Noise Assessment

Proposed Residential Dwellings
39-41 Fairfax Street
Rutherford, NSW

Prepared for: PM. Anderson Consulting Pty Ltd
November 2023
MAC231799-01RP1

Muller Acoustic Consulting

Document Information

Noise Assessment

Proposed Residential Dwellings

39-41 Fairfax Street

Rutherford, NSW

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CONTENTS

1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has been commissioned by PM. Anderson Consulting Pty Ltd to prepare a Noise Assessment (NA) to quantify noise emissions from surrounding developments to the proposed residential dwellings to be located at 39-41 Fairfax Street, Rutherford, NSW (the project).

The NA has quantified potential noise emissions from the surrounding development and recommends reasonable and feasible noise controls where required.

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

- NSW Environment Protection Authority (EPA), Noise Policy for Industry (NPI) 2017;
- NSW Environment Protection Authority (EPA), Approved Methods for the measurement and analysis of environmental noise in NSW, 2022;
- NSW Department of Environment and Climate Change (DECCW) – NSW Interim Construction Noise Guideline (ICNG), July 2009;
- Standards Australia AS 1055:2018 - Acoustics - Description and measurement of environmental noise - General Procedures;
- International Organisation for Standardisation (ISO) 9613-1:1993 (ISO9613:1) - Acoustics - Attenuation of Sound During Propagation Outdoors - Part 1: Calculation of the Absorption of Sound by the Atmosphere;
- International Organisation for Standardisation (ISO) 9613-2:1996 (ISO9613:2) - Acoustics - Attenuation of Sound during Propagation Outdoors - Part 2: General Method of Calculation; and
- ISO/TR 17534-3 - Acoustics — Software for the calculation of sound outdoors — Part 3: Recommendations for quality assured implementation of ISO 9613-2 in software according to ISO 17534-1.

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

1.1 Project Background

The project relates to the construction of two multi-storey residential dwellings to be located on Lots 1 and 3 of DP809354. These dwellings will be known as 39 and 41 Fairfax Street respectively. Both dwellings will have three bedrooms. The project plans are reproduced in **Appendix B**.

1.1.1 Receiver Review

A review of residential receivers in 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. Additionally, a proposed childcare centre is to be constructed and operated immediately adjacent the residential dwellings located at 39-43 Fairfax Street Rutherford. **Figure 1** provides a locality plan showing the position of this childcare centre.

Table 1 Receiver Locations

Receiver	Height	Receiver Type	Coordinates (GDA94/MGA56)	
			Easting	Northing
R01	1.5m	Residential	361309	6380006
R02	1.5m	Residential	361307	6379990
R03	1.5m	Residential	361318	6379950
R04	1.5m	Residential	361319	6379935
R05	1.5m	Residential	361325	6379917
R06	1.5m	Residential	361333	6379896
R07	1.5m	Residential	361345	6379883
R08	1.5m	Residential	361356	6379864
R09	1.5m	Residential	361404	6380003

FIGURE 1

Locality Plan

MAC231799-01

39-41 Fairfax Street

Rutherford NSW

KEY

- Unattended Noise Monitoring
- Attended Noise Monitoring
- Receiver
- Proposed Dwellings
- Childcare Centre Boundary

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2 Noise Policy and Guidelines

2.1 Development Near Rail Corridors and Busy Roads – Interim Guidelines

Guidance for the specification of internal noise levels of habitable rooms is prescribed in Department of Planning's (DoP) Development near Rail Corridors and Busy Roads – Interim Guidelines (2008) (the guideline).

2.1.1 Road Noise Screening Test

Section 5.3.2 of the guideline provides screening tests for single and dual occupancy dwellings. The screening tests provide various categories of noise control treatments for dwellings taking into consideration distance to the road and amount of traffic. The guideline presents two screen tests for a 60/70 km/hr zone and 100/110 km/hr zone that are reproduced in **Figure 2** and **Figure 3** respectively. The screening tests have been adopted in this assessment to provide guidance on building categories for the project. As the residential dwellings are expected to be more than 300m from the New England Highway (60km zone which carries less than 20,000 vehicles per day), a detailed assessment is not required to determine the appropriate acoustic treatments required for the development prior to construction.

It is expected standard construction materials will be able to provide suitable attenuation from road traffic associated with busy roads in the area.

Figure 2 Screen test for habitable areas of single/dual occupancy dwellings adjacent to 60/70 km/hr zones.

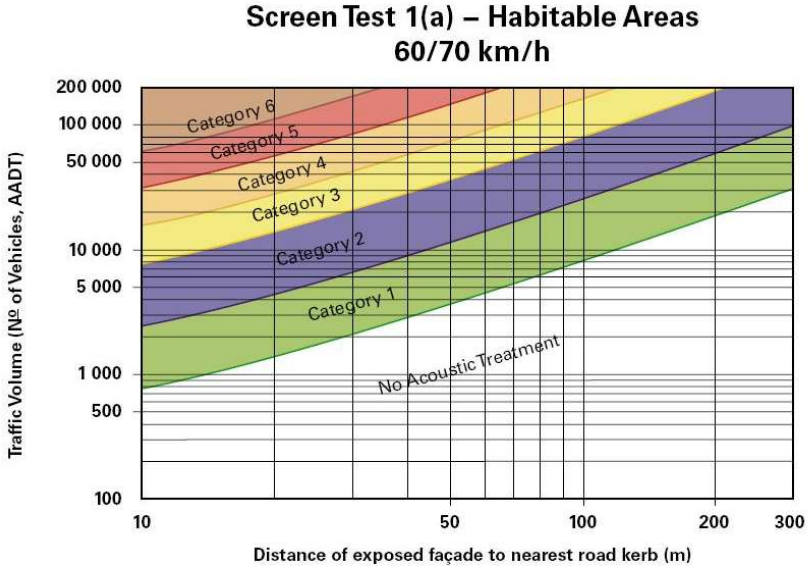
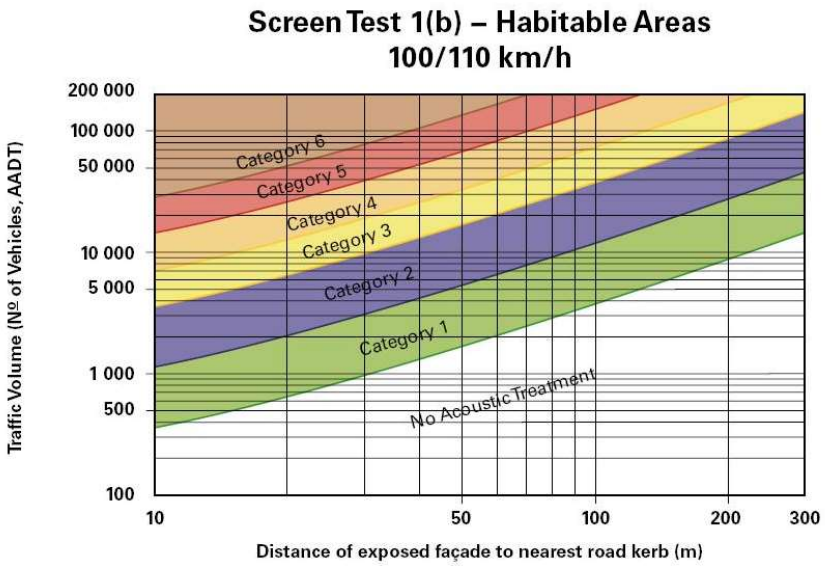


Figure 3 Screen test for habitable areas of single/dual occupancy dwellings adjacent to 100/110 km/hr zones.



2.2 AS2107 Design Sound Levels

Standards Australia AS 2107:2016, recommends design criteria for conditions affecting the acoustic environment within building interiors to ensure a healthy, comfortable and productive environment for the occupants and the users. The background sound levels recommended take into account the function of the area(s) and apply to the sound level measured within the space unoccupied but ready for occupancy.

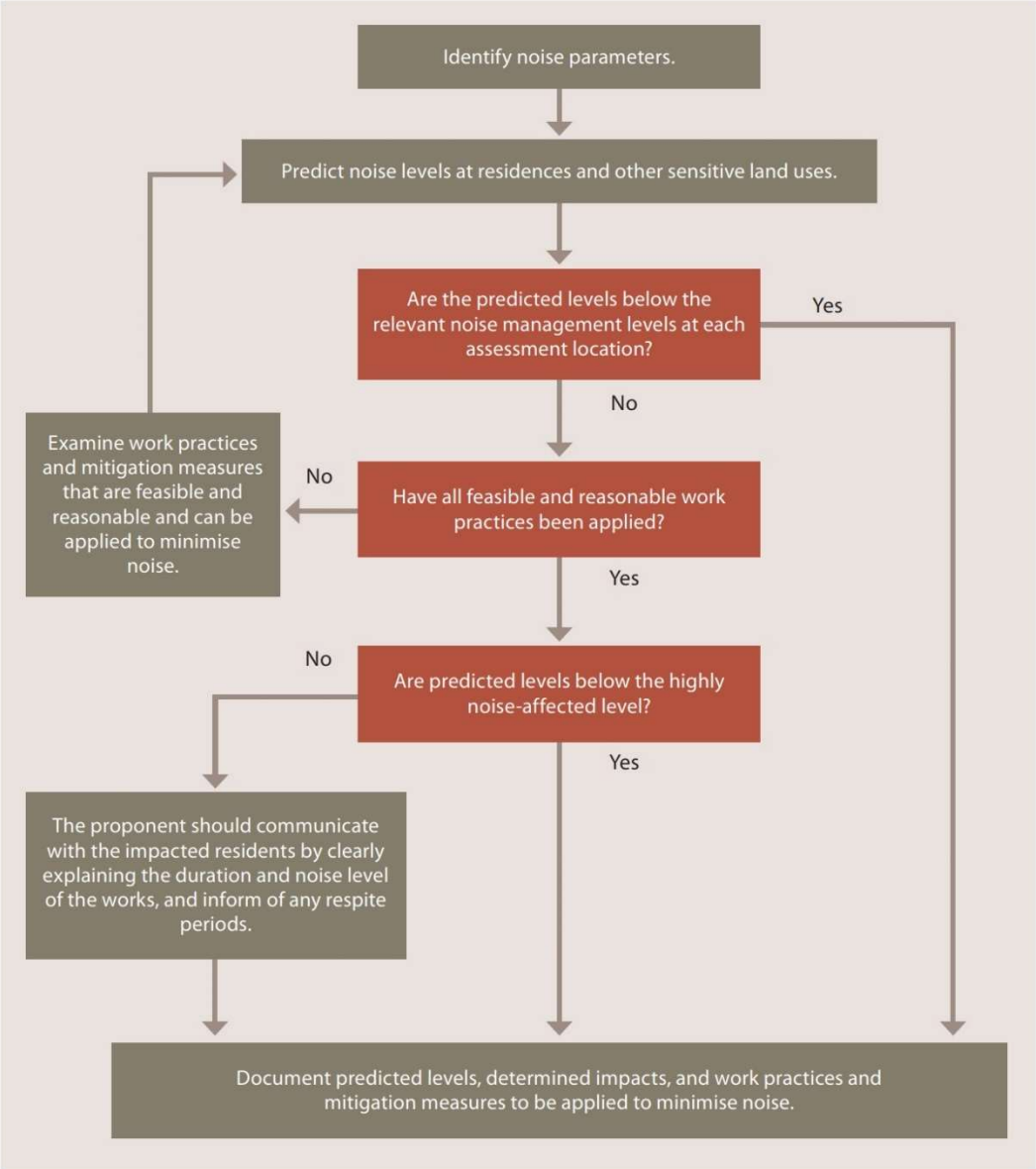
2.3 Interim Construction Noise Guideline

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 qualitative assessment methodology is a more simplified approach that relies on noise management strategies. This study has adopted a quantitative assessment approach which is summarised in **Figure 4**. The quantitative approach includes identification of potentially affected receivers, derivation of the construction Noise Management Levels, quantification of potential noise impact at receivers via predictive modelling and, provides management and mitigation recommendations.

Figure 4: Quantitative Assessment Processes for Assessing and Managing Construction Noise



Source: Department of Environment and Climate Change, 2009.

2.3.1 Standard Hours for Construction

Table 2 summaries the ICNG recommended standard hours for construction works.

Table 2 Recommended Standard Hours for Construction

Daytime	Construction Hours
Monday to Friday	7am to 6pm
Saturdays	8am to 1pm
Sundays or Public Holidays	No construction

These 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.

Construction activities are anticipated to be undertaken during standard construction hours.

2.3.2 Construction Noise Management Levels

Section 4 of the ICNG (DECC, 2009) 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 3 reproduces the ICNG Noise Management Level for residential receivers. The NML is determined by adding 10dB (standard hours) or 5dB (OOH) to the Rating Background Level (RBL) for each specific assessment period.

Table 3 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 + 10dB	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 75dBA	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 + 5dB	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 5dBA 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.

2.4 AAAC Guideline for Childcare Centre Acoustic Assessment

2.4.1 Outdoor Play Areas

The noise impact from children at play in a childcare centre differs from the domestic situation in that it is a business carried out for commercial gain, the number of children can be far greater than in a domestic situation and the age range of the children at the centre does not significantly vary over time as it would in a domestic situation. However, the noise from children is vastly different, in both character and duration, from industrial, commercial or even domestic machine noise. The sound from children at play, in some circumstances, can be pleasant, with noise emission generally only audible during the times the children play outside. Night-time, weekend or public holiday activity is not typical and childcare centres have considerable social and community benefit[1].

[1] Source adopted from the AAAC Childcare Centre Acoustic Assessment Technical Guideline.

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3 Existing Environment

3.1 Unattended Noise Monitoring

To quantify the existing background noise environment of the area, unattended noise monitoring was conducted at one location representative of the ambient environment surrounding the project site. The selected monitoring location is shown in Error! Reference source not found. and is considered representative of surrounding residential receivers as per Fact Sheet B1.1 of the NPI.

Attended and unattended noise surveys were conducted in general accordance with the procedures described in Standards Australia AS 1055:2018, "Acoustics – Description and Measurement of Environmental Noise".

The measurements were carried out using one Svantek 977 noise analyser from Thursday 2 November 2023 to Sunday 12 November 2023. All acoustic instrumentation used carries appropriate and current NATA (or manufacturer) calibration certificates with records of all calibrations maintained by MAC as per Approved Methods for the measurement and analysis of environmental noise in NSW (EPA, 2022) and complies with AS/NZS IEC 61672.1-2019-Electroacoustics - Sound level meters - Specifications. Calibration of all instrumentation was checked prior to and following measurements. Drift in calibration did not exceed ±0.5dBA. Observations on-site identified the surrounding locality was typical of a suburban environment, with traffic noise and birds audible.

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 receivers situated in the surrounding area have been classified under the EPA's suburban amenity category. This criteria 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 4**. The noise monitoring charts for the background monitoring assessment are provided in **Appendix C.**

Table 4 Unattended Noise Monitoring Summary

Location	Measured Background Noise Level (LA_{90}) dB ABL[1]			Measured dB $LA_{eq(period)}$		
	Day	Evening	Night	Day	Evening	Night
L1	37	39	31	48	51	46

Note: Excludes periods of wind or rain affected data. Meteorological data obtained from the Bureau of Meteorology weather station Maitland Airport AWS, NSW 32.7023°S 151.4881°E 28m AMSL.

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 1: Assessment background level (ABL) – the single-figure background level representing each assessment period day, evening and night as per NPI Fact Sheet A.

3.2 Attended Noise Monitoring

To validate background noise levels, an attended noise monitoring measurement was completed at the development site on Thursday 2 November 2023.

Observations during the survey noted that road traffic from New England Highway was a contributor to background noise levels. The monitored noise level contributions and observed meteorological conditions for each measurement are presented in **Table 5**.

Table 5 Operator-Attended Noise Survey Results

Location	Date & Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
A1	2/11/2023 10:58	85	62	40	WD: SE WS: 0.6m/s Rain: Nil	Birds 42-65 Traffic 35-48 Local Residential Noise 35-42

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.

4 Assessment Criteria

4.1 AS2107 Design Sound Levels

Design criteria for the acoustic environment within occupied spaces are prescribed in Standards Australia AS2107. The relevant design sound levels for a residential dwelling are reproduced in **Table 6**.

Table 6 AS/NZS 2107:2016 Recommended Design Sound Levels for Different Areas of Occupancy in Buildings

Type of Occupancy / Activity	Design sound level, range LAeq, t dB(A)
Houses and apartments in suburban areas or near minor roads	
Living areas	30 to 40
Sleeping areas (night-time)	30 to 35

4.2 Development Near Rail Corridors and Busy Roads – Interim Guidelines

The guideline outlines internal noise criteria for Clause 102 (Road) of the State Environmental Planning Policy (SEPP) for Infrastructure (Infrastructure) 2008 (superseded by State Environmental Planning Policy for Transport and Infrastructure 2021):

"If the development is for the purpose of a building for residential use, the consent authority must be satisfied that appropriate measures will be taken to ensure that the following LAeq levels are not exceeded:

- *in any bedroom in the building: 35dBA at any time 10pm–7am; and*
- *anywhere else in the building (other than a garage, kitchen, bathroom or hallway): 40dBA at any time."*

Table 3.1 of the guideline clarifies that the above noise criteria are to be determined as an $LA_{eq(15hr)}$ for the daytime and $LA_{eq(9hr)}$ for the night-time period.

4.3 Construction Noise Criteria

The relevant NMLs for standard construction hours are presented in **Table 7**.

Table 7 Construction Noise Management Levels

Receivers	Assessment Period[1]	Daytime RBL dB LA_{90}	NML dB $LA_{eq(15min)}$
Residential	Standard Hours	37	47 (RBL+10dBA)

Note 1: See **Table 2** for Standard Recommended Hours for Construction.

4.4 AAAC Guideline for Childcare Centre Acoustic Assessment

With the development of childcare centres in residential areas, the background noise level within these areas can at certain times, be low. Thus, a base criterion of a contributed $L_{eq,15min}$ 45dB(A) for the assessment of outdoor play is recommended in locations where the background noise level is less than 40dB(A).

5 Modelling Methodology

Brüel and Kjær Predictor Type 7810 (Version 11.10) and DGMR iNoise modelling software was used to assess potential noise impacts associated with the construction phase of the project, as well as noise impacts from the adjacent childcare centre. A three-dimensional digital terrain map providing all relevant topographic information was 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 Sound Power Levels have been adjusted to account for duration over a fifteen-minute period. It is noted that the potential for maximum noise level events to occur simultaneously is unlikely for this project.

The model calculation method used to predict noise levels was in accordance with ISO 9613:1 and ISO 9613:2 including corrections for meteorological conditions using CONCAWE[2]. The ISO 9613 standards are 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.

[2] Report no. 4/18, "the propagation of noise from petroleum and petrochemical complexes to neighbouring communities", Prepared by C.J. Manning, M.Sc., M.I.O.A. Acoustic Technology Limited (Ref.AT 931), CONCAWE, Den Haag May 1981

5.1 Noise Intrusion from Childcare Centre

An assessment of potential noise emissions from the proposed childcare center located adjacent to the project has been completed. The assessment has identified noise sources that may generate acoustic impacts at the project related dwellings, such as noise associated with children engaging in outdoor play.

These noise source assumptions have been adopted from the Noise Impact Assessment conducted for the Childcare center by Spectrum Acoustics (Report Reference: 212159-9509, Noise Assessment – Proposed Childcare Facility 43a Fairfax Street, Rutherford, NSW, February 2022).

The assessment considered a scenario in which 90 of the 105 children to be in outdoor play areas. Based on the proposed layout of the outdoor spaces, it was assumed that if the 90 children proposed to be in the outdoor play areas and were evenly dispersed throughout those spaces, with three groups of 15 children aged 2-3, two groups of 15 children aged 3-5, and one group of 15 children aged 0-2.

Table 8 presents the Sound Power Levels for each source assessed in this report.

Table 8 Sound Power Levels[1]

Item	Octave Band Sound Power Level								Total dBA[2]
	63	125	250	500	1000	2000	4000	8000	
Noise Intrusion Assessment (dB LA_{eq})									
Children Aged 0-2 years	62	68	74	76	73	69	66	56	80
Children Aged 2-3 years	74	80	86	88	85	81	77	68	92
Children Aged 3-5 years	75	80	86	88	85	81	77	69	92

Note 1: Source adopted from the AAAC Childcare Centre Acoustic Assessment Technical Guideline.

Note 2: Total dBA is Sound Power Level per item.

5.2 Construction Nosie Methodology

For construction, a fleet Sound Power Level of 108dB $LA_{eq(15min)}$ was adopted to quantify construction emissions to surrounding receivers. This Sound Power Level is considered generally representative of average emissions from a variety of construction tasks for residential developments.

5.3 Indicative Attenuation Levels

The Environmental Noise Management Manual (ENMM) (2001) provides a summary of indicative attenuation from standard building types. The indicative attenuation levels are summarised in **Table 9**, which provides typical performance of buildings with respect to noise reduction. A masonry residence with single 3mm glazing would be expected to provide a reduction of approximately 25dBA from external to internal with windows closed. Where windows are closed, the fresh air requirements outlined in the Building Code of Australia should be taken into consideration.

Table 9 Indicative Building Noise Attenuation

Building Type	Windows	Internal noise reduction, dBA
All	Open	10
Light frame	Single glazed (closed)	20
Masonry	Single glazed (closed)	25
	Double glazed (closed)	30

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6 Noise Assessment Results

6.1 Noise Intrusion (Childcare Outdoor Play)

The operational noise levels generated by childcare centre have been conservatively assessed to the proposed dwellings identified as Lot 1 and Lot 3. The results presented in **Table 10** and **Table 11** demonstrate compliance with the recommended design sound levels outlined in AS/NZS 2107:2016 for living and sleeping areas within houses in suburban areas or near minor roads.

Table 10 Noise Prediction Results – Childcare Noise Impacts to Lot 1

Element	Receptor Room Category	Predicted level, dB L_{Aeq}[1] (internal)		Internal Criteria, dB L_{Aeq}		Noise Control Treatment
		Day	Night	Day	Night	
Lot 1 Dwelling – Northern Facade						
Masonry Façade with Single Pane Window	Bedroom 3	<30	<30	40	35	Standard Glazing
	Dining/Living Area	<30	<30	40	40	Standard Glazing
Lot 1 Dwelling – Eastern Facade						
Masonry Façade with Single Pane Window	Bedroom 3	<30	<30	40	40	Standard Glazing
Lot 1 Dwelling – Western Facade						
Masonry Façade with Single Pane Window	Dining/Living Area	<30	<30	40	40	Standard Glazing

Table 11 Noise Prediction Results – Childcare Noise Impacts to Lot 3

Element	Receptor Room Category	Predicted level, dB L_{Aeq}[1] (internal)		Internal Criteria, dB L_{Aeq}		Noise Control Treatment
		Day	Night	Day	Night	
Lot 3 Dwelling – Northern Facade						
Masonry Façade with Single Pane Window	Dining/Living Area	<30	<30	40	40	Standard Glazing
Lot 3 Dwelling – Western Facade						
Masonry Façade with Single Pane Window	Dining/Living Area	<30	<30	40	40	Standard Glazing

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 Construction Noise Results

Predicted $LA_{eq(15min)}$ noise emissions for modelled construction are presented in **Table 12**. Noise modelling identifies that construction activities will be above the relevant NMLs at all assessed receivers. Accordingly, management measures outlined in **Section 7** should be considered during the construction phase of the project to minimise impact to the surrounding community.

Table 12 Construction Noise Emissions

Location	Period[1]	Predicted Noise Level dB LAeq(15min)	NML dB LAeq(15min)	Compliant
R01	Day	82	47	X
R02	Day	78	47	X
R03	Day	77	47	X
R04	Day	85	47	X
R05	Day	89	47	X
R06	Day	86	47	X
R07	Day	83	47	X
R08	Day	77	47	X
R09	Day	88	47	X

Note 1: See **Table 2** for Standard Recommended Hours for Construction.

7 Construction Recommendations

The results of the construction noise assessment demonstrate that emissions from construction are above the ICNG Noise Management Levels at all assessed receivers surrounding the project. Notwithstanding, 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 completed a Noise Assessment to quantify emissions from surrounding developments to the proposed residential dwellings to be located at 39-41 Fairfax Street, Rutherford, NSW.

Noise predictions identified that standard glazing of the bedrooms and living areas of the development are anticipated to attenuate internal levels associated with the proposed childcare centre and satisfy relevant criteria at both dwellings on Lot 1 and Lot 3.

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

In summary, the Noise Assessment supports the Development Application for the project incorporating the recommendations and controls outlined 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**.

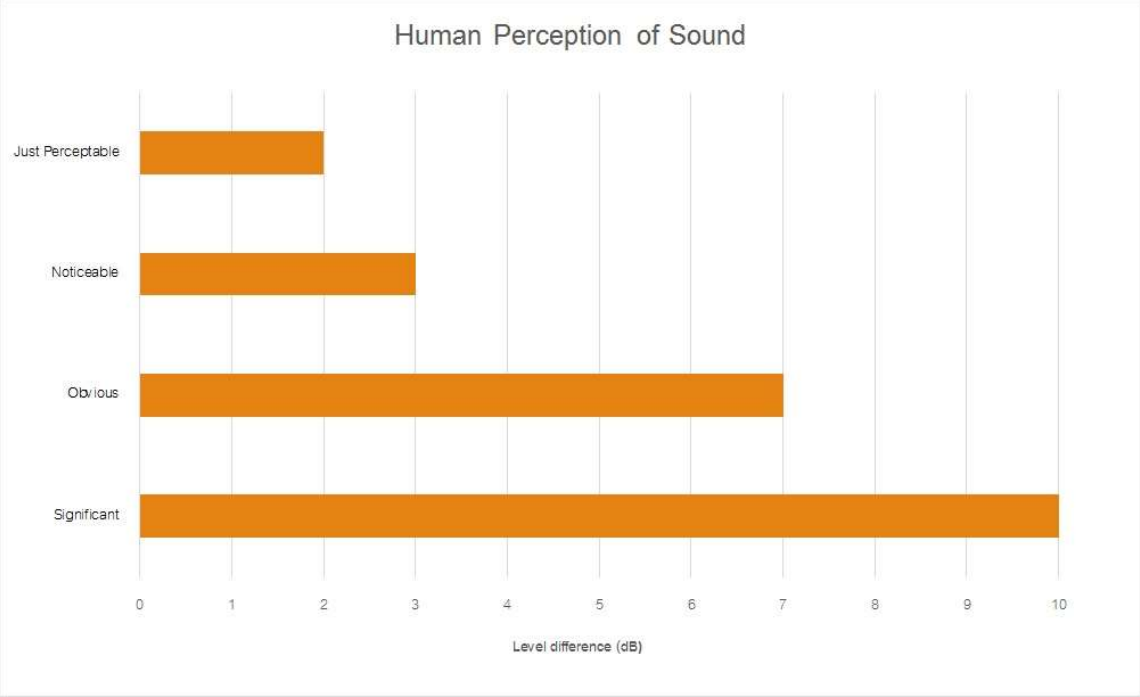
Table A1 Glossary of Acoustical Terms

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 L90 statistical noise levels.
Ambient Noise	The total noise associated with a given environment. Typically, a composite of sounds from all 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 sound.
Background Noise	The underlying level of noise present in the ambient noise, excluding the noise source under investigation, when extraneous noise is removed. This is usually represented by the LA90 descriptor
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 Z-weighted or decibels Linear (unweighted).
Extraneous Noise	Sound resulting from activities that are not typical of the area.
Hertz (Hz)	The measure of frequency of sound wave oscillations per second - 1 oscillation per second equals 1 hertz.
LA10	A sound level which is exceeded 10% of the time.
LA90	Commonly referred to as the background noise, this is the level exceeded 90% of the time.
LAeq	Represents the average noise energy or equivalent sound pressure level over a given period.
LAmax	The maximum sound pressure level received at the microphone during a measuring interval.
Masking	The phenomenon of one sound interfering with the perception of another sound. For example, the interference of traffic noise with use of a public telephone on a busy street.
RBL	The Rating Background Level (RBL) as defined in the NPI, is an overall single figure representing the background level for each assessment period over the whole monitoring period. The RBL, as defined is the median of ABL values over the whole monitoring period.
Sound power level (Lw or SWL)	This is a measure of the total power radiated by a source in the form of sound and is given by 10.log10 (W/Wo). Where W is the sound power in watts to the reference level of 10^{-12} watts.
Sound pressure level (Lp or SPL)	the level of sound pressure; as measured at a distance by a standard sound level meter. This differs from Lw in that it is the sound level at a receiver position as opposed to the sound 'intensity' of the source.

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 Pressure 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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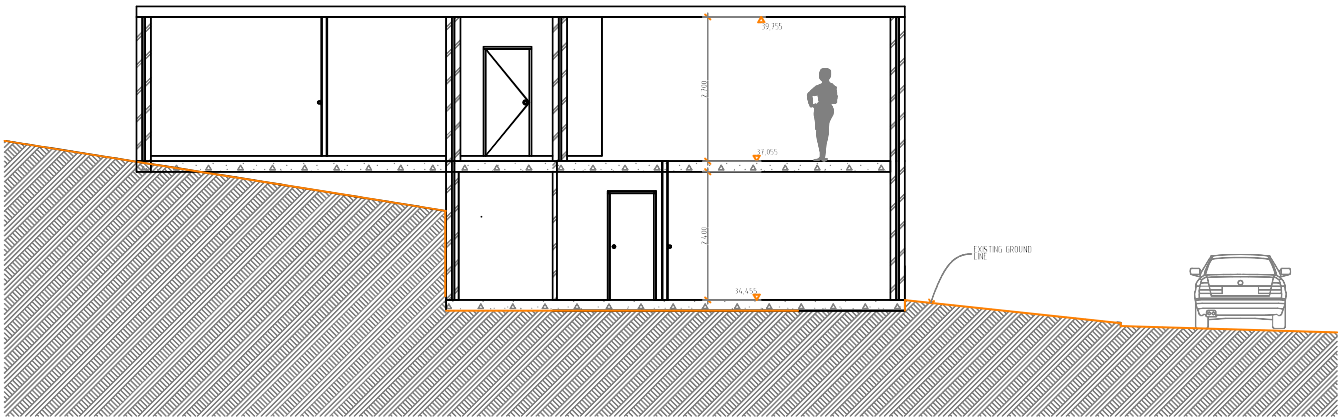
Appendix B – Site Plans



LOT 1

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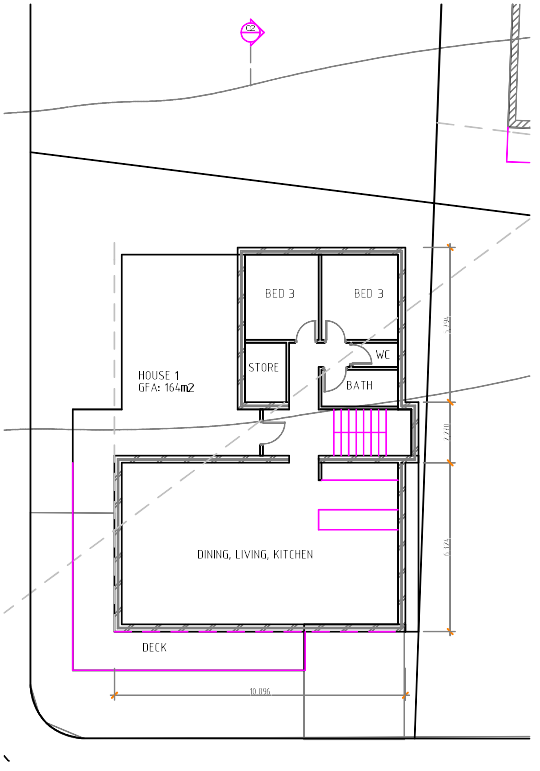

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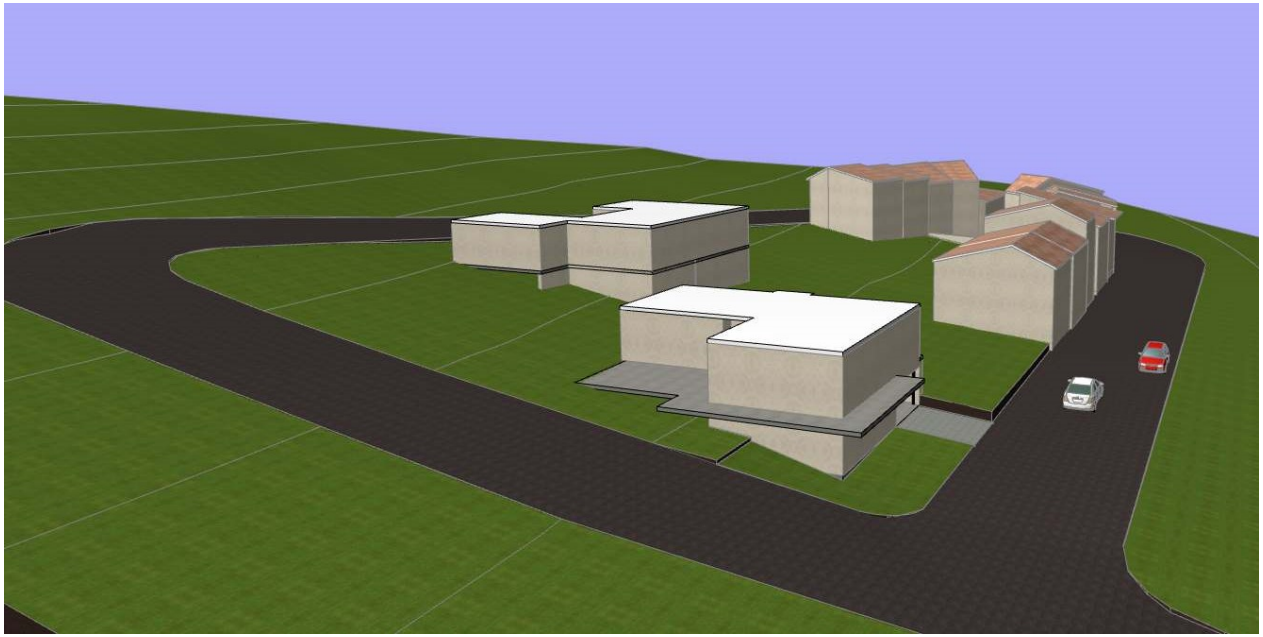
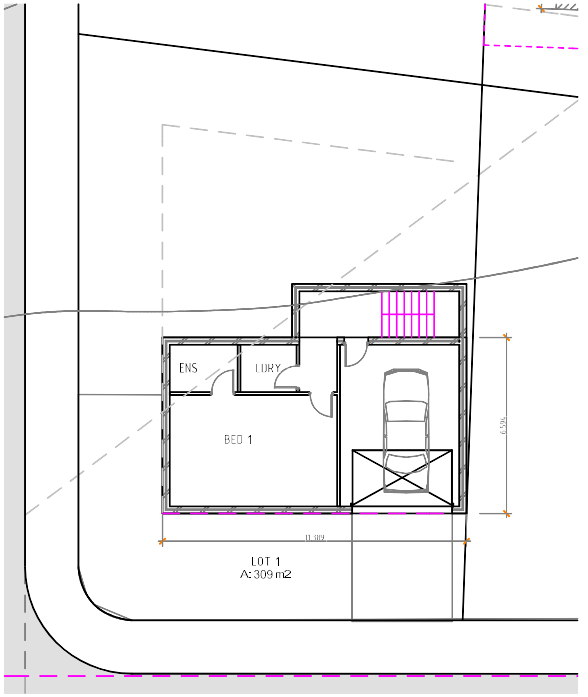


4 AERIAL VIEW 2 1:100



2 GROUND 1:100

Issue Amendment Date

Project

MULTI DWELLING HOUSING

39-41 FAIRFAX STREET

RUTHERFORD 2320

LOTS 10 & 11 DP 809354

Client

TBA

MORRELL ARCHITECTS

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Nominated Architect: Martin Morrell 7862

Sub-Consultant

LEWIS ENGINEERING
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2/74 PARK AVENUE KOTARA NSW 2289
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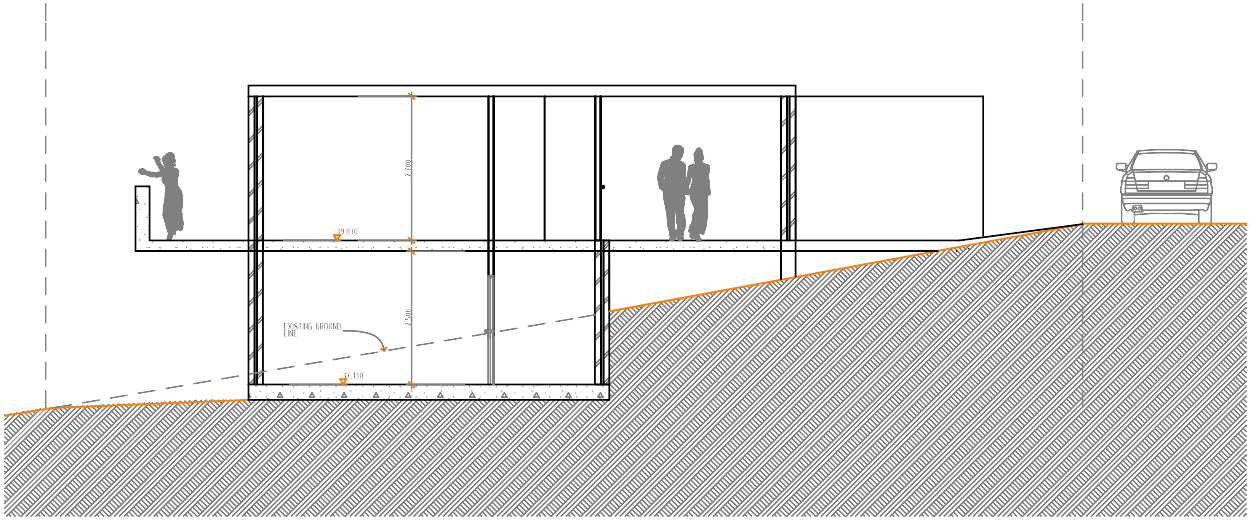
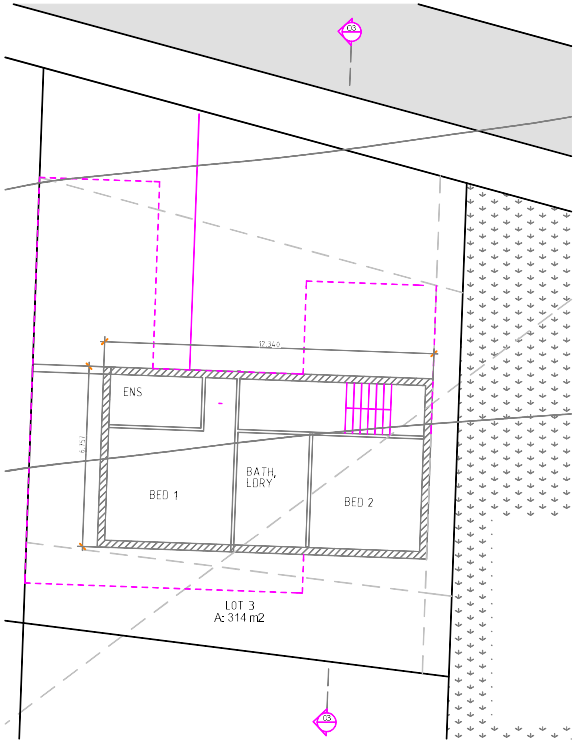
Drawing

LOT 1

Scale	AS SHOWN	Date	13 SEP 2022
Status	CONCEPT	Drawn By:	MMA
Project No:		Drawing No:	Revision
	14222		02



1 SECTION LOT 3 1:50



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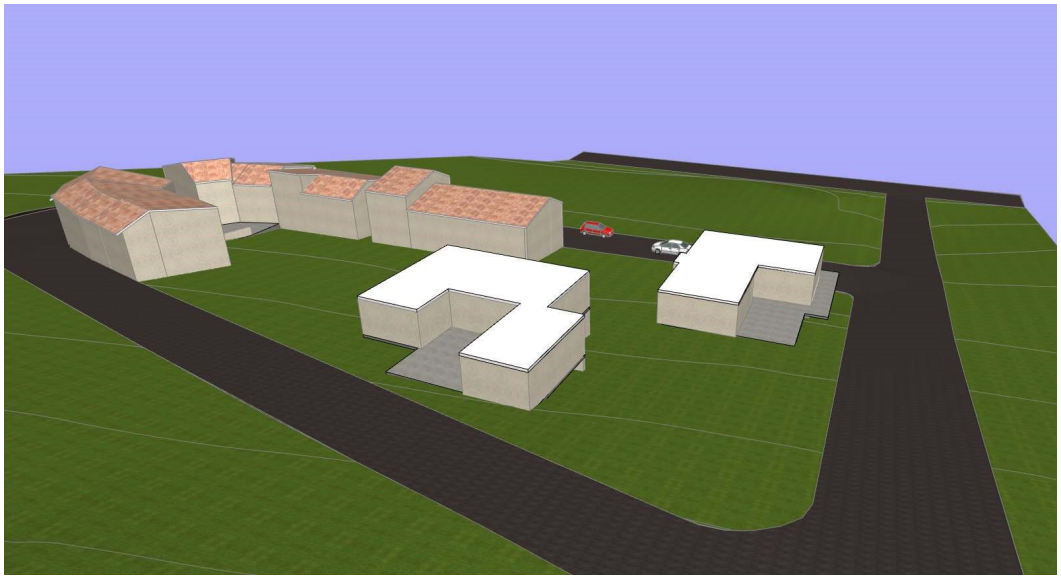

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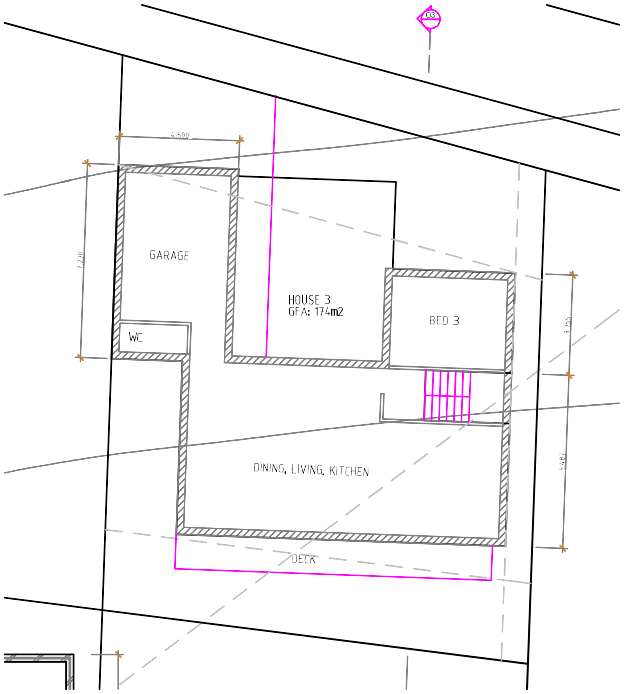

3 FIRST 1:100

Issue Amendment Date

Project
MULTI DWELLING HOUSING
39-41 FAIRFAX STREET
RUTHERFORD 2320
LOTS 10 & 11 DP 809354

Client
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Drawing
LOT 3

Scale AS SHOWN Date 13 SEP 2022
Status CONCEPT Drawn By: MMA
Project No. 14222 Drawing No. 03 Revision
Plot Date 13/09/2022

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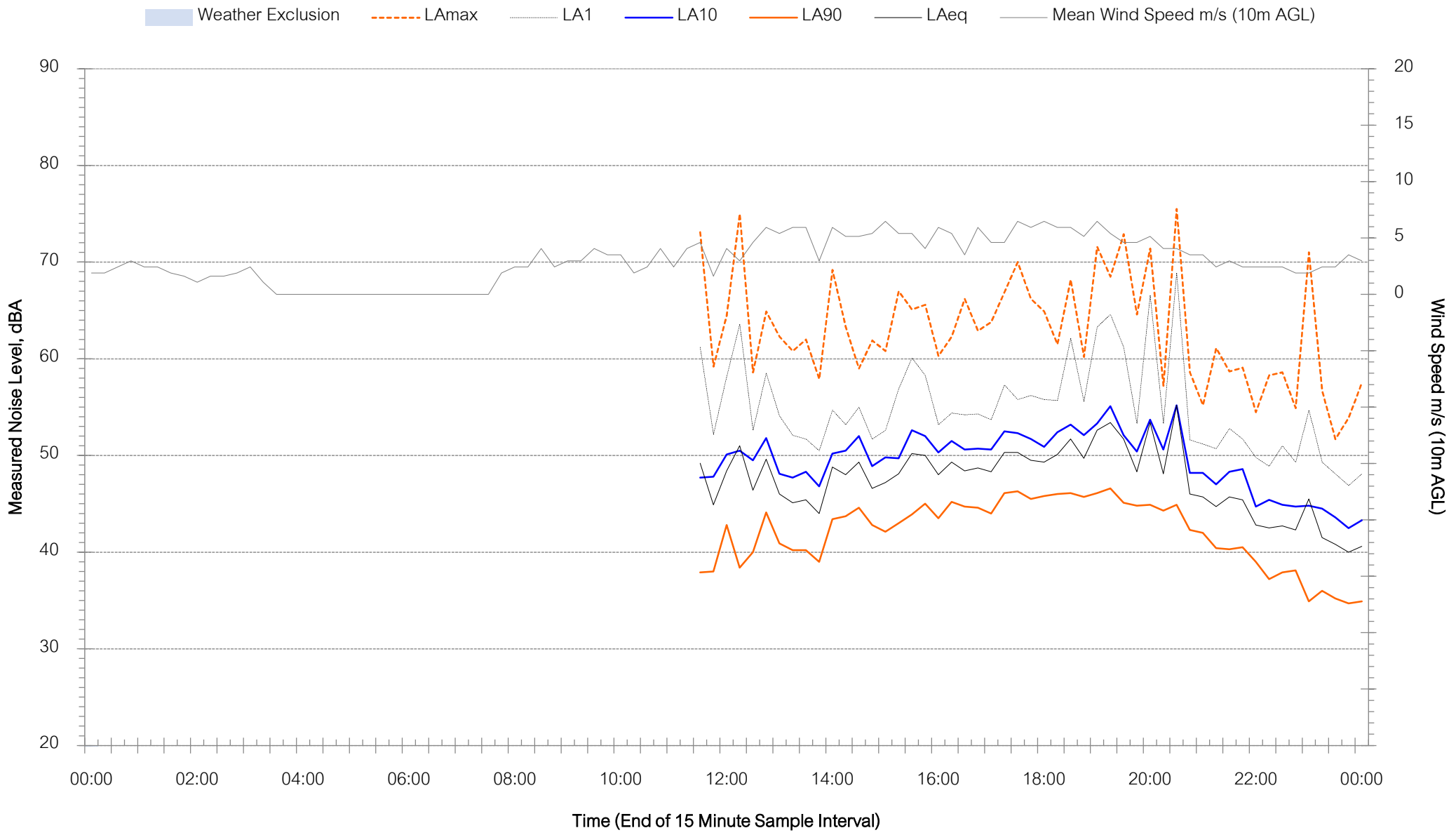
Appendix C – Noise Monitoring Charts

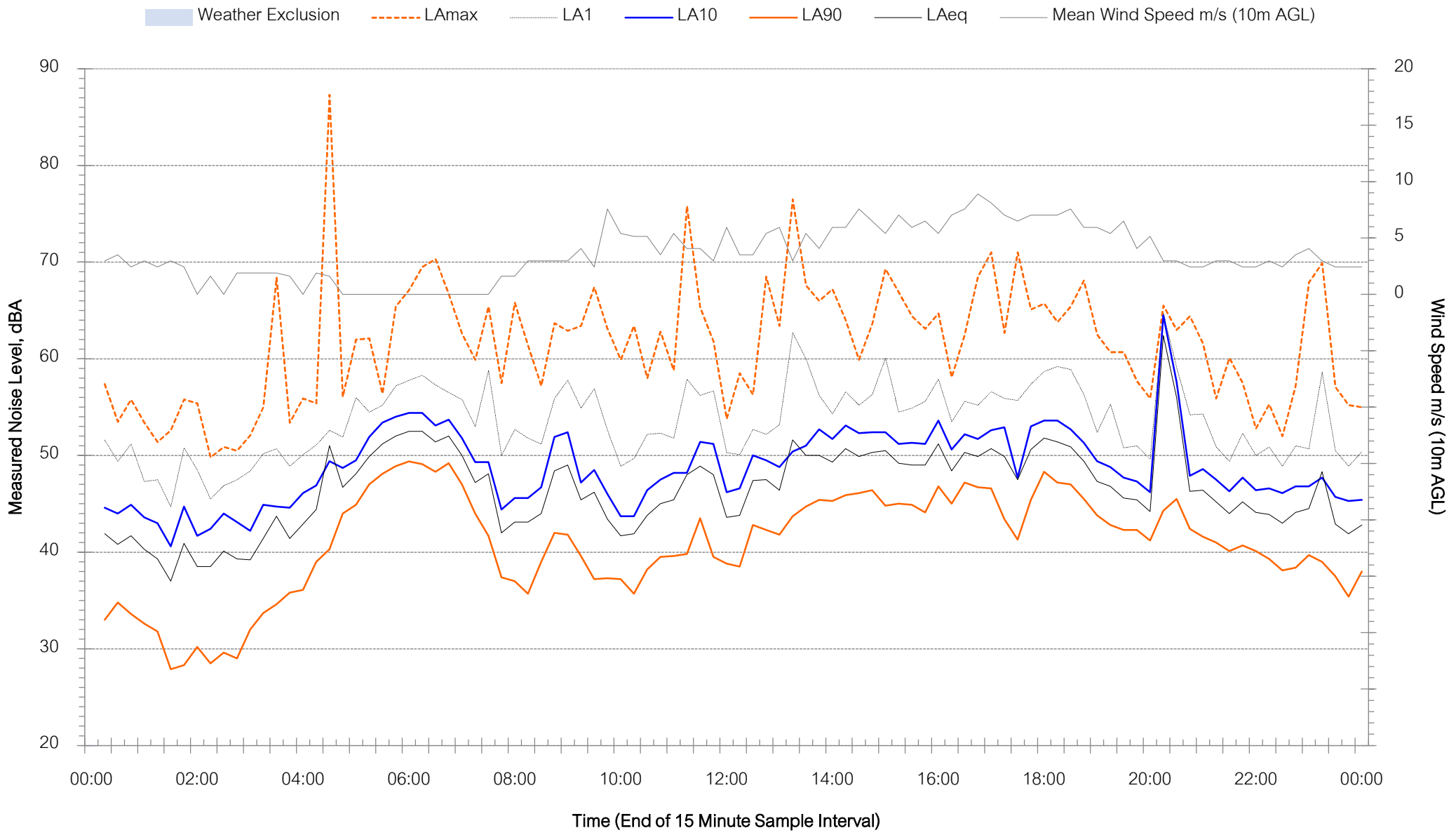
Background Noise Levels

39-41 Fairfax Street, Rutherford, NSW, 2320 - Thursday 2 November 2023



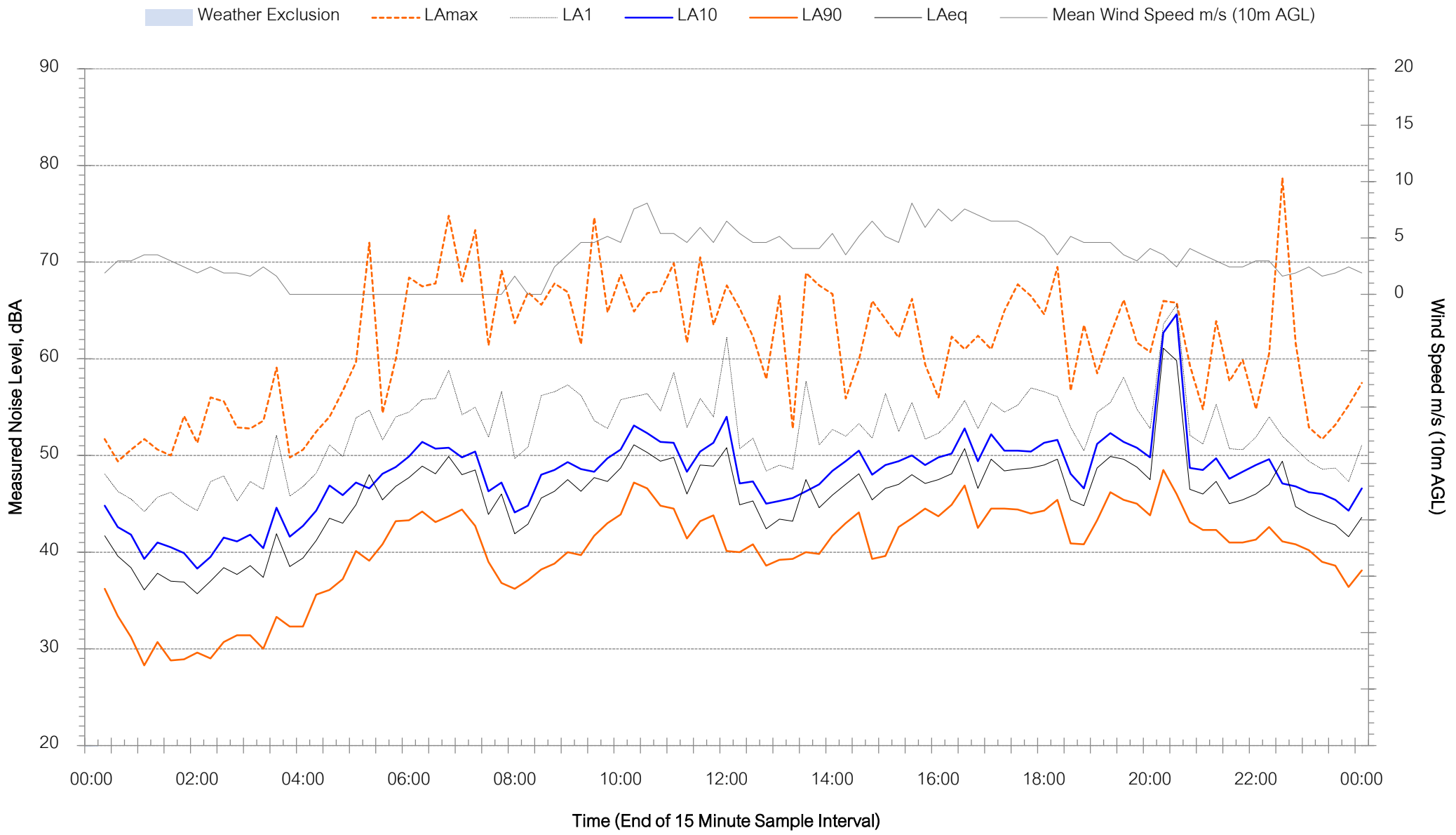
Background Noise Levels

39-41 Fairfax Street, Rutherford, NSW, 2320 - Friday 3 November 2023



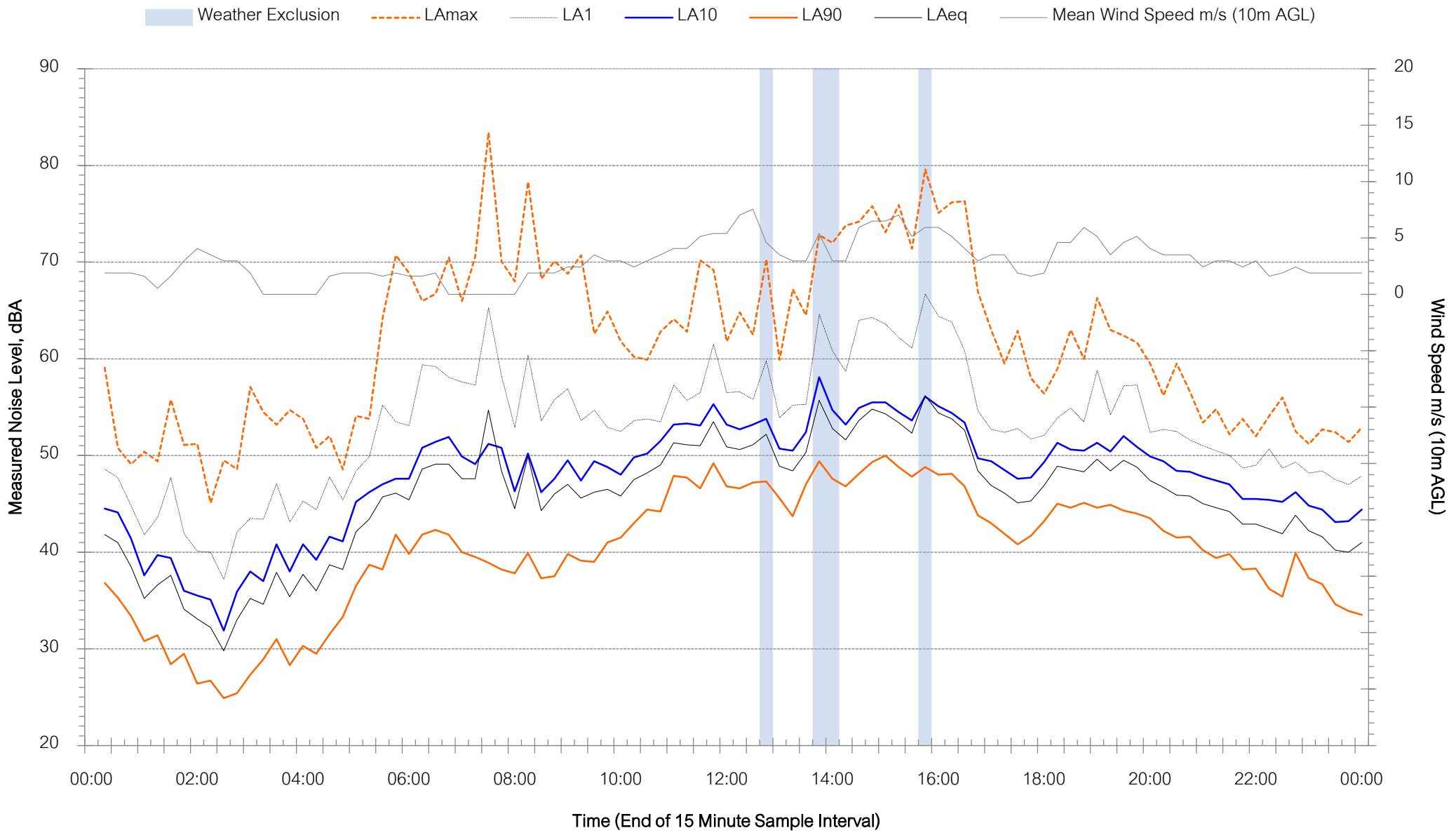
Background Noise Levels

39-41 Fairfax Street, Rutherford, NSW, 2320 - Saturday 4 November 2023



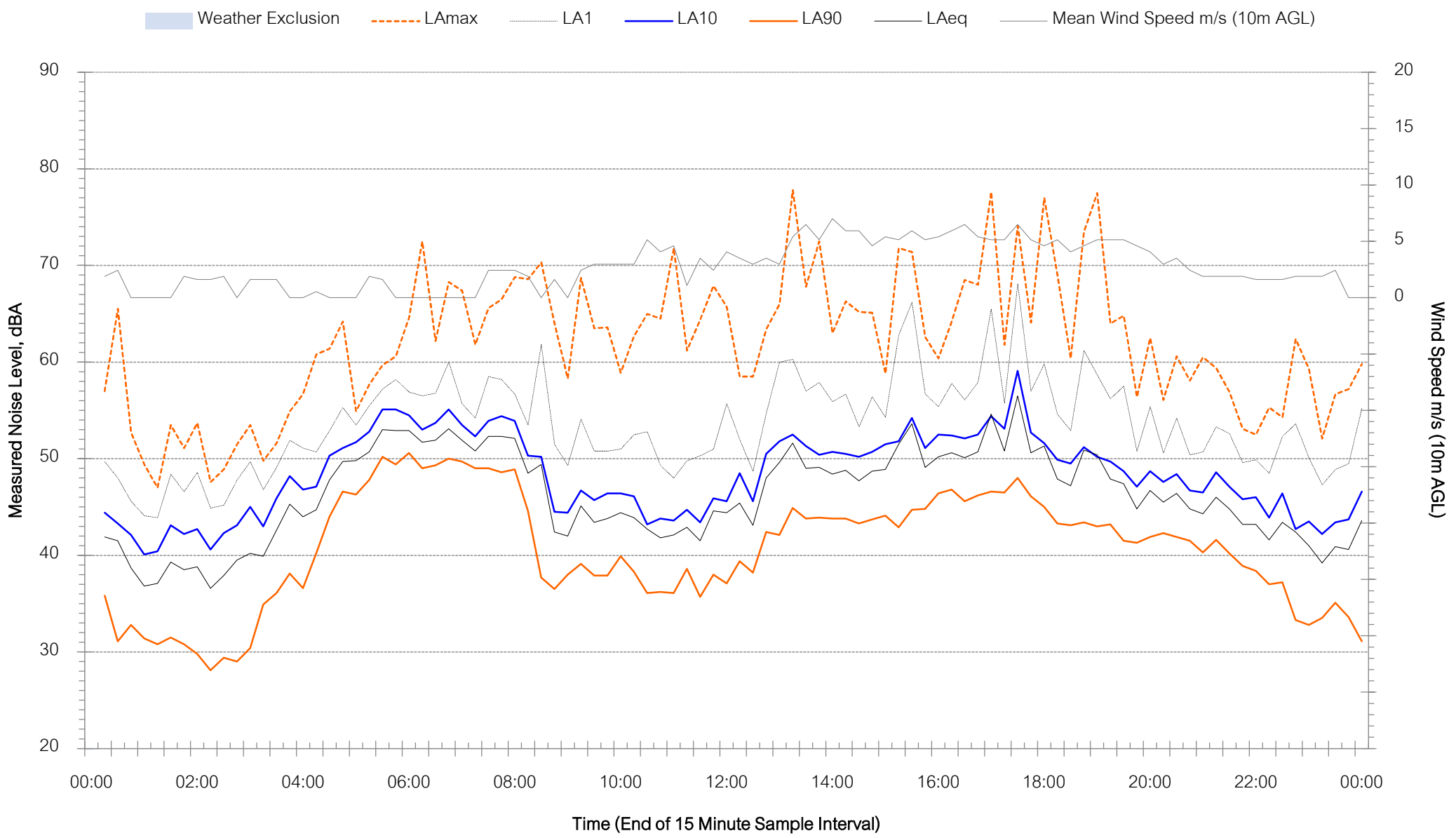
Background Noise Levels

39-41 Fairfax Street, Rutherford, NSW, 2320 - Sunday 5 November 2023



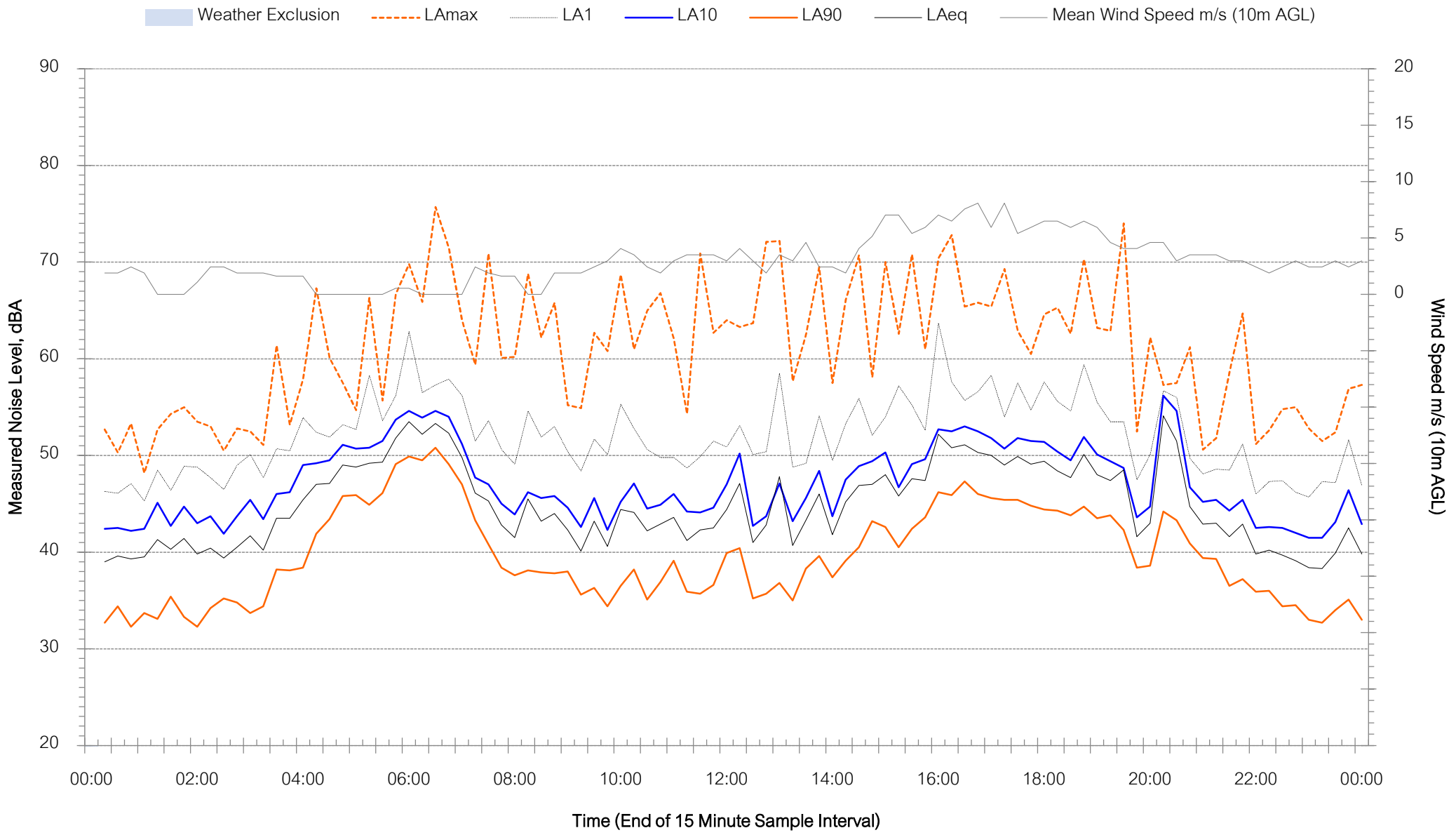
Background Noise Levels

39-41 Fairfax Street, Rutherford, NSW, 2320 - Monday 6 November 2023



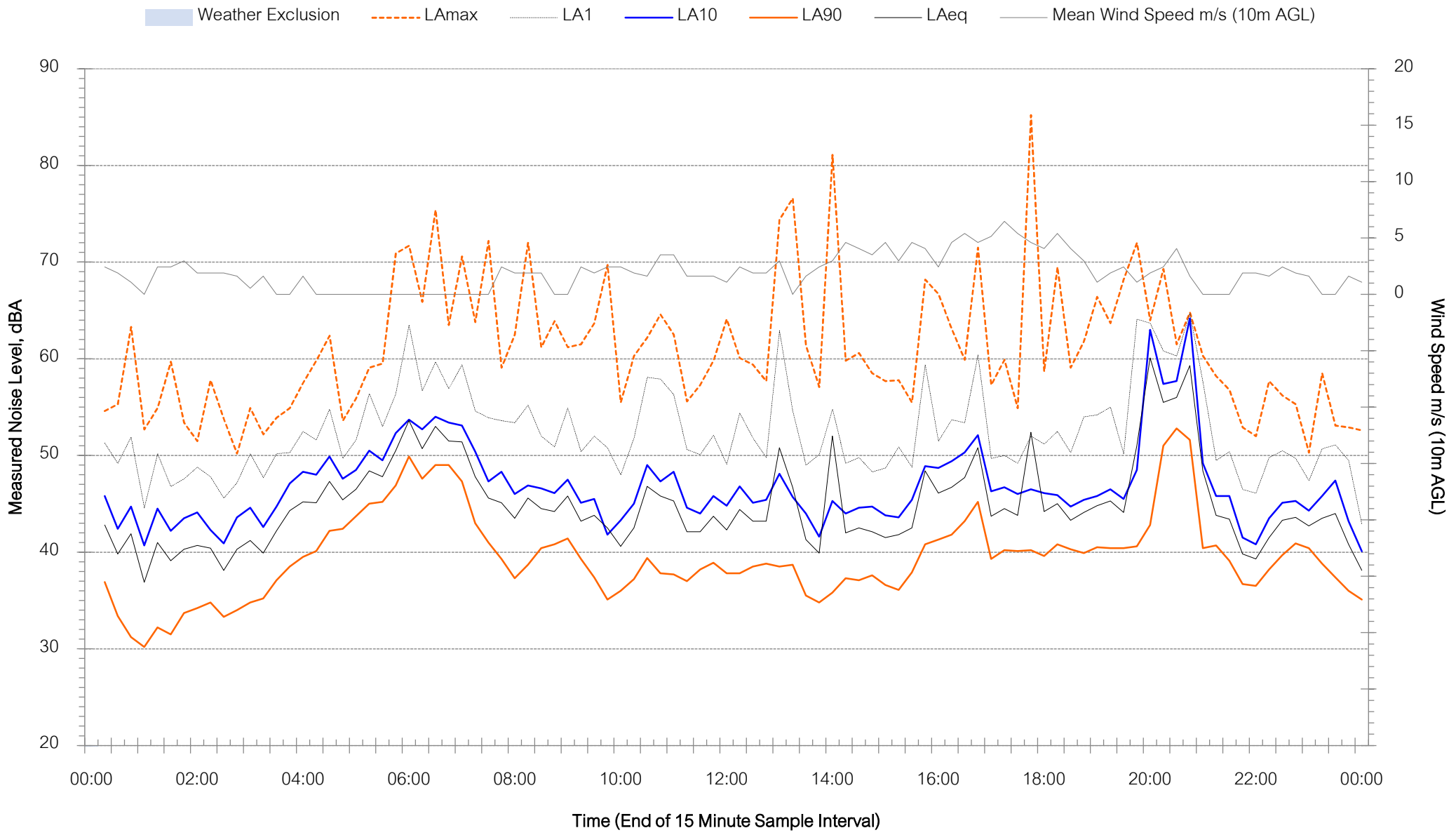
Background Noise Levels

39-41 Fairfax Street, Rutherford, NSW, 2320 - Tuesday 7 November 2023



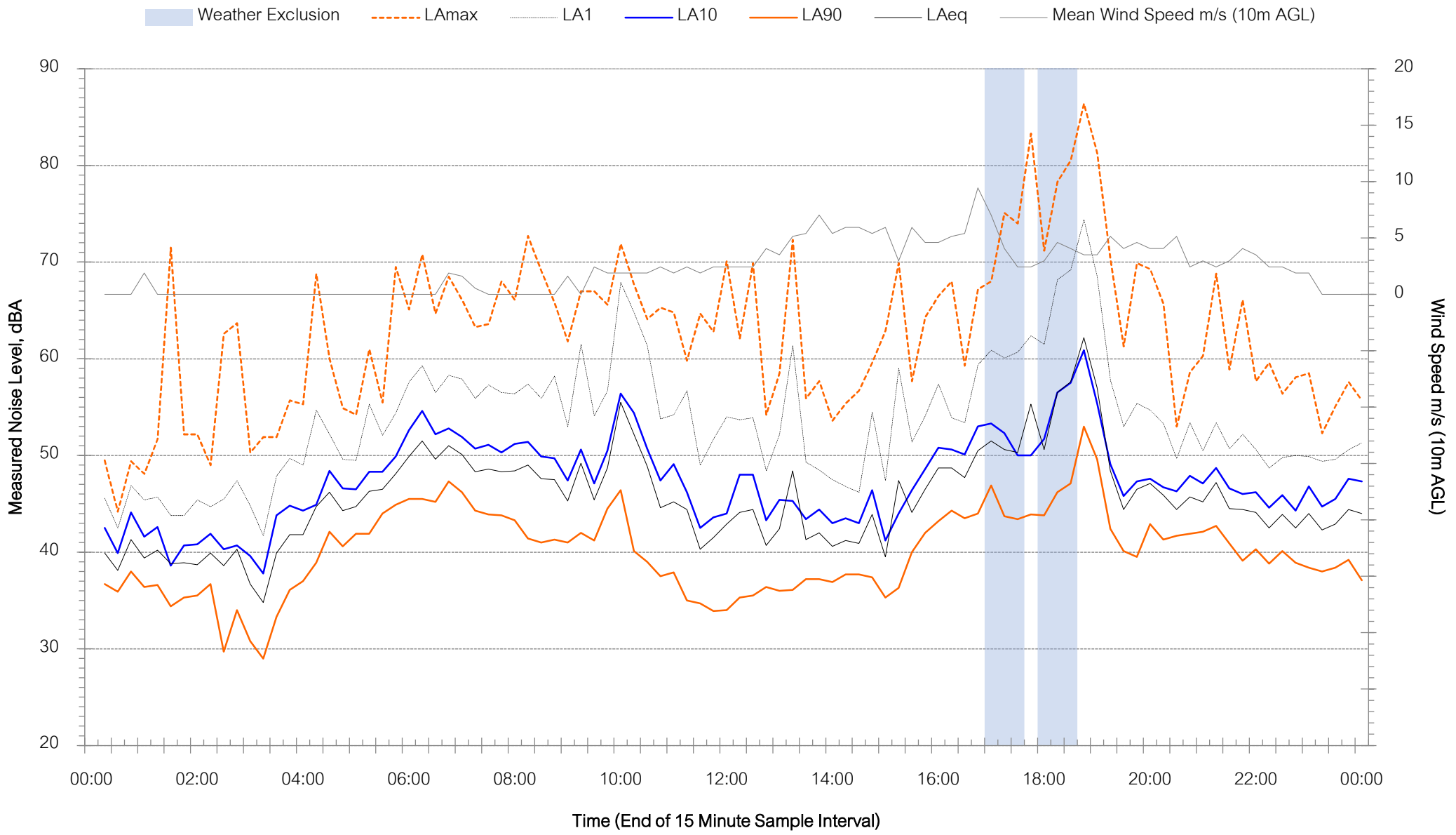
Background Noise Levels

39-41 Fairfax Street, Rutherford, NSW, 2320 - Wednesday 8 November 2023



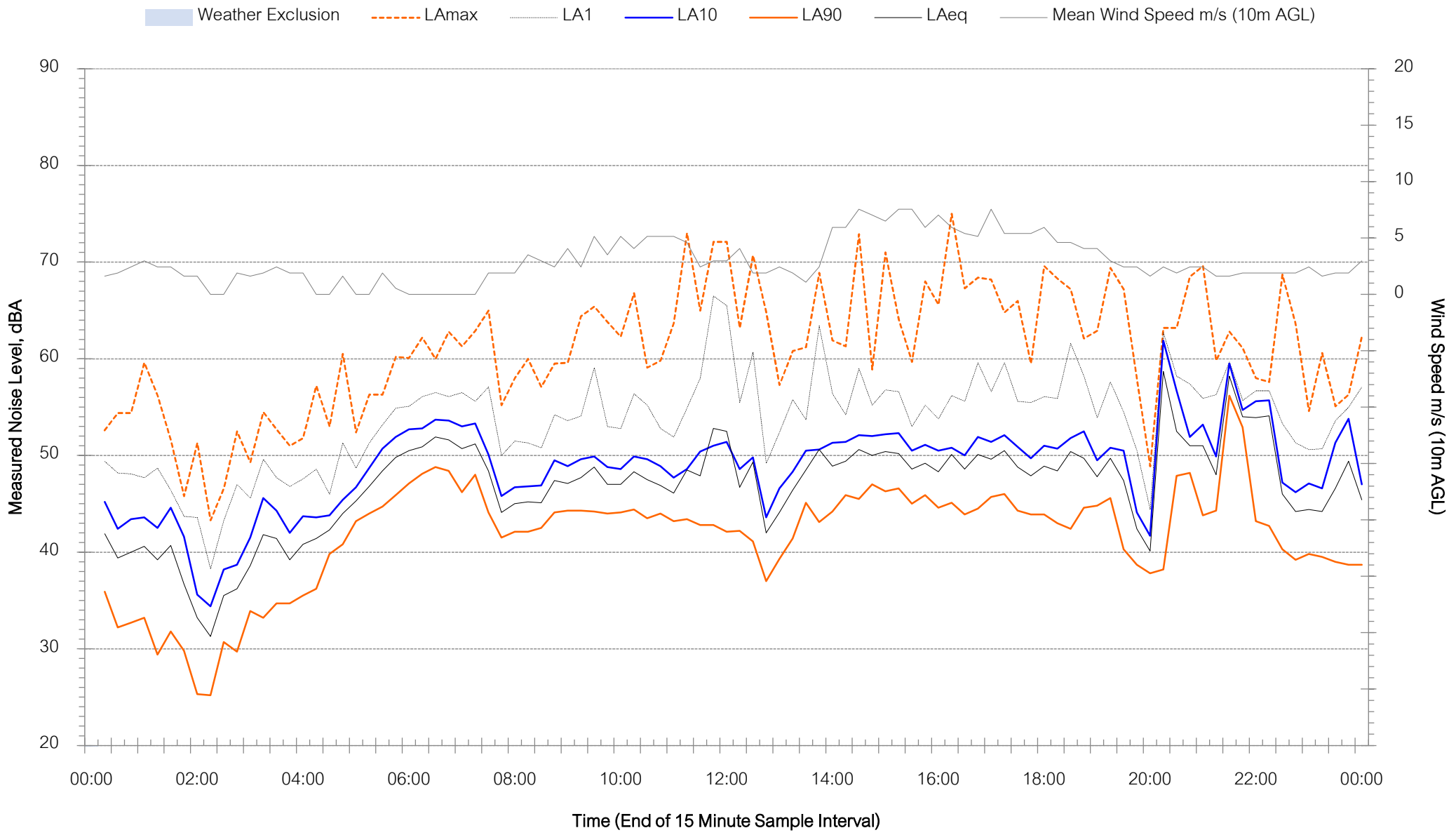
Background Noise Levels

39-41 Fairfax Street, Rutherford, NSW, 2320 - Thursday 9 November 2023



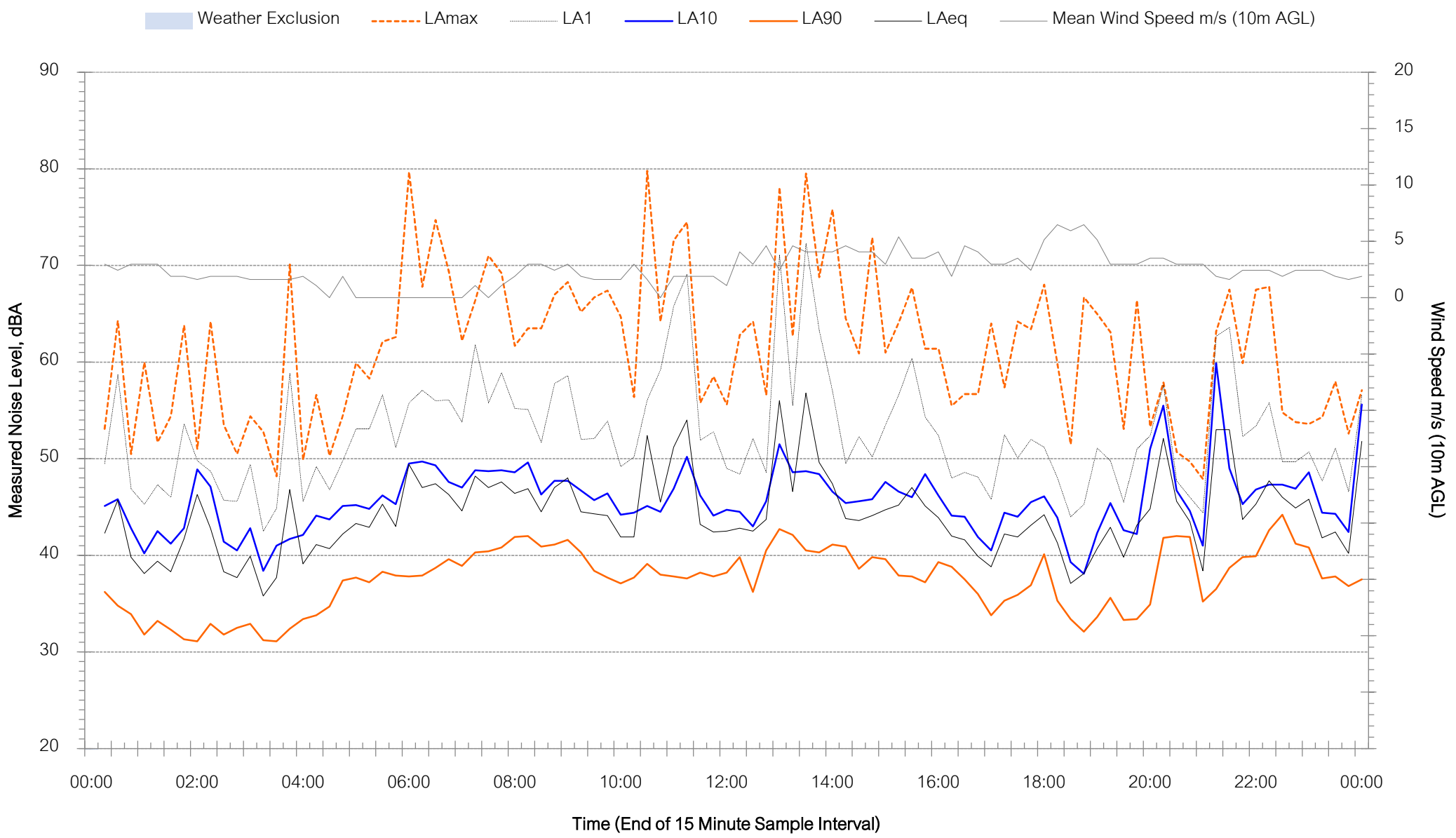
Background Noise Levels

39-41 Fairfax Street, Rutherford, NSW, 2320 - Friday 10 November 2023



Background Noise Levels

39-41 Fairfax Street, Rutherford, NSW, 2320 - Saturday 11 November 2023



Background Noise Levels

39-41 Fairfax Street, Rutherford, NSW, 2320 - Sunday 12 November 2023

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MAC
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