APPENDIX

E

Horizontal Clearances

Noise and Vibration Impact Assessment

DOCUMENT ACCESSIBILITY

Inland Rail is committed to providing digital content that is easily accessible to the widest possible audience, regardless of ability or technology.

If you encounter any accessibility issues within this document please contact us via email at irdigital@artc.com.au or via post at:

Digital Engagement Team
Australian Rail Track Corporation
Inland Rail
GPO Box 2462
Brisbane Qld 4001

If English is your second language and/or you need help reading this document, please call 131 450. This is a free service.

ARTC INLAND RAIL

STOCKINBINGAL TO PARKES (S2P) – HORIZONTAL CLEARANCES

NOISE AND VIBRATION IMPACT ASSESSMENT

TABLE OF CONTENTS

GLOSSARY VI

EXECUTIVE SUMMARY IX

1 INTRODUCTION 1

1.1 THE PROPONENT 1

1.2 THE PROPOSAL 2

1.3 PURPOSE OF THIS REPORT 2

1.4 STRUCTURE OF THIS REPORT 3

1.5 RELEVANT GUIDELINES AND LEGISLATION 3

1.6 PROPOSAL OVERVIEW 4

2 EXISTING ENVIRONMENT 7

2.1 EXISTING NOISE ENVIRONMENT 7

2.2 EXISTING VIBRATION ENVIRONMENT 7

2.3 NOISE SENSITIVE RECEIVERS 7

2.4 NOISE CATCHMENT AREAS 9

2.5 BACKGROUND NOISE MONITORING 10

2.6 UNATTENDED NOISE SURVEY 11

2.7 OPERATOR ATTENDED NOISE SURVEY 12

3 NOISE AND VIBRATION ASSESSMENT CRITERIA 20

3.1 CONSTRUCTION NOISE CRITERIA 20

3.2 CONSTRUCTION VIBRATION CRITERIA 25

3.3 OPERATIONAL NOISE CRITERIA 27

3.4 GROUND-BORNE RAIL NOISE TRIGGER LEVELS 28

3.5 OPERATIONAL GROUND VIBRATION CRITERIA 28

4 CONSTRUCTION NOISE ASSESSMENT 29

4.1 CONSTRUCTION METHODOLOGY 29

4.2 DURATION OF WORKS 29

4.3 WORKING HOURS 30

4.4 CONSTRUCTION NOISE MODELLING METHODOLOGY 33

CONTENTS (Continued)

4.5 RESIDENTIAL CONSTRUCTION NOISE LEVELS 34

4.6 NON-RESIDENTIAL CONSTRUCTION NOISE LEVELS 40

4.7 CONSTRUCTION TRAFFIC ASSESSMENT 41

4.8 DISCUSSION OF CONSTRUCTION NOISE IMPACTS 42

4.9 CUMULATIVE CONSTRUCTION NOISE ASSESSMENT 46

4.10 RESIDUAL CONSTRUCTION NOISE IMPACTS 47

5 CONSTRUCTION VIBRATION ASSESSMENT 55

6 OPERATIONAL NOISE ASSESSMENT 57

6.1 TRAIN OPERATION 57

6.2 TRAIN NUMBERS 57

6.3 OPERATIONAL NOISE MODELLING METHODOLOGY 58

6.4 OPERATIONAL NOISE LEVELS – PROPOSAL OPENING (2027) 59

6.5 OPERATIONAL NOISE LEVELS – FUTURE CAPACITY (2039) 60

6.6 NON-RESIDENTIAL SENSITIVE RECEIVERS 62

6.7 LEVEL CROSSINGS 62

6.8 SUMMARY OF NOISE MITIGATION TRIGGERS 63

6.9 VIBRATION FROM RAILWAY OPERATIONS 65

7 MITIGATION AND MANAGEMENT MEASURES 66

7.1 CONSTRUCTION NOISE AND VIBRATION MANAGEMENT MEASURES 66

7.2 OPERATIONAL NOISE MITIGATION 68

8 CONCLUSION 70

9 REFERENCES 71

LIST OF TABLES

TABLE 1.1 ASSESSMENT GUIDELINES..3
TABLE 1.2 KEY FEATURES AT EACH PROPOSAL SITE............................4
TABLE 1.3 SUMMARY OF PROPOSED HORIZONTAL TRACK REALIGNMENT WORKS 5
TABLE 2.1 IDENTIFIED NOISE SENSITIVE RECEIVERS............................7
TABLE 2.2 NOISE CATCHMENT AREAS (NCAS) 9
TABLE 2.3 NOISE MONITORING LOCATIONS 10
TABLE 2.4 SUMMARY OF UNATTENDED NOISE MONITORING RESULTS (CONSTRUCTION PERIODS).................................11
TABLE 2.5 SUMMARY OF UNATTENDED NOISE MONITORING RESULTS (RAIL PERIODS)..12
TABLE 2.6 SUMMARY OF ATTENDED NOISE MEASUREMENT RESULTS...13
TABLE 3.1 APPLICATION OF THE ICNG NOISE MANAGEMENT LEVELS...21
TABLE 3.2 NOISE MANAGEMENT LEVELS AT RESIDENTIAL RECEIVERS..22
TABLE 3.3 NOISE MANAGEMENT LEVELS FOR NON-RESIDENTIAL SENSITIVE RECEIVERS (WHEN IN USE) 24
TABLE 3.4 ROAD NOISE POLICY ASSESSMENT CRITERIA.....................25
TABLE 3.5 BS 7385-2 GUIDELINE VIBRATION LIMITS FOR COSMETIC DAMAGE..26
TABLE 3.6 HUMAN COMFORT (AMENITY) GUIDELINE VIBRATION LIMITS (INTERMITTENT WORK)...........................26
TABLE 3.7 GUIDELINE VIBRATION LIMITS FOR COSMETIC DAMAGE...26
TABLE 3.8 AIRBORNE RESIDENTIAL NOISE TRIGGER LEVELS FOR REDEVELOPMENT OF EXISTING RAIL LINE 27
TABLE 3.9 GROUND-BORNE RAIL NOISE TRIGGER LEVELS FOR RESIDENTIAL AND SENSITIVE LAND USES...................28
TABLE 3.10 VIBRATION CRITERIA FOR RAIL TRAFFIC 28
TABLE 4.1 RAIL POSSESSION REQUIREMENTS 30
TABLE 4.2 INDICATIVE PLANT AND EQUIPMENT AND SOUND POWER LEVELS (SWL) 31
TABLE 4.3 PREDICTED CONSTRUCTION NOISE LEVELS AT RESIDENTIAL RECEIVERS..34
TABLE 4.4 MAXIMUM PREDICTED NOISE LEVELS (SLEEP DISTURBANCE) 39
TABLE 4.5 PREDICTED CONSTRUCTION NOISE LEVELS AT RESIDENTIAL RECEIVERS..40
TABLE 4.6 PREDICTED CONSTRUCTION TRAFFIC ROUTES AND NUMBERS (SINGLE DIRECTION)...................................41

LIST OF TABLES (CONTINUED)

TABLE 4.7 PROJECTS POTENTIALLY AFFECTING CUMULATIVE NOISE IMPACTS 46
TABLE 4.8 INDICATIVE NOISE REDUCTION FROM CONSTRUCTION CONTROLS 47
TABLE 4.9 ASSUMED MITIGATION MEASURES – POTENTIAL NOISE REDUCTIONS....47
TABLE 4.10 PREDICTED CONSTRUCTION NOISE EXCEEDANCES AT RESIDENTIAL RECEIVERS (PER NCA) 48
TABLE 4.11 MAXIMUM PREDICTED RESIDUAL NOISE LEVELS (SLEEP DISTURBANCE) 52
TABLE 5.1 RECOMMENDED MINIMUM WORKING DISTANCES FOR VIBRATION INTENSIVE PLANT 55
TABLE 5.2 LOCATIONS OF POTENTIAL EXCEEDANCES OF MINIMUM WORKING DISTANCES 56
TABLE 6.1 TYPICAL DAILY TRAIN NUMBERS FOR NOISE MODELLING (BOTH DIRECTIONS) 57
TABLE 6.2 SUMMARY OF TOTAL DAILY TRAIN MOVEMENTS (EACH DIRECTION) 58
TABLE 6.3 NOISE MODELLING INPUTS AND PARAMETERS....58
TABLE 6.4 ASSESSMENT OF RAILWAY NOISE LEVELS 2027 59
TABLE 6.5 ASSESSMENT OF RAILWAY NOISE LEVELS 2039 61
TABLE 6.6 ASSESSMENT OF RAILWAY NOISE LEVELS AT NON-RESIDENTIAL SENSITIVE RECEIVERS....62
TABLE 6.7 SUMMARY OF NOISE MITIGATION TRIGGERS 63
TABLE 6.8 GROUND-BORNE VIBRATION ASSESSMENT....65
TABLE 7.1 ARTC INLAND RAIL NOISE AND VIBRATION MANAGEMENT MEASURES FOR DETAILED DESIGN/PRE-CONSTRUCTION....66
TABLE 7.2 COMPILATION OF MITIGATION MEASURES FOR CONSTRUCTION 67
TABLE 7.3 ARTC INLAND RAIL NOISE AND VIBRATION MANAGEMENT MEASURES FOR DETAILED DESIGN/PRE-CONSTRUCTION....68

LIST OF FIGURES

FIGURE 1.1 PROPOSAL OVERVIEW..6
FIGURE 2.1 NOISE SENSITIVE RECEIVERS..14

LIST OF APPENDICES

APPENDIX A DETAILED NOISE MONITORING RESULTS
APPENDIX B CONSTRUCTION NOISE FAÇADE NOISE MAPS
APPENDIX C PREDICTED RAILWAY NOISE LEVELS

GLOSSARY

TERM	DESCRIPTION
Noise terms	
Acoustic barrier	Solid walls or partitions, solid fences, earth mounds, earth berms, buildings, etc used to reduce noise, without eliminating it.
Ambient noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.
Assessment period	The period in a day over which assessments are made.
Background noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise environment, measured in the absence of the noise under investigation, when extraneous noise is removed. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L_{90} noise level (see below).
Decibels (dB)	The human ear responds to minute pressure variations in the air. These pressure variations can be likened to the ripples on the surface of water but of course cannot be seen. The pressure variations in the air cause the eardrum to vibrate and this is heard as sound in the brain. The stronger the pressure variations, the louder the sound is heard. The range of pressure variations associated with everyday living may span over a range of a million to one. On the top range may be the sound of a jet engine and on the bottom of the range may be the sound of a pin dropping. Instead of expressing pressure in units ranging from a million to one, it is found convenient to condense this range to a scale 0 to 120 and give it the units of decibels. The following are examples of the decibel readings of every day steady or quasi-steady sounds. *0dB the faintest sound we can hear under perfect conditions* *20dB quiet bedroom at night or recording studio* *30dB quiet library or quiet location in the country* *40dB living room* *50dB typical office space or ambience in the city at night* *60dB normal conversational speech* *70dB a car passing by* *80dB kerbside of a busy road* *90dB truck passing by* *100dB nightclub* *110dB rock band or 2m from a jackhammer* *120dB 70m from a jet aircraft* *130dB threshold of pain* *140dB 25m from a jet aircraft*

TERM	DESCRIPTION
dB(A); A-weighted decibels	The ear is not as effective in hearing low frequency sounds as it is hearing high frequency sounds. That is, low frequency sounds of the same sound pressure level are not heard as loud as high frequency sounds. The sound level meter attempts to replicate the human response of the ear by using an electronic filter which is called the “A” filter. A sound level measured with this filter switched in is denoted as dB(A). Most environmental noise is measured using the A filter.
Diffraction	The bending of sound waves around solid obstacles.
Frequency	Of a periodic quantity: the time rate of repetition. The reciprocal of the period. Frequency is measured in hertz (Hz).
Loudness	A 3dB increase represents a doubling of the sound pressure, however an increase of about 10dB is required before the sound will subjectively appear to be twice as loud. That is, a sound of 85dB is twice as loud as a sound of 75dB which is twice as loud as a sound of 65dB and so on. That is, the sound of 85dB is four times as loud as a sound of 65dB. The smallest change which can be readily heard is approximately 2dB. An increase beyond 5dB is considered to represent the level at which a change in loudness begins to be clearly perceived.
L_{90}	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
L_{eq}	Equivalent sound pressure level – the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level occurring. The sound weighting of the noise measurement is commonly added, for example L_{Aeq} or L_{Ceq}.
Reflection	Sound wave changed in direction of propagation due to a solid object obscuring its path.
SEL	Sound Exposure Level (SEL) is the constant sound level which, if maintained for a period of one second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain L_{eq} sound levels over any period of time and can be used for predicting noise at various locations.
Sound level meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound pressure level	The level of sound pressure, expressed in decibels, as measured by a standard sound level meter with a microphone.
Sound power level	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.
Structure-borne noise	Vibration propagating through solid structures in the form of compression or bending waves, heard as sound.

TERM	DESCRIPTION
Vibration terms	
Acceleration	A vector quantity that specifies the time derivative of velocity.
Accelerometer	A piezoelectric sensor that converts an input acceleration to an output (usually electrical) that is proportional to the input acceleration.
Ambient vibration	The all-encompassing vibration associated with a given environment, usually a composite of vibration from many sources, far and near.
Amplitude	The maximum value of a sinusoidal quantity.
Crest factor	The ratio of the peak value to the r.m.s. value.
Cycle	The complete range of states or values through which a periodic phenomenon or function passes before repeating itself identically.
Displacement	A vector quantity that specifies the change of position of a body or particle with respect to a reference frame.
Frequency	The reciprocal of the period when the independent variable is time.
Hertz (Hz)	Units in which frequency is expressed. Synonymous with cycles per second.
Peak value	The maximum value of a quantity during a given interval.
Peak-to-peak value	Of an oscillating quantity. The algebraic difference between the extreme values of the quantity.
Periodic vibration	A periodic quantity whose values recur for certain equal increments of the independent variable.
Resonance	Of a system in forced oscillation. The condition of the system when any change in the frequency of excitation, however small the change, causes a degrease in a response of the system.
Resonance frequency	A frequency at which resonance occurs.
RMS	Root Mean Square of the acceleration value of the vibration source. This measure allows for the magnitude of the vibration, regardless of its direction.
Spectrum	A description of a quantity as a function of frequency or wavelength.
Transducer	A device that receives energy from one system and supplies energy, of either the same or a different kind, to another system in such a manner that the desired characteristics of the input energy appear at the output.
Velocity	A vector quantity that specifies the time derivative of displacement.
Wavelength	Of a periodic wave. The distance, measured perpendicular to the wave front in the direction of propagation, between two successive points on the wave that are separated by one period.

EXECUTIVE SUMMARY

The Inland Rail program is a 1,700-kilometre interstate freight rail corridor that will connect Melbourne and Brisbane, via central-west New South Wales (NSW) and Toowoomba in Queensland (QLD).

The Stockinbingal to Parkes (S2P) section forms a key component of the Inland Rail program. It is a 173km section of existing rail corridor located in regional NSW between the towns of Stockinbingal and Parkes.

A number of enhancement works, which do not constitute a complete upgrade of the track alignment, are required to be undertaken in this section. These works include construction or removal of various structural and track assets along the alignment.

This Noise and Vibration Impact Assessment (NVIA) has been prepared for the Horizontal Clearances works which involve works to achieve horizontal clearances at six sites Forbes Station and Yard, Wirrinya Yard, Caragabal Yard, Quandialla Yard, Bribbaree Yard and Milvale Yard.

The temporary construction works are required to be undertaken adjacent to sensitive receivers and the proposed activities can be inherently noisy. The assessment has identified noise and vibration from most of the construction works can be controlled through the application of feasible and reasonable management and mitigation approaches. These measures include the development of construction environmental management plan.

There are activities, such as track works, and works outside the standard daytime hours that have the potential to result in noise above the adopted noise management levels and require additional controls, for example out of hours protocols, to manage impacts to nearby communities. Sleep disturbance is predicted from construction activities conducted the night-time at Forbes Station and Yard, Wirrinya Yard, Caragabal Yard and Bribbaree Yard.

All construction noise impacts are temporary and confined to discrete periods. Notwithstanding, noise management and mitigation measures would therefore be required to be implemented during construction of the proposal within the extent that is reasonable and feasible.

The proposed upgrade of railway infrastructure at each site is a relatively minor change in track alignment and is not a material influence on railway noise levels.

The horizontal clearances are part of upgrades to facilitate the future railway operations on Inland Rail. The assessment also considered the noise and vibration from railway operations Inland Rail, for example future train movements and track speeds. The assessment determined that railway noise management levels would be met at most sensitive receivers at the opening of the proposal in 2027 and the future rail capacity with Inland Rail in 2039.

In summary, the predicted railway noise levels trigger the investigation of feasible and reasonable noise mitigation measures at three residences in 2027 and 13 receivers in 2039. The mitigation triggers were a result of the future railway operations not the upgrade works as part of the proposed horizontal clearances. These receivers were predicted as follows:

- Forbes Yard
  - During the proposal opening (2027) and future capacity (2039) scenarios, there is one residential receiver triggered for a review of mitigation. This receiver is located on the corner of Union Street and Lewis Street, approximately 40m from the railway alignment at its closest point.
- Wirrinya Yard
  - During both the proposal opening (2027) the future capacity (2039) scenarios, one receiver triggers a review of railway noise mitigation in the Wirrinya area, and is located along Wirrinya Road, approximately 20m from the rail alignment.

- Caragabal Yard
  - During the proposal opening (2027) scenario, no residential receivers trigger a review of railway noise mitigation in the Caragabal area.
  - During the future capacity (2039) scenario, two residential receivers have triggered a review of railway noise mitigation in the Caragabal area. These receivers are located along Railway Street.
- Bribbaree Yard
  - During the proposal opening (2027) scenario, one receiver triggers a review of railway noise mitigation in the Bribbaree area. This receiver is located along Short Street.
  - During the future capacity (2039) scenario, nine residential receivers trigger a review of railway noise mitigation in the Bribbaree area. These receivers are located along Short Street, Railway Street and one residential receiver on the corner of Bribbaree Street and Weedallion Street.

These receivers would be eligible for consideration of feasible and reasonable mitigations. For these sensitive receivers the feasible and reasonable noise mitigation is likely to be at-property treatments such as upgrades to glazing and the building construction and property fencing. A review of noise levels would be undertaken following commencement of the proposal and where it is confirmed that a receiver exceeds operational noise and vibration criteria, specific mitigation measures for each property would be confirmed.

Ground-borne noise and vibration from railway operations is expected to meet relevant assessment criteria at the sensitive receivers.

There is still potential for impacts from perceptible noise and vibration, even where the assessment criteria are achieved. A range of noise management and mitigation measures have been recommended as part of ARTC’s strategy for reducing noise and vibration and managing associated impacts on Inland Rail.

It is recommended that noise and vibration continue to be assessed during the detailed design and pre-construction phase to verify the outcomes of this assessment and confirm mitigation requirements.

1 INTRODUCTION

The Australian Government has committed to delivering a significant piece of national transport infrastructure that will provide a safe, sustainable solution to the freight challenge that exist on Australia's east coast. The Inland Rail program is a 1,700-kilometre interstate freight rail corridor that will connect Melbourne and Brisbane, via central-west New South Wales (NSW) and Toowoomba in Queensland (QLD).

Inland Rail would enhance Australia's existing national rail network and serve the interstate freight market. Key components of the proposal include:

- using the existing interstate rail line though Victoria and southern NSW
- upgrading about 400 kilometres (km) of existing track, mainly in western NSW
- providing about 600km of new track in northern NSW and south-east QLD.

The objectives of Inland Rail are to:

- provide a rail link between Melbourne and Brisbane that is interoperable with train operations to Perth, Adelaide, and other locations on the standard gauge rail network, to serve future rail freight demand, and stimulate growth for inter-capital and regional/bull rail freight
- provide an increase in productivity that would benefit consumers though lower freight transport costs
- provide a step-change improvement in rail service quality in the Melbourne to Brisbane corridor and deliver a freight rail service that is competitive with road
- improve road safety, ease congestion, and reduce environmental impacts by moving freight from road to rail
- bypass bottlenecks within the existing metropolitan rail networks, and free up train paths for other services along the coastal route; and
- act as an enabler for regional economic development along the Inland Rail corridor.

The Inland Rail program is divided into 13 individual projects, with seven located in NSW.

1.1 THE PROPONENT

Australian Rail Track Corporation (ARTC) is the proponent for the proposal and has a ten-year program to delivery Inland Rail. ARTC is an Australian Government owned statutory corporation that manages more than 8,500km of rail track in NSW, QLD, South Australia, Victoria and Western Australia. ARTC is responsible for:

- selling access to the rail network to train operators
- capital investment in the network
- managing train operational across the network
- maintaining the network
- developing new business.

Further information on ARTC and Inland Rail can be found at www.artc.com.au and www.inlandrail.artc.com.au.

1.2 THE PROPOSAL

The Stockinbingal to Parkes (S2P) section forms a key component of the Inland Rail program. It is a 173km section of existing rail corridor located in regional NSW between the towns of Stockinbingal and Parkes.

A number of enhancement works (which do not constitute a complete upgrade of the track alignment) are required to be undertaken in this section, including works to, construction or removal of various structural and track assets along the alignment. Due to the number of enhancement works required along the S2P corridor, the environmental approvals have been split into four Review of Environmental Factors (REF) packages:

- Horizontal Clearances (clearance works at six sites)
- Lachlan River bridge (clearance works)
- Wyndham Avenue bridge (track lowering)
- Daroobalgie (new crossing loop).

This Noise and Vibration Impact Assessment (NVIA) has been prepared for the Horizontal Clearances works (hereafter referred to as "the proposal") which involve works to achieve horizontal clearances at six sites:

- Forbes Station and Yard
- Wirrinya Yard
- Caragabal Yard
- Quandialla Yard
- Bribbaree Yard
- Milvale Yard.

The proposed works at Quandialla and Milvale were determined to not represent rail infrastructure works and, on this basis, an assessment of noise and vibration was not required at these work areas.

1.3 PURPOSE OF THIS REPORT

This NVIA has been prepared as part of the Review of Environmental Factors (REF) for the proposal to:

- identify the noise and vibration assessment study area and associated sensitive receivers
- describe the existing noise environment
- define the assessment criteria adopted to assess the proposal's noise and vibration impacts
- present predicted operational noise and vibration levels associated with the proposal
- present the feasible and reasonable mitigation measures that should be considered for noise and vibration impacts.

This report has been prepared with reference to the previous noise and vibration assessment for the proposal [*Inland Rail – Stockinbingal to Parkes, Horizontal Track Clearances, Review of Environmental Factors, Report no. 2-0002-230-EAP-05-RP-2001, Version C, Lycopodium* (February 2019)] (the 2019 REF).

1.4 STRUCTURE OF THIS REPORT

The structure of the report is as follows:

- Chapter 1 – Introduction – Introduces the report
- Chapter 2 – Existing environment – Describes the existing noise environment of the assessment area and identifies sensitive receivers
- Chapter 3 – Noise and vibration assessment criteria – Describes the assessment according to relevant guidelines
- Chapter 4 – Construction noise assessment – Describes the methodology and predicted noise impacts generated by construction of the proposal
- Chapter 5 – Construction vibration assessment – Describes the methodology and predicted vibration impacts generated by the construction of the proposal
- Chapter 6 – Operational rail noise and vibration assessment
- Chapter 7 – Mitigation and management measures – Details recommended mitigation measures to minimise noise and vibration impacts
- Chapter 8 – Conclusion – Overview of the key findings of the report.

1.5 RELEVANT GUIDELINES AND LEGISLATION

This report has been written in accordance with ARTC's *Inland Rail NSW Construction noise and vibration management framework* (CNVF) and *Inland Rail Technical Specification for noise and vibration assessments* (0-9000-ENV-00-SP-0001_0) as the assessment framework.

The assessment has been prepared with reference to the documents presented in Table 1.1.

Table 1.1 Assessment guidelines

ACOUSTIC ASPECT	DESCRIPTION	ASSESSMENT GUIDELINES
Airborne noise	Operational noise	*Rail Infrastructure Noise Guideline* (NSW Environmental Protection Authority, 2013) (RING)
	Construction noise	*Interim Construction Noise Guideline* (DECCW, 2009) (ICNG) *Construction Noise and Vibration Strategy* 2019 (TfNSW, 2019) (CNVS)
	Construction traffic noise	*NSW Road Noise Policy* (DECCW, 2011) (RNP) *Construction Noise and Vibration Guideline* (CNVG) (Roads and Maritime, 2016)
	Sleep disturbance from construction noise (for work lasting more than 2 consecutive nights)	*Interim Construction Noise Guideline* (DECCW, 2009) *NSW Road Noise Policy* (DECCW, 2011)
	Existing ambient and background noise levels	*Interim Construction Noise Guideline* (DECCW, 2009) *Noise Policy for Industry* (EPA, 2017) *Australian Standard AS 1055 Description and measurement of environmental noise (AS1055)*

ACOUSTIC ASPECT	DESCRIPTION	ASSESSMENT GUIDELINES
Ground-borne noise	Construction noise transmitted through the ground into a structure	*Interim Construction Noise Guideline* (DECCW, 2009)
Vibration	Construction vibration amenity impacts	*Assessing Vibration: a Technical Guideline* (DEC, 2006) (AVaTG)
	Construction vibration effect on structures (structural or cosmetic damage)	*British Standard BS 7358-2: Evaluation and measurement for vibration in buildings guide to damage levels from ground-borne vibration* (BS7358-2) *Construction Noise and Vibration Strategy* 2019 (TfNSW, 2019) *German Standard DIN 4150-3:1999-02, Structural vibration Part 3: Effects of vibration on structures* (1999).
Management	Mitigation and management of noise and vibration issues	*Interim Construction Noise Guideline* (DECCW, 2009) *Construction Noise and Vibration Management Framework 2017* (ARTC, 2017)

1.6 PROPOSAL OVERVIEW

The proponent is seeking to increase horizontal clearances within the rail corridor between Stockinbingal and Forbes, (the proposal) to accommodate double stack freight trains up to 1800 metres long and 6.5 metres high. The existing horizontal clearances of the six sites do not provide the nominated clearance requirements.

The proposed works to achieve the required horizontal clearances include realigning the track away from the adjacent track or structures and by modifying the adjacent structures. Ancillary works include establishing construction compounds and laydown, constructing associated drainage and adjusting signalling, communications, and utilities. The key proposed works at each enhancement site (north to south) are described in Table 1.2. These descriptions are subject to detailed design.

Table 1.2 Key features at each proposal site

SITE	KEY FEATURES
Forbes Station and Yard	— Realignment of approximately 500m of the main line by up to 540mm and associated drainage works. — Realignment of approximately 140m of the goods siding track including installation of a new catch point. — Trimming of the platform awning at Forbes Station by 300mm for the full length.
Wirrinya Yard	— Realignment of approximately 520m of track by up to 350mm.
Caragabal Yard	— Realignment of approximately 250m of track by up to 30mm.
Quandialla Yard	— Removal of redundant pipework from a water tank adjacent to the track.
Bribbaree Yard	— Realignment of approximately 940m of track by up to 300mm, including formation and associated drainage works.
Milvale Yard	— Removal of redundant wiring from a water tank adjacent to the track.

1.6.1 TRACK WORKS

The proposal requires the track to be realigned horizontally to provide compliant clearances to the existing structures and adjacent tracks. At four of the sites, the track will be realigned horizontally by up to 540mm as outlined in Table 1.3.

The existing sleepers and ballast are proposed to be retained, wherever practicable, however additional ballast will be required at various sites and some replacement sleepers may also be required. Earthworks are not proposed for realignments less than 350mm except at Bribbaree Yard where a section of the track formation has been assessed as inadequate and therefore a new formation would be established.

Table 1.3 Summary of proposed horizontal track realignment works

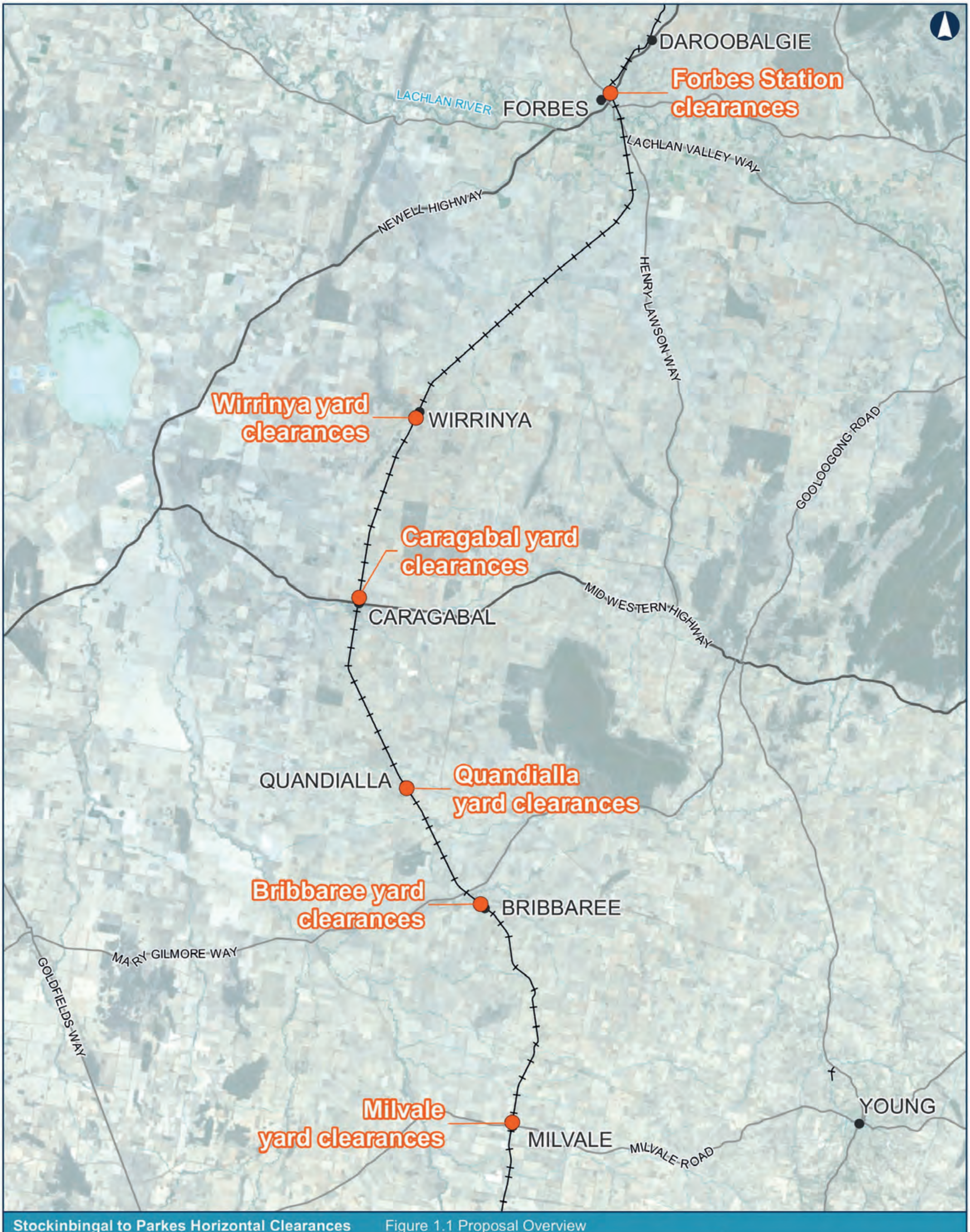
HORIZONTAL CLEARANCE SITE	LINE	HORIZONTAL REALIGNMENT	LENGTH OF REALIGNMENT
Forbes Station and Yard	Main line	Up to 540mm	Approximately 500m
	Goods siding	Up to 350mm	Approximately 140m
Wirrinya Yard	Loop line	Up to 350mm	Approximately 400m
	Grain line	Up to 250mm	Approximately 120m
Caragabal Yard	Main line	Up to 30mm	Approximately 250m
Bribbaree Yard	Main line	Up to 300mm	Approximately 940m

1.6.2 WATER TANK WORKS

Water tank infrastructure adjacent to the track at Milvale Yard and Quandialla Yard would be modified to allow for the appropriate horizontal clearance to the track.

The proposed works at Milvale Yard include removal of redundant wiring, whilst Quandialla Yard involves removal of redundant pipe and flange.

Stockinbingal to Parkes Horizontal Clearances Figure 1.1 Proposal Overview



Coordinate System: GDA 1994 MGA Zone 55

ARTC makes no representation or warranty and assumes no duty of care or other responsibility to any party as to the completeness, accuracy or suitability of the information contained in this GIS map. The GIS map has been prepared from material provided to ARTC by an external source and ARTC has not taken any steps to verify the completeness, accuracy or suitability of that material.
ARTC will not be responsible for any loss or damage suffered as a result of any person whatsoever placing reliance upon the information contained within this GIS map.

Date: 5/08/2021 Paper: A3
Author: WSP Scale: 1:350,000
Data Sources: ARTC, NSWSS

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

D:\WSP O365\AU-WKG - Geospatial - AIS - Projects\PS122419_Albury_to_Illabo\Tasks\230_0004_EAP_REFReportFigures\Documents\04_HorizontalClearances\95pc\230_EAP_HorizontalClearances_NV_ProposalOverview_r1v1.mxd

2 EXISTING ENVIRONMENT

2.1 EXISTING NOISE ENVIRONMENT

Except for works at Forbes Station, the proposal locations are situated in predominately rural areas in regional NSW, between the towns of Stockinbingal and Parkes. The existing noise environment at each site is generally influenced by local and highway noise in addition to train noise at the time of a passby. Natural noise sources such as insects, birds and dogs are commonly audible.

2.2 EXISTING VIBRATION ENVIRONMENT

The most significant existing sources of vibration within the study area is heavy vehicle traffic on the local road network and existing train movements.

Cosmetic building damage as a result of vibration from train movements is generally not a concern at distances exceeding approximately five metres. For human comfort, this distance is more likely to be in the order of 10 to 15m, and as such, existing ground vibration levels may be higher than the recommended human comfort levels at some locations. Existing ground vibration levels from intermittent road and rail traffic are expected to be low but not inconsequential.

2.3 NOISE SENSITIVE RECEIVERS

The nearest noise-sensitive receivers to each proposal site are outlined in Table 2.1 and shown in Figure 2.1.

Table 2.1 Identified noise sensitive receivers

PLAN NUMBER OR ADDRESS	RECEIVER TYPE	DIRECTION FROM PROPOSAL	DISTANCE FROM PROPOSAL (m)
Forbes Station and Yard			
2 Parkes Rd, Forbes	Industrial	East	35
8 Union, St, Forbes	Residential	West	90
17 Union St, Forbes	Industrial	West	115
4 Little Union St, Forbes	Residential	West	110
Little Union St, Forbes	Industrial	West	220
8 Calarie Rd, Forbes	Residential	West	295
27 Calarie Rd, Forbes	Residential	North	395
60 Patterson St, Forbes	Residential	North	510
50 Sam St, Forbes	Residential	East	220
42-46 Sam St, Forbes	Industrial	East	65
Forbes Golf Club, 17 Parkes Rd, Forbes	Active recreation	East	95

PLAN NUMBER OR ADDRESS	RECEIVER TYPE	DIRECTION FROM PROPOSAL	DISTANCE FROM PROPOSAL (m)
Wirrinya Yard			
3745 Wirrinya Rd, Wirrinya	Residential	East	230
The Glen, 3807 Wirrinya Rd, Wirrinya	Residential	West	185
3907 Wirrinya Rd, Wirrinya	Residential	West	635
Caragabal Yard			
17 Railway St, Caragabal	Residential	West	115
10 Gibson St, Caragabal	Residential	West	120
1 Railway St, Caragabal	Residential	South	280
23 Caragabal St, Caragabal	Residential	East	165
2 Wyalong St, Caragabal	Residential	South	440
Quandialla Yard			
6 Glasson St, Quandialla	Residential	West	85
4 Second St, Quandialla	Hotel	West	280
33 Margaret St, Quandialla	Residential	West	95
2 Glasson St, Quandialla	Residential	West	110
8 Talbot St, Quandialla	Residential	West	175
Bribbaree Yard			
2 North St, Bribbaree	Residential	SW	55
6 Short St, Bribbaree	Residential	SW	20
2 Short St, Bribbaree	Residential	South	95
21 Railway St, Bribbaree	Residential	South	50
Morans Rd, Bribbaree	Residential	East	400
Milvale Yard			
18 Schillers Rd, Milvale	Residential	South East	205
1698 Milvale Rd, Milvale	Residential	South	425

2.4 NOISE CATCHMENT AREAS

Noise catchment areas (NCA) have been defined to classify groups of sensitive receivers that are likely to have a similar existing noise environment and experience similar impacts from the proposal.

The noise environments at most proposal rural sites are relatively simple with little spatial variation. As such, the majority of the locations described in Table 2.1 have been assessed using a single noise monitoring location. However, the noise environment within Forbes is more complex and as such the area surrounding Forbes Station and Yard have been separated into several NCAs.

Table 2.2 summarises the general noise environment of each NCA.

Table 2.2 Noise Catchment Areas (NCAs)

NCA ID	APPROXIMATE NUMBER OF RECEIVERS IN NCA	DESCRIPTION
NCA06a	179	Predominantly industrial area comprising of auto repair shops in the south segment of the NCA. Low density residential housing scattered among the southern and western portions of the NCA area with educational buildings located toward the north. The noise environment is characterized by insects, faint distant traffic from Patterson Street and machinery noise from auto repair shops.
NCA06b	1937	Medium density housing with St Laurence’s Parish School to the south and Forbes Public School to the north. Some commercial businesses along Johnson and Union Street. The noise environment is characterized by insects, traffic along Johnson Street and general urban hum.
NCA06c	1099	Medium density housing located on the south of the NCA boundary with mostly open farm area and some industrial land to the north east. The main shopping district for Forbes is enclosed around Lake Forbes. The noise environment is characterised by insects, traffic along Newell Highway and general urban hum.
NCA05	11	Open farmland with small areas of dense vegetation. Low density housing dotted along Wirrinya Road. The noise environment is characterized by insects, faint distant traffic and local wildlife.
NCA04a	50	Medium density single and single-story residential parallel to Mid-Western Highway. Dense bush and forest located south at Little Caragabal. The noise environment is characterised by insects, faint distant traffic and wind.
NCA04b	5	Open farmland with small pockets of low-density housing along Railway Street. The noise environment is dominated by wind and birds through vegetation.
NCA03	88	Open farmland with scattered patches vegetation and low density housing adjacent to Quandialla railway yard. Low density housing dotted along Wirrinya Road. Noise environment characterized by insects, faint distant traffic and local wildlife.
NCA02a	51	Predominantly open farmland with some low-density single storey residential receivers, educational and industrial buildings adjacent to Bribbaree railway station. The noise environment is characterised by wind and birds through vegetation.

NCA ID	APPROXIMATE NUMBER OF RECEIVERS IN NCA	DESCRIPTION
NCA02b	40	Sparse open bushland with low density housing adjacent to Bribbaree railway yard. The noise environment is characterised by wind and birds through vegetation.
NCA01	11	Open farmland with scattered patches of vegetation. The noise environment is characterised by insects, faint distant traffic and wind.

2.5 BACKGROUND NOISE MONITORING

Noise monitoring was carried out to characterise the existing noise environment in the areas surrounding each proposal site and sensitive receivers potentially impacted by the works. Noise monitoring locations were identified by WSP and approved by ARTC. The logger locations selected for the assessment were representative of the existing background and ambient noise environment in the proposal study area.

The weather conditions at the time of monitoring were correlated with the nearest Bureau of Meteorology stations and periods of affected data were removed in accordance with *Noise Policy for Industry* (NPfI) methodology. The locations of the deployed monitoring equipment are presented in Table 2.3 and shown in Figure 2.1.

Table 2.3 Noise monitoring locations

NOISE MONITORING LOCATION	SURVEY METHOD[1]	LOT AND DP	DESCRIPTION
Forbes Station and Yard			
9-1	LOG	Lot 1 DP 595711	50 Sam Street, Forbes, NSW 2871
9-3	LOG	Lot 2 DP 813918	1 Little Union Street, Forbes, NSW 2871
9-5	LOG	Lot 2 DP 813892	1 Union Street, Forbes, NSW 2871
Wirrinya Yard			
7-1	AT/LOG	Lot B DP 385041	The Glen, 3907 Wirrinya Rd, Wirrinya NSW 2871
Caragabal Yard			
6-3	LOG	Lot 11 DP 7892	13 Railway Street, Caragabal NSW 2810
6-1	AT/LOG	Lot 1 DP 700136	1 Railway Street, Caragabal NSW 2810
Quandialla Yard			
5-1	AT/LOG	Lot 4022 DP 1205163	Quandialla Road, Quandialla NSW 2721
Bribbaree Yard			
4-1	LOG	Lot 2 DP 872041	2 North Street, Bribbaree, NSW 2594
4-3	LOG	Lot 1 1007111	14 Railway Street, Bribbaree, NSW 2594
Milvale Yard			
3-1	LOG	Lot 1 DP 965153	18 Schillers Road, Milvale, NSW 2594

(1) LOG = unattended noise logging; AT = operator attended noise survey

2.6 UNATTENDED NOISE SURVEY

Unattended noise monitoring of background noise levels was carried out between 3 March 2021 and 17 March 2021.

The results are summarised in Table 2.4 and detailed daily plots of data are presented in Appendix A.

Where required, background noise levels (RBL) have been adjusted for Evening and Night periods in accordance with methodologies outlined in the NPfI. Noise monitoring parameters are discussed further in Section 3.1.2.

Table 2.4 Summary of unattended noise monitoring results (construction periods)

NCA	LOCATION	RATING BACKGROUND LEVEL (RBL) dBA			AMBIENT NOISE LEVEL dBA $L_{eq,15min}$		
		Day[1]	Evening[1]	Night[1]	Day[1]	Evening[1]	Night[1]
Forbes Station and Yard							
NCA06a	9-1	41	39	34	50	47	46
NCA06b	9-3	38	38	33	51	45	44
NCA06c	9-5	39	39[2] (47)	36	56	54	55
Wirrinya Yard							
NCA05	7-1	35[3] (24)	30[3] (27)	30[3] (20)	45	47	47
Caragabal Yard							
NCA04b	6-3	35	35	34	53	53	47
NCA04a	6-1	35[3] (28)	30[3] (23)	30[3] (19)	55	58	53
Quandialla Yard							
NCA03	5-1	35[3] (28)	31	30[3] (18)	54	53	54
Bribbaree Yard							
NCA02a	4-1	35[3] (29)	30[3] (27)	30[3] (21)	56	50	54
NCA02b	4-3	35[3] (33)	35	30[3] (25)	60	60	56
Milvale Yard							
NCA01	3-1	35[2] (30)	30[2] (45)	30[2] (21)	50	53	48

(1) Time periods defined as – Day: 7am to 6pm Monday to Saturday, 8am to 6pm Sunday; Evening, 6pm to 10pm; Night 10pm to 7am Monday to Saturday, 10pm to 8am Sunday

(2) RBL data has been adjusted for Evening and Night periods as per NPfI standard (bracketed figure indicates measured value)

(3) RBL data adjusted to minimum background levels per APFI standard (bracketed figure indicates measured value)

At several locations, it is noted that night-time rural noise levels are in fact higher than urban noise levels in areas such as Forbes. Although each location is individual, this is often due to influences from night-time noise source such as increasing heavy vehicles on highway or insects (such as frogs or crickets).

Table 2.5 Summary of unattended noise monitoring results (rail periods)

NCA	LOCATION	L_{EQ} NOISE LEVEL dBA	
		Day[1]	Night[1]
Forbes Station and Yard			
NCA06a	9-1	51	47
NCA06b	9-3	51	45
NCA06c	9-5	57	55
Wirrinya Yard			
NCA05	7-1	47	49
Caragabal Yard			
NCA04b	6-3	54	53
NCA04a	6-1	58	57
Quandialla Yard			
NCA03	5-1	55	59
Bribbaree Yard			
NCA02a	4-1	56	54
NCA02b	4-3	63	60
Milvale Yard			
NCA01	3-1	51	49

(1) Time periods defined as – Day: 7am to 10pm; Night 10pm to 7am

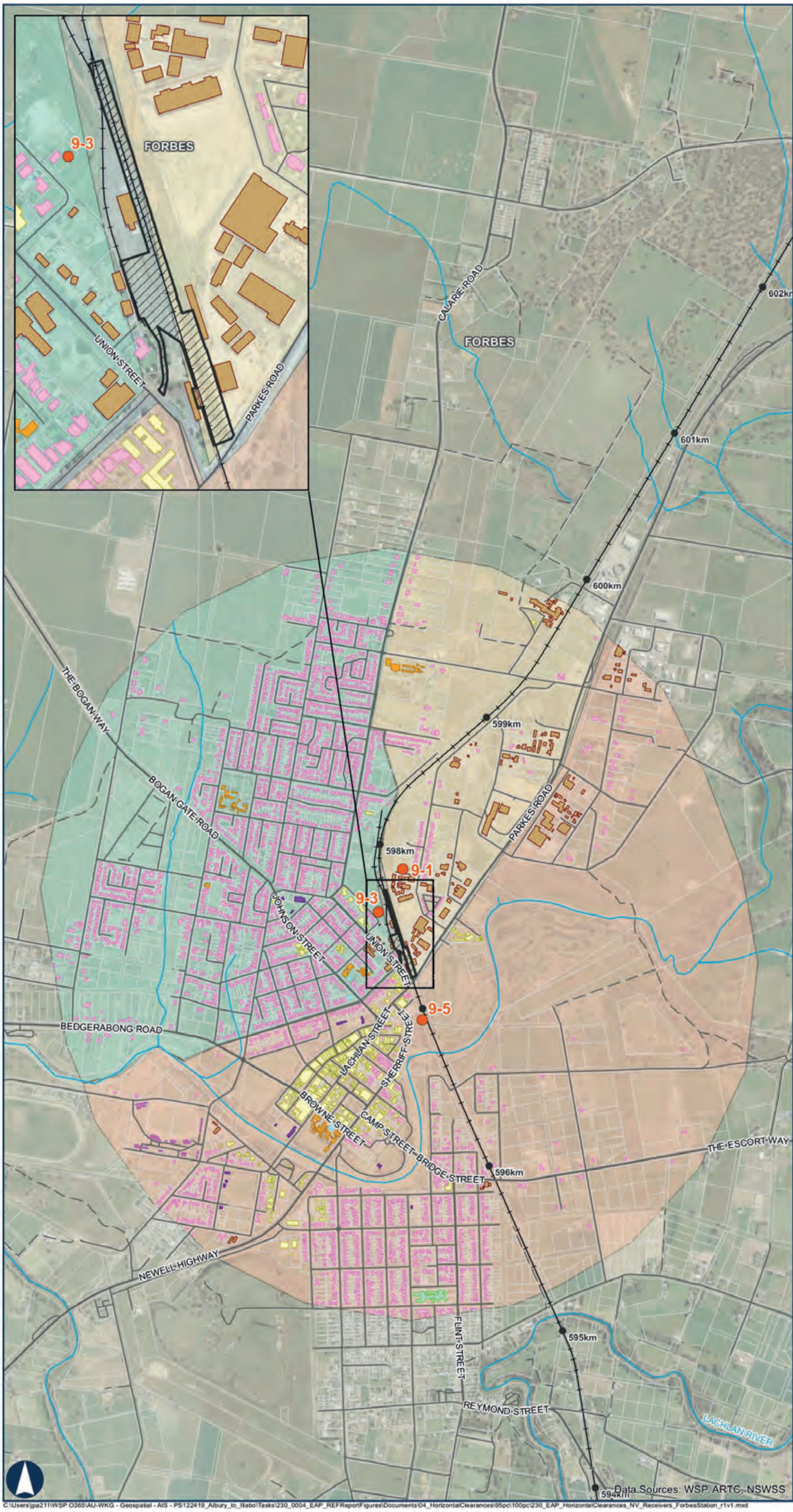
2.7 OPERATOR ATTENDED NOISE SURVEY

Operator attended noise surveys were carried out for a period of 15 minutes to characterise the noise environment and identify the contributors to the acoustic environment. The results of the attended noise surveys generally show good agreement with the unattended monitoring and observations presented in Table 2.6.

Based on the attended and unattended monitoring results, the background noise environments at most locations can be categorised as quiet rural environments with intermittent noise from vehicle pass-bys, local wildlife and wind noise through the surrounding vegetation. Noise levels in central areas of Forbes are marginally louder and are typical of a suburban land use type.

Table 2.6 Summary of attended noise measurement results

LOCATION	DATE	TIME	dBA $L_{eq,15,MIN}$	dBA $L_{90,15MIN}$	OBSERVATIONS
Forbes Station and Yard					
9-1	03/03/2021	15:01	46	37	Background noise environment characterized by insects, faint distant traffic and urban hum. A wind gust with an L_{eq} of approximately 65dBA as a maximum.
9-3	03/03/2021	15:56	43	37	Background noise environment characterized by insects, faint distant traffic and urban hum. A passing car can be heard with an L_{eq} of approximately 53dBA as a maximum.
9-5	03/03/2021	16:51	51	47	Background noise environment characterized by insects, faint distant traffic and urban hum. A passing motorcycle can be heard with an L_{eq} of approximately 60dBA as a maximum.
Wirrinya Yard					
7-1	03/03/2021	10:11	44	23	Background noise environment characterized by insects, faint distant traffic and local wildlife. Car passing with an L_{eq} of approximately 68dBA as a maximum.
Caragabal Yard					
6-3	02/03/2021	16:07	49	41	Background noise environment dominated by wind and birds through vegetation. Distant, faint traffic noise noted in the distance.
6-1	04/03/2021	11:09	56	29	Background noise environment characterized by insects, faint distant traffic and wind. Dogs barking-approximately 82dBA as a maximum.
Quandialla Yard					
5-1	02/03/2021	13:33	63	34	Background noise environment characterized by insects, faint distant traffic, rail crossing bells and train horns. Car passing with an L_{eq} of approximately 84dBA as a maximum.
Bribbaree Yard					
4-1	02/03/2021	11:12	38	29	Background noise environment dominated by wind and birds through vegetation. Distant, faint traffic noise noted in the distance.
4-3	02/03/2021	12:07	46	35	Background noise environment dominated by wind and birds through vegetation. Distant, faint traffic noise noted in the distance.
Milvale Yard					
3-1	02/03/2021	09:45	42	36	Traffic in the distance, birds, trucks on the main road, tractor movements, reverse alarms noted on site. Noise sources dominated by traffic and local wildlife.



INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes Forbes Station clearances

Figure 2.1 Noise Sensitive Receivers

MAP 1 OF 6

LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Cadastre
- Proposal site
- Noise monitoring location

Noise catchment area

- NCA06a
- NCA06b
- NCA06c

Noise sensitive receivers

- Active recreation
- Commercial
- Educational
- Industrial
- Medical
- Place of Worship
- Passive recreation
- Residential

0 0.5 1 km

Coordinate System: GDA 1994 MGA Zone 55

Date: 23/09/2021 Paper: A3

Author: WSP Scale: 1:3,169,023

C:\Users\jpa211\WSP O365\AU-WKG - Geospatial - AIS - PS122419_Albury_to_Illabo\Tasks\230_0004_EAP_REFReportFigures\Documents\04_HorizontalClearances\95pc\100pc\230_EAP_HorizontalClearances_NV_Receivers_ForbesStation_r1v1.mxd

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes Wirrinya yard clearances

Figure 2.1 Noise Sensitive Receivers

MAP 2 OF 6

LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Cadastre
- Proposal site
- Noise monitoring location

Noise catchment area

- NCA05

Noise sensitive receivers

- Residential

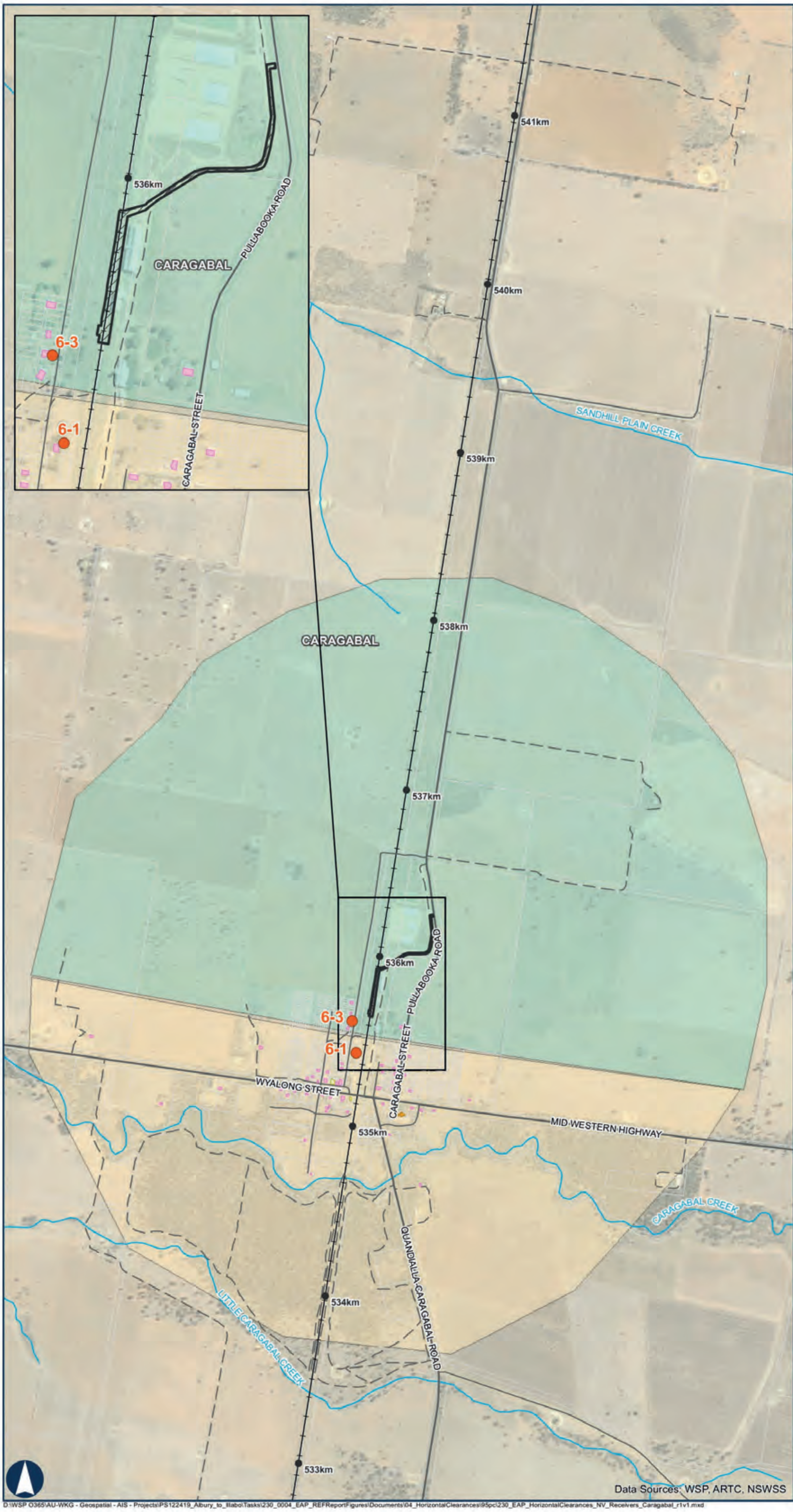
0 0.5 1 km

Coordinate System: GDA 1994 MGA Zone 55

Date: 5/08/2021 Paper: A3

Author: WSP Scale: 1:22,000

D:\WSP O365\AU-WKG - Geospatial - AIS - Projects\PS122419_Albury_to_Illabo\Tasks\230_0004_EAP_REFReportFigures\Documents\04_HorizontalClearances\95pc\230_EAP_HorizontalClearances_NV_Receivers_Wirrinya_r1v1.mxd



INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes Caragabal yard clearances

Figure 2.1 Noise Sensitive Receivers

MAP 3 OF 6

LEGEND

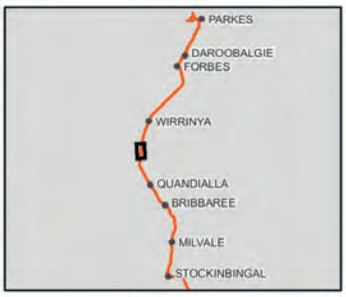
- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Cadastre
- Proposal site
- Noise monitoring location

Noise catchment area

- NCA04a
- NCA04b

Noise sensitive receivers

- Commercial
- Educational
- Residential



0 0.5 1 km

Coordinate System: GDA 1994 MGA Zone 55

Date: 5/08/2021 Paper: A3

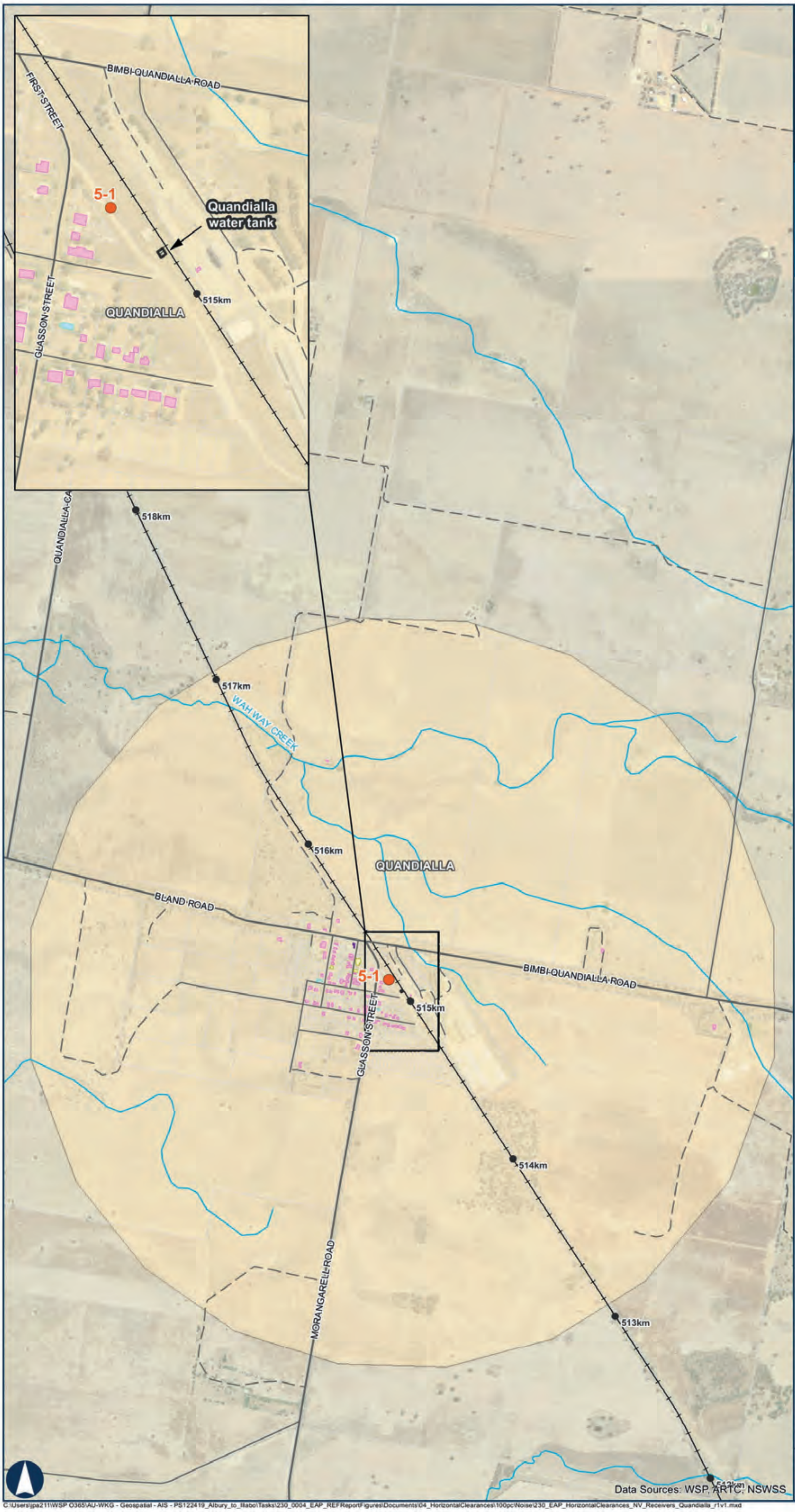
Author: WSP Scale: 1:22,000

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes Quandialla yard clearances

Figure 2.1 Noise Sensitive Receivers

MAP 4 OF 6



LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Cadastre
- Proposal site
- Noise monitoring location

Noise catchment area

- NCA03

Noise sensitive receivers

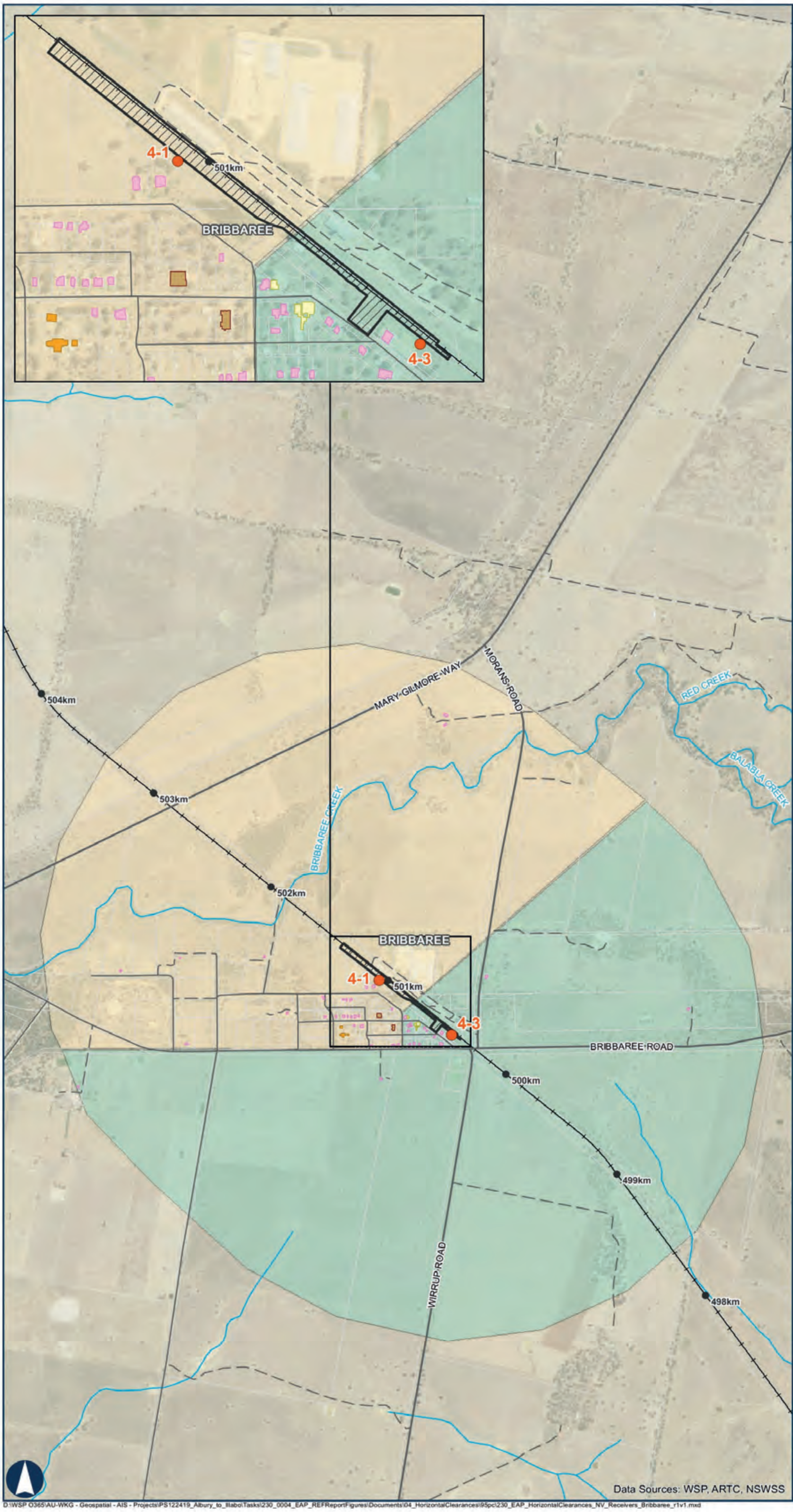
- Active recreation
- Commercial
- Place of Worship
- Residential

Coordinate System: GDA 1994 MGA Zone 55

Date: 28/09/2021 | Paper: A3

Author: WSP | Scale: 1:20,000

C:\Users\jpa211\WSP O365\AU-WKG - Geospatial - AIS - PS122419_Albury_to_Illabo\Tasks\230_0004_EAP_REFReport\Figures\Documents\04_HorizontalClearances\100pc\Noise\230_EAP_HorizontalClearances_NV_Receivers_Quandialla_r1v1.mxd



INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes
Bribbaree yard clearances

Figure 2.1 Noise Sensitive Receivers

MAP 5 OF 6

LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Cadastre
- Proposal site
- Noise monitoring location

Noise catchment area

- NCA02a
- NCA02b

Noise sensitive receivers

- Commercial
- Educational
- Industrial
- Residential

0 0.5 1 km

Coordinate System: GDA 1994 MGA Zone 55

Date: 5/08/2021 Paper: A3

Author: WSP Scale: 1:25,000

D:\WSP O365\AU-WKG - Geospatial - AIS - Projects\PS122419_Albury_to_Illabo\Tasks\230_0004_EAP_REFReportFigures\Documents\04_HorizontalClearances\95pc\230_EAP_HorizontalClearances_NV_Receivers_Bribbaree_r1v1.mxd

INLAND RAIL

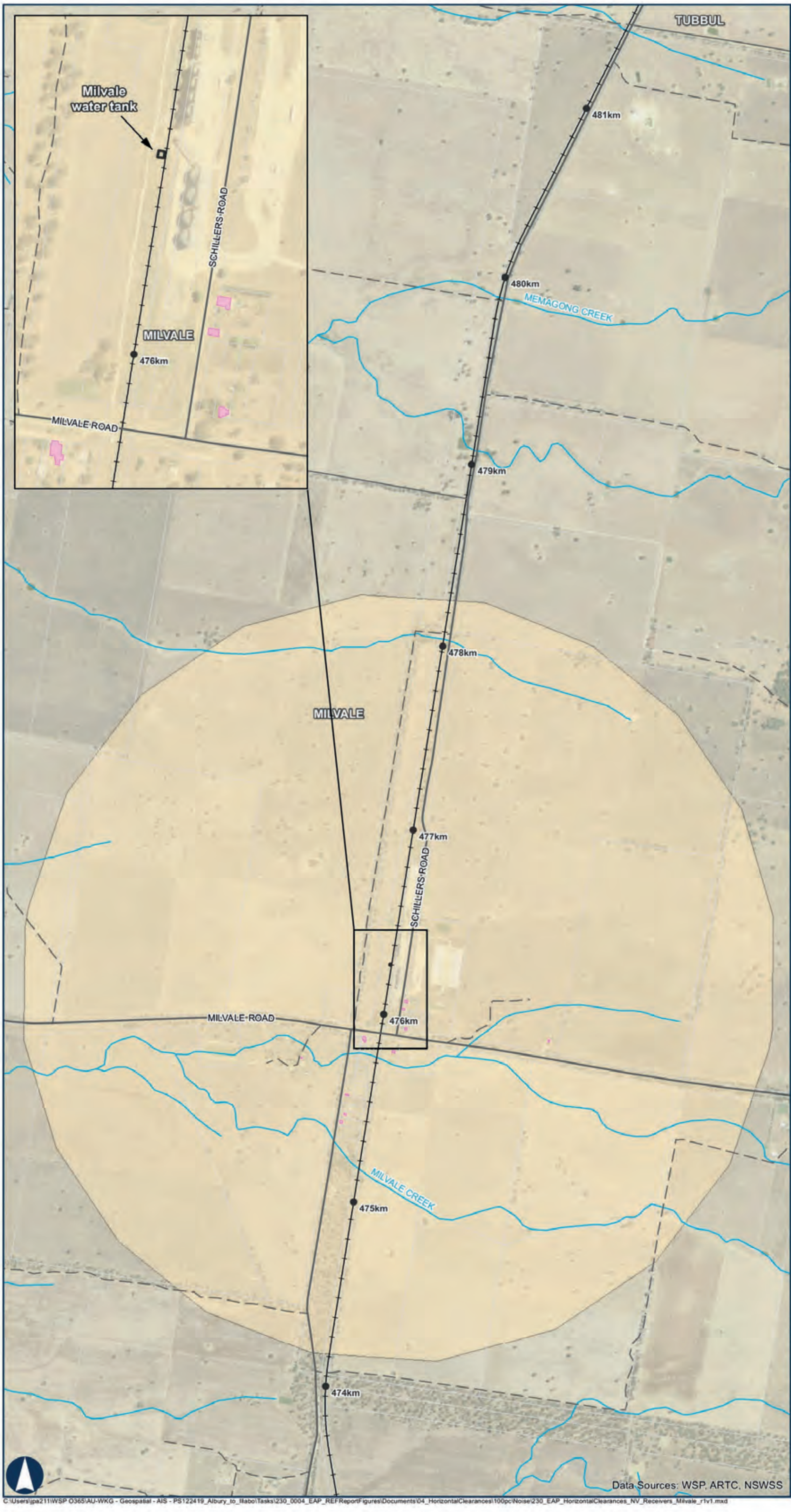
ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes
Milvale yard clearances

Figure 2.1 Noise Sensitive Receivers

MAP 6 OF 6



LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Cadastre
- Proposal site

Noise catchment area

- NCA01

Noise sensitive receivers

- Residential

0 0.5 1 km

Coordinate System: GDA 1994 MGA Zone 55

Date: 28/09/2021 Paper: A3

Author: WSP Scale: 1:20,000

C:\Users\jpa211\WSP O365\AU-WKG - Geospatial - AIS - PS122419_Albury_to_Illabo\Tasks\230_0004_EAP_REFReportFigures\Documents\04_HorizontalClearances\100pc\Noise\230_EAP_HorizontalClearances_NV_Receivers_Milvale_r1v1.mxd

3 NOISE AND VIBRATION ASSESSMENT CRITERIA

3.1 CONSTRUCTION NOISE CRITERIA

3.1.1 ENVIRONMENT PROTECTION LICENCE (EPL 3142)

ARTC operates its rail network in accordance with an Environment Protection Licence (EPL), specifically EPL 3142, administered by the Environment Protection Authority under the *Protection of the Environment Operations Act 1997*. The proposal is considered maintenance of existing railway infrastructure under Clause 33, Schedule 1 of the *Protection of the Environment Operations Act 1997.* Given the minor nature of this proposal, this work will be carried out as maintenance activities under this EPL.

ARTC EPL3142, Condition O9.1 to 9.6 outlines conditions relating to noise and vibration management, and in particular out of hours maintenance activities. This NVIA has been prepared to address the requirements for noise assessment. Management measures are included which address the following aspects concerning noise and vibration:

- railway maintenance activities
- standard railway maintenance hours
- exception to standard railway maintenance hours
- exception to standard railway maintenance hours for low noise impact generating works
- management of noise impacts from maintenance.

3.1.2 INTERIM CONSTRUCTION NOISE GUIDELINE

The Interim Construction Noise Guideline (ICNG) is to be used for assessment and management of construction noise for the proposal. The ICNG is the primary instrument for assessment of construction noise impacts within NSW. It is noted that the ICNG is soon scheduled to be superseded by the Draft Construction Noise Guideline, however at the time of writing of this report, this had not been established and the ICNG was the valid assessment methodology.

3.1.2.1 RECOMMENDED STANDARD CONSTRUCTION HOURS

The ICNG sets Noise Management Levels (NMLs) for land use types based upon the day of week and time of day for which construction noise occurs. For residential land uses the ICNG defines Recommended Standard Hours which represent the times of the day when receivers are likely to be less sensitive to noise impacts. Any works required to be completed outside of standard hours would be undertaken in accordance with assessment and management requirements of ICNG and any conditions attached to ARTC EPL 3142 (conditions O9.1 to O9.6) (refer Section 3.1.1).

Construction noise is considered to adversely impact a receiver if the predicted noise level exceeds the NML, which is determined based on the measured RBLs. RBLs are the Rating Background noise Level, as defined in the NPfI, and relevant RBLs for the proposal are sourced from measurement data in Section 2.4.

Table 3.1 summarises the ICNG NML approach for the residential receiver types which are relevant to the proposal.

Table 3.1 Application of the ICNG noise management levels

SETTING AND APPLYING NMLS AT RESIDENCES		
Time of day	**NML, $L_{eq,15min}$ dBA**	**How to apply**
Recommended standard hours: Monday to Friday 7am to 6pm Saturday 8am to 1pm Excludes 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 $L_{eq,15 min}$ 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 works 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 works near schools, or mid-morning or mid-afternoon for works near residences) — 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 works 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 construction of the proposal it is understood that most works will be conducted during rail possession periods. As such, works will be conducted outside of the ICNG defined standards hours at times. Any works required to be completed outsides of standard working hours would be carried out in accordance with assessment and management requirements of the ICNG and ARTC EPL 3142 Condition O4.

3.1.2.2 CONSTRUCTION NOISE MANAGEMENT LEVELS

The resultant NMLs for residential receivers adjacent the proposal are presented in Table 3.2.

Table 3.2 Noise management levels at residential receivers

ASSESSMENT PERIOD[1]	RBL dBA	NOISE MANAGEMENT LEVEL dBA $L_{EQ,15MIN}$	HIGHLY NOISE AFFECTED LEVEL dBA $L_{eq,15min}$
Forbes Station and Yard (NCA 06a)			
Standard hours	41	51	75
Out of hours – Day	41	46	–
Out of hours – Evening	39	44	–
Out of hours – Night	34	39	–
Forbes Station and Yard (NCA 06b)			
Standard hours	38	48	75
Out of hours – Day	38	43	–
Out of hours – Evening	38	43	–
Out of hours – Night	33	38	–
Forbes Station and Yard (NCA 06c)			
Standard hours	39	49	75
Out of hours – Day	39	44	–
Out of hours – Evening	39	44	–
Out of hours – Night	36	41	–
Wirrinya Yard (NCA 05)			
Standard hours	35	45	75
Out of hours – Day	35	40	–
Out of hours – Evening	30	35	–
Out of hours – Night	30	35	–
Caragabal Yard (NCA 04a)			
Standard hours	35	45	75
Out of hours – Day	35	40	–
Out of hours – Evening	30	35	–
Out of hours – Night	30	35	–

ASSESSMENT PERIOD[1]	RBL dBA	NOISE MANAGEMENT LEVEL dBA $L_{EQ,15MIN}$	HIGHLY NOISE AFFECTED LEVEL dBA $L_{eq,15min}$
Caragabal Yard (NCA 04b)			
Standard hours	35	45	75
Out of hours – Day	35	40	–
Out of hours – Evening	35	40	–
Out of hours – Night	34	39	–
Quandialla Yard (NCA 03)			
Standard hours	35	45	75
Out of hours – Day	35	40	–
Out of hours – Evening	31	36	–
Out of hours – Night	30	35	–
Bribbaree Yard (NCA 02a)			
Standard hours	35	45	75
Out of hours – Day	35	40	–
Out of hours – Evening	30	35	–
Out of hours – Night	30	35	–
Bribbaree Yard (NCA 02b)			
Standard hours	35	45	75
Out of hours – Day	35	40	–
Out of hours – Evening	35	40	–
Out of hours – Night	30	35	–
Milvale Yard (NCA 01)			
Standard hours	35	45	75
Out of hours – Day	35	40	–
Out of hours – Evening	30	35	–
Out of hours – Night	30	35	–

(1) Standard hours: Monday to Friday 7am to 6pm, Saturday 8am to 1pm, Excludes on Sundays or public holidays.
Out of hours – Day Monday to Friday 6am to 7am, Saturday 6am to 8am and 1pm to 6pm, Sunday 6am to 6pm
Out of hours – Evening All days 7am to 6pm
Out of hours – Night 10pm to 6am all days

Where NMLs are exceeded either during or outside of recommended standard hours for construction work, all feasible and reasonable noise mitigation and management measures should be implemented.

Noise management levels at non-residential receivers located within the study areas are presented in Table 3.3.

Table 3.3 Noise management levels for non-residential sensitive receivers (when in use)

LAND USE	NOISE MANAGEMENT LEVEL (EXTERNAL) dBA $L_{eq,15min}$
Educational	55[1, 2]
Hospital wards and operating theatres	55[1, 2]
Commercial (offices, retail outlets)	70[2]
Commercial (industrial)	75[2]
Active Recreation	65[2]
Passive Recreation	60[2]
Place of worship	55[1, 2]

(1) An internal to external correction of +10dB has been applied as per the ICNG

(2) When in use

3.1.3 SLEEP DISTURBANCE

Construction noise during the night (10pm to 7am Monday to Saturday, 10pm to 8am Sunday) has the potential to awaken residents from sleep. The *Construction Noise and Vibration Strategy* (CNVS) refers to the Road Traffic Authority's (RTA) *Environmental Noise Management Manual* (ENMM) (RTA, 2001) and DECCW's *Environmental Criteria for Road Traffic Noise* (ECRTN) (RTA,1999) for guidance relevant to the assessment of sleep disturbance and awakening. These guidelines have been superseded by the *Road Noise Policy* (RNP) (DECCW, 2011).

The RNP adopts the ECRTN's guidance level of $L_{AF1,1min}$ to limit sleep disturbance from environmental noise, which should not exceed the ambient L_{A90} + 15dB. Section 5.4 of the RNP then states that:

> *Maximum internal noise levels below 50 to 55dBA L_{max} would be unlikely to awaken people from sleep; and*
>
> *One or two noise events per night, with maximum internal noise levels of 65-70dBA, are not likely to affect health and wellbeing significantly.*

The RNP indicates that internal noise levels of 50 to 55dBA L_{max} are unlikely to cause sleep awakenings. It follows that at levels above 55dBA L_{max}, sleep awakening would be considered likely. Assuming receivers may have windows partially open for ventilation, a +10dB inside to outside correction has been adopted as outlined in the ICNG.

The NPfI also contains guidance on sleep disturbance and awakening, outlining that further investigation of sleep disturbance and awakening should be undertaken where the following screening levels are exceeded:

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

The assessment of $L_{eq,15\,min}$ against the prevailing RBL plus 5 aligns with construction noise management levels and would be considered the assessment against construction noise management levels. The assessment L_{max} against the prevailing RBL plus 15dB aligns with the ECRTN guidance.

Therefore, assessment of sleep disturbance and awakening has been conducted for residential receivers in each NCA by adopting the most conservative (lowest) of the external noise level screening levels of RBL+15dB and L_{max} 65dBA.

3.1.4 ROAD TRAFFIC NOISE IMPACTS

The proposal requires vehicle movements on adjacent roads to facilitate the delivery and removal of materials to site, as well as the delivery of equipment and construction staff.

As the RNP provides guidance with relation to operational noise impacts, and noise from construction traffic is non-permanent, further guidance has been taken from the Construction Noise and Vibration Guideline (CNVG) (Roads and Maritime, 2016).

The CNVG states that 'an initial screening test should first be applied by evaluating whether noise levels will increase by more than 2dBA due to construction traffic or a temporary reroute due to a road closure. Where increases are 2dBA or less then no further assessment is required'. Where road traffic noise levels are anticipated to increase by more than 2dB, the noise assessment criteria outlined in Table 3.4 will be considered.

Table 3.4 Road Noise Policy assessment criteria

ROAD CATEGORY	TYPE OF PROJECT / LAND USE	TRAFFIC NOISE ASSESSMENT CRITERIA (EXTERNAL)	
		Day (7am to 10pm)	Night (10pm to 7am)
Collector/sub-arterial/ arterial/freeway	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{eq,15hr}$ 60dBA	$L_{eq,9hr}$ 55dBA
Local roads	Existing residences affected by additional traffic on existing local roads generated by land use developments	$L_{eq,1hr}$ 55dBA	$L_{eq,1hr}$ 50dBA

3.2 CONSTRUCTION VIBRATION CRITERIA

Vibration associated with construction activities may result in adverse impacts on human comfort or the damage of physical structures such as dwellings. These two impacts are assessed against different criteria, with the effects of vibration on human comfort having a lower threshold.

3.2.1 COSMETIC BUILDING DAMAGE AND STRUCTURAL INTEGRITY

There are no vibration limits for buildings and structures in *Assessing Vibration: A Technical Guideline* (AVaTG*)*. Therefore, limits have been adopted from the *British Standard BS 7358-2: Evaluation and measurement for vibration in buildings guide to damage levels from ground-borne vibration*.

Importantly, cosmetic damage is regarded as minor in nature; it is readily repairable and does not affect a building's structural integrity. If there is no significant risk of cosmetic damage, then structural damage is not considered a risk.

A summary of the relevant limits from BS7358-2 is presented in Table 3.5. These peak vibration limits are set so that the risk of cosmetic damage is minimal. They have been set at the lowest level above which damage has been credibly demonstrated. The limits assume that the equipment causing the vibration is used intermittently.

Table 3.5 BS 7385-2 Guideline vibration limits for cosmetic damage

GROUP	TYPE OF STRUCTURE	PEAK COMPONENT PARTICLE VELOCITY, mm/s[1]		
		4–15 Hz	15–40 Hz	40 Hz and above
2	Un-reinforced or light framed structures Residential or light commercial buildings	15–20[2]	20–50	50

(1) Values referred to are at the base of the building, on the side of the building facing the source of vibration (where feasible).

(2) At frequencies below 4 Hz, a maximum displacement of 0.6mm (zero to peak) should not be exceeded.

3.2.2 HUMAN COMFORT (AMENITY)

Table 3.6 presents the limits (vibration dose values) above which there is a risk to the amenity and comfort of people occupying buildings from intermittent vibration from construction works. These limits are sourced from the AVTG.

Table 3.6 Human comfort (amenity) guideline vibration limits (intermittent work)

LOCATION	ASSESSMENT PERIOD	VIBRATION DOSE VALUE, $m/s^{1.75}$	
		Preferred values	Maximum values
Residences	Daytime	0.20	0.40
	Night-time	0.13	0.26

3.2.3 HERITAGE AND VIBRATION SENSITIVE STRUCTURES

The German Standard provides the guideline values for vibration quantified using vibration velocity, which is a measure of the rate of displacement (change of position). It is commonly expressed in millimetres per second using Peak Particle Velocity (PPV) which is the maximum velocity during a time interval.

The structural damage criteria from the German Standard are detailed in Table 3.7. Vibration from construction occurs between 8 Hertz (Hz) to 100Hz, to conservatively manage the risk of cosmetic damage the assessment adopted the lowest level above which damage has been credibly demonstrated:

- 5mm/s assessment criteria for dwellings (residences); and
- 3mm/s for sensitive structures of great intrinsic value, for example sites of heritage significance.

Cosmetic damage is regarded as minor in nature; it is readily repairable and does not affect a building's structural integrity. If there is no significant risk of cosmetic damage, then structural damage is not considered a risk.

Table 3.7 Guideline vibration limits for cosmetic damage

TYPE OF STRUCTURE	PEAK COMPONENT PARTICLE VELOCITY, mm/s (A)		
	1–10Hz	10–50Hz	50-100Hz
Structures that have great intrinsic value and not classified as residential, commercial or industrial buildings.	3	3–8	8–10

Source: *German Standard DIN 4150-3:1999-02, Structural vibration Part 3: Effects of vibration on structures* (1999).

3.2.4 GROUND-BORNE NOISE

Ground-borne noise is generated by vibration transmitted through the ground into a building which can be reradiated as an audible low frequency rumble. The ground-borne noise criteria are generally implemented only where the ground-borne noise is a higher level than the airborne noise level and can be perceptible (audible) within habitable rooms. It is noted that the rooms most impacted by ground-borne noise may not be the same as those impacted by airborne noise.

The ICNG provides ground-borne NMLs for residences which indicate when management actions should be implemented as follows:

- Evening (6.00pm to 10.00pm): 40dBA $L_{Aeq,15min}$; and
- Night-time (10.00pm to 7.00am) 35dBA $L_{Aeq,15min}$.

The ground-borne noise levels are only considered during evening and night-time periods, as the objectives are to protect the amenity and sleep of the building occupants. The ground-borne noise levels are to be assessed at the centre of the habitable room most affected by ground-borne noise.

3.3 OPERATIONAL NOISE CRITERIA

3.3.1 RAIL INFRASTRUCTURE NOISE GUIDELINE

The acceptability of rail noise from train operations in NSW is assessed in accordance with the NSW *Rail Infrastructure Noise Guidelines* (RING). This guideline presents noise trigger levels for a project. If these levels are likely to be exceeded as a result of the rail development, noise mitigation measures would need to be considered.

Trigger levels are presented for new rail developments and re-developments of existing rail lines. The redevelopment of existing rail lines generally applies to developments which are intended to increase rail traffic or alter the track alignment through design or engineering changes.

The proposal alignment at all enhancement sites remain within the existing operational rail corridor. As such, the proposal is a redeveloped rail line project. Table 3.8 presents the airborne noise criteria for a redeveloped rail line.

Table 3.8 Airborne residential noise trigger levels for redevelopment of existing rail line

TYPE OF DEVELOPMENT	**NOISE TRIGGER LEVELS (EXTERNAL) dBA**	
	Day (7am to 10pm)	**Night (10pm to 7am)**
Redevelopment of existing train line	Development increases existing $L_{Aeq(period)}$[1] rail noise levels by 2dB or more, or existing L_{Amax} rail noise levels by 3dB or more **and** predicted rail noise levels exceed:	
	$65L_{eq\ 15\ hr}$	$60L_{eq\ 9\ hr}$
	$85L_{max}$[1]	

(1) L_{max} refers to the maximum A-weighted noise level not exceeded for 95 per cent of rail pass-by events

In assessing noise levels emitted by the proposal at residential receiver locations, the external noise level is to be assessed at a location one metre in front of the most affected building facade. Any ‘internal noise level’ refers to the noise level at the centre of the habitable room most exposed to the noise source and applies with windows open sufficiently to provide adequate ventilation.

3.3.2 EPL 3142

EPL 3142 does not specify noise limits for operation of the rail corridor outside construction and maintenance activities. The EPL includes objectives for ARTC to progressively reduce noise impacts from railway systems through a series of measures designed to control noise emissions from freight locomotives. It is expected the noise objectives of EPL 3142 will be complied with and can assist in the management of noise associated with railway operations at the Horizontal Clearances sites.

3.4 GROUND-BORNE RAIL NOISE TRIGGER LEVELS

The RING defines ground-borne rail noise trigger levels for heavy rail for residential and sensitive land uses as presented in Table 3.9.

Table 3.9 Ground-borne rail noise trigger levels for residential and sensitive land uses

SENSITIVE LAND USE	TIME OF DAY	INTERNAL NOISE TRIGGER LEVELS, dBA
		Development increases existing rail noise levels by 3dBA or more and resulting rail noise levels exceed:
Residential	Day (7am – 10pm)	$40L_{Smax}$
	Night (10pm – 7am)	$35L_{Smax}$
Schools, educational institutions, places of worship	When in use	$40–45L_{Smax}$

For schools, educational institutions and places of worship, the lower value of the range is most applicable where low internal noise levels are expected, such as in areas assigned to studying, listening and praying. Ground borne noise trigger levels are not applicable to commercial receivers.

Ground-borne noise level values are relevant only where they are audible and higher than the airborne noise from railways and where the ground-borne noise levels are expected to be, or are, audible within habitable rooms. The levels are to be assessed near to, but not at the centre, of the most affected habitable room.

3.5 OPERATIONAL GROUND VIBRATION CRITERIA

Ground vibration criteria have been determined in accordance with the AVTG, as summarised in Table 3.10. Rail traffic is generally classified as an intermittent vibration source.

Table 3.10 Vibration criteria for rail traffic

RECEIVER TYPE	TIME PERIOD	INTERMITTENT VIBRATION DOSE LEVEL (VDV $MS^{1.75}$)	
Residential	Day (7am to 10pm)	0.2	0.4
	Night (10pm to 7am)	0.13	0.26

4 CONSTRUCTION NOISE ASSESSMENT

4.1 CONSTRUCTION METHODOLOGY

The indicative construction methodology for the proposal is outlined in this section. The proposed timing, methodology, resources and access arrangements would be refined prior to construction. A final construction methodology and program will be developed by the construction contractor based on the mitigation and management measures provided in this document. Should the construction methodology change, ARTC would be consulted and would determine if additional assessment and approvals are required.

Construction of the proposal is expected to last for about 11 weeks, with commencement in early 2024 (subject to ARTC determination of this REF). The activities required for construction of the proposal are identified below and discussed in the following sections:

- site establishment and access
- earthworks
- track work
- awning adjustment to Forbes Station
- minor works to water tanks
- signalling adjustments
- demobilisation and rehabilitation
- ongoing activities at site compound areas.

Construction work at each site is anticipated to generate noise which may impact surrounding receivers except for those works proposed at Milvale and Quandialla Yards. The work activities at these locations are considered minor and the anticipated duration of the work is anticipated to be two days duration only. These two sites are therefore not considered further for the purposes of this noise assessment.

4.2 DURATION OF WORKS

Construction of the proposal is expected to last for about 11 weeks, with commencement in early 2024 (subject to ARTC determination of this REF). Works at each site would be undertaken concurrently, where possible, to maximise use of rail possessions.

The duration of construction at each site would be:

- Forbes Station and Yard—approximately six weeks
- Caragabal Yard—approximately six weeks
- Wirrinya Yard—approximately seven weeks
- Quandialla Yard and Milvale Yard water tanks—approximately two days each
- Bribbaree Yard—approximately 11 weeks.

4.3 WORKING HOURS

Working hours would be in accordance with ARTC's Environmental Protection License (EPL) 3142 (conditions O9.1 to O9.6). All works (as far as practicable) will be undertaken during standard ICNG working hours as follows:

- 7am to 6pm Monday to Friday
- 8am to 1pm Saturday; and
- no work on Sundays or public holidays.

Due to access constraints and the requirement for a safe working site, some works may be undertaken outside standard working hours and during scheduled track possessions. Any works required to be completed outside standard working hours would be approved by ARTC and the affected community would be advised in accordance with the community consultation plan.

4.3.1 WORKS DURING POSSESSIONS

The proposal would require rail possessions or track occupancy authorisations where works would impact the operation of existing rail lines and/or the safety of construction workers as outlined in Table 4.1.

Work under rail possessions would be carried out during scheduled possession periods (that is, the times that the movement of trains along the rail corridor are stopped for maintenance). Rail possessions are typically for a 60-hour periods, two times a year in March and September. During rail possessions, works may need to be carried out on a 24-hour basis.

Outside scheduled rail possessions, works would also occur within available five to 12-hour windows when train services are not scheduled and when authorised by ARTC (called a track occupancy authorisation). These periods are determined in consultation with operators of freight and passenger train services and may occur outside the proposal construction hours.

The construction activities requiring rail possession or track occupancy authorisations are outlined in Table 4.1. Other construction activities such as site establishment demobilisation and rehabilitation would be undertaken during standard hours where practicable but may use rail possessions or track occupancy authorisation periods where construction scheduling overlaps.

Table 4.1 Rail possession requirements

CONSTRUCTION ACTIVITY	DURATION	POSSESSION REQUIREMENTS
Track work/ Track work with earthworks	Approximately six to 11 weeks	Track realignments works at Bribbaree Yard, Caragabal Yard, Wirrinya Yard and Forbes Yard are planned around the use of one rail possession. Associated construction activities directly over or in close proximity to the track such as drainage works or utility adjustments may be undertaken during a track occupancy authorisations.
Water tank works	Approximately two days	Water tank works at Milvale Yard and Quandialla Yard would be undertaken under track occupancy authorisation. A full rail possession is not required for these works, however may be used should scheduling overlap.
Forbes station awning work	Approximately a week	These works would be undertaken under track occupancy authorisation. A full rail possession is not required for these works, however may be used should scheduling overlap.

Any works required to be completed outsides of standard working hours would be carried out in accordance with assessment and management requirements of the ICNG and ARTC EPL 3142 Condition O9.1 to 9.6.

4.3.2 CONSTRUCTION PLANT AND EQUIPMENT

The indicative noisy plant and equipment likely to be required for each construction stage for the proposal is outlined in Table 4.2, with Sound Power Levels (SWLs) adopted for acoustic modelling of noise generating construction plant. This data has been adapted from the Roads and Maritime Services *Construction Noise and Vibration Guideline* (CNVG), and other government databases.

Corrections have been applied for anticipated usage and for the assessment of maximum $L_{1(1min)}$ noise level events. Sound power levels have been presented for Standard Hours and Out of Hours Works (OOHW) as indicated.

Table 4.2 Indicative plant and equipment and Sound Power Levels (SWL)

ID	CONSTRUCTION ACTIVITY	EQUIPMENT REQUIRED	SWL	CORRECTIONS[1]	
			L_{eq} dBA	Usage dBA	$L_{1(1min)}$ dBA
1	Site establishment — Forbes Station Yard — Bribbaree Yard — Wirrinya Yard — Caragabal Yard	14H Grader[2]	115	–	–
		30T Articulated dump truck (ADT)	107	-3	+3
		30T Excavator	108	-3	+4
		Smooth drum roller[3]	107	–	–
		Padfoot roller[3]	109	–	–
		Water cart	107	-3	+3
		TOTAL SH[4] L_{eq}	**118**		
		TOTAL OOHW[4] L_{eq}	**115**		
		TOTAL OOHW[4] $L_{1(1min)}$	**116**		
2	Track works — Wirrinya Yard — Caragabal Yard	ADT (x4)	113	-3	+3
		Loader[c]	110	-3	+4
		30T Excavator	108	-3	+4
		Tamper	115	–	–
		Regulator	114	–	–
		Flash butt welding unit	110	-6	–
		TOTAL SH[4] L_{eq}	**119**		
		TOTAL OOHW[4] L_{eq}	**119**		
		TOTAL OOHW[4] $L_{1(1min)}$	**121**		

ID	CONSTRUCTION ACTIVITY	EQUIPMENT REQUIRED	SWL	CORRECTIONS[1]	
			L_{eq} dBA	Usage dBA	$L_{1(1min)}$ dBA
3	Track works including earthworks — Forbes Station Yard — Bribbaree Yard	ADT (x4)	113	-3	+3
		Loader[c]	110	-3	+4
		5T excavator	105	-3	+4
		30T Excavator	108	-3	+4
		Tamper	115	–	–
		Regulator	114	–	–
		Flash butt welding unit	110	-6	–
		14H Grader[2]	115	–	–
		Padfoot roller[3]	109	–	–
		Smooth drum roller[3]	107	–	–
		Water Carts (x2)	110	-3	+3
		Truck and Dogs (x2)	111	-3	+3
		30T excavator with hammer[2]	122	-6	–
		TOTAL SH[4] L_{eq}	**123**		
		TOTAL OOHW[4] L_{eq}	**121**		
		TOTAL OOHW[4] $L_{1(1min)}$	**122**		
4	Forbes Station awning work — Forbes Station and Yard	Hand tools	105	-6	+3
		14H Grader[2]	115	–	–
		Hi-rail dump trucks	113	-3	+3
		Smooth drum roller[3]	107	–	–
		Hi rail excavator	102	-3	+4
		TOTAL SH[4] L_{eq}	**118**		
		TOTAL OOHW[4] L_{eq}	**114**		
		TOTAL OOHW[4] $L_{1(1min)}$	**116**		
5	Signalling — Forbes Station and Yard — Bribbaree Yard	Hand tools	105	-6	+3
		Elevated work platform[3]	105	-12	+3
		TOTAL SH[4] L_{eq}	**100**		
		TOTAL OOHW[4] L_{eq}	**100**		
		TOTAL OOHW[4] $L_{1(1min)}$	**103**		

ID	CONSTRUCTION ACTIVITY	EQUIPMENT REQUIRED	SWL	CORRECTIONS[1]	
			L_{eq} dBA	Usage dBA	$L_{1(1min)}$ dBA
6	Demobilisation and rehabilitation — Forbes Station Yard — Bribbaree Yard — Wirrinya Yard — Caragabal Yard	5T excavator	105	-3	+4
		14H Grader[2]	115	–	–
		Water Carts	107	-3	+3
		Hydro seed truck	107	-3	+3
		TOTAL SH[4] L_{eq}	**116**		
		TOTAL OOHW[4] L_{eq}	**108**		
		TOTAL OOHW[4] $L_{1(1min)}$	**111**		
7	Compound operation — Forbes Station and Yard — Bribbaree Yard	Light vehicles	88	-12	+3
		Generator	103	–	–
		Delivery trucks[2, 3]	108	-6	+3
		Franna[2]	98	-6	+3
		TOTAL SH[4] L_{eq}	**106**		
		TOTAL OOHW[4] L_{eq}	**103**		
		TOTAL OOHW[4] $L_{1(1min)}$	**107**		

(1) Estimated, assuming typical working conditions

(2) Noisy plant – assumed to not operate during Out of Hours Works periods

(3) Total noise level includes 5dB penalty for annoyance in accordance with ICNG methodology

(4) SH – Standard Hours / OOHW – Out of Hours Work

4.4 CONSTRUCTION NOISE MODELLING METHODOLOGY

A construction noise model was developed using SoundPLAN 8.2 noise modelling software in accordance with ARTC's *Inland Rail NSW Construction noise and Vibration Management Framework* (CNVF).

The SoundPLAN implementation of the CONCAWE noise propagation algorithm was utilised to predict environmental noise propagation, determining receiver noise levels for each of the construction stages.

Modelling inputs for each scenario included topography, ground and air absorption, locations of sensitive receivers, noise-generating equipment and buildings surrounding the proposal.

The following assumptions were used in the modelling:

- all noise sources modelled at 1.5m above ground level
- receiver heights were modelled for the most affected floor and facade for each building
- a ground absorption factor of 0.75
- neutral meteorological conditions.

The predictions assume the listed construction equipment in each modelling scenario would be operating simultaneously at the closest point to the receiver. In practice, most plant items are not expected to be operating in this stationary position for the full 15-minute assessment duration. As such the modelling results are a conservative representation of construction noise impacts and demonstrate the potential worst case noise levels that may be experienced.

It should be noted that assessments of construction noise and vibration have been prepared based on the knowledge of the likely construction methodology available at the time of preparation. Potential construction noise impacts will be re-assessed by the construction contractor before construction commences and following the finalisation of construction methodology.

4.5 RESIDENTIAL CONSTRUCTION NOISE LEVELS

Table 4.3 presents a summary of the predicted noise levels compared against the relevant NMLs for residential receivers for each assessed scenario. Results have been presented in terms of number of properties exceeding the construction NMLs for each work stage.

Detailed results of noise modelling for Standard Hours and Out of Hours Night, being the most sensitive period, over which works occur, are presented as graphics in Appendix B.

Table 4.3 Predicted construction noise levels at residential receivers

WORK STAGE	NML $L_{eq,15\ min}$	NUMBER OF PROPERTIES EXCEEDING NML, GROUPED BY MAGNITUDE OF EXCEEDANCE					HIGHLY NOISE AFFECTED
		0–5dB	5–10dB	10–20dB	20–30dB	>30dB	> 75dB
Forbes Station Yard – NCA06a (Total number of receivers – 179)							
Standard hours							
Site establishment	51	20	6	0	0	0	0
Track works + earthworks	51	29	20	6	0	0	0
Awning work	51	20	6	0	0	0	0
Signalling	51	0	0	0	0	0	0
Demobilisation + rehabilitation	51	15	0	0	0	0	0
Site compound	51	0	0	0	0	0	0
Outside standard hours – Day time/Evening[1]							
Site establishment	44	25	15	3	0	0	0
Track works + earthworks	44	24	29	26	0	0	0
Awning work	44	22	15	0	0	0	0
Signalling	44	0	0	0	0	0	0
Demobilisation + rehabilitation	44	12	0	0	0	0	0
Site compound	44	0	0	0	0	0	0

WORK STAGE	NML $L_{eq,15\ min}$	NUMBER OF PROPERTIES EXCEEDING NML, GROUPED BY MAGNITUDE OF EXCEEDANCE					HIGHLY NOISE AFFECTED
		0–5dB	5–10dB	10–20dB	20–30dB	>30dB	> 75dB
Outside standard hours – Night[1]							
Site establishment	39	34	25	18	0	0	0
Track works + earthworks	39	5	24	49	6	0	0
Awning work	39	38	22	15	0	0	0
Signalling	39	3	0	0	0	0	0
Demobilisation + rehabilitation	39	20	12	0	0	0	0
Site compound	39	12	0	0	0	0	0
Forbes Station Yard – NCA06b (Total number of receivers – 1937)							
Standard hours							
Site establishment	48	364	54	9	1	0	0
Track works + earthworks	48	842	364	63	1	0	1
Awning work	48	364	54	9	1	0	0
Signalling	48	0	1	0	0	0	0
Demobilisation + rehabilitation	48	165	16	4	1	0	0
Site compound	48	4	0	1	0	0	0
Outside standard hours – Day time/Evening[1]							
Site establishment	43	630	110	16	1	0	0
Track works + earthworks	43	739	731	181	4	1	1
Awning work	43	493	83	12	1	0	0
Signalling	43	1	0	1	0	0	0
Demobilisation + rehabilitation	43	54	9	1	0	0	0
Site compound	43	9	0	1	0	0	0

WORK STAGE	NML $L_{eq,15 min}$	NUMBER OF PROPERTIES EXCEEDING NML, GROUPED BY MAGNITUDE OF EXCEEDANCE					HIGHLY NOISE AFFECTED
		0–5dB	5–10dB	10–20dB	20–30dB	>30dB	> 75dB
Outside standard hours – Night[1]							
Site establishment	38	814	630	125	1	1	0
Track works + earthworks	38	168	739	896	20	1	1
Awning work	38	853	493	95	0	1	0
Signalling	38	15	1	1	0	0	0
Demobilisation + rehabilitation	38	365	54	9	1	0	0
Site compound	38	54	9	1	0	0	0
Forbes Station Yard – NCA06c (Total number of receivers 1099)							
Standard hours							
Site establishment	49	31	3	3	0	0	0
Track works + earthworks	49	147	31	6	0	0	0
Awning work	49	31	3	3	0	0	0
Signalling	49	0	0	0	0	0	0
Demobilisation + rehabilitation	49	15	4	0	0	0	0
Site compound	49	0	0	0	0	0	0
Outside standard hours – Day time/Evening[1]							
Site establishment	44	61	10	3	0	0	0
Track works + earthworks	44	291	83	18	0	0	0
Awning work	44	45	5	3	0	0	0
Signalling	44	0	0	0	0	0	0
Demobilisation + rehabilitation	44	3	3	0	0	0	0
Site compound	44	3	0	0	0	0	0

WORK STAGE	NML $L_{eq,15\ min}$	NUMBER OF PROPERTIES EXCEEDING NML, GROUPED BY MAGNITUDE OF EXCEEDANCE					HIGHLY NOISE AFFECTED
		0–5dB	5–10dB	10–20dB	20–30dB	>30dB	> 75dB
Outside standard hours – Night[1]							
Site establishment	41	147	31	6	0	0	0
Track works + earthworks	41	385	175	50	3	0	0
Awning work	41	107	23	5	0	0	0
Signalling	41	3	0	0	0	0	0
Demobilisation + rehabilitation	41	14	4	0	0	0	0
Site compound	41	4	0	0	0	0	0
Wirrinya Yard – NCA05 (Total number of receivers – 11)							
Standard hours							
Site establishment	45	3	2	2	0	0	0
Track works	45	1	4	2	0	0	0
Demobilisation + rehabilitation	45	4	1	2	0	0	0
Outside standard hours – Night[1]							
Site establishment	35	1	0	6	1	0	0
Track works	35	1	0	5	2	0	0
Demobilisation + rehabilitation	35	3	2	2	0	0	0
Caragabal Yard – NCA04a (Total number of receivers – 50)							
Standard hours							
Site establishment	45	25	15	0	0	0	0
Track works	45	20	18	2	0	0	0
Demobilisation + rehabilitation	45	27	5	0	0	0	0
Outside standard hours – Night[1]							
Site establishment	35	1	18	24	0	0	0
Track works	35	1	3	38	2	0	0
Demobilisation + rehabilitation	35	25	15	0	0	0	0

WORK STAGE	NML $L_{eq,15\ min}$	NUMBER OF PROPERTIES EXCEEDING NML, GROUPED BY MAGNITUDE OF EXCEEDANCE					HIGHLY NOISE AFFECTED
		0–5dB	5–10dB	10–20dB	20–30dB	>30dB	> 75dB
Caragabal Yard – NCA04b (Total number of receivers – 5)							
Standard hours							
Site establishment	45	0	1	4	0	0	0
Track works	45	0	0	5	0	0	0
Demobilisation + rehabilitation	45	0	1	4	0	0	0
Outside standard hours – Day time/Evening[1]							
Site establishment	40	0	0	5	0	0	0
Track works	40	0	0	2	3	0	0
Demobilisation + rehabilitation	40	1	2	2	0	0	0
Outside standard hours – Night[1]							
Site establishment	39	0	0	4	1	0	0
Track works	39	0	0	1	4	0	0
Demobilisation + rehabilitation	39	0	2	3	0	0	0
Bribbaree Yard – NCA02 (Total number of receivers – 51)							
Standard hours							
Site establishment	45	0	21	12	3	0	0
Track works + earthworks	45	4	0	29	7	0	0
Signalling	45	5	0	0	0	0	0
Demobilisation + rehabilitation	45	7	19	8	2	0	0
Site compound	45	5	3	2	0	0	0
Outside standard hours							
Site establishment	35	2	3	28	8	0	0
Track works + earthworks	35	1	2	10	24	5	0
Signalling	35	17	3	5	0	0	0
Demobilisation + rehabilitation	35	0	21	12	3	0	0
Site compound	35	21	8	7	0	0	0

(1) Refer Table 3.2 for a description of hours

Table 4.4 presents a summary of the maximum noise level assessment noise levels compared against the sleep disturbance levels for residential receivers for each assessed scenario. Results have been presented in terms of number of properties exceeding the sleep disturbance levels for each work stage.

Table 4.4 Maximum predicted noise levels (sleep disturbance)

WORK STAGE	MAXIMUM NOISE LEVEL		NUMBER OF RECEIVERS EXCEEDING SLEEP DISTURBANCE LEVELS[1]
	RBL + 15 (dBA)	L_{max} (dBA)	
Forbes Station Yard – NCA06a (Total number of receivers – 179)			
Site establishment	49	65	43
Track works + earthworks			79
Awning work			43
Signalling			0
Demobilisation + rehabilitation			24
Site compound			10
Forbes Station Yard – NCA06b (Total number of receivers – 1937)			
Site establishment	48	65	870
Track works + earthworks			1,653
Awning work			870
Signalling			21
Demobilisation + rehabilitation			205
Site compound			62
Forbes Station Yard – NCA06c (Total number of receivers 1099)			
Site establishment	51	65	47
Track works + earthworks			224
Awning work			47
Signalling			5
Demobilisation + rehabilitation			13
Site compound			8
Wirrinya Yard – NCA05 (Total number of receivers – 11)			
Site establishment	45	65	7
Track works			7
Demobilisation + rehabilitation			6

WORK STAGE	MAXIMUM NOISE LEVEL		NUMBER OF RECEIVERS EXCEEDING SLEEP DISTURBANCE LEVELS[1]
	RBL + 15 (dBA)	L_{max} (dBA)	
Caragabal Yard – NCA04a (Total number of receivers – 50)			
Site establishment	45	65	42
Track works			43
Demobilisation + rehabilitation			32
Caragabal Yard – NCA04b (Total number of receivers – 5)			
Site establishment	49	65	5
Track works			5
Demobilisation + rehabilitation			5
Bribbaree Yard – NCA02 (Total number of receivers – 51)			
Site establishment	45	65	39
Track works + earthworks			42
Signalling			27
Demobilisation + rehabilitation			36
Site compound			33

(1) Sleep disturbance applicable at residential receivers only, during period of 10pm to 7am.

4.6 NON-RESIDENTIAL CONSTRUCTION NOISE LEVELS

Table 4.8 presents a summary of the predicted noise levels compared to the relevant NMLs for non-residential receivers for each assessed scenario. Results have been presented in terms of number of properties exceeding the construction NMLs for each work stage.

Table 4.5 Predicted construction noise levels at residential receivers

RECEIVER TYPE	NML[1]	NUMBER OF PROPERTIES EXCEEDING NML					
	$L_{EQ,15\,min}$	Site establishment	Track works + earthworks	Awning work	Signalling	Demobilisation	Site compound
Educational	55	4	7	4	0	0	0
Medical	55	0	0	0	0	0	0
Commercial	70	0	0	0	0	0	0
Industrial	75	6	6	6	6	0	6
Active recreation	65	0	0	0	0	0	0
Passive recreation	60	0	0	0	0	0	0
Place of worship	55	0	1	0	0	0	0

(1) NMLs for non-residential land uses apply when in use.

All exceedances predicted for non-residential receivers are minor and few exceed NMLs by more than 5dB. Most exceedances are predicted to occur in Forbes, particularly during trackwork activities. However, minor exceedances have also been predicted to occur at educational facilities within Bribbaree.

Detailed results of noise modelling for non-residential receivers are presented graphically in Appendix B.

4.7 CONSTRUCTION TRAFFIC ASSESSMENT

During the construction phase of the proposal, heavy vehicles would be required for materials and equipment delivery while light vehicles will transport workers to and from the site. This additional road traffic may impact receivers along the proposed transport routes.

The likely routes for these vehicles and proposal traffic numbers are shown for each site in Table 4.6. Traffic numbers would be similar at all locations with track works.

Section 3.1.4 outlines that an increase in road traffic noise during construction of less than 2dB would generally be considered acceptable. This corresponds to an approximate increase in traffic of 60 per cent.

Quantitative increases in road traffic noise as a result of additional construction traffic have been calculated using a spreadsheet CoRTN road noise calculations and presented in Table 4.6.

Where existing traffic volumes were available, a quantitative prediction of the expected road traffic noise increase has been provided. At all other sites, a qualitative discussion is presented, in the absence of site specific information.

Table 4.6 Predicted construction traffic routes and numbers (Single direction)

TRAFFIC ROUTE	CONSTRUCTION TRAFFIC NUMBERS (PEAK PER HOUR)		EXISTING TRAFFIC NUMBERS[1] (PER DAY)		PREDICTED INCREASE IN ROAD TRAFFIC NOISE dBA
	Light vehicles	Heavy vehicles	Light vehicles	Heavy vehicles	
Forbes Station and Yard					
Newell Highway	10	8	815[2]	478[2]	0.0 $L_{eq\ (15\ hr)}$
Union Street	10	8	1,054[5]	188[5]	0.0 $L_{eq\ (15\ hr)}$
Wirrinya Yard					
Newell Highway	10	8	815[2]	478[2]	0.0 $L_{eq\ (15\ hr)}$
Wirrinya Road	10	8	37[5]	34[5]	–
Caragabal Yard					
Newell Highway	10	8	1,035[5]	826[5]	0.0 $L_{eq\ (15\ hr)}$
Mid Western Hwy	10	8	Unknown	Unknown	–

TRAFFIC ROUTE	CONSTRUCTION TRAFFIC NUMBERS (PEAK PER HOUR)		EXISTING TRAFFIC NUMBERS[1] (PER DAY)		PREDICTED INCREASE IN ROAD TRAFFIC NOISE dBA
	Light vehicles	Heavy vehicles	Light vehicles	Heavy vehicles	
Bribbaree Yard					
Railway Street	10	8	Unknown	Unknown	–
Bribbaree Road	10	8	Unknown	Unknown	–
Mary Gilmore Way	10	8	Unknown	Unknown	–
Goldfields Way	10	8	Unknown	Unknown	–
Newell Highway	10	8	634[4]	405[4]	0.0 $L_{eq\ (15\ hr)}$

(1) Source: https://roads-waterways.transport.nsw.gov.au/about/corporate-publications/statistics/traffic-volumes/aadt-map/index.html#/?z=11

(2) ID 6144, Newell Hwy, 150m West of Greens Road

(3) ID T0253, Newell Hwy, 250m South of Mid-Western Hwy

(4) ID 6142, Newell Hwy, 460m East of Nicholson Lane

(5) Forbes Shir Council traffic counts

Existing traffic numbers were estimated at locations along the Newell Highway. At these sites, the predicted increase in road traffic noise is expected to be less than 0.1dB and would not be noticeable.

With the exception of Union Street in Forbes and Railway Street in Bribbaree, all remaining locations are designated as approved B double routes (https://www.rms.nsw.gov.au/business-industry/heavy-vehicles/maps/restricted-access-vehicles-map/map/index.html). Union Street is designated as an 'Approved route, pending travel conditions'. Given likely existing traffic numbers (including heavy vehicles) along these routes, adverse road traffic noise impacts are not anticipated as a result of construction of the proposal during daytime hours. Noise impacts may be noted whilst heavy vehicles are moving along Railway Street at Bribbaree, however as this route is short, impacts will be minor. Where heavy vehicle movements are required to be undertaken outside of standard hours and on routes away from the Newell Highway, impacts may occur.

Noise management measures have been recommended in Section 7.1 to assist in minimising the potential for noise disturbance from construction traffic.

4.8 DISCUSSION OF CONSTRUCTION NOISE IMPACTS

4.8.1 FORBES STATION AND YARD (NCA06A)

Exceedances for NMLS are shown at residential properties in NCA06a during Standard (Daytime) Hours for all work stages, except for signalling and compound activities. Most exceedances are predicted to be relatively minor (<5dBA), however during track works, up to 26 receivers may experience noise levels more than 5dB above NMLs. Exceedances have been predicted to occur during site establishment and demobilisation, however due to the short-term nature of these works, the impacts are considered minor.

No properties are expected to exceed the highly affected level of 75dB $L_{eq\ 15\ min}$.

Where works are conducted during Out of Hours Works (night) periods, noise impacts are predicted to be somewhat higher. Again, track works are predicted to generate the largest noise impacts, with exceedances of more than 5dB predicted to occur at 79 properties; with 55 receivers exceeding more than 5dB above NMLs. Where station work is undertaken during Out of Hours Night periods, noise levels more than 5dB above the NMLS are anticipated at 37 properties and sleep disturbance may occur at up to 79 properties during track work activities.

It is proposed that track works and work on the Forbes Station awning are carried out over a single 60 hour possession period and track occupancy authorisations. Construction activities would be undertaken where practicable within standard ICNG hours.

4.8.2 FORBES STATION AND YARD (NCA06B)

It is proposed that track works and work on the Forbes Station awning are carried out over a single 60 hour possession period and track occupancy authorisations. Construction activities would be undertaken where practicable within standard ICNG hours.

This is the largest noise catchment area, covering 1937 properties, across much of the urban area of Forbes. During the loudest work stage (track works), exceedances may occur at up to 429 residences during Standard (daytime) hours. Exceedances of more than 5dB above NML are predicted during all work stages except site compound establishment. Exceedances have been predicted to occur during site establishment and demobilisation, however due to the short-term nature of these works, the impacts are considered minor.

One property is expected to exceed the highly affected level of 75dB $L_{eq\ 15\ min}$ during track works.

Where works are conducted during Out of Hours Works periods, noise impacts are predicted to be somewhat higher. Again, track works are predicted to generate the largest noise impacts, with exceedances of more than 5dB predicted to occur at 1657 properties. Where station work is undertaken during night-time hours, noise levels above the NMLs may be noted at 589 properties and sleep disturbance may occur at up to 1,653 properties during track work activities.

It is proposed that track works and work on the Forbes Station awning are carried out over a single 60 hour possession period and track occupancy authorisations. Construction activities would be undertaken where practicable within standard ICNG hours.

4.8.3 FORBES STATION AND YARD (NCA06C)

This is the second largest noise catchment area, covering 1099 properties. Impacts within NCA06c are substantially lower than within NCA06b. During the loudest work stage (track works), exceedances of more than 5dB greater than the NMLs have been predicted at 37 properties, with six residences experiencing exceedances up to 20dB above NMLs. All other exceedances are predicted to be relatively minor (< 5dB).

No properties are expected to exceed the highly affected level of 75dB $L_{eq\ 15\ min}$ during any work stage.

Where works are conducted during Out of Hours Works periods, noise impacts are predicted to be somewhat higher. Again, track works are predicted to generate the largest noise impacts, with exceedances of more than 5dB predicted to occur at 228 properties, with 50 residences experiencing exceedances up to 20dB above NMLs and three residences up to 30dB above NMLs and sleep disturbance may occur at up to 224 properties during track work activities.

It is proposed that track works and work on the Forbes Station awning are carried out over a single 60 hour possession period and track occupancy authorisations. Construction activities would be undertaken where practicable within standard ICNG hours.

4.8.4 WIRRINYA YARD (NCA05)

NCA05 includes 11 noise sensitive receivers within Wirrinya and surrounds. Noise impacts have been predicted during all work stages, however exceedances of more than 5dB are only predicted to occur at 6 properties during the loudest work stage (track works). Exceedances have been predicted to occur during site establishment and demobilisation, however due to the short-term nature of these works, the impacts are considered minor.

No properties are expected to exceed the highly affected level of 75dB $L_{eq\ 15\ min}$ during any work stage.

Where works are conducted during Out of Hours Works periods, noise impacts are predicted during all work stages, with the largest impacts expected to exceed NMLs by more than 5dB at up to seven properties during track works, with one residence experiencing exceedances up to 30dB above NMLs. Sleep disturbance impacts may occur at up to 7 properties during all night-time work stages. It is proposed that track works are carried out over a single 60 hour possession period, while other work stages are not planned for outside of standard ICNG hours.

4.8.5 CARAGABAL YARD (NCA04A)

NCA04a contains 50 noise sensitive receivers, of which up to 40 residences may be impacted during daytime track works, with 20 receivers predicted to experience exceedances more than 5dB above NMLs. Exceedances have been predicted to occur during site establishment and demobilisation, however due to the short-term nature of these works, the impacts are considered minor.

No properties are expected to exceed the highly affected level of 75dB $L_{eq\ 15\ min}$ during any work stage.

Where track works are conducted during Out of Hours Works periods, noise impacts are predicted to exceed NMLs by more than 5dB at up to 43 properties, with 38 residences experiencing exceedances up to 20dB above NMLs, and two up to 30dB above NMLs. Sleep disturbance impacts have been predicted during all night-time work stages at up to 43 properties. It is proposed that track works are carried out over a single 60 hour possession period, while other work stages are not planned for outside of standard ICNG hours.

4.8.6 CARAGABAL YARD (NCA04B)

This NCA contains only five noise sensitive receivers, however during track works, exceedances of more than 5dB above NMLs have been predicted at all identified properties. Exceedances have been predicted to occur during site establishment and demobilisation, however due to the short-term nature of these works, the impacts are considered minor.

No properties are expected to exceed the highly affected level of 75dB $L_{eq\ 15\ min}$ during any work stage.

Where track works are conducted during Out of Hours Works periods, noise impacts are predicted to exceed NMLs by more than 5dB at all five properties, with four of the properties to experience exceedances up to 30dB above NMLs. Sleep disturbance impacts may occur at 5 residences and during all night-time work stages. It is proposed that track works are carried out over a single 60 hour possession period, while other work stages are not planned for outside of standard ICNG hours.

4.8.7 BRIBBAREE YARD (NCA02)

NCA02 includes 51 noise sensitive receivers in Bribbaree. Of these properties, 40 residences may be impacted during track works, with 36 receivers identified as experiencing exceedances more than 5dB above NMLs. Exceedances have been predicted to occur during site establishment and demobilisation, however due to the short term nature of these works, the impacts are considered minor.

Site compound works during Standard (daytime) hours activities are predicted to exceedances NMLs by more than 5dB at five properties. During Out of Hours (Night) periods, these exceedances increase to 15 properties.

No properties are expected to exceed the highly affected level of 75dB $L_{eq\ 15\ min}$ during any work stage.

Where track works are conducted during Out of Hours (Night) periods, noise impacts are predicted to exceed NMLs by more than 5dB at up to 36 properties, with exceedances up to 20dB above NMLs at 12 residences, and up to 30dB above NMLs at three residences. Sleep disturbance impacts have been predicted during all night-time work stages and may occur at up to 42 residences and during night-time track works. It is proposed that track works are carried out over a single 60 hour possession period, while other work stages are not planned for outside of standard ICNG hours.

4.8.8 SUMMARY

Construction noise levels are predicted to exceed relevant construction NMLs at residential receivers at all track works sites, primarily during the track work activities. Most other exceedances are minor and can be managed with appropriate measures outlined in this report.

Due to the number of potentially affected receivers in the proposal affectation area, and the proximity of receivers to construction sites, many impacted receivers have been identified in the vicinity of Forbes Station and Yard (NCA06). Where track works are undertaken during Out of Hours (Night) periods, these impacts will be substantially higher. It is proposed that track works are carried out over a single 60 hour possession period and track occupancy authorisations, while work on the Forbes Station awning would be undertaken during track occupancy authorisations, for a period of around one week. Construction activities would be undertaken where practicable within standard ICNG hours.

Only one receiver in NCA06b is predicted to exceed the highly noise affected level of 75dB $L_{eq\ 15\ min}$ during any work stage. This expected to occur during track work activities. During this work stage, sleep disturbance impacts may occur at up to:

- 1,956 properties in Forbes (NCA6a, NCA06b and NCA06b)
- 7 in Wirrinya Yard (NCA05)
- 48 in Caragabal Yard (NCA04a and NCA04b)
- 42 at Bribbaree Yard (NCA02).

The identified impacts during site establishment and demobilisation are short term and as such are considered minor.

All construction noise impacts are temporary and confined to discrete periods. Accordingly, the identified impacts are not considered to be significant.

The relevant construction NMLs are predicted to be exceeded by up to 30dBA at several locations across several stages of construction, during Standard (daytime) hours and Out of Hours works periods. Noise management and mitigation measures would therefore be required to be implemented during construction of the proposal within the extent that is reasonable and feasible. Details of such noise mitigation are included in Chapter 7.

4.9 CUMULATIVE CONSTRUCTION NOISE ASSESSMENT

Sensitive receivers may be potentially impacted by cumulative noise levels associated with separate construction scenarios occurring simultaneously at adjacent worksites. Table 4.7 outlines project that are in planning stages in the vicinity of the Forbes Station and yard proposal. No other developments have been identified in the vicinity of other proposal sites.

Table 4.7 Projects potentially affecting cumulative noise impacts

PROPOSAL	DESCRIPTION	LOCATION	COMMENTS
Forbes Station and yards	This proposal	Refer Figure 1.1	Where track works on southern areas of the study area coincide with works at Forbes Station, some cumulative impacts may occur at receivers in the close vicinity of Forbes Station.
Lachlan River Bridge	Upgrade to the external structure of the Lachlan River Rail Bridge	2km south east of Forbes Station	Where works at Forbes Station coincide with works at the Lachlan River Bridge, some cumulative impacts may occur at receivers in the south of Forbes.
Wyndham Avenue	Track lowering	1km north east of Forbes Station	Where works at Forbes Station coincide with works at Wyndham Avenue, some cumulative impacts may occur for receivers in the north of Forbes.
Daroobalgie Loop	Track works	6km north east of Forbes Station	No cumulative noise impacts are predicted to occur from this project.
Daroobalgie Solar Farm	New 100MW solar farm. No approvals or anticipated start date have been confirmed at this time.	9km north east of Forbes Station	No cumulative noise impacts are predicted to occur from this project.
Edward Street subdivision	New subdivision for 223 residential properties and associated services	2km north west of Forbes Station	No cumulative noise impacts are predicted to occur from this project.

In most cases the cumulative noise impact experienced at the identified sensitive receivers will be equivalent to the highest construction noise level, or in worst case scenarios up to 3dBA higher than the highest noise level. These cumulative impacts would be experienced for limited periods of time when the highest noise generating construction activities in each area are occurring simultaneously.

In order to quantify specific cumulative impacts, it is essential to understand the scheduling for each project and further assessment on cumulative noise impacts should be undertaken during preparation of the CNVMP.

4.10 RESIDUAL CONSTRUCTION NOISE IMPACTS

Specific noise mitigation measures will be determined by the construction contractor during detailed construction planning. Where residual exceedances occur after the implementation of reasonable and feasible site-specific mitigation measures, the *ARTC Construction Noise and Vibration Framework (CNVF)* provides guidance on additional mitigation measures to be implemented for each receiver depending on the magnitude of residual exceedance. These are discussed further in Section 7.1.

Table 7.1 presents typical noise reductions from a selection of standard noise management measures.

Table 4.8 Indicative noise reduction from construction controls

REF	ENGINEERING CONTROLS	POSSIBLE NOISE BENEFIT, dBA
1	Portable temporary screens	5–10
2	Screen or enclosure for stationary equipment	10–15
3	Maximising the offset distance between noisy plant items and sensitive receivers	3–6
4	Avoiding using noisy plant simultaneously and/or close together, adjacent to sensitive receivers	2–5
5	Orienting equipment away from sensitive receivers	3–5
6	Carrying out loading and unloading away from sensitive receivers	3–5
7	Using noise source controls, such as the use of residential class mufflers, to reduce noise from all plant and equipment including bulldozers, cranes, graders, excavators and trucks	5–10
8	Selecting site access points and roads as far as possible away from sensitive receivers	3–6

Table 4.9 outlines recommended mitigation measures and the potential noise reductions during each work stage where these measures have been adopted. Where these specific management measures are not implanted, actual noise reductions will differ.

Table 4.9 Assumed mitigation measures – Potential noise reductions

WORK STAGE	ASSUMED NOISE MANAGEMENT MEASURES[1]	POTENTIAL NOISE REDUCTION dBA
Site establishment	6, 7	15
Track works	–	
Track works including earthworks	–	
Forbes Station awning work	4, 8	5
Signalling	–	
Demobilisation and rehabilitation	6, 7	15
Site compounds	2, 3, 5, 6	19

(1) Refer Table 4.7

Where these reductions are applied to the predicted construction noise levels outlined in Table 4.3, the number of properties predicted to experience noise levels in excess of the NMLs is substantially reduced. The updated noise levels are provided below in Table 4.10.

Table 4.10 Predicted construction noise exceedances at residential receivers (per NCA)

WORK STAGE	NML $L_{Aeq\ 15\ min}$	NUMBER OF PROPERTIES EXCEEDING NML, GROUPED BY MAGNITUDE OF EXCEEDANCE					
		0–5dB	5–10dB	10–20dB	20–30dB	>30dB	>75dB
Forbes Station Yard – NCA06a (Total number of receivers – 179)							
Standard hours							
Site establishment	51	0	0	0	0	0	0
Track works + earthworks	51	29	20	6	0	0	0
Awning work	51	6	0	0	0	0	0
Signalling	51	0	0	0	0	0	0
Demobilisation + rehabilitation	51	0	0	0	0	0	0
Site compound	51	0	0	0	0	0	0
Outside standard hours							
Site establishment	44	0	0	0	0	0	0
Track works + earthworks	44	24	29	26	0	0	0
Awning work	44	15	0	0	0	0	0
Signalling	44	0	0	0	0	0	0
Demobilisation + rehabilitation	44	0	0	0	0	0	0
Site compound	44	0	0	0	0	0	0
Outside standard hours							
Site establishment	39	3	0	0	0	0	0
Track works + earthworks	39	5	24	49	6	0	0
Awning work	39	22	15	0	0	0	0
Signalling	39	3	0	0	0	0	0
Demobilisation + rehabilitation	39	0	0	0	0	0	0
Site compound	39	0	0	0	0	0	0

WORK STAGE	NML $L_{Aeq\ 15\ min}$	NUMBER OF PROPERTIES EXCEEDING NML, GROUPED BY MAGNITUDE OF EXCEEDANCE					
		0–5dB	5–10dB	10–20dB	20–30dB	>30dB	>75dB
Forbes Station Yard – NCA06b (Total number of receivers – 1937)							
Standard hours							
Site establishment	48	0	1	0	0	0	0
Track works + earthworks	48	842	364	63	1	0	1
Awning work	48	54	9	1	0	0	0
Signalling	48	0	1	0	0	0	0
Demobilisation + rehabilitation	48	0	1	0	0	0	0
Site compound	48	0	0	0	0	0	0
Outside standard hours							
Site establishment	43	1	0	1	0	0	0
Track works + earthworks	43	739	731	181	4	1	1
Awning work	43	83	12	0	1	0	0
Signalling	43	1	0	1	0	0	0
Demobilisation + rehabilitation	43	1	0	0	0	0	0
Site compound	43	0	0	0	0	0	0
Outside standard hours							
Site establishment	38	15	1	1	0	0	0
Track works + earthworks	38	168	739	896	20	1	1
Awning work	38	493	83	12	1	0	0
Signalling	38	15	1	1	0	0	0
Demobilisation + rehabilitation	38	0	1	0	0	0	0
Site compound	38	1	0	0	0	0	0

WORK STAGE	NML $L_{Aeq\ 15\ min}$	NUMBER OF PROPERTIES EXCEEDING NML, GROUPED BY MAGNITUDE OF EXCEEDANCE					
		0–5dB	5–10dB	10–20dB	20–30dB	>30dB	>75dB
Forbes Station Yard – NCA06c (Total number of receivers – 1099)							
Standard hours							
Site establishment	49	0	0	0	0	0	0
Track works + earthworks	49	147	31	6	0	0	0
Awning work	49	3	3	0	0	0	0
Signalling	49	0	0	0	0	0	0
Demobilisation + rehabilitation	49	0	0	0	0	0	0
Site compound	49	0	0	0	0	0	0
Outside standard hours							
Site establishment	44	0	0	0	0	0	0
Track works + earthworks	44	291	83	18	0	0	0
Awning work	44	5	3	0	0	0	0
Signalling	44	0	0	0	0	0	0
Demobilisation + rehabilitation	44	0	0	0	0	0	0
Site compound	44	0	0	0	0	0	0
Outside standard hours							
Site establishment	41	3	0	0	0	0	0
Track works + earthworks	41	385	175	50	3	0	0
Awning work	41	23	3	2	0	0	0
Signalling	41	3	0	0	0	0	0
Demobilisation + rehabilitation	41	0	0	0	0	0	0
Site compound	41	0	0	0	0	0	0
Wirrinya Yard – NCA05 (Total number of receivers – 11)							
Standard hours							
Site establishment	45	1	0	0	0	0	0
Track works	45	1	4	2	0	0	0
Demobilisation + rehabilitation	45	0	0	0	0	0	0

WORK STAGE	NML $L_{Aeq\ 15\ min}$	NUMBER OF PROPERTIES EXCEEDING NML, GROUPED BY MAGNITUDE OF EXCEEDANCE					
		0–5dB	5–10dB	10–20dB	20–30dB	>30dB	>75dB
Outside standard hours							
Site establishment	35	1	1	0	0	0	0
Track works	35	1	0	5	2	0	0
Demobilisation + rehabilitation	35	1	0	0	0	0	0
Caragabal Yard – NCA04a (Total number of receivers – 50)							
Standard hours							
Site establishment	45	0	0	0	0	0	0
Track works	45	20	18	2	0	0	0
Demobilisation + rehabilitation	45	0	0	0	0	0	0
Outside standard hours							
Site establishment	35	2	0	0	0	0	0
Track works	35	1	3	38	2	0	0
Demobilisation + rehabilitation	35	0	0	0	0	0	0
Caragabal Yard – NCA04b (Total number of receivers – 5)							
Standard hours							
Site establishment	45	2	0	0	0	0	0
Track works	45	0	0	5	0	0	0
Demobilisation + rehabilitation	45	1	0	0	0	0	0
Outside standard hours							
Site establishment	40	4	0	0	0	0	0
Track works	40	0	0	2	3	0	0
Demobilisation + rehabilitation	40	0	0	0	0	0	0
Outside standard hours							
Site establishment	39	3	1	0	0	0	0
Track works	39	0	0	1	4	0	0
Demobilisation + rehabilitation	39	0	0	0	0	0	0

WORK STAGE	NML $L_{Aeq\ 15\ min}$	NUMBER OF PROPERTIES EXCEEDING NML, GROUPED BY MAGNITUDE OF EXCEEDANCE					
		0–5dB	5–10dB	10–20dB	20–30dB	>30dB	>75dB
Bribbaree Yard – NCA02 (Total number of receivers – 51)							
Standard hours							
Site establishment	45	4	3	0	0	0	0
Track works + earthworks	45	4	0	29	7	0	0
Signalling	45	5	0	0	0	0	0
Demobilisation + rehabilitation	45	3	2	0	0	0	0
Site compound	45	0	0	0	0	0	0
Outside standard hours							
Site establishment	35	17	3	5	0	0	0
Track works + earthworks	35	1	2	10	24	5	0
Signalling	35	17	3	5	0	0	0
Demobilisation + rehabilitation	35	4	3	0	0	0	0
Site compound	35	0	0	0	0	0	0

Except for track and earthwork stages, the adoption of the standard engineering control outlined in Table 4.10 are likely to substantially reduce the incidence of noise impacts.

Table 4.11 presents a summary of the maximum residual noise levels compared against the sleep disturbance levels for residential receivers for each assessed scenario. Results have been presented in terms of number of properties exceeding the sleep disturbance levels for each work stage.

Table 4.11 Maximum predicted residual noise levels (sleep disturbance)

WORK STAGE	MAXIMUM NOISE LEVEL		NUMBER OF RECEIVERS EXCEEDING SLEEP DISTURBANCE LEVELS[1]
	RBL + 15 (dBA)	L_{max} (dBA)	
Forbes Station Yard – NCA06a (Total number of receivers – 179)			
Site establishment	49	65	0
Track works + earthworks			79
Awning work			24
Signalling			0
Demobilisation + rehabilitation			0
Site compound			0

WORK STAGE	MAXIMUM NOISE LEVEL		NUMBER OF RECEIVERS EXCEEDING SLEEP DISTURBANCE LEVELS[1]
	RBL + 15 (dBA)	L_{max} (dBA)	
Forbes Station Yard – NCA06b (Total number of receivers – 1937)			
Site establishment	48	65	12
Track works + earthworks			1653
Awning work			205
Signalling			21
Demobilisation + rehabilitation			1
Site compound			1
Forbes Station Yard – NCA06c (Total number of receivers 1099)			
Site establishment	51	65	4
Track works + earthworks			224
Awning work			13
Signalling			5
Demobilisation + rehabilitation			0
Site compound			0
Wirrinya Yard – NCA05 (Total number of receivers – 11)			
Site establishment	45	65	3
Track works			7
Demobilisation + rehabilitation			1
Caragabal Yard – NCA04a (Total number of receivers – 50)			
Site establishment	45	65	0
Track works			43
Demobilisation + rehabilitation			0
Caragabal Yard – NCA04b (Total number of receivers – 5)			
Site establishment	49	65	3
Track works			5
Demobilisation + rehabilitation			0
Bribbaree Yard – NCA02 (Total number of receivers – 51)			
Site establishment	45	65	16
Track works + earthworks			42
Signalling			27
Demobilisation + rehabilitation			11
Site compound			5

(1) Sleep disturbance applicable at residential receivers only, during period of 10pm to 7am.

4.10.1 ADDITIONAL CONSTRUCTION NOISE MANAGEMENT FOR RESIDUAL IMPACTS

Where all reasonable and feasible standard mitigation measures have been applied and exceedances are still predicted to occur, Chapter 7 provides guidance on additional mitigation measures to be implemented for each receiver. These will be considered in detail during preparation of the Construction Noise and Vibration Management Plan (CNVMP) (refer Section 7.1) for the proposal.

5 CONSTRUCTION VIBRATION ASSESSMENT

Vibration-generating equipment is required for certain construction activities. Vibration from this construction plant has the potential to affect nearby sensitive receivers. The vibration-generating plant indicated to be required during construction are vibratory rollers and hydraulic rock-breakers.

Table 5.1 presents the indicative minimum working distances for the nominated construction plant to minimise the risk of cosmetic damage to residential buildings and human comfort for sensitive receivers. Vibration levels and minimum safe working distances have been sourced from the Roads and Maritime Construction Noise and Vibration Guideline (CNVG).

The minimum working distances are based on the typical distances between proposed works and sensitive receivers to meet the limits set out in Section 3.2. Note that these distances are indicative only and results may vary depending on the activity, equipment, local ground, and receiver conditions.

Table 5.1 Recommended minimum working distances for vibration intensive plant

PLANT ITEM	MINIMUM WORKING DISTANCE (m)		
	Cosmetic damage	Human response	Vibration sensitive (heritage)
Forbes Station Yard			
Vibratory roller (7-13T)	15m	100m	15
Large hydraulic hammer (1800kg 18-34T excavator)	22m	73m	20
Bribbaree Yard			
Vibratory roller (7-13T)	15m	100m	15
Large hydraulic hammer (1800kg 18-34T excavator)	22m	73m	20
Wirrinya Yard			
Vibratory roller (7-13T)	15m	100m	15
Caragabal Yard			
Vibratory roller (7-13T)	15m	100m	15

Source: RMS CNVG.

Table 5.2 identifies the nearest vibration sensitive receivers to each proposal area, and where these locations are within minimum working distances, potential impacts to human comfort may occur.

Table 5.2 Locations of potential exceedances of minimum working distances

ADDRESS	DISTANCE (m)	POTENTIAL IMPACT	
		Cosmetic damage	Human response
Forbes Station Yard			
8 Union, St, Forbes	75	No	**Yes**
Forbes Station (state and locally heritage listed)	–	**Yes**[1]	No
Bribbaree Yard			
2 North St, Bribbaree	55	No	**Yes**
6 Short St, Bribbaree	20	**Yes**	**Yes**
2 Short St, Bribbaree	95	No	**Yes**
21 Railway St, Bribbaree	50	No	**Yes**
St Columba's Catholic Church and Presbytery (locally heritage listed)	50[2]	**No**	**Yes**
Bribbaree War Memorial (locally heritage listed)	40	No	**N/A**

(1) Where track works are conducted within distance outlined in Table 5.1

(2) It is noted that while the distance to the edge of the heritage curtilage for these items is 20m, the distance to any identified vibration sensitive structure is approximately 50m.

Potential impacts to human comfort may be experienced at two properties in Forbes and five sites in Bribbaree. Where a large hydraulic hammer is used within 22m of 6 Short Street, there is the potential for building damage and alternative less intensive construction methods should be used.

It is noted that a number of heritage items associated with the historic station are located within these distances. Given their current exposure to rail vibration, it is assumed that they are structurally sound and of low risk to vibration damage, however mitigation measures, including the preparation of condition reports have been provided in Chapter 7.

Where the use of vibration intensive plant is required and residential receivers are located within the minimum working distances outlined above, mitigation measures should be considered. These have been provided in Section 7.1.

6 OPERATIONAL NOISE ASSESSMENT

6.1 TRAIN OPERATION

The proposal would form part of the rail network managed and maintained by ARTC. Train services would be provided by a variety of operators. Inland Rail would be operational once all 13 sections of the overall project are complete, which is estimated to be in 2027.

Inland Rail would operate 24 hours per day and would initially accommodate double-stacked freight trains of up to 1,800 metres in length and up to 6.5 metres high. Train speeds would vary according to axle loads and range from 80 to 115km per hour.

It is estimated that Inland Rail would be trafficked by an average of 12 trains per day (each direction) in 2027, increasing to about 18 trains per day (each direction) in 2039. This rail traffic would be in addition to the existing rail traffic using other lines that the proposal interacts with, as described in Section 3.2.3.

The Inland Rail trains would be a mix of grain, bulk freight and other general transport trains. Total annual freight tonnages would be about 10 million tonnes in 2027, increasing to about 17.5 million tonnes in 2039.

The assessment of railway noise and vibration considers the redevelopment of the existing rail infrastructure, as part of the proposal, and the future railway operations forecast to occur once Inland Rail commences operations.

6.2 TRAIN NUMBERS

The noise assessment has considered exiting railway operations based no change from the year 2020, the future railway operations once Inland Rail commences operations in 2027 and the future capacity of Inland Rail in the year 2039. The daily train movements were adopted from ARTC's *Technical Note - IR Tonnage Profile and Train Plan*[1] and ARTC's noise emission modelling methodology for Inland Rail[2].

The train movements for each year of assessment are detailed in Table 6.1 and Table 6.2. For the purpose of assessing noise levels, an approximate 60:40 split of the daily train movements was assumed for daytime and night-time periods.

Table 6.1 Typical daily train numbers for noise modelling (both directions)

YEAR	TRAIN TYPE	TOTAL LENGTH, m	LOCOMOTIVE CLASS	TYPICAL DAYTIME	TYPICAL NIGHT-TIME	DAILY AVERAGE
2020 existing	NSW grain freight	984	82	3	2	5
2027 proposal opening	NSW grain freight	984	NR	1	1	2
	Inland Rail superfreighters	1,750	NR	5	3	8
	Steel freight	1,000	NR	1	1	2
2039 future capacity	NSW grain freight	984	NR	1	2	3
	Inland Rail superfreighters	1,750	NR	8	6	14
	Steel freight	1,000	NR	1	0	1

1 ARTC document 0-00000-900-POP-00-TN-0001_3.

2 ARTC document 01-9000-PE-P00-ME-1005 REV2.

Table 6.2 Summary of total daily train movements (each direction)

YEAR	TYPICAL DAYTIME	TYPICAL NIGHT-TIME	TOTAL 24-HOURS
2020 existing	3	2	5
2027 proposal opening	7	5	12
2027 (no proposal)	3	2	5
2039 future capacity	10	8	18
2039 (no proposal)	3	2	5

6.3 OPERATIONAL NOISE MODELLING METHODOLOGY

An operational train noise model was developed for each site where track works have been proposed using SoundPLAN 8.2 noise modelling software. Railway noise levels for daytime and night-time railway operations at each proposal site were calculated utilising the Nordic Rail Prediction Methodology (Kilde 130).

In addition to the train movements detailed above, the noise modelling adopted the approach detailed in Table 6.3.

Table 6.3 Noise modelling inputs and parameters

MODELLING ASPECT	APPROACH
Train speeds	80km/h all areas for existing (2020) traffic. 2027 and 2039 with Inland Rail, 80km/h in Forbes and 115km/h all other track sections.
Ground absorption	0.6
Façade correction	+2.5dBA
Level crossing	+6dBA to wheel rail emission
Locomotive notch	Medium (flat/level track)
Track curvature	No tight radius curves
Receivers	Digitised from the PSMA Geoscapes database with receivers at 1m from each building façade 2.4m above ground level.

Noise levels were modelled for an area 2km either side of the proposal alignment, the exception being Forbes where an area 500m either side of the track was adopted for the assessment of worst-case noise levels based on the high density of buildings on both sides of the railway corridor.

Buildings were reviewed to identify sensitive receivers consistent with the classification of receivers in the RING. The buildings identified as not being sensitive receivers were retained in the noise model as they will screen railway noise.

At this stage of the design, the specific notch operations of the locomotives as they traverse the alignment was not confirmed. For the purpose of assessment, a medium notch setting was applied at all locations as the track gradient is relatively level and uphill movements (high notch setting) or dynamic braking on downhill sections was not identified.

Local railway infrastructure was identified from aerial imagery, for example as rail bridges over waterways and level crossings where the rail alignment intersects the local road network.

Where receivers such as education institutions and places of worship require an assessment of internal railway noise levels a conservative 10dBA difference between the external noise levels at the building façade and the potential internal noise levels was applied. In practice, for modern buildings the difference could be more than 20dBA where windows are closed, for example where a property has air-conditioning.

6.4 OPERATIONAL NOISE LEVELS – PROPOSAL OPENING (2027)

6.4.1 OVERVIEW

For the opening year of railway operations within the proposal (2027), noise levels were calculated for the daytime and night-time railway operations and assessed against the noise management levels from the RING. The predicted railway noise levels are for the daily train movements on the rail line within the study area for each of the horizontal clearances.

The railway noise levels at residential receivers for railway operations at the opening of the proposal (2027) are detailed in Appendix C. The predicted daytime and night-time railway noise levels have been assessed against the noise management levels from the RING and 2027 predictions under a 'no proposal' scenario.

6.4.2 SUMMARY OF OPERATIONAL NOISE LEVELS 2027

A summary of the predicted railway noise levels, and residential receivers triggering a review of noise mitigation, is provided in Table 6.4. Further discussion on the identified noise triggers is provided in Section 6.8 and Section 7.2.

The proposed change in horizontal track alignment has a minor (less than 1 dB) influence on railway noise levels and, in isolation, does not trigger a review of railway noise mitigation at any of the horizontal clearances.

The railway noise levels and predicted change from the 2027 no-build scenario, are influenced by the proposed railway operations. This includes more trains per daytime and night-time period, longer trains, increased train speeds and the introduction of new types of rollingstock.

Table 6.4 Assessment of railway noise levels 2027

AREA	RAILWAY NOISE ASSESSMENT	NOISE TRIGGERS
Forbes Station and Yard	At residential receivers, railway noise levels with the proposal are predicted up to: — Daytime 62dBA $L_{Aeq15hr}$ — Night-time 62dBA L_{Aeq9hr} — Maximum 77dBA L_{Amax} Change (increase) in railway noise from no-build scenario: — Daytime 6dBA $L_{Aeq15hr}$ — Night-time 5dBA L_{Aeq9hr} — Maximum 1dBA L_{Amax}	The daytime operations and maximum railway noise levels do not trigger a review of mitigation The proposed night-time operations require a review of noise mitigation at one residence where noise levels are up to 2dB above the 60dBA $L_{Aeq,9hr}$ noise management level.
Wirrinya Yard	At residential receivers, railway noise levels with the proposal are predicted up to: — Daytime 70dBA $L_{Aeq15hr}$ — Night-time 69dBA L_{Aeq9hr} — Maximum 86dBA L_{Amax} Change (increase) in railway noise from no-build scenario: — Daytime 10dBA $L_{Aeq15hr}$ — Night-time 9dBA L_{Aeq9hr} — Maximum 4dBA L_{Amax}	There is one residence where the daytime, night-time and maximum noise levels trigger the noise management levels. The highest margin by which the noise management levels are triggered is 9dBA (night-time $L_{Aeq,9hr}$ noise levels).

AREA	RAILWAY NOISE ASSESSMENT	NOISE TRIGGERS
Caragabal Yard	At residential receivers, railway noise levels with the proposal are predicted up to: — Daytime 60dBA $L_{Aeq15hr}$ — Night-time 60dBA L_{Aeq9hr} — Maximum 76dBA L_{Amax} Change (increase) in railway noise from no-build scenario: — Daytime 10dBA $L_{Aeq15hr}$ — Night-time 9dBA L_{Aeq9hr} — Maximum 5dBA L_{Amax}	No receivers trigger the daytime or night-time noise management level. The maximum noise levels meet the L_{Amax} noise management levels at all residences.
Bribbaree Yard	At residential receivers, railway noise levels with the proposal are predicted up to: — Daytime 61dBA $L_{Aeq15hr}$ — Night-time 60dBA L_{Aeq9hr} — Maximum 77dBA L_{Amax} Change (increase) in railway noise from no-build scenario: — Daytime 9dBA $L_{Aeq15hr}$ — Night-time 8dBA L_{Aeq9hr} — Maximum 5dBA L_{Amax}	While daytime operations do not require a review of noise mitigation, there is one residence where the night-time noise levels trigger the noise management levels by less than 1dBA (night-time $L_{Aeq,9hr}$ noise levels). The maximum noise levels meet the L_{Amax} noise management levels at all residences.

6.5 OPERATIONAL NOISE LEVELS – FUTURE CAPACITY (2039)

6.5.1 OVERVIEW

The proposed railway operations in 2039 represent an increase in daily train movements only, all other operations are consistent with the proposal opening (2027) assessment scenario. The railway noise levels at residential receivers for the future capacity operations in 2039 are detailed in Appendix C. The predicted daytime and night-time railway noise levels have been assessed against the noise management levels from the RING and 2039 predictions under a 'no proposal' scenario.

6.5.2 SUMMARY OF OPERATIONAL NOISE LEVELS 2039

A summary of the predicted railway noise levels, and residential receivers triggering a review of noise mitigation, is provided in Table 6.5. Further discussion on the identified noise triggers is provided in Section 6.8 and Section 7.2.

Consistent with the assessment of railway noise for 2027, the railway noise levels, and predicted increase from the no-build scenario, are influenced by the proposed railway operations with Inland Rail. The proposed change in horizontal track alignment has a minor (less than 1dB) influence to railway noise levels and, in isolation, does not trigger a review of railway noise mitigation at any of the horizontal clearances.

Table 6.5 Assessment of railway noise levels 2039

AREA	RAILWAY NOISE ASSESSMENT	NOISE TRIGGERS
Forbes Station and Yard	At residential receivers, railway noise levels with the proposal are predicted up to: — Daytime 64dBA $L_{Aeq15hr}$ — Night-time 65dBA L_{Aeq9hr} — Maximum 77dBA L_{Amax} Change (increase) in railway noise from no-build scenario: — Daytime 7dBA $L_{Aeq15hr}$ — Night-time 7dBA L_{Aeq9hr} — Maximum 1dBA L_{Amax}	While the daytime operations do not require a review of noise mitigation, the proposed night-time operations require a review of noise mitigation at 1 residence. The night-time noise level at this receiver is up to 5dB above the 60dBA $L_{Aeq,9hr}$ noise management level. The maximum railway noise levels do not trigger a review of mitigation.
Wirrinya Yard	At residential receivers, railway noise levels with the proposal are predicted up to: — Daytime 72dBA $L_{Aeq15hr}$ — Night-time 72dBA L_{Aeq9hr} — Maximum 86dBA L_{Amax} Change (increase) in railway noise from no-build scenario: — Daytime 12dBA $L_{Aeq15hr}$ — Night-time 11dBA L_{Aeq9hr} — Maximum 4dBA L_{Amax}	There is one residence where the daytime, night-time and maximum noise levels trigger the noise management levels. The highest margin by which the noise management levels are triggered is 12dBA (night-time $L_{Aeq,9hr}$ noise levels).
Caragabal Yard	At residential receivers, railway noise levels with the proposal are predicted up to: — Daytime 62dBA $L_{Aeq15hr}$ — Night-time 63dBA L_{Aeq9hr} — Maximum 76dBA L_{Amax} Change (increase) in railway noise from no-build scenario: — Daytime 12dBA $L_{Aeq15hr}$ — Night-time 11dBA L_{Aeq9hr} — Maximum 5dBA L_{Amax}	While the daytime operations do not require a review of noise mitigation, there are 2 residences where the night-time noise levels trigger the noise management levels. The highest margin by which the noise management levels are triggered is 3dBA (night-time $L_{Aeq,9hr}$ noise levels). The maximum noise levels meet the L_{Amax} noise management level at all residences.
Bribbaree Yard	At residential receivers, railway noise levels with the proposal are predicted up to: — Daytime 63dBA $L_{Aeq15hr}$ — Night-time 63dBA L_{Aeq9hr} — Maximum 77dBA L_{Amax} Change (increase) in railway noise from no-build scenario: — Daytime 12dBA $L_{Aeq15hr}$ — Night-time 11dBA L_{Aeq9hr} — Maximum 5dBA L_{Amax}	While the daytime operations do not require a review of noise mitigation, there are nine residences where the night-time noise levels trigger the noise management levels by up to 3dBA. The maximum noise levels meet the L_{Amax} noise management level at all residences.

6.6 NON-RESIDENTIAL SENSITIVE RECEIVERS

The noise assessment has assumed that sensitive receivers (other than residential) such as education institutions and places of worship would usually be occupied the daytime period (7.00am to 10.00pm) but there can be instances where properties are in use outside this period.

Based on the predicted external railway noise levels and allowing for a conservative 10dBA difference between external and internal railway noise levels, the assessment found the RING noise management levels were met at most receivers.

A summary of the non-residential sensitive receivers where the RING noise management levels may be triggered is provided in Table 6.6. To confirm that the non-residential sensitive receivers trigger the RING criteria, noise monitoring will be conducted to determine the effectiveness of the façade.

Noise levels would be assessed to meet the noise trigger levels where the building facades attenuate the intrusion of railway noise so the difference between external and internal railway noise is greater than 12dBA. This is potentially achieved where windows and doors are closed.

Table 6.6 Assessment of railway noise levels at non-residential sensitive receivers

AREA	RAILWAY NOISE ASSESSMENT NON-RESIDENTIAL SENSITIVE RECEIVERS
Forbes Station and Yard	2027 and 2039 – no triggers
Wirrinya Yard	2027 and 2039 – no triggers
Caragabal Yard	2027 and 2039 – no triggers
Bribbaree Yard	2027 and 2039 – no triggers

6.7 LEVEL CROSSINGS

The proposed infrastructure for the horizontal clearances is not upgrading existing level crossings where the rail crosses local road networks. On this basis there proposed infrastructure upgrades will not influence noise from level crossings.

There is potential for the future railway operations to amend the noise levels associated of the level crossings. The proposed increase in train speeds may require trains to sound their horns further from level crossings to allow enough time to warn pedestrians and road users. As a result, there could be a transfer of noise away from some receivers but bring train horn events closer to other receivers.

The increased train movements in the daytime and night-time periods are likely to result in addition train horn and level crossing events. These additional events are not expected to materially influence the 15-hour daytime and 9-hour night-time L_{Aeq} railway noise levels.

The 95th percentile L_{Amax} noise levels at individual receivers can be influenced by the train horns depending on the number of events and the various noise level contributions from the train passbys, level crossing alarm bells and train horn events. Nonetheless, there is potential for annoyance or disturbance due to the increase in the number of highest noise events where receivers experience train horn and/or level crossing noise.

It is recommended that a detailed assessment of noise from railway operations at level crossings is undertaken during detailed design when the various sources of noise during each 24-hour period are known, including the future location of train horn events for northbound and southbound rail traffic.

6.8 SUMMARY OF NOISE MITIGATION TRIGGERS

6.8.1 REVIEW OF NOISE TRIGGERS

The operational railway noise levels have been assessed to not materially change (less than 1dBA change) as a result of the proposed upgrade works associated with the horizontal clearances. The future railway operations with Inland Rail have been determined to increase railway noise levels and, in some cases, trigger a review of railway noise mitigation.

The residential properties where railway noise levels trigger a review of feasible and reasonable noise mitigation are summarised in Table 6.7.

For most of the receivers, a reduction in operational noise levels of 3dBA or less is required for the noise levels to meet the RING noise management levels. The required noise reduction and the location of the individual sensitive receivers are considered as part of the decision of feasible and reasonable mitigations.

FORBES STATION AND YARD

During the proposal opening (2027) and future capacity (2039) scenarios, there is one residential receiver triggered for a review of mitigation. This receiver is located on the corner of Union Street and Lewis Street, approximately 40m from the railway alignment at its closest point.

WIRRINYA

During both the proposal opening (2027) the future capacity (2039) scenarios, one receiver triggers a review of railway noise mitigation in the Wirrinya area, and is located along Wirrinya Road, approximately 20m from the rail alignment.

CARAGABAL

During the proposal opening (2027) scenario, no residential receiver have triggered a review of railway noise mitigation in the Caragabal area. These receiver is located along Railway Street, approximately 100m from the rail alignment.

During the future capacity (2039) scenario, two residential receivers have triggered a review of railway noise mitigation in the Caragabal area. These receivers are located along Railway Street.

BRIBBAREE

During the proposal opening (2027) scenario, one receiver triggers a review of railway noise mitigation in the Bribbaree area. This receiver is located along Short Street.

During the future capacity (2039) scenario, nine residential receivers trigger a review of railway noise mitigation in the Bribbaree area. These receivers are located along Short Street, Railway Street and one residential receiver on the corner of Bribbaree Street and Weedallion Street. These receivers are dispersed over a distance of more than 500 metres, and as such a barrier is not considered to be a reasonable mitigation measure to reduce these impacts at Bribbaree.

Table 6.7 Summary of noise mitigation triggers

NOISE TRIGGER MARGIN	YEAR 2027 NOISE TRIGGERS	YEAR 2039 NOISE TRIGGERS
Forbes Station and Yard		
1 to 3dBA	1	0
>3dBA to 5dBA	0	1
>5dBA to 10dBA	0	0
>10dBA	0	0
Total per scenario	1	1

NOISE TRIGGER MARGIN	YEAR 2027 NOISE TRIGGERS	YEAR 2039 NOISE TRIGGERS
Wirrinya Yard		
1 to 3dBA	0	0
>3dBA to 5dBA	0	0
>5dBA to 10dBA	1	0
>10dBA	0	1
Total per scenario	1	1
Caragabal Yard		
1 to 3dBA	0	2
>3dBA to 5dBA	0	0
>5dBA to 10dBA	0	0
>10dBA	0	0
Total per scenario	0	2
Bribbaree Yard		
1 to 3dBA	1	9
>3dBA to 5dBA	0	0
>5dBA to 10dBA	0	0
>10dBA	0	0
Total per scenario	1	9

The assessment has identified up to 13 residential sensitive receivers where the noise management levels may not be achieved without the implementation of noise mitigation. In addition, ARTC is proposing to implement a range of noise mitigation measures that can reduce noise levels to achieve a perceptible reduction to the level and character of the noise at sensitive receivers. In particular, the at-property treatments can manage the intrusion of railway noise, with the objective of maintaining amenity within habitable rooms. Receivers will be contacted during the approvals phase concerning specific mitigation.

6.8.2 RESIDUAL IMPACTS

In the context of the local environment at the sites of the horizontal clearances, it is likely the rail freight operations will influence the noise environment. The predicted railway noise levels within the immediate 1km are at or above the ambient noise levels and there remains potential for train passby events, particularly, during the night-time to be clearly audible. There may still remain the potential for annoyance or disturbance, even where noise mitigation is in place and the noise management levels from the RING are readily achieved, particularly in the short term as the community adjusts to changes in this noise source.

6.9 VIBRATION FROM RAILWAY OPERATIONS

6.9.1 *GROUND-BORNE VIBRATION*

In isolation, the upgrade of the track as part of the horizontal clearances is not expected to materially change the potential levels of ground-borne vibration that may be experienced at existing receivers.

The assessment has considered the future railway operations with Inland Rail. Referencing the proposed daytime and night-time train movements for 2027 and 2039. To assess potential impacts from ground-borne vibration a reference vibration dose value (VDV) for a freight train passby of $0.04m/s^{1.75}$ at 15m was adopted from measurement and assessment of vibration on Inland Rail.

The calculated distance from the nearest rail to meet the VDV assessment criteria are detailed in Table 6.8.

Table 6.8 Ground-borne vibration assessment

RAILWAY OPERATIONS	GROUND-BORNE VIBRATION OFFSET DISTANCE	
	Daytime	Night-time
Proposal opening (2027)	9m	11m
Future capacity (2039)	10m	12m

Note: Daytime criterion $0.2m/s^{1.75}$ and night-time criterion $0.13\ m/s^{1.75}$

An offset distance of 12m is estimated to meet the assessment criteria. There is one sensitive receiver at Wirrinya that is 14m from the rail line, all other sensitive receivers are at least 35m from the rail line at the horizontal clearances.

Based on the scoping assessment there is a relatively low risk of impact from railway induced vibration at most sensitive receivers. Notwithstanding, there can still be potential for train passbys to result in perceptible ground-borne vibration at sensitive receivers even where the assessment criteria are met.

The Forbes Station buildings are site of heritage significance that are already exposed to railway vibration and assumed to be structurally sound and of low risk to vibration damage. It is recommended that further evaluation of heritage significant sites is undertaken during detailed design and pre-construction where they structures are identified to be at risk of cosmetic damage from railway induced vibration.

6.9.2 *GROUND-BORNE NOISE*

In isolation, the upgrade of the track as part of the horizontal clearances is not expected to materially change the potential levels of ground-borne noise that may already be experienced at existing receivers.

Referencing a typical ground-borne noise emission level of 82dBA at 15m from a freight train passby, the more stringent night-time L_{ASmax} 35dBA criterion is conservatively estimated to be met at receivers located 60m or greater from the railway line. The distance is based on train at 115km/h and is reduced to approximately 45m from train at 80km/h.

There are existing sensitive receivers within 45m to 60m of the railway line. At these distances the airborne railway noise is expected to be the dominant contribution and likely to mask the ground-borne noise component at habitable rooms facing the rail line.

Notwithstanding, the airborne noise may not fully mask the ground-borne noise within all rooms and there can still be a risk of minor perceptible ground-borne noise even where the criteria are achieved. The potential for impact will be dependent on the vibration propagation within individual buildings and the acoustic environment of the receiving rooms.

It is recommended that ground-borne noise is reviewed during the detailed design and pre-construction stage to verify the ground-borne noise levels and assessment outcomes.

7 MITIGATION AND MANAGEMENT MEASURES

7.1 CONSTRUCTION NOISE AND VIBRATION MANAGEMENT MEASURES

7.1.1 SITE SPECIFIC MITIGATION MEASURES

Based on the outcomes of this assessment, construction activities are anticipated to generate impacts at some receivers, requiring the implementation of noise management and mitigation measures.

The following site-specific construction noise mitigation measures should be considered during preparation of the Construction Noise and Vibration Management Plan (CNVMP):

- Sections O9.1 to O9.6 of the ARTC EPL 3142.
- It is recommended that noisy works, particularly including the use of rock breakers, concrete saws and earthworks equipment are undertaken within ICNG standard hours (7am to 6pm Weekdays, 8am to 1pm Saturday) as far as practicable, to minimise impacts during sensitive sleeping/resting periods. Where work is required outside of ICNG standard hours, and there is an adverse impact to sensitive receivers resulting from the use of this equipment, sensitive periods such as after 10pm and before 7am should be avoided as far as practicable.
- Respite periods will be provided during noisy work where noise impacts have been predicted.
- Deliveries should be during ICNG standard hours where practicable.
- Screen or enclose stationary noisy equipment.
- Select the minimum feasible noise (or vibration) generating plant of method for each task.
- Maximise the separation distance between noisy plant items and sensitive receivers.
- Use equipment noise controls, such as the use of residential class mufflers to reduce noise from trackwork and earth earthmoving plant and equipment.
- The preparation of Building/infrastructure/utilities reports for items potentially affected by construction vibration, heritage items such as Forbes Station.

7.1.2 ARTC INLAND RAIL ENVIRONMENTAL MANAGEMENT MEASURES

Construction noise and vibration would be managed in accordance with *ARTC Inland Rail Environmental Management Measures* (0-0000-900-EEC-00-PL-0001_0). Relevant management measures that would be implemented during construction and operation of the proposal are provided in Table 7.1 and Table 7.2.

Table 7.1 ARTC Inland Rail noise and vibration management measures for detailed design/pre-construction

REF	ISSUE / IMPACT	MITIGATION MEASURES – DETAILED DESIGN / PRE-CONSTRUCTION
CNV1	*Managing the potential for construction noise and vibration impacts*	Prior to the commencement of construction, noise and vibration impacts would be confirmed based on the final project design.

REF	ISSUE / IMPACT	MITIGATION MEASURES – DETAILED DESIGN / PRE-CONSTRUCTION
CNV2	*Minimising the potential for construction vibration (structural) impacts*	Where vibration levels are predicted to exceed the structural screening criteria for a particular structure as a result of detailed design, a more detailed assessment of the structure and vibration monitoring would be carried out in accordance with the Inland Rail NSW *Construction Noise and Vibration Management Framework*, to ensure appropriate mitigation and management plans are implemented. During construction, if vibration-generating activities are conducted within 15 metres of a residence, attended vibration measurements would be undertaken at the commencement of vibration generating activities to confirm that structural vibration limits are within the acceptable range. Where vibration levels are found to be unacceptable, alternative work methods would be implemented so the vibration impacts are reduced to acceptable levels.

Table 7.2 Compilation of mitigation measures for construction

REF	ISSUE / IMPACT	MITIGATION MEASURES – CONSTRUCTION
CNV3	*Managing the potential for noise and vibration impacts during construction*	A Construction Noise and Vibration Management Plan (CNVMP) would be prepared and implemented as part of the CEMP in accordance with the Inland Rail NSW Construction Noise and Vibration Management Framework and ARTC's EPL3142. The plan would have measures, processes and responsibilities to manage and monitor noise and vibration and minimise the potential for impacts during construction. This plan will include: — construction noise and vibration criteria for the proposal — location of sensitive receivers in proximity to the construction area — specific management measures for activities that could exceed the construction noise and vibration criteria — notification of impacts would be undertaken in accordance with the communication management plan for the proposal.
CNV4	*Impacts of out-of-hours work*	An out-of-hours work protocol would be developed to define the process for considering, approving and managing out-of-hours work, including implementation of feasible and reasonable measures and communication requirements. Measures would be aimed at pro-active communication and engagement with potentially affected receivers, provision of respite periods and/or alternative accommodation for defined exceedance levels. All work outside the primary proposal construction hours would be undertaken in accordance with the *Inland Rail NSW Construction Noise and Vibration Management Framework* and in accordance with the out-of-hours work protocol. The protocol would provide guidance for the preparation of out-of-hours work plans for each construction work location and for key works. Out-of-hours work plans would be prepared in consultation with key stakeholders (including the NSW EPA) and the community and incorporated into the construction noise and vibration management plan.

REF	ISSUE / IMPACT	MITIGATION MEASURES – CONSTRUCTION
CNV5	*Minimising the potential for construction vibration (structural) impacts*	Building condition surveys would be completed before and after construction works where buildings or structures are within the minimum vibration working distances for cosmetic damage (refer Table 5.2).
CNV6	*Impacts on heritage items as a result of construction vibration*	Prior to the commencement of vibration intensive works within the minimum working distances for cosmetic damage for heritage items, the potential for damage to the item would be assessed. Where there is potential for damage to heritage items, alternative methods that generate less vibration would be investigated and substituted where practicable. Where residual cosmetic damage risks to heritage items remain, condition surveys would be carried out and vibration monitoring with real-time notification of exceedance would occur during the activity. Any identified vibration-related damage to the heritage items would be rectified.

7.2 OPERATIONAL NOISE MITIGATION

7.2.1 ARTC INLAND RAIL ENVIRONMENTAL MANAGEMENT MEASURES

During the detailed design and pre-construction phase the management and mitigation of railway noise and vibration shall adopt the measures outlined in the *ARTC Inland Rail Environmental Management Measures* (0-0000-900-EEC-00-PL-0001_0), refer Table 7.3.

Table 7.3 ARTC Inland Rail noise and vibration management measures for detailed design/pre-construction

REF	ISSUE / IMPACT	MITIGATION MEASURES – DETAILED DESIGN / PRE-CONSTRUCTION
ONV1	*Noise and vibration impacts during operation*	An operational noise and vibration review would be undertaken to review the potential for operational impacts and guide the approach to identifying feasible and reasonable mitigation measures to be incorporated in the detailed design. Operational noise and vibration compliance monitoring would be undertaken, once Inland Rail has commenced operation, at representative locations to compare actual noise performance against that predicted by the operational noise and vibration review.
ONV2		Feasible and reasonable mitigation measures would be identified where exceedances of operational noise and vibration criteria are confirmed. Measures would be identified in accordance with the outcome of the operational noise and vibration review and the *Inland Rail Noise and Vibration Strategy*. Where at-property noise treatments are identified as the preferred mitigation option, these would be developed in consultation with individual property owners.

REF	ISSUE / IMPACT	MITIGATION MEASURES – DETAILED DESIGN / PRE-CONSTRUCTION
ONV3	*Structural vibration impacts*	If the operational noise and vibration review indicates that vibration levels are predicted to exceed the screening criteria (refer Section 3.2.1) at sensitive receivers, a more detailed assessment of the structure would be carried out. For any heritage items with the potential to be affected including Forbes Station and the three locally listed heritage items within 50 metres of the Bribbaree Yard clearances, the detailed assessment would determine any specific sensitivities in consultation with a heritage specialist to ensure risks are adequately managed. If a heritage structure is found to be structurally unsound following inspection, a more conservative cosmetic damage objective (for example 2.5mm/s peak component particle velocity for long term vibration) would be considered. Where impacts are identified, further mitigation may be required and this will be confirmed during detailed design.

8 CONCLUSION

The assessment has identified residential properties surrounding the trackwork proposal sites that may be affected by noise and vibration during construction of the proposal, particularly during work outside of Standard Hours.

Construction noise levels are predicted to exceed relevant construction NMLs at residential receivers at all track works sites, primarily during the track work activities. Many other exceedances are minor and can be managed with appropriate measures outlined in this report.

Due to the number of potentially affected receivers in the proposal affectation area, and the proximity of receivers to construction sites, most impacted receivers have been identified in the vicinity of Forbes Station and Yard (NCA06). Where track works are undertaken during Out of Hours (Night) periods, these impacts will be substantially higher. Only one receiver in NCA06b is predicted to exceed the highly noise affected of 75dB $L_{Aeq\ 15\ min}$ during any work stage. This expected to occur during track work activities.

Sleep disturbance impacts are predicted Forbes Station and Yard, Wirrinya Yard, Caragabal Yard and Bribbaree Yard particularly during track works. Sleep disturbance would impact the most receivers around Forbes Station and Yard with up to 1,956 properties predicted to be affected. Implementation for mitigation measures such as screening and respite periods would substantially reduce the impact.

All construction noise impacts are temporary and confined to discrete periods. Notwithstanding, noise management and mitigation measures would therefore be required to be implemented during construction of the proposal within the extent that is reasonable and feasible.

The proposed upgrade of railway infrastructure at each site is a relatively minor change in track alignment and is not a material influence on railway noise levels. The upgrade works are part of the works to facilitate the future railway operations on Inland Rail and the noise levels as a result of the proposed increased daily train movements, changes to track speeds and rollingstock have been assessed. The assessment determined that railway noise management levels from the RING would be met at most sensitive receivers at the opening of the proposal in 2027 and the future rail scenario in 2039. In total, the predicted railway noise levels trigger the investigation of feasible and reasonable noise mitigation measures at 3 residences in 2027 and 13 residences in 2039.

For these sensitive receivers the feasible and reasonable noise mitigation is likely to be at-property treatments such as upgrades to glazing and the building construction and property fencing. Receivers will be contacted during the approvals phase concerning specific mitigation.

Ground-borne noise and vibration from railway operations is expected to meet relevant assessment criteria at the sensitive receivers.

There is still potential for impacts from perceptible noise vibration, even where the assessment criteria are achieved. A range of noise management and mitigation measures have been recommended as part of ARTC's strategy for reducing noise and vibration and managing associated impacts on Inland Rail.

It is recommended that noise and vibration continue to be assessed during the detailed design and pre-construction phase to verify the outcomes of this assessment and confirm mitigation requirements.

9 REFERENCES

Australian and New Zealand Environment Council. (1990). *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration.*

Australian Rail Track Corporation (ARTC). 2020), *Technical Note: IR Tonnage Profile and Train Plan.*

ARTC. (2018) Inland Rail Programme – Environmental Assessment Procedure (2-9000-PEN-00).

ARTC ((2017a). *Construction Noise and Vibration Management Framework* (0-9000-ENV-00-RP-+0001 Rev 3).

ARTC. (2017b). *Technical specification for noise and vibration assessments* (0-9000-EV-00-SP-0001_0).

ARTC (2017). *Inland Rail Programme Noise and Vibration Assessment Procedure* (NVAP) (2-9000-0000-EAP-PR-0002_0).

Australian Standard. (1997). *1055:1997 – Acoustics – Description and Measurement of Environmental Noise.*

British Standards. (1993). *7358-2: Evaluation and measurement for vibration in buildings. Guide to damage levels from ground-borne vibration.*

Department of Climate Change and Water (DECCW). (2011). *Road Noise Policy.*

Department of Environment and Climate Change and Water (DECCW) (2009). *Interim Construction Noise Guideline.*

Department of Environment and Conservation. (2006*). Assessing Vibration: a technical guideline*.

NSW Environment Protection Authority (EPA). (2020). *Draft Construction Noise Guideline*.

NSW EPA. (2017a). *Noise Policy for Industry*. Available at: epa.nsw.gov.au/your-environment/noise/industrial-noise/noise-policy-for-industry-(2017).

NSW EPA. (2013). *Rail Infrastructure Noise Guideline.* Available at: epa.nsw.gov.au/-/media/epa/corporate-site/resources/noise/20130018eparing.pdf.

German Standards. (2016). *DIN 4150-3: Structural Vibration – effects of vibration on structures.*

Roads and Maritime. (2016). *Construction Noise and Vibration Guideline*. Available at: roads-waterways.transport.nsw.gov.au/business-industry/partners-suppliers/documents/guides-manuals/construction-noise-and-vibration-guideline.pdf.

Transport for NSW (2019) *Construction Noise and Vibration Strategy* . Available at: file:///C:/Users/AUEP503498/Downloads/Planning-Environment-Sustainability-Construction-Noise-and-Vibration-Strategy-ST-157.pdf

APPENDIX E

Horizontal Clearances

Noise and Vibration Impact Assessment

Appendix A Detailed noise monitoring results

APPENDIX A-1
FORBES STATION AND YARD

Site Details	9-1, 50 SAM STREET,FORBES	Microphone Position	1.5m - free field
Start Date	Wed 03 March 2021		
End Date	Wed 17 March 2021		

Measurement Summary

Date	03-03	04-03	05-03	06-03	07-03	08-03	09-03	10-03
$L_{eq,1\ hour\ day}$ dBA	50	53	60	56	52	56	59	54
$L_{eq,1\ hour\ night}$ dBA	47	48	51	48	48	51	53	49
$L_{eq,\ Day}$ dBA	47	49	51	50	48	53	55	51
$L_{eq,\ Evening}$ dBA	46	45	55	44	49	51	42	47
$L_{eq,\ Night}$ dBA	48	48	48	43	46	46	49	42
RBL, $_{Day}$ dBA		40	43	34	37	45	41	38
RBL, $_{Evening}$ dBA	39	39	39	34	38	39	38	37
RBL, $_{Night}$ dBA	33	34	34	34	34	32	35	38

Date	11-03	12-03	13-03	14-03	15-03	16-03	17-03	
$L_{eq,1\ hour\ day}$ dBA	52	51	57	54	55	53	50	
$L_{eq,1\ hour\ night}$ dBA	48	46	51	47	49	48	45	
$L_{eq,\ Day}$ dBA	50	47	52	49	51	49	49	
$L_{eq,\ Evening}$ dBA	46	45	50	46	46	48		
$L_{eq,\ Night}$ dBA	44	47	45	42	47	46		
RBL, $_{Day}$ dBA	38		42	40	42	43		
RBL, $_{Evening}$ dBA	38	35	41		40	42		
RBL, $_{Night}$ dBA		33		29	36	31		

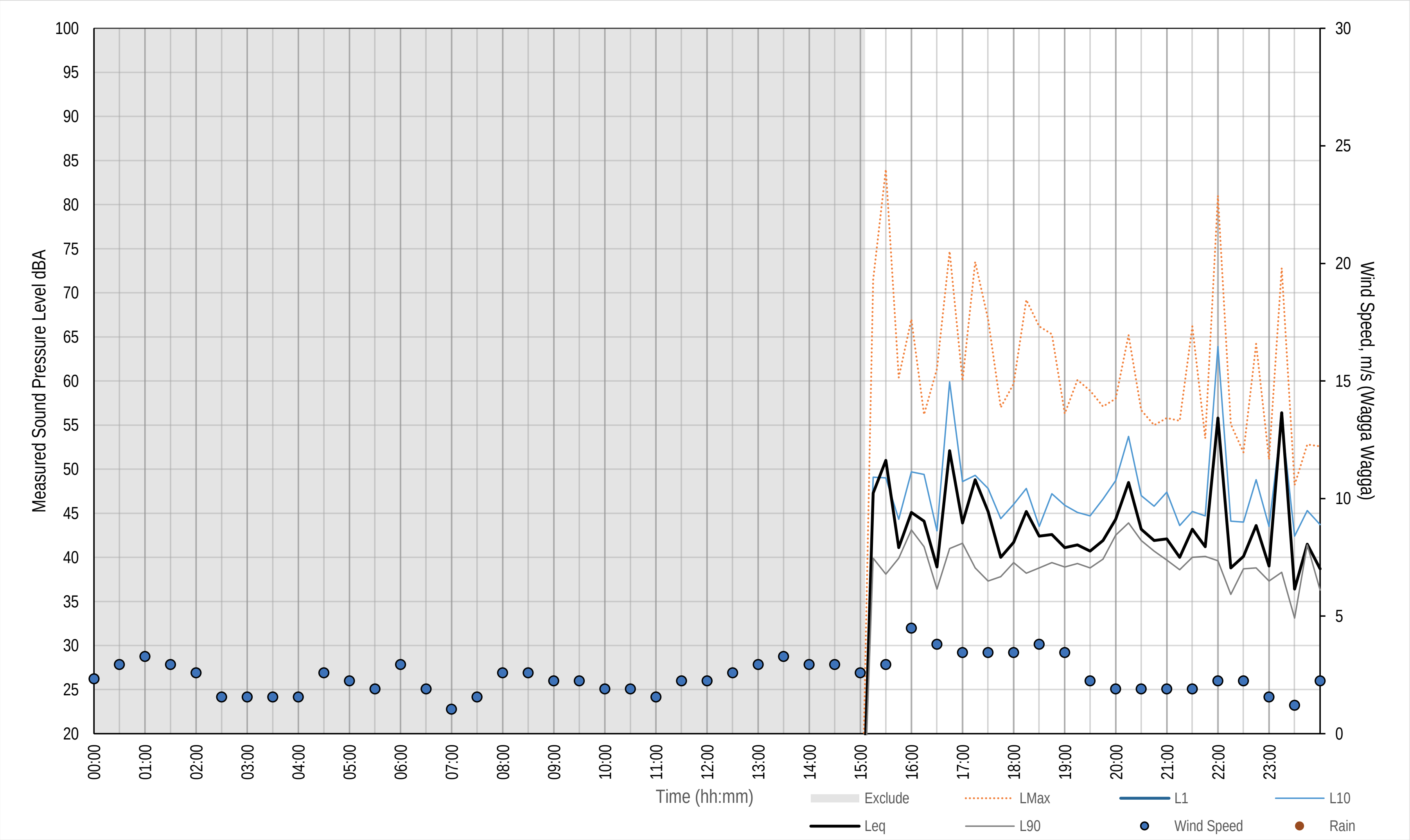
Summary	Average (dBA)
$L_{eq,\ Day}$ dBA	50
$L_{eq,\ Evening}$ dBA	47
$L_{eq,\ Night}$ dBA	46
RBL, $_{Day}$ dBA	41
RBL, $_{Evening}$ dBA	39
RBL, $_{Night}$ dBA	34

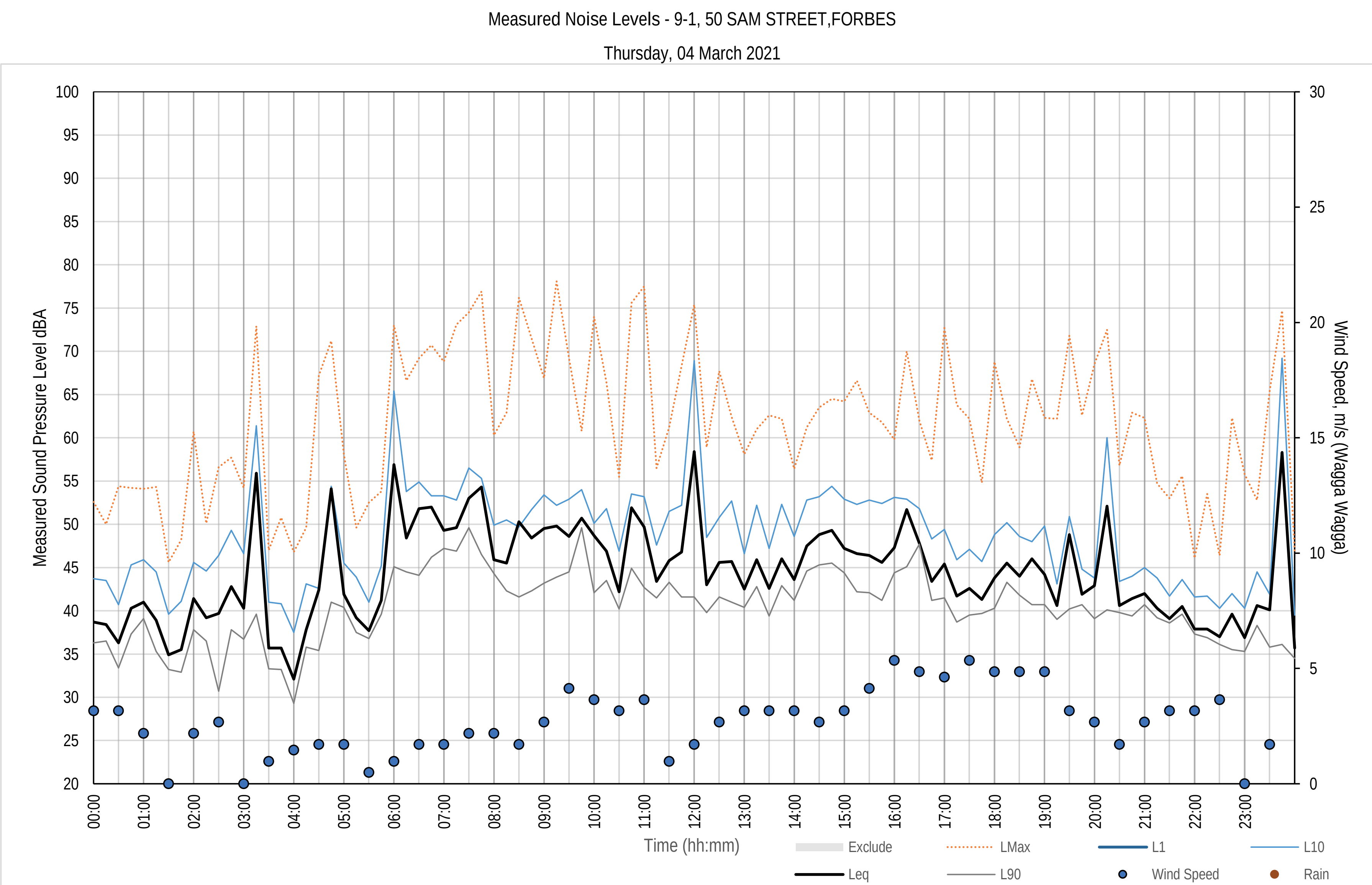
Summary	Average (dBA)
$L_{eq,1\ hour\ day}$ dBA	54
$L_{eq,1\ hour\ night}$ dBA	48
$L_{eq,\ 15\ hour\ day}$ dBA	51
$L_{eq,\ 9\ hour\ night}$ dBA	47

Site Photo

Measured Noise Levels - 9-1, 50 SAM STREET,FORBES

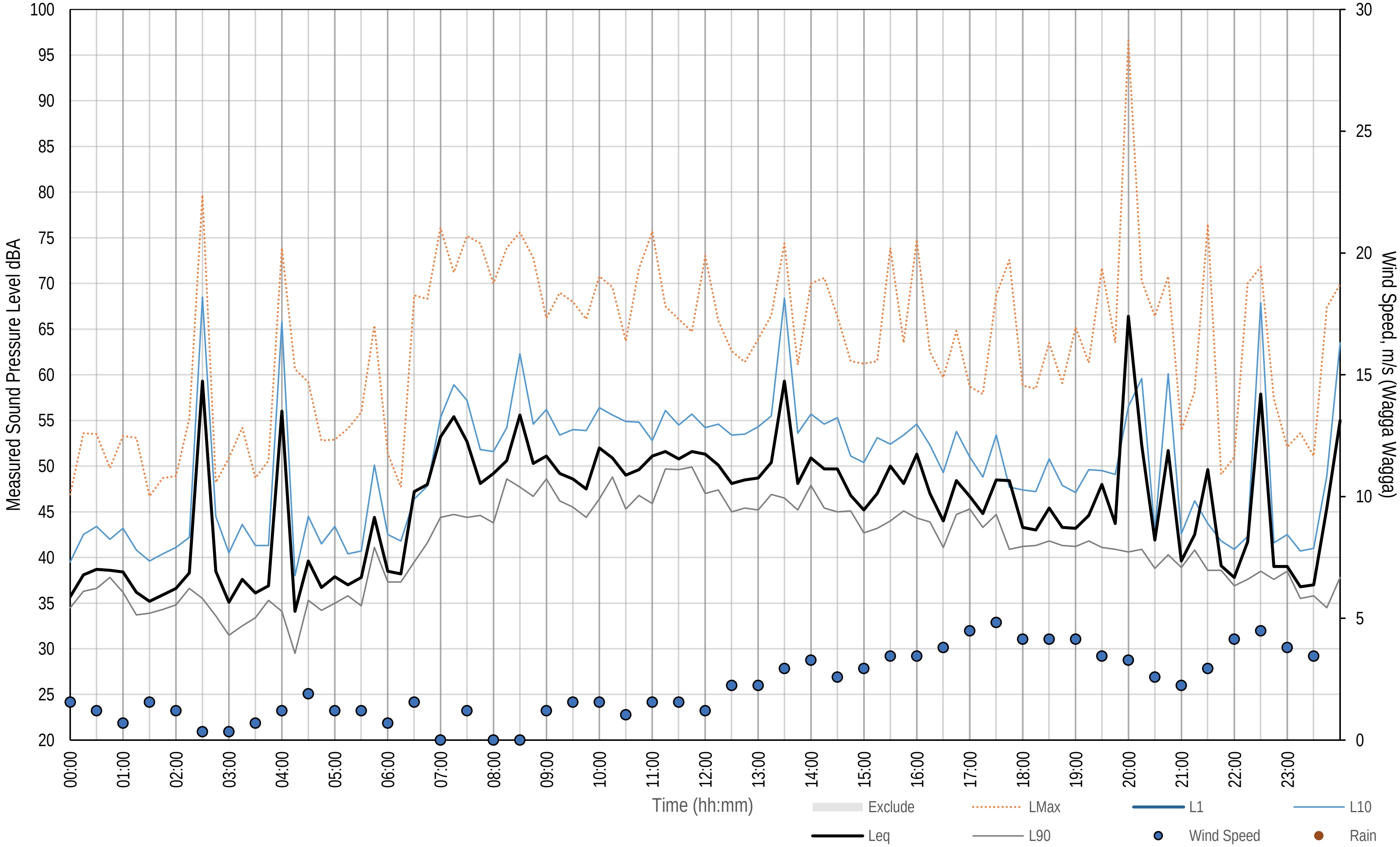
Wednesday, 03 March 2021




Measured Noise Levels - 9-1, 50 SAM STREET,FORBES
Thursday, 04 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
Time (hh:mm)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
30
25
20
15
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain

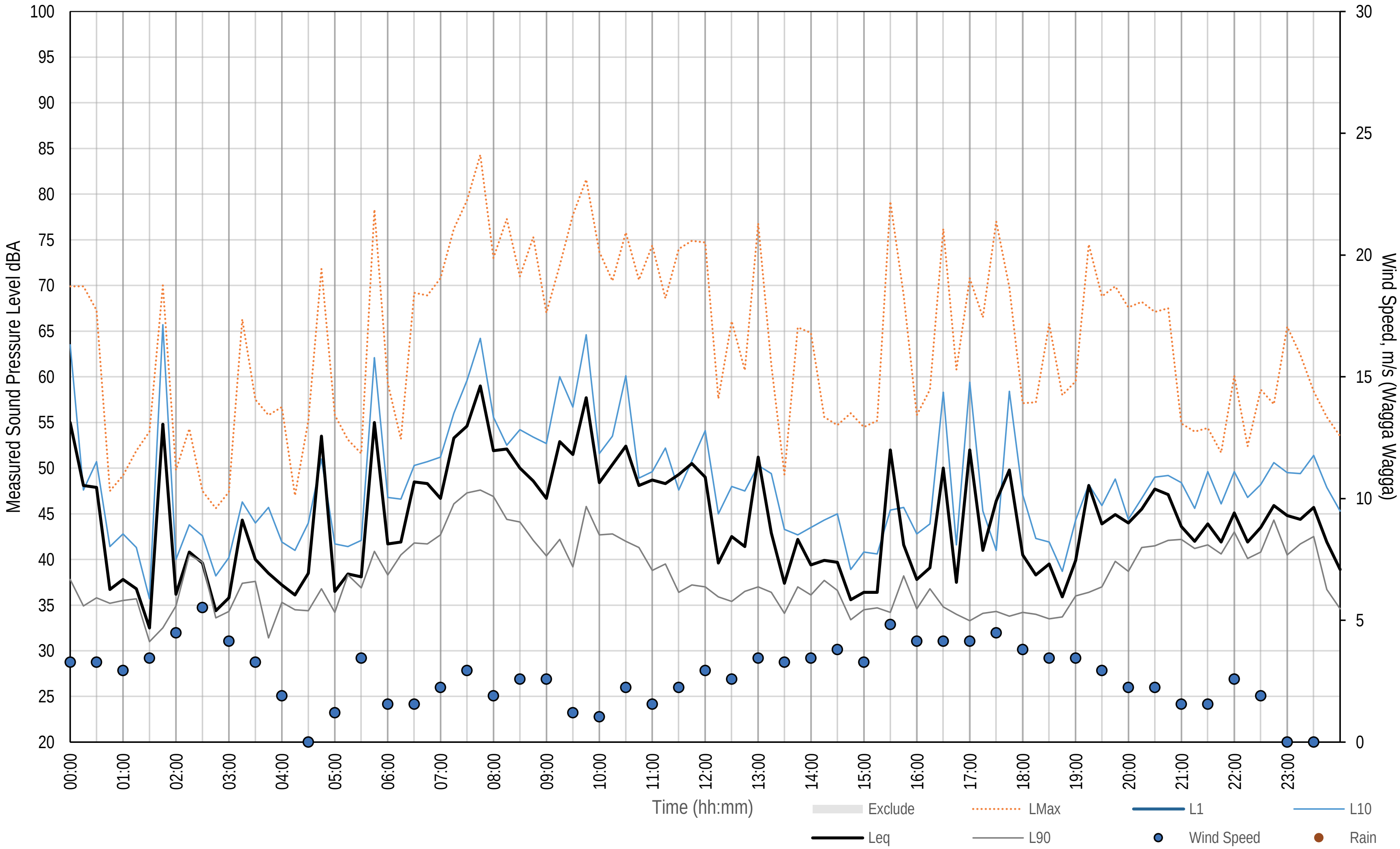
Measured Noise Levels - 9-1, 50 SAM STREET,FORBES

Friday, 05 March 2021



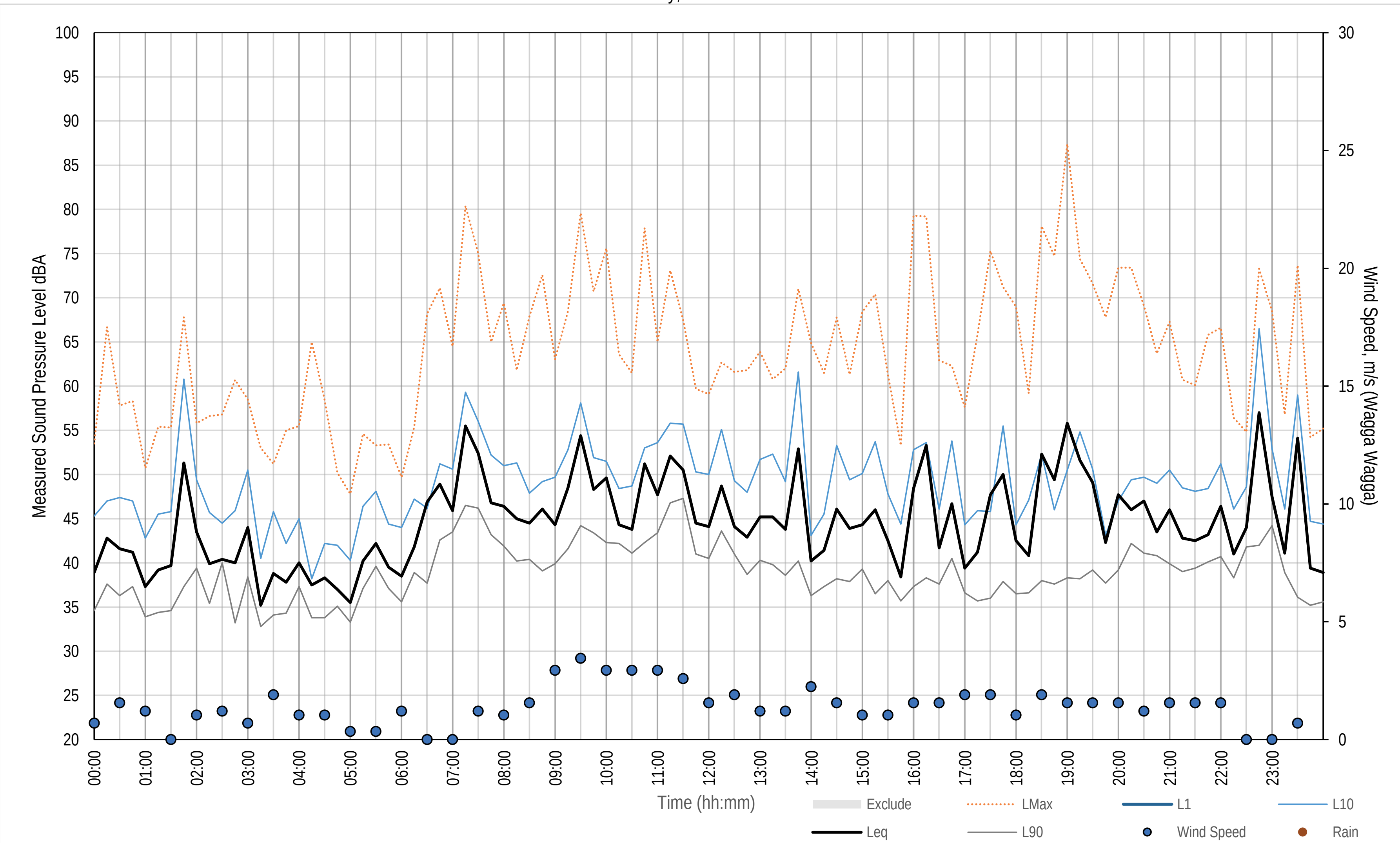
Measured Noise Levels - 9-1, 50 SAM STREET,FORBES

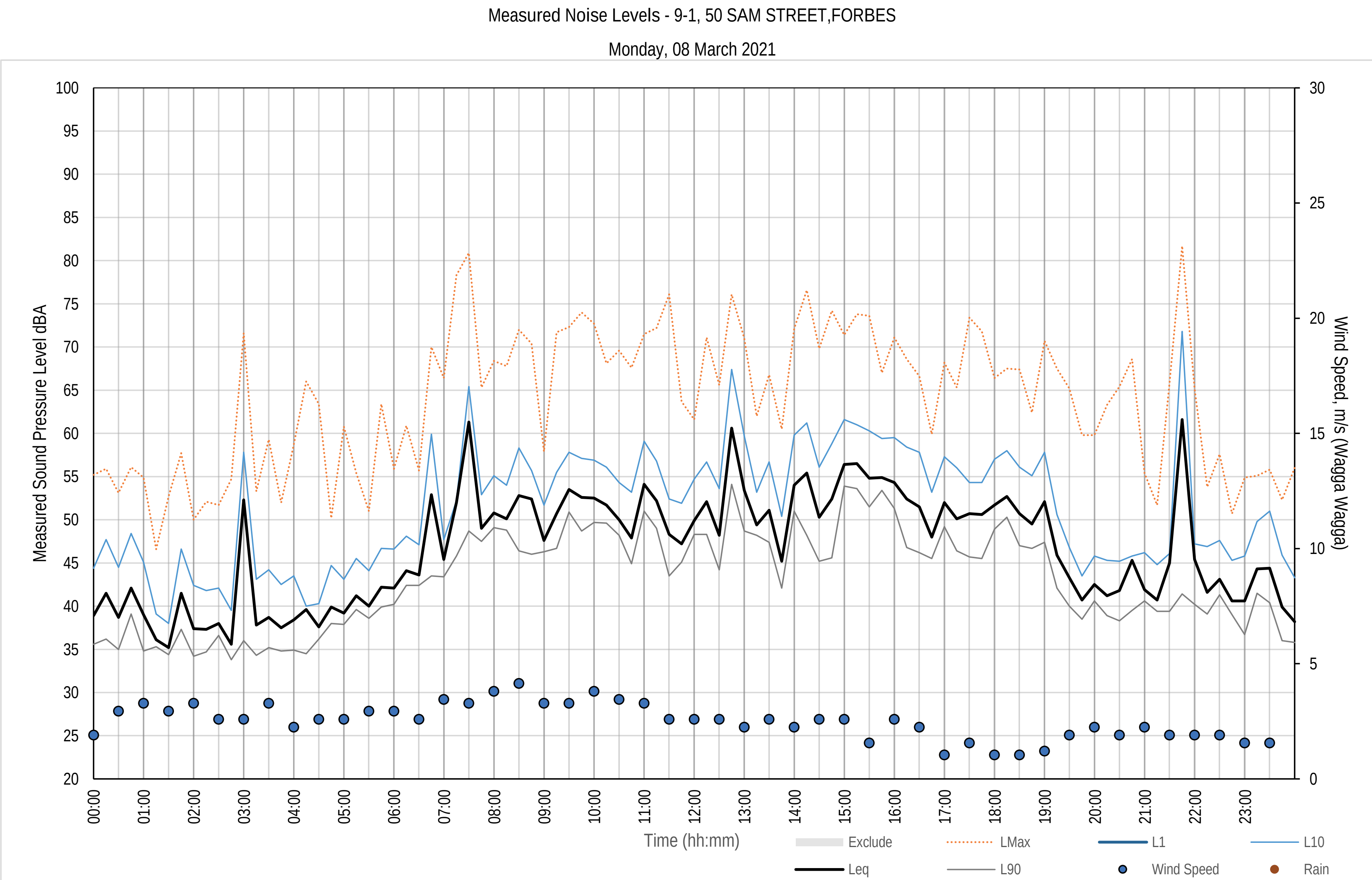
Saturday, 06 March 2021



Measured Noise Levels - 9-1, 50 SAM STREET,FORBES

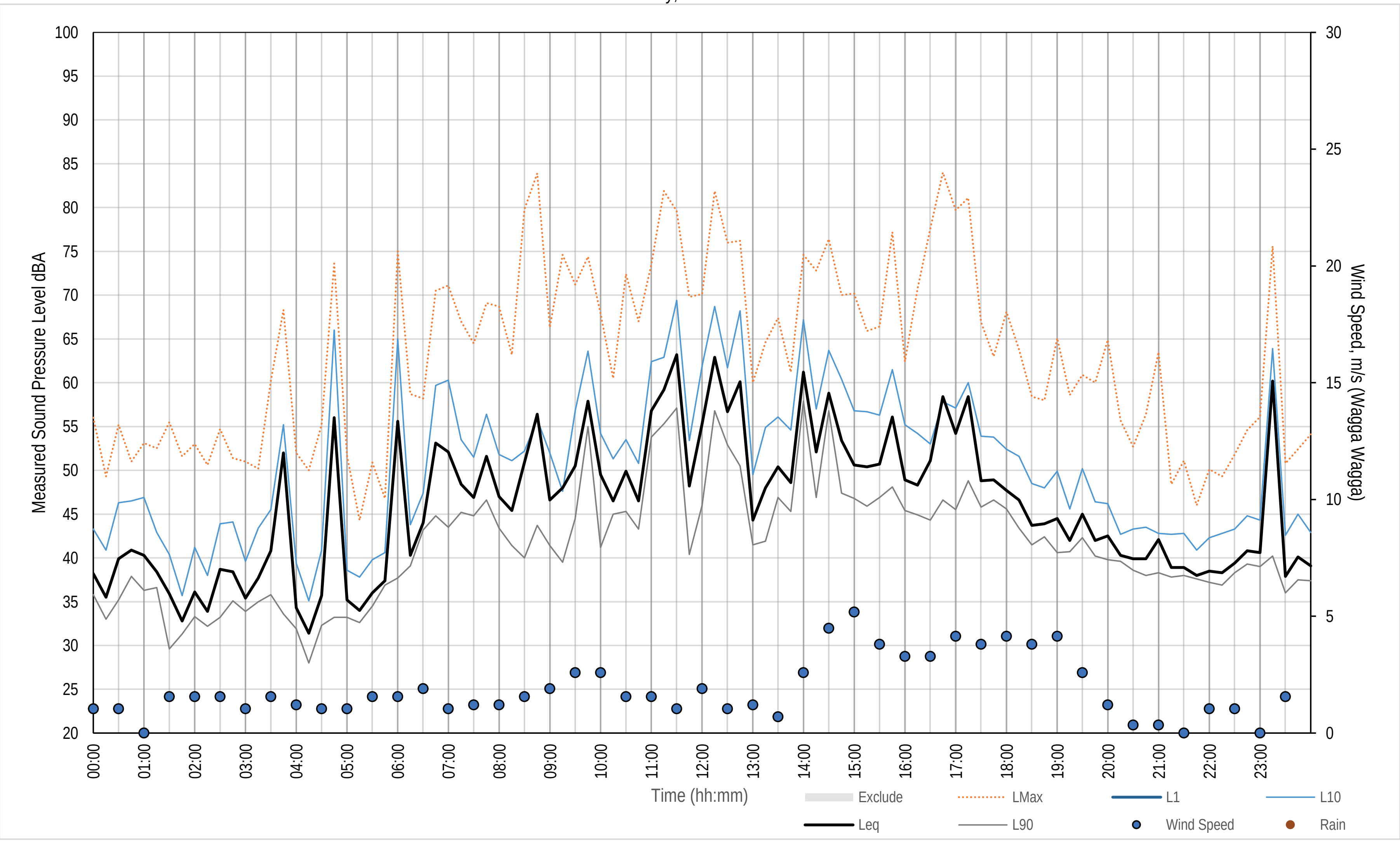
Sunday, 07 March 2021




Measured Noise Levels - 9-1, 50 SAM STREET,FORBES
Monday, 08 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
30
25
20
15
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
Time (hh:mm)
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain

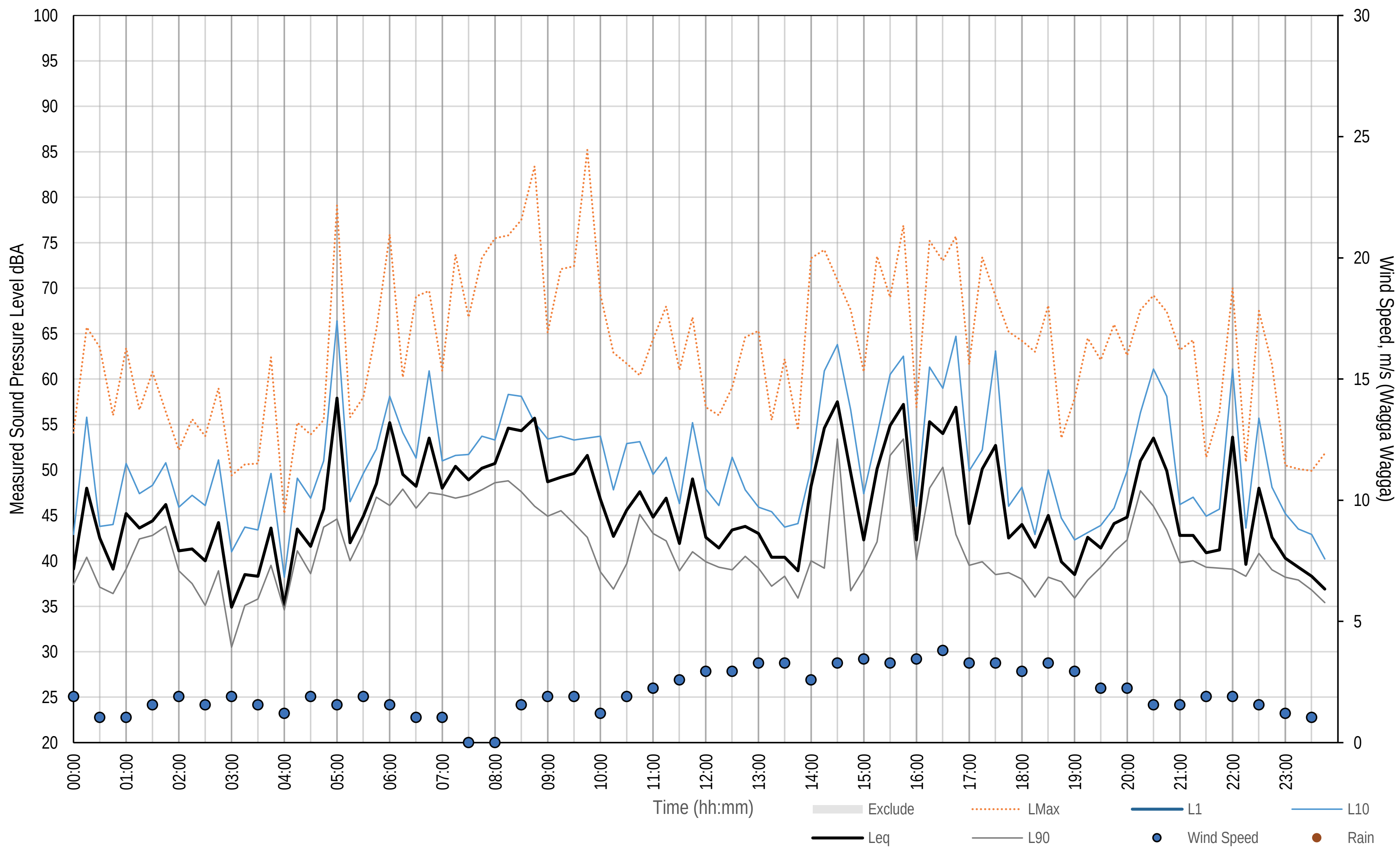
Measured Noise Levels - 9-1, 50 SAM STREET,FORBES

Tuesday, 09 March 2021



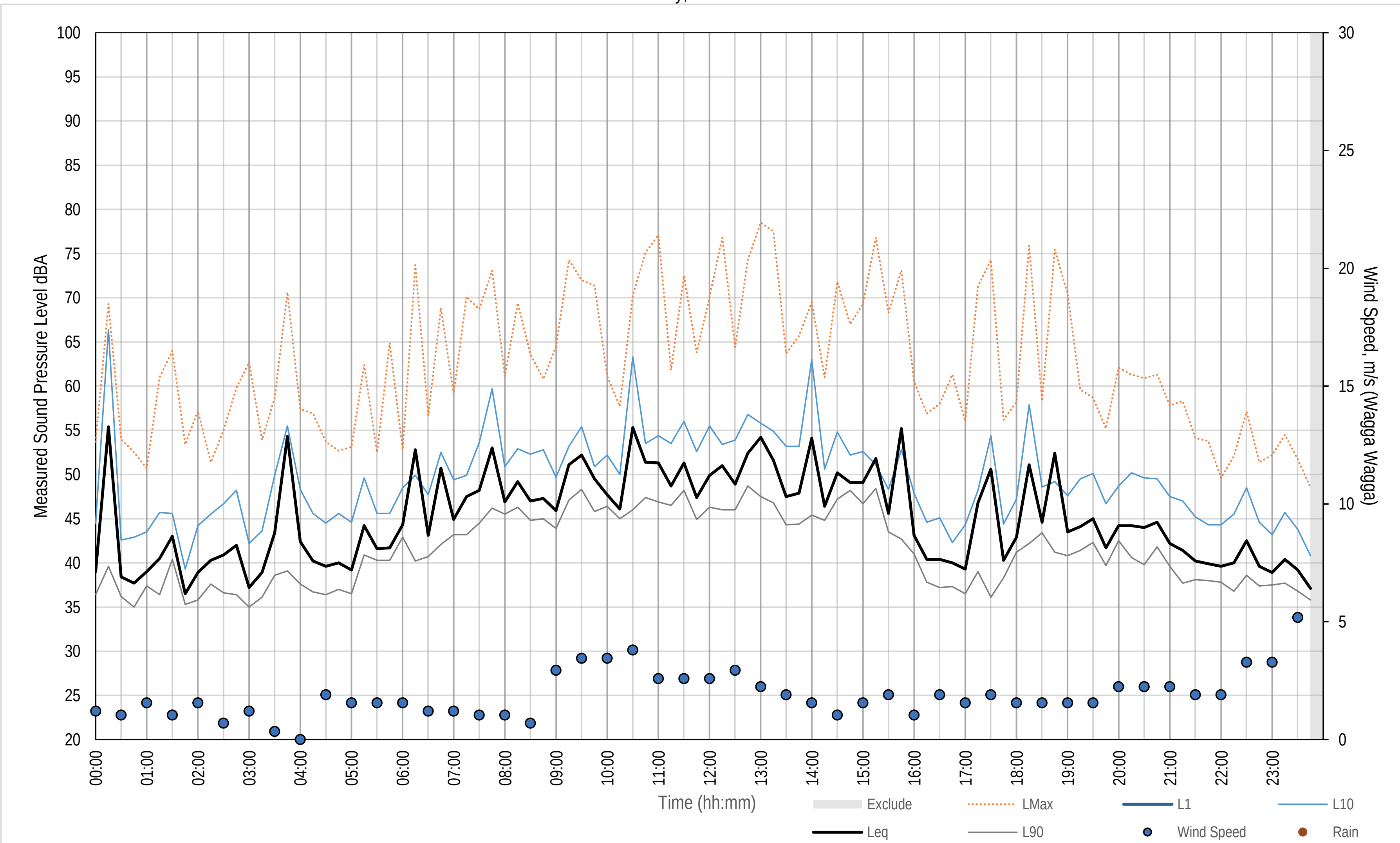
Measured Noise Levels - 9-1, 50 SAM STREET,FORBES

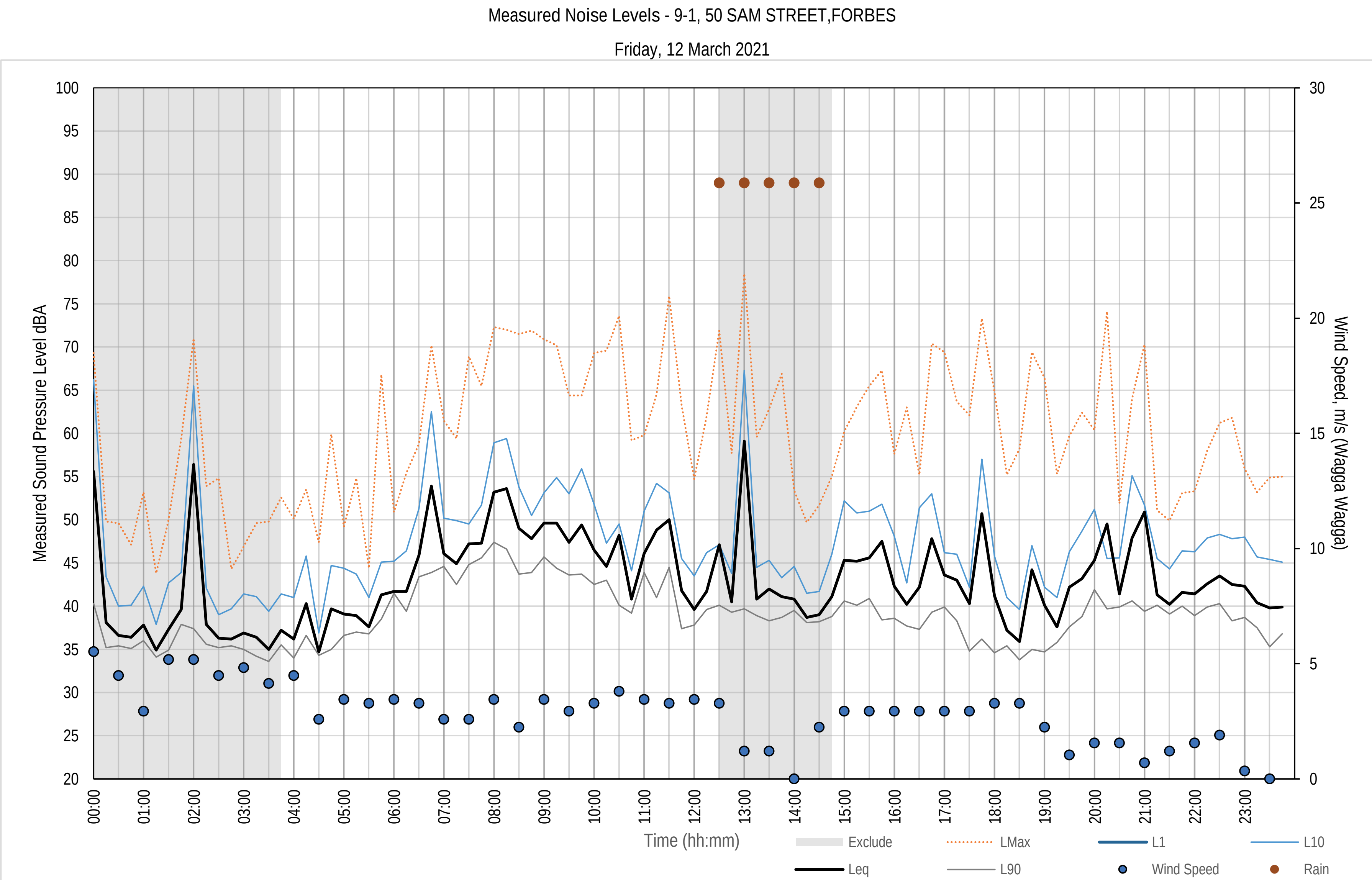
Wednesday, 10 March 2021



Measured Noise Levels - 9-1, 50 SAM STREET,FORBES

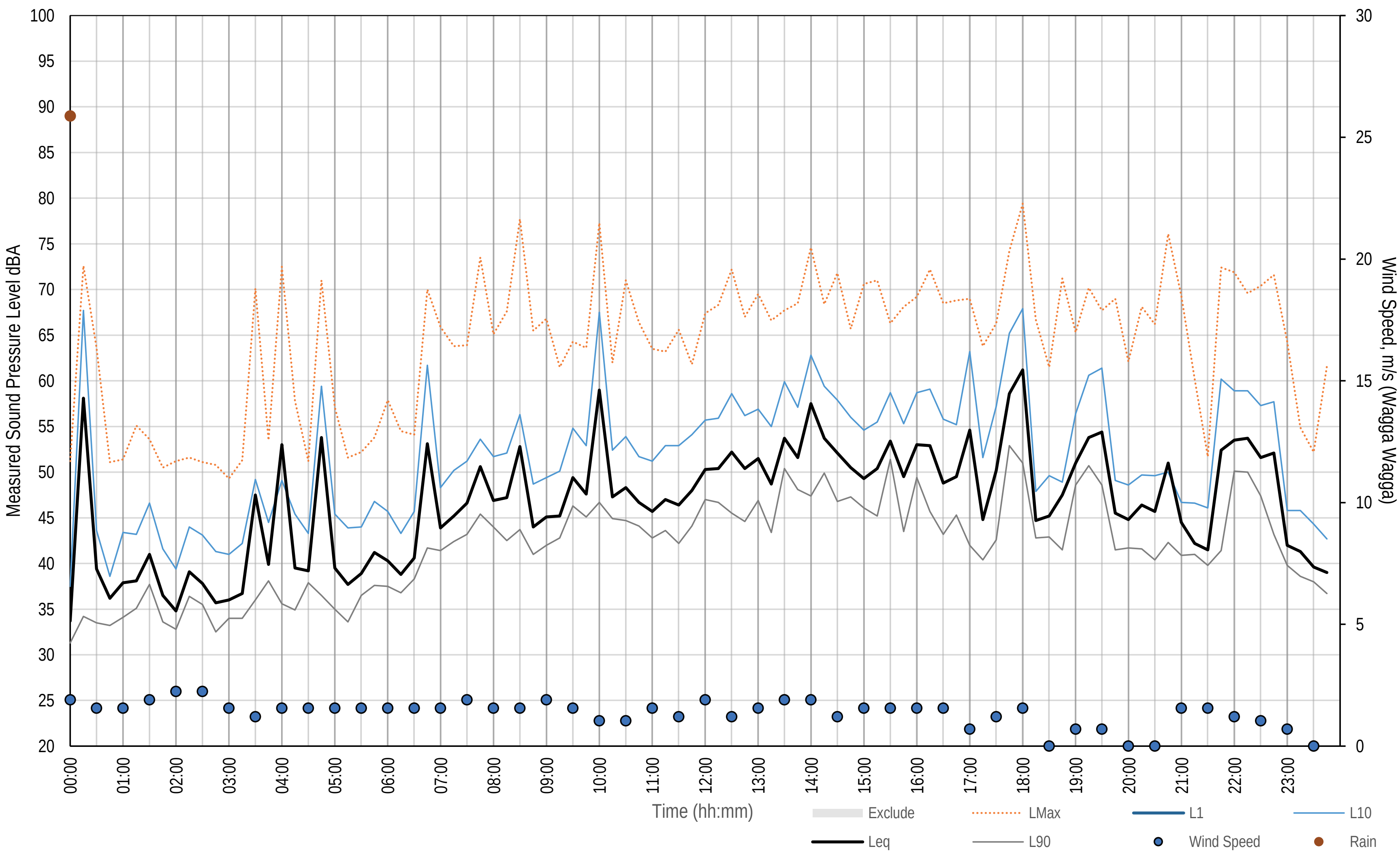
Thursday, 11 March 2021

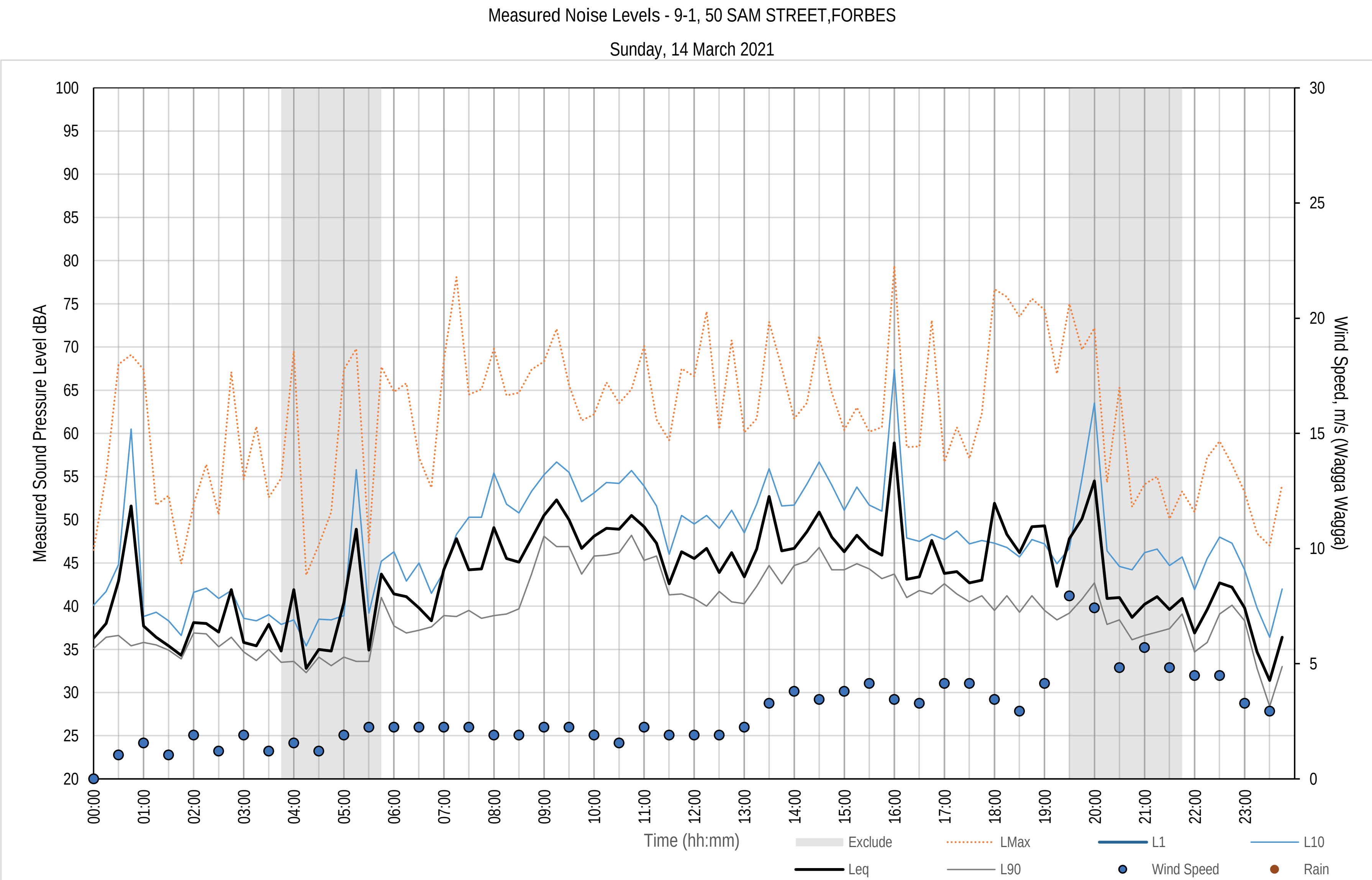



Measured Noise Levels - 9-1, 50 SAM STREET,FORBES
Friday, 12 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
Time (hh:mm)
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain

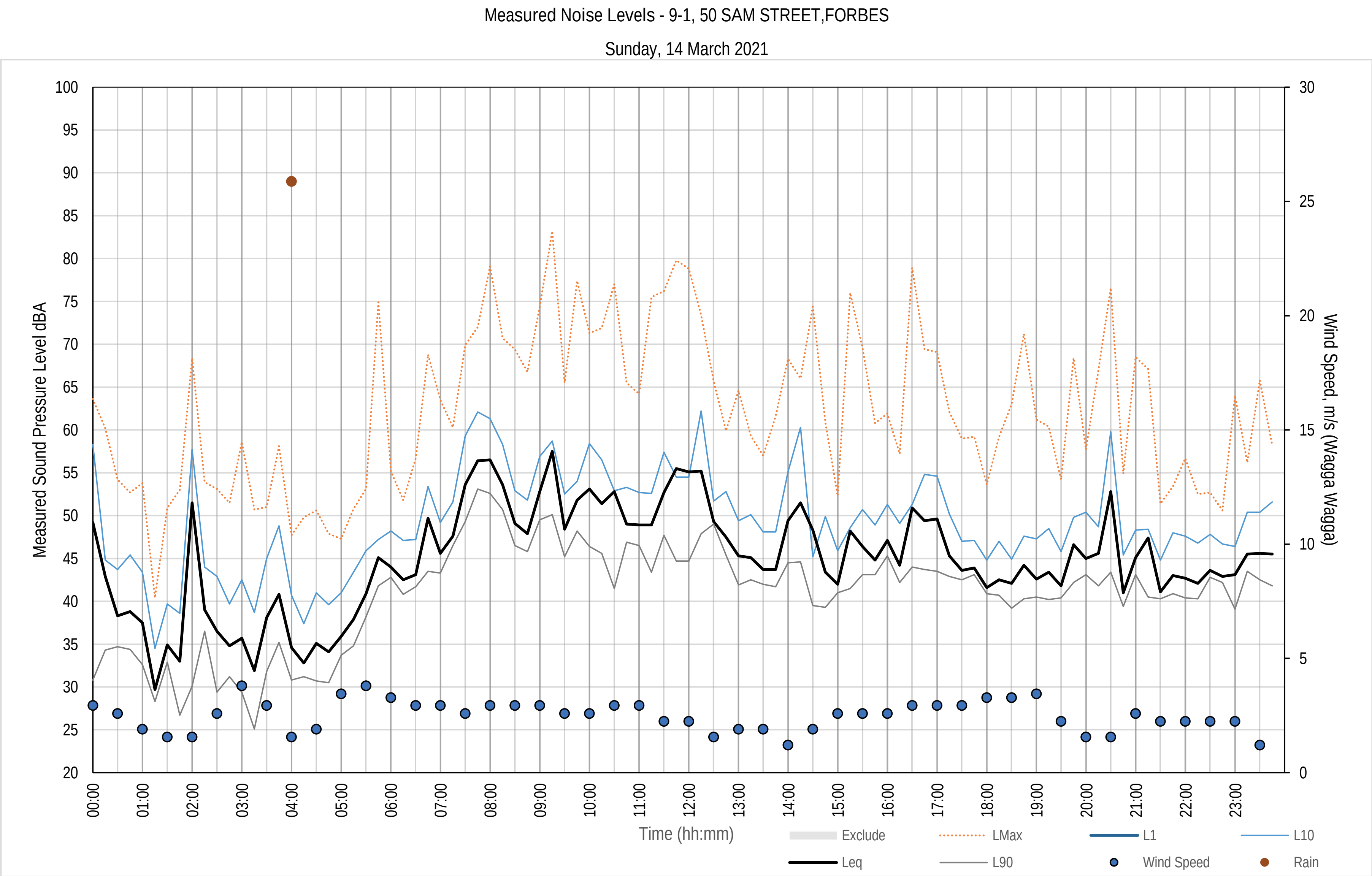
Measured Noise Levels - 9-1, 50 SAM STREET,FORBES

Saturday, 13 March 2021





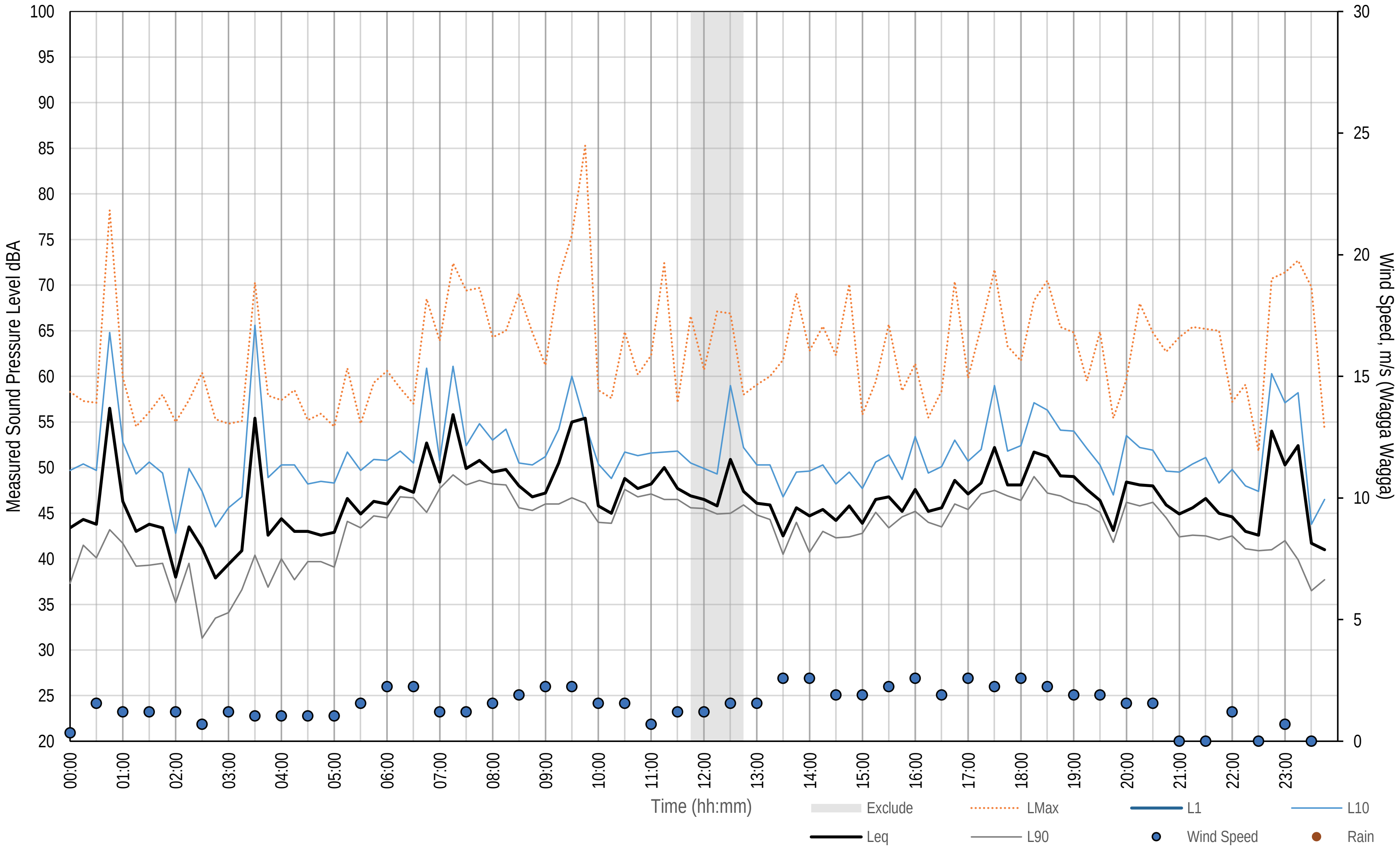
Measured Noise Levels - 9-1, 50 SAM STREET,FORBES
Sunday, 14 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
30
25
20
15
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
Time (hh:mm)
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain



Measured Noise Levels - 9-1, 50 SAM STREET,FORBES
Sunday, 14 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
Time (hh:mm)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
30
25
20
15
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain

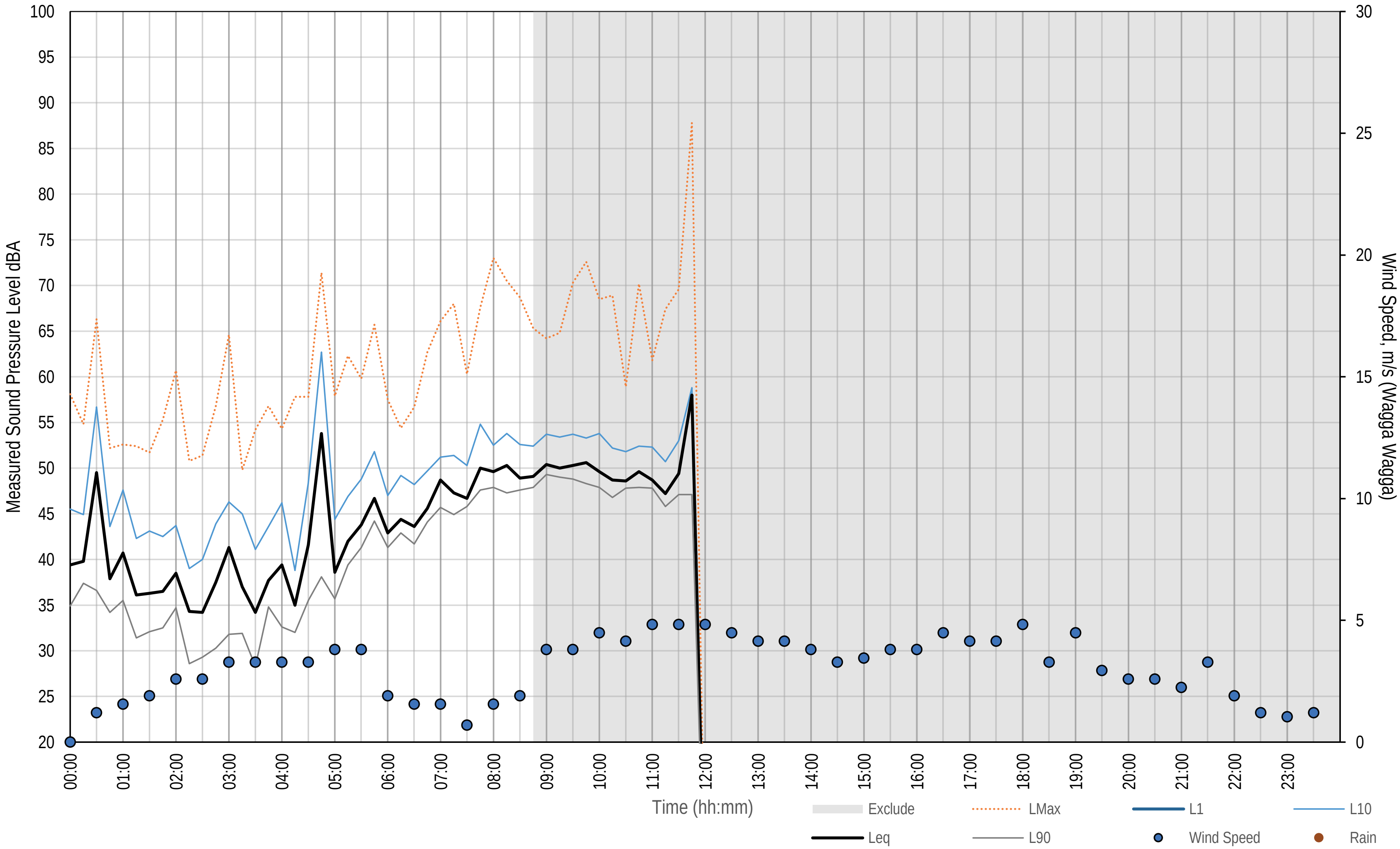
Measured Noise Levels - 9-1, 50 SAM STREET,FORBES

Monday, 15 March 2021



Measured Noise Levels - 9-1, 50 SAM STREET,FORBES

Tuesday, 16 March 2021



Site Details	9-3, 1 LITTLE UNION STREET, FORBES	**Microphone Position**	1.5m - free field
Start Date	Wed 03 March 2021		
End Date	Mon 15 March 2021		

Measurement Summary

Date	03-03	04-03	05-03	06-03	07-03	08-03	09-03	10-03
$L_{eq,1\ hour\ day}$ dBA	56	58	60	55	53	59	57	54
$L_{eq,1\ hour\ night}$ dBA	50	50	49	47	46	53	51	48
$L_{eq,\ Day}$ dBA	54	52	52	49	47	56	53	49
$L_{eq,\ Evening}$ dBA	48	49	47	41	43	48	41	48
$L_{eq,\ Night}$ dBA	45	44	44	41	48	47	46	41
RBL, $_{Day}$ dBA		38	41	33	35	41	38	36
RBL, $_{Evening}$ dBA	39	38	39	37	35	38	38	37
RBL, $_{Night}$ dBA	33	32	31	31	33	30	33	40

Date	11-03	12-03	13-03	14-03	15-03			
$L_{eq,1\ hour\ day}$ dBA	52	50	58	57	53			
$L_{eq,1\ hour\ night}$ dBA	48	44	49	48	48			
$L_{eq,\ Day}$ dBA	49	45	51	50	51			
$L_{eq,\ Evening}$ dBA	45	43	46	42				
$L_{eq,\ Night}$ dBA	39	47	40	41				
RBL, $_{Day}$ dBA	38		38	41				
RBL, $_{Evening}$ dBA	40	35	39					
RBL, $_{Night}$ dBA		37		28				

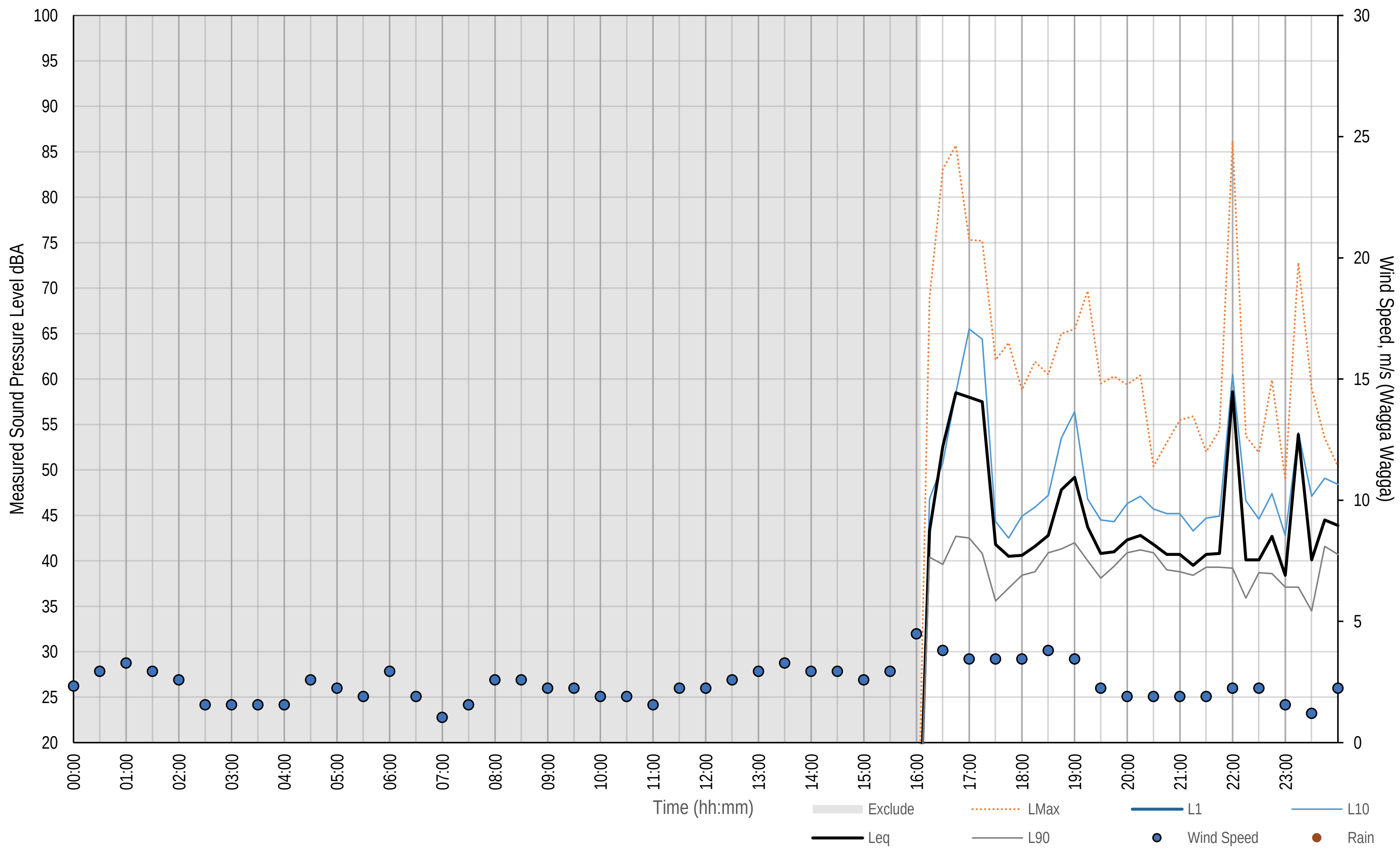
Summary	**Average (dBA)**
$L_{eq,\ Day}$ dBA	51
$L_{eq,\ Evening}$ dBA	45
$L_{eq,\ Night}$ dBA	44
RBL, $_{Day}$ dBA	38
RBL, $_{Evening}$ dBA	38
RBL, $_{Night}$ dBA	32

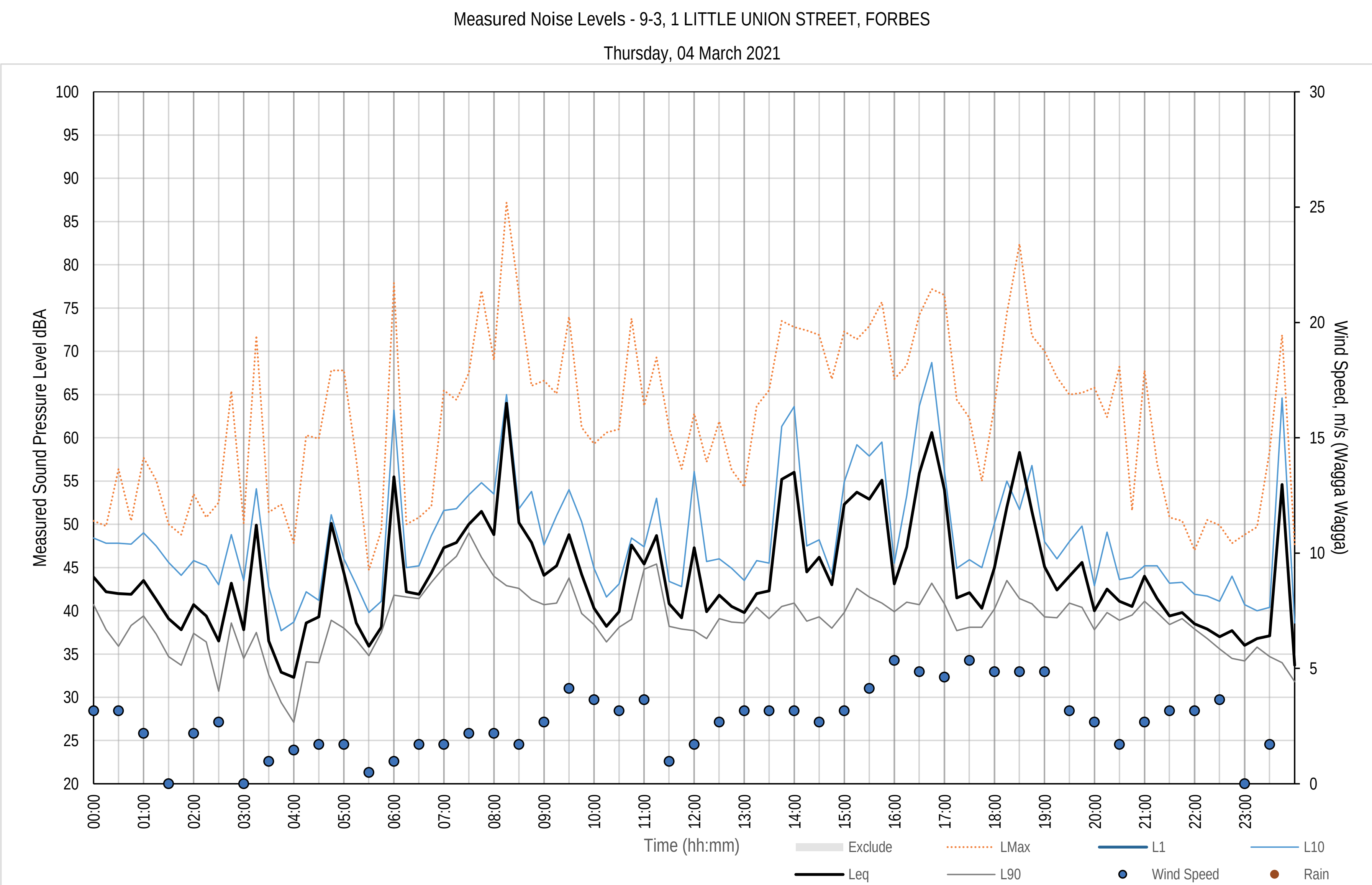
Summary	**Average (dBA)**
$L_{eq,1\ hour\ day}$ dBA	56
$L_{eq,1\ hour\ night}$ dBA	48
$L_{eq,\ 15\ hour\ day}$ dBA	51
$L_{eq,\ 9\ hour\ night}$ dBA	45

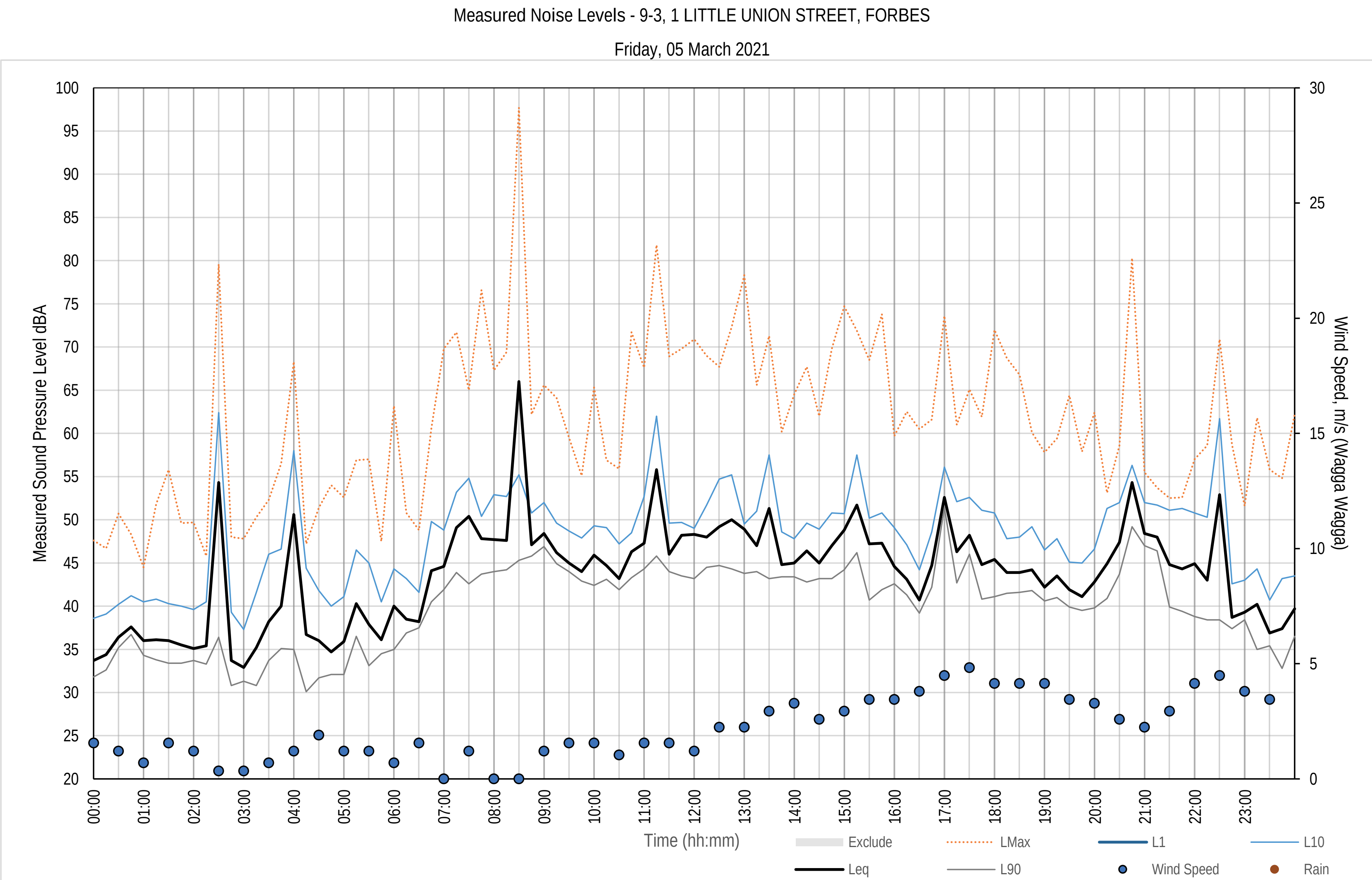
Site Photo

Measured Noise Levels - 9-3, 1 LITTLE UNION STREET, FORBES

Wednesday, 03 March 2021



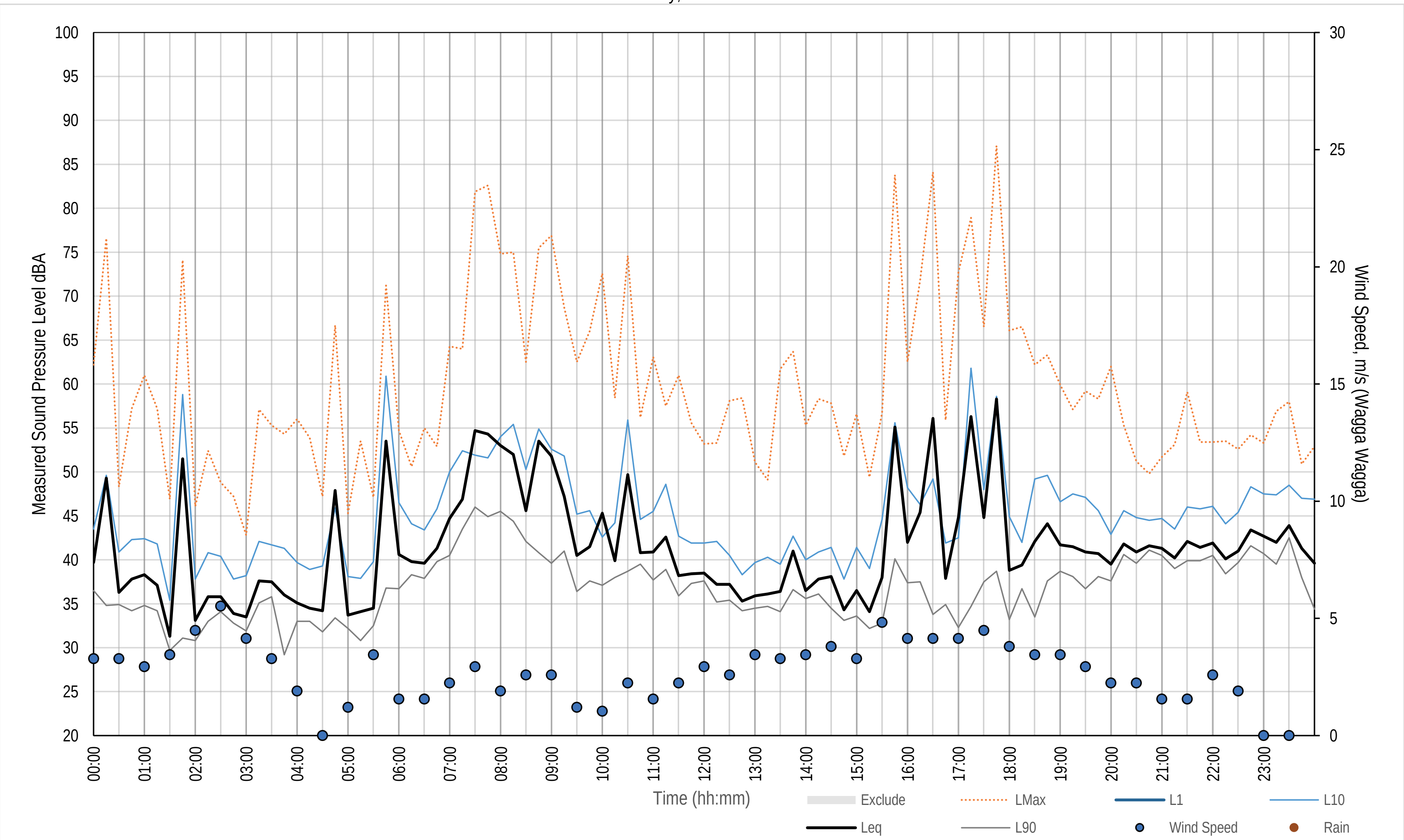

Measured Noise Levels - 9-3, 1 LITTLE UNION STREET, FORBES
Thursday, 04 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
30
25
20
15
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
Time (hh:mm)
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain

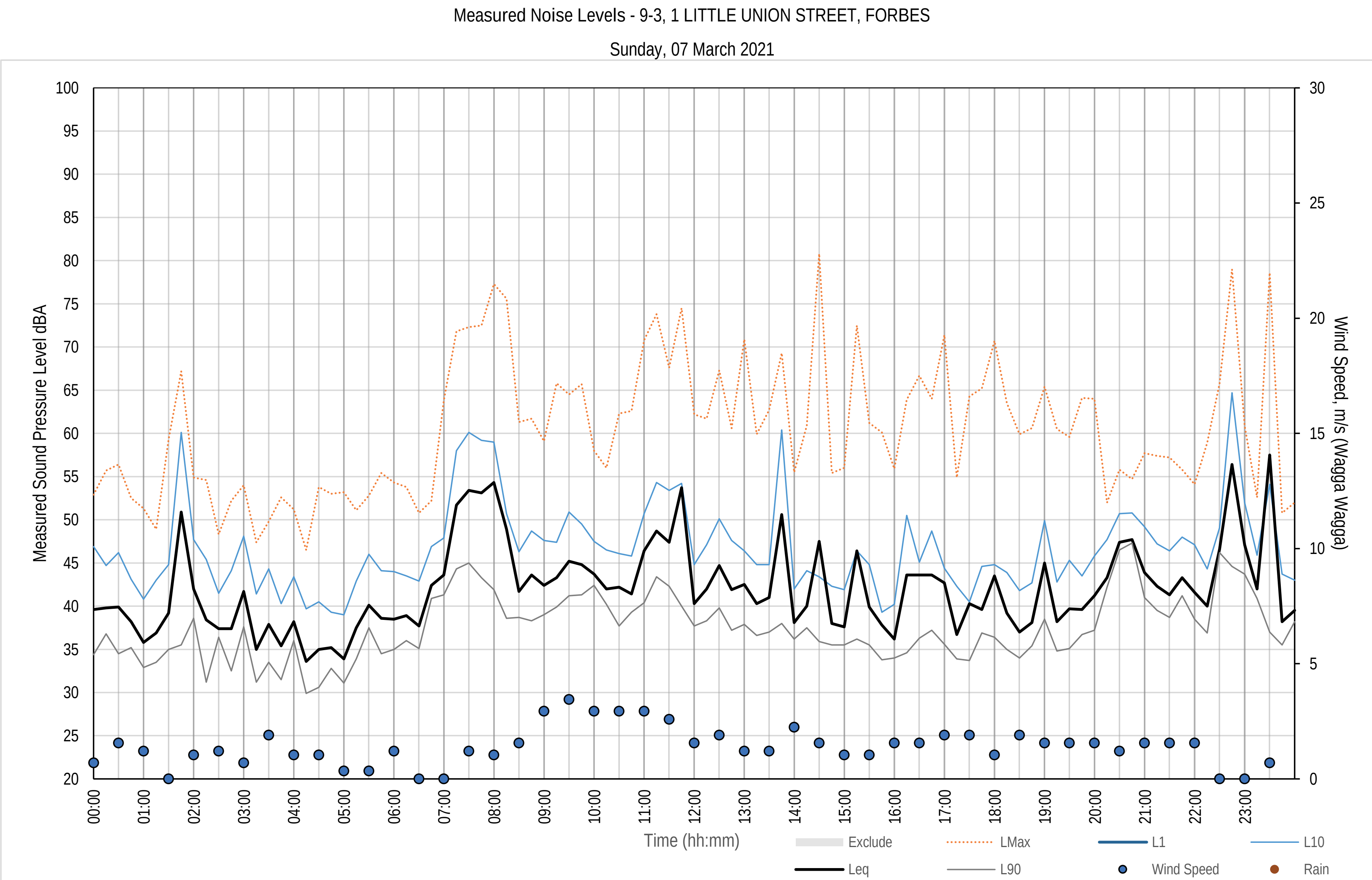


Measured Noise Levels - 9-3, 1 LITTLE UNION STREET, FORBES
Friday, 05 March 2021
Measured Sound Pressure Level dBA
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
Wind Speed, m/s (Wagga Wagga)
30
25
20
15
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
Time (hh:mm)
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain

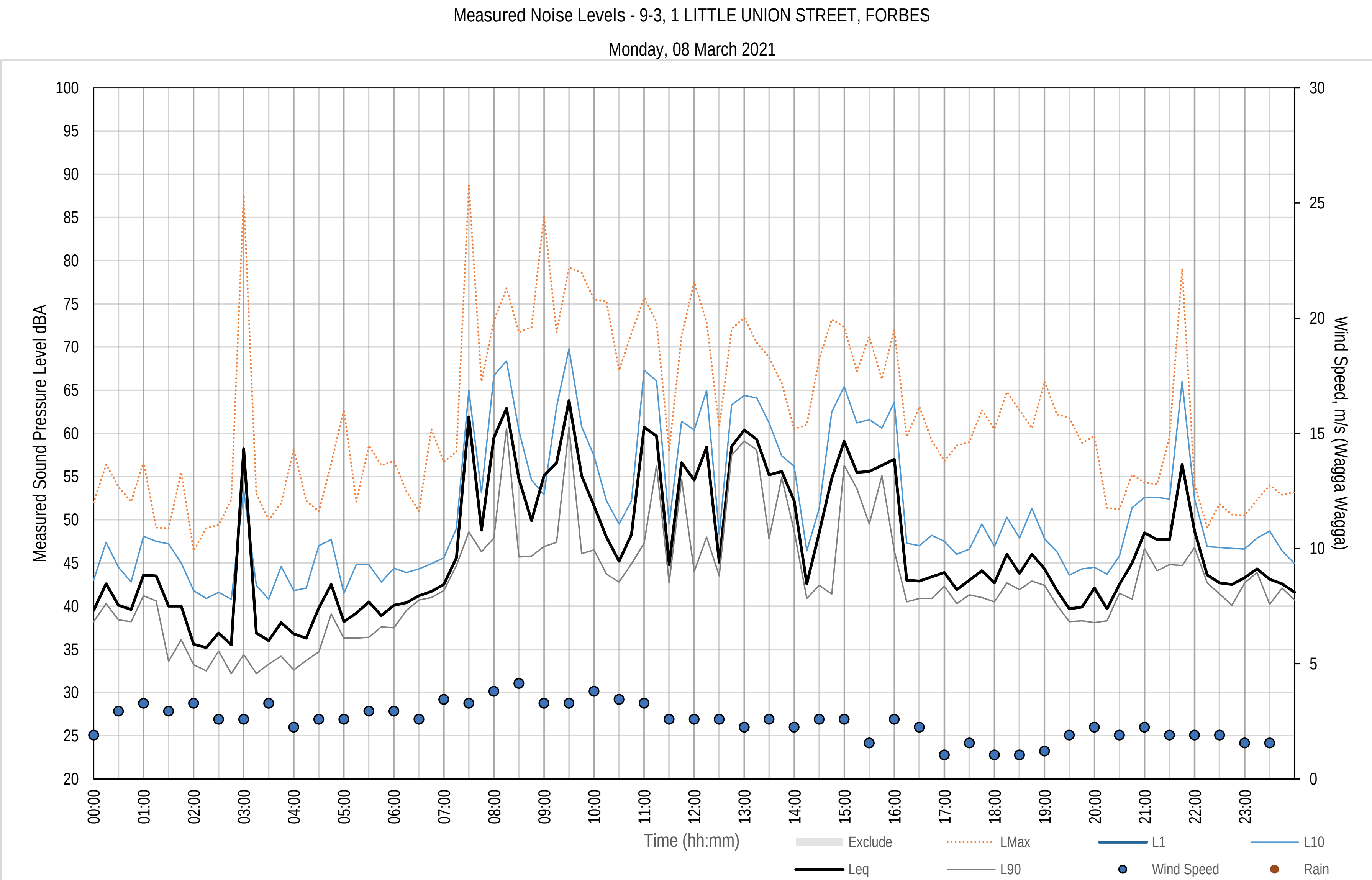
Measured Noise Levels - 9-3, 1 LITTLE UNION STREET, FORBES

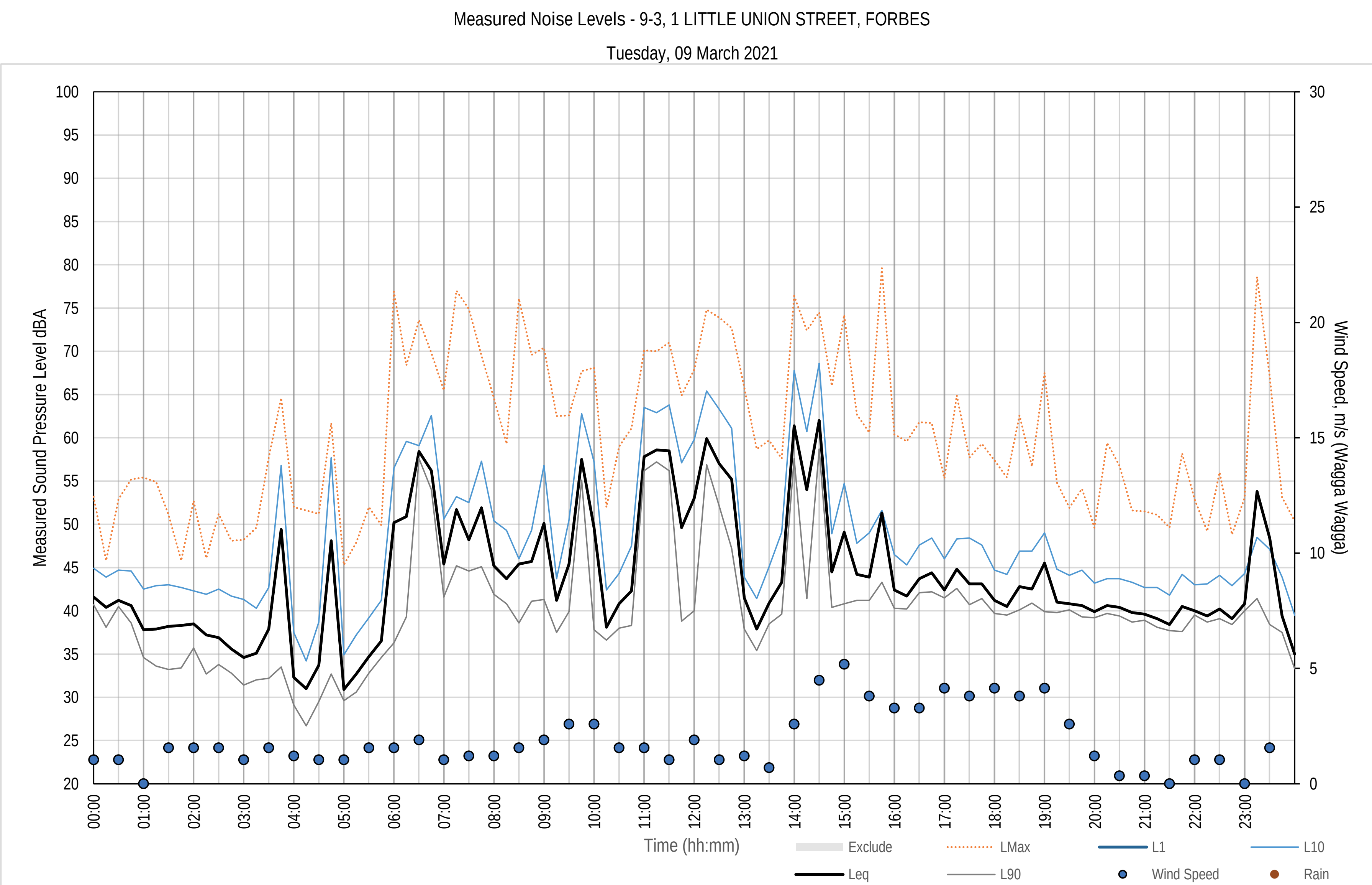
Saturday, 06 March 2021





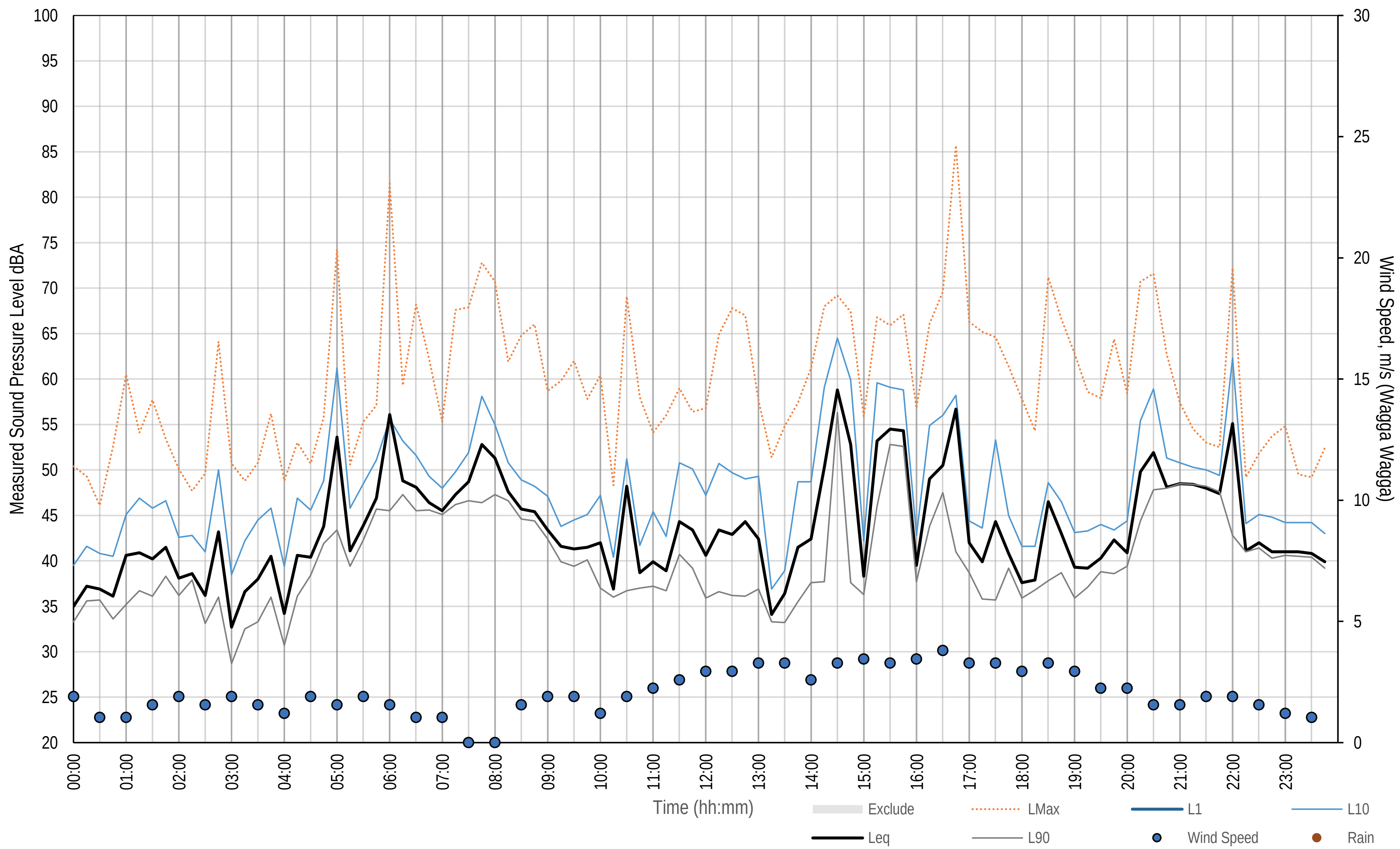
Measured Noise Levels - 9-3, 1 LITTLE UNION STREET, FORBES
Sunday, 07 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
30
25
20
15
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
Time (hh:mm)
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain

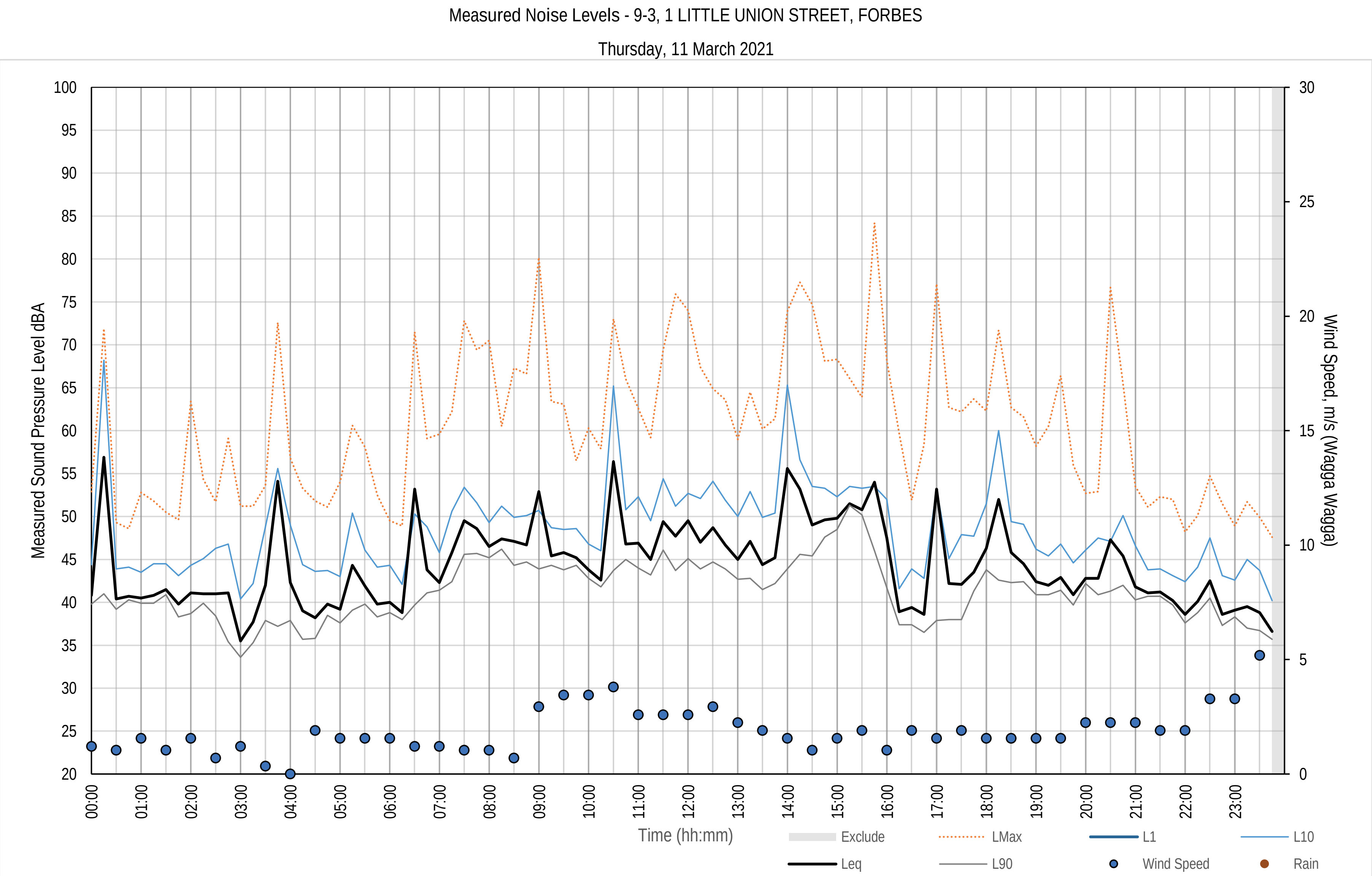

Measured Noise Levels - 9-3, 1 LITTLE UNION STREET, FORBES
Monday, 08 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
Time (hh:mm)
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain


Measured Noise Levels - 9-3, 1 LITTLE UNION STREET, FORBES
Tuesday, 09 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
Time (hh:mm)
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain

Measured Noise Levels - 9-3, 1 LITTLE UNION STREET, FORBES

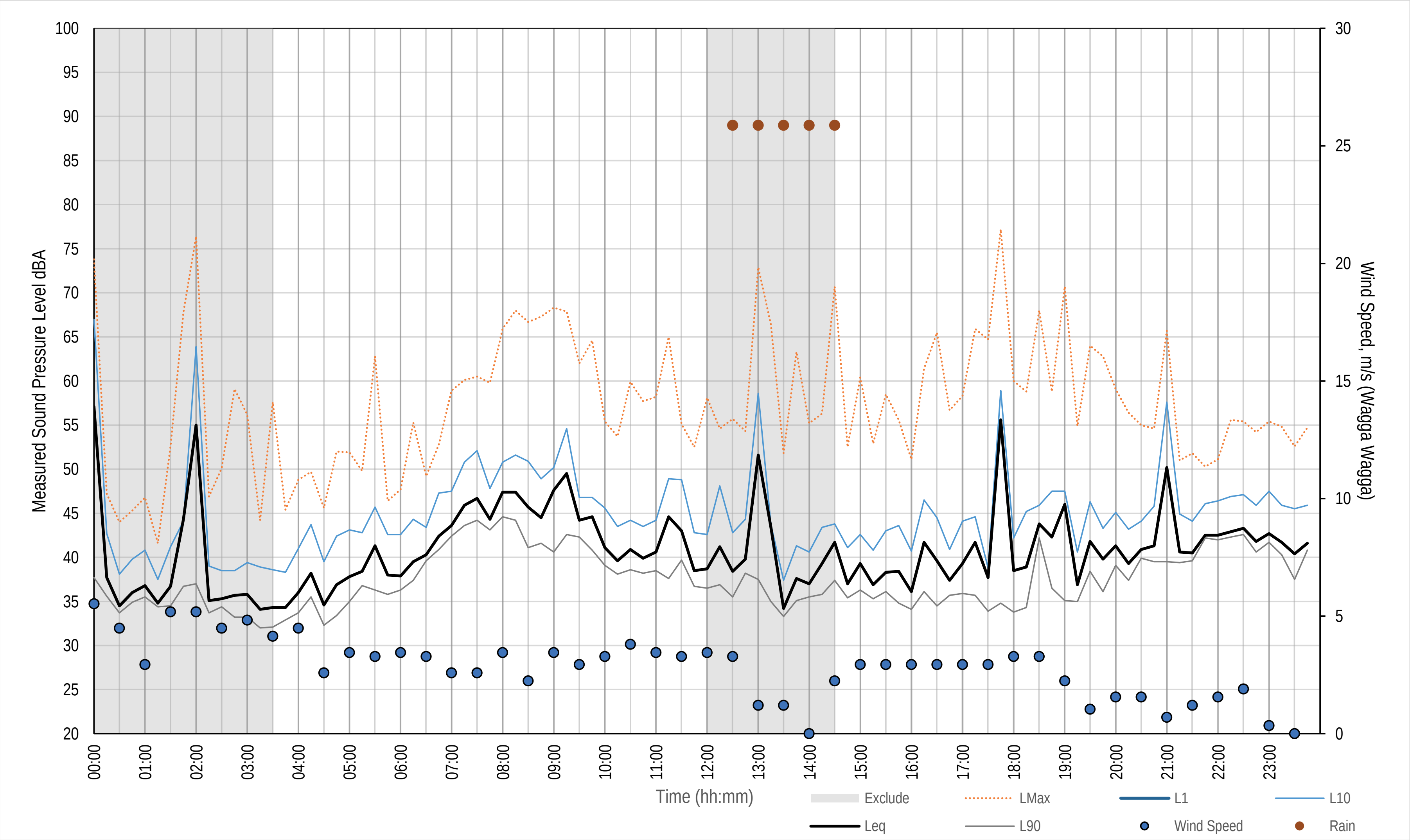
Wednesday, 10 March 2021




Measured Noise Levels - 9-3, 1 LITTLE UNION STREET, FORBES
Thursday, 11 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
Time (hh:mm)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
30
25
20
15
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain

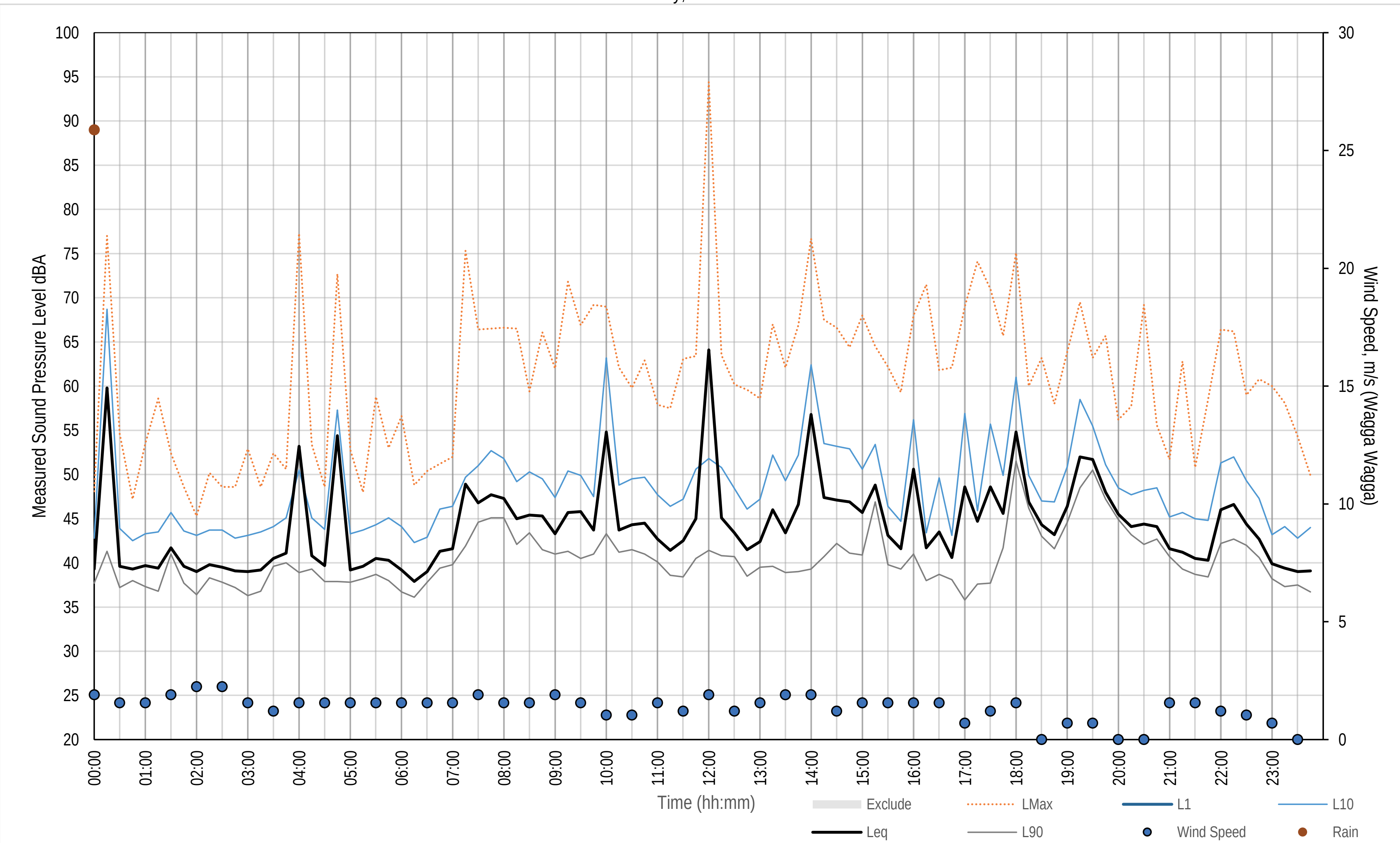
Measured Noise Levels - 9-3, 1 LITTLE UNION STREET, FORBES

Friday, 12 March 2021



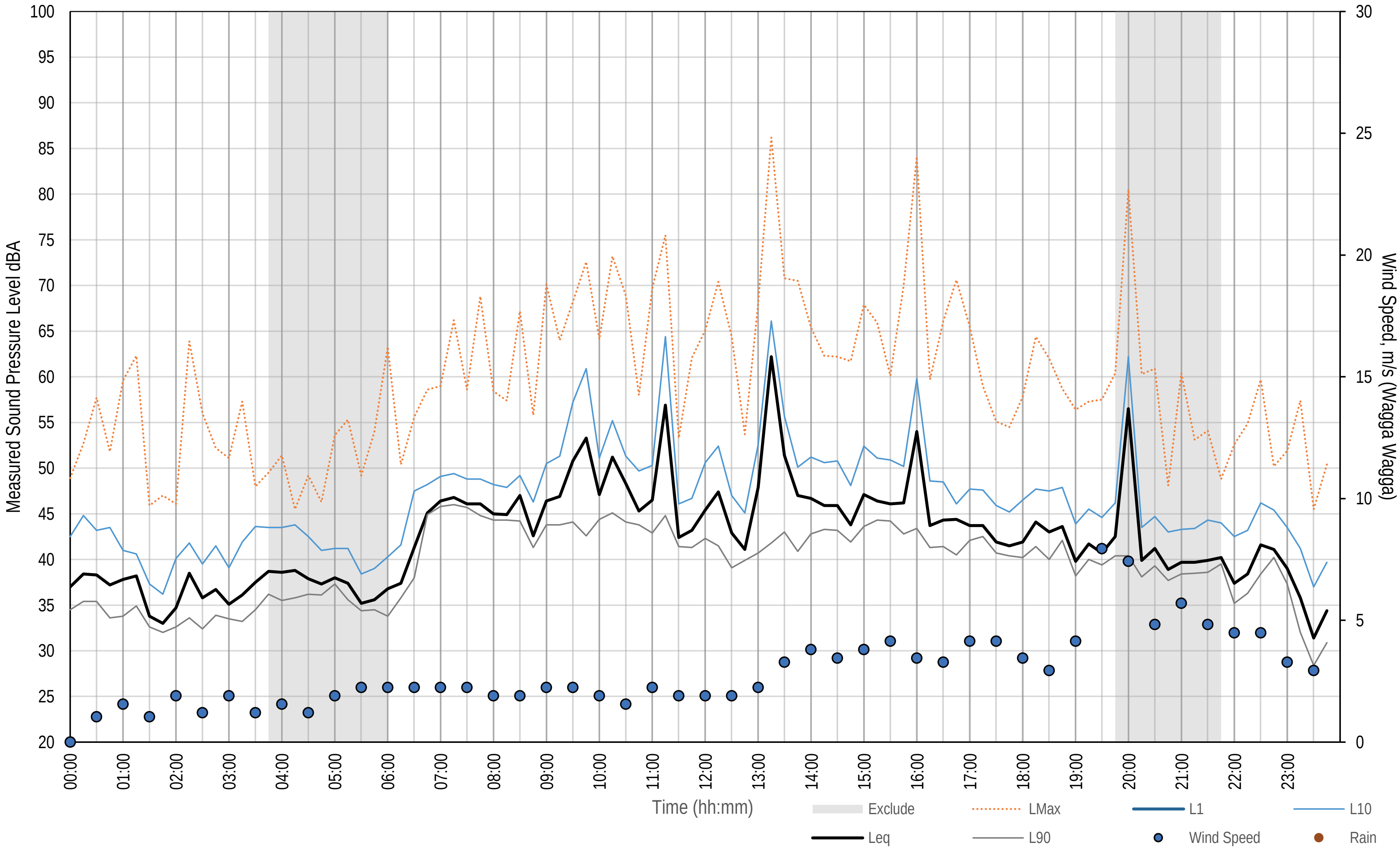
Measured Noise Levels - 9-3, 1 LITTLE UNION STREET, FORBES

Saturday, 13 March 2021



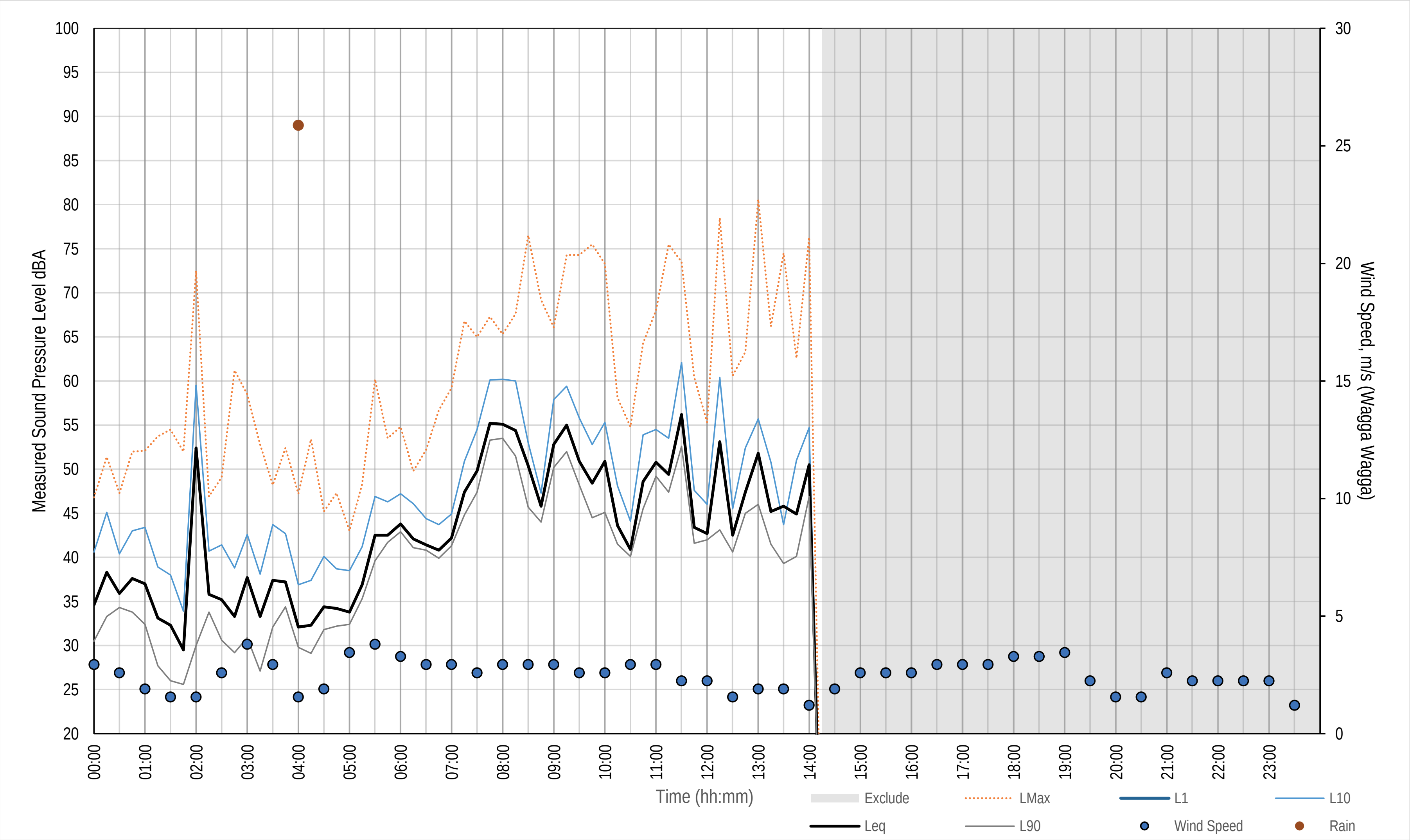
Measured Noise Levels - 9-3, 1 LITTLE UNION STREET, FORBES

Sunday, 14 March 2021



Measured Noise Levels - 9-3, 1 LITTLE UNION STREET, FORBES

Sunday, 14 March 2021



Site Details	9-5, 1 Union St Forbes	**Microphone Position**	1.5m - free field
Start Date	Thu 04 March 2021		
End Date	Fri 12 March 2021		

Measurement Summary

Date	04-03	05-03	06-03	07-03	08-03	09-03	10-03	11-03
$L_{eq,1\ hour\ day}$ dBA	75	60	63	60	57	60	60	57
$L_{eq,1\ hour\ night}$ dBA	67	53	56	53	53	54	55	55
$L_{eq,\ Day}$ dBA	75	53	57	53	51	54	54	52
$L_{eq,\ Evening}$ dBA	52	53	56	54	55	56	53	54
$L_{eq,\ Night}$ dBA	57	53	53	50	55	55	54	63
RBL, $_{Day}$ dBA		41	43	36	39	44	39	38
RBL, $_{Evening}$ dBA	47	47	48	47	41	46	46	44
RBL, $_{Night}$ dBA	35	36	33	35	47	40	37	

Date	12-03							
$L_{eq,1\ hour\ day}$ dBA								
$L_{eq,1\ hour\ night}$ dBA	56							
$L_{eq,\ Day}$ dBA								
$L_{eq,\ Evening}$ dBA								
$L_{eq,\ Night}$ dBA								
RBL, $_{Day}$ dBA								
RBL, $_{Evening}$ dBA								
RBL, $_{Night}$ dBA								

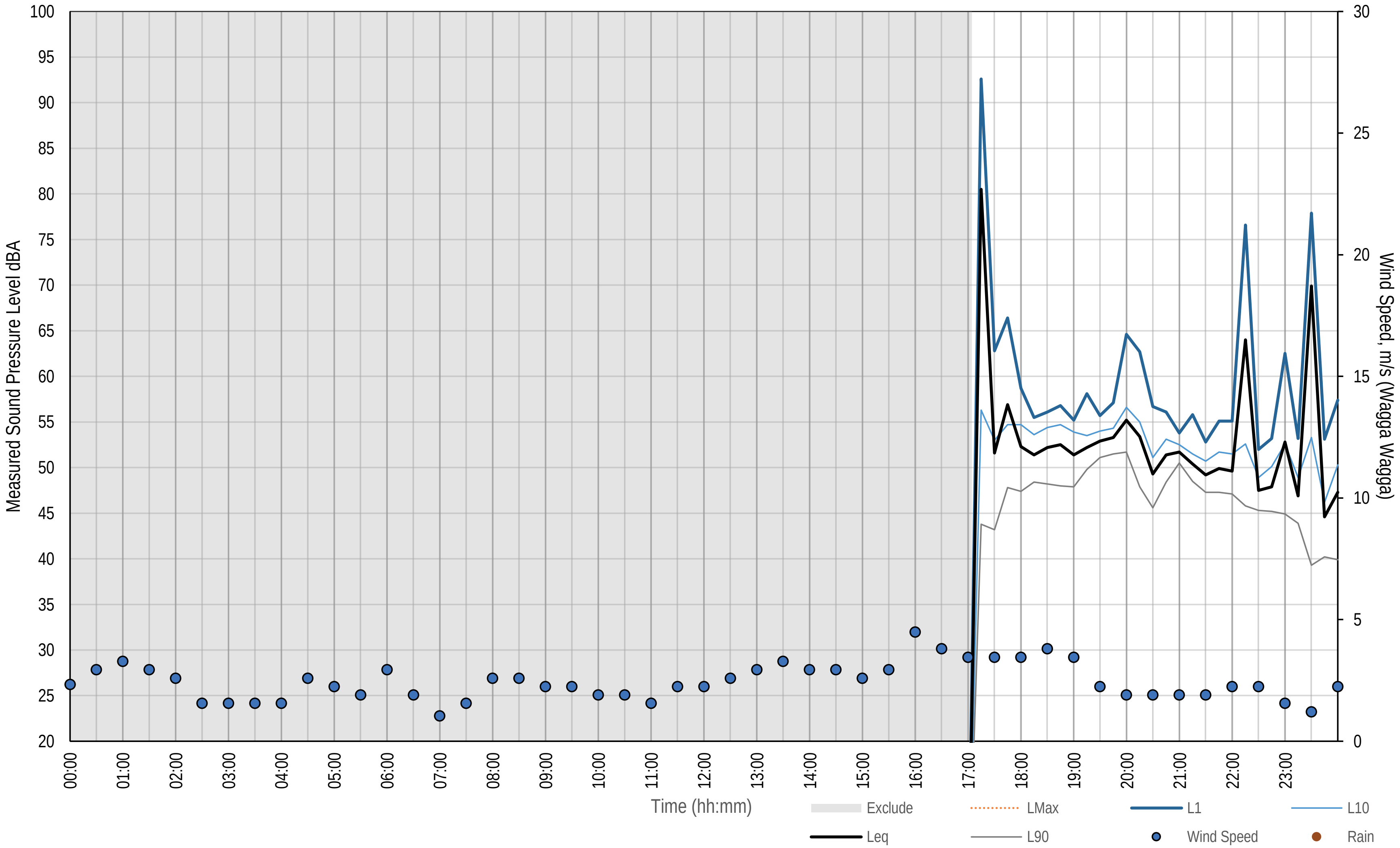
Summary	**Average (dBA)**
$L_{eq,\ Day}$ dBA	56
$L_{eq,\ Evening}$ dBA	54
$L_{eq,\ Night}$ dBA	55
RBL, $_{Day}$ dBA	39
RBL, $_{Evening}$ dBA	47
RBL, $_{Night}$ dBA	36

Summary	**Average (dBA)**
$L_{eq,1\ hour\ day}$ dBA	60
$L_{eq,1\ hour\ night}$ dBA	55
$L_{eq,\ 15\ hour\ day}$ dBA	57
$L_{eq,\ 9\ hour\ night}$ dBA	55

Site Photo

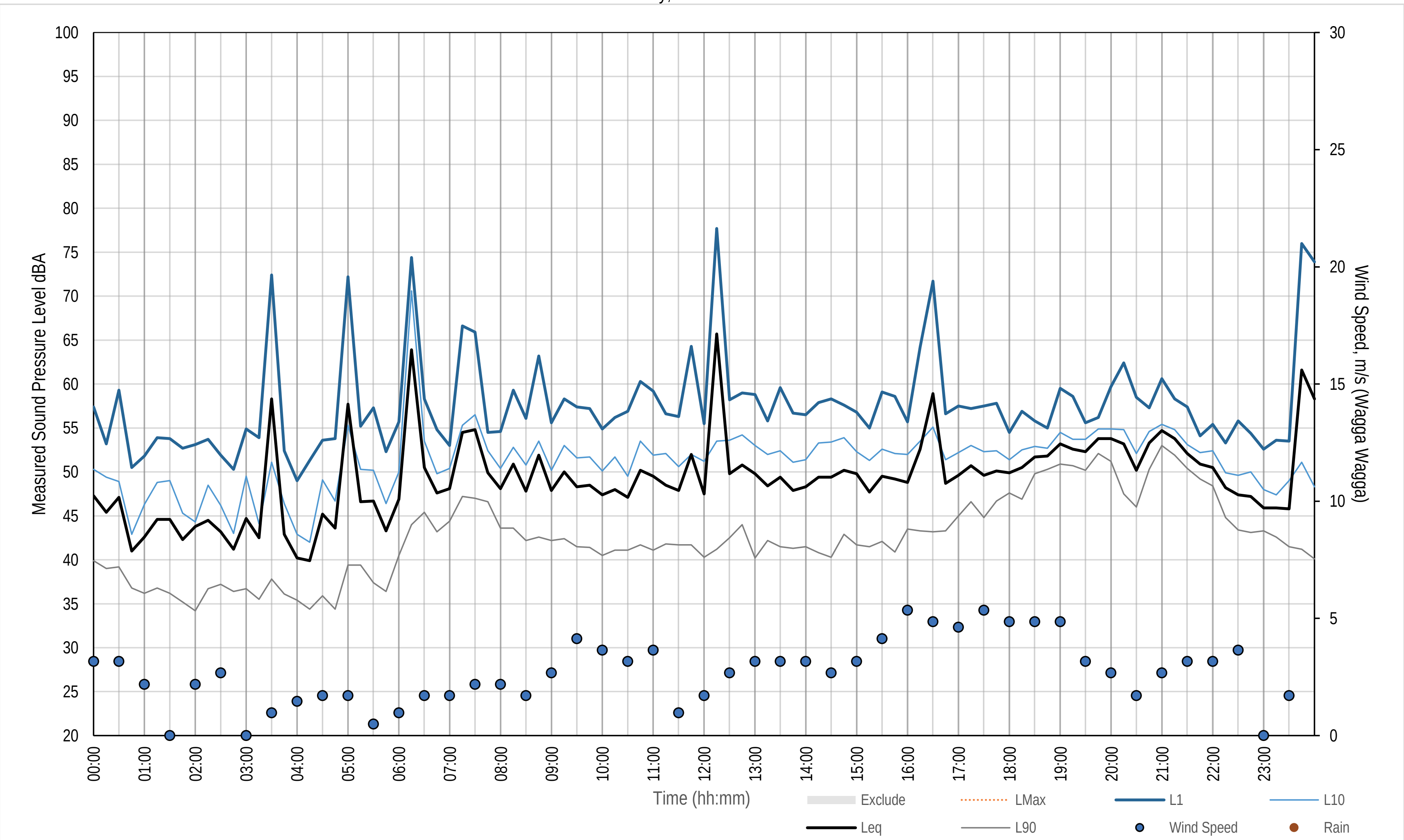
Measured Noise Levels - 9-5, 1 Union St Forbes

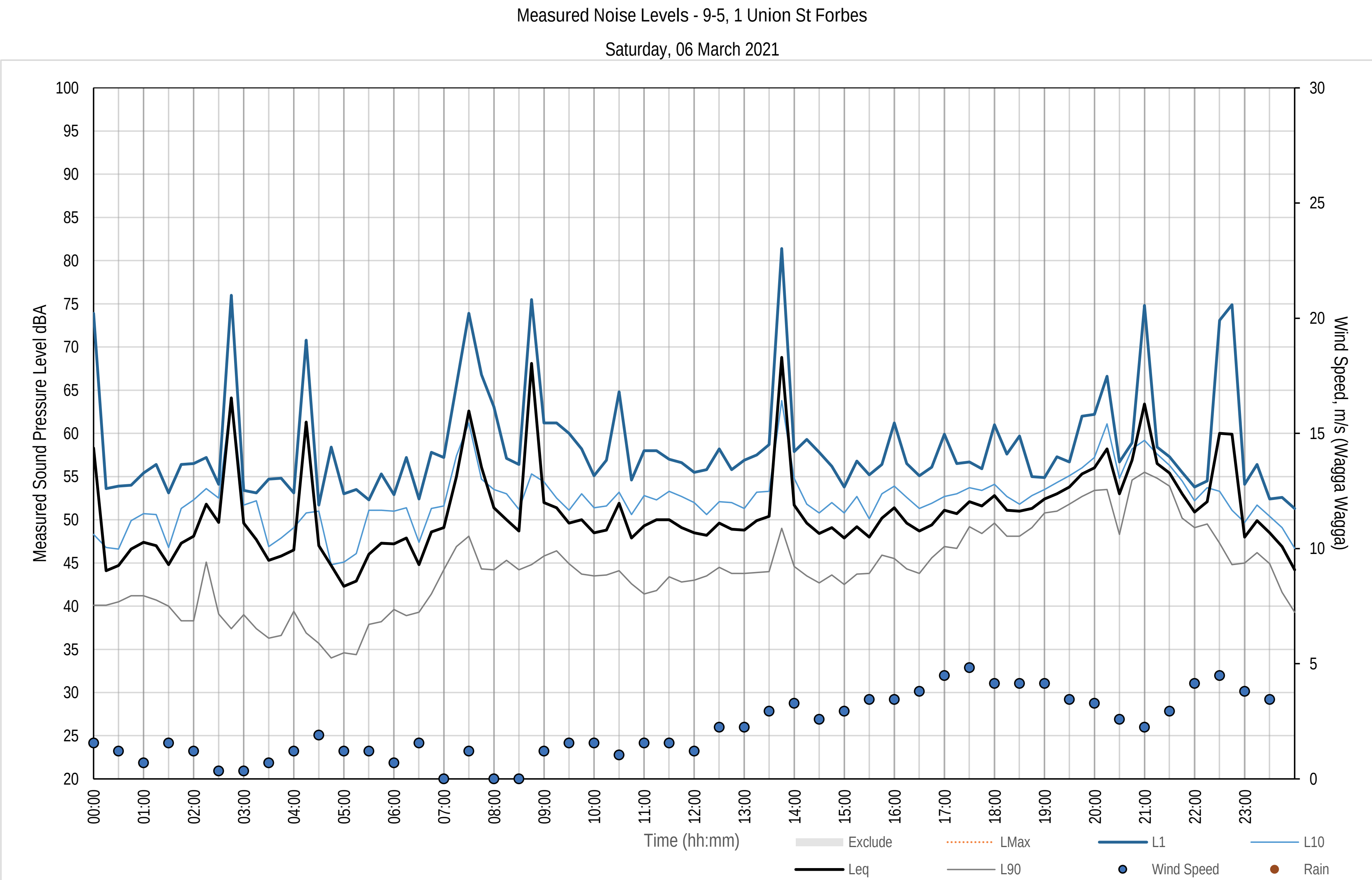
Thursday, 04 March 2021



Measured Noise Levels - 9-5, 1 Union St Forbes

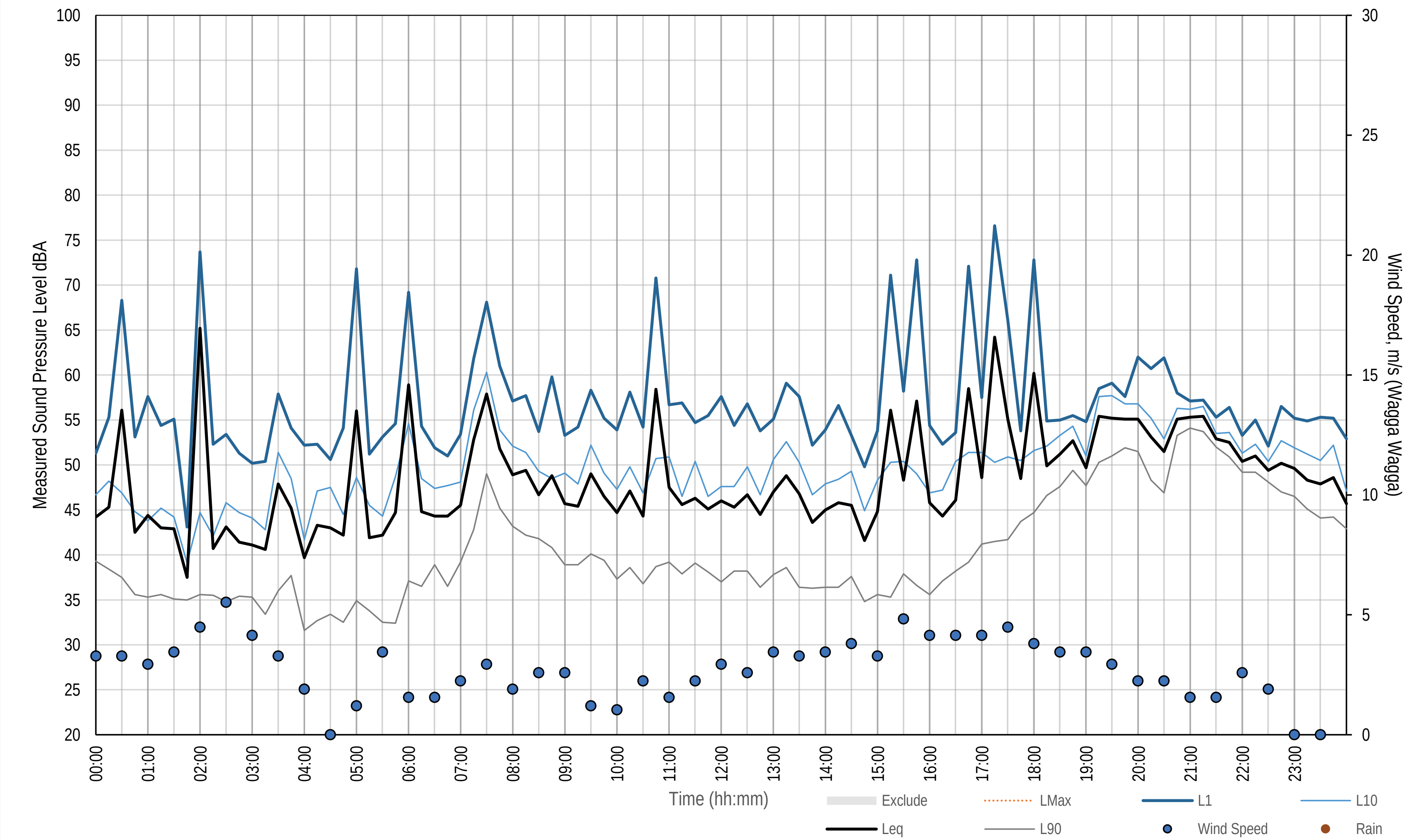
Friday, 05 March 2021




Measured Noise Levels - 9-5, 1 Union St Forbes
Saturday, 06 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
30
25
20
15
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
Time (hh:mm)
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain

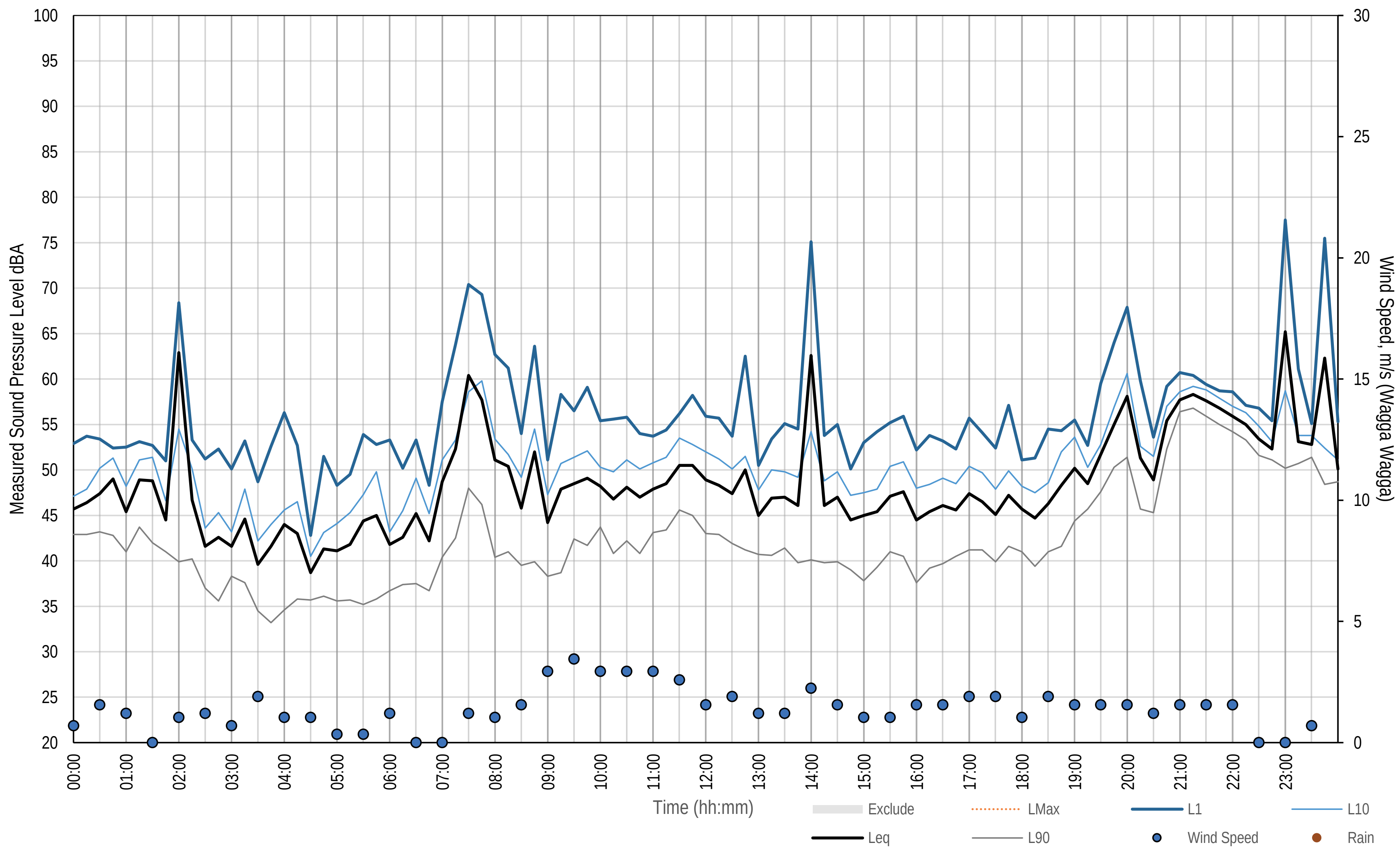
Measured Noise Levels - 9-5, 1 Union St Forbes

Sunday, 07 March 2021



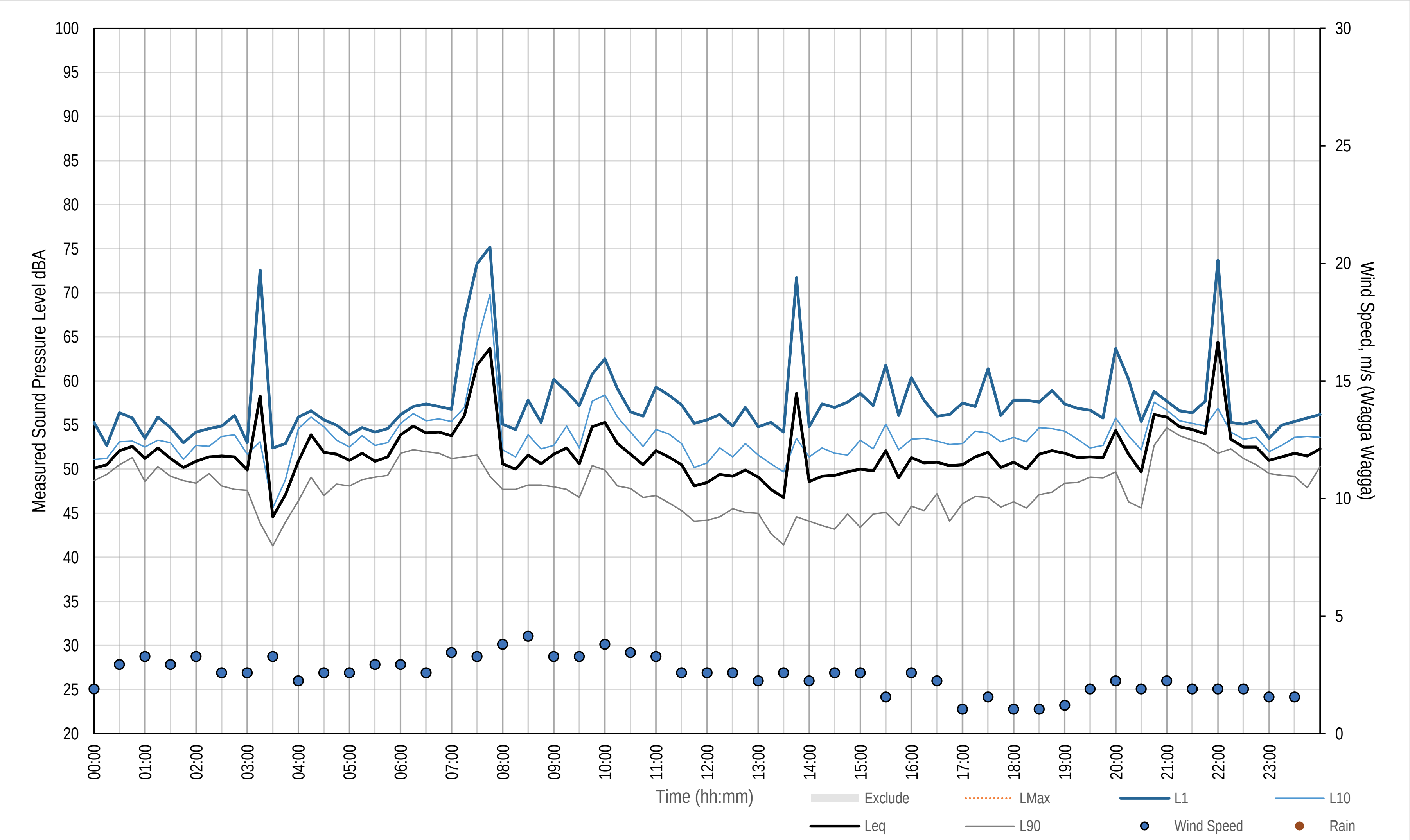
Measured Noise Levels - 9-5, 1 Union St Forbes

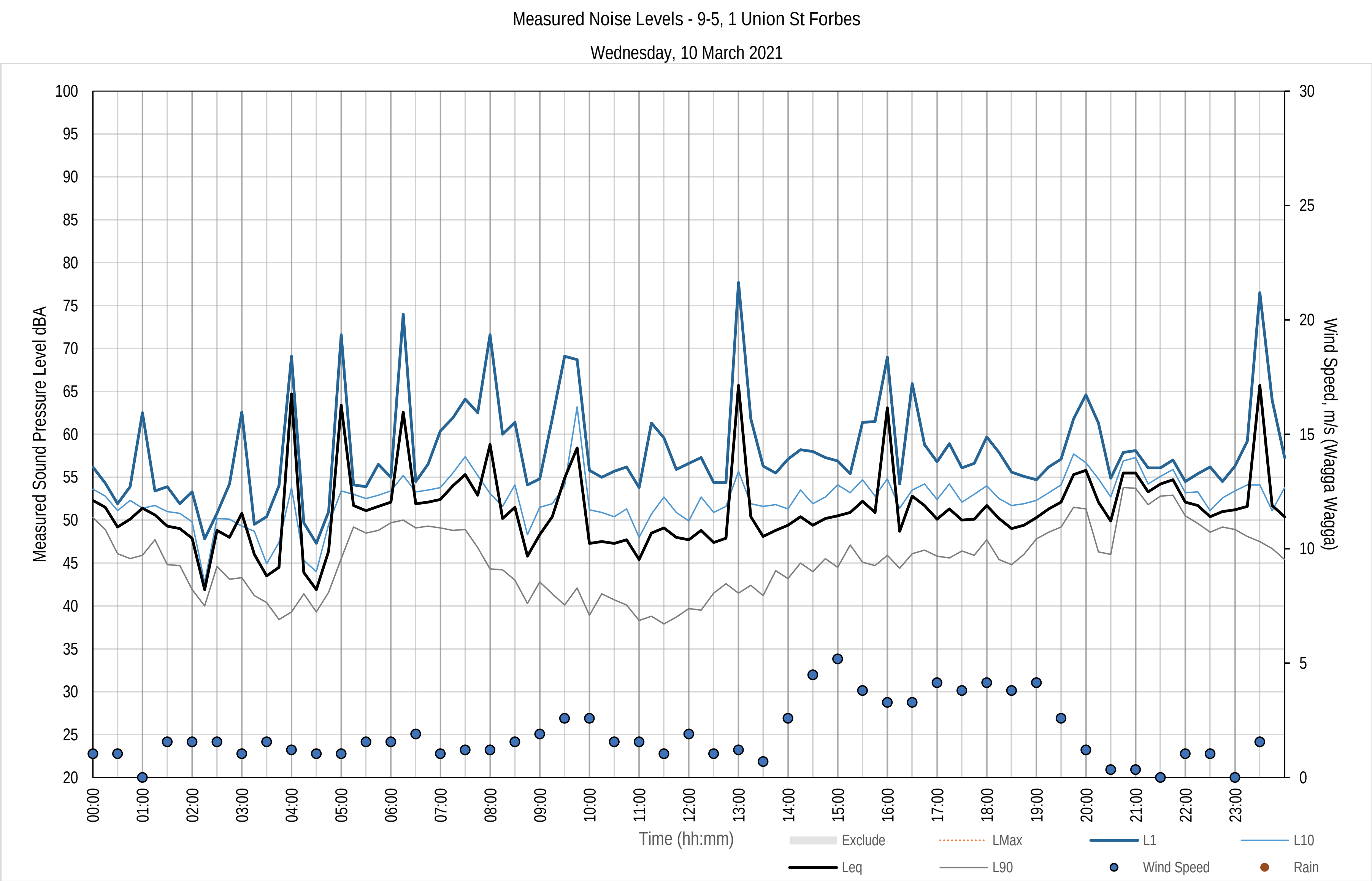
Monday, 08 March 2021



Measured Noise Levels - 9-5, 1 Union St Forbes

Tuesday, 09 March 2021

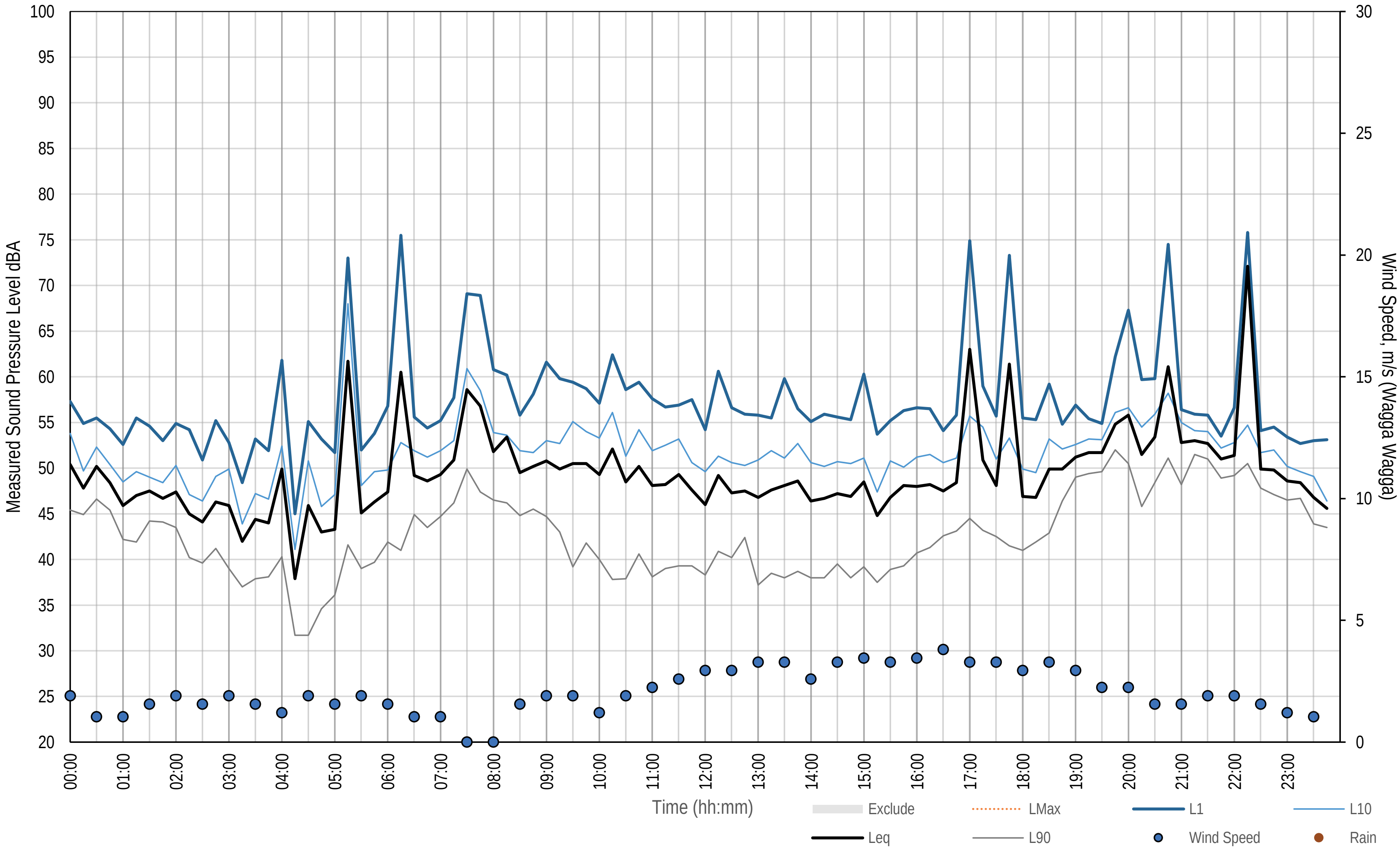




Measured Noise Levels - 9-5, 1 Union St Forbes
Wednesday, 10 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
Time (hh:mm)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
30
25
20
15
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain

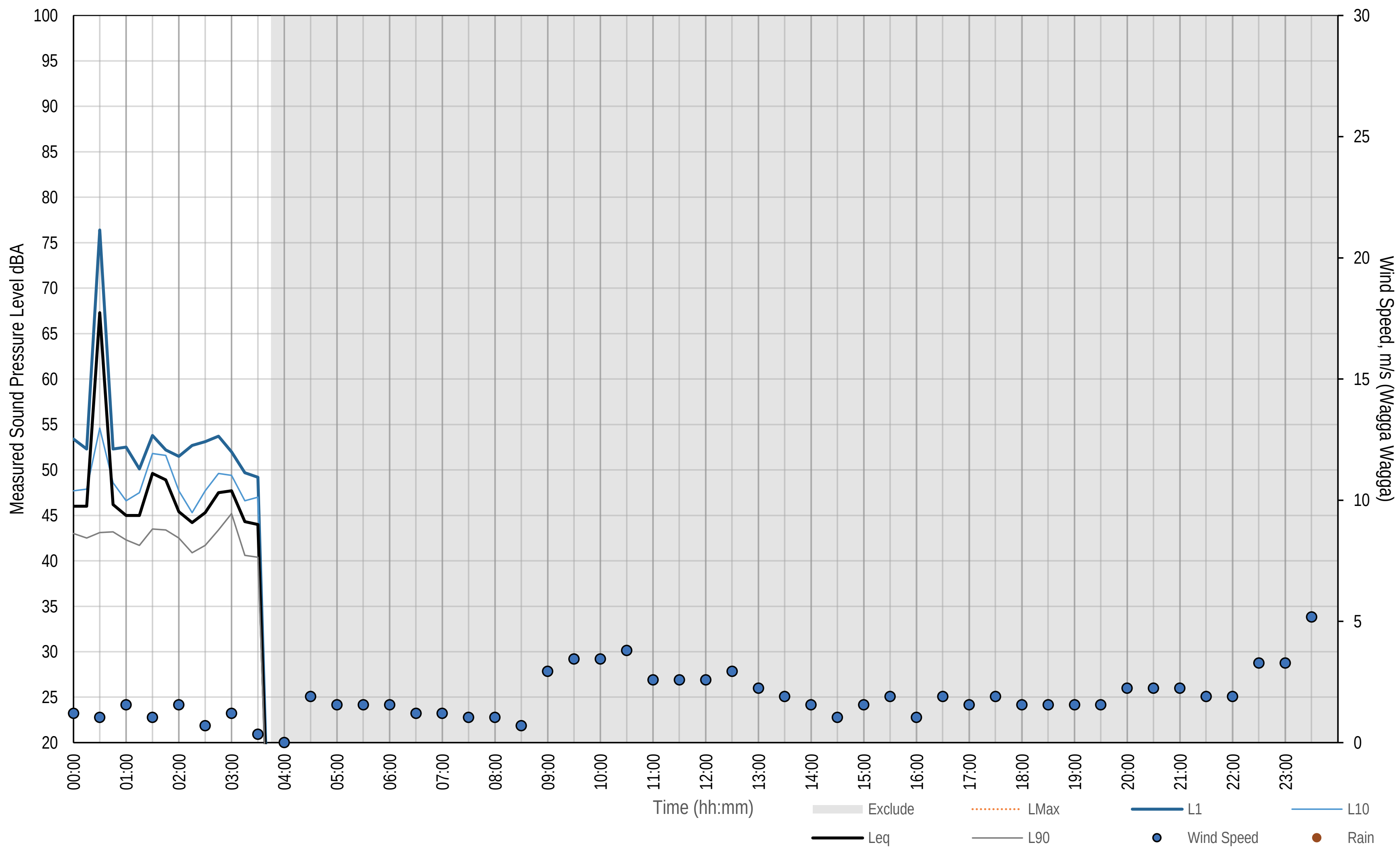
Measured Noise Levels - 9-5, 1 Union St Forbes

Thursday, 11 March 2021



Measured Noise Levels - 9-5, 1 Union St Forbes

Friday, 12 March 2021



APPENDIX A-2
WIRRINYA YARD

Site Details	7-1, 1 The Glen, 3907 Wirrinya Rd, Wirrinya NSW	**Microphone Position**	1.5m - free field
Start Date	Wed 03 March 2021		
End Date	Wed 17 March 2021		

Measurement Summary

Date	03-03	04-03	05-03	06-03	07-03	08-03	09-03	10-03
$L_{eq,1\ hour\ day}$ dBA	46	48	52	51	46	58	51	55
$L_{eq,1\ hour\ night}$ dBA	45	46	48	43	44	49	46	46
$L_{eq,\ Day}$ dBA	43	43	49	43	42	50	46	42
$L_{eq,\ Evening}$ dBA	42	45	48	46	38	50	42	49
$L_{eq,\ Night}$ dBA	49	48	43	43	49	47	47	38
RBL, $_{Day}$ dBA		21	32	22	24	27	24	22
RBL, $_{Evening}$ dBA	31	31	34	25	25	28	27	24
RBL, $_{Night}$ dBA	16	28	17	25	22	19	15	

Date	11-03	12-03	13-03	14-03	15-03	16-03	17-03	
$L_{eq,1\ hour\ day}$ dBA	57	52	60	53	57	58	47	
$L_{eq,1\ hour\ night}$ dBA	48	51	50	47	45	50	49	
$L_{eq,\ Day}$ dBA	50	41	46	49	43	50	46	
$L_{eq,\ Evening}$ dBA	45	49	54	48	51	53		
$L_{eq,\ Night}$ dBA	49	54	49	41	46	50		
RBL, $_{Day}$ dBA		25		33	24	30		
RBL, $_{Evening}$ dBA	28	27	27	21	27	34		
RBL, $_{Night}$ dBA	24	23		15	17	24		

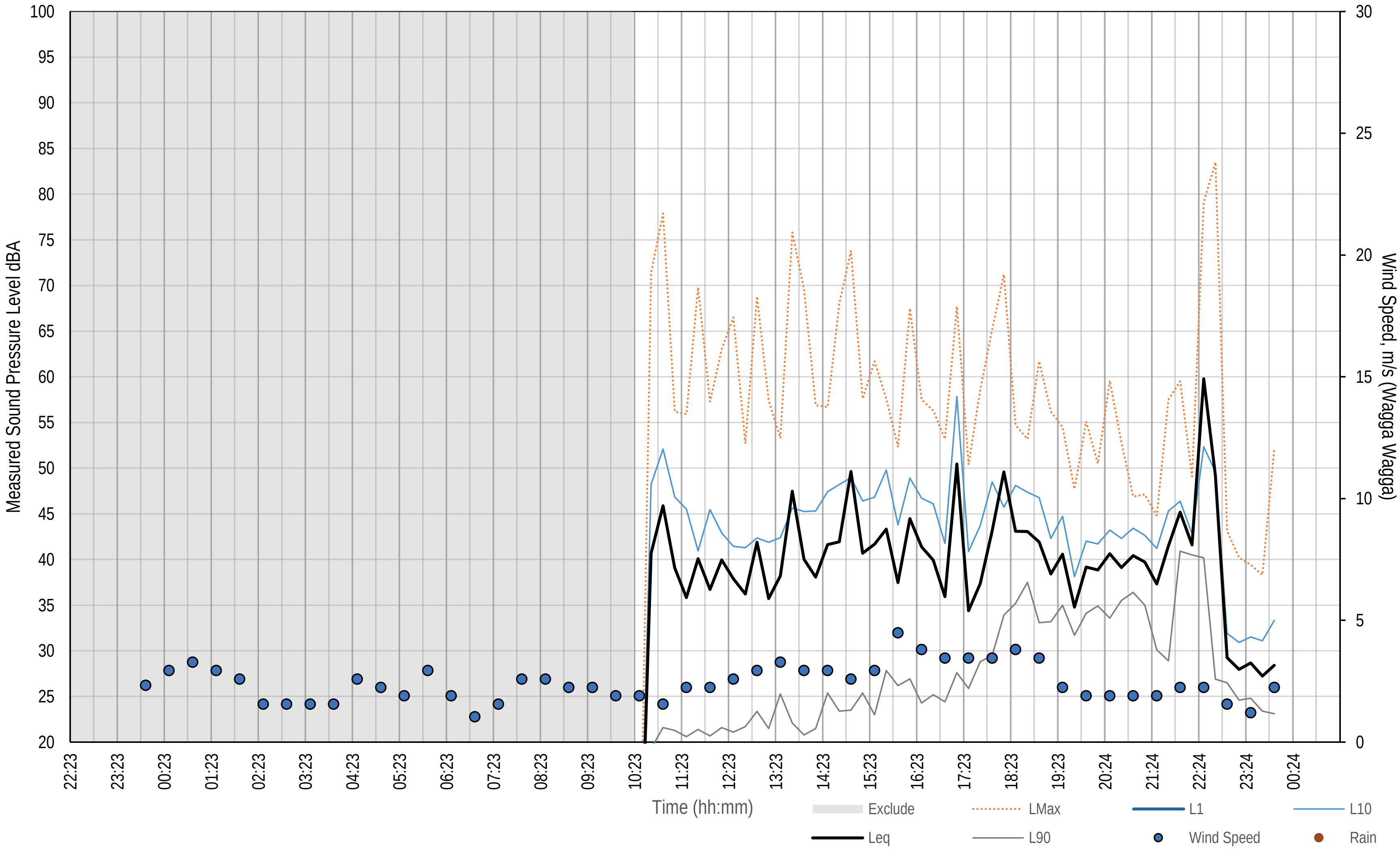
Summary	**Average (dBA)**
$L_{eq,\ Day}$ dBA	45
$L_{eq,\ Evening}$ dBA	47
$L_{eq,\ Night}$ dBA	47
RBL, $_{Day}$ dBA	24
RBL, $_{Evening}$ dBA	27
RBL, $_{Night}$ dBA	20

Summary	**Average (dBA)**
$L_{eq,1\ hour\ day}$ dBA	52
$L_{eq,1\ hour\ night}$ dBA	47
$L_{eq,\ 15\ hour\ day}$ dBA	47
$L_{eq,\ 9\ hour\ night}$ dBA	49

Site Photo

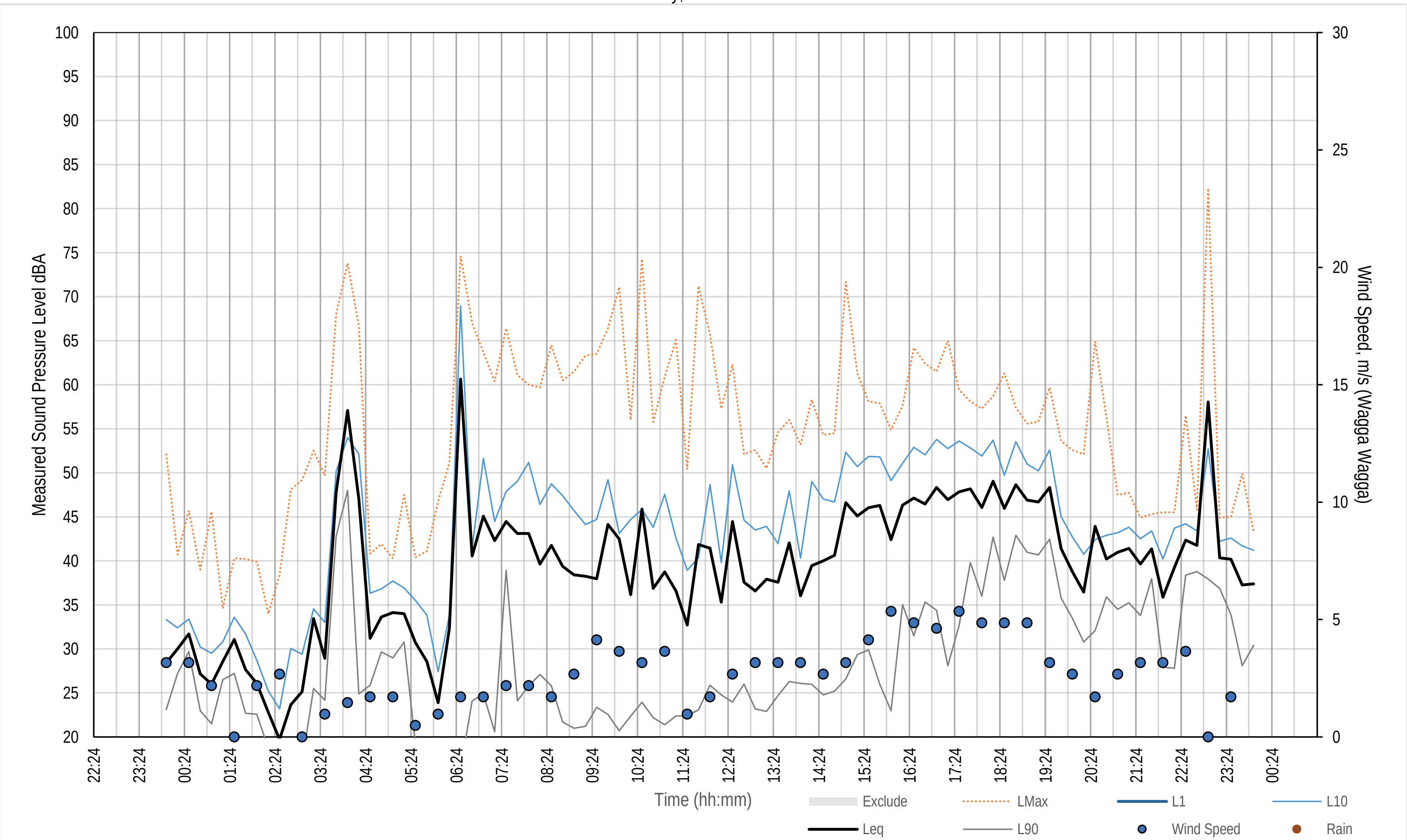
Measured Noise Levels - 7-1, 1 The Glen, 3907 Wirrinya Rd, Wirrinya NSW 2810

Wednesday, 03 March 2021



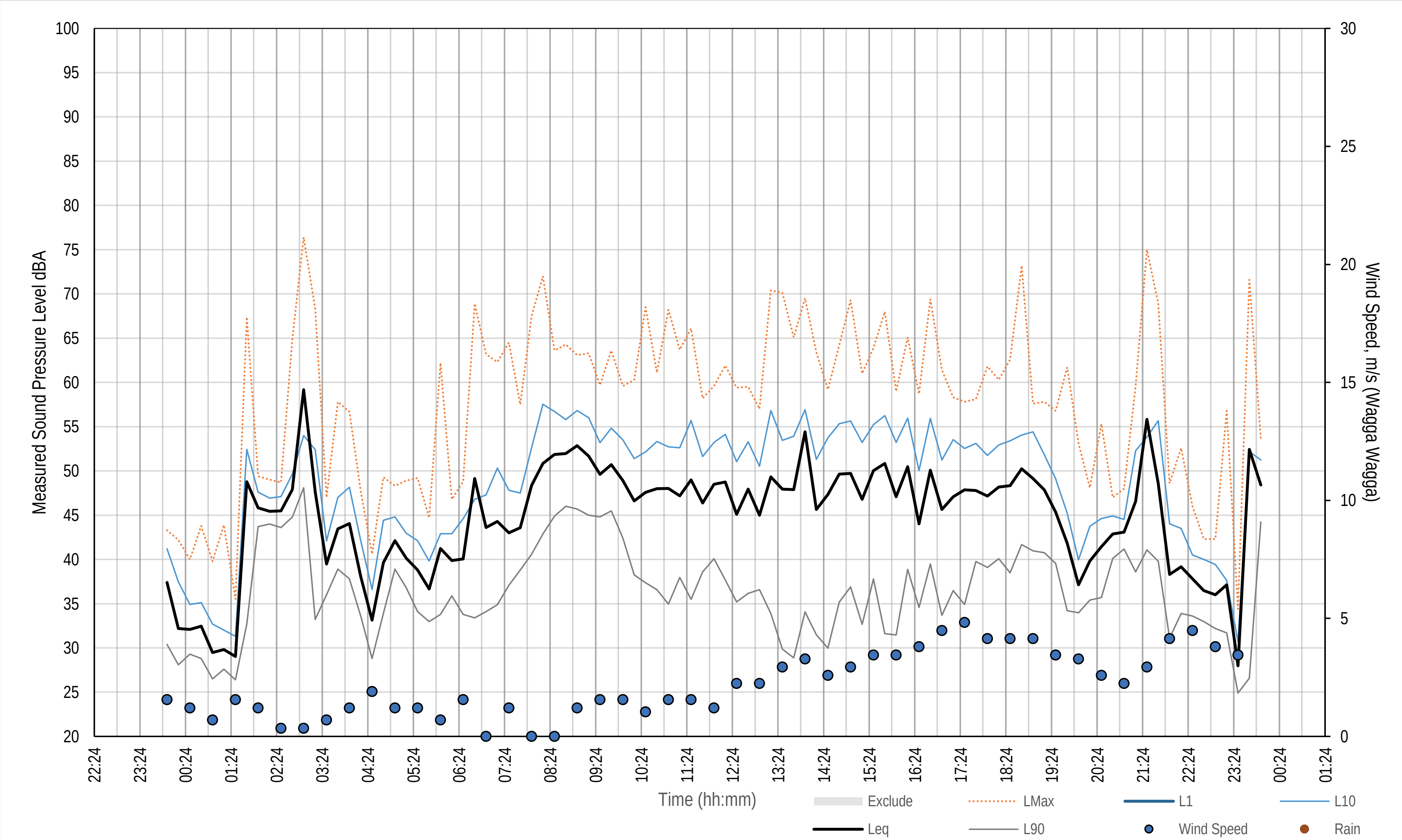
Measured Noise Levels - 7-1, 1 The Glen, 3907 Wirrinya Rd, Wirrinya NSW 2810

Thursday, 04 March 2021



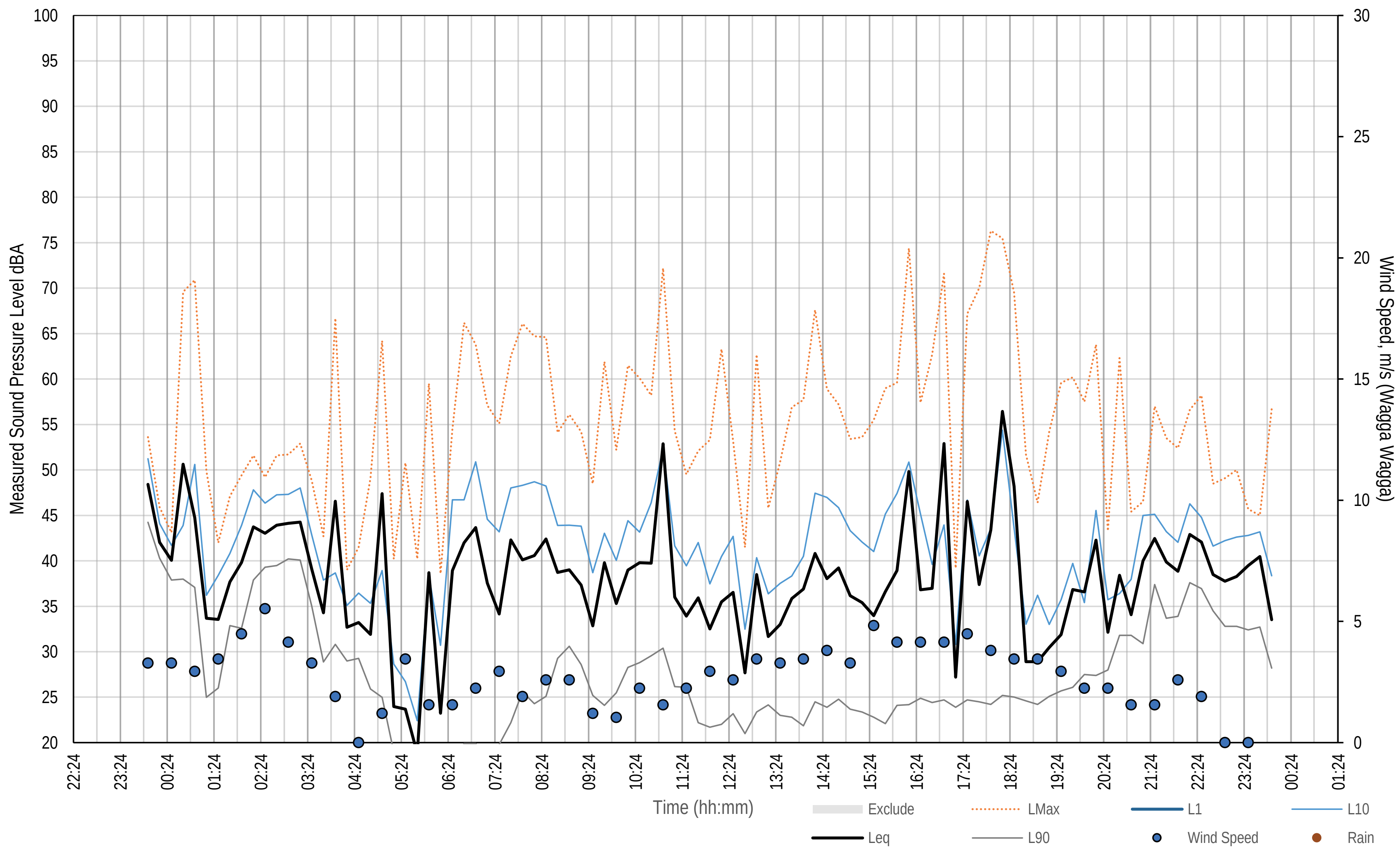
Measured Noise Levels - 7-1, 1 The Glen, 3907 Wirrinya Rd, Wirrinya NSW 2810

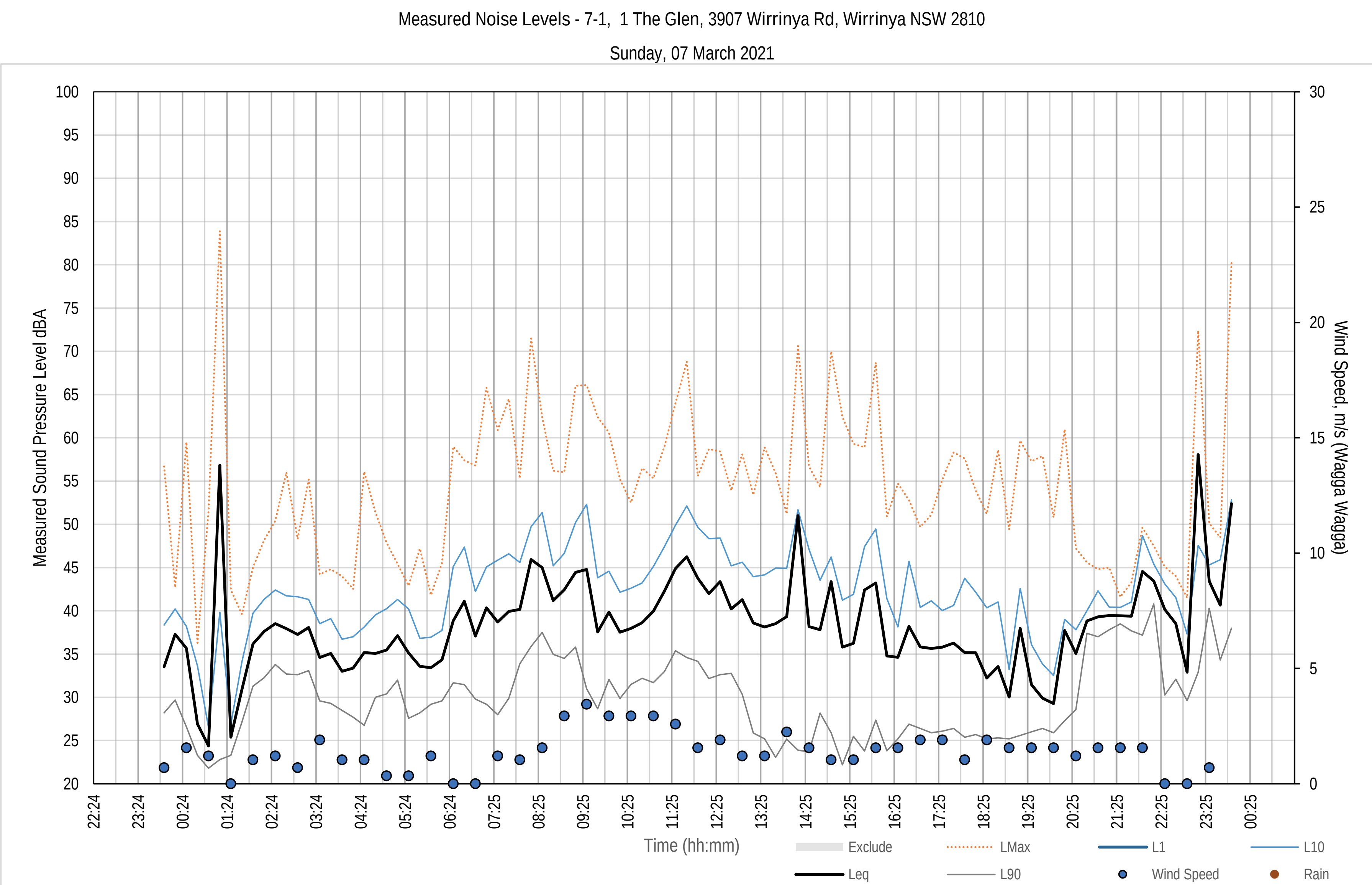
Friday, 05 March 2021



Measured Noise Levels - 7-1, 1 The Glen, 3907 Wirrinya Rd, Wirrinya NSW 2810

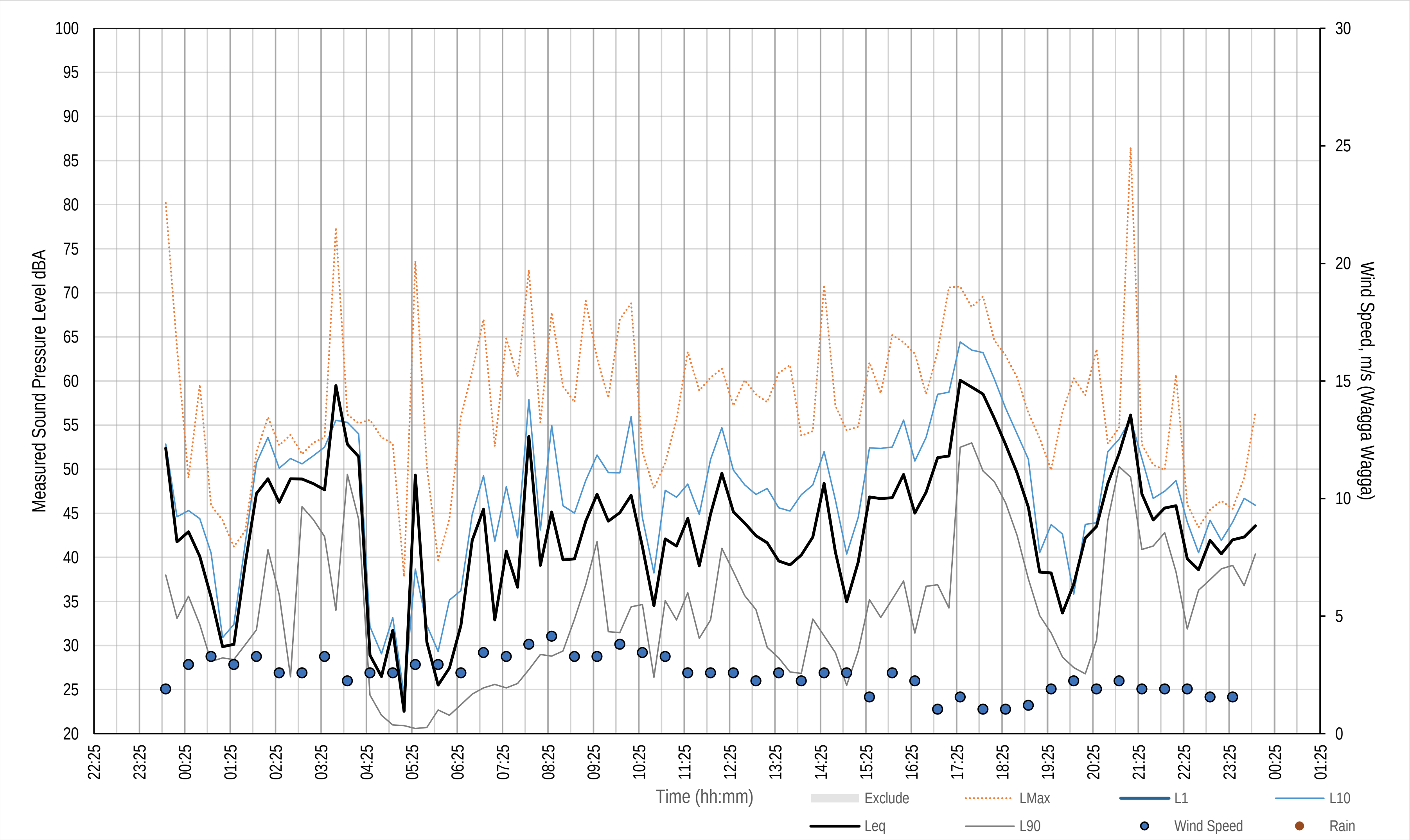
Saturday, 06 March 2021

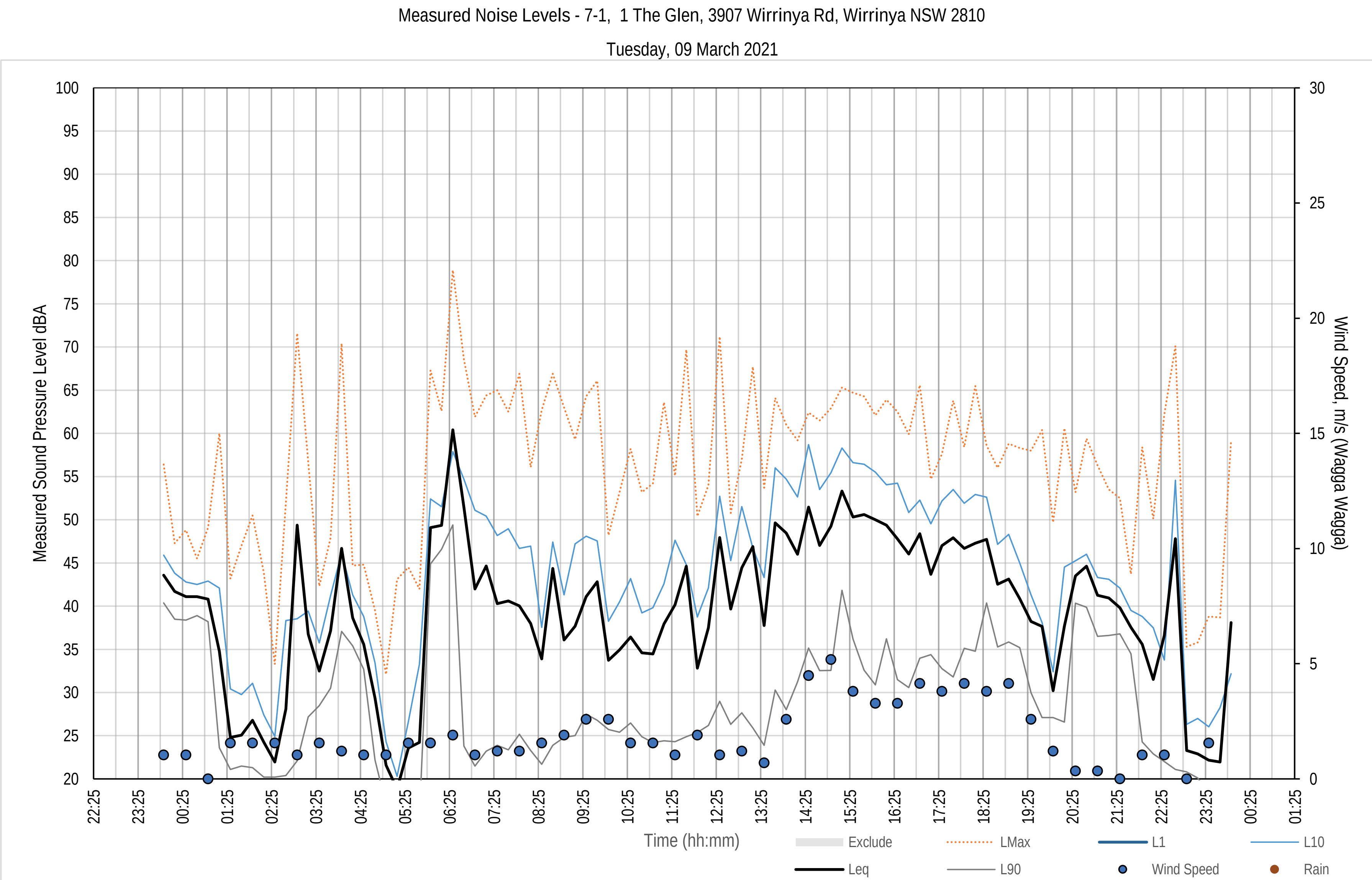



Measured Noise Levels - 7-1, 1 The Glen, 3907 Wirrinya Rd, Wirrinya NSW 2810
Sunday, 07 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
30
25
20
15
10
5
0
22:24
23:24
00:24
01:24
02:24
03:24
04:24
05:24
06:24
07:25
08:25
09:25
10:25
11:25
12:25
13:25
14:25
15:25
16:25
17:25
18:25
19:25
20:25
21:25
22:25
23:25
00:25
Time (hh:mm)
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain

Measured Noise Levels - 7-1, 1 The Glen, 3907 Wirrinya Rd, Wirrinya NSW 2810

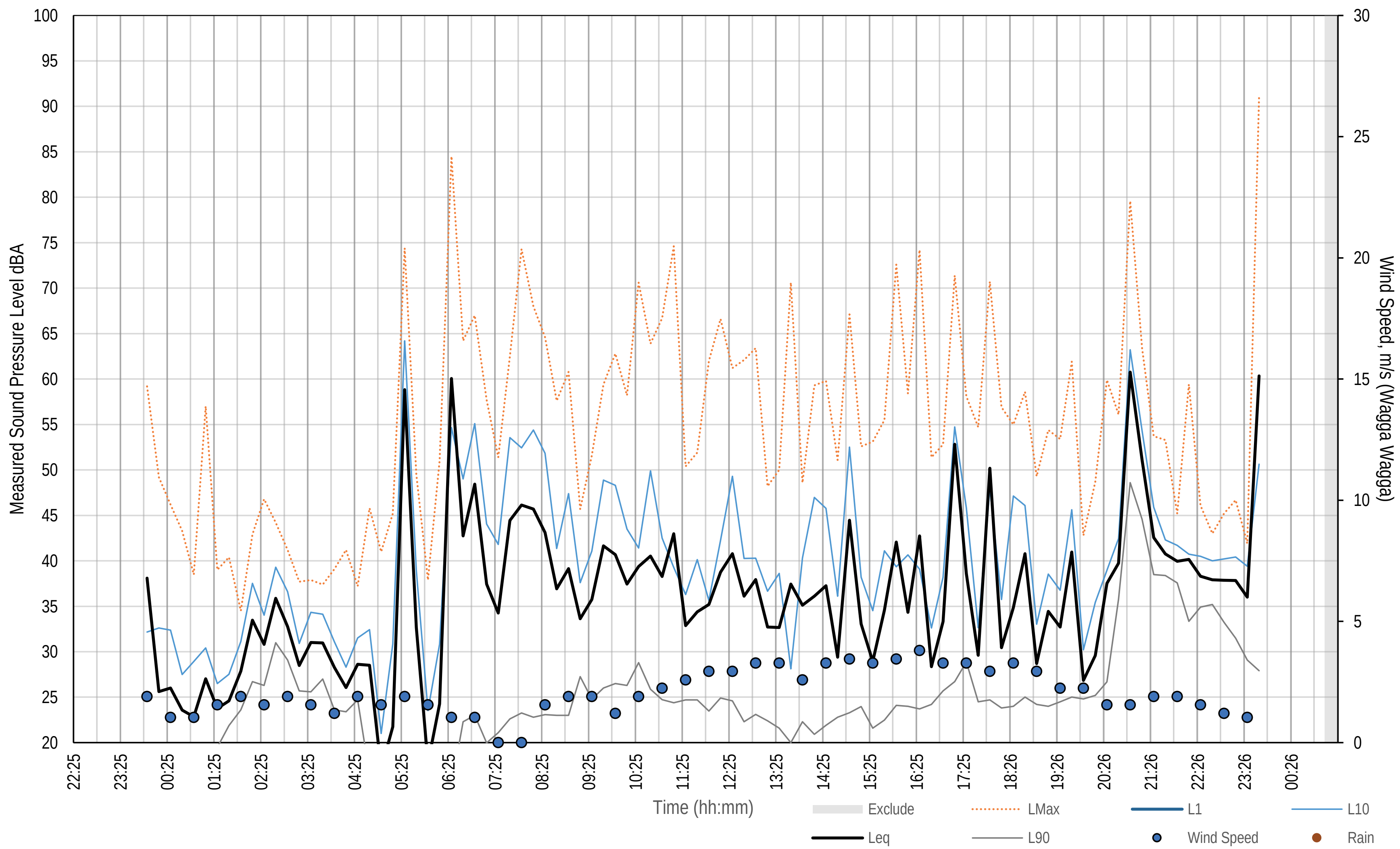
Monday, 08 March 2021

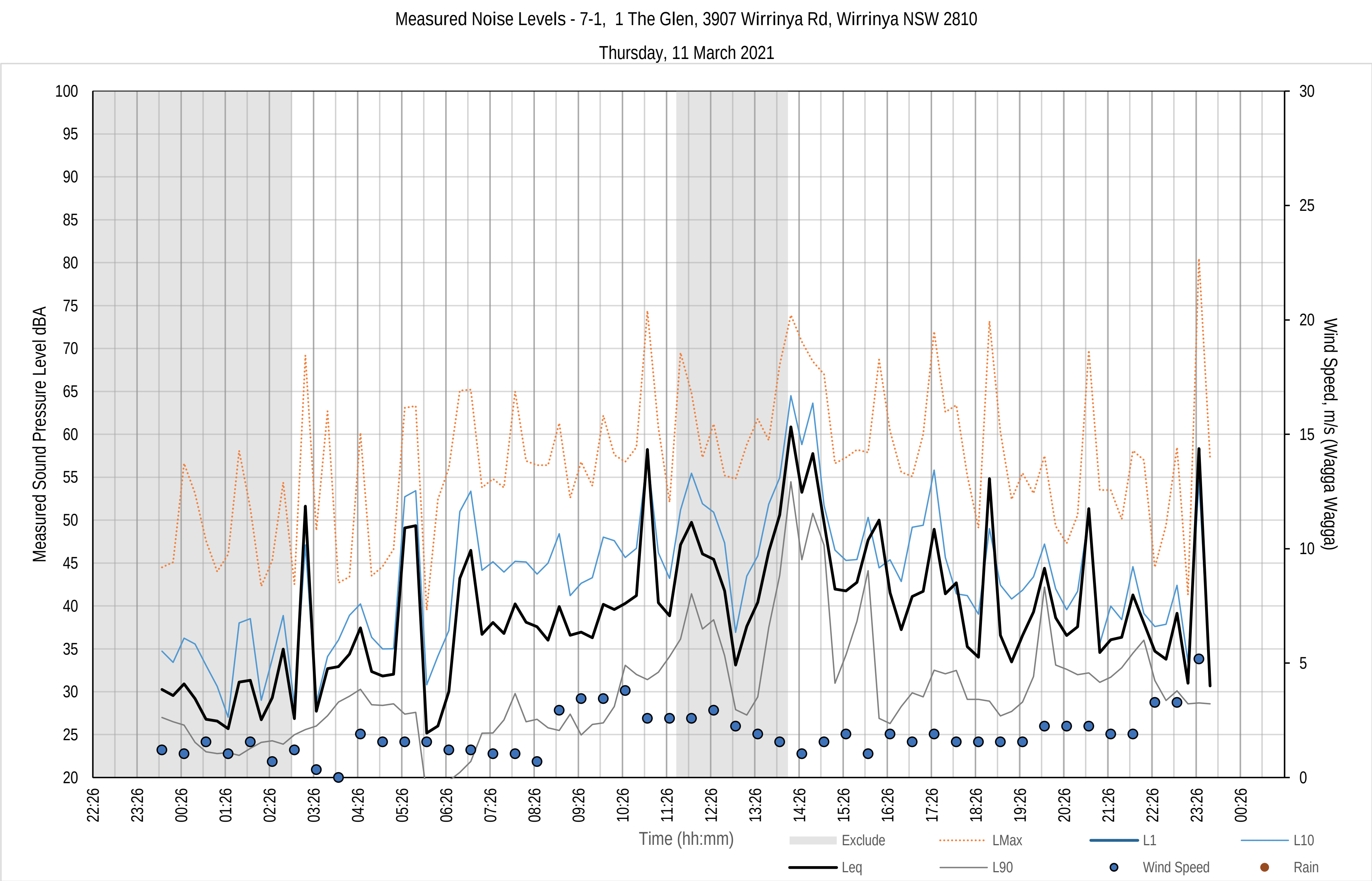



Measured Noise Levels - 7-1, 1 The Glen, 3907 Wirrinya Rd, Wirrinya NSW 2810
Tuesday, 09 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
Time (hh:mm)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
30
25
20
15
10
5
0
22:25
23:25
00:25
01:25
02:25
03:25
04:25
05:25
06:25
07:25
08:25
09:25
10:25
11:25
12:25
13:25
14:25
15:25
16:25
17:25
18:25
19:25
20:25
21:25
22:25
23:25
00:25
01:25
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain

Measured Noise Levels - 7-1, 1 The Glen, 3907 Wirrinya Rd, Wirrinya NSW 2810

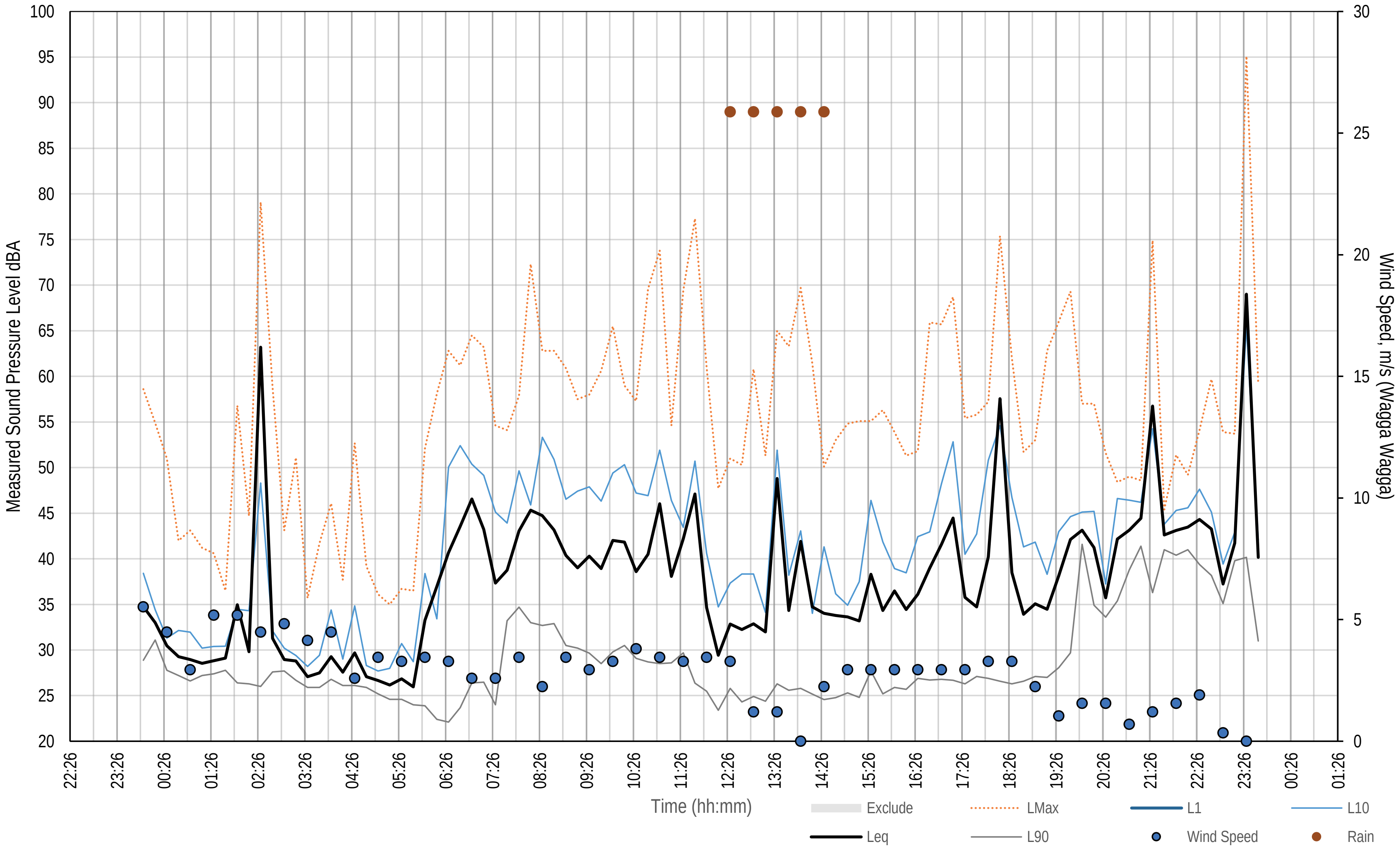
Wednesday, 10 March 2021




Measured Noise Levels - 7-1, 1 The Glen, 3907 Wirrinya Rd, Wirrinya NSW 2810
Thursday, 11 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
0
5
10
15
20
25
30
22:26
23:26
00:26
01:26
02:26
03:26
04:26
05:26
06:26
07:26
08:26
09:26
10:26
11:26
12:26
13:26
14:26
15:26
16:26
17:26
18:26
19:26
20:26
21:26
22:26
23:26
00:26
Time (hh:mm)
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain

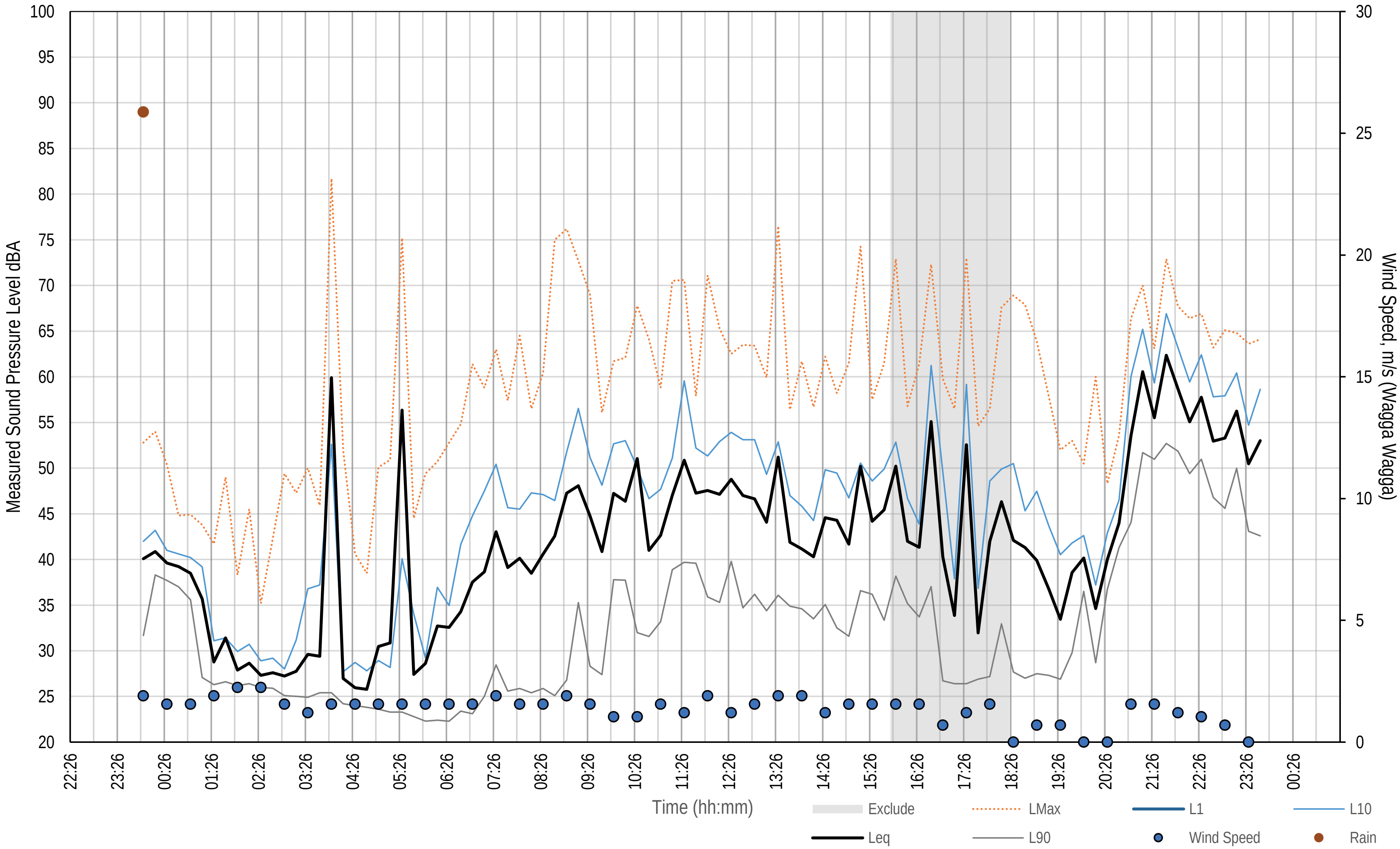
Measured Noise Levels - 7-1, 1 The Glen, 3907 Wirrinya Rd, Wirrinya NSW 2810

Friday, 12 March 2021



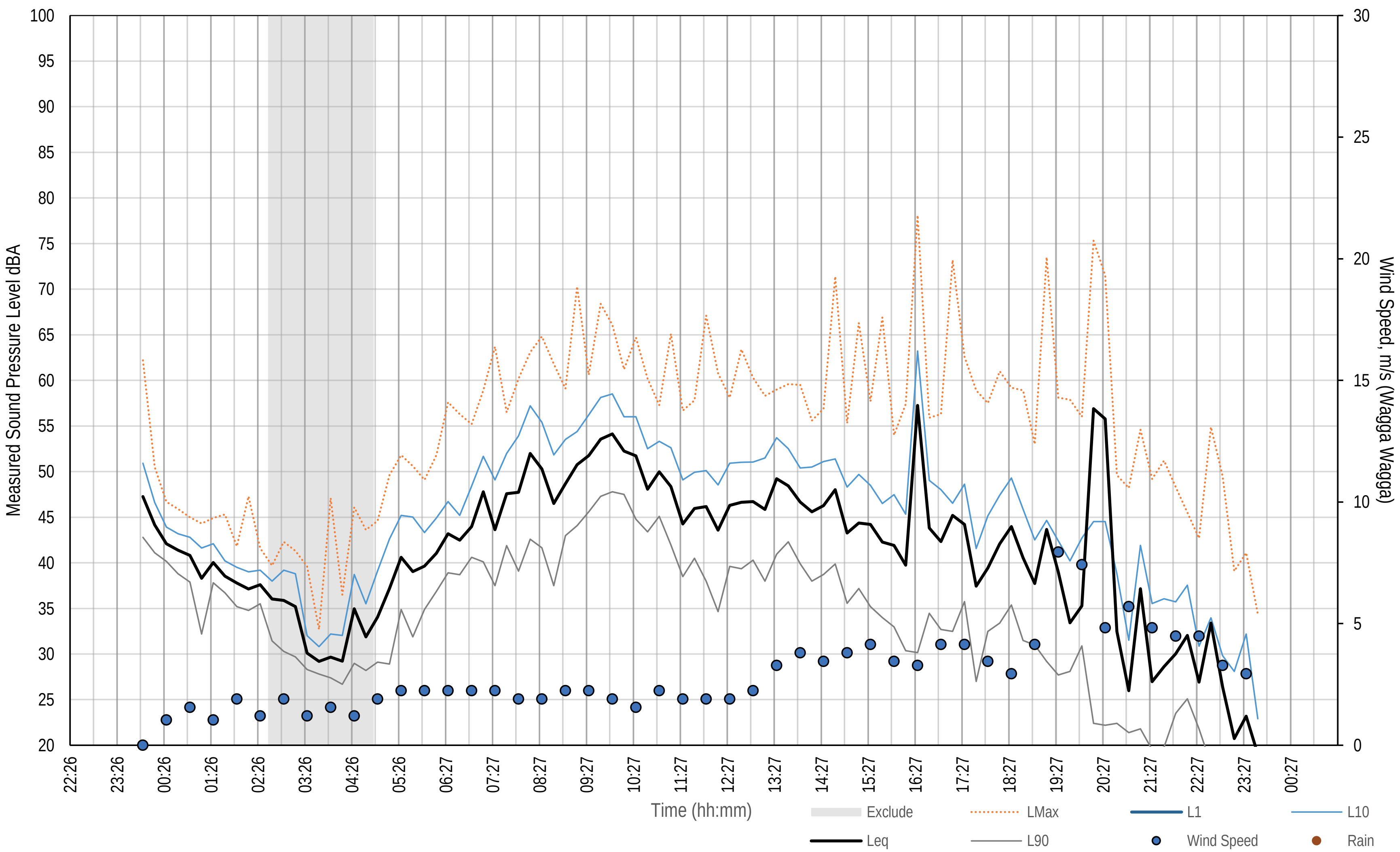
Measured Noise Levels - 7-1, 1 The Glen, 3907 Wirrinya Rd, Wirrinya NSW 2810

Saturday, 13 March 2021



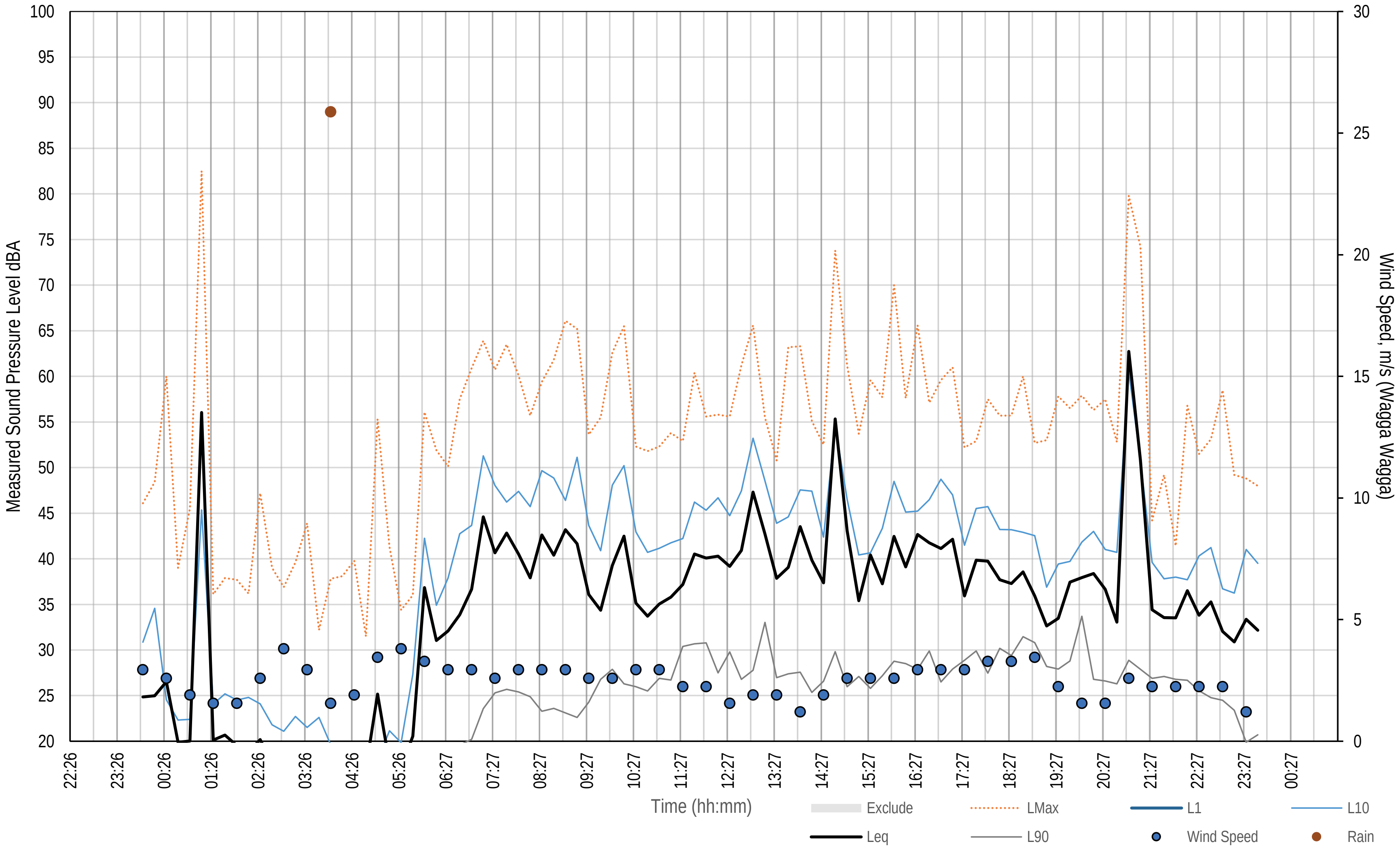
Measured Noise Levels - 7-1, 1 The Glen, 3907 Wirrinya Rd, Wirrinya NSW 2810

Sunday, 14 March 2021



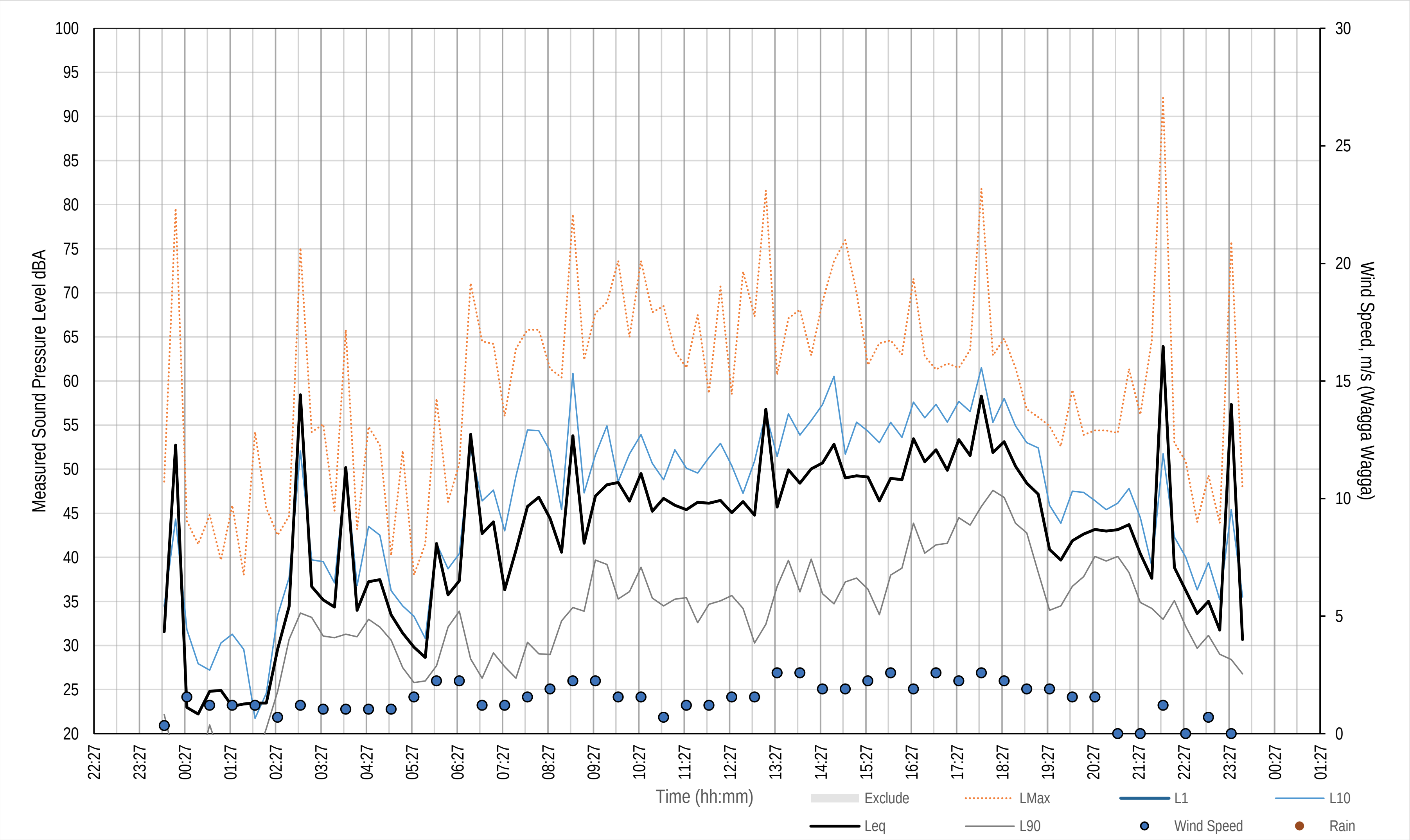
Measured Noise Levels - 7-1, 1 The Glen, 3907 Wirrinya Rd, Wirrinya NSW 2810

Sunday, 14 March 2021



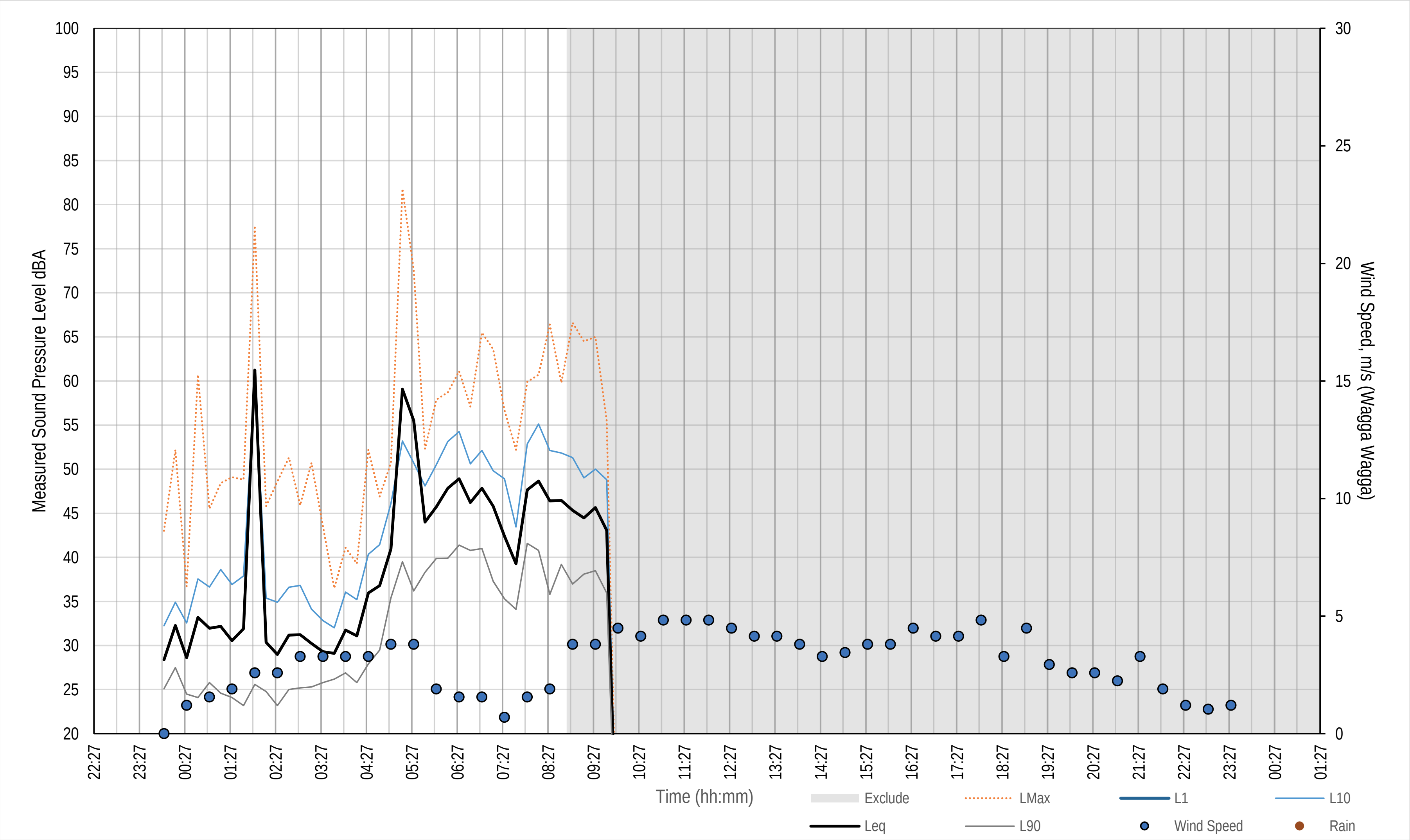
Measured Noise Levels - 7-1, 1 The Glen, 3907 Wirrinya Rd, Wirrinya NSW 2810

Monday, 15 March 2021



Measured Noise Levels - 7-1, 1 The Glen, 3907 Wirrinya Rd, Wirrinya NSW 2810

Tuesday, 16 March 2021



APPENDIX A-3
CARAGABAL YARD

Site Details	6-1, 1 Railway Street, Caragabal NSW 2810	**Microphone Position**	1.5m - free field
Start Date	Thu 04 March 2021		
End Date	Thu 18 March 2021		

Measurement Summary

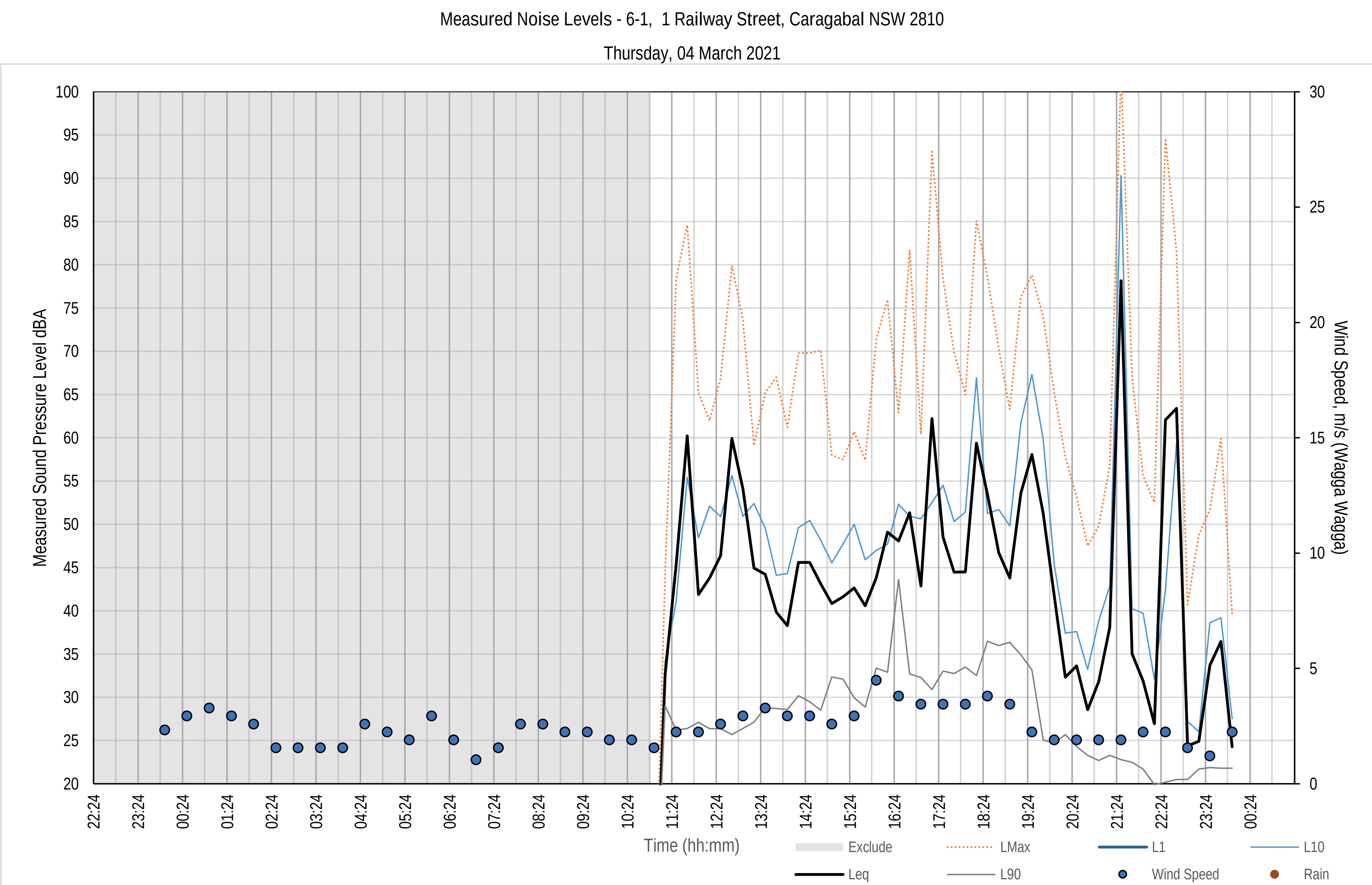
Date	04-03	05-03	06-03	07-03	08-03	09-03	10-03	11-03
$L_{eq,1\ hour\ day}$ dBA	72	67	72	62	64	61	70	69
$L_{eq,1\ hour\ night}$ dBA	62	58	59	54	57	54	58	59
$L_{eq,\ Day}$ dBA	52	58	62	56	56	54	59	59
$L_{eq,\ Evening}$ dBA	66	61	55	48	58	49	57	63
$L_{eq,\ Night}$ dBA	55	51	47	58	55	57	49	56
RBL, $_{Day}$ dBA		30	25	25	28	27	24	
RBL, $_{Evening}$ dBA	23	23	23	27	23	22	25	26
RBL, $_{Night}$ dBA	20	17	16	18	20	19		20

Date	12-03	13-03	14-03	15-03	16-03	17-03	18-03	
$L_{eq,1\ hour\ day}$ dBA	65	65	67	63	72	62	58	
$L_{eq,1\ hour\ night}$ dBA	56	55	56	57	60	58	56	
$L_{eq,\ Day}$ dBA	57	58	51	54	52	49	55	
$L_{eq,\ Evening}$ dBA	55	49	62	57	67	60		
$L_{eq,\ Night}$ dBA	52	42	48	60	57	58		
RBL, $_{Day}$ dBA	25	29	30	30	30			
RBL, $_{Evening}$ dBA	28	26	19	22	37	18		
RBL, $_{Night}$ dBA	20		17	17	23	19		

Summary	**Average (dBA)**
$L_{eq,\ Day}$ dBA	55
$L_{eq,\ Evening}$ dBA	58
$L_{eq,\ Night}$ dBA	53
RBL, $_{Day}$ dBA	28
RBL, $_{Evening}$ dBA	23
RBL, $_{Night}$ dBA	19

Summary	**Average (dBA)**
$L_{eq,1\ hour\ day}$ dBA	65
$L_{eq,1\ hour\ night}$ dBA	57
$L_{eq,\ 15\ hour\ day}$ dBA	58
$L_{eq,\ 9\ hour\ night}$ dBA	57

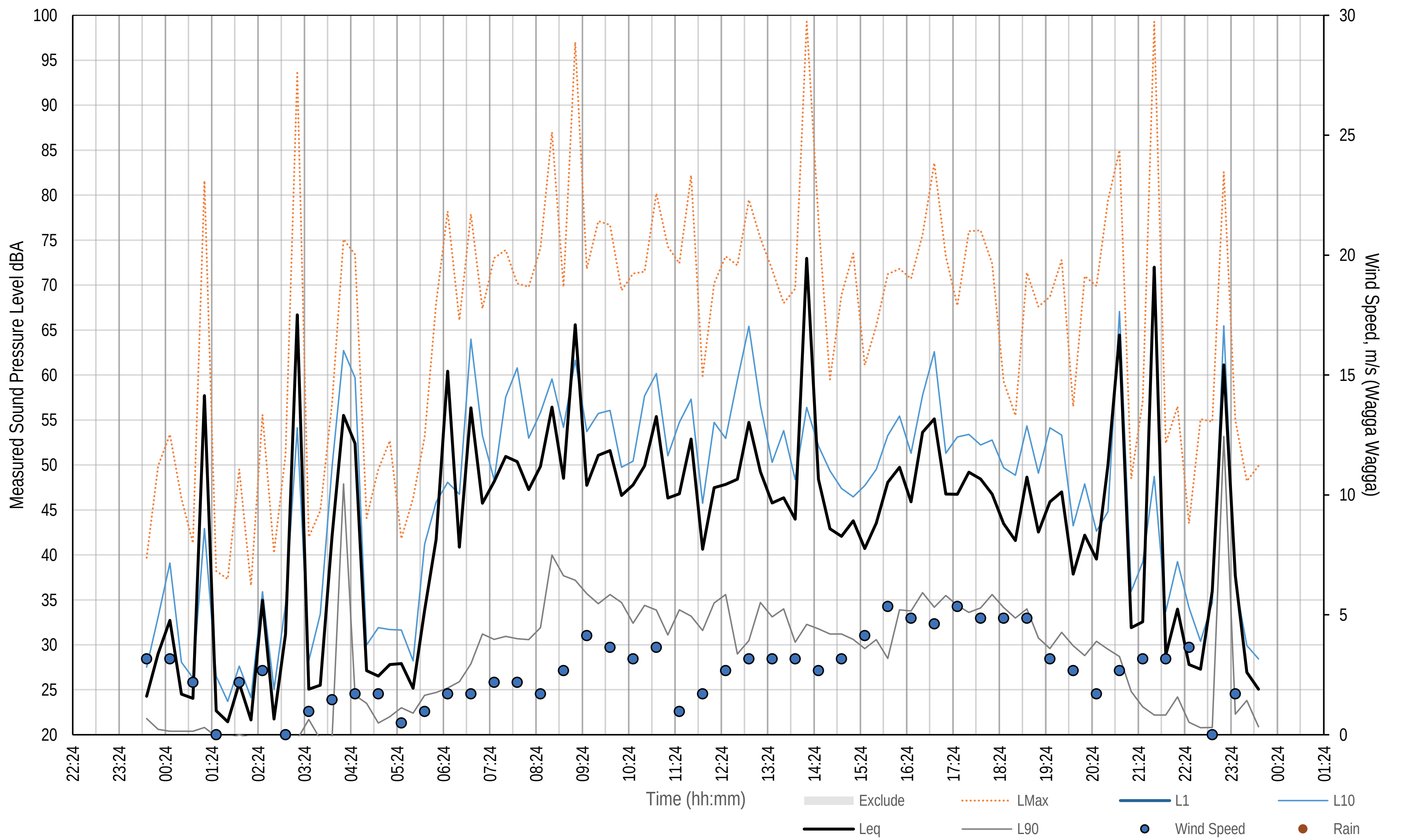
Site Photo



Measured Noise Levels - 6-1, 1 Railway Street, Caragabal NSW 2810
Thursday, 04 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
0
5
10
15
20
25
30
22:24
23:24
00:24
01:24
02:24
03:24
04:24
05:24
06:24
07:24
08:24
09:24
10:24
11:24
12:24
13:24
14:24
15:24
16:24
17:24
18:24
19:24
20:24
21:24
22:24
23:24
00:24
Time (hh:mm)
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain

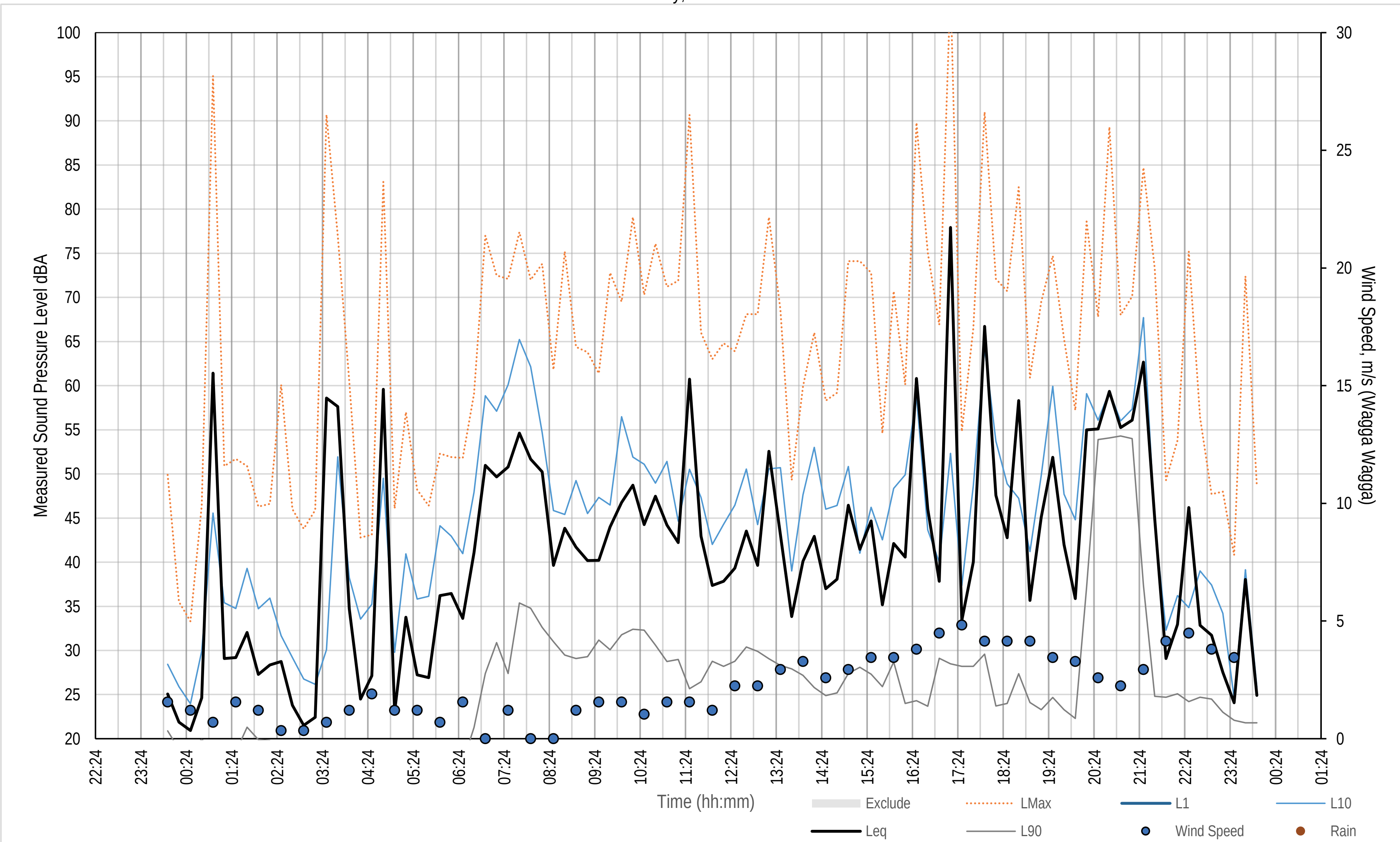
Measured Noise Levels - 6-1, 1 Railway Street, Caragabal NSW 2810

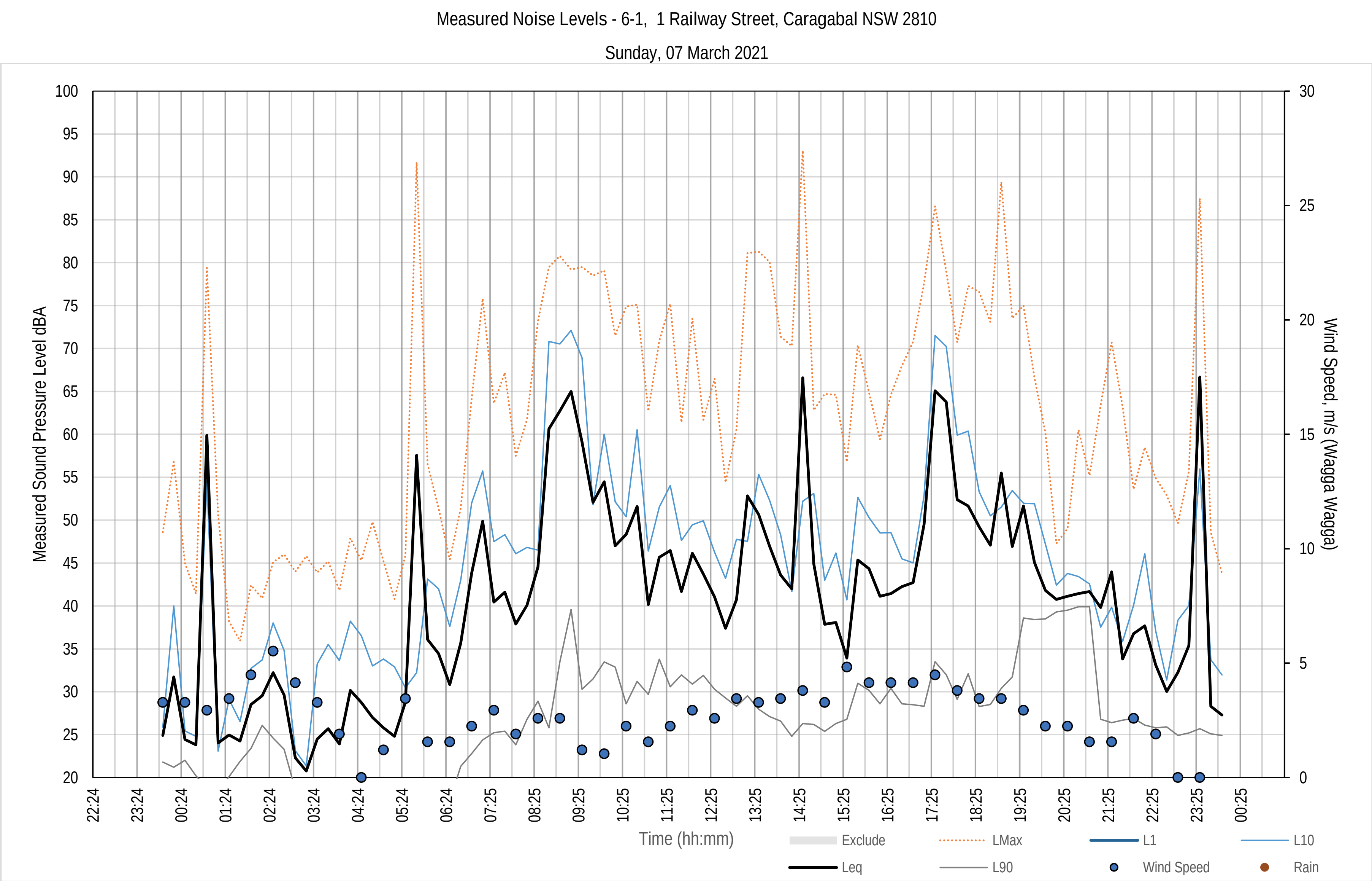
Friday, 05 March 2021



Measured Noise Levels - 6-1, 1 Railway Street, Caragabal NSW 2810

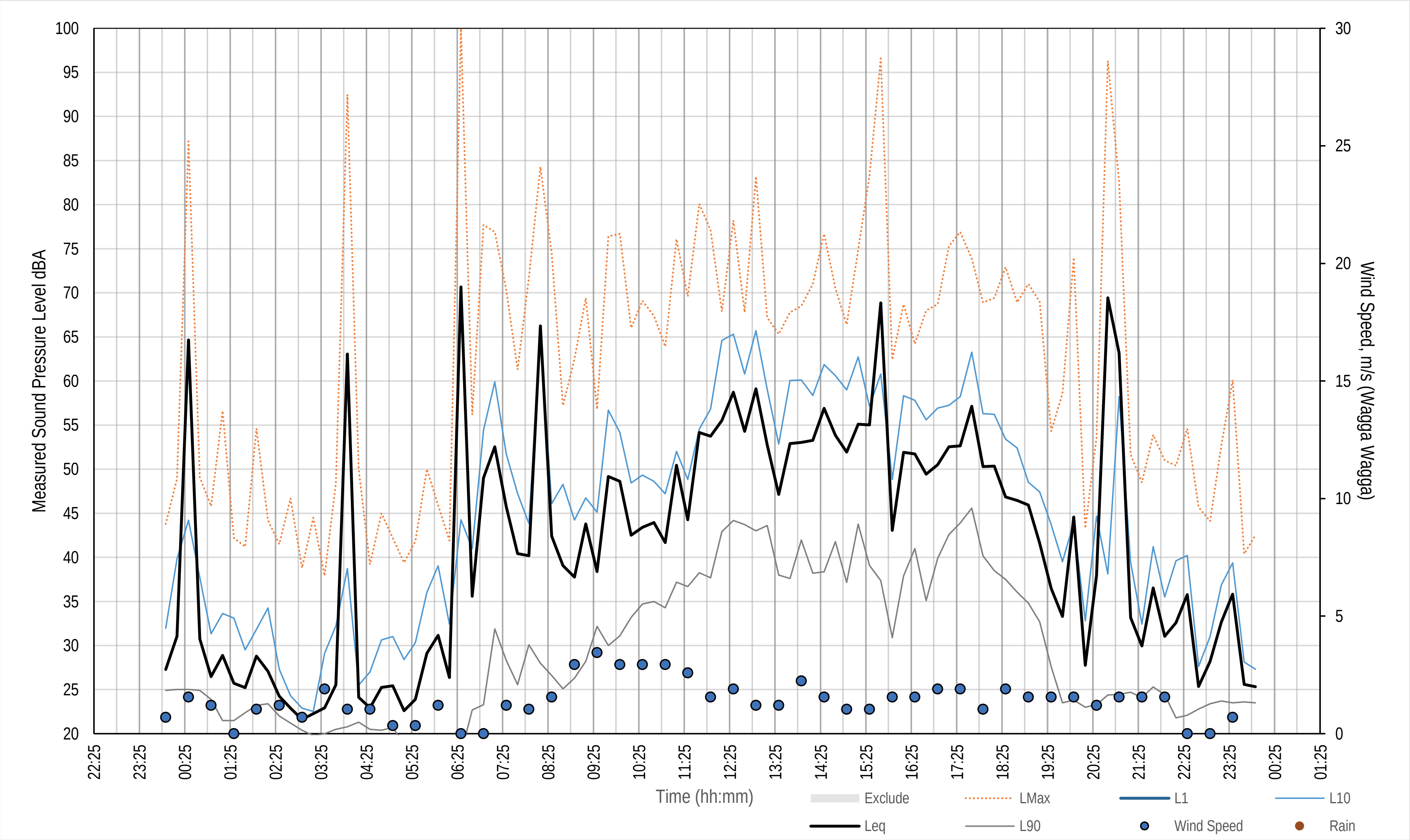
Saturday, 06 March 2021

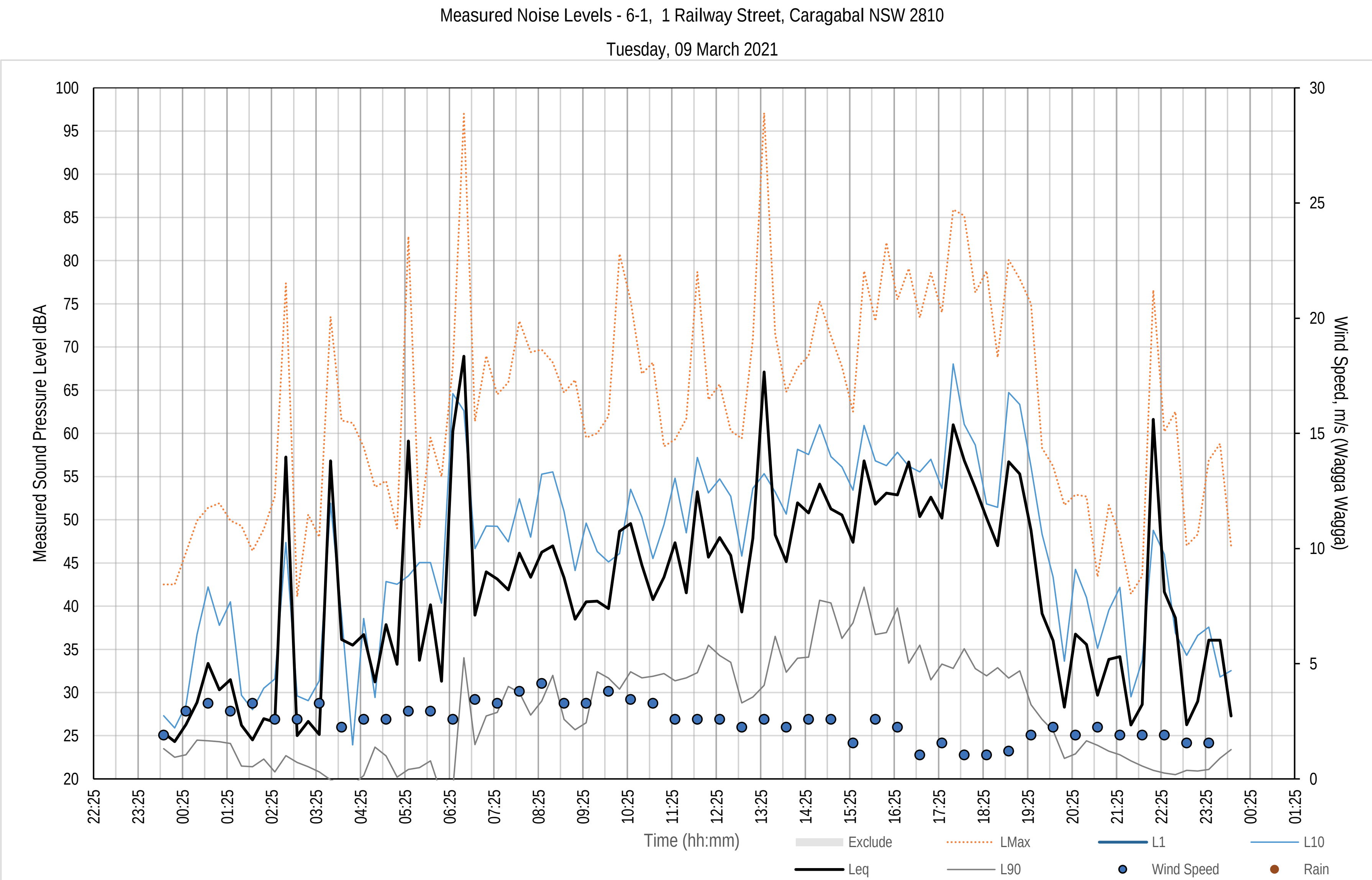


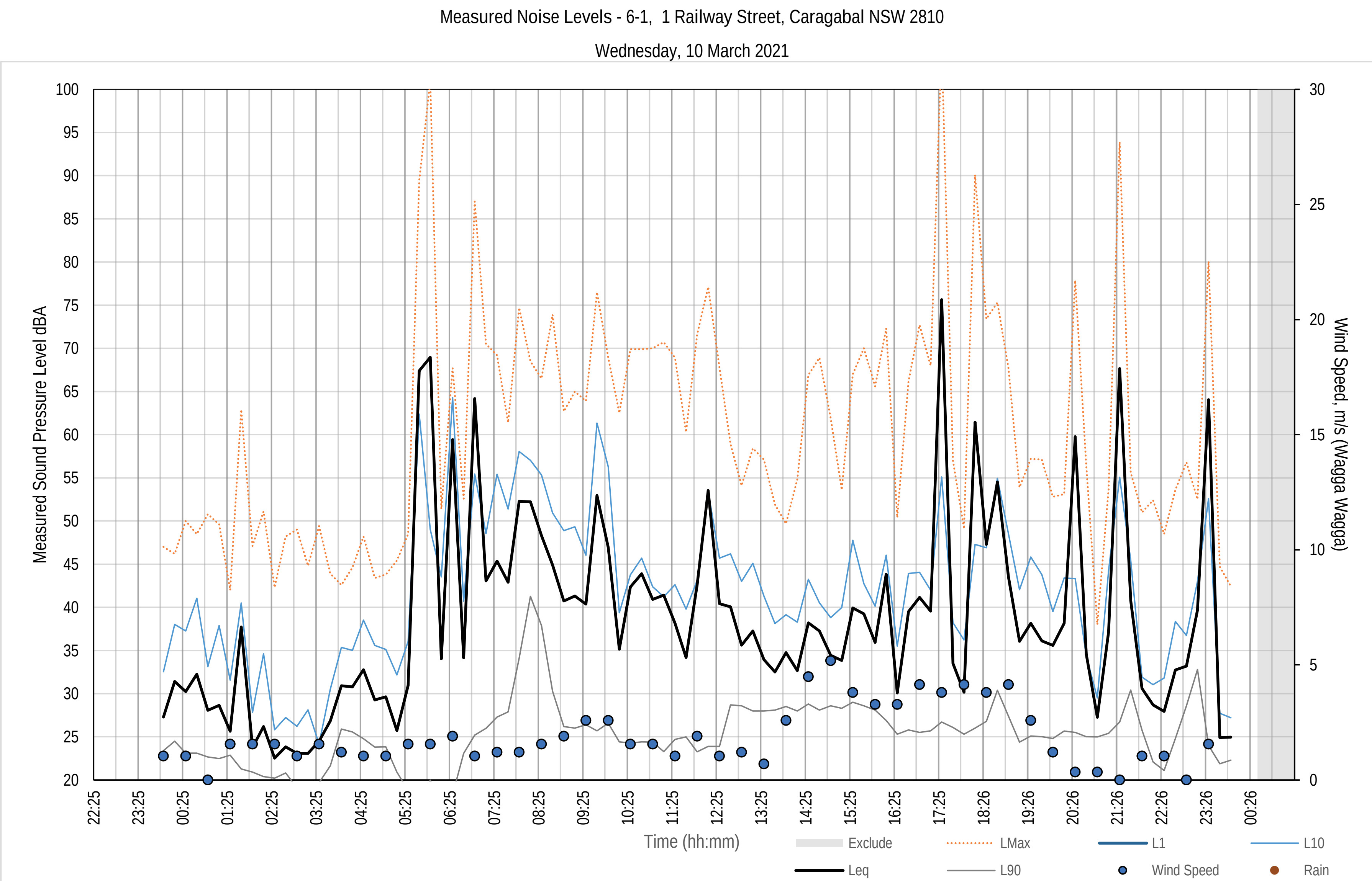

Measured Noise Levels - 6-1, 1 Railway Street, Caragabal NSW 2810
Sunday, 07 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
Time (hh:mm)
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain

Measured Noise Levels - 6-1, 1 Railway Street, Caragabal NSW 2810

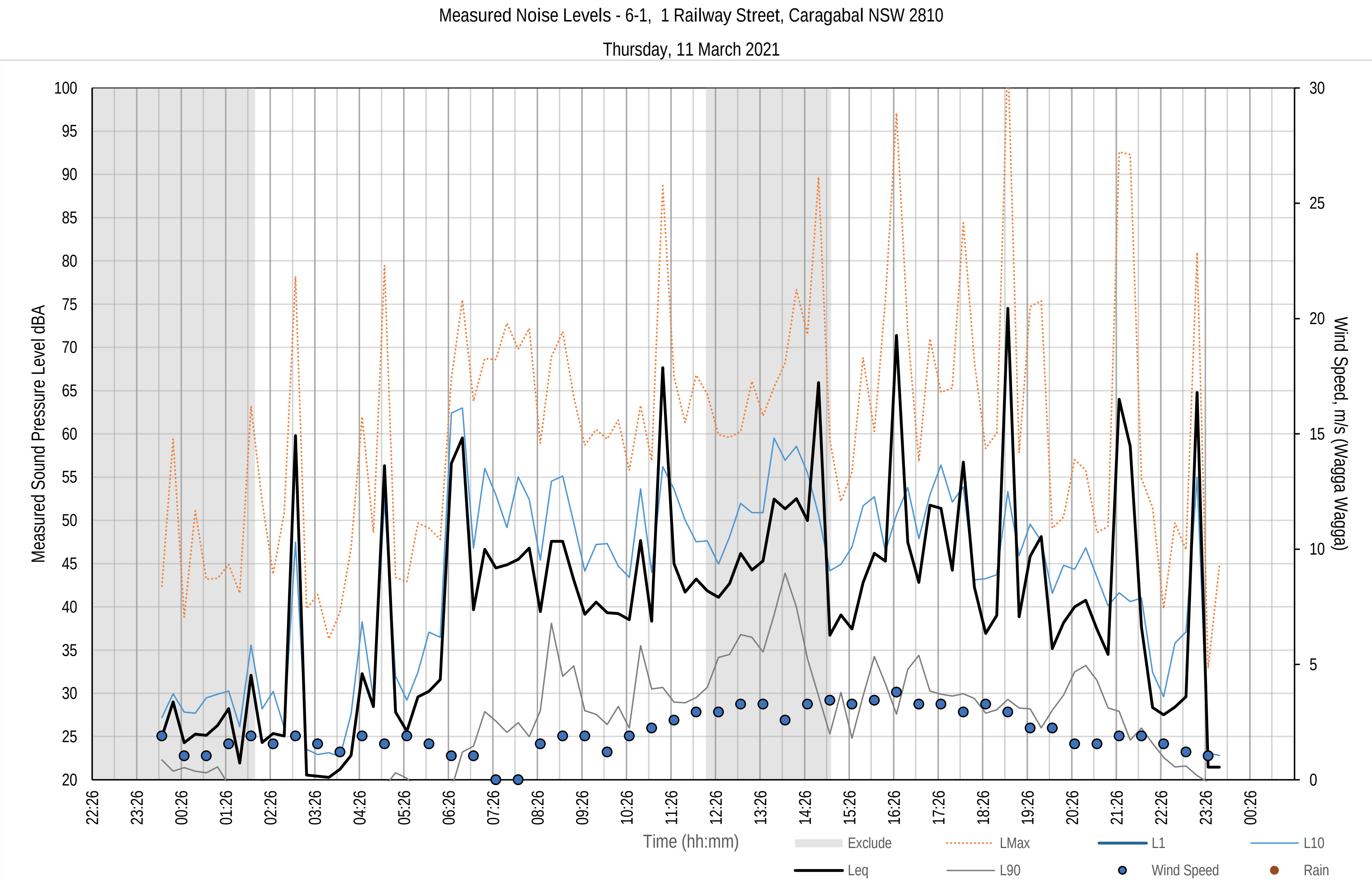
Monday, 08 March 2021




Measured Noise Levels - 6-1, 1 Railway Street, Caragabal NSW 2810
Tuesday, 09 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
Time (hh:mm)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
30
25
20
15
10
5
0
22:25
23:25
00:25
01:25
02:25
03:25
04:25
05:25
06:25
07:25
08:25
09:25
10:25
11:25
12:25
13:25
14:25
15:25
16:25
17:25
18:25
19:25
20:25
21:25
22:25
23:25
00:25
01:25
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain

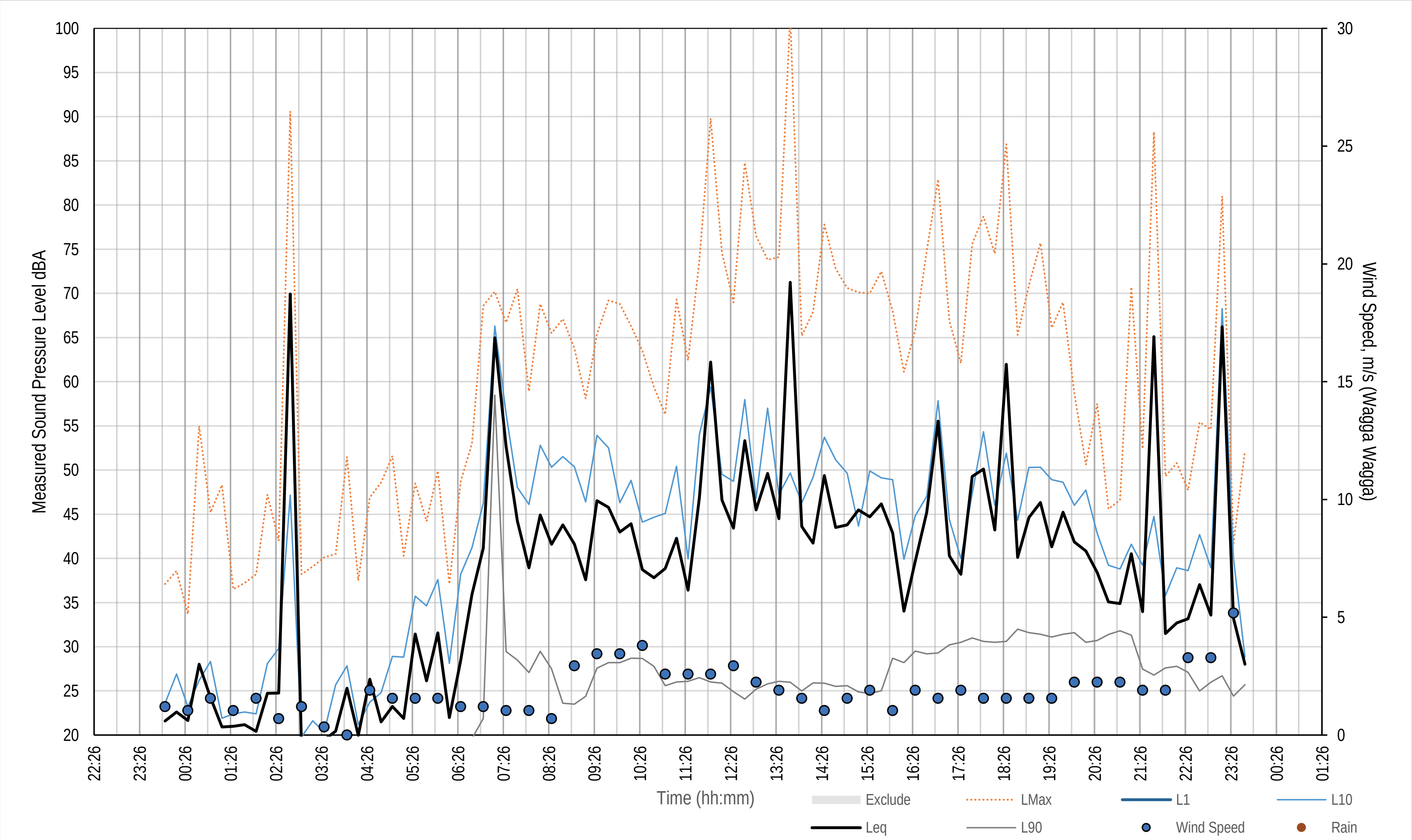


Measured Noise Levels - 6-1, 1 Railway Street, Caragabal NSW 2810
Wednesday, 10 March 2021
Measured Sound Pressure Level dBA
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
Wind Speed, m/s (Wagga Wagga)
30
25
20
15
10
5
0
22:25
23:25
00:25
01:25
02:25
03:25
04:25
05:25
06:25
07:25
08:25
09:25
10:25
11:25
12:25
13:25
14:25
15:25
16:25
17:25
18:26
19:26
20:26
21:26
22:26
23:26
00:26
Time (hh:mm)
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain


Measured Noise Levels - 6-1, 1 Railway Street, Caragabal NSW 2810
Thursday, 11 March 2021
Measured Sound Pressure Level dBA
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
Wind Speed, m/s (Wagga Wagga)
30
25
20
15
10
5
0
22:26
23:26
00:26
01:26
02:26
03:26
04:26
05:26
06:26
07:26
08:26
09:26
10:26
11:26
12:26
13:26
14:26
15:26
16:26
17:26
18:26
19:26
20:26
21:26
22:26
23:26
00:26
Time (hh:mm)
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain

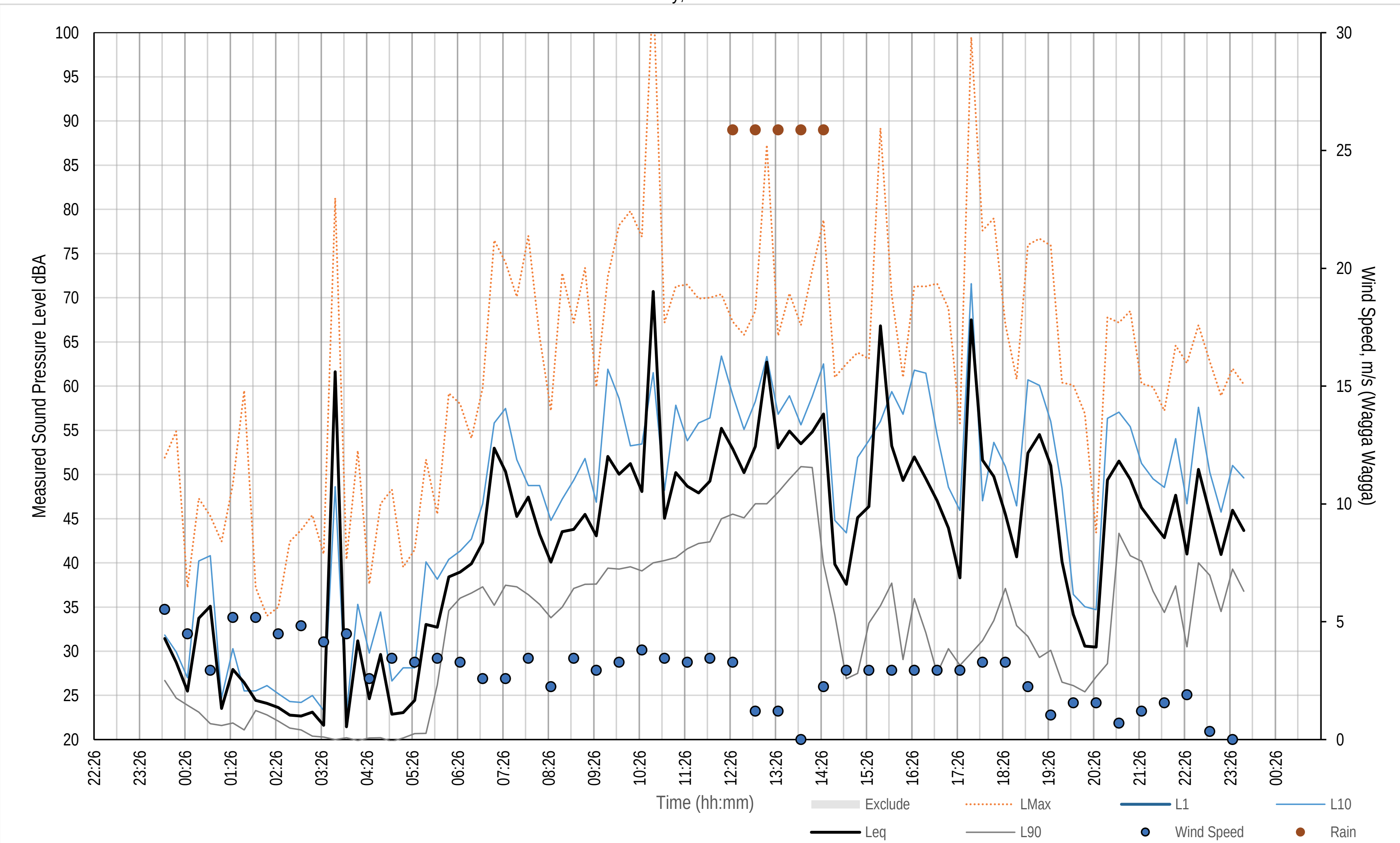
Measured Noise Levels - 6-1, 1 Railway Street, Caragabal NSW 2810

Friday, 12 March 2021



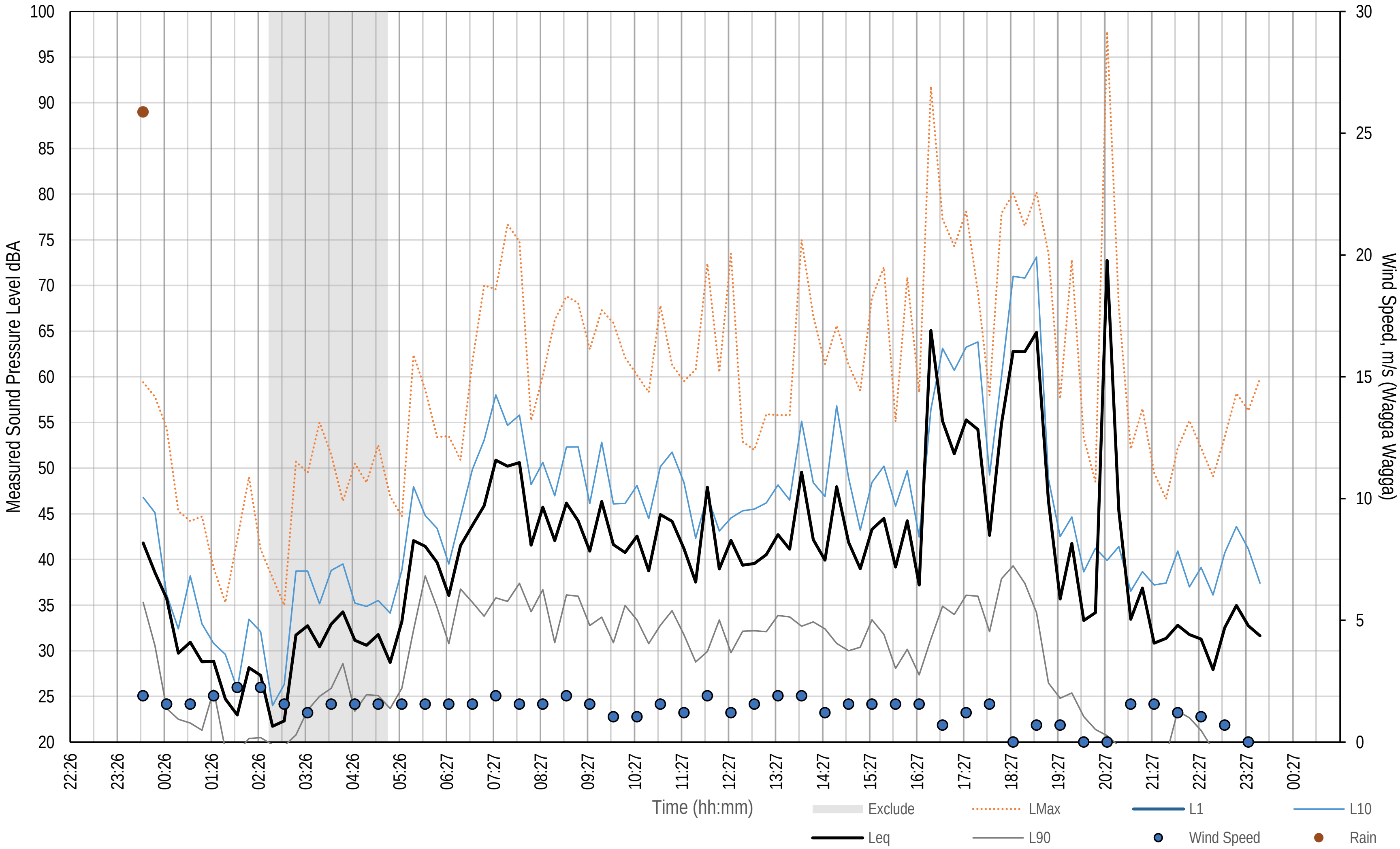
Measured Noise Levels - 6-1, 1 Railway Street, Caragabal NSW 2810

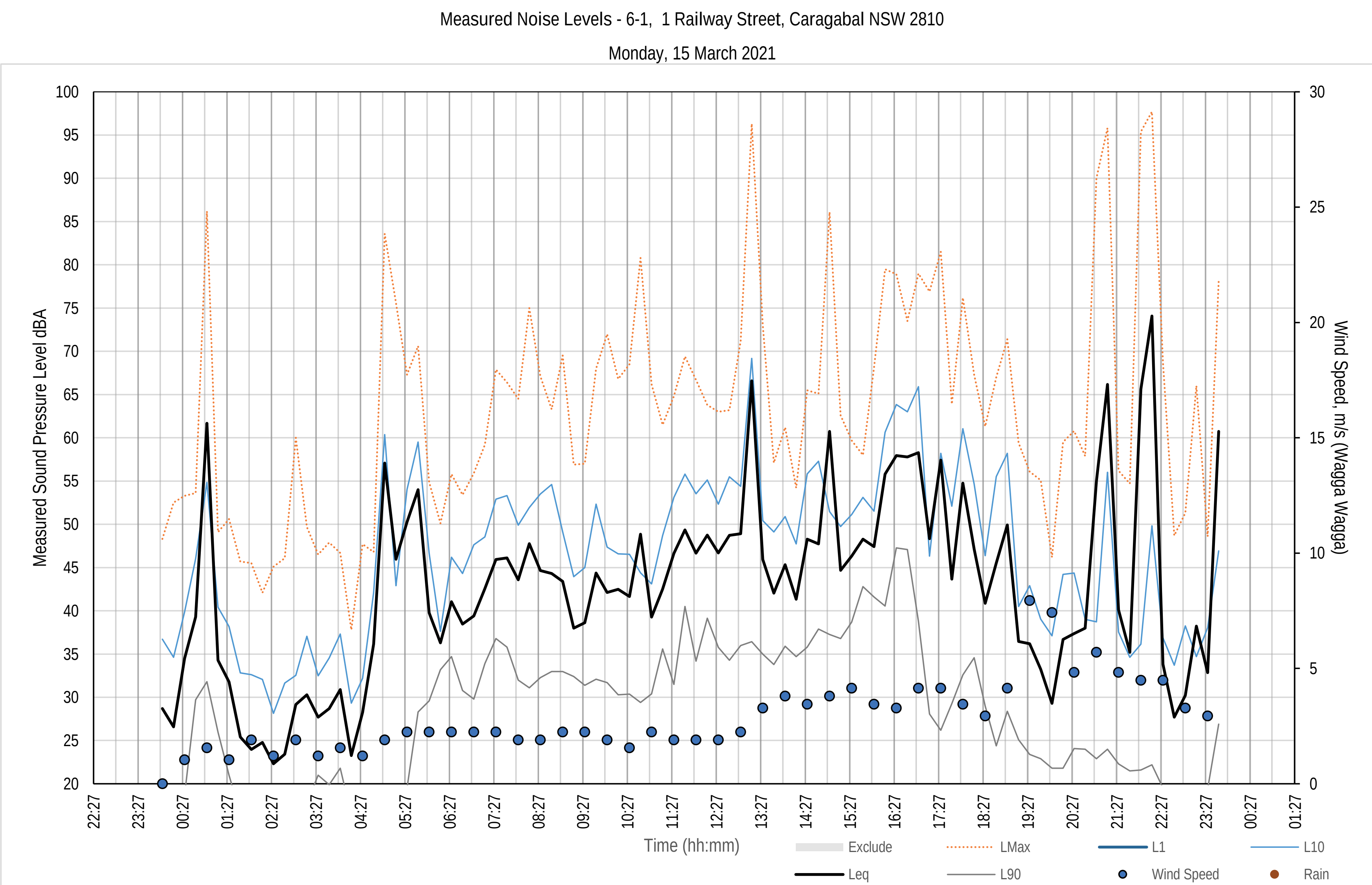
Saturday, 13 March 2021



Measured Noise Levels - 6-1, 1 Railway Street, Caragabal NSW 2810

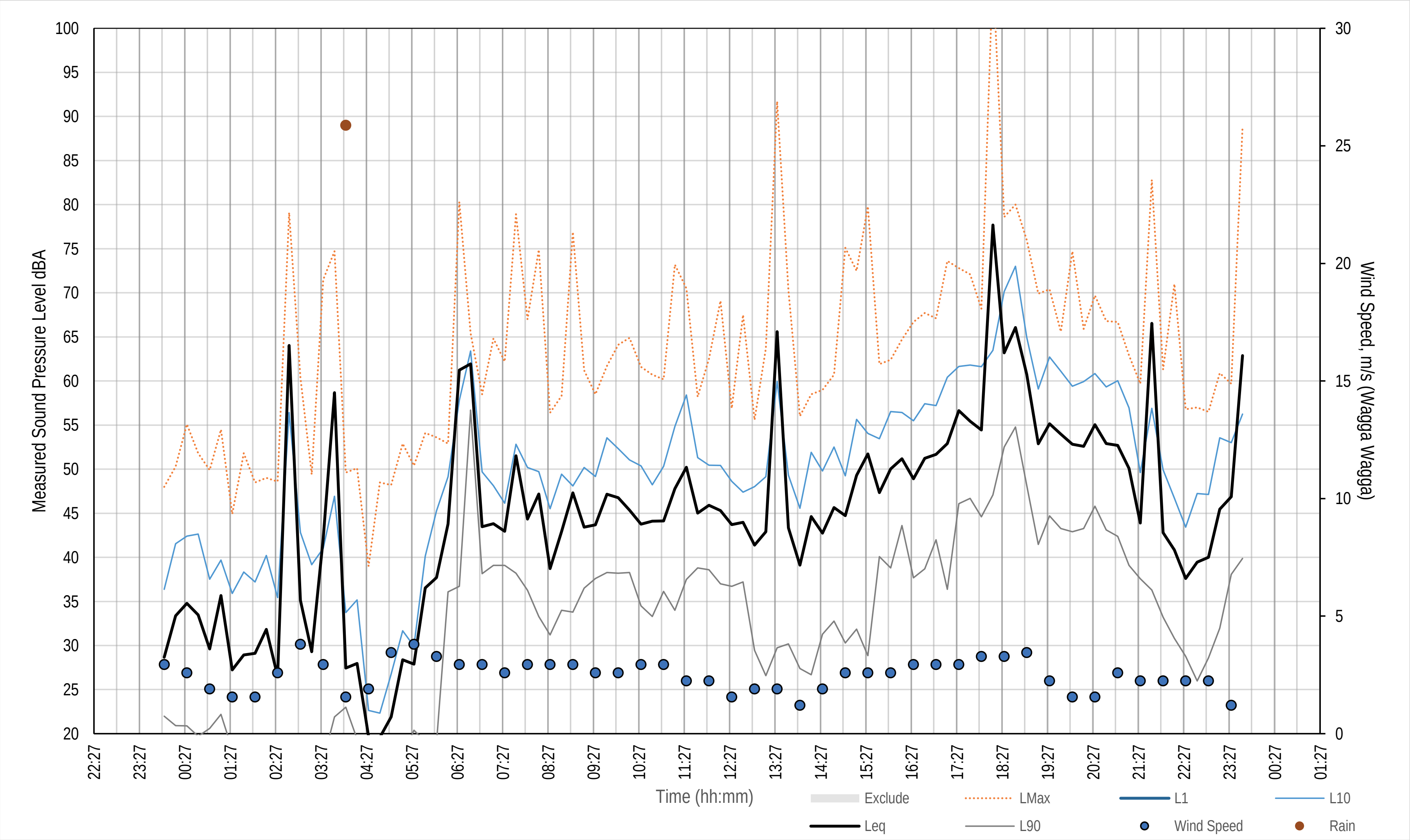
Sunday, 14 March 2021




Measured Noise Levels - 6-1, 1 Railway Street, Caragabal NSW 2810
Monday, 15 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
30
25
20
15
10
5
0
22:27
23:27
00:27
01:27
02:27
03:27
04:27
05:27
06:27
07:27
08:27
09:27
10:27
11:27
12:27
13:27
14:27
15:27
16:27
17:27
18:27
19:27
20:27
21:27
22:27
23:27
00:27
01:27
Time (hh:mm)
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain

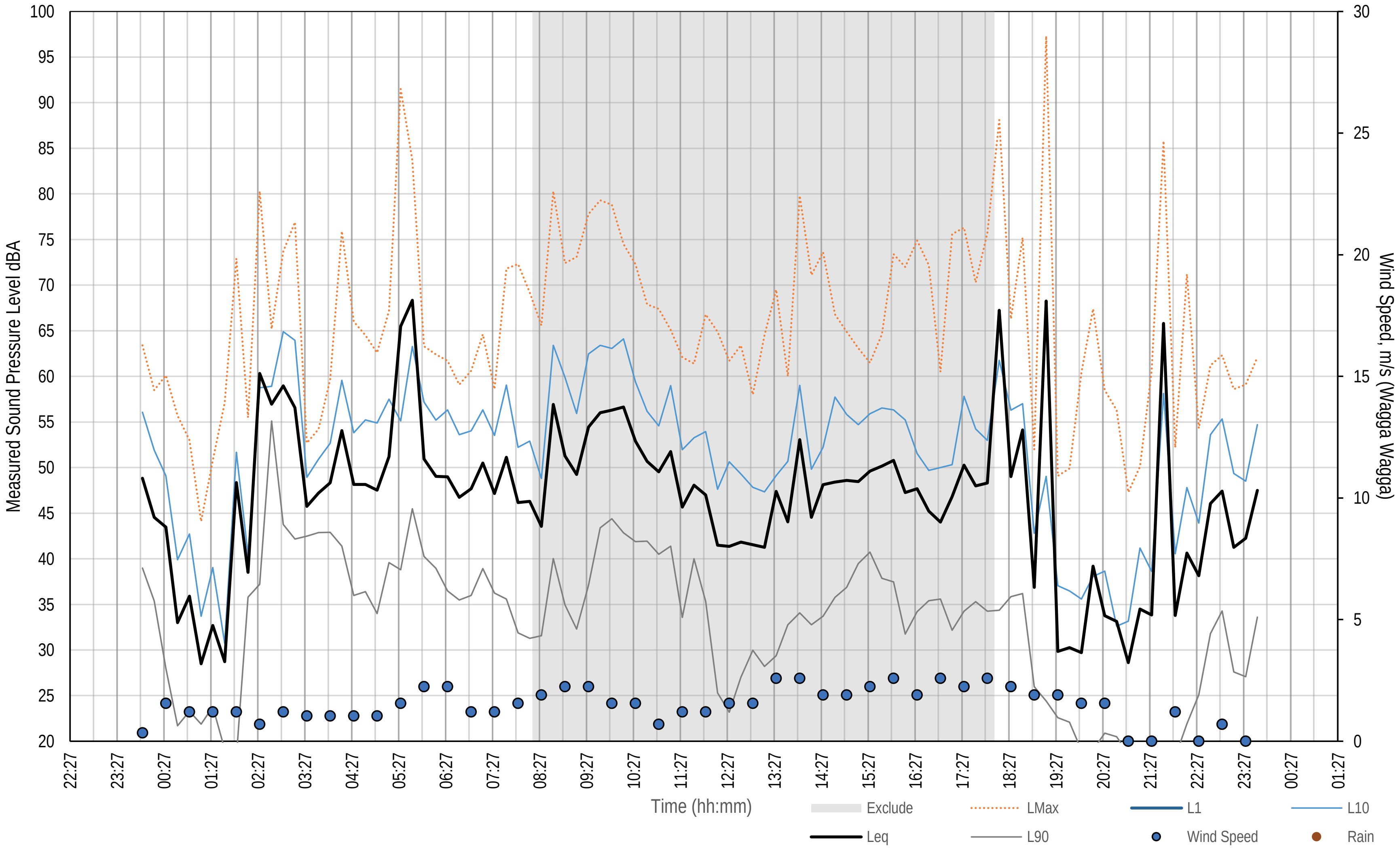
Measured Noise Levels - 6-1, 1 Railway Street, Caragabal NSW 2810

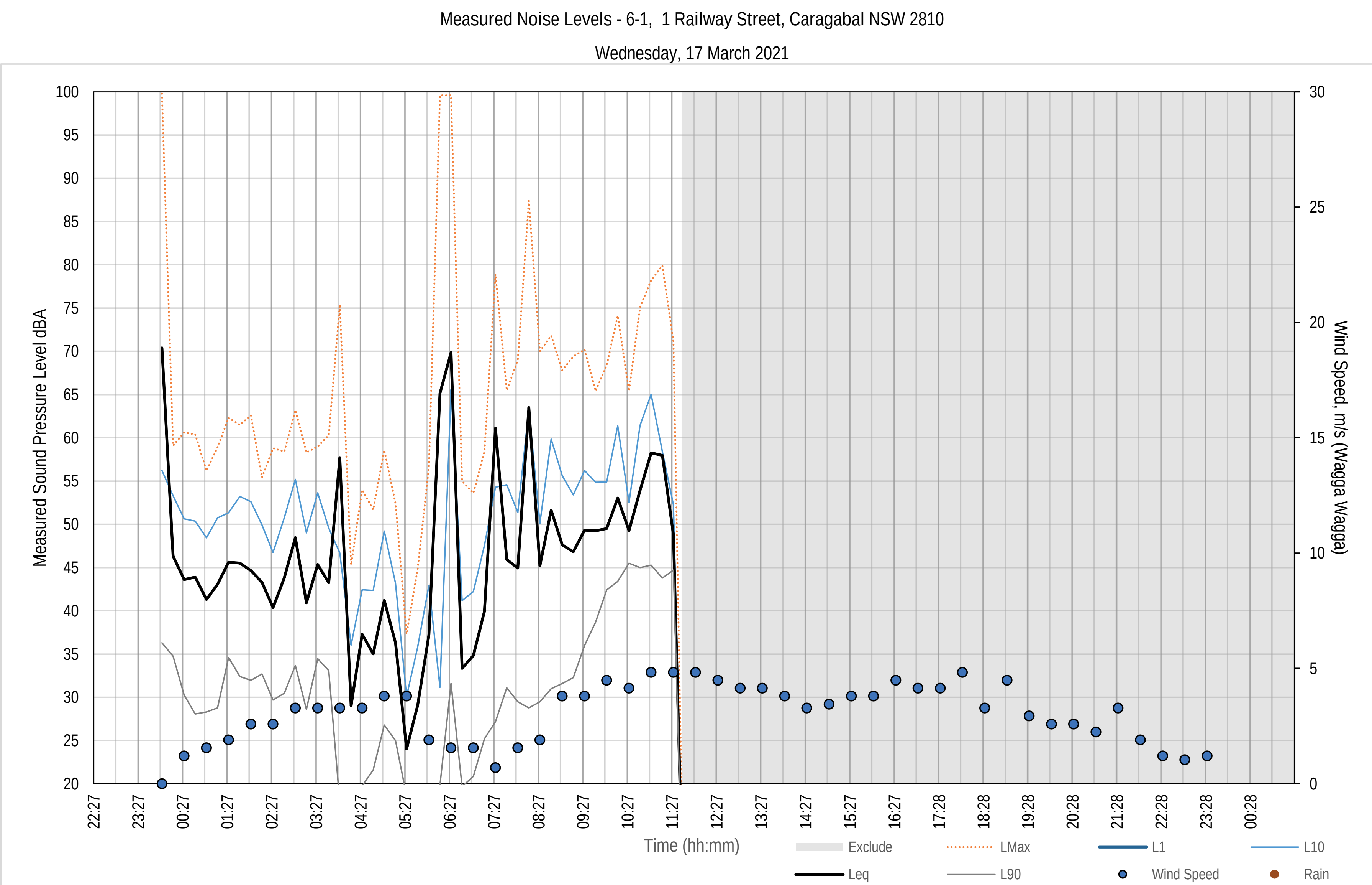
Monday, 15 March 2021



Measured Noise Levels - 6-1, 1 Railway Street, Caragabal NSW 2810

Tuesday, 16 March 2021





Measured Noise Levels - 6-1, 1 Railway Street, Caragabal NSW 2810
Wednesday, 17 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
30
25
20
15
10
5
0
22:27
23:27
00:27
01:27
02:27
03:27
04:27
05:27
06:27
07:27
08:27
09:27
10:27
11:27
12:27
13:27
14:27
15:27
16:27
17:28
18:28
19:28
20:28
21:28
22:28
23:28
00:28
Time (hh:mm)
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain

Site Details	6-3 13 railway street CARAGABAL	**Microphone Position**	1.5m - free field
Start Date	Tue 02 March 2021		
End Date	Sat 13 March 2021		

Measurement Summary

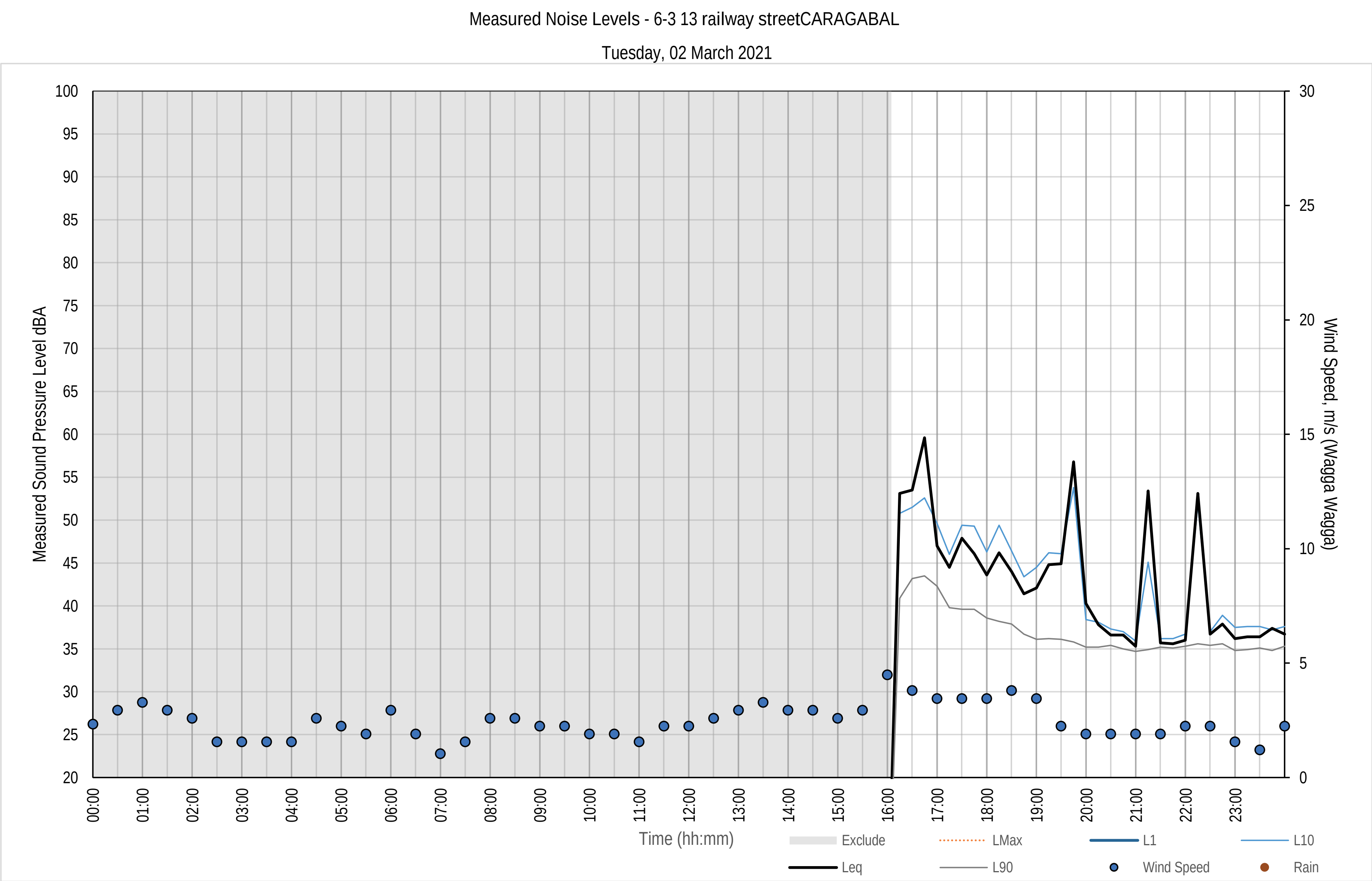
Date	02-03	03-03	04-03	05-03	06-03	07-03	08-03	09-03
$L_{eq,1\ hour\ day}$ dBA	55	59	69	60	62	63	63	59
$L_{eq,1\ hour\ night}$ dBA	49	51	59	53	52	53	53	52
$L_{eq,\ Day}$ dBA	53	51	55	55	51	55	55	55
$L_{eq,\ Evening}$ dBA	47	54	65	52	56	54	50	50
$L_{eq,\ Night}$ dBA	47	49	50	45	46	49	48	46
RBL, $_{Day}$ dBA		41	35	37	35	27	30	36
RBL, $_{Evening}$ dBA	35	35	37	35	34	34	36	37
RBL, $_{Night}$ dBA	33	34	35	34	18	20	34	36

Date	10-03	11-03	12-03	13-03				
$L_{eq,1\ hour\ day}$ dBA	58	58	57					
$L_{eq,1\ hour\ night}$ dBA	51	52	50	30				
$L_{eq,\ Day}$ dBA	51	53	51					
$L_{eq,\ Evening}$ dBA	53	55	48					
$L_{eq,\ Night}$ dBA	46	49	46					
RBL, $_{Day}$ dBA	34		28					
RBL, $_{Evening}$ dBA	37	29	31					
RBL, $_{Night}$ dBA		21						

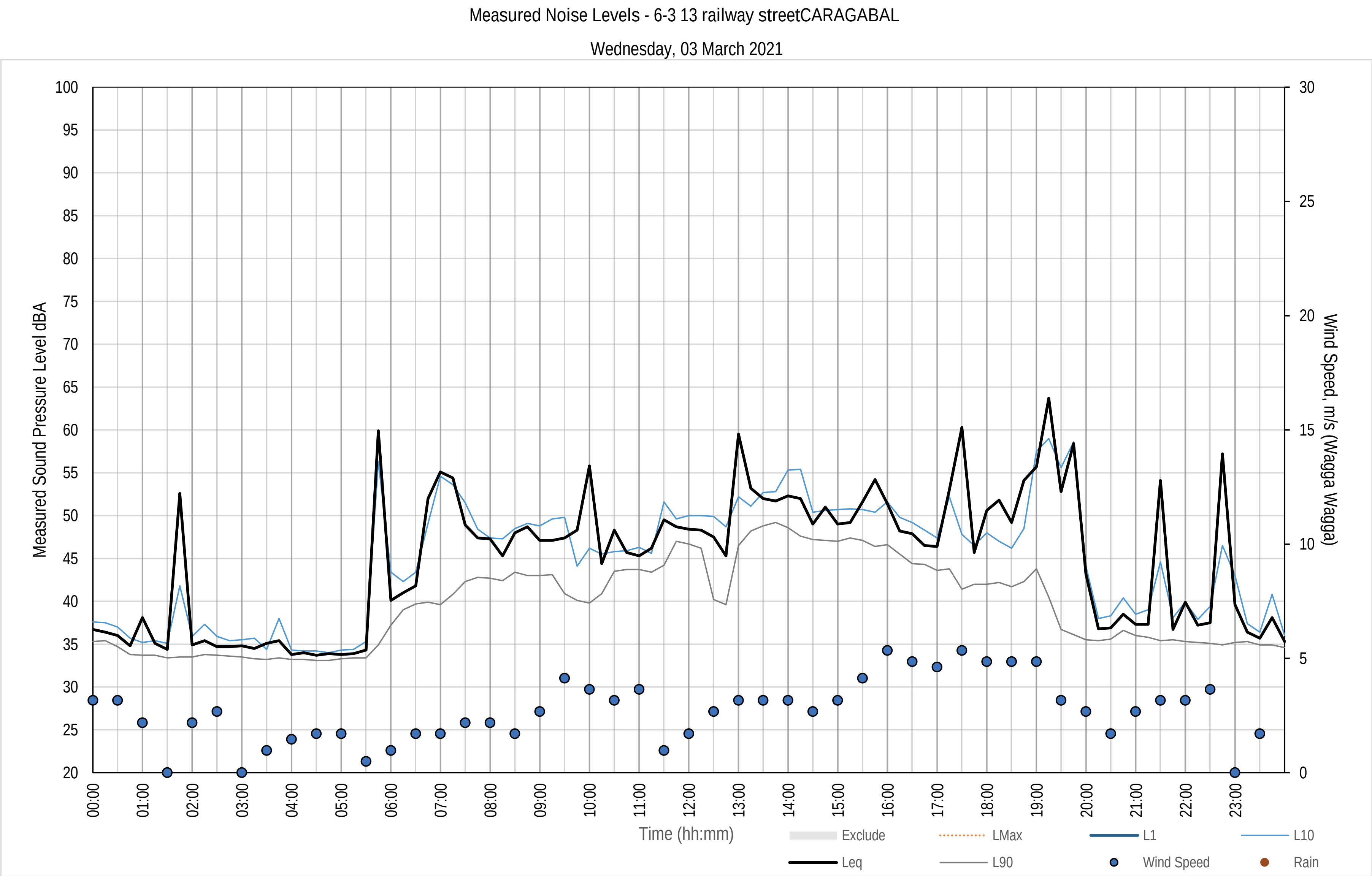
Summary	**Average (dBA)**
$L_{eq,\ Day}$ dBA	53
$L_{eq,\ Evening}$ dBA	53
$L_{eq,\ Night}$ dBA	47
RBL, $_{Day}$ dBA	35
RBL, $_{Evening}$ dBA	35
RBL, $_{Night}$ dBA	34

Summary	**Average (dBA)**
$L_{eq,1\ hour\ day}$ dBA	59
$L_{eq,1\ hour\ night}$ dBA	52
$L_{eq,\ 15\ hour\ day}$ dBA	54
$L_{eq,\ 9\ hour\ night}$ dBA	53

Site Photo

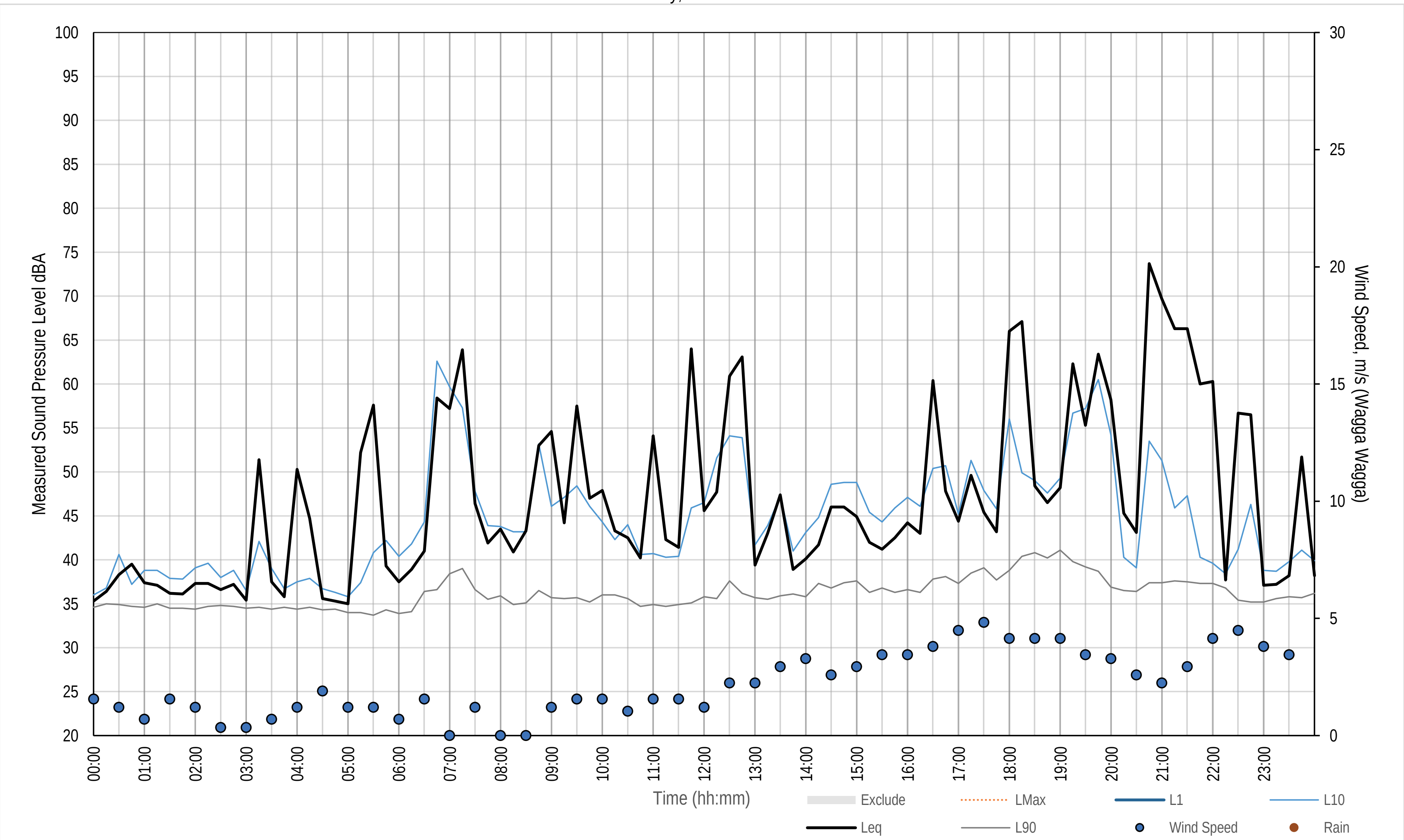


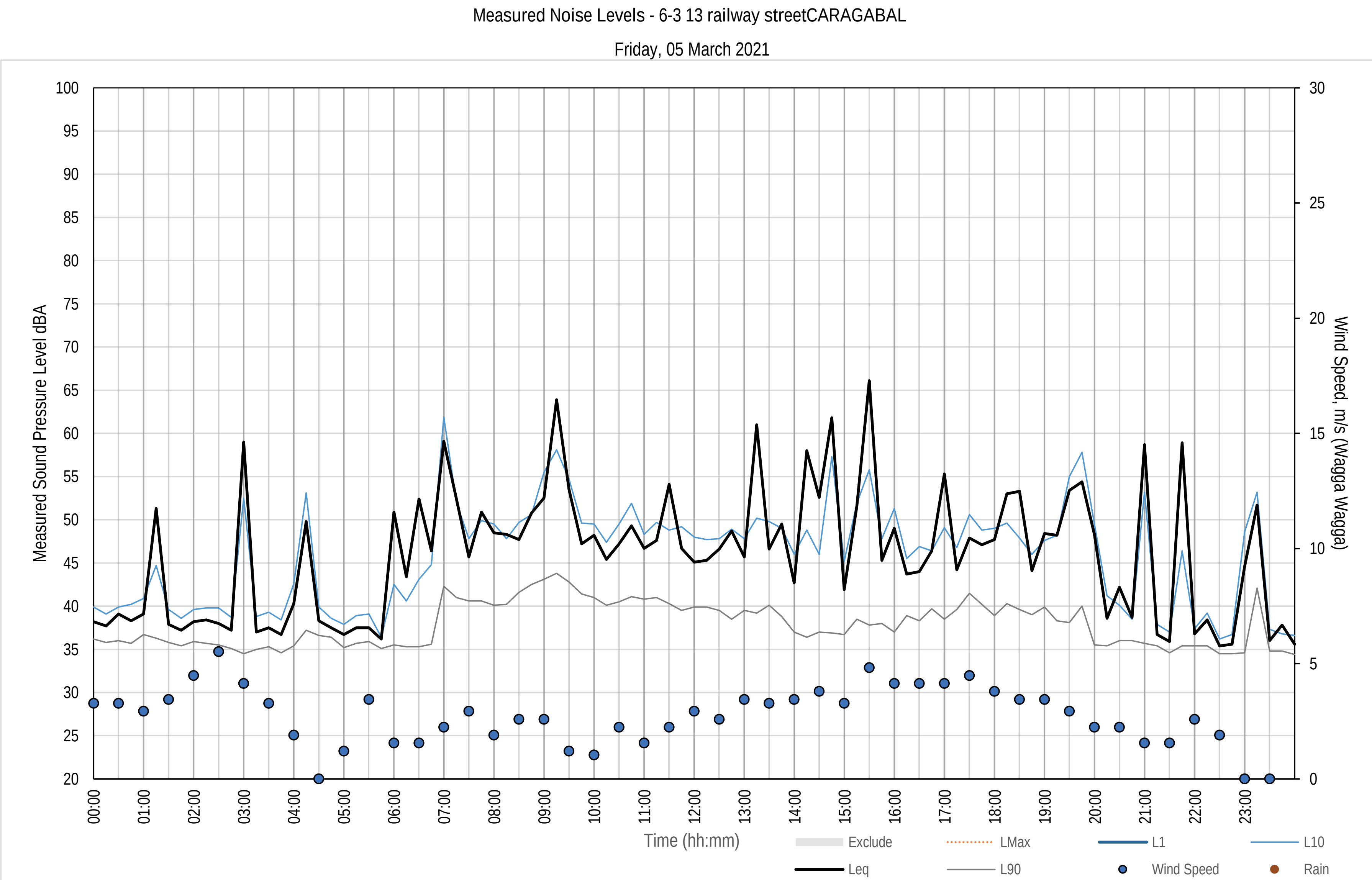
Measured Noise Levels - 6-3 13 railway streetCARAGABAL
Tuesday, 02 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
Time (hh:mm)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
30
25
20
15
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain


Measured Noise Levels - 6-3 13 railway streetCARAGABAL
Wednesday, 03 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
Time (hh:mm)
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain

Measured Noise Levels - 6-3 13 railway streetCARAGABAL

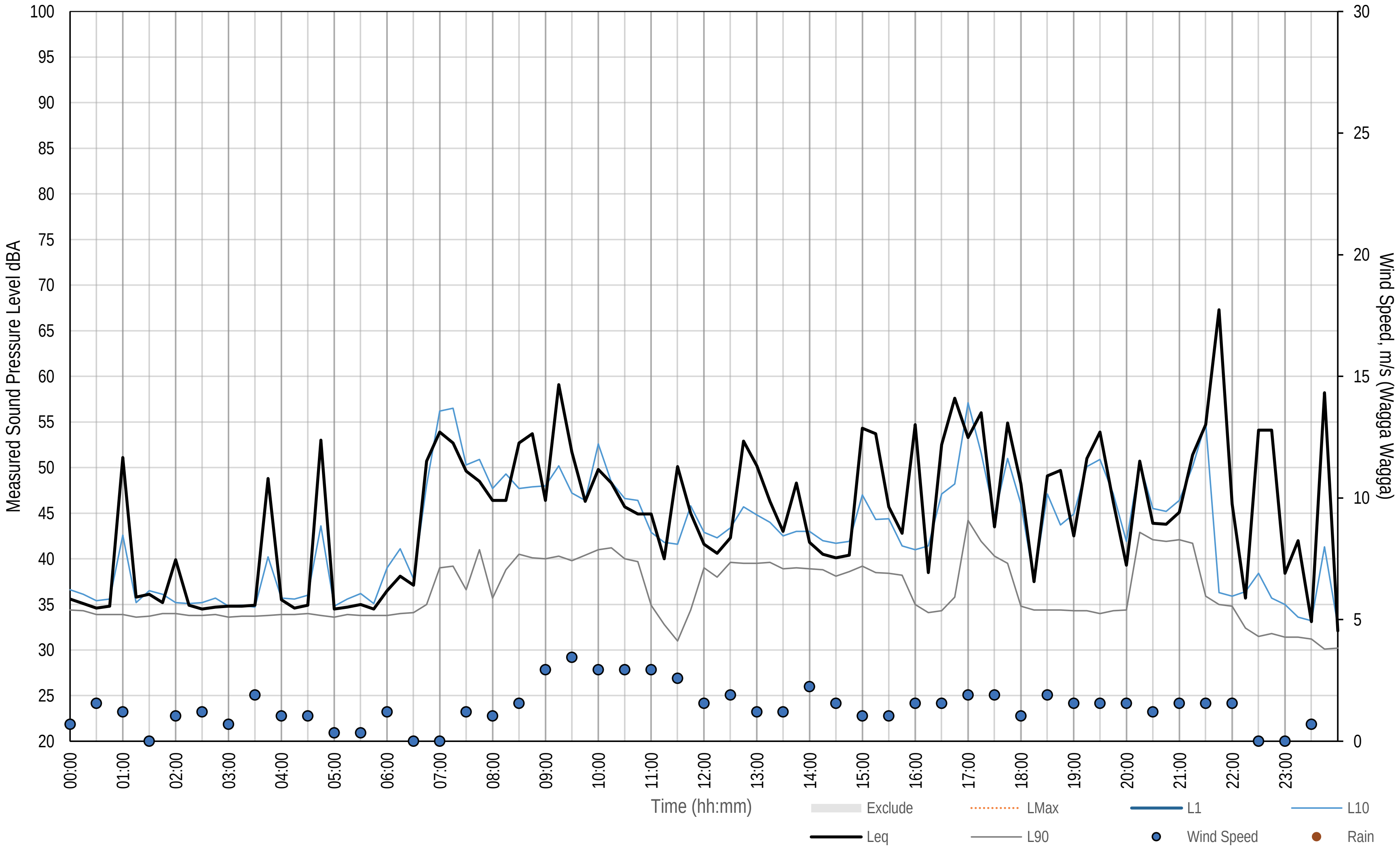
Thursday, 04 March 2021

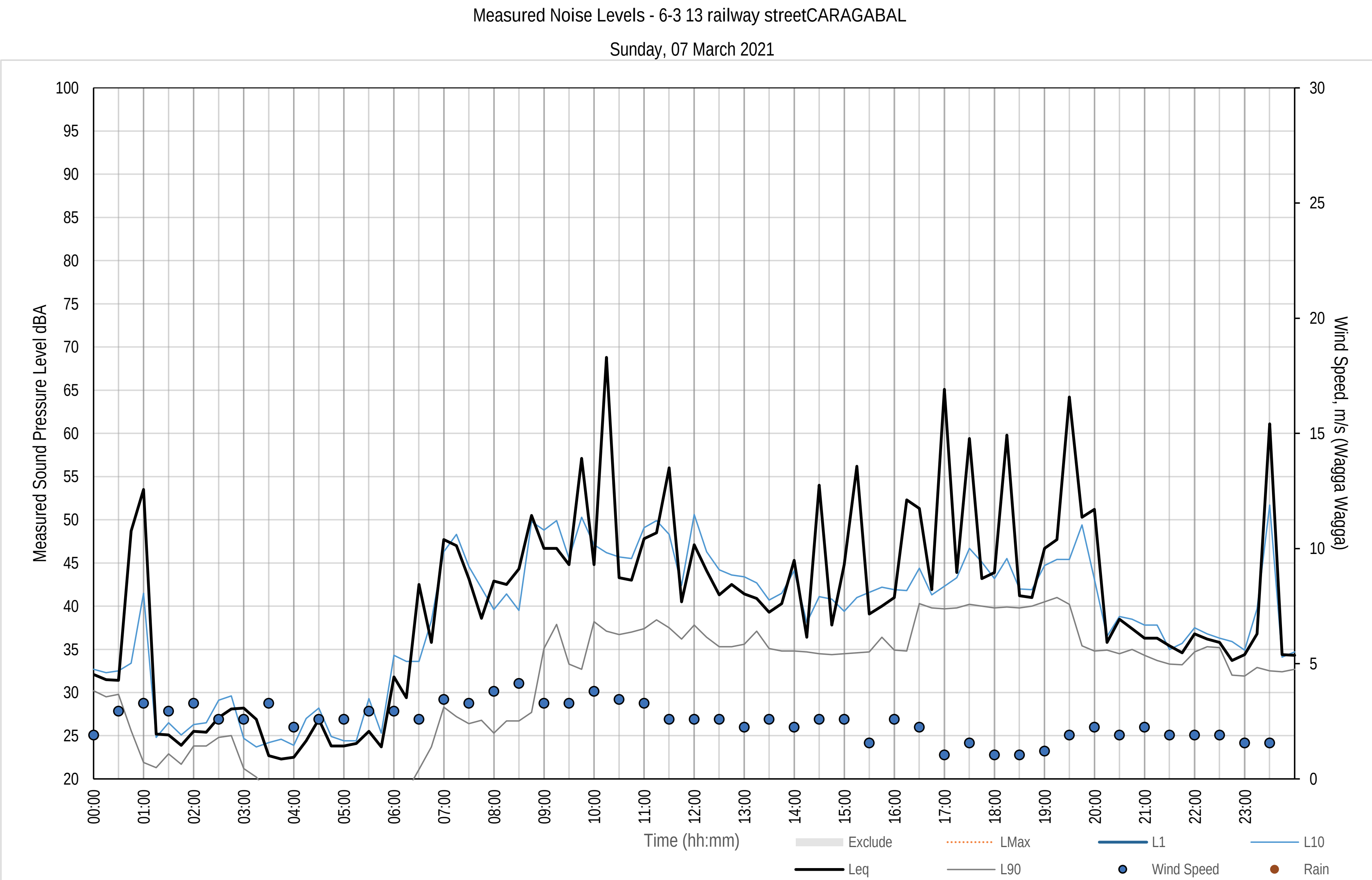



Measured Noise Levels - 6-3 13 railway streetCARAGABAL
Friday, 05 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
30
25
20
15
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
Time (hh:mm)
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain

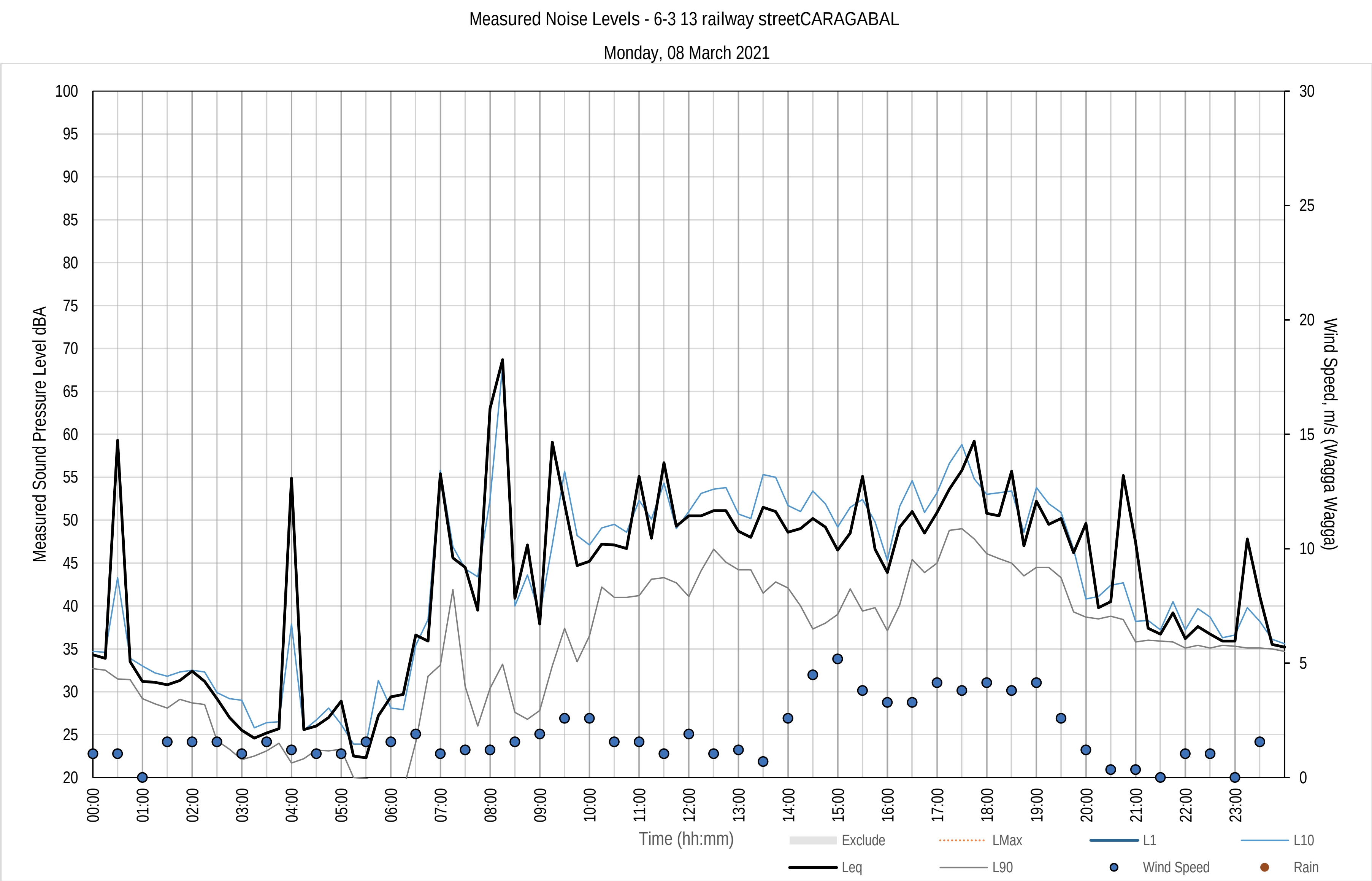
Measured Noise Levels - 6-3 13 railway streetCARAGABAL

Saturday, 06 March 2021





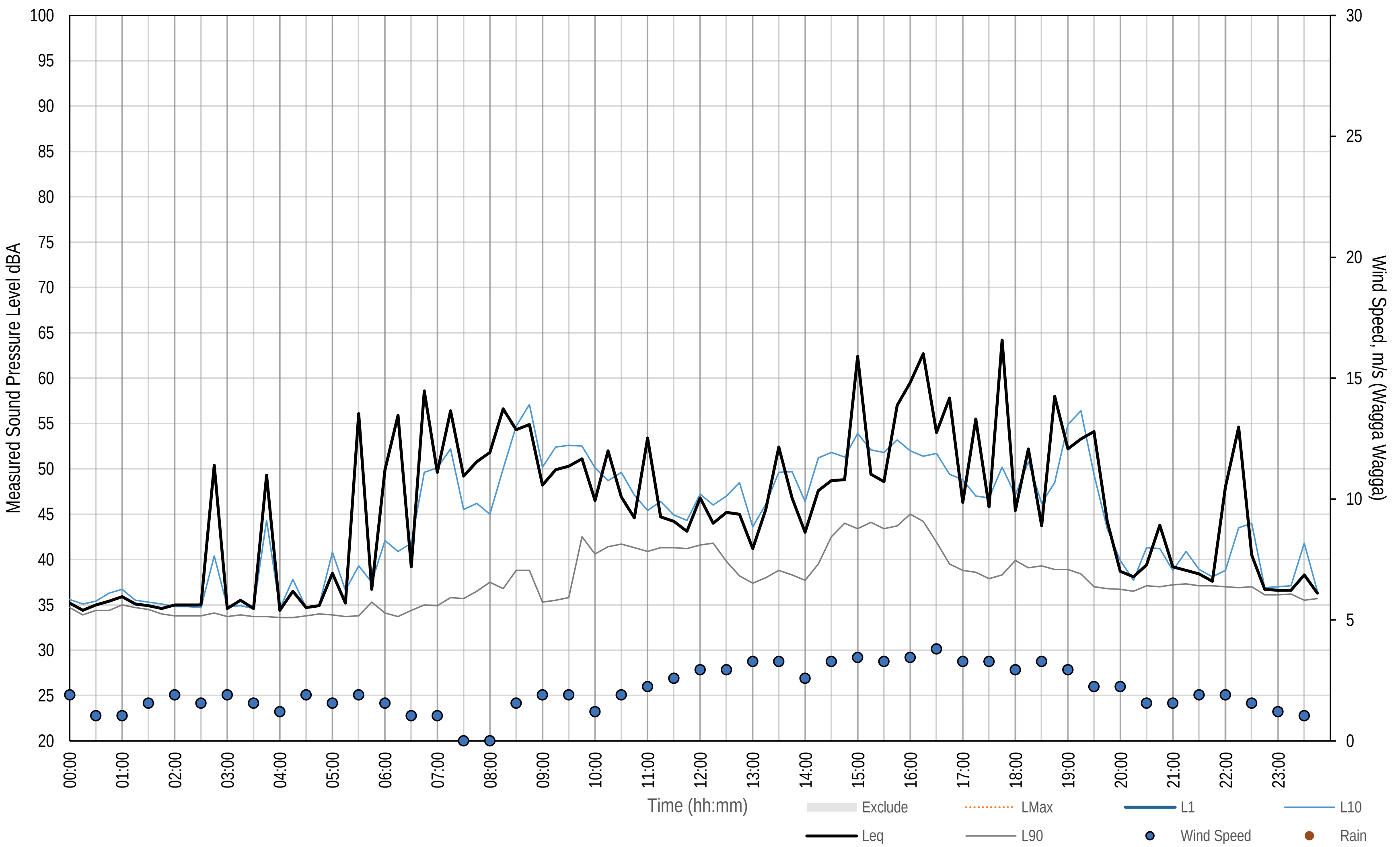
Measured Noise Levels - 6-3 13 railway streetCARAGABAL
Sunday, 07 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
30
25
20
15
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
Time (hh:mm)
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain



Measured Noise Levels - 6-3 13 railway streetCARAGABAL
Monday, 08 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
30
25
20
15
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
Time (hh:mm)
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain

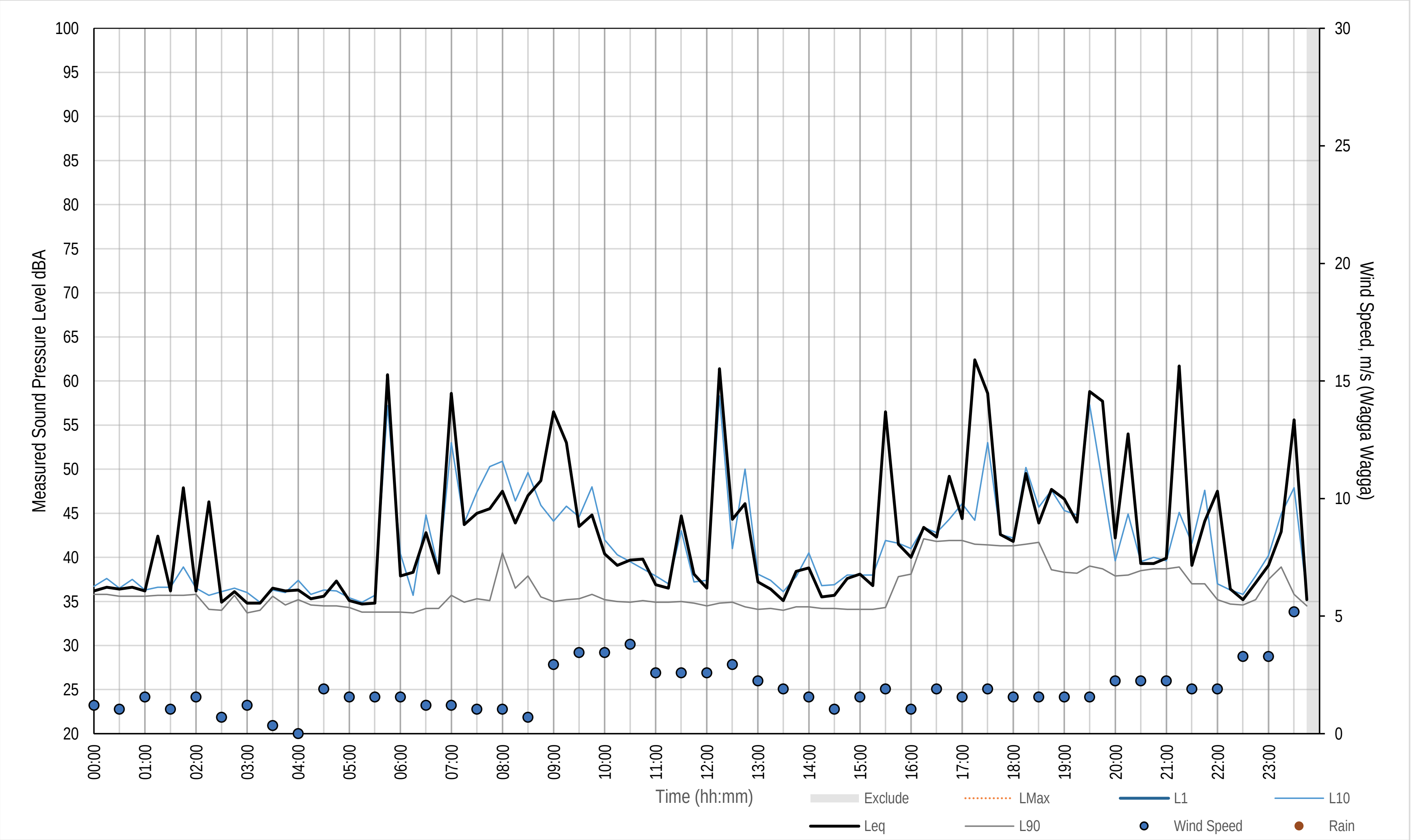
Measured Noise Levels - 6-3 13 railway streetCARAGABAL

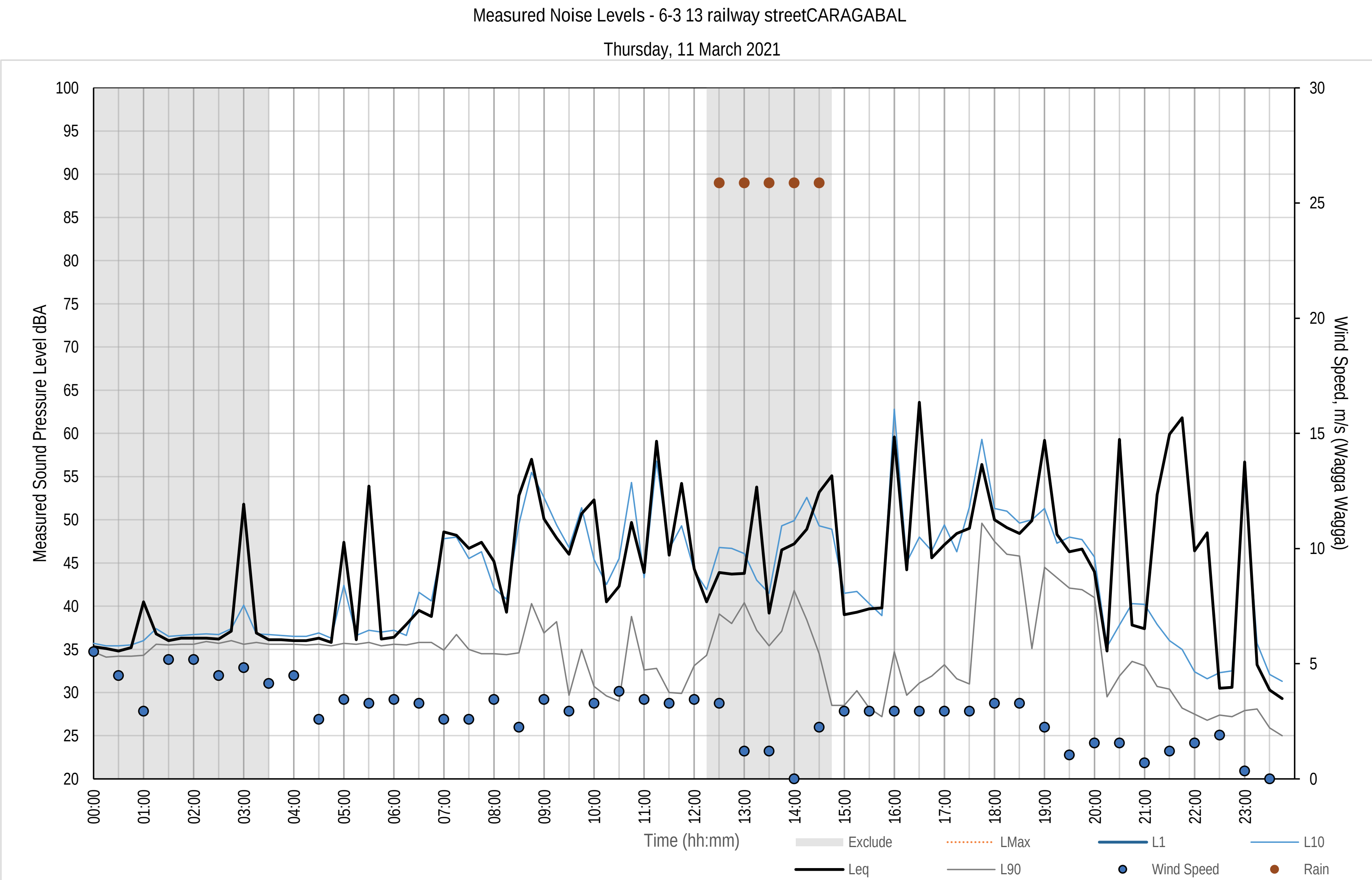
Tuesday, 09 March 2021



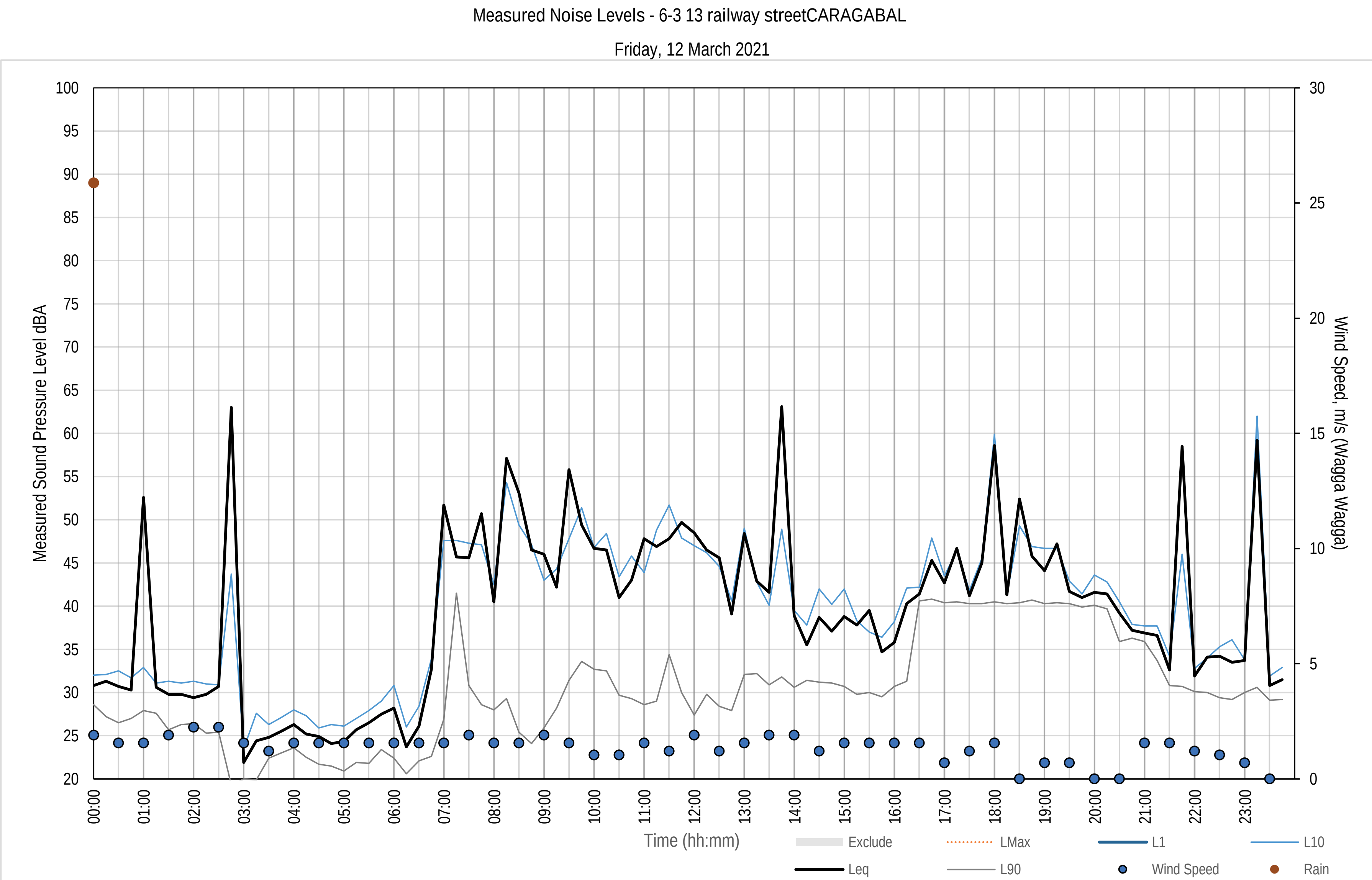
Measured Noise Levels - 6-3 13 railway streetCARAGABAL

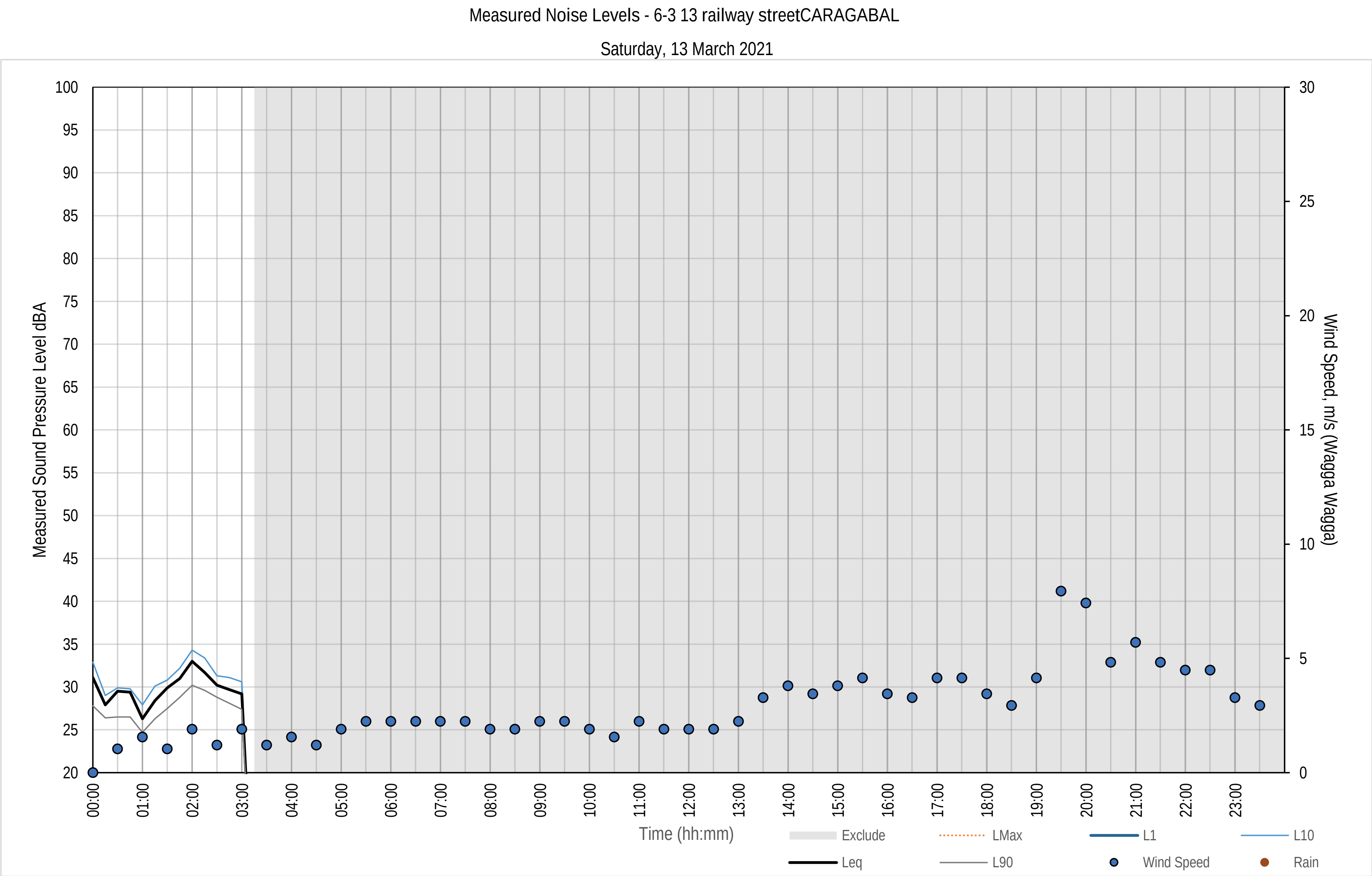
Wednesday, 10 March 2021





Measured Noise Levels - 6-3 13 railway streetCARAGABAL
Thursday, 11 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
30
25
20
15
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
Time (hh:mm)
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain


Measured Noise Levels - 6-3 13 railway streetCARAGABAL
Friday, 12 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
Time (hh:mm)
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain


Measured Noise Levels - 6-3 13 railway streetCARAGABAL
Saturday, 13 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
0
5
10
15
20
25
30
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
Time (hh:mm)
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain

APPENDIX A-4
QUANDIALLA YARD

Site Details	5-1, Quandialla Road, Quandialla	**Microphone Position**	1.5m - free field
Start Date	Tue 02 March 2021		
End Date	Tue 16 March 2021		

Measurement Summary

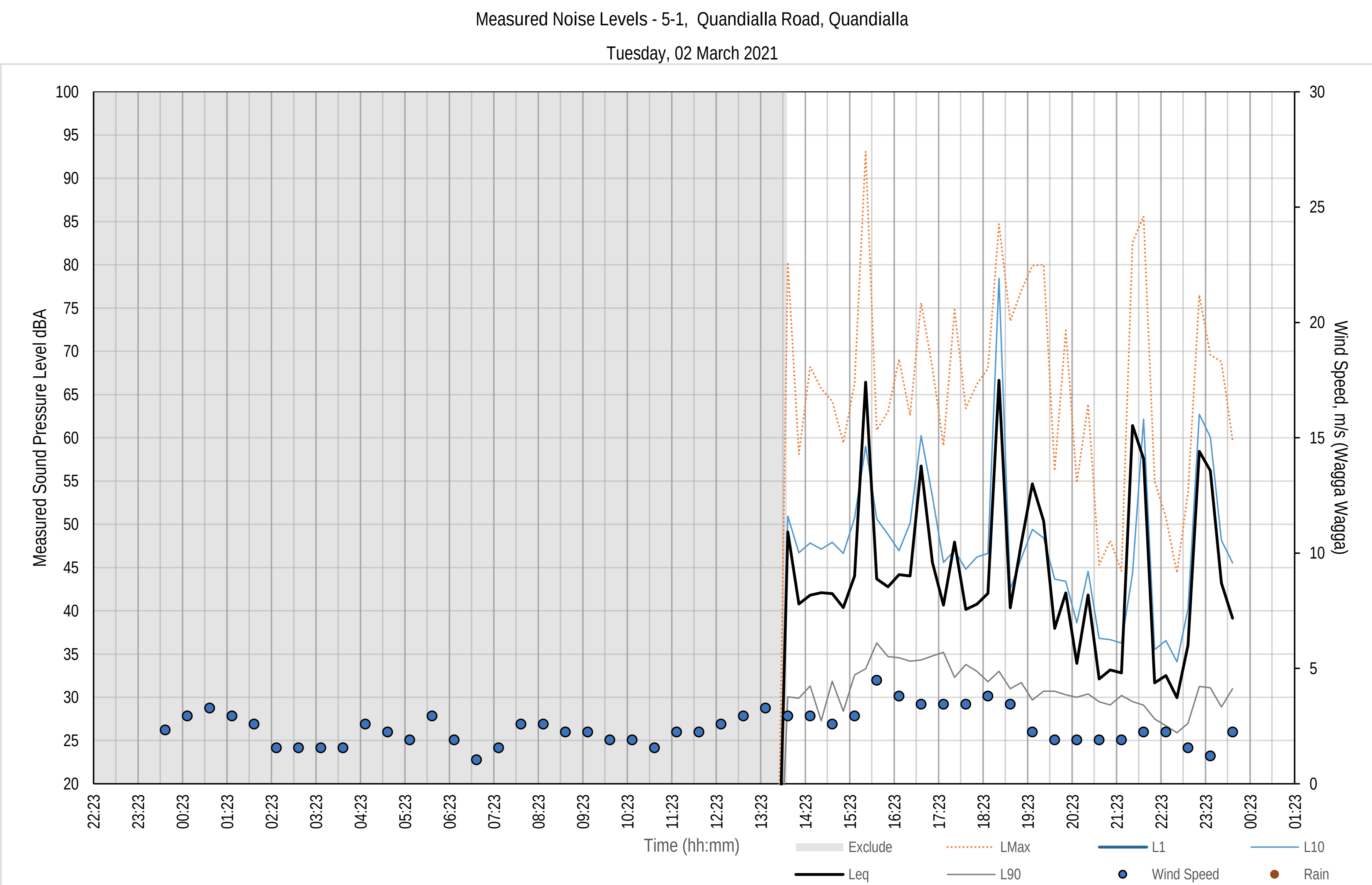
Date	02-03	03-03	04-03	05-03	06-03	07-03	08-03	09-03
$L_{eq,1\ hour\ day}$ dBA	61	70	61	66	62	60	62	58
$L_{eq,1\ hour\ night}$ dBA	55	58	54	55	56	52	54	54
$L_{eq,\ Day}$ dBA	55	60	52	52	54	51	55	50
$L_{eq,\ Evening}$ dBA	56	55	48	60	58	43	52	53
$L_{eq,\ Night}$ dBA	54	57	56	56	50	56	57	32
RBL, $_{Day}$ dBA		28	27	28	26	25	31	28
RBL, $_{Evening}$ dBA	29	30	32	29	31	31	32	32
RBL, $_{Night}$ dBA	15	16	16	16	23	23	18	24

Date	10-03	11-03	12-03	13-03	14-03	15-03	16-03	
$L_{eq,1\ hour\ day}$ dBA	65	61	61	64	60	59	58	
$L_{eq,1\ hour\ night}$ dBA	63	59	60	55	51	52	53	
$L_{eq,\ Day}$ dBA	53	54	53	58	52	52	51	
$L_{eq,\ Evening}$ dBA	61	52	55	47	55	53		
$L_{eq,\ Night}$ dBA	69	61	64	36	48	54		
RBL, $_{Day}$ dBA	25		28	30	28	30		
RBL, $_{Evening}$ dBA	30	32	32	32	29	27		
RBL, $_{Night}$ dBA		22	26		17	18		

Summary	**Average (dBA)**
$L_{eq,\ Day}$ dBA	54
$L_{eq,\ Evening}$ dBA	53
$L_{eq,\ Night}$ dBA	54
RBL, $_{Day}$ dBA	28
RBL, $_{Evening}$ dBA	31
RBL, $_{Night}$ dBA	18

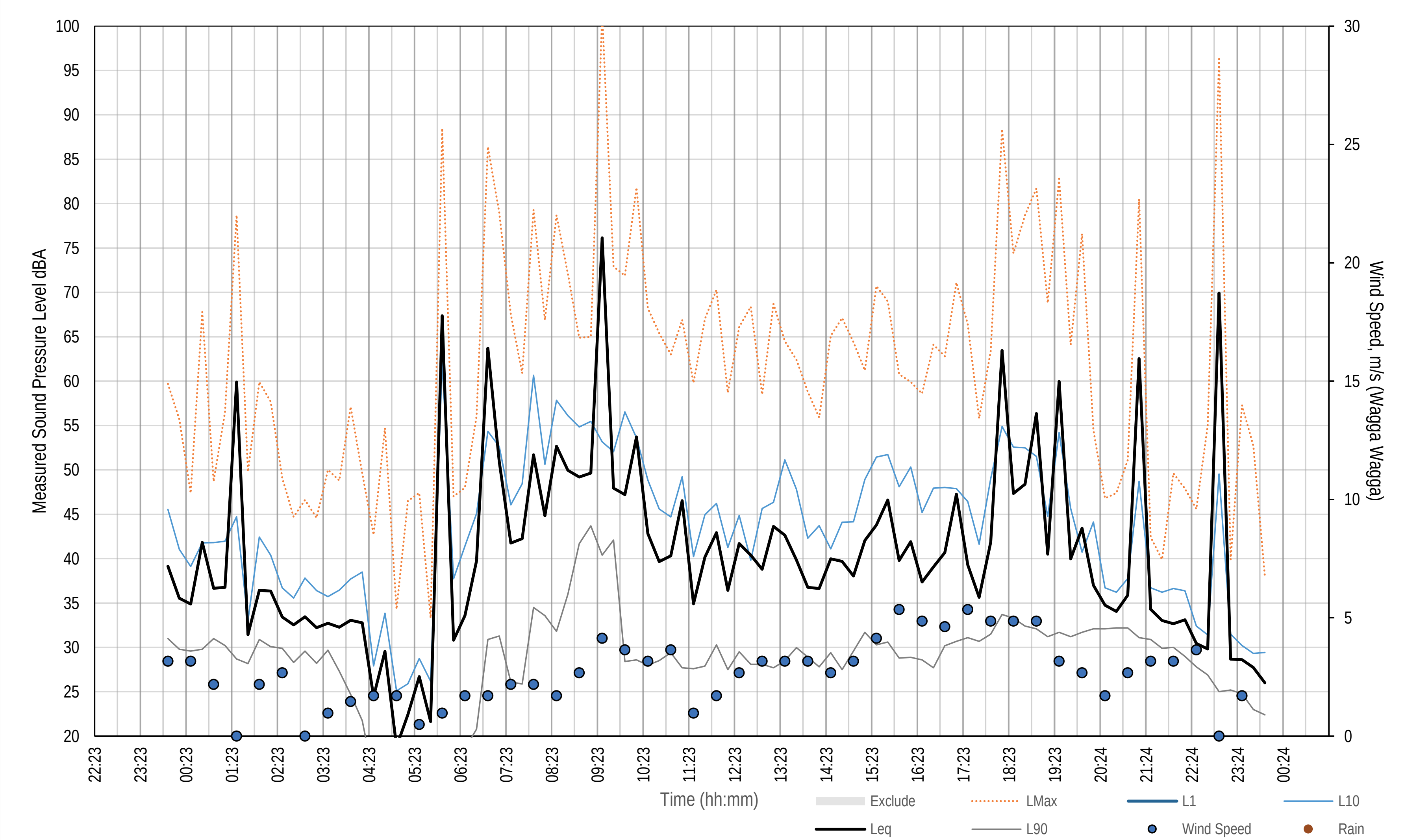
Summary	**Average (dBA)**
$L_{eq,1\ hour\ day}$ dBA	61
$L_{eq,1\ hour\ night}$ dBA	55
$L_{eq,\ 15\ hour\ day}$ dBA	55
$L_{eq,\ 9\ hour\ night}$ dBA	59

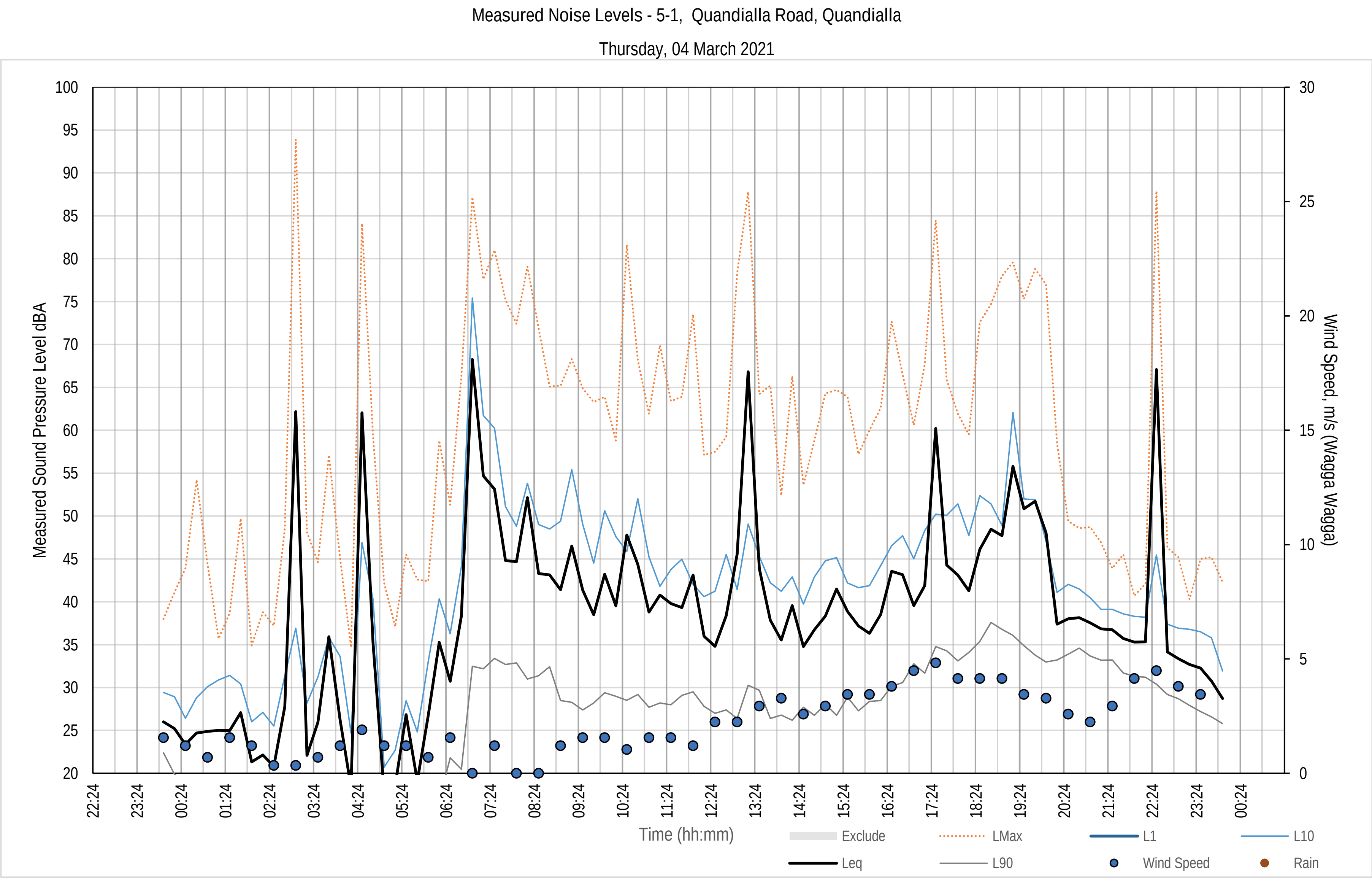
Site Photo


Measured Noise Levels - 5-1, Quandialla Road, Quandialla
Tuesday, 02 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
Time (hh:mm)
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain

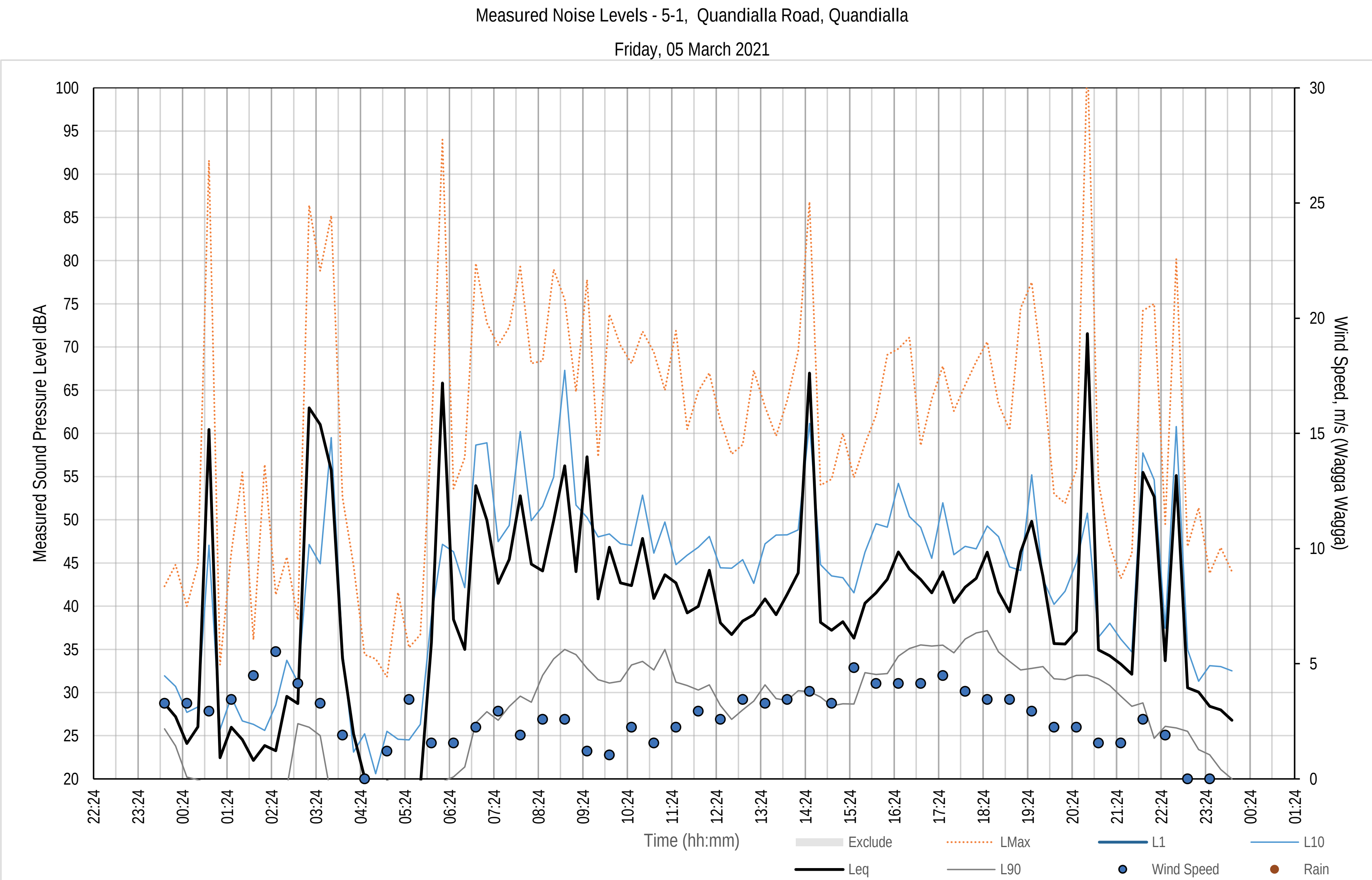
Measured Noise Levels - 5-1, Quandialla Road, Quandialla

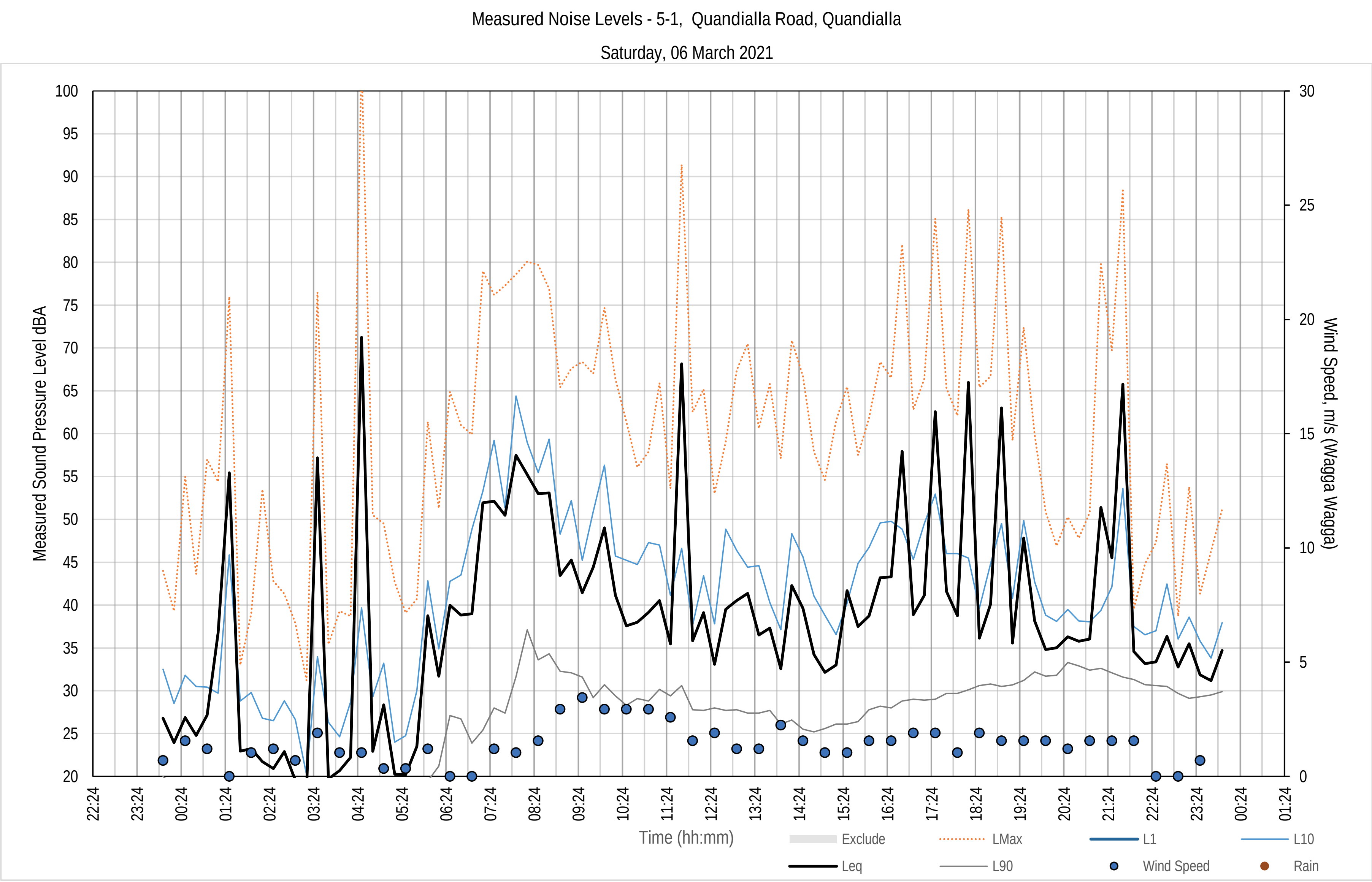
Wednesday, 03 March 2021



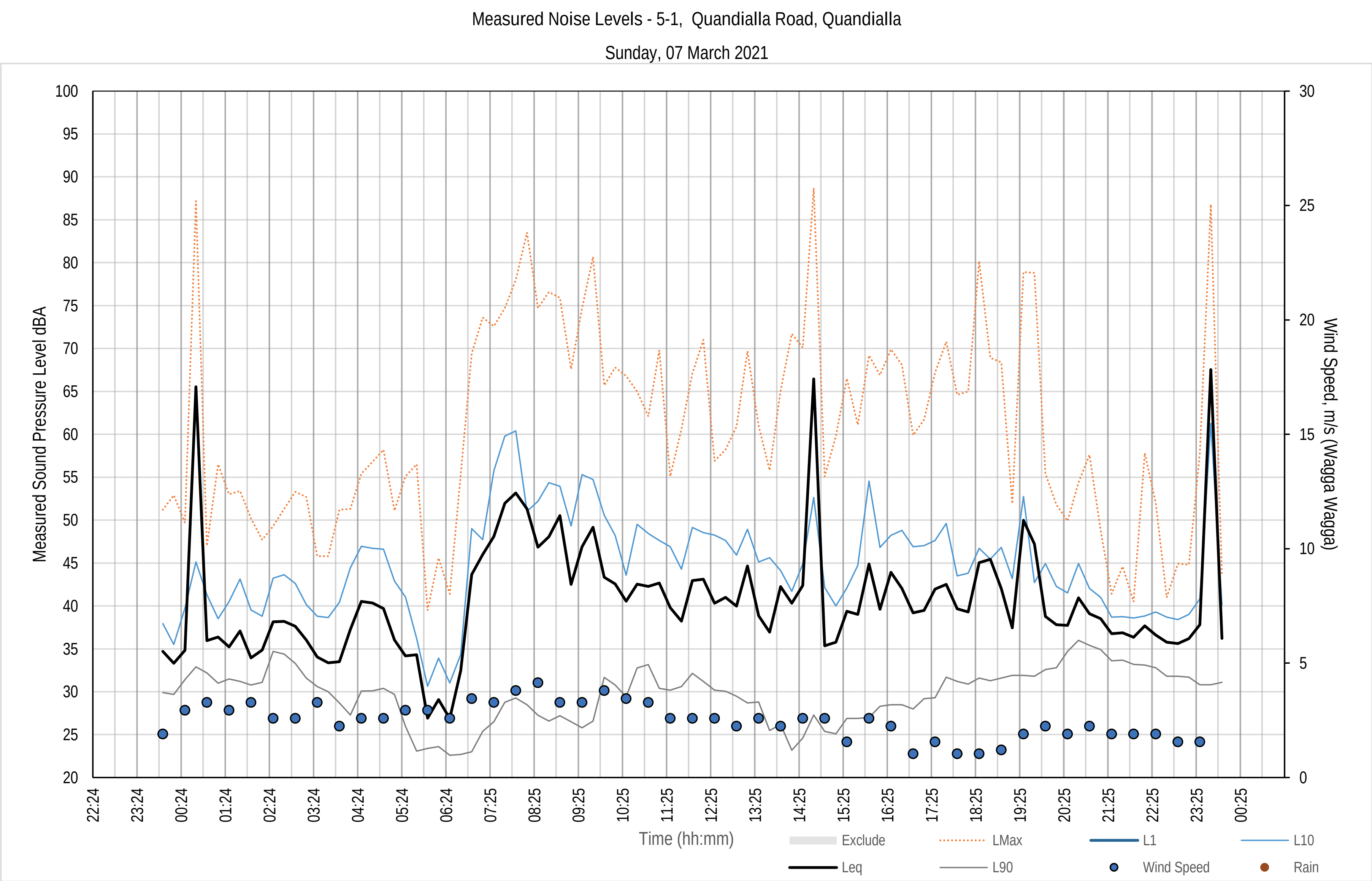


Measured Noise Levels - 5-1, Quandialla Road, Quandialla
Thursday, 04 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
Time (hh:mm)
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain


Measured Noise Levels - 5-1, Quandialla Road, Quandialla
Friday, 05 March 2021
Measured Sound Pressure Level dBA
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
Wind Speed, m/s (Wagga Wagga)
30
25
20
15
10
5
0
22:24
23:24
00:24
01:24
02:24
03:24
04:24
05:24
06:24
07:24
08:24
09:24
10:24
11:24
12:24
13:24
14:24
15:24
16:24
17:24
18:24
19:24
20:24
21:24
22:24
23:24
00:24
01:24
Time (hh:mm)
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain

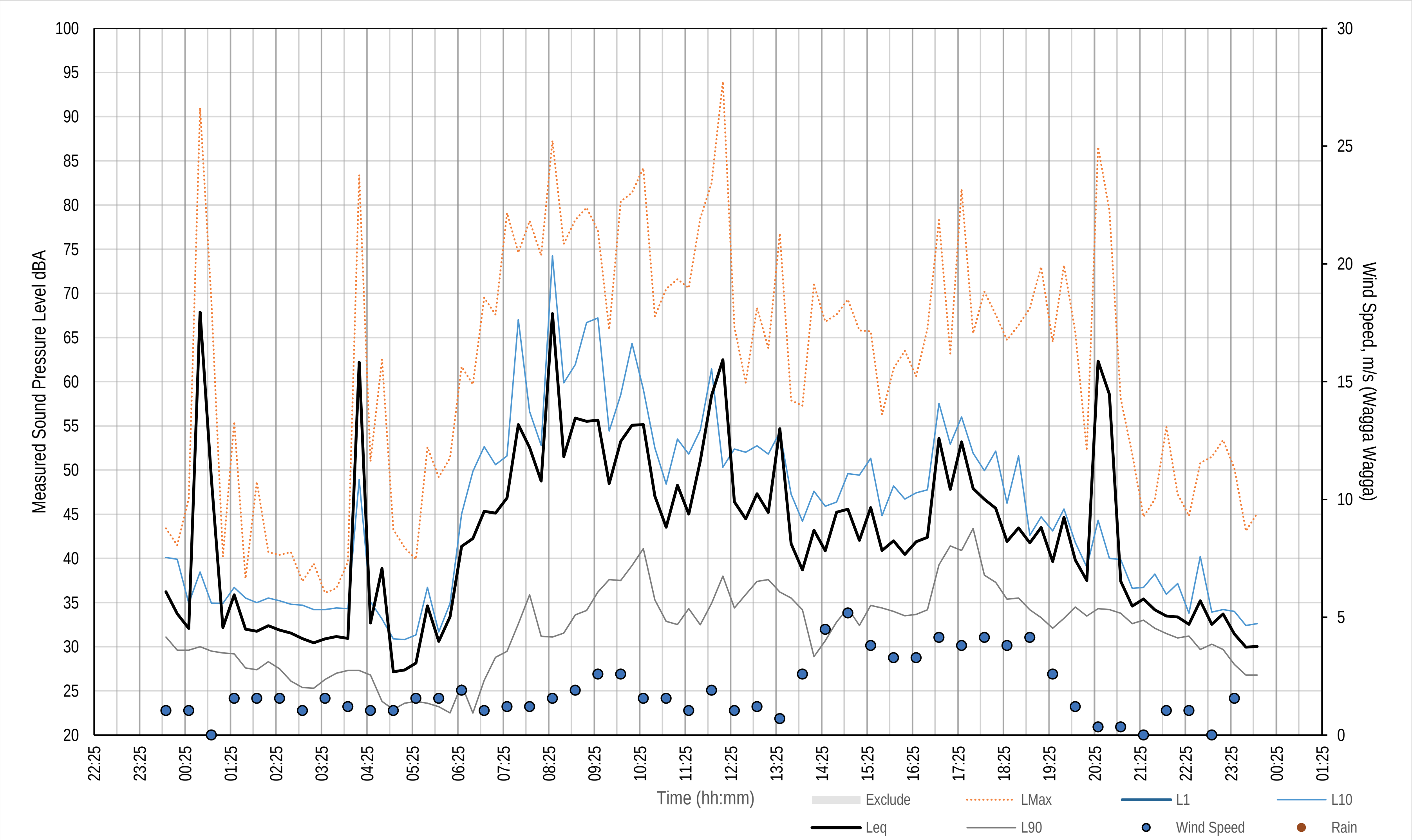


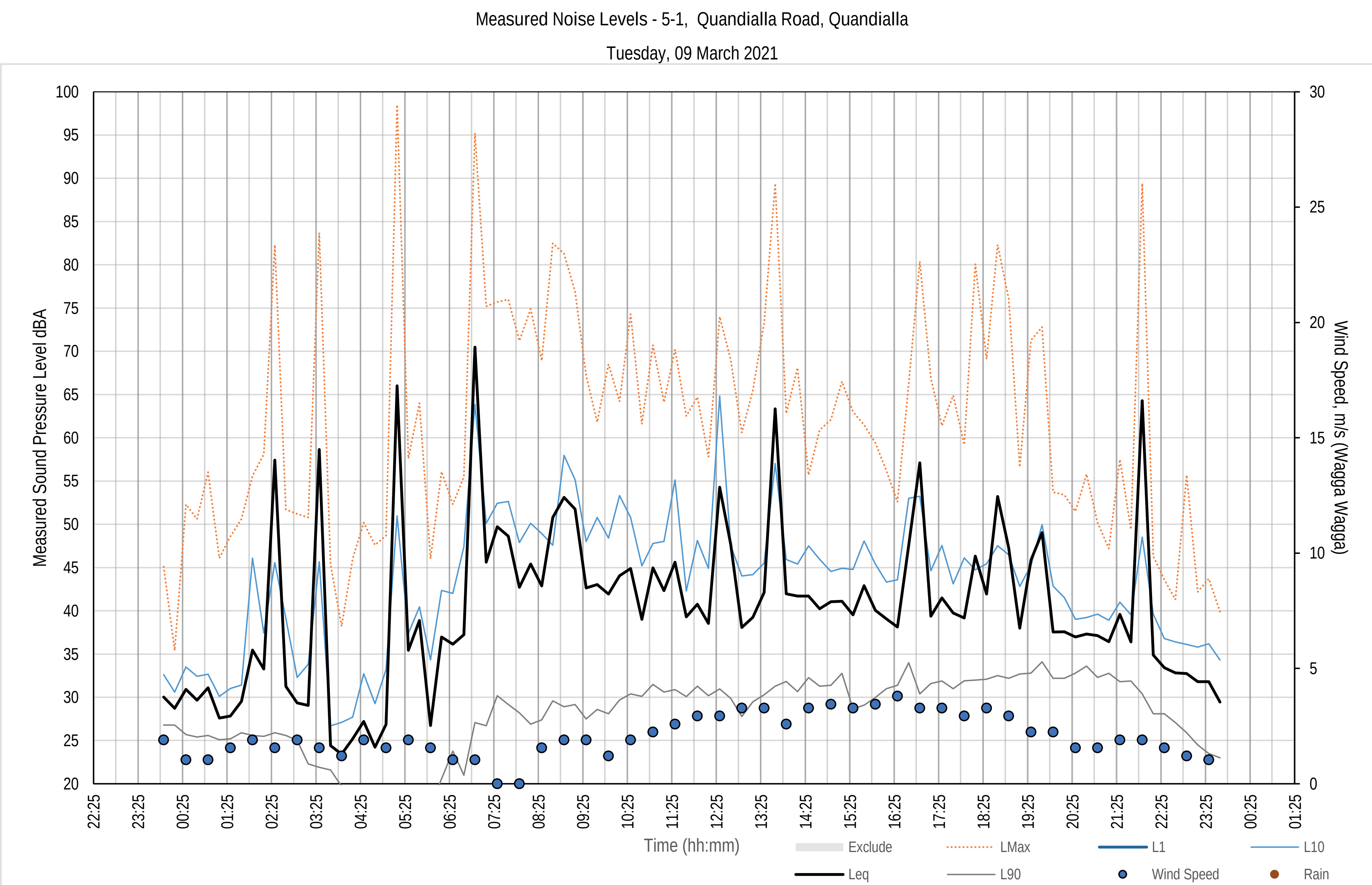
Measured Noise Levels - 5-1, Quandialla Road, Quandialla
Saturday, 06 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
Time (hh:mm)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
30
25
20
15
10
5
0
22:24
23:24
00:24
01:24
02:24
03:24
04:24
05:24
06:24
07:24
08:24
09:24
10:24
11:24
12:24
13:24
14:24
15:24
16:24
17:24
18:24
19:24
20:24
21:24
22:24
23:24
00:24
01:24
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain


Measured Noise Levels - 5-1, Quandialla Road, Quandialla
Sunday, 07 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
30
25
20
15
10
5
0
22:24
23:24
00:24
01:24
02:24
03:24
04:24
05:24
06:24
07:25
08:25
09:25
10:25
11:25
12:25
13:25
14:25
15:25
16:25
17:25
18:25
19:25
20:25
21:25
22:25
23:25
00:25
Time (hh:mm)
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain

Measured Noise Levels - 5-1, Quandialla Road, Quandialla

Monday, 08 March 2021

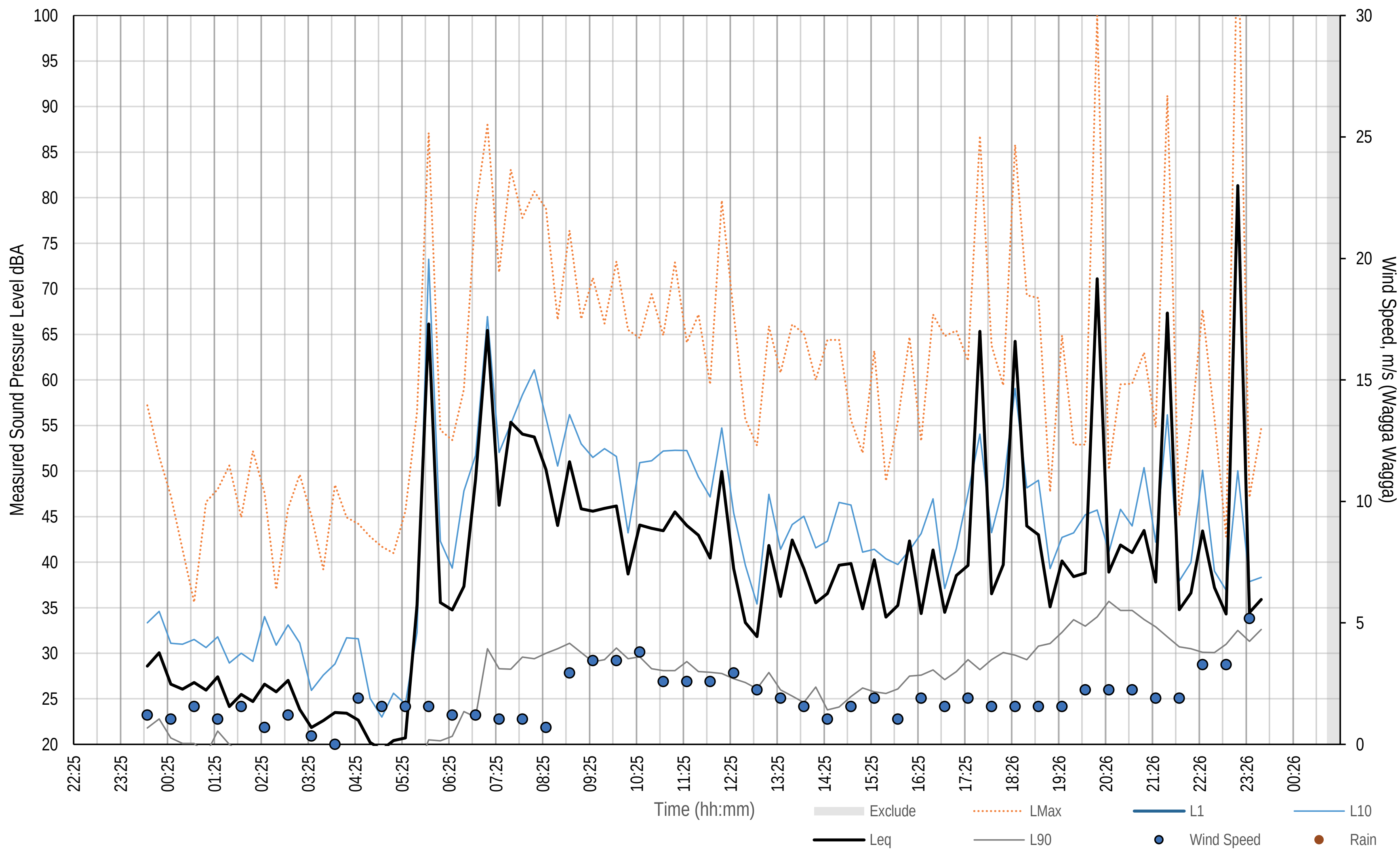


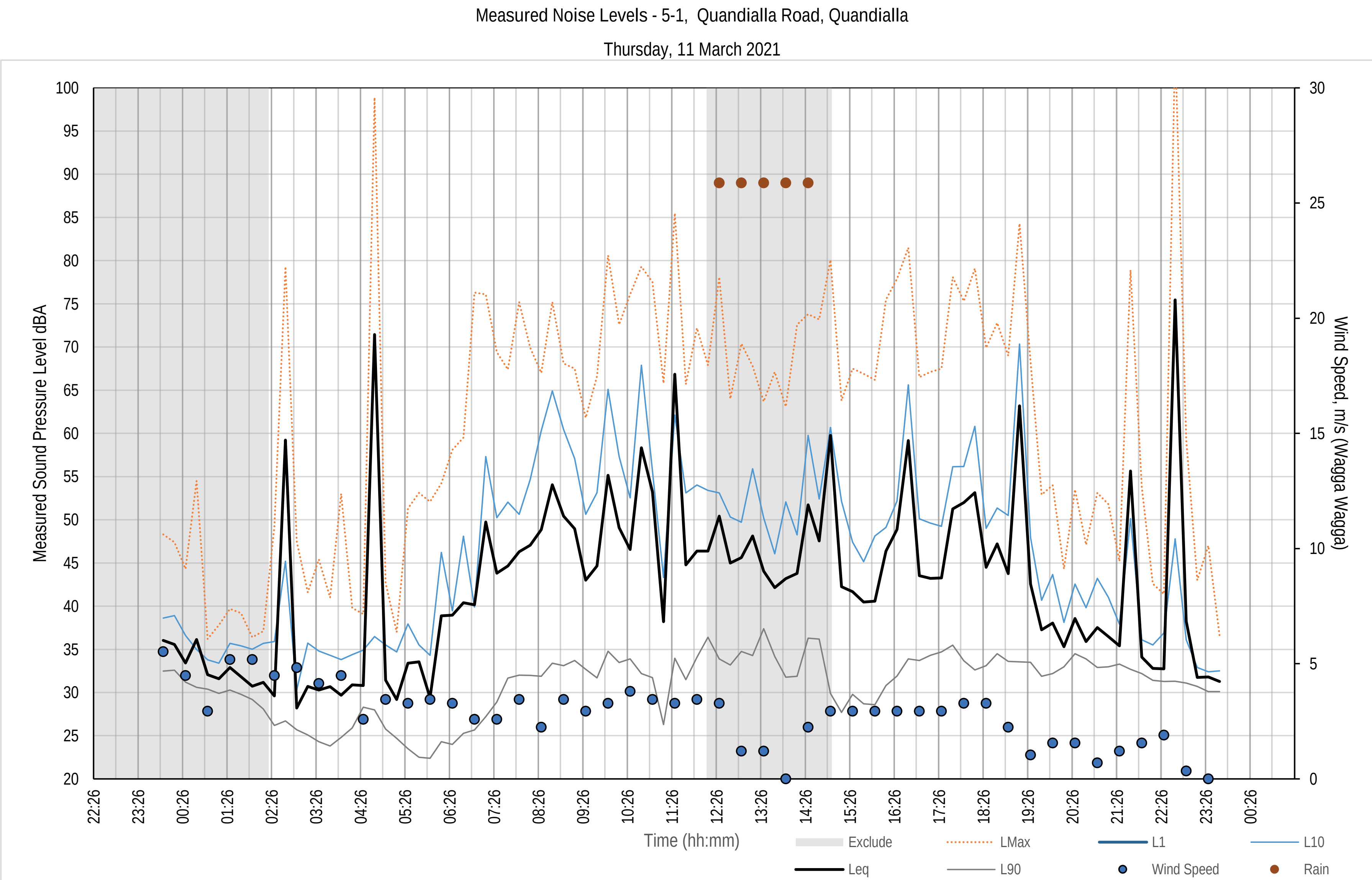


Measured Noise Levels - 5-1, Quandialla Road, Quandialla
Tuesday, 09 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
Time (hh:mm)
22:25
23:25
00:25
01:25
02:25
03:25
04:25
05:25
06:25
07:25
08:25
09:25
10:25
11:25
12:25
13:25
14:25
15:25
16:25
17:25
18:25
19:25
20:25
21:25
22:25
23:25
00:25
01:25
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain

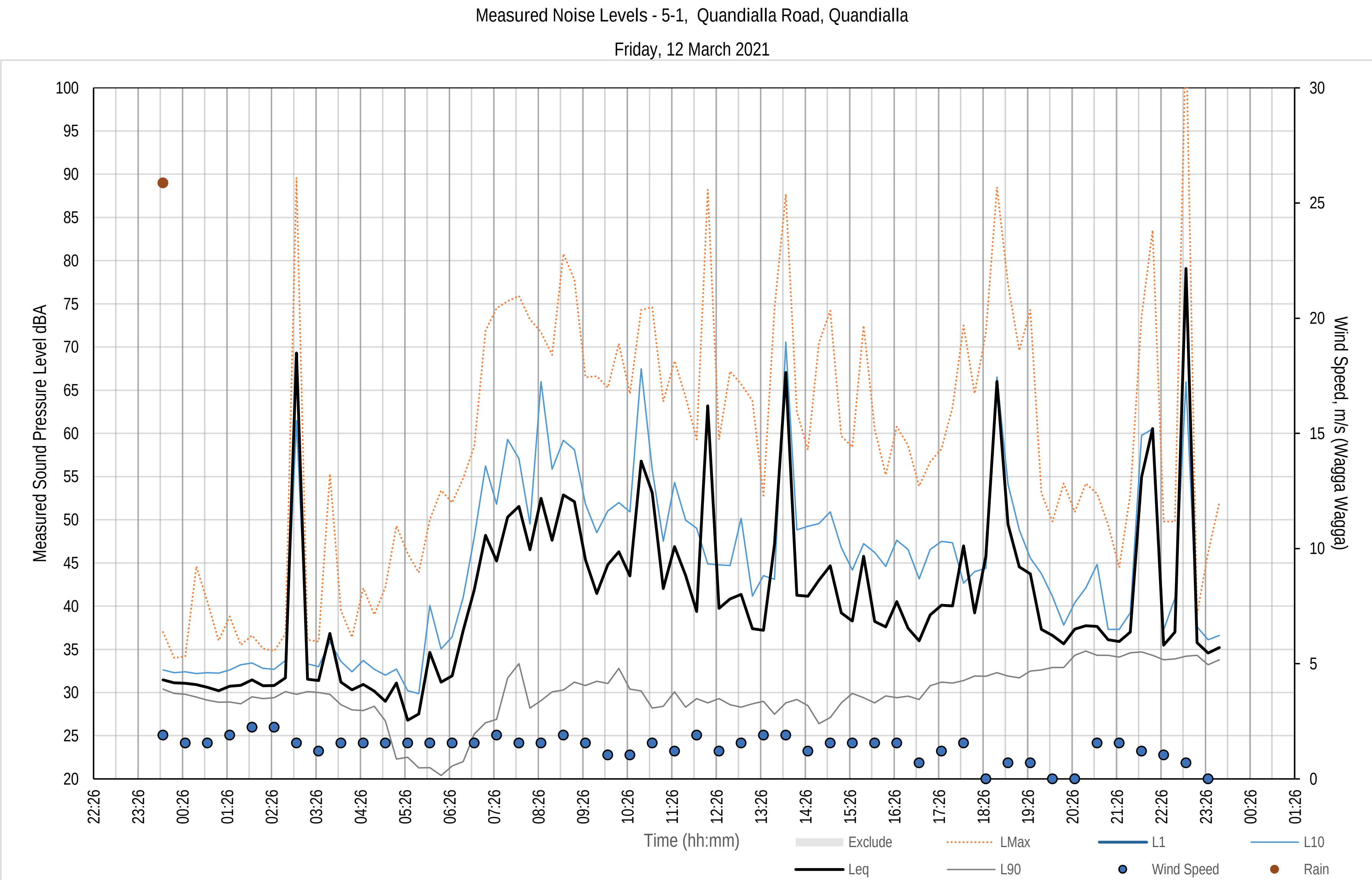
Measured Noise Levels - 5-1, Quandialla Road, Quandialla

Wednesday, 10 March 2021





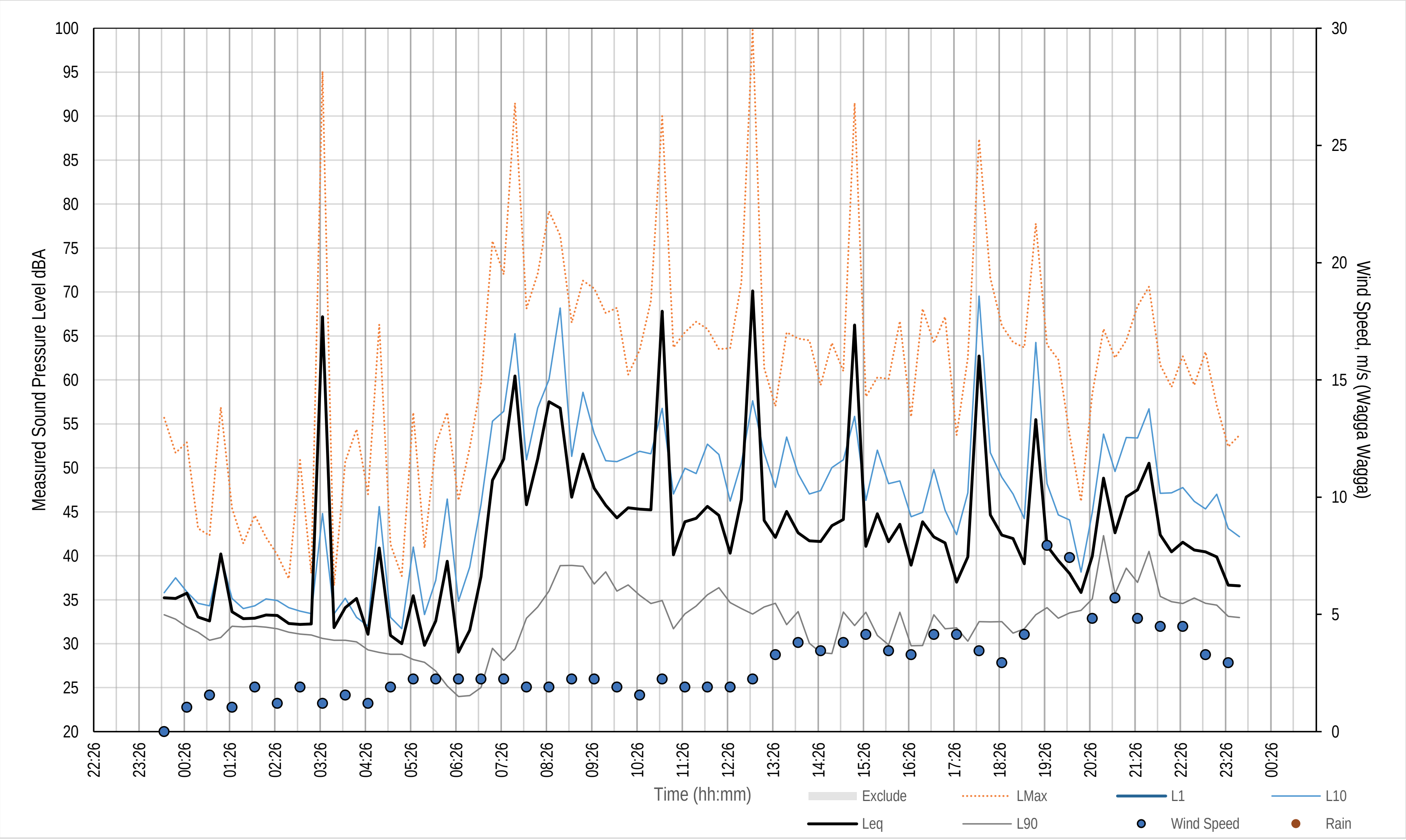
Measured Noise Levels - 5-1, Quandialla Road, Quandialla
Thursday, 11 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
Time (hh:mm)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
30
25
20
15
10
5
0
22:26
23:26
00:26
01:26
02:26
03:26
04:26
05:26
06:26
07:26
08:26
09:26
10:26
11:26
12:26
13:26
14:26
15:26
16:26
17:26
18:26
19:26
20:26
21:26
22:26
23:26
00:26
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain



Measured Noise Levels - 5-1, Quandialla Road, Quandialla
Friday, 12 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
30
25
20
15
10
5
0
22:26
23:26
00:26
01:26
02:26
03:26
04:26
05:26
06:26
07:26
08:26
09:26
10:26
11:26
12:26
13:26
14:26
15:26
16:26
17:26
18:26
19:26
20:26
21:26
22:26
23:26
00:26
01:26
Time (hh:mm)
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain

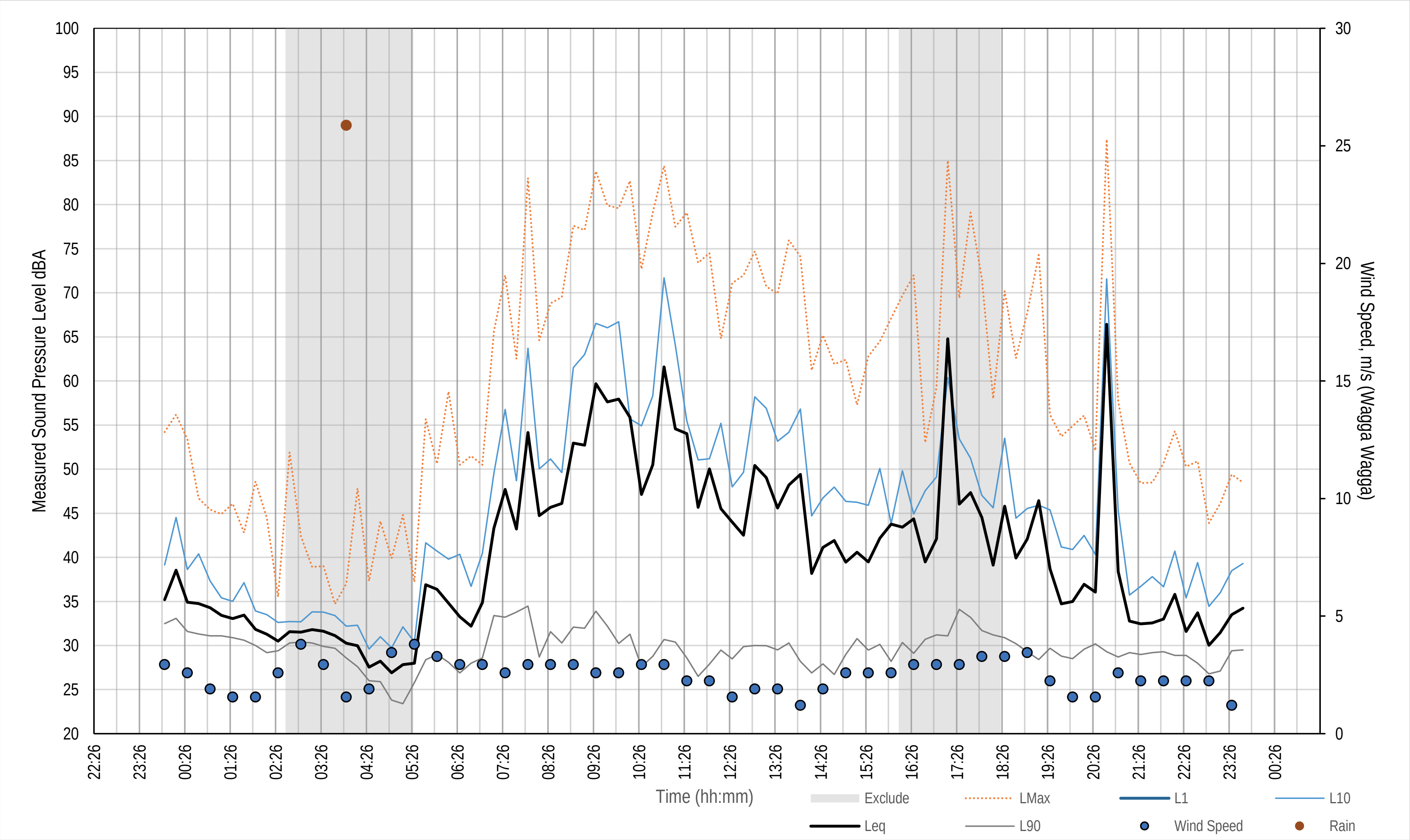
Measured Noise Levels - 5-1, Quandialla Road, Quandialla

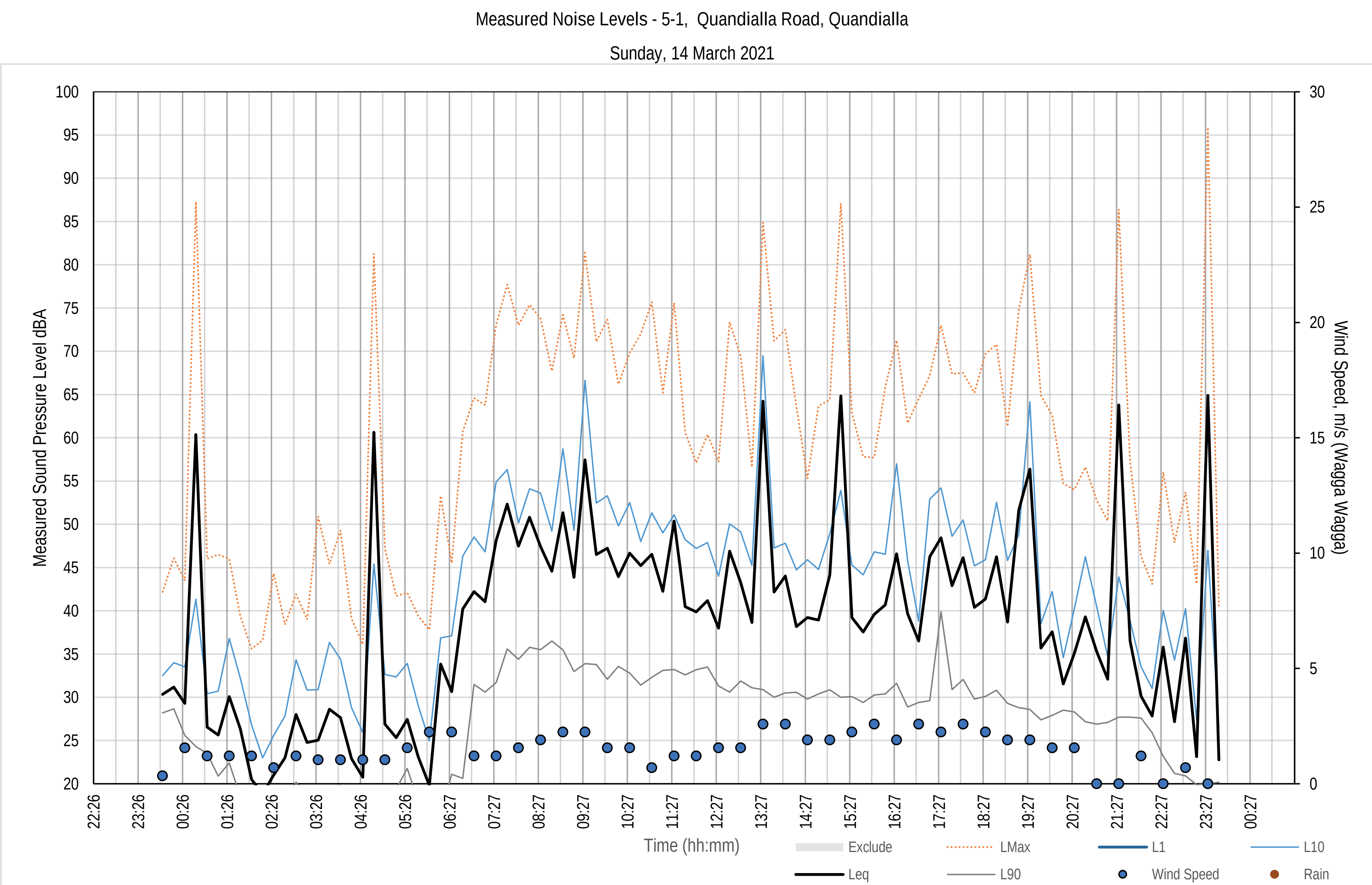
Saturday, 13 March 2021



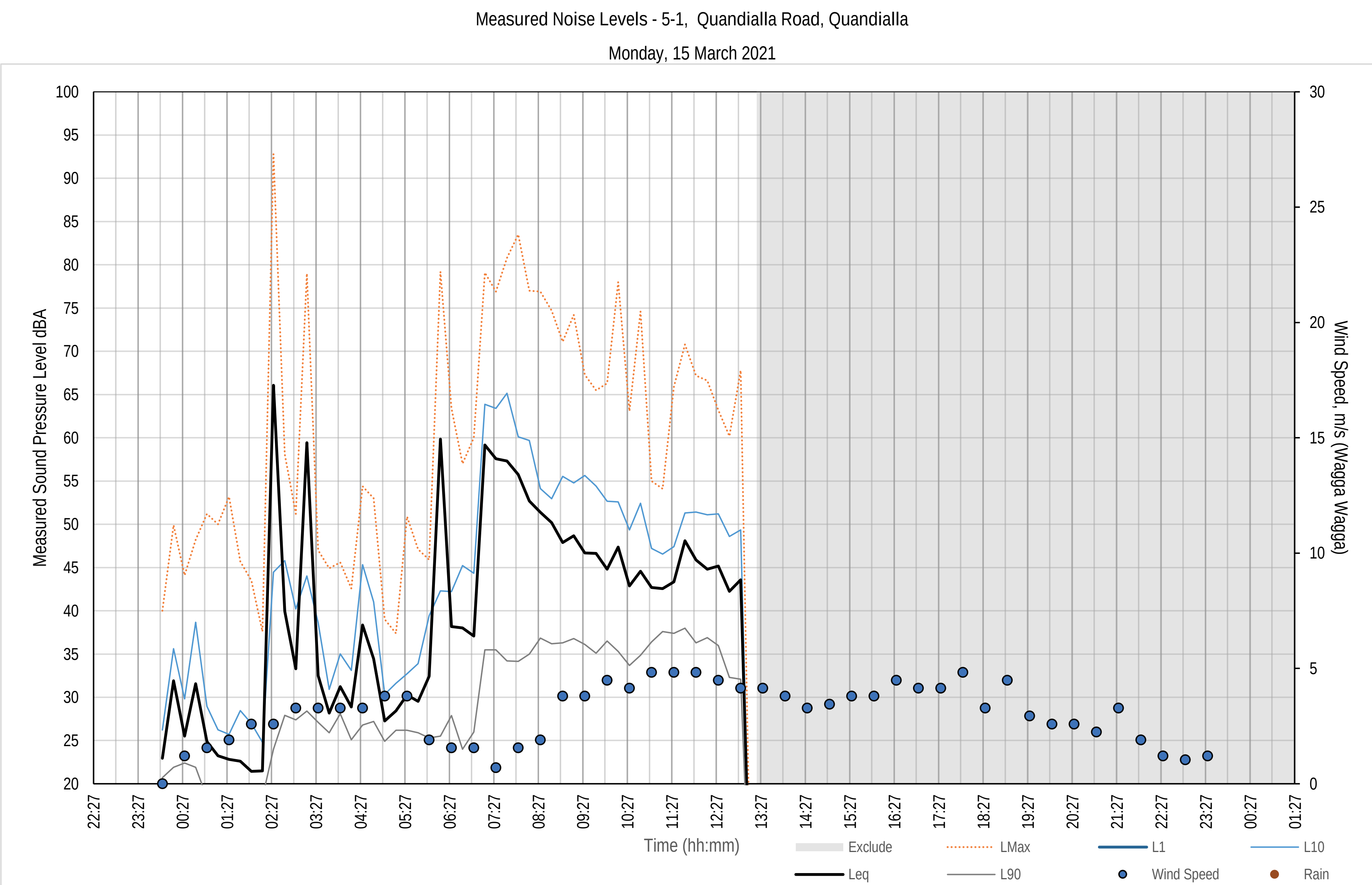
Measured Noise Levels - 5-1, Quandialla Road, Quandialla

Saturday, 13 March 2021





Measured Noise Levels - 5-1, Quandialla Road, Quandialla
Sunday, 14 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
Time (hh:mm)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
30
25
20
15
10
5
0
22:26
23:26
00:26
01:26
02:26
03:26
04:26
05:26
06:27
07:27
08:27
09:27
10:27
11:27
12:27
13:27
14:27
15:27
16:27
17:27
18:27
19:27
20:27
21:27
22:27
23:27
00:27
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain



Measured Noise Levels - 5-1, Quandialla Road, Quandialla
Monday, 15 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
Time (hh:mm)
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain

APPENDIX A-5
BRIBBAREE YARD

Site Details	4-1, 2 North Street Bribaree	Microphone Position	1.5m - free field
Start Date	Sat 03 April 2021		
End Date	Mon 12 April 2021		

Measurement Summary

Date	03-04	04-04	05-04	06-04	07-04	08-04	09-04	10-04
$L_{eq,1\ hour\ day}$ dBA	63	65	65	59	62	61	63	64
$L_{eq,1\ hour\ night}$ dBA	56	55	57	48	56	52	57	56
$L_{eq,\ Day}$ dBA	58	55	59	49	57	53	58	56
$L_{eq,\ Evening}$ dBA	40	53	58	35	55	52	56	53
$L_{eq,\ Night}$ dBA	55	52	52	56	49	53	54	62
RBL, $_{Day}$ dBA	42	28	30	25	43	27	26	29
RBL, $_{Evening}$ dBA	27	26	29	26	26	27	26	32
RBL, $_{Night}$ dBA	20	20	26	23	20	20	26	27

Date	11-04	12-04						
$L_{eq,1\ hour\ day}$ dBA	65	66						
$L_{eq,1\ hour\ night}$ dBA	58	55						
$L_{eq,\ Day}$ dBA	58	57						
$L_{eq,\ Evening}$ dBA	52							
$L_{eq,\ Night}$ dBA	56							
RBL, $_{Day}$ dBA	30							
RBL, $_{Evening}$ dBA	28							
RBL, $_{Night}$ dBA								

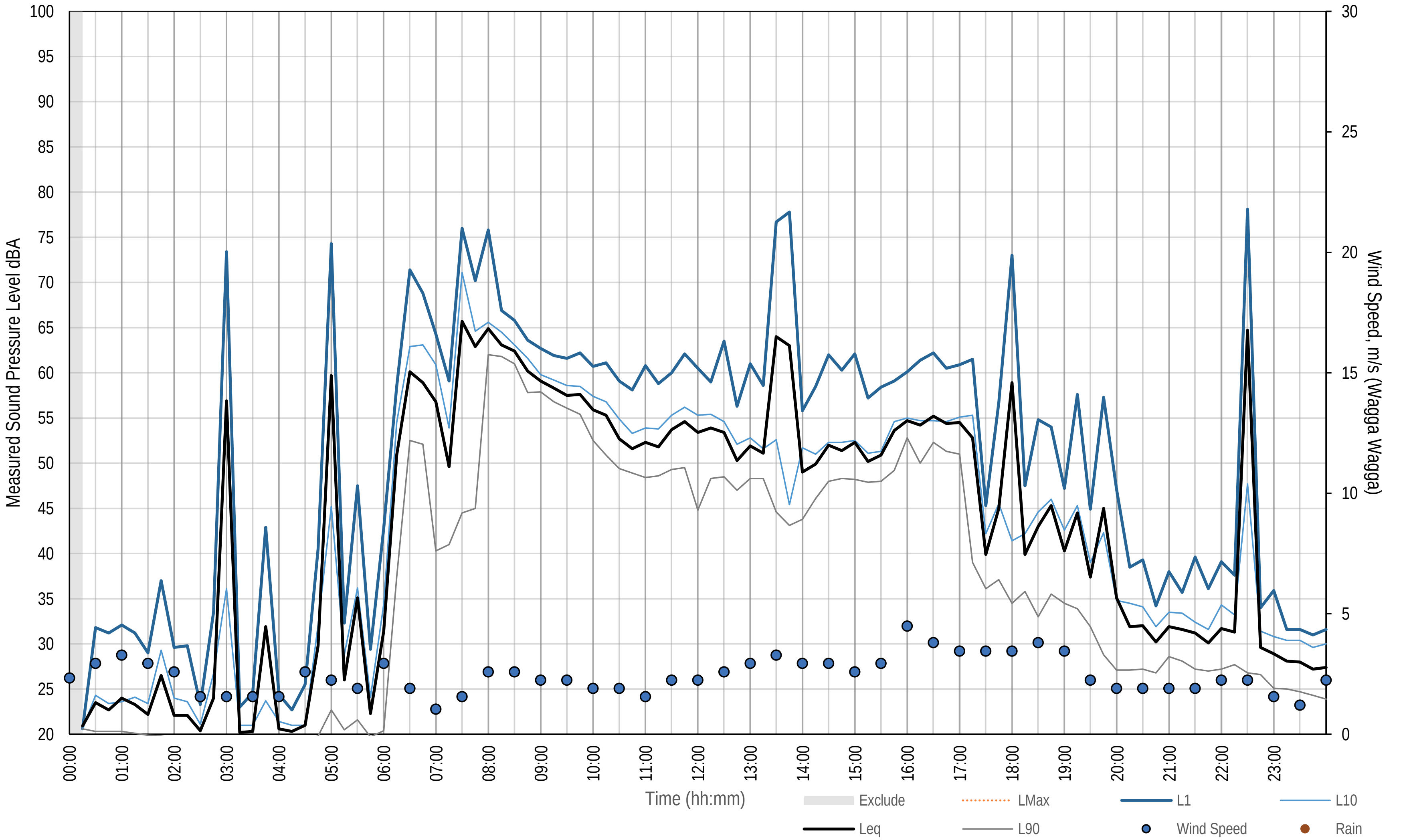
Summary	Average (dBA)
$L_{eq,\ Day}$ dBA	56
$L_{eq,\ Evening}$ dBA	50
$L_{eq,\ Night}$ dBA	54
RBL, $_{Day}$ dBA	29
RBL, $_{Evening}$ dBA	27
RBL, $_{Night}$ dBA	21

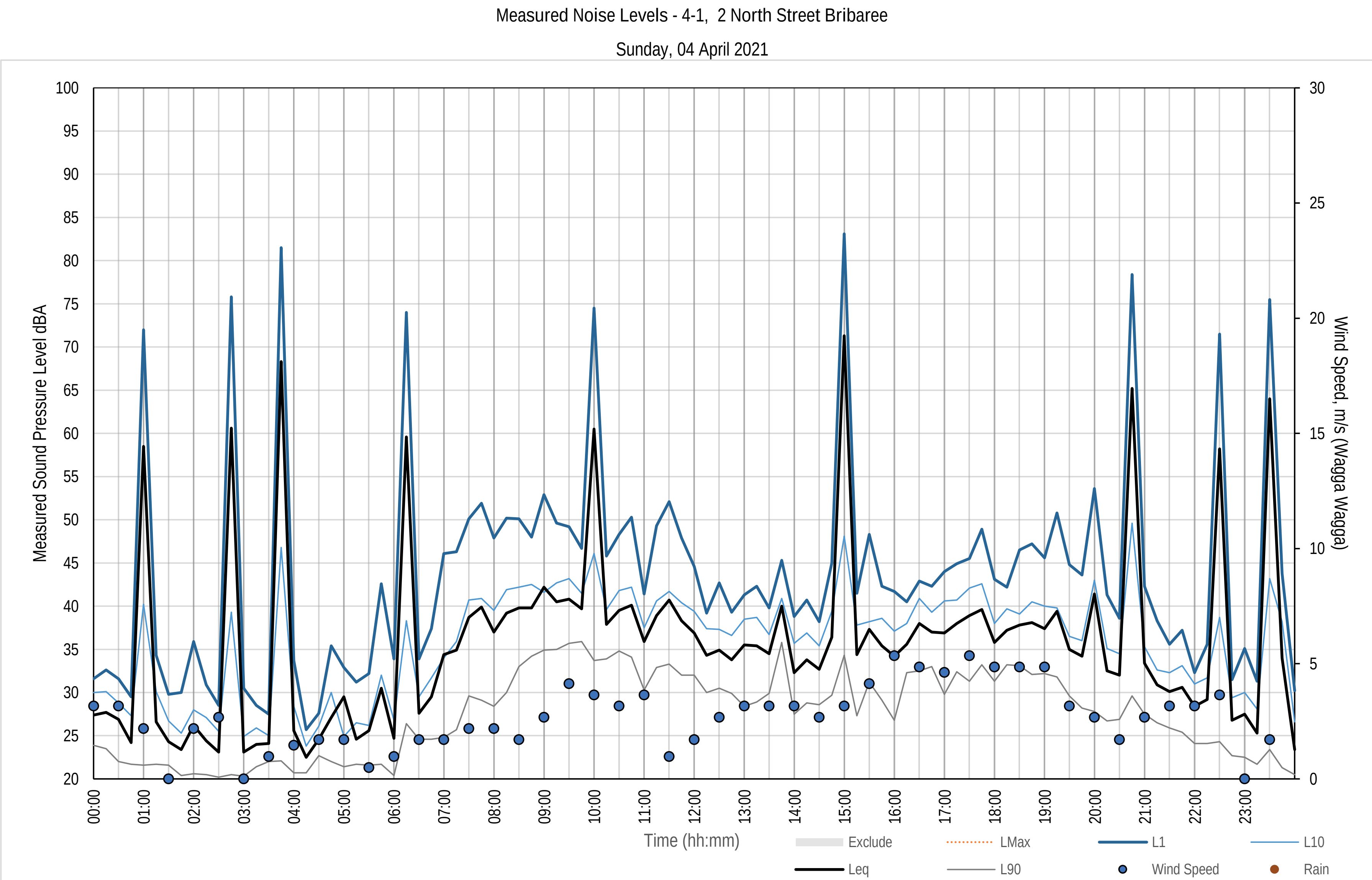
Summary	Average (dBA)
$L_{eq,1\ hour\ day}$ dBA	64
$L_{eq,1\ hour\ night}$ dBA	56
$L_{eq,\ 15\ hour\ day}$ dBA	56
$L_{eq,\ 9\ hour\ night}$ dBA	54

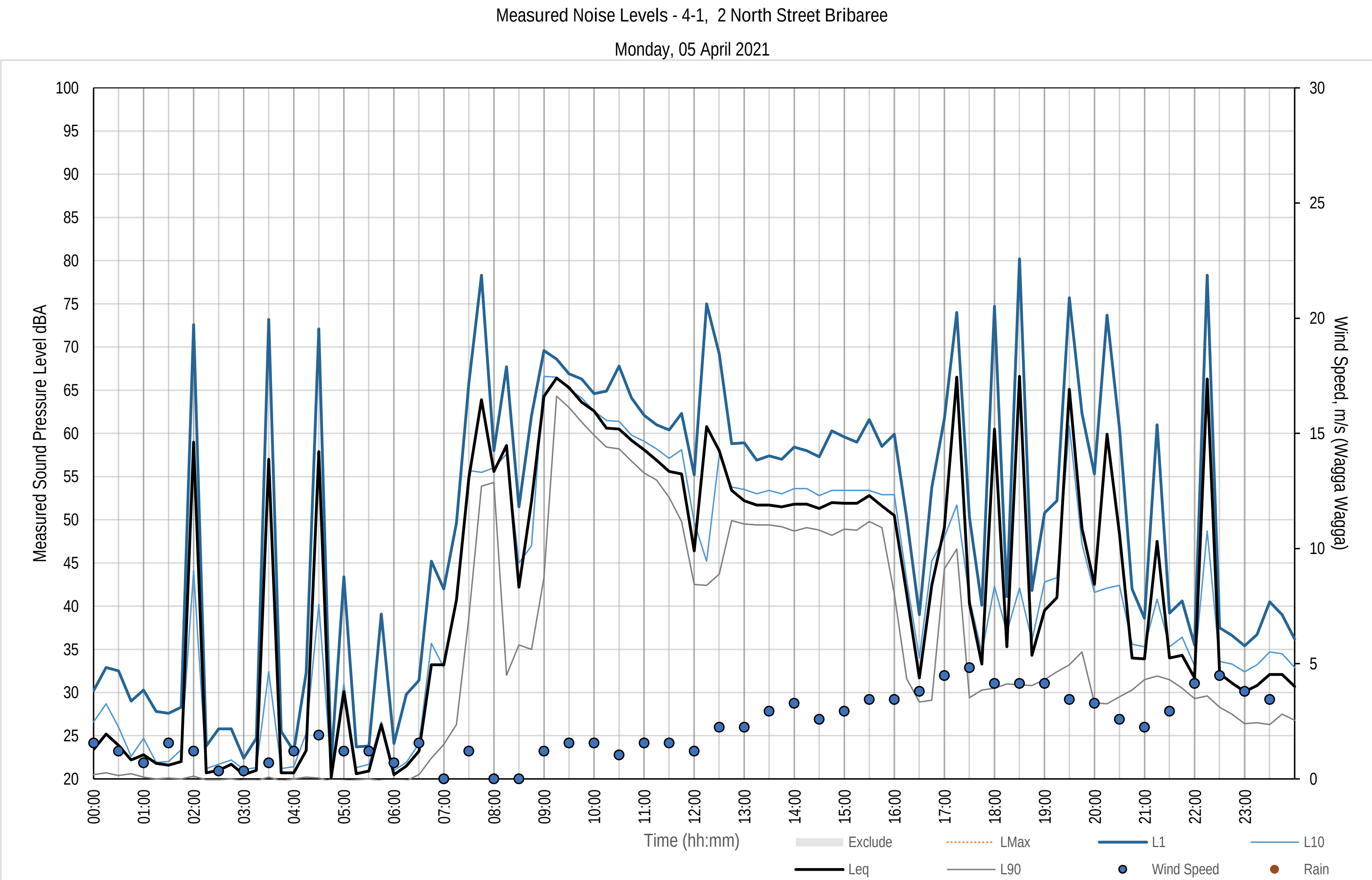
Site Photo

Measured Noise Levels - 4-1, 2 North Street Bribaree

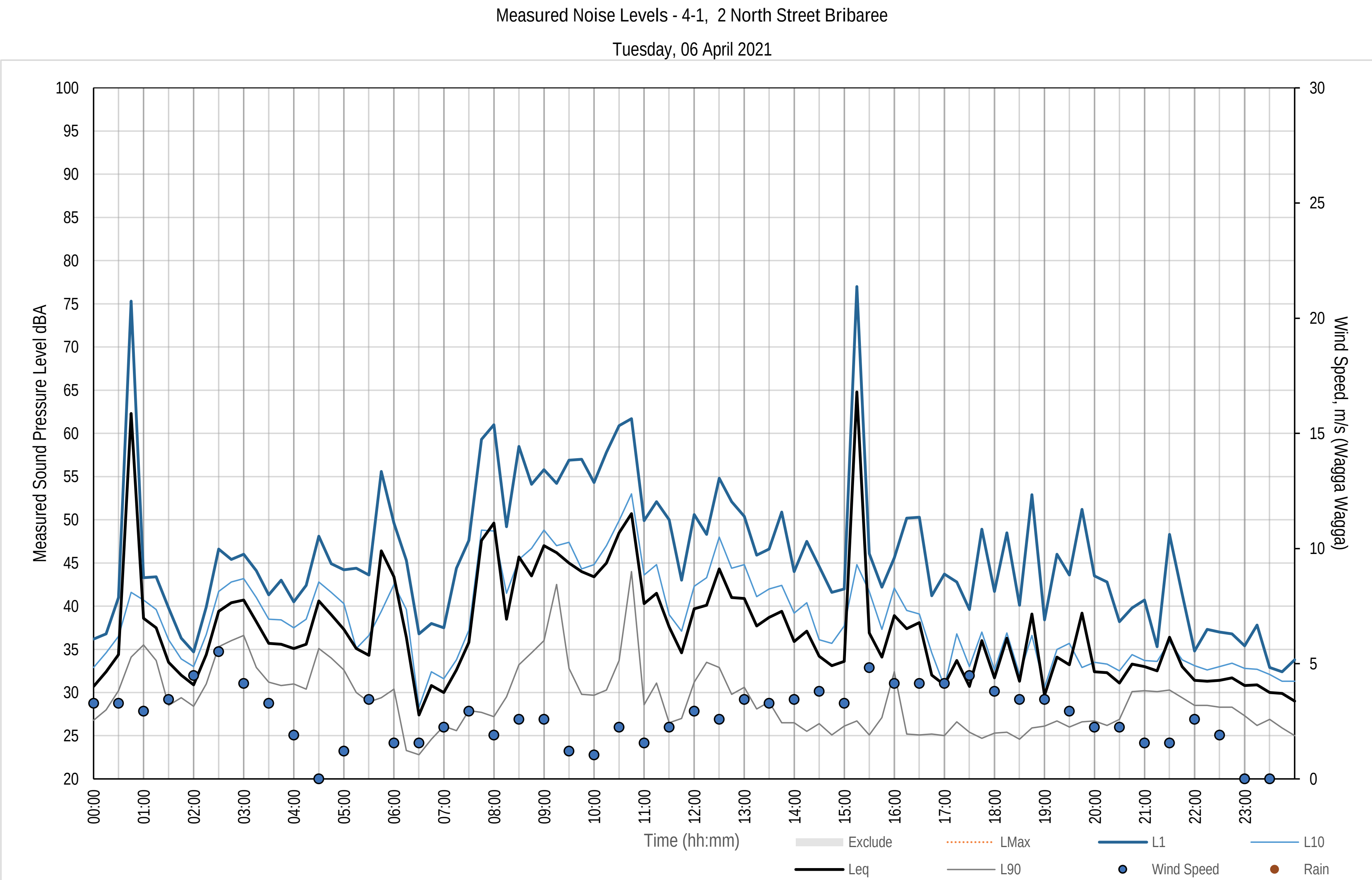
Saturday, 03 April 2021



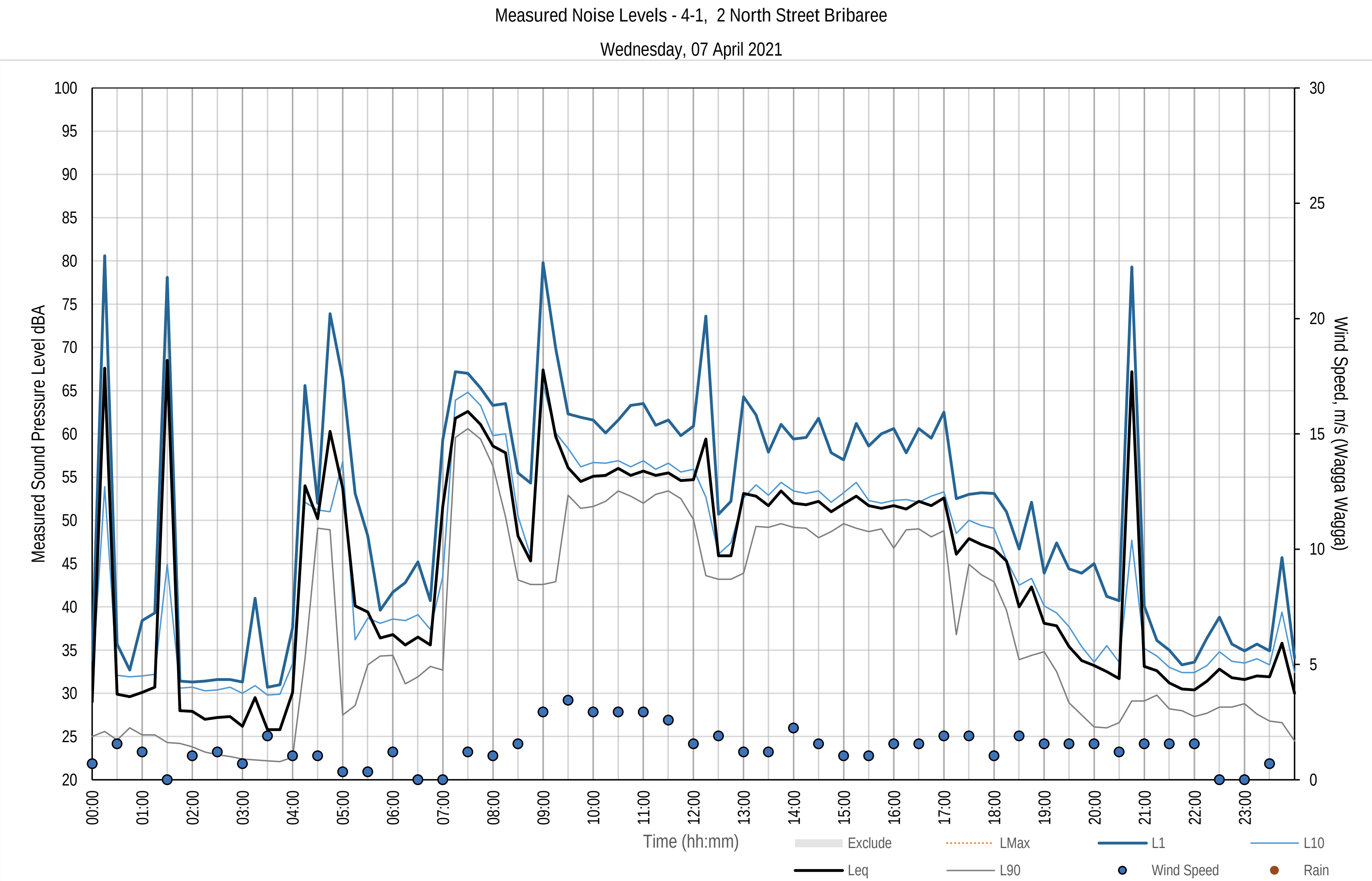

Measured Noise Levels - 4-1, 2 North Street Bribaree
Sunday, 04 April 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
Time (hh:mm)
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain



Measured Noise Levels - 4-1, 2 North Street Bribaree
Monday, 05 April 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
Time (hh:mm)
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain

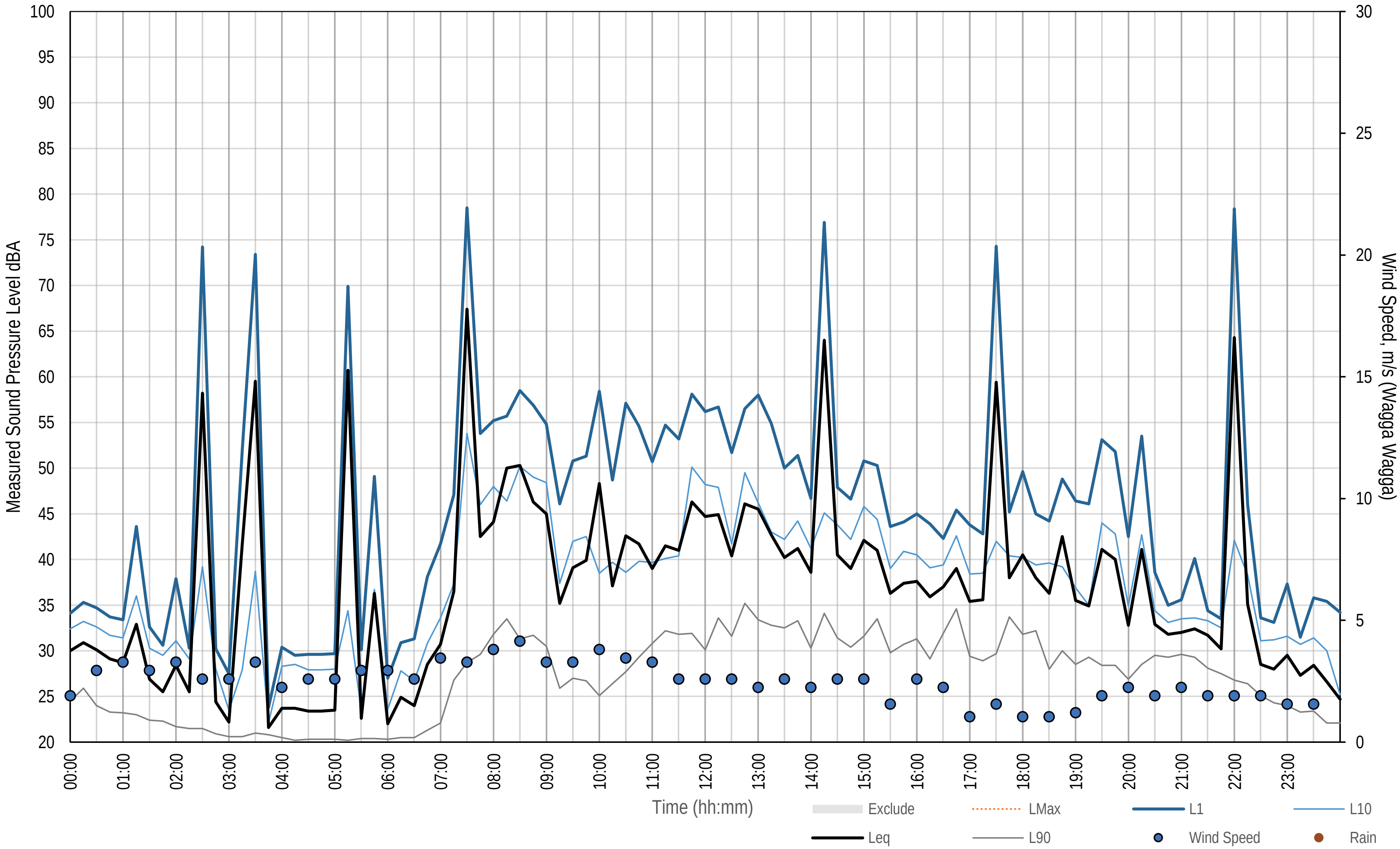


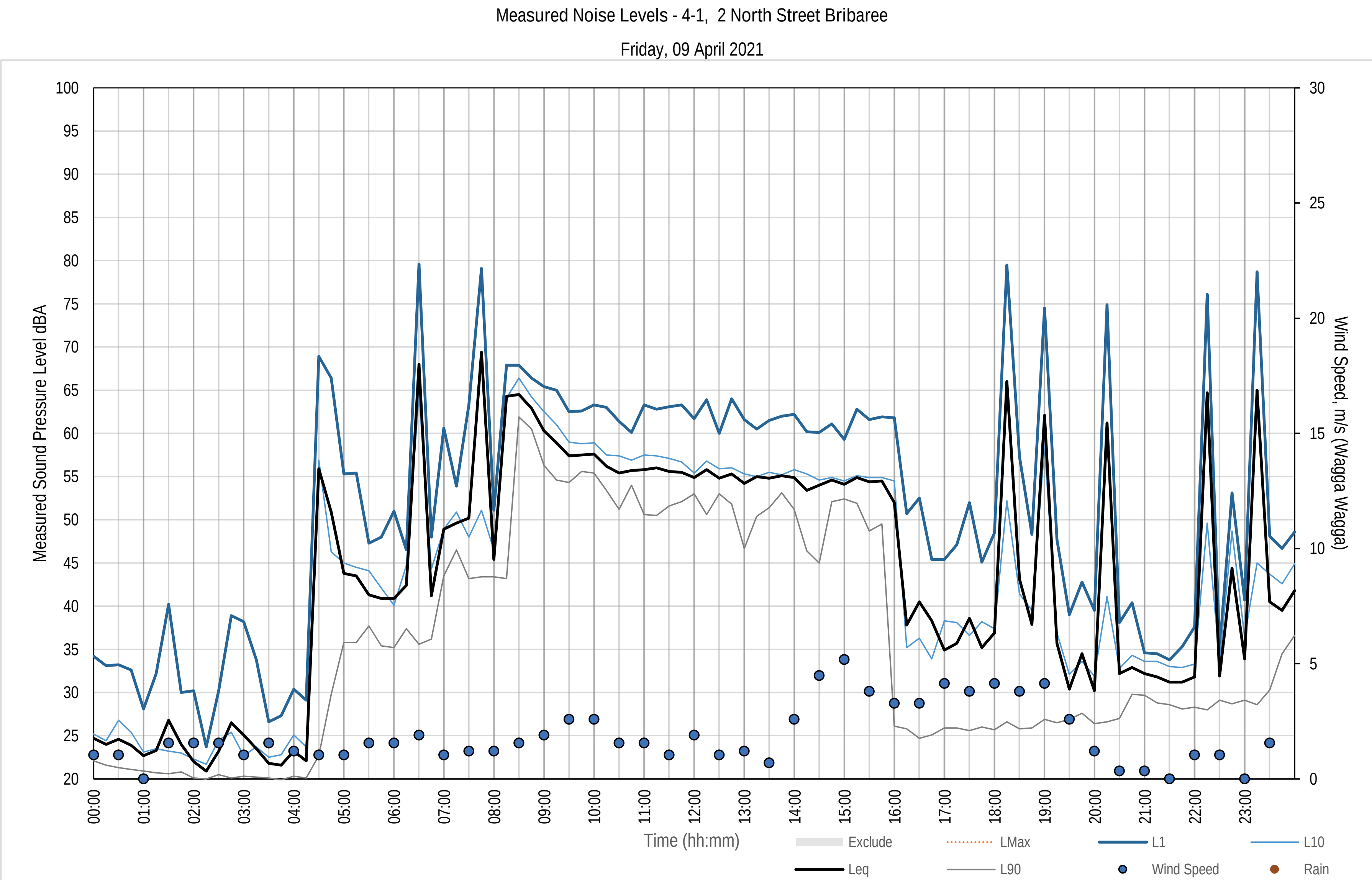
Measured Noise Levels - 4-1, 2 North Street Bribaree
Tuesday, 06 April 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
30
25
20
15
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
Time (hh:mm)
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain


Measured Noise Levels - 4-1, 2 North Street Bribaree
Wednesday, 07 April 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
Time (hh:mm)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
30
25
20
15
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain

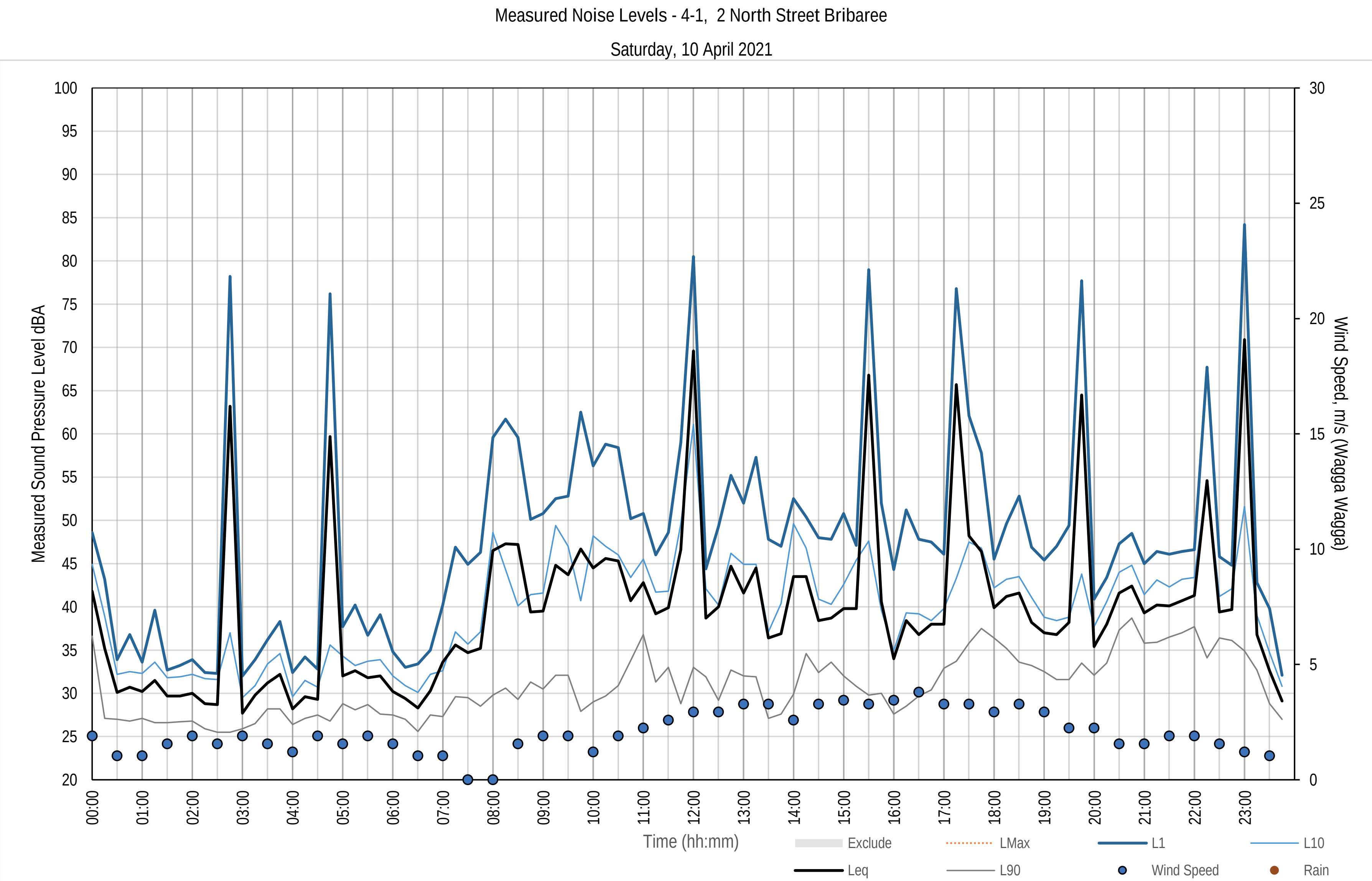
Measured Noise Levels - 4-1, 2 North Street Bribaree

Thursday, 08 April 2021



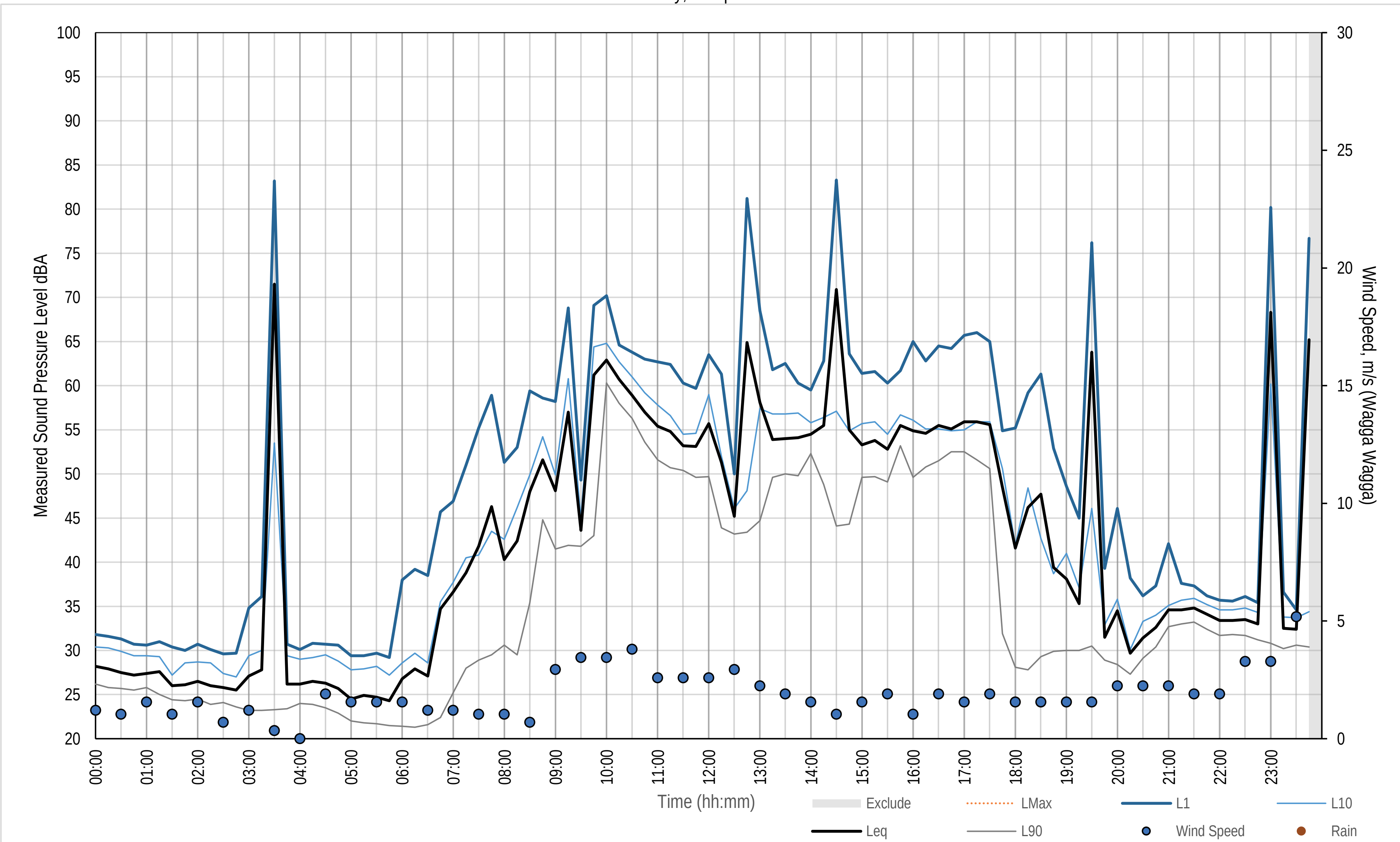


Measured Noise Levels - 4-1, 2 North Street Bribaree
Friday, 09 April 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
30
25
20
15
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
Time (hh:mm)
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain


Measured Noise Levels - 4-1, 2 North Street Bribaree
Saturday, 10 April 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
Time (hh:mm)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
30
25
20
15
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain

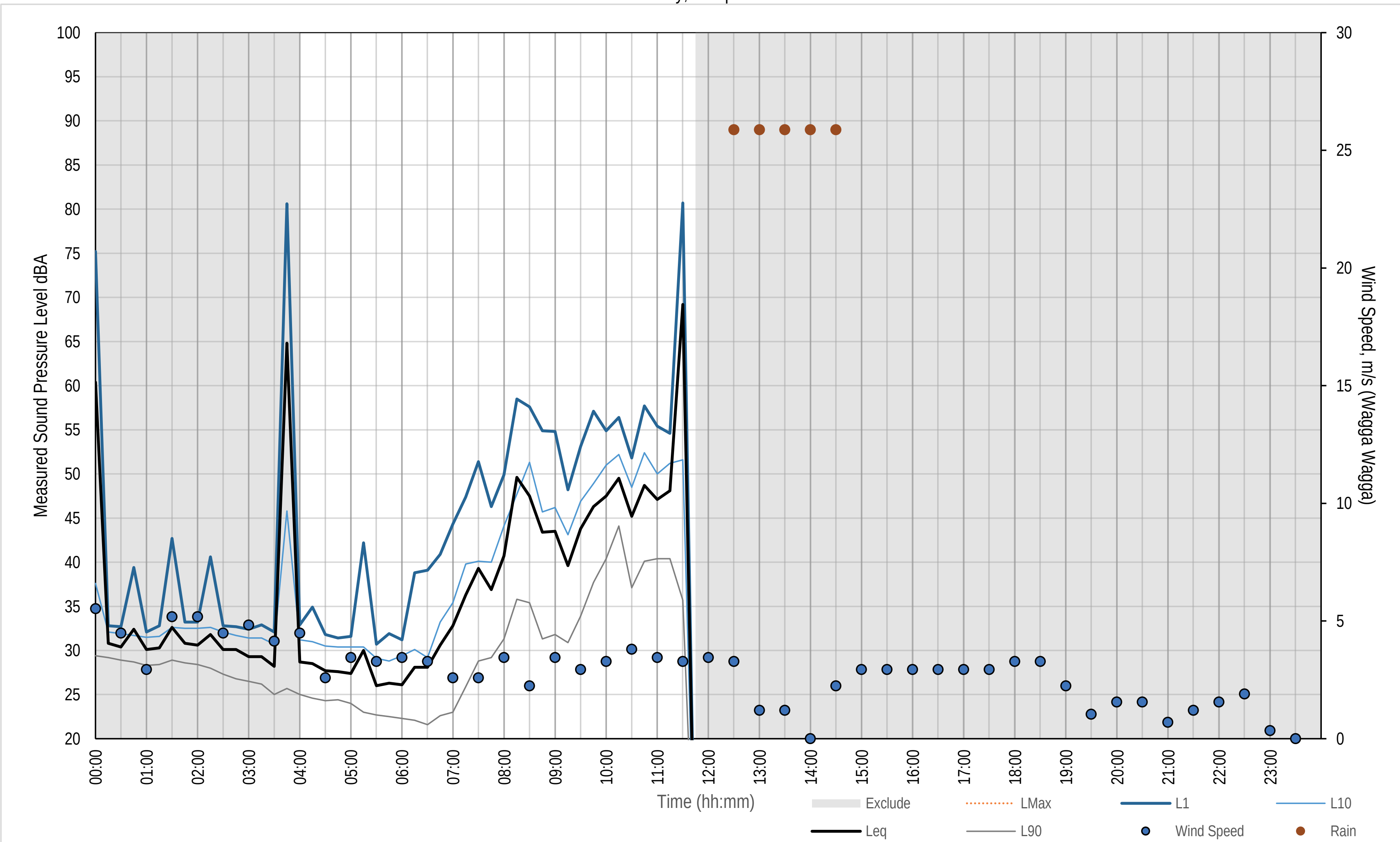
Measured Noise Levels - 4-1, 2 North Street Bribaree

Sunday, 11 April 2021



Measured Noise Levels - 4-1, 2 North Street Bribaree

Monday, 12 April 2021



Site Details	4-3, 14 RAILWAY STREET, BRIBBAREE	**Microphone Position**	1.5m - free field
Start Date	Tue 02 March 2021		
End Date	Tue 16 March 2021		

Measurement Summary

Date	02-03	03-03	04-03	05-03	06-03	07-03	08-03	09-03
$L_{eq,1\ hour\ day}$ dBA	70	70	69	69	73	64	66	73
$L_{eq,1\ hour\ night}$ dBA	64	61	61	63	63	58	59	61
$L_{eq,\ Day}$ dBA	65	54	63	60	62	55	57	64
$L_{eq,\ Evening}$ dBA	63	67	54	60	69	40	58	57
$L_{eq,\ Night}$ dBA	60	58	65	58	57	64	54	34
RBL, $_{Day}$ dBA		31	35	33	34	31	36	33
RBL, $_{Evening}$ dBA	32	39	37	33	37	36	36	35
RBL, $_{Night}$ dBA	20	23	28	19	31	30	23	28

Date	10-03	11-03	12-03	13-03	14-03	15-03	16-03	
$L_{eq,1\ hour\ day}$ dBA	73	71	71	75	73	69	58	
$L_{eq,1\ hour\ night}$ dBA	63	63	62	63	61	59	58	
$L_{eq,\ Day}$ dBA	65	65	60	58	63	60	54	
$L_{eq,\ Evening}$ dBA	64	55	65	72	60	59		
$L_{eq,\ Night}$ dBA	58	61	61	43	55	59		
RBL, $_{Day}$ dBA	32		33	33	34	31		
RBL, $_{Evening}$ dBA	34	36	35		29	27		
RBL, $_{Night}$ dBA		27		31	22	18		

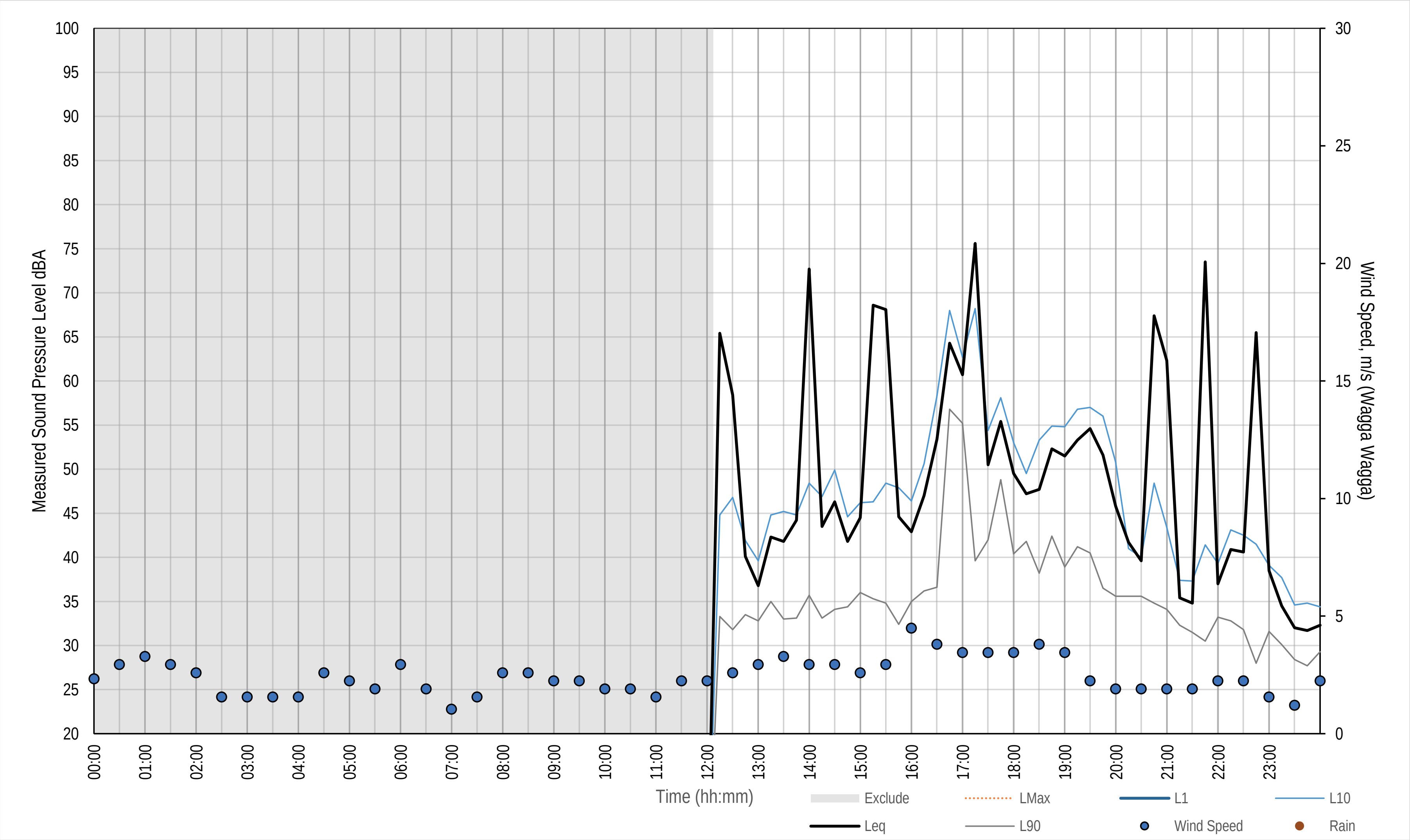
Summary	**Average (dBA)**
$L_{eq,\ Day}$ dBA	60
$L_{eq,\ Evening}$ dBA	60
$L_{eq,\ Night}$ dBA	56
RBL, $_{Day}$ dBA	33
RBL, $_{Evening}$ dBA	35
RBL, $_{Night}$ dBA	25

Summary	**Average (dBA)**
$L_{eq,1\ hour\ day}$ dBA	70
$L_{eq,1\ hour\ night}$ dBA	61
$L_{eq,\ 15\ hour\ day}$ dBA	63
$L_{eq,\ 9\ hour\ night}$ dBA	60

Site Photo

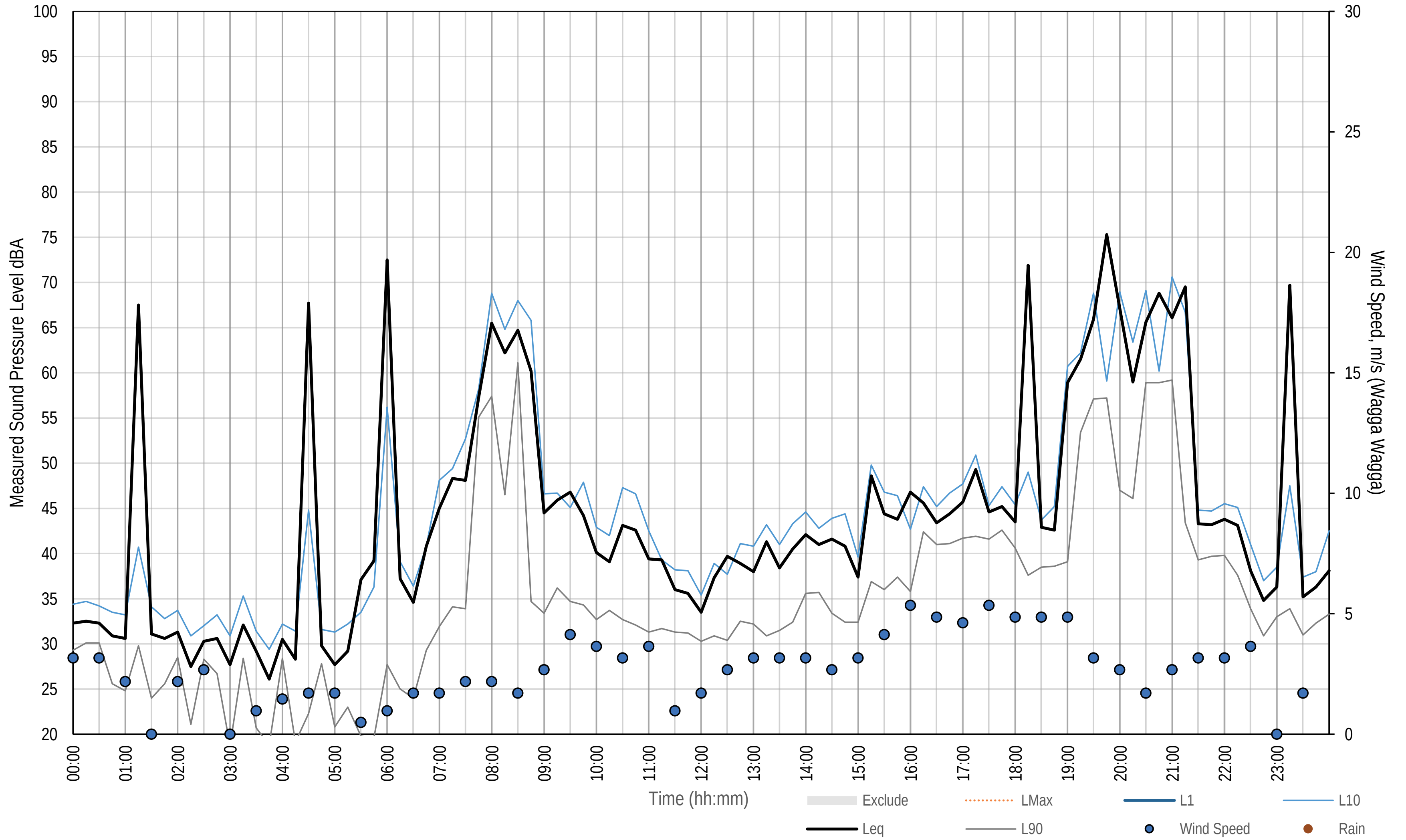
Measured Noise Levels - 4-3, 14 RAILWAY STREET, BRIBBAREE

Tuesday, 02 March 2021



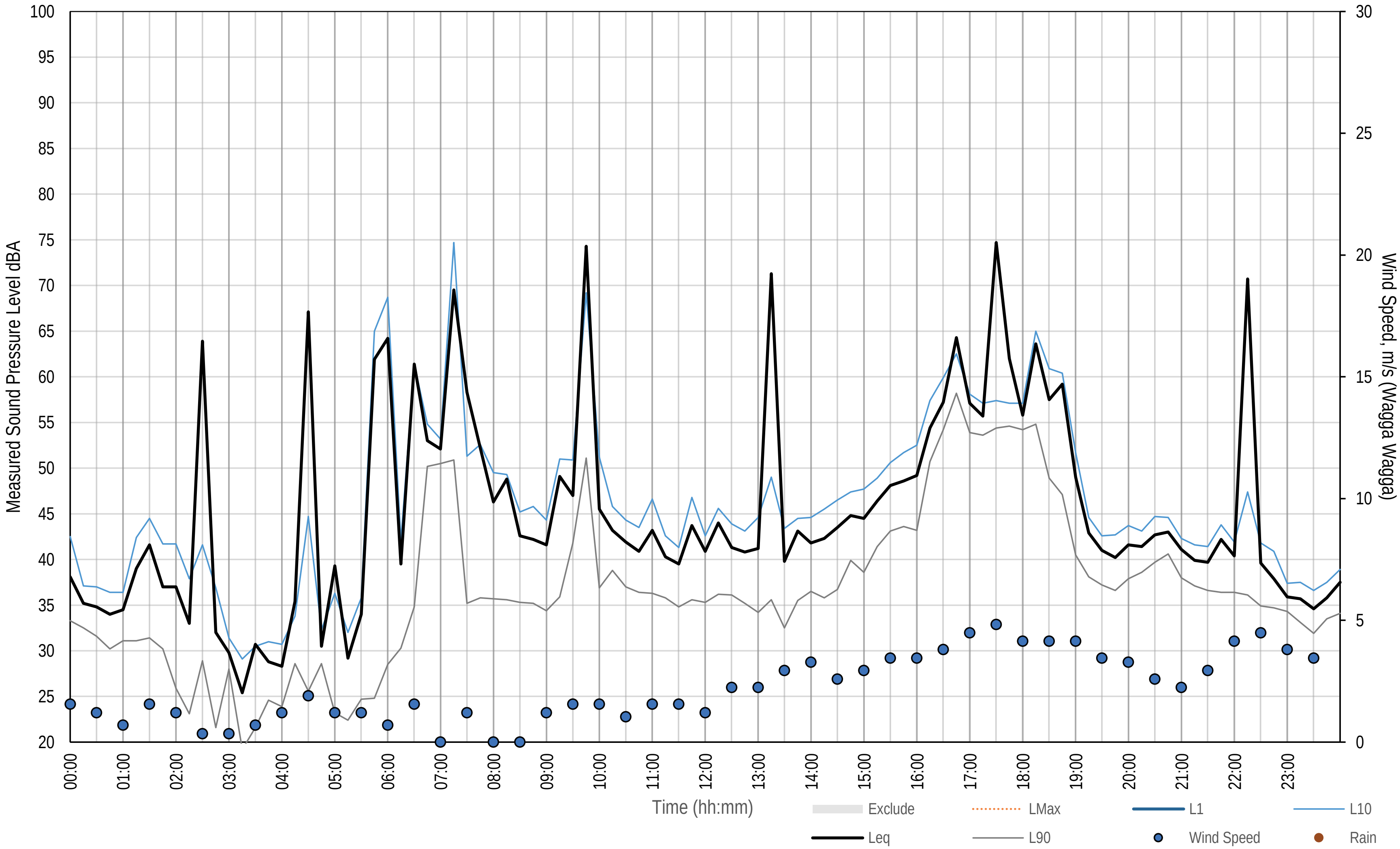
Measured Noise Levels - 4-3, 14 RAILWAY STREET, BRIBBAREE

Wednesday, 03 March 2021



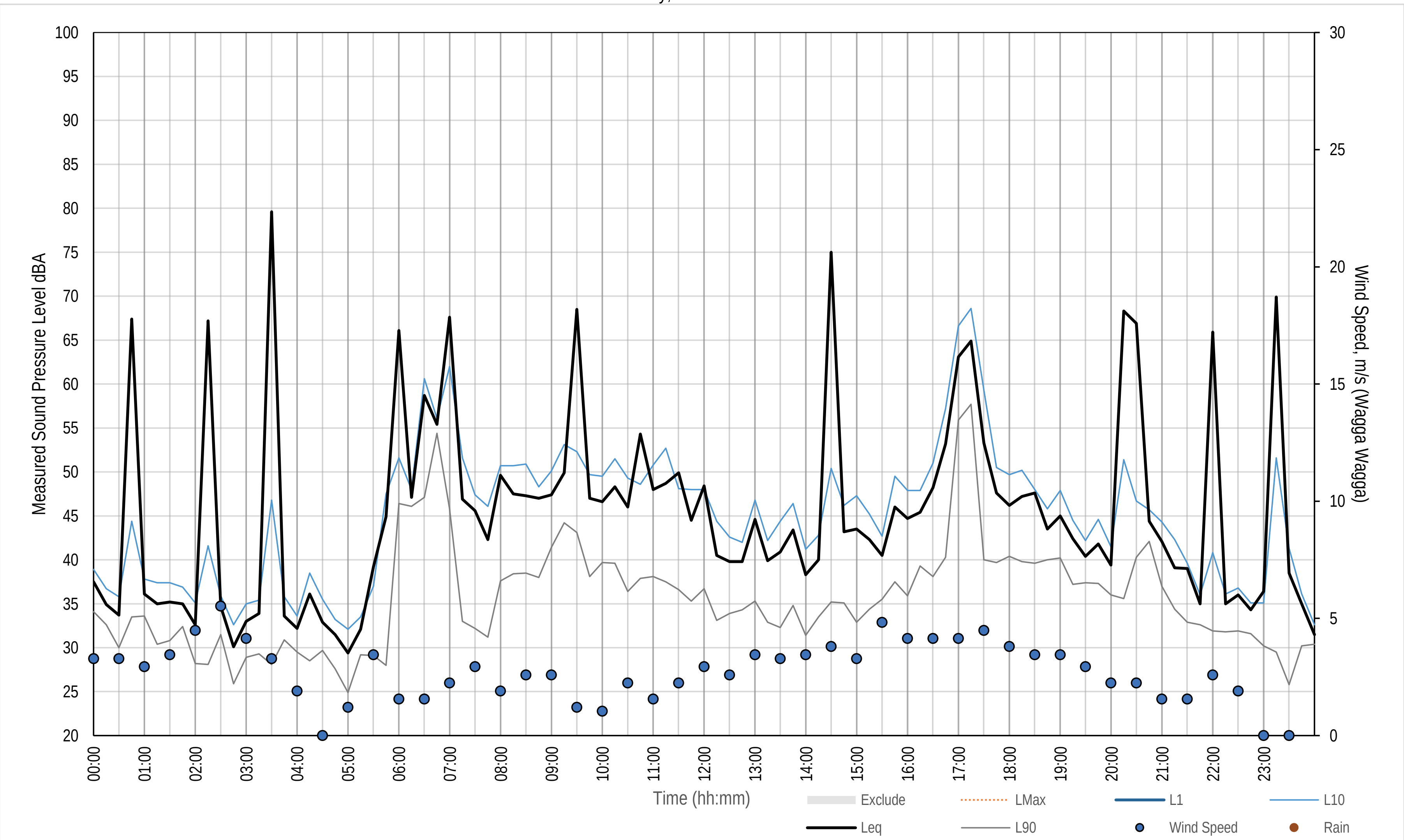
Measured Noise Levels - 4-3, 14 RAILWAY STREET, BRIBBAREE

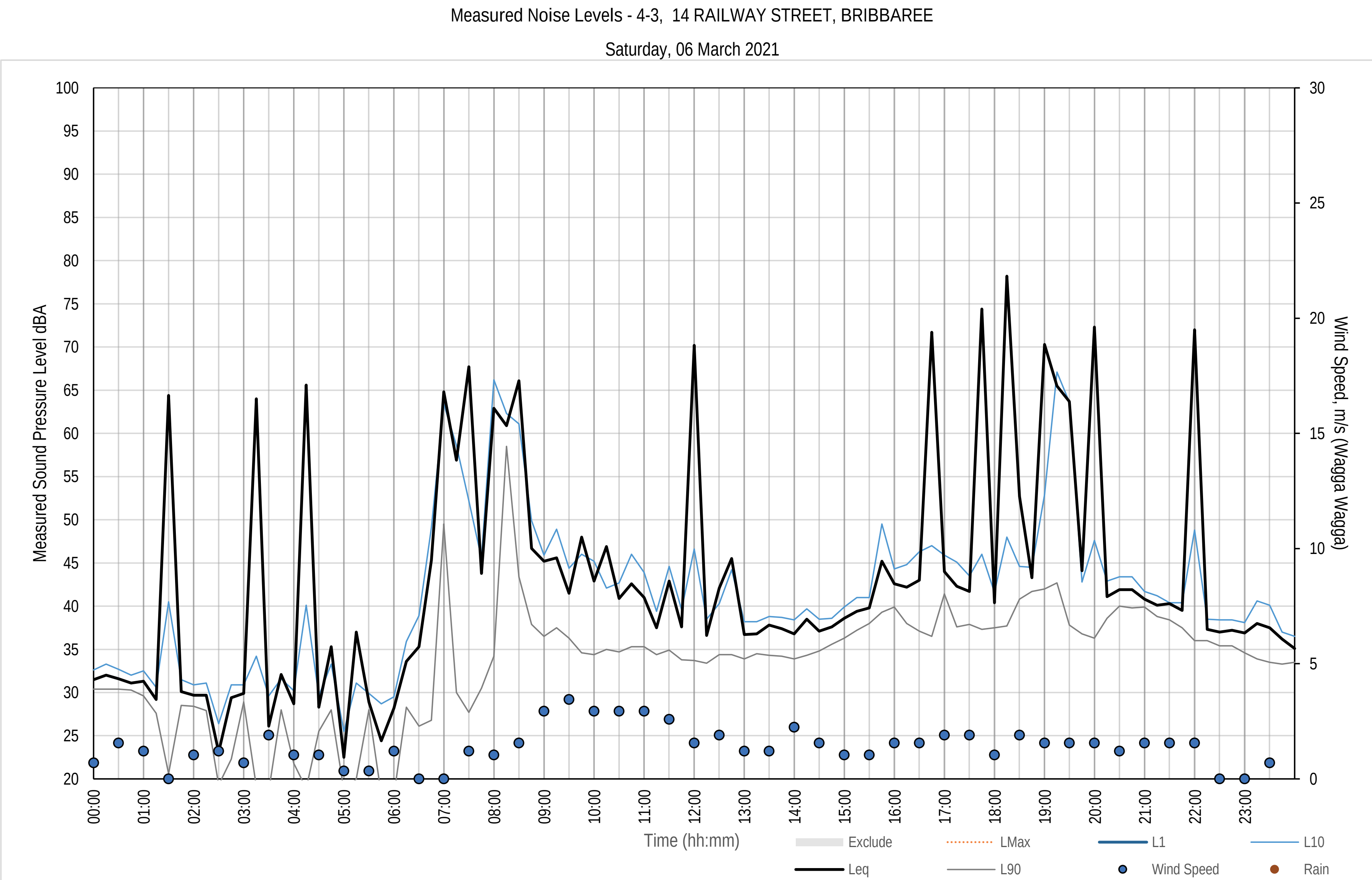
Thursday, 04 March 2021



Measured Noise Levels - 4-3, 14 RAILWAY STREET, BRIBBAREE

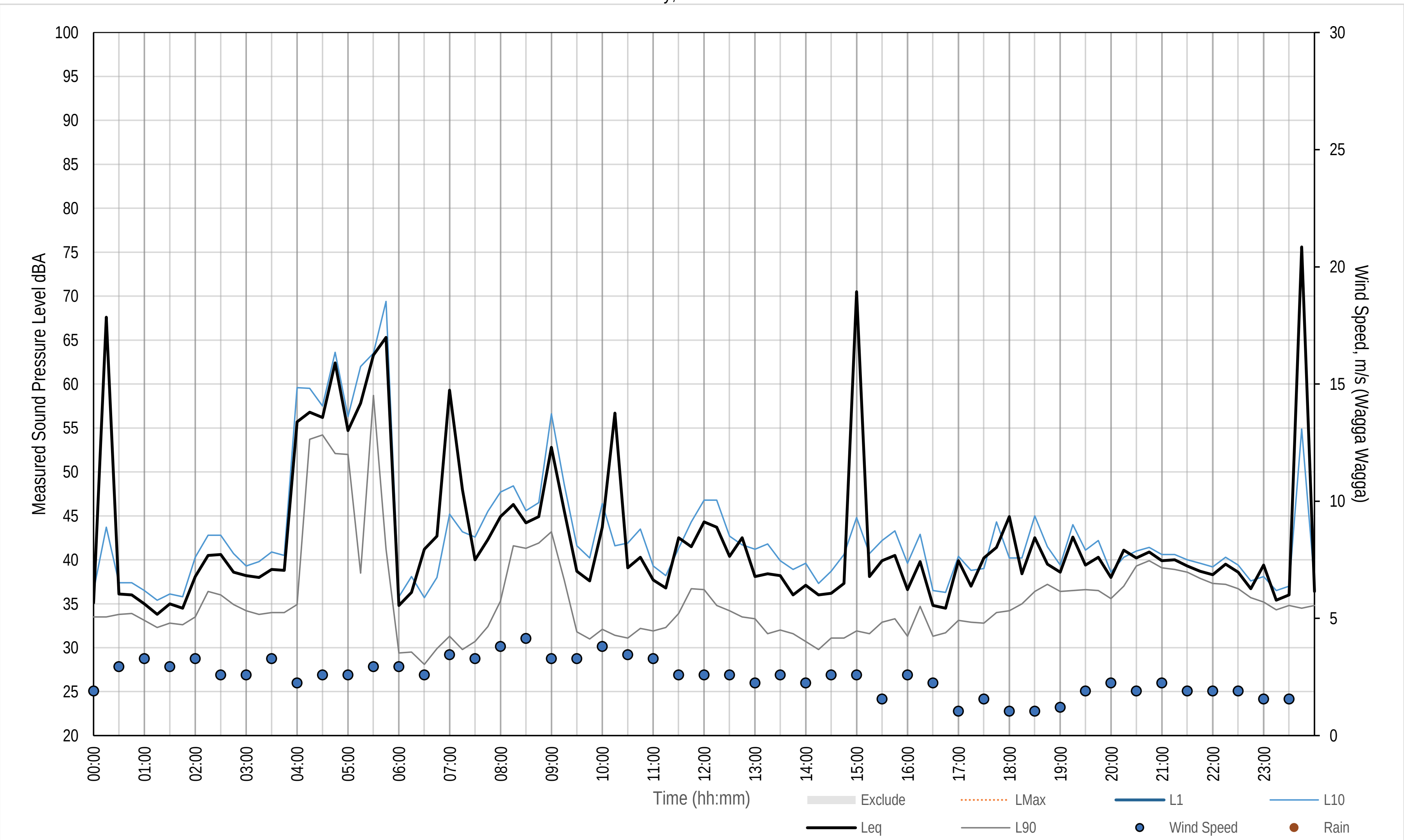
Friday, 05 March 2021

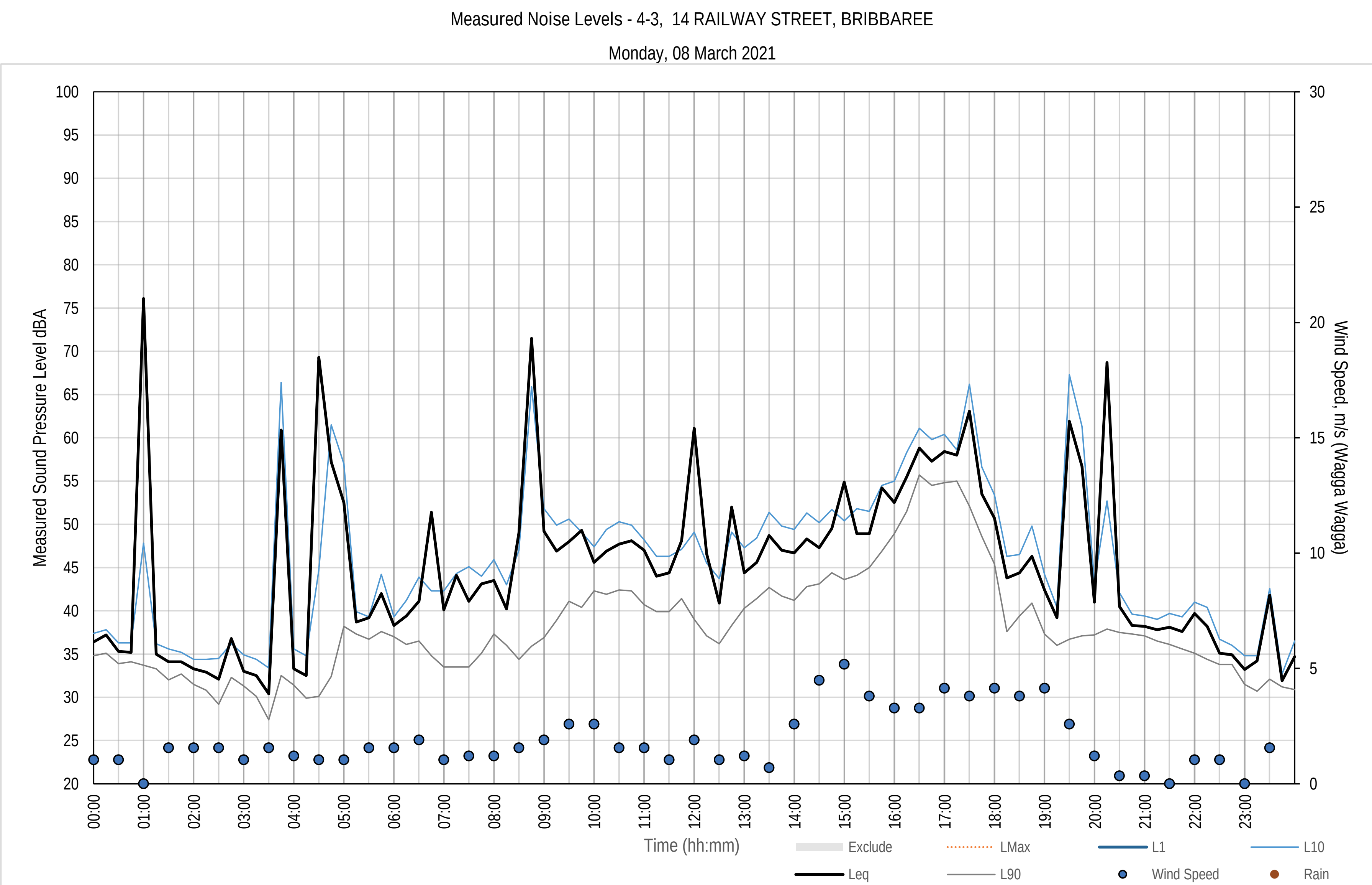



Measured Noise Levels - 4-3, 14 RAILWAY STREET, BRIBBAREE
Saturday, 06 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
Time (hh:mm)
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain

Measured Noise Levels - 4-3, 14 RAILWAY STREET, BRIBBAREE

Sunday, 07 March 2021

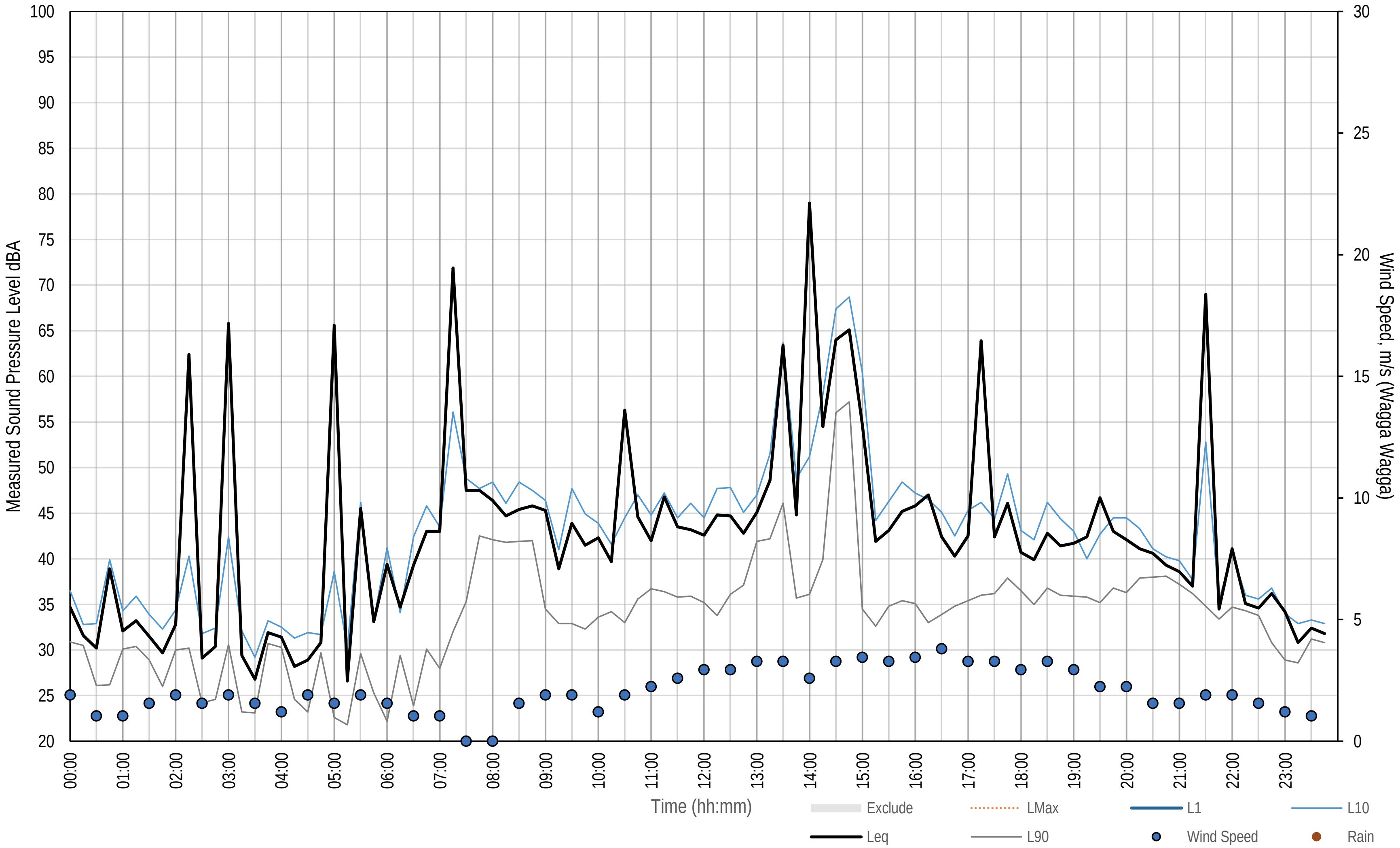




Measured Noise Levels - 4-3, 14 RAILWAY STREET, BRIBBAREE
Monday, 08 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
Time (hh:mm)
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain

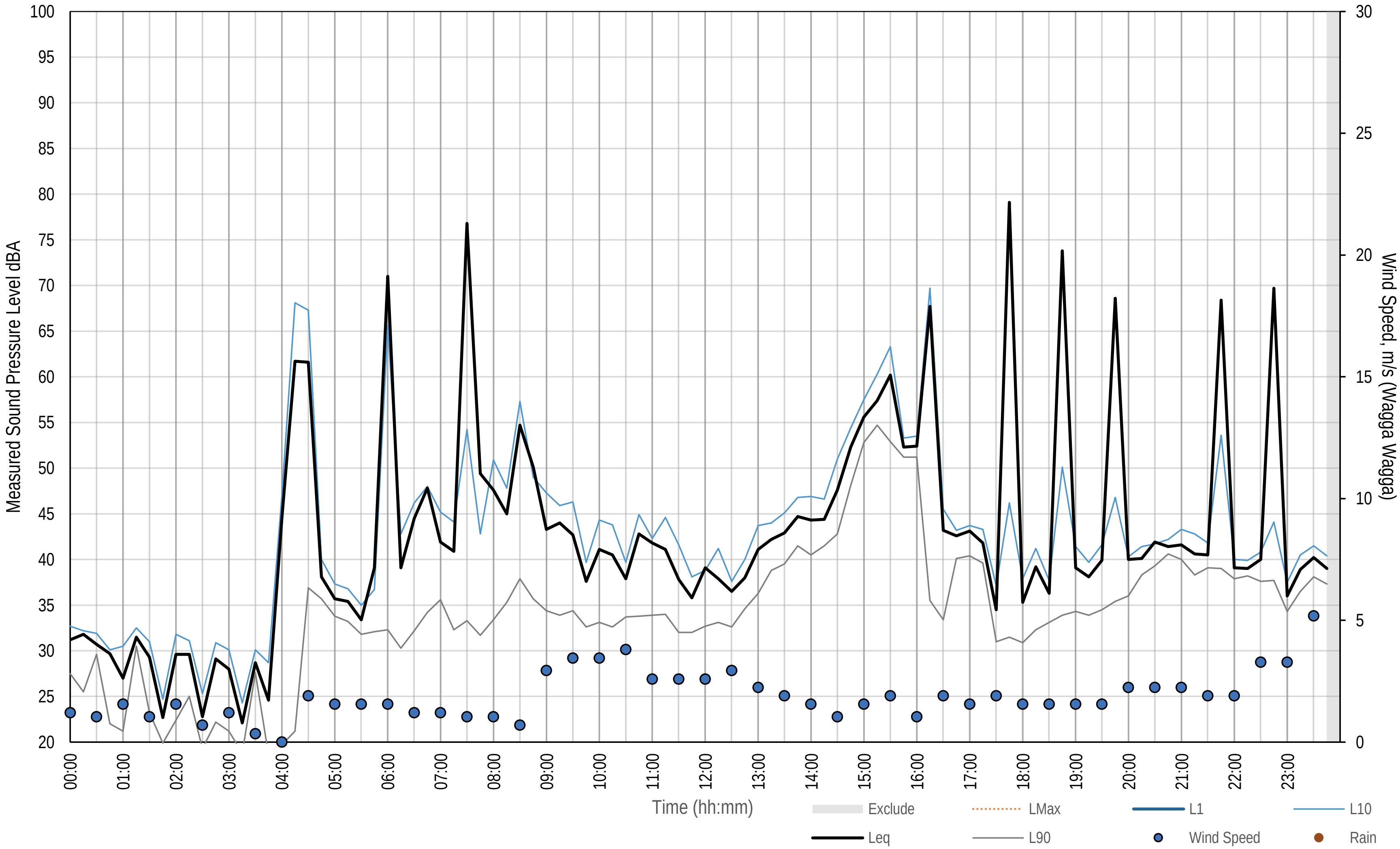
Measured Noise Levels - 4-3, 14 RAILWAY STREET, BRIBBAREE

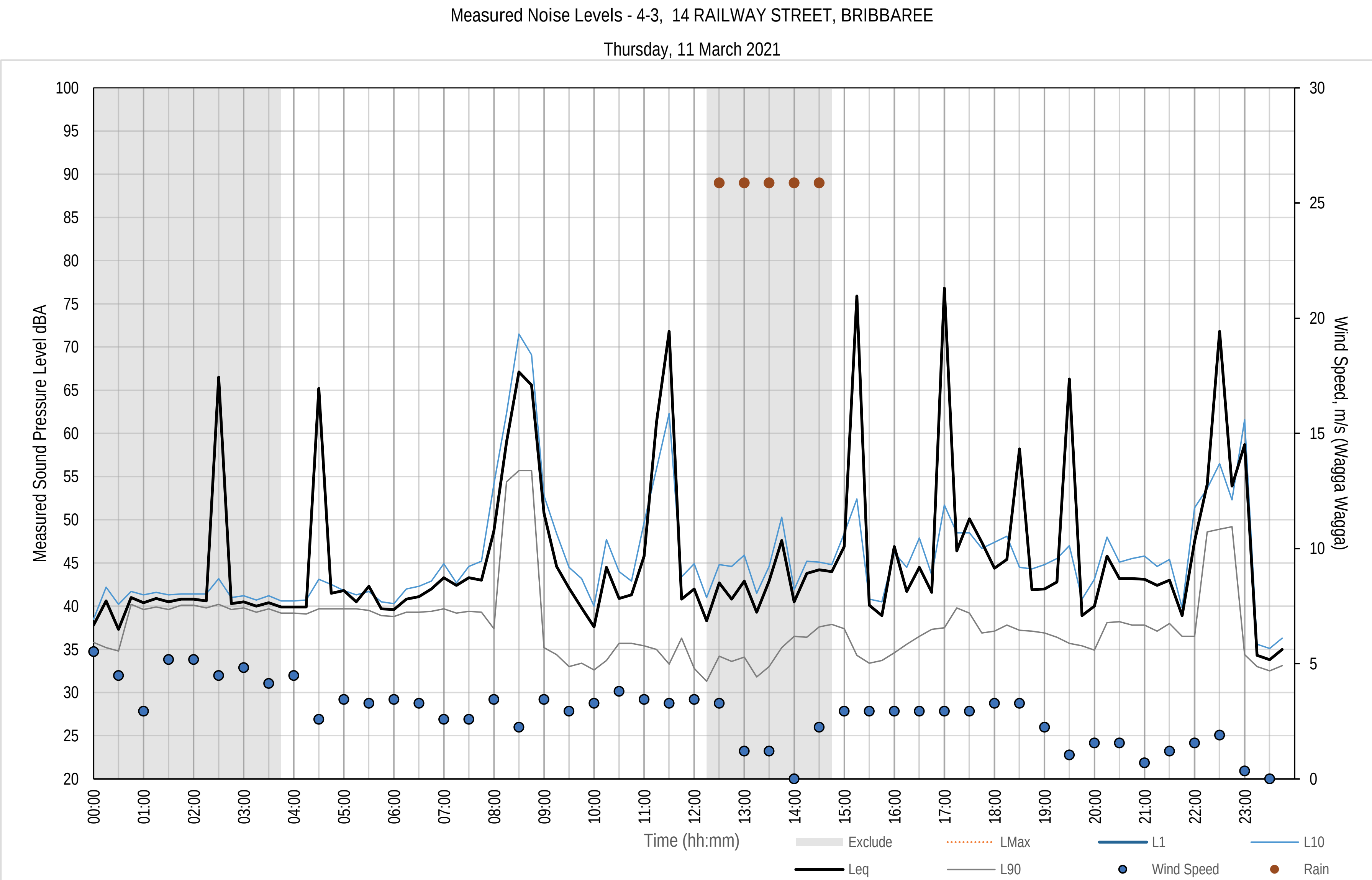
Tuesday, 09 March 2021



Measured Noise Levels - 4-3, 14 RAILWAY STREET, BRIBBAREE

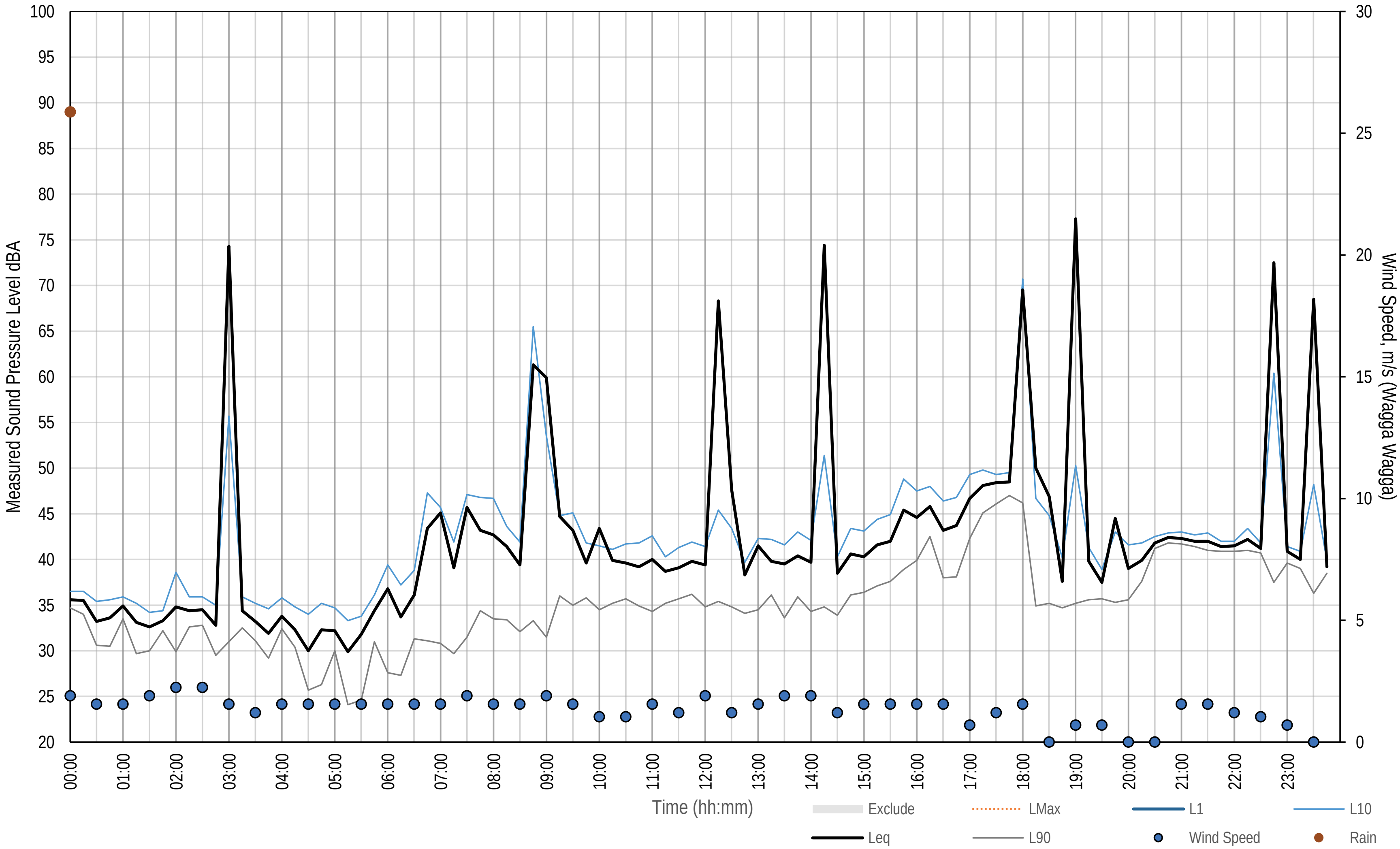
Wednesday, 10 March 2021

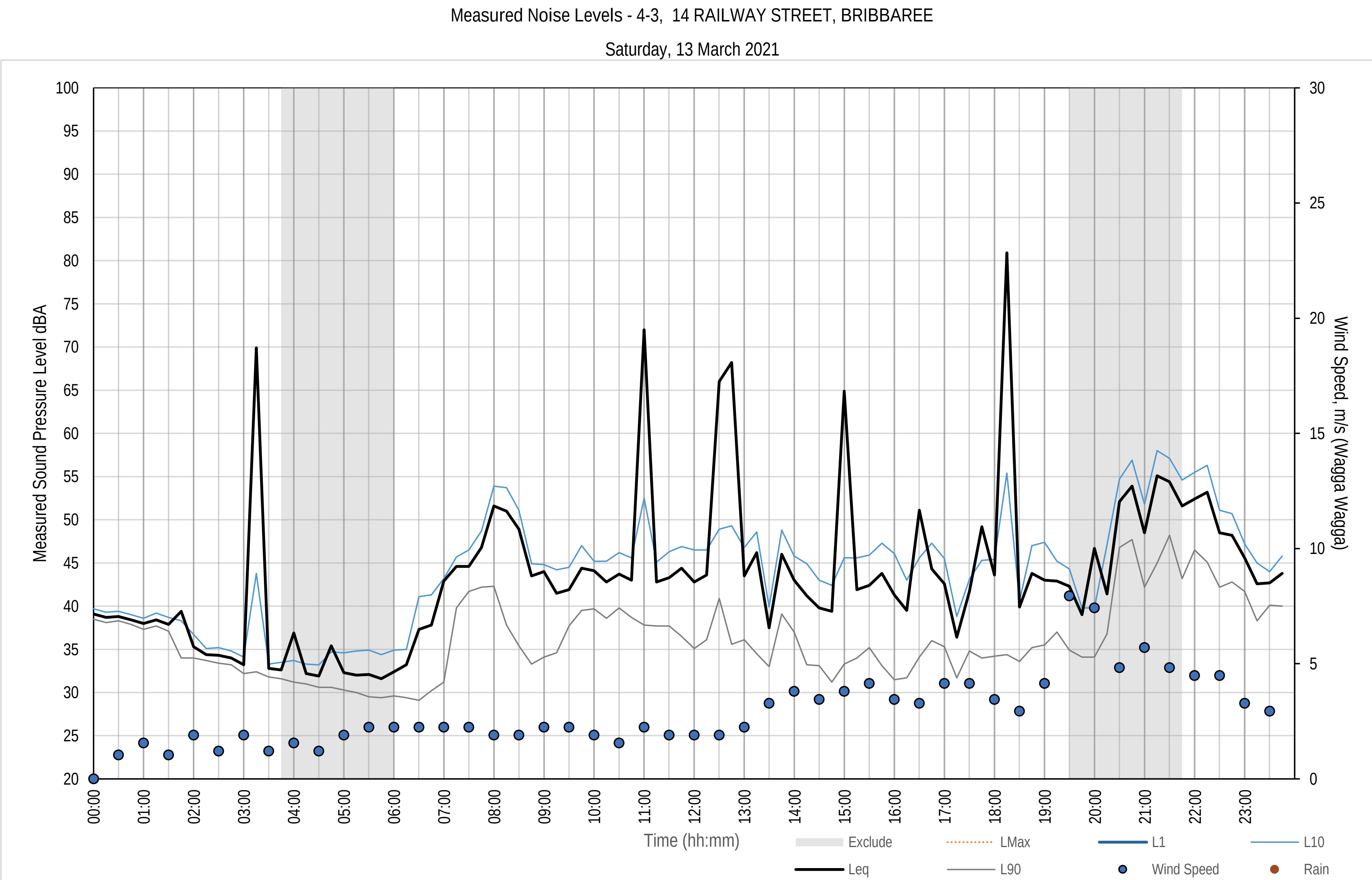



Measured Noise Levels - 4-3, 14 RAILWAY STREET, BRIBBAREE
Thursday, 11 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
Time (hh:mm)
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain

Measured Noise Levels - 4-3, 14 RAILWAY STREET, BRIBBAREE

Friday, 12 March 2021

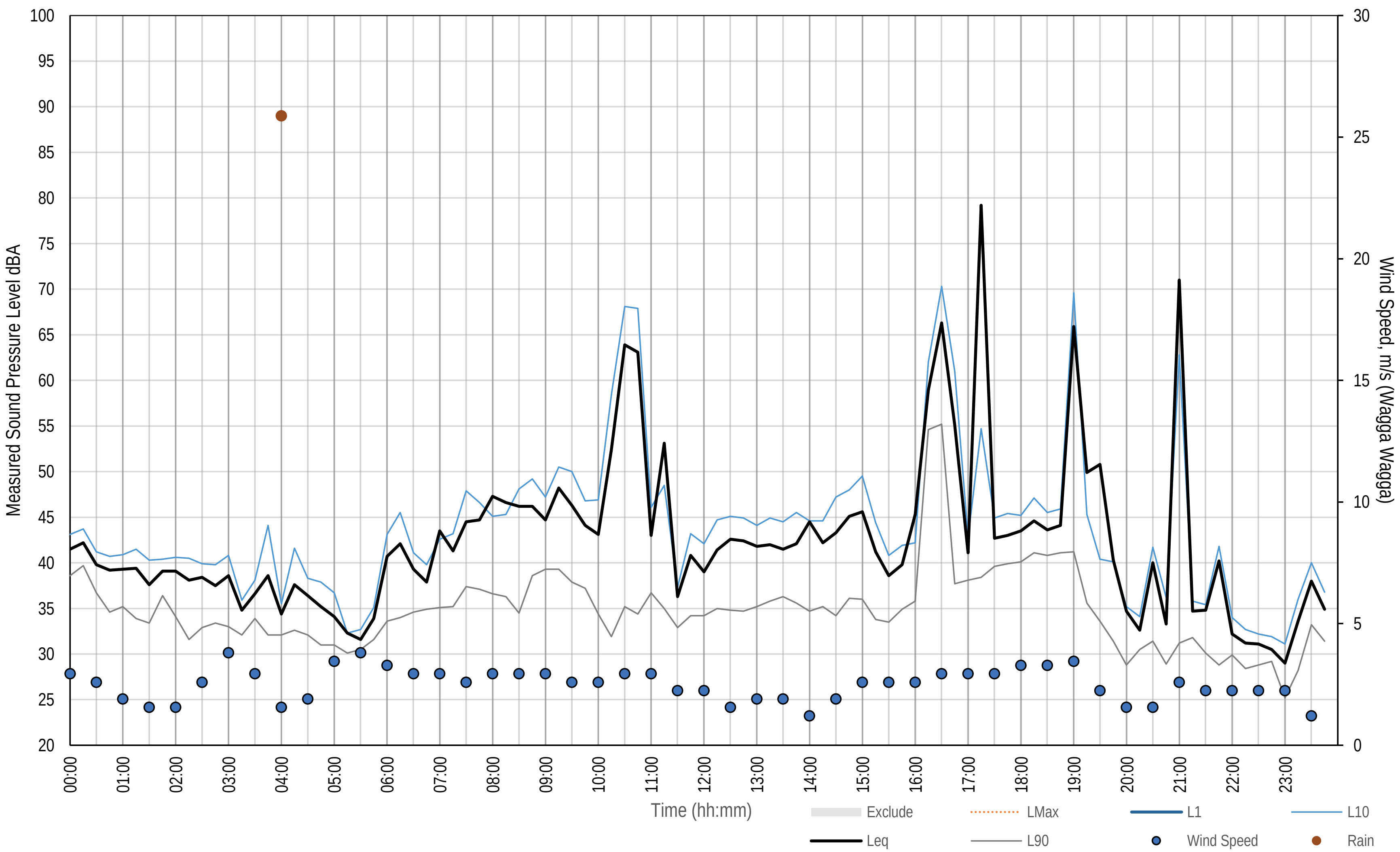




Measured Noise Levels - 4-3, 14 RAILWAY STREET, BRIBBAREE
Saturday, 13 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
Time (hh:mm)
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain

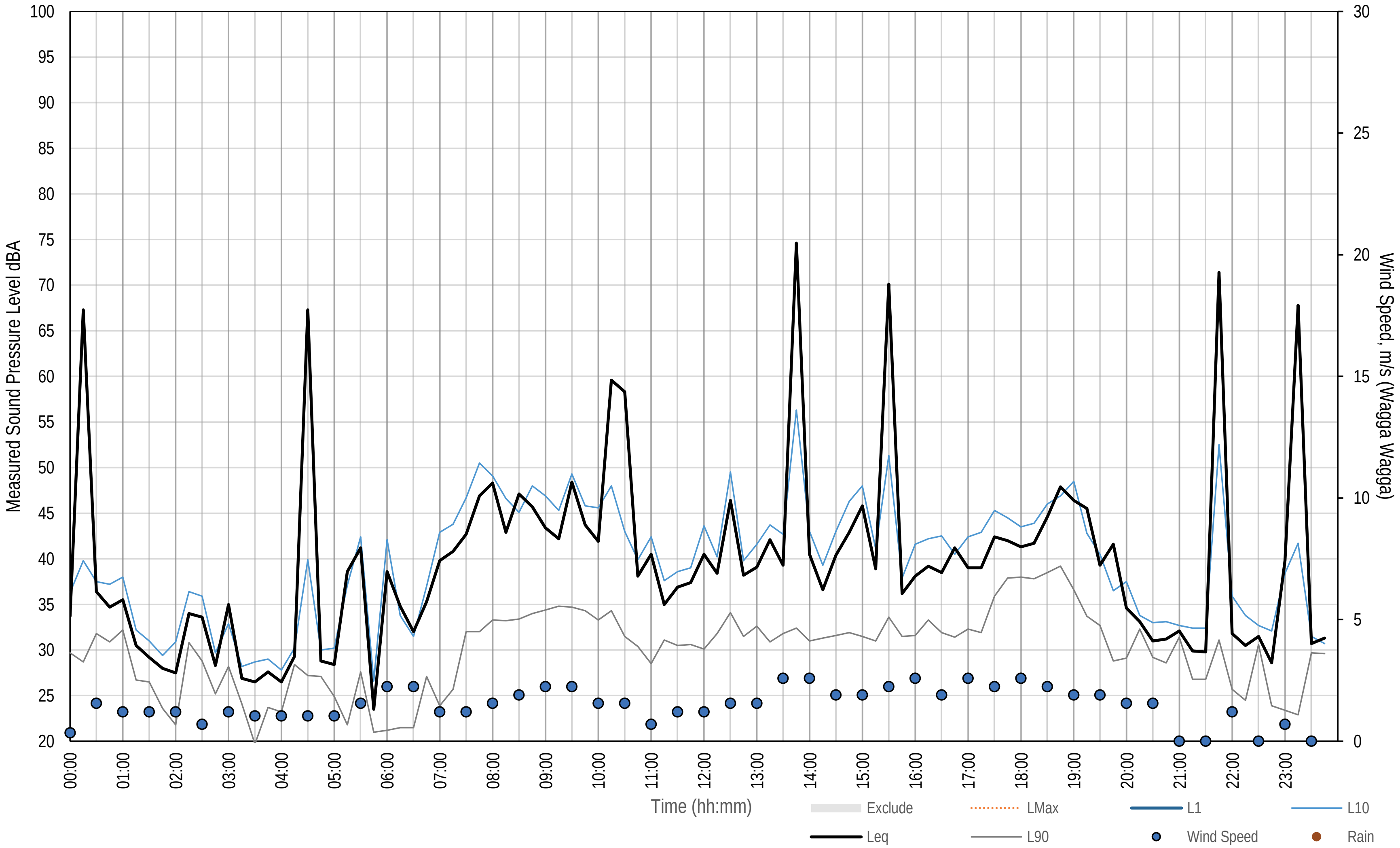
Measured Noise Levels - 4-3, 14 RAILWAY STREET, BRIBBAREE

Saturday, 13 March 2021



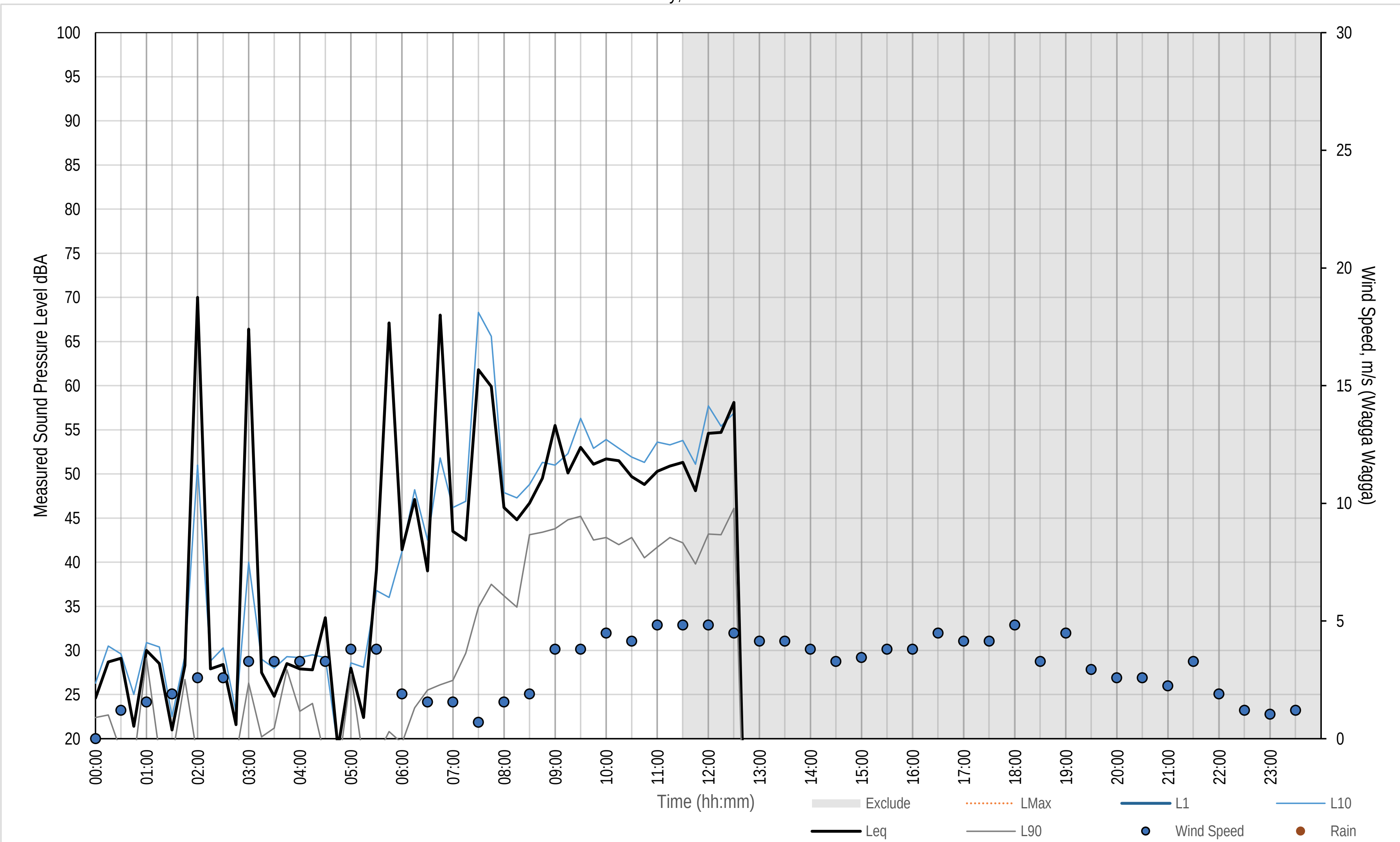
Measured Noise Levels - 4-3, 14 RAILWAY STREET, BRIBBAREE

Sunday, 14 March 2021



Measured Noise Levels - 4-3, 14 RAILWAY STREET, BRIBBAREE

Monday, 15 March 2021



APPENDIX A-6
MILVALE YARD

Site Details	3-1, 18 Schillers Road, Milvale	**Microphone Position**	1.5m - free field
Start Date	Tue 02 March 2021		
End Date	Tue 16 March 2021		

Measurement Summary

Date	02-03	03-03	04-03	05-03	06-03	07-03	08-03	09-03
$L_{eq,1\ hour\ day}$ dBA	59	57	56	55	58	52	56	52
$L_{eq,1\ hour\ night}$ dBA	53	51	52	50	50	47	50	47
$L_{eq,\ Day}$ dBA	52	52	52	50	49	46	49	47
$L_{eq,\ Evening}$ dBA	54	53	55	53	54	51	54	50
$L_{eq,\ Night}$ dBA	48	49	47	48	47	47	47	46
RBL, $_{Day}$ dBA		31	28	32	29	29	33	30
RBL, $_{Evening}$ dBA	39	43	46	46	46	44	47	45
RBL, $_{Night}$ dBA	18	18	21	20	30	28	20	28

Date	10-03	11-03	12-03	13-03	14-03	15-03	16-03	
$L_{eq,1\ hour\ day}$ dBA	53	55	61	61	56	51	50	
$L_{eq,1\ hour\ night}$ dBA	49	51	53	51	50	49	46	
$L_{eq,\ Day}$ dBA	49	51	53	47	50	47	48	
$L_{eq,\ Evening}$ dBA	52	53	57	59	53	50		
$L_{eq,\ Night}$ dBA	47	49	49	50	47	48		
RBL, $_{Day}$ dBA	29		29	34	41	30		
RBL, $_{Evening}$ dBA	45	43	48		35	34		
RBL, $_{Night}$ dBA		32	36		17	18		

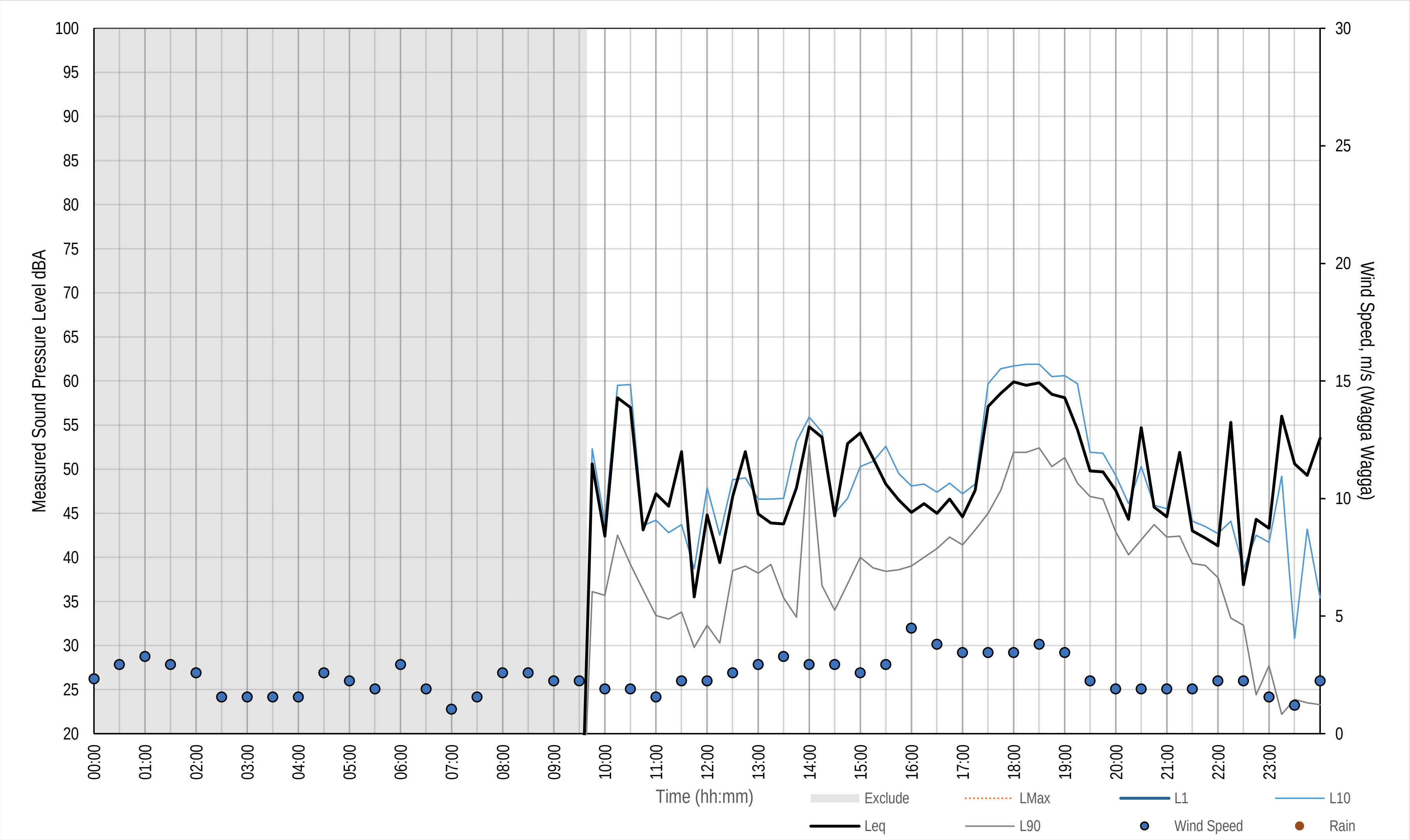
Summary	Average (dBA)
$L_{eq,\ Day}$ dBA	50
$L_{eq,\ Evening}$ dBA	53
$L_{eq,\ Night}$ dBA	48
RBL, $_{Day}$ dBA	30
RBL, $_{Evening}$ dBA	45
RBL, $_{Night}$ dBA	21

Summary	Average (dBA)
$L_{eq,1\ hour\ day}$ dBA	56
$L_{eq,1\ hour\ night}$ dBA	50
$L_{eq,\ 15\ hour\ day}$ dBA	51
$L_{eq,\ 9\ hour\ night}$ dBA	49

Site Photo

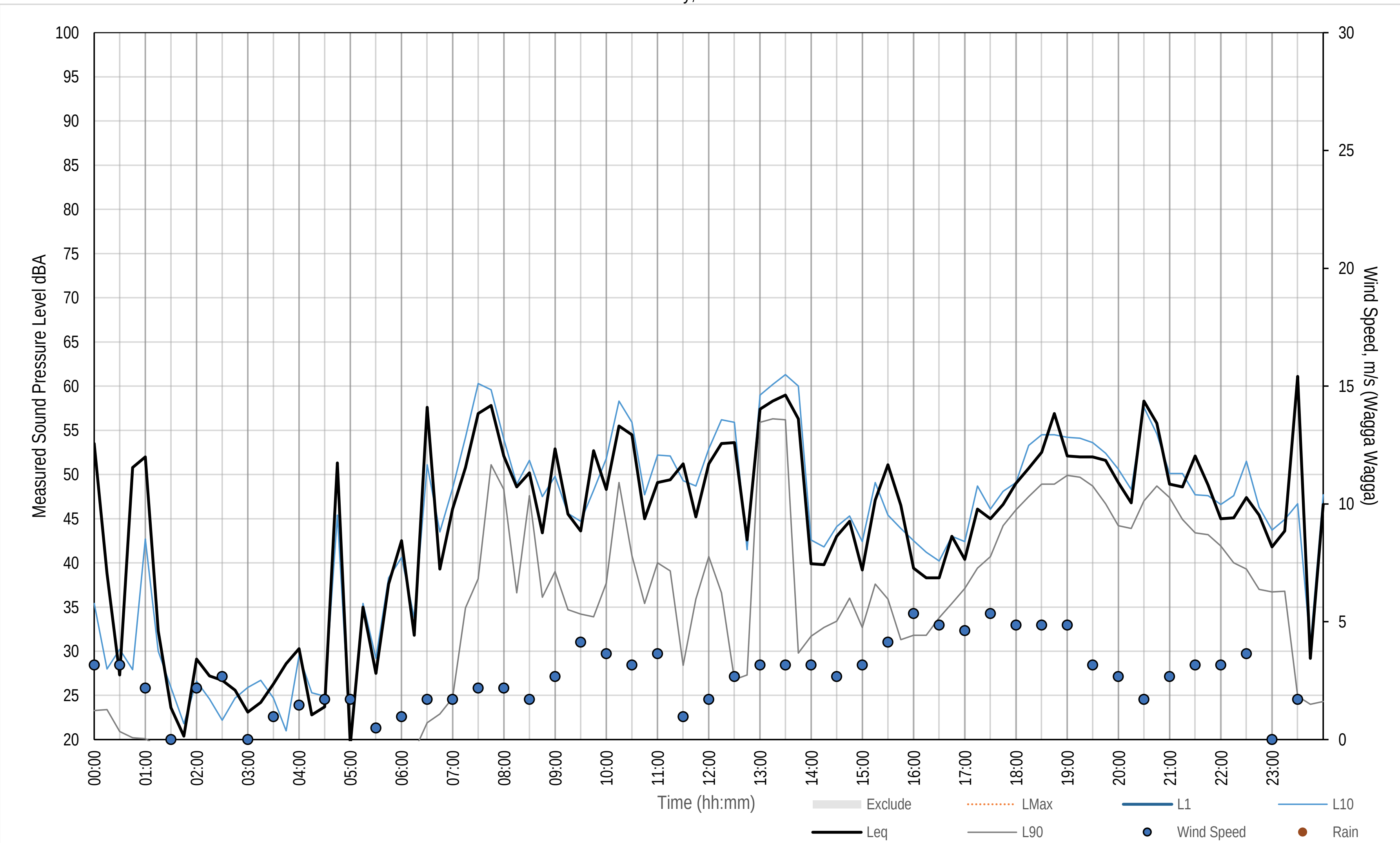
Measured Noise Levels - 3-1, 18 Schillers Road, Milvale

Tuesday, 02 March 2021



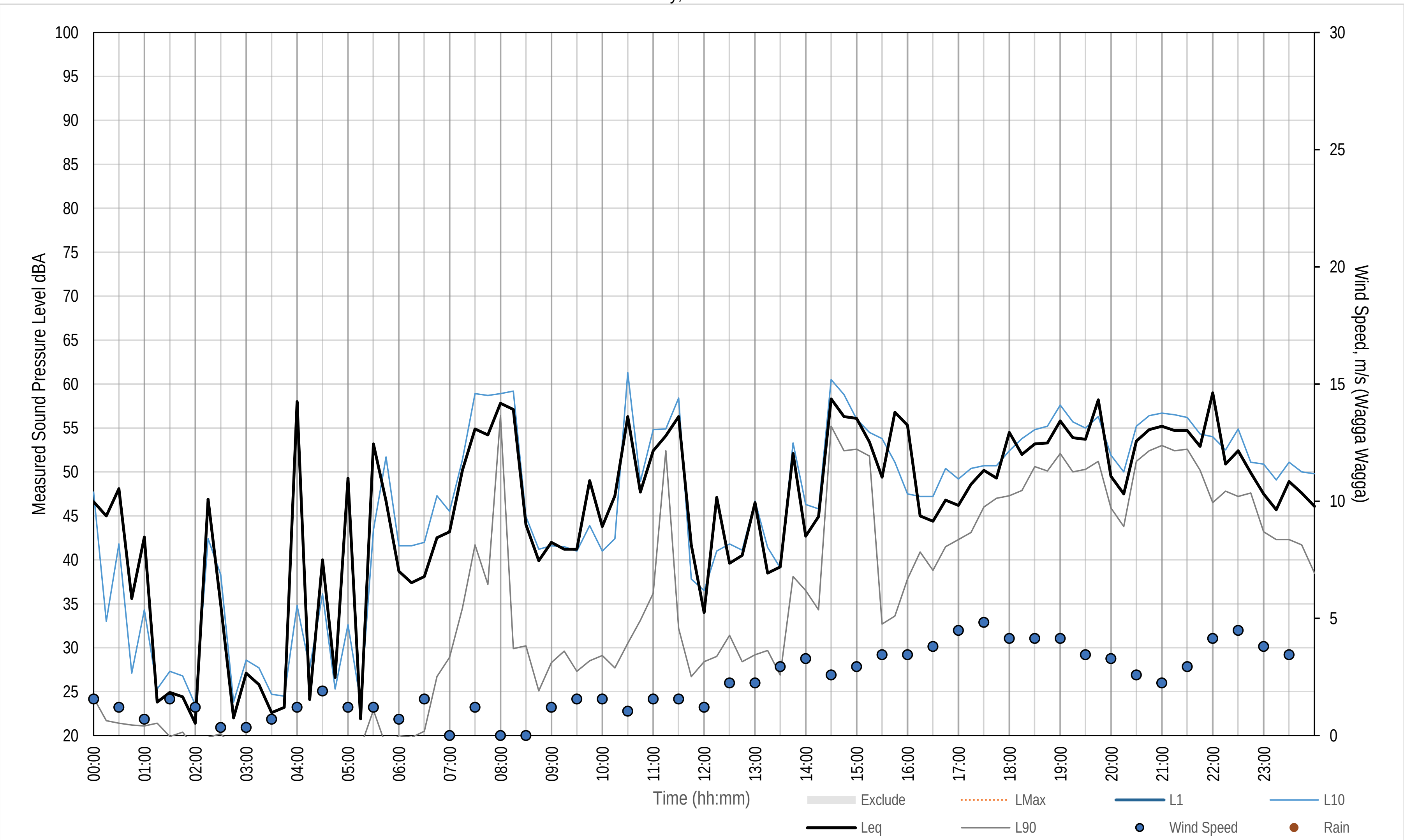
Measured Noise Levels - 3-1, 18 Schillers Road, Milvale

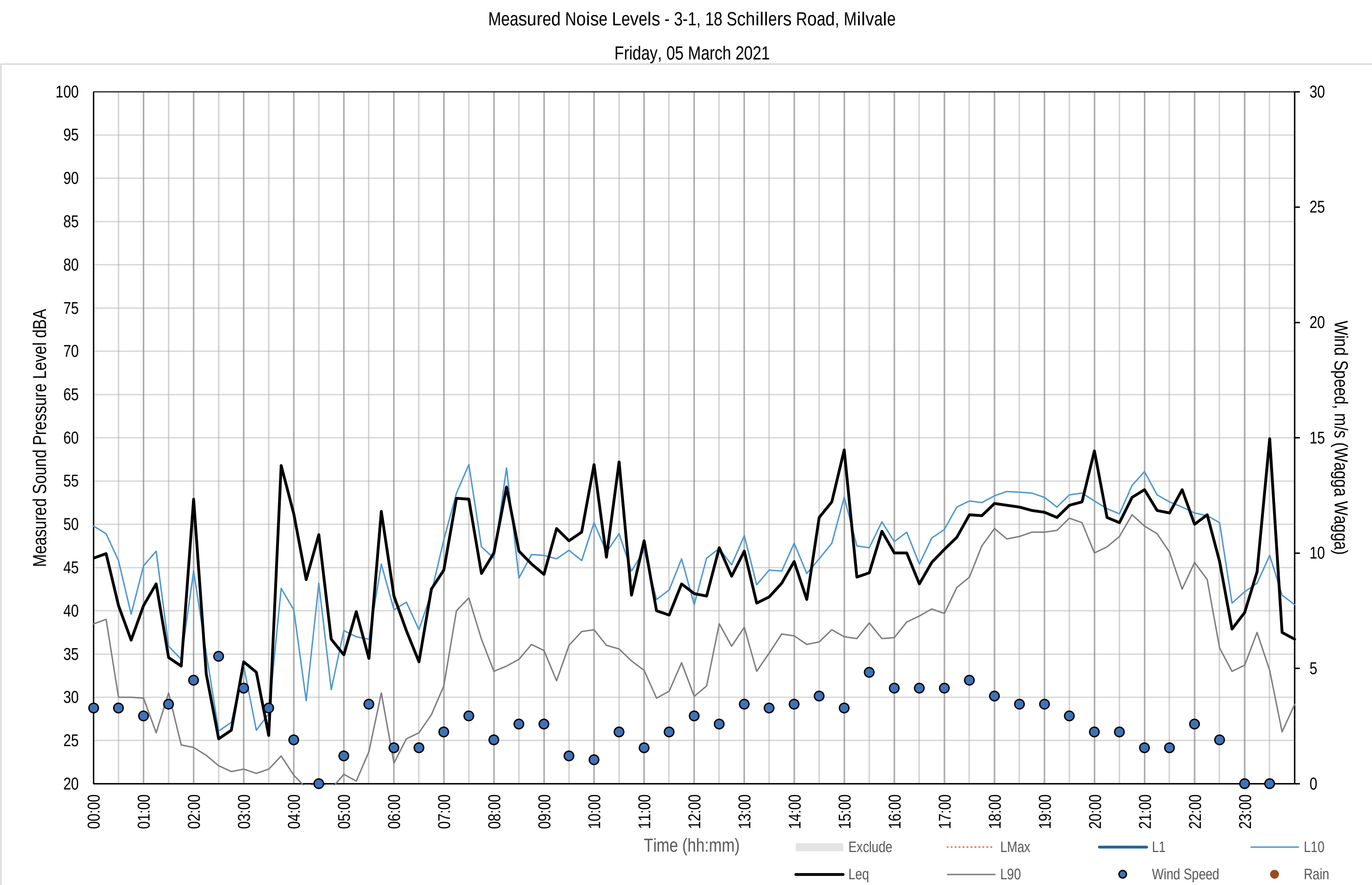
Wednesday, 03 March 2021

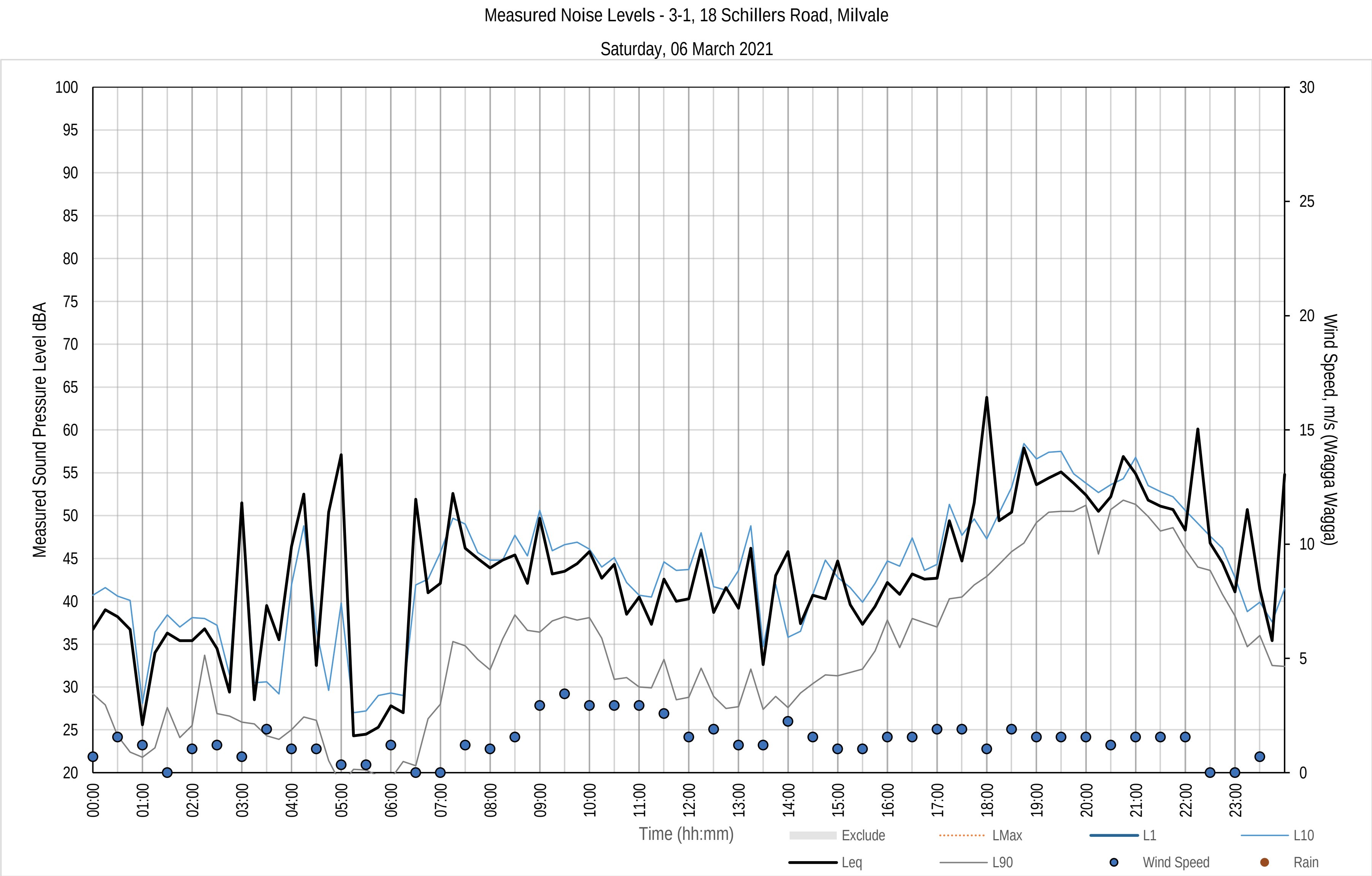


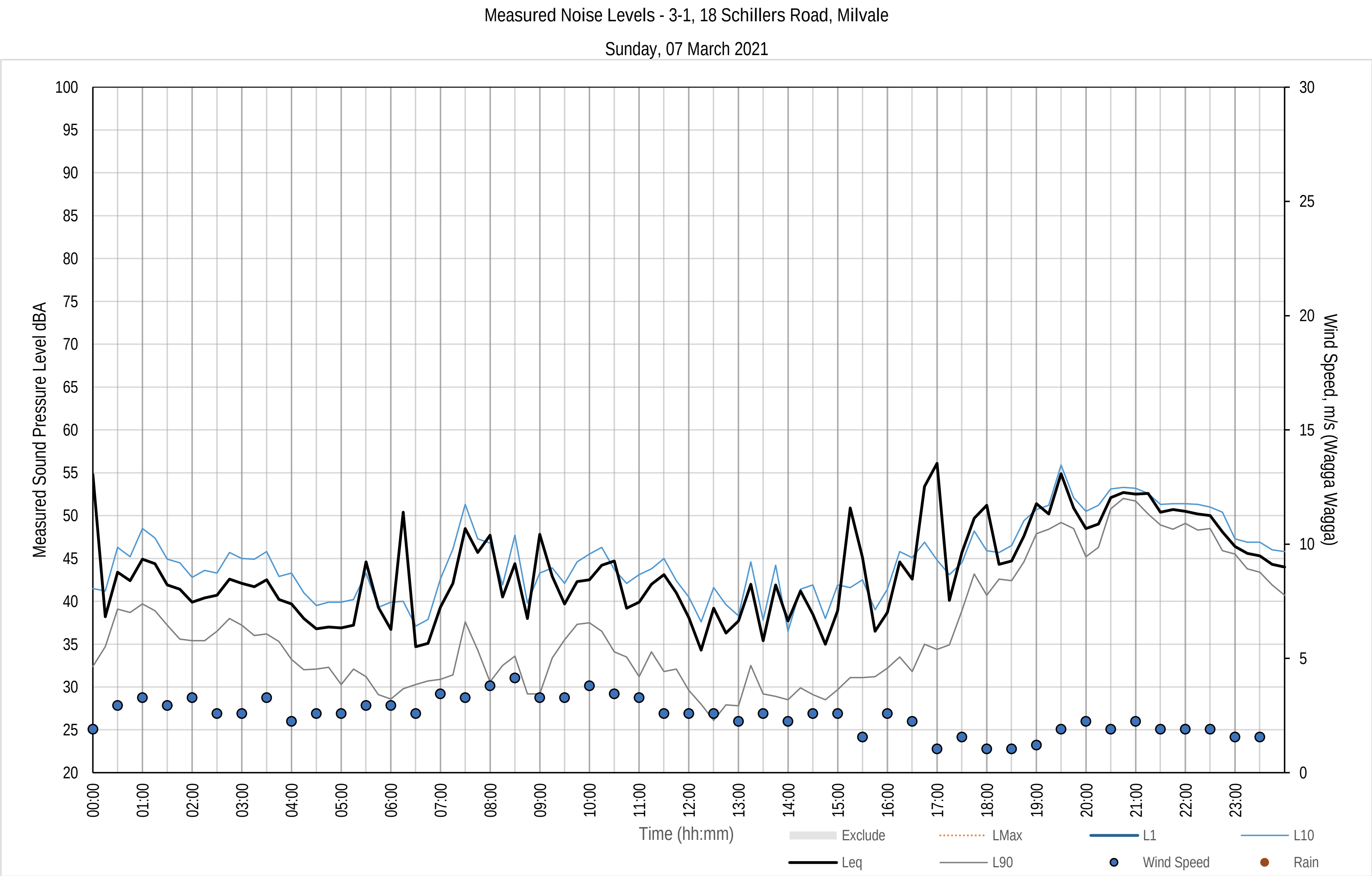
Measured Noise Levels - 3-1, 18 Schillers Road, Milvale

Thursday, 04 March 2021




Measured Noise Levels - 3-1, 18 Schillers Road, Milvale
Friday, 05 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
Time (hh:mm)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
30
25
20
15
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain

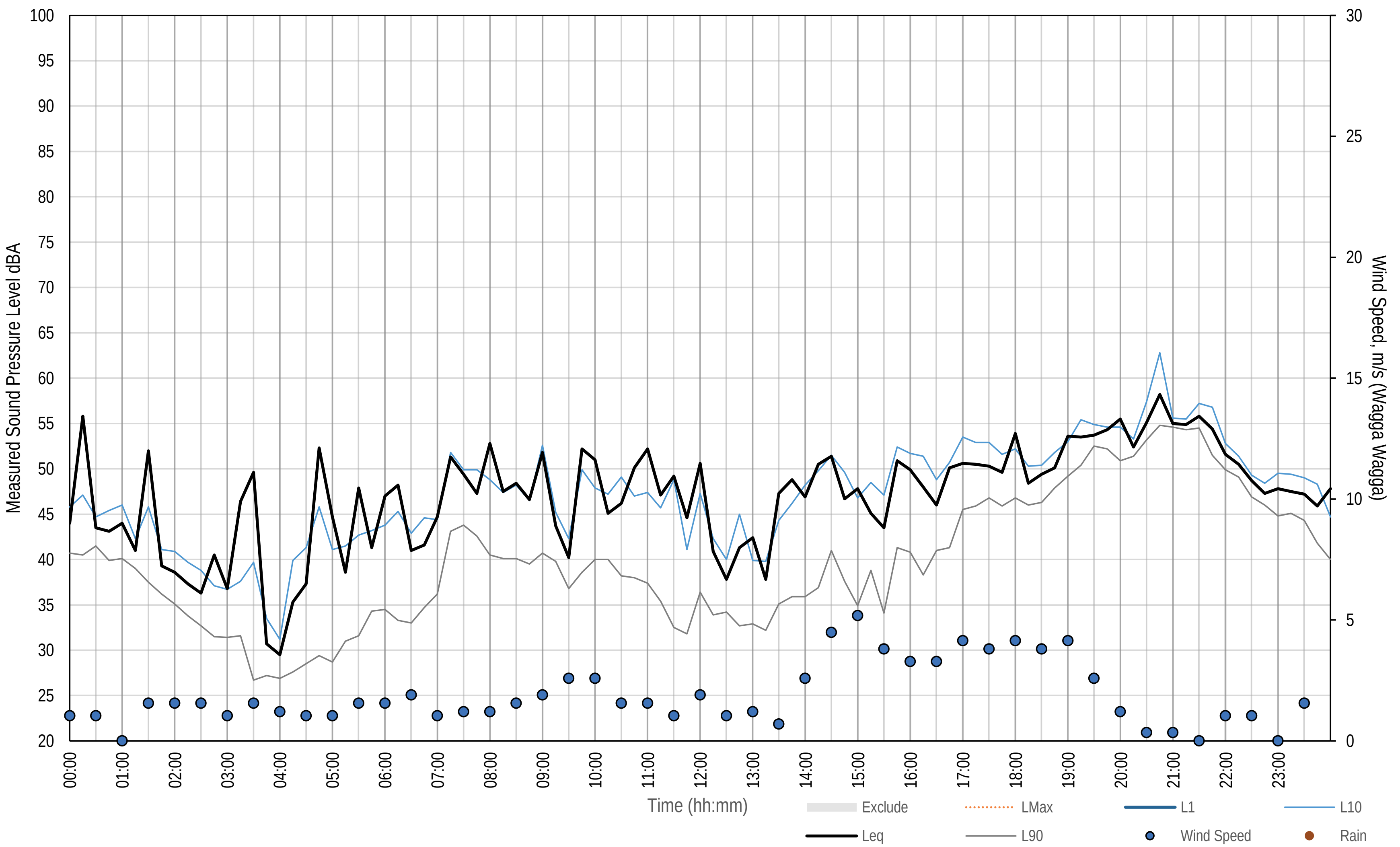

Measured Noise Levels - 3-1, 18 Schillers Road, Milvale
Saturday, 06 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
Time (hh:mm)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
30
25
20
15
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain



Measured Noise Levels - 3-1, 18 Schillers Road, Milvale
Sunday, 07 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
Time (hh:mm)
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain

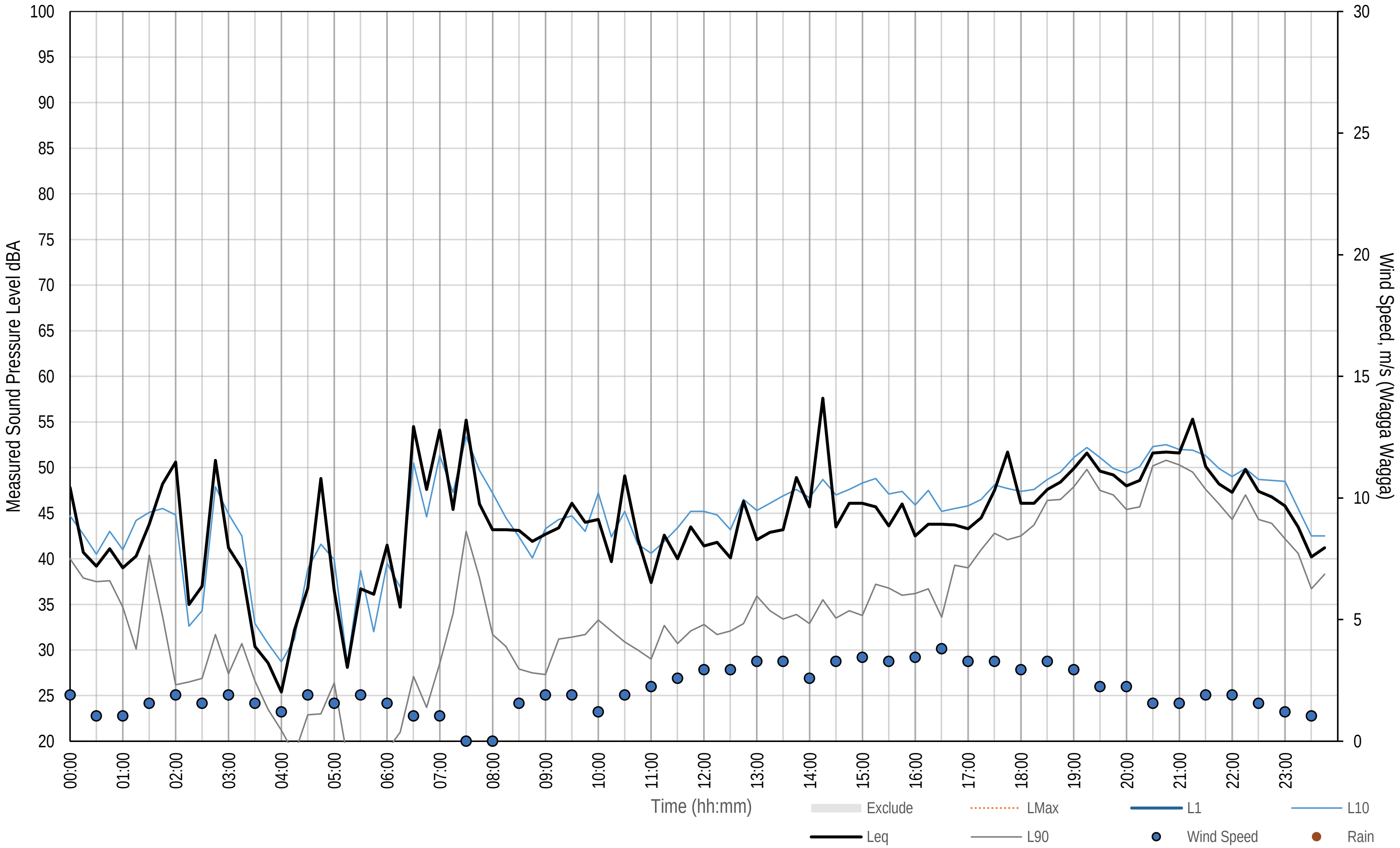
Measured Noise Levels - 3-1, 18 Schillers Road, Milvale

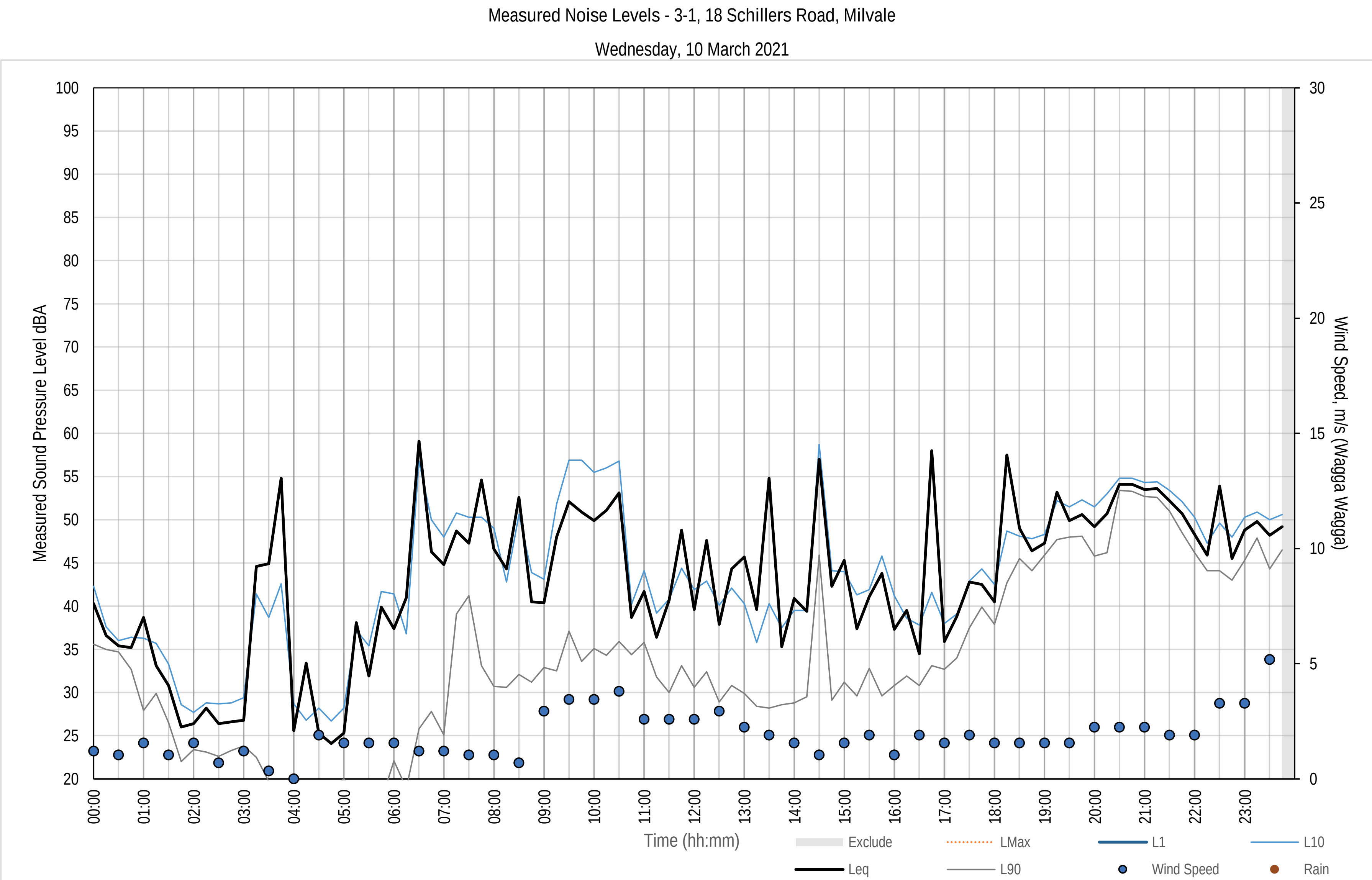
Monday, 08 March 2021



Measured Noise Levels - 3-1, 18 Schillers Road, Milvale

Tuesday, 09 March 2021

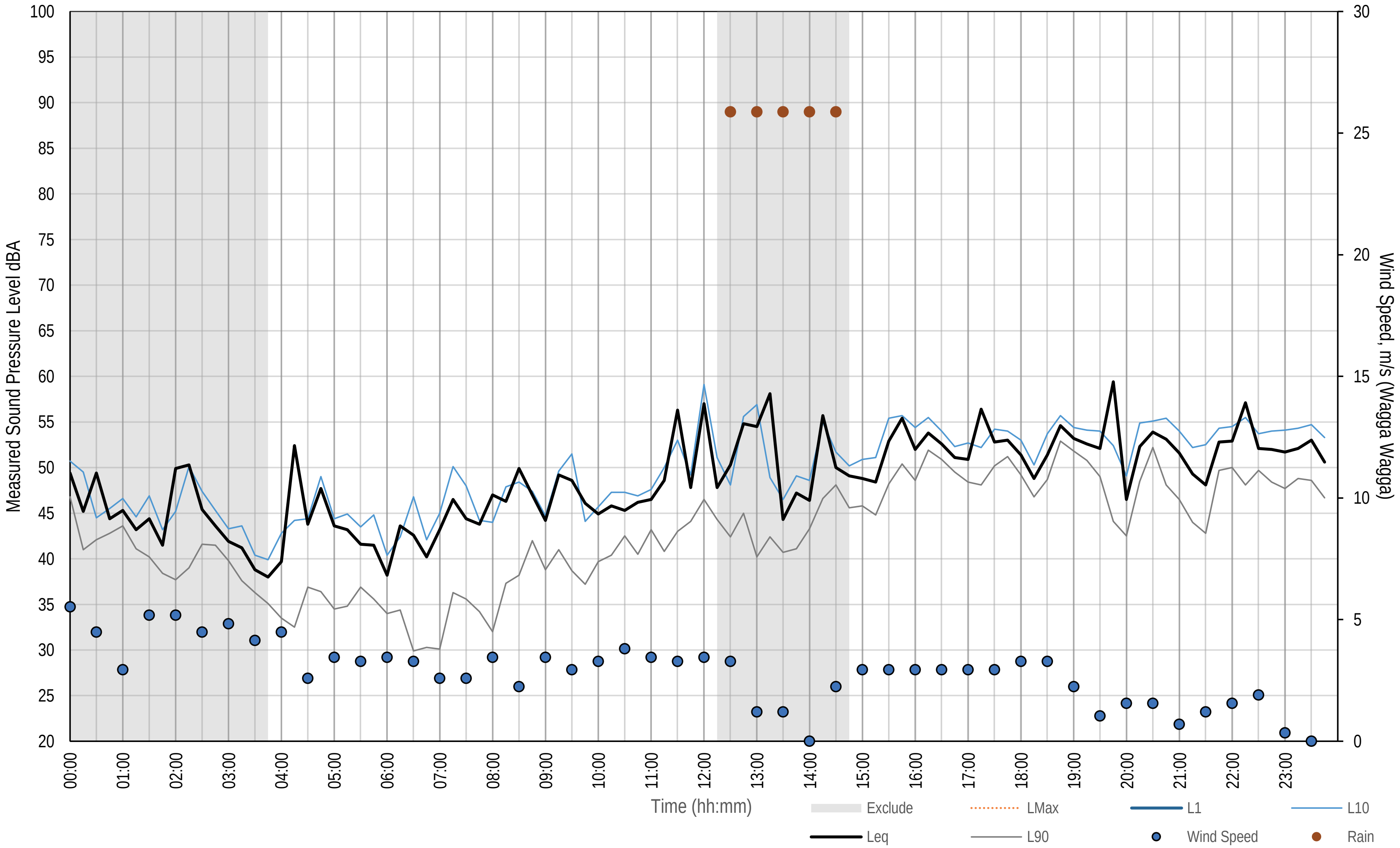




Measured Noise Levels - 3-1, 18 Schillers Road, Milvale
Wednesday, 10 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
Time (hh:mm)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
30
25
20
15
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain

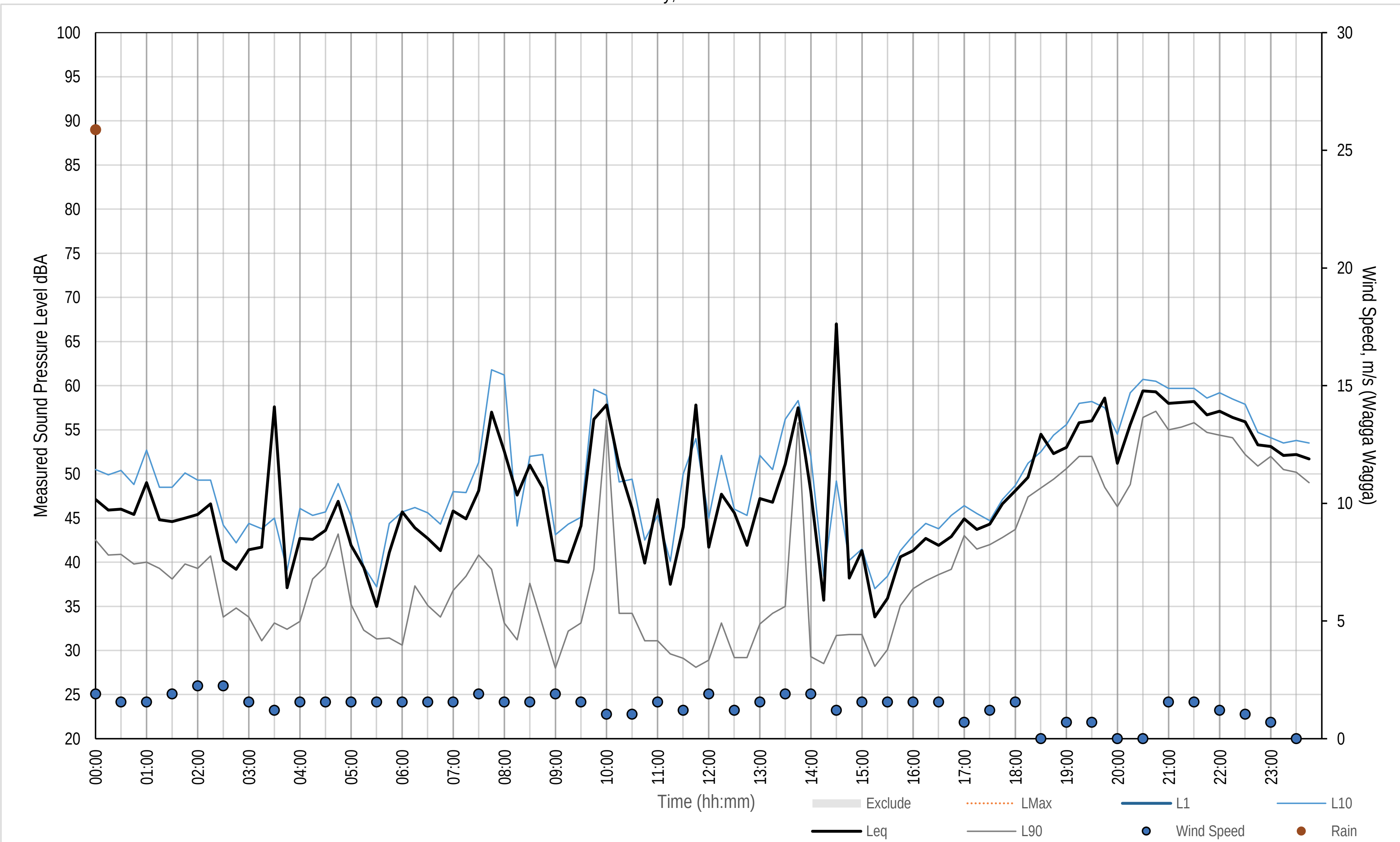
Measured Noise Levels - 3-1, 18 Schillers Road, Milvale

Thursday, 11 March 2021



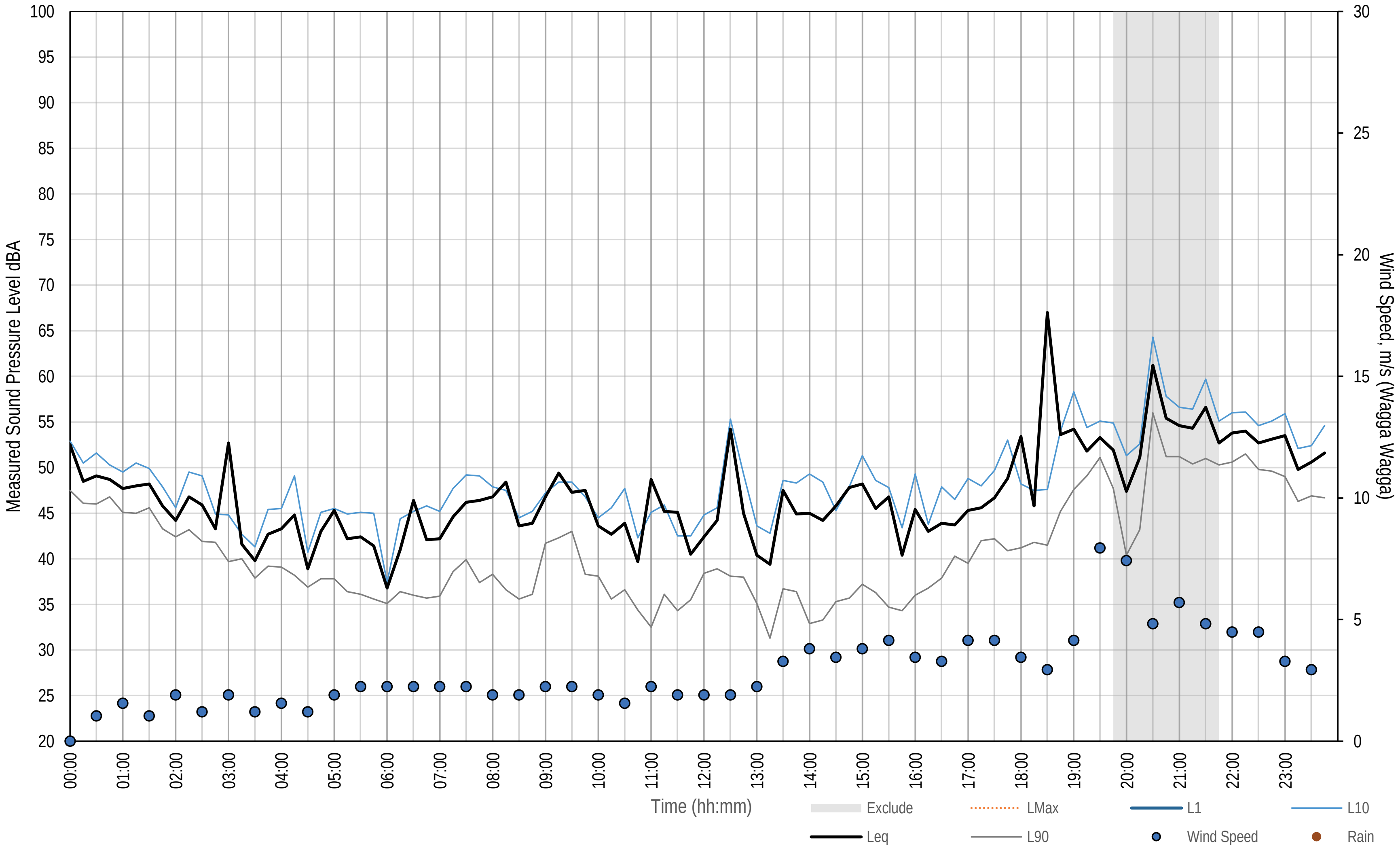
Measured Noise Levels - 3-1, 18 Schillers Road, Milvale

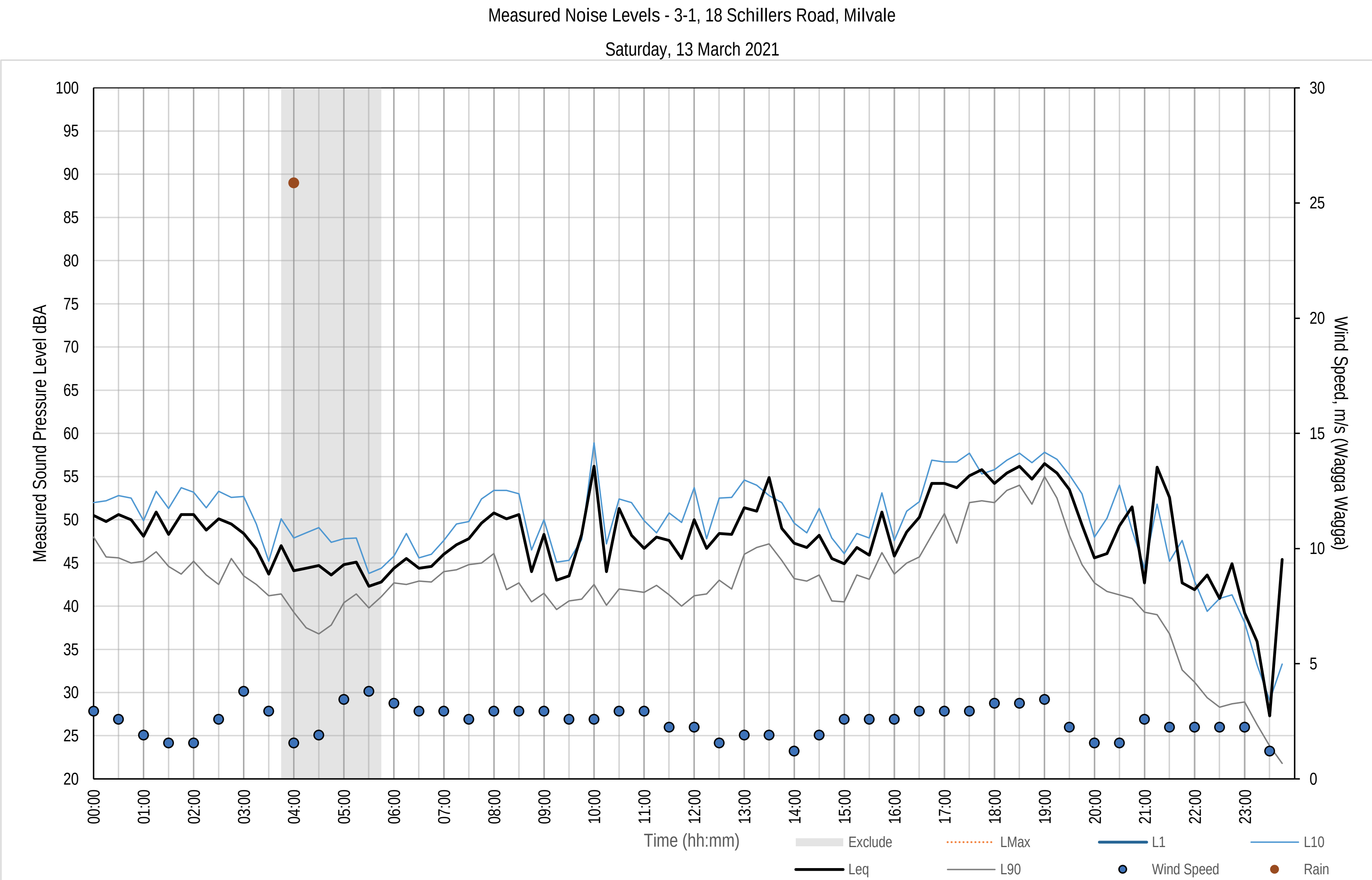
Friday, 12 March 2021



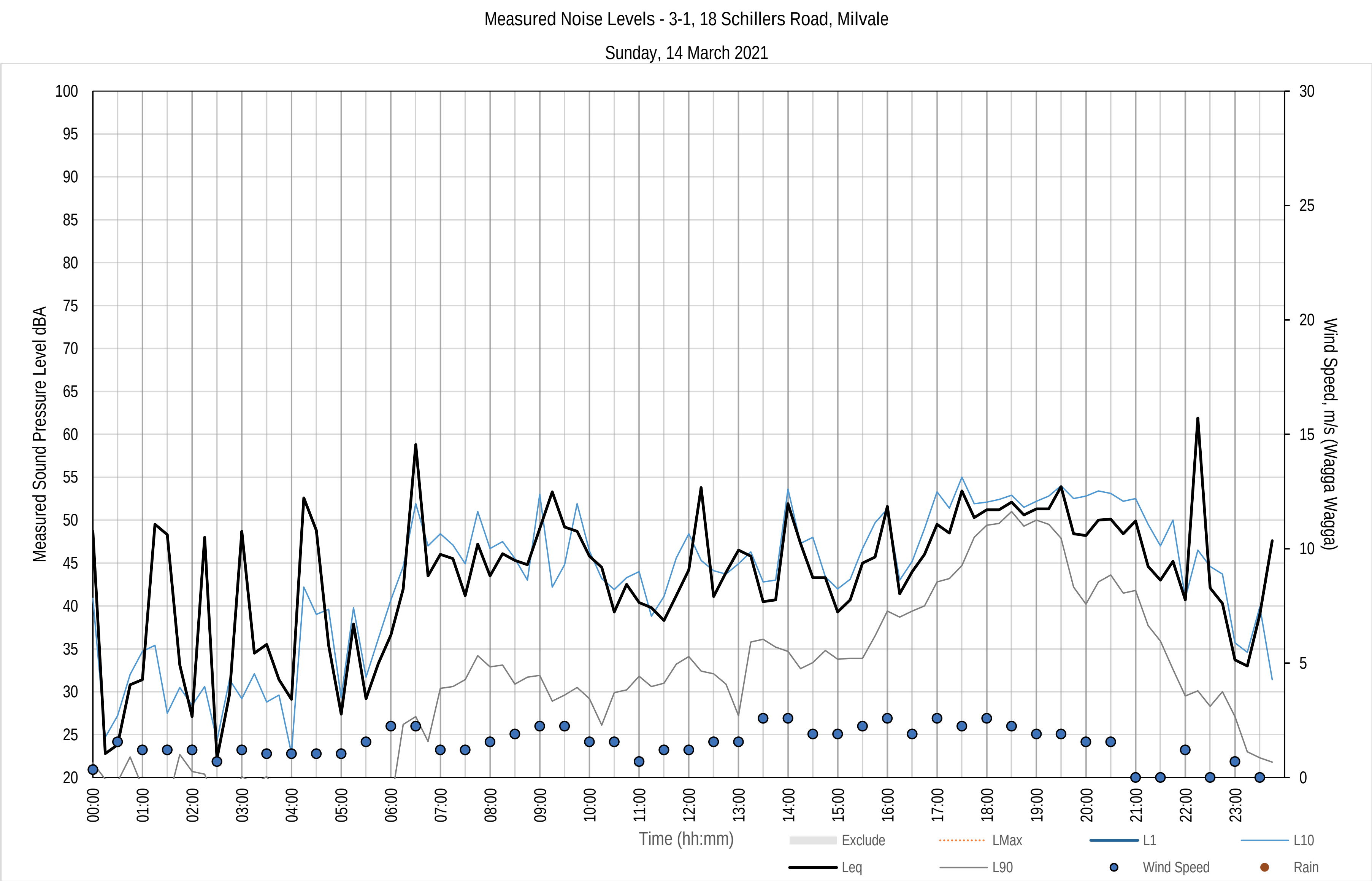
Measured Noise Levels - 3-1, 18 Schillers Road, Milvale

Saturday, 13 March 2021

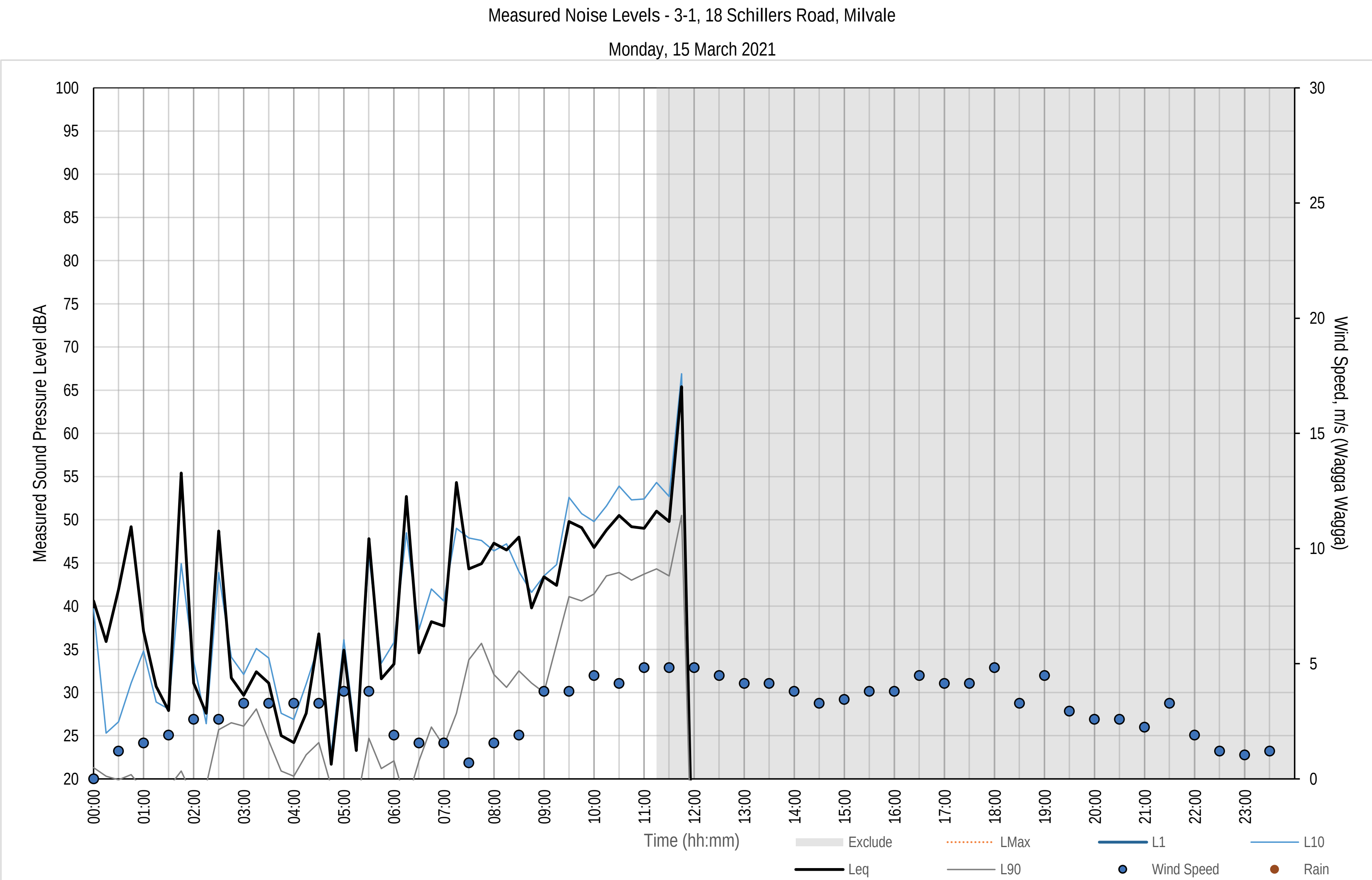




Measured Noise Levels - 3-1, 18 Schillers Road, Milvale
Saturday, 13 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
Time (hh:mm)
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain



Measured Noise Levels - 3-1, 18 Schillers Road, Milvale
Sunday, 14 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
Time (hh:mm)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
30
25
20
15
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain


Measured Noise Levels - 3-1, 18 Schillers Road, Milvale
Monday, 15 March 2021
Measured Sound Pressure Level dBA
Wind Speed, m/s (Wagga Wagga)
Time (hh:mm)
Exclude
LMax
L1
L10
Leq
L90
Wind Speed
Rain

APPENDIX
E

Horizontal Clearances

Noise and Vibration Impact Assessment

Appendix B Construction noise façade maps

STOCKINBINGAL TO PARKES REVIEW OF ENVIRONMENTAL FACTORS

INLAND RAIL
ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes Bribbaree yard clearances

Appendix B
Daytime construction noise predictions
Figure B1 Site establishment

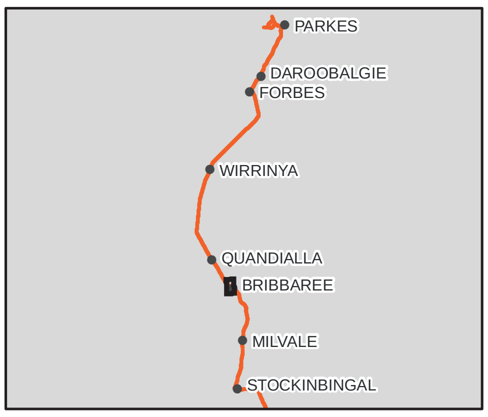
MAP 1 OF 4

LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Cadastre
- Proposal site

Exceedance of project construction noise criteria LAeq(15 minutes)

- <NML (Criteria)
- NML + 5dB
- NML + 10dB
- NML + 20dB
- NML + 30dB
- >30dB
- >75dB (Residences only)



0 250 500 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 29/07/2021 Paper: A3
Author: WSP Scale: 1:15,000

D:\WSP O365\AU-WKG - Geospatial - AIS - Projects\PS122419_Albury_to_Illabo\Tasks\230_0004_EAP_REFReportFigures\Documents\04_HorizontalClearances\95pc\230_EAP_HorizontalClearances_NV_NoiseDayB1_r1v1.mxd

INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes
Caragabal yard clearances

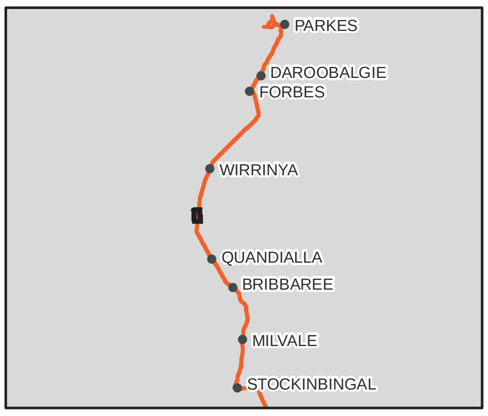
Appendix B
Daytime construction noise predictions
Figure B1 Site establishment
MAP 2 OF 4

LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Cadastre
- Proposal site

Exceedance of project construction noise criteria LAeq(15 minutes)

- <NML (Criteria)
- NML + 5dB
- NML + 10dB
- NML + 20dB
- NML + 30dB
- >30dB
- >75dB (Residences only)



0 250 500 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 29/07/2021 Paper: A3
Author: WSP Scale: 1:12,000

INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes Wirrinya yard clearances

Appendix B

Daytime construction noise predictions

Figure B1 Site establishment

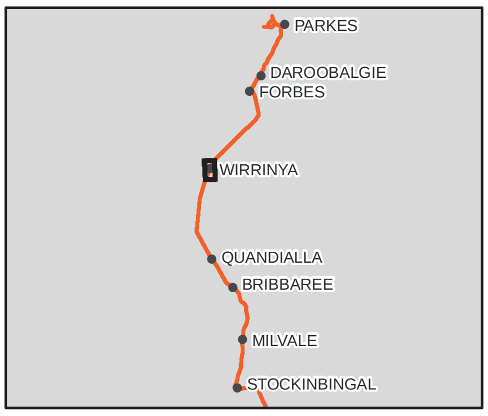
MAP 3 OF 4

LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Cadastre
- Proposal site

Exceedance of project construction noise criteria LAeq(15 minutes)

- <NML (Criteria)
- NML + 5dB
- NML + 10dB
- NML + 20dB
- NML + 30dB
- >30dB
- >75dB (Residences only)



0 250 500 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 29/07/2021 Paper: A3

Author: WSP Scale: 1:20,000

INLAND RAIL

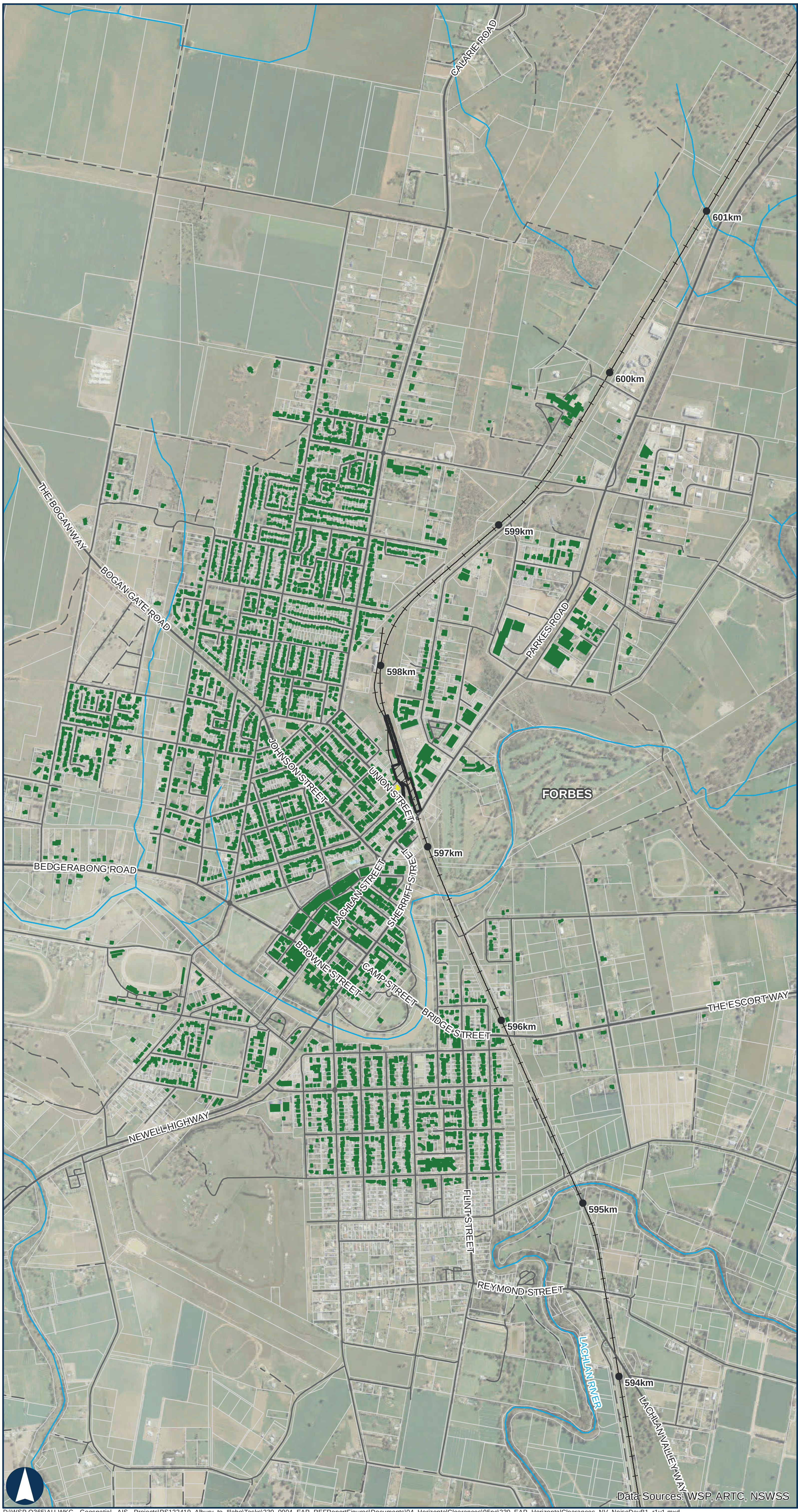
ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes Forbes Station clearances

Appendix B
Daytime construction noise predictions
Figure B1 Site establishment

MAP 4 OF 4

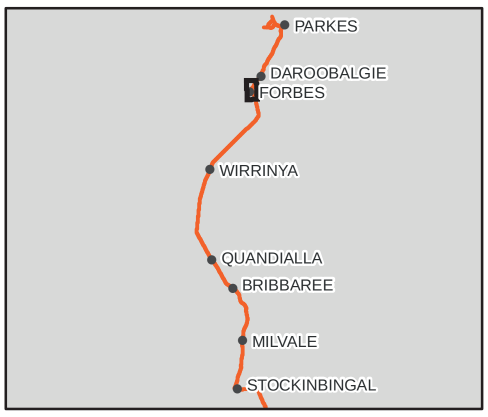


LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Cadastre
- Proposal site

Exceedance of project construction noise criteria LAeq(15 minutes)

- <NML (Criteria)
- NML + 5dB
- NML + 10dB
- NML + 20dB
- NML + 30dB
- >30dB
- >75dB (Residences only)



0 250 500
m

Coordinate System: GDA 1994 MGA Zone 55

Date: 29/07/2021 Paper: A3
Author: WSP Scale: 1:20,000

INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes
Caragabal yard clearances

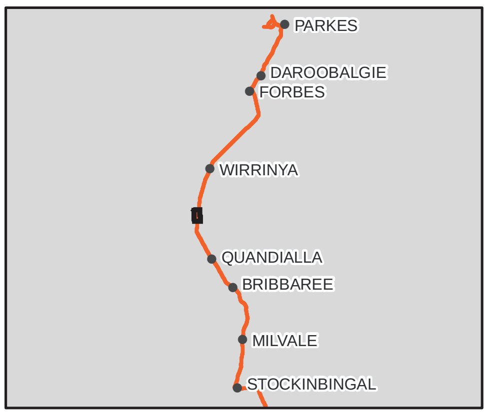
Appendix B
Daytime construction noise predictions
Figure B2 Track works
MAP 1 OF 2

LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Cadastre
- Proposal site

Exceedance of project construction noise criteria LAeq(15 minutes)

- <NML (Criteria)
- NML + 5dB
- NML + 10dB
- NML + 20dB
- NML + 30dB
- >30dB
- >75dB (Residences only)



0 250 500 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 29/07/2021 Paper: A3
Author: WSP Scale: 1:12,000

INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes
Wirrinya yard clearances

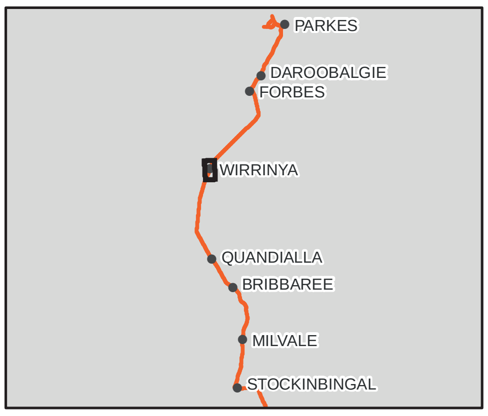
Appendix B
Daytime construction noise predictions
Figure B2 Track works
MAP 2 OF 2

LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Cadastre
- Proposal site

Exceedance of project construction noise criteria LAeq(15 minutes)

- <NML (Criteria)
- NML + 5dB
- NML + 10dB
- NML + 20dB
- NML + 30dB
- >30dB
- >75dB (Residences only)



0 250 500 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 29/07/2021
Paper: A3
Author: WSP
Scale: 1:20,000

INLAND RAIL
ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes Bribbaree yard clearances

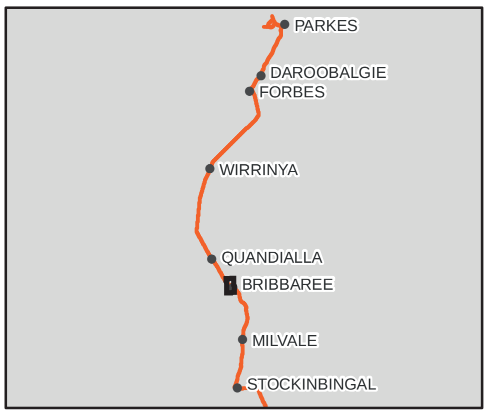
Appendix B
Daytime construction noise predictions
Figure B3 Track works and earthworks
MAP 1 OF 2

LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Cadastre
- Proposal site

Exceedance of project construction noise criteria LAeq(15 minutes)

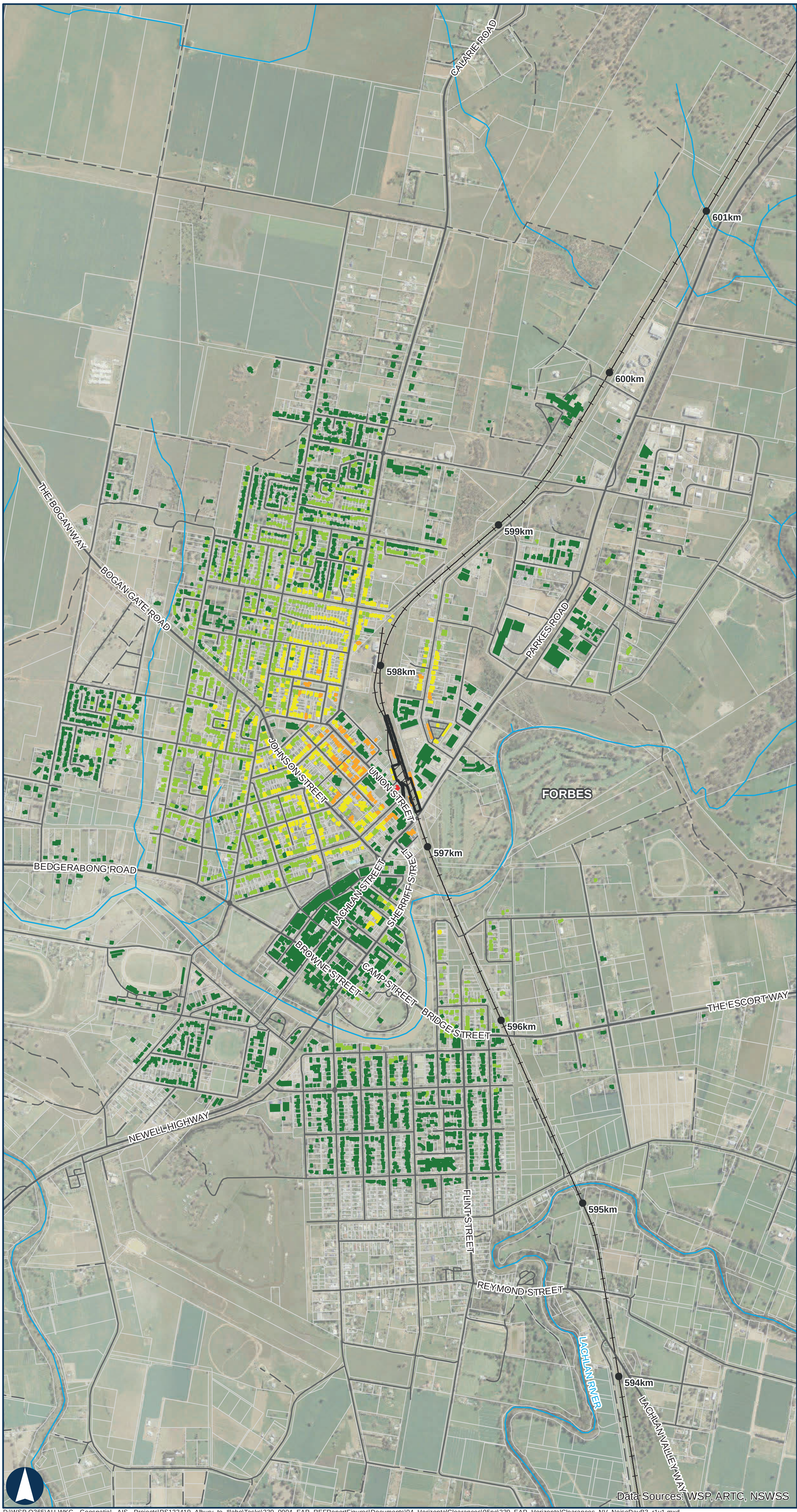
- <NML (Criteria)
- NML + 5dB
- NML + 10dB
- NML + 20dB
- NML + 30dB
- >30dB
- >75dB (Residences only)



0 250 500 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 29/07/2021
Paper: A3
Author: WSP
Scale: 1:15,000



INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes Forbes Station clearances

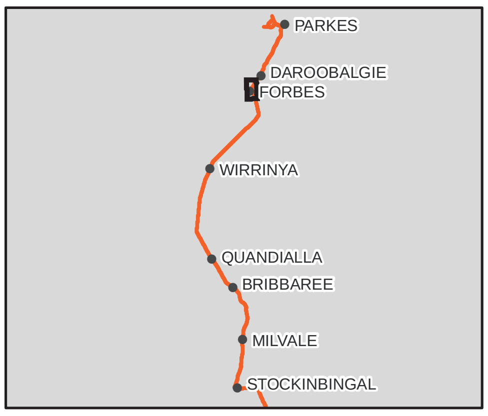
Appendix B
Daytime construction noise predictions
Figure B3 Track works and earthworks
MAP 2 OF 2

LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Cadastre
- Proposal site

Exceedance of project construction noise criteria LAeq(15 minutes)

- <NML (Criteria)
- NML + 5dB
- NML + 10dB
- NML + 20dB
- NML + 30dB
- >30dB
- >75dB (Residences only)



0 250 500 m

Coordinate System: GDA 1994 MGA Zone 55

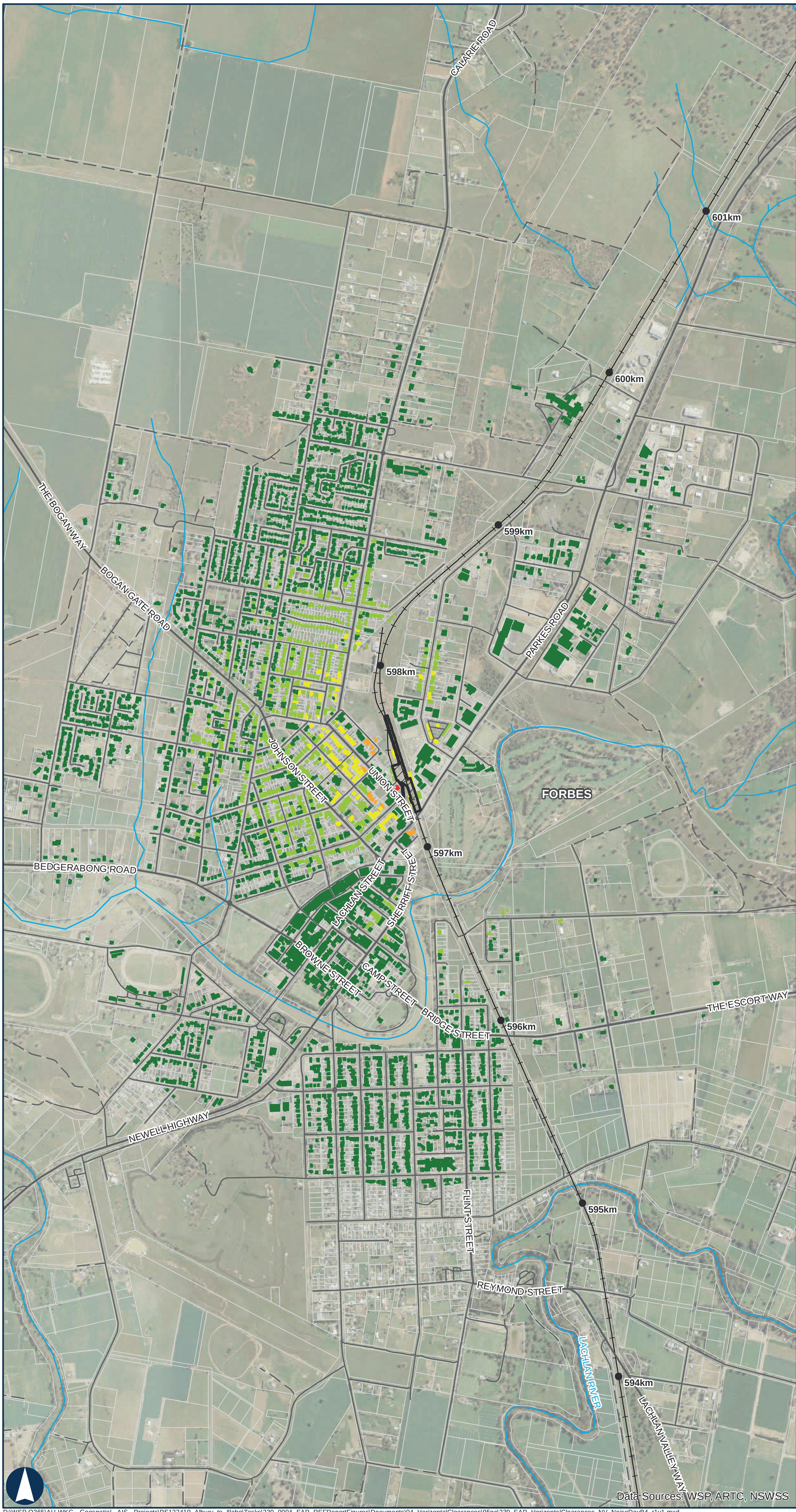
Date: 29/07/2021 Paper: A3
Author: WSP Scale: 1:20,000

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes Forbes Station clearances

Appendix B
Daytime construction noise predictions
Figure B4 Canopy work

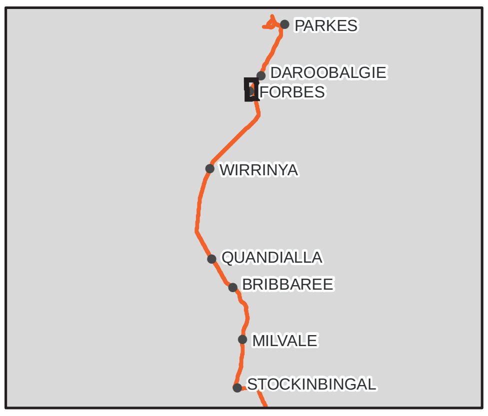


LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Cadastre
- Proposal site

Exceedance of project construction noise criteria LAeq(15 minutes)

- <NML (Criteria)
- NML + 5dB
- NML + 10dB
- NML + 20dB
- NML + 30dB
- >30dB
- >75dB (Residences only)



0 250 500 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 29/07/2021 Paper: A3
Author: WSP Scale: 1:20,000

INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes
Bribbaree yard clearances

Appendix B
Daytime construction noise predictions
Figure B5 Signalling

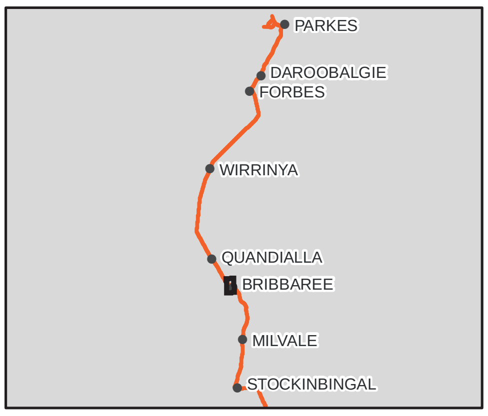
MAP 1 OF 2

LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Cadastre
- Proposal site

Exceedance of project construction noise criteria LAeq(15 minutes)

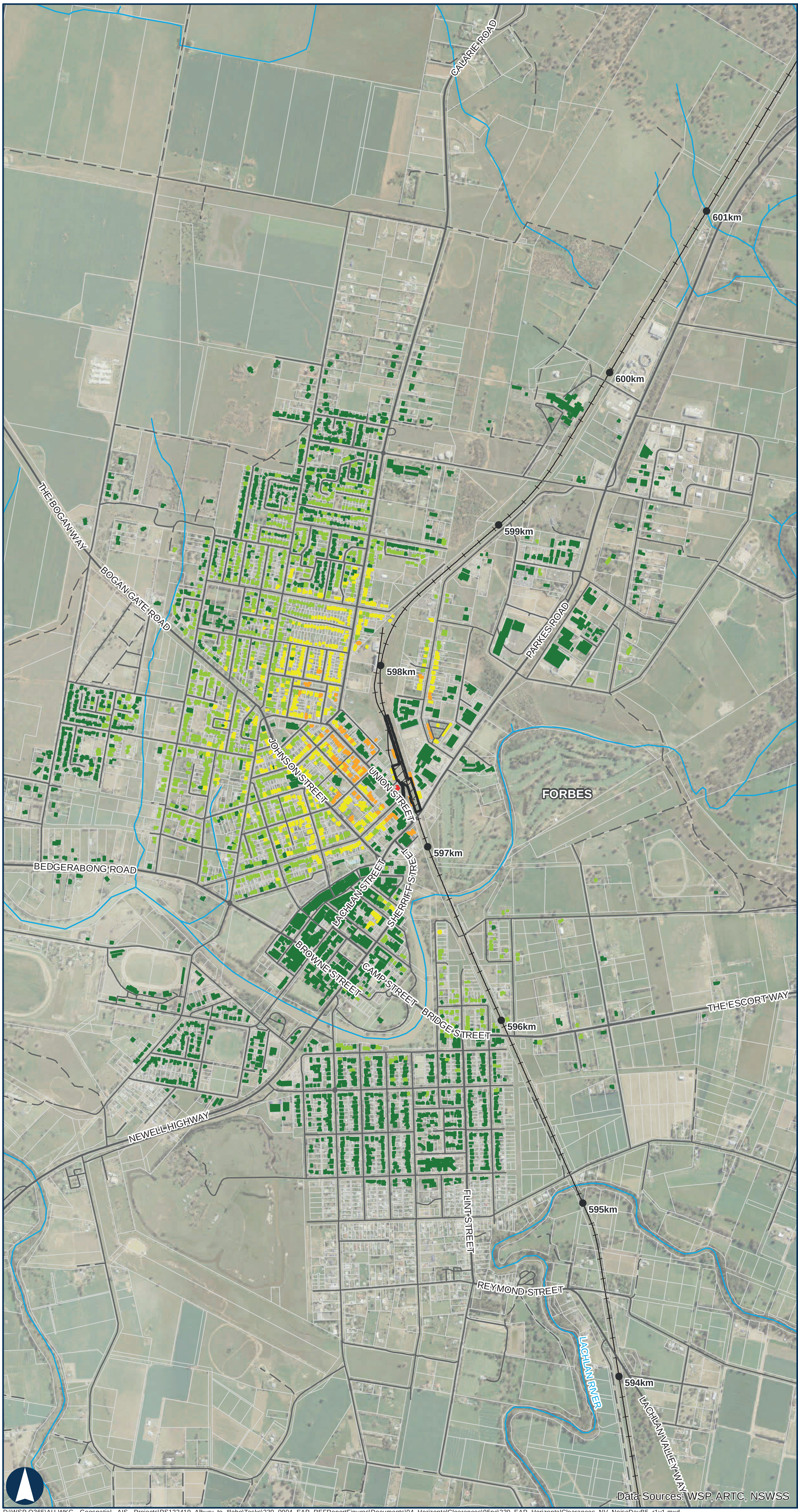
- <NML (Criteria)
- NML + 5dB
- NML + 10dB
- NML + 20dB
- NML + 30dB
- >30dB
- >75dB (Residences only)



0 250 500 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 29/07/2021 Paper: A3
Author: WSP Scale: 1:15,000



INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes Forbes Station clearances

Appendix B
Daytime construction noise predictions
Figure B5 Signalling

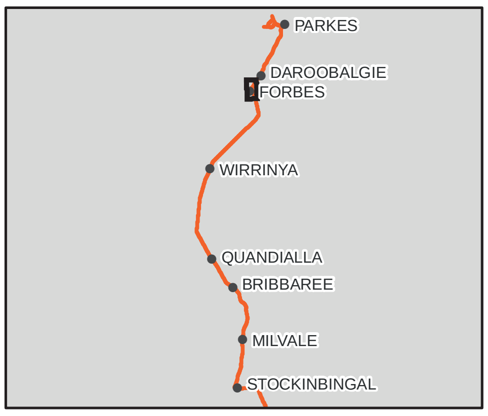
MAP 2 OF 2

LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Cadastre
- Proposal site

Exceedance of project construction noise criteria LAeq(15 minutes)

- <NML (Criteria)
- NML + 5dB
- NML + 10dB
- NML + 20dB
- NML + 30dB
- >30dB
- >75dB (Residences only)



0 250 500 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 29/07/2021 Paper: A3

Author: WSP Scale: 1:20,000

INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes Bribbaree yard clearances

Appendix B

Daytime construction noise predictions

Figure B7 Demobilisation and rehabilitation

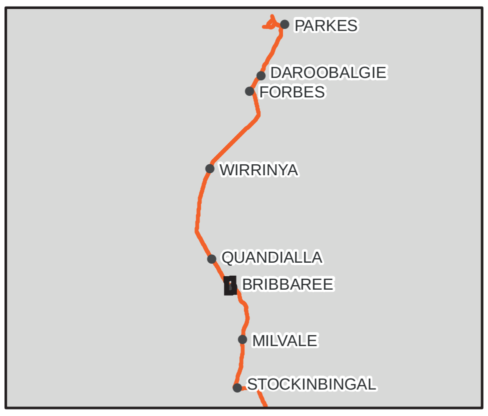
MAP 1 OF 4

LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Cadastre
- Proposal site

Exceedance of project construction noise criteria LAeq(15 minutes)

- <NML (Criteria)
- NML + 5dB
- NML + 10dB
- NML + 20dB
- NML + 30dB
- >30dB
- >75dB (Residences only)



0 250 500 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 29/07/2021 Paper: A3

Author: WSP Scale: 1:15,000

D:\WSP O365\AU-WKG - Geospatial - AIS - Projects\PS122419_Albury_to_Illabo\Tasks\230_0004_EAP_REFReportFigures\Documents\04_HorizontalClearances\95pc\230_EAP_HorizontalClearances_NV_NoiseDayB6_r1v1.mxd

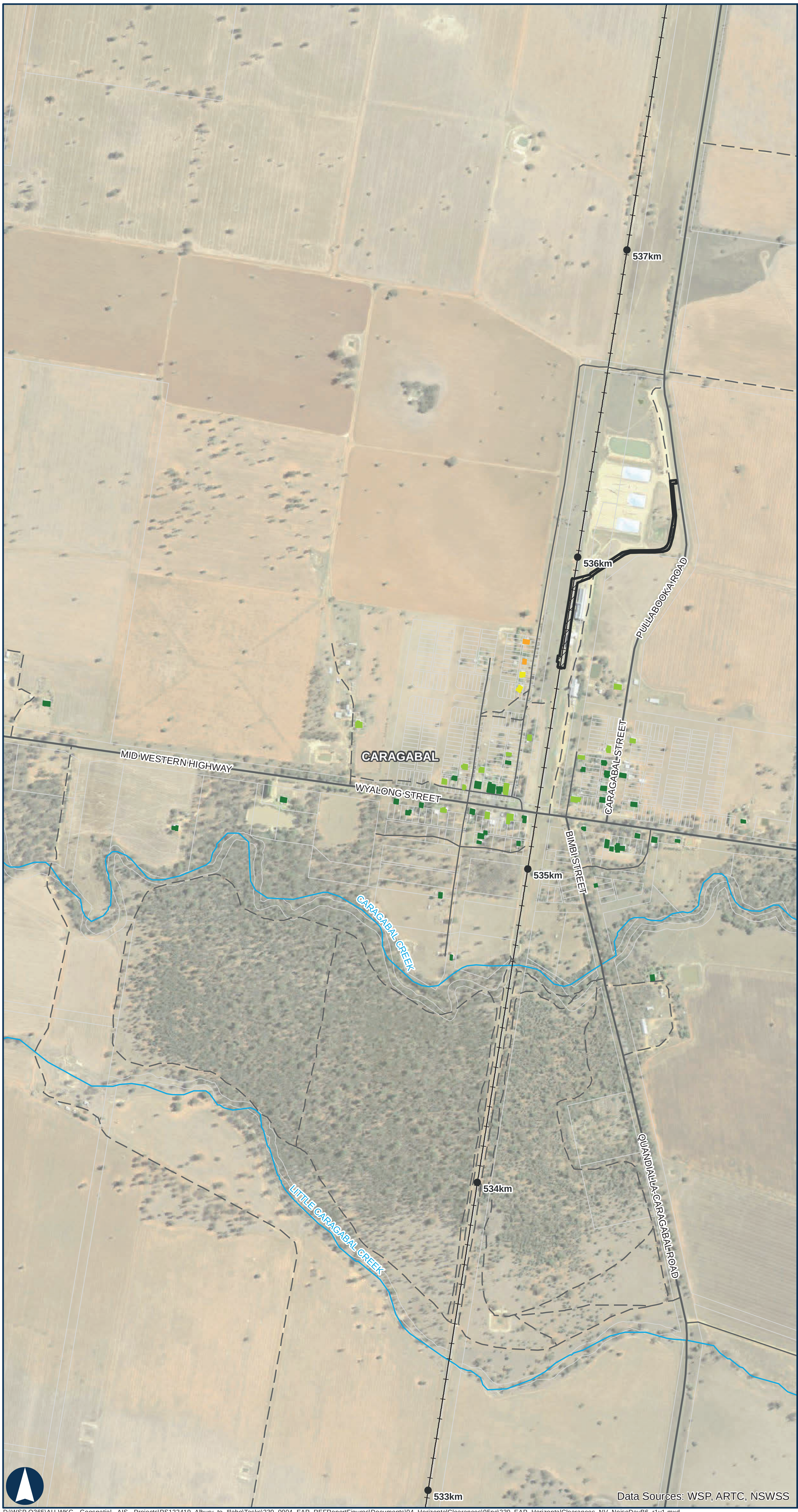
INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes
Caragabal yard clearances

Appendix B
Daytime construction noise predictions
Figure B7 Demobilisation and rehabilitation

MAP 2 OF 4

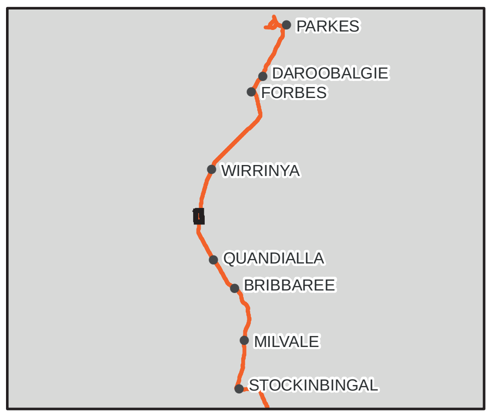


LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Cadastre
- Proposal site

Exceedance of project construction noise criteria LAeq(15 minutes)

- <NML (Criteria)
- NML + 5dB
- NML + 10dB
- NML + 20dB
- NML + 30dB
- >30dB
- >75dB (Residences only)



0 250 500 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 29/07/2021 Paper: A3
Author: WSP Scale: 1:12,000

Stockinbingal to Parkes Wirrinya yard clearances

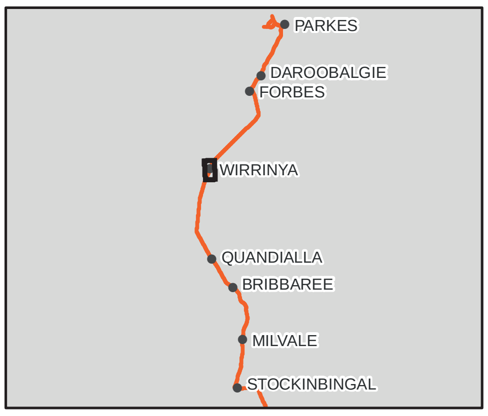
Appendix B
Daytime construction noise predictions
Figure B7 Demobilisation and rehabilitation
MAP 3 OF 4

LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Cadastre
- Proposal site

Exceedance of project construction noise criteria LAeq(15 minutes)

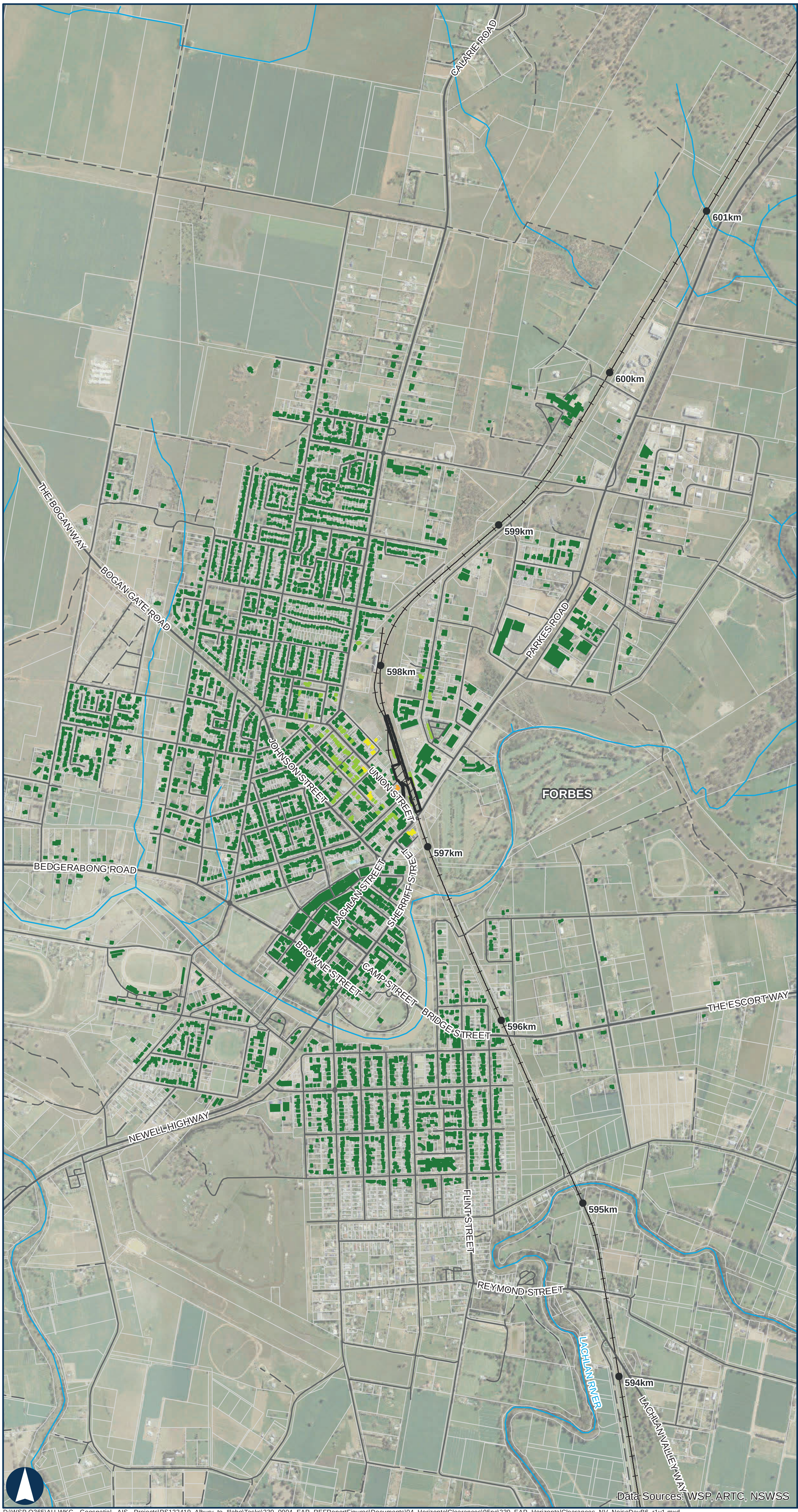
- <NML (Criteria)
- NML + 5dB
- NML + 10dB
- NML + 20dB
- NML + 30dB
- >30dB
- >75dB (Residences only)



0 250 500 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 29/07/2021
Paper: A3
Author: WSP
Scale: 1:20,000



INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes Forbes Station clearances

Appendix B
Daytime construction noise predictions
Figure B7 Demobilisation and rehabilitation

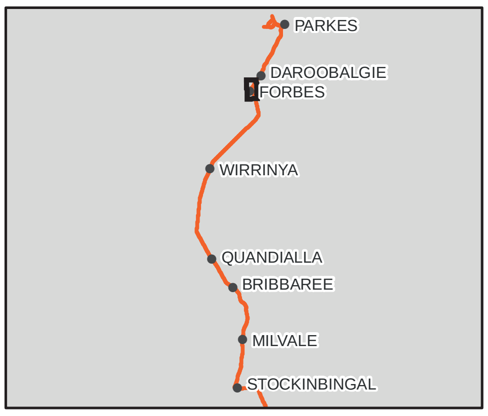
MAP 4 OF 4

LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Cadastre
- Proposal site

Exceedance of project construction noise criteria LAeq(15 minutes)

- <NML (Criteria)
- NML + 5dB
- NML + 10dB
- NML + 20dB
- NML + 30dB
- >30dB
- >75dB (Residences only)



0 250 500 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 29/07/2021 Paper: A3
Author: WSP Scale: 1:20,000

D:\WSP O365\AU-WKG - Geospatial - AIS - Projects\PS122419_Albury_to_Illabo\Tasks\230_0004_EAP_REFReportFigures\Documents\04_HorizontalClearances\95pc\230_EAP_HorizontalClearances_NV_NoiseDayB6_r1v1.mxd

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes
Milvale yard clearances

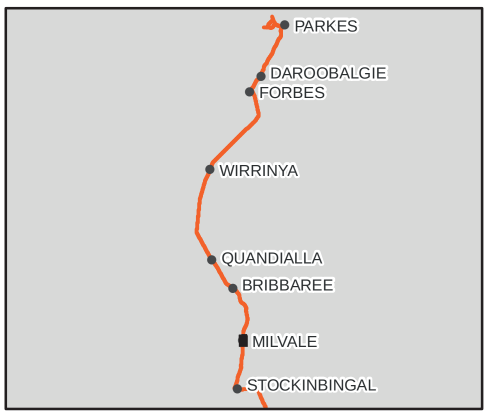
Appendix B
Daytime construction noise predictions
Figure B7 Water tank modifications
MAP 1 OF 2

LEGEND

- KM post
- Existing railway
- Main road
- Track
- Watercourse
- Cadastre
- Proposal site

Exceedance of project construction noise criteria LAeq(15 minutes)

- <NML (Criteria)
- NML + 5dB
- NML + 10dB
- NML + 20dB
- NML + 30dB
- >30dB
- >75dB (Residences only)



0 200 400 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 29/07/2021 Paper: A3
Author: WSP Scale: 1:7,500

D:\WSP O365\AU-WKG - Geospatial - AIS - Projects\PS122419_Albury_to_Illabo\Tasks\230_0004_EAP_REFReportFigures\Documents\04_HorizontalClearances\95pc\230_EAP_HorizontalClearances_NV_NoiseDayB7_r1v1.mxd

INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes
Quandialla yard clearances

Appendix B
Daytime construction noise predictions
Figure B7 Water tank modifications

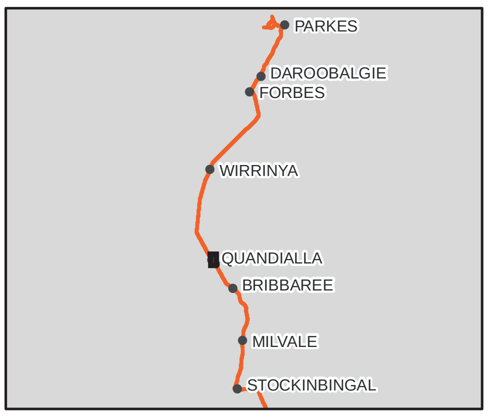
MAP 2 OF 2

LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Cadastre
- Proposal site

Exceedance of project construction noise criteria LAeq(15 minutes)

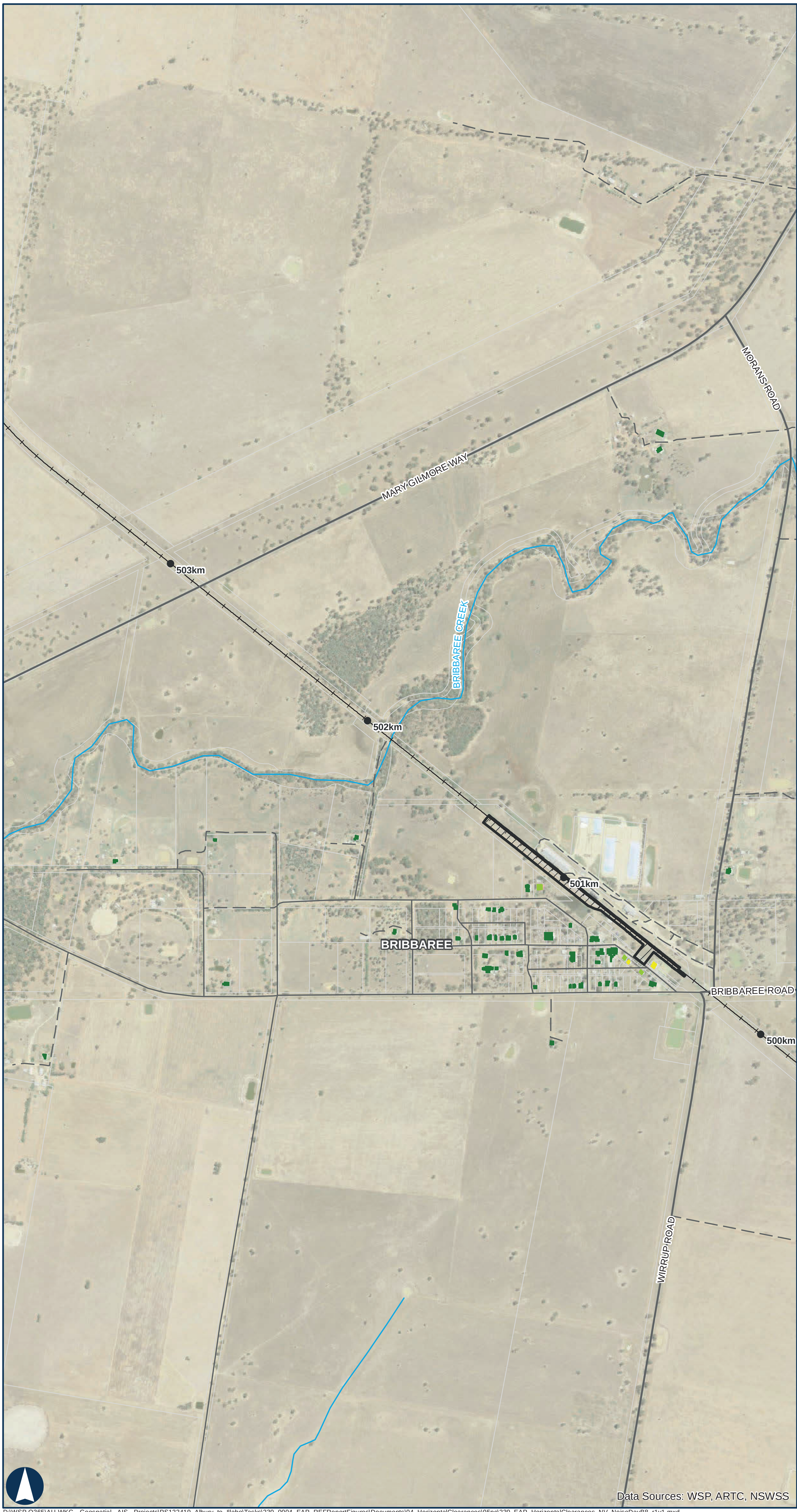
- <NML (Criteria)
- NML + 5dB
- NML + 10dB
- NML + 20dB
- NML + 30dB
- >30dB
- >75dB (Residences only)



0 200 400 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 29/07/2021 Paper: A3
Author: WSP Scale: 1:12,000



INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes Bribbaree yard clearances

Appendix B
Daytime construction noise predictions
Figure B8 Site compound

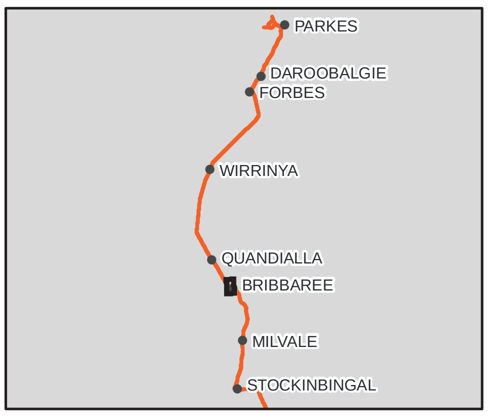
MAP 1 OF 2

LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Cadastre
- Proposal site

Exceedance of project construction noise criteria LAeq(15 minutes)

- <NML (Criteria)
- NML + 5dB
- NML + 10dB
- NML + 20dB
- NML + 30dB
- >30dB
- >75dB (Residences only)



0 250 500 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 29/07/2021 Paper: A3
Author: WSP Scale: 1:15,000

D:\WSP O365\AU-WKG - Geospatial - AIS - Projects\PS122419_Albury_to_Illabo\Tasks\230_0004_EAP_REFReportFigures\Documents\04_HorizontalClearances\95pc\230_EAP_HorizontalClearances_NV_NoiseDayB8_r1v1.mxd

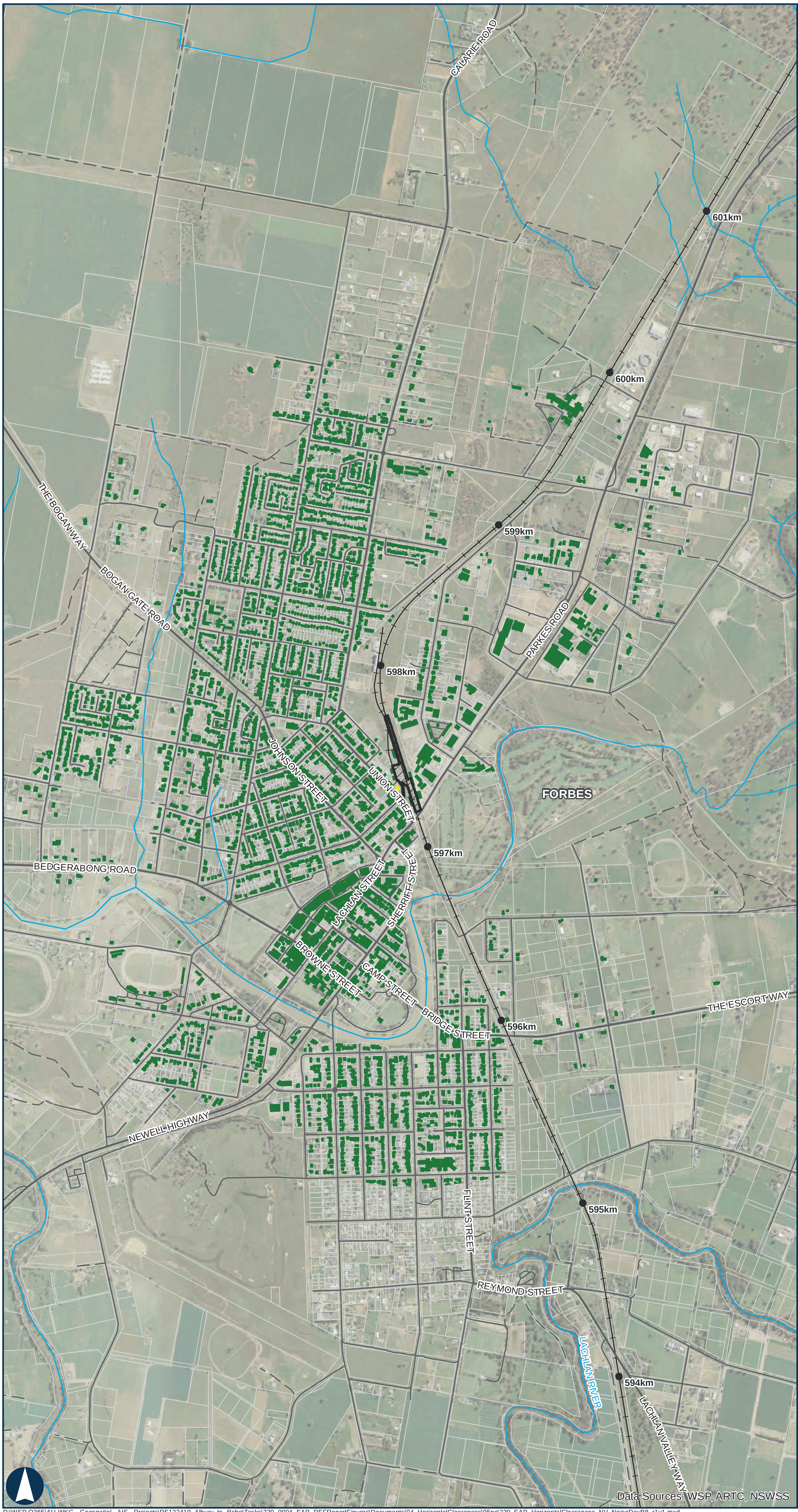
INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes Forbes Station clearances

Appendix B
Daytime construction noise predictions
Figure B8 Site compound

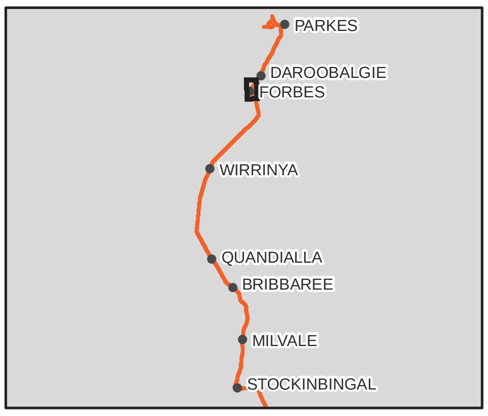


LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Cadastre
- Proposal site

Exceedance of project construction noise criteria LAeq(15 minutes)

- <NML (Criteria)
- NML + 5dB
- NML + 10dB
- NML + 20dB
- NML + 30dB
- >30dB
- >75dB (Residences only)



0 250 500 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 29/07/2021 Paper: A3
Author: WSP Scale: 1:20,000

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes
Bribbaree yard clearances

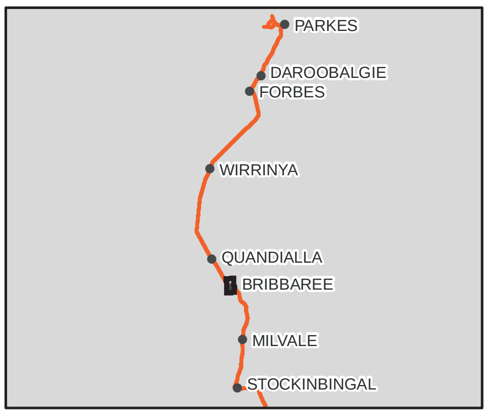
Appendix B
Night-time construction noise predictions
Figure B1 Site establishment
MAP 1 OF 4

LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Cadastre
- Proposal site

Exceedance of project construction noise criteria LAeq(15 minutes)

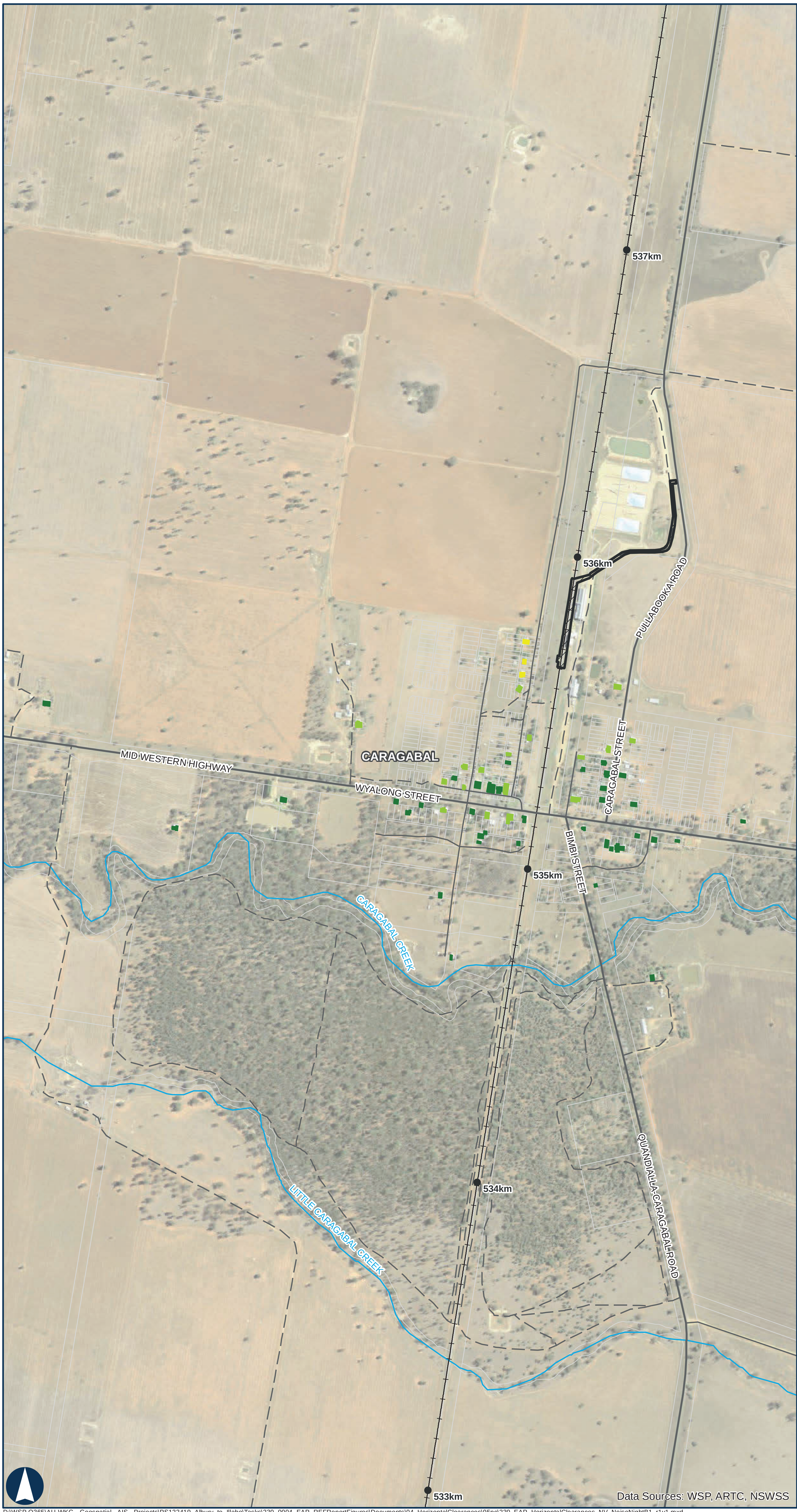
- <NML (Criteria)
- NML + 5dB
- NML + 10dB
- NML + 20dB
- NML + 30dB
- >30dB
- >75dB (Residences only)



0 250 500 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 29/07/2021 Paper: A3
Author: WSP Scale: 1:15,000



INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes
Caragabal yard clearances

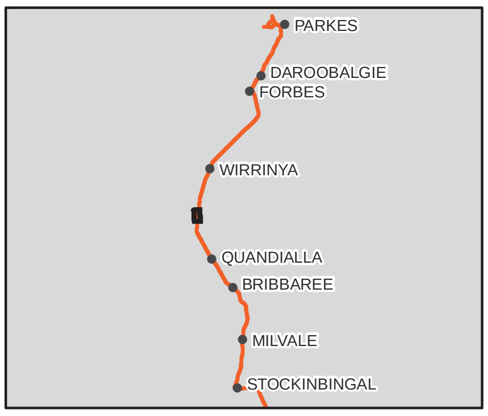
Appendix B
Night-time construction noise predictions
Figure B1 Site establishment
MAP 2 OF 4

LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Cadastre
- Proposal site

Exceedance of project construction noise criteria LAeq(15 minutes)

- <NML (Criteria)
- NML + 5dB
- NML + 10dB
- NML + 20dB
- NML + 30dB
- >30dB
- >75dB (Residences only)



0 250 500
m

Coordinate System: GDA 1994 MGA Zone 55

Date: 29/07/2021
Paper: A3
Author: WSP
Scale: 1:12,000

D:\WSP O365\AU-WKG - Geospatial - AIS - Projects\PS122419_Albury_to_Illabo\Tasks\230_0004_EAP_REFReportFigures\Documents\04_HorizontalClearances\95pc\230_EAP_HorizontalClearances_NV_NoiseNightB1_r1v1.mxd

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes Wirrinya yard clearances

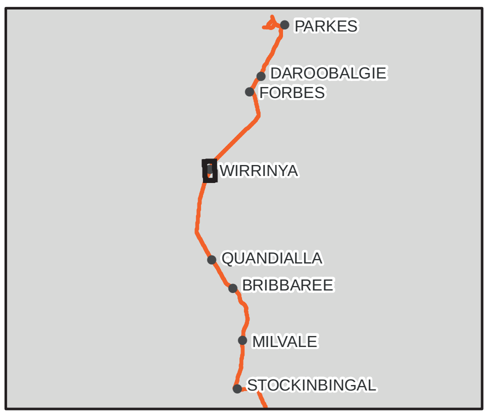
Appendix B
Night-time construction noise predictions
Figure B1 Site establishment
MAP 3 OF 4

LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Cadastre
- Proposal site

Exceedance of project construction noise criteria LAeq(15 minutes)

- <NML (Criteria)
- NML + 5dB
- NML + 10dB
- NML + 20dB
- NML + 30dB
- >30dB
- >75dB (Residences only)



0 250 500 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 29/07/2021 Paper: A3
Author: WSP Scale: 1:20,000

INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

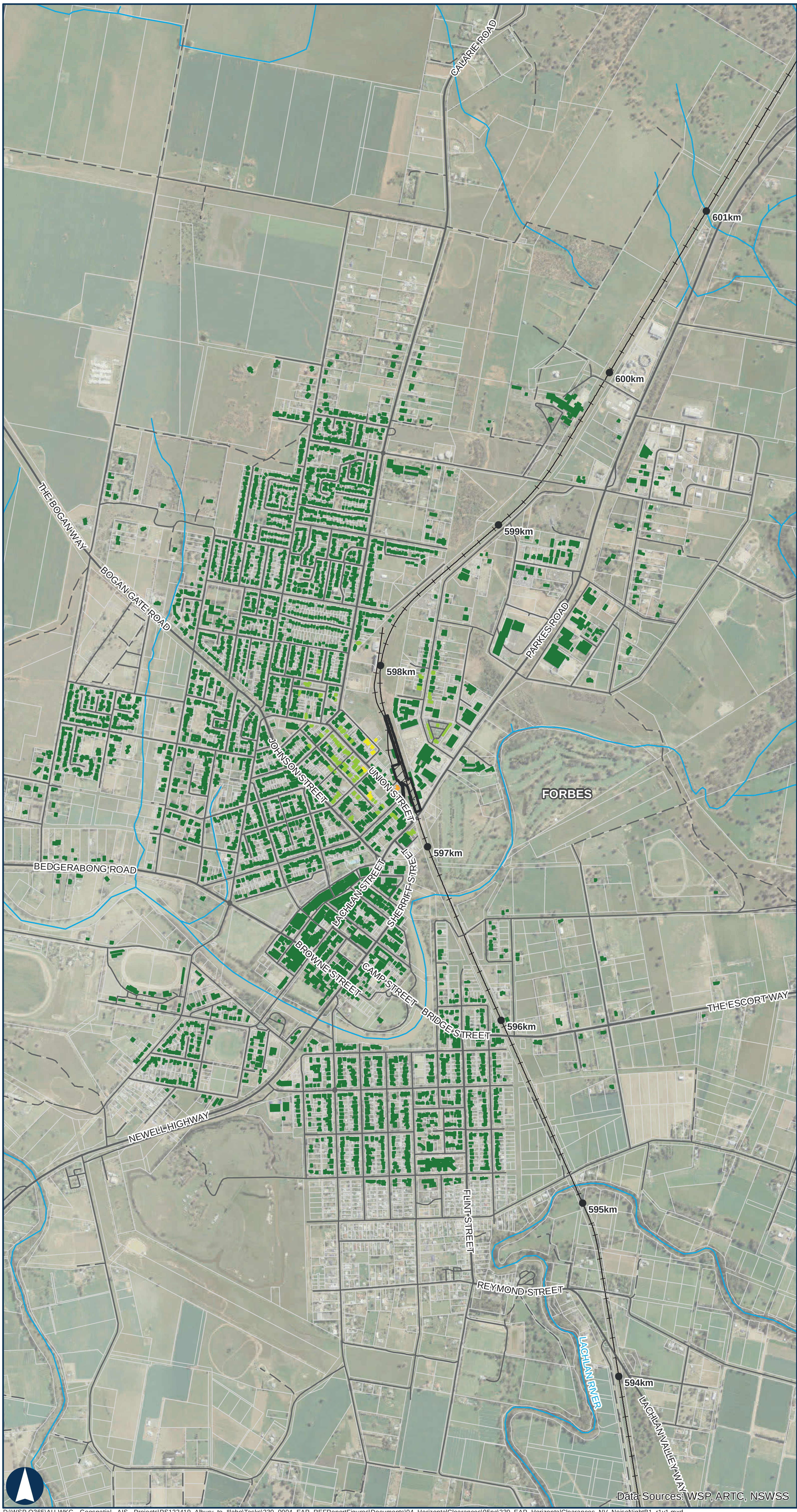
Stockinbingal to Parkes Forbes Station clearances

Appendix B

Night-time construction noise predictions

Figure B1 Site establishment

MAP 4 OF 4

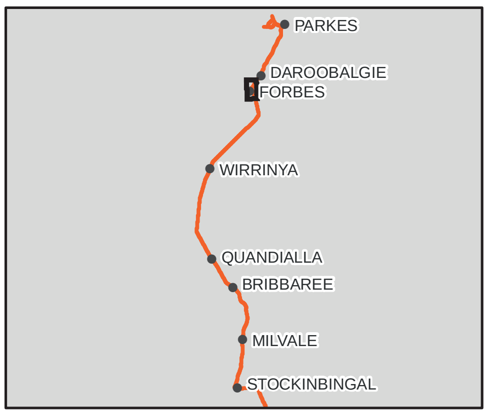


LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Cadastre
- Proposal site

Exceedance of project construction noise criteria LAeq(15 minutes)

- <NML (Criteria)
- NML + 5dB
- NML + 10dB
- NML + 20dB
- NML + 30dB
- >30dB
- >75dB (Residences only)



0 250 500 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 29/07/2021 Paper: A3

Author: WSP Scale: 1:20,000

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes Caragabal yard clearances

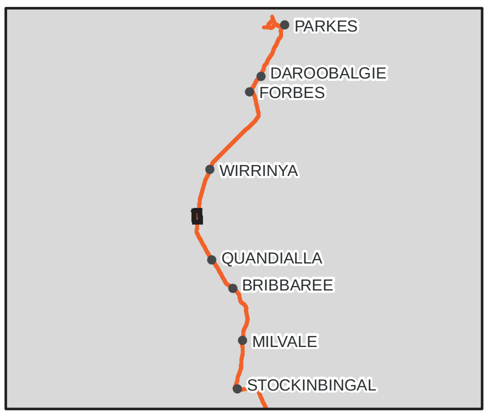
Appendix B
Night-time construction noise predictions
Figure B2 Track works
MAP 1 OF 2

LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Cadastre
- Proposal site

Exceedance of project construction noise criteria LAeq(15 minutes)

- <NML (Criteria)
- NML + 5dB
- NML + 10dB
- NML + 20dB
- NML + 30dB
- >30dB
- >75dB (Residences only)



0 250 500 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 29/07/2021 Paper: A3
Author: WSP Scale: 1:12,000

D:\WSP O365\AU-WKG - Geospatial - AIS - Projects\PS122419_Albury_to_Illabo\Tasks\230_0004_EAP_REFReportFigures\Documents\04_HorizontalClearances\95pc\230_EAP_HorizontalClearances_NV_NoiseNightB2_r1v1.mxd

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes Wirrinya yard clearances

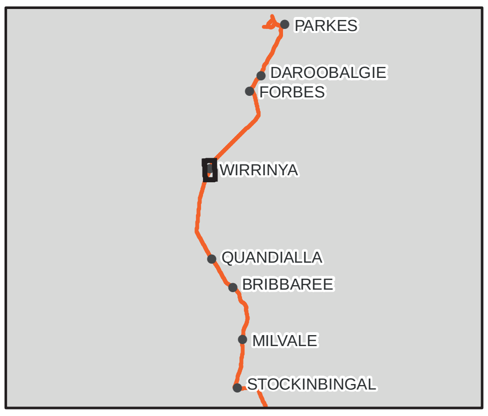
Appendix B
Night-time construction noise predictions
Figure B2 Track works
MAP 2 OF 2

LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Cadastre
- Proposal site

Exceedance of project construction noise criteria LAeq(15 minutes)

- <NML (Criteria)
- NML + 5dB
- NML + 10dB
- NML + 20dB
- NML + 30dB
- >30dB
- >75dB (Residences only)



0 250 500 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 29/07/2021 Paper: A3
Author: WSP Scale: 1:20,000

D:\WSP O365\AU-WKG - Geospatial - AIS - Projects\PS122419_Albury_to_Illabo\Tasks\230_0004_EAP_REFReportFigures\Documents\04_HorizontalClearances\95pc\230_EAP_HorizontalClearances_NV_NoiseNightB2_r1v1.mxd

INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes Bribbaree yard clearances

Appendix B

Night-time construction noise predictions

Figure B3 Track works and earthworks

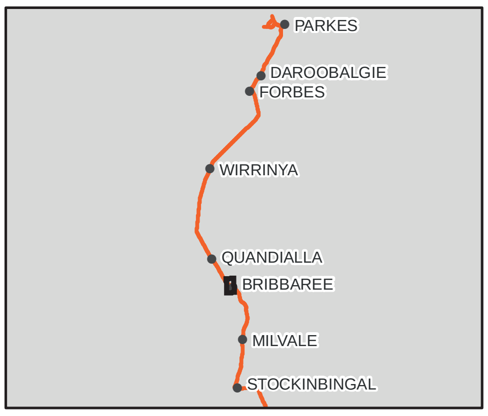
MAP 1 OF 2

LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Cadastre
- Proposal site

Exceedance of project construction noise criteria LAeq(15 minutes)

- <NML (Criteria)
- NML + 5dB
- NML + 10dB
- NML + 20dB
- NML + 30dB
- >30dB
- >75dB (Residences only)



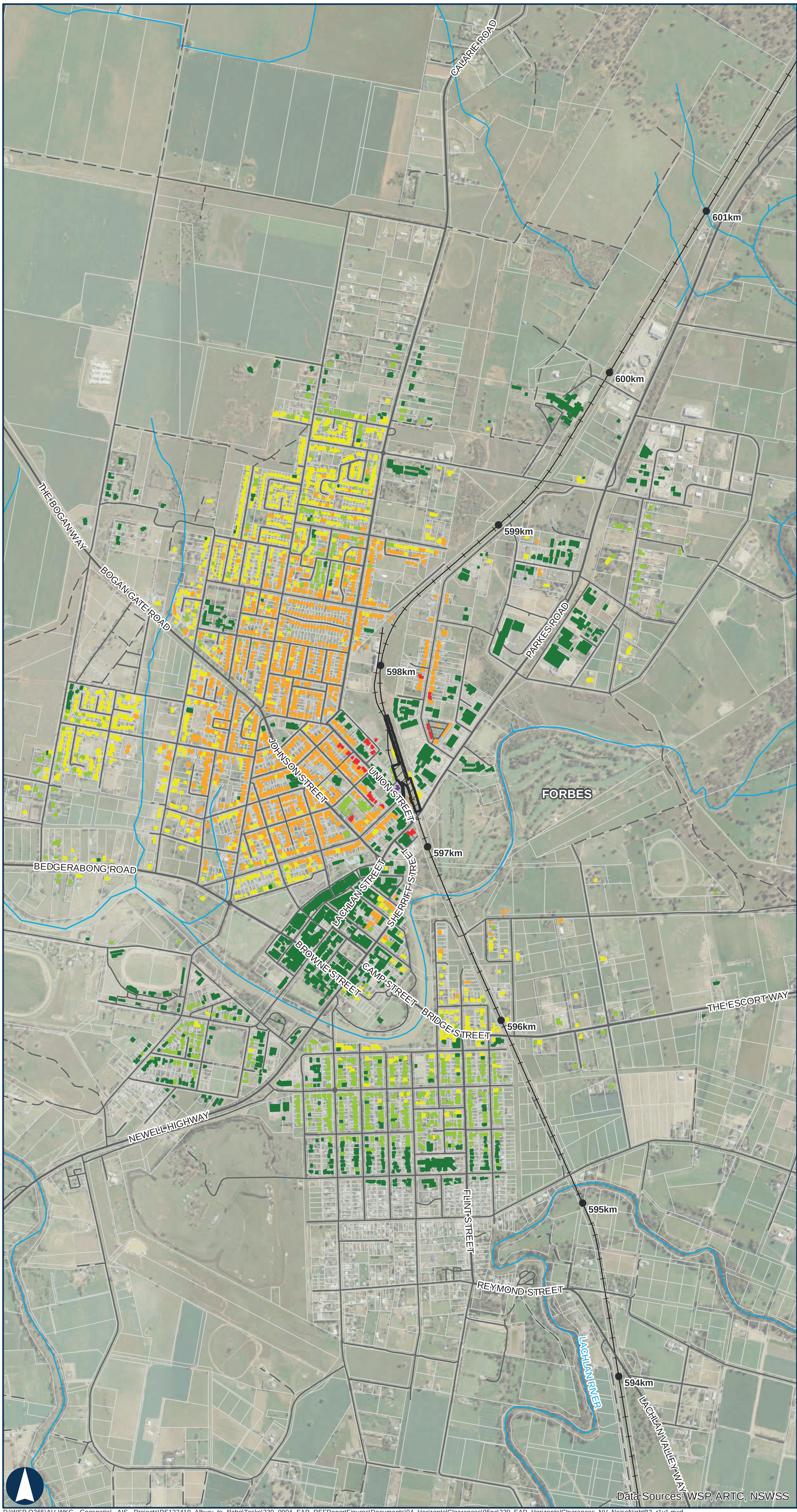
0 250 500 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 29/07/2021 Paper: A3

Author: WSP Scale: 1:15,000

D:\WSP O365\AU-WKG - Geospatial - AIS - Projects\PS122419_Albury_to_Illabo\Tasks\230_0004_EAP_REFReportFigures\Documents\04_HorizontalClearances\95pc\230_EAP_HorizontalClearances_NV_NoiseNightB3_r1v1.mxd



INLAND RAIL
ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes Forbes Station clearances

Appendix B
Night-time construction noise predictions
Figure B3 Track works and earthworks

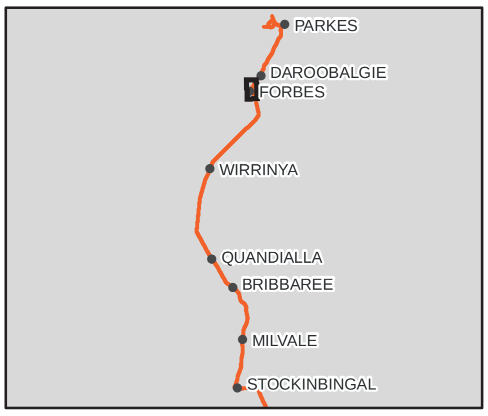
MAP 2 OF 2

LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Cadastre
- Proposal site

Exceedance of project construction noise criteria LAeq(15 minutes)

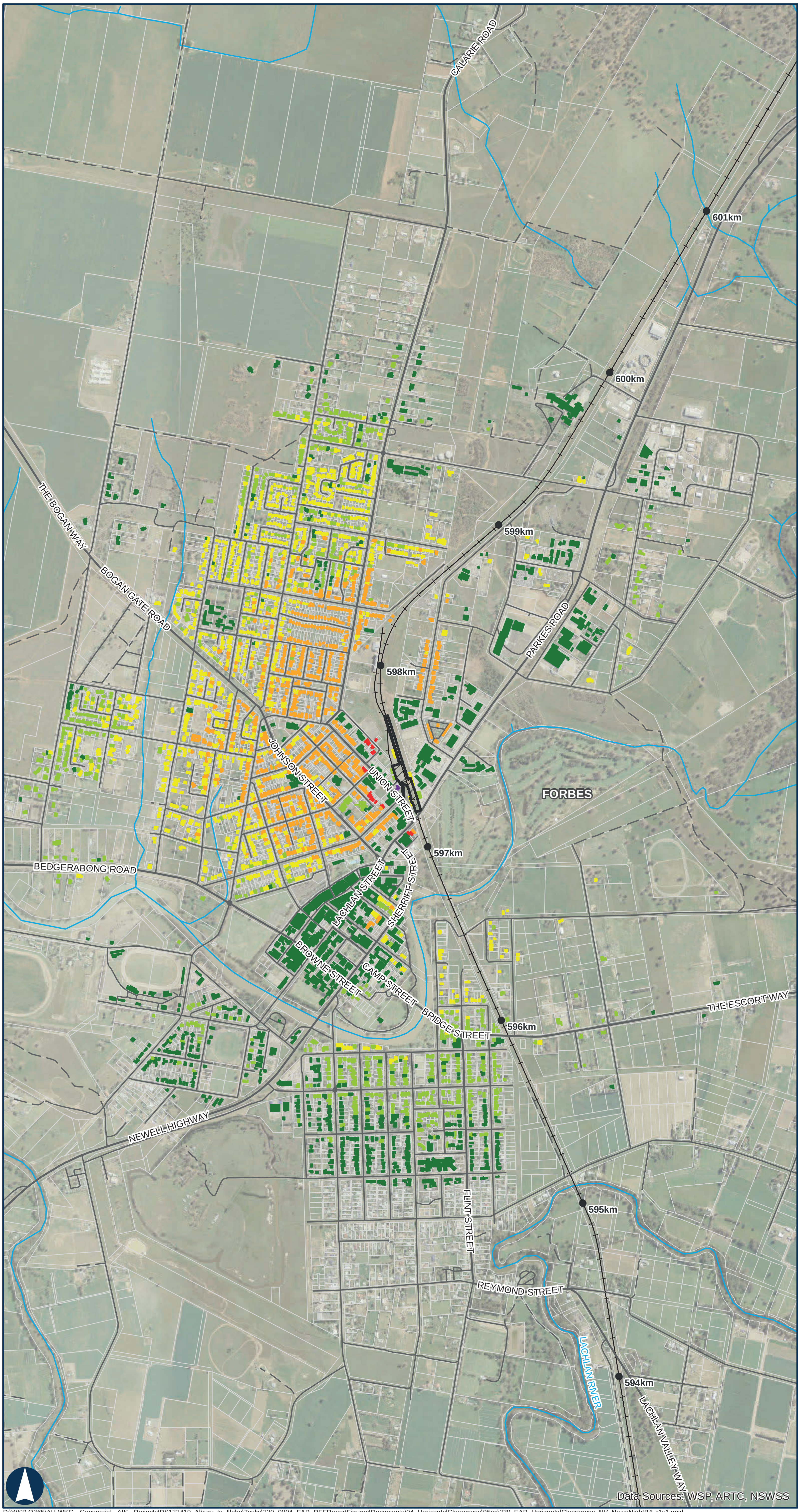
- <NML (Criteria)
- NML + 5dB
- NML + 10dB
- NML + 20dB
- NML + 30dB
- >30dB
- >75dB (Residences only)



0 250 500 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 29/07/2021 Paper: A3
Author: WSP Scale: 1:20,000



The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes Forbes Station clearances

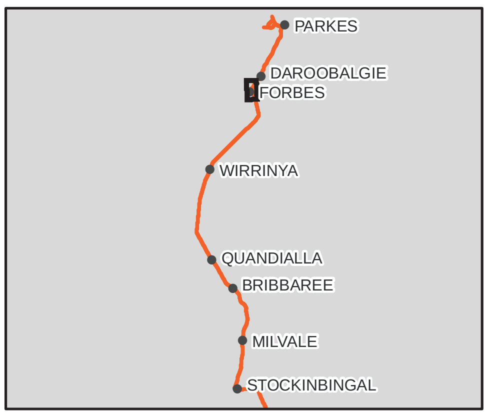
Appendix B
Night-time construction noise predictions
Figure B4 Canopy work

LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Cadastre
- Proposal site

Exceedance of project construction noise criteria LAeq(15 minutes)

- <NML (Criteria)
- NML + 5dB
- NML + 10dB
- NML + 20dB
- NML + 30dB
- >30dB
- >75dB (Residences only)



0 250 500 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 29/07/2021 Paper: A3
Author: WSP Scale: 1:20,000

INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes
Bribbaree yard clearances

Appendix B
Night-time construction noise predictions
Figure B5 Signalling

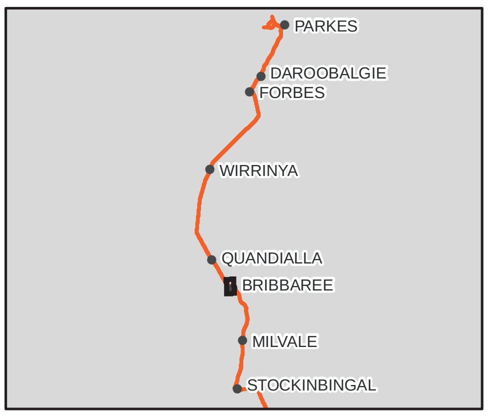
MAP 1 OF 2

LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Cadastre
- Proposal site

Exceedance of project construction noise criteria LAeq(15 minutes)

- <NML (Criteria)
- NML + 5dB
- NML + 10dB
- NML + 20dB
- NML + 30dB
- >30dB
- >75dB (Residences only)

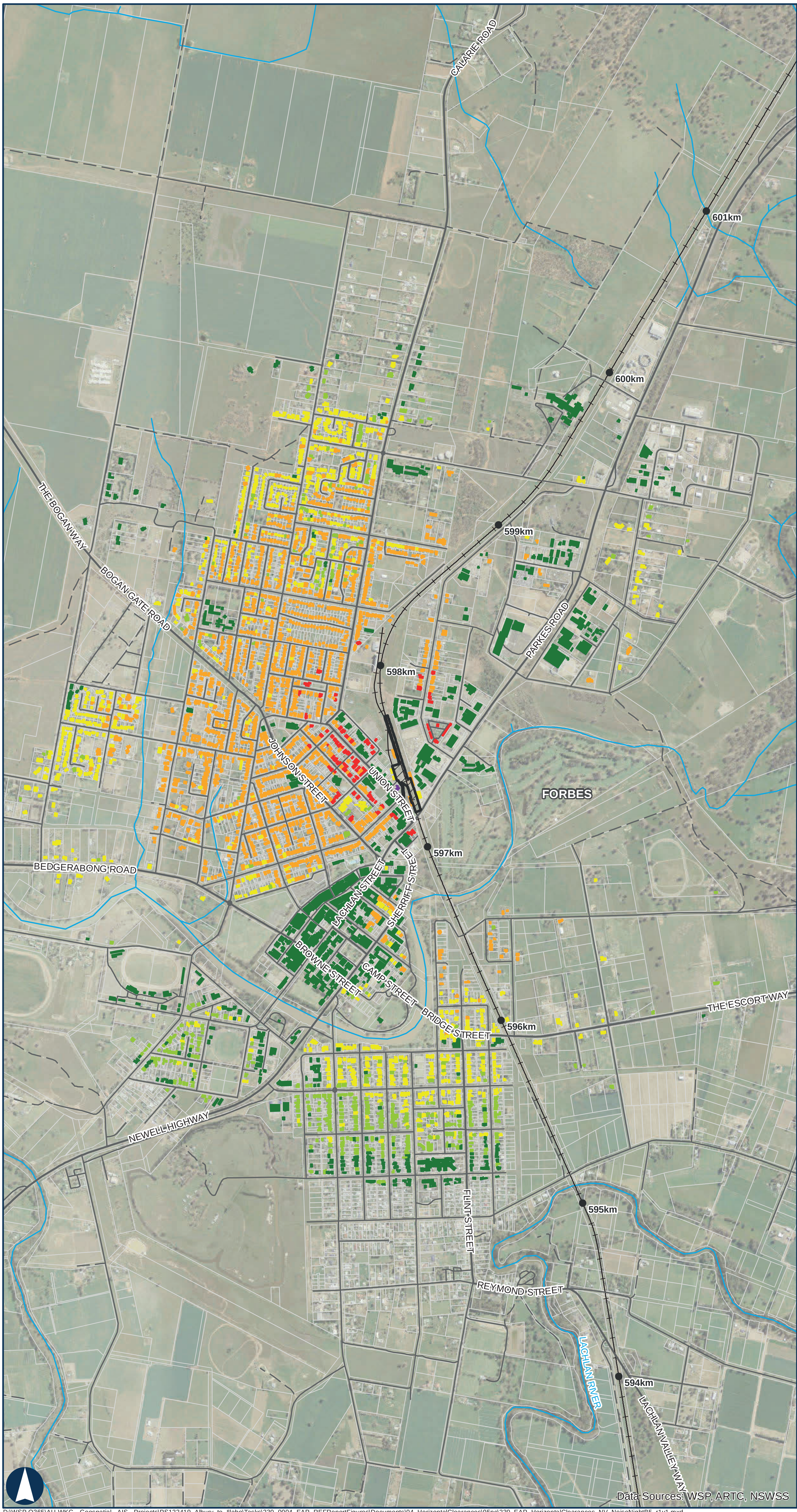


0 250 500 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 29/07/2021 | Paper: A3
Author: WSP | Scale: 1:15,000

D:\WSP O365\AU-WKG - Geospatial - AIS - Projects\PS122419_Albury_to_Illabo\Tasks\230_0004_EAP_REFReportFigures\Documents\04_HorizontalClearances\95pc\230_EAP_HorizontalClearances_NV_NoiseNightB5_r1v1.mxd



INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes Forbes Station clearances

Appendix B
Night-time construction noise predictions
Figure B5 Signalling

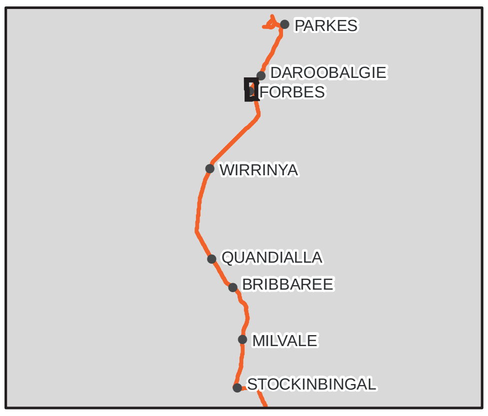
MAP 2 OF 2

LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Cadastre
- Proposal site

Exceedance of project construction noise criteria LAeq(15 minutes)

- <NML (Criteria)
- NML + 5dB
- NML + 10dB
- NML + 20dB
- NML + 30dB
- >30dB
- >75dB (Residences only)



0 250 500 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 29/07/2021 Paper: A3
Author: WSP Scale: 1:20,000

INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes
Bribbaree yard clearances

Appendix B
Night-time construction noise predictions
Figure B6 Demobilisation and rehabilitation

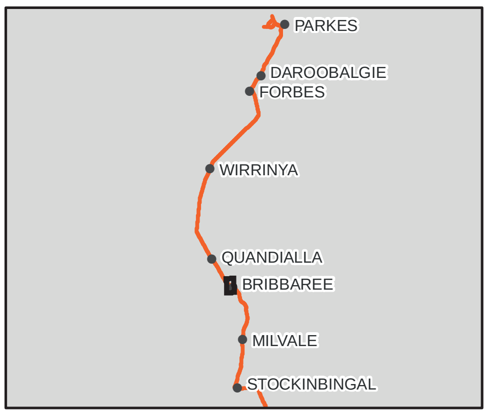
MAP 1 OF 4

LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Cadastre
- Proposal site

Exceedance of project construction noise criteria LAeq(15 minutes)

- <NML (Criteria)
- NML + 5dB
- NML + 10dB
- NML + 20dB
- NML + 30dB
- >30dB
- >75dB (Residences only)



0 250 500 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 29/07/2021 Paper: A3
Author: WSP Scale: 1:15,000

D:\WSP O365\AU-WKG - Geospatial - AIS - Projects\PS122419_Albury_to_Illabo\Tasks\230_0004_EAP_REFReportFigures\Documents\04_HorizontalClearances\95pc\230_EAP_HorizontalClearances_NV_NoiseNightB6_r1v1.mxd

INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes
Caragabal yard clearances

Appendix B
Night-time construction noise predictions
Figure B6 Demobilisation and rehabilitation

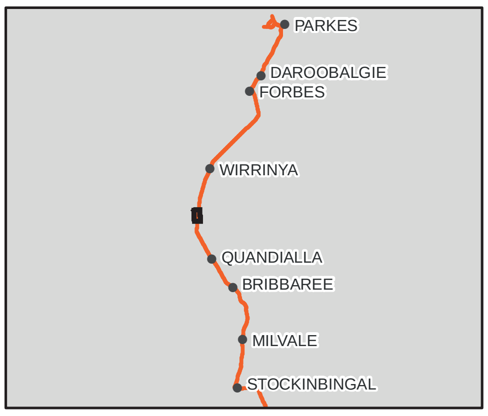
MAP 2 OF 4

LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Cadastre
- Proposal site

Exceedance of project construction noise criteria LAeq(15 minutes)

- <NML (Criteria)
- NML + 5dB
- NML + 10dB
- NML + 20dB
- NML + 30dB
- >30dB
- >75dB (Residences only)



0 250 500 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 29/07/2021 Paper: A3
Author: WSP Scale: 1:12,000

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes
Wirrinya yard clearances

Appendix B
Night-time construction noise predictions
Figure B6 Demobilisation and rehabilitation

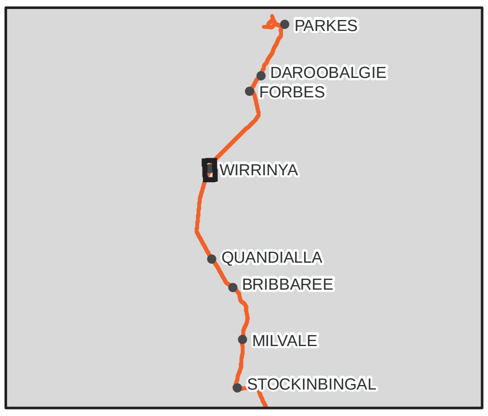
MAP 3 OF 4

LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Cadastre
- Proposal site

Exceedance of project construction noise criteria LAeq(15 minutes)

- <NML (Criteria)
- NML + 5dB
- NML + 10dB
- NML + 20dB
- NML + 30dB
- >30dB
- >75dB (Residences only)



0 250 500 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 29/07/2021
Paper: A3
Author: WSP
Scale: 1:20,000

D:\WSP O365\AU-WKG - Geospatial - AIS - Projects\PS122419_Albury_to_Illabo\Tasks\230_0004_EAP_REFReportFigures\Documents\04_HorizontalClearances\95pc\230_EAP_HorizontalClearances_NV_NoiseNightB6_r1v1.mxd

INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes Forbes Station clearances

Appendix B
Night-time construction noise predictions
Figure B6 Demobilisation and rehabilitation

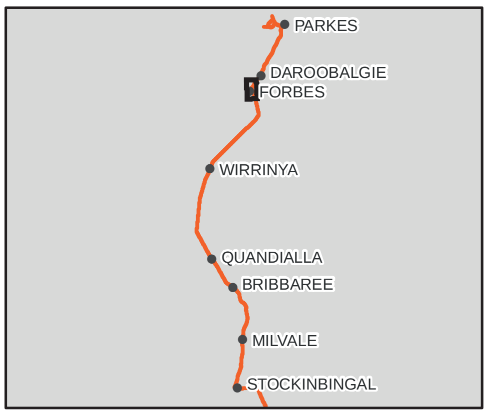
MAP 4 OF 4

LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Cadastre
- Proposal site

Exceedance of project construction noise criteria LAeq(15 minutes)

- <NML (Criteria)
- NML + 5dB
- NML + 10dB
- NML + 20dB
- NML + 30dB
- >30dB
- >75dB (Residences only)



0 250 500 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 29/07/2021 Paper: A3
Author: WSP Scale: 1:20,000

D:\WSP O365\AU-WKG - Geospatial - AIS - Projects\PS122419_Albury_to_Illabo\Tasks\230_0004_EAP_REFReportFigures\Documents\04_HorizontalClearances\95pc\230_EAP_HorizontalClearances_NV_NoiseNightB6_r1v1.mxd

INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes
Milvale yard clearances

Appendix B
Night-time construction noise predictions
Figure B7 Water tank modifications

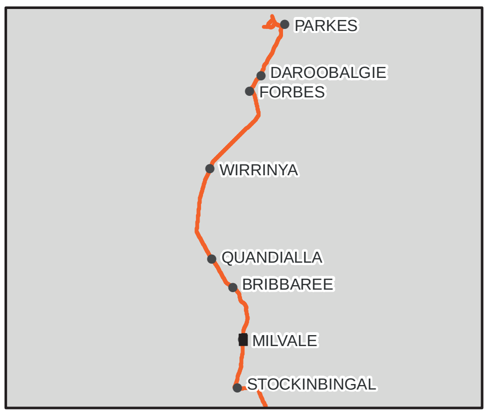
MAP 1 OF 2

LEGEND

- KM post
- Existing railway
- Main road
- Track
- Watercourse
- Cadastre
- Proposal site

Exceedance of project construction noise criteria LAeq(15 minutes)

- <NML (Criteria)
- NML + 5dB
- NML + 10dB
- NML + 20dB
- NML + 30dB
- >30dB
- >75dB (Residences only)



0 200 400 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 29/07/2021 | Paper: A3
Author: WSP | Scale: 1:7,500

INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes
Quandialla yard clearances

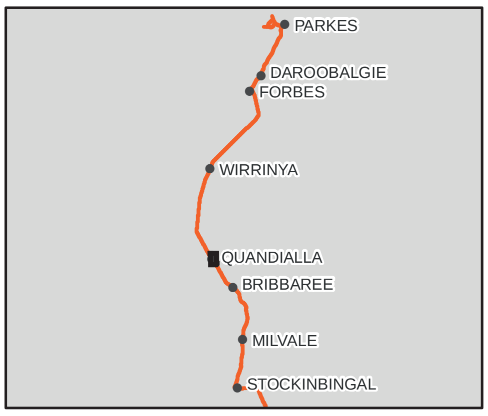
Appendix B
Night-time construction noise predictions
Figure B7 Water tank modifications
MAP 2 OF 2

LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Cadastre
- Proposal site

Exceedance of project construction noise criteria LAeq(15 minutes)

- <NML (Criteria)
- NML + 5dB
- NML + 10dB
- NML + 20dB
- NML + 30dB
- >30dB
- >75dB (Residences only)



0 200 400 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 29/07/2021 Paper: A3
Author: WSP Scale: 1:12,000

D:\WSP O365\AU-WKG - Geospatial - AIS - Projects\PS122419_Albury_to_Illabo\Tasks\230_0004_EAP_REFReportFigures\Documents\04_HorizontalClearances\95pc\230_EAP_HorizontalClearances_NV_NoiseNightB7_r1v1.mxd

INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes Bribbaree yard clearances

Appendix B
Night-time construction noise predictions
Figure B8 Site compound

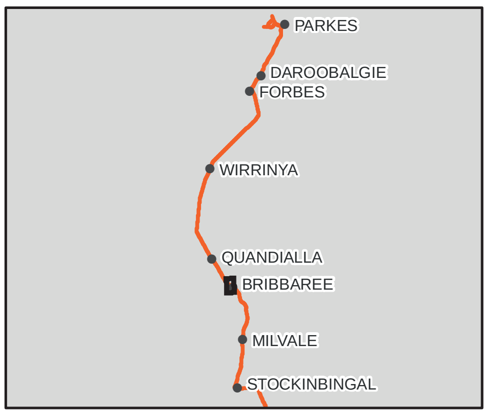
MAP 1 OF 2

LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Cadastre
- Proposal site

Exceedance of project construction noise criteria LAeq(15 minutes)

- <NML (Criteria)
- NML + 5dB
- NML + 10dB
- NML + 20dB
- NML + 30dB
- >30dB
- >75dB (Residences only)



0 250 500 m

Coordinate System: GDA 1994 MGA Zone 55

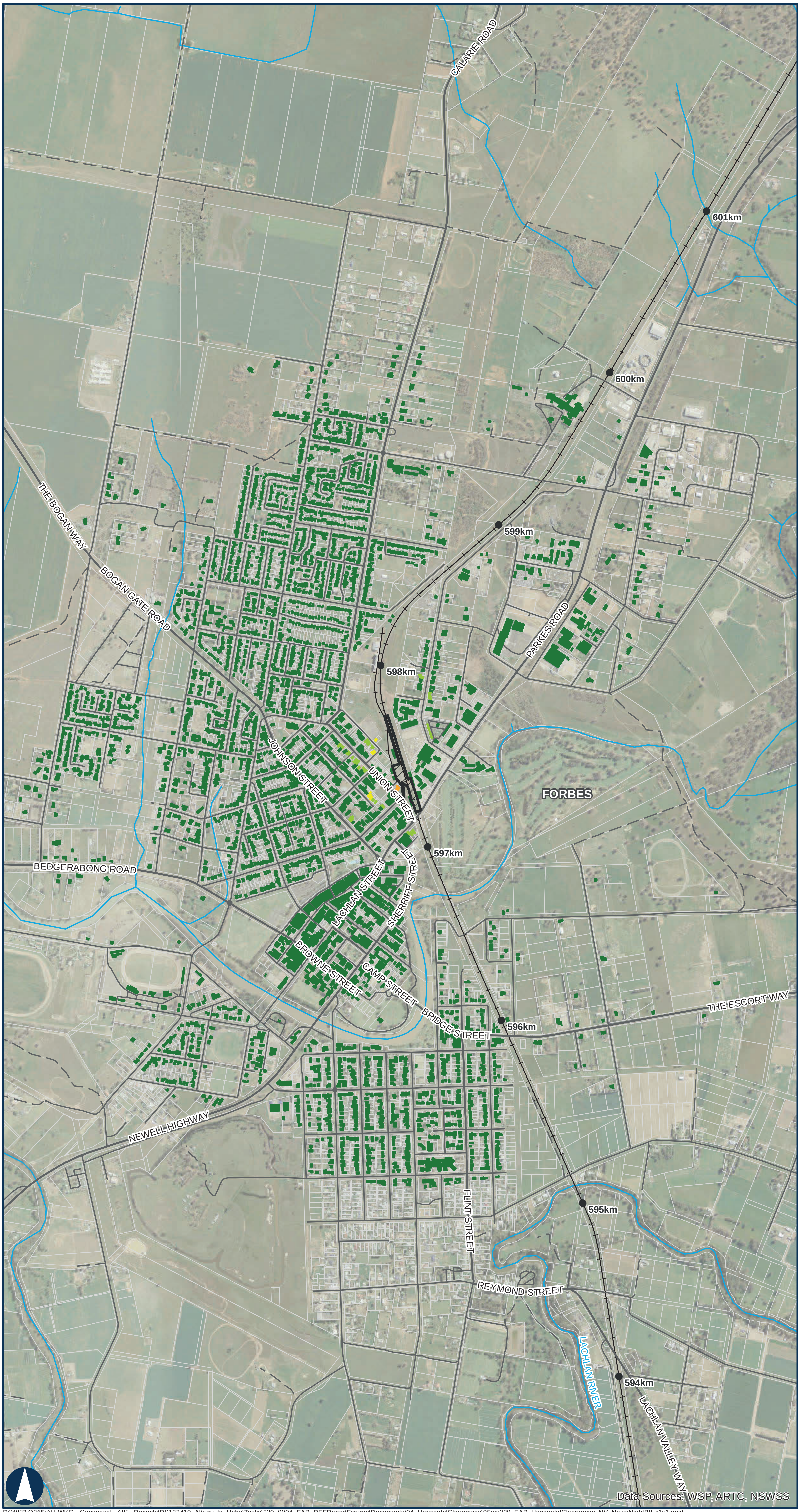
Date: 29/07/2021
Paper: A3
Author: WSP
Scale: 1:15,000

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes Forbes Station clearances

Appendix B
Night-time construction noise predictions
Figure B8 Site compound
MAP 2 OF 2

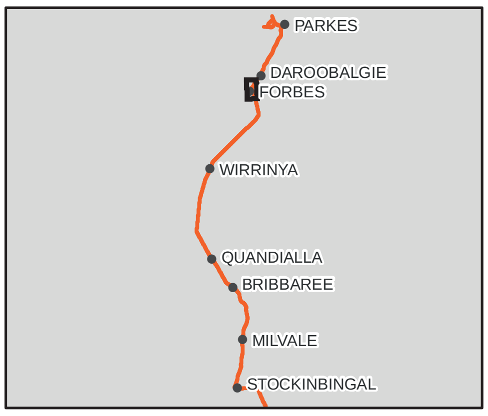


LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Cadastre
- Proposal site

Exceedance of project construction noise criteria LAeq(15 minutes)

- <NML (Criteria)
- NML + 5dB
- NML + 10dB
- NML + 20dB
- NML + 30dB
- >30dB
- >75dB (Residences only)



0 250 500 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 29/07/2021 Paper: A3
Author: WSP Scale: 1:20,000

D:\WSP O365\AU-WKG - Geospatial - AIS - Projects\PS122419_Albury_to_Illabo\Tasks\230_0004_EAP_REFReportFigures\Documents\04_HorizontalClearances\95pc\230_EAP_HorizontalClearances_NV_NoiseNightB8_r1v1.mxd

APPENDIX E

Horizontal Clearances

Noise and Vibration Impact Assessment

Appendix C Predicted railway noise levels

APPENDIX C-1
EXISTING RAILWAY OPERATIONS 2020

The predicted noise levels for existing railway operations are detailed in the following graphs.

The noise levels have been referenced to determine where the introduction of the proposal, including the future railway operations with Inland Rail, are predicted to increase railway noise levels at the sensitive receivers. An assessment of existing railway noise levels is not required.

FORBES STATION AND YARD

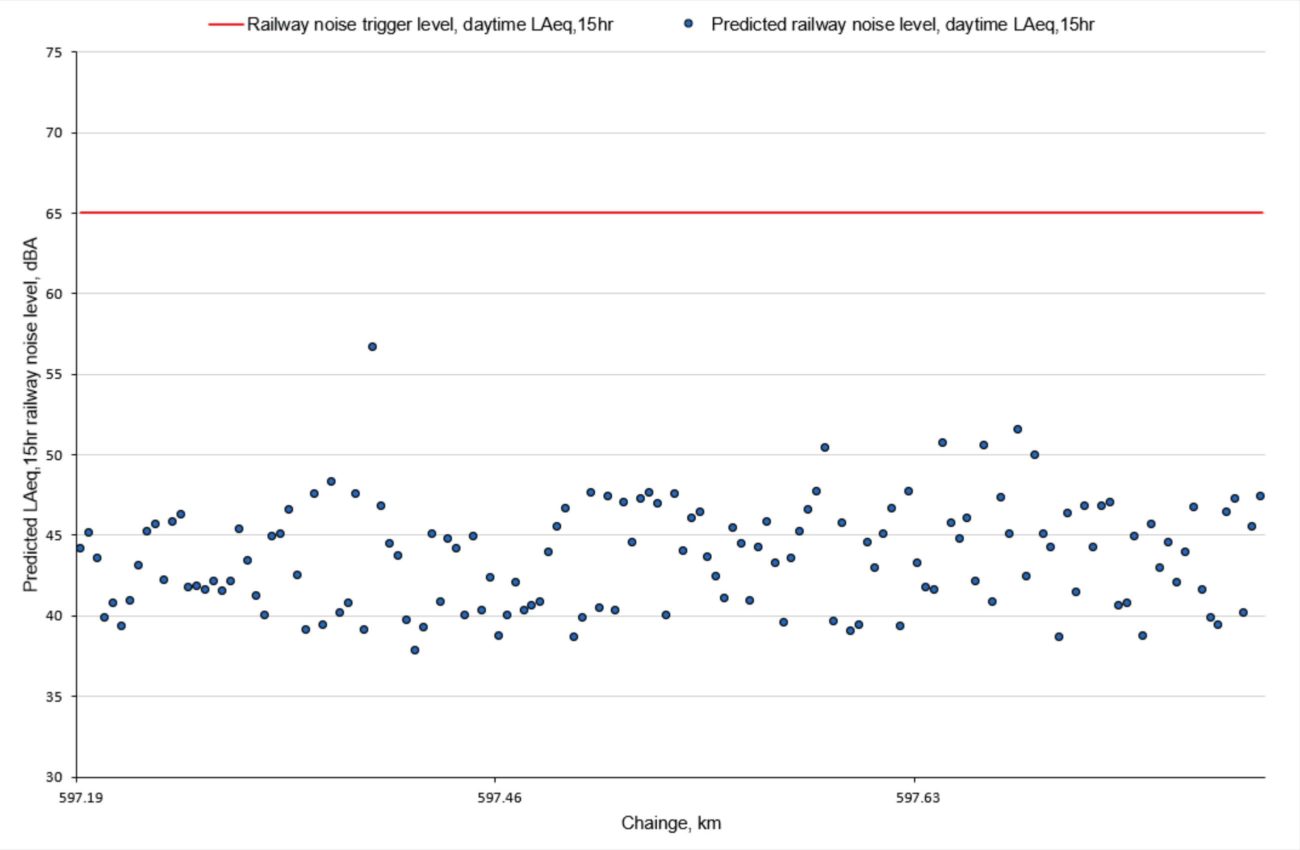


Figure C-1.1 Predicted daytime $L_{Aeq,15hr}$ railway noise levels (2020)

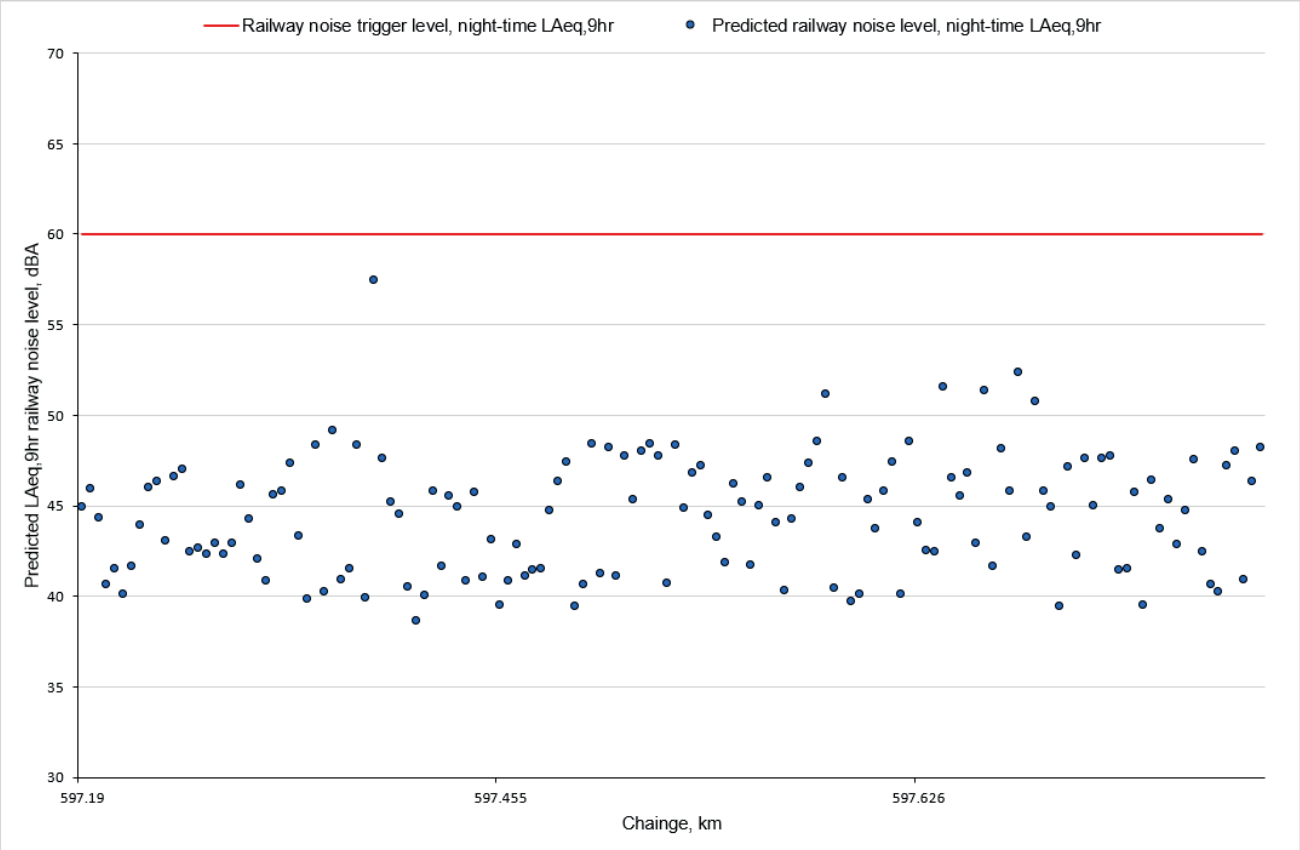


Figure C-1.2 Predicted night-time $L_{Aeq,9hr}$ railway noise levels (2020)

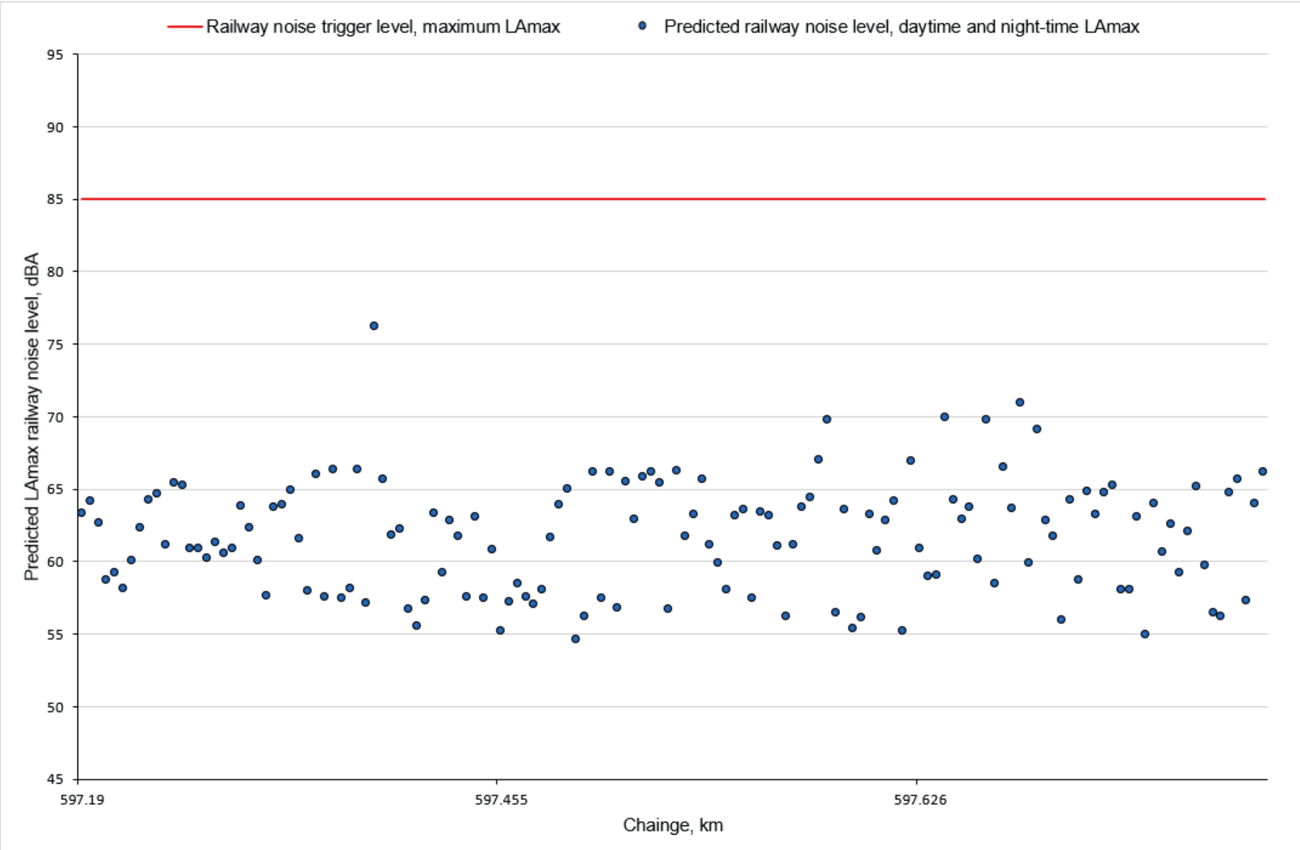


Figure C-1.3 Predicted daytime and night-time L_{Amax} railway noise levels (2020)

WIRRINYA YARD

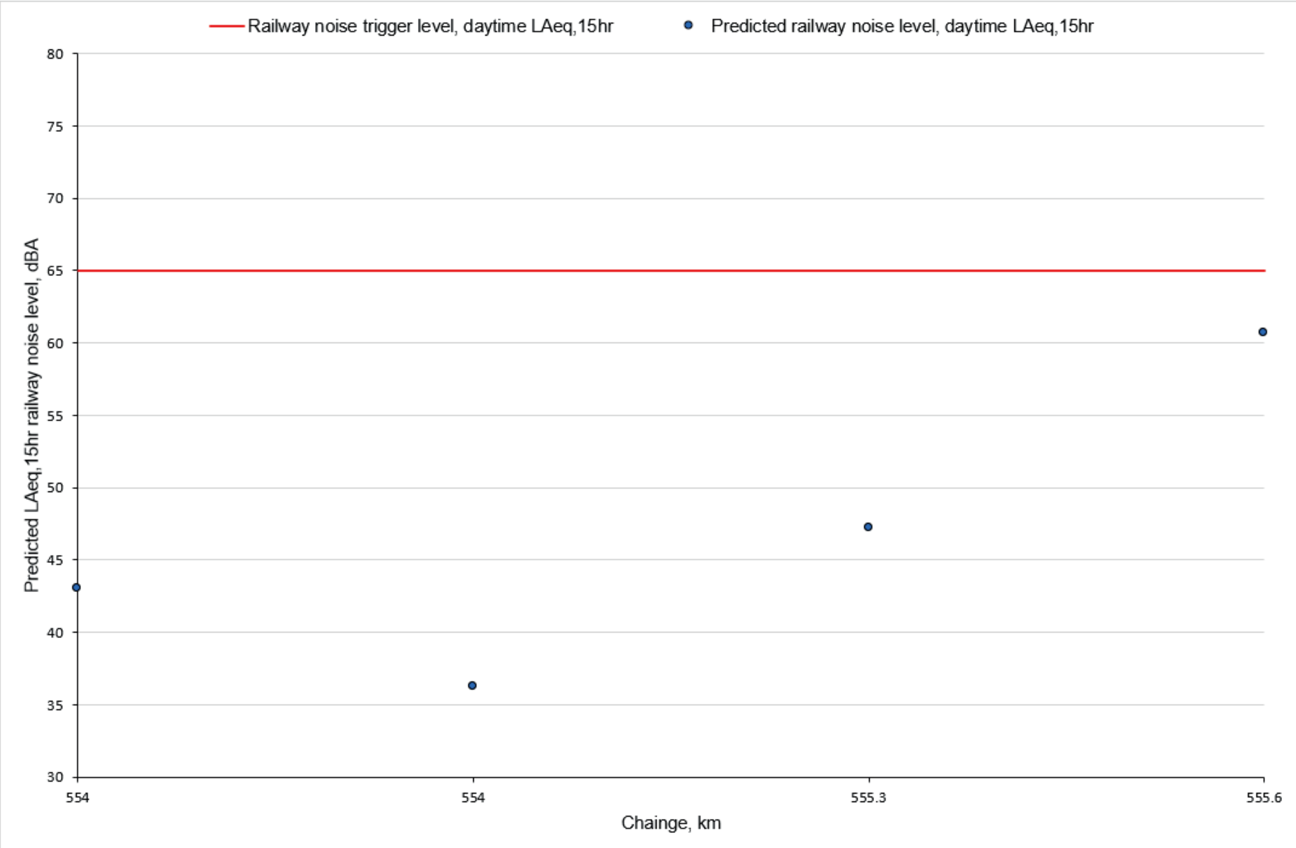


Figure C-1.4 Predicted daytime $L_{Aeq,15hr}$ railway noise levels (2020)

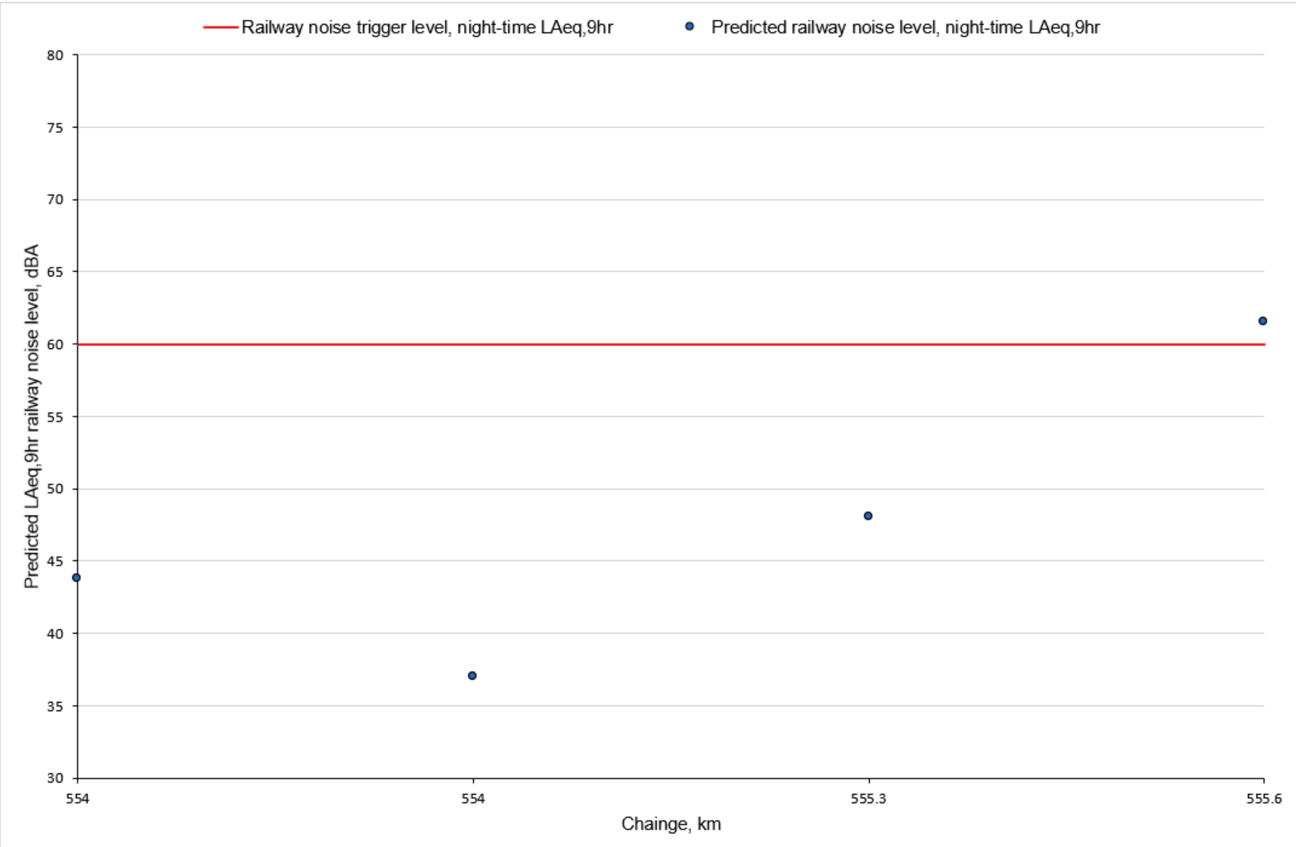


Figure C-1.5 Predicted night-time $L_{Aeq,9hr}$ railway noise levels (2020)

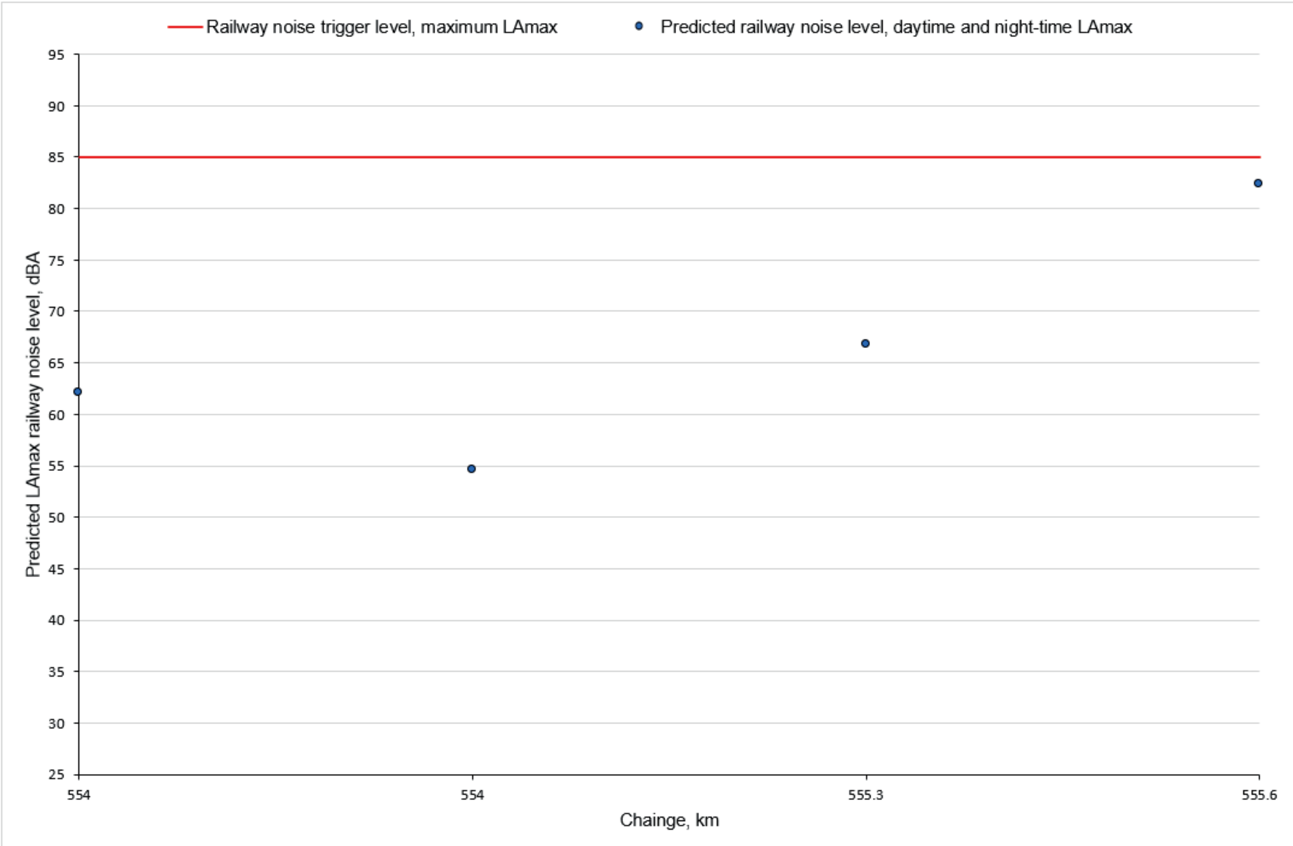


Figure C-1.6 Predicted maximum daytime and night-time railway noise levels (2020)

CARAGABAL YARD

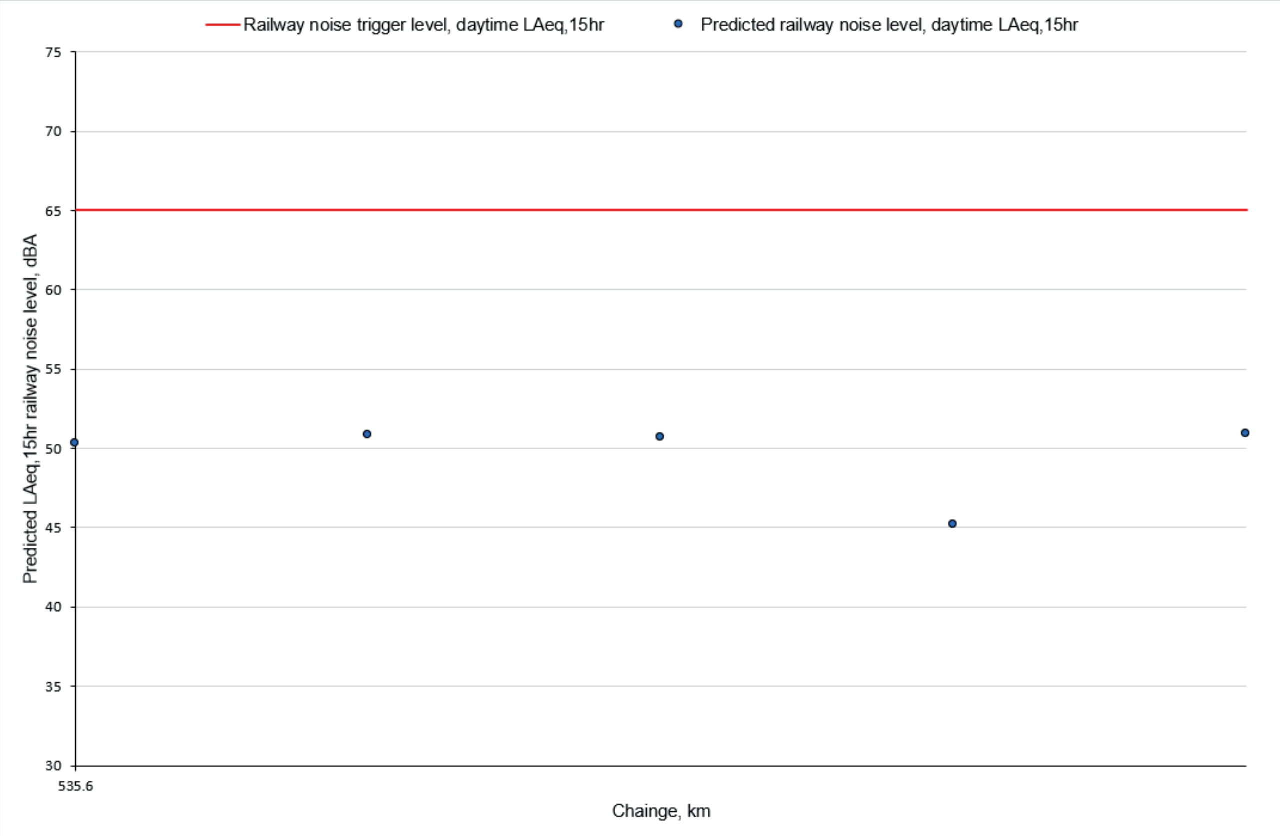


Figure C-1.7 Predicted daytime $L_{Aeq,15hr}$ railway noise levels (2020)

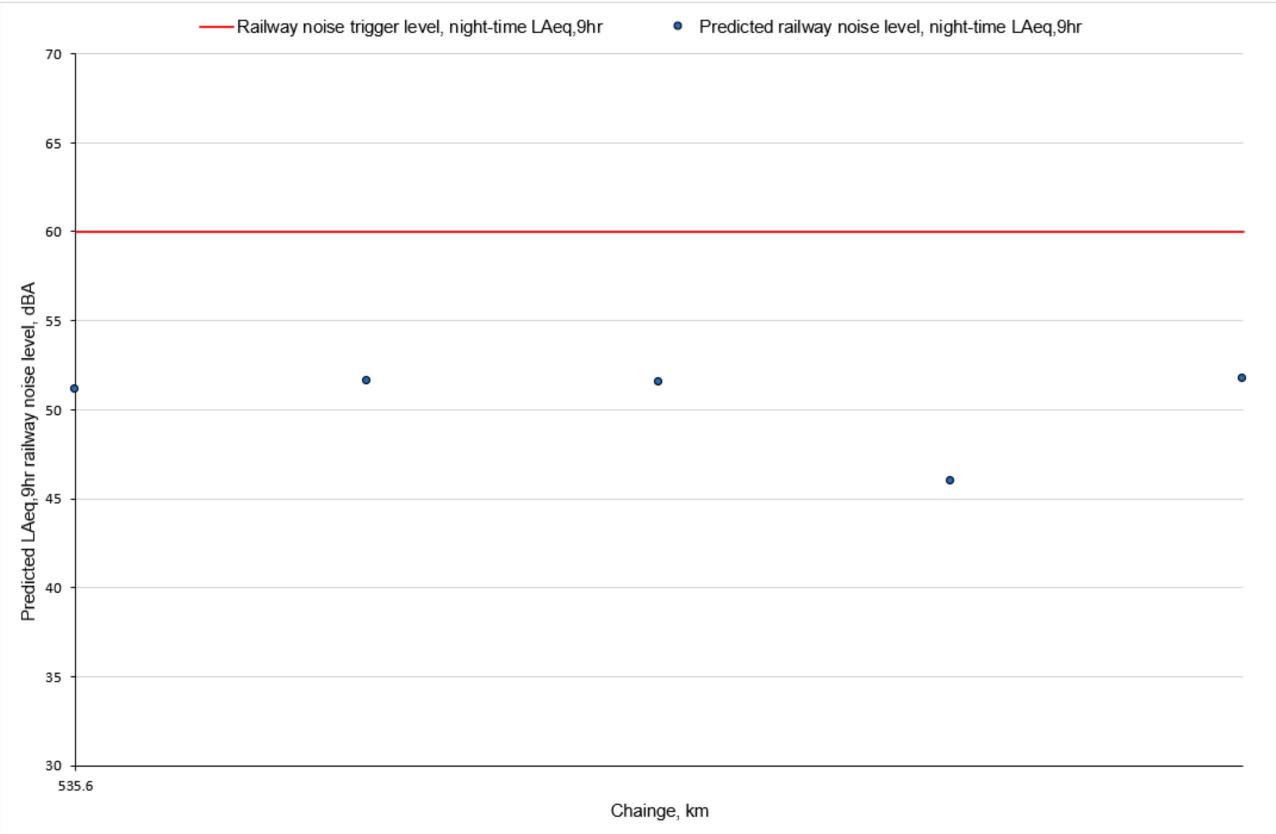


Figure C-1.8 Predicted night-time $L_{Aeq,9hr}$ railway noise levels (2020)

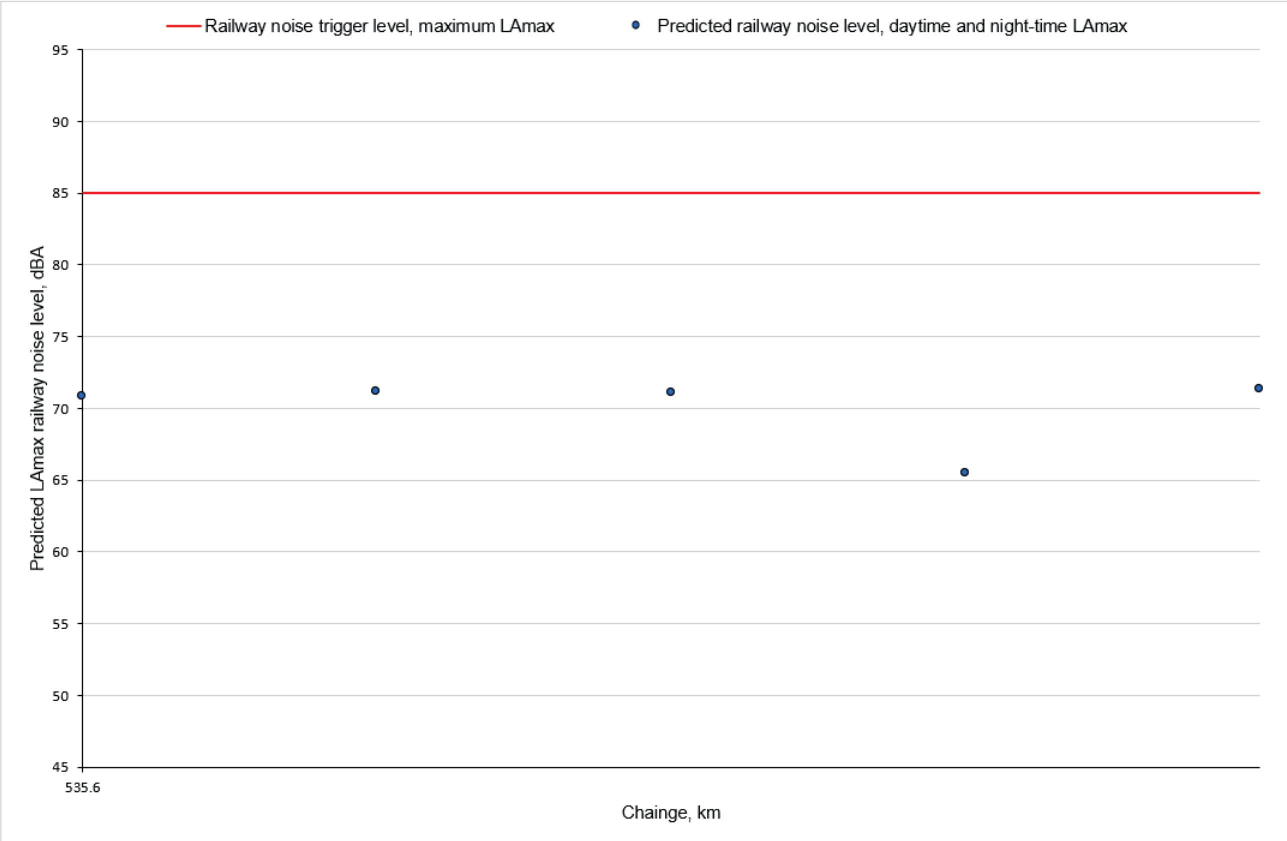


Figure C-1.9 Predicted maximum daytime and night-time railway noise levels (2020)

BRIBBAREE YARD

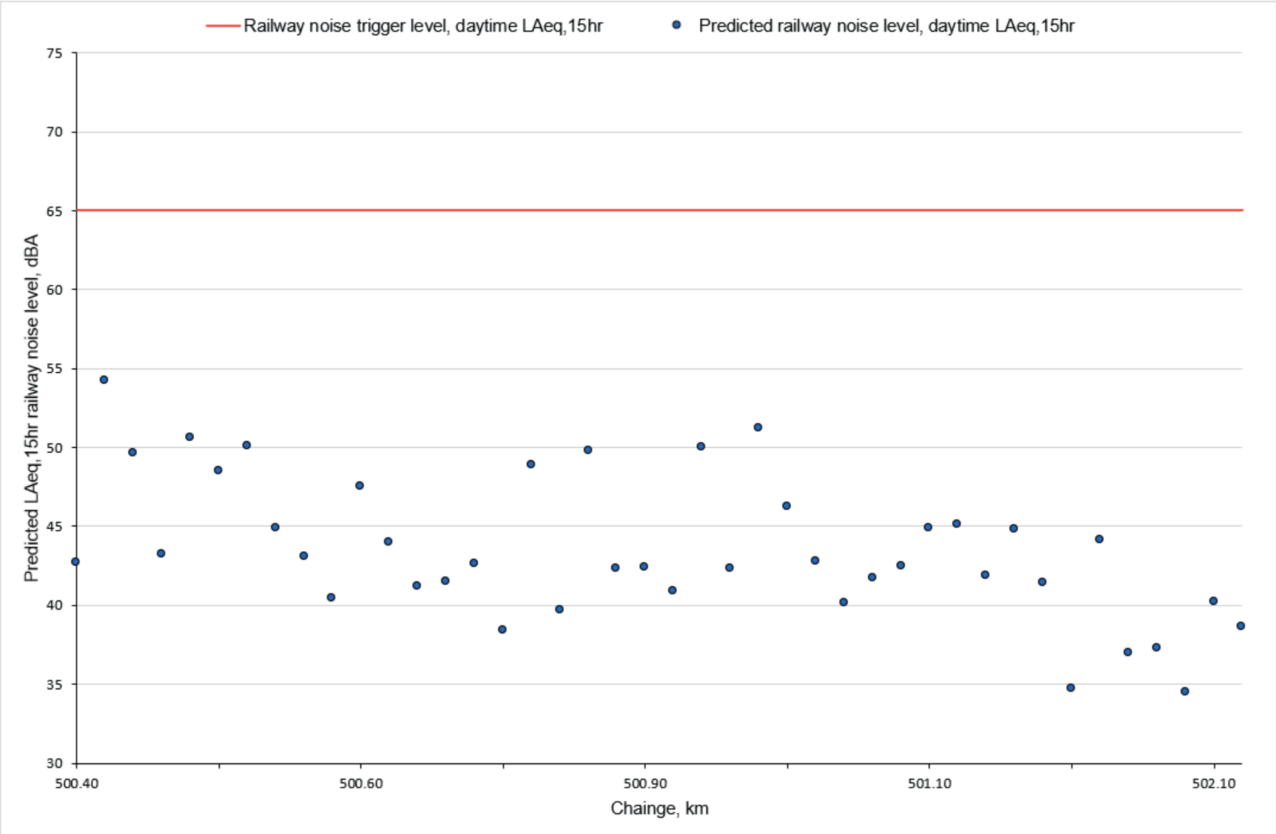


Figure C-1.10 Predicted daytime $L_{Aeq,15hr}$ railway noise levels (2020)

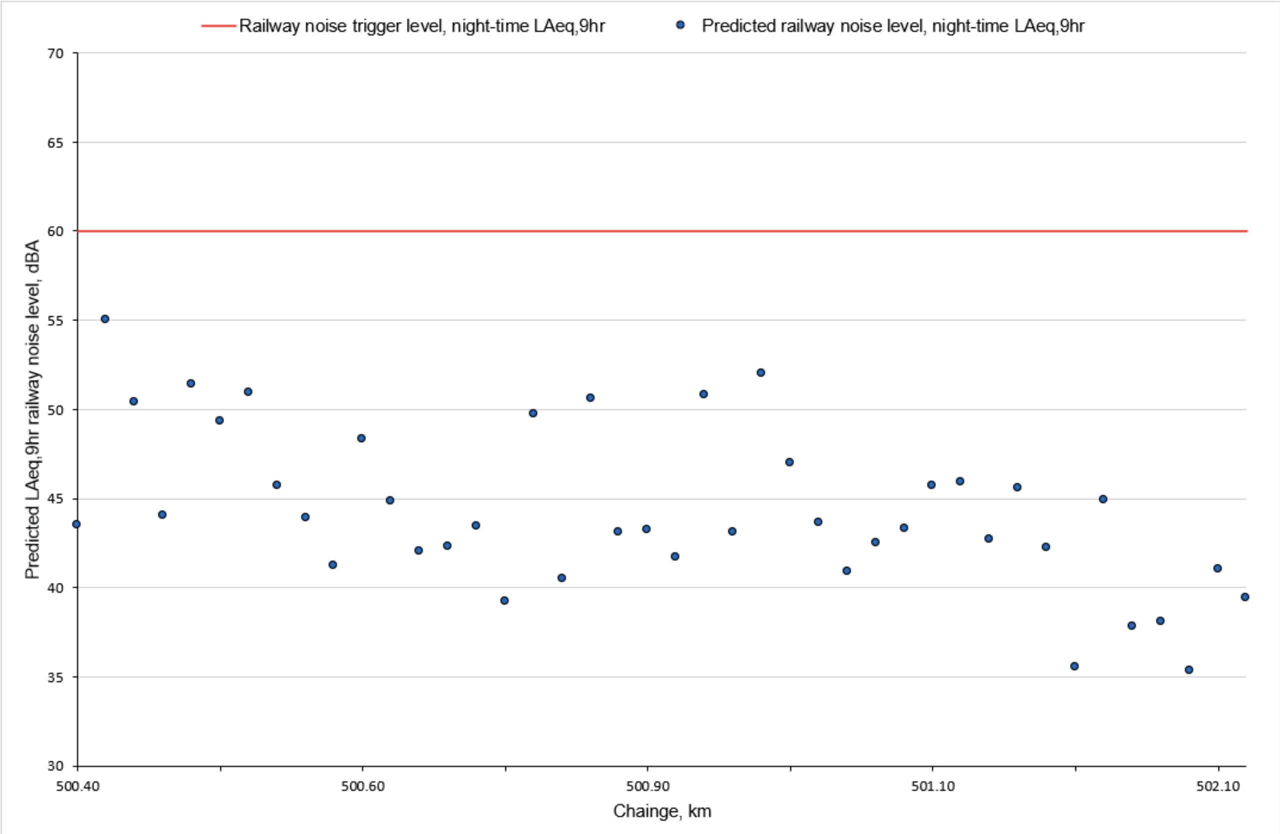


Figure C-1.11 Predicted night-time $L_{Aeq,9hr}$ railway noise levels (2020)

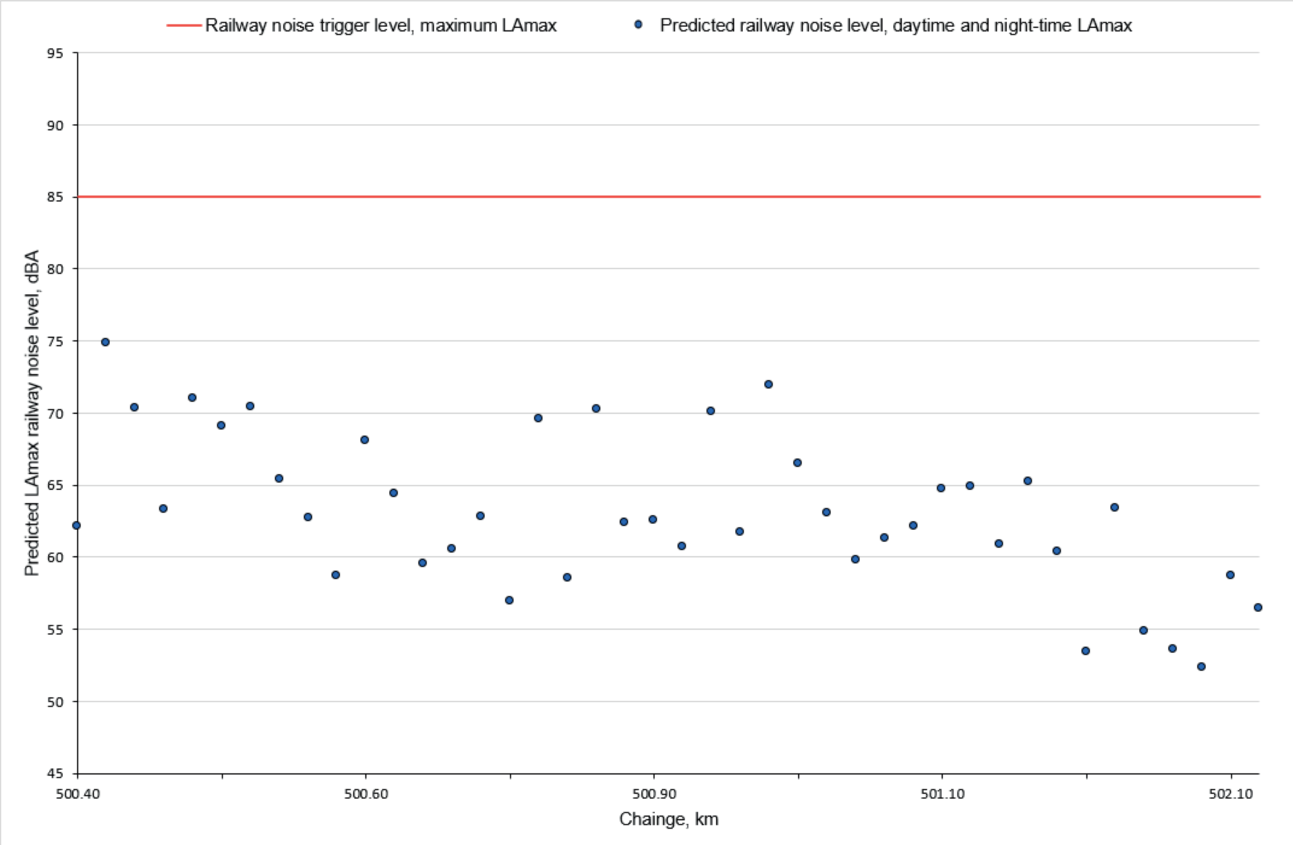


Figure C-1.12 Predicted maximum daytime and night-time railway noise levels (2020)

APPENDIX C-2
RAILWAY OPERATIONS – PROPOSAL OPENING 2027

The proposed change to the horizontal alignment is a minor influence (less than 1dBA) influence to the predicted railway noise levels. The main influence on the predicted noise levels in 2027 being the proposed railway operations with Inland Rail.

The proposed Inland Rail operations in 2027 has been predicted to increase railway noise levels by more than 2dBA $L_{Aeq,15hr}$ daytime, 2dBA $L_{Aeq,9hr}$ night-time and 3dBA L_{Amax} from the predicted 2020 (existing) noise levels. Consequently, where noise levels at sensitive receivers are predicted to trigger the noise management levels, they also trigger the change (increase) in railway noise criteria.

FORBES STATION AND YARD

DAYTIME RAILWAY OPERATIONS (2027)

The predicted $L_{Aeq,15hr}$ railway noise levels at residential receivers for the daytime period with the proposal in 2027 are detailed in Figure C-2.1. The predicted railway noise levels meet the daytime 65dBA $L_{Aeq,15hr}$ noise management level at all residential receivers.

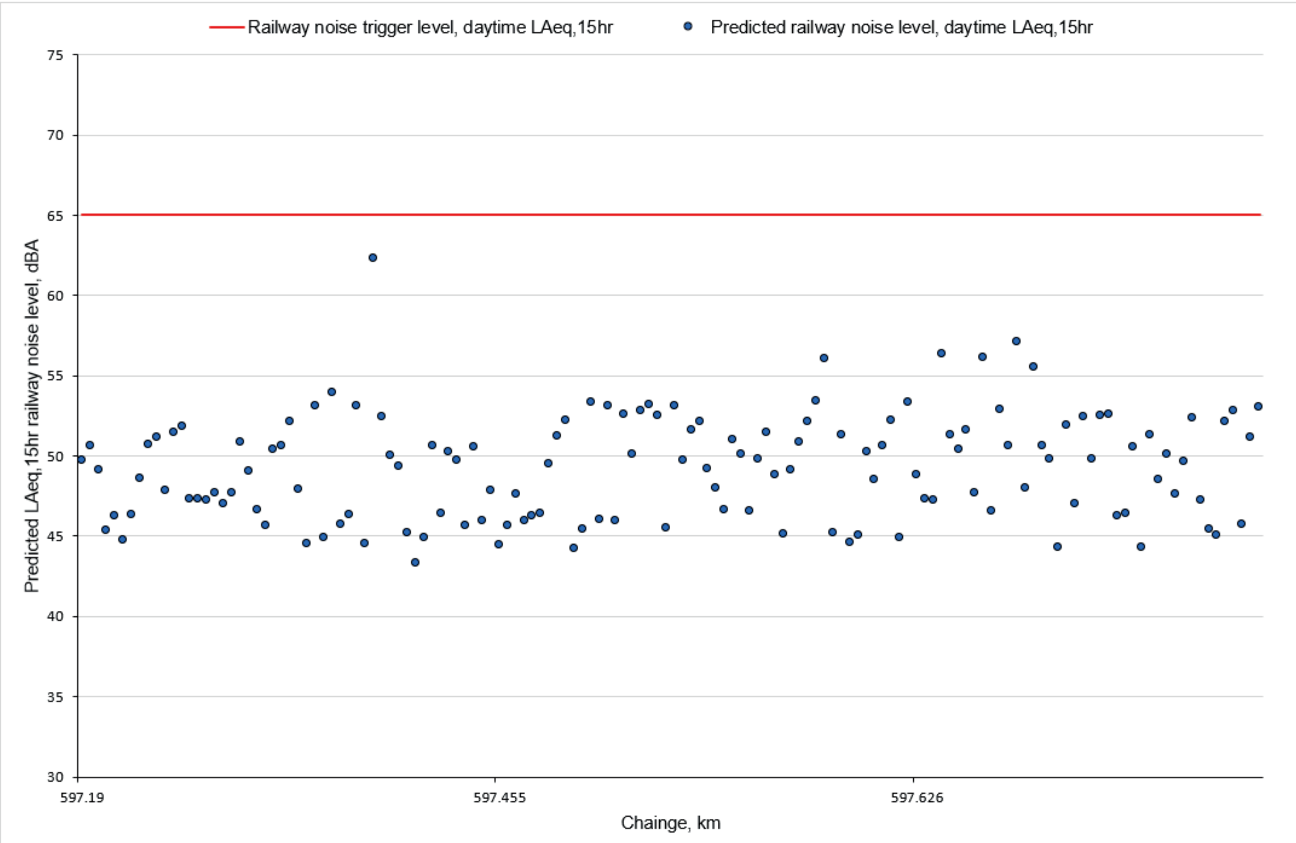


Figure C-2.1 Predicted daytime railway noise levels (2027)

NIGHT-TIME RAILWAY OPERATIONS (2027)

The predicted $L_{Aeq,9hr}$ railway noise levels at residential receivers for the night-time period are detailed in Figure C-2.2. The railway noise levels meet the 60dBA $L_{Aeq,9hr}$ noise management level at most residential receivers.

At up to nine residences the predicted railway noise levels are up to 5dB above the noise management level and trigger a review of feasible and reasonable noise mitigation measures to reduce and control railway noise.

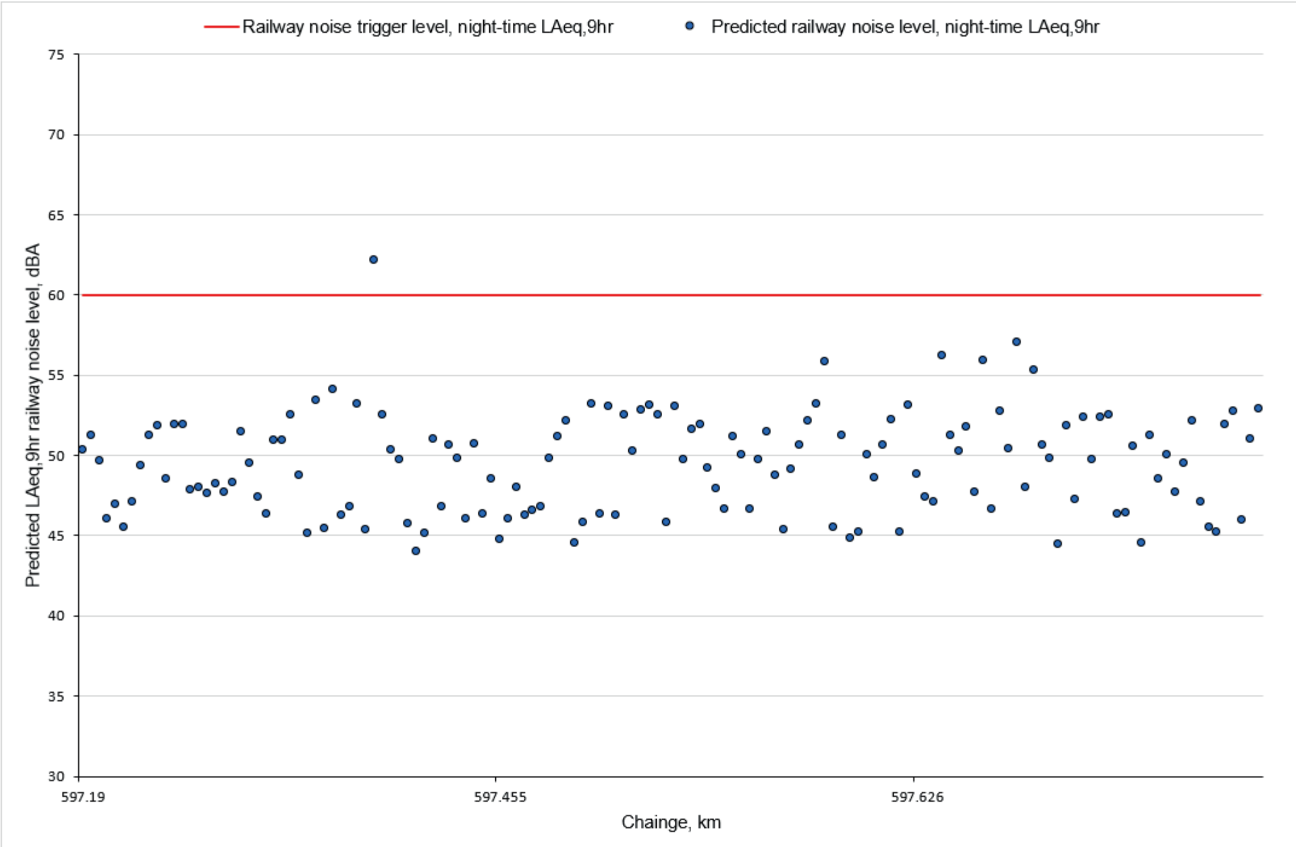


Figure C-2.2 Predicted night-time railway noise levels (2027)

MAXIMUM RAILWAY NOISE LEVELS (2027)

The predicted maximum railway noise levels at residential receivers for the with the proposal in 2027 are detailed in Figure C-2.3. The predicted noise levels at all residential receivers meet the 85dBA L_{Amax} noise management level.

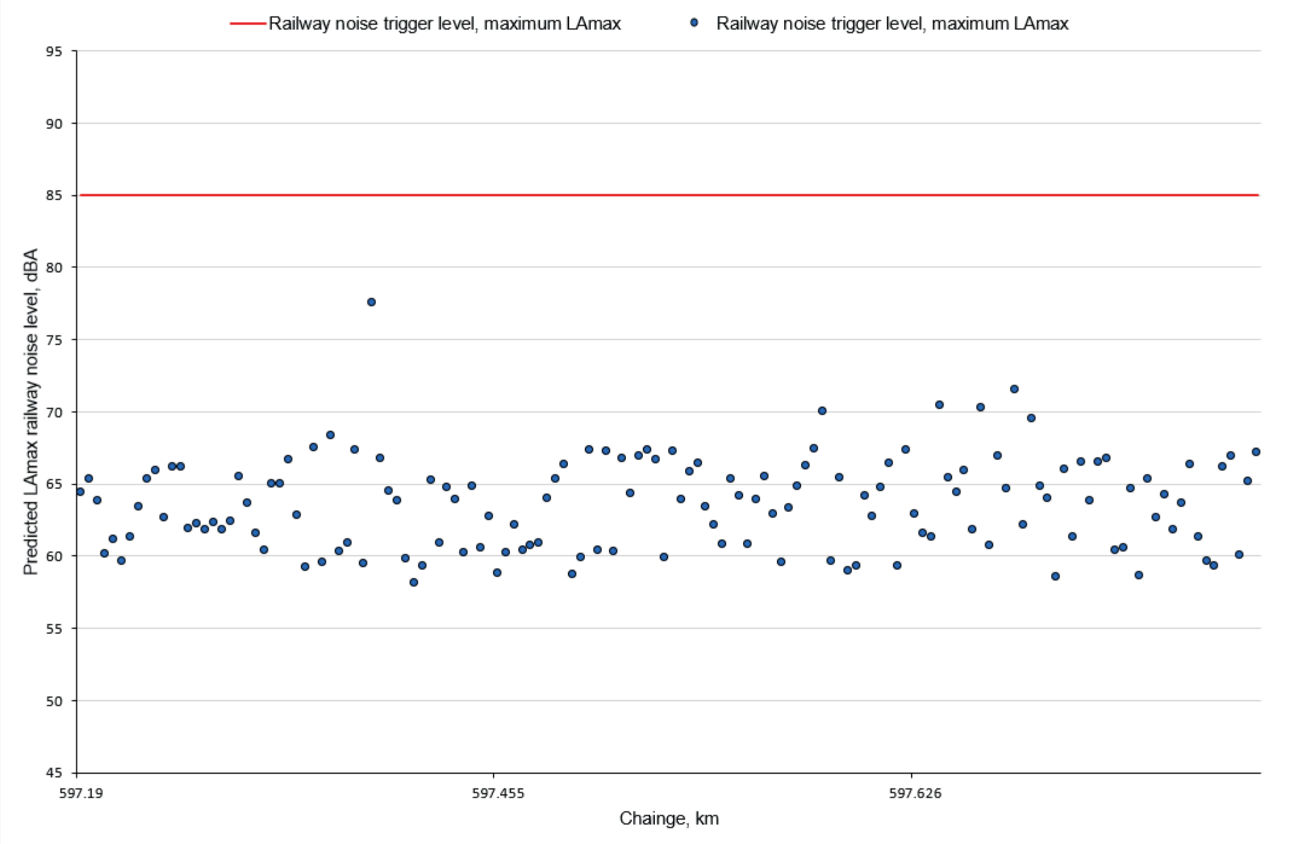


Figure C-2.3 Predicted maximum daytime and night-time railway noise levels (2027)

WIRRINYA YARD

DAYTIME RAILWAY OPERATIONS (2027)

The predicted $L_{Aeq,15hr}$ railway noise levels at residential receivers for the daytime period with the proposal in 2027 are detailed in Figure C-2.4.

The predicted noise levels meet the 65dBA $L_{Aeq,15hr}$ noise management level at all but one of the residential receivers.

At one residence located approximately 14m from the rail line, the predicted noise levels of 70dBA $L_{Aeq,15hr}$ are up to 5dB above the daytime noise management level and noise levels trigger a review of feasible and reasonable noise mitigation at this receiver.

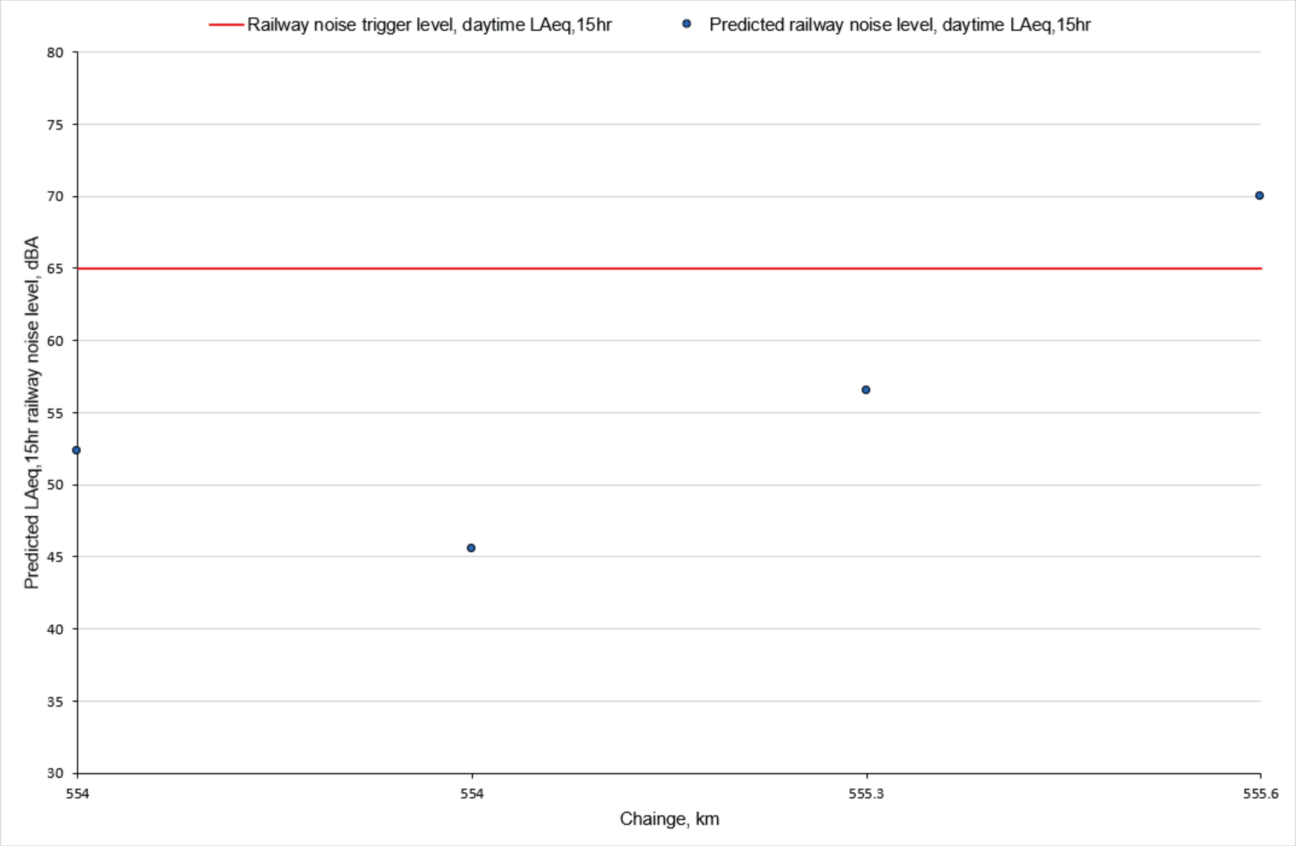


Figure C-2.4 Predicted daytime railway noise levels, Wirrinya Yard (2027)

NIGHT-TIME RAILWAY OPERATIONS (2027)

The predicted $L_{Aeq,9hr}$ railway noise levels at residential receivers for the night-time period with the proposal in 2027 are detailed in Figure C-2.5.

Consistent with the daytime railway noise levels, the predicted noise levels meet the noise management level at all but one of the residential receivers.

At one residence the predicted noise levels of up to 70dBA $L_{Aeq,9hr}$ are up to 10dB above the 60dBA $L_{Aeq,9hr}$ night-time noise management level.

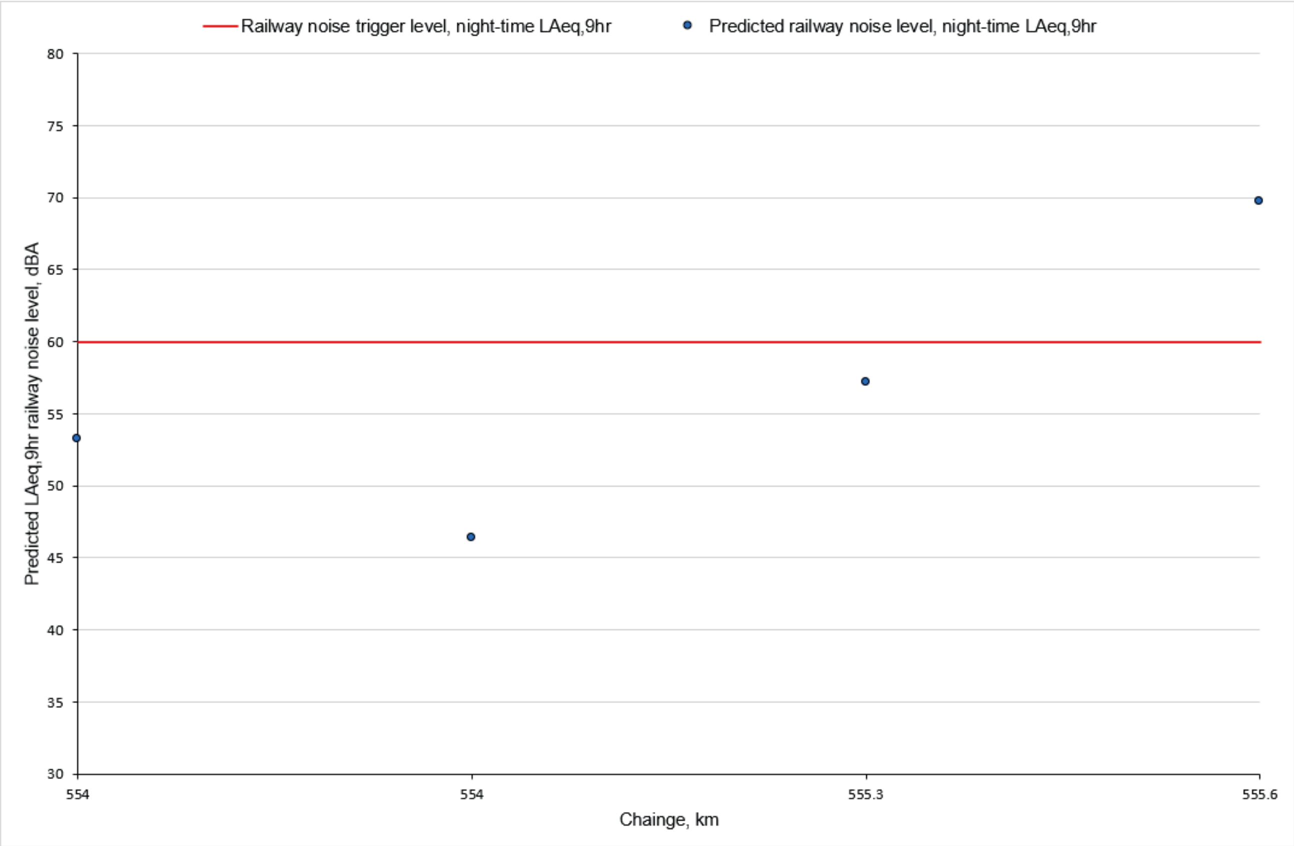


Figure C-2.5 Predicted night-time railway noise levels, Wirrinya Yard (2027)

MAXIMUM RAILWAY NOISE LEVELS (2027)

The predicted L_{Amax} railway noise levels at residential receivers are detailed in Figure C-2.6. The noise levels meet the criteria at all but one residence, where noise levels are up to 1dB above the 85dBA L_{Amax} noise management level.

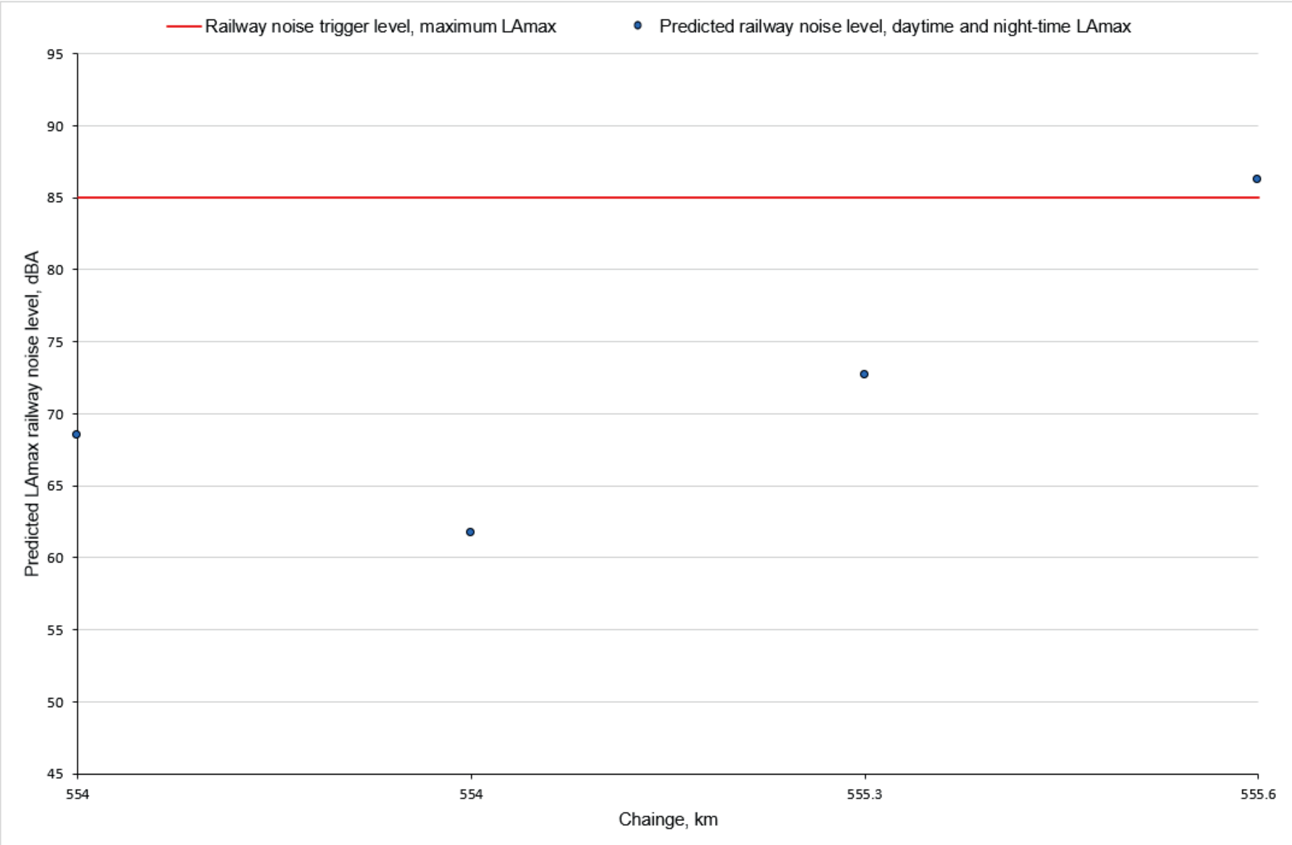


Figure C-2.6 Predicted maximum daytime and night-time railway noise levels, Wirrinya Yard (2027)

CARAGABAL YARD

DAYTIME RAILWAY OPERATIONS (2027)

The predicted $L_{Aeq,15hr}$ railway noise levels at residential receivers for the daytime period with the proposal in 2027 are detailed in Figure C-2.7. The predicted noise levels meet the 65dBA $L_{Aeq,15hr}$ noise management level at all residential receivers.

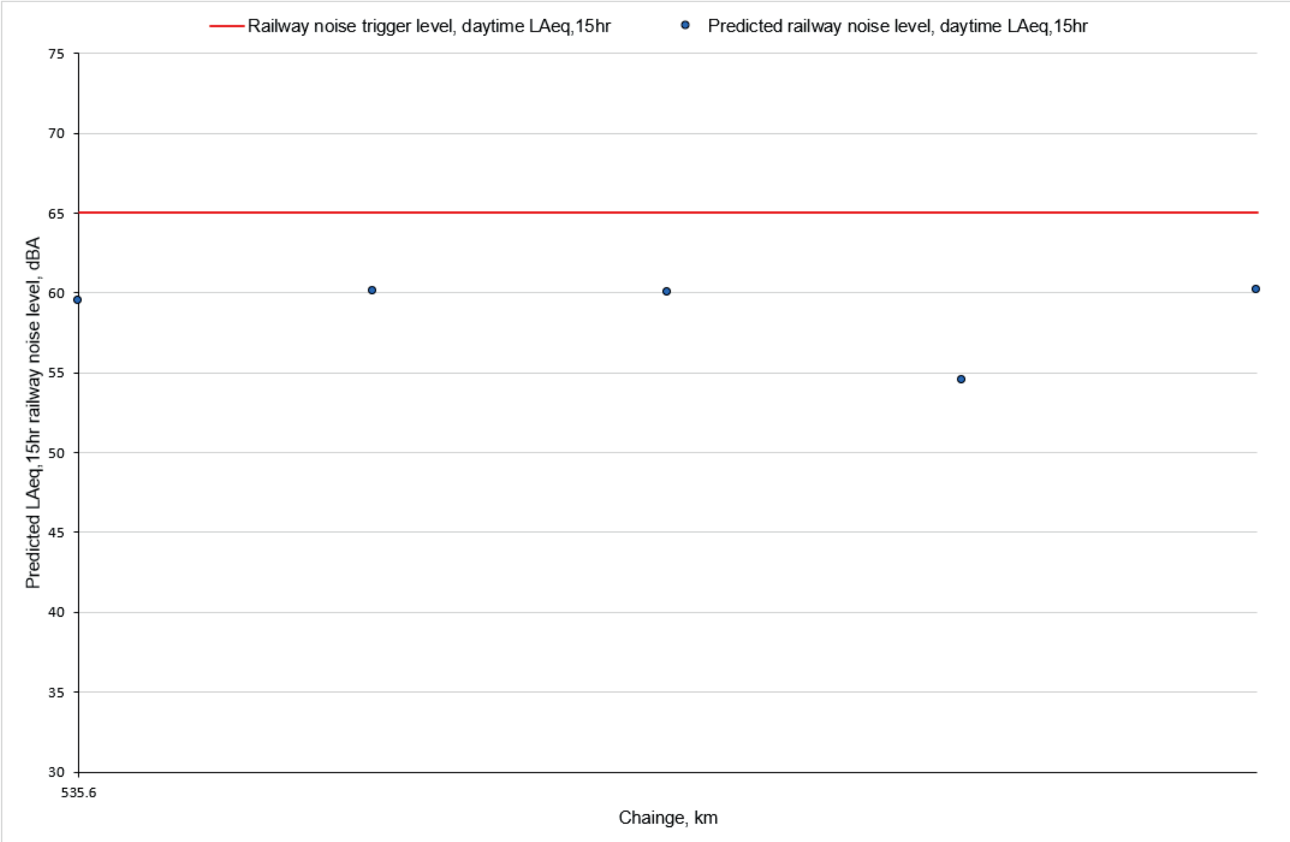


Figure C-2.7 Predicted daytime railway noise levels, Caragabal Yard (2027)

NIGHT-TIME RAILWAY OPERATIONS (2027)

The predicted $L_{Aeq,9hr}$ railway noise levels at residential receivers for the night-time period in 2027 at the opening of Inland Rail are detailed in Figure C-2.8.

The predicted noise levels meet the 60dBA $L_{Aeq,9hr}$ noise management level at all but two of the residential receivers. The night-time noise levels are up to 5dBA above the 60dBA $L_{Aeq,9hr}$ railway noise management level.

The two receivers are located between 35m and 55m from the rail line and the predicted noise levels trigger a review of feasible and reasonable noise mitigation for these residences.

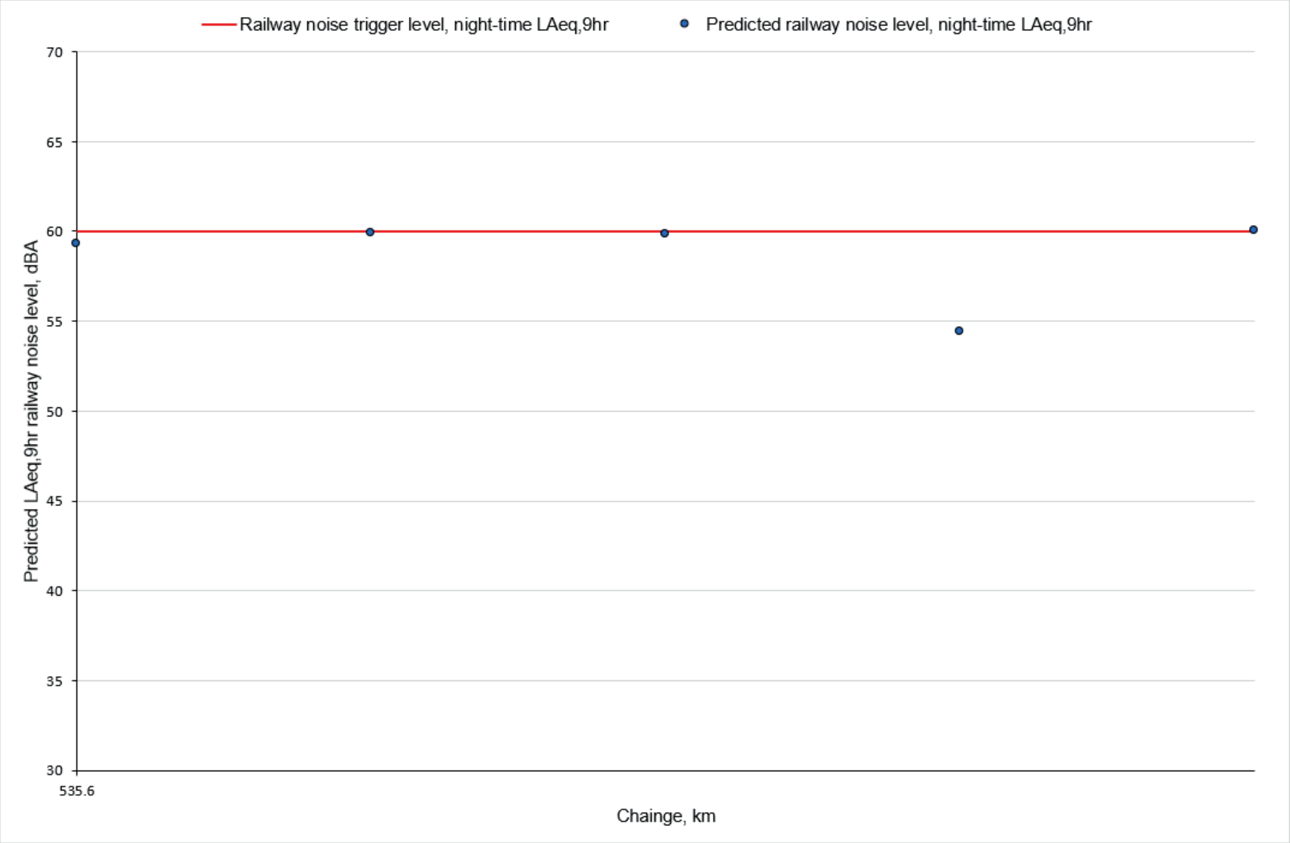


Figure C-2.8 Predicted night-time railway noise levels, Caragabal Yard (2027)

MAXIMUM RAILWAY NOISE LEVELS (2027)

The predicted L_{Amax} railway noise levels at residential receivers are detailed in Figure C-2.9. The predicted noise levels meet the 85dBA L_{Amax} noise management level at all residential receivers.

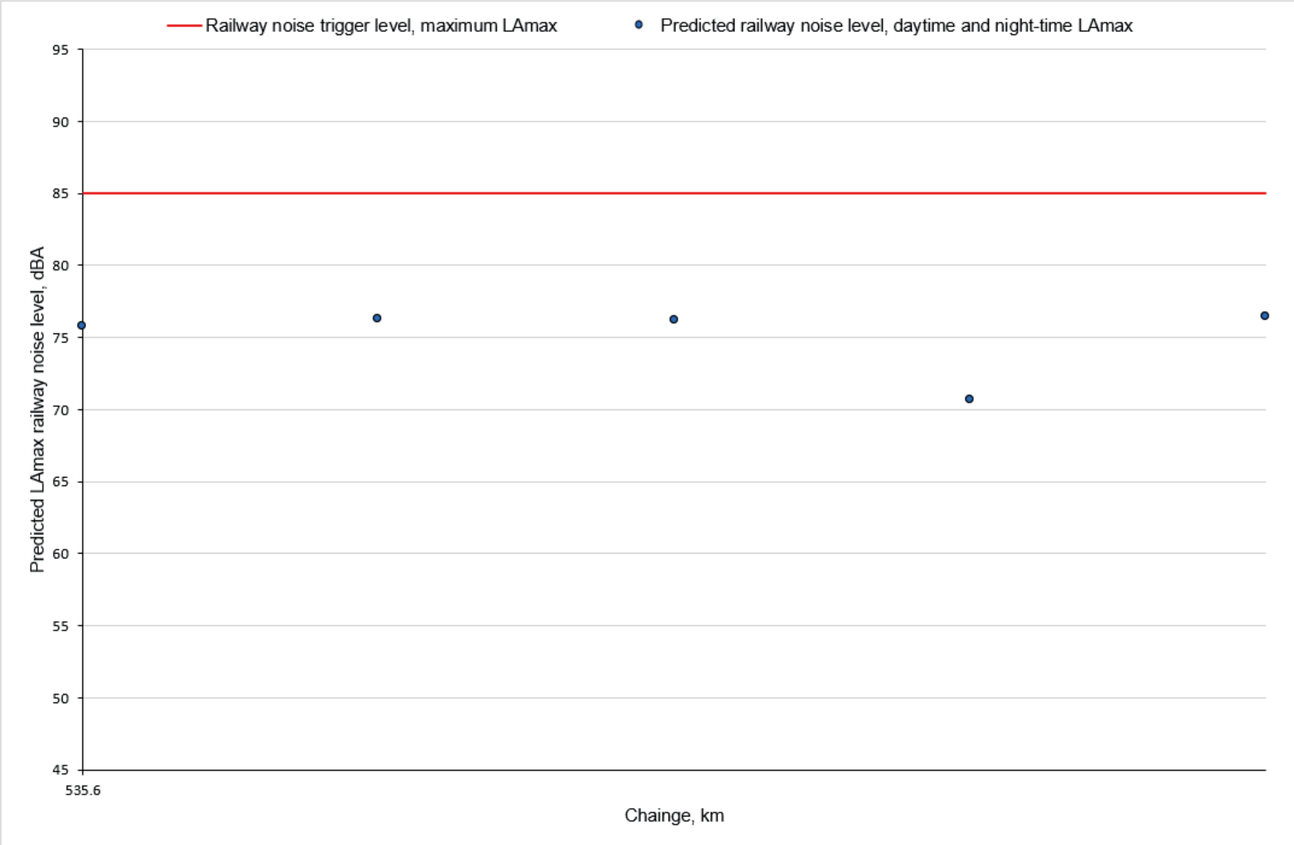


Figure C-2.9 Predicted maximum daytime and night-time railway noise levels, Caragabal Yard (2027)

BRIBBAREE YARD

DAYTIME RAILWAY OPERATIONS (2027)

The predicted $L_{Aeq,15hr}$ railway noise levels for the daytime period with the proposal in 2027 are detailed in Figure C-2.10. The predicted noise levels meet the 65dBA $L_{Aeq,15hr}$ noise management level at all residential receivers.

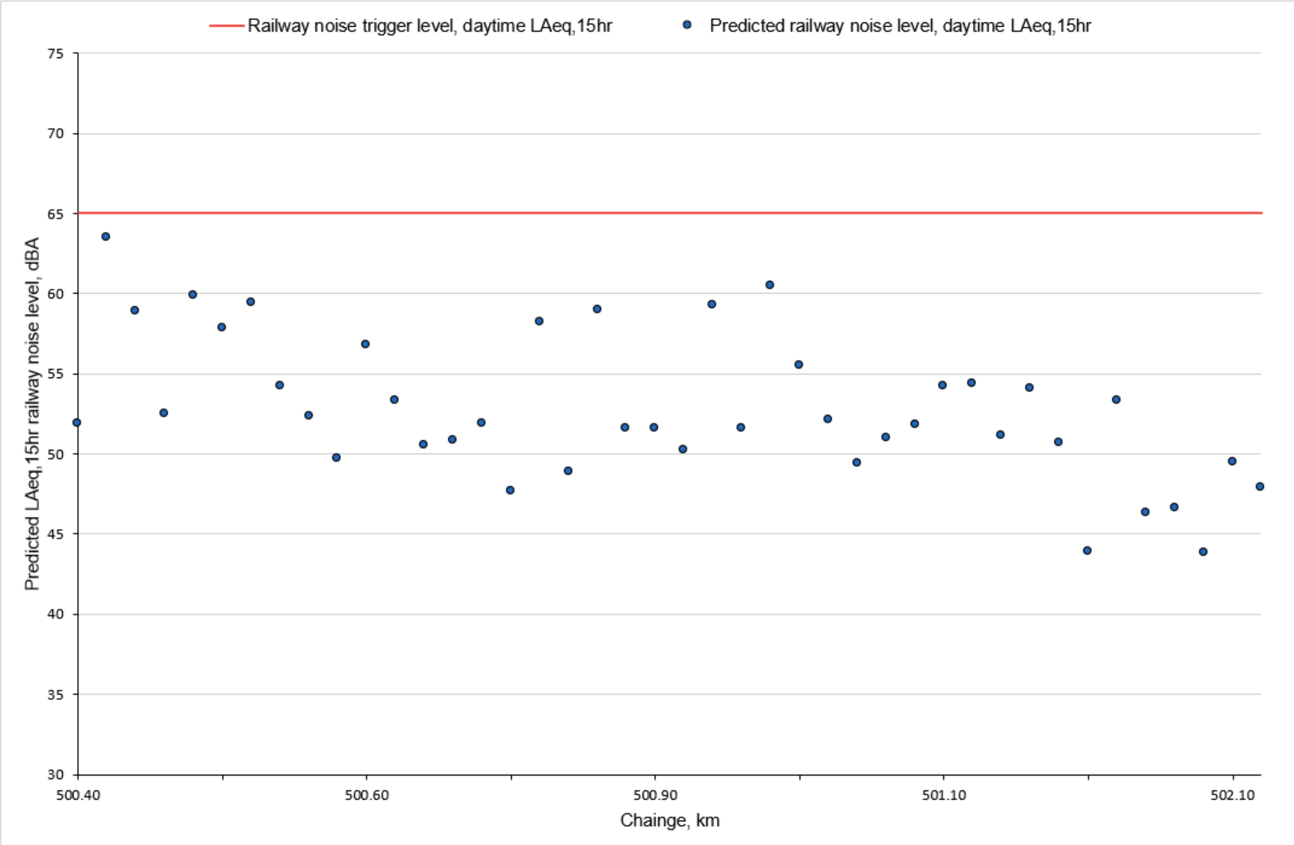


Figure C-2.10 Predicted daytime railway noise levels, Bribbaree Yard (2027)

NIGHT-TIME RAILWAY OPERATIONS (2027)

The predicted $L_{Aeq,9hr}$ railway noise levels at residential receivers for the night-time period in 2027 at the opening of Inland Rail are detailed in Figure C-2.11.

The predicted noise levels meet the 60dBA $L_{Aeq,9hr}$ noise management level at all but one of the residential receivers. At the residence, the night-time noise levels are up to 3dBA above the 60dBA $L_{Aeq,9hr}$ railway noise management level.

The receiver is located approximately 40m from the rail line and the predicted noise levels trigger a review of feasible and reasonable noise mitigation for the residence.

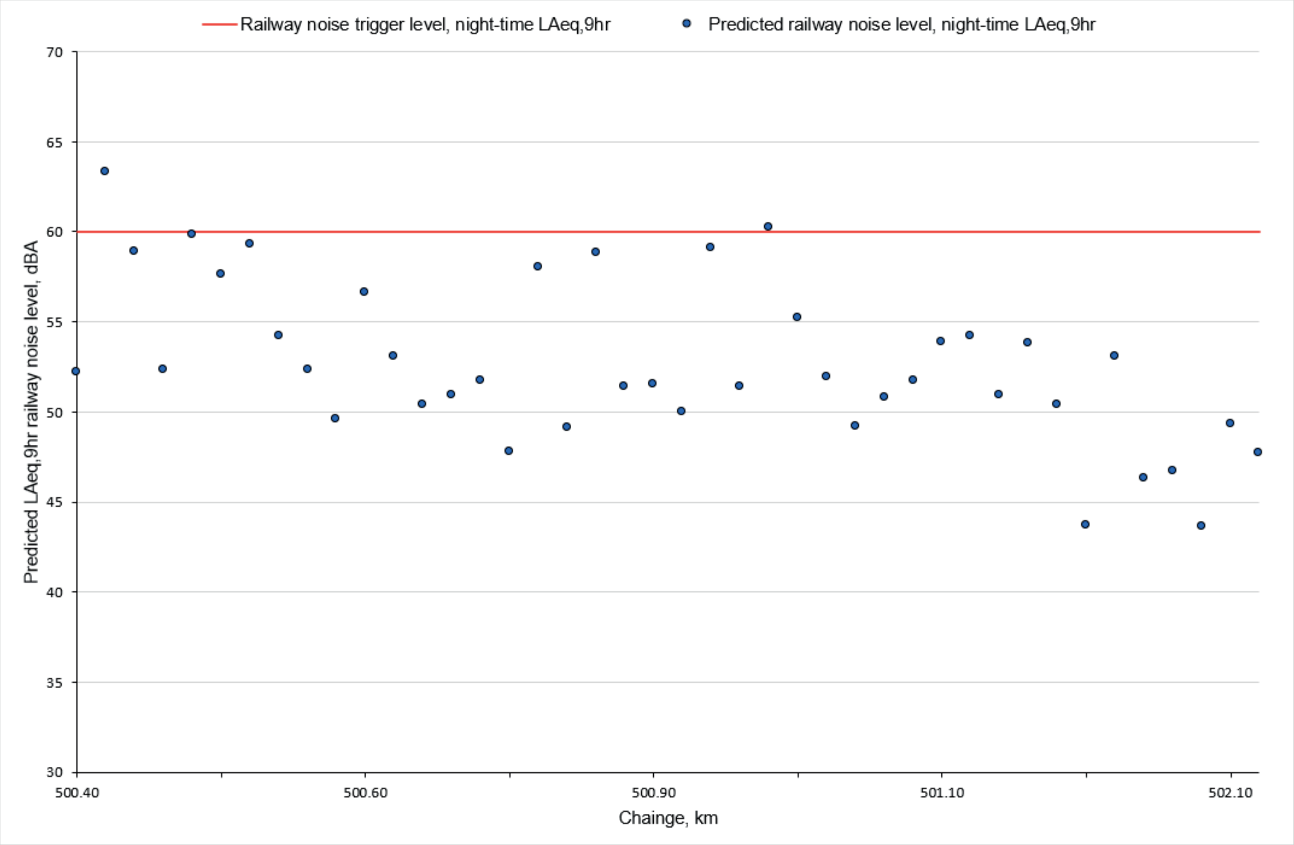


Figure C-2.11 Predicted night-time railway noise levels, Bribbaree Yard (2027)

MAXIMUM RAILWAY OPERATIONS (2027)

The predicted L_{Amax} railway noise levels at residential receivers are detailed in Figure C-2.12. The noise levels meet the 85dBA L_{Amax} noise management level at all the identified residences.

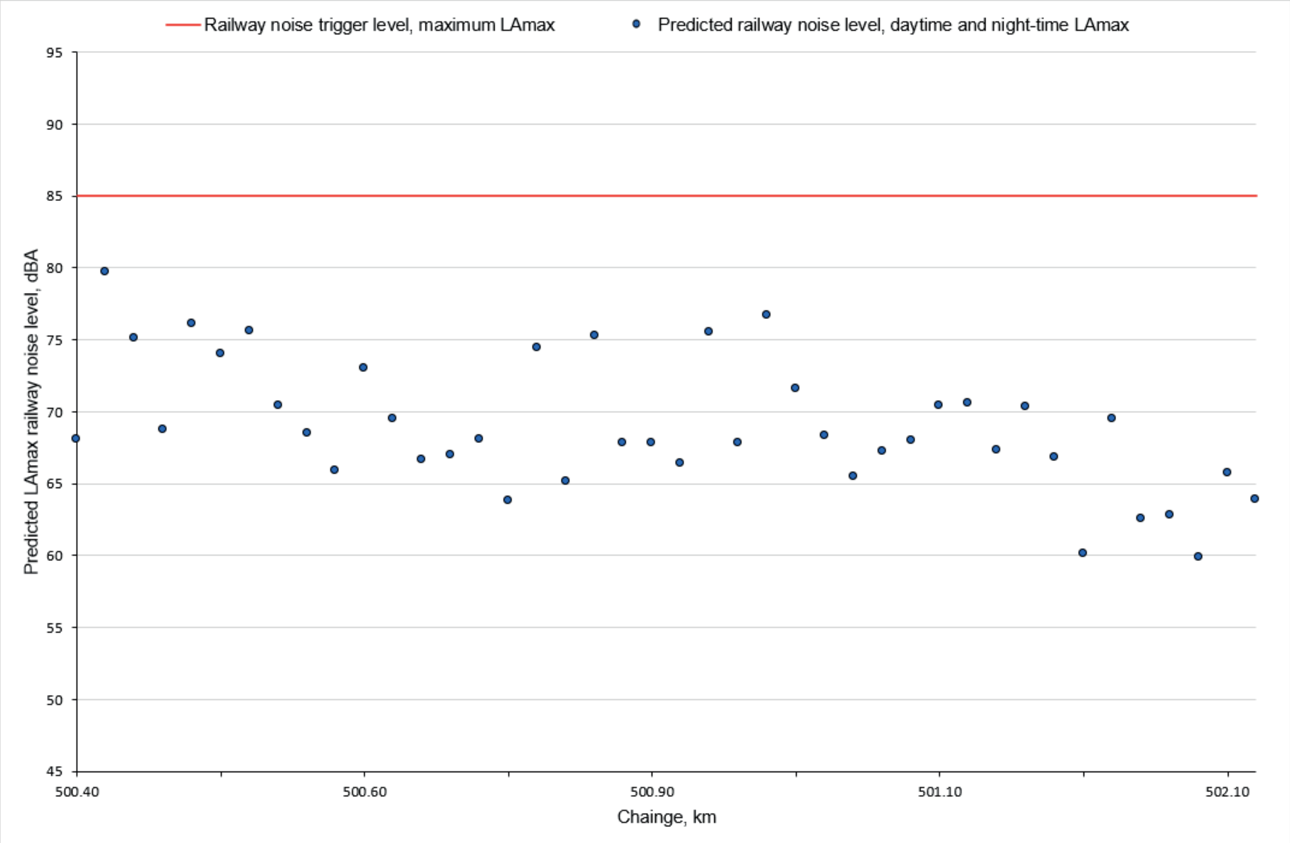


Figure C-2.12 Predicted maximum daytime and night-time railway noise levels, Bribbaree Yard (2027)

APPENDIX C-3
RAILWAY OPERATIONS – FUTURE CAPACITY 2039

The assessment outcomes are similar between years 2027 and 2039, with daytime and night-time $L_{Aeq,T}$ railway noise levels being approximately 2.5dB higher due to the increase in daily train movements in 2039.

FORBES STATION AND YARD

DAYTIME RAILWAY OPERATIONS (2039)

The predicted $L_{Aeq,15hr}$ railway noise levels for the daytime period with the proposal in 2039 are detailed in Figure C-3.1.

The predicted noise levels meet the 65dBA $L_{Aeq,15hr}$ noise management level at the majority of residential receivers. Railway noise levels of up to 67dBA $L_{Aeq,15hr}$ at three residences are 2dBA above the noise management level.

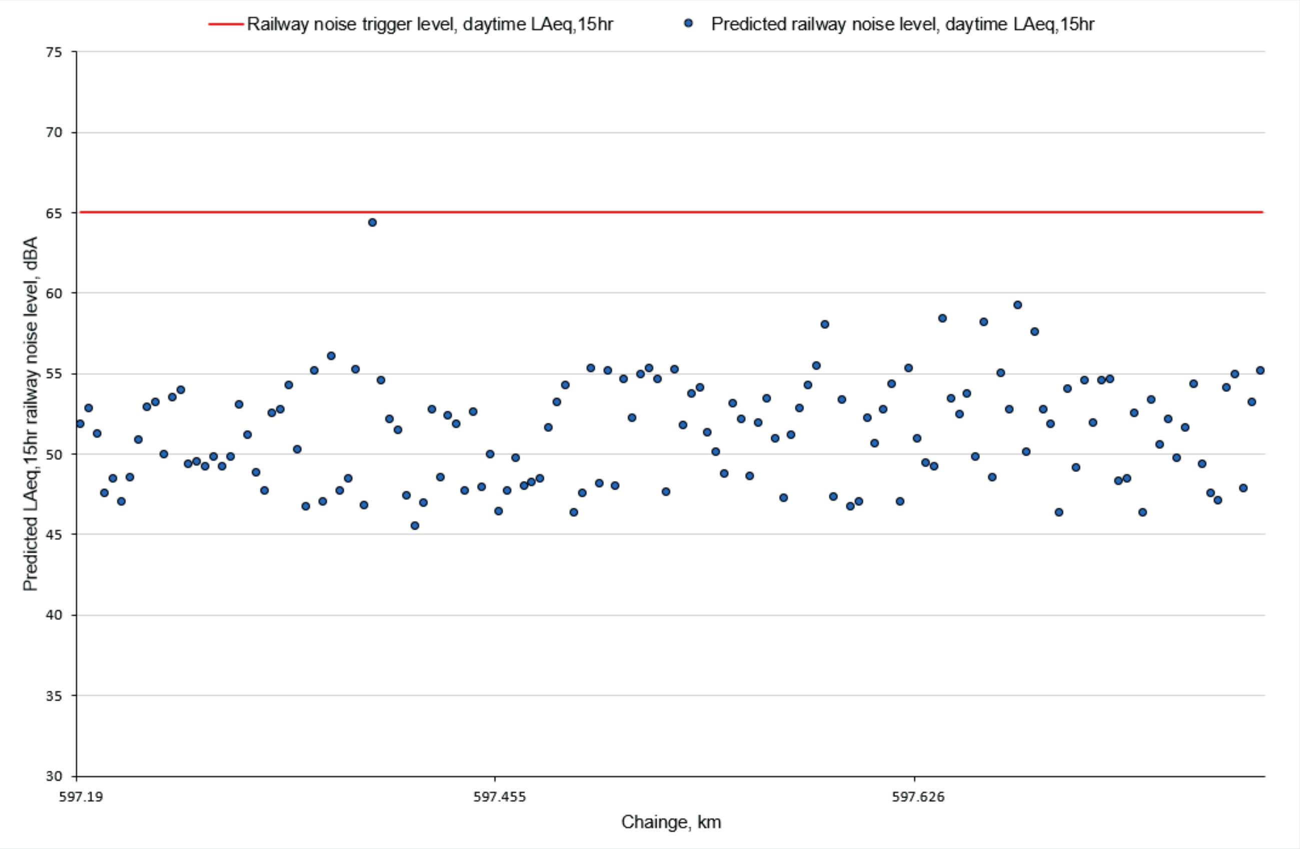


Figure C-3.1 Predicted daytime railway noise levels, Forbes Yard (2039)

NIGHT-TIME RAILWAY OPERATIONS (2039)

The predicted $L_{Aeq,9hr}$ railway noise levels for the night-time period with the proposal in 2039 are detailed in Figure C-3.2.

The predicted noise levels meet the 60dBA $L_{Aeq,9hr}$ noise management level at the majority of residential receivers. Railway noise levels of up to 67dBA $L_{Aeq,9hr}$ at 19 residences are 7dBA above the noise management level

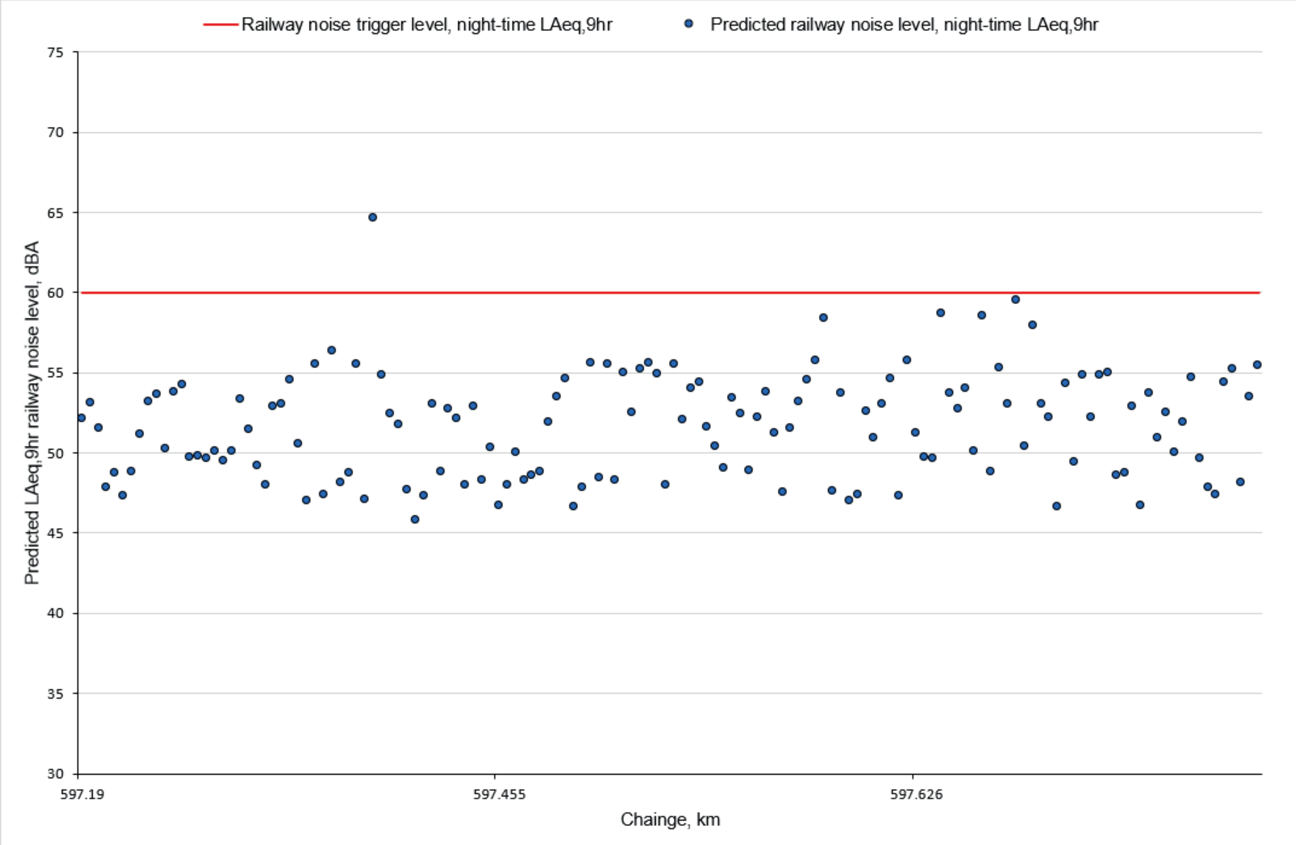


Figure C-3.2 Predicted night-time railway noise levels, Forbes Yard (2039)

MAXIMUM RAILWAY OPERATIONS (2039)

The predicted L_{Amax} railway noise levels are detailed in Figure C-3.3. The predicted noise levels meet the 85dBA L_{Amax} noise management level at all residential receivers.

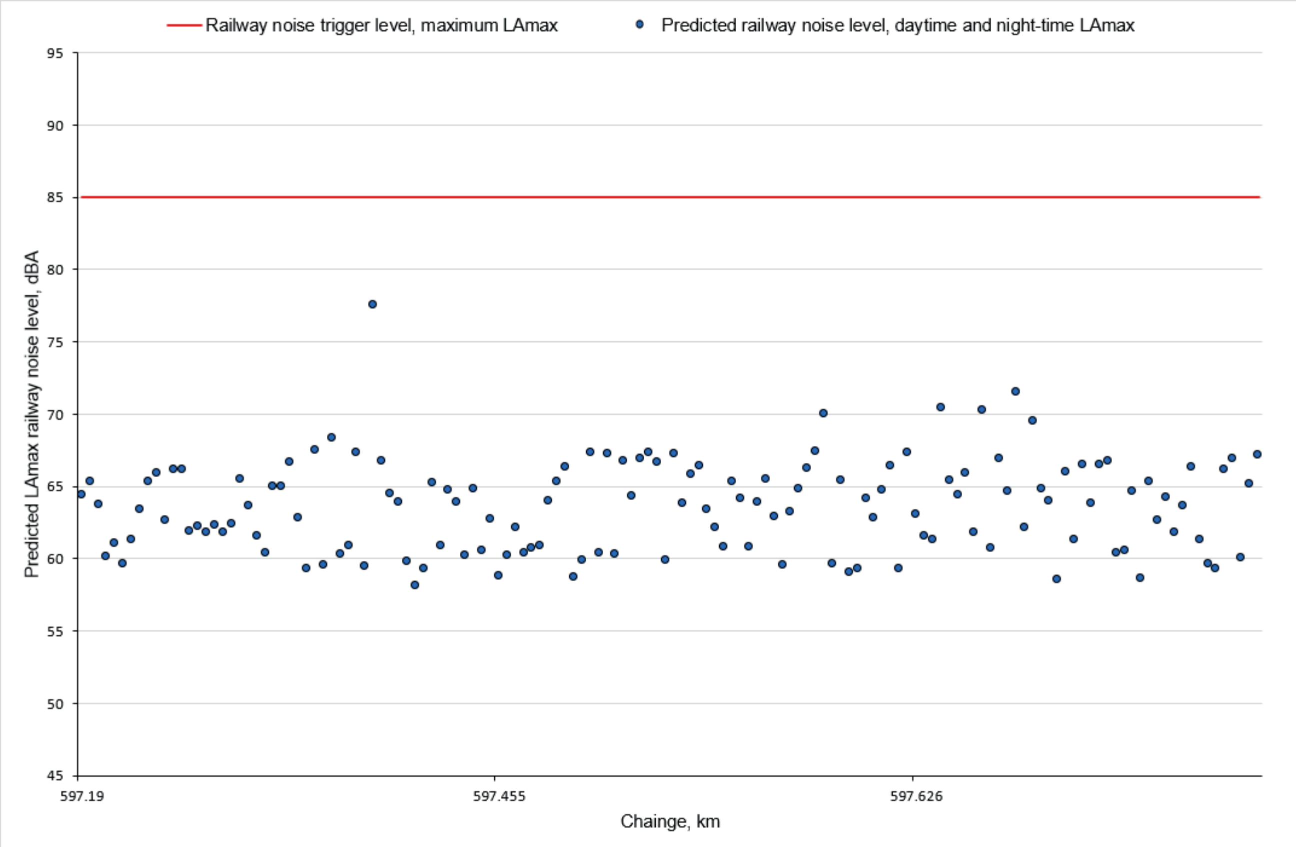


Figure C-3.3 Predicted maximum daytime and night-time railway noise levels, Forbes Yard (2039)

WIRRINYA YARD

DAYTIME RAILWAY OPERATIONS (2039)

The predicted $L_{Aeq,15hr}$ railway noise levels for the daytime period with the proposal in 2039 are detailed in Figure C-3.4. The railway noise levels meet the 65dBA $L_{Aeq,15hr}$ noise management level at most residential receivers. Railway noise levels of 72dBA $L_{Aeq,15hr}$ at one residence are up to 7dBA above the noise management level.

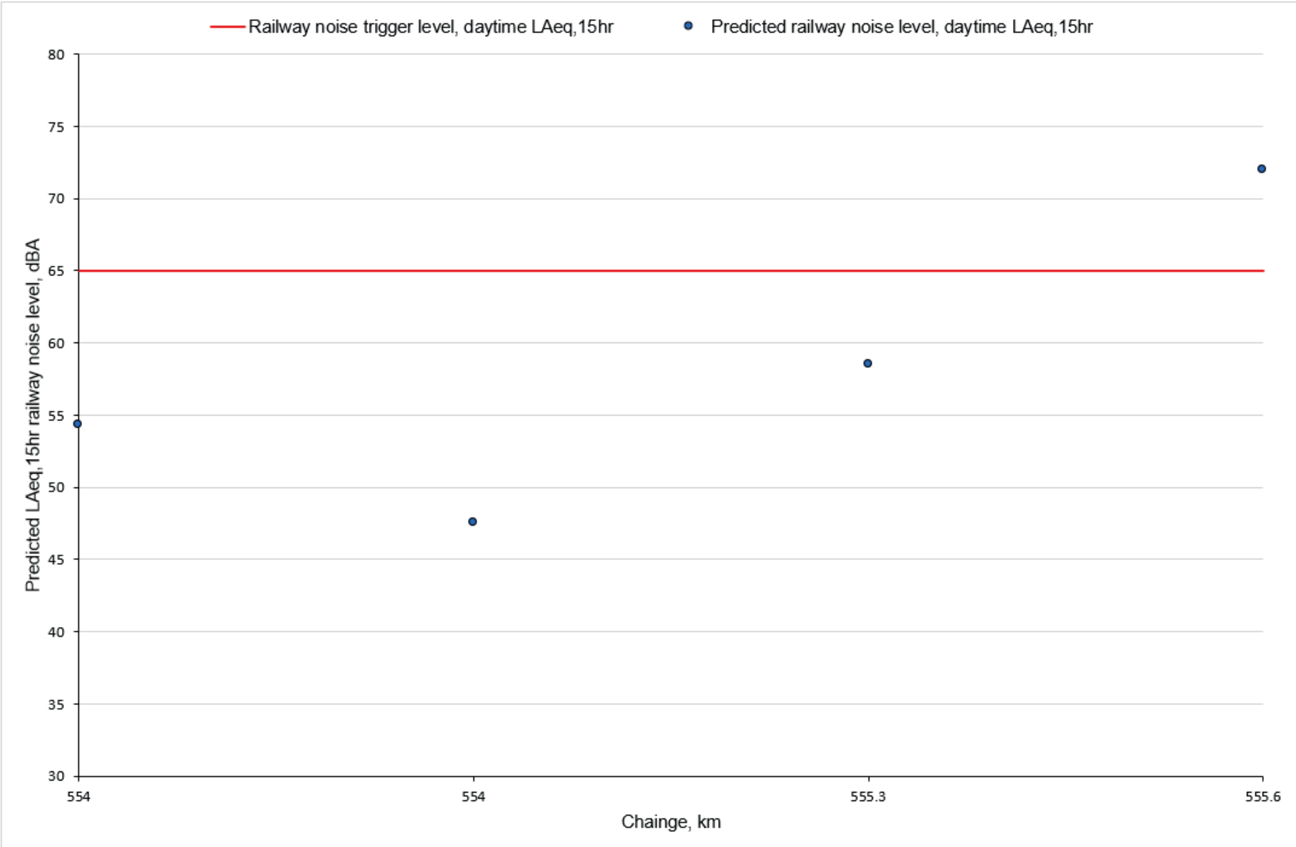


Figure C-3.4 Predicted daytime railway noise levels, Wirrinya Yard (2039)

NIGHT-TIME RAILWAY OPERATIONS (2039)

The predicted $L_{Aeq,9hr}$ railway noise levels for the night-time period with the proposal in 2039 are detailed in Figure C-3.5.

The predicted noise levels meet the 60dBA $L_{Aeq,9hr}$ noise management level at all but one residential receiver. Railway noise levels of up to 72dBA $L_{Aeq,9hr}$ at 19 residences are 12dBA above the noise management level.

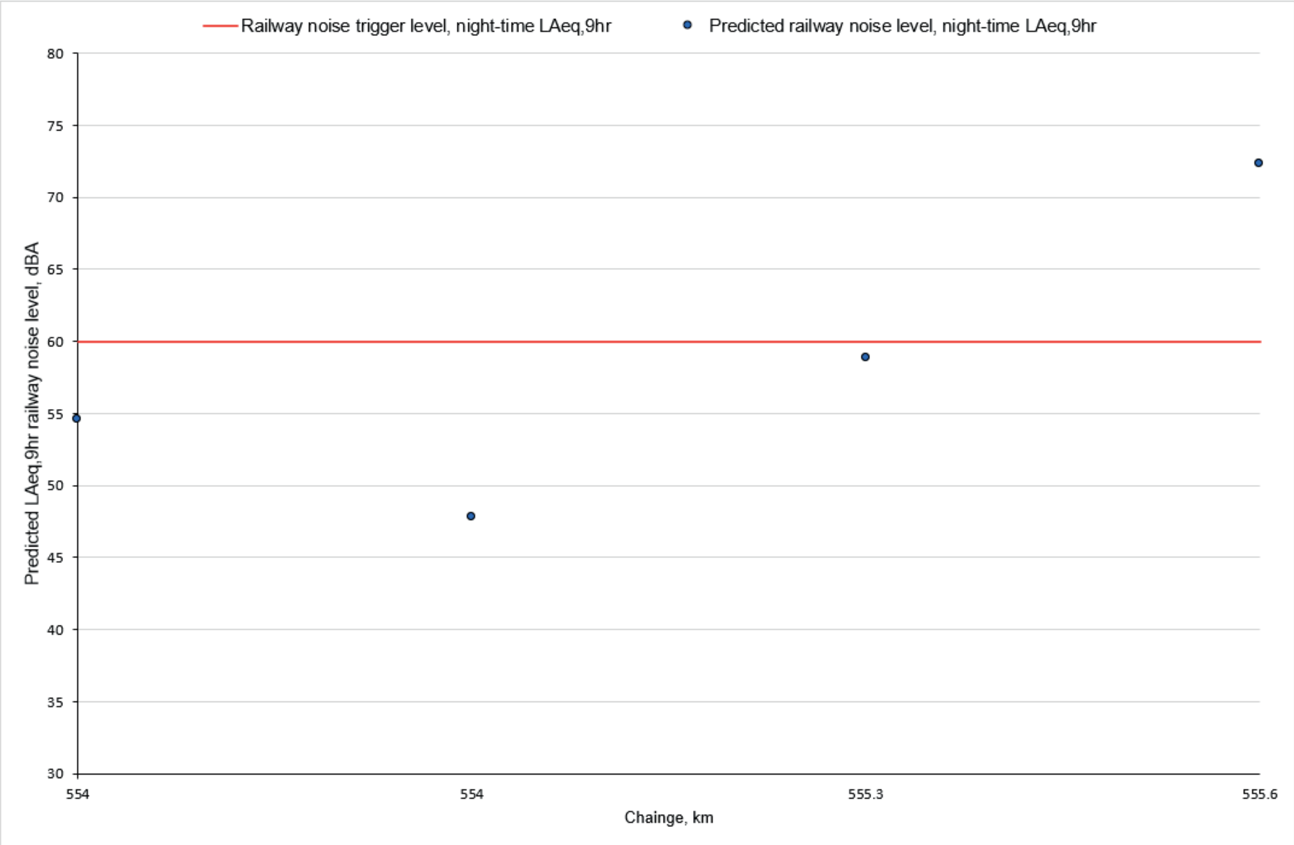


Figure C-3.5 Predicted night-time railway noise levels, Wirrinya Yard (2039)

MAXIMUM RAILWAY OPERATIONS (2039)

The predicted L_{Amax} railway noise levels are detailed in Figure C-3.6. The predicted noise levels meet the 85dBA L_{Amax} noise management level at all but one residential receiver where noise levels are 1dB above the noise management level.

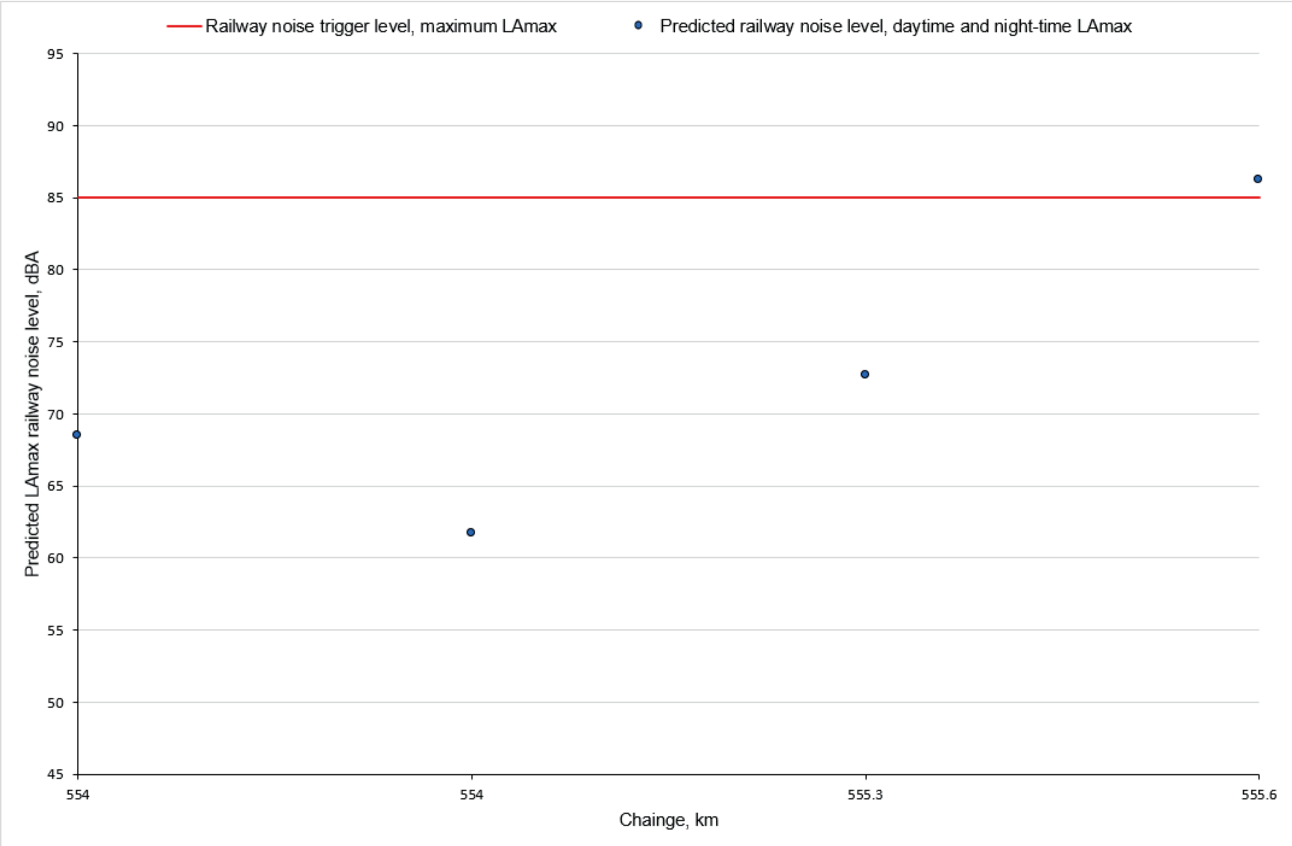


Figure C-3.6 Predicted maximum daytime and night-time railway noise levels, Wirrinya Yard (2039)

CARAGABAL YARD

DAYTIME RAILWAY OPERATIONS (2039)

The predicted $L_{Aeq,15hr}$ railway noise levels for the daytime period with the proposal in 2039 are detailed in Figure C-3.7.

The railway noise levels meet the 65dBA $L_{Aeq,15hr}$ noise management level at most residential receivers. Railway noise levels of 67dBA $L_{Aeq,15hr}$ at one residence are up to 2dBA above the noise management level.

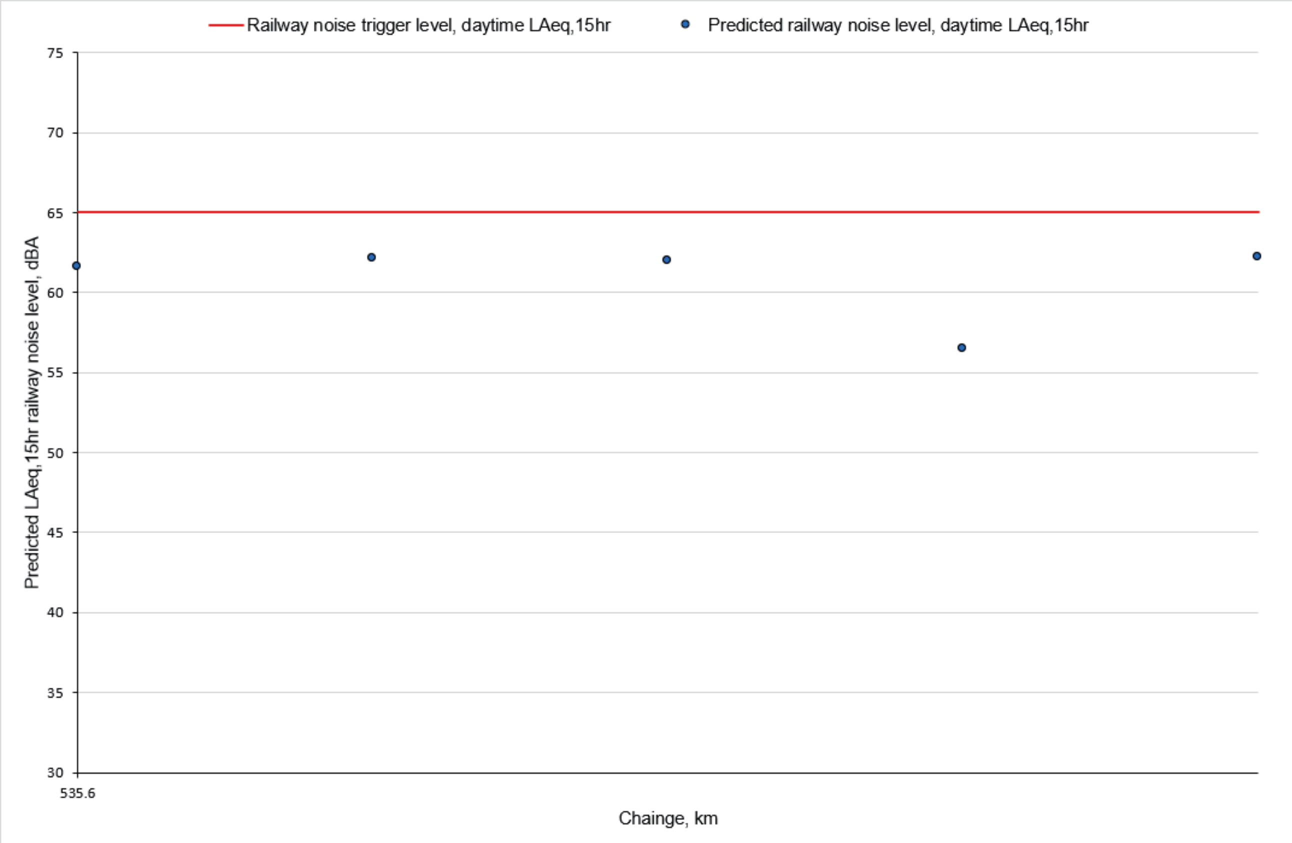


Figure C-3.7 Predicted daytime railway noise levels, Caragabal Yard (2039)

NIGHT-TIME RAILWAY OPERATIONS (2039)

The predicted $L_{Aeq,9hr}$ railway noise levels for the night-time period with the proposal in 2039 are detailed in Figure C-3.8.

The predicted noise levels meet the 60dBA $L_{Aeq,9hr}$ noise management level at most residential receivers. The railway noise levels of up to 67dBA $L_{Aeq,9hr}$ at 14 residences are 7dBA above the noise management level.

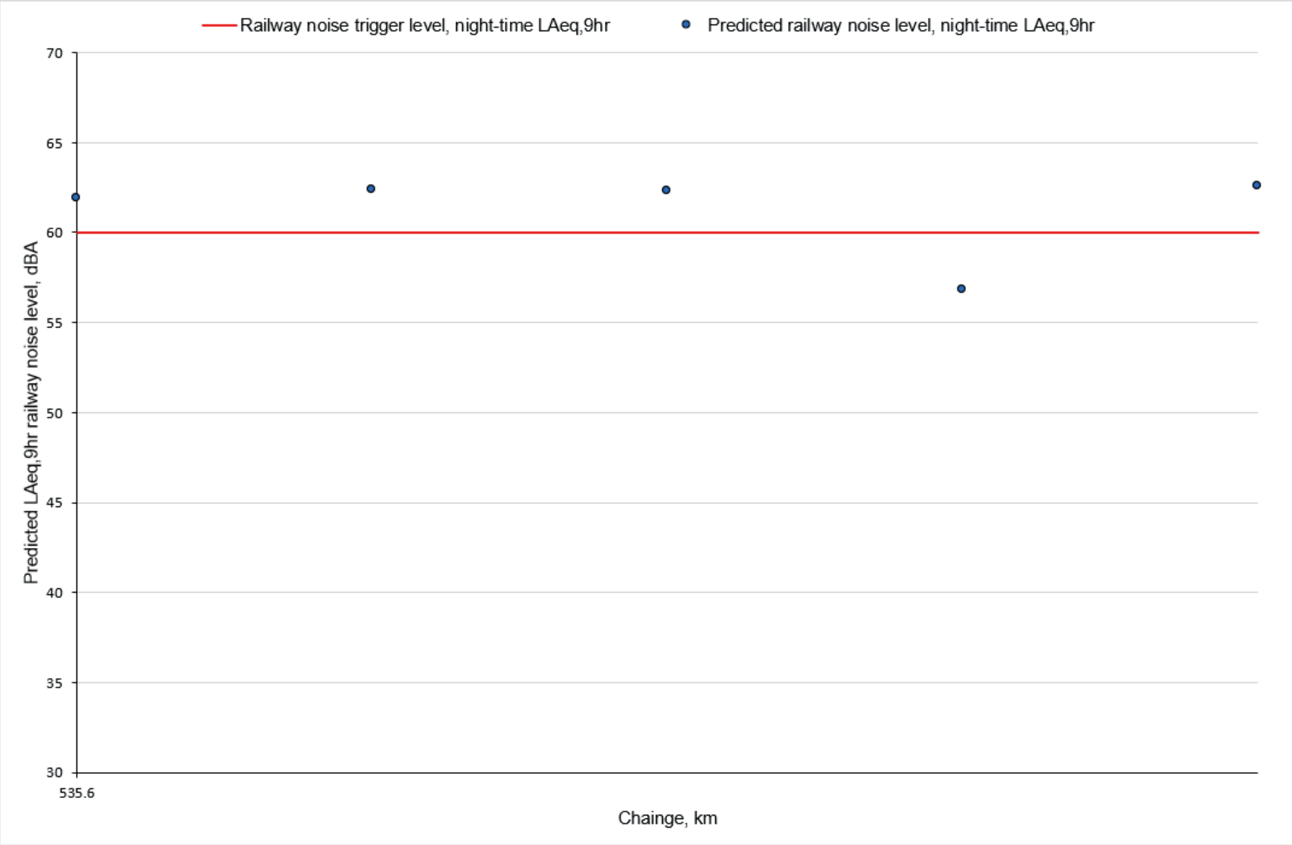


Figure C-3.8 Predicted night-time railway noise levels, Caragabal Yard (2039)

MAXIMUM RAILWAY OPERATIONS (2039)

The predicted L_{Amax} railway noise levels are detailed in Figure C-3.9. The predicted noise levels meet the 85dBA L_{Amax} noise management level at all but one residential receiver where noise levels are 1dB above the noise management level.

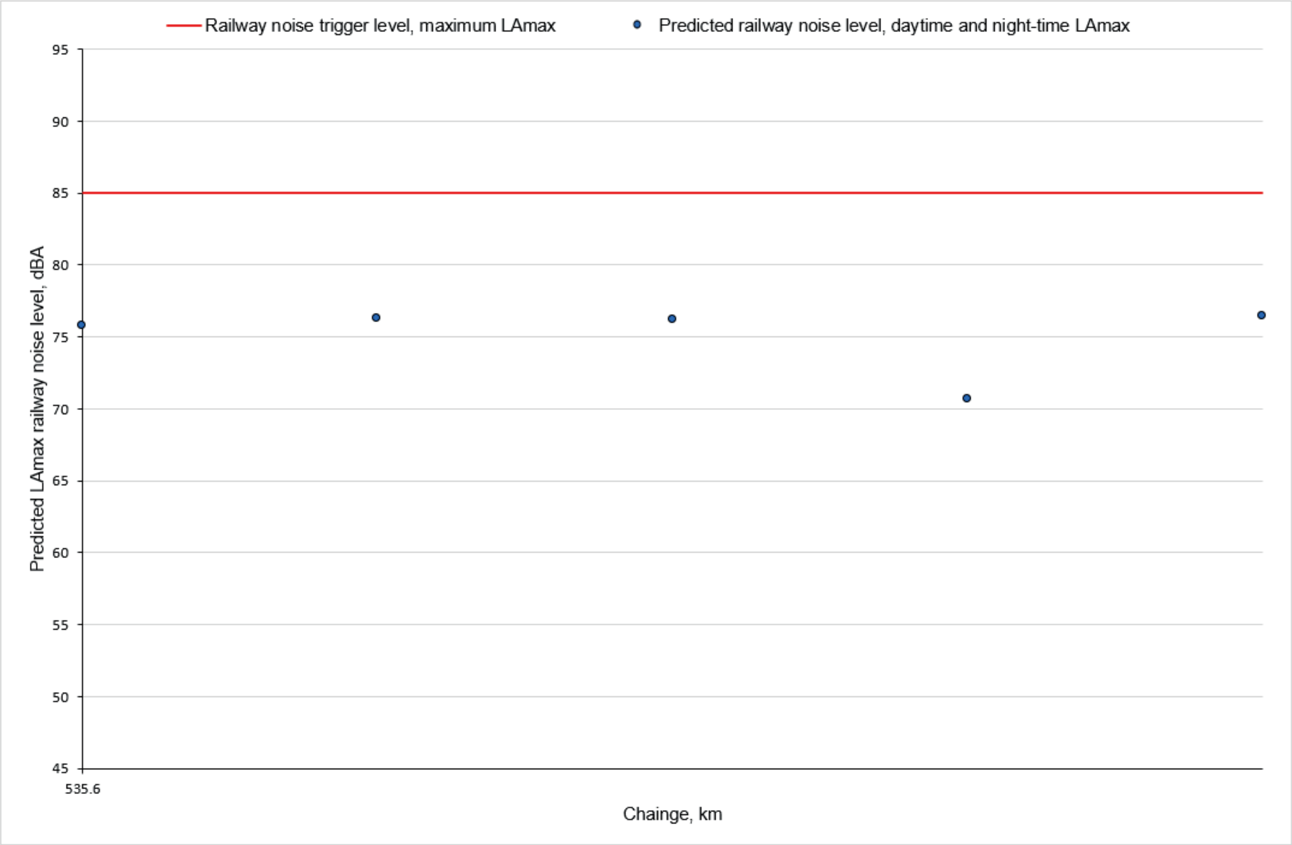


Figure C-3.9 Predicted maximum daytime and night-time railway noise levels, Caragabal Yard (2039)

BRIBBAREE YARD

DAYTIME RAILWAY OPERATIONS (2039)

The predicted $L_{Aeq,15hr}$ railway noise levels for the daytime period with the proposal in 2039 are detailed in Figure C-3.10.

The railway noise levels meet the 65dBA $L_{Aeq,15hr}$ noise management level at all but one residential receiver. Railway noise levels of 66dBA $L_{Aeq,15hr}$ at one residence are up to 1dBA above the noise management level.

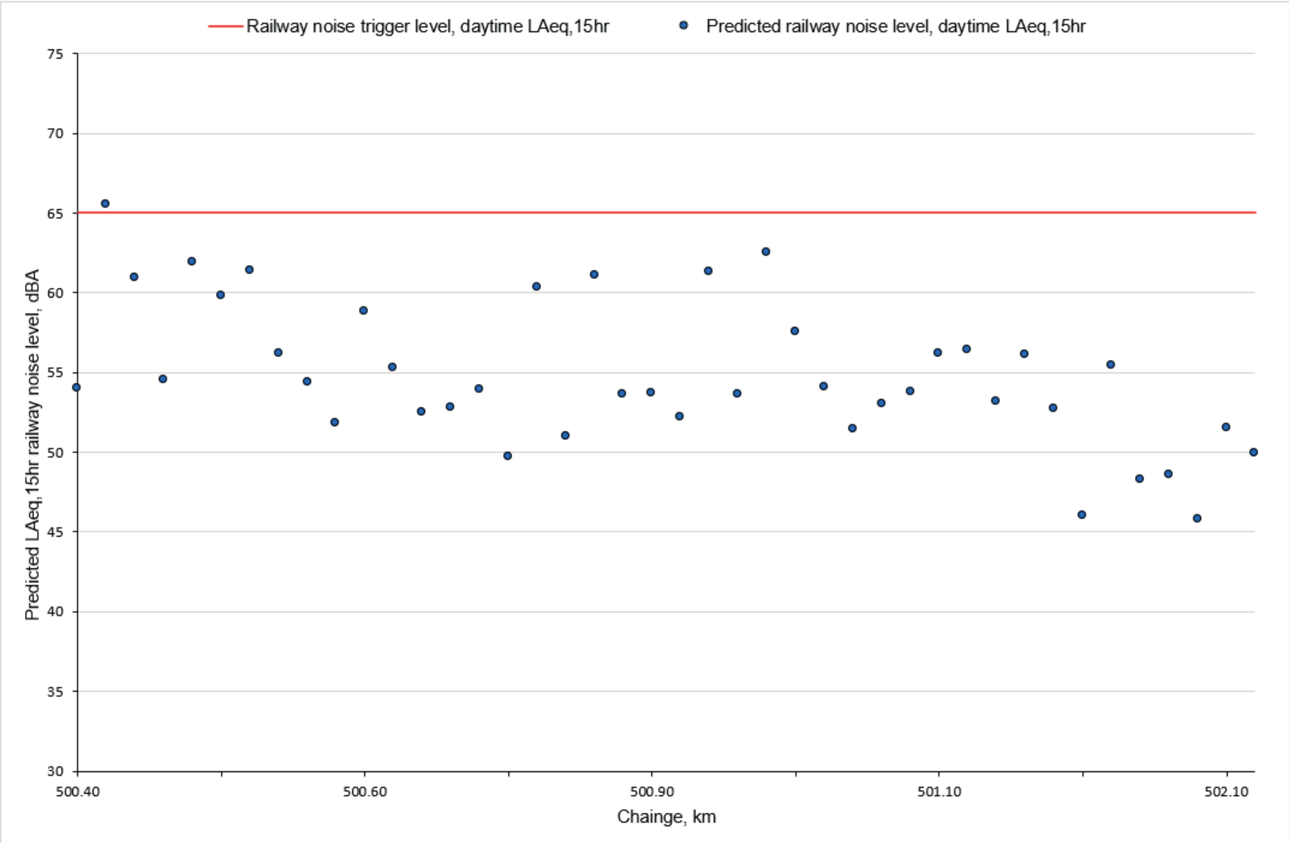


Figure C-3.10 Predicted daytime railway noise levels, Bribbaree Yard (2039)

NIGHT-TIME RAILWAY OPERATIONS (2039)

The predicted $L_{Aeq,9hr}$ railway noise levels for the night-time period with the proposal in 2039 are detailed in Figure C-3.11.

The predicted noise levels meet the 60dBA $L_{Aeq,9hr}$ noise management level at most residential receivers. The railway noise levels of up to 66dBA $L_{Aeq,9hr}$ at 8 residences are 6dBA above the noise management level.

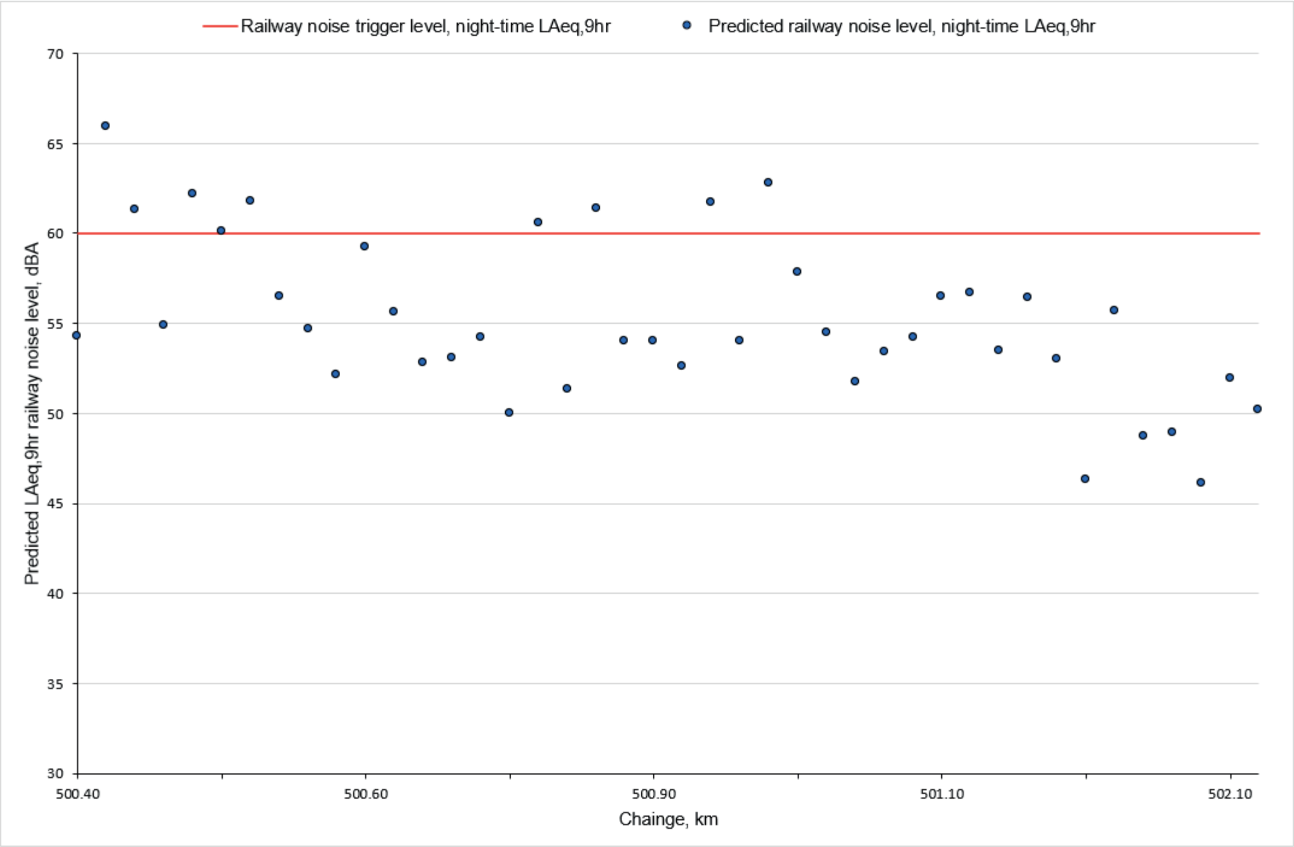


Figure C-3.11 Predicted night-time railway noise levels, Bribbaree Yard (2039)

MAXIMUM RAILWAY OPERATIONS (2039)

The predicted L_{Amax} railway noise levels are detailed in Figure C-3.12. The predicted noise levels meet the 85dBA L_{Amax} noise management level at all residential receivers.

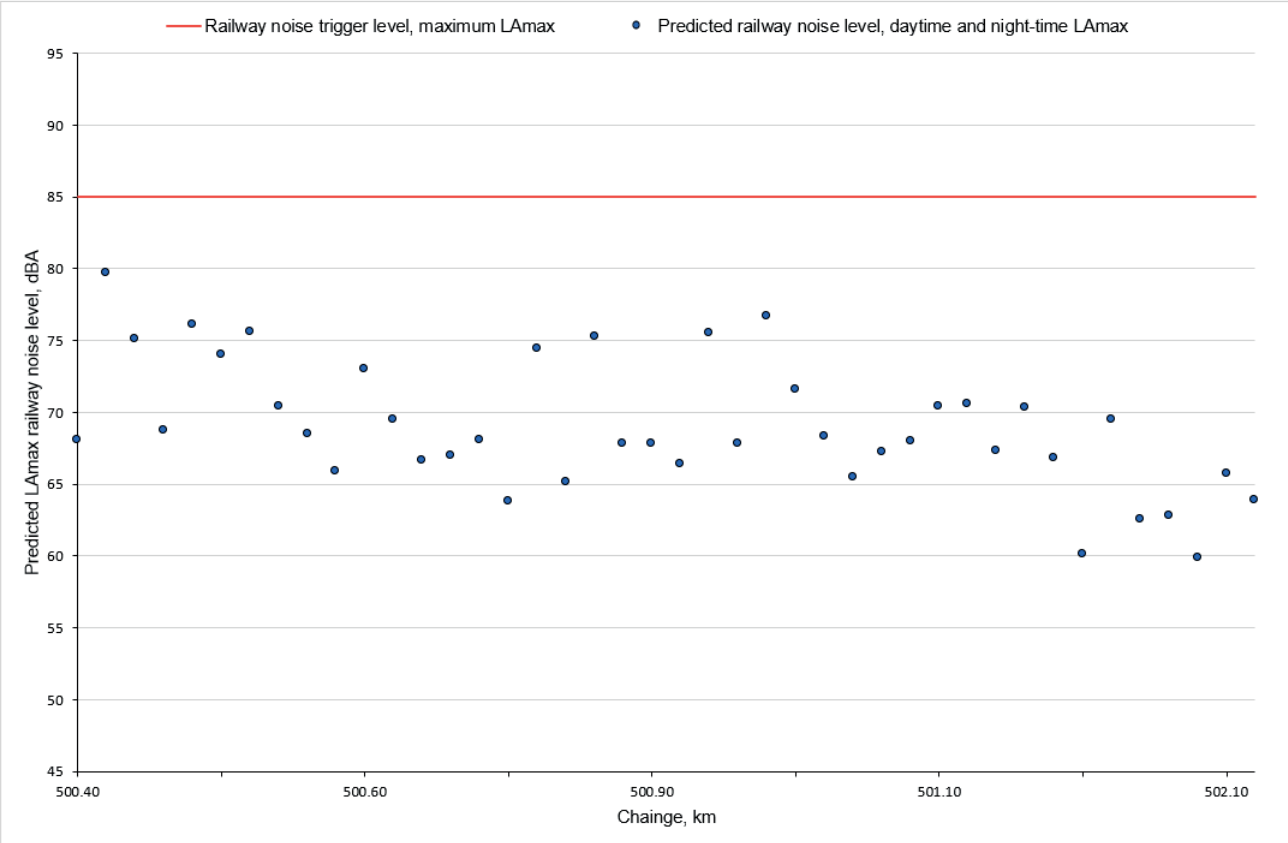
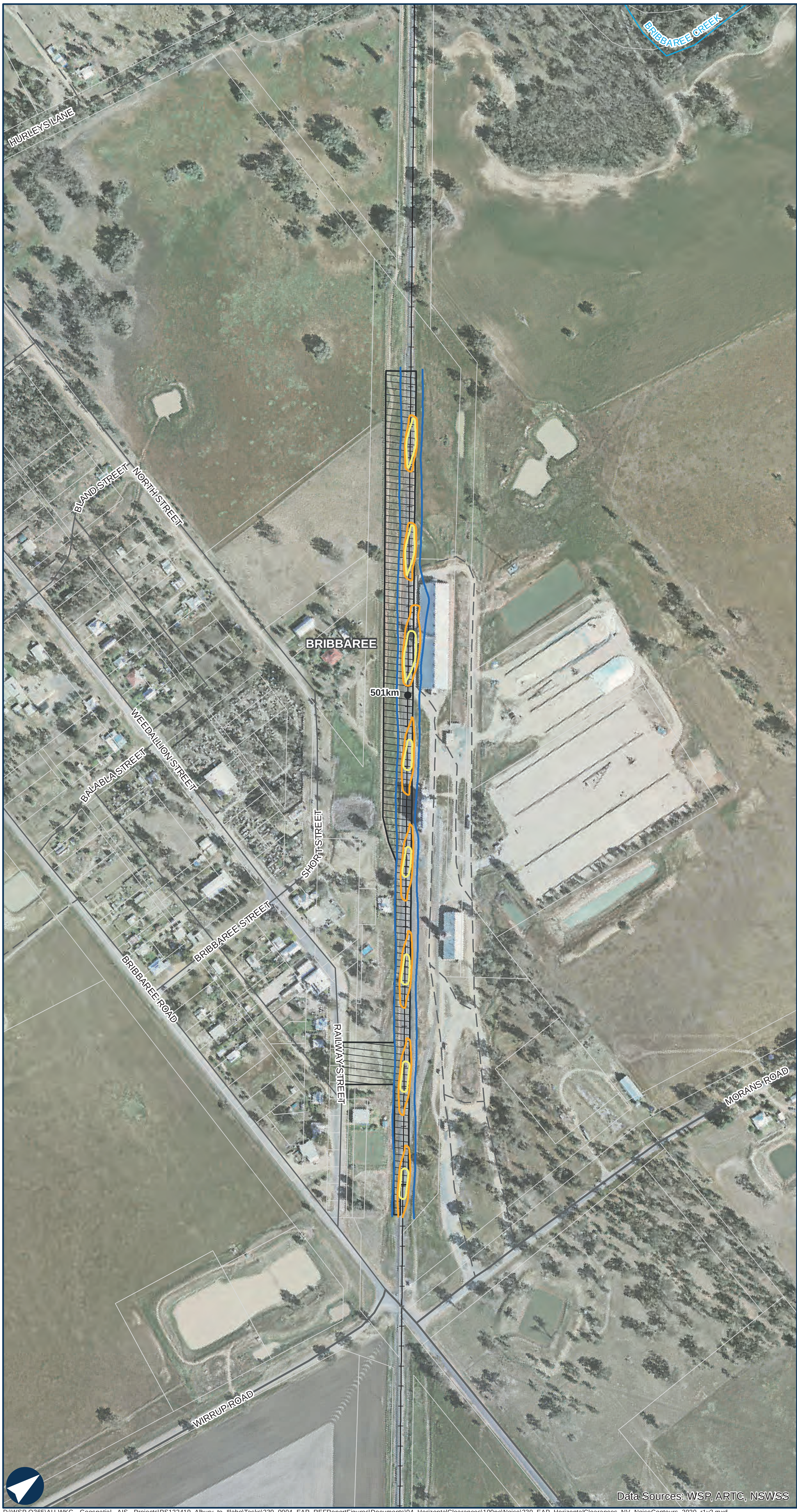


Figure C-3.12 Predicted maximum daytime and night-time railway noise levels, Bribbaree Yard (2039)

APPENDIX C-4
OPERATIONAL NOISE IMPACTS – CONTOUR MAPS



INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

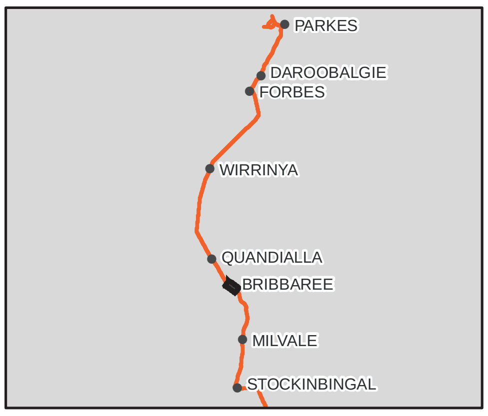
Stockinbingal to Parkes Bribbaree yard clearances

Appendix C.1 - 2020 existing / 2027 no-build / 2039 no-build

MAP 1 OF 4

LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Proposal site
- Cadastre
- $L_{eq,15hr}$ 65dBA (daytime criteria)
- $L_{eq,9hr}$ 60dBA (night-time criteria)
- L_{max} 85dBA (Lmax criteria)



0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 1/10/2021 Paper: A3
Author: WSP Scale: 1:4,500

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

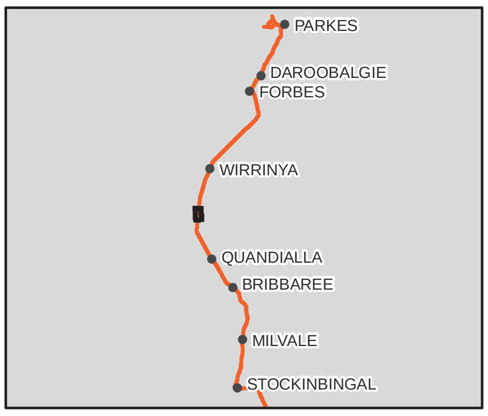
Stockinbingal to Parkes Caragabal yard clearances

Appendix C.1 - 2020 existing / 2027 no-build / 2039 no-build

MAP 2 OF 4

LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Proposal site
- Cadastre
- $L_{eq,15hr}$ 65dBA (daytime criteria)
- $L_{eq,9hr}$ 60dBA (night-time criteria)
- L_{max} 85dBA (Lmax criteria)



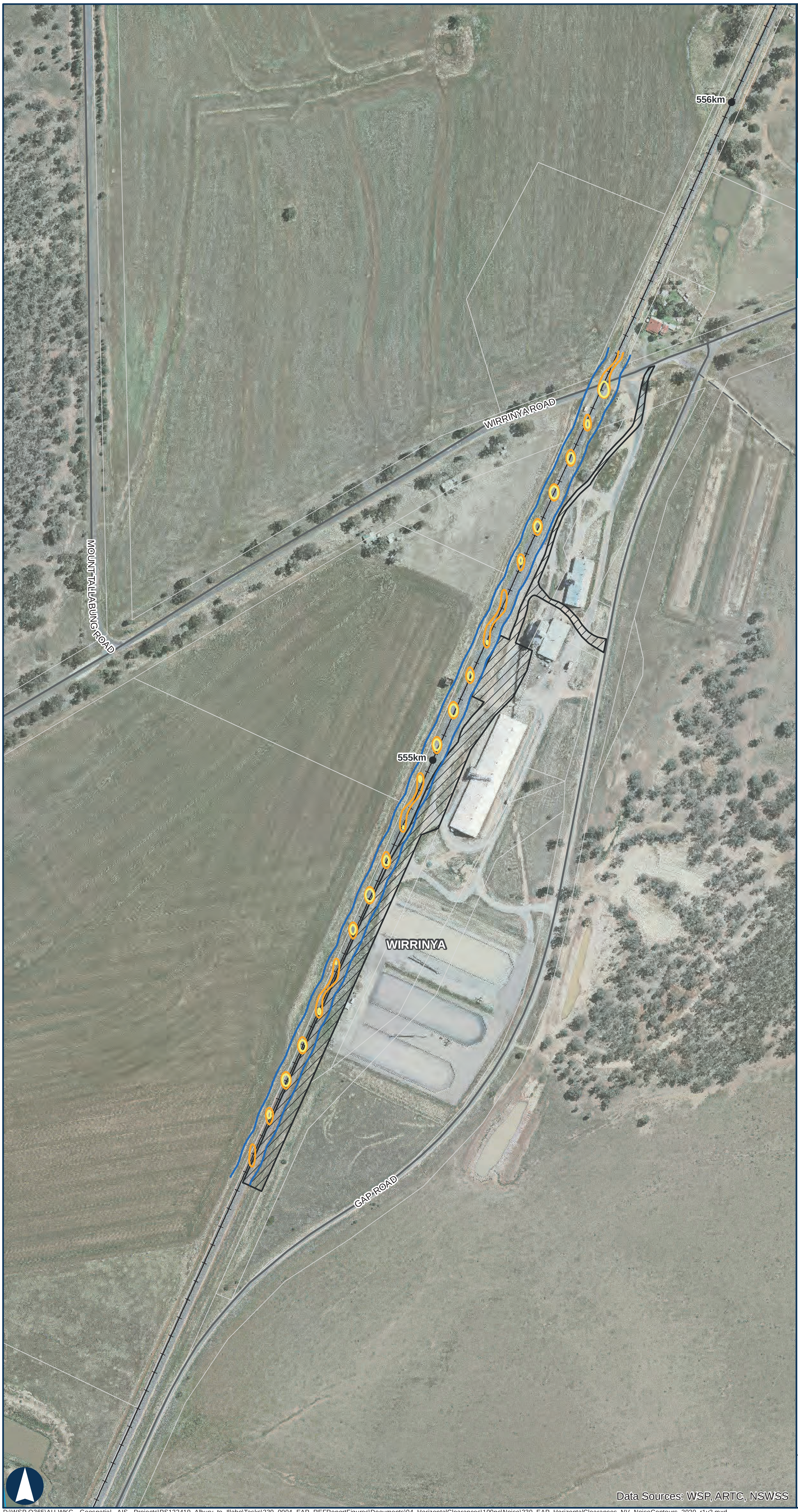
0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 1/10/2021 Paper: A3

Author: WSP Scale: 1:4,500

D:\WSP O365\AU-WKG - Geospatial - AIS - Projects\PS122419_Albury_to_Illabo\Tasks\230_0004_EAP_REFReportFigures\Documents\04_HorizontalClearances\100pc\Noise\230_EAP_HorizontalClearances_NV_NoiseContours_2020_r1v2.mxd



INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

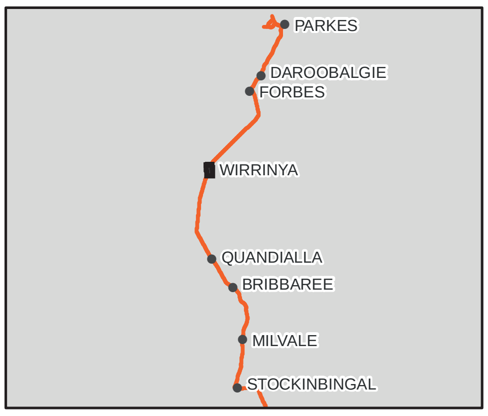
Stockinbingal to Parkes Wirrinya yard clearances

Appendix C.1 - 2020 existing / 2027 no-build / 2039 no-build

MAP 3 OF 4

LEGEND

- KM post
- Existing railway
- Main road
- Track
- Watercourse
- Proposal site
- Cadastre
- $L_{eq,15hr}$ 65dBA (daytime criteria)
- $L_{eq,9hr}$ 60dBA (night-time criteria)
- L_{max} 85dBA (Lmax criteria)



0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 1/10/2021 | Paper: A3

Author: WSP | Scale: 1:4,500

D:\WSP O365\AU-WKG - Geospatial - AIS - Projects\PS122419_Albury_to_Illabo\Tasks\230_0004_EAP_REFReportFigures\Documents\04_HorizontalClearances\100pc\Noise\230_EAP_HorizontalClearances_NV_NoiseContours_2020_r1v2.mxd

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

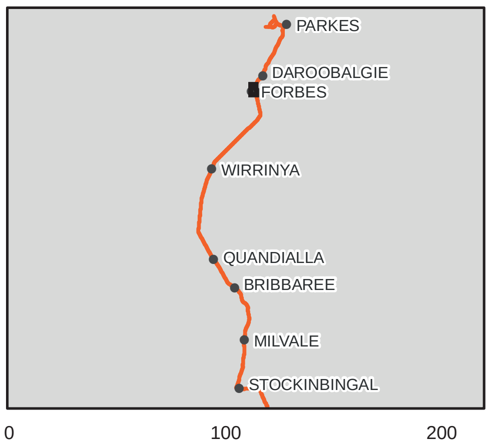
Stockinbingal to Parkes Forbes Station clearances

Appendix C.1 - 2020 existing / 2027 no-build / 2039 no-build

MAP 4 OF 4

LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Watercourse
- Proposal site
- Cadastre
- $L_{eq,15hr}$ 65dBA (daytime criteria)
- $L_{eq,9hr}$ 60dBA (night-time criteria)
- L_{max} 85dBA (Lmax criteria)



0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

ARTC makes no representation or warranty and assumes no duty of care or other responsibility to any party as to the completeness, accuracy or suitability of the information contained in this GIS map. The GIS map has been prepared from material provided to ARTC by an external source and ARTC has not taken any steps to verify the completeness, accuracy or suitability of that material. ARTC will not be responsible for any loss or damage suffered as a result of any person whatsoever placing reliance upon the information contained within this GIS map.

Date: 1/10/2021 Paper: A3

Author: WSP Scale: 1:3,500

D:\WSP O365\AU-WKG - Geospatial - AIS - Projects\PS122419_Albury_to_Illabo\Tasks\230_0004_EAP_REFReportFigures\Documents\04_HorizontalClearances\100pc\Noise\230_EAP_HorizontalClearances_NV_NoiseContours_2020_r1v2.mxd

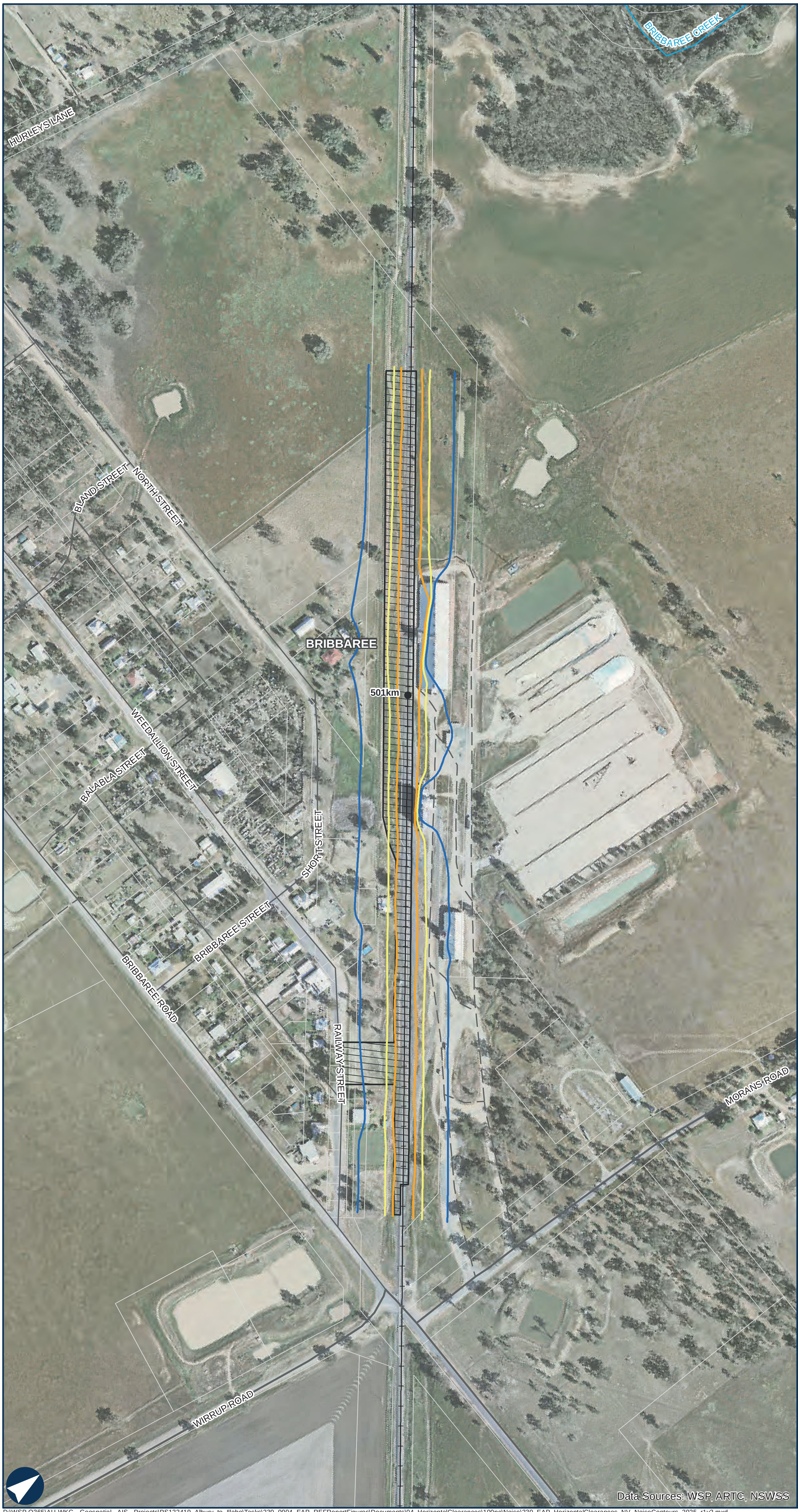
INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes Bribbaree yard clearances

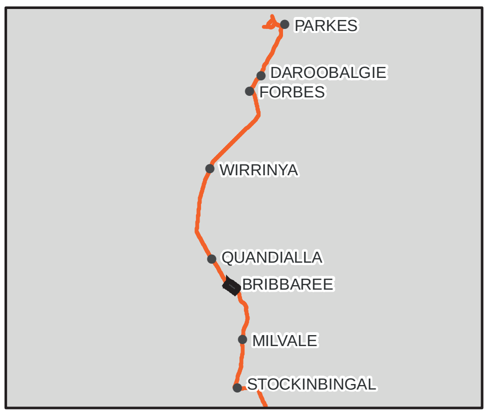
Appendix C.2 - Proposal opening (2027)

MAP 1 OF 4



LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Proposal site
- Cadastre
- $L_{eq,15hr}$ 65dBA (daytime criteria)
- $L_{eq,9hr}$ 60dBA (night-time criteria)
- L_{max} 85dBA (Lmax criteria)



0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 1/10/2021 Paper: A3
Author: WSP Scale: 1:4,500

D:\WSP O365\AU-WKG - Geospatial - AIS - Projects\PS122419_Albury_to_Illabo\Tasks\230_0004_EAP_REFReportFigures\Documents\04_HorizontalClearances\100pc\Noise\230_EAP_HorizontalClearances_NV_NoiseContours_2025_r1v2.mxd

INLAND RAIL   ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

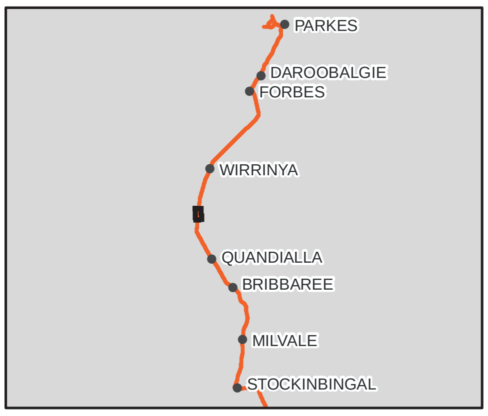
Stockinbingal to Parkes
Caragabal yard clearances

Appendix C.2 - Proposal opening (2027)

MAP 2 OF 4

LEGEND

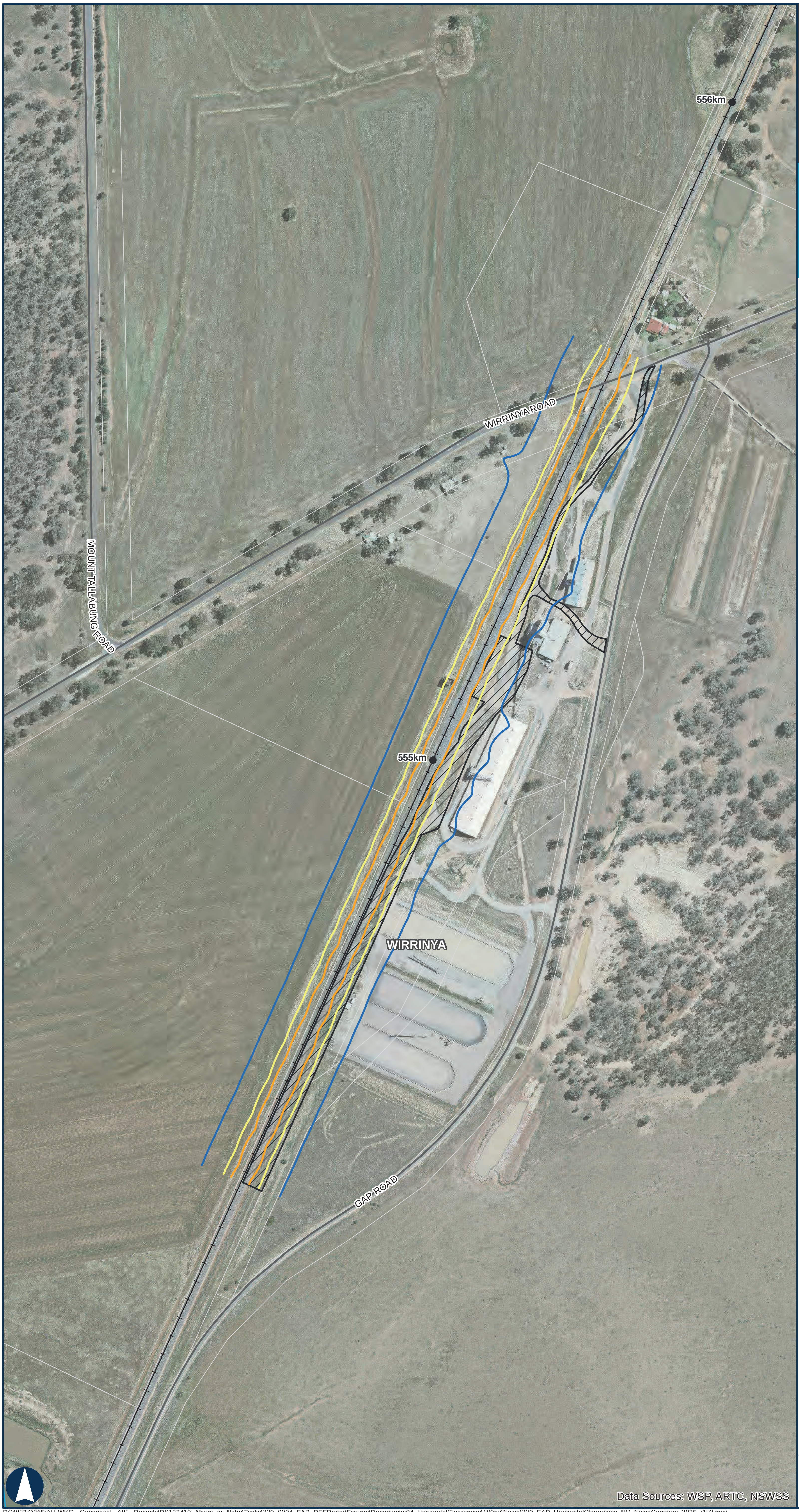
- KM post
- Existing railway
- Main road
- Local road
- Track
- Proposal site
- Cadastre
- $L_{eq,15hr}$ 65dBA (daytime criteria)
- $L_{eq,9hr}$ 60dBA (night-time criteria)
- L_{max} 85dBA (Lmax criteria)



0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 1/10/2021 Paper: A3
Author: WSP Scale: 1:4,500



INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

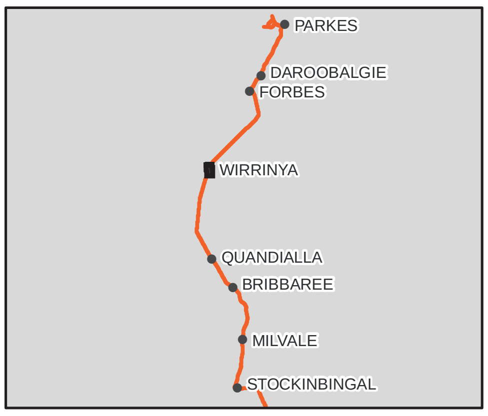
Stockinbingal to Parkes
Wirrinya yard clearances

Appendix C.2 - Proposal opening (2027)

MAP 3 OF 4

LEGEND

- KM post
- Existing railway
- Main road
- Track
- Watercourse
- Proposal site
- Cadastre
- $L_{eq,15hr}$ 65dBA (daytime criteria)
- $L_{eq,9hr}$ 60dBA (night-time criteria)
- L_{max} 85dBA (Lmax criteria)



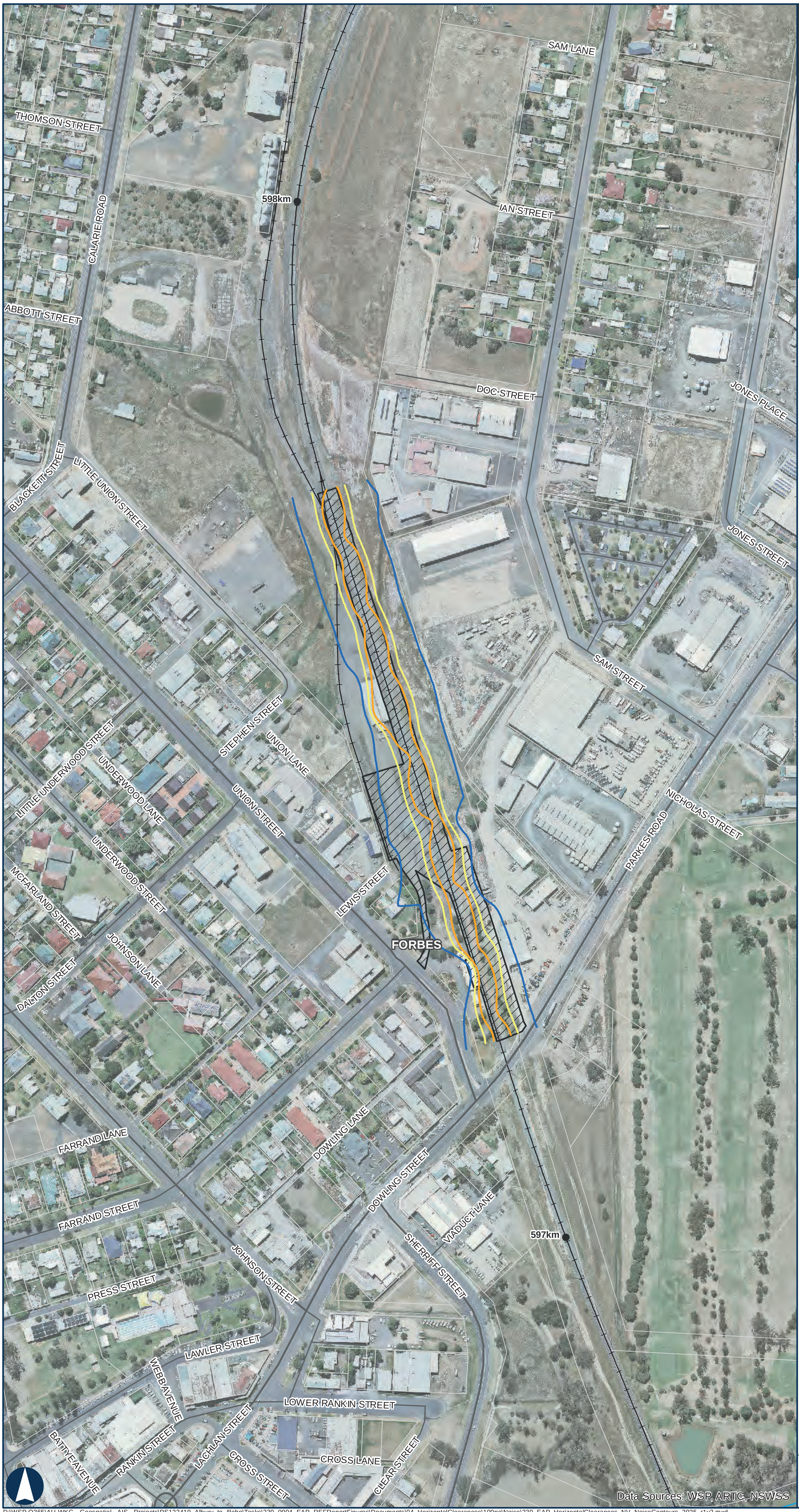
0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 1/10/2021 Paper: A3

Author: WSP Scale: 1:4,500

D:\WSP O365\AU-WKG - Geospatial - AIS - Projects\PS122419_Albury_to_Illabo\Tasks\230_0004_EAP_REFReportFigures\Documents\04_HorizontalClearances\100pc\Noise\230_EAP_HorizontalClearances_NV_NoiseContours_2025_r1v2.mxd



INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

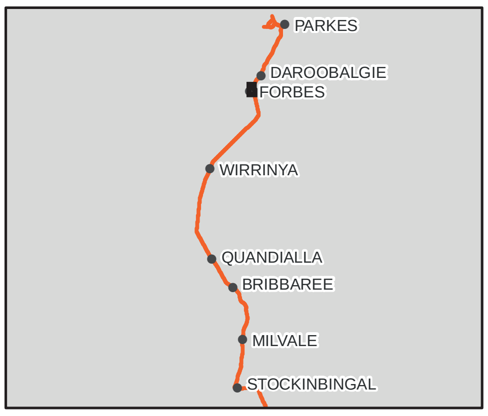
Stockinbingal to Parkes Forbes Station clearances

Appendix C.2 - Proposal opening (2027)

MAP 4 OF 4

LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Watercourse
- Proposal site
- Cadastre
- $L_{eq,15hr}$ 65dBA (daytime criteria)
- $L_{eq,9hr}$ 60dBA (night-time criteria)
- L_{max} 85dBA (Lmax criteria)



0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 1/10/2021
Paper: A3
Author: WSP
Scale: 1:3,500

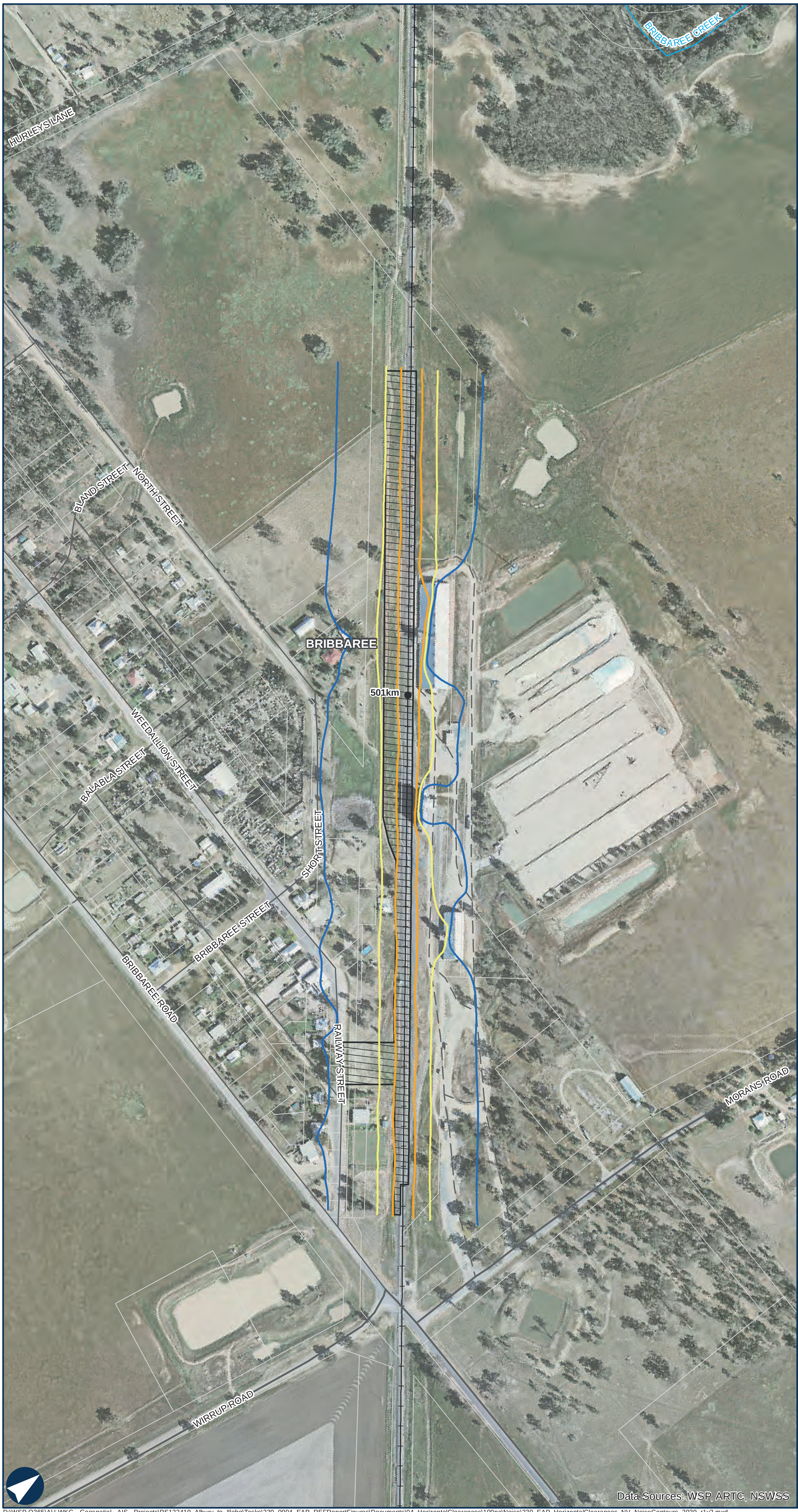
D:\WSP O365\AU-WKG - Geospatial - AIS - Projects\PS122419_Albury_to_Illabo\Tasks\230_0004_EAP_REFReportFigures\Documents\04_HorizontalClearances\100pc\Noise\230_EAP_HorizontalClearances_NV_NoiseContours_2025_r1v2.mxd

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes
Bribbaree yard clearances

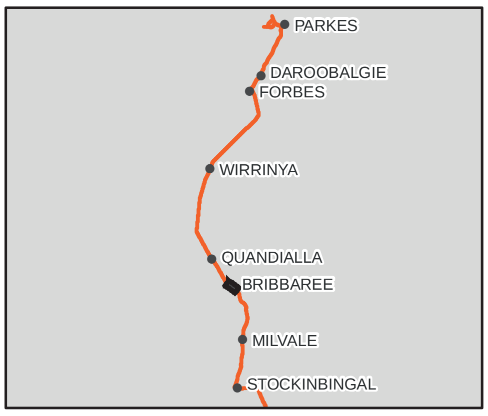
Appendix C.3 - Future capacity (2039)

MAP 1 OF 4



LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Watercourse
- Proposal site
- Cadastre
- $L_{eq,15hr}$ 65dBA (daytime criteria)
- $L_{eq,9hr}$ 60dBA (night-time criteria)
- L_{max} 85dBA (Lmax criteria)



0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 1/10/2021 Paper: A3
Author: WSP Scale: 1:4,500

D:\WSP O365\AU-WKG - Geospatial - AIS - Projects\PS122419_Albury_to_Illabo\Tasks\230_0004_EAP_REFReportFigures\Documents\04_HorizontalClearances\100pc\Noise\230_EAP_HorizontalClearances_NV_NoiseContours_2039_r1v2.mxd

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

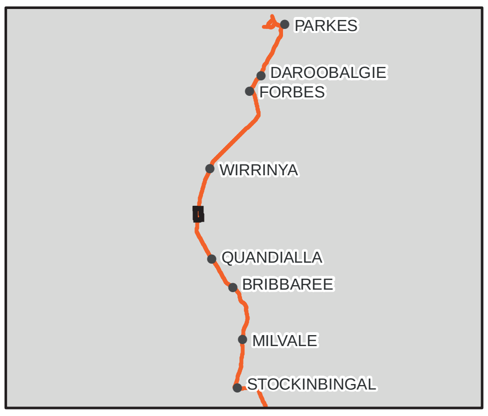
Stockinbingal to Parkes Caragabal yard clearances

Appendix C.3 - Future capacity (2039)

MAP 2 OF 4

LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Track
- Proposal site
- Cadastre
- $L_{eq,15hr}$ 65dBA (daytime criteria)
- $L_{eq,9hr}$ 60dBA (night-time criteria)
- L_{max} 85dBA (Lmax criteria)

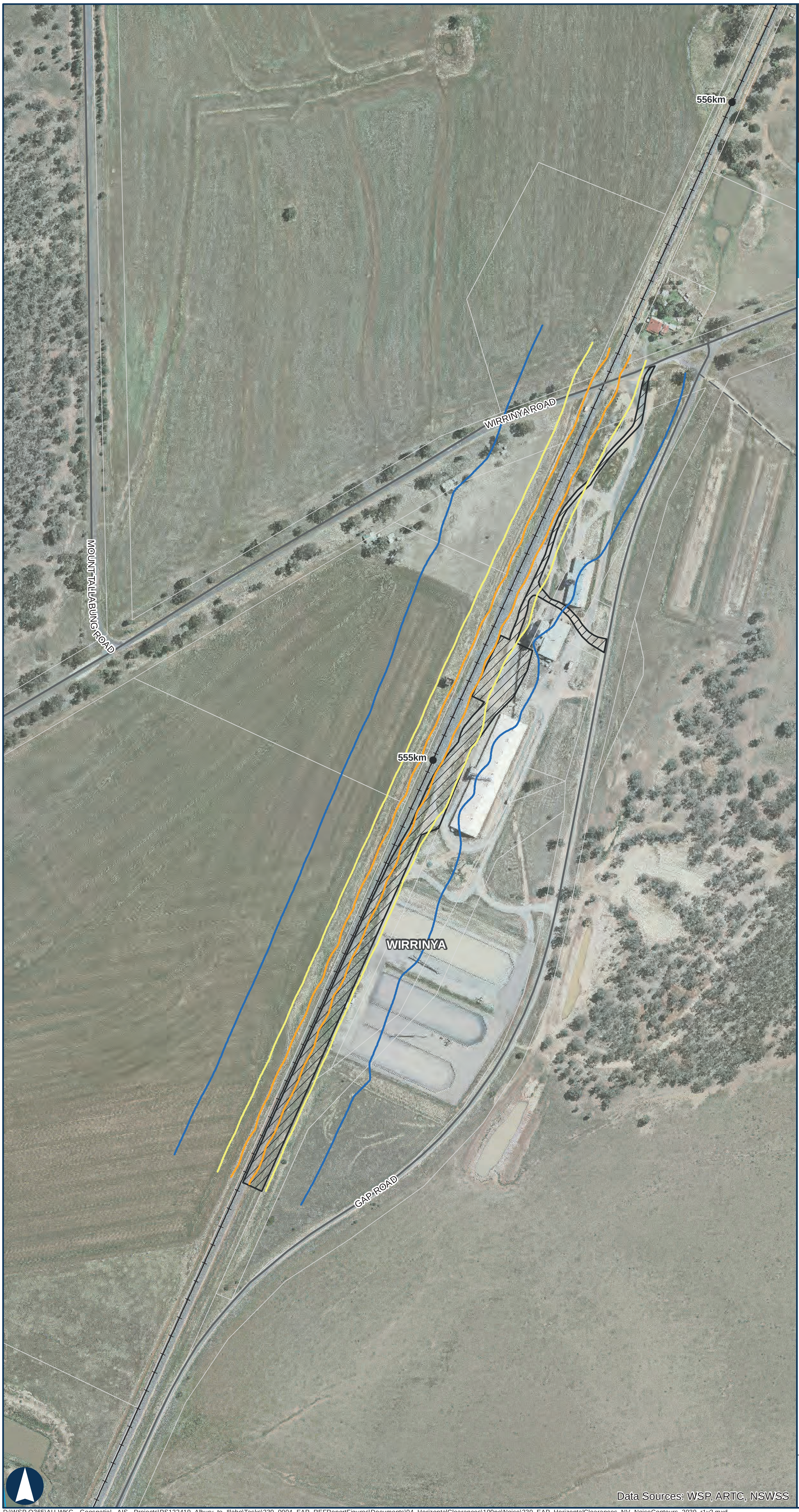


0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 1/10/2021
Paper: A3
Author: WSP
Scale: 1:4,500

D:\WSP O365\AU-WKG - Geospatial - AIS - Projects\PS122419_Albury_to_Illabo\Tasks\230_0004_EAP_REFReportFigures\Documents\04_HorizontalClearances\100pc\Noise\230_EAP_HorizontalClearances_NV_NoiseContours_2039_r1v2.mxd



INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

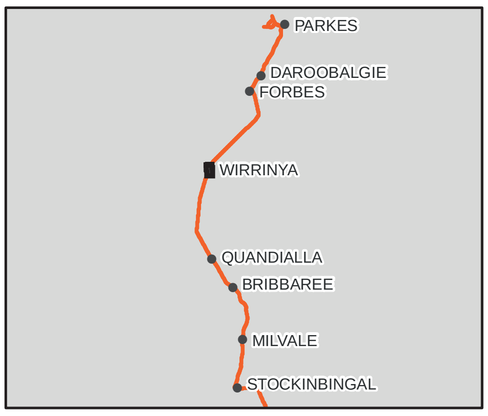
Stockinbingal to Parkes Wirrinya yard clearances

Appendix C.3 - Future capacity (2039)

MAP 3 OF 4

LEGEND

- KM post
- Existing railway
- Main road
- Track
- Watercourse
- Proposal site
- Cadastre
- $L_{eq,15hr}$ 65dBA (daytime criteria)
- $L_{eq,9hr}$ 60dBA (night-time criteria)
- L_{max} 85dBA (Lmax criteria)



0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 1/10/2021 Paper: A3
Author: WSP Scale: 1:4,500

D:\WSP O365\AU-WKG - Geospatial - AIS - Projects\PS122419_Albury_to_Illabo\Tasks\230_0004_EAP_REFReportFigures\Documents\04_HorizontalClearances\100pc\Noise\230_EAP_HorizontalClearances_NV_NoiseContours_2039_r1v2.mxd

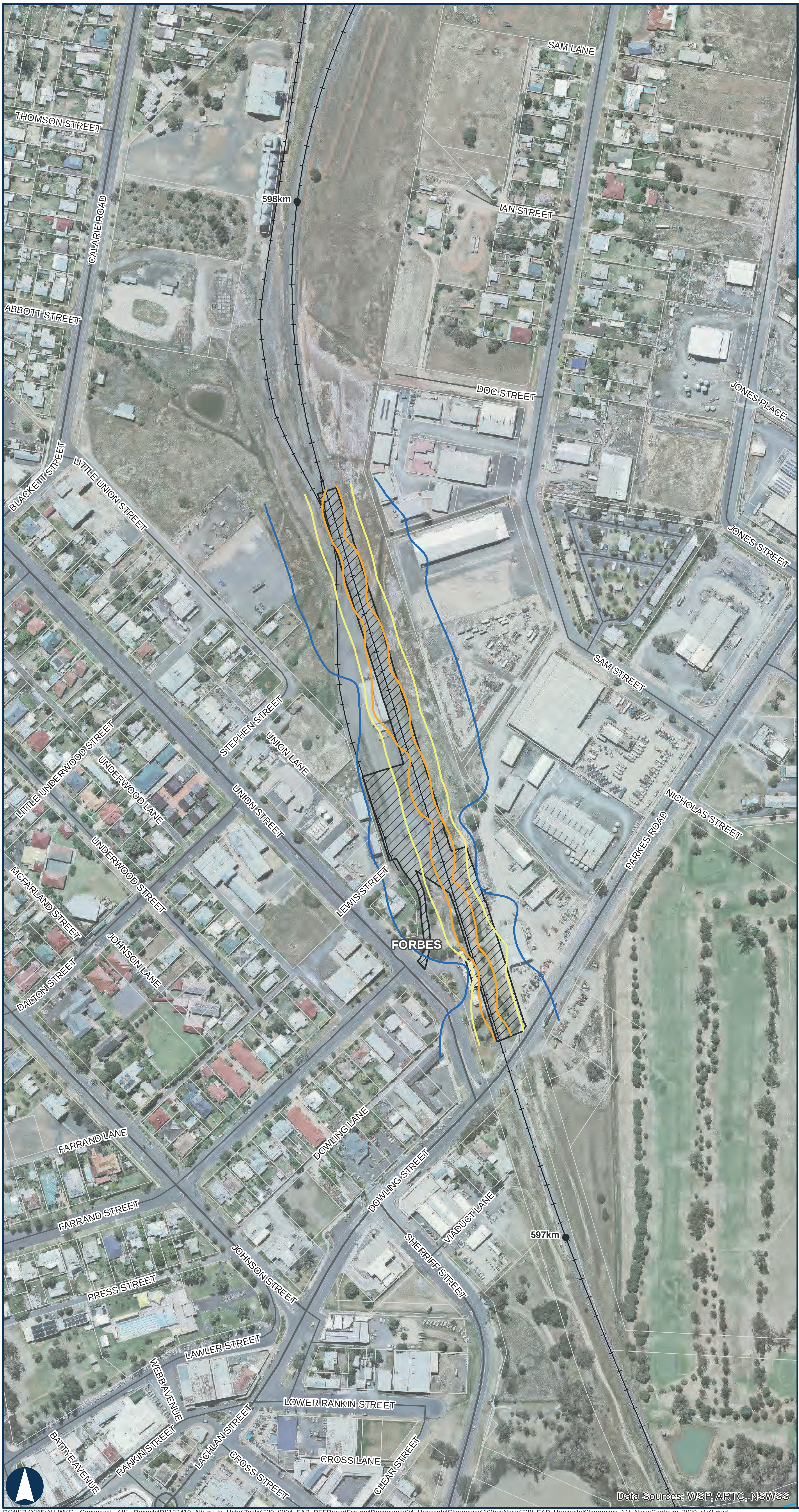
INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Stockinbingal to Parkes Forbes Station clearances

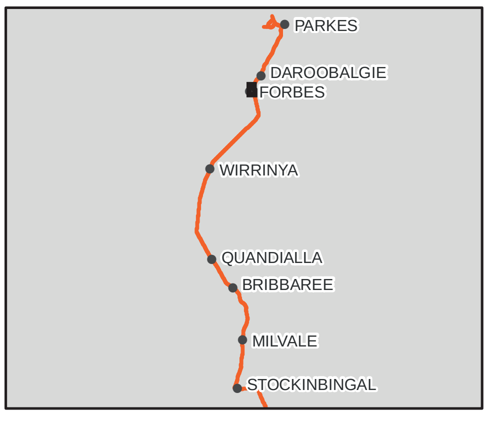
Appendix C.3 - Future capacity (2039)

MAP 4 OF 4



LEGEND

- KM post
- Existing railway
- Main road
- Local road
- Watercourse
- Proposal site
- Cadastre
- $L_{eq,15hr}$ 65dBA (daytime criteria)
- $L_{eq,9hr}$ 60dBA (night-time criteria)
- L_{max} 85dBA (Lmax criteria)



0 100 200 m

Coordinate System: GDA 1994 MGA Zone 55

Date: 1/10/2021 Paper: A3

Author: WSP Scale: 1:3,500

D:\WSP O365\AU-WKG - Geospatial - AIS - Projects\PS122419_Albury_to_Illabo\Tasks\230_0004_EAP_REFReportFigures\Documents\04_HorizontalClearances\100pc\Noise\230_EAP_HorizontalClearances_NV_NoiseContours_2039_r1v2.mxd