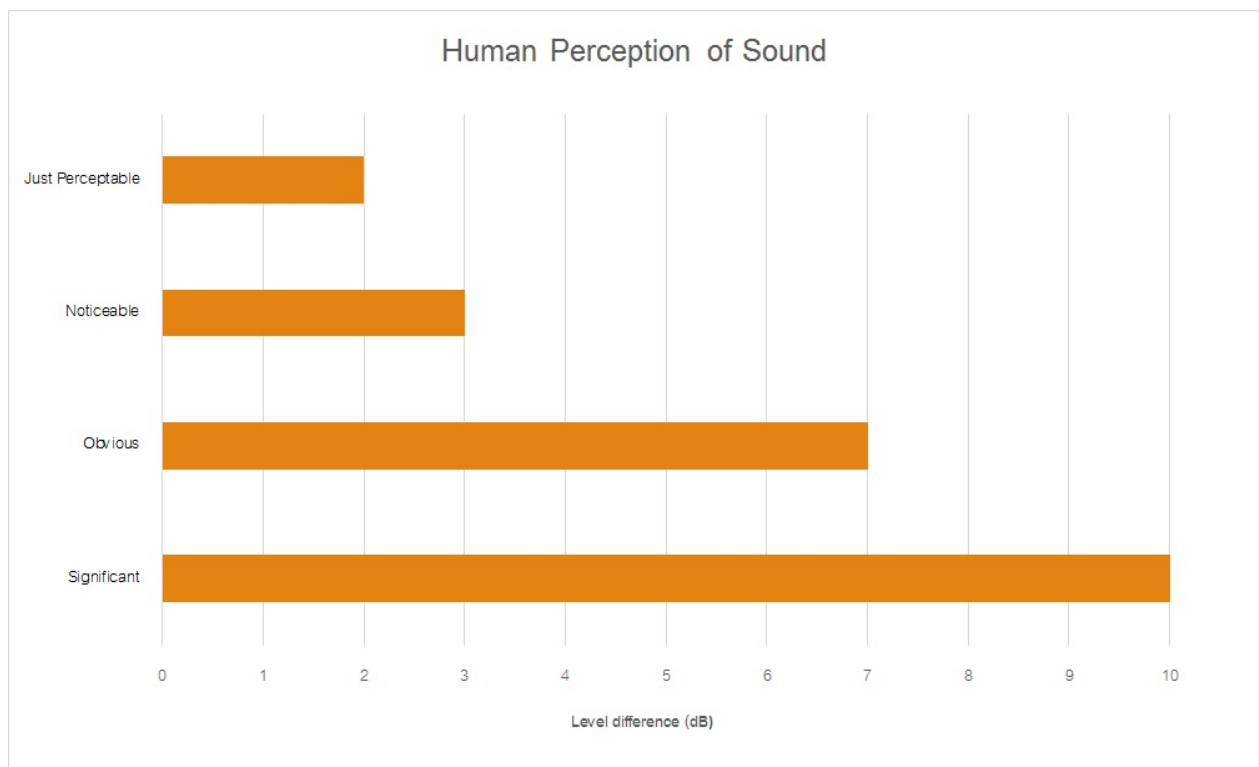
Table A1 provides a number of technical terms have been used in this report.

Table A1 Glossary of Terms	
Term	Description
1/3 Octave	Single octave bands divided into three parts
Octave	A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit.
ABL	Assessment Background Level (ABL) is defined in the NPI as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured LA90 statistical noise levels.
Ambient Noise	The noise associated with a given environment. Typically, a composite of sounds from many sources located both near and far where no particular sound is dominant.
A Weighting	A standard weighting of the audible frequencies designed to reflect the response of the human ear to noise.
dBA	Noise is measured in units called decibels (dB). There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear.
dB(Z), dB(L)	Decibels Linear or decibels Z-weighted.
Hertz (Hz)	The measure of frequency of sound wave oscillations per second - 1 oscillation per second equals 1 hertz.
LA10	A noise level which is exceeded 10 % of the time. It is approximately equivalent to the average of maximum noise levels.
LA90	Commonly referred to as the background noise, this is the level exceeded 90 % of the time.
LAeq	The summation of noise over a selected period of time. It is the energy average noise from a source, and is the equivalent continuous sound pressure level over a given period.
LAm _{ax}	The maximum root mean squared (rms) sound pressure level received at the microphone during a measuring interval.
RBL	The Rating Background Level (RBL) is an overall single figure background level representing each assessment period over the whole monitoring period. The RBL is used to determine the intrusiveness criteria for noise assessment purposes and is the median of the ABL's.
Sound power level (LW)	<p>This is a measure of the total power radiated by a source. The sound power of a source is a fundamental location of the source and is independent of the surrounding environment. Or a measure of the energy emitted from a source as sound and is given by:</p> $= 10 \cdot \log_{10} (W/W_0)$ <p>Where: W is the sound power in watts and W₀ is the sound reference power at 10-12 watts.</p>

Table A2 provides a list of common noise sources and their typical sound level.

Table A2 Common Noise Sources and Their Typical Sound Pressure Levels (SPL), dBA	
Source	Typical Sound Level
Threshold of pain	140
Jet engine	130
Hydraulic hammer	120
Chainsaw	110
Industrial workshop	100
Lawn-mower (operator position)	90
Heavy traffic (footpath)	80
Elevated speech	70
Typical conversation	60
Ambient suburban environment	40
Ambient rural environment	30
Bedroom (night with windows closed)	20
Threshold of hearing	0

Figure A1 – Human Perception of Sound



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Appendix B – Project Site Plans



MEDOWIE MIXED USE

ARCHITECTURAL DRAWING SCHEDULE

ID	DRAWING	REV	SCALE	PAGE
A00	COVER SHEET	D	NTS	A3
A01	SITE PLAN/ROOF PLAN	F	1:200	A3
A02	SITE ANALYSIS PLAN	D	1:200	A3
A03	BASEMENT LEVEL	G	1:200	A3
A04	GROUND FLOOR	G	1:200	A3
A05	ELEVATIONS	F	1:200	A3
A06	3D PERSPECTIVES PAGE 1	D	NTS	A3
A07	3D PERSPECTIVES PAGE 2	D	NTS	A3
A08	SCHEDULE OF MATERIALS & FINISHES	D	NTS	A3
A09	NOTIFICATION PLAN	D	VARIOUS	A3

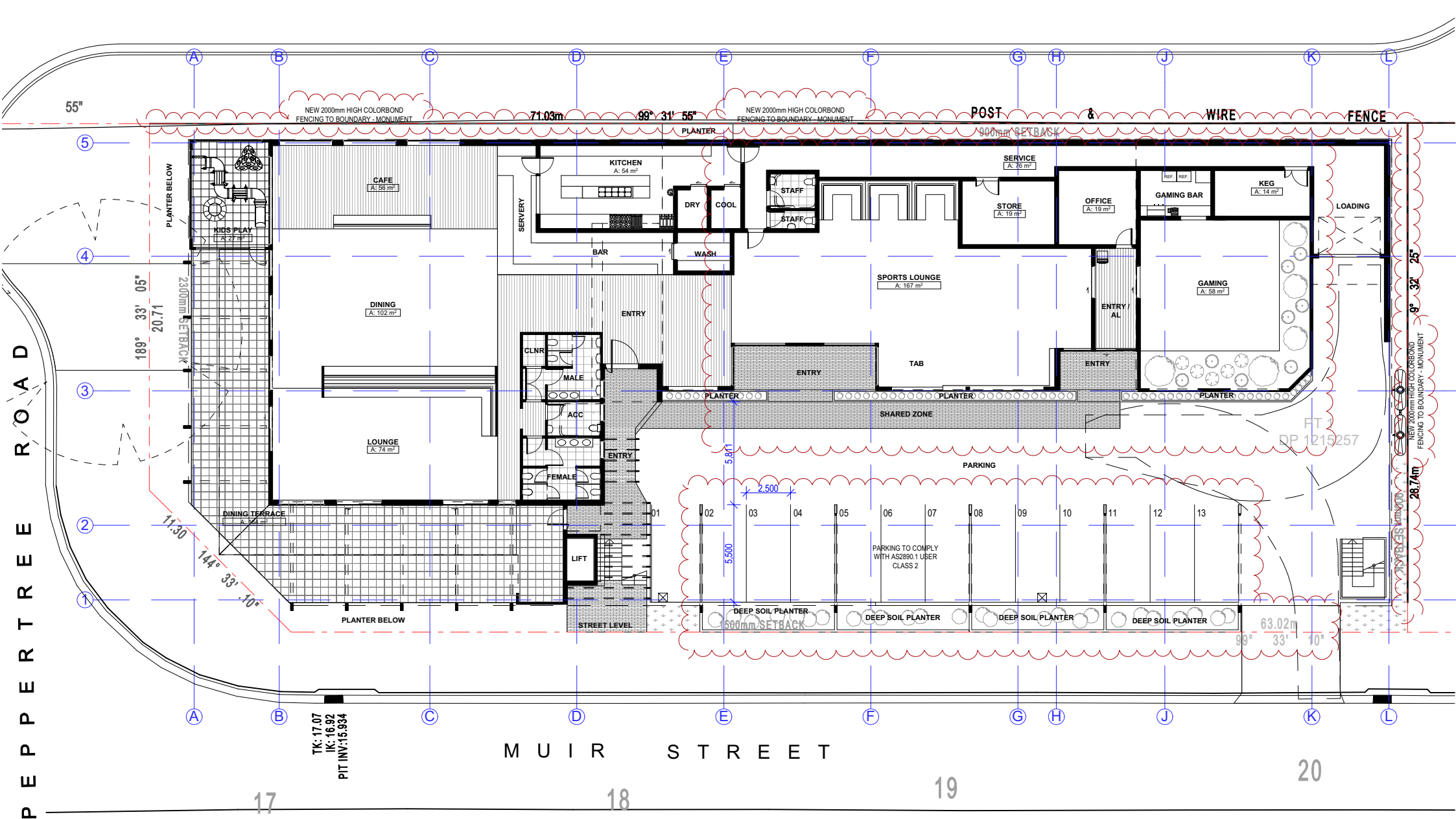
CORNER MUIR STREET & PEPPERTREE
ROAD, MEDOWIE, NSW 2300

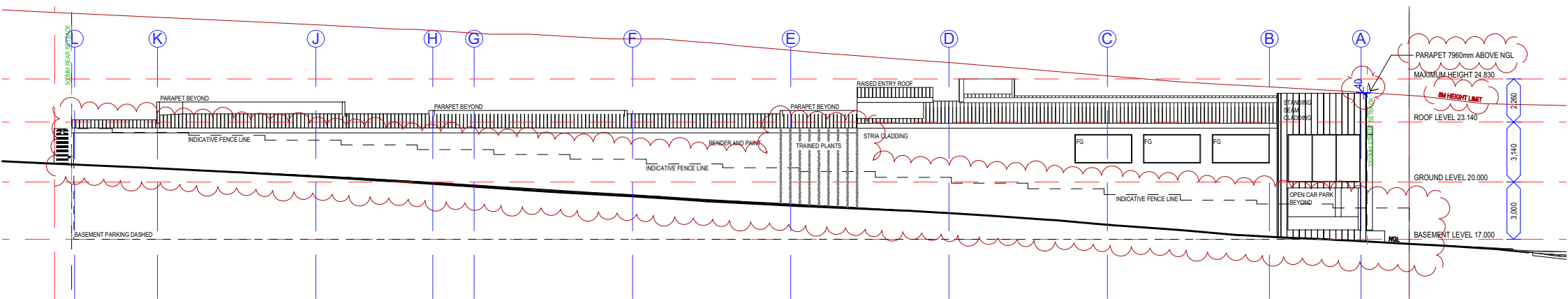
DA ISSUE

REVISION G



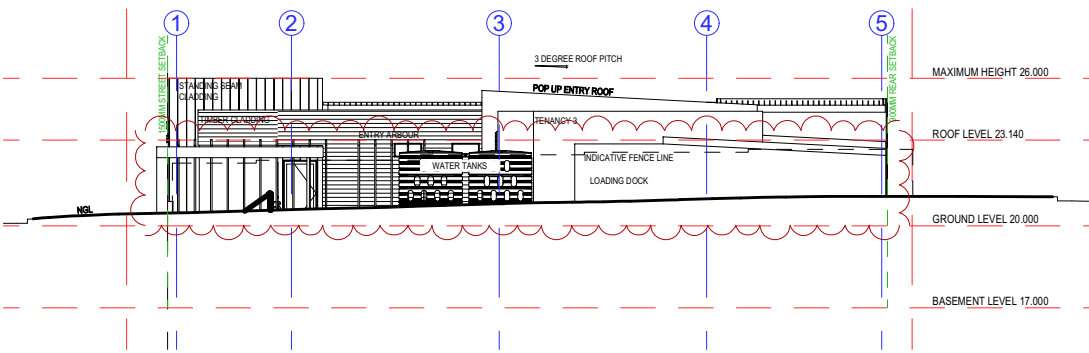
PEPPER TREE ROAD





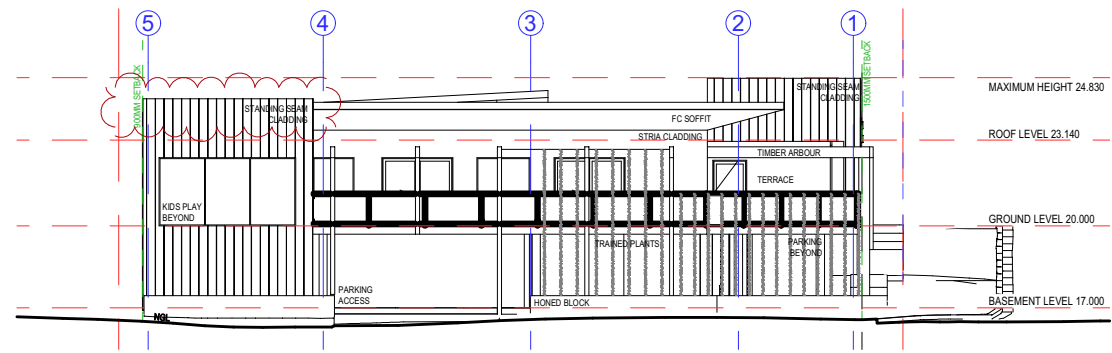
NORTH ELEVATION

1:200



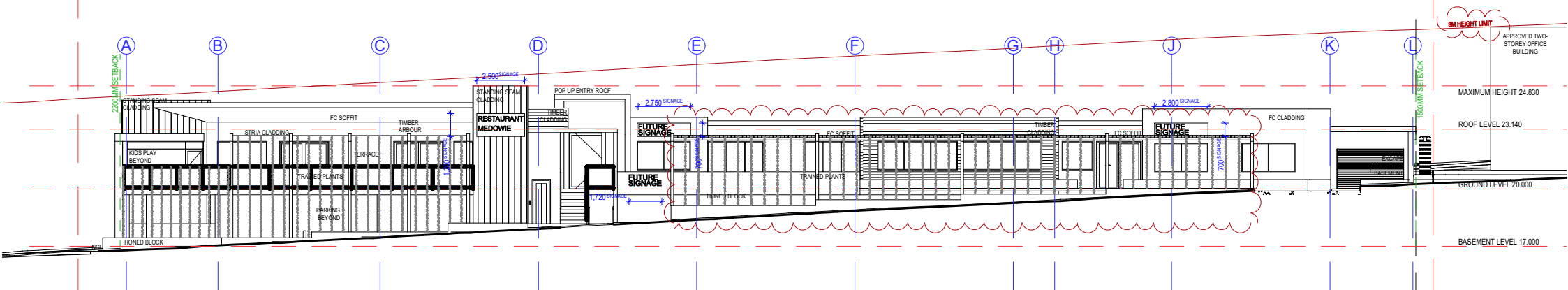
EAST ELEVATION

1:200



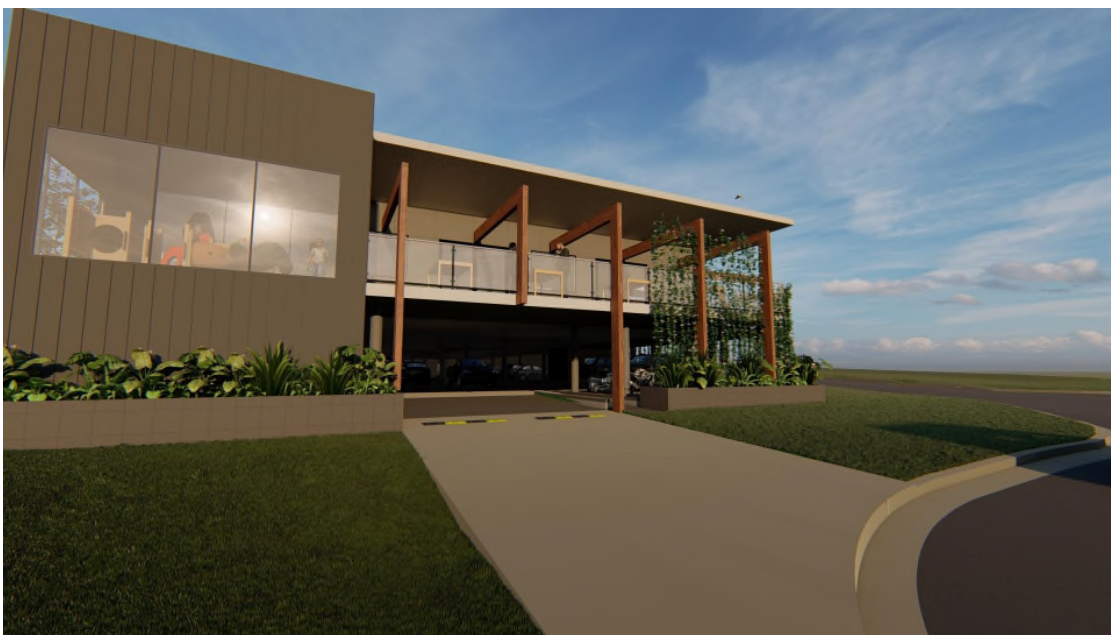
WEST ELEVATION

1:200

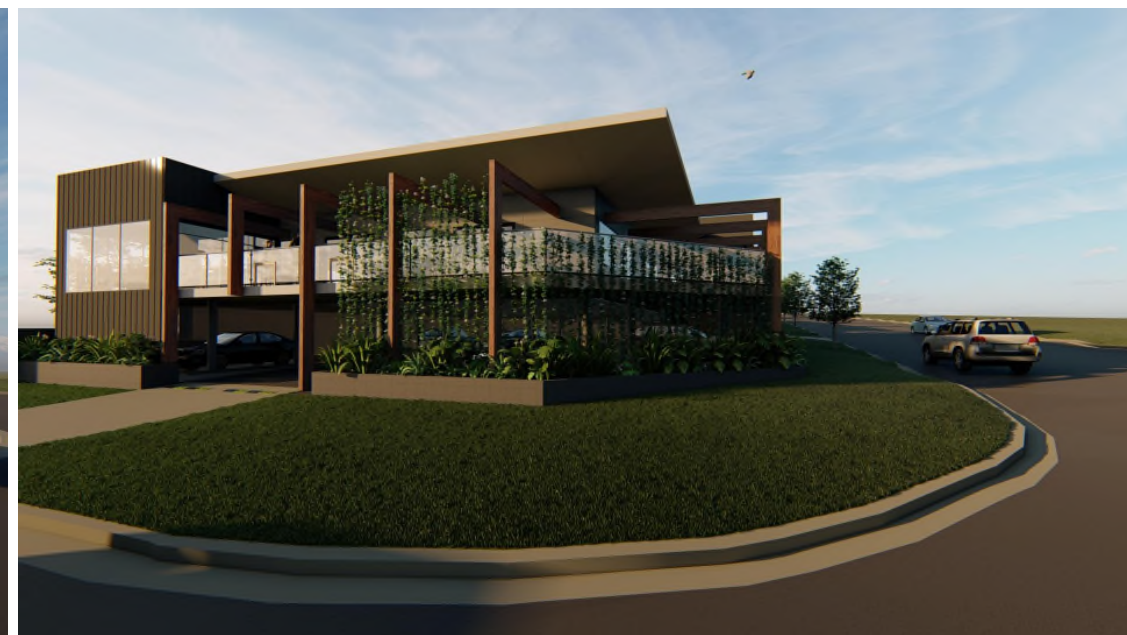


SOUTH ELEVATION

1:200



VIEW FROM WEST TOWARD KIDS PLAY AND CAR PARK



WESTERN ELEVATION



VIEW OF CORNER



ENTRY VIEWED FROM SOUTH



ENTRY SEQUENCE



UPPER CAR PARK VIEW



DRONE VIEW

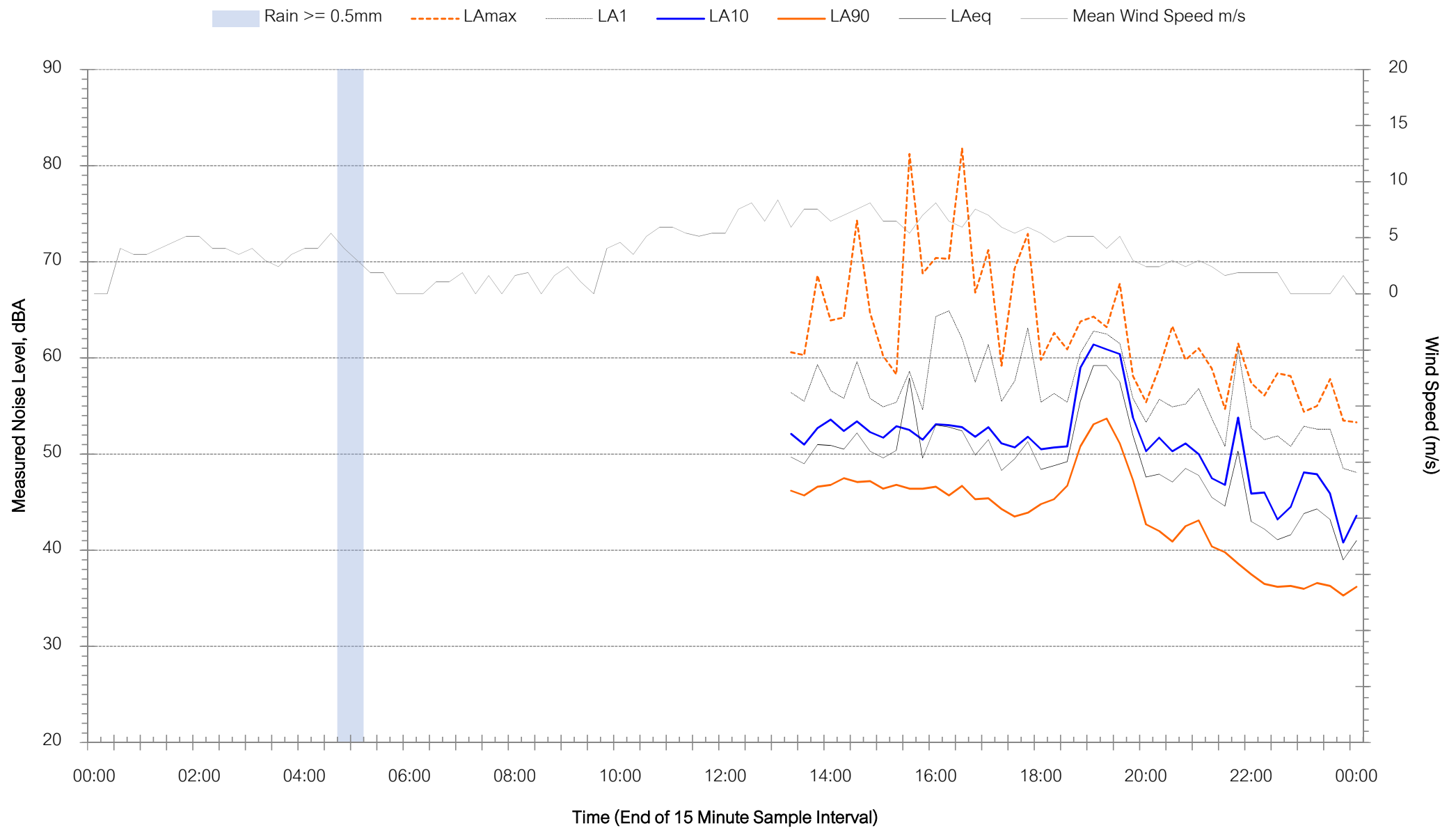


NORTHERN BOUNDARY VIEW

Appendix C – Noise Monitoring Charts

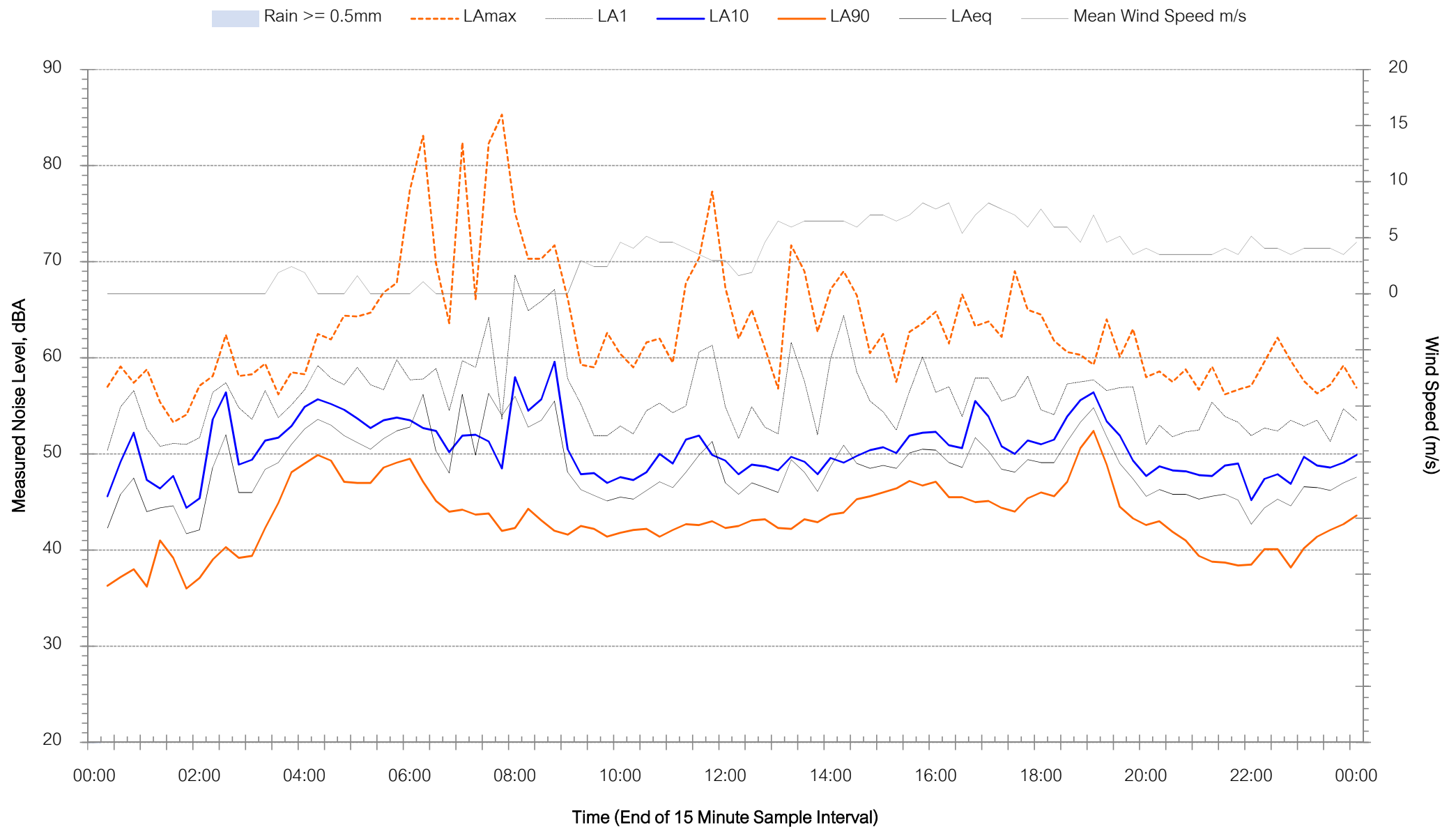
Background Noise Levels

795 Medowie Road, Medowie - Monday 25 February 2019



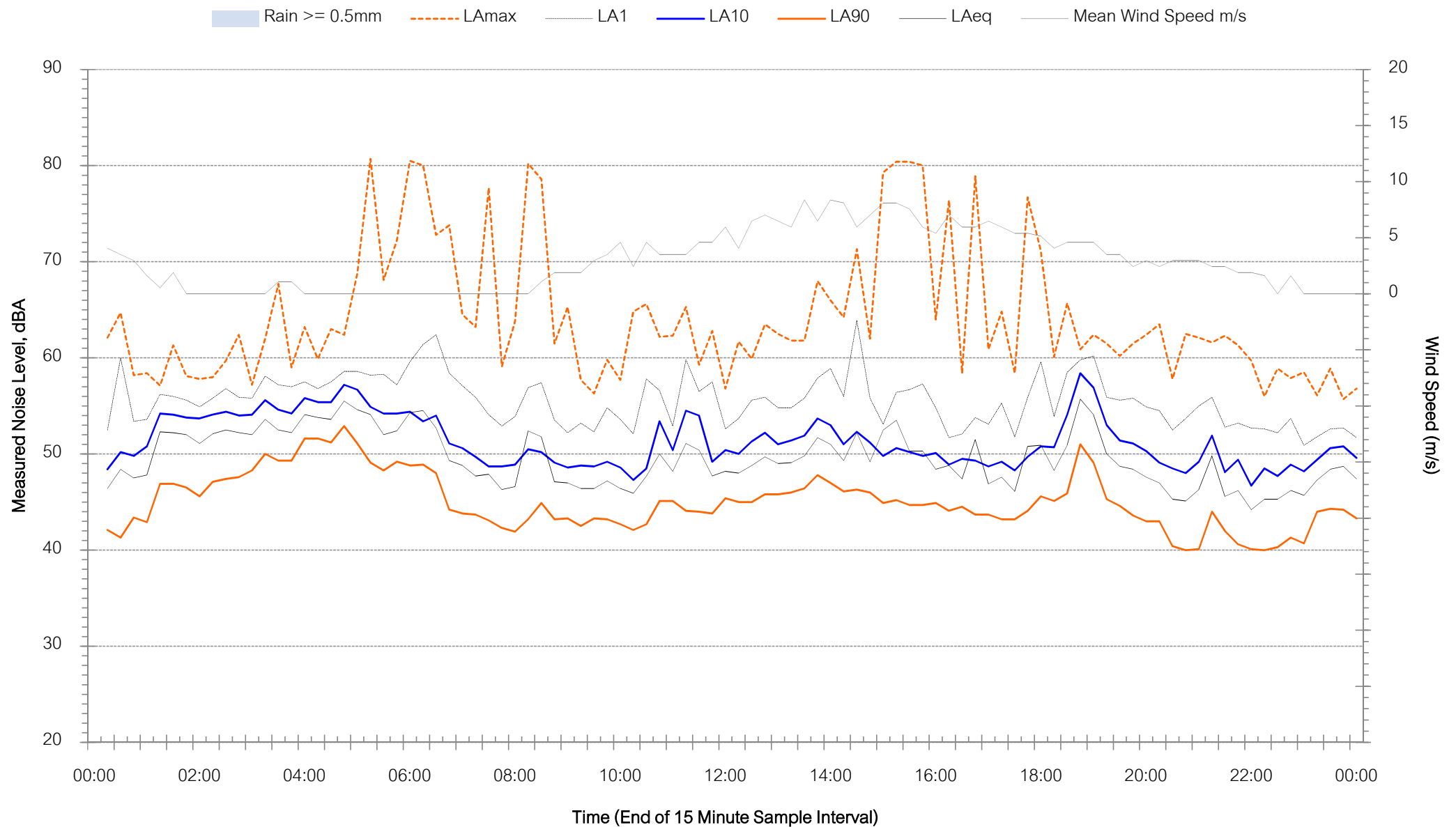
Background Noise Levels

795 Medowie Road, Medowie - Tuesday 26 February 2019



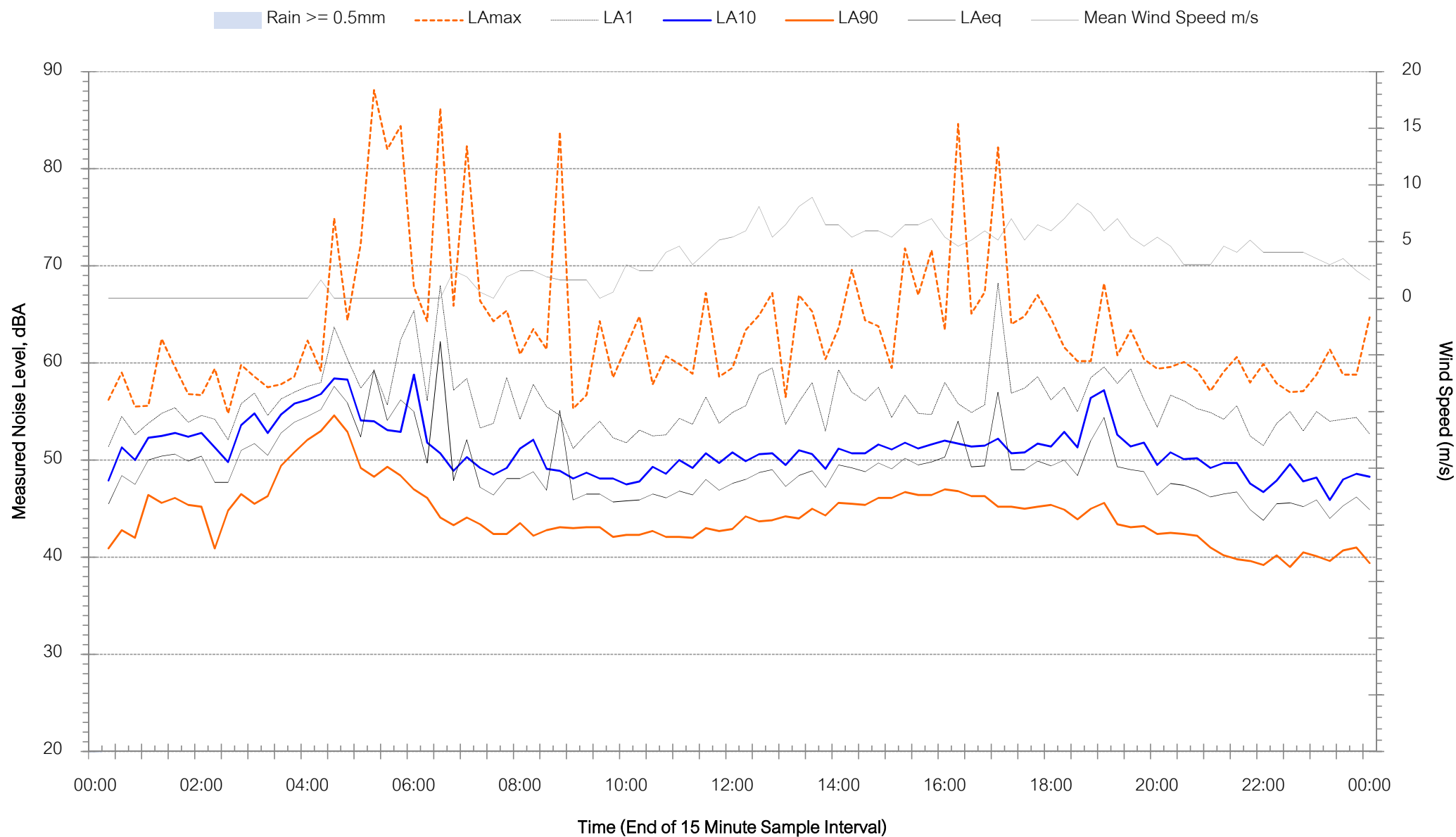
Background Noise Levels

795 Medowie Road, Medowie - Wednesday 27 February 2019



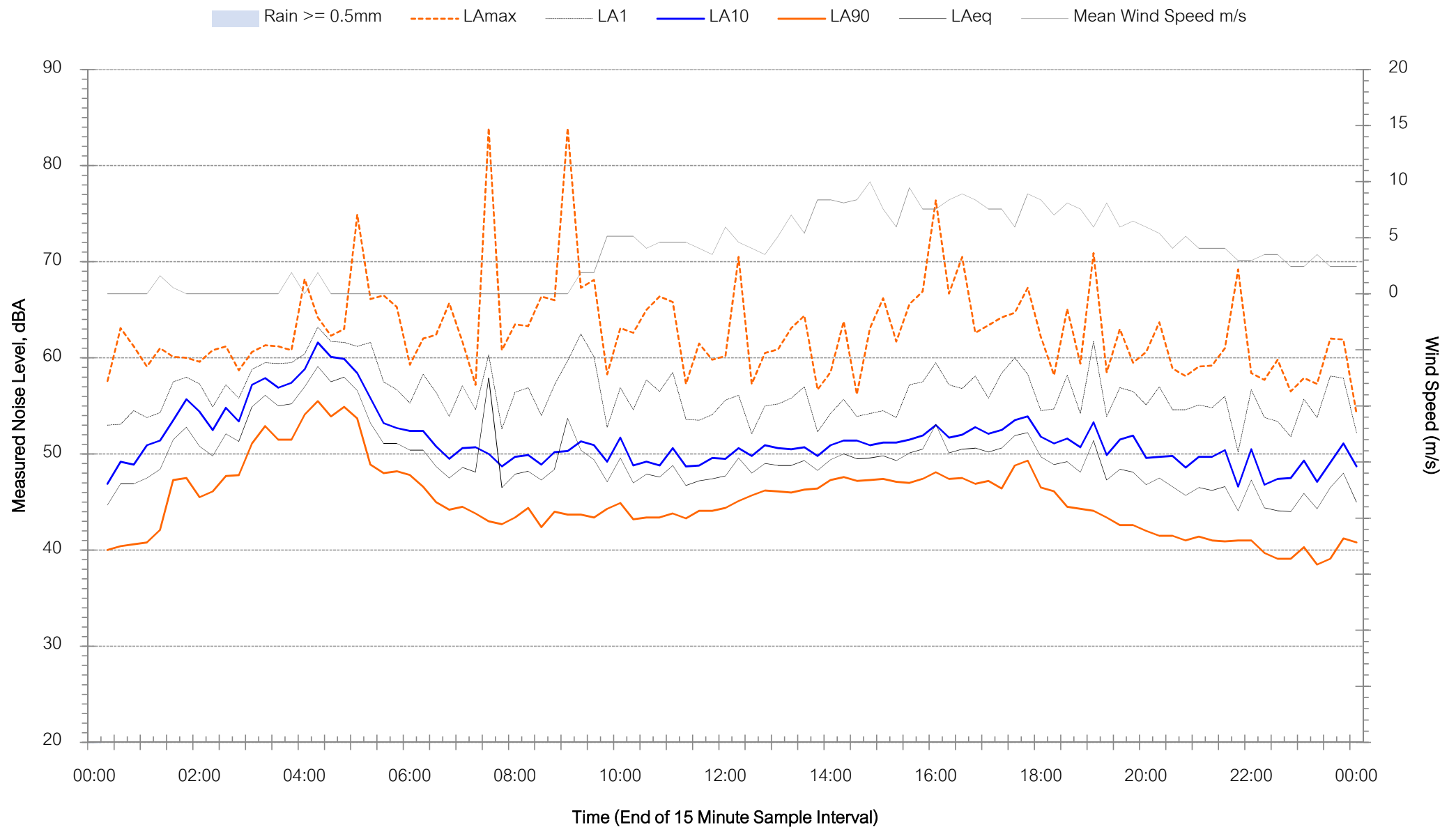
Background Noise Levels

795 Medowie Road, Medowie - Thursday 28 February 2019



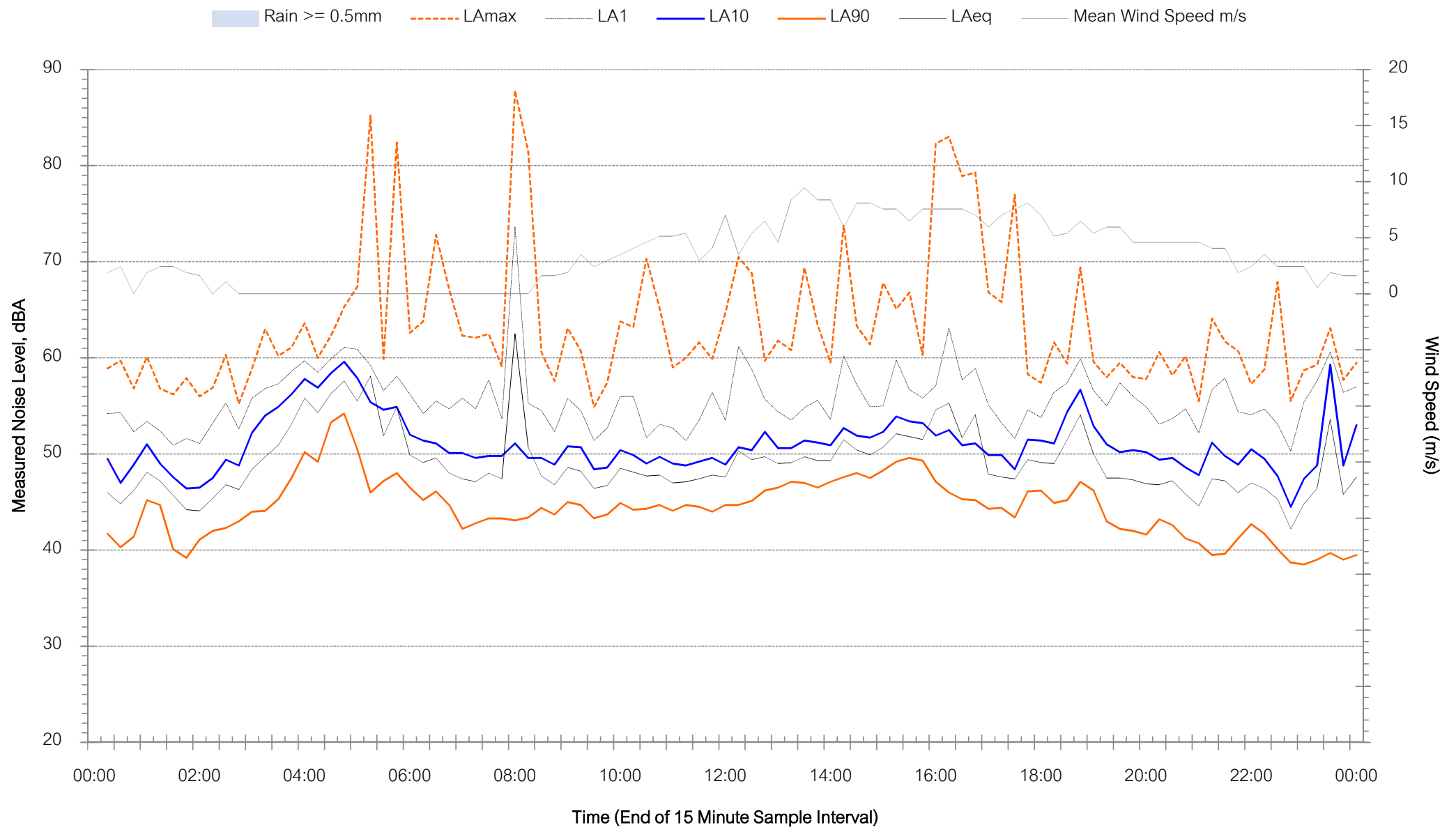
Background Noise Levels

795 Medowie Road, Medowie - Friday 1 March 2019



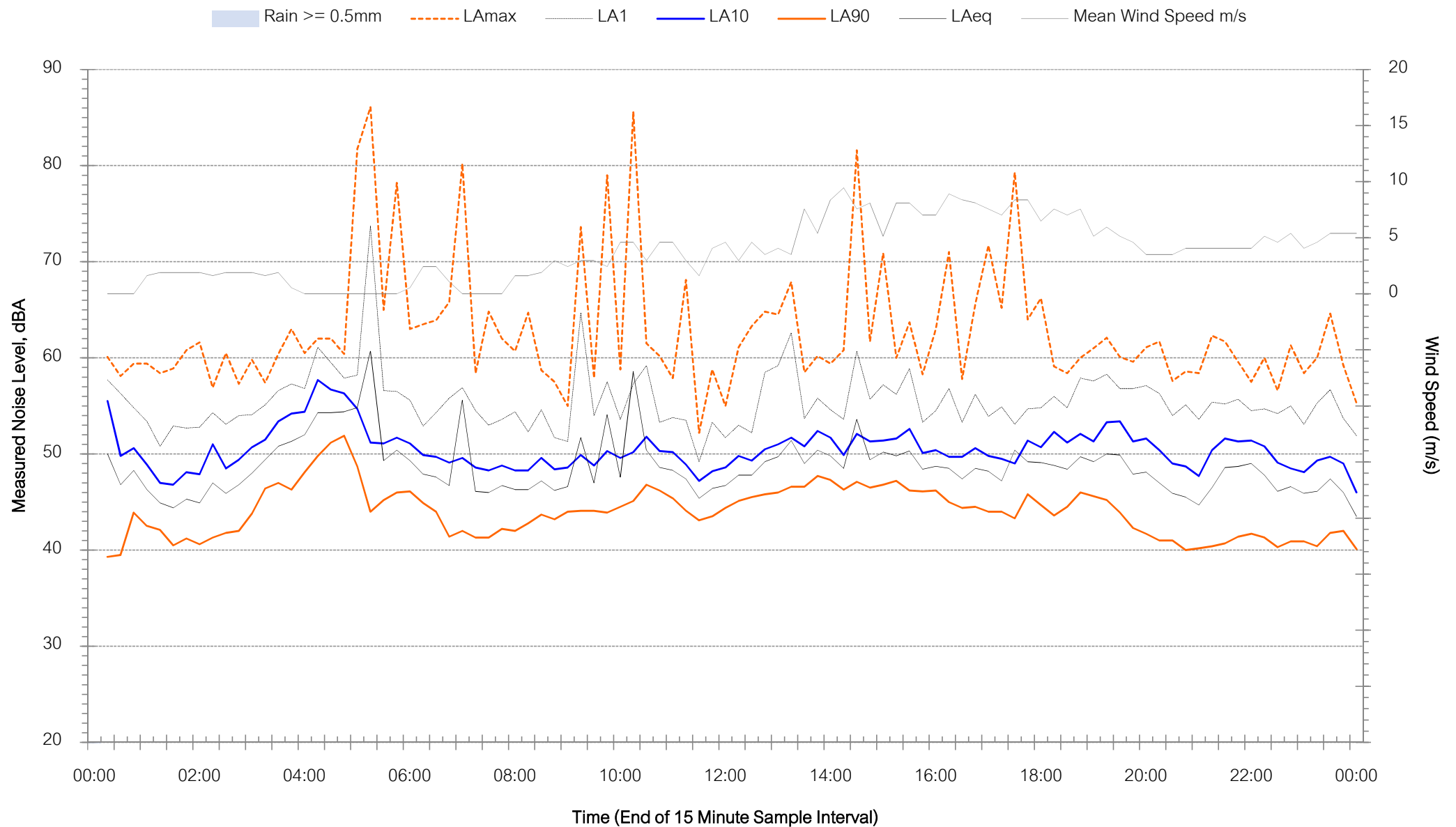
Background Noise Levels

795 Medowie Road, Medowie - Saturday 2 March 2019



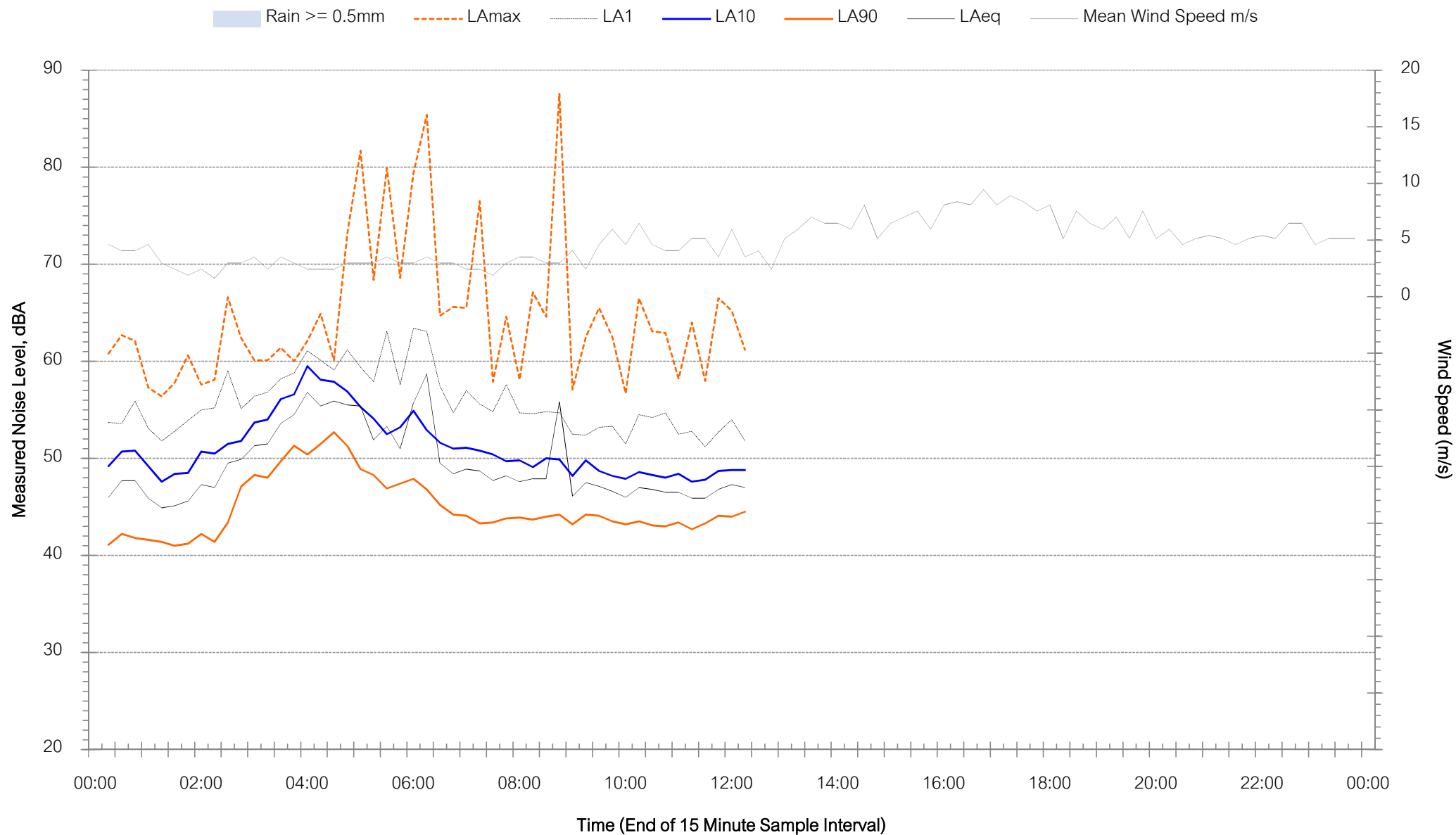
Background Noise Levels

795 Medowie Road, Medowie - Sunday 3 March 2019



Background Noise Levels

795 Medowie Road, Medowie - Monday 4 March 2019



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