Noise Assessment

Proposed McDonald's Development
2710 Remembrance Drive
Tahmoor, NSW.

Prepared for: McDonalds Australia Ltd
March 2019
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Muller Acoustic Consulting

Document Information

Noise Assessment

Proposed McDonald's Development

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1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has been commissioned by McDonald's Australia Ltd to prepare a Noise Assessment (NA) to quantify emissions from the proposed McDonald's Operation (the 'operation') to be established at DP874556, 2710 Remembrance Drive, Tahmoor, NSW.

The NA has quantified potential operational, sleep disturbance and construction noise emissions from the operation and recommends reasonable and feasible noise controls where required.

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

- Environment Protection Authority (EPA), NSW Noise Policy for Industry (NPI) 2017;
- 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**.

1.1 Proposal

The project proposes the construction of a new operation at a greenfield site, 2710 Remembrance Drive, Tahmoor, NSW. The project will consist of the McDonald's building, two drive thru lanes and will provide 38 light vehicle car parks. The operation is proposed to operate 24 hours a day, seven days. **Appendix B** provides the site layout plans of the project.

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2 Project Description

2.1 General

The operation is to be established at DP874556, 2710 Remembrance Drive, Tahmoor, NSW. This locality currently comprises predominantly residential land uses. The surrounding noise catchment consists of residential receivers situated to the north-east, east, and south-west of the operation. A motel is also located south east of the project across Remembrance Drive.

Several commercial receivers are proposed as part of the subdivision of the greenfield site and will be located to the north-west, north and east of the operation site.

2.2 Receiver Review

A review of residential and commercial receivers in close proximity to the project has been completed and are summarised in **Table 1. Figure 1** provides a locality plan showing the position of these receivers in relation to the project. All receiver heights were set to 1.5m above relative ground level.

Table 1 Receiver Locations				
Receiver	Coordinates		Receiver Height	Receiver Type
R1	277692	6209497	1.5m	Residential
R2	277656	6209465	1.5m	Residential
R3	277590	6209517	1.5m	Residential
R4	277564	6209553	1.5m	Residential
R5	277664	6209723	1.5m	Residential
R6	277853	6209901	1.5m	Residential
R7	277857	6209885	1.5m	Residential
R8	277856	6209873	1.5m	Residential
R9	277860	6209851	1.5m	Residential
R10	277867	6209834	1.5m	Residential
R11	277892	6209821	1.5m	Residential
R12	277898	6209816	1.5m	Residential
R13	278072	6209826	1.5m	Residential
R14	278078	6209807	1.5m	Residential
R15	278086	6209788	1.5m	Residential
R16	278091	6209770	1.5m	Residential
R17	278099	6209751	1.5m	Residential
R18	278103	6209733	1.5m	Residential
R19	278109	6209715	1.5m	Residential
R20	278000	6209703	1.5m	Residential
M1	277864	6209620	1.5m	Motel/Residential
M2	277843	6209600	1.5m	Motel/Residential
C1	277880	6209646	1.5m	Commercial
FC1	277759	6209731	1.5m	Future Commercial
FC2	277735	6209750	1.5m	Future Commercial
FC3	277740	6209804	1.5m	Future Commercial
FC4	277745	6209892	1.5m	Future Commercial
FC5	277787	6209780	1.5m	Future Commercial
FC6	277815	6209755	1.5m	Future Commercial

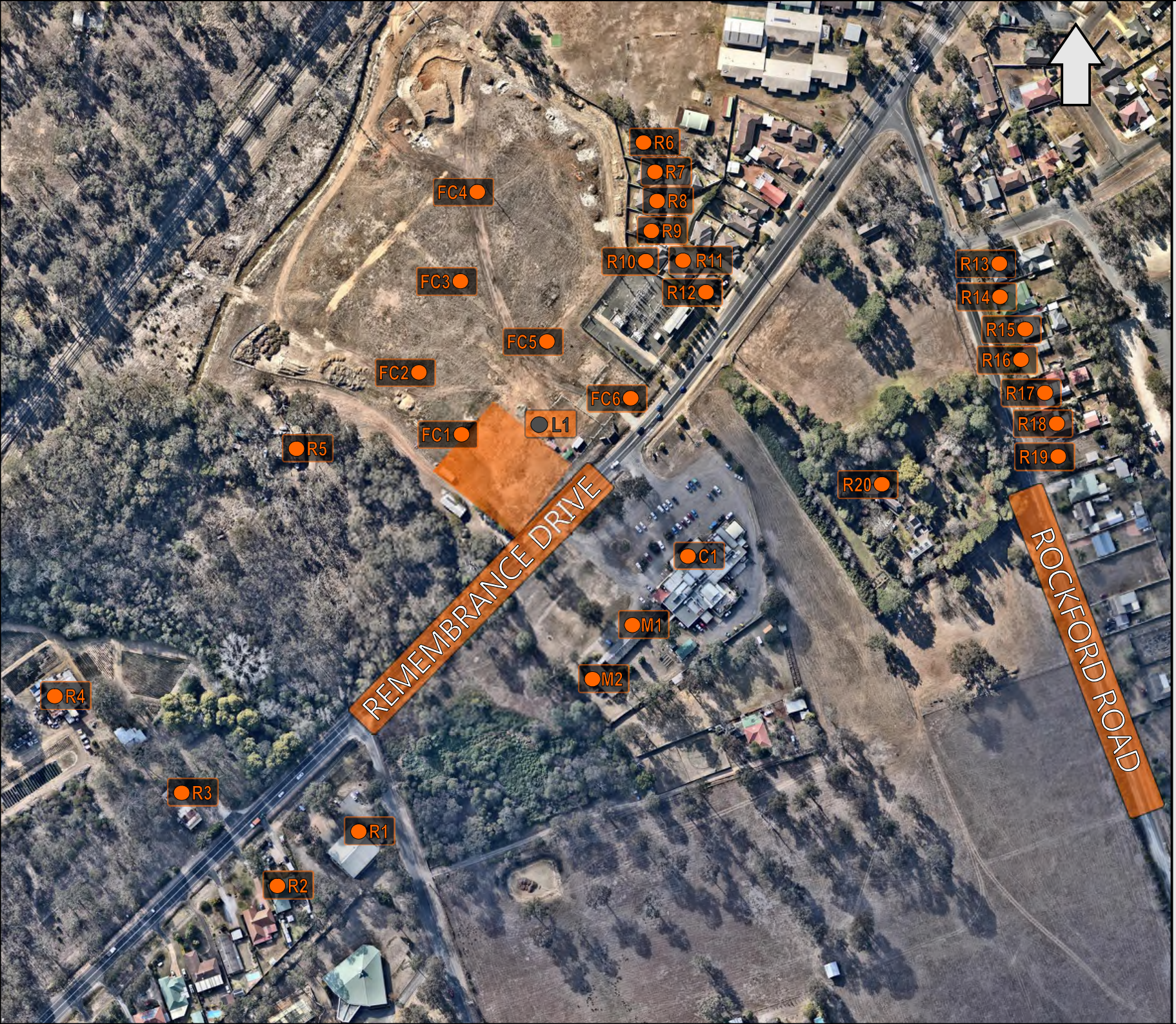

FIGURE 1

LOCALITY PLAN

REF: MAC180748

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.

Table 2 provides a summary of project noise sources and the assessment period in which they propose to occur.

Table 2 Noise Generating Activities

Activity/Source	Period	Operational
Customer light vehicles (customers)	Day (7am to 6pm)	✓
	Evening (6pm to 10pm)	✓
	Night (10pm to 7am)	✓
Truck Consumable Deliveries	Day (7am to 6pm)	✓
	Evening (6pm to 10pm)	✓
	Night (10pm to 7am)	✓
Drive Thru Operations	Day (7am to 6pm)	✓
	Evening (6pm to 10pm)	✓
	Night (10pm to 7am)	✓
Waste Collection	Day (7am to 6pm)	✓
	Evening (6pm to 10pm)	✓
	Night (10pm to 7am)	✓
Mechanical Plant	Day (7am to 6pm)	✓
	Evening (6pm to 10pm)	✓
	Night (10pm to 7am)	✓

Note 1: Day is 7am to 6pm, Evening is 6pm to 10pm, Night is from 10pm to 7am

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 3**.

Table 3 Amenity Criteria

Receiver Type	Noise Amenity Area	Time of day	Recommended amenity noise level L_{Aeq} dBA
Residential	Suburban	Day	55
		Evening	45
		Night	40
Motel/Hotel	Suburban	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:

- $L_{Aeq,15min}$ 40dBA or the prevailing RBL plus 5dB, whichever is the greater, and/or
- L_{Amax} 52dBA or the prevailing RBL plus 15dB, whichever is the greater,

a detailed maximum noise level event assessment should be undertaken.

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 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 4** summarises the ICNG recommended standard hours for construction.

Table 4 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).

3.2.1 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 $LA_{eq(15min)}$ NMLs and how they are to be applied.

Table 5 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.

4 Noise Criteria

4.1 Background Noise Environment

4.1.1 Unattended Noise Monitoring

To quantify the existing background noise environment of the area, unattended noise monitoring was conducted at eastern boundary of the operation site. The selected monitoring location is shown in **Figure 1** and is considered representative of surrounding receivers as per Fact Sheet B1.1 o the NPI.

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 one Svantek 977 noise analysers from Thursday 20 September 2018 to Wednesday 3 October 2018. Observations on-site identified the surrounding locality was typical of a suburban environment, with residential, birds and traffic audible. 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 suburban amenity category. This criterion is used in conjunction with the intrusiveness criteria to determine the limiting criteria. The results of long-term unattended noise monitoring are provided in **Table 6**. The noise monitoring charts for the background logging assessment are provided in **Appendix C**.

Table 6 Background Noise Monitoring Summary

Location	Measured background noise level, RBL, dBA			Measured LA_{eq}, 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	40	34	30 (27)[1]	53	50	49

Note: Excludes periods of wind or rain affected data. Meteorological data obtained from the Bureau of Meteorology weather station Camden Airport AWS 34.04°S 150.7°E 74m AMSL.

Note 1: Bracketed value represents measured value, 30dBA adopted as per minimum RBL outlined in the NPI.

4.2 Operational Noise Criteria

4.2.1 Project Intrusiveness Noise Levels

The intrusiveness criteria 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 dB LA_{90}	Intrusiveness Noise Level dB $LA_{eq,15min}$
R1-R20	Day	40	45
	Evening	34	39
	Night	30	35

Note: As per Section 2.1 of the NPI, Intrusiveness Noise Levels only apply to residences.

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 receiver types (ie non-residential) potentially affected by the project are presented in **Table 8.**

Table 8 Amenity Noise Levels and Project Amenity Noise Levels, dB

Receiver Type	Noise Amenity Area	Assessment Period[1]	Recommended ANL $LA_{eq,period}$[2]	PANL $LA_{eq,period}$[3]	PANL $LA_{eq(15min)}$[4]
R1-R20	Suburban	Day	55	50	53
		Evening	45	40	43
		Night	40	35	38
M1-M2	Suburban	Day	60	55	58
		Evening	50	45	48
		Night	45	40	43
C1 & FC1-FC6	Commercial	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 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]	Intrusiveness Noise Level, dB $L_{Aeq,15min}$	Project Amenity Noise Level, dB $L_{Aeq,15min}$	PNTL, dB $L_{Aeq,15min}$
R1-R20	Day	45	53	45
	Evening	39	43	39
	Night	35	38	35
M1-M2	Day	N/A	58	45
	Evening	N/A	48	39
	Night	N/A	43	35
C1 & 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.

Table 10 Maximum Noise Level Assessment Screening Criteria

Residential Receivers R1-R20, M1-M2			
$L_{Aeq(15min)}$		L_{Amax}	
40dB $L_{Aeq(15min)}$ or RBL + 5dB		52dB L_{Amax} or RBL + 15dB	
Trigger	40	Trigger	52
RBL +5dB	35	RBL +15dB	45
Highest	**40**	**Highest**	**52**

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

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

Receivers	Period[1]	Rating Background Level (RBL), LA_{90} dBA	Noise Management Level $LA_{eq(15min)}$ (RBL+10dB)
R1-R20 & M1-M2	Day	40	50
C1 & FC1-FC6	Day	N/A	70

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

5 Noise Assessment Methodology

DGMR (iNoise, Version 2018.02) 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

Table 12 presents the sound power level for each noise source modelled in this assessment. It is noted that sound power levels were sourced from manufacturer's specifications or from in-field measurements at similar project sites. The sound power levels have been adjusted to account for duration over a fifteen-minute period.

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

Item and number modelled per 15 minutes	Individual Sound Power Level, $LA_{eq(15min)}$ dBA	Total source Sound Power Level, $LA_{eq(15min)}$ dBA	Source Height[1]
Operation			
AC Plant PCG203U	71	71	0.5m
AC Plant PCG153U	70	70	0.5m
Fan CGD404	77	77	0.5m
AC Plant PCG290L/R (x2)	78	81	0.5m
AC Plant PKY620T-6Q1	81	81	0.5m
Customer Ordering Displays (x2)	75	78	1.0m
Truck Deliveries (x1)	92	92	1.5m
Car idle, start up and drive off (x28)[2]	73	87	0.5m
Sleep disturbance assessment (LA_{max}), Night time periods (10pm to 7am)			
Delivery Impact	102		1.5m
Construction Fleet			
Combined Construction Fleet	108		1.5m

Note 1: Height above the relative ground or building below source.

Note 2: Modelling assumes the night period will have a 50% reduction in customer light vehicles.

5.2 Noise Attenuation Assumptions

The noise model incorporated the following controls:

- construction of an impervious barrier along the service yard and adjacent staff parking spaces (see Figure 2). The fence is assumed to be constructed to an RL of 2.5m above the relative ground level and consist of materials with a surface density of at least 10kg/m^2, and not contain any gaps (ie lapped and capped timber or equivalent);
- the mechanical plant is to be located on the rooftop plant deck of the operation and will be shielded to receivers by the impervious barrier that extends 600mm above the top of the plant; and
- the COD's are assumed to be set at the lowest volume setting.

FIGURE 2

BARRIER LOCATION

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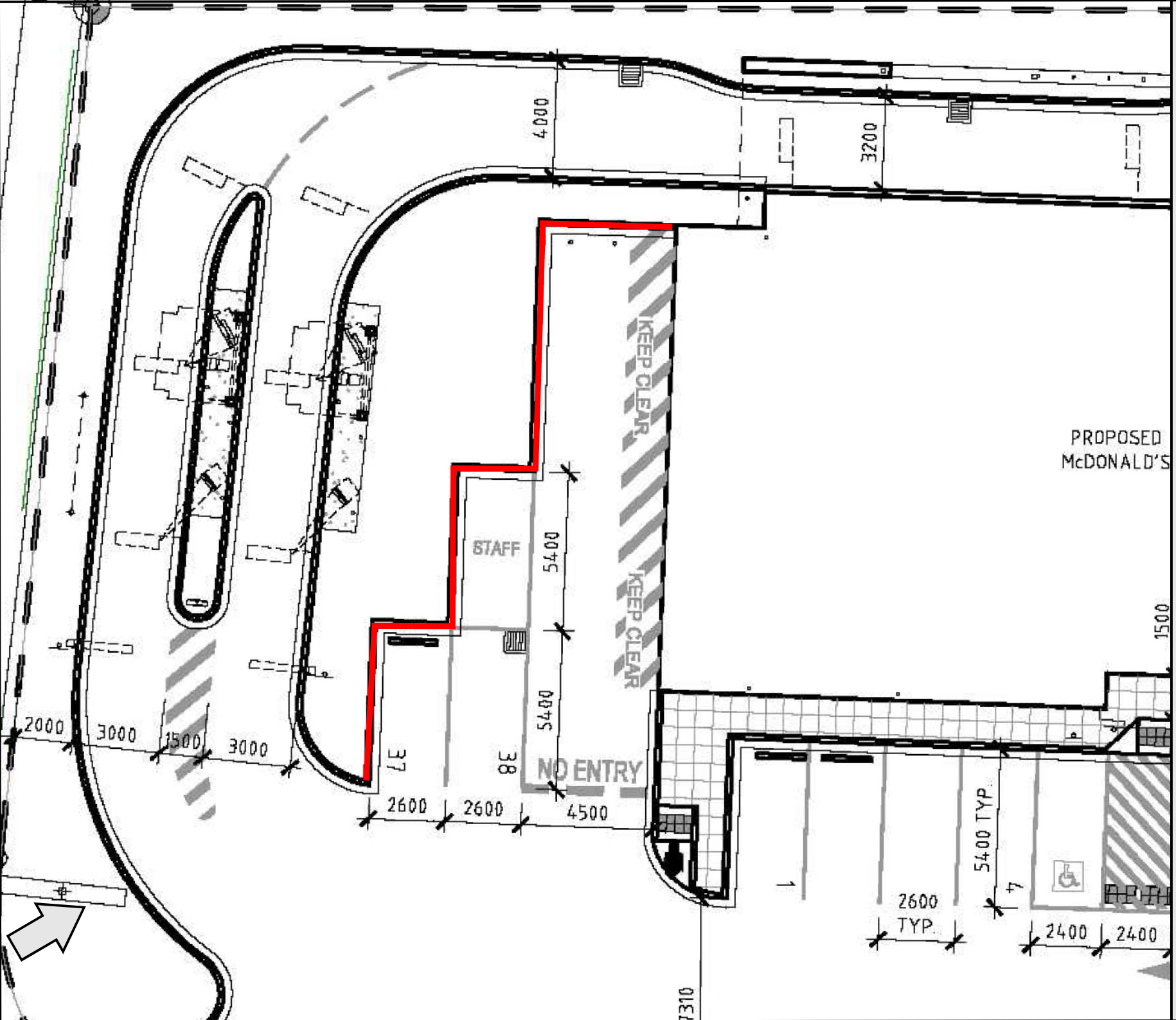

KEY
2.5m Acoustic Barrier

MAC
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6 Noise Assessment Results

This assessment has quantified operational noise levels at the nearest receivers combining the simultaneous occurrence of all the following sources:

- customer car noise (driving around site / parking);
- COD's, customers, passbys and deliveries/collections; and
- mechanical plant.

It is noted that the potential for maximum noise level events to occur simultaneously is unlikely for this project as the majority of vehicles in any fifteen-minute period would be parked and not operational.

6.1 Operational Noise Results

Noise predictions from all sources have been quantified at surrounding residential receivers to the project site and are presented in **Table 13**. The coincidence of all plant occurring onsite simultaneously for an entire fifteen-minute period is unlikely.

However, it is probable that several plant may operate simultaneously on occasion for a limited duration. To account for this, modelling has adopted the $LA_{eq(15min)}$ contribution of sources which were derived from in-field measurements of operation sources or activities. Noise levels from combined activities are predicted to satisfy the relevant NPI criteria at all nearest receivers.

Table 13 Combined Noise Predictions – All Receivers

Residential Receivers

Rec No	Predicted Noise Level, $LA_{eq(15min)}$ dBA			PNTL $LA_{eq(15min)}$ dBA			Compliant
	Day	Evening	Night	Day	Evening	Night	
R1	<30	<30	<30	45	39	35	✓
R2	<30	<30	<30	45	39	35	✓
R3	<30	<30	<30	45	39	35	✓
R4	<30	<30	<30	45	39	35	✓
R5	<30	<30	<30	45	39	35	✓
R6	<30	<30	<30	45	39	35	✓
R7	<30	<30	<30	45	39	35	✓
R8	<30	<30	<30	45	39	35	✓
R9	<30	<30	<30	45	39	35	✓
R10	32	32	31	45	39	35	✓
R11	33	33	32	45	39	35	✓
R12	33	33	32	45	39	35	✓
R13	31	31	31	45	39	35	✓
R14	30	30	<30	45	39	35	✓
R15	<30	<30	<30	45	39	35	✓
R16	<30	<30	<30	45	39	35	✓
R17	<30	<30	<30	45	39	35	✓
R18	<30	<30	<30	45	39	35	✓
R19	<30	<30	<30	45	39	35	✓
R20	30	30	<30	45	39	35	✓
M1	36	36	35	45	39	35	✓
M2	35	35	34	45	39	35	✓

Other Receivers

Rec No	Period	Predicted Noise Level, $LA_{eq(15min)}$ dBA	PNTL $LA_{eq(15min)}$ dBA	Compliant
C1	When in use	37	63	✓
FC1	When in use	47	63	✓
FC2	When in use	40	63	✓
FC3	When in use	34	63	✓
FC4	When in use	<30	63	✓
FC5	When in use	42	63	✓
FC6	When in use	45	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.

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. The use of the L_{Amax} noise level provides a worst-case prediction since the $L_{A1(1minute)}$ noise level of a noise event is likely to be less than the L_{Amax}. For the maximum noise assessment, a sound power level of 102dBA for delivery impact noise are 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 14.** Results identify that the maximum noise events screening criterion will be satisfied for all assessed receivers.

Table 14 Maximum Noise Levels Assessment (Night)[1]

Receiver	Predicted Noise Level,		Screening Criterion		Compliant
	$L_{Aeq(15min)}$ dBA	L_{Amax} dBA	$L_{Aeq(15min)}$ dBA	L_{Amax} dBA	
R1	<30	35	40	52	✓
R2	<30	<35	40	52	✓
R3	<30	<35	40	52	✓
R4	<30	<35	40	52	✓
R5	<30	<35	40	52	✓
R6	<30	<35	40	52	✓
R7	<30	<35	40	52	✓
R8	<30	<35	40	52	✓
R9	<30	38	40	52	✓
R10	31	41	40	52	✓
R11	32	43	40	52	✓
R12	32	43	40	52	✓
R13	31	42	40	52	✓
R14	<30	41	40	52	✓
R15	<30	42	40	52	✓
R16	<30	39	40	52	✓
R17	<30	38	40	52	✓
R18	<30	38	40	52	✓
R19	<30	38	40	52	✓
R20	<30	39	40	52	✓
M1	35	43	40	52	✓
M2	34	43	40	52	✓

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 Construction Noise Results

Predictions identify that emissions from construction have the potential to be above the noise management levels for several assessed receivers. Accordingly, recommendations to reduce the impact of construction noise emissions on surrounding receivers, are provided in **Section 7**. **Table 15** presents the results of modelled construction noise emissions.

Table 15 Construction Noise Levels – All Receivers

Receiver	Period[1]	Predicted Noise Level, $L_{Aeq(15min)}$ dBA	Management Level $L_{Aeq(15min)}$ dBA	Compliant
R1	Day	46	50	✓
R2	Day	44	50	✓
R3	Day	<30	50	✓
R4	Day	<30	50	✓
R5	Day	55	50	✓
R6	Day	44	50	✓
R7	Day	46	50	✓
R8	Day	46	50	✓
R9	Day	44	50	✓
R10	Day	47	50	✓
R11	Day	46	50	✓
R12	Day	46	50	✓
R13	Day	44	50	✓
R14	Day	42	50	✓
R15	Day	44	50	✓
R16	Day	42	50	✓
R17	Day	42	50	✓
R18	Day	42	50	✓
R19	Day	41	50	✓
R20	Day	47	50	✓
M1	Day	54	50	X
M2	Day	54	50	X
C1	Day	54	70	✓
FC1	Day	68	70	✓
FC2	Day	61	70	✓
FC3	Day	56	70	✓
FC4	Day	44	70	✓
FC5	Day	60	70	✓
FC6	Day	62	70	✓

Note 1: See Table 4 for recommended standard hours for construction.

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 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 impact 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 completed a Noise Assessment to quantify potential noise impacts from the McDonald's Operation to be established at DP874556, 2710 Remembrance Drive, Tahmoor, NSW.

The assessment has quantified potential operational emissions pertaining to customer generated noise, including light vehicles, truck deliveries and mechanical plant.

The results of the Noise Assessment demonstrate that emissions from the project would satisfy the relevant PNTLs at all assessed receivers for all assessment periods.

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

Modelled noise emissions from project construction activities identify that predicted noise emissions levels may be above the applicable construction management levels. Accordingly, noise management measures are provided in this report to reduce potential impacts on surrounding receivers.

Based on the findings of the Noise Assessment, it is recommended Council approve the operation taking into consideration the noise control and management strategies provided in this report.

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Appendix A - Glossary of Terms

A number of technical terms have been used in this report and are explained in **Table A1**.

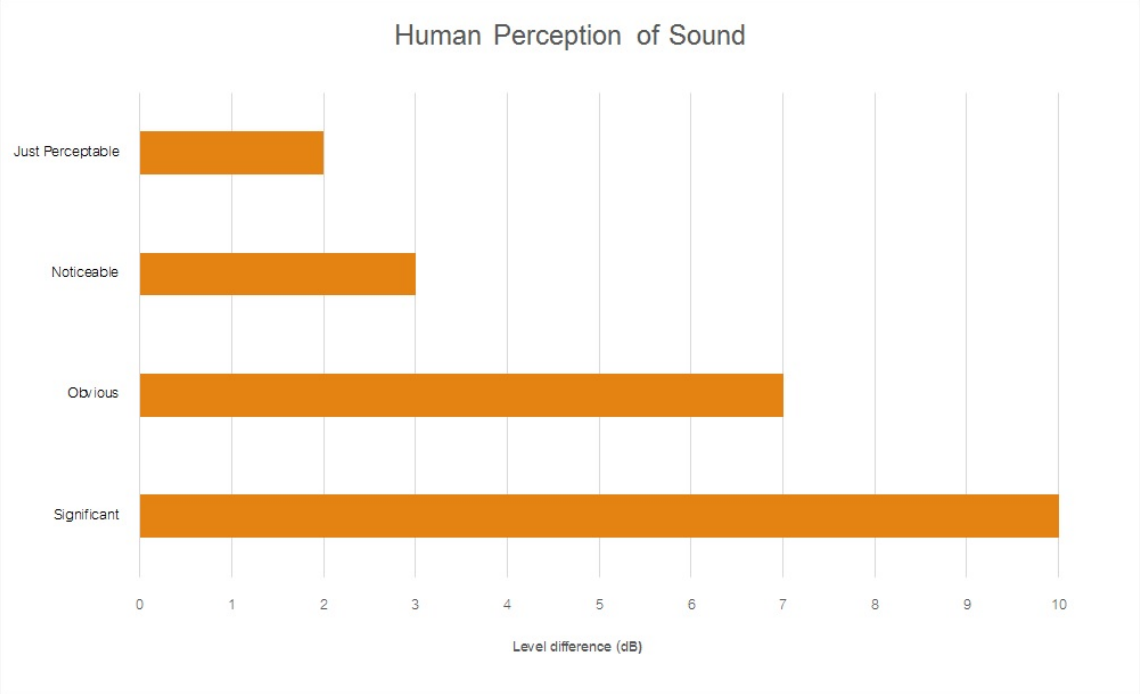
Table A1 Glossary of Terms

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.
Extraneous Noise	Noise resulting from activities that are not typical of the area. Atypical activities include sources such as construction and holiday period traffic.
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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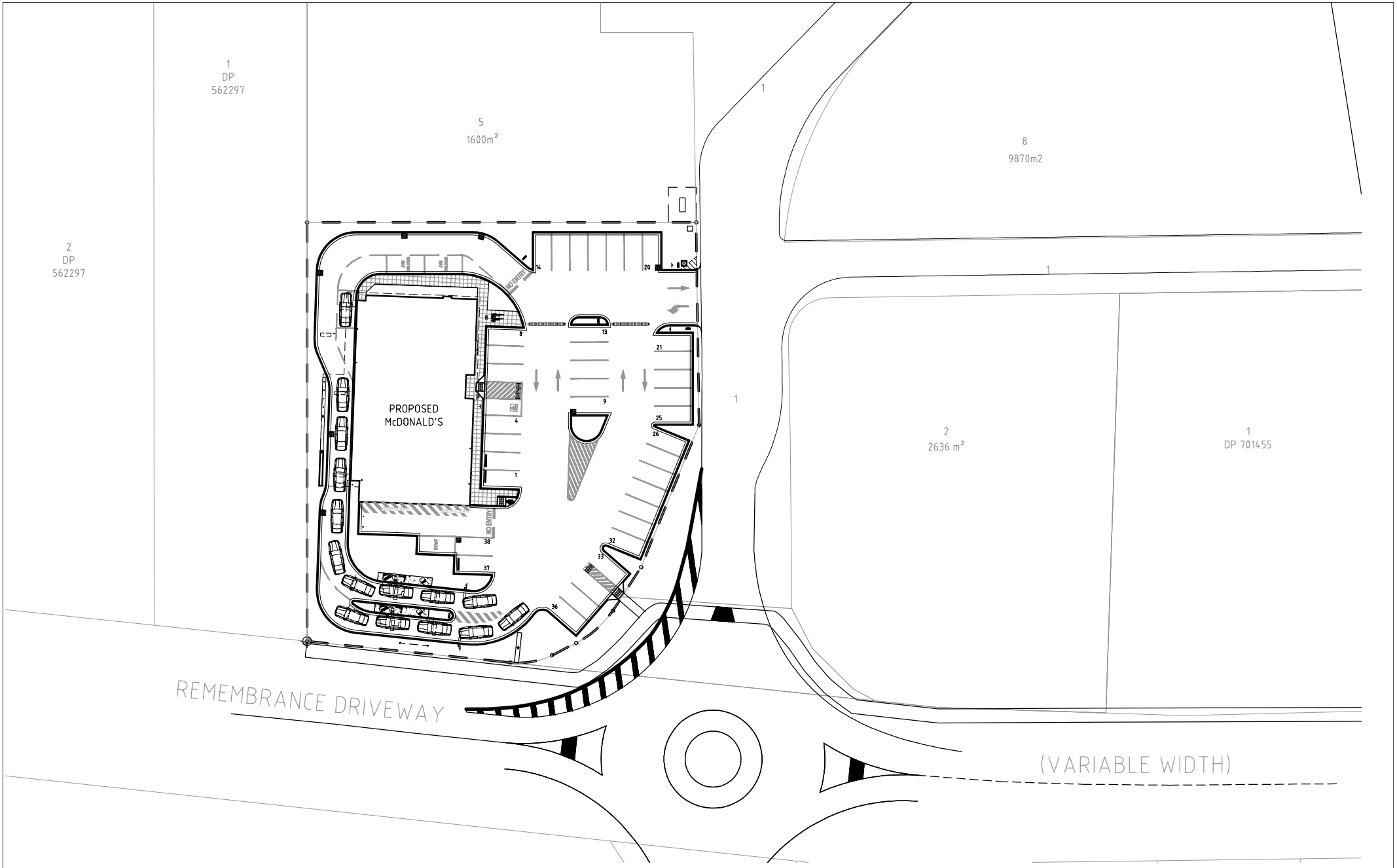
Appendix B - Site Plans



ISSUE	AMENDMENT	DATE	INT
A	PRELIMINARY ISSUE	04-05-2018	GM
D	DA ISSUE	15-01-2019	GM

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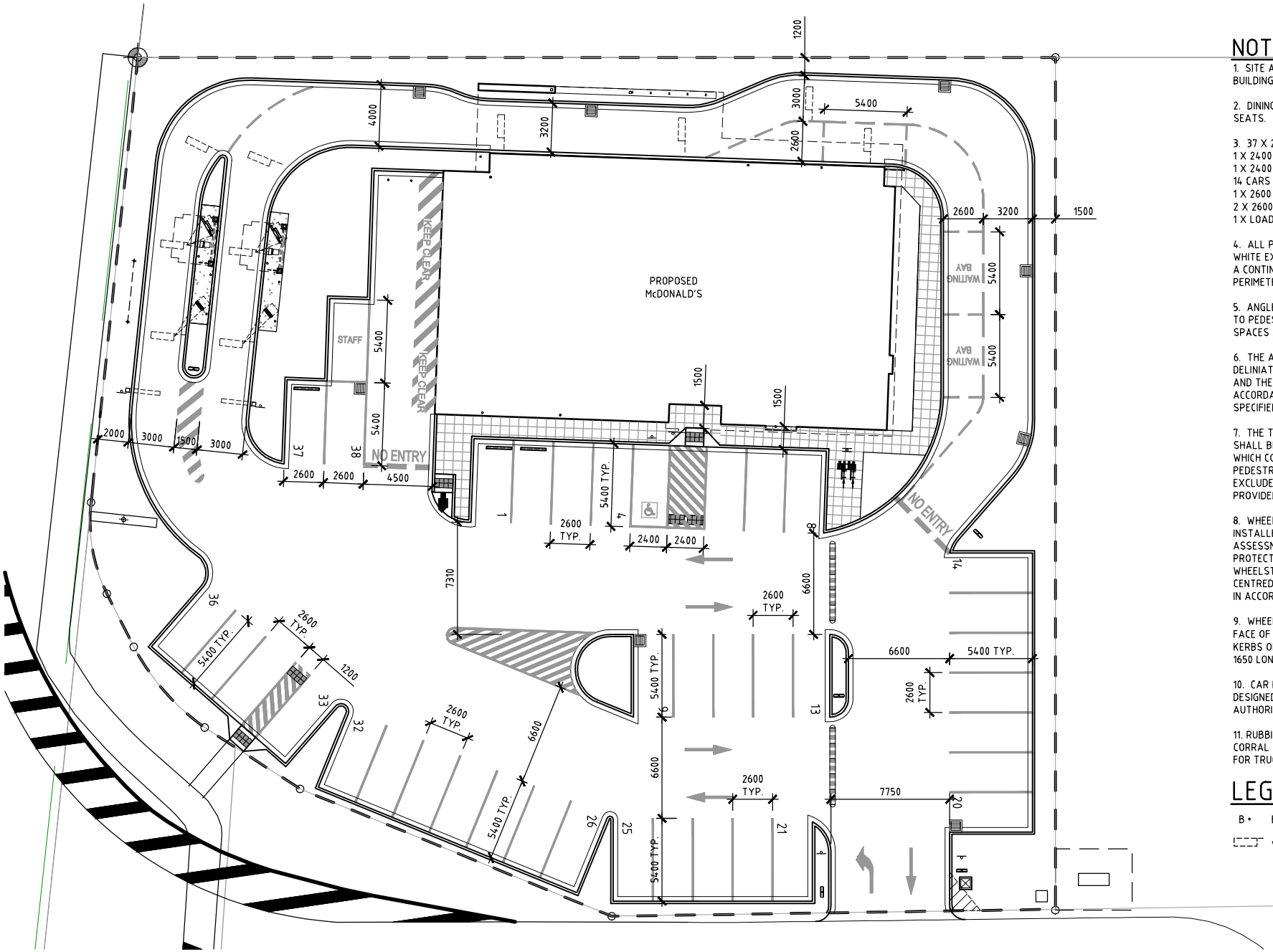
BUILDING OPTIONS

McDonald's Australia Limited
ABN: 43 008 496 928
02 9875 6666
devgroup-aust@au.mcd.com
NDG NATIONAL DEVELOPMENT GROUP

PROJECT: REF: 180069
PROPOSED McDONALD'S OPERATION AT
REMEMBRANCE DRIVEWAY
TAHMOOR NSW 2573

STATUS:	DATE:	TITLE : OVERALL SITE PLAN				
DA ISSUE	MAY 2018					
SERIES:	REF.	DRAWN	CHECKED	SCALE	DWG. NO.	REV.
MOD 517	01	GM	SH	1:500	A041	D

UNMODIFIED MASTER DRAWING
PROJECT SPECIFIC DRAWING



NOTES

1. SITE AREA = 3200 SQ.M.
BUILDING GFA = 483 SQ.M.

2. DINING ROOM SEATING CAPACITY = 76 SEATS.

3. 37 X 2600 X 5400 CAR SPACES.
1 X 2400 X 5400 ACCESSIBLE SPACE WITH
1 X 2400 X 5400 CLEAR ADJACENT SPACE.
14 CARS IN DRIVE THRU QUEUE.
1 X 2600 X 5400 SERVERY BAY (3rd WINDOW).
2 X 2600 X 5400 WAITING BAY(S).
1 X LOADING BAY.

4. ALL PAVEMENT LINEMARKINGS SHALL BE WHITE EXCEPT WHERE NOTED. DO NOT PROVIDE A CONTINUOUS BORDER AROUND THE PERIMETER OF CHEVRON MARKING.

5. ANGLED LINEMARKING SHALL BE ADOPTED TO PEDESTRIAN WALKWAYS BETWEEN CAR SPACES AND WHERE SHOWN ON PLAN.

6. THE ACCESSIBLE PARKING SPACE SHALL BE DELINIATED WITH A LINEMARKED PERIMETER AND THE INTERNATIONAL SYMBOL IN ACCORDANCE WITH AS1428.1 AND AS SPECIFIED.

7. THE TOP AND VERTICAL FACE OF KERBS SHALL BE PAINTED YELLOW IN ALL AREAS WHICH COULD BE TRAFFICKED BY PEDESTRIANS. THE DRIVE THRU LANE MAY BE EXCLUDED IF APPROPRIATE SIGNAGE IS PROVIDED. REFER TO SIGNAGE SCHEDULE.

8. WHEELSTOPS SHALL BE AVOIDED AND ONLY INSTALLED ON COMPLETION OF A RISK ASSESSMENT AND WHERE ALTERNATIVE PROTECTION DEVICES ARE UNSUITABLE. WHEELSTOPS SHALL BE PAINTED YELLOW, CENTRED ON THE CAR SPACE AND INSTALLED IN ACCORDANCE WITH AS2890.1.

9. WHEELSTOP SPACING SHALL BE 620 FROM FACE OF KERB (INCREASE TO 820 AGAINST HIGH KERBS OR WALLS). WHEELSTOPS SHALL BE 1650 LONG.

10. CAR PARK ENTRY AND EXITS SHALL BE DESIGNED IN ACCORDANCE WITH LOCAL AUTHORITY REQUIREMENTS AND AS2890.1.

11. RUBBISH & RECYCLE BINS WHEELED OUT OF CORRAL & ROTATED WITHIN DELIVERY DOCK FOR TRUCK PICK UP.

LEGEND

B ∘ BOLLARD.

VEHICLE DETECTOR LOOP.

ISSUE	AMENDMENT	DATE	INT
A	PRELIMINARY ISSUE	04-05-2018	GM
B	PRELIMINARY ISSUE	17-08-2018	GM
C	PRELIMINARY ISSUE	18-09-2018	SH
D	DA ISSUE	15-01-2019	GM

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PROJECT: REF: 180069
PROPOSED McDONALD'S OPERATION AT REMEMBRANCE DRIVEWAY TAHMOOR NSW 2573

STATUS: DA ISSUE
DATE: MAY 2018
TITLE : SITE PLAN

SERIES: MOD 517
REF. 01
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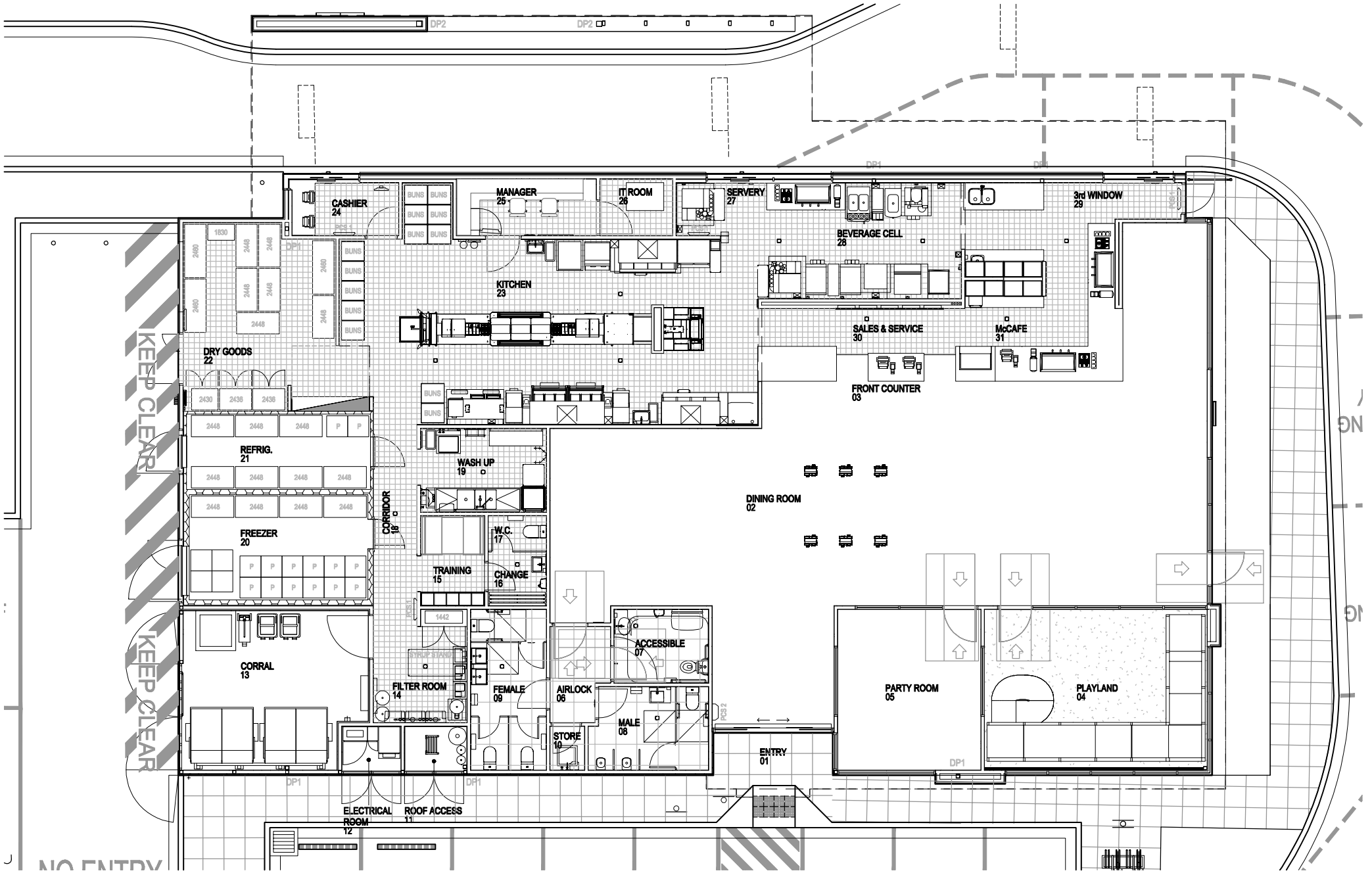
GM	SH	1:250	A062	D



ISSUE	AMENDMENT	DATE	INT
D	DA ISSUE	15-01-2018	GM

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NDG NATIONAL DEVELOPMENT GROUP

PROJECT: REF: 180069
PROPOSED McDONALD'S OPERATION AT REMEMBRANCE DRIVEWAY TAHMOOR NSW 2573

STATUS: DA ISSUE
DATE: MAY 2018
TITLE : FLOOR PLAN

SERIES: MOD 517
REF. 01

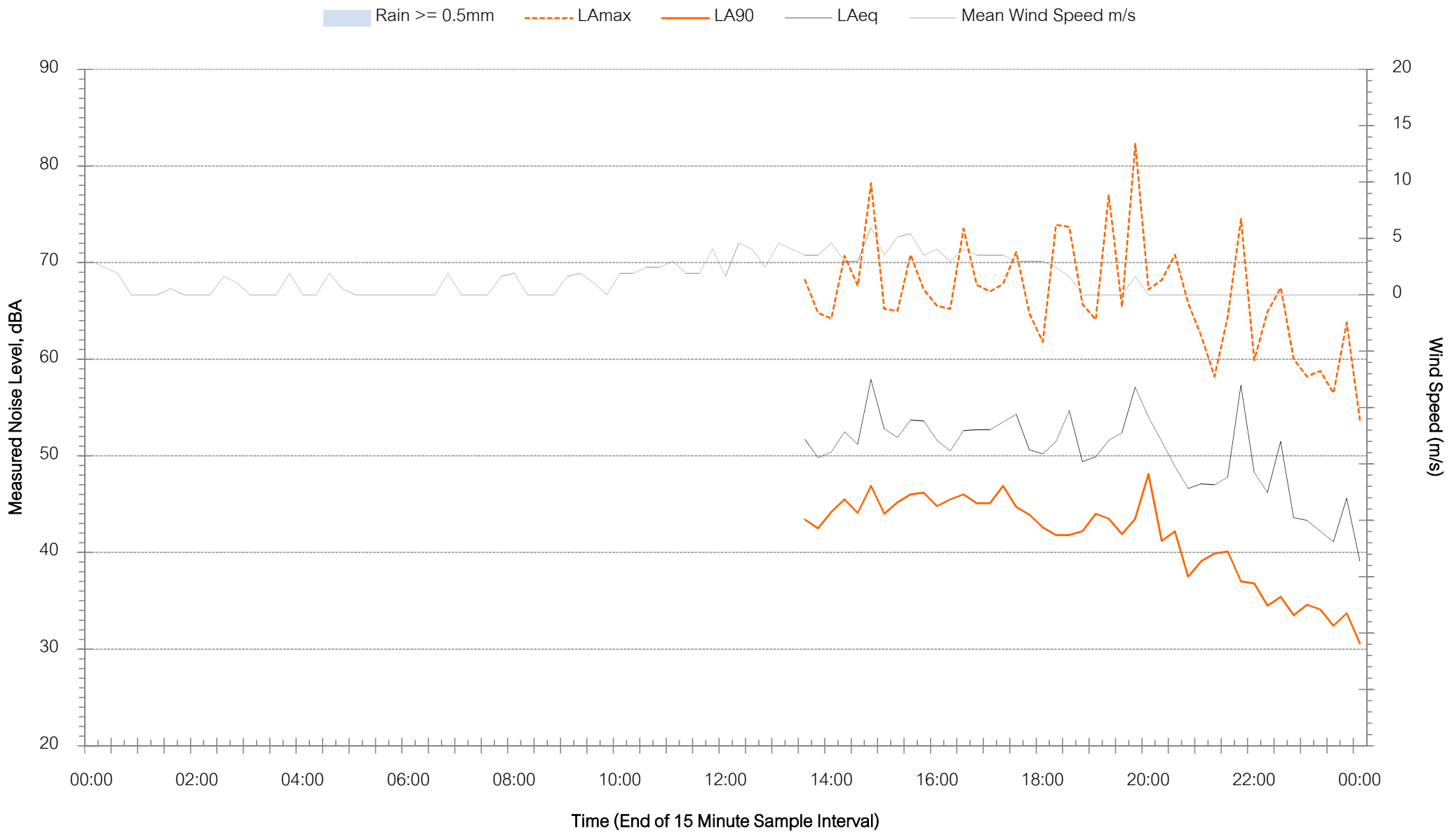
UNMODIFIED MASTER DRAWING
PROJECT SPECIFIC DRAWING

DRAWN	CHECKED	SCALE	DWG. NO.	REV.
GM	SH	1:100	A101	D

Appendix C - Noise Logging Charts

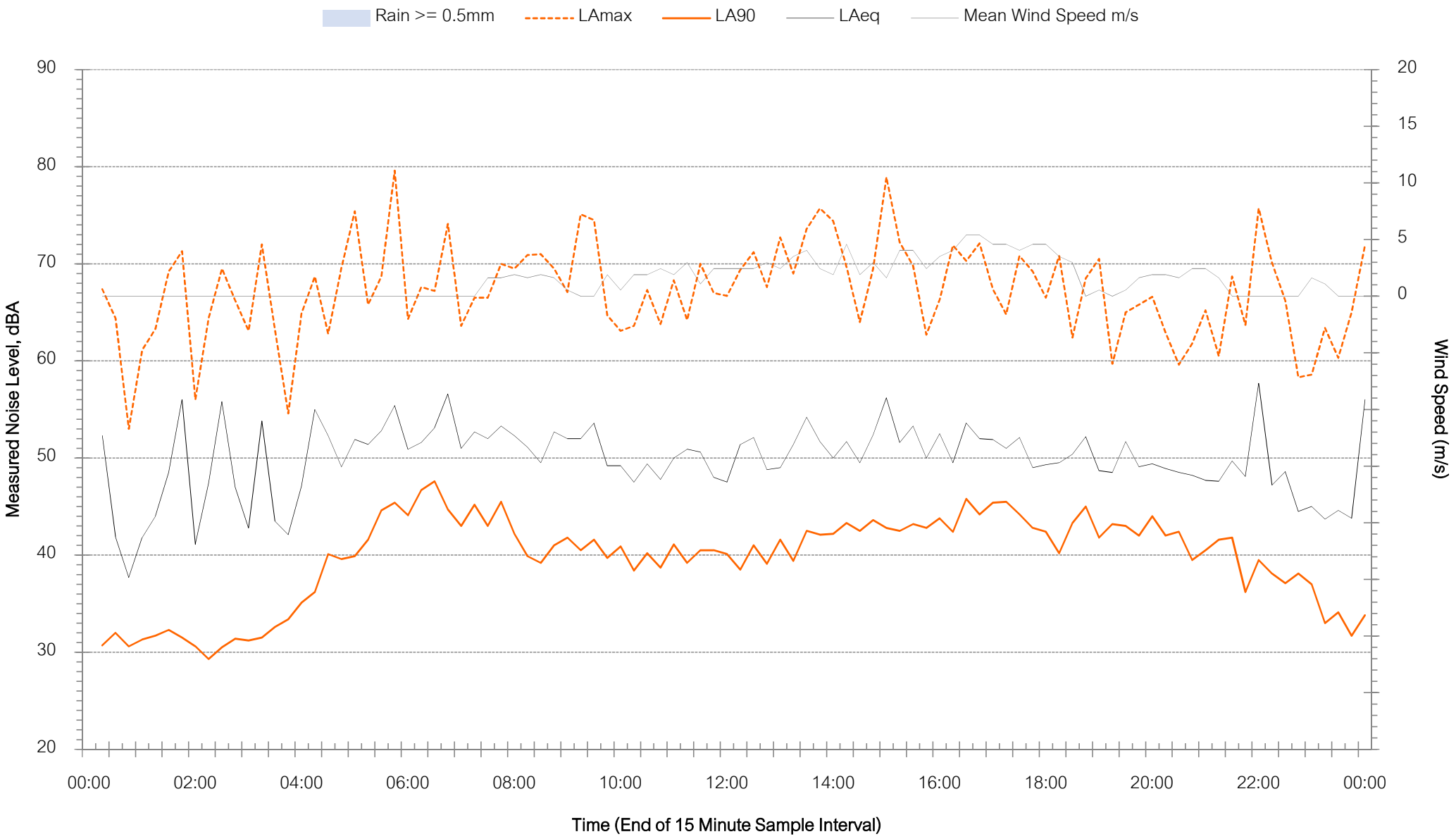
Background Noise Levels

Location 1 - Tahmoor, NSW - Thursday 20 September 2018



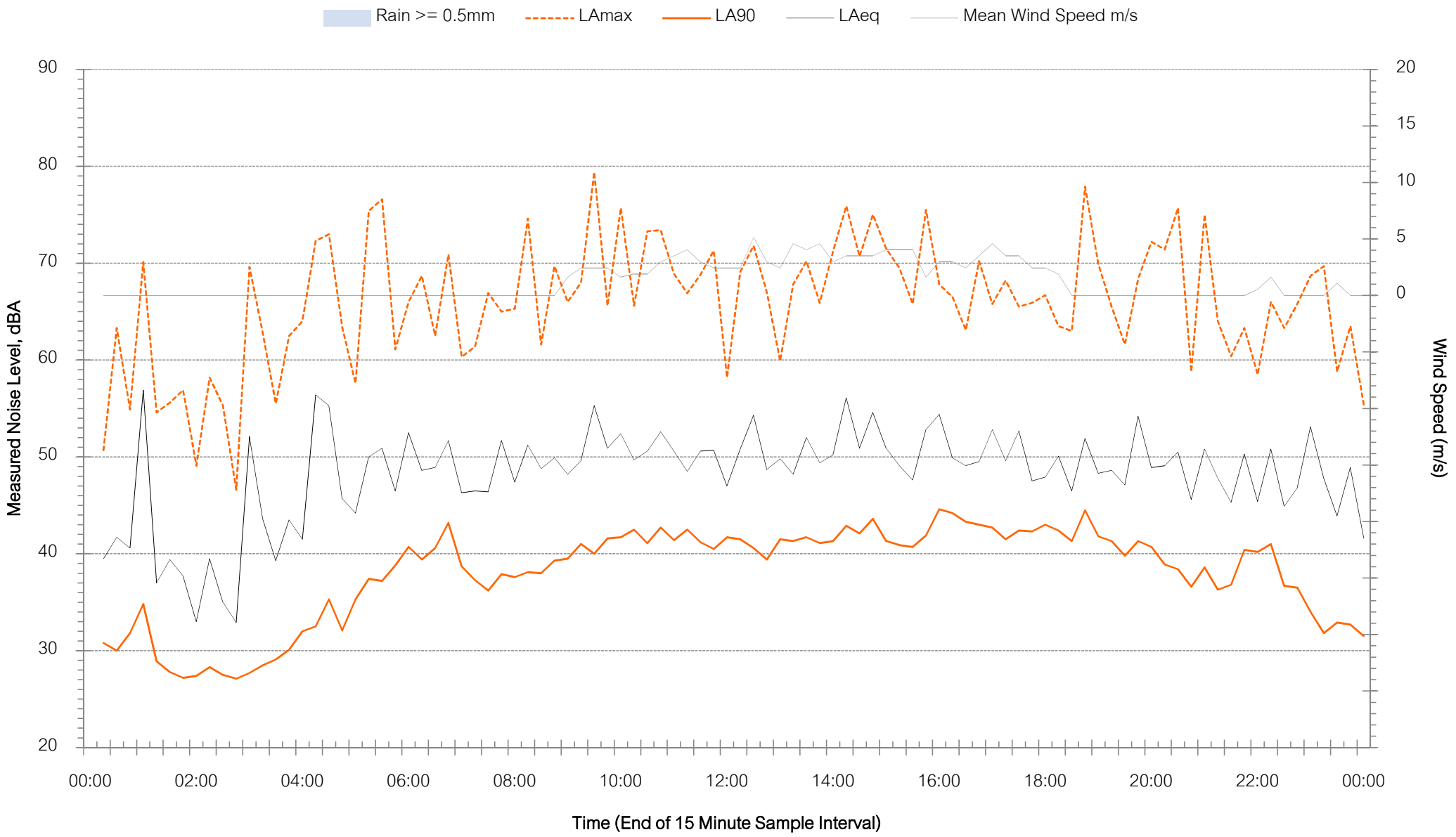
Background Noise Levels

Location 1 - Tahmoor, NSW - Friday 21 September 2018



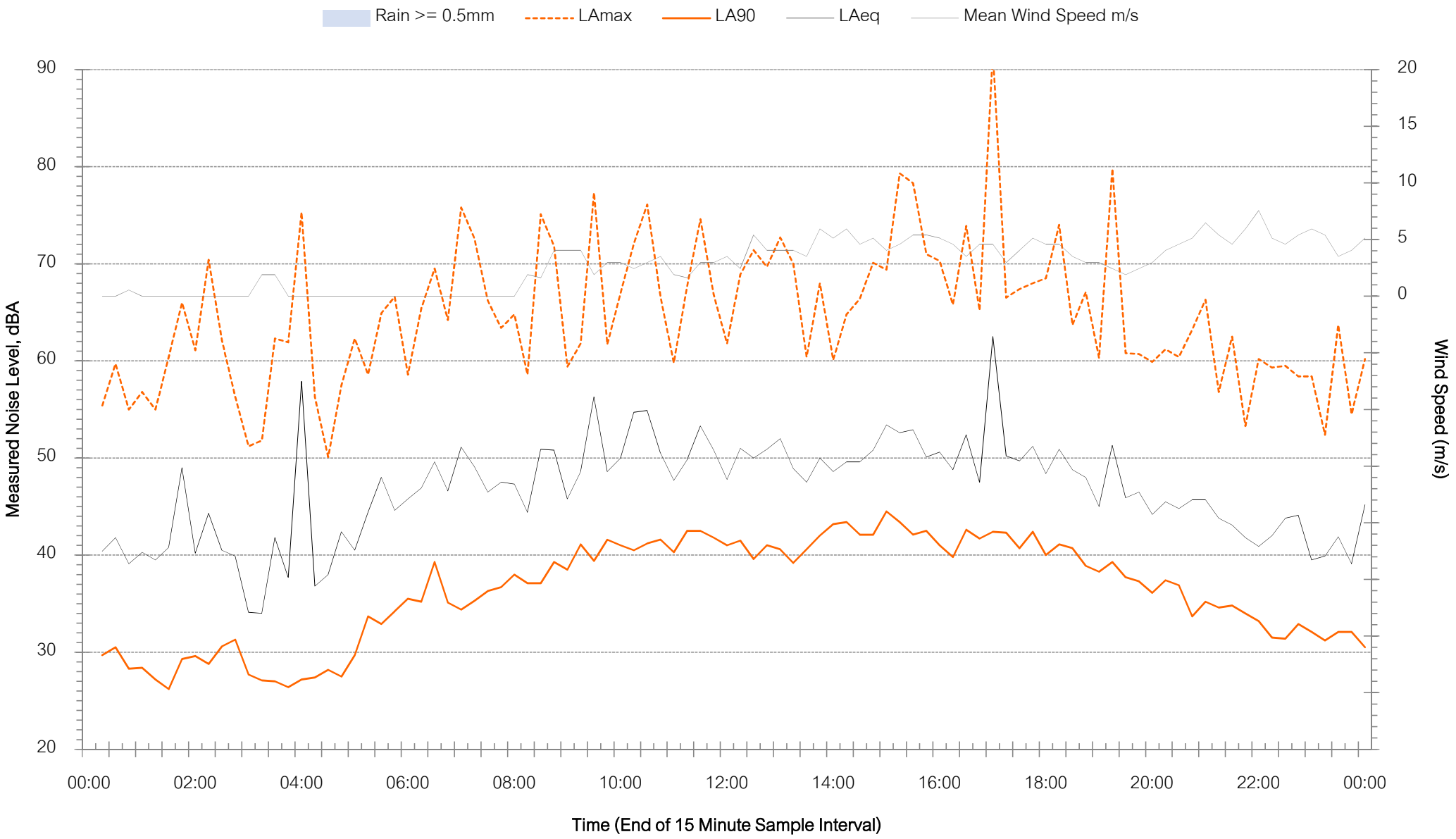
Background Noise Levels

Location 1 - Tahmoor, NSW - Saturday 22 September 2018



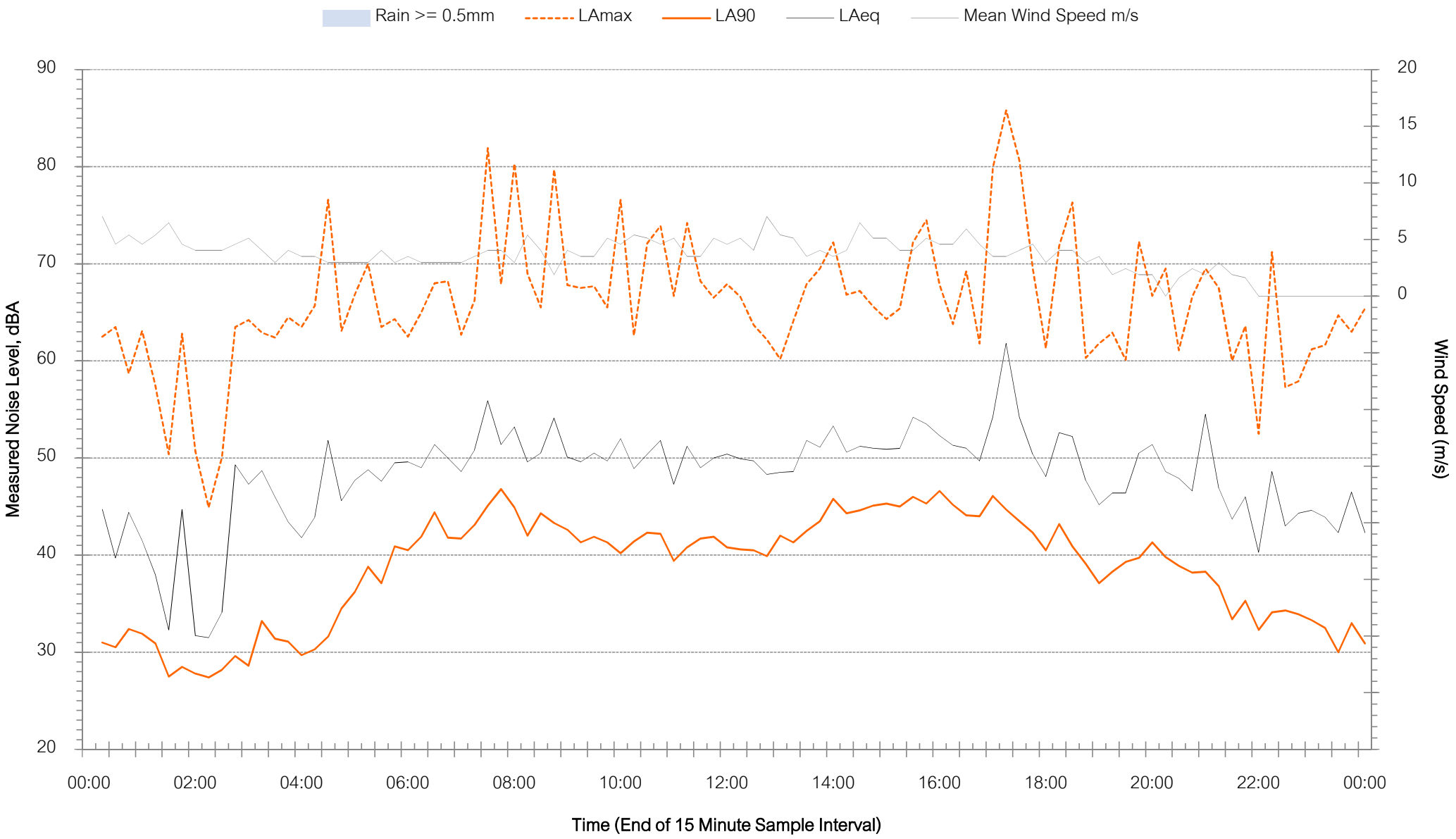
Background Noise Levels

Location 1 - Tahmoor, NSW - Sunday 23 September 2018



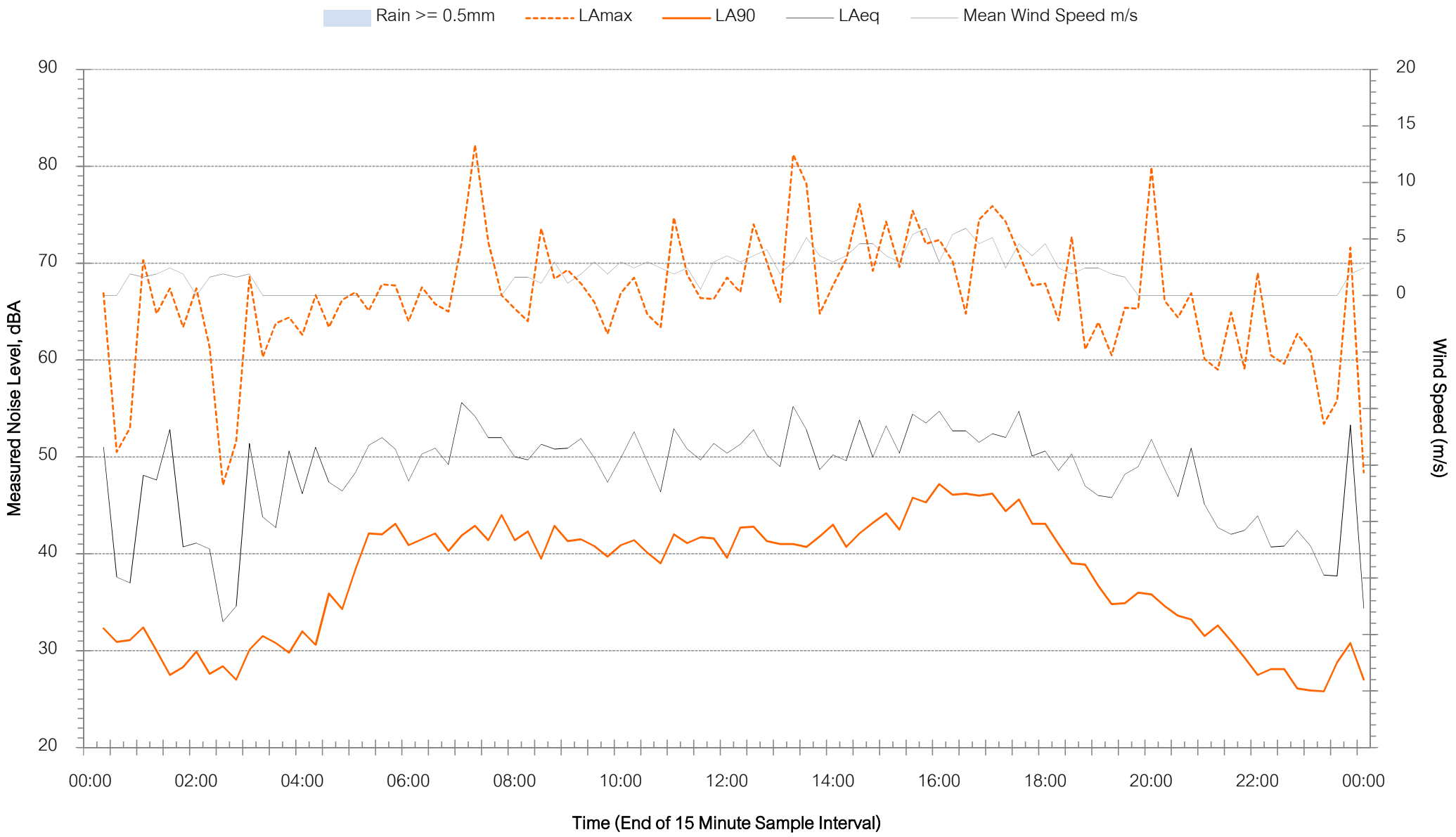
Background Noise Levels

Location 1 - Tahmoor, NSW - Monday 24 September 2018



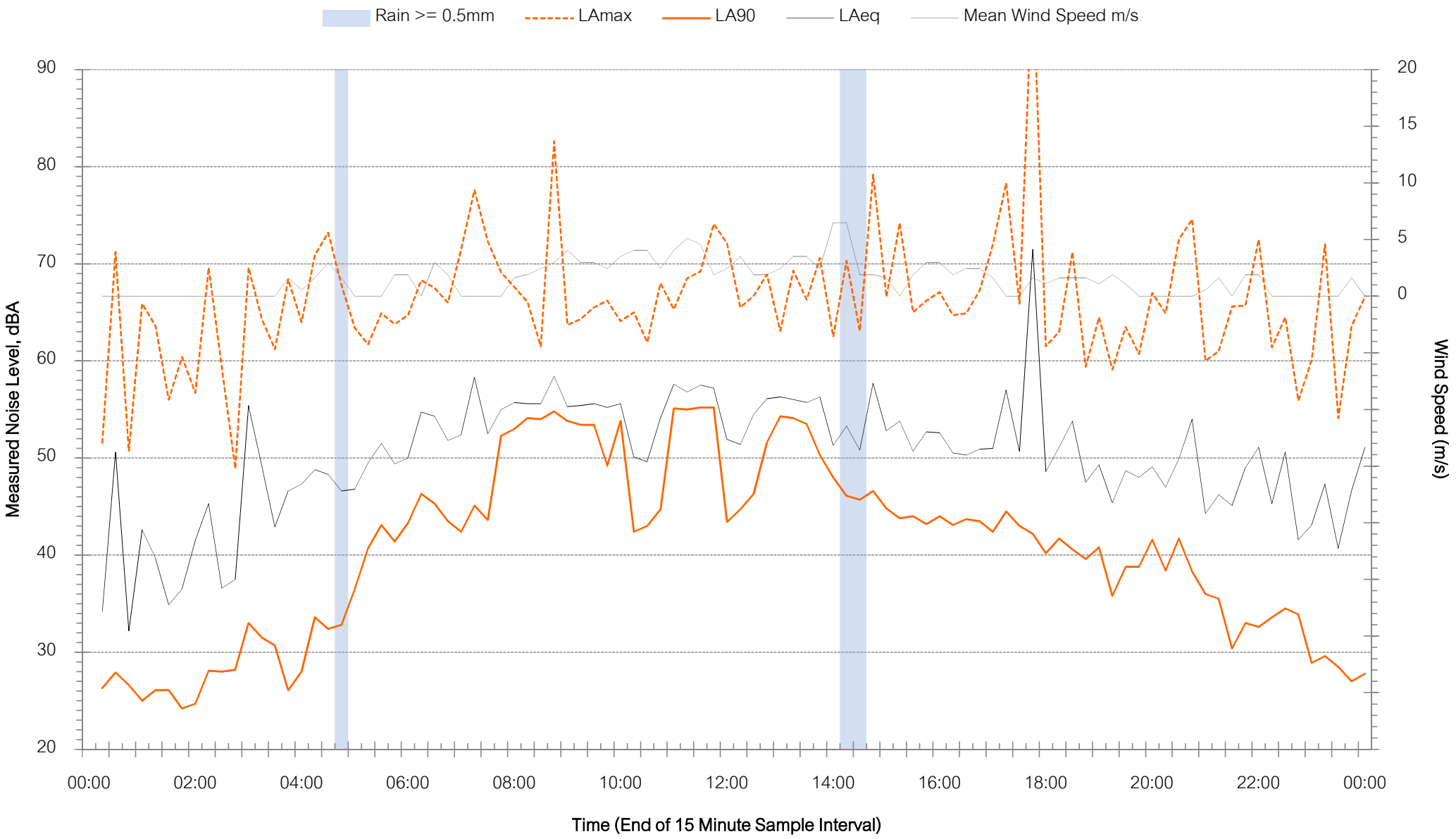
Background Noise Levels

Location 1 - Tahmoor, NSW - Tuesday 25 September 2018



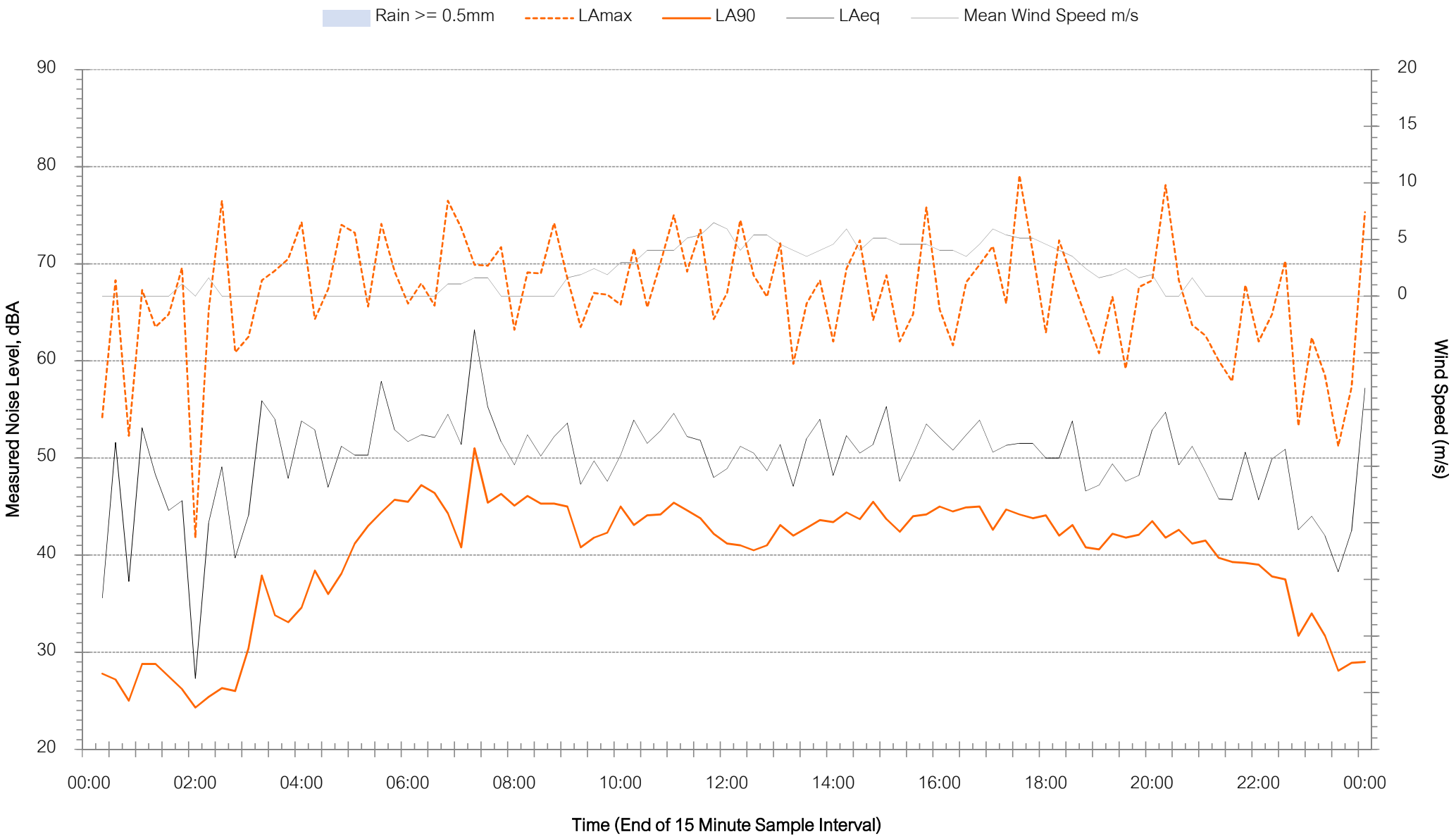
Background Noise Levels

Location 1 - Tahmoor, NSW - Wednesday 26 September 2018



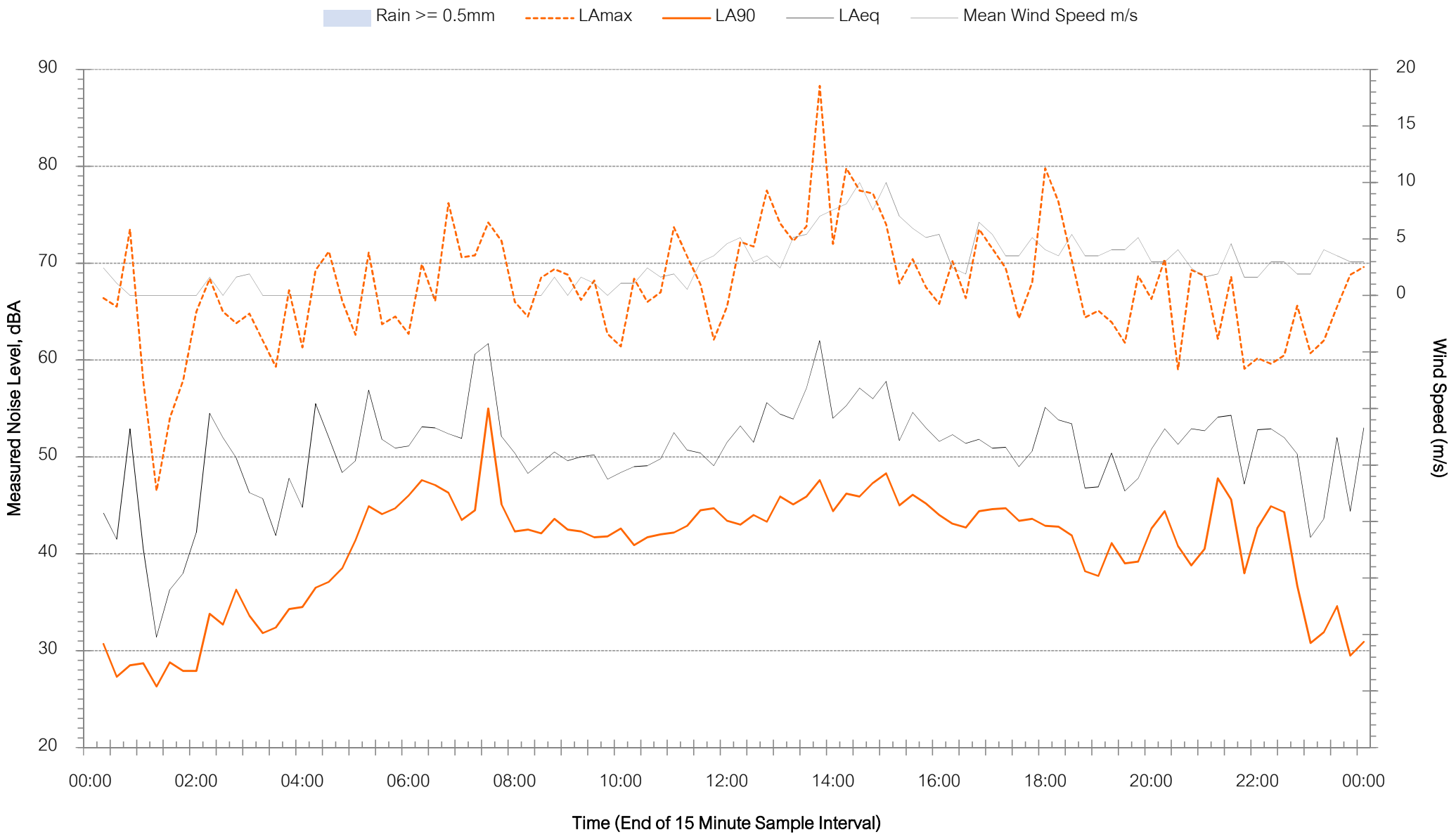
Background Noise Levels

Location 1 - Tahmoor, NSW - Thursday 27 September 2018



Background Noise Levels

Location 1 - Tahmoor, NSW - Friday 28 September 2018



Background Noise Levels

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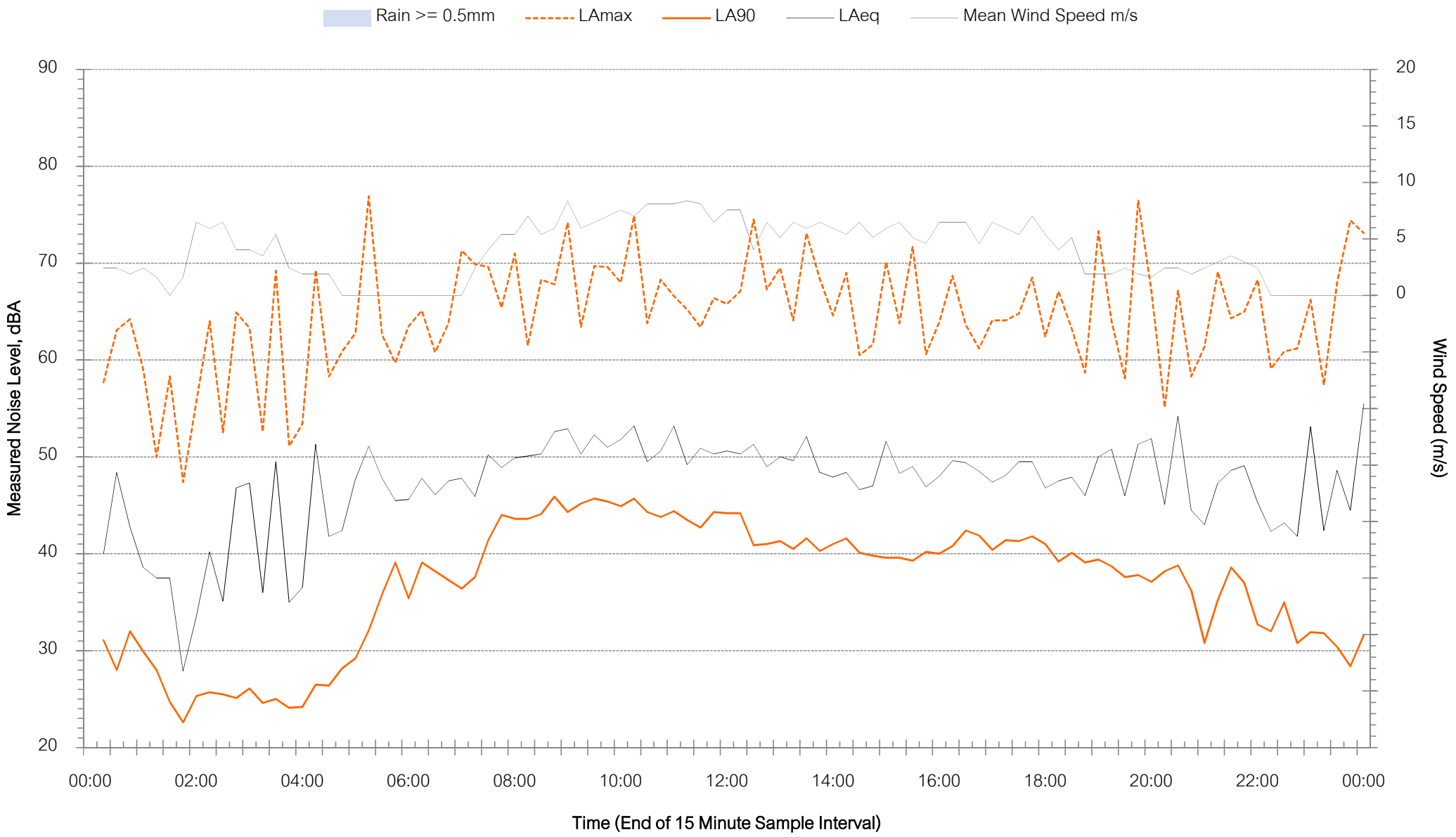
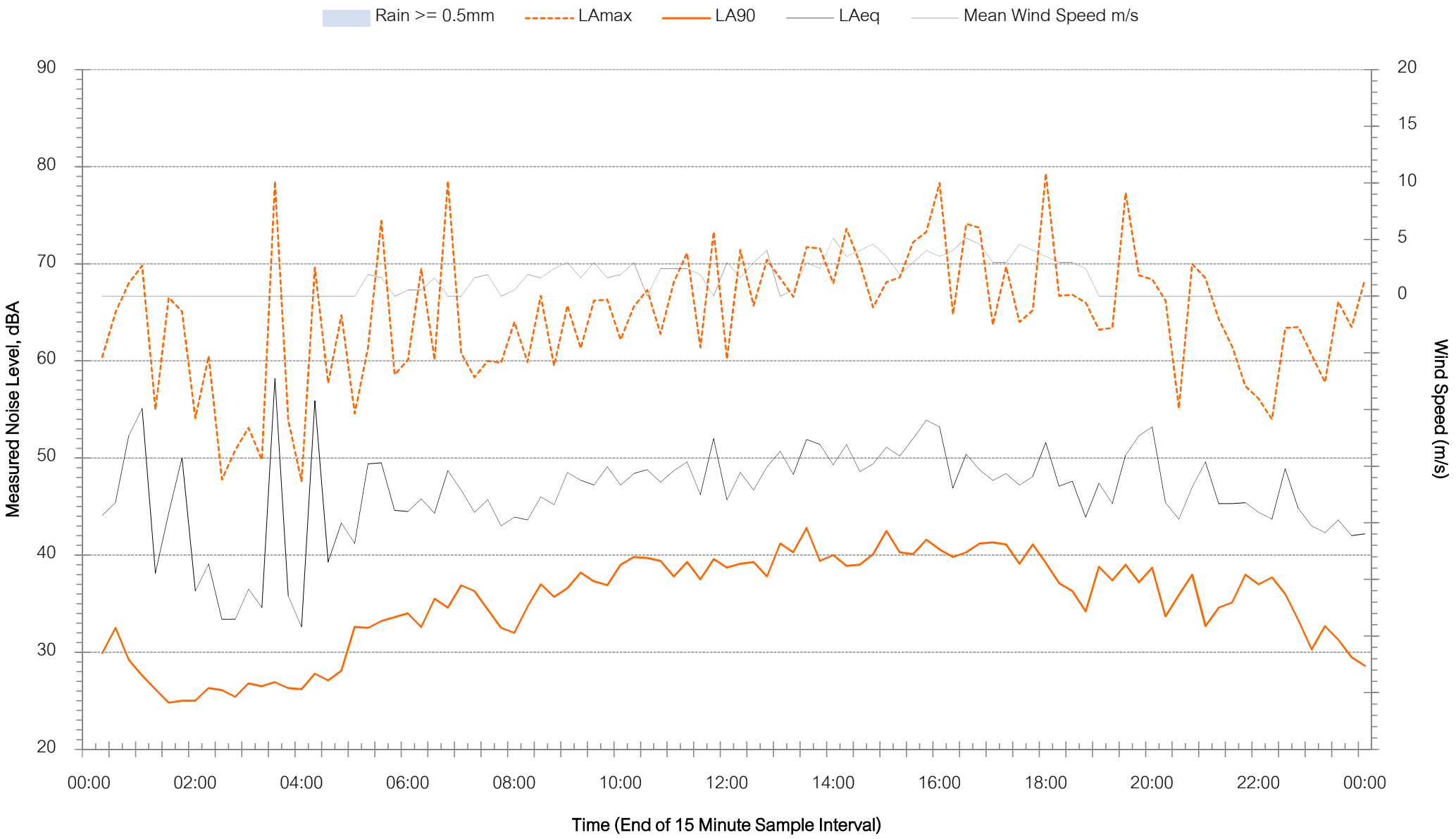


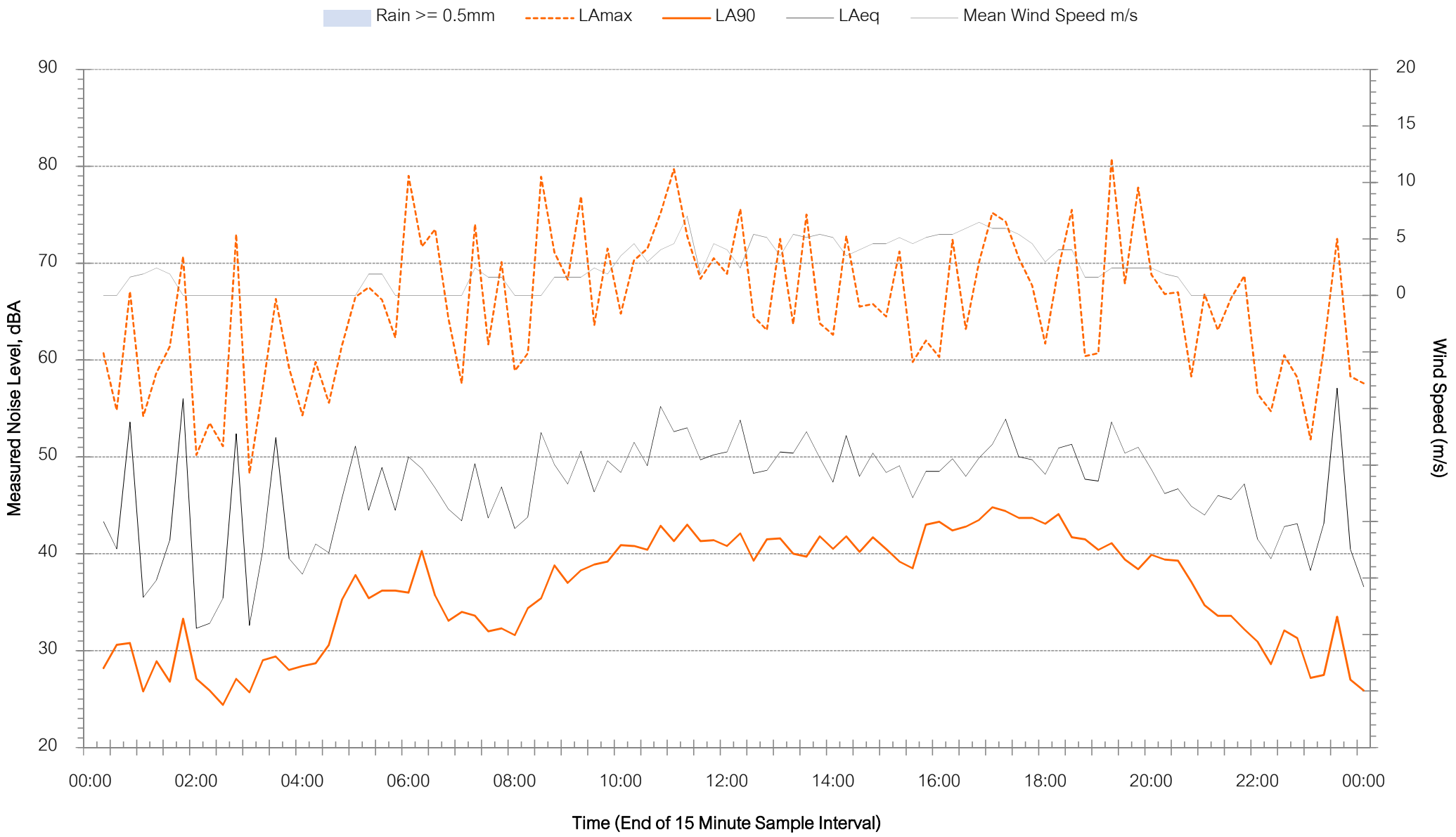
Background Noise Levels

Location 1 - Tahmoor, NSW - Sunday 30 September 2018



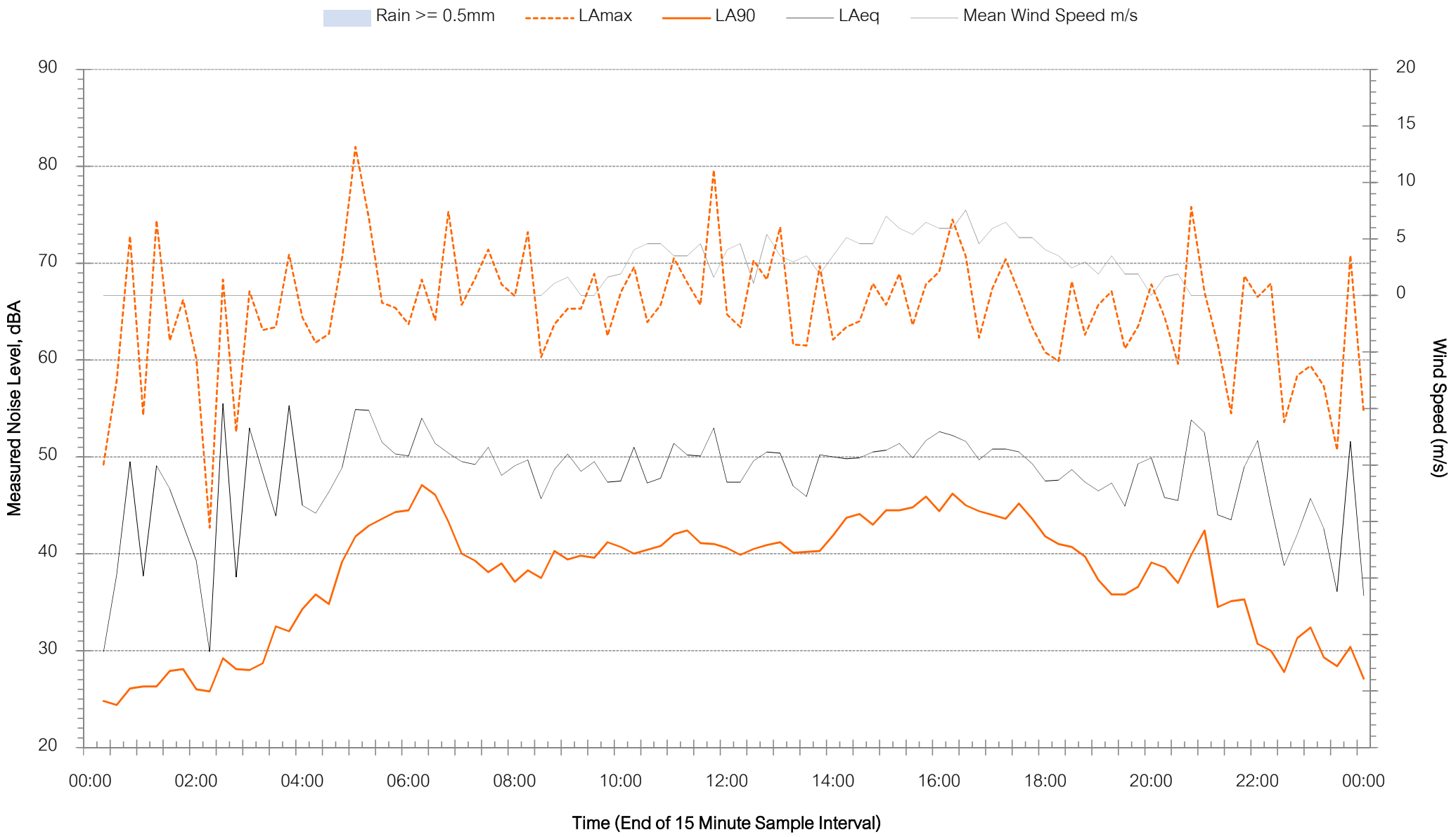
Background Noise Levels

Location 1 - Tahmoor, NSW - Monday 1 October 2018



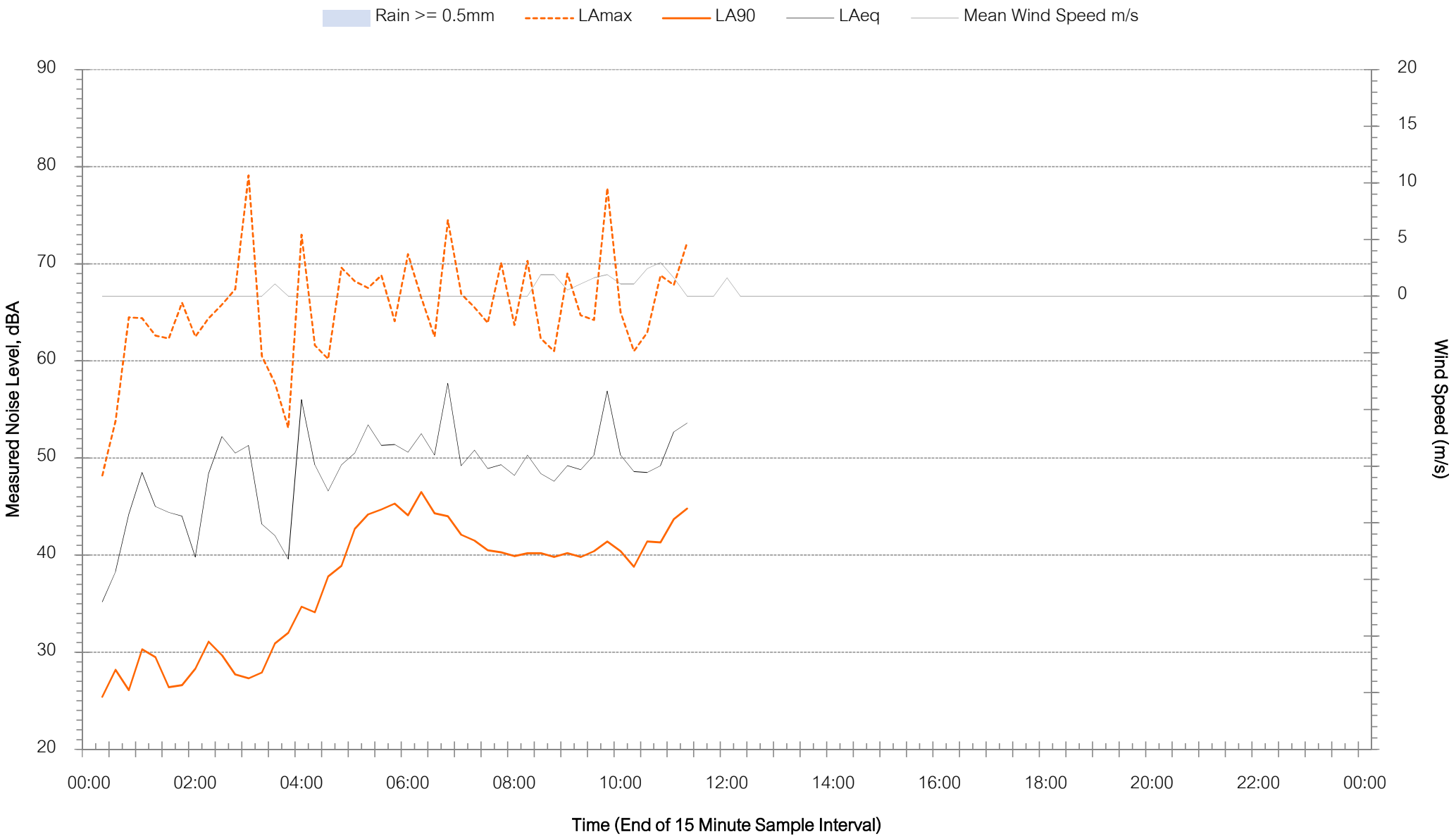
Background Noise Levels

Location 1 - Tahmoor, NSW - Tuesday 2 October 2018



Background Noise Levels

Location 1 - Tahmoor, NSW - Wednesday 3 October 2018



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