Noise and Vibration Impact Assessment

Johns River Quarry
175 Bulleys Road
Johns River, NSW

Prepared for: Boral Resources (Country) Pty Ltd
C/- Arnold Planning Pty Ltd
August 2024
MAC242091-01RP1V1

Muller Acoustic Consulting

Document Information

Noise and Vibration Impact Assessment

Johns River Quarry

175 Bulleys Road

Johns River, NSW

Prepared for: Boral Resources (Country) Pty Ltd

C/- Arnold Planning Pty Ltd

Suite 282, Ground Floor, 1 Market Street

Newcastle NSW 2300

Prepared by: Muller Acoustic Consulting Pty Ltd

PO Box 678, Kotara NSW 2289

ABN: 36 602 225 132

P: +61 2 4920 1833

www.mulleracoustic.com

DOCUMENT ID	DATE	PREPARED	SIGNED	REVIEWED	SIGNED
MAC242091-01RP1V1	30 August 2024	Rod Linnett		Oliver Muller	

CONTENTS

1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has been commissioned by Arnold Planning Pty Ltd (AP) on behalf of Boral Construction Materials Limited (Boral) to prepare a Noise and Vibration Impact Assessment (NVIA) to quantify emissions from the proposed Johns River Quarry Extension (the 'project').

The NVIA has quantified potential noise and blasting emissions (airblast and vibration) associated with the operation of the quarry expansion 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 Department of Environment, Climate Change and Water (DECCW) – NSW Road Noise Policy (RNP), March 2011;
- NSW Environment Protection Authority (EPA), Approved Methods for the measurement and analysis of environmental noise in NSW, 2022;
- Australian Standard 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;
- 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;
- Australia and New Zealand Environment Council (ANZEC) Guideline – Technical Basis For Guidelines To Minimise Annoyance Due To Blasting Overpressure And Ground Vibration (ANZEC Guideline), September 1990; and
- Standards Australia AS2187.2-2006 (AS2187.2) – Explosives—Storage and Use Part 2: Use of Explosives.

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

This page has been intentionally left blank

2 Project Description

Boral Resources (Country) Pty Ltd (Boral) owns and operates the Johns River Quarry at Bulleys Road, Johns River (the quarry or the site), a long-standing hard rock quarry that extracts and transports high quality hard rock aggregates for use as road base and in the construction industry. The quarry operates under development consent no. DA 93/31 (as amended) from the (former) Greater Taree Council. DA 93/31 is due to expire in July 2026.

The quarry is located at the northern end of Bulleys Road, approximately 2 km north of the village of Johns River and 500 m north-west of the Pacific Highway. The regional city of Taree is located approximately 38 km south-west of the quarry.

The existing quarry operations area is approximately 16.46 hectares (ha) and incorporates the extraction area, haul roads, plant area, stockpile and loading area, weighbridge and truck staging area, noise bunds and water management structures, car parking and amenities.

The existing layout of the quarry and the proposed extension area is shown in **Figure 1**.

Due to the ongoing demand for high quality hard rock quarry products, Boral is seeking consent from the MidCoast Council to modify DA 93/31 to extend the life of the quarry through a minor extension of the quarry operations area.

The key components of the Johns River Quarry Extension – Modification 3 (the proposed modification) include:

- continuing existing operations for an additional 15 years (until 2041); and
- extending the quarry operations area by 2.03ha to the north-east to provide access to approximately 2.3 million tonnes (Mt) of additional resource.

There would be no other changes, noting that the proposed modification does not seek to modify:

- the approved rate of extraction;
- the depth of extraction;
- the type of product being extracted;
- existing drill and blast extraction methods;
- truck types or the number of movements;
- hours of operation;
- the number of employees;

- existing site office, amenities, weighbridge and parking area; and
- existing stockpile areas, crushing and screening plant, and mobile machinery.

2.1 Proposed Activities & Operating Hours

There are several key activities associated with the project that have the potential to generate acoustic impacts on nearby receivers. **Table 1** provides a summary of project noise sources and the assessment period in which they propose to occur.

Table 1 Operations Activities

Activity	Operating Hours	NPI Period
Extraction Operations (Drill, blast, load and haul)	Monday to Friday: 7 am to 6 pm Saturday: 7 am to 1.30 pm Sunday: No works	Daytime
Rehabilitation of extraction areas		Daytime
Processing		Daytime
Transport		Daytime
Blasting	9am to 3pm Monday to Friday 9am to 1.30pm Saturday	Daytime

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.

2.2 Development Consent

The quarry currently operates pursuant to development consent DA 93/91, granted by the Greater Taree Council on 28 July 1993. The consent has been modified twice, most recently on 16 September 2015.

2.3 Environment Protection Licence

Johns River Quarry holds Environment Protection Licence (EPL) 4812 for the quarry under the provisions of the Protection of the Environment Operations Act 1997 (POEO Act). The EPL is administered by the Environment Protection Authority (EPA) and licences the extraction of between 100,000tpa and 500,000tpa of quarry material.

3 Receiver Review

A review of residential receivers in proximity to the project has been completed and are summarised in **Table 2. Figure 1** provides a locality plan showing the position of these receivers in relation to the project.

Table 2 Receiver Locations

Receiver	Description	Coordinates (GDA94/MGA56)	
		Easting	Northing
R001[1]	99 Middle Brother Road	471868	6491632
R002[1]	124 Bulleys Road	471472	6490878
R01	20 Yaralin Close	472350	6491016
R02	26 Bulleys Road	471456	6490306
R03[2]	75 Bulleys Road (Boral Owned)	471472	6490245
R04	27 Bulleys Road North (Unoccupied)	471010	6490281
R05	27 Bulleys Road South	470865	6489974
R06	Lot 245 Pacific Highway	472583	6490948
R07	111 Wharf Road	472566	6490332
R08	9 Wharf Road	471529	6490037
R09	Johns River Village	471529	6489429
R10	48 Algona Road	473117	6492267
R11	117 Algona Road	472419	6491923
R12	69 Wharf Road	472070	6490175
R13	20737 Pacific Highway	473029	6491501

Note 1: Boral has a negotiated agreement with the receiver.

Note 2: Boral Owned.

A review of sensitive receivers in proximity to the project has been completed. Receivers R001 and R002 have a negotiated agreement with Boral and hence are not assessed. Receiver R03 is owned by Boral and is also not assessed.

All non project related residential receivers have been classified as 'Rural' as per the land use zoning and in accordance with Table 2.3 of the NPI. A locality plan showing all receivers in relation to the quarry is provided in **Figure 1.**

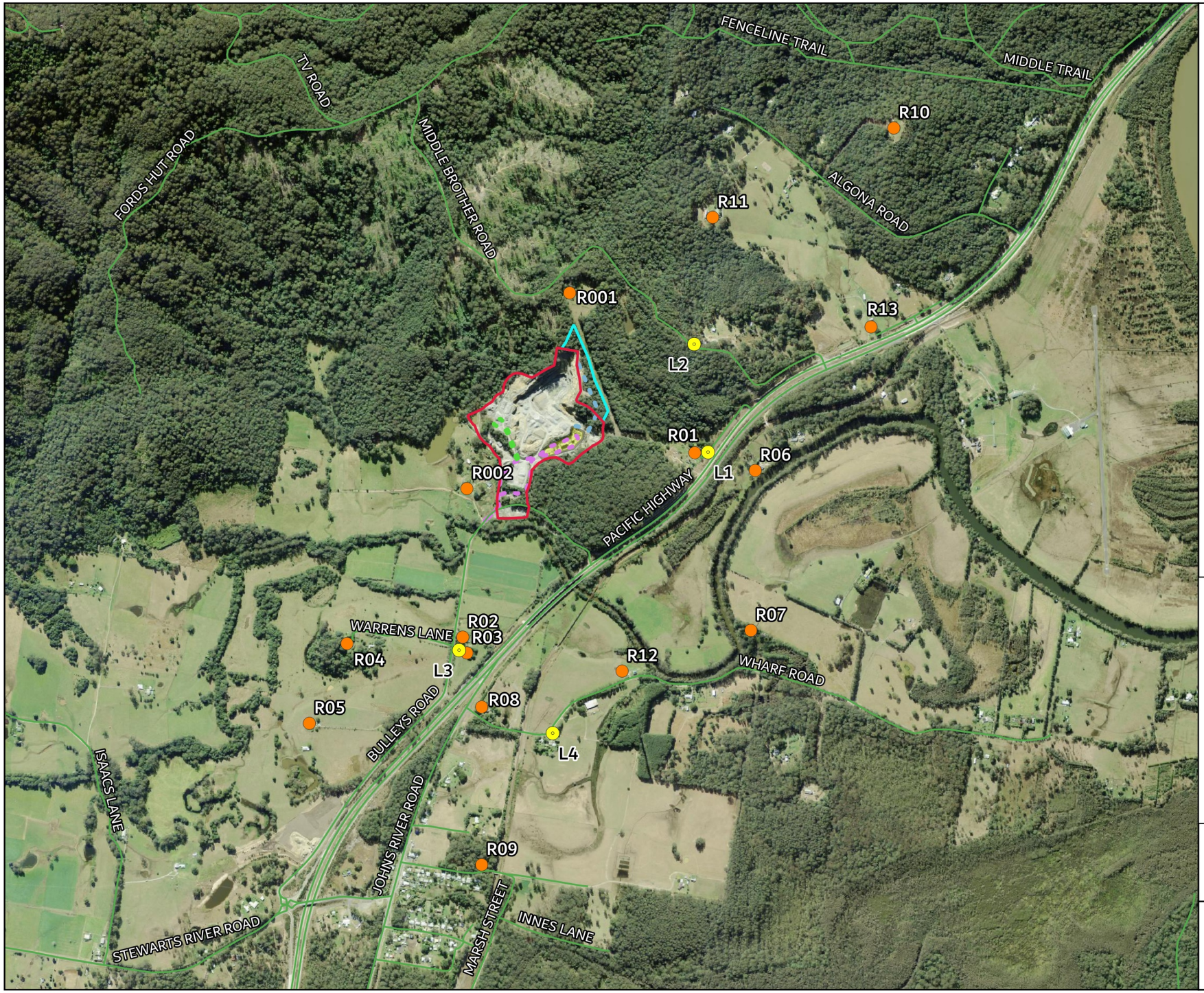


FIGURE 1

Project Layout and Receivers

MAC242091-01

Johns River Quarry Extension

KEY

- Receiver
- Monitoring Location
- Existing Extraction Area
- Proposed Extension Area
- Processing Area

0 100 200 300 400 500 m

N

MAC
Muller Acoustic Consulting

4 Noise Policy and Guidelines

4.1 Noise Policy for Industry

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

The objectives of the NPI are to:

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

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

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

5. Set statutory compliance levels that reflect the best achievable and agreed noise limits for the development.

6. Monitor and report environmental noise levels from the development.

4.1.1 Project Noise Trigger Levels (PNTL)

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

4.1.2 Rating Background Level (RBL)

The Rating Background Level (RBL) is a parameter determined from noise monitoring and is used for assessment purposes. As per the NPI, the RBL is an overall single figure background level representing each assessment period (day, evening and night) over the noise monitoring period. The measured RBLs relevant to the project are contained in **Section 5**.

For low noise environments, such as rural environments, minimum assumed RBLs apply within the NPI can be adopted in lieu of completing background noise measurements. This is considered the most conservative method for establishing noise criteria for a project. The minimum assumed RBLs are as follows:

- Minimum Day RBL = 35dBA;
- Minimum Evening RBL = 30dBA; and
- Minimum Night RBL = 30dBA.

4.1.3 Project Intrusiveness Noise Level (PINL)

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 need to be measured.

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

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

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

Boral has owned and operated the Quarry Facility for over 20 years and has been operating for more than 10 years during the assessment periods being considered.

MAC has conducted the EPL noise compliance monitoring assessments on a quarterly basis for the quarry since June 2017 via operator attended noise monitoring. Monitoring shows that the site is generally inaudible at all monitoring locations. Measured or estimated noise contributions from the quarry have satisfied the EPL noise limits and consent criteria at all locations during all assessment periods over the period since June 2017, demonstrating that the noise mitigation and management measures in the Environmental Management Plan (EMP) are effective.

4.1.4 Project Amenity Noise Level (PANL)

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

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

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

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

The following exceptions apply when deriving the PANL:

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

The NPI states with respect to high traffic noise areas:

The level of transport noise, road traffic noise in particular, may be high enough to make noise from an industrial source effectively inaudible, even though the LAeq noise level from that industrial noise source may exceed the project amenity noise level. In such cases the project amenity noise level may be derived from the LAeq, period(traffic) minus 15 dB(A).

Where relevant this assessment has considered influences of traffic with respect to amenity noise levels (ie areas where existing traffic noise levels are 10dB greater than the recommended amenity noise level).

Furthermore, Section 2.4 of the NPI states "*where the project amenity noise level applies and it can be met, no additional consideration of cumulative industrial noise is required*. "

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

Table 3 Amenity Noise Levels

Receiver Type	Noise Amenity Area	Time of day	Recommended amenity noise level dB LAeq(period)
Residential	Rural	Day	50
		Evening	45
		Night	40
	Suburban	Day	55
		Evening	45
		Night	40
	Urban	Day	60
		Evening	50
		Night	45
Hotels, motels, caretakers' quarters, holiday accommodation, permanent resident caravan parks.	See column 4	See column 4	5dB above the recommended amenity noise level for a residence for the relevant noise amenity area and time of day
School Classroom	All	Noisiest 1-hour period when in use	35 (internal) 45 (external)
Hospital ward - internal - external	 All All	 Noisiest 1-hour Noisiest 1-hour	 35 50
Place of worship - internal	All	When in use	40
Passive Recreation	All	When in use	50
Active Recreation	All	When in use	55
Commercial premises	All	When in use	65
Industrial	All	When in use	70

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 of the NPI.

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.

This page has been intentionally left blank

5 Existing Environment

5.1 Background Noise levels

5.1.1 Unattended Noise Monitoring

To quantify the existing background noise environment of the area, unattended noise monitoring was conducted at four locations representative of the ambient environment at the receivers surrounding the project. The selected monitoring locations are shown in **Figure 1** and are considered representative of surrounding residential receivers as per Fact Sheet B1.1 of 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 four Svantek 977 noise analysers from Friday 17 May 2024 to Monday 27 May 2024 The acoustic instrumentation used carries current NATA calibration 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. All equipment carries appropriate and current NATA (or manufacturer) calibration certificates with records of all calibrations maintained by MAC as per the EPA's Approved Methods for the measurement and analysis of environmental noise in NSW (EPA, 2022).

The results of long-term unattended noise monitoring are provided in **Table 4** to **Table 7** for Location 1 to Location 4 respectively. The noise monitoring charts for the background monitoring assessment are provided in **Appendix B**. Data affected by adverse meteorological conditions have been excluded from the results in accordance with methodologies provided in Fact Sheet A4 of the NPI.

Table 4 Background Noise Monitoring Summary – Location 1		
Date	Measured Background Noise Level (LA90) dB ABL[1]	Measured Ambient Noise Level dB LAeq(period)
	Day	Day
Friday-17-May-24	53	63
Saturday-18-May-24	51	62
Sunday-19-May-24	50	63
Monday-20-May-24	50	64
Tuesday-21-May-24	50	63
Wednesday-22-May-24	50	63
Location 1 – RBL / Leq Overall	**50**	**63**

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.

Note: Excludes periods of wind or rain affected data. Meteorological data obtained from the Bureau of Meteorology weather station at Taree Airport (Site 60141).

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.

Table 5 Background Noise Monitoring Summary – Location 2		
Date	Measured Background Noise Level (LA90) dB ABL[1]	Measured Ambient Noise Level dB LAeq(period)
	Day	Day
Friday-17-May-24	43	48
Saturday-18-May-24	48	54
Sunday-19-May-24	45	50
Monday-20-May-24	45	50
Tuesday-21-May-24	44	49
Wednesday-22-May-24	43	48
Thursday-23-May-24	42	48
Friday-24-May-24	44	52
Saturday-25-May-24	41	47
Sunday-26-May-24	43	49
Monday-27-May-24	41	48
Location 2 – RBL / Leq Overall	**43**	**50**

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.

Note: Excludes periods of wind or rain affected data. Meteorological data obtained from the Bureau of Meteorology weather station at Taree Airport (Site 60141).

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.

Table 6 Background Noise Monitoring Summary – Location 3

Date	Measured Background Noise Level (LA90) dB ABL[1]	Measured Ambient Noise Level dB LAeq(period)
	Day	Day
Friday-17-May-24	46	54
Saturday-18-May-24	48	55
Sunday-19-May-24	47	54
Monday-20-May-24	46	53
Tuesday-21-May-24	46	55
Wednesday-22-May-24	44	54
Thursday-23-May-24	42	54
Friday-24-May-24	46	63
Saturday-25-May-24	43	52
Sunday-26-May-24	44	56
Monday-27-May-24	44	55
Location 3 – RBL / Leq Overall	**46**	**56**

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.

Note: Excludes periods of wind or rain affected data. Meteorological data obtained from the Bureau of Meteorology weather station at Taree Airport (Site 60141).

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.

Table 7 Background Noise Monitoring Summary – Location 4

Date	Measured Background Noise Level (LA90) dB ABL[1]	Measured Ambient Noise Level dB LAeq(period)
	Day	Day
Friday-17-May-24	40	60
Saturday-18-May-24	47	55
Sunday-19-May-24	46	54
Monday-20-May-24	47	54
Tuesday-21-May-24	43	52
Wednesday-22-May-24	43	52
Thursday-23-May-24	43	53
Friday-24-May-24	39	50
Saturday-25-May-24	38	51
Sunday-26-May-24	39	51
Monday-27-May-24	39	64
Location 4 – RBL / Leq Overall	**43**	**57**

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.

Note 2: Excludes periods of wind or rain affected data. Meteorological data obtained from the Bureau of Meteorology weather station at Taree Airport (Site 60141).

Note 3: 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.

5.2 Attended Noise Monitoring

To supplement the unattended noise assessment and to quantify the changes in ambient noise in the community surrounding the operation, one 15 minute attended measurement was completed at each location.

The attended 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 acoustic instrumentation used carries current NATA calibration 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. All equipment carries appropriate and current NATA (or manufacturer) calibration certificates with records of all calibrations maintained by MAC as per the EPA's Approved Methods for the measurement and analysis of environmental noise in NSW (EPA, 2022).

The attended noise monitoring was conducted using a Svantek 971 noise analyser to quantify ambient background noise levels. The attended measurements summarised in **Table 8** were completed during calm and clear meteorological conditions and confirmed that ambient traffic noise dominated the surrounding environment.

Table 8 Operator-Attended Noise Survey Results

Date/Time (hrs)	Noise Descriptor (dB re 20µPa)			Meteorology	Description and SPL, dBA
	L_{Amax}	L_{Aeq}	L_{A90}		
Location 1					
16/05/2024 10:42	80	62	54	WD: W WS: <0.5m/s 19°C	Traffic 47-80 Birds 47-50
Location 2					
16/05/2024 11:07	67	47	43	WD: W WS: <0.5m/s 19°C	Traffic 41-49 Birds 41-61 MAC operator 48-67
Location 3					
16/05/2024 10:18	82	61	47	WD: W WS: <0.5m/s 19°C	Traffic 44-82 Birds 44-54 Residential noise 44-48
Location 4					
16/05/2024 11:38	82	59	43	WD: W WS: <0.5m/s 19°C	Traffic 41-61 Birds 41-56 Train 41-82 Residential noise 50-56

6 Assessment Criteria

6.1 Operational Noise Trigger Levels (Criteria)

This section outlines the determination of PNTLs and Maximum Noise Assessment Trigger Levels in accordance with NPI methodology.

6.1.1 Intrusiveness Noise Levels

The PINL for the project are presented in **Table 9** and have been determined based on the RBL +5dBA and only apply to residential receivers. The quarry has been operating for more than 10 years in the assessment periods being considered and is therefore a part of the ambient acoustic environment. The site has been operating within the EPL noise limits and relevant consent conditions.

Table 9 Project Intrusiveness Noise Levels

Location	Receiver Type	Period[1]	Measured RBL dB LA_{90}	Adopted RBL dB LA_{90}	PINL dB $LA_{eq(15min)}$
L1	Residential	Day	50	50	55
L2	Residential	Day	43	43	48
L3	Residential	Day	46	46	51
L4	Residential	Day	43	43	48

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.

6.1.2 Amenity Noise Levels and Project Amenity Noise Levels

The PANL for residential receivers and other receiver types (ie non-residential) potentially affected by the project are presented in **Table 10.**

Table 10 Amenity Noise Levels and Project Amenity Noise Levels – All Receiver Types

Receiver Type	Noise Amenity Area	Assessment Period[1]	NPI Recommended ANL dB $LA_{eq(period)}$	ANL dB $LA_{eq(period)}$[2]	PANL dB $LA_{eq(15min)}$[3]
Residential	Rural	Day	50	45	48
		Evening	45	40	43
		Night	40	35	38

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: Project Amenity Noise Level equals the Amenity Noise Level -5dB as there is other industry in the area.

Note 3: Includes a +3dB adjustment to the amenity period level to convert to a 15-minute assessment period as per Section 2.2 of the NPI.

6.1.3 Project Noise Trigger Levels

The PNTL are the lower of either the PINL or the PANL. **Table 11** presents the derivation of the PNTLs in accordance with the methodologies outlined in the NPI.

Table 11 Project Noise Trigger Levels

Receiver Type	Noise Catchment Area	Assessment Period[1]	PINL dB $L_{Aeq(15min)}$	PANL dB $L_{Aeq(15min)}$	PNTL dB $L_{Aeq(15min)}$
Residential	L1	Day	55	48	48
Residential	L2	Day	48	48	48
Residential	L3	Day	51	48	48
Residential	L4	Day	48	48	48

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 Voluntary Land Acquisition and Mitigation Policy

The Voluntary Land Acquisition and Mitigation Policy (VLAMP, November 2018) describes the NSW Government's policy for voluntary mitigation and land acquisition actions undertaken to address noise impacts from State significant mining, petroleum and extractive industry developments. It aims to provide a balance between economic development and protecting the health, preserve amenity and control intrusive noise where potential impacts are identified.

The VLAMP provides guidance for consent authorities as to when voluntary mitigation or voluntary acquisition rights are to be applied to reduce operational noise impacts from a development on privately owned land. The policy does not apply to construction noise impacts, impacts from the public road or rail network or modifications to existing developments with legacy noise issues.

The VLAMP outlines methods to determine the significance of potential exceedances of relevant noise assessment criteria and identifies potential treatments for those exceedances (VLAMP Table 1) and has been reproduced in **Table 12**.

Voluntary Mitigation Rights

A consent authority should only apply voluntary land mitigation rights where, even with the implementation of best practice management at the quarry:

- the noise generated by the development would meet the requirements of Table 1 (VLAMP) such that the impacts would be characterised marginal, moderate or significant at any residence or privately owned land; or

- the development would increase the total industrial noise level at any residence on privately owned land by more than 1dBA and noise levels at the residence are already above the recommended amenity noise levels in Table 2.2 of the NPI; or
- the development includes a private rail line and the use of that private rail line would cause exceedances of the recommended acceptable levels in Table 6 of Appendix 3 of the RING by greater than or equal to 3dBA at any residences on privately owned land.

Table 12 Characterisation of Noise Impacts and Potential Treatments (VLAMP Table 1)

If the predicted noise level minus the project noise trigger level is:	And the total cumulative industrial noise level is:	Characterisation of impacts:	Potential treatment:
All time periods 0-2dBA	Not applicable	Impacts are considered to be negligible	The exceedances would not be discernible by the average listener and therefore would not warrant receiver based treatments or controls
All time periods 3-5dBA	< recommended amenity noise level in Table 2.2 of the NPI; or > recommended amenity noise level in Table 2.2 of the NPI, but the increase in total cumulative industrial noise level resulting from the development is >1dB	Impacts are considered to be marginal	Provide mechanical ventilation / comfort condition systems to enable windows to be closed without compromising internal air quality / amenity.
All time periods 3-5dBA	> recommended amenity noise level in Table 2.2 of the NPI, and the increase in total cumulative industrial noise level resulting from the development is >1dB	Impacts are considered to be moderate	As for marginal impacts but also upgraded facade elements like windows, doors or roof insulation, to further increase the ability of the building facade to reduce noise levels.
Day and evening >5dBA	< recommended amenity noise levels in Table 2.2 of the NPI	Impacts are considered to be moderate	As for marginal impacts but also upgraded facade elements like windows, doors or roof insulation, to further increase the ability of the building facade to reduce noise levels.
Day and evening >5dBA	> recommended amenity noise levels in Table 2.2 of the NPI	Impacts are considered to be significant	Provide mitigation as for moderate impacts and see voluntary land acquisition provisions above.

Table 12 Characterisation of Noise Impacts and Potential Treatments (VLAMP Table 1)			
If the predicted noise level minus the project noise trigger level is:	And the total cumulative industrial noise level is:	Characterisation of impacts:	Potential treatment:
Night >5dBA	Not applicable	Impacts are considered to be significant	Provide mitigation as for moderate impacts and see voluntary land acquisition provisions above.

Voluntary Acquisition Rights

A consent authority should only apply voluntary land acquisition rights where, even with the implementation of best practice management at the quarry:

- the noise generated by the development would be characterised as significant, according to Table 1 (VLAMP), at any residence on privately owned land; or
- the noise generated by the development would contribute to exceedances of the acceptable noise levels plus 5dB in Table 2.2 of the NPI on more than 25% of any privately owned land where there is an existing dwelling or where a dwelling could be built under existing planning controls; or
- the development includes a private rail line and the use of that private rail line would cause exceedances of the recommended maximum criteria outlined in Table 6 of Appendix 3 of the RING by greater than or equal to 3dBA at any residences on privately owned land.

Impacts would be classified as significant where:

- During the **daytime** and **evening** periods, noise levels from the project are >5dBA above the PNTLs and the total cumulative industrial noise level is greater than the recommended amenity noise levels in Table 2.2 of the NPI; or
- During the **night time** period, noise levels from the project are >5dBA above the PNTLs.

7 Modelling Methodology

A computer model was developed to quantify project noise emissions to neighbouring receivers using DGMR (iNoise, Version 2024) noise modelling software. iNoise is an intuitive and quality assured software for industrial noise calculations in the environment. 3D noise modelling is considered industry best practice for assessing noise emissions from projects.

The model incorporated a three-dimensional digital terrain map giving all relevant topographic information used in the modelling process. Additionally, the model uses relevant noise source data, ground type, attenuation from barrier or buildings and atmospheric information to predict noise levels at the nearest potentially affected receivers. Where relevant, modifying factors in accordance with Fact Sheet C of the NPI have been applied to calculations.

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[1]. 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.

7.1 Assessment Scenario

A typical operational scenario has been assessed to represent extraction within the proposed extension area as shown in **Figure 2.** Key activities include the following:

- Drilling and blasting of material;
- Crushing in pit;
- Load materials with excavator and haul to the processing area;
- Processing of material within the processing area;
- Front-end loader managing product stockpiles and loading road trucks in the processing area; and
- Transport of quarry products using road truck via quarry access road onto public road.

There are no changes to the current processing, loading and off site transport operations.

[1] 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

FIGURE 2

Typical (Proposed) Extraction, Processing and Transport Operations

MAC242091-01

Johns River Quarry Extension

KEY

- Receiver
- Existing Extraction Area
- Proposed Extension Area
- Noise Source
- Reference Location
- Pit Haul Truck
- Sales Truck
- Water Cart

0 40 80 120 160 200 m

N

MAC
Muller Acoustic Consulting

7.2 Sound Power Levels

Table 13 presents the sound power level for each noise source modelled in this assessment. It is noted that sound power levels were sourced in-field measurements of the equipment operating at the quarry.

Table 13 Acoustically Significant Sources - Sound Power Levels dBA (re 10^{-12} Watts)

Item and number modelled per 15 minutes	Individual Sound Power Level	Modelled Sound Power Level dB LAeq(15min)	Source Height[1]
Operation			
Drill Rig - Atlas Copco T45	118	118	1.5m
Pit Excavator - Hitachi 450H - 45 tonne	106	106	1.5m
Pit Front End Loader Komatsu WA-500	102	102	1.5m
Sales/Front End Loader CAT 972	101	101	1.5m
Pit Crusher	118	118	1.5m
CAT 772G Haul Truck[2] (2 loads per 15 min)	107	107	1.5m
Water Cart - Freightliner Road Truck[2] (2 circuits per 15 min)	102	102	1.5m

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

Note 2: Modelled as a moving point source with adjustments for length of travelled path, velocity and number of movements in a 15-minute period.

7.3 Model Validation

The noise model was validated using the results of the operator attended noise survey results for current operations at a reference location (refer **Figure 2**) approximately 200m from the processing area. **Table 14** presents the results of the validation modelling, outlining the modelled noise levels for existing operations compared to the measured noise levels at the reference location.

Table 14 Noise Model Validation

Location	Noise Level dB LAeq(15min) Daytime		
	Measured Level	Predicted Level	Variance
Reference Location	53.2	54.0	+0.8

7.4 Meteorological Analysis

Noise emissions can be influenced by prevailing weather conditions. Light stable winds (<3m/s) and temperature inversions have the potential to increase noise at a receiver.

Fact Sheet D of the NPI provides two options when considering meteorological effects:

- adopt the noise enhancing conditions for all assessment periods without an assessment of how often the conditions occur – a conservative approach that considers a source to receiver winds for all receivers and F class temperature inversions with wind speeds up to 2m/s at night; or
- determine the significance of noise enhancing conditions. This requires assessing the significance of temperature inversions (F and G Class stability categories) for the night time period and the significance of light winds up to 3m/s for all assessment periods during stability categories other than E, F or G.

Standard meteorological conditions and noise-enhancing meteorological conditions as defined in Table D1of the NPI are reproduced in **Table 15**.

Table 15 Standard and Noise-Enhancing Meteorological Conditions

Meteorological Conditions	Meteorological Parameters
Standard Meteorological Conditions	Day/evening/night: stability categories A–D with wind speed up to 0.5m/s at 10m AGL.
Noise Enhancing Meteorological Conditions	Daytime/evening: stability categories A–D with light winds (up to 3 m/s at 10m AGL). Night-time: stability categories A–D with light winds (up to 3m/s at 10m AGL) and/or stability category F with winds up to 2m/s at 10 m AGL.

A detailed analysis of the significance of noise enhancing conditions has not been undertaken and hence, the NPI noise enhancing meteorological conditions have been applied to the noise modelling assessment are presented in **Table 16**.

Table 16 Modelled Meteorological Parameters

Assessment Condition[1]	Temperature	Wind Speed[2]/ Direction	Relative Humidity	Stability Class[2]
Day	20°C	3m/s	50%	D

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: Implemented using CONCAWE meteorological corrections.

7.5 NPI Very Noise Enhancing Conditions

Fact Sheet D of the NPI also states:

'Noise limits derived for consents and licences will apply under the meteorological conditions used in the environmental assessment process, that is, standard or noise-enhancing meteorological conditions. For 'very noise-enhancing meteorological conditions' (see glossary[2]) a limit is set based on the limit derived under standard or noise-enhancing conditions (whichever is adopted in the assessment) plus 5dB. In this way a development is subject to noise limits under all meteorological conditions.'

Essentially, this means a limiting criterion of PNTL +5dB is applicable for meteorological conditions outside that adopted in the assessment. In the context of the project, this means that the operation would need to comply with PNTL +5dB for any prevailing wind or temperature inversion conditions.

[2] Meteorological conditions outside of the range of either standard or noise-enhancing meteorological conditions as adopted in the noise impact assessment following the procedures in Fact Sheet D.

This page has been intentionally left blank

8 Noise Assessment Results

This assessment has quantified operational noise levels at the nearest receivers from the proposed extraction area.

8.1 Operational Noise Assessment

Noise predictions from all sources have been quantified at surrounding residential receivers to the project site and are presented in **Table 17** and as noise contours in **Figure 3**.

Table 17 Noise Predictions – All Receivers Daytime Period[1]

Location	Description	Predicted Noise Level dB LAeq(15min)	PNTL dB LAeq(15min)	Compliant
R01	20 Yaralin Close	<35	48	✓
R02	26 Bulleys Road	43	48	✓
R04	27 Bulleys Road North (Unoccupied)	40	48	✓
R05	27 Bulleys Road South	36	48	✓
R06	Lot 245 Pacific Highway	36	48	✓
R07	111 Wharf Road	<35	48	✓
R08	9 Wharf Road	40	48	✓
R09	Johns River Village	35	48	✓
R10	48 Algona Road	<35	48	✓
R11	117 Algona Road	<35	48	✓
R12	69 Wharf Road	40	48	✓
R13	20737 Pacific Highway	<35	48	✓

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.

8.2 VLAMP Assessment

A review of noise contours demonstrates that predicted project noise levels do not exceed the VLAMP criteria (40dB $L_{Aeq(15min)}$ daytime) at any receiver location. Additionally, predicted project noise levels do not exceed the VLAMP criteria (50dB $L_{Aeq(period)}$ daytime) on any privately owned vacant lands. Hence, mitigation and/or acquisition rights are not applicable.

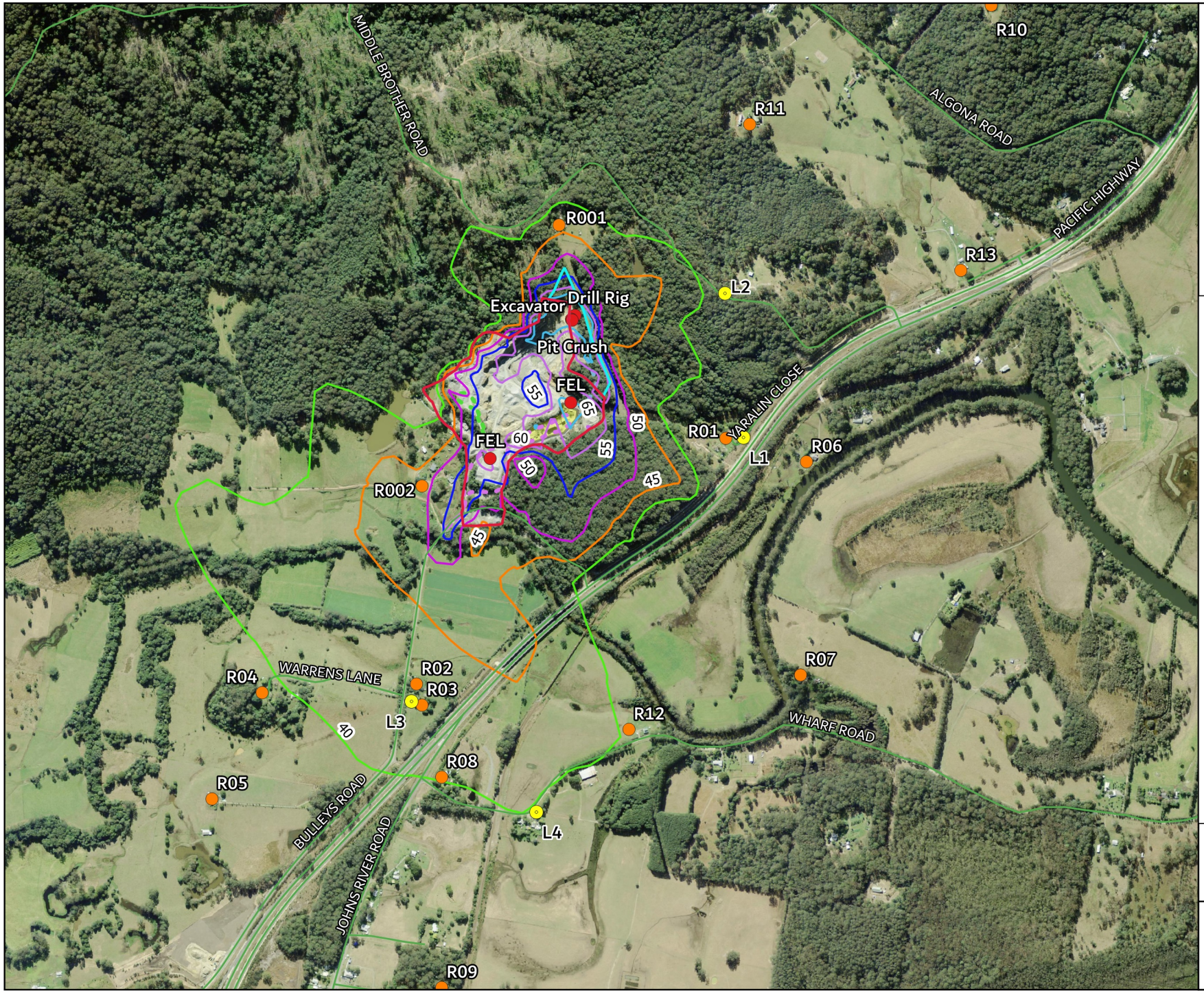


FIGURE 3

Predicted Noise Levels - Typical Extraction, Processing and Transport Operations Noise Enhancing Conditions Daytime

MAC242091-01

Johns River Quarry Extension

KEY

- Receiver
- Existing Extraction Area
- Proposed Extension Area
- Noise Source
- Pit Haul Truck
- Sales Truck
- Water Cart

Noise Level dB LAeq(15min)

- 40
- 45
- 50
- 55
- 60

0 100 200 300 400 500 m

N

MAC
Muller Acoustic Consulting

9 Blasting Assessment

9.1 Blasting Criteria

The quarry would be expected to operate within the overpressure and ground vibration limits stipulated in ANZEC guidelines which are reproduced in **Table 18**.

Table 18 Blasting Emissions Criteria

Receiver	Airblast Overpressure (dBZ Peak)	Ground Vibration (mm/s)	Allowable Exceedance
Any Residences on privately owned land	120	10	0%
	115	5	5% of the total number of blasts over a period of 12 months

9.1.1 Cosmetic Damage Criteria

The DIN 4150-3 provides safe limit values (maximum levels measured in any direction at the foundation, or maximum levels measured in (x) or (y) horizontal directions, in the plane of the uppermost floor) are summarised in **Table 19**.

Table 19 Structural Damage Safe Limit Values (DIN 4150-3)

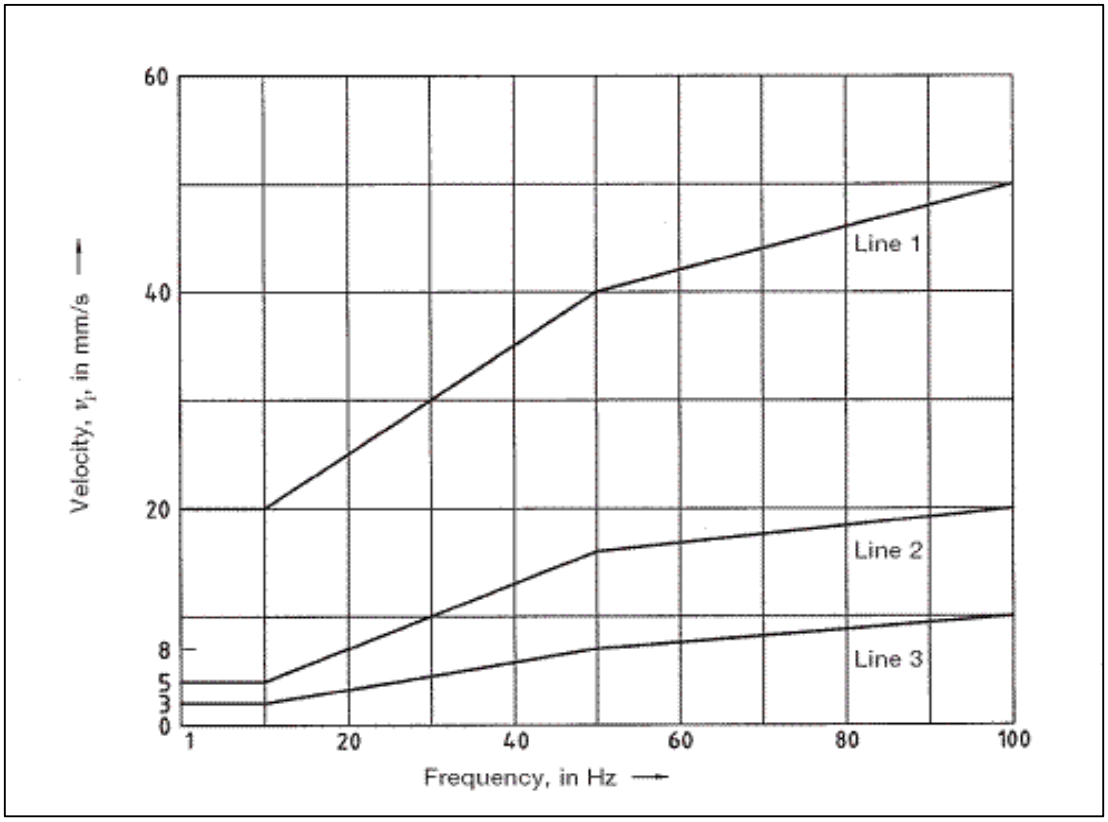
Line	Type of Structure	Vibration Velocity in mm/s			
		Vibration at foundation at a Frequency of:			Plane of Floor of Uppermost Storey at all Frequencies
		Less than 10Hz	10Hz to 50Hz	50Hz to 100Hz1	
1	Buildings used for commercial purposes, industrial buildings, and buildings of similar design	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/or occupancy	5	5 to 15	15 to 20	15
3	Sensitive Buildings: Structures that because of their particular sensitivity to vibration do not correspond to those listed in Lines 1 or 2 and have intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	8
At frequencies above 100Hz, the values given in this column may be used as a minimum.					

Guidance Note

These levels are safe limits, for which damage due to vibration is unlikely to occur. Damage is defined in DIN 4150 to include minor non-structural effects such as superficial cracking in cement render, the enlargement of cracks already present, and the separation of partitions or intermediate walls from load bearing walls. Should such damage be observed without vibration levels exceeding the safe limits then it is likely to be attributable to other causes. DIN 4150 also states that when vibration levels higher than the safe limits are present, it does not necessarily follow that damage will occur.

As indicated by the criteria from DIN 4150 high frequency vibration has less potential to cause damage than that from lower frequencies. DIN 4150 safe limit curves are presented in **Figure 4**.

Figure 4 – DIN-4150-3 Structural Damage Safe Limits for a variety of building types



9.2 Other Blasting Criteria

Typically, infrastructure such as pipelines, power transmission lines, railways and roads are less sensitive to vibration than residential buildings due to the nature of their construction and purpose. Vibration criteria for this infrastructure range from 50mm/s to 100mm/s depending on the item and purpose as shown for pipelines in **Table 20**.

Table 20 Blasting Emissions Criteria

Line	Pipe Material	Guideline Values for the velocity measured on the pipe
1	Steel (including welded pipes)	100
2	Clay, concrete, reinforced concrete, pre stressed concrete, metal (with or without flange)	80
3	Masonry, plastic	50

9.3 Blasting Assessment Methodology

An estimation of air-blast overpressure and ground-borne vibration levels has been conducted in accordance with methods in AS2187.2. The estimation adopted a MIC of 100kg with blasting locations assumed to be at the extremities of the extraction areas, which is a worst case scenario.

9.3.1 Air-Blast Overpressure

Calculations of overpressure have been completed using the following AS2187.2 equation:

Where:

$$\mathrm{P} = K_a \left(\frac{R}{(Q^{1/3})} \right)^a$$

P = Pressure, in kilopascals;

Q = Effective explosives charge mass, in kilograms (MIC);

R = Distance from charge, in metres;

Ka = Site constant, a value of 20 was adopted; and

a = Site exponent, a value of -1.45 was adopted.

The conversion of 'P' to unweighted decibels (dBZ) is completed using the following formula:

$$\mathrm{SPL} = 10\ x \log \left(\frac{P}{P_0} \right)^2$$

9.3.2 Ground-Borne Vibration

Preliminary estimations for vibration have been completed using the following AS2187.2 equation:

$$V = K_g \left(\frac{R}{(Q^{1/2})} \right)^{-B}$$

Where:

V = ground vibration as vector peak particle velocity, in mm/s;

R = distance between charge and point of measurement, in m;

Q = maximum instantaneous charge (effective charge mass per delay, MIC), in kg;

Kg = a constant related to site and rock properties, a value of 1140 was adopted; and

B = a constant related to site and rock properties for estimation purposes, a value of 1.6 was adopted.

9.4 Blasting Assessment

Airblast overpressure and ground vibration levels are predicted to meet the criteria at the closest receivers for blasts up to 100kg MIC are presented in **Table 21**.

Table 21 Blasting Emissions

Receiver ID	Distance to Charge, m	Airblast Overpressure dBZ Peak	Ground Vibration mm/s
R01	541	115	0.8
R02	1144	106	0.3
R03	1193	105	0.2
R04	1406	103	0.2
R05	1736	100	0.1
R06	772	111	0.5
R07	1203	105	0.2
R08	1371	104	0.2
R09	1960	99	0.1
R10	1508	102	0.2
R11	758	111	0.5
R12	1183	105	0.2
R13	1116	106	0.3

Blast effects resulting from the quarry are predicted to be, at worst for overpressure up to 115dBZ, and up to 0.8mm/s which satisfy the requirements ANZEC guidelines.

The nearest infrastructure to the quarry is the Pacific Highway which is over 500m from the quarry. Hence there are no significant vibration effects from blasting on infrastructure which are typically less sensitive to vibration than residential receivers.

10 Discussion and Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise and Vibration Impact Assessment (NVIA) to quantify emissions from the proposed Johns River Quarry Extension located at 175 Bulleys Road, Johns River NSW.

The assessment has quantified potential operation emissions pertaining to noise and blasting emissions (airblast and vibration) associated with the quarry extension to the northeast.

Background noise levels were measured at four locations representative of each noise catchment area to determine contemporary operational noise assessment criteria (PNTLs) which differ to the current EPL noise limits. Provided consent is given for this Modification, the Environmental Protection Licence (EPL 4812) would need to be varied to reflect the contemporary criteria/limits and policy changes since the modification in 2015. Similarly, any references to EPL noise limits in the EMP would also need to be updated.

The results of the NVIA demonstrate that noise emissions from the extractive operations in the proposed extension area and continuing (unchanged) processing and transport operations would satisfy the relevant PNTLs at all non project related receivers.

Furthermore, blasting emissions are expected to satisfy the relevant blasting criteria for a maximum instantaneous charge weight of 100kg.

Accordingly, the NVIA supports the Development Application for the project.

This page has been intentionally left blank

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

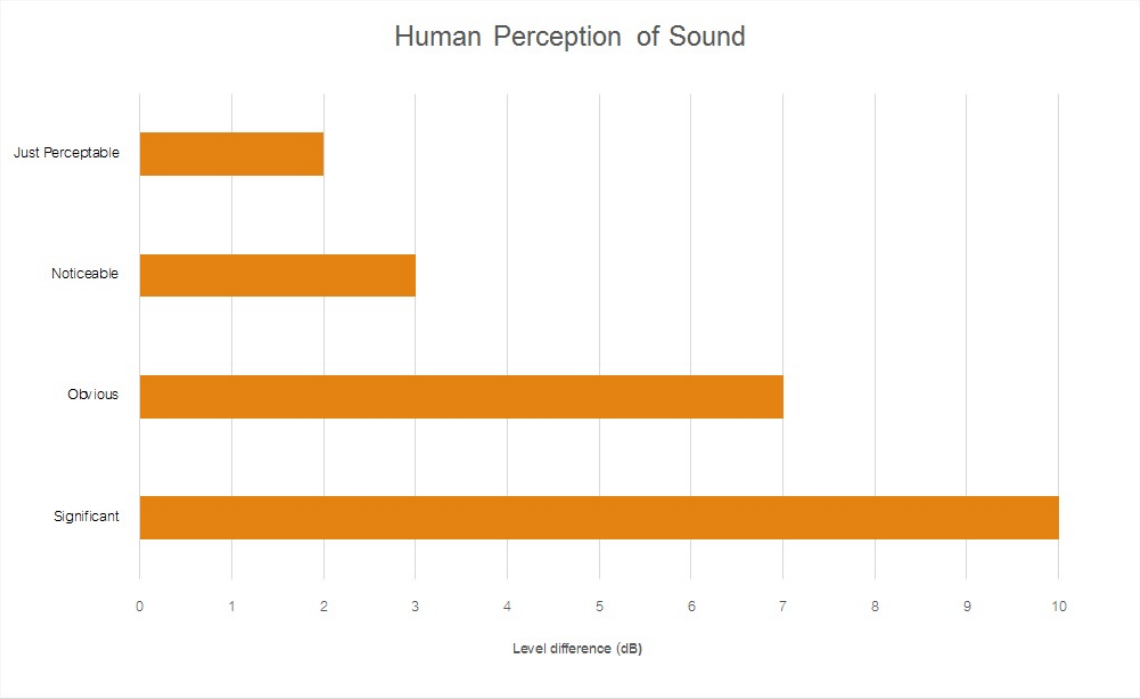
Term	Description
1/3 Octave	Single octave bands divided into three parts
Octave	A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit.
ABL	Assessment Background Level (ABL) is defined in the NPI as a single figure background level for 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

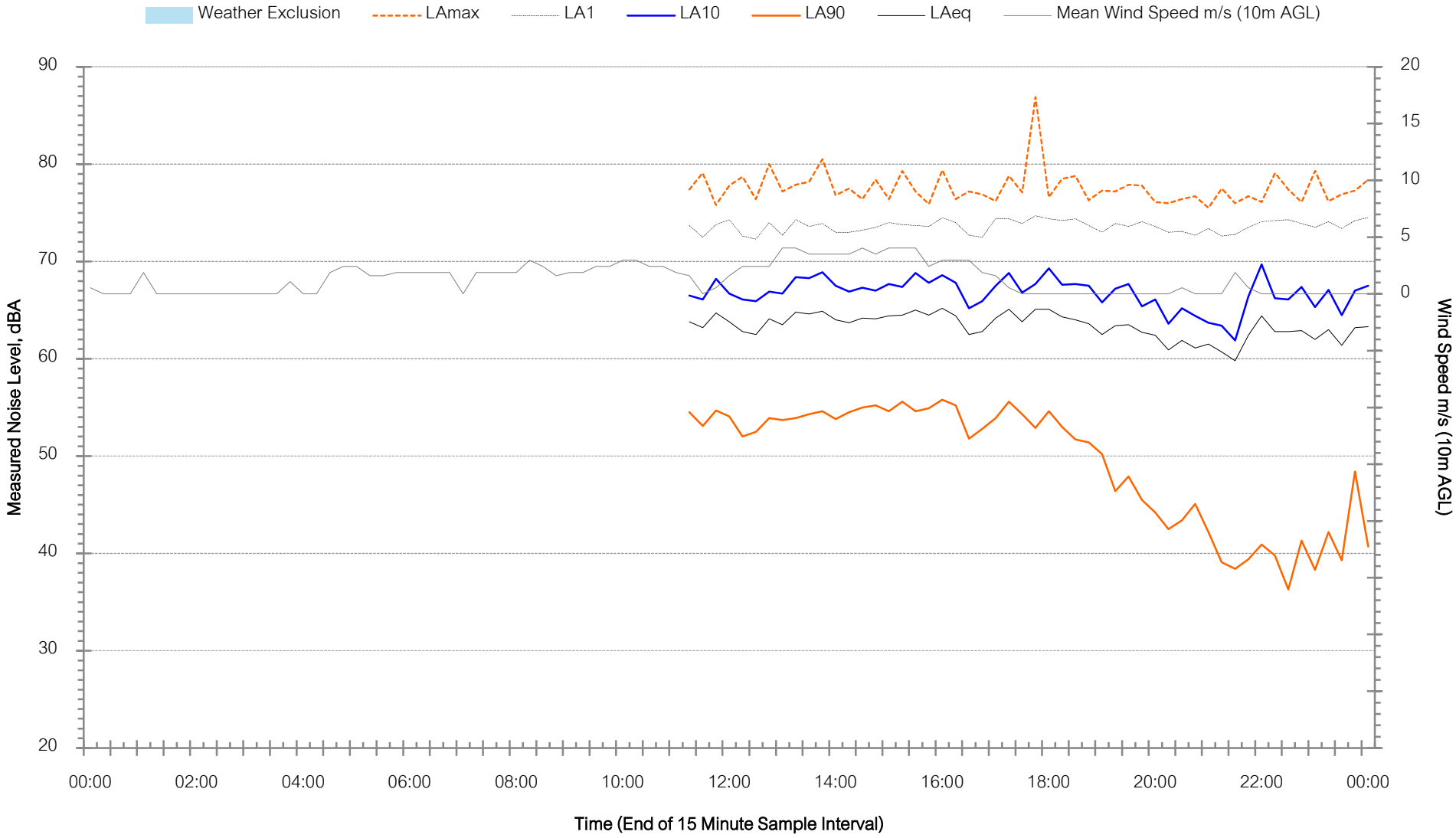


This page has been intentionally left blank

Appendix B – Noise Monitoring Charts

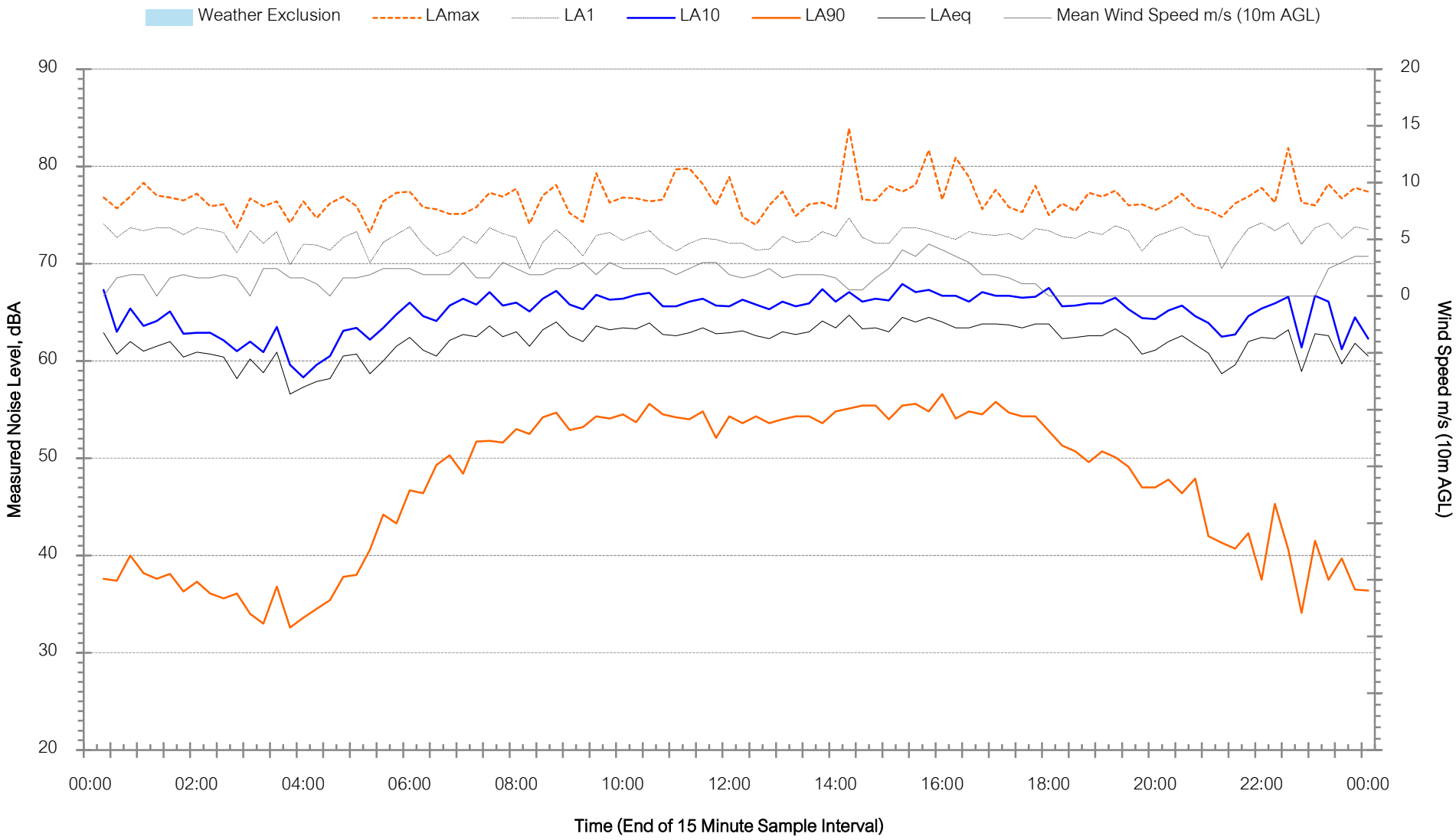
Background Noise Levels

L1 - Thursday 16 May 2024



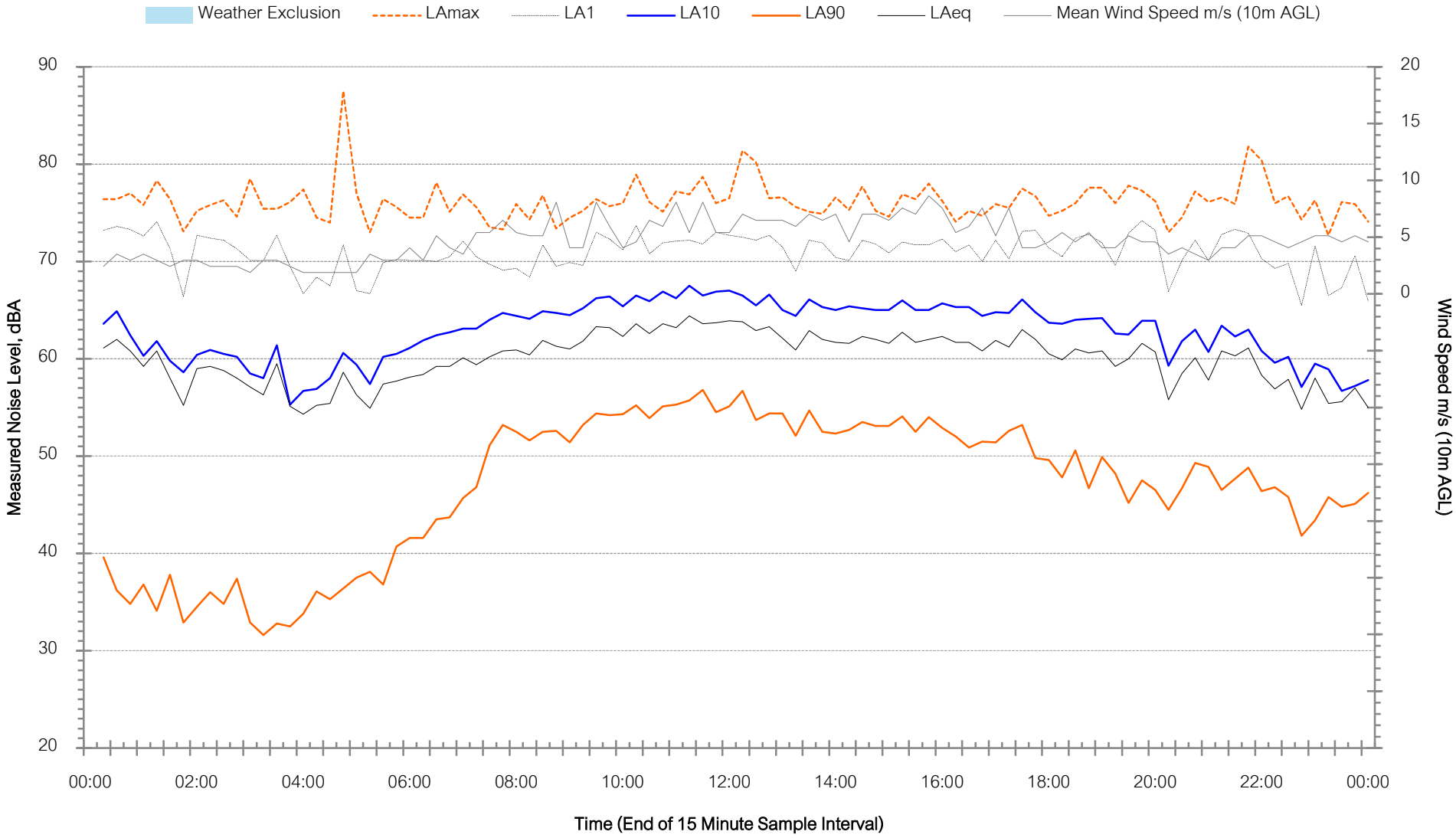
Background Noise Levels

L1 - Friday 17 May 2024



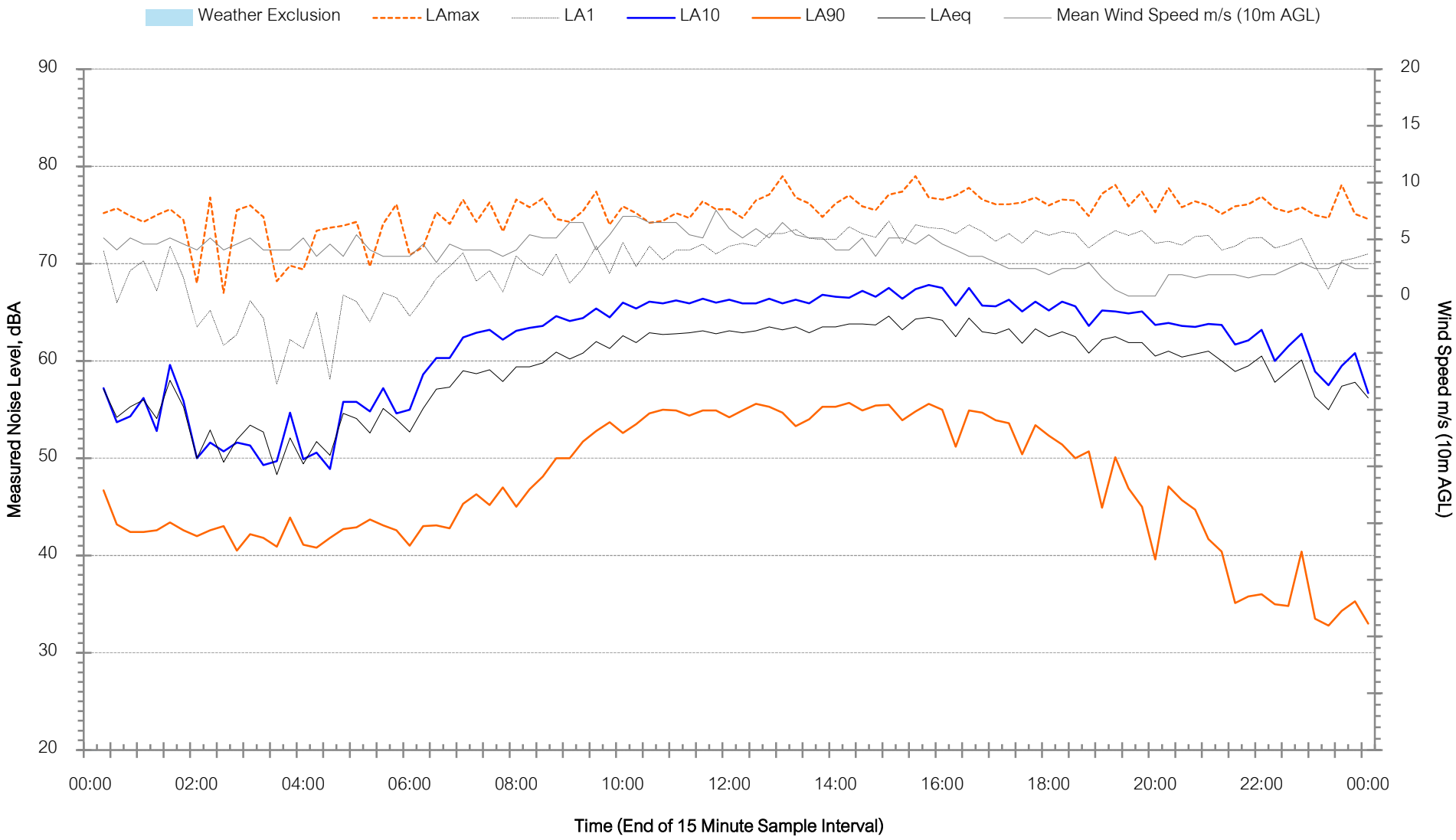
Background Noise Levels

L1 - Saturday 18 May 2024



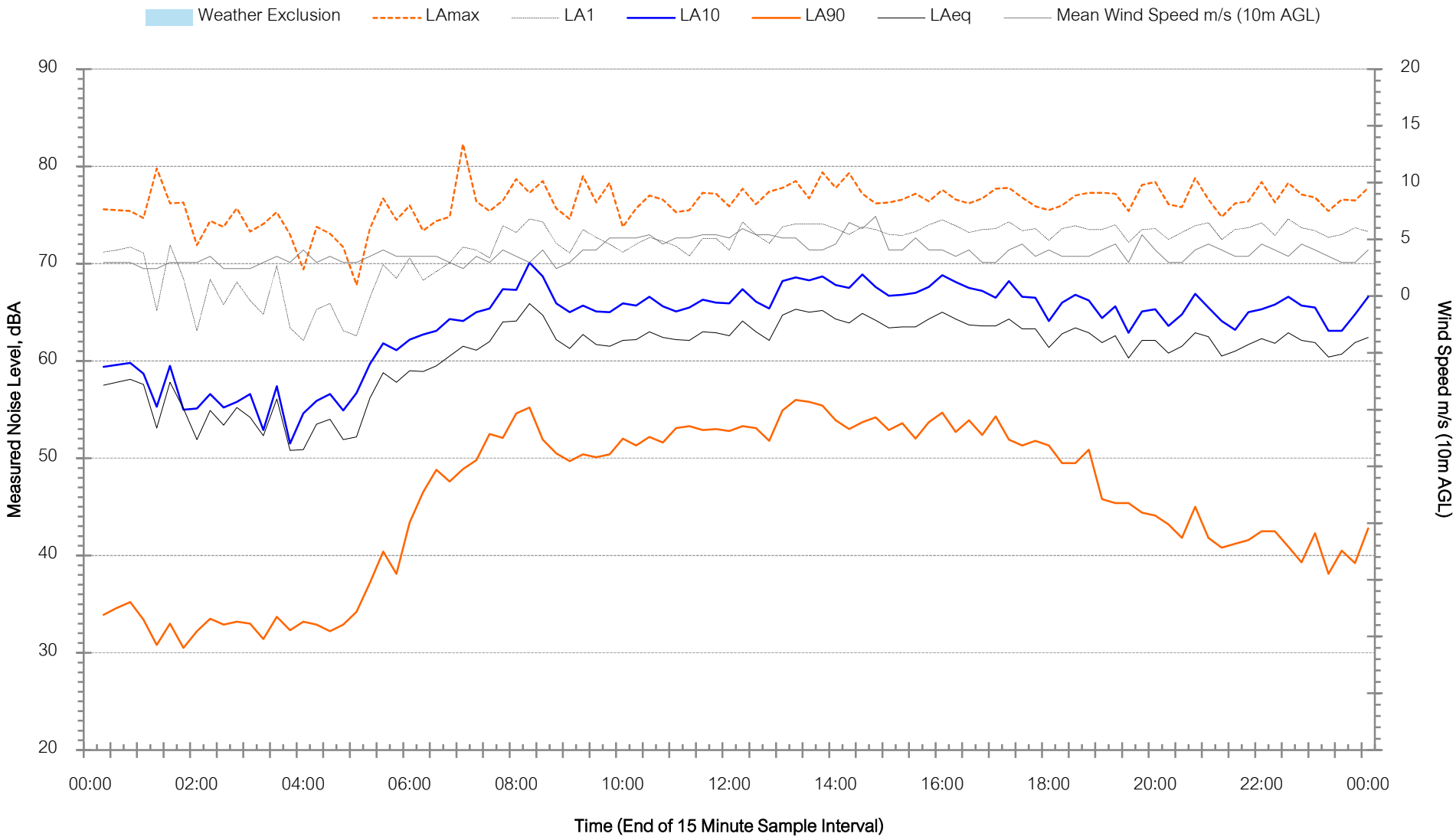
Background Noise Levels

L1 - Sunday 19 May 2024



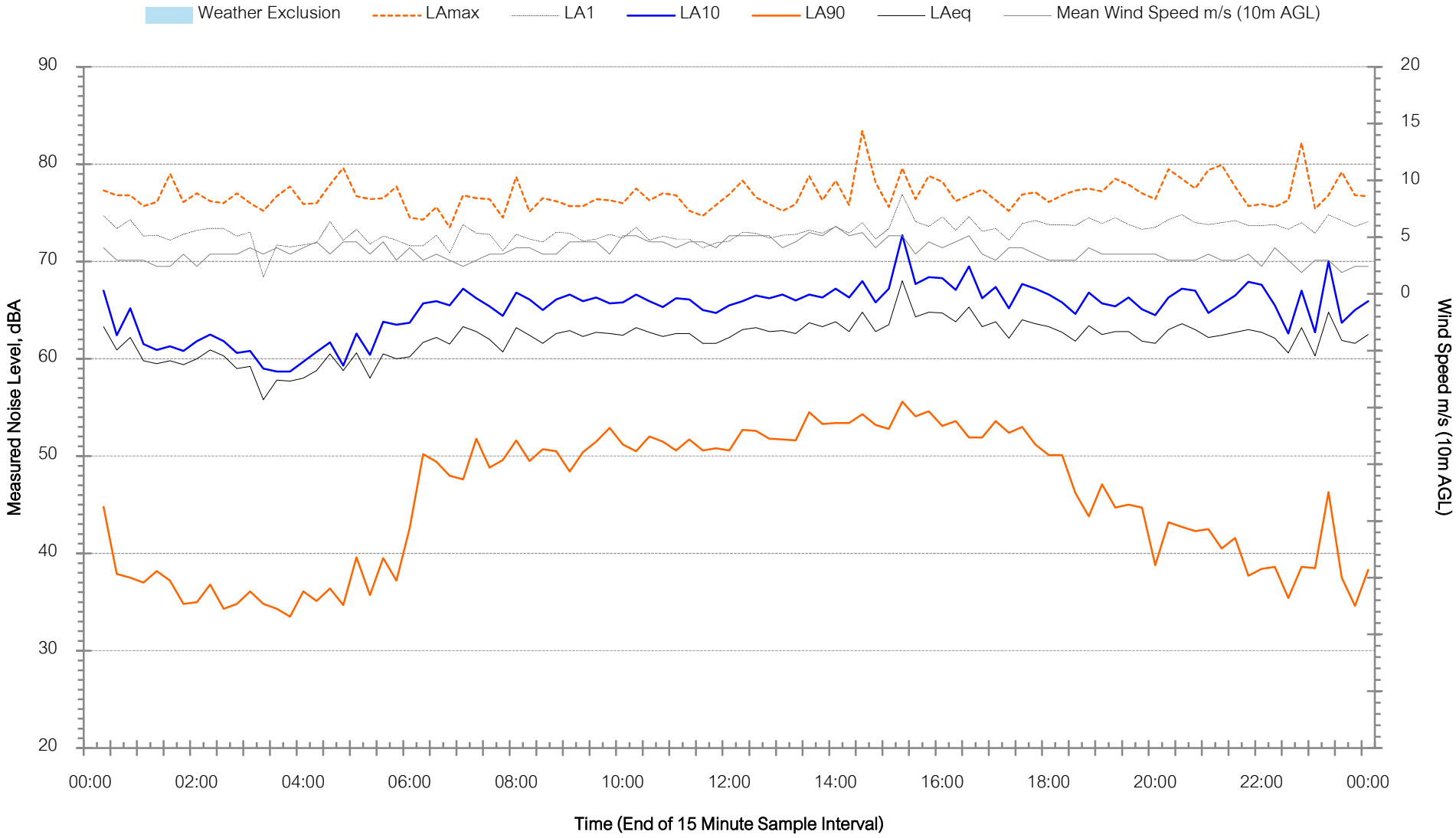
Background Noise Levels

L1 - Monday 20 May 2024



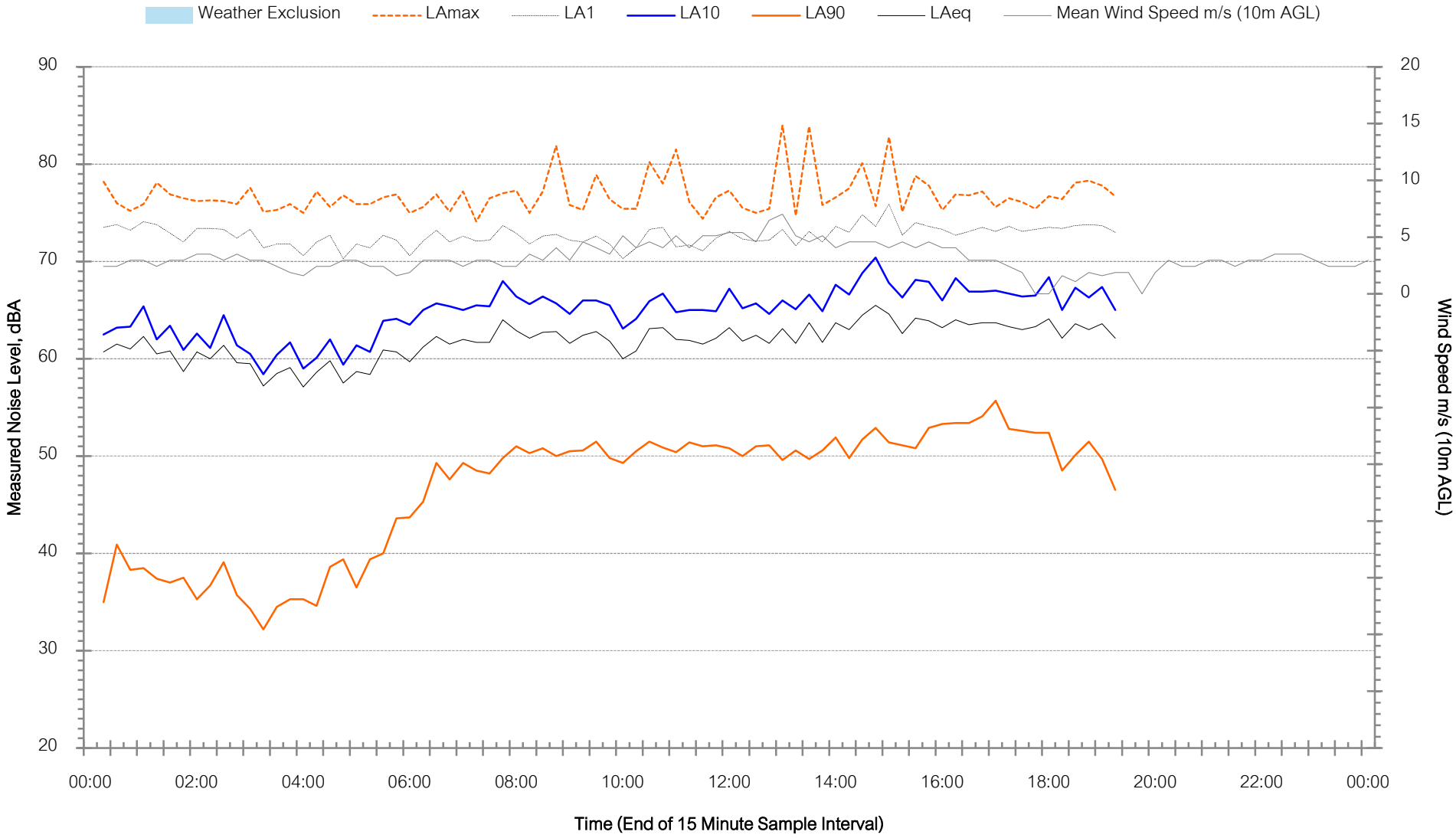
Background Noise Levels

L1 - Tuesday 21 May 2024



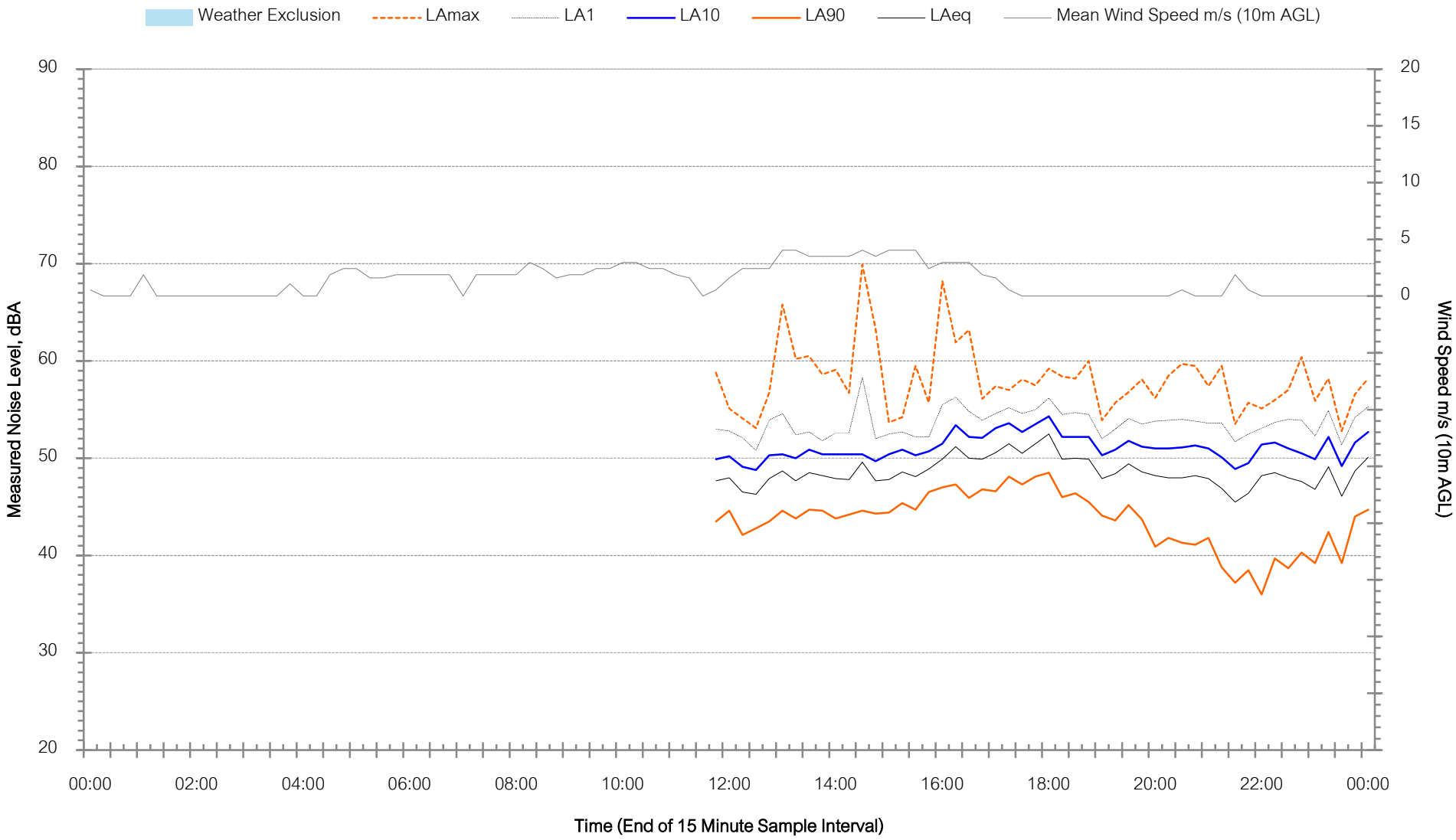
Background Noise Levels

L1 - Wednesday 22 May 2024



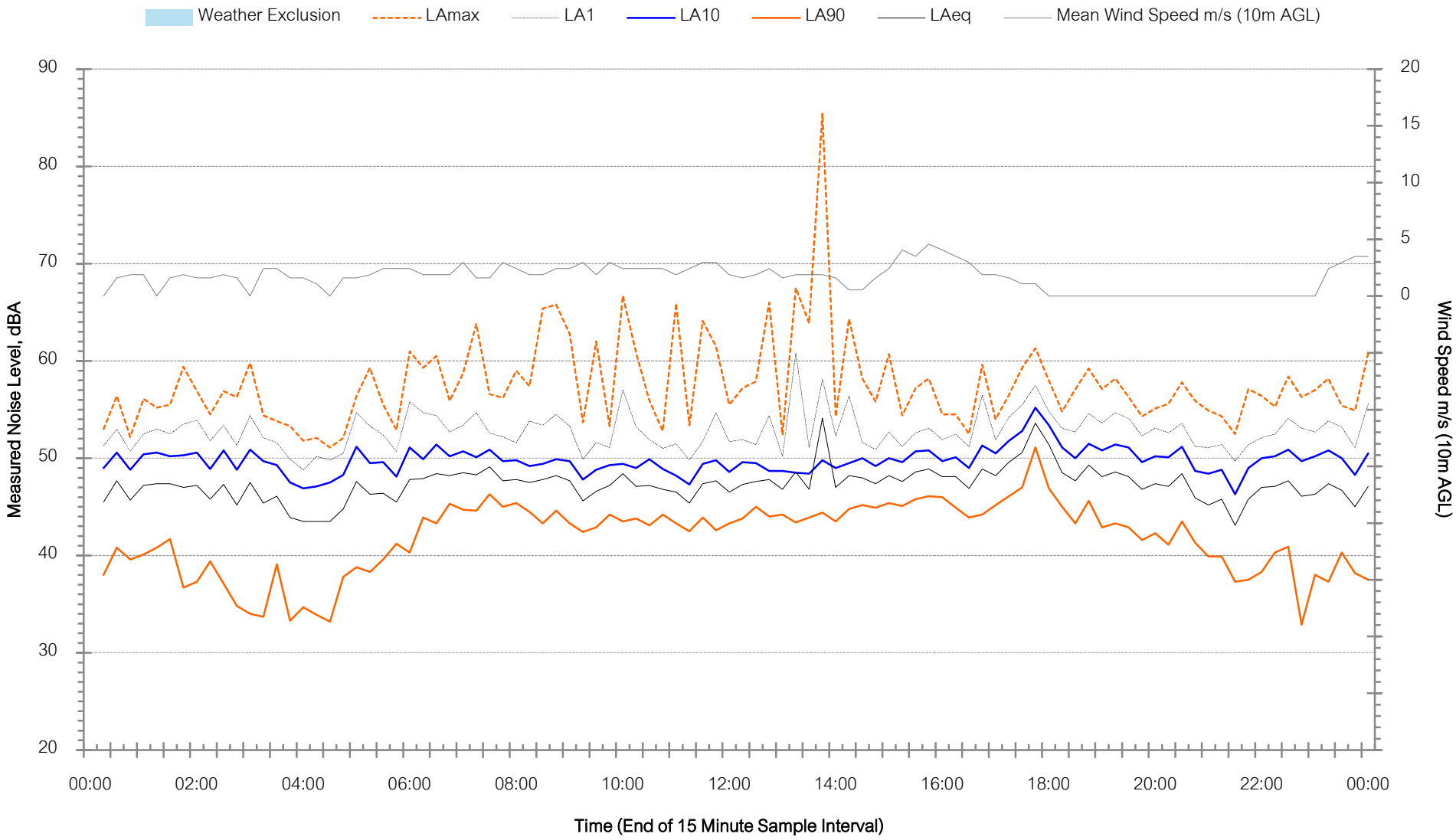
Background Noise Levels

L2 - Thursday 16 May 2024



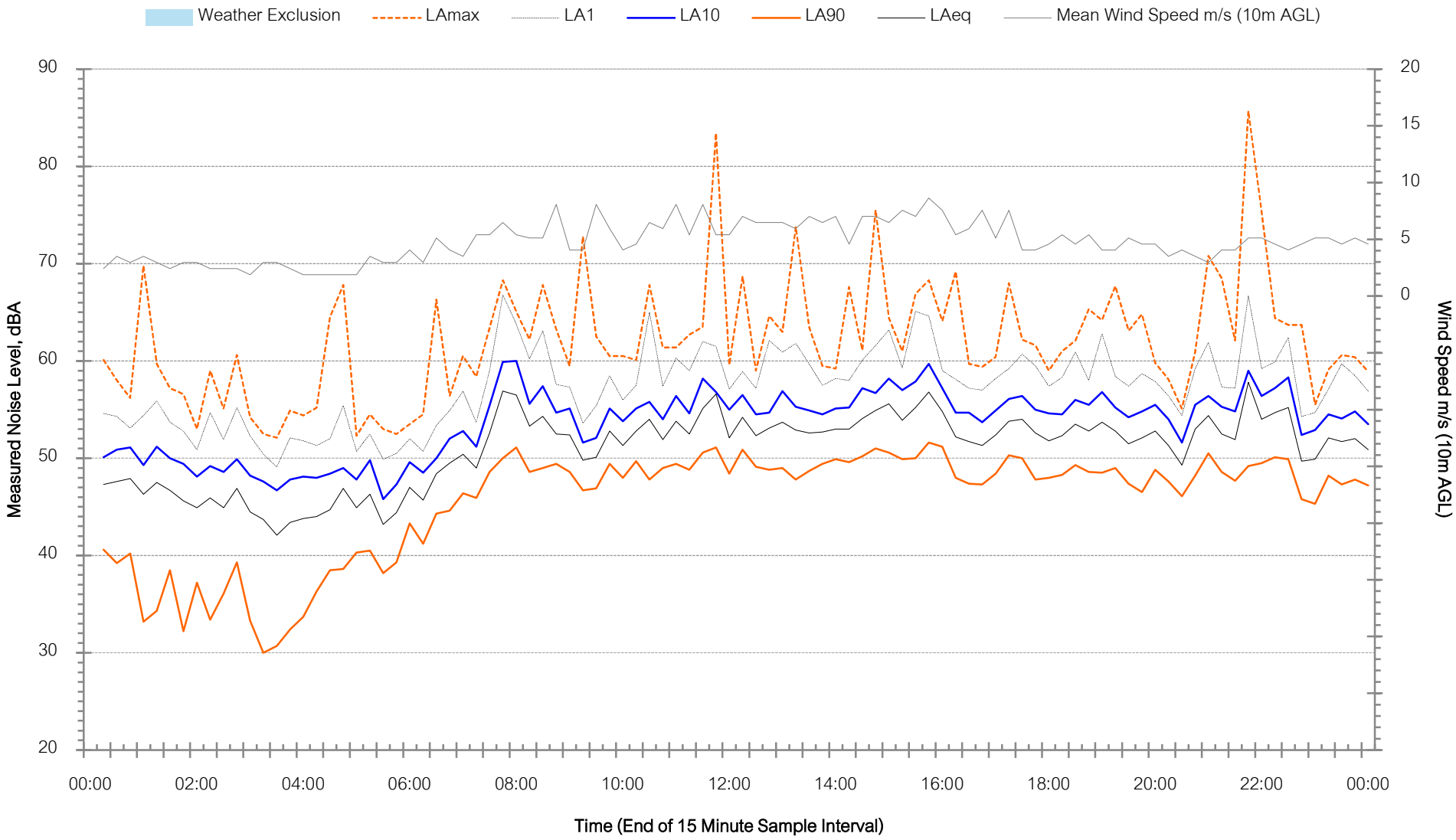
Background Noise Levels

L2 - Friday 17 May 2024



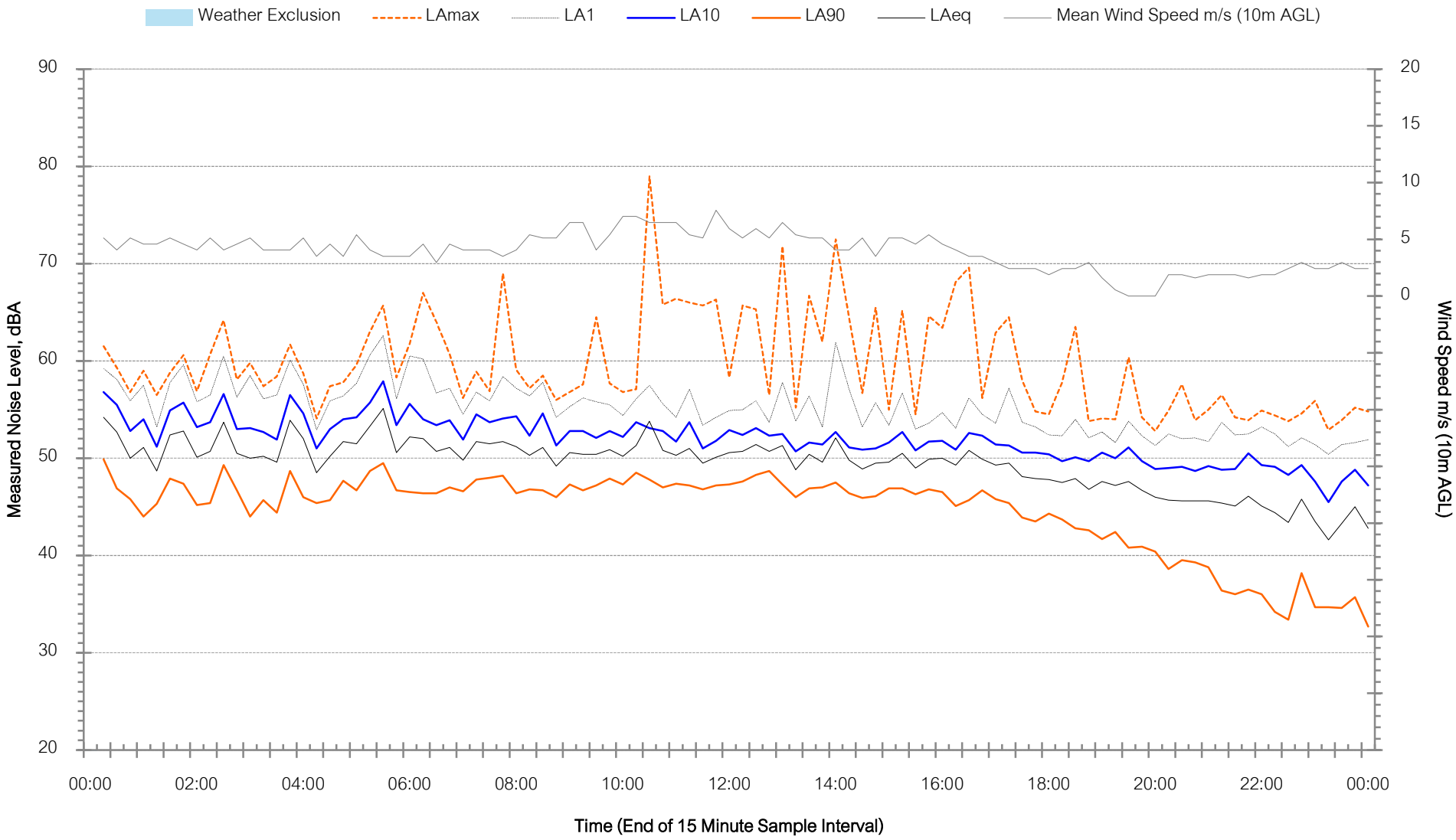
Background Noise Levels

L2 - Saturday 18 May 2024



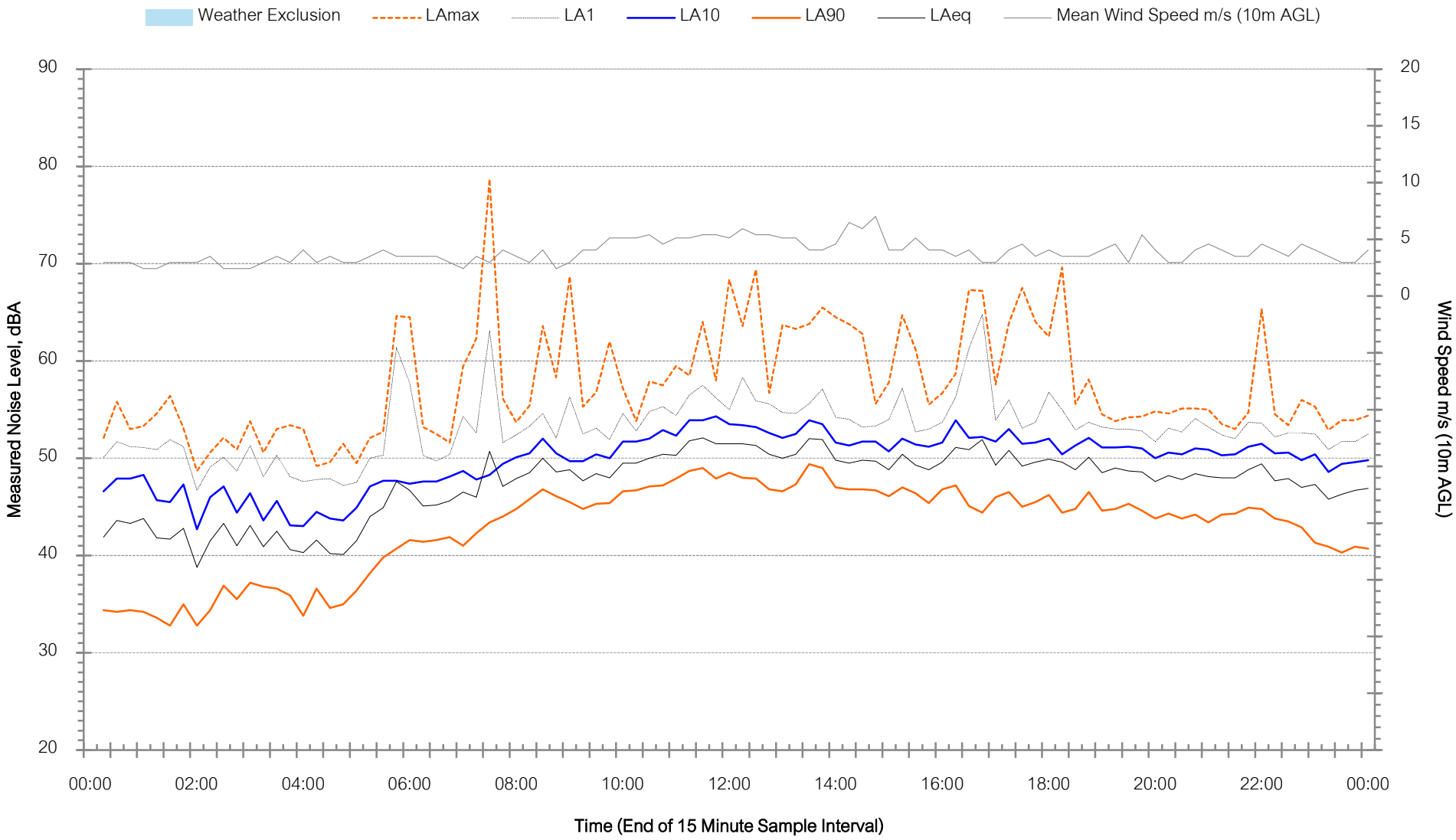
Background Noise Levels

L2 - Sunday 19 May 2024



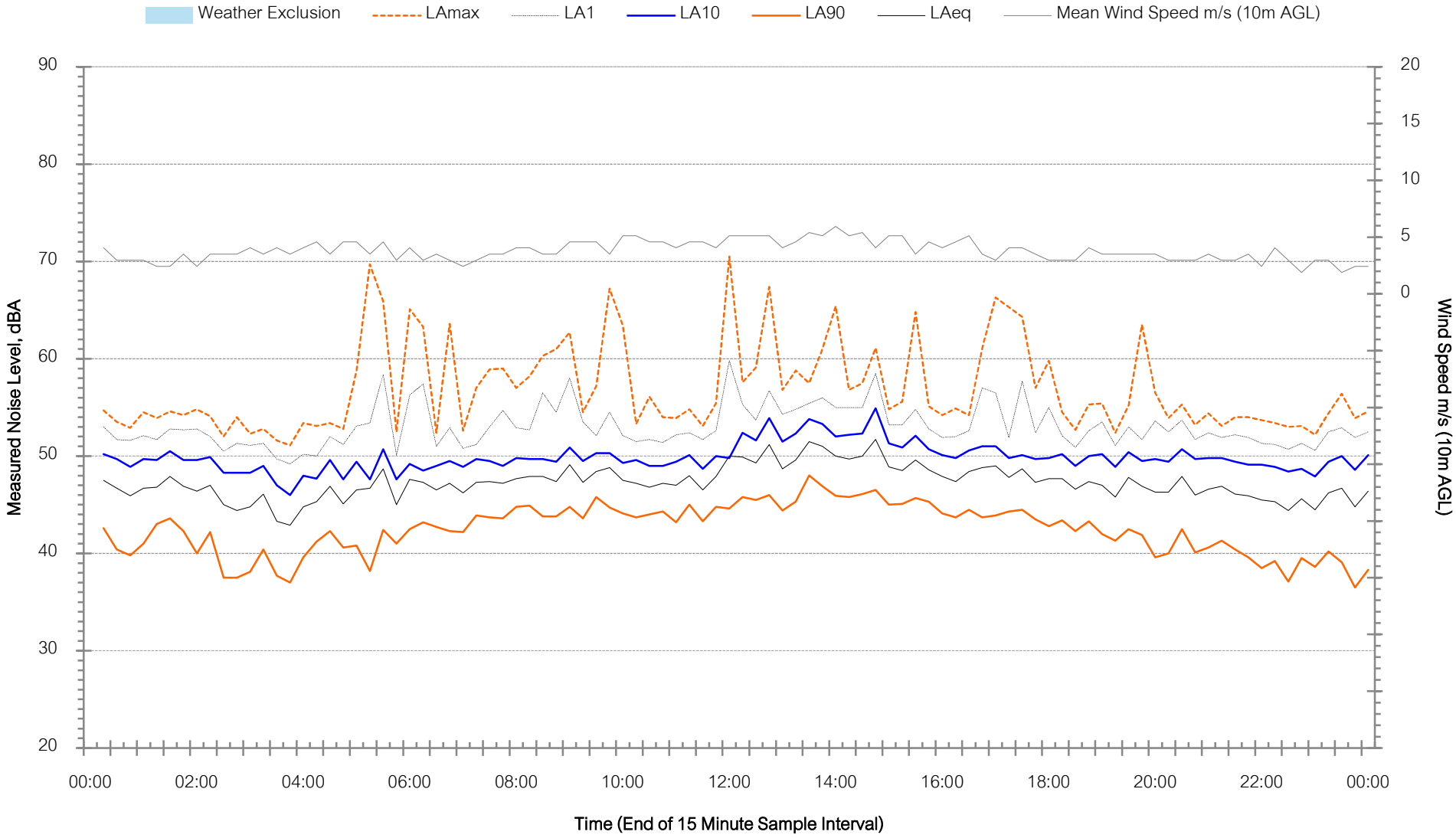
Background Noise Levels

L2 - Monday 20 May 2024



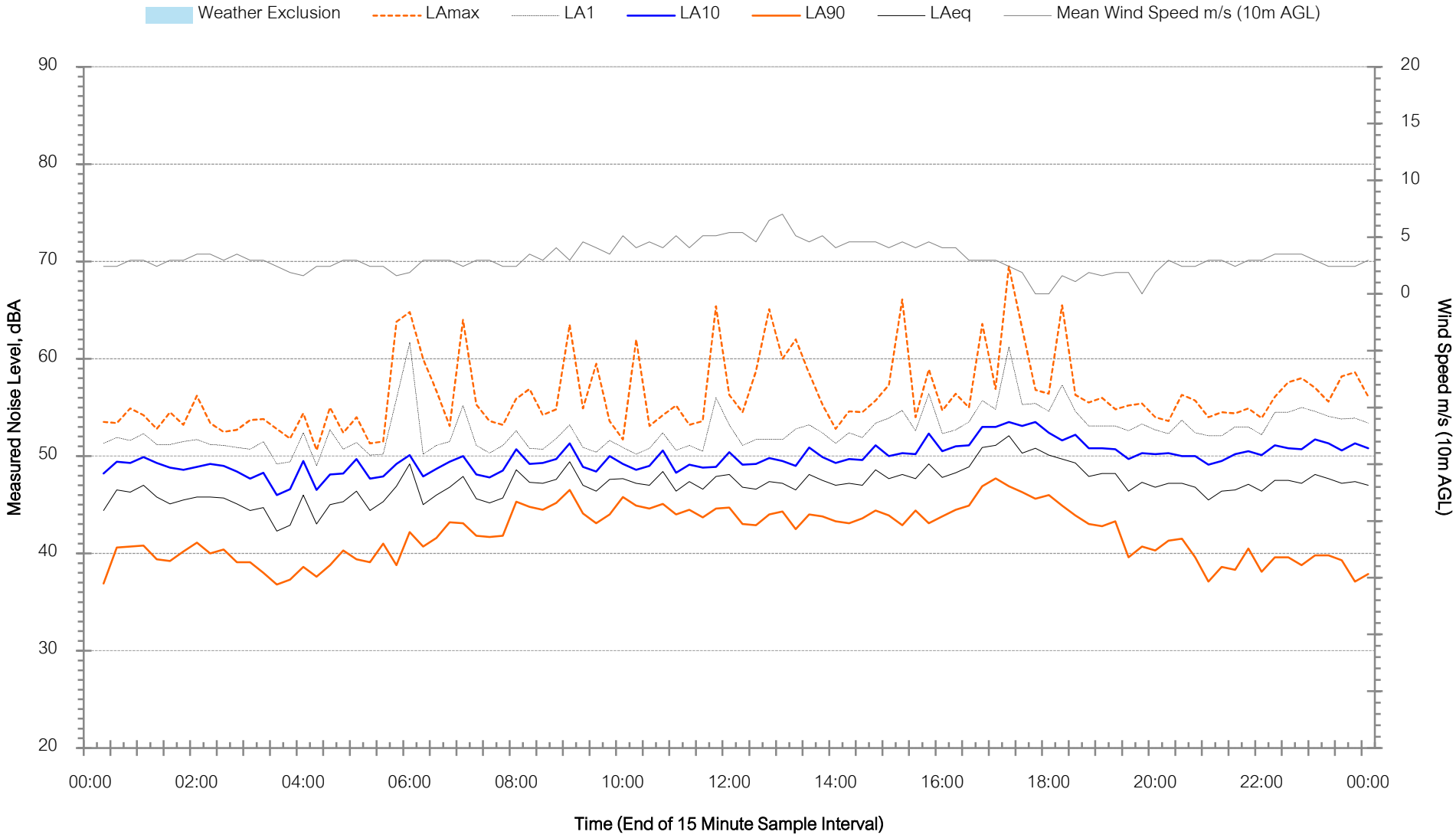
Background Noise Levels

L2 - Tuesday 21 May 2024



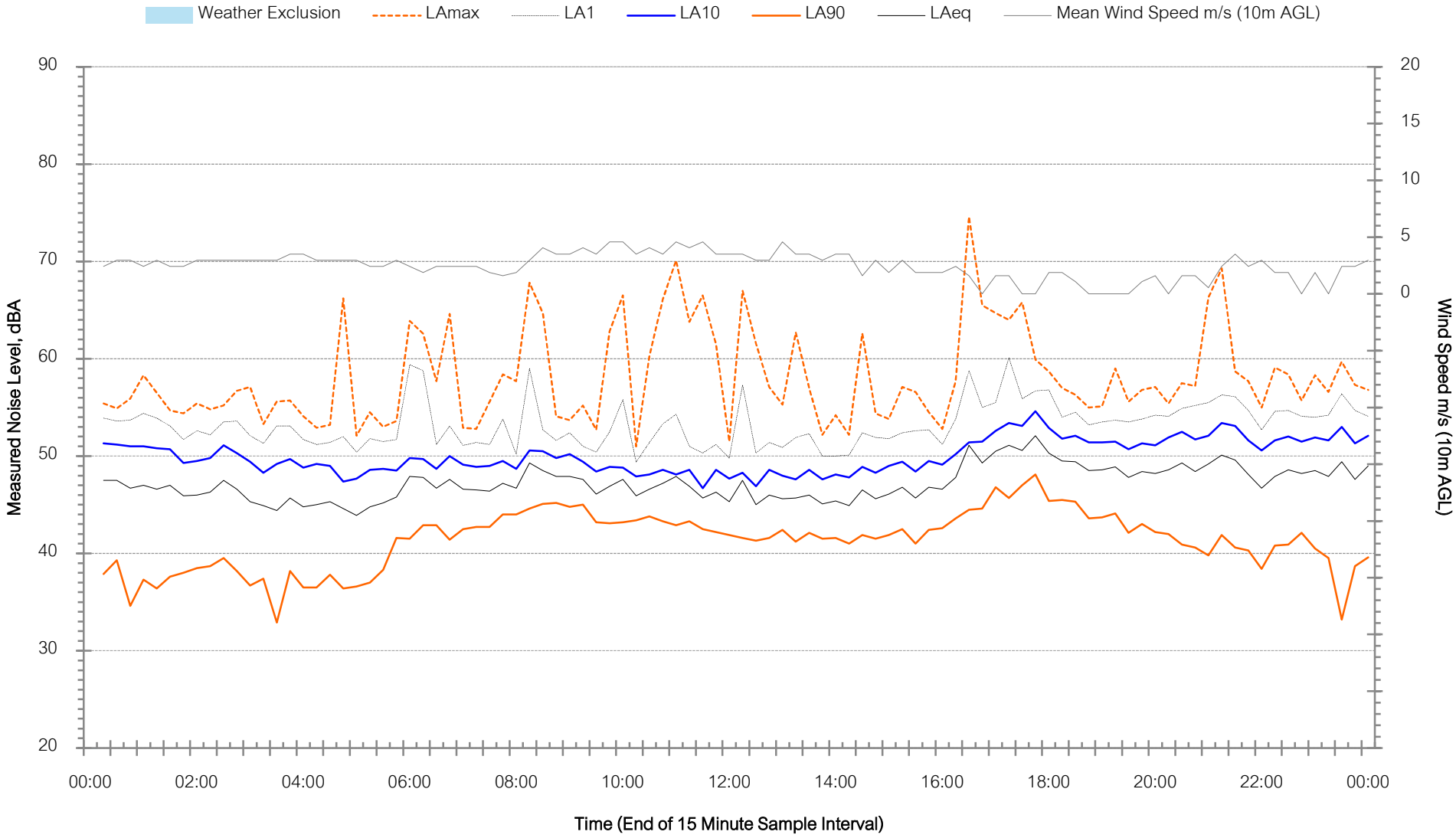
Background Noise Levels

L2 - Wednesday 22 May 2024



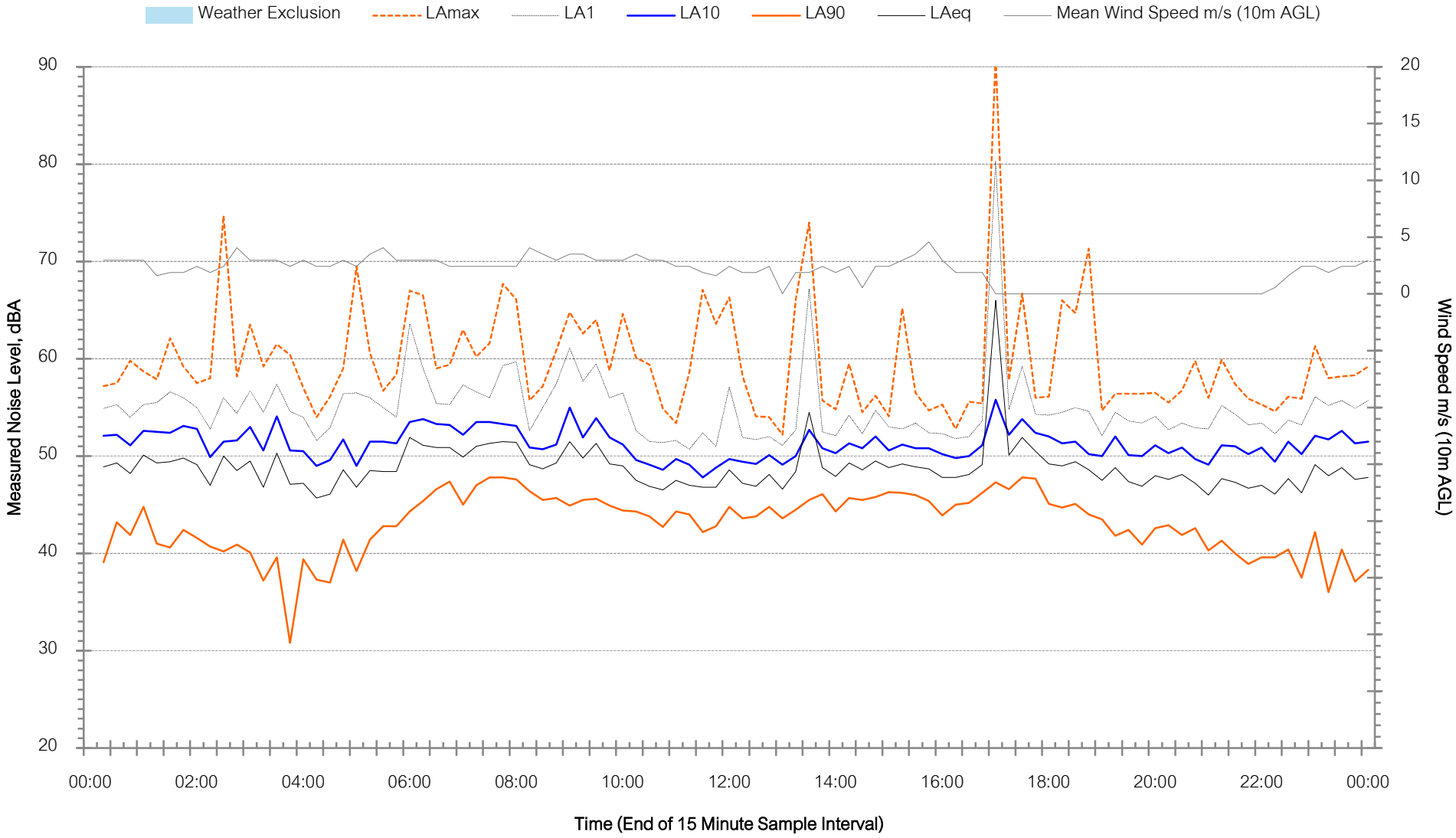
Background Noise Levels

L2 - Thursday 23 May 2024



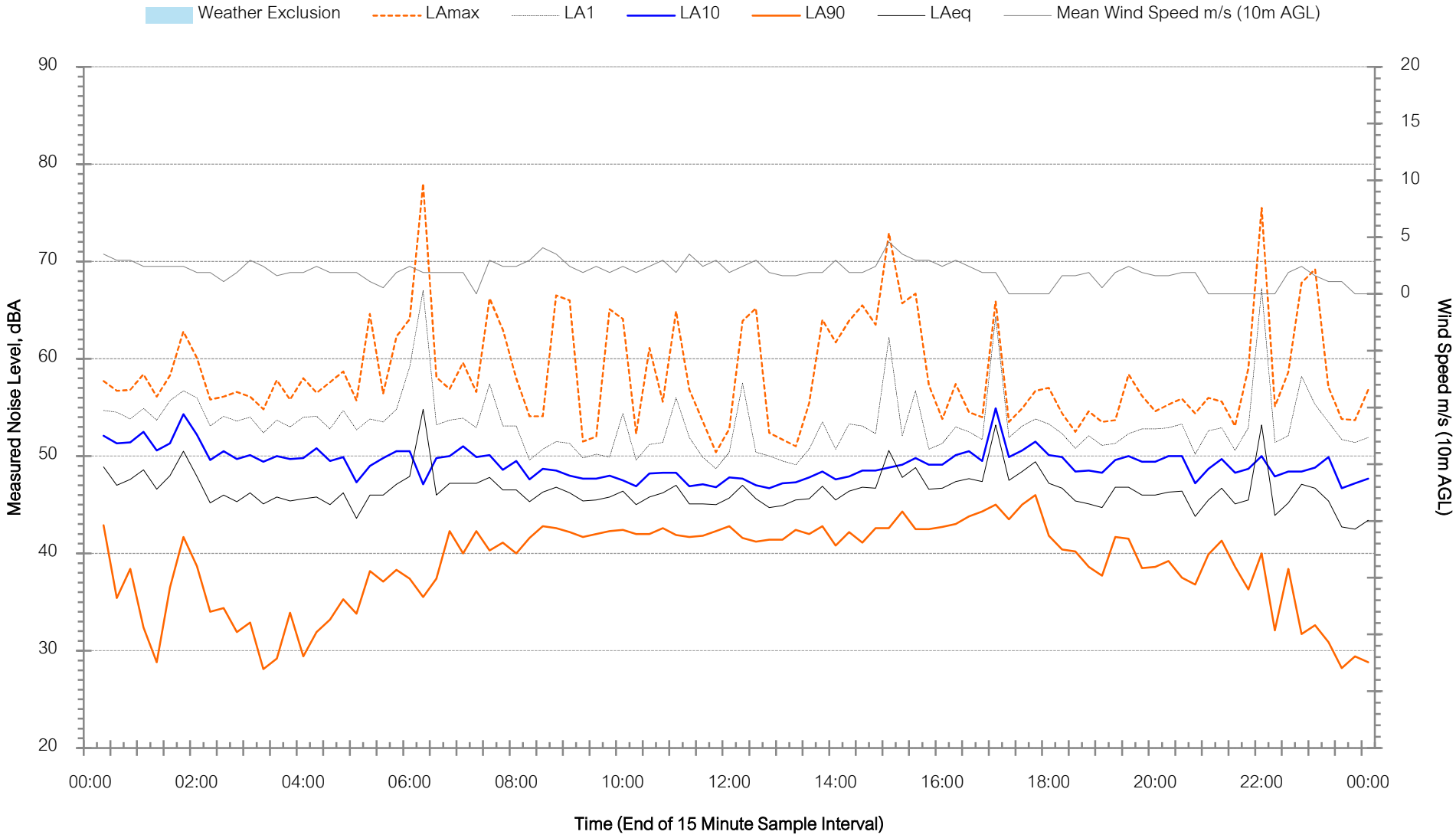
Background Noise Levels

L2 - Friday 24 May 2024



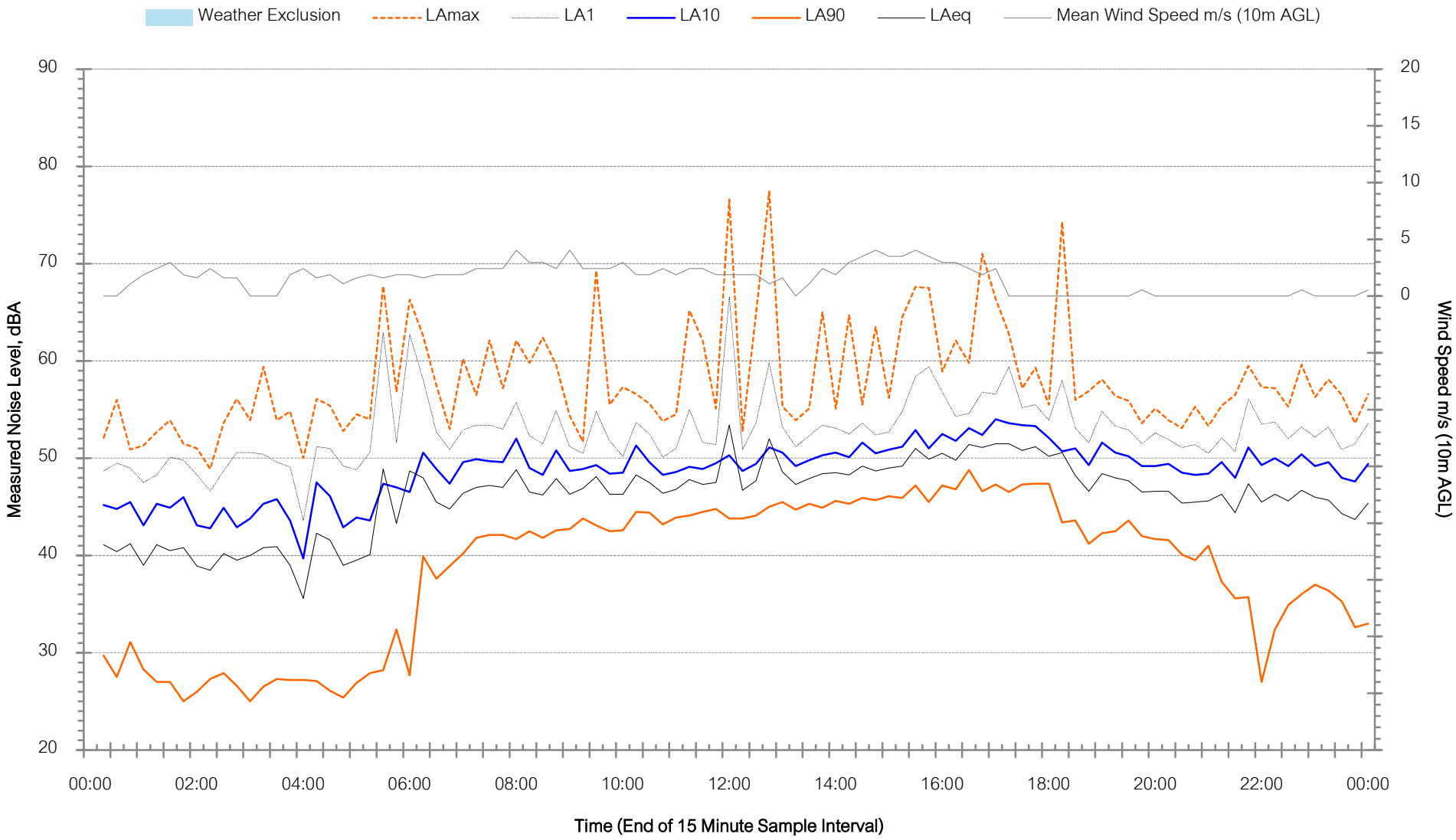
Background Noise Levels

L2 - Saturday 25 May 2024



Background Noise Levels

L2 - Sunday 26 May 2024



Background Noise Levels

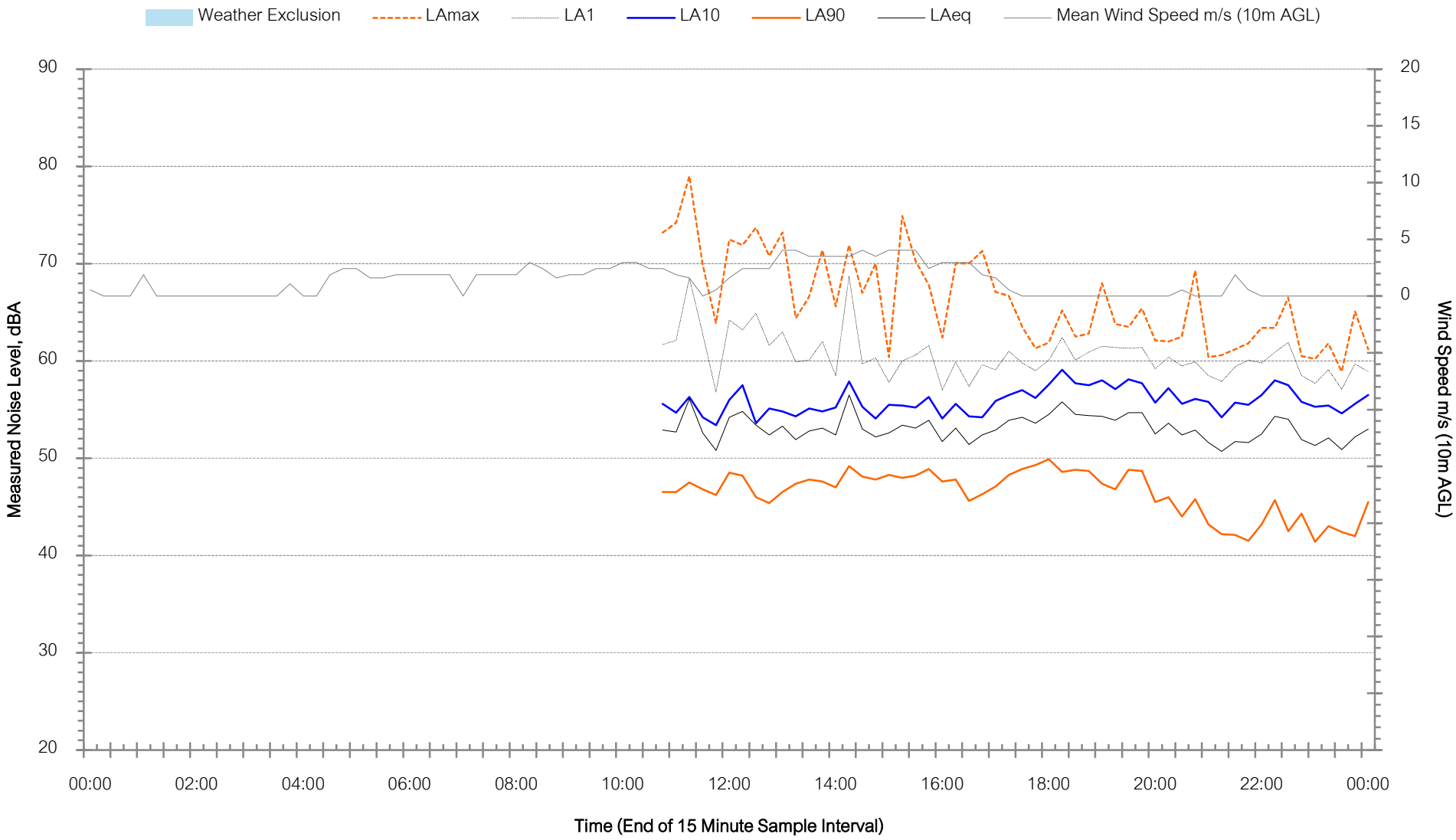
L2 - Monday 27 May 2024

Background Noise Levels

L2 - Tuesday 28 May 2024

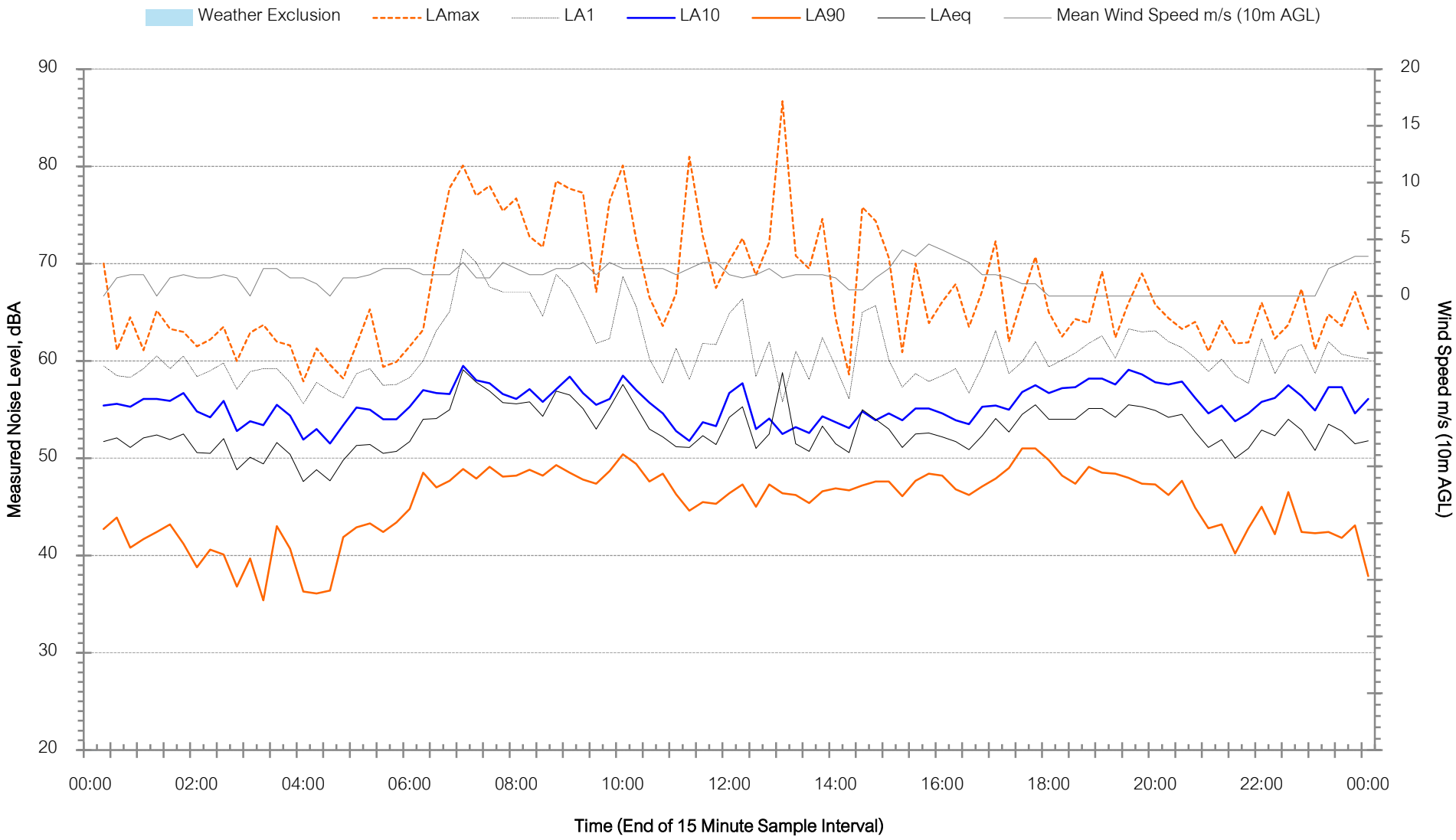
Background Noise Levels

L3 - Thursday 16 May 2024



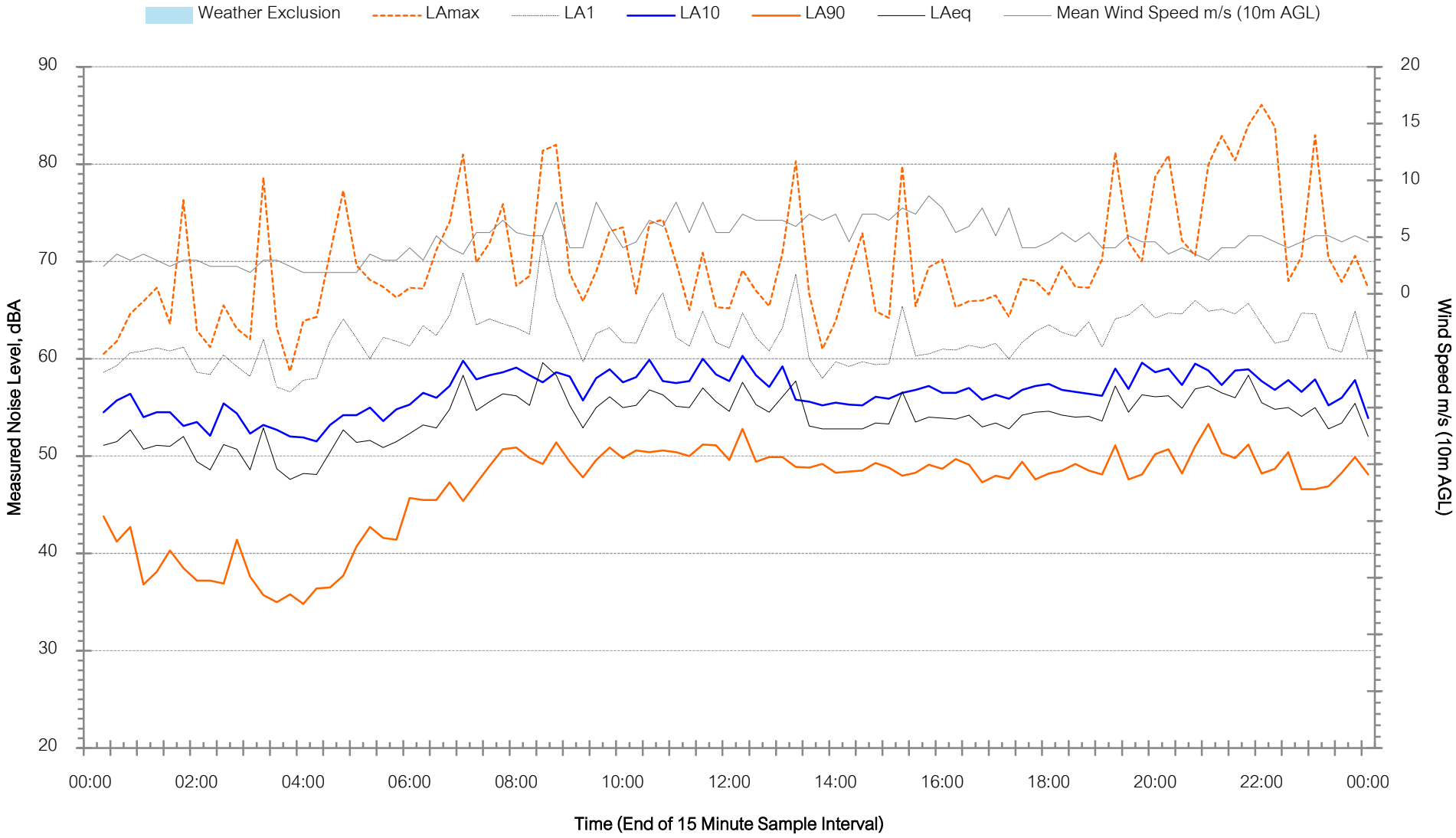
Background Noise Levels

L3 - Friday 17 May 2024



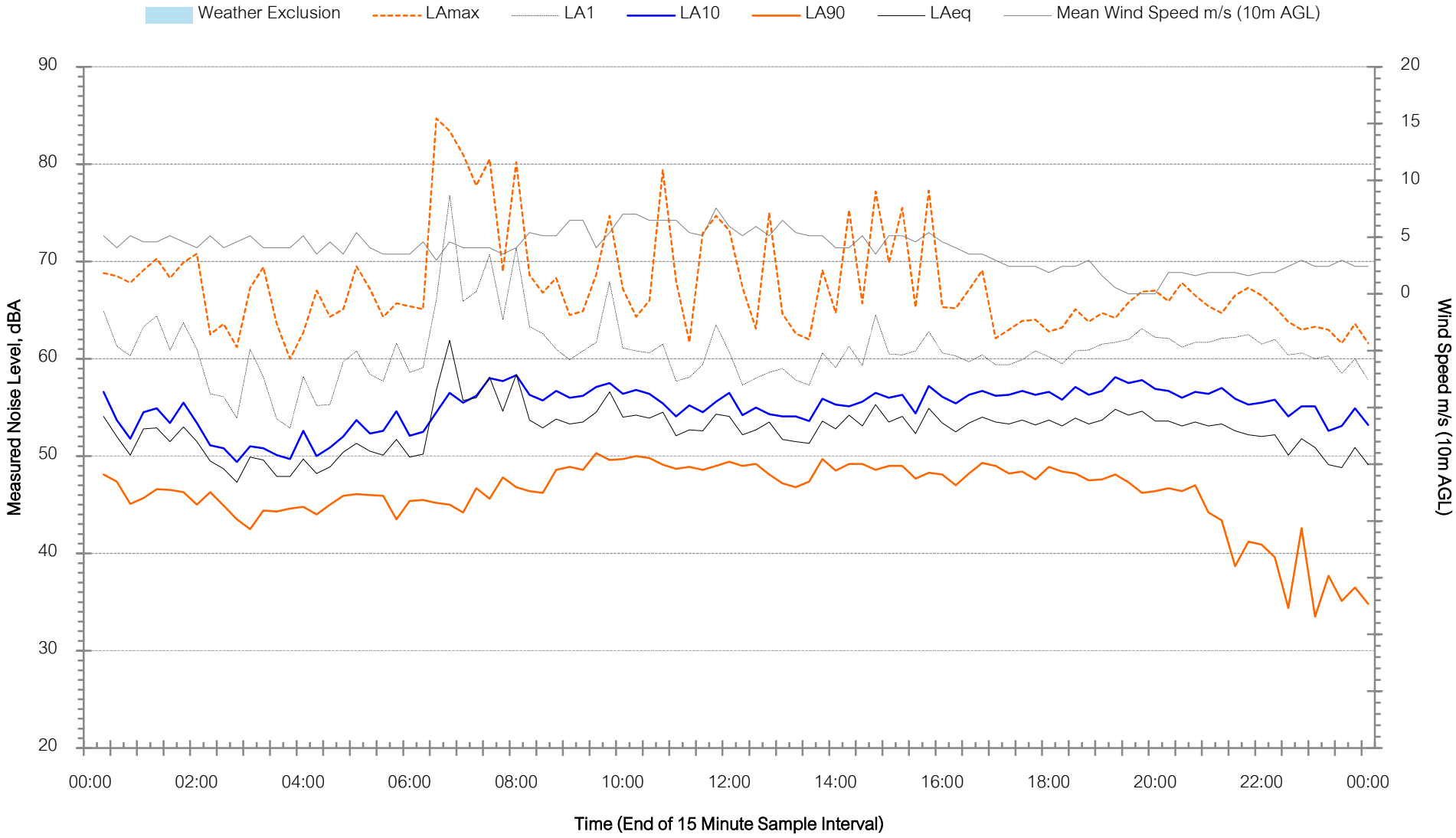
Background Noise Levels

L3 - Saturday 18 May 2024



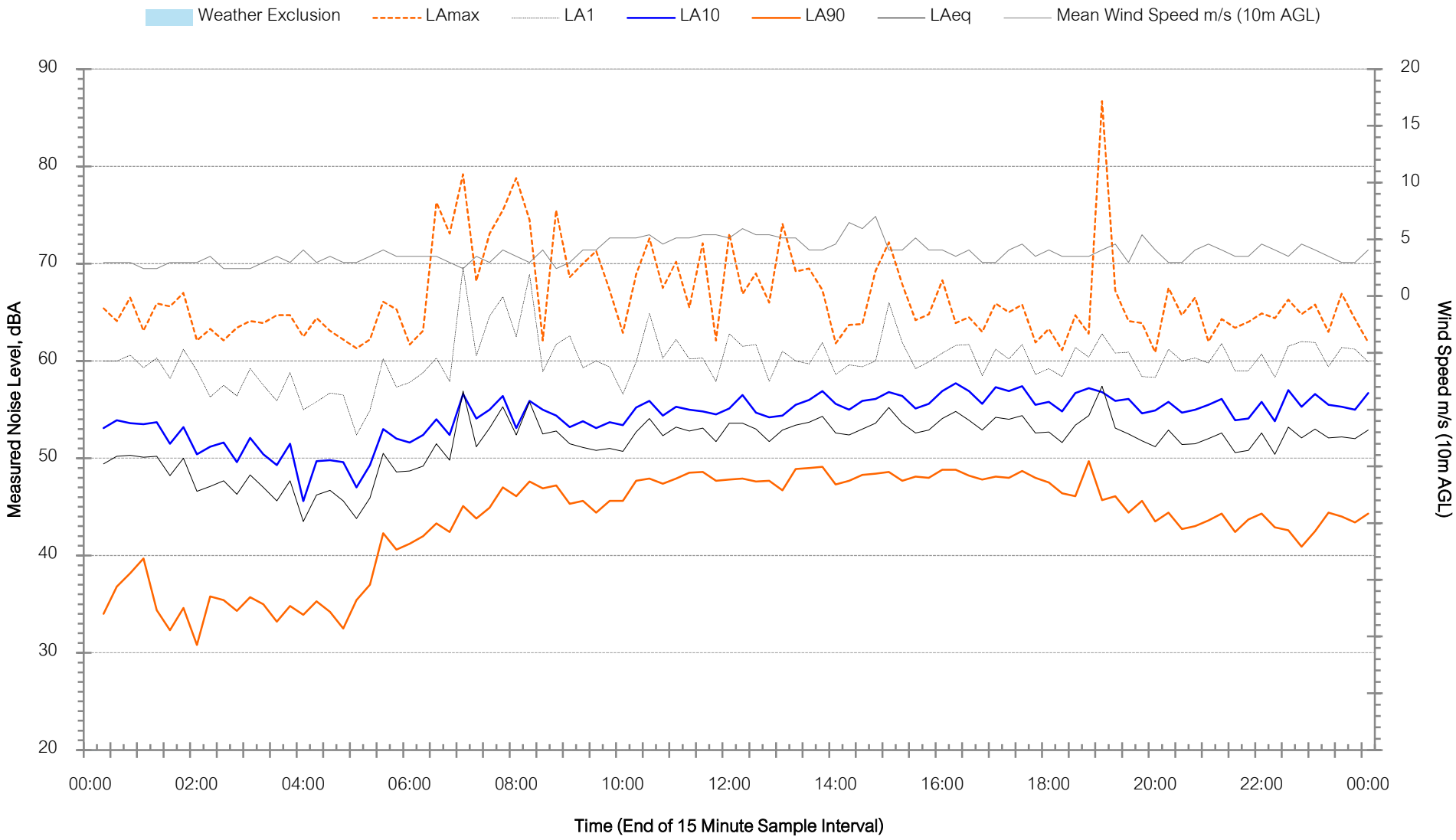
Background Noise Levels

L3 - Sunday 19 May 2024



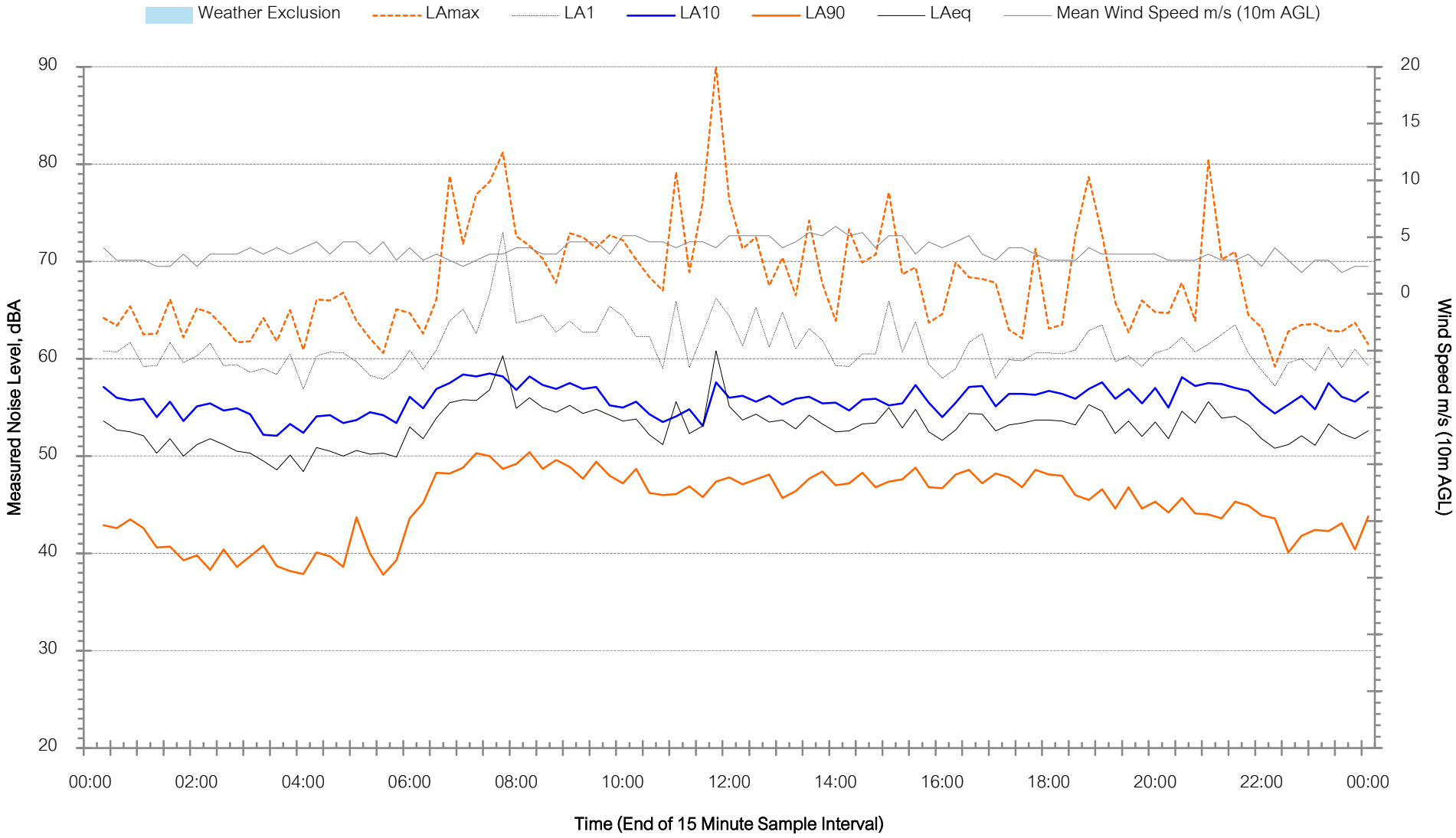
Background Noise Levels

L3 - Monday 20 May 2024



Background Noise Levels

L3 - Tuesday 21 May 2024



Background Noise Levels

L3 - Wednesday 22 May 2024

Background Noise Levels

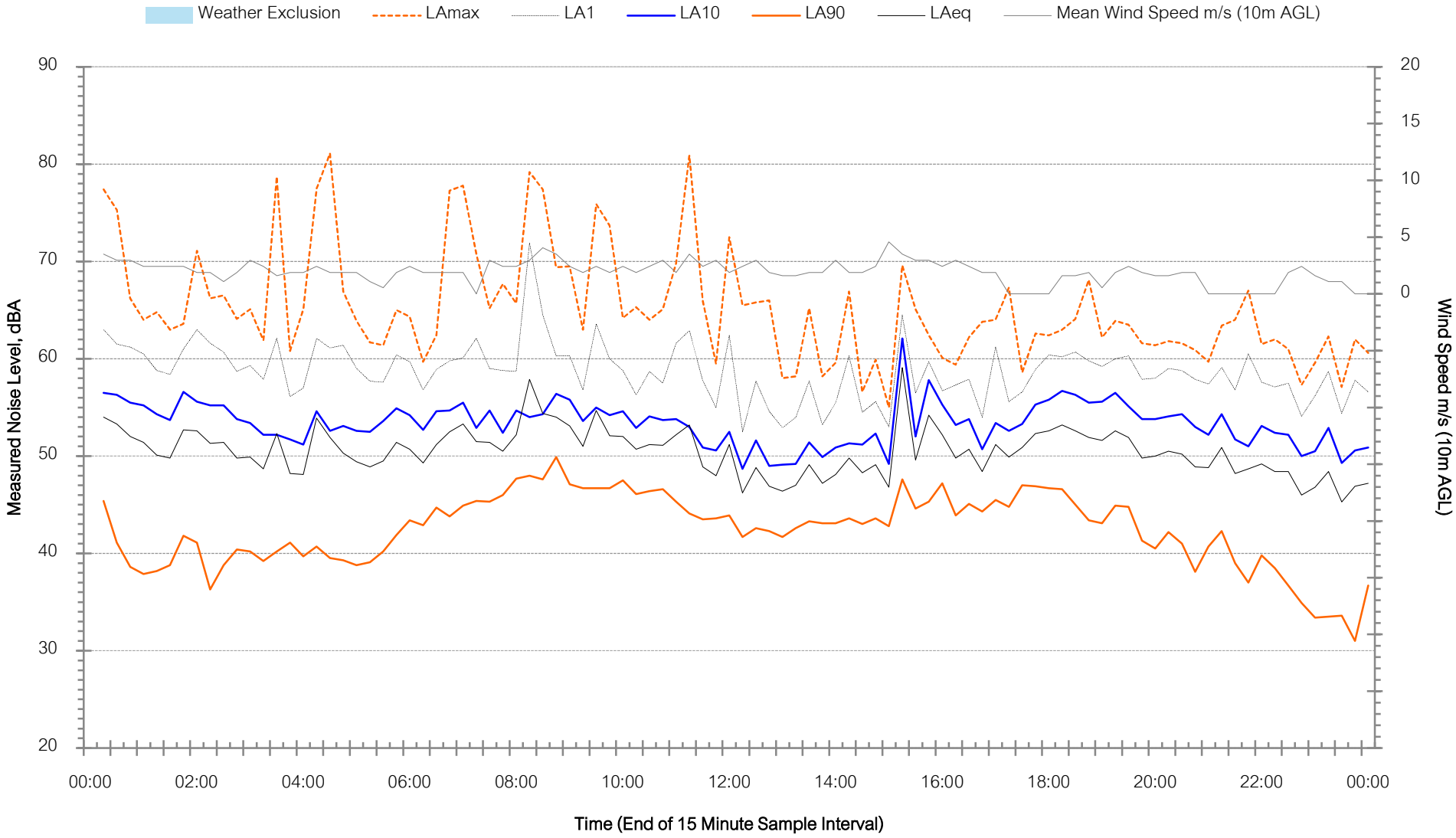
L3 - Thursday 23 May 2024

Background Noise Levels

L3 - Friday 24 May 2024

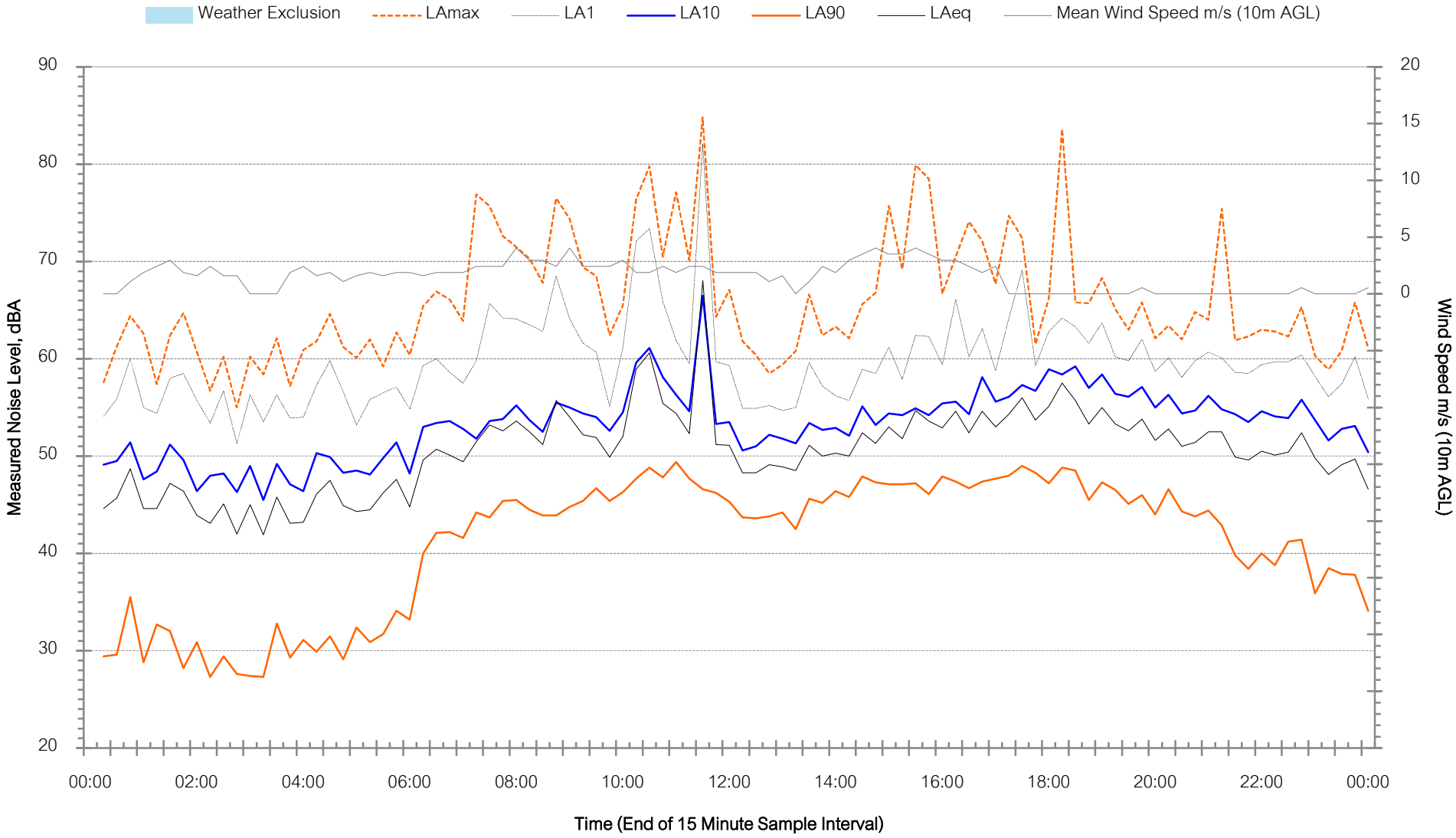
Background Noise Levels

L3 - Saturday 25 May 2024



Background Noise Levels

L3 - Sunday 26 May 2024

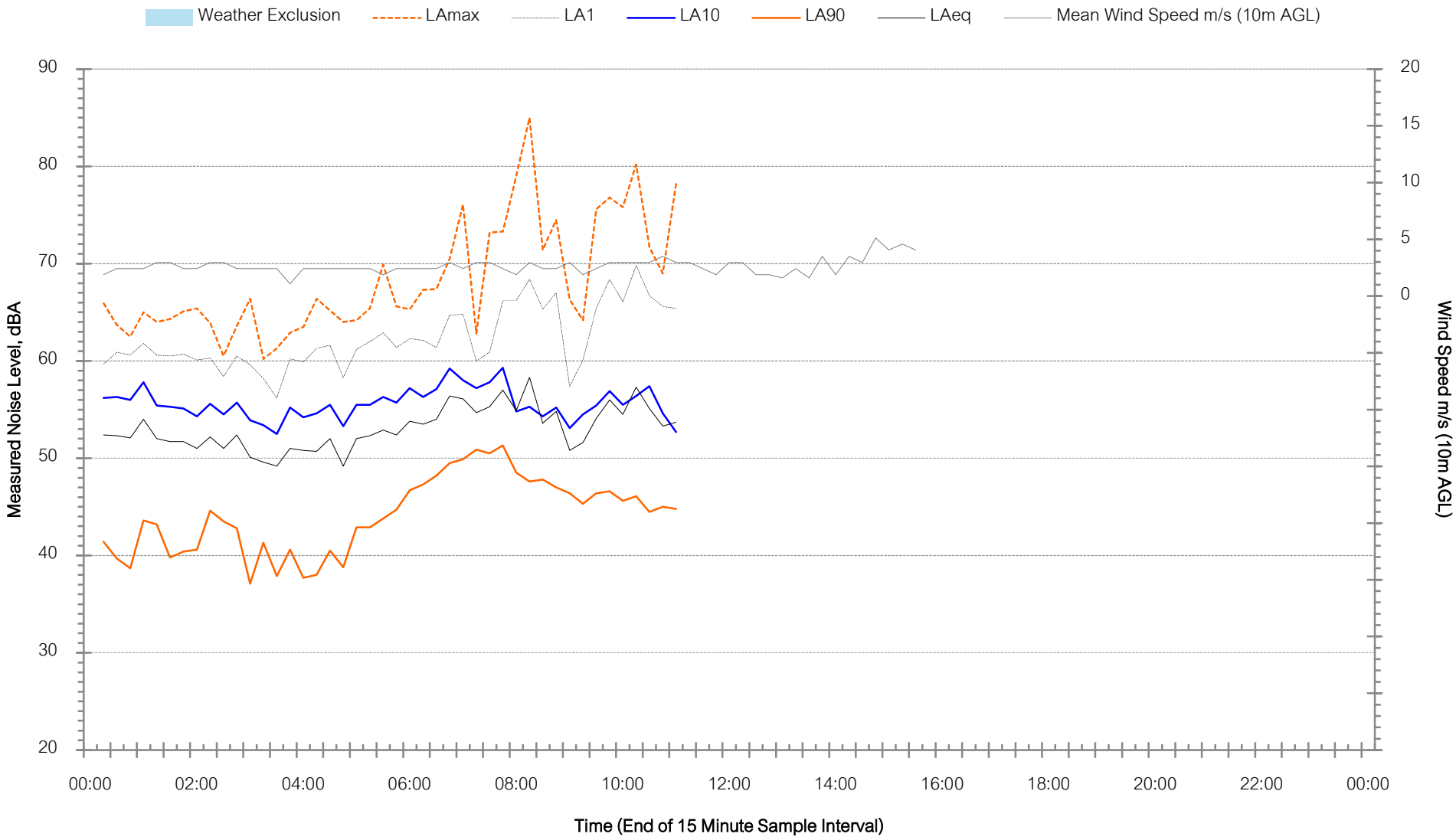


Background Noise Levels

L3 - Monday 27 May 2024

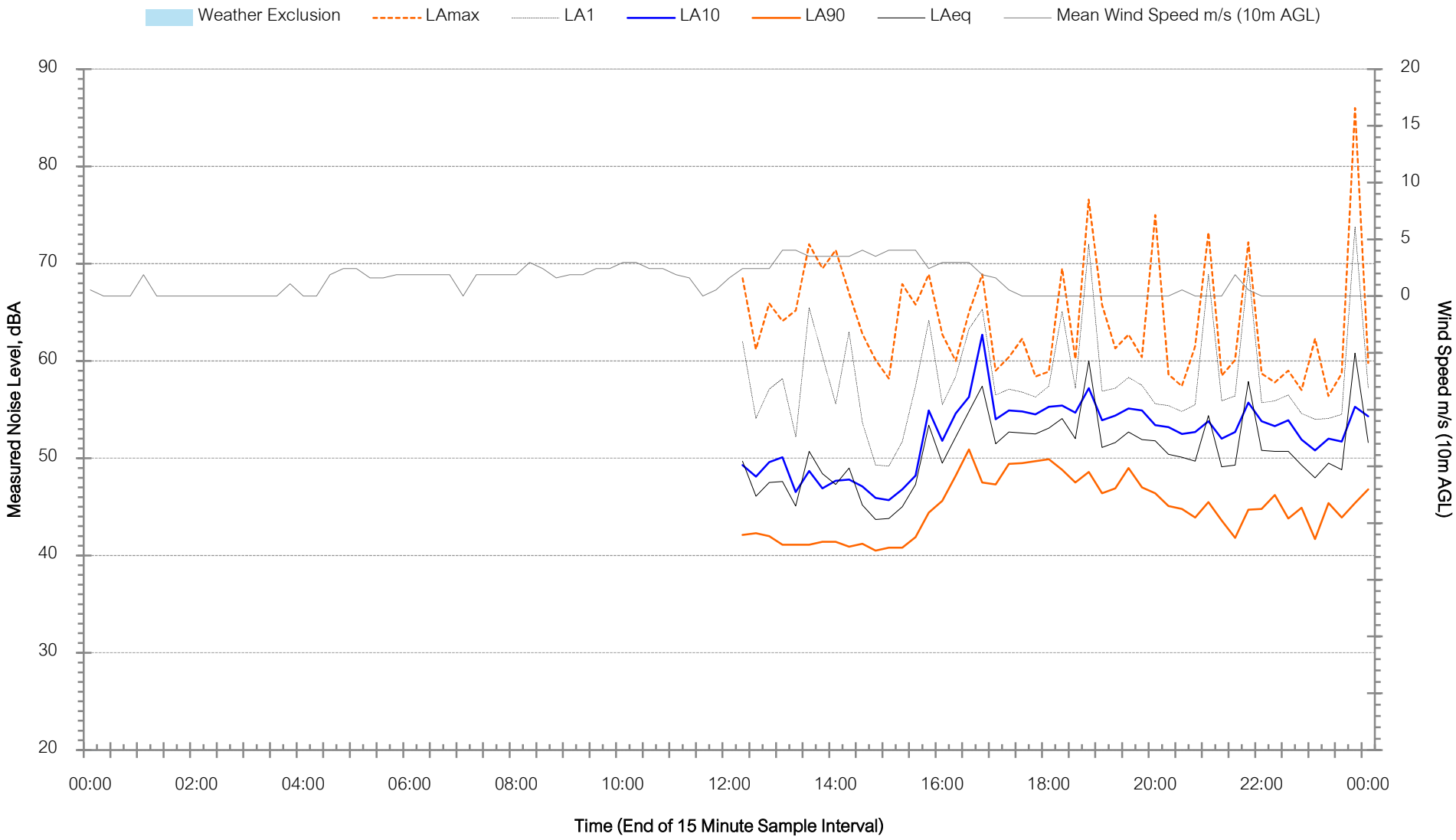
Background Noise Levels

L3 - Tuesday 28 May 2024



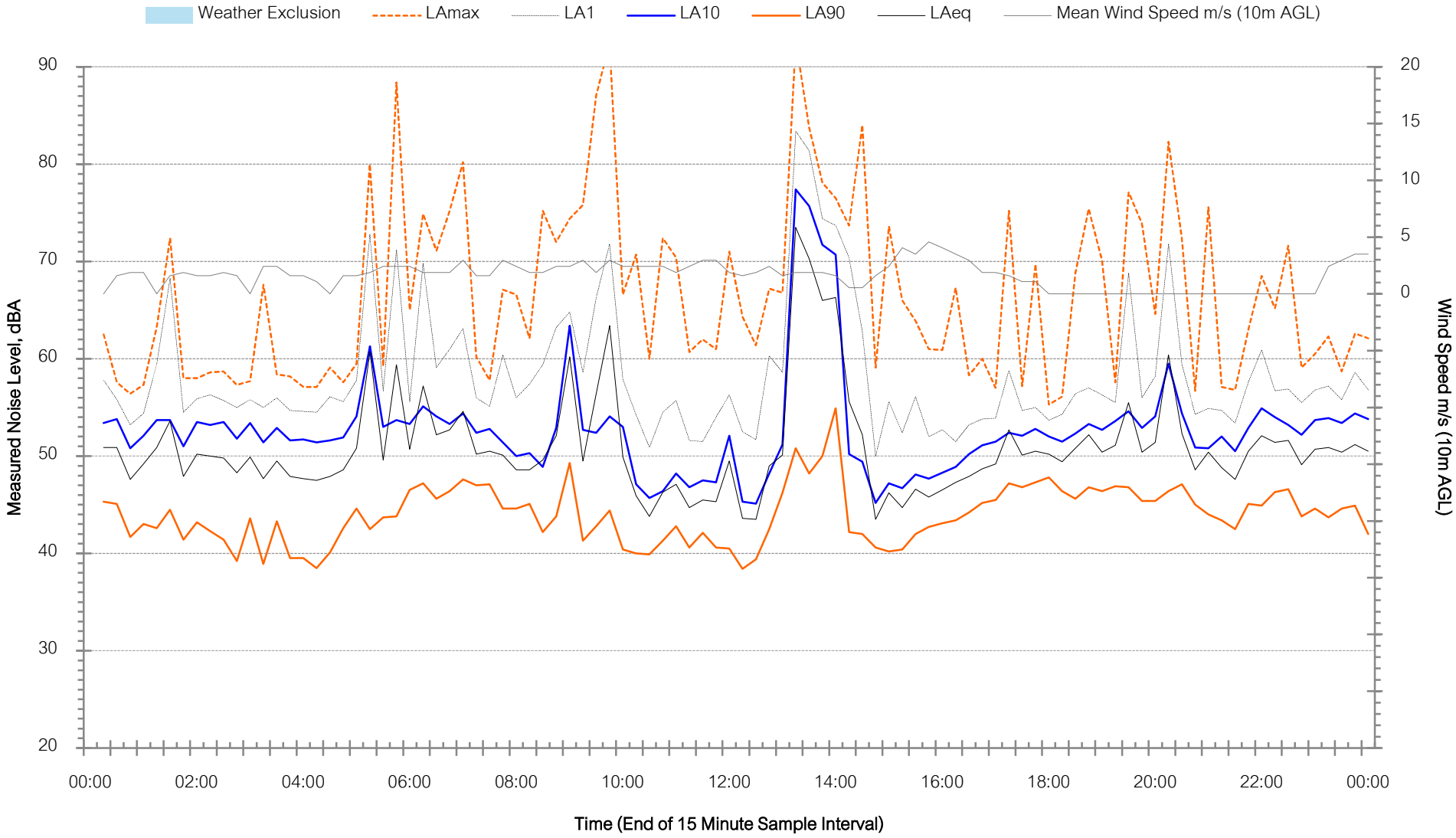
Background Noise Levels

L4 - Thursday 16 May 2024



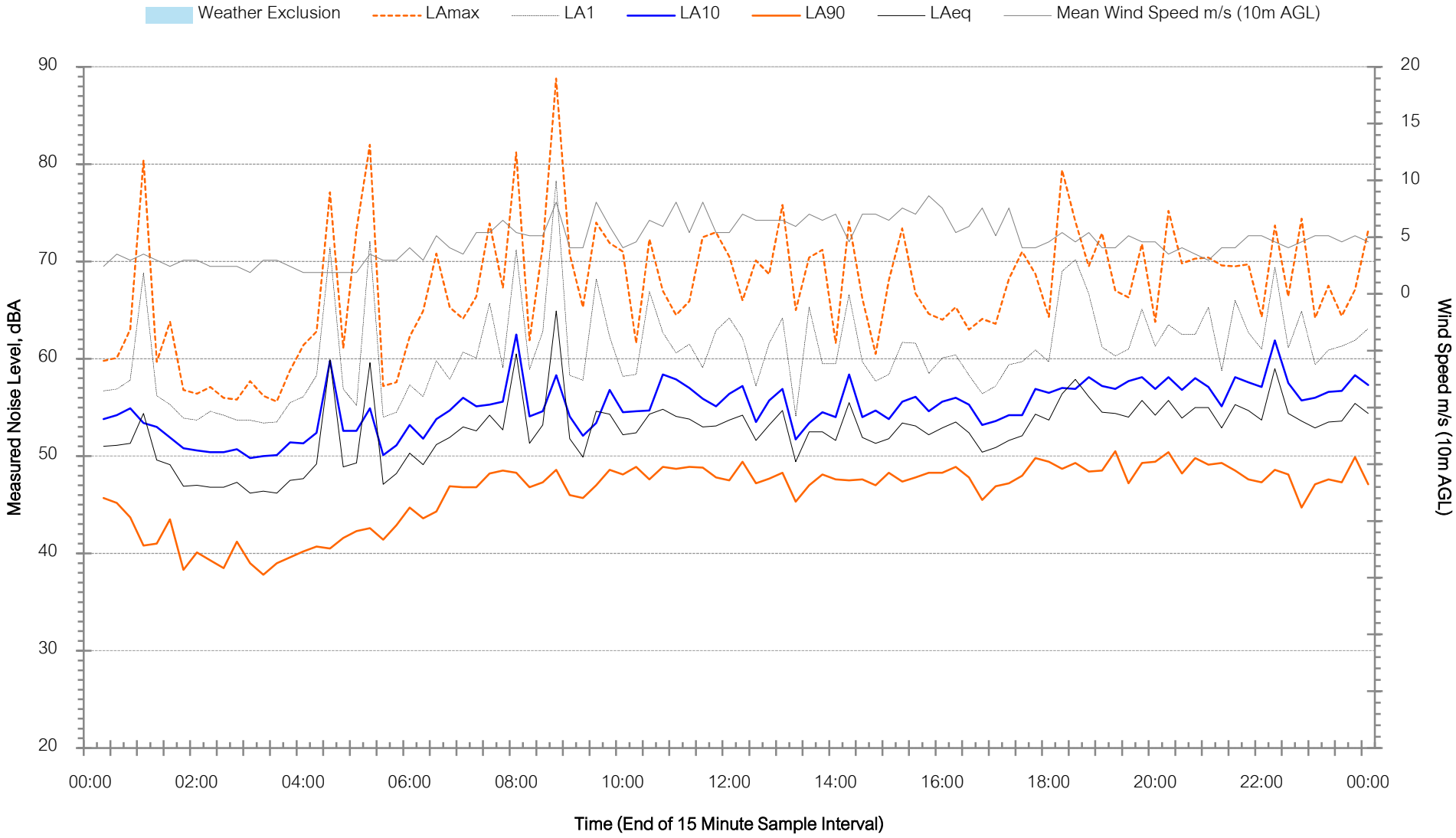
Background Noise Levels

L4 - Friday 17 May 2024



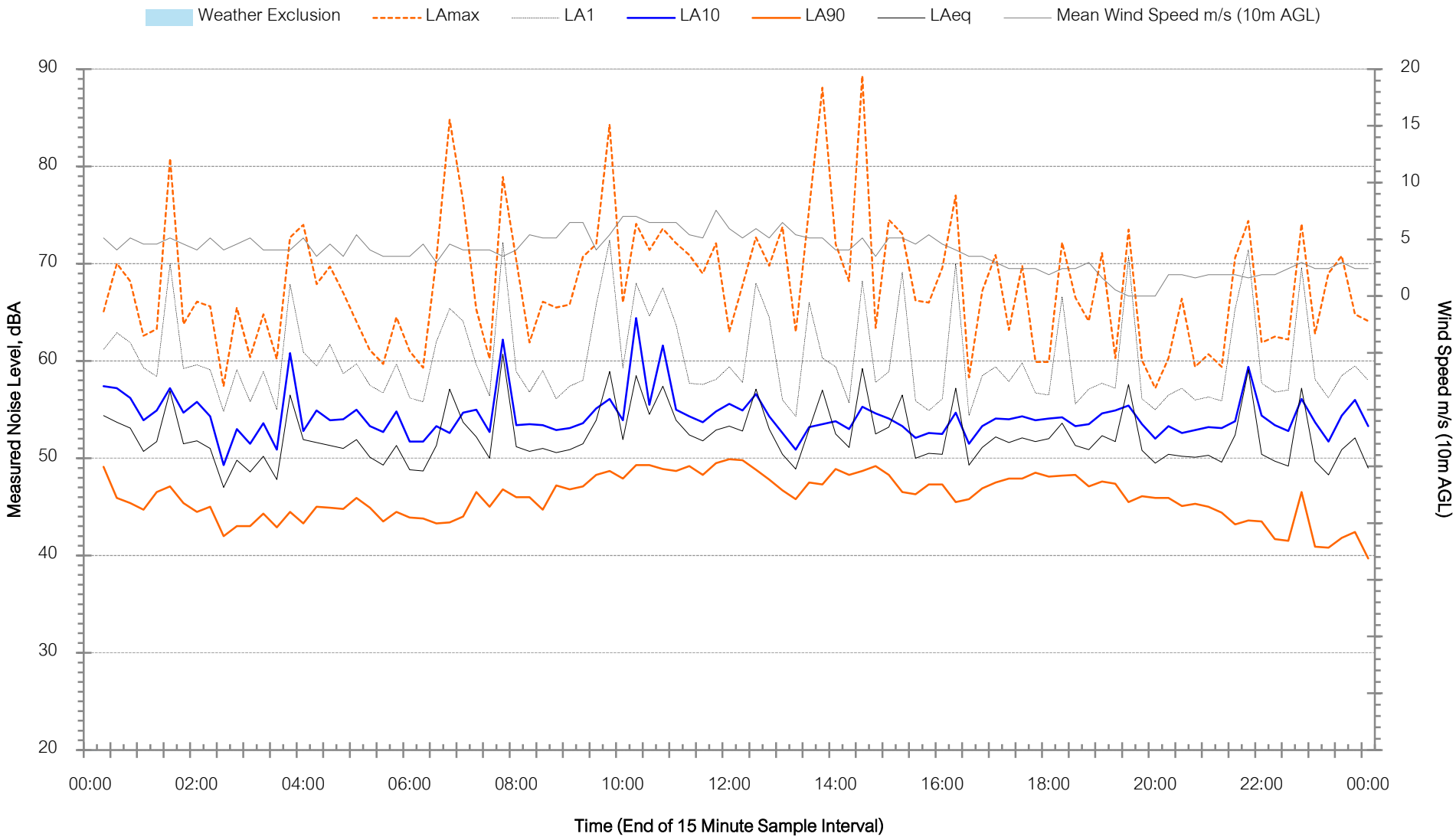
Background Noise Levels

L4 - Saturday 18 May 2024



Background Noise Levels

L4 - Sunday 19 May 2024



Background Noise Levels

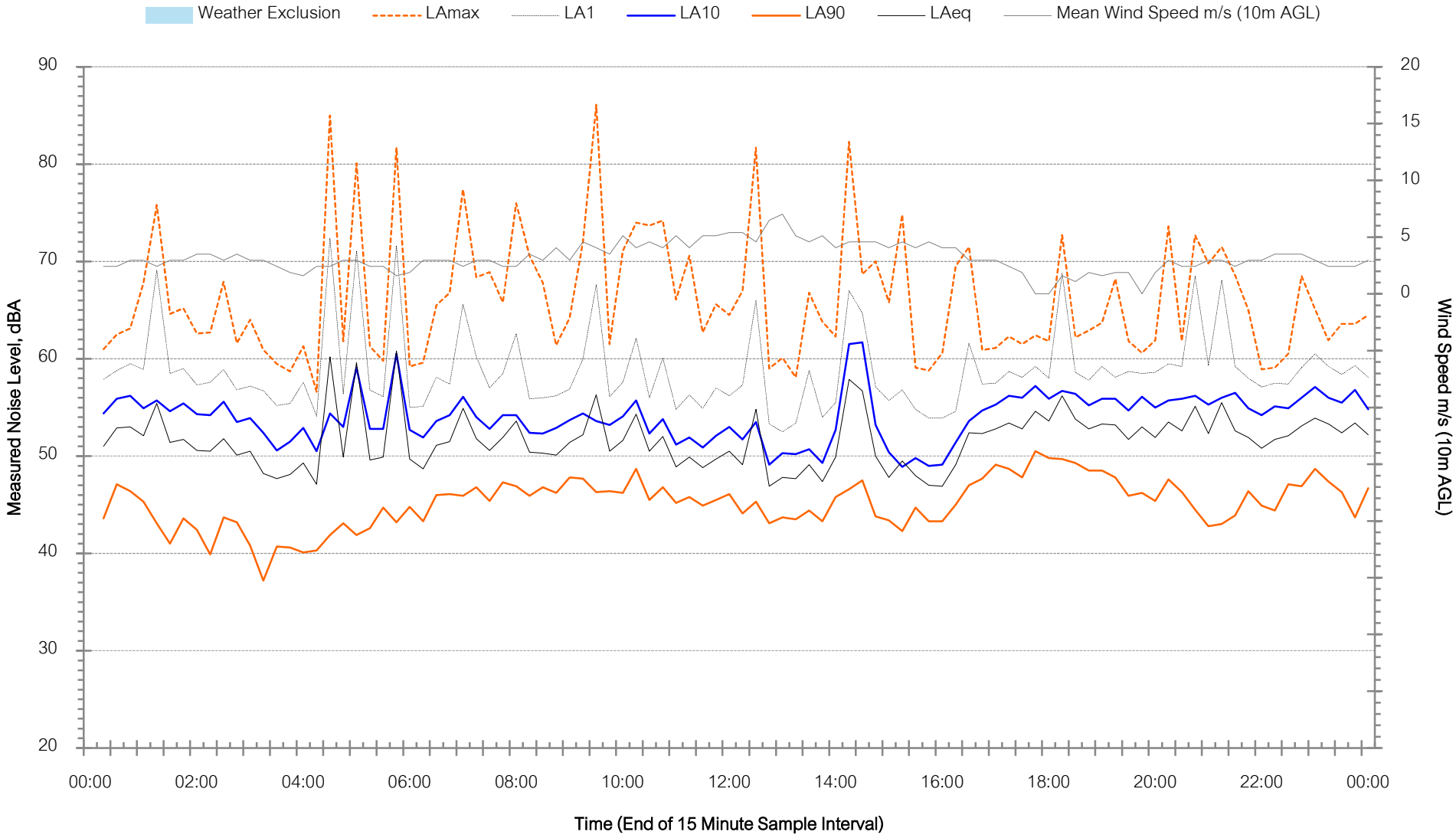
L4 - Monday 20 May 2024

Background Noise Levels

L4 - Tuesday 21 May 2024

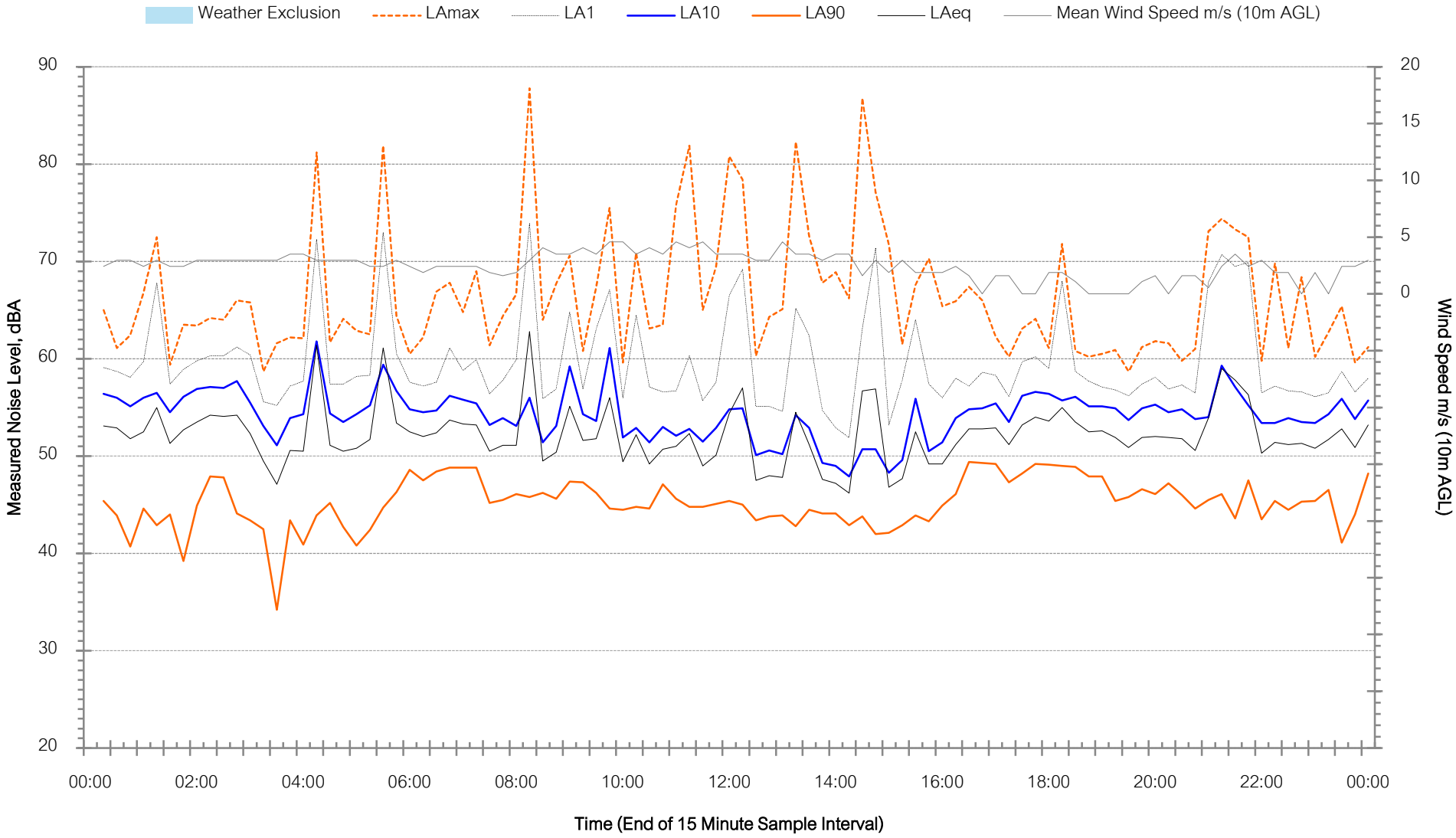
Background Noise Levels

L4 - Wednesday 22 May 2024



Background Noise Levels

L4 - Thursday 23 May 2024

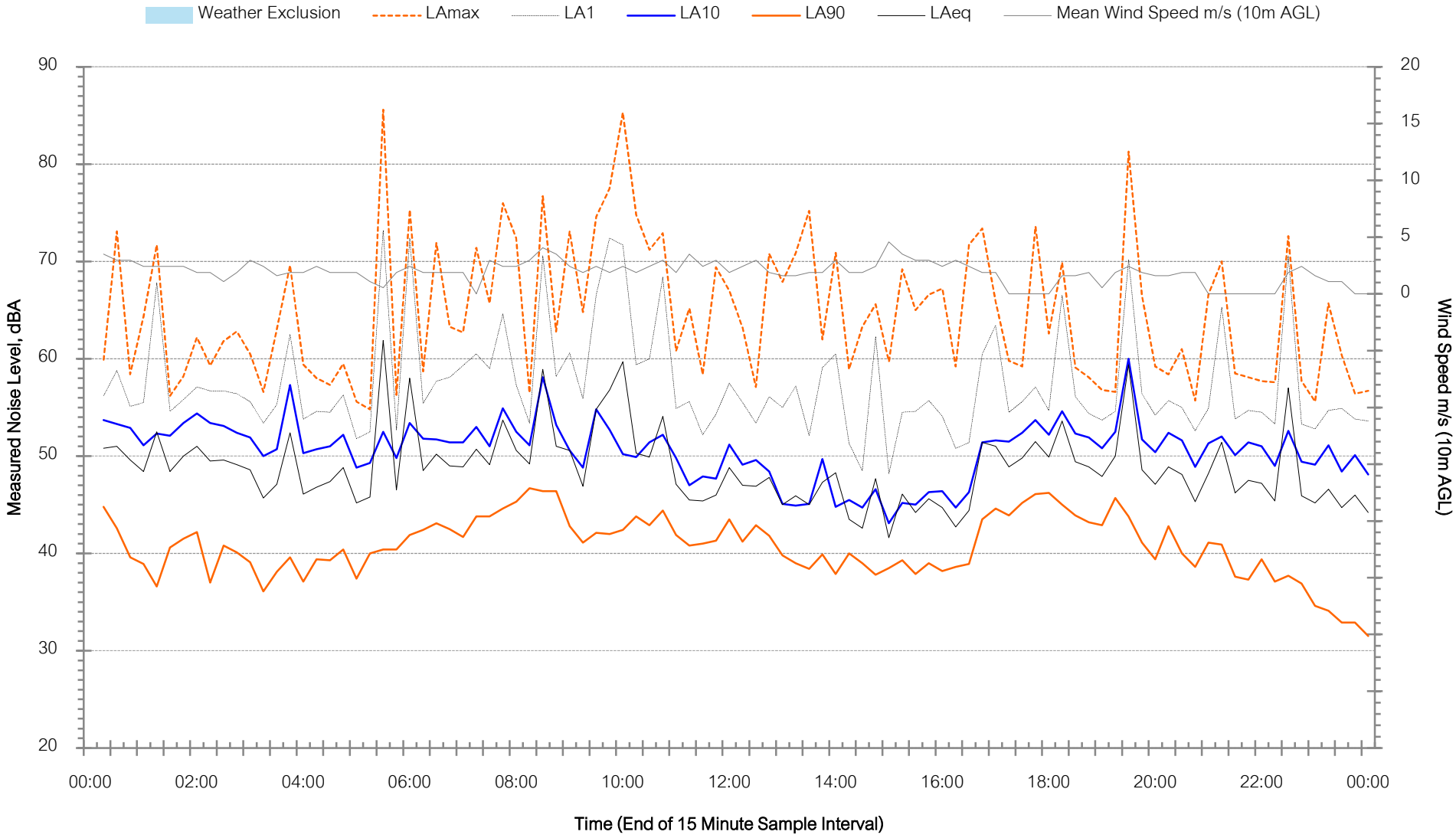


Background Noise Levels

L4 - Friday 24 May 2024

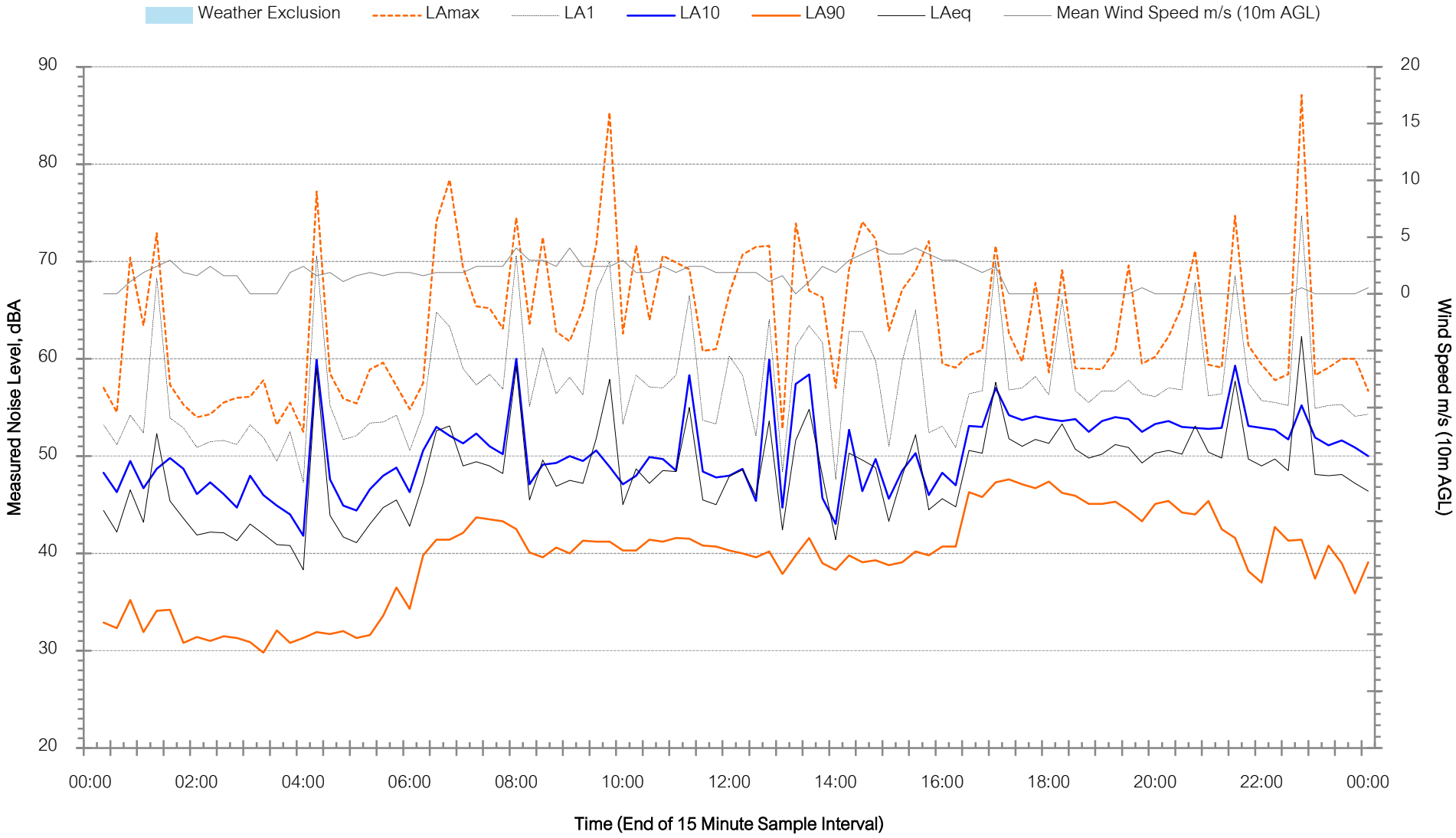
Background Noise Levels

L4 - Saturday 25 May 2024



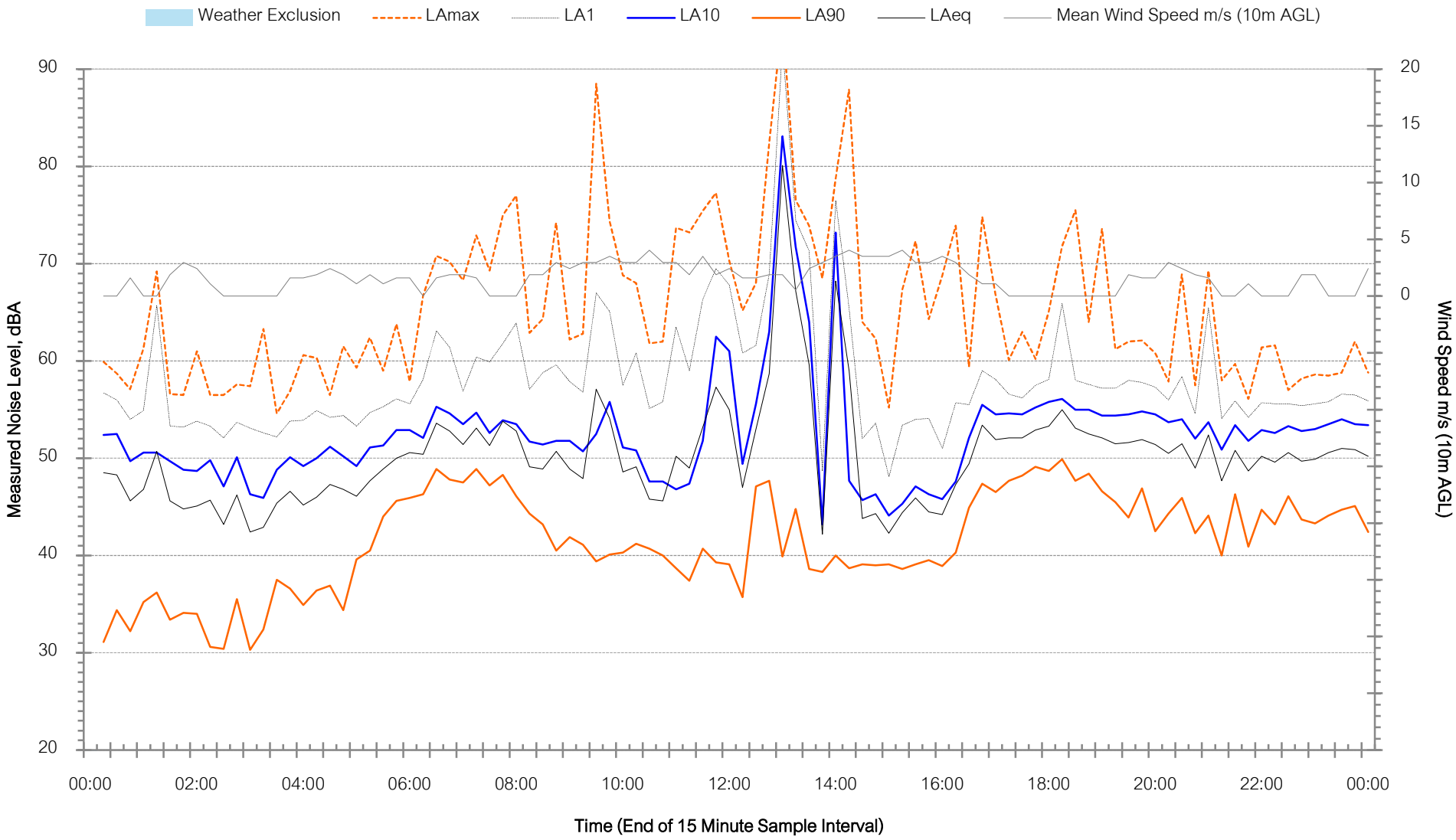
Background Noise Levels

L4 - Sunday 26 May 2024



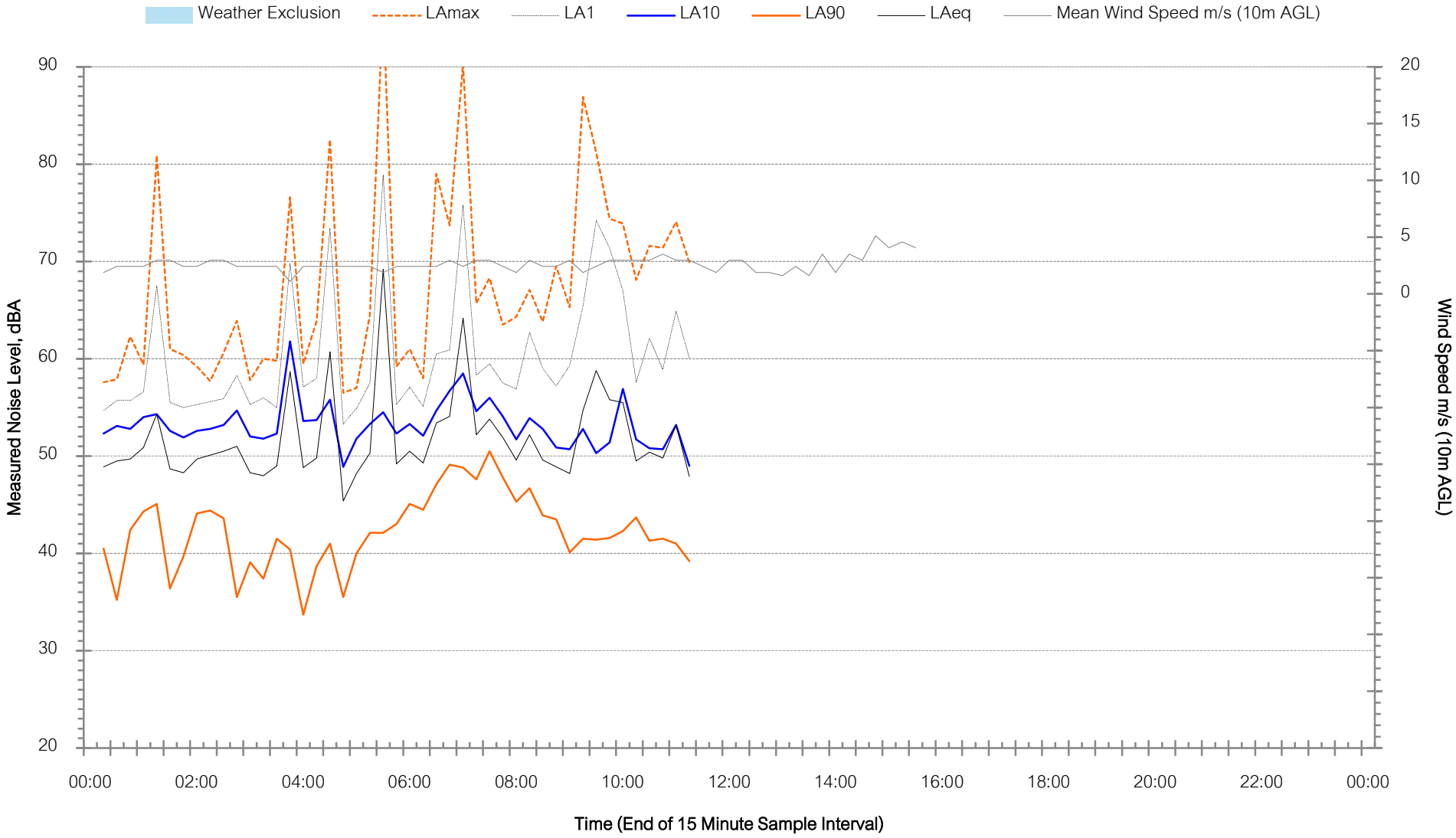
Background Noise Levels

L4 - Monday 27 May 2024



Background Noise Levels

L4 - Tuesday 28 May 2024



Muller Acoustic Consulting Pty Ltd
PO Box 678, Kotara NSW 2289
ABN: 36 602 225 132
Ph: +61 2 4920 1833
www.mulleracoustic.com

MAC
Muller Acoustic Consulting