Noise Assessment

Proposed Child Care Centre and Retail Premises
795 Medowie Road
Medowie, NSW.

Prepared for: Medowie Retail Unit Trust
July 2019
MAC190867RP1V1

Muller Acoustic Consulting

Document Information

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Proposed Child Care Centre and Retail Premises

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CONTENTS

1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has been commissioned by Medowie Retail Unit Trust to prepare an Acoustic Assessment (AA) to address potential noise emissions associated with the proposed Child Care Centre (CCC) and Retail Premises (RP) ('the project') to be established at 795 Medowie Road, Medowie, NSW.

The project will consist of a Child Care Centre, medical and retail premises building and an additional retail premises building. A McDonald's Operation is proposed to be located adjacent to the project site however is subject to a separate DA. The NA has quantified potential operational noise emissions pertaining to customer vehicles, delivery/collection vehicles, children playing in the CCC and mechanical plant associated with the proposed buildings. The NA recommends reasonable and feasible noise controls where required.

Additionally, the assessment has quantified the noise intrusion from surrounding noise sources to the CCC. 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;
- Association of Australian Acoustical Consultants (AAAC), Guideline for Child Care Centre Acoustic Assessment (GCCCAA);
- 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 795 Medowie Road, Medowie, NSW, which is located in a mixed commercial and residential area. The site is bounded to the west by Peppertree Road, to the east by Medowie Road and north by Muir Road. A Woolworths supermarket is located immediately to the south of the project site. A proposed McDonald's Operation is also proposed to be located on the project site, however this is subject to a separate DA. The site location is shown in **Figure 1**.

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 three buildings including a Child Care Centre (CCC), medical and retail premises building and an additional retail premises building. The single storey CCC will include outside playgrounds on the south east of the site and provide childcare for up to 124 children. The site will also provide an off-street carpark, with approximately 106 spaces. Site plans are provided in **Appendix B**.

The CCC proposed hours of operation are 7am to 7pm Monday to Friday. Children's outdoor activities are generally planned with consideration given primarily to sun exposure and age of the children. The retail spaces are proposed to operate 8am to 6pm Monday to Friday and 9am to 5pm Saturday and Sunday with the medical centre and pharmacy to operate 8am to 7pm Monday to Friday and 8am to 4pm Saturday and Sunday

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 is 20m to the south east of the CCC. The majority of residential receivers are located to the east on Medowie Road. The residential receptor, 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	393513	6377248	1.5m	Residential
R4	393873	6377167	1.5m	Residential
R5	393918	6377152	1.5m	Residential
R6	393907	6377111	1.5m	Residential
R7	393901	6377084	1.5m	Residential
R8	393977	6377084	1.5m	Residential
R9	393974	6377060	1.5m	Residential
R10	393971	6377032	1.5m	Residential
R11	393962	6377013	1.5m	Residential
R12	393962	6376994	1.5m	Residential
R13	393961	6376966	1.5m	Residential
R14	393960	6376943	1.5/4.0m	Residential
R15	393954	6376923	1.5m	Residential
R16	393949	6376898	1.5m	Residential
R17	393951	6376882	1.5m	Residential
R18	393876	6376887	1.5m	Residential
R19	393877	6376911	1.5/4.0m	Residential
R20	393879	6376920	1.5/4.0m	Residential
R21	393865	6376951	1.5m	Residential
R22	393898	6377021	1.5/4.0m	Residential
C1	393778	6376935	1.5m	Commercial
C2	393725	6376920	1.5m	Commercial
C3	393716	6376981	1.5m	Commercial
FC1	393864	6376981	1.5m	Future Commercial
FC2	393800	6377050	1.5m	Future Commercial

The CCC receivers for both external play areas and internal occupied rooms are presented in **Table 2.**

Table 2 On-site Receiver Locations

Receptors	Type	MGA56 Coordinates	
Outdoor Play Area 1	Play Area	393824	6376962
Outdoor Play Area 2	Play Area	393841	6376960
Outdoor Play Area 3	Play Area	393839	6376953
Outdoor Play Area 4	Play Area	393837	6376944
Toddlers 1	Internal Playroom	393824	6376943
Toddlers 2	Internal Playroom	393825	6376952
Babies 1	Internal Playroom	393820	6376968
Babies 2	Internal Playroom	393830	6376967
Preschool 1	Internal Playroom	393839	6376965
Preschool 2	Internal Playroom	393848	6376964

FIGURE 1

LOCALITY PLAN

REF: MAC190867

0 100m

KEY	
R1	RECEIVER LOCATION
L1	LOGGER LOCATION
	SITE LOCATION

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*Imagery Source : nearmaps

2.3 Proposed Activities

There are several key activities associated with the project that have the potential to generate acoustic impacts on nearby receivers and are summarised below.

2.3.1 Child Care Centre Activities

CCC noise generating activities include noise generated by children playing in the playgrounds and mechanical plant associated with the CCC.

2.3.2 Retail and Premises

Activities associated with the RP include customers in light vehicles, truck deliveries and collection (including consumables and waste) and mechanical plant noise associated with their operation. Table 3 provides a summary of noise sources, assessment period and proposed time of occurrence.

Table 3 Noise Generating Activities

Activity/Source	Period	Operational
Child Care Centre		
Operation Including Mechanical Plant	Day (7am to 6pm)	✓
	Evening (6pm to 10pm)	✓
	Night (10pm to 7am)	X
Retail Premises		
Customer light vehicles	Day (7am to 6pm)	✓
	Evening (6pm to 10pm)	✓
	Night (10pm to 7am)	X
Truck Consumable Deliveries or Waste Collection	Day (7am to 6pm)	✓
	Evening (6pm to 10pm)	✓
	Night (10pm to 7am)	X
Mechanical Plant	Day (7am to 6pm)	✓
	Evening (6pm to 10pm)	✓
	Night (10pm to 7am)	✓

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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, taking into account 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) value 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

The PINL ($LA_{eq(15min)}$) 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 needs to be measured.

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.
- **Project Amenity Noise Levels (PANL)** – is the recommended levels 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 levels applies for each new source of industrial noise as follows*":

- 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 reproduced in **Table 4**.

Table 4 Amenity Criteria

Receiver Type	Noise Amenity Area	Time of day	Recommended amenity noise level dB L_{Aeq}
Residential	Suburban	Day	55
		Evening	45
		Night	40
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.

3.2 The AAAC Guideline

The Guideline for the assessment of noise from the CCC has been prepared by the AAAC. The document provides criteria for the assessment of noise intrusion into and noise emissions from CCCs and also provides recommendations for treatment to minimise noise upon surrounding receptors. The guideline aligns with the NPI and Council for establishing criteria for CCCs with respect to the following noise sources:

- mechanical plant (air conditioning condensers and mechanical ventilation);
- on-site traffic, deliveries and ingress and egress of vehicles;
- on-site drop off/collection areas of children; and
- internal noise emissions from children at play.

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 impact 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;
- Qualitative, which is suited to short term infrastructure maintenance (for projects with a typical duration of less than 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 5** summarises the ICNG recommended standard hours for construction.

Table 5 Recommended Standard Hours for Construction

Period	Preferred Construction Hours
Day (Standard construction hours)	Monday to Friday - 7am to 6pm Saturdays - 8am to 1pm Sundays or Public Holidays - No construction

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 6** provides the ICNG recommended $LA_{eq(15min)}$ NMLs and how they are to be applied.

Table 6 Noise Management Levels

Time of Day	Management Level $LA_{eq(15min)}$[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 $LA_{eq(15min)}$ 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 project site 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 ±0.5dBA. 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 7** 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 7 Background Noise Monitoring Summary

Location	Measured background noise level, RBL, dBA			Measured LA_{eq} Noise Level, dBA		
	Day 7am to 6pm	Evening 6pm to 10pm	Night 10pm to 7am	Day 7am to 6pm	Evening 6pm to 10pm	Night 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 Williamtown 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 8** and have been determined based on the RBL +5dBA.

Table 8 Intrusiveness Noise Levels

Receiver	Period[1]	Measured RBL dB LA_{90}	PINL dB $LA_{eq(15min)}$
Residential Receivers (R1-R22)	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 9.**

Table 9 Amenity Noise Levels and Project Amenity Levels

Receiver Type	Noise Amenity Area	Period[1]	Recommended Amenity Noise Level $LA_{eq(period)}$[2]	PANL $LA_{eq(period)}$[3]	PANL $LA_{eq(15min)}$[4]
Residential Receivers (R1-R22)	Suburban	Day	60	55	58
		Evening	50	45	48
		Night	45	40	43
Commercial C1-C3 & FC1-FC2		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) is the lower of either the PINL or the PANL. **Table 10** presents the derivation of the PNTL's in accordance with the methodologies outlined in the NPI.

Table 10 Project Noise Trigger Levels

Receiver	Period[1]	PINL dB $L_{Aeq(15min)}$	PANL dB $L_{Aeq(15min)}$	PNTL dB $L_{Aeq(15min)}$
Residential R1-R22	Day	48	58	48
	Evening	45	48	45
	Night	45	43	43
Commercial C1-C3 & FC1-FC2	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 Noise Intrusion Criteria to Child Care Centres

The AAAC child care centre guideline also provides recommendations for external noise impact upon children in child care centres. The relevant criteria for noise intrusion to the CCC is reproduced below:

- The $L_{Aeq(1\text{-}hour)}$ intrusive noise level from road, rail or industry at any location within an outdoor play area should not exceed 55dBA; and
- The $L_{Aeq(1\text{-}hour)}$ intrusive noise level from road, rail or industry within the indoor play or sleeping areas should not exceed 40dBA.

4.4 Construction Noise Management Levels

The Construction Noise Management Levels established in accordance with the ICNG for the project are presented in **Table 11**.

Table 11 Construction Noise Management Levels

Location	Period[1]	Rating Background Level (RBL), dB L_{A90}	Noise Management Level dB $L_{Aeq(15min)}$ (RBL+10dB)
Residential R1-R22	Day	43	53
Commercial C1-C3 & FC1-FC2	Day	N/A	70

Note 1: See Table 5 of this report for Recommended Standard Hours for Construction.

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5 Noise Assessment Methodology

DGMR (iNoise, Version 2019) noise modelling software was used to assess potential noise impacts from the project. The model incorporated three-dimensional ground contours and buildings within the project site and the surrounding locality. Plant and equipment were modelled at various locations and heights, representative of realistic operating conditions for assessed scenarios. 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'.

5.1 Sound Power Levels

Sound power data for the proposed CCC and RP were referenced from the GCCCAA (AAAC, 2010) or the MAC noise source data base for similar developments. The sound power levels for noise sources adopted for this assessment are summarised in **Table 12**.

Table 12 Acoustically Significant Sources - Sound Power Levels ***(re 10-12 Watts)***

Item and number modelled per 15 minutes	Individual Sound Power Level, dB $LA_{eq(15min)}$	Total source Sound Power Level, dB $LA_{eq(15min)}$	Source Height[1]
Operation			
AC Plant (x14)	71	82	1.0m
Refrigeration Plant (x4)	75	80	1.0m
Truck Deliveries (x1)	92	92	1.5m
Car idle, start up and drive off (x48)[2]	73	90	0.5m
Construction Fleet			
Combined Construction Fleet	108		1.5m
Outdoor play[1]			
3 groups of 10 children aged 0-2 years		77 to 80 (per group)	
5 groups of 10 children aged 2-3 years		83 to 87 (per group)	
4 groups of 10 children aged 3-6 years		84 to 90 (per group)	

Note 1. Referenced from GCCCAA (AAAC 2010).

5.2 Noise Attenuation Assumptions and Controls

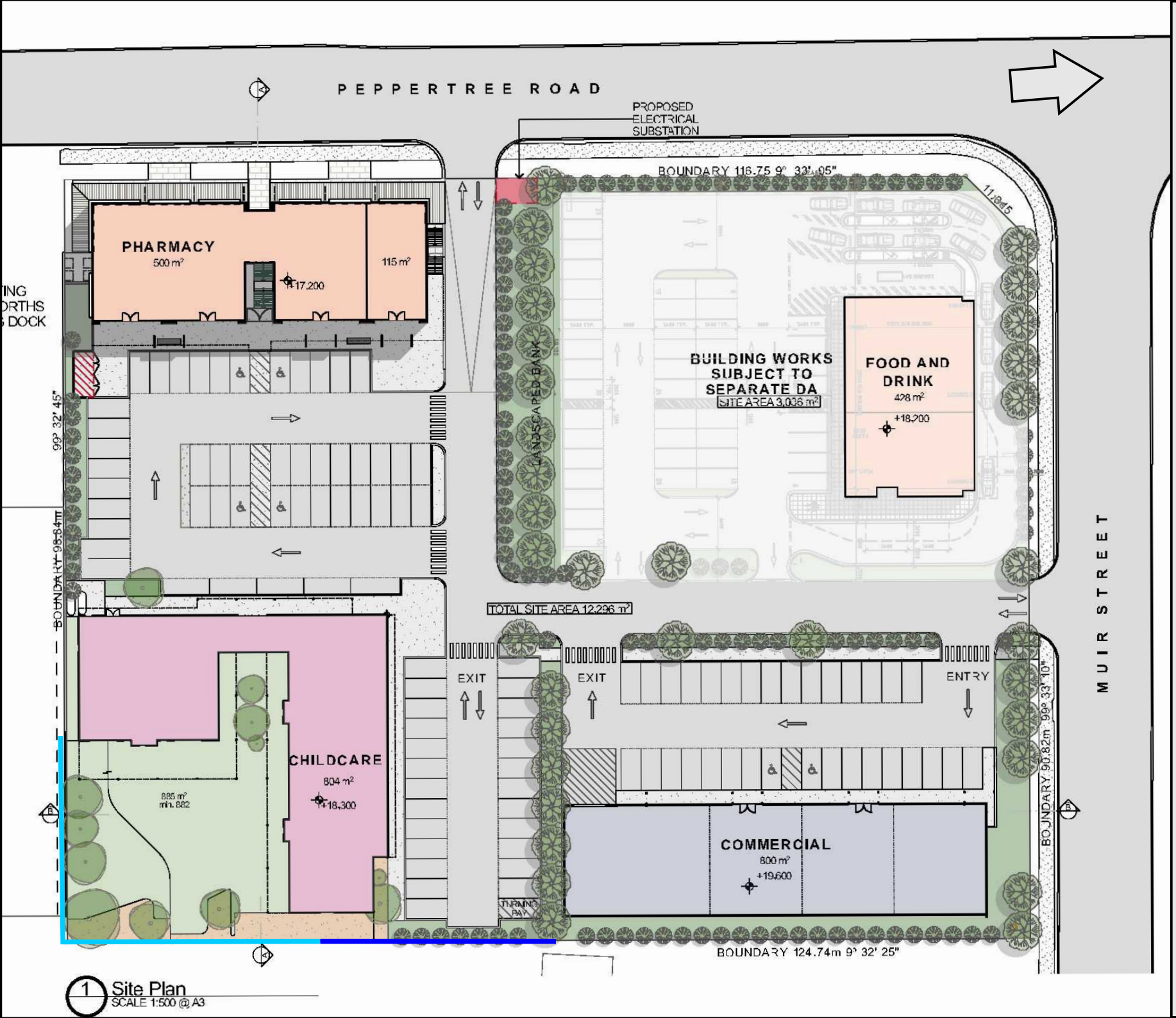
The noise model adopted the following noise controls:

- Acoustic fence along the southern and eastern boundary of the CCC outdoor play area (see Figure 2). 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. It is assumed that the acoustic barriers for the proposed adjacent service station development are constructed to a height of 2.0m along the western boundary and 2.4m of the southern boundary of the service station site; and
- It is assumed that any mechanical plant for cooling and refrigeration of the RP are located on roof top plant decks.

FIGURE 2

BARRIER LOCATION

REF: MAC190867



1 Site Plan
SCALE 1:500 @ A3

KEY	
	2.0m Service Station Barrier
	2.0m CCC Barrier

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6 Assessment of Noise Impacts

6.1 Operational Noise Results for Residential Receptors (Combined Sites)

Noise predictions from all sources (CCC and RP) have been quantified to surrounding receivers to the project and are presented in **Table 13**. 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 13 Combined Noise Predictions – All Receivers

Residential Receivers

Receiver	Predicted Noise Level, dB $LA_{eq(15min)}$			PNTL dB $LA_{eq(15min)}$			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	38	<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	<35	<35	<35	48	45	43	✓
R13	<35	<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	<35	<35	<35	48	45	43	✓
R18	37	<35	<35	48	45	43	✓
R19	42	40	<35	48	45	43	✓
R20	44	41	<35	48	45	43	✓
R21	47	44	<35	48	45	43	✓
R22	39	38	38	48	45	43	✓

Other Receivers

Rec	Period	Predicted Noise Level, dB $LA_{eq(15min)}$	PNTL dB $LA_{eq(15min)}$	Compliant
C1	When in Use	44	63	✓
C2	When in Use	35	63	✓
C3	When in Use	<35	63	✓
FC1	When in Use	40	63	✓
FC2	When in Use	49	63	✓

6.2 Child Care Centre Noise Intrusion Results

6.2.1 Noise Intrusion Results - Outdoor Play Area

Table 14 presents the predicted noise intrusion from the surrounding industrial sources, including those proposed with the RP portion of the project, the predicted noise intrusion from passing traffic and the predicted cumulative level impacting on the CCC external play spaces. The predicted results show compliance with the AAAC child care centre guideline criteria.

Table 14 External Play Area Noise Results

Receptor	Predicted Noise Level dB $L_{Aeq(15min)}$			Criteria dB $L_{Aeq(15min)}$	Compliant
	Industrial	Traffic	Cumulative		
Outdoor Play Area 1	38	44	44	55	✓
Outdoor Play Area 2	42	44	46	55	✓
Outdoor Play Area 3	42	45	47	55	✓
Outdoor Play Area 4	43	45	47	55	✓

6.2.2 Noise Intrusion Results – Internal Spaces

Table 15 presents the predicted internal CCC noise levels from the surrounding industrial sources, including those associated with the RP component of the project. The predicted results show compliance with the AAAC Guideline criteria assuming a 10dB loss for the installed windows partially closed.

Table 15 Internal Cumulative Noise Results

Receptor	Predicted noise level dB $L_{Aeq(15min)}$				Internal Criteria dB $L_{Aeq(15min)}$	Compliant
	Industrial	Traffic	Cumulative External	Cumulative[1] Internal (partially closed windows)		
Babies 1	37	43	44	34	40	✓
Babies 2	41	43	45	35	40	✓
Preschool 1	41	43	45	35	40	✓
Preschool 2	41	43	45	35	40	✓
Toddlers 1	40	44	45	35	40	✓
Toddlers 2	41	45	47	37	40	✓

Note 1: Assumes 10dB attenuation for partially closed external windows

6.3 Construction Noise Results

Table 16 presents the results of modelled construction/demolition 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 16 Construction/Demolition Noise Levels – All Receivers

Receiver	Predicted Noise Level, dB LA_{eq}			Management Level dB LA_{eq}	Compliant
	Medical	CCC	Retail		
R1	37	36	36	53	✓
R2	39	38	38	53	✓
R3	43	42	42	53	✓
R4	45	51	55	53	X
R5	41	49	53	53	✓
R6	42	52	57	53	X
R7	42	53	59	53	X
R8	43	37	53	53	✓
R9	42	42	56	53	X
R10	<35	32	39	53	✓
R11	<35	41	38	53	✓
R12	35	41	55	53	X
R13	39	37	39	53	✓
R14	40	48	<35	53	✓
R15	43	49	<35	53	✓
R16	35	38	<35	53	✓
R17	36	38	<35	53	✓
R18	35	43	<35	53	✓
R19	<35	39	<35	53	✓
R20	<35	35	<35	53	✓
R21	<35	42	<35	53	X
R22	44	40	<35	53	X
C1	48	44	36	70	✓
C2	45	56	<35	70	✓
C3	47	35	64	70	✓
FC1	48	37	64	70	✓
FC2	58	38	44	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 levels during standard construction hours have the potential to be above the ICNG noise management levels at two 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 an Acoustic Assessment (AA) to address potential noise emissions associated with the proposed Child Care Centre and Retail Premises to be established at 795 Medowie Road, Medowie, NSW.

Additionally, emissions from the CCC, and RP buildings have been quantified to surrounding receivers. Noise sources include customer generated noise, including light vehicles, truck movements, including consumables deliveries/ waste collection and mechanical plant.

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

Construction noise emissions are predicted to be above the relevant noise management levels during construction/demolition 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.

Noise levels are predicted to comply with the AAAC Child Care Centre Acoustic Assessment Guideline criteria based on the inclusion of a 2.0m barrier being constructed along the southern and eastern boundary of the centre outdoor play area (See **Figure 2**).

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

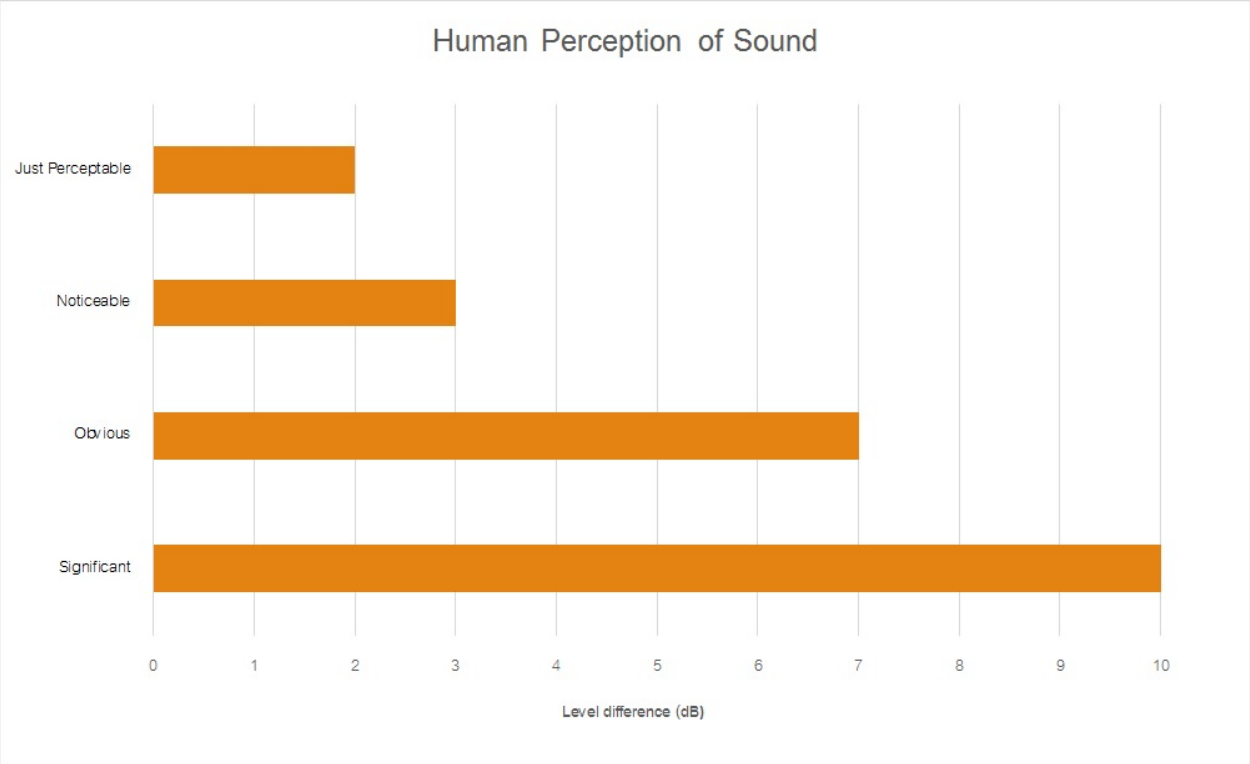
Table A1 provides a number of technical terms have been used in this report.

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.
LAmax	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)	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: = 10.log10 (W/Wo) Where: W is the sound power in watts and Wo is the sound reference power at 10-12 watts.

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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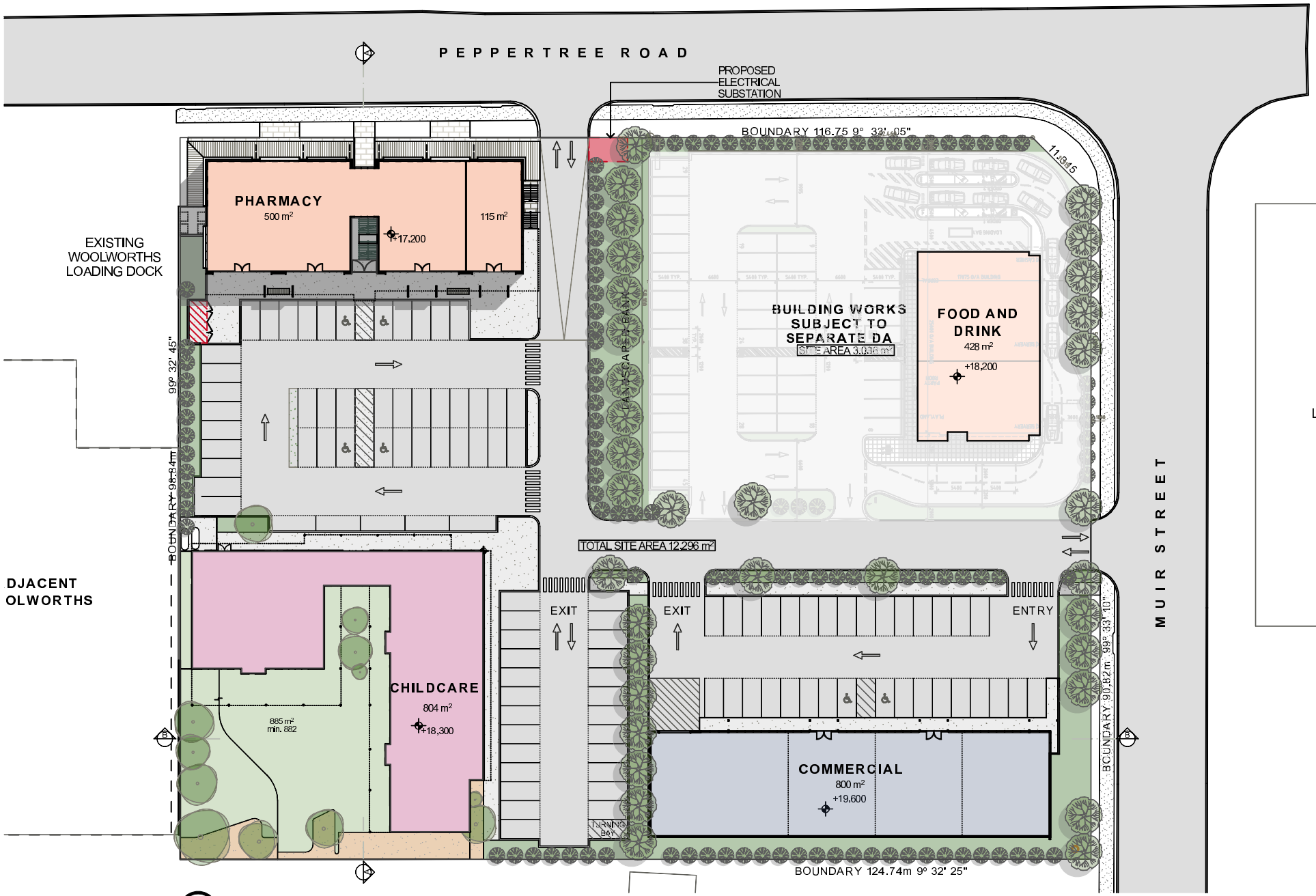
Appendix B – Project Site Plans

MEDOWIE RETAIL UNIT TRUST DEVELOPMENT

795 MEDOWIE RD,
MEDOWIE, NSW, 2318

Development Application



1 Site Plan
SCALE 1:500 @ A3

Development Application

CKDS ARCHITECTURE
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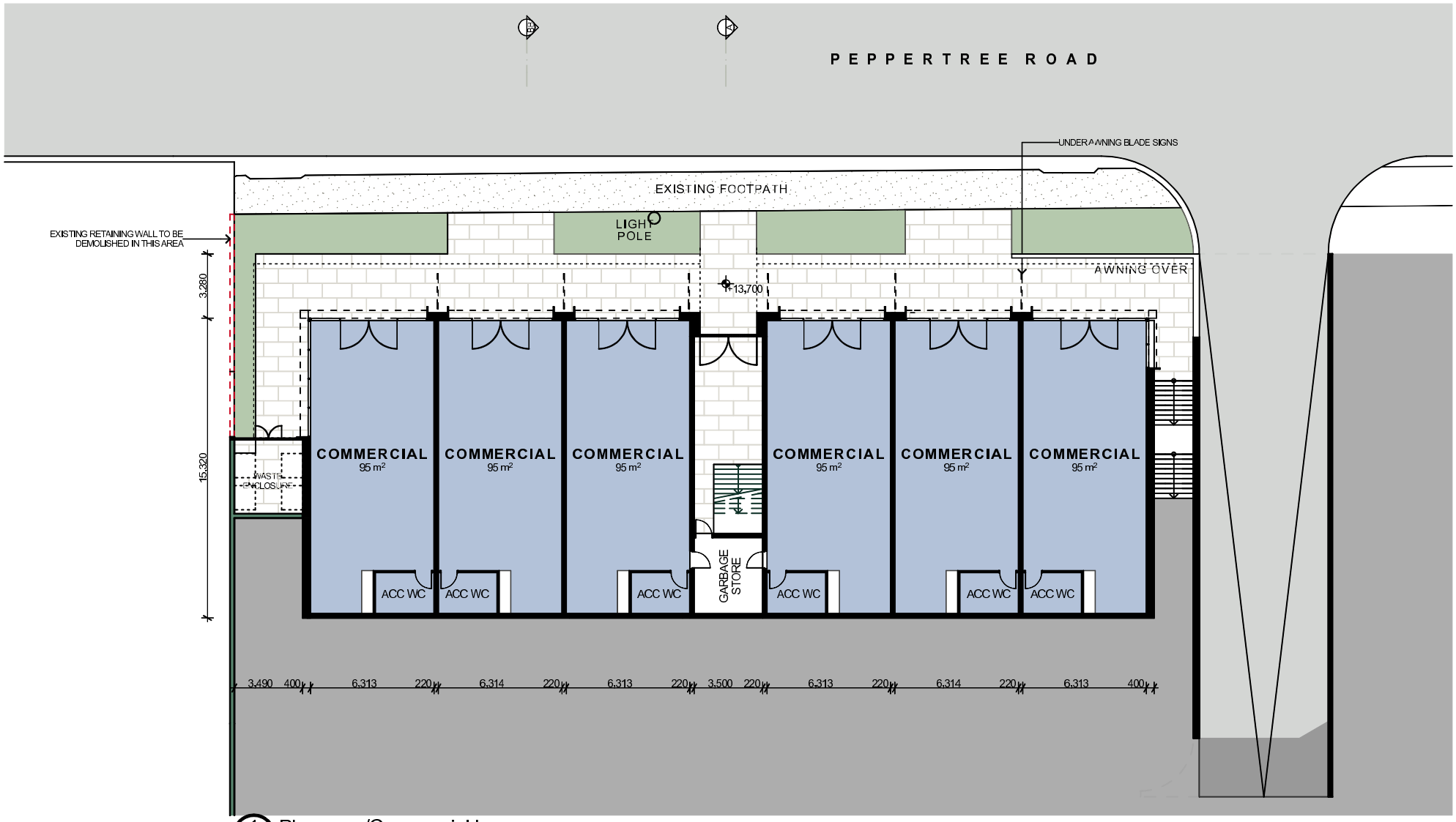
Newcastle NSW Australia
Ph 02 4321 0503
ACN 129 291 269

Mavid Medowie Development
project # 19007
795 Medowie Rd, Medowie, 2318 NSW

Site Plan
drawing # DA-1002
issue 10
1:500 @ A3
5/7/19



1 Pharmacy/Commercial Lower
SCALE 1:200 @A3

Development Application

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Mavid Medowie Development
project# 19007
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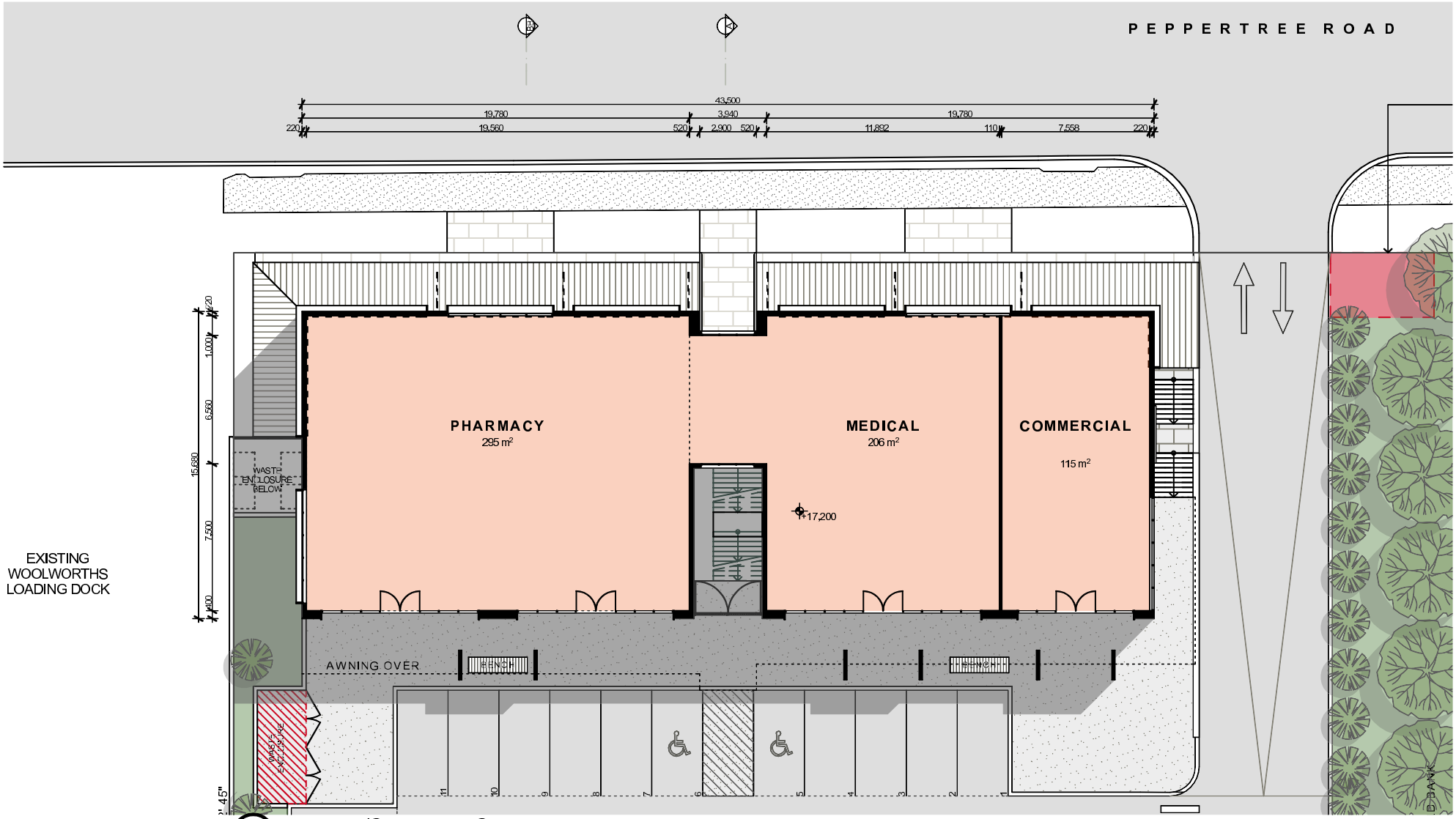
Pharmacy Lower Floor Plan
drawing# DA-1101
issue 09
1:200 @ A3
5/7/19



1 Pharmacy/Commercial Ground Floor Plan
SCALE 1:200 @A3

Development Application

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Pharmacy Ground Floor Plan
drawing#
DA-1102
issue
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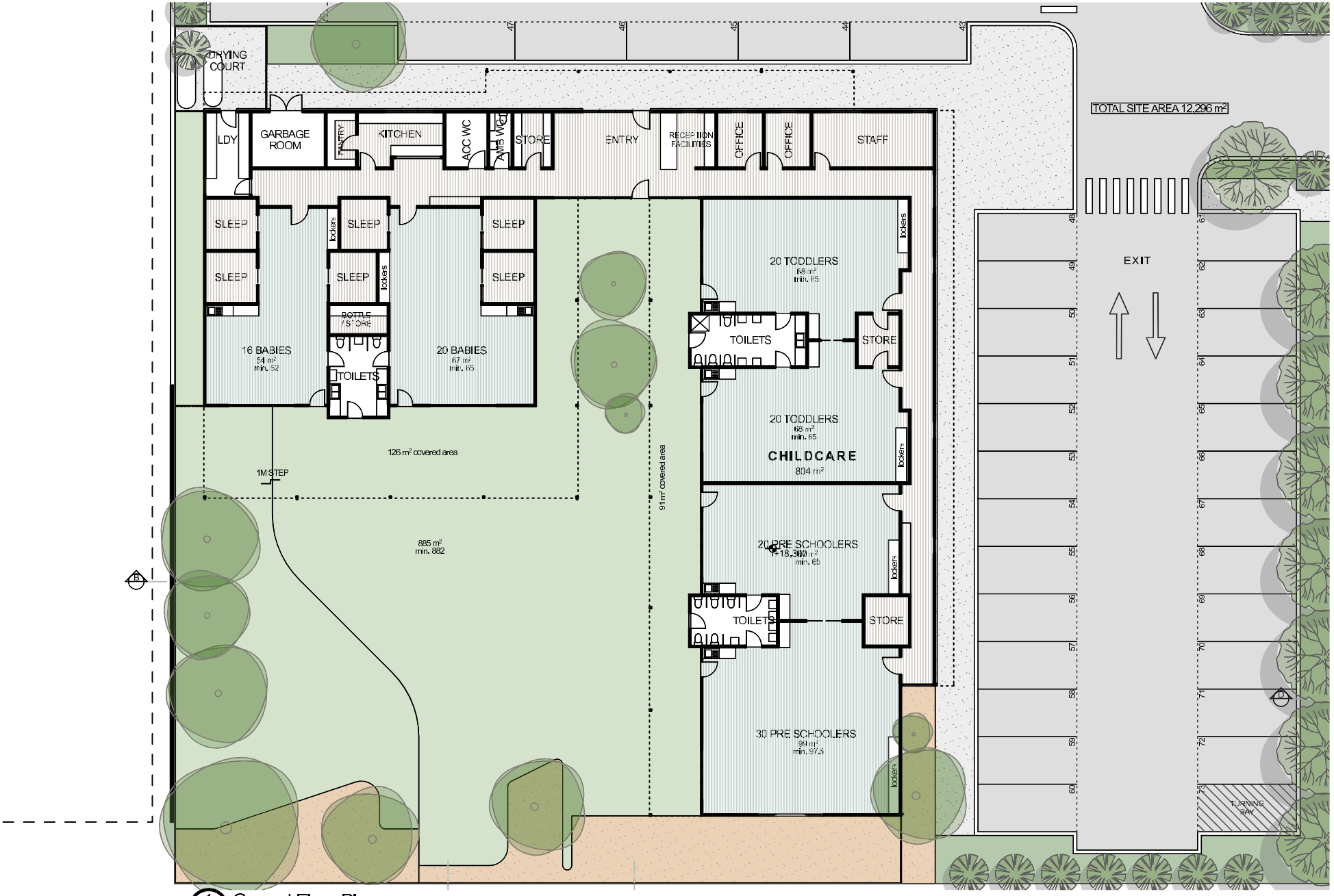
1:200 @ A3
5/7/19



1 Ground Floor Plan
SCALE 1:200 @ A3

Development Application

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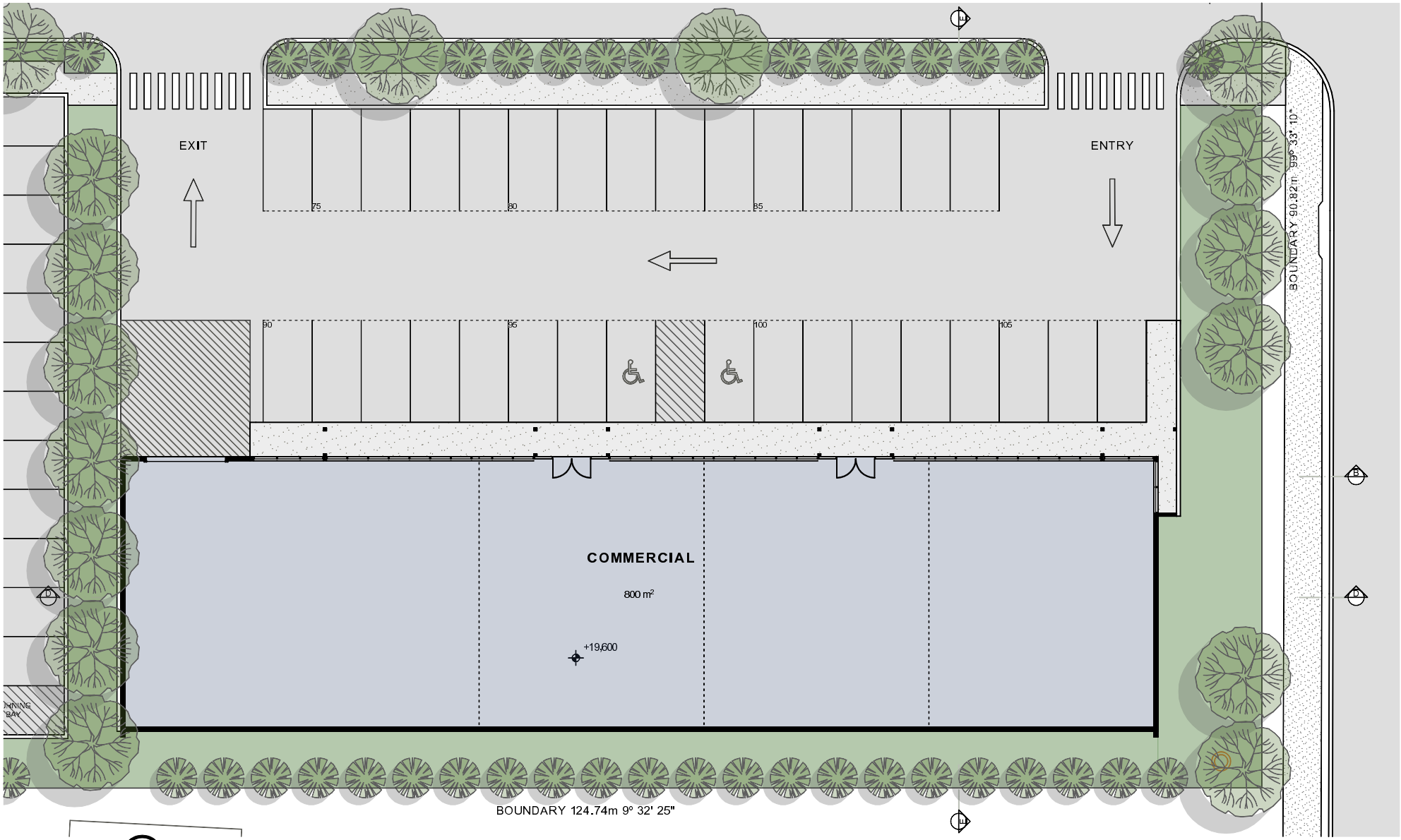
Childcare + OOSH Floor Plan
drawing# DA-1201
issue 09
1:200 @ A3
5/7/19



1 Retail Ground Floor Plan
SCALE 1:200 @ A3

Development Application

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Mavid Medowie Development
project# 19007
795 Medowie Rd, Medowie, 2318 NSW

Commercial Ground Floor Plan
drawing# DA-3001
issue 08
1:200 @ A3
5/7/19

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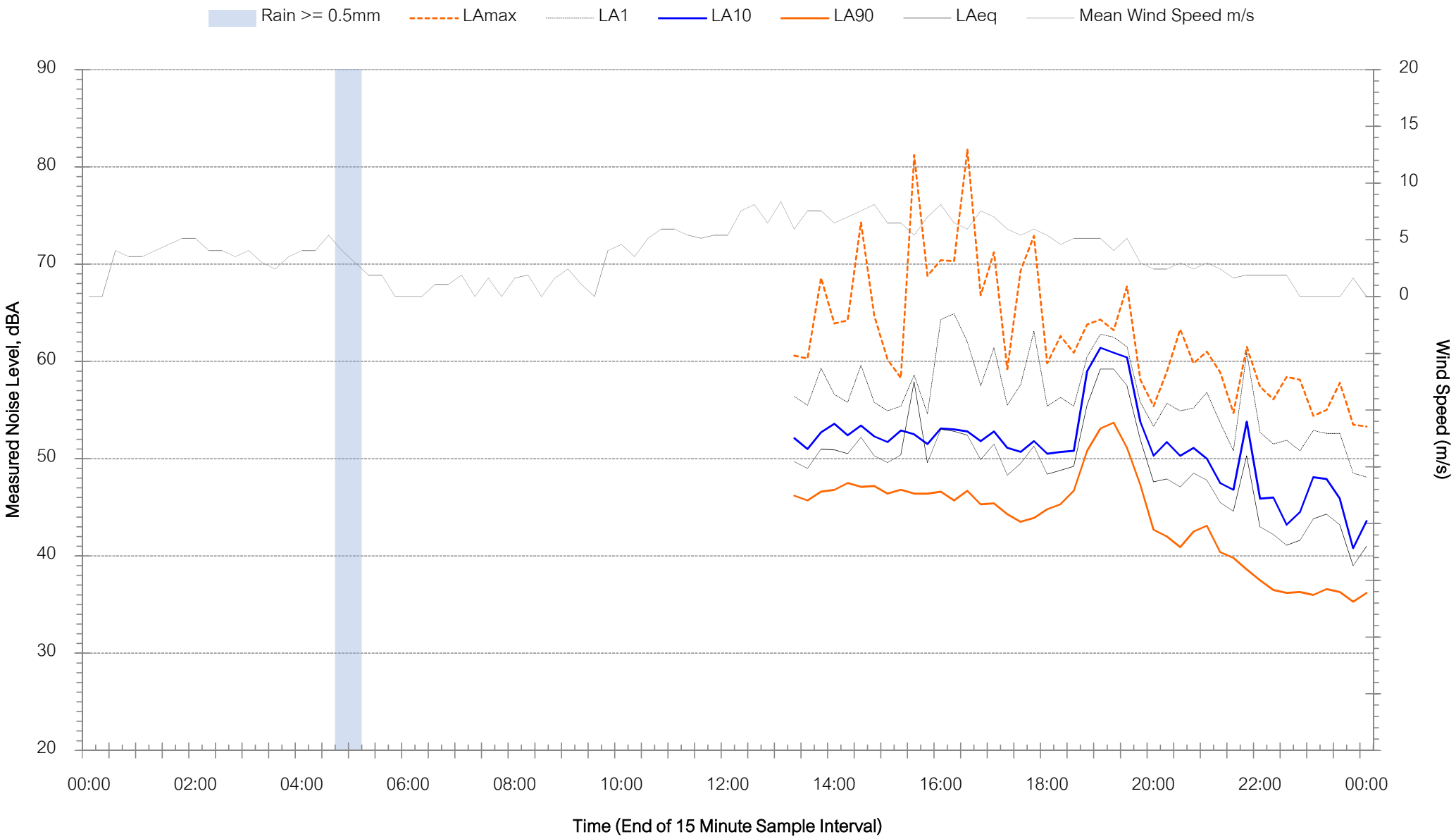
Appendix C – Noise Monitoring Charts

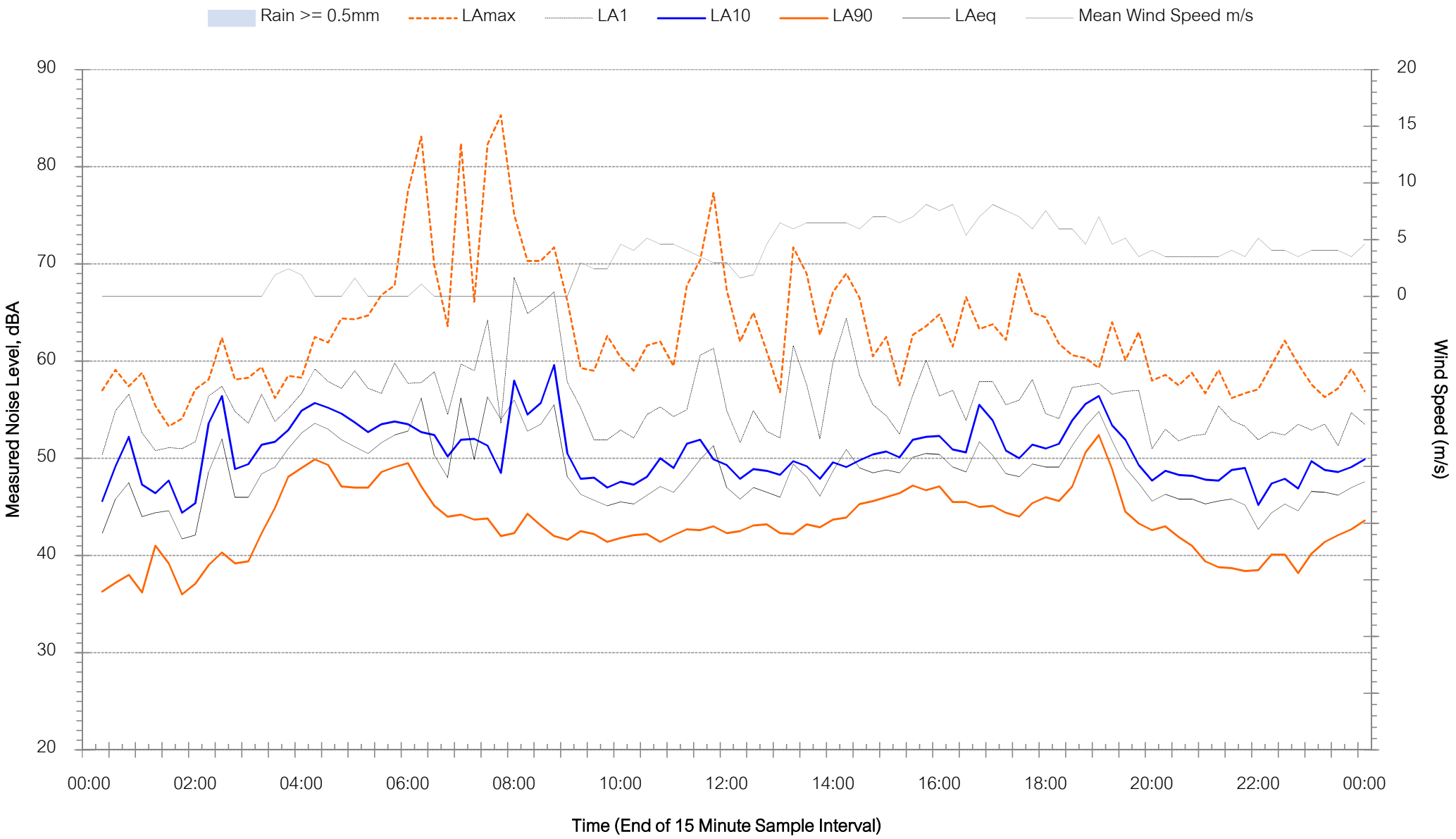
Background Noise Levels

795 Medowie Road, Medowie - Monday 25 February 2019



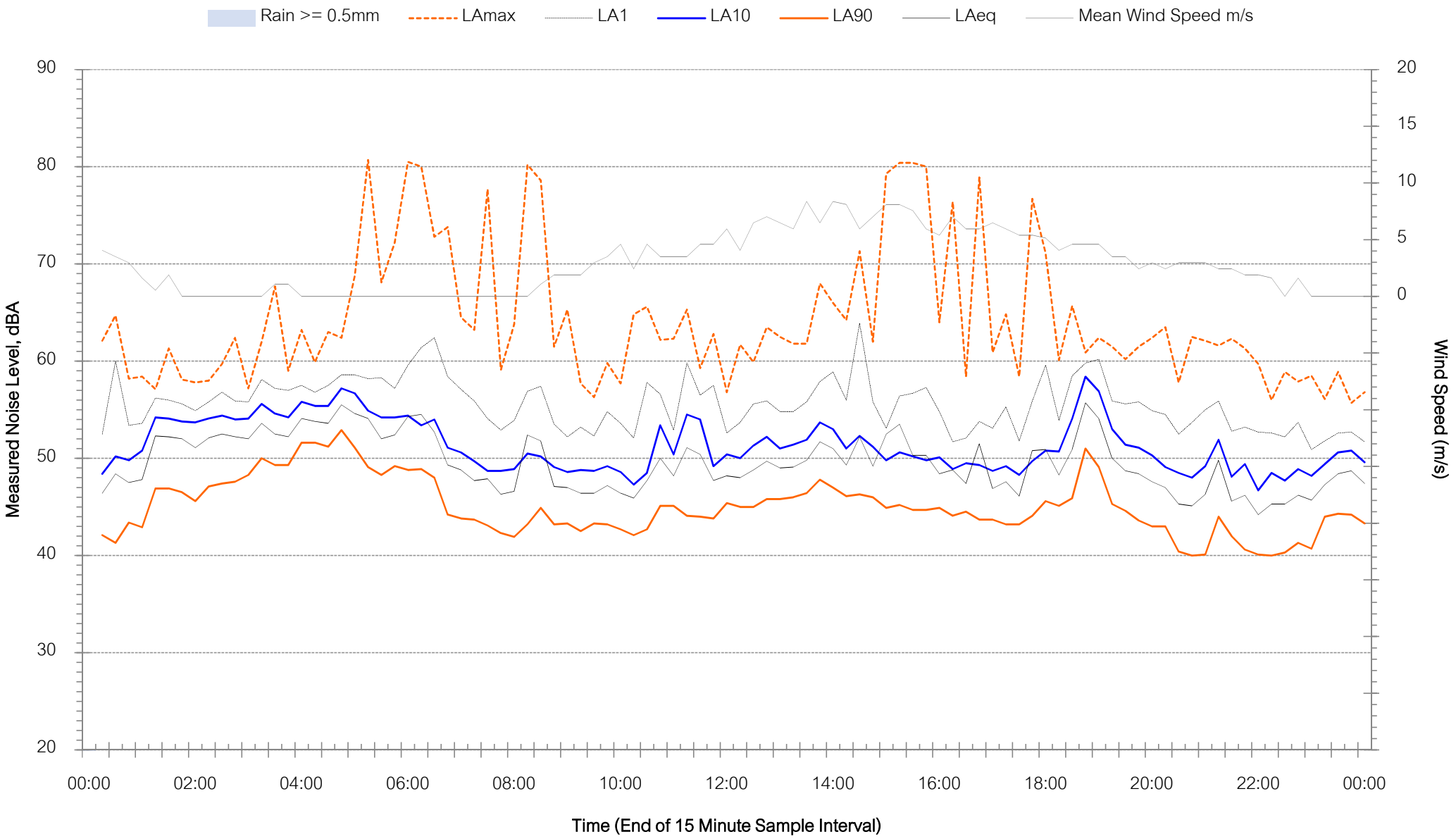
Background Noise Levels

795 Medowie Road, Medowie - Tuesday 26 February 2019



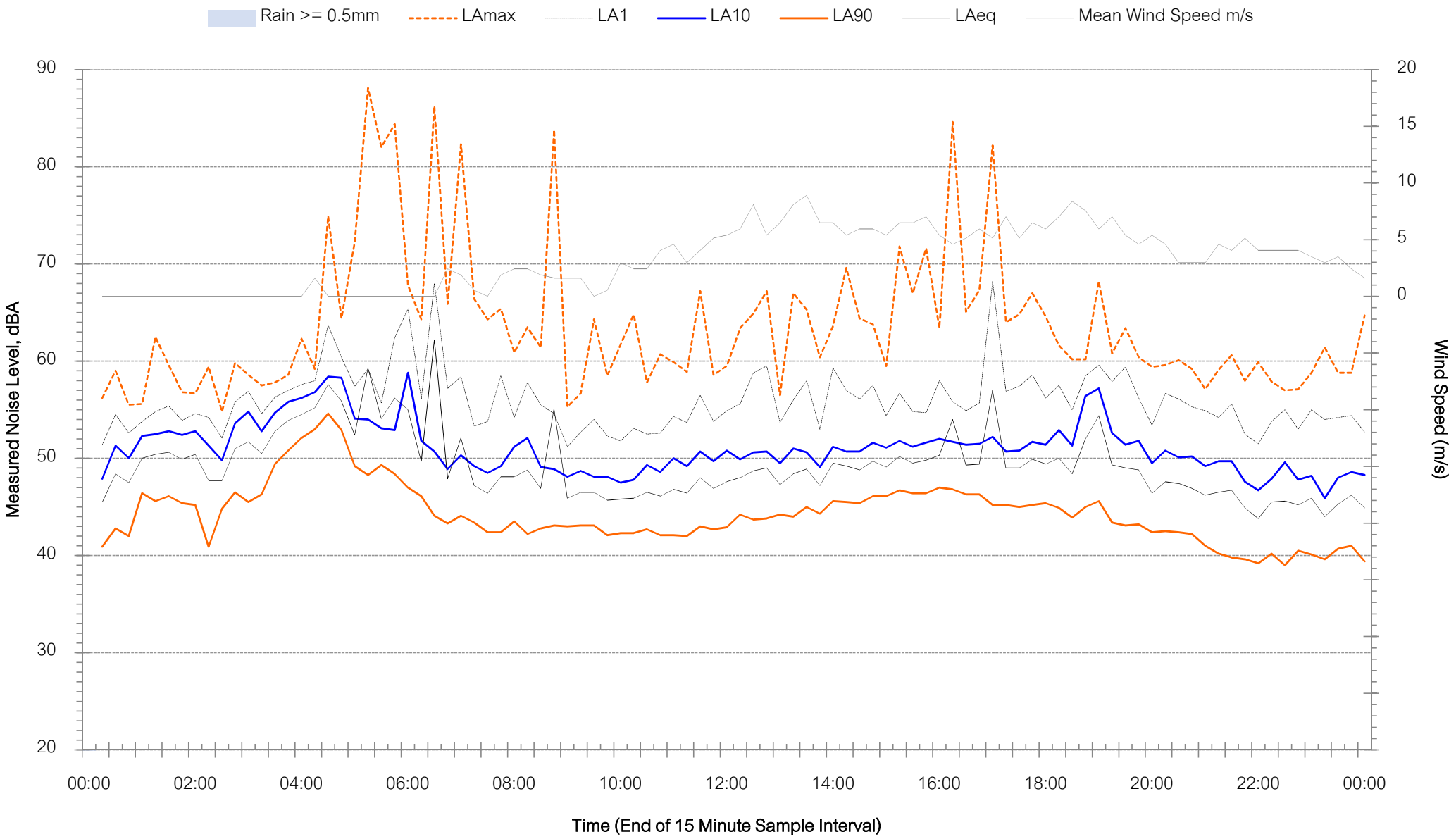
Background Noise Levels

795 Medowie Road, Medowie - Wednesday 27 February 2019



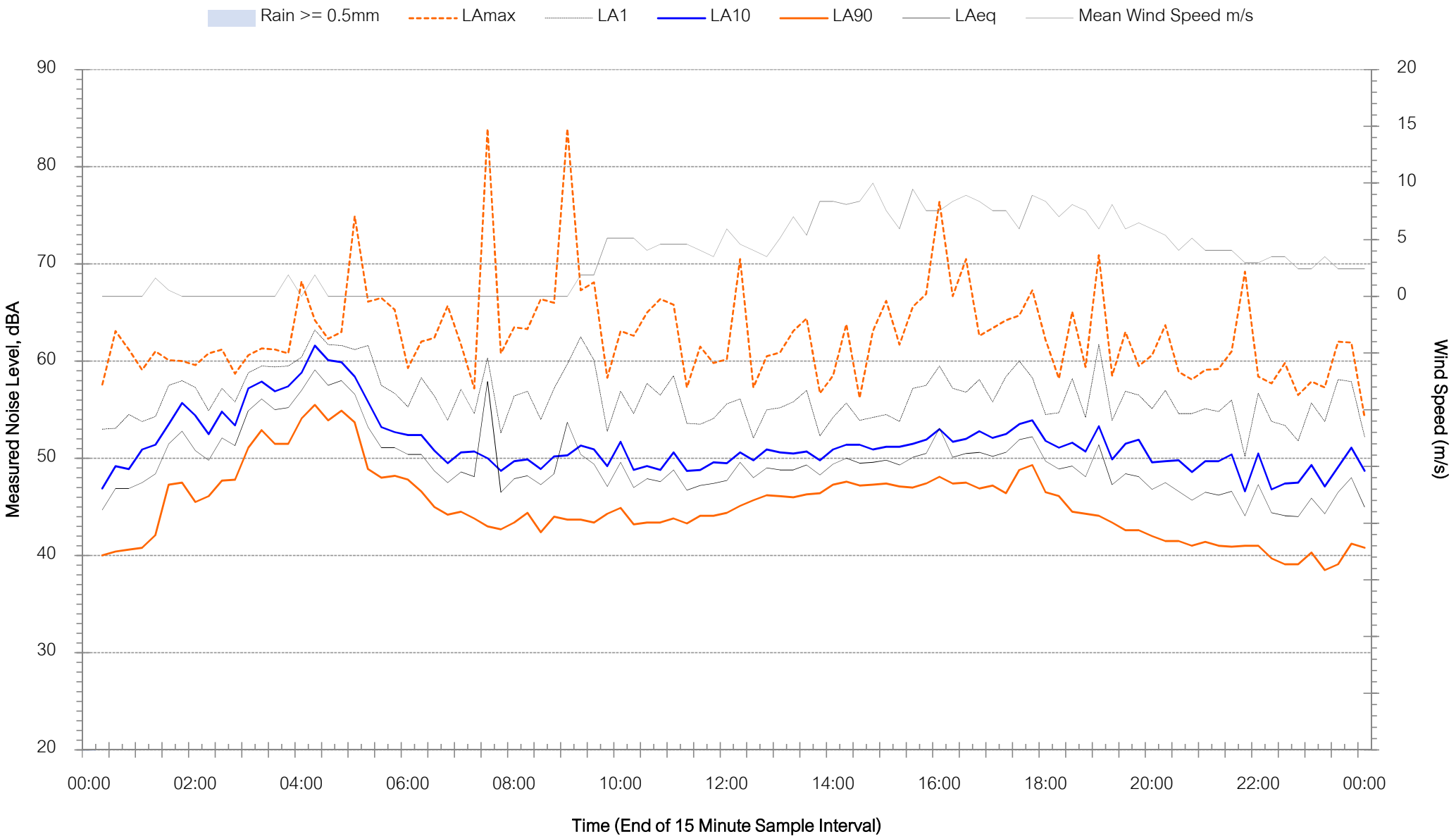
Background Noise Levels

795 Medowie Road, Medowie - Thursday 28 February 2019



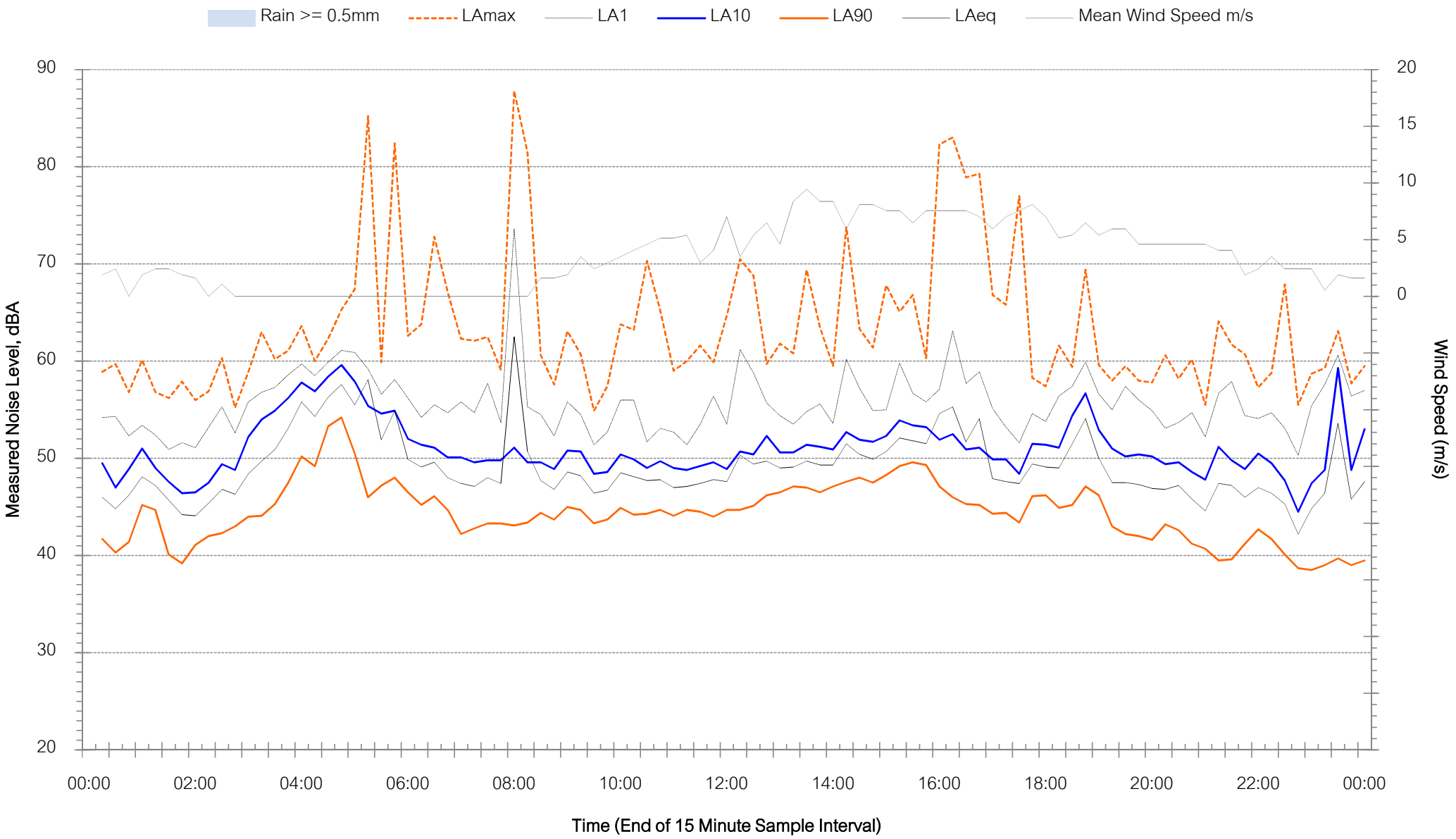
Background Noise Levels

795 Medowie Road, Medowie - Friday 1 March 2019



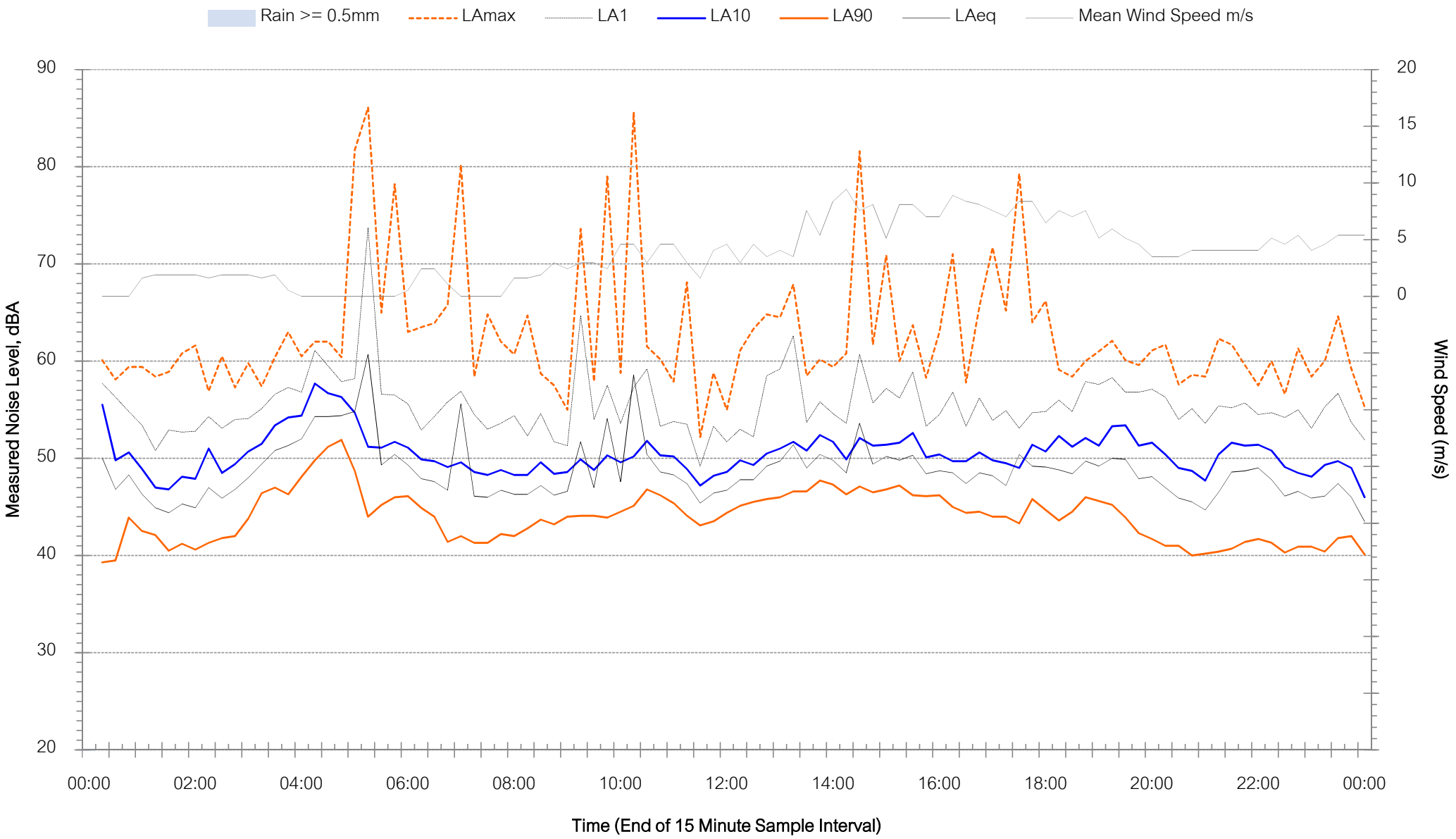
Background Noise Levels

795 Medowie Road, Medowie - Saturday 2 March 2019



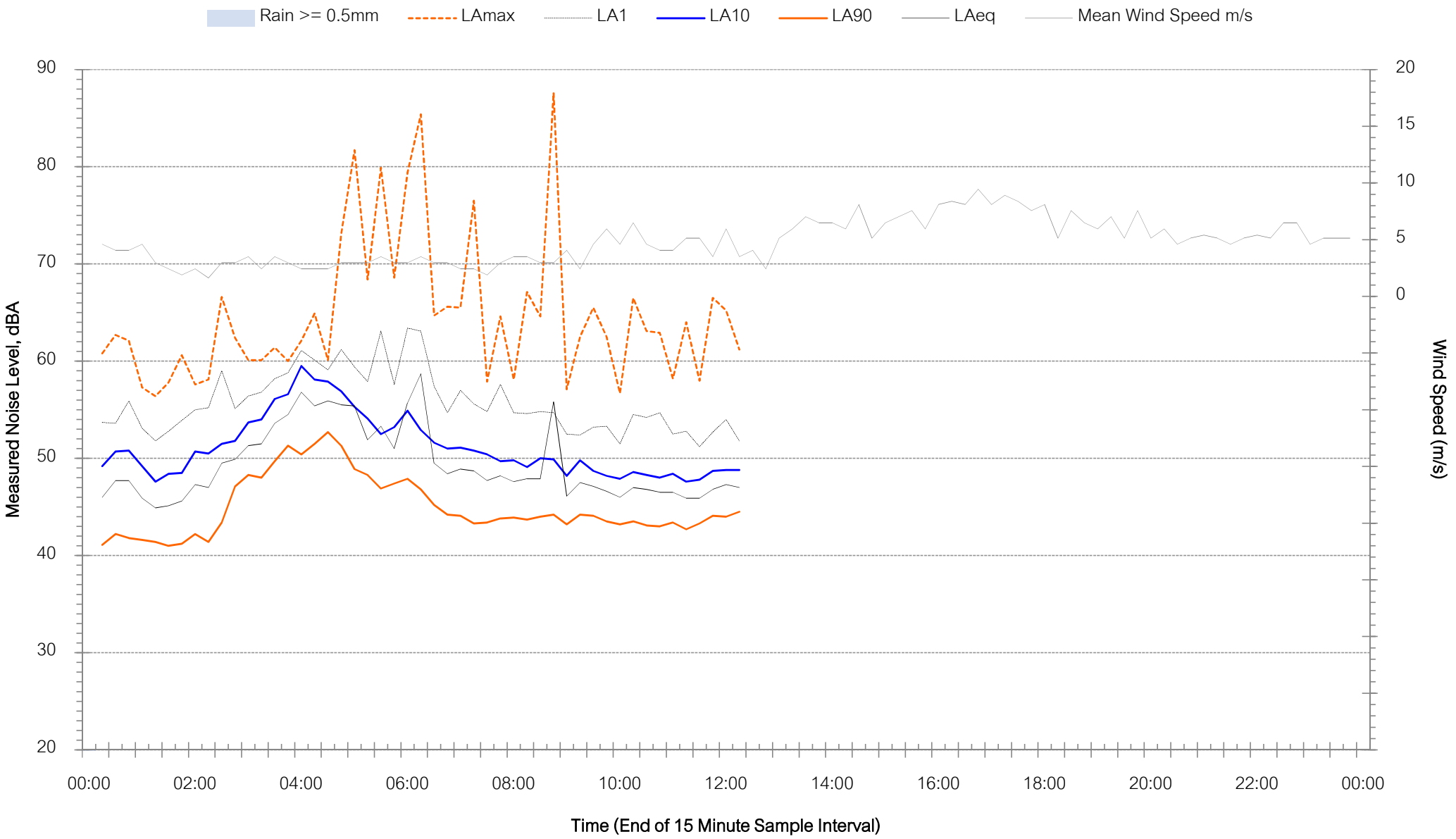
Background Noise Levels

795 Medowie Road, Medowie - Sunday 3 March 2019



Background Noise Levels

795 Medowie Road, Medowie - Monday 4 March 2019



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