Noise Assessment

Mount Piper Power Station Coal Unloader
Wallerawang, NSW.

Prepared for: KDC Pty Ltd
August 2018
MAC180648RP1

Muller Acoustic Consulting

Document Information

Noise Assessment

Mount Piper Power Station Coal Unloader, Wallerawang NSW.

Prepared for:
KDC Pty Ltd
Suite 2B, 125 Bull Street
Newcastle West NSW 2302

Prepared by: Muller Acoustic Consulting Pty Ltd
PO Box 262, Newcastle NSW 2300
ABN: 36 602 225 132
P: +61 2 4920 1833
www.mulleracoustic.com

Document ID	Status	Date	Prepared By	Signed	Reviewed By	Signed
MAC180648RP1	Final	24 August 2018	Rod Linnett		Oliver Muller	

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1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has been engaged by KDC Pty Ltd (KDC) on behalf of EnergyAustralia (EA) to complete a Noise Assessment (NA) for the proposed modification to the Mount Piper Power Station Western Rail Coal Unloader (WRCU) near Wallerawang, NSW (the 'project'). This report presents the methodology and findings of the NA for the construction and operation of the modification.

1.1 Purpose and Objectives

A NA is required as part of the project to the WRCU Project Approval 06_271 (PA). The purpose of the NA is to quantify potential environmental noise levels associated with the construction and operation of the modification.

Where impacts are identified, the assessment includes recommendations for potential noise mitigation and management measures.

1.2 Scope of the Assessment

The NA includes the following key tasks:

- review construction and operating activities to identify noise generating plant, equipment, machinery or activities proposed to be undertaken as part of the project;
- identify the closest and/or potentially most affected receivers situated within the area of influence to the project;
- establish existing noise levels to determine construction Noise Management Levels (NMLs), and operational noise criteria;
- undertake 3D noise modelling to predict levels that may occur as a result of the construction and operation of the project at the closest and/or potentially most affected receivers;
- provide a comparison of predicted noise levels against relevant construction NMLs and operational criteria;

- assess the potential noise impacts associated with construction and operational aspects of the modification; and
- provide feasible and reasonable noise mitigation and management measures, and monitoring options, where NMLs or operational criteria may be exceeded.

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

2 Project Description

2.1 Background

EA currently owns and operates the Mount Piper Power Station and is proposing to build a rail loop and coal unloading facility to service the needs of Mount Piper Power Station. The proposed rail loop, coal unloader and conveyor system would be built in the area known as Pipers Flat, located between Portland and Wallerawang. The modification to the WRCU would involve the construction and operation of:

- a rail loop comprising a branch rail line off the Wallerawang – Mudgee Main Line; and
- a coal unloader/dump station to allow coal to be delivered into a hopper located below the rail line.

An environmental assessment was completed in 2007 and approval was given in 2009 (Project Approval PA 06_271) for the construction and operation of the WRCU. The Project Approval required the project noise contribution to comply with a limit of 35dB $L_{Aeq(15min)}$ for all operating periods and 45dB $L_{A1(1min)}$ during the night time period.

During recent optimisation studies, EnergyAustralia has identified a number of construction and operational efficiencies that have resulted in a modified design to that proposed and approved in 2009, presented in **Figure 1** (SKM 2006) and the current proposed design in **Figure 2** shows the outcomes of the optimisation studies undertaken by EnergyAustralia.

Therefore, an assessment has been undertaken to address the design changes, in particular the location of the dump station and the redesigned loop having the ability to enter and exit from both directions and to identify any new noise sensitive receivers and potential changes in the acoustic environment.

Whilst the noise limits within the approval were expected to be achieved (SKM Western Coal Unloader, 2007) they would not apply to this assessment given the changes in noise policy and guidelines since 2006. It is expected that if approved the project approval will be updated in accordance with the current noise policy and guidelines.

2.2 Description of the Operation

2.2.1 Description of Proposed Construction Works

Construction is anticipated to take 18 months to complete. It is intended that the construction staging is as proposed in the Environmental Assessment however remains subject to detailed design and includes:

- site establishment, installation of erosion controls and major earthworks for the rail line loop and excavation of the coal unloader chamber;
- construction of the dump station and rail line including drainage, rail track, crossing loops, signalling and level crossing; and
- construction of the coal unloader housing and the overland coal conveyor.

During construction, traffic generated by the project would include construction workers and delivery vehicles. During the peak construction period, the traffic volume is not expected to be of a magnitude requiring assessment.

2.2.2 Description of Proposed Operation

The Coal Unloader will be accessed by a branch rail line off the Wallerawang – Mudgee Main Line allowing coal trains to access the new coal receiver facility from the north or the south. Once the coal wagon is at the unloader the coal would be released into a hopper located below the rail line. From the hopper, coal would be fed onto a conveyor that would traverse the terrain north to Mount Piper Power Station.

The revised rail loop and dump station design provides an optimised throughput up to 5Mtpa. This equates to approximately 15 to 20 trains per week over 50 weeks per year. During normal operations an average of two to three trains per day would be required to achieve the required throughput.

The coal receiving facility would be designed to operate seven days per week, 24 hours a day to provide operational flexibility. The project will be contained solely within the site, including areas required for stockpiling and materials laydown during construction as shown in Figure 3.

2.3 Scope and Potential Impacts

Potential noise impacts associated with the project relate to construction and operational noise from the rail loop, dump station and conveyor.

Road traffic noise associated with the transportation of equipment to site during construction has not been assessed for receivers along the proposed transport/access route.

FIGURE 1
Location of Noise Monitor

Delta Electricity Western Rail Coal Unloader
GDA 94 MGA Zone 56

0 250 500
Meters

MAC
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FIGURE 2

2018 OPTIMISED DESIGN

REF: MAC180648

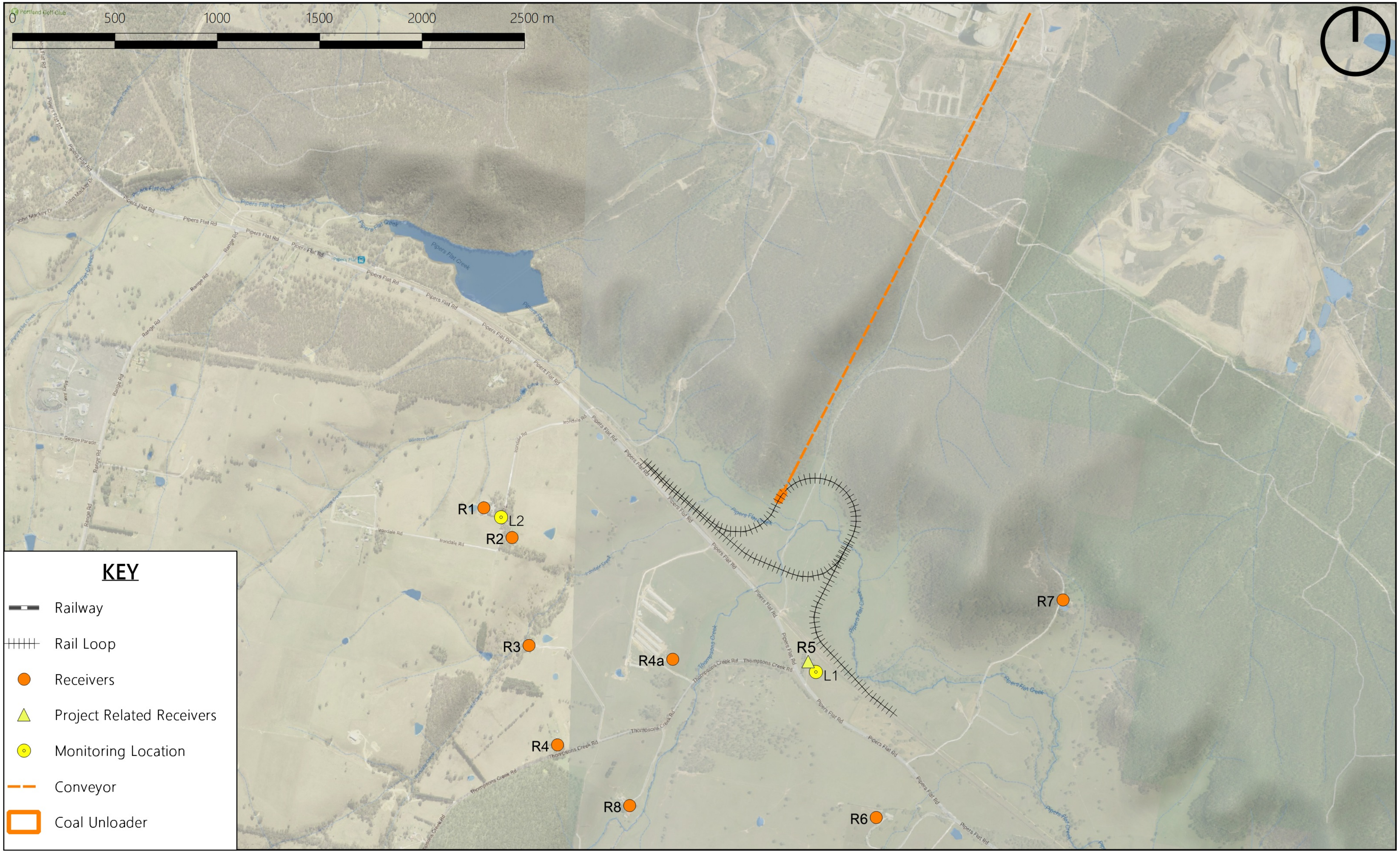

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FIGURE 3

PROJECT LAYOUT

REF: MAC180648

3 Noise Policy and Guidelines

This NA has been conducted in accordance with the following key policy and guidelines:

- NSW Department of Environment and Climate Change, NSW Interim Construction Noise Guideline (ICNG), 2009; and
- NSW Environment Protection Authority's (EPA's), Rail Infrastructure Noise Guideline (RING) 2013;

The assessment has also considered and applied the following additional policy, guidelines and standards where relevant:

- NSW Environment Protection Authority's (EPA's), Noise Policy for Industry (NPI), 2017;
- Australian Standard AS 2436–2010 (R2016) (AS 2436) – Guide to Noise and Vibration Control on Construction, Demolition and Maintenance sites;
- Australian Standard AS 1055–1997 (AS 1055) – Description and Measurement of Environmental Noise;
- Australian Standard AS IEC 61672.1–2004 (AS 61672) – Electro Acoustics - Sound Level Meters Specifications Monitoring; and
- Australian Standard AS IEC 60942-2004 (AS 60942) – Electroacoustics – Sound Calibrators.

3.1 Interim Construction Noise Guideline

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

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

The ICNG provides two methodologies for the assessment of construction noise emissions:

- Quantitative, which is suited to major construction projects with typical durations of more than three weeks; or
- Qualitative, which is suited to short term infrastructure maintenance (for projects with a typical duration of less than three weeks).

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

The quantitative approach includes identification of potentially affected receivers, description of activities involved in the project, derivation of the construction noise management levels, quantification of potential noise impact at receivers and, provides management and mitigation recommendations. Table 1 summarises the ICNG recommended standard hours for construction.

Table 1 Recommended Standard Hours for Construction

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

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

> **Period 1** (evening/low risk period): Monday to Friday – 6pm to 10pm, Saturdays – 1pm to 6pm, Sundays – 8am to 6pm.
>
> **Period 2** (night/medium to high risk period): Monday to Friday – 10pm to 7am, Saturdays/Sundays – 6pm to 7am (8am on Sunday mornings).

There are no out of hours construction work proposed for this project.

3.1.1 Construction Noise Management Levels

Section 4 of the ICNG details the quantitative assessment method involving predicting noise levels and comparing them with the Noise Management Level (NML) and are key indicators for the potential level of construction noise impacts. **Table 2** provides the ICNG recommended $L_{Aeq(15\text{-}min)}$ NMLs and describes how they are to be applied.

Table 2 Noise Management Levels		
Time of Day	Management Level $LA_{eq(15\text{-}min)}$[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 $LA_{eq(15\text{-}min)}$ 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.

3.1.2 Construction Sleep Disturbance

Section 4.3 of the ICNG (DECC, 2009) states that a sleep disturbance assessment is required where construction activities are planned to occur for more than two consecutive nights.

Given that construction activities are anticipated to occur during standard construction hours, sleep disturbance has not been considered in this assessment.

3.2 Rail Infrastructure Noise Guideline

The EPA released the Rail Infrastructure Noise Guideline Policy (RING) in May 2013, replacing the Interim Guideline for the Assessment of Noise from Rail Infrastructure Projects (IGANRIP, DECC 2007) and provides a procedure for the consideration of feasible and reasonable noise mitigation measures that form part of a Noise Impact Assessment (NIA) to be used by planning authorities to assess rail projects. The purpose of the RING is to specify noise and vibration trigger levels for assessing heavy and light rail infrastructure projects to protect the community from the adverse effects of noise and vibration from rail infrastructure projects.

The RING applies to all heavy rail infrastructure redevelopments including works such as crossovers, sidings, turnouts, loops, refuges, relief lines, straightening curves or the installation of track signalling devices – all of which should be assessed in accordance with the redeveloped rail line trigger levels.

3.2.1 RING Noise Trigger Levels

Operational rail noise can have a significant effect on noise-sensitive receivers near a rail line. The RING specifies noise and vibration trigger levels, and if exceeded by the proposed rail development, mitigation measures need to be considered to reduce emissions. The noise and vibration triggers apply to existing noise-sensitive receivers and future sensitive receivers associated with any planned developments.

All RING noise trigger levels differentiate between noise impacts during the day and at night. A more stringent noise trigger is applied for night-time. It is widely accepted that noise is generally more disturbing at night because more noise-sensitive activities occur at that time (e.g. listening activities and sleep). Also, most residents are at home and noise is more intrusive due to lower background levels at night.

To evaluate predicted rail noise, triggers are provided for both $L_{Aeq(period)}$ (the level of average noise energy over the day or night period including maximum noise events from individual train pass-bys) and L_{Amax} (the maximum noise level not exceeded by 95 per cent of individual train pass-bys).

For non-residential noise-sensitive land uses, only the L_{Aeq} parameter is applied, as the focus is on speech interference and provide adequate acoustic protection to conduct the activities associated with those land uses.

Trigger levels in this guideline that apply to heavy rail projects relate to:

- the absolute level of rail noise associated with all rail transportation services, and
- the increase in the predicted rail noise due to the proposed rail infrastructure project in the case of redevelopments.

In addition, the RING also requires that if the Noise Impact Assessment undertaken for the infrastructure proposal indicates that the trigger levels are likely to be exceeded, a detailed study must be made to evaluate the predicted noise and vibration levels. The predicted levels should then be compared to the noise and vibration trigger levels and it is then necessary to consider feasible and reasonable mitigation measures. If the triggers are not exceeded, mitigation considerations are not required under this guideline. However, assessment obligations under the EP&A Act remain unaffected.

3.2.2 Non-Network Rail Lines

Appendix 3 of the RING describes how the guideline is to be applied for non-network rail lines on or exclusively servicing industrial sites, such is the case for the WRCU.

The RING states:

"Where a non-network rail line exclusively servicing one or more industrial sites extends beyond the boundary of the industrial premises, noise from this section of track should be assessed against the recommended acceptable L_{Aeq} noise levels from industrial noise sources for the relevant receiver type and indicative noise amenity area in Table 2.1 of the INP"

Table 2.1 of the INP has now been superseded by Table 2.2 of the NPI which is reproduced in **Table 3**.

The RING does not address maximum noise levels for non-network rail lines, however, the NPI maximum noise level screening criteria would apply, as they would be considered an industrial noise source.

Table 3 Recommended LAeq Noise Levels from Industrial Noise Sources

Receiver Type	Noise Amenity Area	Time of day	Recommended amenity noise level LAeq, dBA
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	5dBA above the recommended amenity noise level for a residence for the relevant noise amenity area and time of day
School classroom – internal	All	Noisiest 1-hour period when in use	35
Hospital ward - internal - external	All	Noisiest 1 hour Noisiest 1 hour	35 50
Place of worship – internal	All	When in use	40
Area specifically reserved for passive recreation (e.g. national park)	All	When in use	50
Active recreation area (e.g. school playground, golf course)	All	When in use	55
Commercial premises	All	When in use	65
Industrial premises	All	When in use	70
Industrial interface (applicable only to residential noise amenity areas)	All	All	Add 5dBA to recommended noise amenity area

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

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

Time of day is defined as follows: (These periods may be varied where appropriate, for example, see A3 in Fact Sheet A.)

• day – the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays;

• evening – the period from 6pm to 10pm;

• night – the remaining periods.

In the case where existing schools are affected by noise from existing industrial noise sources, the acceptable LAeq noise level may be increased to 40dB LAeq(1hr).

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4 Existing Environment

A key element in assessing environmental noise impacts is understanding the existing ambient environment and background noise levels at the closest and/or potentially most affected receivers to the project.

4.1 Potentially Sensitive Receivers

From review of aerial imagery and associated project information, MAC has identified the following potentially sensitive receivers that may be affected by noise from operations and construction activities. **Table 4** presents a summary of receiver identification, address and coordinates and are presented graphically in Error! Reference source not found..

Table 4 Noise Sensitive Receivers

ID	Description/Address	Coordinates (MGA 55)	
		Easting	Northing
R1 (L2)	70 Irondale Road	779894	6302258
R2	69 Irondale Road	779939	6302109
R3	110 Thompsons Creek Road	780015	6301587
R4	136 Thompsons Creek Road	780159	6301104
R4a	Poultry Farm Residence - Pipers Flat Road	780722	6301514
R5[1] (L1)	708 Pipers Flat Road	781393	6301504
R6	611 Pipers Flat Road	781732	6300737
R7	644 Pipers Flat Road	782632	6301807
R8	77 Thompsons Creek Road	780514	6300778

Note 1: Receiver location is project related,

4.2 Noise Monitoring Methodology

In accordance with NSW noise guidelines, background noise levels are measured in the absence of the site under assessment and are used to determine RBLs for residential receivers.

To quantify existing noise levels, long-term unattended noise measurements were undertaken at two locations representative of receivers situated near the project (refer **Table 5**) together with operator attended monitoring to quantify ambient noise sources.

4.2.1 Unattended Noise Monitoring

The unattended noise monitoring survey was conducted in general accordance with the procedures described in Australian Standard AS 1055-1997, "Acoustics - Description and Measurement of Environmental Noise". Noise measurements were carried out using Svantek Type 1, 977 noise analysers from Wednesday 23 May 2018 to Thursday 31 May 2018. The acoustic instrumentation used carries current NATA calibration and complies with AS IEC 61672.1-2004-Electroacoustics - Sound level meters - Specifications. Calibration of all instrumentation was checked prior to and following measurements. Drift in calibration did not exceed ±0.5dBA.

Table 5 Noise Monitoring Locations

ID	Unattended Noise Monitoring Location	Site Description	Co-ordinates MGA55	
			Easting, m	Northing, m
L1	708 Pipers Flat Road	Rural Dwelling	781393	6301504
L2	70 Irondale Road	Rural Dwelling	779894	6302258

4.2.2 Operator Attended Noise Monitoring

In addition to unattended monitoring, operator attended measurements were conducted on Thursday 31 May 2018 to qualify existing ambient and background noise levels. Instrumentation used was a Svantek Type 1, 971 octave sound analyser set to 'Fast' time weighting and 'A' frequency weighting. The analyser was calibrated before and after the measurements with no drift in calibration noted. Measurements were conducted in general accordance with the procedures described in Australian Standard AS 1055, 1997 Acoustics - Description and Measurement of Environmental Noise.

4.3 Unattended Noise Monitoring Results

From observations whilst on site and attended noise monitoring, the noise environment at existing residential receivers is best described as 'rural' in accordance with the NPI. A rural area, as described in the NPI, is one that has an acoustical environment that is dominated by natural sounds having little or no road traffic noise and generally characterised by low background noise levels.

The results of the unattended noise measurements for the background monitoring location, including derived RBLs are summarised in Table 6. Appendix B presents the noise monitoring charts for the monitoring period.

Table 6 Unattended Noise Monitoring Results				
Unattended Noise Monitoring Location	Period[1]	Measured Background Level RBL L_{A90}, dBA	Adopted Background Level RBL L_{A90}, dBA	Measured Ambient Noise Level L_{Aeq}, dBA
L1 708 Pipers Flat Road	Day	31	31	49
	Evening	26	30[2]	48
	Night	25	30[2]	45
L2 70 Irondale Road	Day	26	30[2]	51
	Evening	25	30[2]	46
	Night	25	30[2]	43

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: Minimum RBL adopted as per NPI Fact Sheet B.

4.4 Operator Attended Noise Monitoring Results

The results of the operator attended noise measurements are summarised in **Table 7**. The results of the operator attended noise monitoring confirm that the existing acoustic environment is dominated by natural sounds with occasional road traffic noise and other extraneous noise sources.

Table 7 Operator Attended Noise Monitoring Results					
Location	Date/Time Meteorology	Measurement Descriptor, dBA			Comments
		L_{Amax}	L_{Aeq}	L_{A90}	
L1 708 Pipers Flat Road	31/05/18 13:10 1.5m/s SW	62	49	36	Birds 35-38 Traffic passby 46-60
L2 70 Irondale Road	31/05/18 13:36 1.5m/s SW	62	44	37	Birds 37-47 Car at house 61 Dog 51

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5 Assessment Criteria

5.1 Construction Noise Management Levels

Noise Management Levels (NMLs) for construction activities for all residential receivers are 45dB $LA_{eq(15\text{-}min)}$ (RBL +10dB). Construction activities are planned for standard hours, however the relevant NML standard construction hours and out of hours periods are summarised in **Table 8**.

Table 8 Construction Noise Management Levels

Location	Assessment Period[1]	RBL, dBA	NML dB $LA_{eq(15\text{-}min)}$
All Residential Receivers	Day (Standard Hours)	35	45 (RBL+10dBA)
	Evening (OOH Period 1)	30	35 (RBL+5dBA)
	Night (OOH Period 2)	30	35 (RBL+5dBA)

Note 1: Refer to Table 1 for Recommended Standard Hours for Construction.

5.2 Operational Noise Criteria

5.2.1 RING Noise Trigger Levels

The PNTLs in accordance with Appendix 3 of the RING are the "recommended acceptable LA_{eq} noise levels for the relevant receiver type and indicative noise amenity area in Table 2.1 of the INP" (**Table 3**). **Table 9** summarises the derivation of the PNTL's in accordance with the methodologies outlined in the NPI. For this assessment the night time PNTL of 40dB $LA_{eq(period)}$ is the limiting criteria.

Table 9 Project Noise Trigger Levels

Catchment	Assessment Period[1]	Recommended Acceptable Noise Level dB $LA_{eq(period)}$	RING PNTL dB $LA_{eq(period)}$
Residential Receivers (Rural)	Day	50	50
	Evening	45	45
	Night	40	40

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.

5.2.2 Maximum Noise Level Screening Criterion

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

Table 10 Maximum Noise Assessment Trigger Levels

Residential Receivers			
$L_{Aeq(15\text{-}min)}$		L_{Amax}	
40dB $L_{Aeq(15\text{-}min)}$ or RBL + 5dB		52dB L_{Amax} or RBL + 15dB	
Trigger	40	Trigger	52
RBL + 5dB	35	RBL + 15dB	45
Highest	40	Highest	52

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

6 Modelling Methodology

A computer model was developed to quantify project noise emissions to neighbouring receivers for typical construction activities and operations. Brüel and Kjær Predictor Type 7810 (Version 11.10) noise modelling software was used to assess potential noise impacts associated with the project. A three-dimensional digital terrain map giving all relevant topographic information was used in the modelling process. Additionally, the model uses relevant noise source data, ground type, shielding such as barriers and/or adjacent buildings and atmospheric information to predict noise levels at the nearest potentially affected receivers. Plant and equipment were modelled at various locations and heights, representative of realistic construction and operational conditions for assessed scenarios.

The model calculation method used to predict noise levels was in accordance with ISO 9613-1 'Acoustics - Attenuation of sound during propagation outdoors. Part 1: Calculation of the absorption of sound by the atmosphere' and ISO 9613-2 'Acoustics - Attenuation of sound during propagation outdoors. Part 2: General method of calculation'.

6.1 Construction Assessment Methodology

Two construction scenarios have been included in this assessment: general construction such as earthworks; and ballast tamping as this is a highly noise intensive construction activity. Construction is understood to be undertaken during standard construction hours.

Noise emission data and assumptions used in this assessment are summarised in Table 11. All significant noise generating construction activities will be limited to standard construction hours. Where low intensity construction activities are required to be undertaken outside standard construction hours, such as cabling, minor assembly, use of hand tools etc, they will be managed such that they are not audible at any residential receivers.

Table 11 Construction Equipment Sound Power Levels, Lw dBA re 10^{-12} W				
Noise Source/Item	Utilisation %	Quantity	Lw/Item	Total Lw
		General Construction		
Light vehicle	50	2	76	76
Hand tools/Power tools	25	1	102	96
Welder	50	2	105	105
Backhoe	100	2	104	107
Mobile Crane/HIAB	100	1	104	104
Heavy vehicle	100	2	103	106
Tele-handler	75	2	104	107
Total – Trenching & Earthworks				112
		Rail Ballast Tamping		
Tamping Machine	100	1	123	123
Total – Piling				123

6.2 Operational Assessment Methodology

6.2.1 Operational Noise Modelling Scenarios

For this assessment, noise predictions were modelled for a typical operational scenario where a train will travel around the balloon loop in an anti-clockwise direction and stop before entry to the dump station. The train then proceeds through the dump station at <1 kph to deliver coal to the dump hopper at a rate of 2,000 tph. The dump hopper has a capacity of 600 tonne with 6 feeders at the base to feed the coal on to the conveyor. The entire dump hopper facility is below the rail level and will be enclosed in a concrete bunker. The overland conveyor is 1200mm wide travelling at 5m/s and leaves the bunker via a 140m tunnel before going overland for 3600m to the 16m high transfer tower adjacent to the Mount Piper Power Station coal stockyard, where the coal is delivered to the stockpile via an existing conveyor system.

The unloading cycle time for a typical train is approximately three hours and there is potential for up to three trains per (24 hour) day. The assessment is based on a $L_{Aeq(period)}$ noise emission, ie daytime (11 hours); evening (4 hours); and night time (9 hours). A worst case assessment scenario has been adopted based on two train unloading events during the daytime; one train unloading event during the evening; and two train unloading events during the night time. The assumptions, quantities and sound power levels used in the noise modelling are presented in Table 12. Where relevant, modifying factors in accordance with Section 3.3 and Fact Sheet D of the NPI have been applied to calculations.

Table 12 Operational Equipment Sound Power Levels, Lw dBA re 10^{-12} W				
Noise Source/Item	Activity	Quantity	Lw/Item	Total Lw
Locomotive	Entering rail loop, shunting and push on rail loop	2	108	111
Wagons	Bunching, shunting on rail loop	Up to 80	n/a	107
Dump Station	Unloading rail wagons	1	105	105
Coal Hopper % Belt Feeders	Transfer coal to conveyor	1	104	104
Conveyor (partially enclosed)	Deliver coal to stockyard	3600m	87dBA/m	126

6.2.2 Meteorological Analysis

Noise emissions from industry can be significantly influenced by prevailing weather conditions. Wind has the potential to increase noise at a receiver when it is at low velocities and travels from the direction of the noise source.

An assessment of the occurrence of winds above 3m/s has not been undertaken for the NA. Hence, the NPI default noise enhancing meteorological conditions have been adopted for the prediction of noise levels enhanced by wind as per Table D1 of NPI Fact Sheet D, and are summarised in in **Table 13**.

Table 13 Modelled Site Specific Meteorological Parameters				
Assessment Condition[1]	Temperature	Wind Speed / Direction	Relative Humidity	Stability Class
Day	20°C	N/A	60%	A
Evening	14°C	3m/s All Directions	60%	D
Night Calm	10°C	3m/s All Directions	60%	D
Night Temperature Inversion	10°C	2m/s All Directions	60%	F

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

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7 Results

7.1 Construction Noise Results

Noise levels were calculated at each assessed receiver assuming receiver heights of 1.5m above ground level for general construction activities and rail tamping. Predicted noise levels for both scenarios at assessed receivers are presented in **Table 14** and **Table 15**.

Table 14 Predicted Noise Levels – General Construction

Receiver ID	Address	Predicted Noise Level dB $L_{Aeq(15\text{-}min)}$	NML Standard Hours dB $L_{Aeq(15\text{-}min)}$	Comply
R1 (L2)	70 Irondale Road	30	45	Yes
R2	69 Irondale Road	35	45	Yes
R3	110 Thompsons Creek Road	30	45	Yes
R4	136 Thompsons Creek Road	31	45	Yes
R4a	Poultry Farm Residence - Pipers Flat Road	41	45	Yes
R5[1] (L1)	708 Pipers Flat Road	59	45	Yes
R6	611 Pipers Flat Road	36	45	Yes
R7	644 Pipers Flat Road	<25	45	Yes
R8	77 Thompsons Creek Road	30	45	Yes

Note 1: Receiver R5 is project related.

Predicted noise levels for general construction activities are expected to meet the NMLs at all receivers except project related receiver R5. However, for tamping operations, noise levels are anticipated to exceed the NMLs at receivers R4a and R5 hence, noise control recommendations are provided in Section 8.

Table 15 Predicted Noise Levels – Rail Tamping

Receiver ID	Address	Predicted Noise Level dB $L_{Aeq(15\text{-}min)}$	NML Standard Hours dB $L_{Aeq(15\text{-}min)}$	Comply
R1 (L2)	70 Irondale Road	39	45	Yes
R2	69 Irondale Road	41	45	Yes
R3	110 Thompsons Creek Road	36	45	Yes
R4	136 Thompsons Creek Road	37	45	Yes
R4a	Poultry Farm Residence - Pipers Flat Road	**49**	**45**	**No**
R5[1] (L1)	708 Pipers Flat Road	66	45	Yes
R6	611 Pipers Flat Road	45	45	Yes
R7	644 Pipers Flat Road	26	45	Yes
R8	77 Thompsons Creek Road	37	45	Yes

Note 1: Receiver R5 is project related.

7.2 Operational Noise Results

Noise levels were predicted at each assessed receiver assuming receiver heights of 1.5m above ground level. **Table 16** summarises the predicted operational noise levels from the rail loop and are demonstrated to comply with the RING NTLs at all residential receivers for all periods. Noise levels are generally lower than those presented in for the approved project SKM 2007. This is primarily due to lower throughput and less rail movements compared to the approved project design.

Table 16 Predicted Operational Noise Levels – Rail Loop

Receiver ID	Predicted Noise Level dB $LA_{eq(period)}$				RING NTL dB $LA_{eq(period)}$			Comply
	Day	Evening	Night	Night Temp Inversion	Day	Evening	Night	
R1 (L2)	<25	<25	<25	<25	50	45	40	Yes
R2	<25	<25	<25	<25	50	45	40	Yes
R3	<25	<25	<25	<25	50	45	40	Yes
R4	<25	<25	<25	<25	50	45	40	Yes
R4a	<25	28	27	27	50	45	40	Yes
R5 (L1)	32	34	34	34	50	45	40	Yes[1]
R6	<25	<25	<25	<25	50	45	40	Yes
R7	<25	<25	<25	<25	50	45	40	Yes
R8	<25	<25	<25	<25	50	45	40	Yes

Note 1: Receiver location is project related,

Technical Note:

Noise emissions from the conveyor system have been calculated to be below 30dBA at all assessed receivers for all operating periods and would comply with the minimum applicable NPI noise criteria of 35dB $LA_{eq(15\text{-}min)}$ for the night time.

7.3 Maximum Noise Level Assessment - Operations

Typical LAmax noise levels from transient events were assessed to the nearest residential receivers. A sound power level of 107dBA was used for shunting noise on the rail loop. Predicted noise levels from LAmax events for assessed receivers are presented in **Table 17**.

Table 17 Predicted Operational Maximum Noise Levels

Receiver ID	Predicted Noise Level dB $L_{Aeq(15\text{-}min)}$	Predicted Noise Level dB L_{Amax}	Screening Criterion dB $L_{Aeq(15\text{-}min)}$	Screening Criterion dB L_{Amax}	Comply
R1 (L2)	<30	26	40	52	Yes
R2	<30	27	40	52	Yes
R3	<30	<25	40	52	Yes
R4	<30	<25	40	52	Yes
R4a	30	29	40	52	Yes
R5 (L1)	37	51	40	52	Yes[1]
R6	<30	31	40	52	Yes
R7	<30	<25	40	52	Yes
R8	<30	<25	40	52	Yes

Note 1: Receiver location is project related,

A detailed maximum noise level assessment is not required for the project as predicted noise levels for night time operations do not exceed the maximum noise level screening criterion of 40dB $L_{Aeq(15\text{-}min)}$ and/or 52dB L_{Amax}.

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8 Recommendations

8.1 Construction Noise Recommendations

It is noted that general construction noise emissions are anticipated to satisfy relevant NMLs however when tamping occurs, it is likely that noise levels may exceed the NMLs at Receiver R4a. Tamping is expected to occur over a short period of between one to two weeks.

To manage this potential noise exceedance, the Construction Noise Management Plan (CNMP) shall consider application of the following measures during rail tamping:

- where possible use localised mobile screens or construction hoarding around plant to act as barriers between construction works and receivers;
- Operating plant in a conservative manner (no over-revving), be shut down when not in use, and be parked/started as far as practically possible away from residential receivers;
- consider the use of the quietest suitable rail tamper available;
- avoidance of noisy plant/machinery working simultaneously where practicable; and
- utilise project related community consultation forums to notify residences within close proximity of the timing and duration of rail tamping activities.

8.2 Operational Noise Recommendations

Operational noise predictions identify that relevant noise criteria would be satisfied at all receivers. However, general operational noise emissions will be controlled by implementing appropriate enclosure design for equipment within the dump hopper building. The dump hopper building itself would also require acoustic design input to ensure noise emissions are minimised. Take up rollers for the conveyors and coal transfer towers will be designed within acoustic enclosures for drive motors to reduce the transmission of noise from equipment and operations to the external environment.

To reduce the likelihood of rail/wheel noise, the inclusion of wooden sleepers, track ballast, rail head profiling and cambering of the track would be considered in the design. The provision for trackside lubricators would be incorporated in the project design.

Noise mitigation measure will be considered in consultation with the community.

A one-off noise validation monitoring assessment to quantify emissions from site and to confirm emissions meet relevant criteria will be completed.

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9 Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has been engaged by KDC Pty Ltd (KDC) on behalf of EnergyAustralia (EA) to complete a Noise Assessment (NA) for the proposed modification to the Mount Piper Power Station Rail Unloader near Wallerawang, NSW (the 'project'). The assessment has quantified potential noise emissions associated with the construction and operation of the project.

The results of the NA demonstrate that construction noise levels satisfy relevant NMLs at all assessed receivers, except at one receiver where noise levels have the potential to exceed NMLs when rail tamping is conducted over a short period during the construction phase.

The results of the assessment show that operational noise levels are predicted to satisfy the RING NTLs and LA_{max} screening criteria at all assessed receivers and are expected to be slightly lower than the noise levels in the Project Approval as the overall throughput is considerably less and here will be fewer train movements in the modified design.

Based on the NA results, there are no noise related issues which would prevent the approval of the project. Notwithstanding, noise management controls are recommended for tamping activities to manage noise emissions during the construction phase.

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Appendix A – Glossary of Terms

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

Table A1 Glossary of Terms

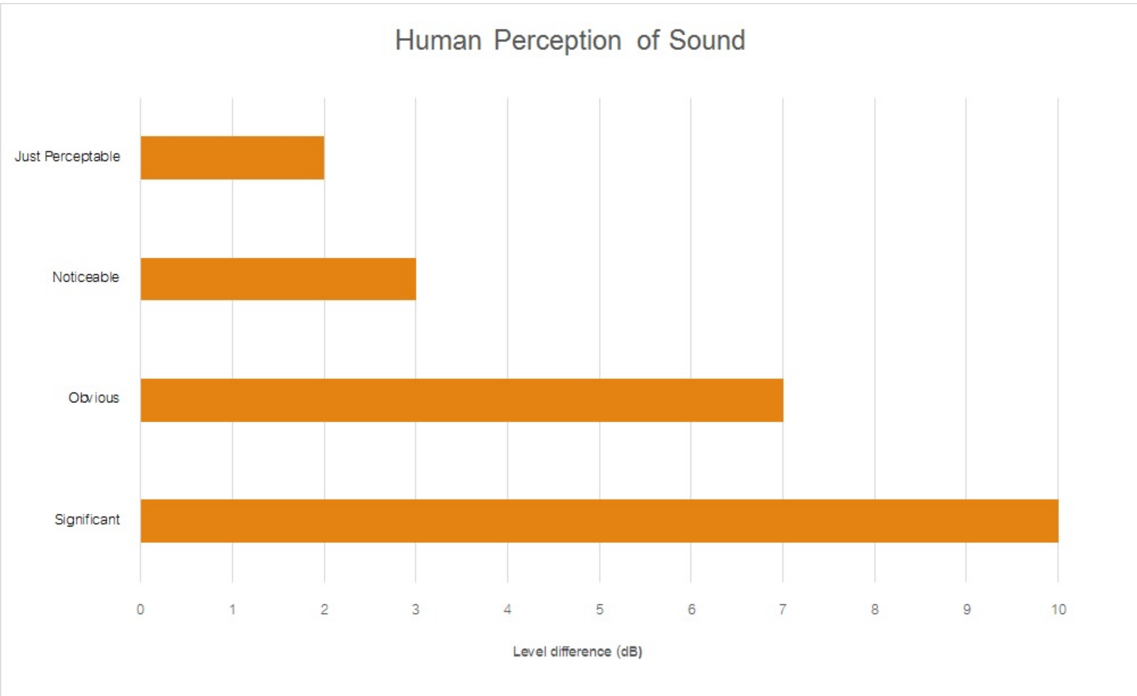
Term	Description
1/3 Octave	Single octave bands divided into three parts
Octave	A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit.
ABL	Assessment Background Level (ABL) is defined in the NPI as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured L90 statistical noise levels.
Ambient Noise	The noise associated with a given environment. Typically a composite of sounds from many sources located both near and far where no particular sound is dominant.
A Weighting	A standard weighting of the audible frequencies designed to reflect the response of the human ear to noise.
dBA	Noise is measured in units called decibels (dB). There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear.
dB(Z), dB(L)	Decibels Linear or decibels Z-weighted.
Hertz (Hz)	The measure of frequency of sound wave oscillations per second - 1 oscillation per second equals 1 hertz.
LA10	A noise level which is exceeded 10 % of the time. It is approximately equivalent to the average of maximum noise levels.
LA90	Commonly referred to as the background noise, this is the level exceeded 90 % of the time.
LAeq	The summation of noise over a selected period of time. It is the energy average noise from a source, and is the equivalent continuous sound pressure level over a given period.
LAmax	The maximum root mean squared (rms) sound pressure level received at the microphone during a measuring interval.
RBL	The Rating Background Level (RBL) is an overall single figure background level representing each assessment period over the whole monitoring period. The RBL is used to determine the intrusiveness criteria for noise assessment purposes and is the median of the ABL's.
Sound power level (LW)	This is a measure of the total power radiated by a source. The sound power of a source is a fundamental location of the source and is independent of the surrounding environment. Or a measure of the energy emitted from a source as sound and is given by : = 10.log10 (W/Wo) Where : W is the sound power in watts and Wo is the sound reference power at 10-12 watts.

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

Table A2 Common Noise Sources and Their Typical Sound Pressure Levels (SPL), dBA

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

Figure A1 – Human Perception of Sound



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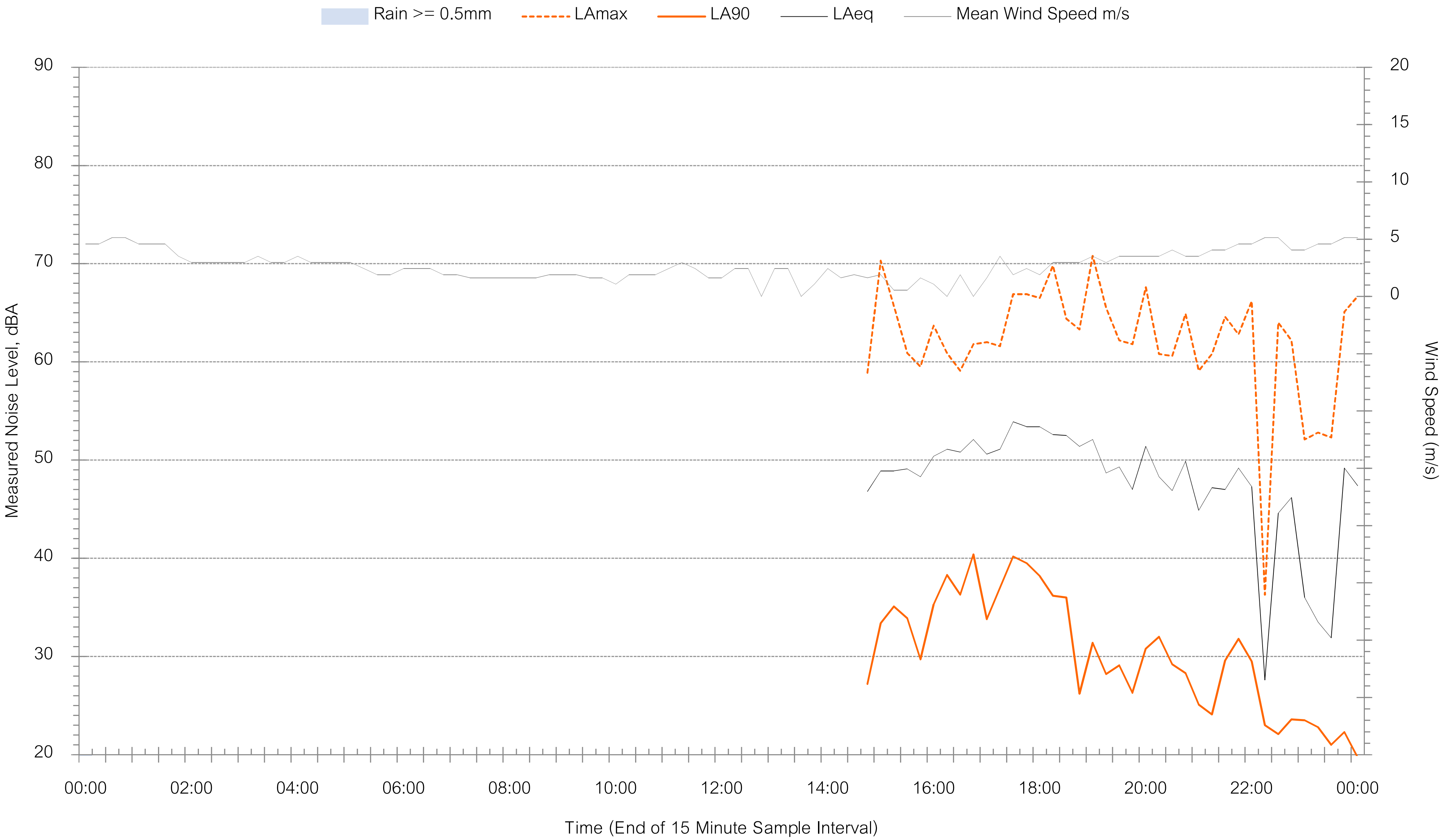
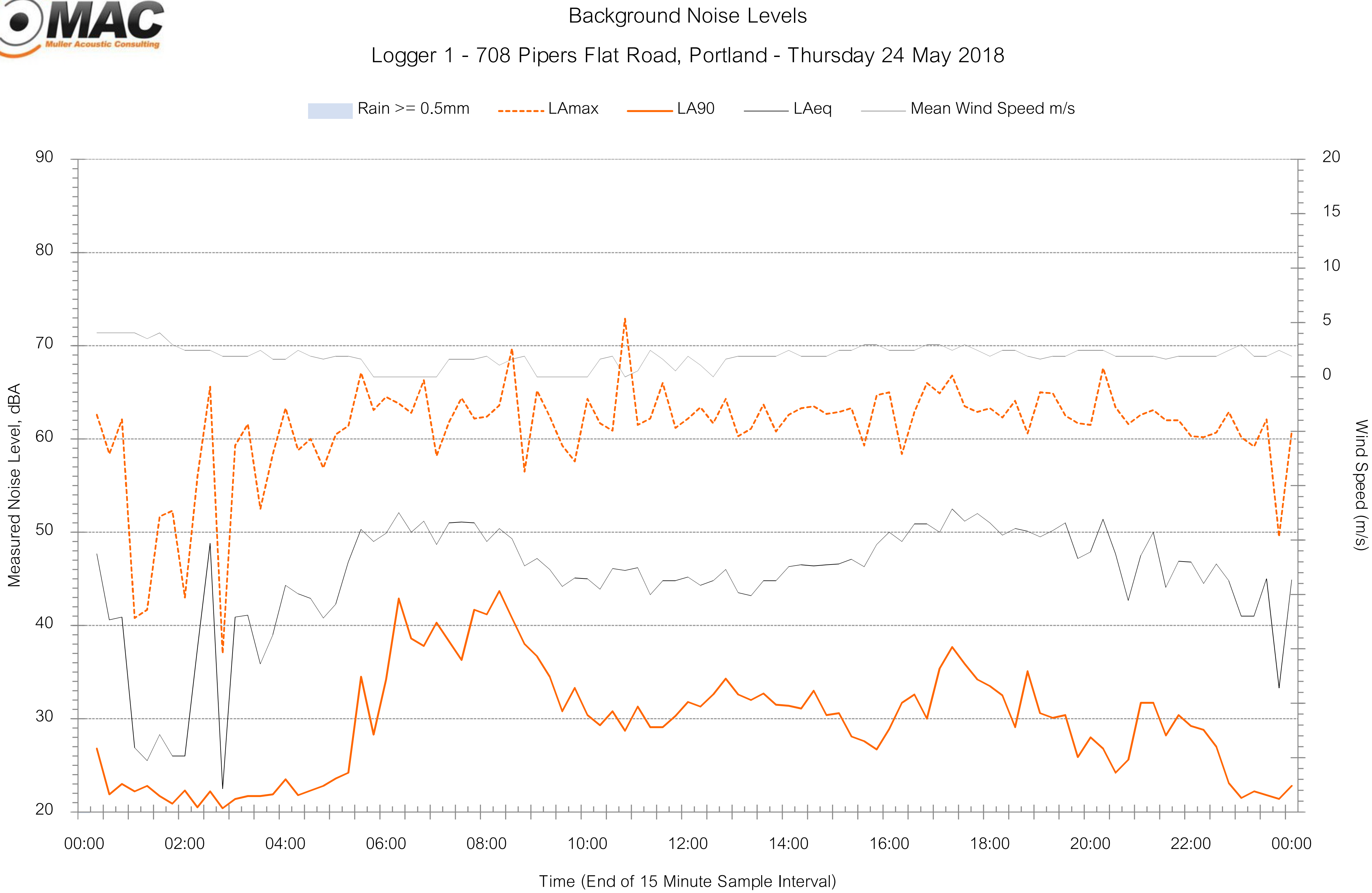
Appendix B – Unattended Noise Monitoring Charts

Background Noise Levels

Logger 1 - 708 Pipers Flat Road, Portland - Wednesday 23 May 2018




Background Noise Levels
Logger 1 - 708 Pipers Flat Road, Portland - Thursday 24 May 2018
Rain >= 0.5mm
LAmax
LA90
LAeq
Mean Wind Speed m/s
Measured Noise Level, dBA
Wind Speed (m/s)
90
80
70
60
50
40
30
20
15
10
5
0
00:00
02:00
04:00
06:00
08:00
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12:00
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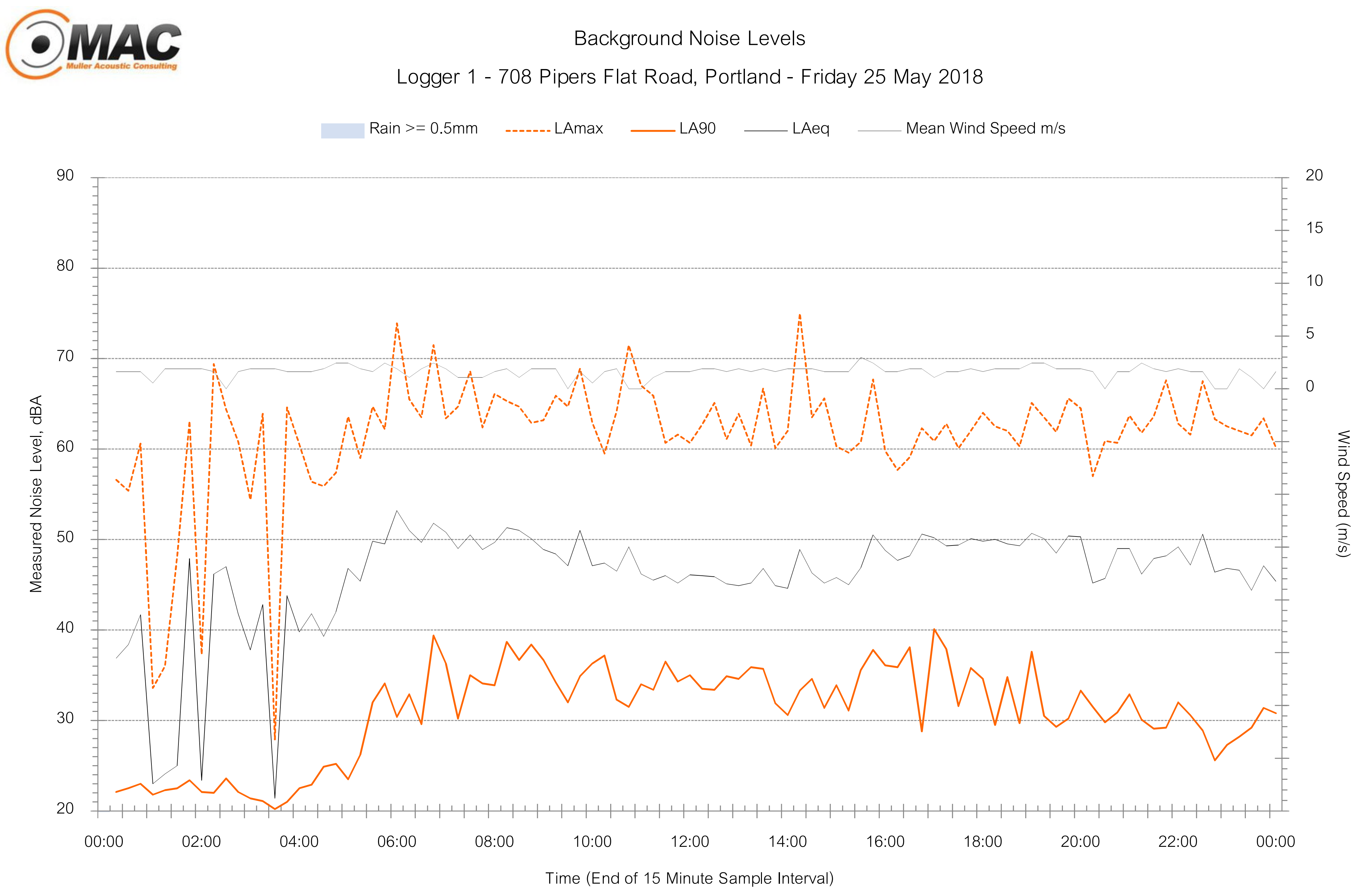
18:00
20:00
22:00
00:00
Time (End of 15 Minute Sample Interval)



Muller Acoustic Consulting
Background Noise Levels
Logger 1 - 708 Pipers Flat Road, Portland - Friday 25 May 2018
Rain >= 0.5mm
LAmax
LA90
LAeq
Mean Wind Speed m/s
Measured Noise Level, dBA
Wind Speed (m/s)
90
80
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60
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40
30
20
15
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02:00
04:00
06:00
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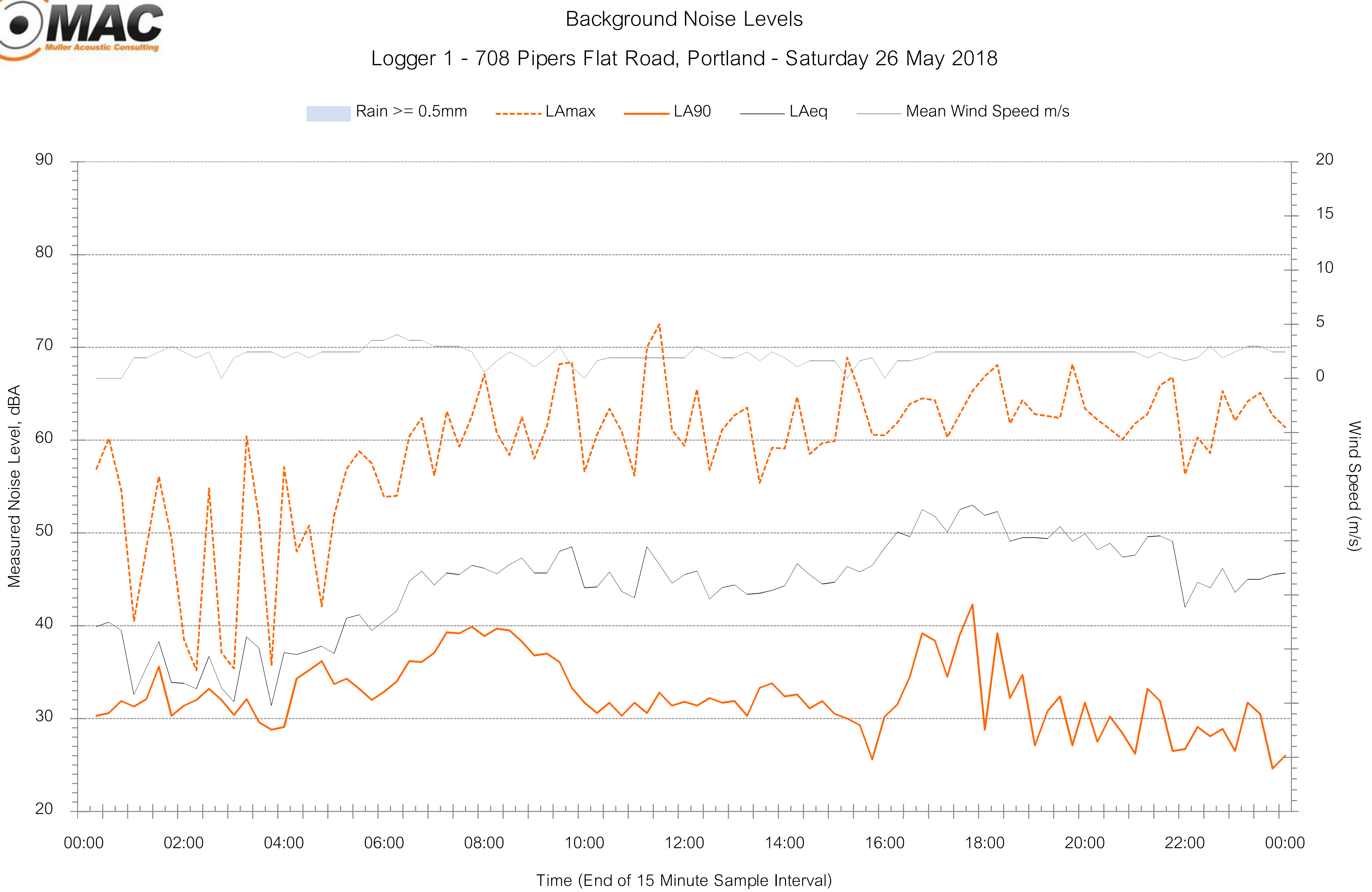
20:00
22:00
00:00
Time (End of 15 Minute Sample Interval)



Background Noise Levels
Logger 1 - 708 Pipers Flat Road, Portland - Saturday 26 May 2018
Rain >= 0.5mm
LAmax
LA90
LAeq
Mean Wind Speed m/s
Measured Noise Level, dBA
90
80
70
60
50
40
30
20
Wind Speed (m/s)
20
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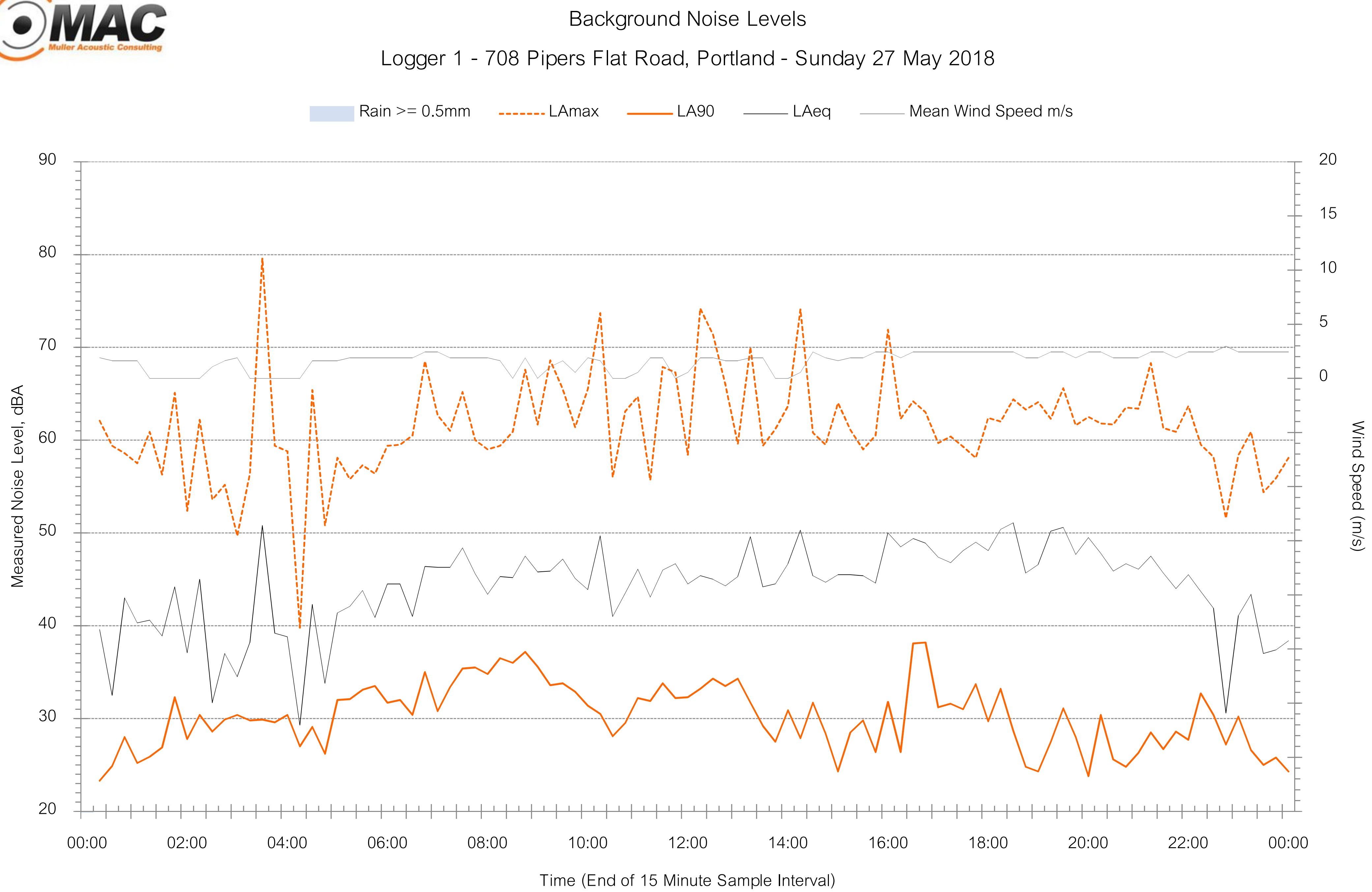
22:00
00:00
Time (End of 15 Minute Sample Interval)



Background Noise Levels
Logger 1 - 708 Pipers Flat Road, Portland - Sunday 27 May 2018
Rain >= 0.5mm
LAmax
LA90
LAeq
Mean Wind Speed m/s
Measured Noise Level, dBA
Wind Speed (m/s)
90
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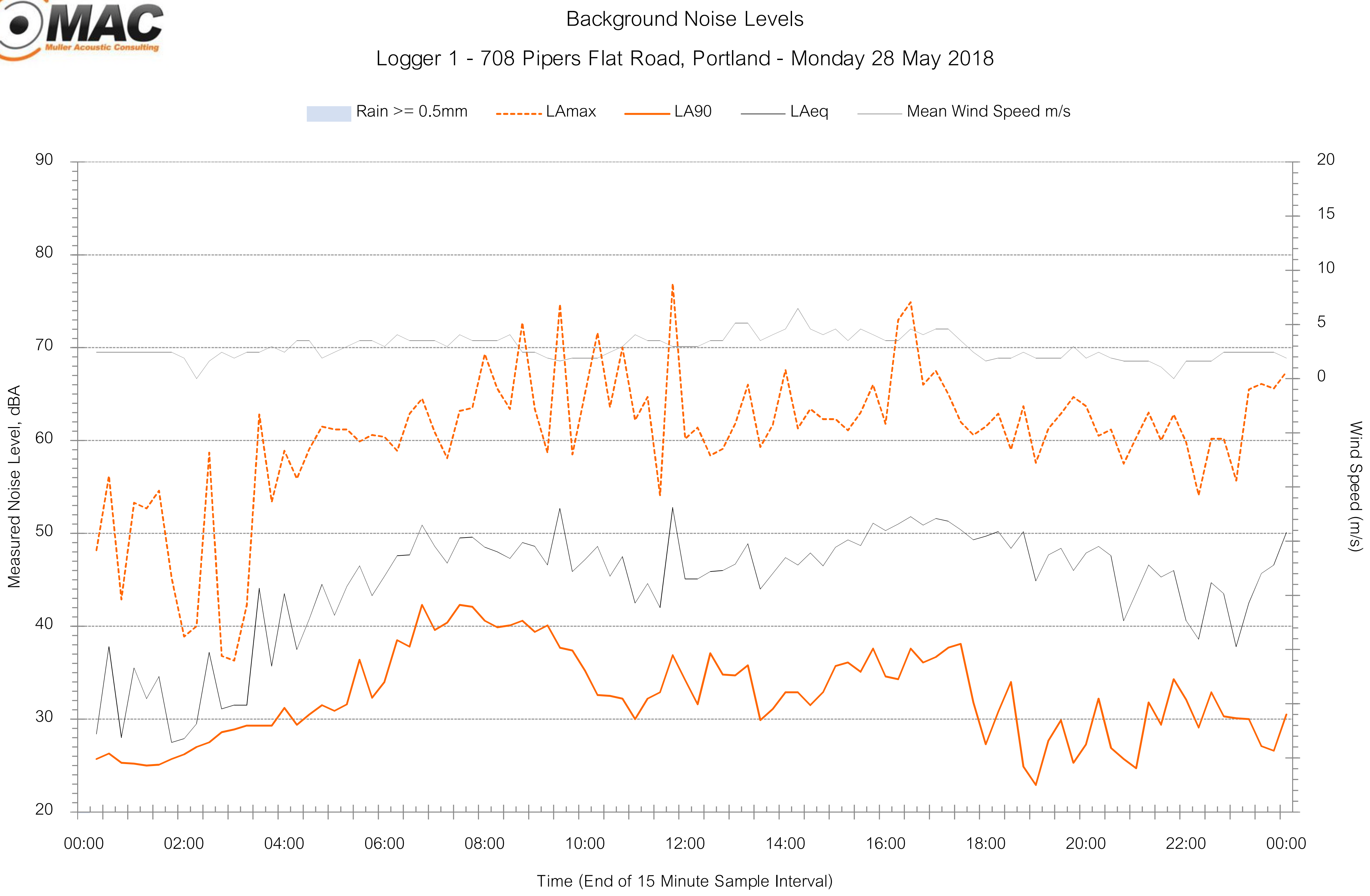
Time (End of 15 Minute Sample Interval)


Background Noise Levels
Logger 1 - 708 Pipers Flat Road, Portland - Monday 28 May 2018
Rain >= 0.5mm
LAmax
LA90
LAeq
Mean Wind Speed m/s
Measured Noise Level, dBA
90
80
70
60
50
40
30
20
Wind Speed (m/s)
20
15
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18:00
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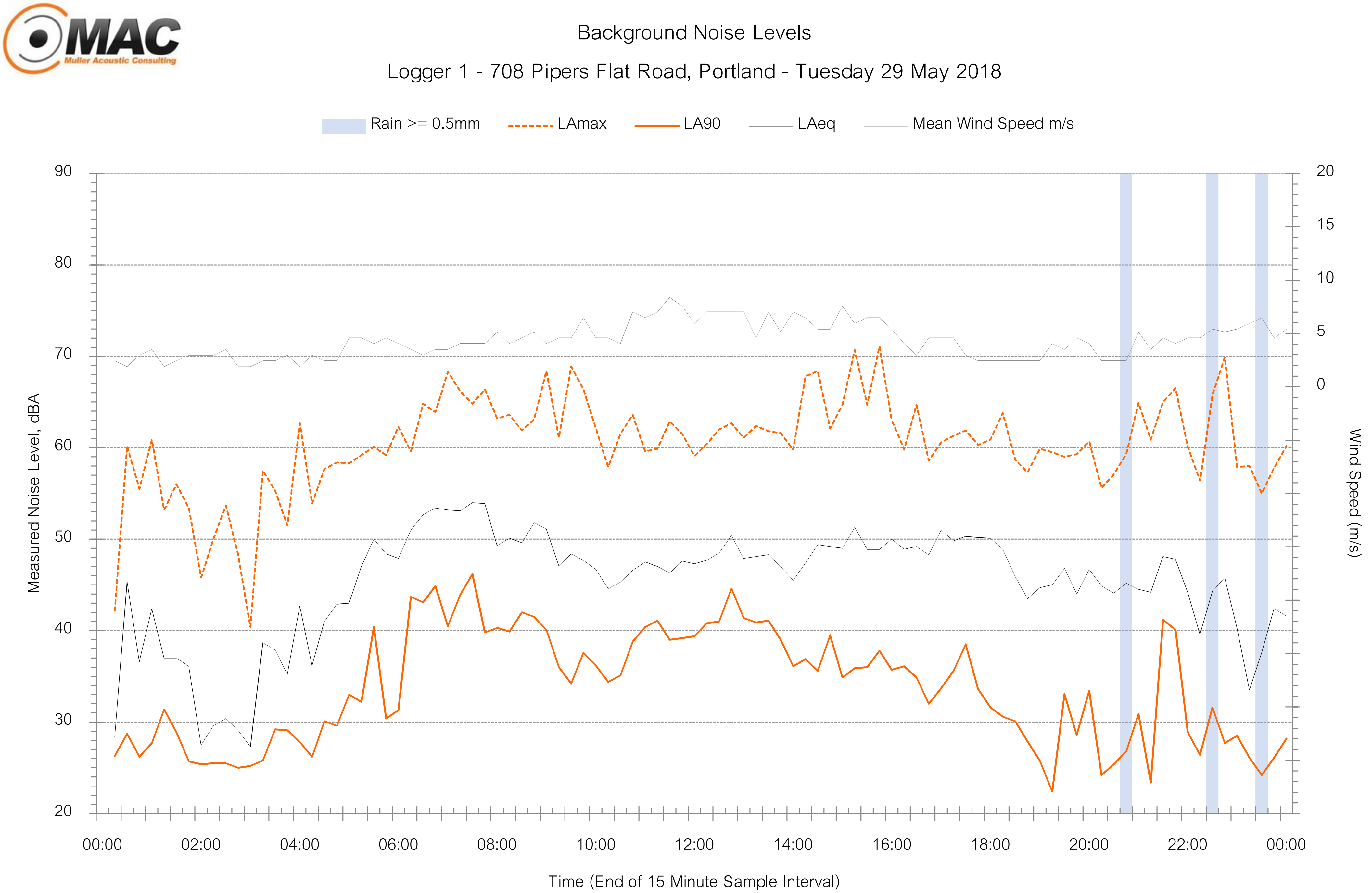
22:00
00:00
Time (End of 15 Minute Sample Interval)



Muller Acoustic Consulting
Background Noise Levels
Logger 1 - 708 Pipers Flat Road, Portland - Tuesday 29 May 2018
Rain >= 0.5mm
LAmax
LA90
LAeq
Mean Wind Speed m/s
Measured Noise Level, dBA
Wind Speed (m/s)
90
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22:00
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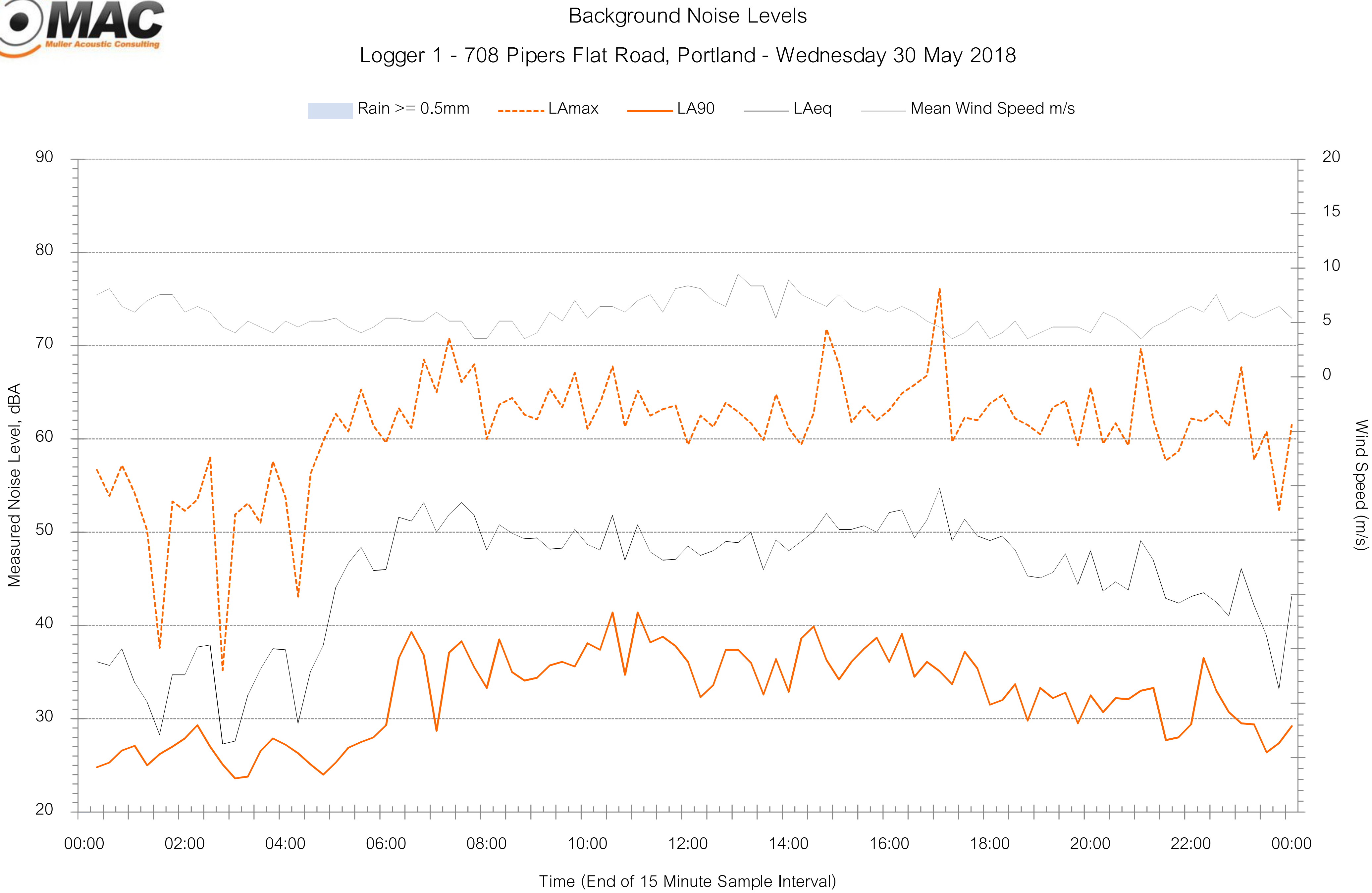
Time (End of 15 Minute Sample Interval)


Background Noise Levels
Logger 1 - 708 Pipers Flat Road, Portland - Wednesday 30 May 2018
Rain >= 0.5mm
LAmax
LA90
LAeq
Mean Wind Speed m/s
Measured Noise Level, dBA
Wind Speed (m/s)
Time (End of 15 Minute Sample Interval)
90
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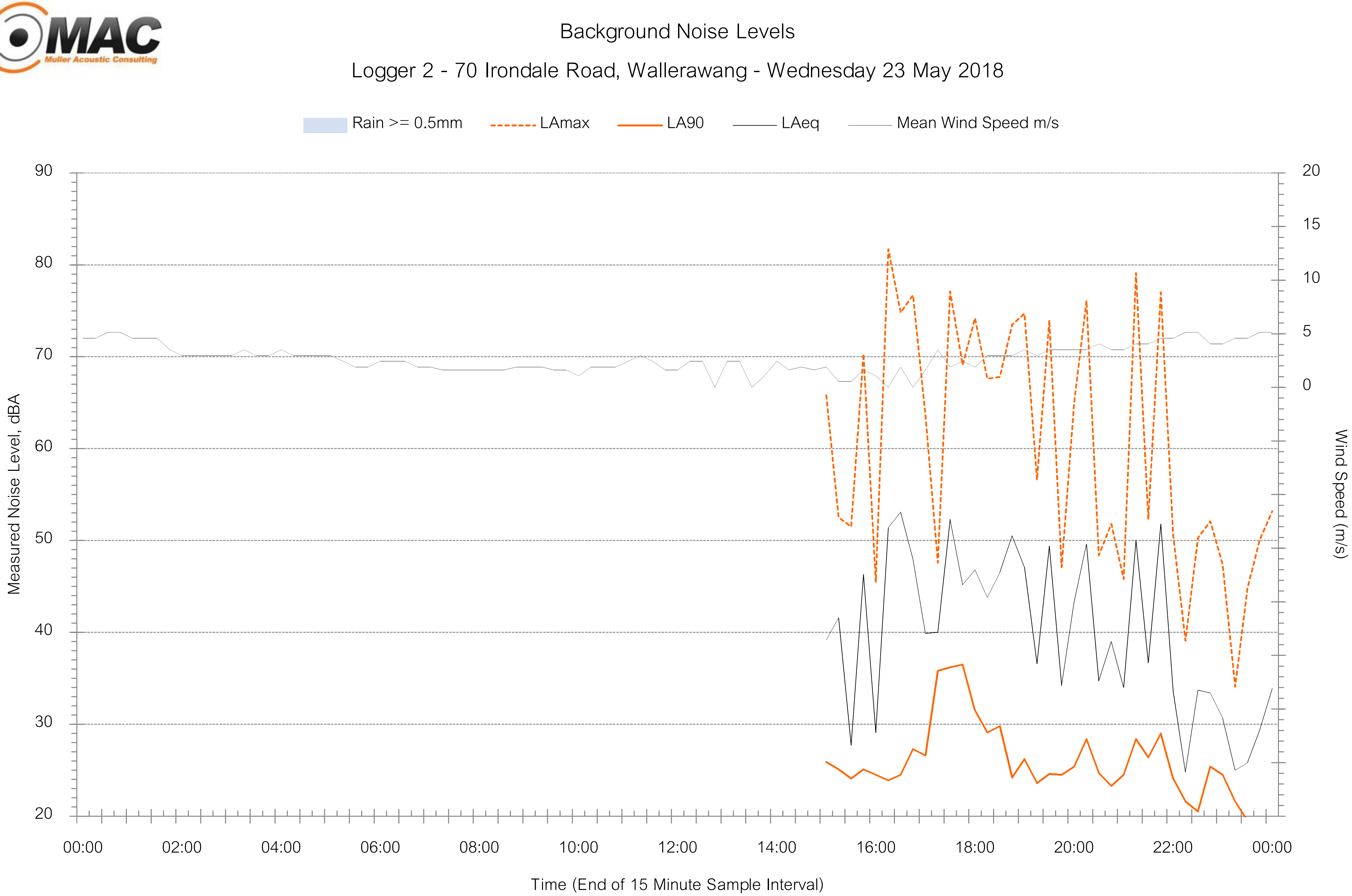
Background Noise Levels

Logger 1 - 708 Pipers Flat Road, Portland - Thursday 31 May 2018



Background Noise Levels
Logger 2 - 70 Irondale Road, Wallerawang - Wednesday 23 May 2018
Rain >= 0.5mm
LAmax
LA90
LAeq
Mean Wind Speed m/s
Measured Noise Level, dBA
90
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70
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40
30
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Wind Speed (m/s)
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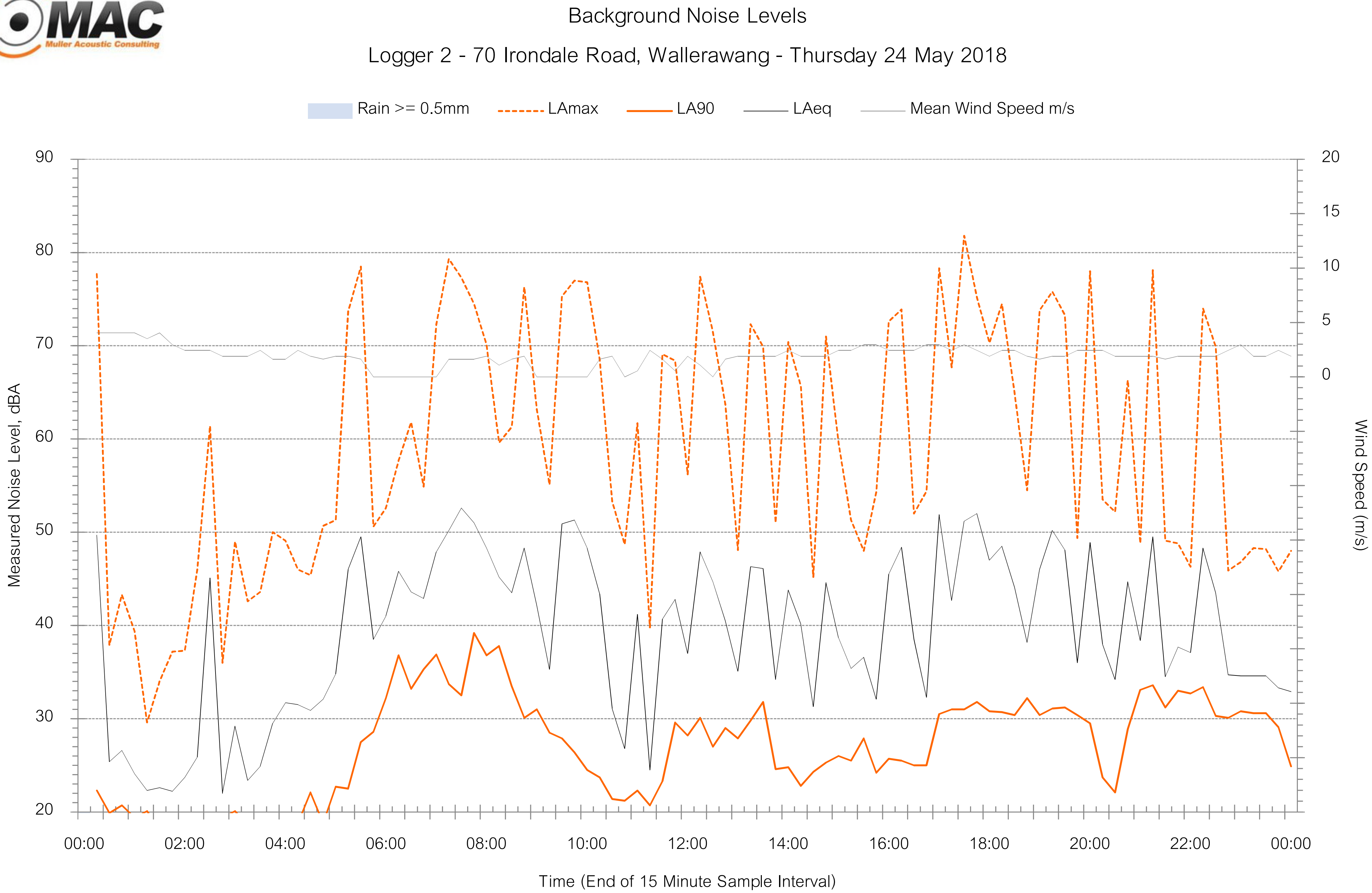
Time (End of 15 Minute Sample Interval)



Background Noise Levels
Logger 2 - 70 Irondale Road, Wallerawang - Thursday 24 May 2018
Rain >= 0.5mm
LAmax
LA90
LAeq
Mean Wind Speed m/s
Measured Noise Level, dBA
Wind Speed (m/s)
Time (End of 15 Minute Sample Interval)
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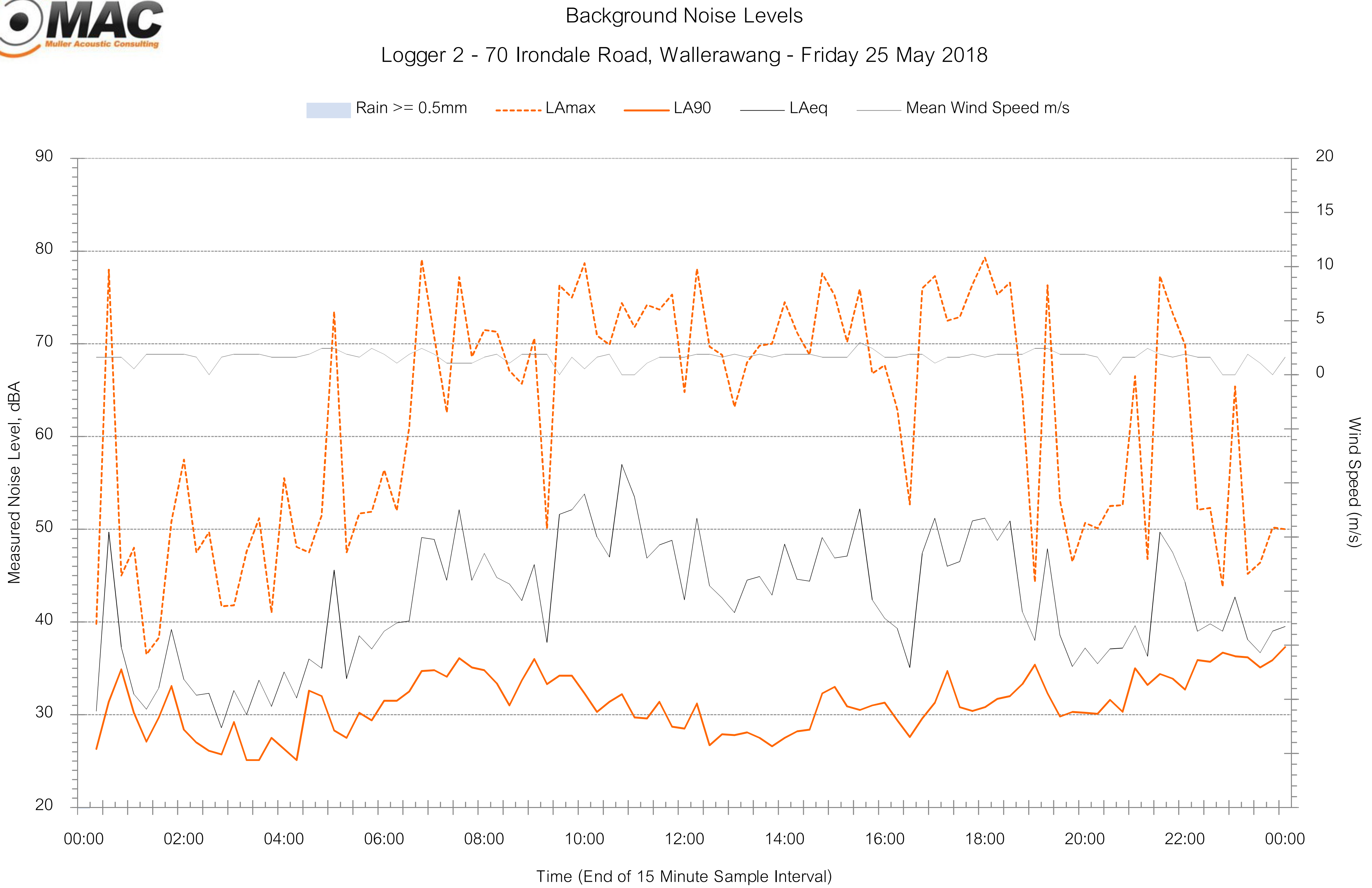
Background Noise Levels
Logger 2 - 70 Irondale Road, Wallerawang - Friday 25 May 2018
Rain >= 0.5mm
LAmax
LA90
LAeq
Mean Wind Speed m/s
Measured Noise Level, dBA
Wind Speed (m/s)
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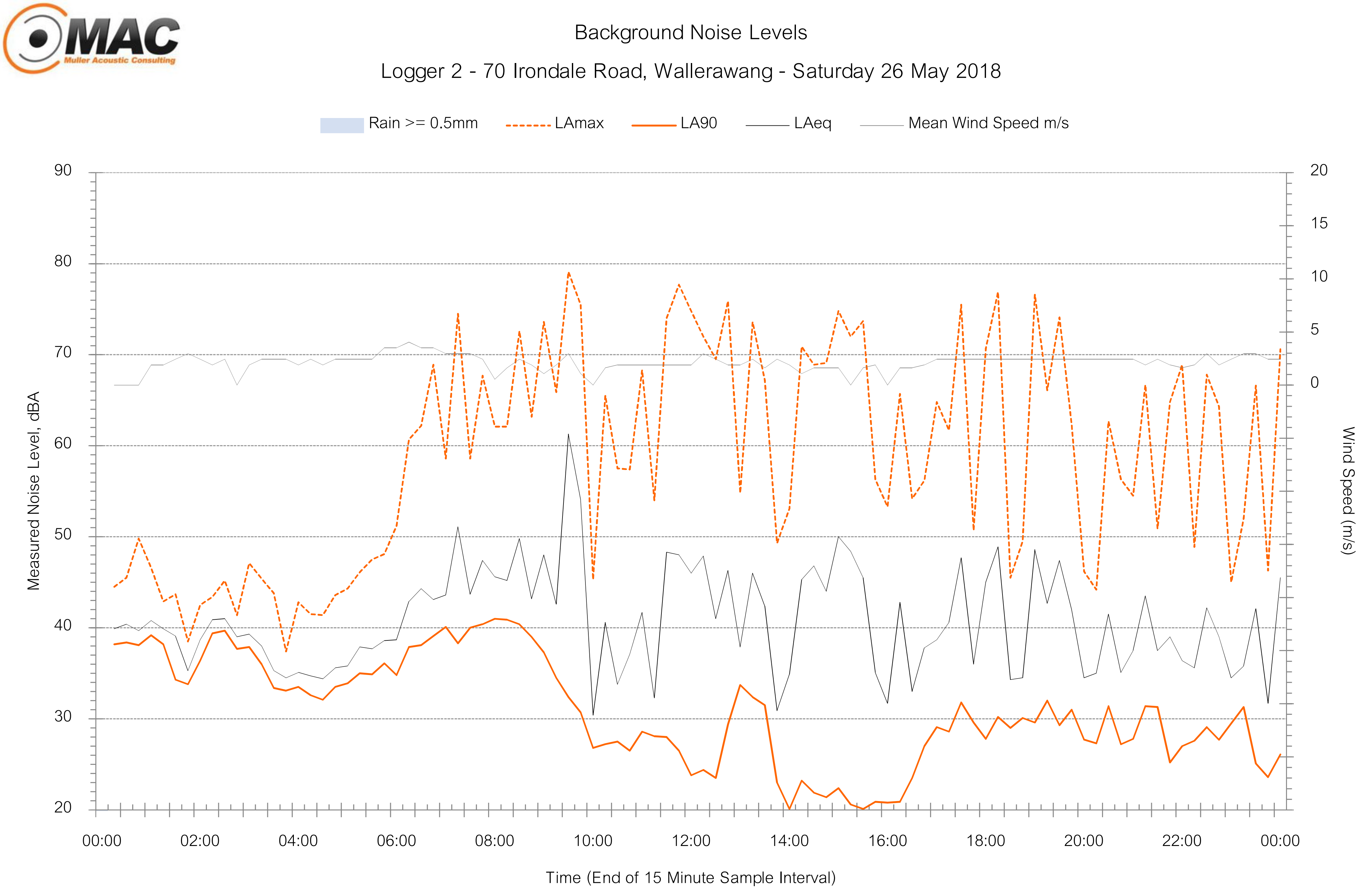
Time (End of 15 Minute Sample Interval)



Background Noise Levels
Logger 2 - 70 Irondale Road, Wallerawang - Saturday 26 May 2018
Rain >= 0.5mm
LAmax
LA90
LAeq
Mean Wind Speed m/s
90
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30
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Measured Noise Level, dBA
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Wind Speed (m/s)
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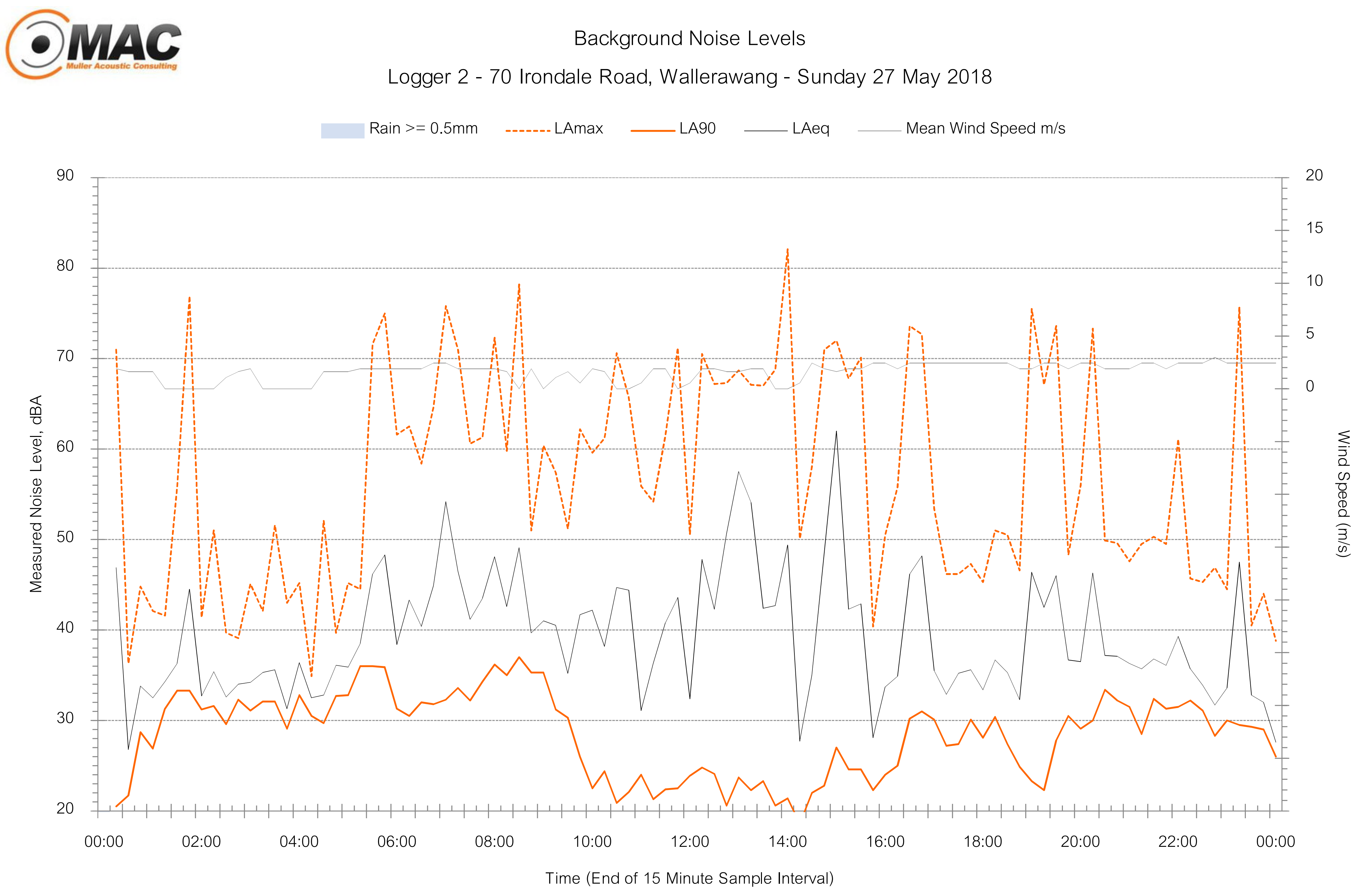
Time (End of 15 Minute Sample Interval)



MAC
Muller Acoustic Consulting
Background Noise Levels
Logger 2 - 70 Irondale Road, Wallerawang - Sunday 27 May 2018
Rain >= 0.5mm
LAmax
LA90
LAeq
Mean Wind Speed m/s
Measured Noise Level, dBA
Wind Speed (m/s)
90
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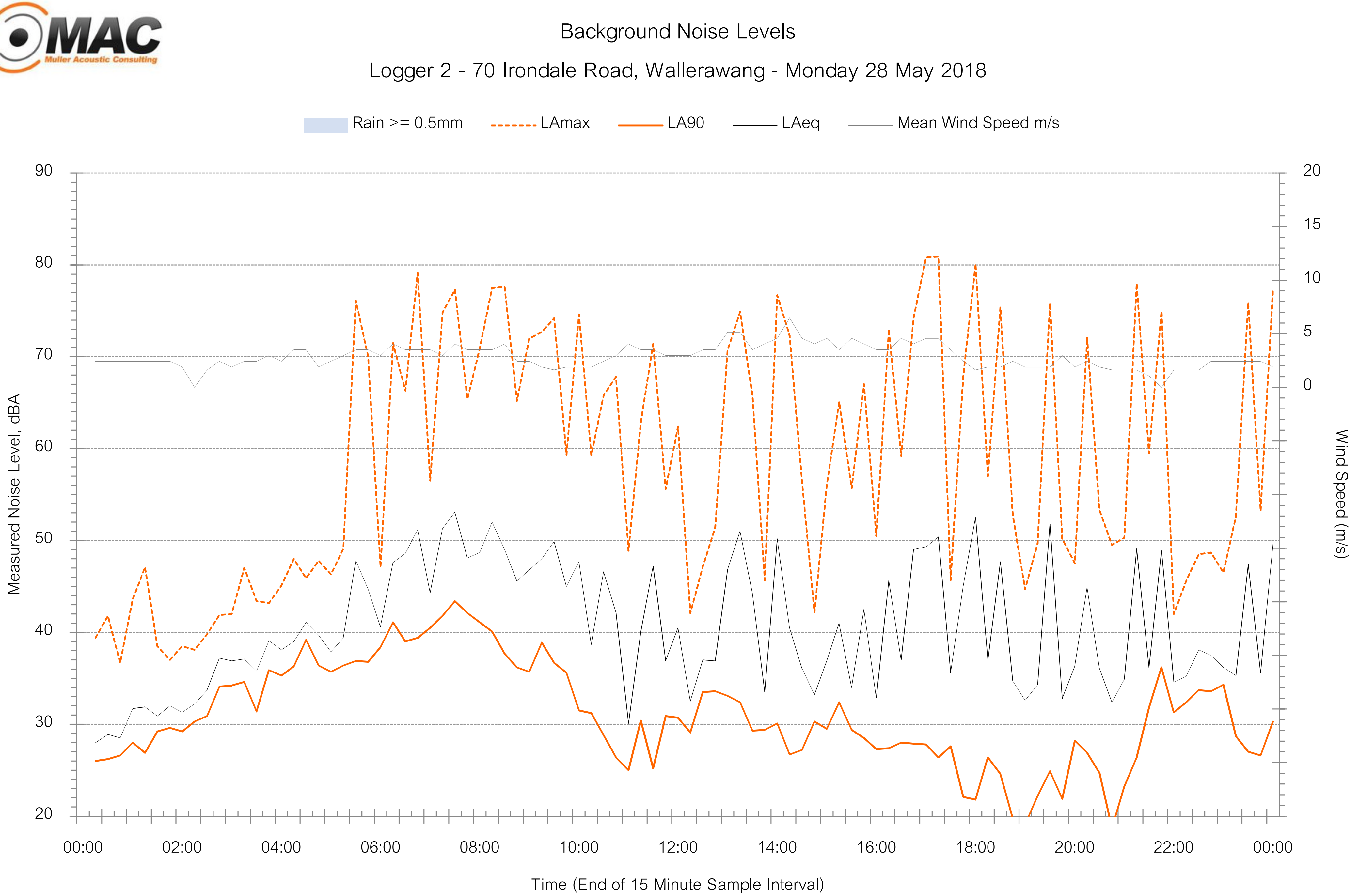
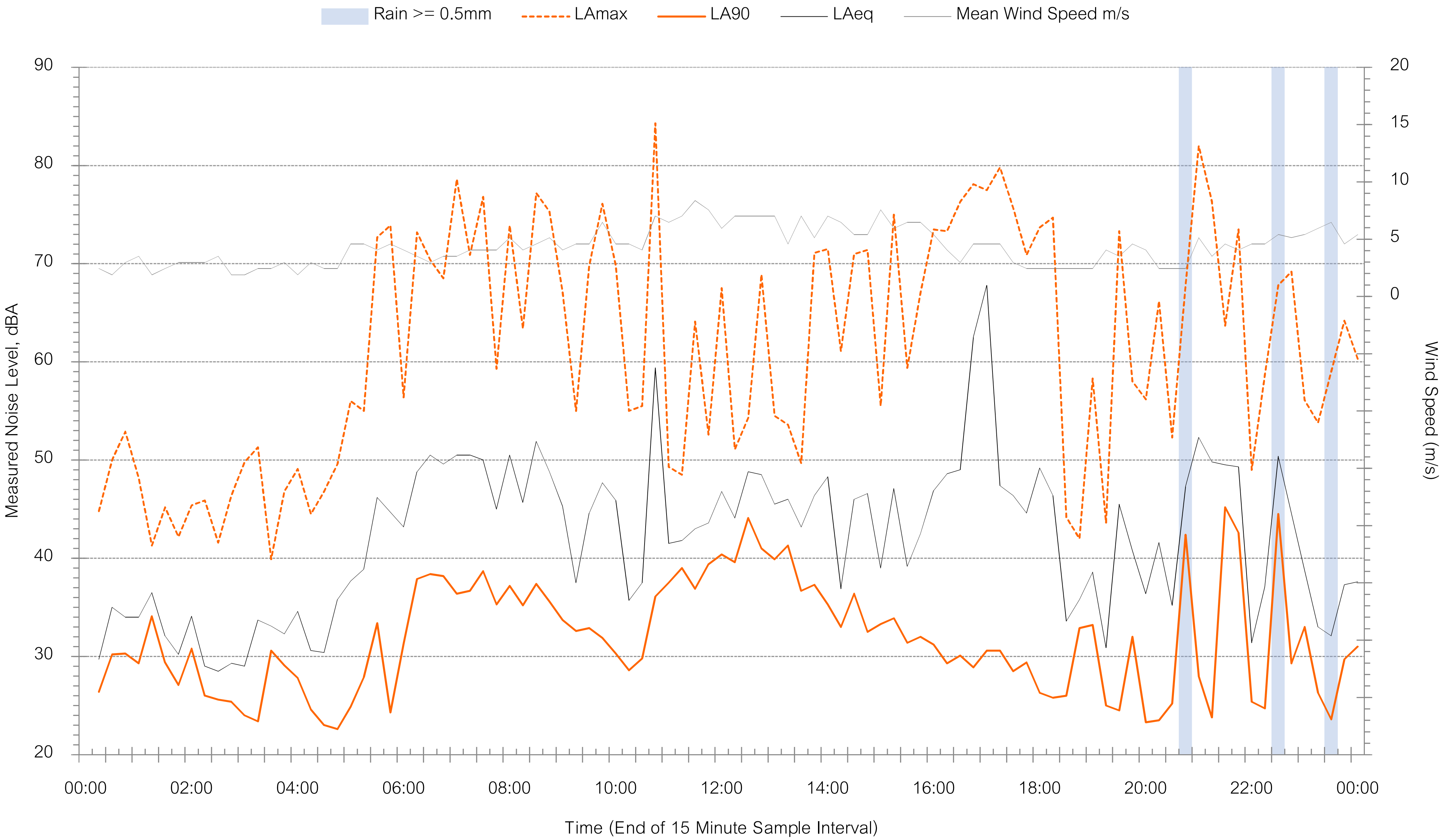
Time (End of 15 Minute Sample Interval)



Background Noise Levels
Logger 2 - 70 Irondale Road, Wallerawang - Monday 28 May 2018
Rain >= 0.5mm
LAmax
LA90
LAeq
Mean Wind Speed m/s
Measured Noise Level, dBA
Wind Speed (m/s)
Time (End of 15 Minute Sample Interval)

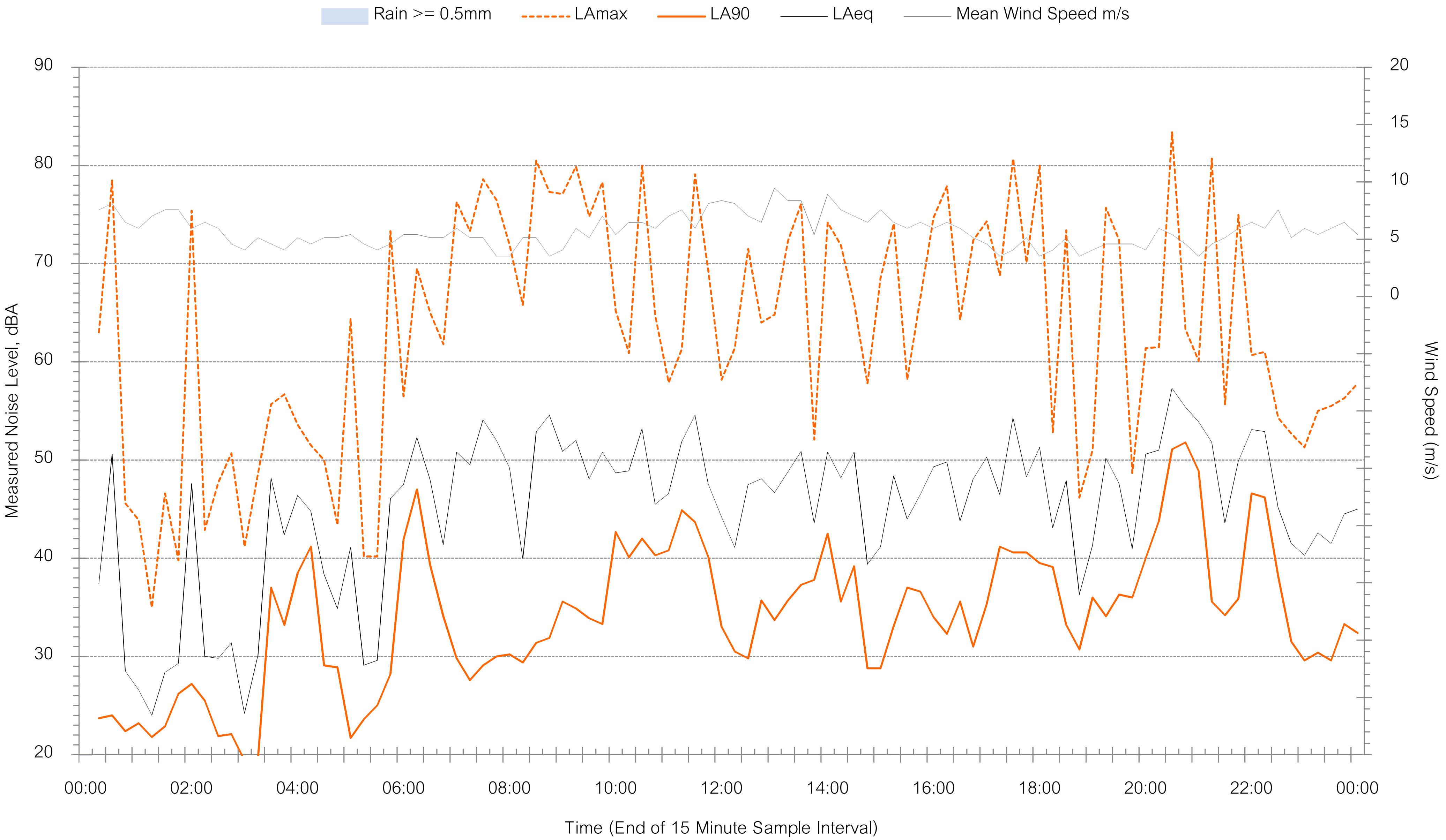
Background Noise Levels

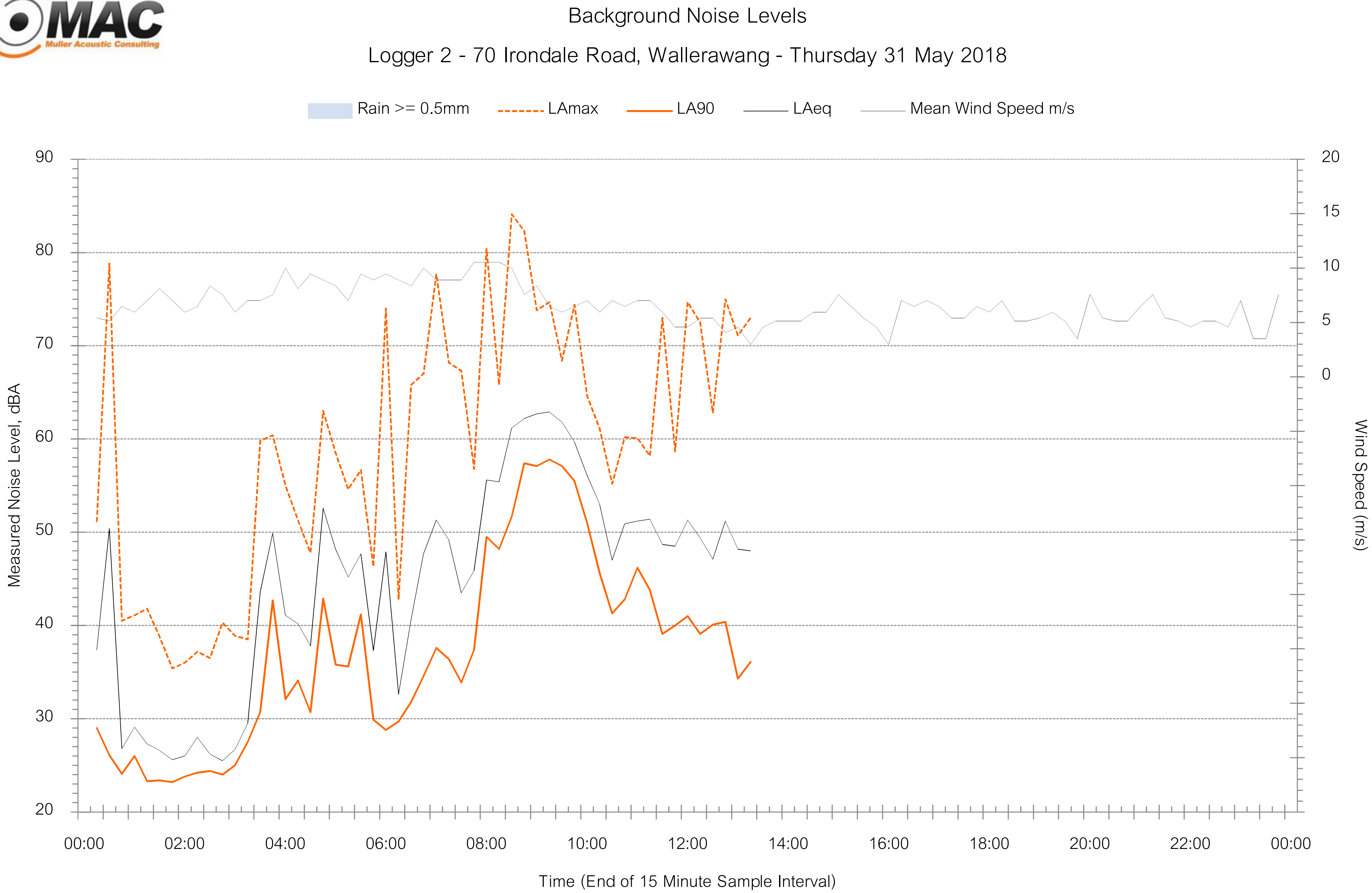
Logger 2 - 70 Irondale Road, Wallerawang - Tuesday 29 May 2018



Background Noise Levels

Logger 2 - 70 Irondale Road, Wallerawang - Wednesday 30 May 2018





Background Noise Levels
Logger 2 - 70 Irondale Road, Wallerawang - Thursday 31 May 2018
Rain >= 0.5mm
LAmax
LA90
LAeq
Mean Wind Speed m/s
Measured Noise Level, dBA
Wind Speed (m/s)
90
80
70
60
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06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
00:00
Time (End of 15 Minute Sample Interval)

Muller Acoustic Consulting Pty Ltd
PO Box 262, Newcastle NSW 2300
ABN: 36 602 225 132
P: +61 2 4920 1833
www.mulleracoustic.com

MAC
Muller Acoustic Consulting