



Great Northern Highway Muehea to Wubin Upgrade - Stage 2

MAIN ROADS WESTERN AUSTRALIA

Bindoon Bypass | Noise Assessment

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Arup Jacobs Joint Venture

Level 11, Durack Centre
263 Adelaide Terrace
Perth WA 6000 Australia

T +61 8 9469 4199
F +61 8 9469 4488

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Appendix A. Noise Model Input

Appendix B. Noise Monitoring Methodology and Results

Appendix C. Noise Contours - Proposed Bindoon Bypass Alignment

Glossary

Abbreviation	Description
AADT	Annual Average Daily Traffic
ASJV	Arup Jacobs Joint Venture
BoM	Bureau of Meteorology
CoRTN	UK Calculation of Road Traffic Noise
dB	decibels
dB(A)	A-weighted decibel level
DEFRA	UK Department for Environment, Food and Rural Affairs
DoE	UK Department of the Environment
EPA	Environmental Protection Authority of WA
EP Act	<i>Environmental Protection Act 1986 (WA)</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999 (Cwlth)</i>
GIS	Geographic Information System
GNH	Great Northern Highway
IUCN	International Union for Conservation of Nature
M2W team	Muchea to Wubin Integrated Project Team, comprising Main Roads and industry partners Jacobs and Arup
NATA	National Association of Testing Authorities
NMP	Noise Management Plan
OSOM	Over Size Over Mass vehicles
SLK	Straight Line Kilometre
SPP 5.4	WA State Planning Policy 5.4
TNRB	Transport Noise Reference Book

1. Introduction

The Great Northern Highway (GNH) is a critical freight link between the Perth metropolitan area and the towns and mining centres of the Midwest and Pilbara regions of Western Australia. In 2014, Main Roads Western Australia (Main Roads) established the Muchea to Wubin Integrated Project Team (M2W Team), comprising Main Roads and industry partners Arup and Jacobs (combining to form Arup Jacobs Joint Venture, ASJV) to conduct a comprehensive planning review of the full Muchea to Wubin link along the GNH. The focus of the planning review was to improve freight efficiency and safety for both road users and local communities.

The current GNH runs through the increasingly populated regions of the Swan Valley, Bullsbrook and Bindoon, resulting in increased congestion, reduced social amenity and service quality in this area and negatively impacting freight efficiency. Heavy vehicles currently struggle with the steep grades on the existing GNH at Bindoon Hill. With the proposed approval of 53.5 m road trains to travel between Muchea and Wubin, it has been identified that the current grade was likely to present a barrier to the movement of 53.5 m road trains and a more efficient route through or around Bindoon is required.

Identified impediments to 53.5 m road trains travelling along this section of GNH include:

- Bindoon town: Major safety concerns regarding conflicts between local traffic, pedestrian, Over Size Over Mass vehicles (OSOMs) and heavy freight through the Bindoon town centre; and
- Bindoon Hill:
 - ▶ the steep grades of up to 6.2% over a 2 km length currently result in heavy vehicles travelling slowly at speeds of approximately 20 km/h. This would be exacerbated by 53.5 m road trains travelling at 12 km/h or slower. The speed differential between slow moving heavy vehicles and light vehicles would cause operational safety issues;
 - ▶ there are a number of substandard horizontal curves and no passing lanes on the downhill sections; and
 - ▶ high temperatures in the summer months can adversely impact the bitumen surface and heavy vehicle performance on the steep sections of the hill.

As such, Main Roads proposes to construct a bypass around the town of Bindoon, located within the Shire of Chittering approximately 70 km north east of Perth and approximately 13 km north of Muchea, Western Australia. The proposed Bindoon Bypass will divert from the existing GNH at the Chittering Roadhouse, running west of Bindoon and re-joining the GNH between Hay Flat Road and Calingiri West Road. This will involve the construction of 48 km of new highway. The Bindoon Bypass will be constructed in stages based on the expected traffic volumes. The initial stage is proposed to consist of single carriageway (two lane) with a number of overtaking lanes for both north-bound and south-bound traffic as well as stopping facilities. It is proposed that the new highway will ultimately be dual carriageway (four lanes) between Chittering Roadhouse and Bindoon-Moora Road and single carriageway (two lanes) between Bindoon-Moora Road and the tie in to the existing GNH just north of Calingiri Road. Upgrades to local roads, rail crossings and intersections may also be required.

This report provides details of an acoustic assessment of the Bindoon Bypass portion of the GNH. The assessment includes investigation of predicted noise levels along the proposed alignment against relevant transportation noise policy for Western Australia. The noise model used to predict traffic noise levels has been calibrated for local conditions, and considers the ultimate dual carriageway option.

2. Assessment Criteria

Road traffic noise in WA is subject to State Planning Policy 5.4¹ (SPP 5.4), which includes requirements for ‘new roads’ and ‘major redevelopments of existing major roads’ (upgraded roads). The proposed Bindoon Bypass is classified as a new road for the extent of the proposed works.

This assessment identifies noise-sensitive buildings that exceed the Noise Targets, and Noise Limits set in SPP 5.4. The noise targets and limits are presented in Table 2-1.

Table 2-1: Noise targets and noise limits according to SPP 5.4, dB re 20 µPa

Time Period	Noise Target, dBL _{Aeq}	Noise Limit, dBL _{Aeq}
Day 06:00 hrs – 22:00 hrs	55	60
Night 22:00 hrs – 06:00 hrs	50	55

According to the SPP 5.4 Implementation Guidelines², transport infrastructure providers and developers are required to consider and implement design measures to achieve the limit, and to also consider measures to meet the target and to implement these if practicable.

Where a transport infrastructure project will emit transport noise levels that meet the noise target, no further measures are required under the policy.

Compliance with the Policy is achieved when the traffic noise *limit* of L_{Aeq (Day)} 60 dB and L_{Aeq (Night)} 55 dB, when assessed 1 m from the façade of a ground floor level habitable room. The road authority or transport infrastructure providers are also required to consider design measures to meet the noise target of L_{Aeq (Day)} 55 dB and L_{Aeq (Night)} 50 dB, and to implement these measures where reasonable and practicable.

Based on maintaining consistency with other Main Roads projects, it is considered appropriate to adopt the Day *limit* criterion of L_{Aeq (Day)} 60 dB, when designing noise mitigation.

SPP 5.4 considers noise sensitive receivers ‘in the vicinity’ of ‘proposed new major road or rail projects’, where ‘in the vicinity’ is defined as:

- i) *Abutting; or*
- ii) *Separated by only a road, access way or other land that is likely to remain substantially open and undeveloped in terms of buildings, up to a maximum distance of 300 m*

The SPP 5.4 Implementation Guidelines state that:

“road traffic may be assessed using the UK Calculation of Road Traffic Noise (CoRTN) algorithm which yields L_{A10,18hour} values, provided a suitable conversion to Australian conditions is made to obtain the appropriate L_{Aeq,Day} (L_{Aeq,16hour}) or L_{Aeq,Night} (L_{Aeq,8hour}) values as specified in [SPP 5.4]. It is preferable to undertake direct noise measurements of the roadway being investigated to determine the existing differences between relevant noise parameters. Where this is not possible, reference should be made to the Department for Environment, Food and Rural Affairs (DEFRA) publication “Method for Converting the UK Road Traffic Noise Index L_{A10,18hour} to the EU Noise Indices for Road Noise Mapping”, which provides conversion formulae. Also, where traffic noise measurement data are unavailable and the road traffic noise

¹ Western Australian Planning Commission, *State Planning Policy 5.4: Road and Rail Transport Noise and Freight Considerations in Land Use Planning*, September 2009

² Western Australian Planning Commission, *Implementation Guidelines for State Planning Policy 5.4: Road and Rail Transport Noise and Freight Considerations in Land Use Planning*, December 2014

model cannot be calibrated against existing noise conditions, it is standard practise to apply a further correction of -1.7 dB.”

Traffic noise measurements along the existing GNH near Bindoon were conducted, and have been considered to establish the appropriate calibration factor and conversion factor for L_{Aeq} to L_{A10} . Further details are provided in Section 5.1.2.

3. Environmental Scoping Document

The Environmental Protection Authority (EPA) of Western Australia have released the Environmental Scoping Document for the proposed Bindoon Bypass³, which determined that the proposal shall be assessed under Part IV of the *WA Environmental Protection Act 1986* (EP Act). Requirements 30 – 34 concern noise, and stipulate the following:

- Requirement 30. Undertake noise monitoring along the proposed alignment to determine ambient noise levels in areas of noise sensitive receptors
- Requirement 31. Undertake a screening assessment and, if required, a detailed noise assessment in accordance with the relevant guidelines set out below to predict future noise levels resulting from the proposal on sensitive receptors, including recreational values and terrestrial fauna as appropriate
- Requirement 32. Identify relevant noise mitigation measures for identified sensitive receptors in 31 above and describe any proposed mitigation to reduce the potential impacts of construction and operation of the proposal. Provide maps of and justification for the location and number of any proposed mitigation infrastructure
- Requirement 33. Include any proposed management and/or monitoring plans for noise that will be implemented pre- and post-construction to demonstrate and ensure the EPA's objectives can be met
- Requirement 34. Identify and describe the potential residual impacts (direct and indirect) that may occur following implementation of the proposed mitigation measures and determine the significance of the residual impacts of noise on the identified sensitive receptors in 31 above with reference to the residual impact model set out in the WA Environmental Offsets Guidelines

The following provides a summary of our findings with respect to Requirements 30 – 34.

3.1 Requirement 30

Noise monitoring has been undertaken along the proposed alignment of the Bindoon Bypass. Details of the ambient noise measurements are presented in Appendix B.

3.2 Requirement 31

A detailed noise assessment has been deemed necessary, as per SPP 5.4. The details of the assessment are presented in Section 5.

3.3 Requirement 32

From the noise assessment, the need for mitigation measures has been assessed at the noise sensitive receptors. The results of our findings are presented in Section 6.

3.4 Requirement 33

All relevant details of noise monitoring positions prior to construction are presented in Appendix B. Post construction traffic noise monitoring to demonstrate compliance with the project noise limits will be completed at later stages of the project.

³ Government of Western Australia Environmental Protection Authority, *Draft Environmental Scoping Document: Great Northern Highway – Bindoon Bypass, Assessment number 2135, EPBC reference number 2017/8035*

3.5 Requirement 34

The residual impact assessment will be addressed at a later stage of the project.

4. Noise Measurements

Long term noise measurements have been undertaken along the existing GNH and in the vicinity of the proposed alignment for the Bindoon Bypass.

4.1 Traffic Noise Measurements along Existing Alignment

Attended noise measurements and unattended noise monitoring along the existing alignment of the GNH passing through Bindoon were undertaken at the sites presented in Table 4-1. The average noise levels for the day and night time periods for three (3) acceptable weather days at each monitoring location are also listed in Table 4-1

Table 4-1: Long Term Noise Monitoring Locations and Average Traffic Noise Levels along Existing Alignment

Noise Monitoring Position		L _{Aeq,16hours} (day) dB	L _{Aeq,8hours} (night) dB
1.1	Lot 554, 7372 GNH, Bindoon	71	50
1.2	Lot 5933, 6486 GNH, Bindoon	68	62
1.3	Lot 501, 5885 GNH, Bindoon	69	63
1.4	Lot 18, 5077 GNH, Bindoon	71	60
1.5	Lot 151, 21 Sandalford Drive, Chittering	61*	55*

*Noise logger at this position failed after 2 days. This noise level only includes measurements from a 2-day period.

Traffic noise levels during the day time period are higher than the night time period.

Further details of the long-term noise monitoring locations and traffic noise measurements are presented in Appendix B.

4.2 Noise Monitoring along the Proposed Alignment

Attended noise measurements and unattended noise monitoring were undertaken at ten (10) locations along the proposed alignment for the Bindoon Bypass. The locations are as presented in Table 4-2. The average noise levels for the day and night time periods for three (3) acceptable weather days at each monitoring location are also listed in Table 4-2.

The ten (10) noise monitoring locations were selected due to their proximity to the proposed Bindoon Bypass alignment. Specifically, these locations all include noise sensitive receivers. The existing ambient noise levels at each of these locations may be easily compared with the traffic noise levels on completion of the alignment. Noise monitoring locations have been chosen to give a representation of the different ambient noise conditions along the extent of the proposed alignment. Where possible dwellings were selected with a direct line-of-sight to the alignment.

Table 4-2: Long Term Noise Monitoring Locations and Average Ambient Noise Levels along the Proposed Alignment

Noise monitoring location		L _{Aeq,16hours} (day) dB	L _{Aeq,8hours} (night) dB
2.1	Lot 1, 537 Teatree Rd, Bindoon	43	40
2.2	Lot 36, 620 Gray Rd, Bindoon	43	40
2.3	Lot 502, 737 Crest Hill Rd, Mooliabeenee	48	43
2.4	Lot M1364, 16 Cullalla Rd, Mooliabeenee	57	45

Noise monitoring location		L _{Aeq,16hours} (day) dB	L _{Aeq,8hours} (night) dB
2.5	Lot 1, 428 Gingilling Rd, Mooliabeenee	47	43
2.6	Lot 53, 644 Gingilling Rd, Wannamal	47	37
2.7	Lot 1, 2261 Bindoon-Moora Rd, Wannamal	49	40
2.8	Lot 3, 2087 Bindoon-Moora Rd, Wannamal	61	36
2.9	Lot 2917, 75 Kangaroo Gully Rd, Wannamal	51	37
2.10	Lot 3281, 9071 GNH, Wannamal	42	31

Traffic noise levels during the day time period were significantly higher than the night time period. As a result, day time traffic noise levels shall be considered to assess compliance against the SPP 5.4.

The day time noise levels at Location (2.4) 16 Cullalla Road and Location (2.8) 2087 Bindoon-Moora Rd were higher than at the other monitoring locations. The owner of 16 Cullalla Road operated motorcycles on the site. The owner of 2087 Bindoon-Moora Road conducted bird scaring techniques that were clearly audible by the noise monitoring equipment.

The locations and further details of the ambient noise measurements are presented in Appendix B.

4.3 Meteorological conditions during the noise measurement periods

Meteorological conditions, including wind speed, wind direction and rainfall, were monitored by the Bureau of Meteorology (BoM) during the noise measurement periods.

The assessment of the meteorological conditions indicate that the measured wind speeds were rarely below the limit set by the SPP 5.4 for ‘good’ weather conditions. The prevailing winds in the vicinity of the noise monitoring sites have been investigated, and wind conditions during the measurement period were consistent with the long-term meteorological data.

Acceptable weather days during the noise measurement periods include days with the lowest wind speeds. The acceptable weather days represent the average ambient conditions for the nominated sites, and noise measurements on these days were not negatively impacted by the wind speeds. Further information regarding the investigation into meteorological data is presented in Appendix B.

5. Noise Assessment Methodology

The traffic noise models have been constructed in SoundPLAN Version 8.0, with the CoRTN⁴ methodology implemented for road traffic noise prediction. SoundPLAN is an environmental noise modelling software, and is widely used for traffic noise modelling.

The following methodology has been considered for the assessment of traffic noise impacts along the proposed Bindoon Bypass:

- Construct a traffic noise model in SoundPLAN Version 8.0 of the terrain and sensitive receivers in the vicinity of the GNH
- Apply the three-dimensional earthworks design for the Bindoon Bypass
- Using year 2038 forecast traffic volumes, determine day-time and night-time source noise levels for the GNH. This has also been done for the year 2051 traffic volumes, as this is the ultimate design scenario for the Bindoon Bypass.
- Predict the year 2038 (and 2051) traffic noise levels adjacent to the GNH
- Assess the predicted noise levels with respect to SPP 5.4, and identify noise sensitive receivers where mitigation may be required to meet the project noise limits

Further details of the assessment are provided in the following sections.

5.1 Traffic Noise Models

Two traffic noise models have been developed to adequately assess the noise levels to noise sensitive receivers along the proposed Bindoon Bypass alignment. The models are:

- The existing alignment of the GNH that passes through Bindoon to Wubin
- The proposed Bindoon Bypass alignment

5.1.1 Existing Great Northern Highway Traffic Noise Model

A traffic noise model of the existing GNH alignment was developed to assess the applicability of the assumptions in CoRTN for local conditions along the existing GNH. CoRTN was not developed for Australian road conditions and it is best practice to calibrate traffic noise models of existing conditions. For the existing and proposed GNH it is expected that there will be a low daily volume of traffic (i.e. less than 4,000 vehicles per day), and a high percentage of heavy vehicles. These attributes are not typical of traffic flow as predicted by CoRTN, and verification of the traffic noise model will assist with calibrating the traffic noise model for local conditions. The methodology undertaken for this project permits calibration of CoRTN for local conditions.

Adjustments have been applied to the CoRTN methodology to suit Australian conditions⁵. The noise adjustments are discussed in Section 5.1.2.

The split height approach from the Transport Noise Reference Book⁶ (TNRB) for noise sources has also been adopted for the traffic noise model. The TNRB split height approach separates the noise sources from light vehicles (e.g. cars) and heavy vehicles (e.g. trucks). For heavy vehicles, the following source line components are applied:

⁴ HMSO Department of Transport, *Calculation of Road Traffic Noise*, 1988

⁵ Australian Road Research Board, *An Evaluation of the UK DoE Traffic Noise Prediction*, 1983

⁶ Nelson, *Transport Noise Reference Book*, 1987

- 0.5 m for exhausts/engines and car/truck tyre noise
- 1.5 m for truck engines
- 3.6 m for truck exhausts

The noise mitigation provided by ground features such as earth cuttings and mounds has been included in the traffic noise modelling as part of the digital ground model (a three-dimensional model of the ground conditions in the vicinity of the GNH).

A ground absorption factor of 0.7 was applied and considered to be appropriate for the project.

Further details of data inputs are provided in Appendix A.

5.1.2 Great Northern Highway Traffic Noise Model Calibration

Noise loggers were installed on several sites along the existing GNH alignment to determine the existing noise levels and site conditions. The measured noise levels were cross-referenced with meteorological data over the noise measurement period. Three days of noise measurements that coincided with acceptable weather conditions were selected for the calibration process of the traffic noise model. The measured existing traffic noise levels were compared against the predicted traffic noise levels for the existing GNH. This comparison revealed that the measured noise levels were, on average, 1.4 dB lower than the predicted noise levels, and as such, a calibration adjustment of minus (-) 1.4 dB was applied to the predicted noise levels along the proposed alignment. This calibration factor is in general agreement with the minus (-) 1.7 dB recommended by DEFRA as detailed in Section 2 and SPP 5.4.

CoRTN calculates traffic noise levels as $L_{A10,18hr}$, however the SPP 5.4 traffic noise targets and limits are $L_{Aeq,16hr}$ (day) and $L_{Aeq,8hr}$ (night-time). As a result, an adjustment between the $L_{A10,18hr}$ and $L_{Aeq,16hr}$ (day) and the $L_{A10,18hr}$ and $L_{Aeq,8hr}$ (night-time) was developed based on measured traffic noise levels along the GNH. The following adjustments were applied to the calibrated $L_{A10,18hr}$:

- $L_{Aeq,16hr}$ (day) = $L_{A10,18hr} - 1.0$ dB
- $L_{Aeq,8hr}$ (night) = $L_{A10,18hr} - 6.7$ dB

The adjustments have been applied to the results of the noise modelling and are considered appropriate for Australian conditions.

5.2 Proposed Alignment for Bindoon Bypass Traffic Noise Model

The traffic noise model for the proposed Bindoon Bypass alignment carries the same assumptions and traffic noise model corrections as described in the noise model calibration process.

The traffic noise model is based on the most recent available road design information. The input design information is detailed in Appendix A, and includes the conceptual three-dimensional draft design of the road and earthworks for the Bindoon Bypass. The three-dimensional design has been integrated with the three-dimensional digital terrain model of existing ground conditions. The road alignment used for the noise assessment is the proposed ultimate design case, which includes dual carriageways.

Forecast traffic volumes for the day and night-time periods have been used to predict the day and night-time traffic noise levels along the proposed Bindoon Bypass. These are based on forecast traffic volumes for the year 2051. Further details of the traffic information used for modelling are presented in Appendix A.

Noise sensitive receivers have been modelled as single point receivers attached to building façades (i.e. including the façade correction of 2.5 dB). The locations of the receivers have been determined using project geographic information system (GIS) data, as well as consultation with the project team, and site inspections.

Buildings that are not noise sensitive, such as sheds or commercial buildings, have been excluded from the assessment.

Noise sensitive receivers that have been considered in the assessment are shown on noise contour maps in Appendix C.

Single point receivers in the traffic noise model have been located 1 m from the building façade, and 1.4 m above ground level, to meet the requirements of SPP 5.4.

The split height correction values applied to the traffic noise model are provided in Section Table 5-1.

Table 5-1: Summary of noise model corrections

Correction, dB(A)	Description
0 car source 0 truck tyre source - 0.6 truck engine source - 8.6 truck exhaust source	Split height corrections based on the Transportation Noise Reference Book (TNRB), and SPP 5.4.

The proposed road surface finish for the proposed Bindoon Bypass is a 14 mm/7 mm double bituminous seal. It is our understanding that the existing road surface is of a similar surface seal.

6. Noise Modelling Results

The predicted day and night time noise levels at the existing noise sensitive receivers along the proposed Bindoon Bypass are presented in Table 6-1. For completeness, both the day and night time traffic noise levels have been shown.

The existing noise sensitive receivers that are predicted to exceed the SPP 5.4 noise target or limit are highlighted as follows:

Noise sensitive receivers that exceed the noise target L_{Aeq} 55 dB (Day), but not the noise limit, are highlighted in yellow	Noise sensitive receivers that exceed the noise limit L_{Aeq} 60 dB (Day) are highlighted in red
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Table 6-1: Existing noise sensitive receivers noise modelling results

Location	Predicted Day Time Noise Level, L_{Aeq} dB	Predicted Night Time Noise Level, L_{Aeq} dB
5259 Great Northern Hwy, Chittering	53	47
5283 Great Northern Hwy, Chittering	46	40
383 Teatree Rd, Bindoon	51	45
32 Windemere Way, Bindoon	53	47
73 Windemere Way, Bindoon	54	49
85 Windemere Way, Bindoon	55	49
322 Forrest Hills Pde, Bindoon	46	41
320 Forrest Hills Pde, Bindoon	47	41
300 Forrest Hills Pde, Bindoon	42	37
288 Forrest Hills Pde, Bindoon	38	33
284 Forrest Hills Pde, Bindoon	41	35
274 Forrest Hills Pde, Bindoon	38	32
262 Forrest Hills Pde, Bindoon	38	32
258 Forrest Hills Pde, Bindoon	38	32
254 Forrest Hills Pde, Bindoon	37	31
246 Forrest Hills Pde, Bindoon	40	35
411 Teatree Rd, Bindoon	52	46
534 Teatree Rd, Bindoon	53	47
444 Gray Rd, Bindoon	38	32
112 Hidaway Dr, Bindoon	38	32
366 Gray Rd, Bindoon	39	33
620 Gray Rd, Bindoon	56	51
737 Crest Hill Rd, Mooliabeenee	58	53
739 Crest Hill Rd, Mooliabeenee	58	53

Location	Predicted Day Time Noise Level, L_{Aeq} dB	Predicted Night Time Noise Level, L_{Aeq} dB
756 Crest Hill Rd, Mooliabeenee	55	49
370 Mooliabeenee Rd, Mooliabeenee	55	49
482 Mooliabeenee Rd, Mooliabeenee	52	47
16 Cullalla Rd, Mooliabeenee	53	47
204 Cullalla Rd, Mooliabeenee	49	44
431 Cullalla Rd, Moondah	58	52
669 Cullalla Rd, Cullalla	50	44
428 Gingilling Rd, Mooliabeenee	61	55
907 Cullalla Rd, Cullalla	57	51
630 Gingilling Rd, Mooliabeenee	56	50
644 Gingilling Rd, Mooliabeenee	58	53
828 Gingilling Rd, Wannamal	57	52
2261 Bindoon-Moora Rd, Wannamal	47	41
75 Kangaroo Gully Rd, Wannamal	57	51
Lot 2526 off Kangaroo Gully Rd, Wannamal	48	43
177 Head Rd, Wannamal	53	48
100 Hay Flat Rd, Wannamal	51	45
908 Hay Flat Rd, Wannamal	55	49
1121 Hay Flat Rd, Wannamal	58	52
9071 Great Northern Hwy, Wannamal	60	54
9219 Great Northern Hwy, Wannamal	50	44

As presented in Table 6-1, there are up to eleven (11) receivers that have traffic noise levels that are predicted to exceed the noise target (but not the *noise limit*), and one (1) receiver that is predicted to exceed both the noise target and the noise limit.

In all cases where the traffic noise level is predicted to exceed the noise target or limit, the noise level is predicted to exceed during both the day and night time periods. This implies that neither the day nor night time traffic noise will be dominant, as the target or limit is exceeded by the same amount for both the day and the night time period.

Noise contour plots of the predicted noise levels, that include the positions of the noise sensitive receivers, along the proposed Bindoon Bypass alignment are presented in Appendix C.

6.1 Noise mitigation for noise sensitive receivers

A Noise Management Plan (NMP) is required for noise sensitive receivers identified in Table 6-1 that exceed the noise limit. Options for traffic noise mitigation include:

- Noise walls
- Earth mounds

- Landscaped easements
- Selecting a low-noise pavement for sections of the alignment
- Set back dwellings
- Providing noise mitigation to the dwelling or in close proximity to the dwelling.

For highways in rural areas, noise barriers along the alignment are usually considered impracticable, as the length of barrier necessary to sufficiently reduce the noise to the sensitive receivers is disproportionately costly. Noise barriers may also negatively impact the visual amenity of the area.

6.2 Noise mitigation options for existing noise sensitive receivers

In accordance with SPP 5.4, a detailed NMP for the receivers predicted to exceed the noise limit must be submitted to, and approved by the Responsible Authority. The NMP must demonstrate that mitigation has been designed to meet the relevant requirements of SPP 5.4.

For the dwelling at 428 Gingilling Road, it is proposed to investigate reasonable and feasible noise mitigation strategies between the property owner and Main Roads to satisfy SPP 5.4. At this location the exceedance is within 1 dB of the project noise limit. An increase of 1 dB is generally not noticeable. Noise mitigation may consist of providing façade upgrades or other mitigation strategies to the dwelling. However, a feasible and reasonable approach to noise mitigation shall be considered.

The acoustic assessment suggests that the dwelling at 176 Gingilling Road has the potential to exceed the SPP 5.4 noise limit, however we understand the dwelling is located within the limit of works for the project and will be relocated. This dwelling has not been assessed.

6.3 Noise mitigation options for future noise sensitive receivers

It is understood that there is a proposed residential sub-division north of Teatree Road, Chittering, owned by Parkwood Properties Pty Ltd. Currently the owner has lodged two Development Applications for two separate dwellings. One on each of the current lots owned by Parkwood Properties Pty Ltd, however as these fall within the area of land to be acquired for construction of the Bindoon Bypass, no noise mitigation is proposed. It is recommended that the alignment of the proposed Bindoon Bypass be considered when selecting locations for dwellings in the development. In accordance with SPP 5.4, a detailed NMP shall be completed by Main Roads Western Australia to noise sensitive receivers that are likely to exceed the noise limit. The NMP is to be approved by the Responsible Authority. The NMP must demonstrate that mitigation has been designed to meet the relevant requirements of SPP 5.4.

7. Conclusion

An acoustic assessment of the proposed Bindoon Bypass has been undertaken, which included prediction of noise levels using SoundPLAN Version 8.0, calibrated against measured existing traffic noise levels.

The traffic noise assessment demonstrates that up to eleven (11) existing noise sensitive receivers have the potential to exceed the traffic noise target, and one (1) existing noise sensitive receiver has the potential to exceed the day-time traffic noise limit.

It is recommended that future residential dwellings at the Parkwood development be sited appropriately to minimise the requirement for noise mitigation to the dwellings.

While it is desirable to achieve the “target” of $L_{Aeq (Day)}$ 55 dB for noise sensitive premises in the vicinity of the proposed alignment, it may not be practicable to achieve this noise level at some locations due the extent of noise barrier required to mitigate isolated rural dwellings.

The extent of noise control required would need to be individually assessed for each property, and the outcomes negotiated with the property owner.



Appendix A. Noise Model Input

A.1 Existing Alignment Model

The following information was used to model the traffic noise from the existing GNH.

Table 7-1: Existing Alignment Model Input

Item	File used <i>Layer used</i>	Date
Existing terrain contours	Existing GNH Survey Model 3D_MX.dxf <i>SURV BINDOON HUG94</i>	5 Dec 2017
Existing road alignment	Existing 1m Contours with existing road strings_3D.dxf	7 March 2018
Buildings	Existing GNH Survey Model 3D_MX.dxf <i>Shoulders</i>	5 Dec 2017

The traffic volumes presented in Table 7-1 were used to model noise along the existing GNH alignment. These traffic volumes are based on data obtained in 2014 and corrected for traffic volume for 2017. Noise monitoring of the existing conditions was conducted in December 2017.

The following assumptions have been applied to model traffic noise along the existing alignment. These assumptions have been confirmed with the project team through the Transport and Traffic Report⁷, or through communication or project engineers.

The speed limit along the existing GNH in the vicinity of the noise measurement sites is 110 km/h.

The number of vehicles during the day and night-times has been calculated based on the Annual Average Daily Traffic (AADT) assuming that 95 % of vehicles will travel along the road in the day time (i.e. between 06:00 hrs and 22:00 hrs), and 5 % of vehicles will travel along the road in the night-time (i.e. between 22:00 hrs and 06:00 hrs the next day). The AADT was equally divided for the north and south bound traffic volumes as instructed by the project team. Presented in Table 7-2 are traffic volumes considered for the existing alignment.

Table 7-2: Existing Alignment Traffic Volumes Model Input

Start SLK	End SLK	Heavy Vehicles %	Day-time One Way Vehicles/hour	Night-time One Way Vehicle/hour
45.43	51.25	27	139	16
51.34	55.15	27	139	16
55.25	61.83	26	117	13
61.88	63.23	26	112	13
63.24	64.52	26	112	13
64.56	69.91	32	87	10

⁷ GNH-Bindoan Bypass Transport Modelling, Main Roads Western Australia, Technical Report, 001|2 Final, 9 December 2016, prepared by the Arup-Jacobs Joint Venture (trading as ASJV)

Start SLK	End SLK	Heavy Vehicles %	Day-time One Way Vehicles/hour	Night-time One Way Vehicle/hour
69.93	74.64	39	53	8
74.66	78.22	38	52	8
78.26	82.49	38	52	8
82.53	88.99	38	52	8

A.2 Proposed Traffic Noise Model

The following information was used to model the traffic noise for the proposed alignment of the Bindoon Bypass. Table 7-3 details the data considered for the traffic noise model.

Table 7-3: Proposed Alignment Model Input

Item	File imported <i>Layer imported</i>	Date
Existing terrain contours	Design Cut into Existing Terrain Contours_3D MX.dxf <i>COMPOSIT DESIGN WBA HUG94 ST</i>	16 March 2018
Existing road alignment	Design Cut into Existing Terrain Contours_3D MX.dxf <i>Proposed Reference Line</i>	16 March 2018
Buildings	GNH_Spatial_Data_20171123	27 Nov 2017

The traffic volumes presented in Table 7-4 were used to model traffic noise along the existing GNH alignment. The predicted 2038 traffic volumes have been used.

The following assumptions have been used in modelling the traffic noise along the proposed Bindoon Bypass. These assumptions have been confirmed with the project team.

The speed limit along the proposed Bindoon Bypass is modelled as 110 km/h.

The number of vehicles during the day and night times has been calculated based on the AADT assuming that 95 % of vehicles will travel along the road in the day time (i.e. between 06:00 hrs and 22:00 hrs), and 5 % of vehicles will travel along the road in the night-time (i.e. between 22:00 hrs and 06:00 hrs the next day). The AADT was equal divided for the north and southbound traffic volumes as instructed by the project team. Presented in Table 7-4 are the traffic volumes considered for the existing alignment.

Table 7-4: Proposed Alignment Traffic Volumes Model Input for 2038

Interchange Name	Heavy Vehicles %	Day Time One Way Vehicles/hour	Night-time One Way Vehicle/hour
Southern intersection	56	143	15
Teatree Road West	56	131	14
Teatree Road East	56	137	14
Grey Road West	56	119	13
Grey Road East	56	125	13

Interchange Name	Heavy Vehicles %	Day Time One Way Vehicles/hour	Night-time One Way Vehicle/hour
Mooliabeenie 2	56	113	12
Mooliabeenie 1	56	113	12
Barn Rd Rail Crossing	56	101	11
Cook Rd Rail Crossing	56	89	9
Bindoon Moora Blue MCA Option	56	77	8
Hay Flat Road	56	65	7
Existing GNH Connection	56	143	15
Calingiri Rd	56	143	15

Appendix B. Noise Monitoring Methodology and Results

Noise monitoring was undertaken along the existing alignment of the GNH through the township of Bindoon, as well as along the proposed alignment of the Bindoon Bypass.

The monitoring has been undertaken in general accordance with the SPP 5.4 Implementation Guidelines.

The details of the noise monitoring are outlined below.

B.1 Measurement Equipment

All equipment used for noise measurements holds a current National Association of Testing Authorities (NATA) calibration certificate, and was checked for calibration before and after each measurement. No significant drift was detected.

The equipment was set up to measure noise levels (including $L_{Aeq,1hour}$, L_{A10} , and L_{A90}) over 1 hour periods, on the fast time setting.

The details of which equipment was used for which monitoring location is presented in Sections B.3 and B.4.

B.2 Weather Conditions

Weather conditions were monitored throughout the noise measurement period, and days with unacceptable weather conditions have been excluded from the assessment.

In accordance with the SPP 5.4 guidelines, “a minimum of three ‘valid’ 24-hour weekday periods must be obtained for unattended measurements”. Valid weather conditions, according to the guidelines, are as follows, for a source-receiver distance greater than 20 m:

- “variable wind during a 24-hour period up to 19 kilometres per hour” (5.3 m/s); or
- “calm conditions, or continuous positive wind up to 11 kilometres per hour (3.1 m/s).”

In accordance with the guidelines, public holidays and weekends were excluded from the assessment days.

The Gingin Airport and Pearce weather stations were used to monitor the weather during noise measurement periods, as they are the closest weather stations to the measurement sites.

During the monitoring period, winds exceeded the limits set for valid weather conditions, such that there were not 3 days of ‘valid’ weather during the measurement period. Thus, an investigation of the prevailing wind conditions was undertaken to determine the ‘average’ wind near the monitoring sites.

The BoM assess wind conditions at 10 m above ground level, this reference height position was considered appropriate when compared to the noise monitoring height of 1.5 m above ground level. The weather conditions measured at the two weather stations during the noise measurement period do continuously exceed the SPP 5.4 acceptable wind speed conditions.

The three days selected were considered to be most appropriate weather conditions over the noise measurement period and were compared against long-term average wind speed (measured between 2003 and 2017), as outlined in Table 7-5 below.

Table 7-5: Long term wind speed average, 1993 – 2017, measured 10-minute mean wind speed at 10m above ground level for Gingin and Pearce

Mean Wind Speed km/h	% of occurrence at Gingin	% of occurrence at Pearce
“Calm” – 18	64.188	64.216
18 – 36	35.008	34.335
36 – 54	0.801	1.432

Mean Wind Speed km/h	% of occurrence at Gingin	% of occurrence at Pearce
54 – 70	0.003	0.016

There was not a significant amount of rainfall during the noise measurement periods, and any measurements during a rainfall event have been excluded from this analysis.

Tabulated weather data for the noise assessment periods is shown in Table 7-6 and Table 7-7 below.

Table 7-6: Weather conditions during measurement along the existing alignment

Date and time AWST, 24 hr	Wind Direction	Wind Speed m/s	Rain Since 9am mm
2017-12-13 00:00:00	SSE	6	0.00
2017-12-13 01:00:00	SE	6	0.00
2017-12-13 02:00:00	SSE	5	0.00
2017-12-13 03:00:00	S	6	0.00
2017-12-13 04:00:00	SSW	8	0.00
2017-12-13 05:00:00	SSW	8	0.00
2017-12-13 06:00:00	SSW	9	0.00
2017-12-13 07:00:00	SSW	9	0.00
2017-12-13 08:00:00	SSW	9	0.00
2017-12-13 09:00:00	SSW	9	0.00
2017-12-13 10:00:00	SSW	8	0.00
2017-12-13 11:00:00	SSW	6	0.00
2017-12-13 12:00:00	S	5	0.00
2017-12-13 13:00:00	S	5	0.00
2017-12-13 14:00:00	S	4	0.00
2017-12-13 15:00:00	SSE	3	0.00
2017-12-13 16:00:00	SSE	3	0.00
2017-12-13 17:00:00	SSE	4	0.00
2017-12-13 18:00:00	SSE	3	0.00
2017-12-13 19:00:00	SSE	3	0.00
2017-12-13 20:00:00	SSE	3	0.00
2017-12-13 21:00:00	SSE	3	0.00
2017-12-13 22:00:00	ESE	4	0.00
2017-12-13 23:00:00	E	7	0.00
2017-12-14 00:00:00	E	7	0.00
2017-12-14 01:00:00	E	5	0.00
2017-12-14 02:00:00	E	5	0.00
2017-12-14 03:00:00	ESE	4	0.00
2017-12-14 04:00:00	ENE	3	0.00
2017-12-14 05:00:00	SE	3	0.00

Date and time AWST, 24 hr	Wind Direction	Wind Speed m/s	Rain Since 9am mm
2017-12-14 06:00:00	SSW	8	0.00
2017-12-14 07:00:00	SSW	9	0.00
2017-12-14 08:00:00	SSW	9	0.00
2017-12-14 09:00:00	SSW	9	0.00
2017-12-14 10:00:00	S	7	0.00
2017-12-14 11:00:00	S	7	0.00
2017-12-14 12:00:00	S	5	0.00
2017-12-14 13:00:00	S	4	0.00
2017-12-14 14:00:00	S	3	0.00
2017-12-14 15:00:00	S	2	0.00
2017-12-14 16:00:00	SSE	2	0.00
2017-12-14 17:00:00	SSE	2	0.00
2017-12-14 18:00:00	SE	2	0.00
2017-12-14 19:00:00	SE	1	0.00
2017-12-14 20:00:00	SSE	2	0.00
2017-12-14 21:00:00	SSE	3	0.00
2017-12-14 22:00:00	SE	4	0.00
2017-12-14 23:00:00	ESE	5	0.00
2017-12-15 00:00:00	ESE	3	0.00
2017-12-15 01:00:00	SSE	2	0.00
2017-12-15 02:00:00	SSE	2	0.00
2017-12-15 03:00:00	SSE	3	0.00
2017-12-15 04:00:00	SSW	8	0.00
2017-12-15 05:00:00	SSW	9	0.00
2017-12-15 06:00:00	SSW	9	0.00
2017-12-15 07:00:00	SSW	9	0.00
2017-12-15 08:00:00	SSW	8	0.00
2017-12-15 09:00:00	SSW	7	0.00
2017-12-15 10:00:00	SSW	6	0.00
2017-12-15 11:00:00	SSW	5	0.00
2017-12-15 12:00:00	SSW	4	0.00
2017-12-15 13:00:00	SSW	5	0.00
2017-12-15 14:00:00	SSW	4	0.00
2017-12-15 15:00:00	SSW	2	0.00
2017-12-15 16:00:00	NNE	0	0.00
2017-12-15 17:00:00	N	0	0.00
2017-12-15 18:00:00	SE	1	0.00

Date and time AWST, 24 hr	Wind Direction	Wind Speed m/s	Rain Since 9am mm
2017-12-15 19:00:00	ENE	1	0.00
2017-12-15 20:00:00	SE	2	0.00
2017-12-15 21:00:00	ESE	2	0.00
2017-12-15 22:00:00	SE	2	0.00
2017-12-15 23:00:00	SSE	4	0.00

Table 7-7: Weather conditions during measurement along the future alignment

Date and time AWST, 24 hr	Wind Direction	Wind Speed m/s	Rain Since 9am mm
2018-01-23 00:00:00	E	6	0.00
2018-01-23 01:00:00	E	5	0.00
2018-01-23 02:00:00	ESE	4	0.00
2018-01-23 03:00:00	ESE	4	0.00
2018-01-23 04:00:00	SE	4	0.00
2018-01-23 05:00:00	ESE	5	0.00
2018-01-23 06:00:00	SSW	7	0.00
2018-01-23 07:00:00	SSW	9	0.00
2018-01-23 08:00:00	SSW	9	0.00
2018-01-23 09:00:00	SSW	8	0.00
2018-01-23 10:00:00	SSW	7	0.00
2018-01-23 11:00:00	S	4	0.00
2018-01-23 12:00:00	SSW	5	0.00
2018-01-23 13:00:00	S	4	0.00
2018-01-23 14:00:00	SE	2	0.00
2018-01-23 15:00:00	SE	4	0.00
2018-01-23 16:00:00	ESE	6	0.00
2018-01-23 17:00:00	E	7	0.00
2018-01-23 18:00:00	ESE	6	0.00
2018-01-23 19:00:00	E	7	0.00
2018-01-23 20:00:00	ESE	6	0.00
2018-01-23 21:00:00	E	5	0.00
2018-01-23 22:00:00	ESE	5	0.00
2018-01-23 23:00:00	ESE	6	0.00
2018-01-24 00:00:00	E	5	0.00
2018-01-24 01:00:00	ESE	4	0.00
2018-01-24 02:00:00	ESE	4	0.00
2018-01-24 03:00:00	SSE	4	0.00

Date and time AWST, 24 hr	Wind Direction	Wind Speed m/s	Rain Since 9am mm
2018-01-24 04:00:00	S	5	0.00
2018-01-24 05:00:00	SSW	8	0.00
2018-01-24 06:00:00	SSW	9	0.00
2018-01-24 07:00:00	SSW	9	0.00
2018-01-24 08:00:00	SSW	9	0.00
2018-01-24 09:00:00	SSW	8	0.00
2018-01-24 10:00:00	SSW	7	0.00
2018-01-24 11:00:00	SSW	5	0.00
2018-01-24 12:00:00	SSW	5	0.00
2018-01-24 13:00:00	S	4	0.00
2018-01-24 14:00:00	S	4	0.00
2018-01-24 15:00:00	SSW	3	0.00
2018-01-24 16:00:00	SSW	2	0.00
2018-01-24 17:00:00	SSE	2	0.00
2018-01-24 18:00:00	SSE	2	0.00
2018-01-24 19:00:00	SE	1	0.00
2018-01-24 20:00:00	E	1	0.00
2018-01-24 21:00:00	SE	2	0.00
2018-01-24 22:00:00	SSE	3	0.00
2018-01-24 23:00:00	SSE	5	0.00
2018-01-25 00:00:00	SSE	5	0.00
2018-01-25 01:00:00	SSE	5	0.00
2018-01-25 02:00:00	SSE	5	0.00
2018-01-25 03:00:00	SSE	5	0.00
2018-01-25 04:00:00	S	6	0.00
2018-01-25 05:00:00	SSW	8	0.00
2018-01-25 06:00:00	SSW	8	0.00
2018-01-25 07:00:00	SSW	9	0.00
2018-01-25 08:00:00	SSW	9	0.00
2018-01-25 09:00:00	SSW	9	0.00
2018-01-25 10:00:00	SSW	6	0.00
2018-01-25 11:00:00	SSW	6	0.00
2018-01-25 12:00:00	SSW	5	0.00
2018-01-25 13:00:00	SSW	4	0.00
2018-01-25 14:00:00	S	3	0.00
2018-01-25 15:00:00	S	2	0.00
2018-01-25 16:00:00	S	2	0.00

Date and time AWST, 24 hr	Wind Direction	Wind Speed m/s	Rain Since 9am mm
2018-01-25 17:00:00	S	2	0.00
2018-01-25 18:00:00	SSE	2	0.00
2018-01-25 19:00:00	SSE	2	0.00
2018-01-25 20:00:00	SE	3	0.00
2018-02-07 00:00:00	SSE	6	0.00
2018-02-07 01:00:00	SSE	6	0.00
2018-02-07 02:00:00	SE	6	0.00
2018-02-07 03:00:00	SE	7	0.00
2018-02-07 04:00:00	SE	7	0.00
2018-02-07 05:00:00	SE	7	0.00
2018-02-07 06:00:00	SE	6	0.00
2018-02-07 07:00:00	SE	6	0.00
2018-02-07 08:00:00	SE	6	0.00
2018-02-07 09:00:00	SE	6	0.00
2018-02-07 10:00:00	ESE	5	0.00
2018-02-07 11:00:00	ESE	6	0.00
2018-02-07 12:00:00	E	5	0.00
2018-02-07 13:00:00	E	5	0.00
2018-02-07 14:00:00	E	4	0.00
2018-02-07 15:00:00	E	4	0.00
2018-02-07 16:00:00	E	4	0.00
2018-02-07 17:00:00	ESE	3	0.00
2018-02-07 18:00:00	SE	3	0.00
2018-02-07 19:00:00	SSE	3	0.00
2018-02-07 20:00:00	SE	4	0.00
2018-02-07 21:00:00	SE	3	0.00
2018-02-07 22:00:00	SSE	3	0.00
2018-02-07 23:00:00	ESE	4	0.00
2018-02-08 00:00:00	E	6	0.00
2018-02-08 01:00:00	E	7	0.00
2018-02-08 02:00:00	ENE	6	0.00
2018-02-08 03:00:00	ENE	5	0.00
2018-02-08 04:00:00	E	3	0.00
2018-02-08 05:00:00	E	3	0.00
2018-02-08 06:00:00	ENE	3	0.00
2018-02-08 07:00:00	ENE	3	0.00
2018-02-08 08:00:00	SSW	7	0.00

Date and time AWST, 24 hr	Wind Direction	Wind Speed m/s	Rain Since 9am mm
2018-02-08 09:00:00	SSW	8	0.00
2018-02-08 10:00:00	S	6	0.00
2018-02-08 11:00:00	SSW	4	0.00
2018-02-08 12:00:00	SSW	4	0.00
2018-02-08 13:00:00	S	3	0.00
2018-02-08 14:00:00	E	1	0.00
2018-02-08 15:00:00	SE	1	0.00
2018-02-08 16:00:00	NW	2	0.00
2018-02-08 17:00:00	SW	1	0.00
2018-02-08 18:00:00	N	0	0.00
2018-02-08 19:00:00	ENE	1	0.00
2018-02-08 20:00:00	NE	1	0.00
2018-02-08 21:00:00	NE	1	0.00
2018-02-08 22:00:00	SSE	2	0.00
2018-02-08 23:00:00	ESE	2	0.00
2018-02-09 00:00:00	S	5	0.00
2018-02-12 00:00:00	E	5	0.00
2018-02-12 01:00:00	E	4	0.00
2018-02-12 02:00:00	ESE	3	0.00
2018-02-12 03:00:00	SE	4	0.00
2018-02-12 04:00:00	S	4	0.00
2018-02-12 05:00:00	SSW	6	0.00
2018-02-12 06:00:00	SSW	9	0.00
2018-02-12 07:00:00	SSW	8	0.00
2018-02-12 08:00:00	SSW	9	0.00
2018-02-12 09:00:00	SSW	8	0.00
2018-02-12 10:00:00	SSW	7	0.00
2018-02-12 11:00:00	SSW	4	0.00
2018-02-12 12:00:00	S	3	0.00
2018-02-12 13:00:00	SSW	4	0.00
2018-02-12 14:00:00	SSW	4	0.00
2018-02-12 15:00:00	SSW	5	0.00
2018-02-12 16:00:00	S	3	0.00
2018-02-12 17:00:00	SSW	4	0.00
2018-02-12 18:00:00	SSW	4	0.00
2018-02-12 19:00:00	S	3	0.00
2018-02-12 20:00:00	S	2	0.00

Date and time AWST, 24 hr	Wind Direction	Wind Speed m/s	Rain Since 9am mm
2018-02-12 21:00:00	SSE	2	0.00
2018-02-12 22:00:00	NE	1	0.00
2018-02-12 23:00:00	SE	3	0.00
2018-02-14 00:00:00	E	6	0.00
2018-02-14 01:00:00	E	5	0.00
2018-02-14 02:00:00	E	5	0.00
2018-02-14 03:00:00	E	4	0.00
2018-02-14 04:00:00	ESE	3	0.00
2018-02-14 05:00:00	SSE	4	0.00
2018-02-14 06:00:00	S	8	0.00
2018-02-14 07:00:00	SSW	9	0.00
2018-02-14 08:00:00	SSW	9	0.00
2018-02-14 09:00:00	S	8	0.00
2018-02-14 10:00:00	S	7	0.00
2018-02-14 11:00:00	S	5	0.00
2018-02-14 12:00:00	S	4	0.00
2018-02-14 13:00:00	S	4	0.00
2018-02-14 14:00:00	SSE	3	0.00
2018-02-14 15:00:00	SSE	2	0.00
2018-02-14 16:00:00	SE	2	0.00
2018-02-14 17:00:00	SSE	2	0.00
2018-02-14 18:00:00	ENE	1	0.00
2018-02-14 19:00:00	SE	3	0.00
2018-02-14 20:00:00	ESE	4	0.00
2018-02-14 21:00:00	ESE	5	0.00
2018-02-14 22:00:00	E	7	0.00
2018-02-14 23:00:00	E	8	0.00
2018-02-15 00:00:00	E	7	0.00
2018-02-16 00:00:00	NE	6	0.00
2018-02-16 01:00:00	ENE	6	0.00
2018-02-16 02:00:00	SSW	7	0.00
2018-02-16 03:00:00	W	7	0.00
2018-02-16 04:00:00	W	7	0.00
2018-02-16 05:00:00	W	7	0.00
2018-02-16 06:00:00	WSW	6	0.00
2018-02-16 07:00:00	SW	9	0.00
2018-02-16 08:00:00	SSW	6	0.00

Date and time AWST, 24 hr	Wind Direction	Wind Speed m/s	Rain Since 9am mm
2018-02-16 09:00:00	SSE	4	0.00
2018-02-16 10:00:00	SW	2	0.00
2018-02-16 11:00:00	W	2	0.00
2018-02-16 12:00:00	W	3	0.00
2018-02-16 13:00:00	WSW	4	0.00
2018-02-16 14:00:00	WSW	3	0.00
2018-02-16 15:00:00	SSE	2	0.00
2018-02-16 16:00:00	ESE	1	0.00
2018-02-16 17:00:00	SSE	2	0.03
2018-02-16 18:00:00	WNW	2	0.03
2018-02-16 19:00:00	SSW	2	0.00
2018-02-16 20:00:00	SW	2	0.00
2018-02-16 21:00:00	NW	2	0.00
2018-02-16 22:00:00	NW	2	0.00
2018-02-16 23:00:00	WSW	2	0.00
2018-02-17 00:00:00	SSE	2	0.00
2018-02-21 00:00:00	E	7	0.00
2018-02-21 01:00:00	ENE	6	0.00
2018-02-21 02:00:00	ENE	5	0.00
2018-02-21 03:00:00	ESE	4	0.00
2018-02-21 04:00:00	E	3	0.00
2018-02-21 05:00:00	ENE	4	0.00
2018-02-21 06:00:00	ESE	3	0.00
2018-02-21 07:00:00	SW	8	0.00
2018-02-21 08:00:00	SSW	8	0.00
2018-02-21 09:00:00	SSW	8	0.00
2018-02-21 10:00:00	SSW	7	0.00
2018-02-21 11:00:00	SSW	5	0.00
2018-02-21 12:00:00	SSW	3	0.00
2018-02-21 13:00:00	SSW	3	0.00
2018-02-21 14:00:00	S	3	0.00
2018-02-21 15:00:00	S	2	0.00
2018-02-21 16:00:00	N	0	0.00
2018-02-21 17:00:00	N	0	0.00
2018-02-21 18:00:00	N	0	0.00
2018-02-21 19:00:00	N	0	0.00
2018-02-21 20:00:00	NNE	1	0.00

Date and time AWST, 24 hr	Wind Direction	Wind Speed m/s	Rain Since 9am mm
2018-02-21 21:00:00	N	0	0.00
2018-02-21 22:00:00	NNE	1	0.00
2018-02-21 23:00:00	NE	2	0.00
2018-02-22 00:00:00	ESE	2	0.00
2018-02-22 01:00:00	S	1	0.00
2018-02-22 02:00:00	N	0	0.00
2018-02-22 03:00:00	WSW	3	0.04
2018-02-22 04:00:00	WNW	5	0.00
2018-02-22 05:00:00	WSW	8	0.00
2018-02-22 06:00:00	SW	8	0.00
2018-02-22 07:00:00	SW	8	0.00
2018-02-22 08:00:00	SW	7	0.00
2018-02-22 09:00:00	SW	7	0.03
2018-02-22 10:00:00	SW	6	0.00
2018-02-22 11:00:00	SSW	5	0.00
2018-02-22 12:00:00	SW	3	0.00
2018-02-22 13:00:00	WSW	2	0.00
2018-02-22 14:00:00	SE	1	0.00
2018-02-22 15:00:00	SE	1	0.00
2018-02-22 16:00:00	SSE	1	0.00
2018-02-22 17:00:00	NW	2	0.00
2018-02-22 18:00:00	NW	2	0.00
2018-02-22 19:00:00	W	3	0.00
2018-02-22 20:00:00	SSW	4	0.00
2018-02-22 21:00:00	SSE	2	0.00
2018-02-22 22:00:00	SE	2	0.00
2018-02-22 23:00:00	SE	2	0.00
2018-02-23 00:00:00	SSE	3	0.00
2018-02-27 00:00:00	SE	6	0.00
2018-02-27 01:00:00	SSE	6	0.13
2018-02-27 02:00:00	SSE	6	0.00
2018-02-27 03:00:00	SSE	5	0.00
2018-02-27 04:00:00	SSE	4	0.00
2018-02-27 05:00:00	SSE	5	0.00
2018-02-27 06:00:00	SSW	7	0.00
2018-02-27 07:00:00	SSW	8	0.00
2018-02-27 08:00:00	SSW	8	0.00

Date and time AWST, 24 hr	Wind Direction	Wind Speed m/s	Rain Since 9am mm
2018-02-27 09:00:00	SSW	7	0.00
2018-02-27 10:00:00	S	7	0.00
2018-02-27 11:00:00	S	5	0.00
2018-02-27 12:00:00	S	4	0.00
2018-02-27 13:00:00	SSE	2	0.00
2018-02-27 14:00:00	SE	2	0.00
2018-02-27 15:00:00	SE	3	0.00
2018-02-27 16:00:00	SE	3	0.00
2018-02-27 17:00:00	SE	3	0.00
2018-02-27 18:00:00	SE	4	0.00
2018-02-27 19:00:00	ESE	4	0.00
2018-02-27 20:00:00	ESE	5	0.00
2018-02-27 21:00:00	ESE	5	0.00
2018-02-27 22:00:00	E	5	0.00
2018-02-27 23:00:00	E	5	0.00
2018-02-28 00:00:00	E	7	0.00
2018-02-28 01:00:00	E	8	0.00
2018-02-28 02:00:00	E	6	0.00
2018-02-28 03:00:00	ESE	5	0.00
2018-02-28 04:00:00	ENE	5	0.00
2018-02-28 05:00:00	E	5	0.00
2018-02-28 06:00:00	E	4	0.00
2018-02-28 07:00:00	E	5	0.00
2018-02-28 08:00:00	SE	5	0.00
2018-02-28 09:00:00	S	8	0.00
2018-02-28 10:00:00	S	8	0.00
2018-02-28 11:00:00	S	5	0.00
2018-02-28 12:00:00	SSE	3	0.00
2018-02-28 13:00:00	SE	2	0.00
2018-02-28 14:00:00	SE	3	0.00
2018-02-28 15:00:00	SE	2	0.00
2018-02-28 16:00:00	SE	3	0.00
2018-02-28 17:00:00	SE	3	0.00
2018-02-28 18:00:00	SE	4	0.00
2018-02-28 19:00:00	ESE	3	0.00
2018-02-28 20:00:00	E	3	0.00
2018-02-28 21:00:00	E	3	0.00

Date and time AWST, 24 hr	Wind Direction	Wind Speed m/s	Rain Since 9am mm
2018-02-28 22:00:00	SE	3	0.00
2018-02-28 23:00:00	E	3	0.00
2018-03-01 00:00:00	ENE	3	0.00
2018-03-01 01:00:00	ENE	2	0.00
2018-03-01 02:00:00	SE	2	0.00
2018-03-01 03:00:00	SSW	3	0.00
2018-03-01 04:00:00	SSW	6	0.00
2018-03-01 05:00:00	SSW	6	0.00
2018-03-01 06:00:00	SSW	6	0.00
2018-03-01 07:00:00	SSW	7	0.00
2018-03-01 08:00:00	SSW	8	0.00
2018-03-01 09:00:00	SSW	7	0.00
2018-03-01 10:00:00	SSW	6	0.00
2018-03-01 11:00:00	SSW	6	0.00
2018-03-01 12:00:00	S	5	0.00
2018-03-01 13:00:00	S	3	0.00
2018-03-01 14:00:00	SSW	3	0.00
2018-03-01 15:00:00	SSW	3	0.00
2018-03-01 16:00:00	S	3	0.00
2018-03-01 17:00:00	S	2	0.00
2018-03-01 18:00:00	SSE	2	0.00
2018-03-01 19:00:00	SE	2	0.00
2018-03-01 20:00:00	SE	3	0.00
2018-03-01 21:00:00	SSE	3	0.00
2018-03-01 22:00:00	SSE	3	0.00
2018-03-01 23:00:00	SSE	4	0.00
2018-03-02 00:00:00	SSE	6	0.00
2018-03-02 01:00:00	SSE	6	0.00
2018-03-02 02:00:00	SSE	5	0.00
2018-03-02 03:00:00	SSE	6	0.00
2018-03-02 04:00:00	S	6	0.00
2018-03-02 05:00:00	SSW	7	0.00
2018-03-02 06:00:00	SSW	8	0.00
2018-03-02 07:00:00	SSW	9	0.00
2018-03-02 08:00:00	SSW	9	0.00
2018-03-02 09:00:00	SSW	8	0.00
2018-03-02 10:00:00	SSW	7	0.00

Date and time AWST, 24 hr	Wind Direction	Wind Speed m/s	Rain Since 9am mm
2018-03-02 11:00:00	S	5	0.00
2018-03-02 12:00:00	S	3	0.00
2018-03-02 13:00:00	SSE	2	0.00
2018-03-02 14:00:00	SSE	4	0.00
2018-03-02 15:00:00	ESE	6	0.00
2018-03-02 16:00:00	ESE	8	0.00
2018-03-02 17:00:00	E	8	0.00
2018-03-02 18:00:00	ESE	6	0.00
2018-03-02 19:00:00	ESE	7	0.00
2018-03-02 20:00:00	ESE	7	0.00
2018-03-02 21:00:00	ESE	7	0.00
2018-03-02 22:00:00	ESE	6	0.00
2018-03-02 23:00:00	E	7	0.00
2018-03-03 00:00:00	E	8	0.00

B.3 Measured Noise Levels along the Existing Alignment

Noise monitoring was undertaken along the existing alignment of the GNH through the town of Bindoon between 12 December 2017 and 21 December 2017.

A summary of the locations and noise levels is presented in Table 7-8.

Table 7-8: Measured Noise Data along Existing Alignment

Measurement Position		L _{Aeq,16hours} (day) dB	L _{Aeq,8hours} (night) dB
1.1	Lot 554, 7372 GNH, Bindoon	71	50
1.2	Lot 5933, 6486 GNH, Bindoon	68	62
1.3	Lot 501, 5885 GNH, Bindoon	69	63
1.4	Lot 18, 5077 GNH, Bindoon	71	60
1.5	Lot 151, 21 Sandalford Drive, Chittering	61*	55*

*Noise logger at this position failed after 2 days. This noise level only includes measurements from a 2-day period.

B.3.1 Details of noise measurement locations along existing alignment

All coordinates are presented in MGA 94 Zone 50, in metres.

B.3.1.1 Location 1.1

Description	Details
Noise Logger	RTA Technology Pty Ltd RTA04 Noise Logger Serial Number: RTA04-010
Measurement duration	12 December 2017 – 21 December 2017
Location	Lot 554, 7372 Great Northern Highway, Bindoon

Description	Details
Coordinates (Easting; Northing)	419,256; 6,536,047
Photo	

Date	Time	L _{Aeq, 1 hr} dB	L _{A10, 1 hr} dB	L _{A90, 1 hr} dB
19-12-17	12:00 AM	43	42	36
19-12-17	1:00 AM	53	47	36
19-12-17	2:00 AM	40	40	36
19-12-17	3:00 AM	41	39	36
19-12-17	4:00 AM	39	38	36
19-12-17	5:00 AM	42	41	37
19-12-17	6:00 AM	44	45	37
19-12-17	7:00 AM	47	48	37
19-12-17	8:00 AM	51	53	39
19-12-17	9:00 AM	62	56	41
19-12-17	10:00 AM	63	56	42
19-12-17	11:00 AM	54	57	38
19-12-17	12:00 PM	52	55	37
19-12-17	1:00 PM	73	56	37
19-12-17	2:00 PM	55	57	37
19-12-17	3:00 PM	58	55	38
19-12-17	4:00 PM	63	57	39
19-12-17	5:00 PM	63	59	45
19-12-17	6:00 PM	64	59	46
19-12-17	7:00 PM	50	53	39
19-12-17	8:00 PM	48	50	35
19-12-17	9:00 PM	49	51	35
19-12-17	10:00 PM	49	50	35

Date	Time	L _{Aeq, 1 hr} dB	L _{A10, 1 hr} dB	L _{A90, 1 hr} dB
19-12-17	11:00 PM	48	47	35
20-12-17	12:00 AM	48	47	35
20-12-17	1:00 AM	46	44	36
20-12-17	2:00 AM	49	50	39
20-12-17	3:00 AM	47	47	38
20-12-17	4:00 AM	56	51	42
20-12-17	5:00 AM	58	55	44
20-12-17	6:00 AM	64	57	46
20-12-17	7:00 AM	73	59	47
20-12-17	8:00 AM	64	58	47
20-12-17	9:00 AM	59	55	44
20-12-17	10:00 AM	56	54	40
20-12-17	11:00 AM	53	55	40
20-12-17	12:00 PM	51	53	36
20-12-17	1:00 PM	60	54	36
20-12-17	2:00 PM	57	55	37
20-12-17	3:00 PM	52	55	37
20-12-17	4:00 PM	53	55	37
20-12-17	5:00 PM	52	54	37
20-12-17	6:00 PM	51	53	37
20-12-17	7:00 PM	50	52	36
20-12-17	8:00 PM	54	56	41
20-12-17	9:00 PM	49	48	35
20-12-17	10:00 PM	48	48	35
20-12-17	11:00 PM	46	44	35

7372 Great Northern Highway, Bindoon

Tuesday 19/12/2017

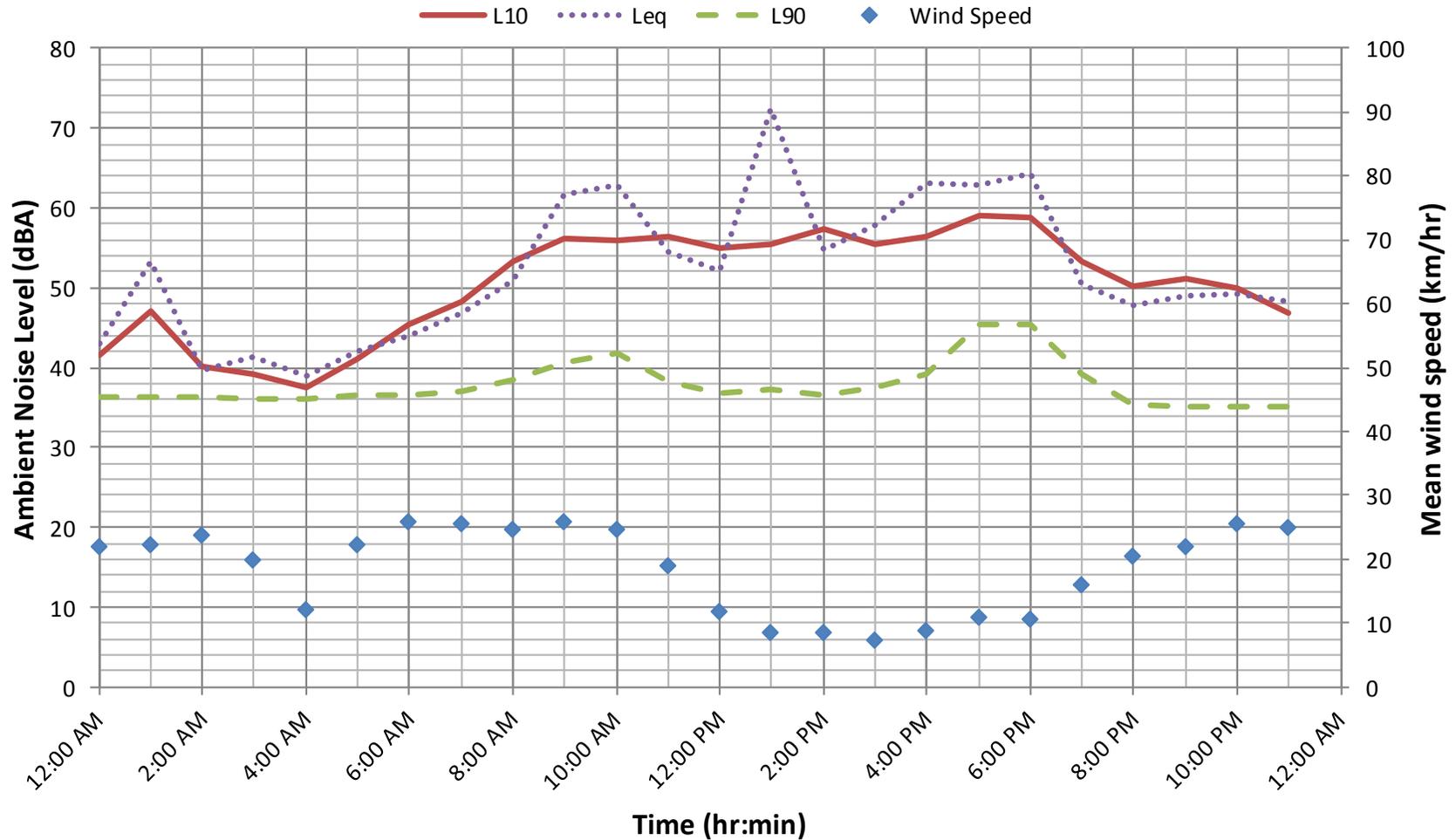


Figure 1: 7372 Great Northern Highway, Bindoon – 19/12/2017

7372 Great Northern Highway, Bindoon

Wednesday 20/12/2017

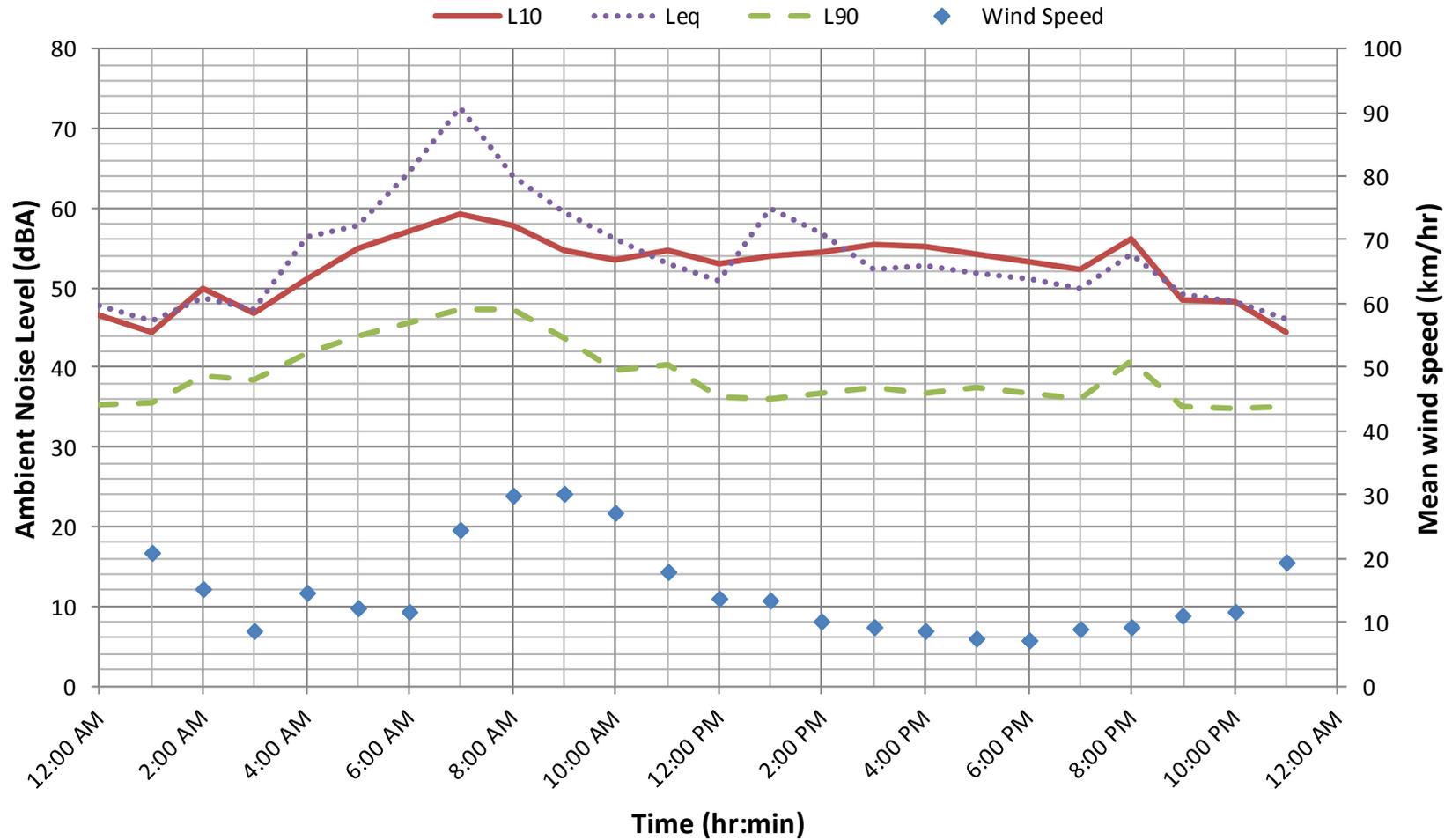


Figure 2: 7372 Great Northern Highway, Bindoon – 20/12/2017

B.3.1.2 Location 1.2

Description	Details
Noise Logger	Acoustics Research Laboratories Ngara Noise Logger Serial Number: 878061
Measurement duration	12 December 2017 – 21 December 2017
Location	Lot 5933, 6486 Great Northern Highway, Bindoon
Coordinates (Easting; Northing)	451,122; 6,529,865
Photo*	<p>Site Drawing / Photograph of Logger Setup</p> <p>Co-ordinates MGA 94 SOJ 0415122 ± 5m Elevation of mike 130m RL Elevation of road approx 129m RL</p> <p>Legend ⊙ PP = Power pole -F- = Fence</p>

*No photograph available for this site, so set-up sketch has been used to show location

Date	Time	L _{Aeq} , 1 hr dB	L _{A10} , 1 hr dB	L _{A90} , 1 hr dB
13-12-17	12:00 AM	62	53	28
13-12-17	1:00 AM	61	53	24
13-12-17	2:00 AM	50	33	25
13-12-17	3:00 AM	62	49	24
13-12-17	4:00 AM	61	51	25
13-12-17	5:00 AM	64	58	23
13-12-17	6:00 AM	66	63	33
13-12-17	7:00 AM	68	66	35
13-12-17	8:00 AM	69	69	40
13-12-17	9:00 AM	68	68	40
13-12-17	10:00 AM	67	67	40

Date	Time	L _{Aeq, 1 hr} dB	L _{A10, 1 hr} dB	L _{A90, 1 hr} dB
13-12-17	11:00 AM	68	68	41
13-12-17	12:00 PM	68	67	41
13-12-17	1:00 PM	68	66	40
13-12-17	2:00 PM	69	68	42
13-12-17	3:00 PM	68	69	44
13-12-17	4:00 PM	68	69	46
13-12-17	5:00 PM	69	70	47
13-12-17	6:00 PM	67	67	46
13-12-17	7:00 PM	69	69	44
13-12-17	8:00 PM	69	66	37
13-12-17	9:00 PM	68	66	34
13-12-17	10:00 PM	66	60	30
13-12-17	11:00 PM	65	57	29
14-12-17	12:00 AM	63	55	24
14-12-17	1:00 AM	60	48	21
14-12-17	2:00 AM	54	36	21
14-12-17	3:00 AM	61	49	22
14-12-17	4:00 AM	61	54	22
14-12-17	5:00 AM	66	62	24
14-12-17	6:00 AM	65	64	33
14-12-17	7:00 AM	66	64	37
14-12-17	8:00 AM	69	68	44
14-12-17	9:00 AM	68	68	43
14-12-17	10:00 AM	66	64	41
14-12-17	11:00 AM	67	65	40
14-12-17	12:00 PM	67	66	38
14-12-17	1:00 PM	67	67	39
14-12-17	2:00 PM	68	66	36
14-12-17	3:00 PM	68	68	38
14-12-17	4:00 PM	67	68	39
14-12-17	5:00 PM	69	69	47
14-12-17	6:00 PM	70	70	47
14-12-17	7:00 PM	69	68	40
14-12-17	8:00 PM	68	66	36
14-12-17	9:00 PM	66	61	30
14-12-17	10:00 PM	66	60	27
14-12-17	11:00 PM	65	60	25
15-12-17	12:00 AM	63	55	22

Date	Time	L _{Aeq} , 1 hr dB	L _{A10} , 1 hr dB	L _{A90} , 1 hr dB
15-12-17	1:00 AM	58	47	21
15-12-17	2:00 AM	58	47	22
15-12-17	3:00 AM	61	54	22
15-12-17	4:00 AM	60	49	22
15-12-17	5:00 AM	64	59	28
15-12-17	6:00 AM	67	65	33
15-12-17	7:00 AM	68	65	35
15-12-17	8:00 AM	68	67	36
15-12-17	9:00 AM	69	69	41
15-12-17	10:00 AM	67	67	39
15-12-17	11:00 AM	69	70	39
15-12-17	12:00 PM	67	68	37
15-12-17	1:00 PM	68	69	38
15-12-17	2:00 PM	68	69	41
15-12-17	3:00 PM	69	70	48
15-12-17	4:00 PM	69	71	46
15-12-17	5:00 PM	70	71	47
15-12-17	6:00 PM	71	72	45
15-12-17	7:00 PM	69	69	39
15-12-17	8:00 PM	69	68	34
15-12-17	9:00 PM	69	66	31
15-12-17	10:00 PM	68	62	31
15-12-17	11:00 PM	65	57	26

6486 Great Northern Highway, Bindoon

Wednesday 13/12/2017

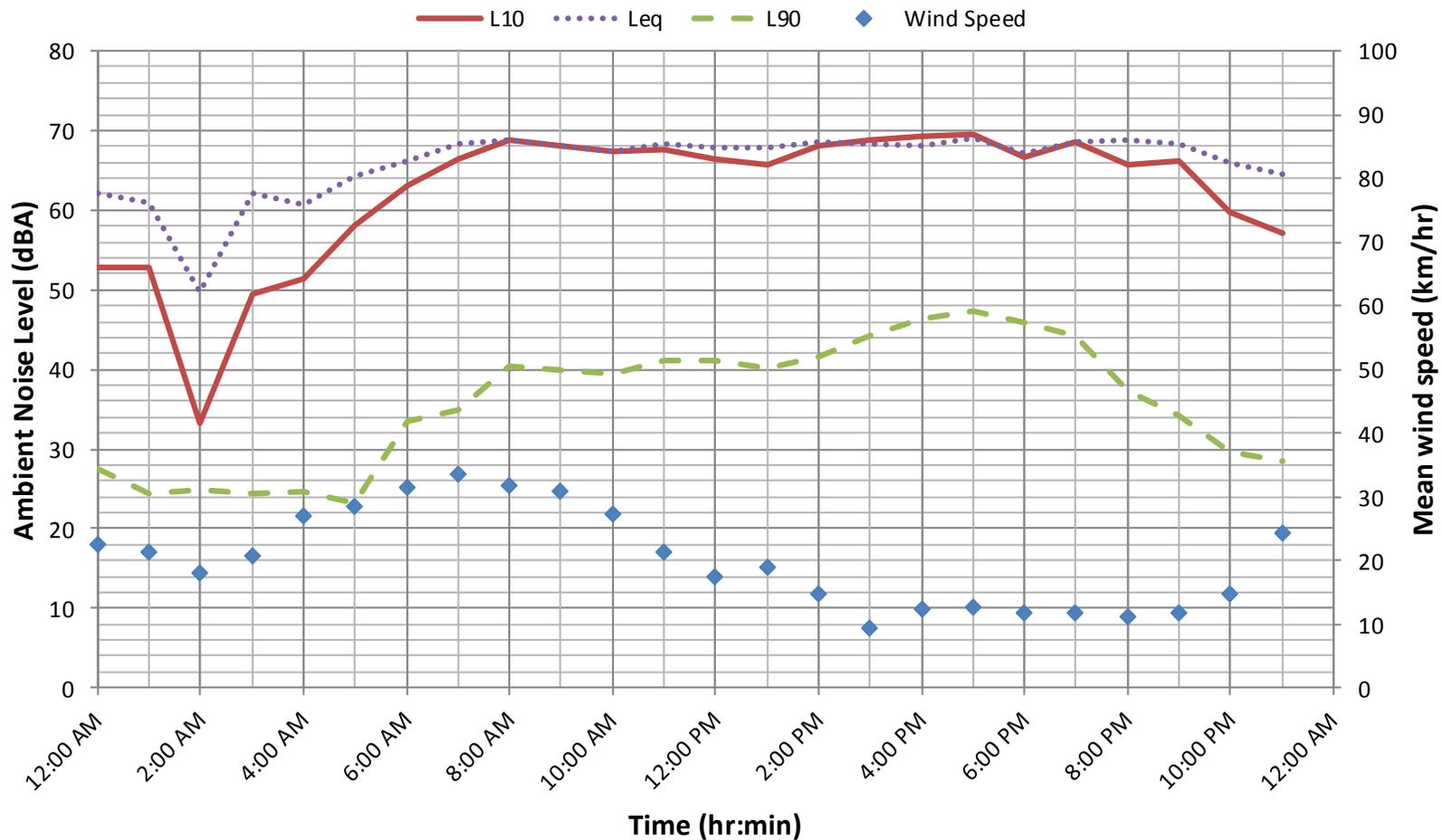


Figure 3: 6486 Great Northern Highway - 13/12/2017

6486 Great Northern Highway, Bindoon

Thursday 14/12/2017

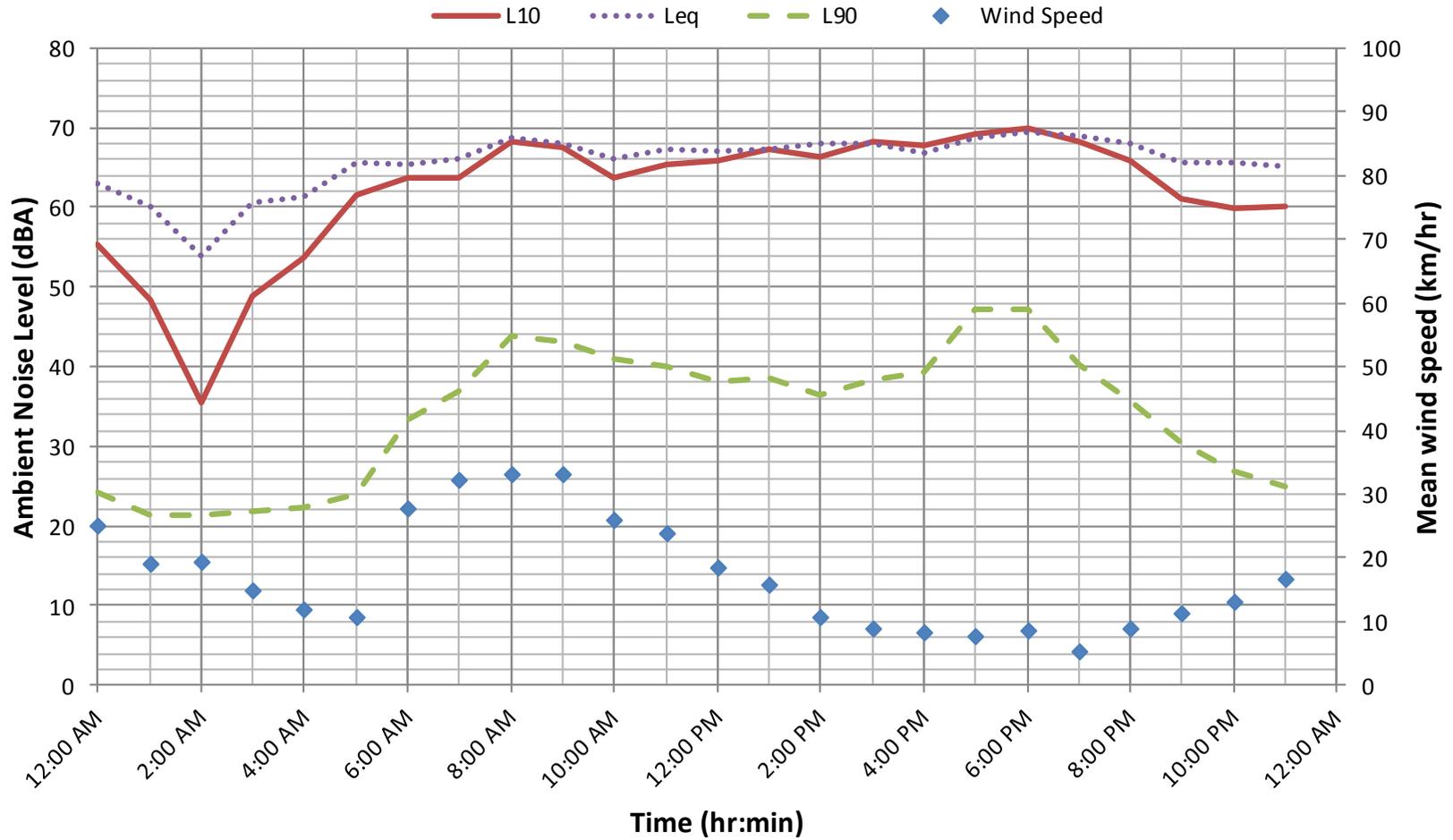


Figure 4: 6486 Great Northern Highway - 14/12/2017

6486 Great Northern Highway, Bindoon

Friday 15/12/2017

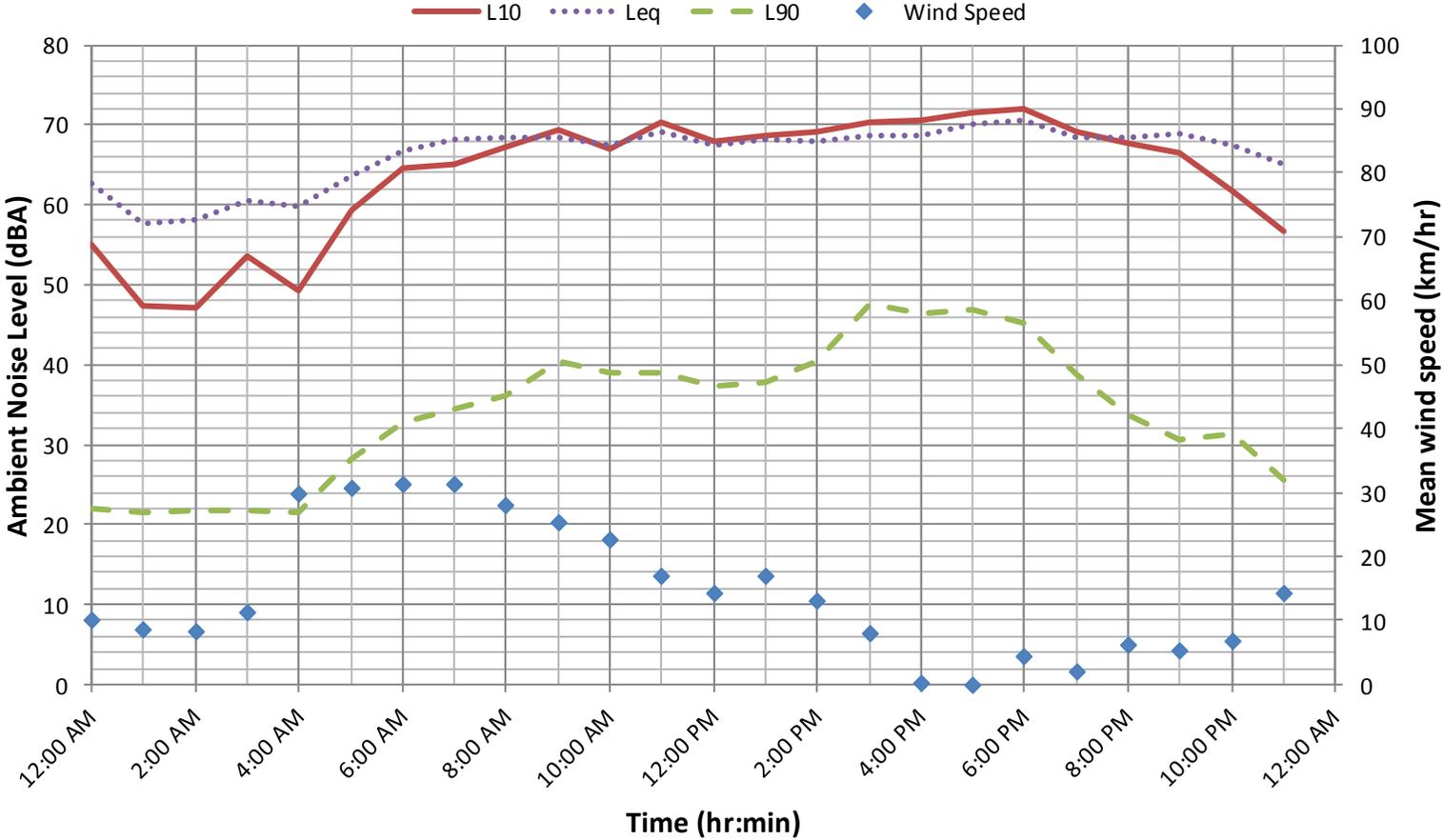


Figure 5: 6486 Great Northern Highway - 15/12/2017

B.3.1.3 Location 1.3

Description	Details
Noise Logger	Acoustics Research Laboratories Ngara Noise Logger Serial Number: 87807F
Measurement duration	12 December 2017 – 21 December 2017
Location	Lot 501, 5885 Great Northern Highway, Bindoon
Coordinates (Easting; Northing)	451,122; 6,529,865
Photo	

Date	Time	L _{Aeq} , 1 hr dB	L _{A10} , 1 hr dB	L _{A90} , 1 hr dB
13-12-17	12:00 AM	62	56	31
13-12-17	1:00 AM	62	55	31
13-12-17	2:00 AM	52	35	28
13-12-17	3:00 AM	62	49	25
13-12-17	4:00 AM	61	51	22
13-12-17	5:00 AM	65	62	26
13-12-17	6:00 AM	67	67	34
13-12-17	7:00 AM	69	71	34
13-12-17	8:00 AM	70	73	43
13-12-17	9:00 AM	70	74	43
13-12-17	10:00 AM	69	73	40
13-12-17	11:00 AM	70	74	39
13-12-17	12:00 PM	70	73	40
13-12-17	1:00 PM	69	72	37
13-12-17	2:00 PM	70	72	41

Date	Time	L _{Aeq} , 1 hr dB	L _{A10} , 1 hr dB	L _{A90} , 1 hr dB
13-12-17	3:00 PM	70	73	42
13-12-17	4:00 PM	70	74	46
13-12-17	5:00 PM	70	74	45
13-12-17	6:00 PM	69	73	45
13-12-17	7:00 PM	69	73	42
13-12-17	8:00 PM	69	71	36
13-12-17	9:00 PM	69	71	34
13-12-17	10:00 PM	66	64	31
13-12-17	11:00 PM	65	62	31
14-12-17	12:00 AM	64	59	29
14-12-17	1:00 AM	58	40	26
14-12-17	2:00 AM	59	40	23
14-12-17	3:00 AM	61	47	21
14-12-17	4:00 AM	62	50	21
14-12-17	5:00 AM	66	61	26
14-12-17	6:00 AM	67	66	29
14-12-17	7:00 AM	68	71	36
14-12-17	8:00 AM	69	73	43
14-12-17	9:00 AM	70	73	43
14-12-17	10:00 AM	69	73	40
14-12-17	11:00 AM	69	73	39
14-12-17	12:00 PM	69	73	40
14-12-17	1:00 PM	70	73	36
14-12-17	2:00 PM	70	73	37
14-12-17	3:00 PM	69	73	41
14-12-17	4:00 PM	70	73	43
14-12-17	5:00 PM	70	74	46
14-12-17	6:00 PM	70	74	43
14-12-17	7:00 PM	70	73	39
14-12-17	8:00 PM	68	70	34
14-12-17	9:00 PM	66	65	31
14-12-17	10:00 PM	67	66	32
14-12-17	11:00 PM	65	63	29
15-12-17	12:00 AM	63	58	28
15-12-17	1:00 AM	59	46	25
15-12-17	2:00 AM	58	40	22
15-12-17	3:00 AM	62	54	21
15-12-17	4:00 AM	60	49	22

Date	Time	L _{Aeq} , 1 hr dB	L _{A10} , 1 hr dB	L _{A90} , 1 hr dB
15-12-17	5:00 AM	64	60	26
15-12-17	6:00 AM	67	67	32
15-12-17	7:00 AM	69	72	35
15-12-17	8:00 AM	70	74	39
15-12-17	9:00 AM	70	74	41
15-12-17	10:00 AM	69	73	40
15-12-17	11:00 AM	71	74	42
15-12-17	12:00 PM	69	73	36
15-12-17	1:00 PM	70	73	40
15-12-17	2:00 PM	69	74	41
15-12-17	3:00 PM	69	73	46
15-12-17	4:00 PM	70	74	46
15-12-17	5:00 PM	70	74	48
15-12-17	6:00 PM	71	74	46
15-12-17	7:00 PM	69	72	40
15-12-17	8:00 PM	69	71	34
15-12-17	9:00 PM	69	70	33
15-12-17	10:00 PM	68	66	30
15-12-17	11:00 PM	65	62	29

5885 Great Northern Highway, Bindoon

Wednesday 13/12/2017

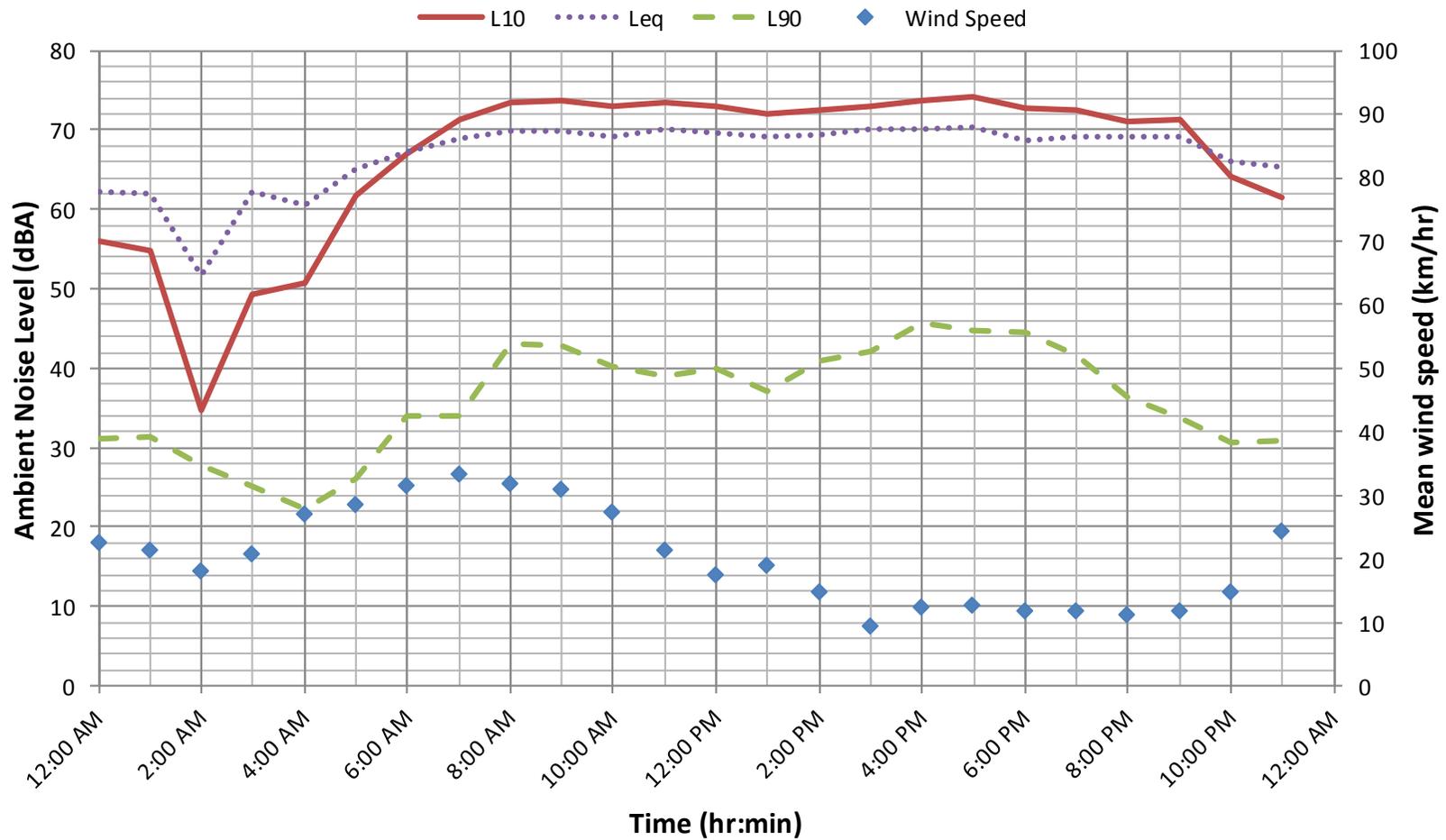


Figure 6: 5885 Great Northern Highway, Bindoon - 13/12/2017

5885 Great Northern Highway, Bindoon

Thursday 14/12/2017

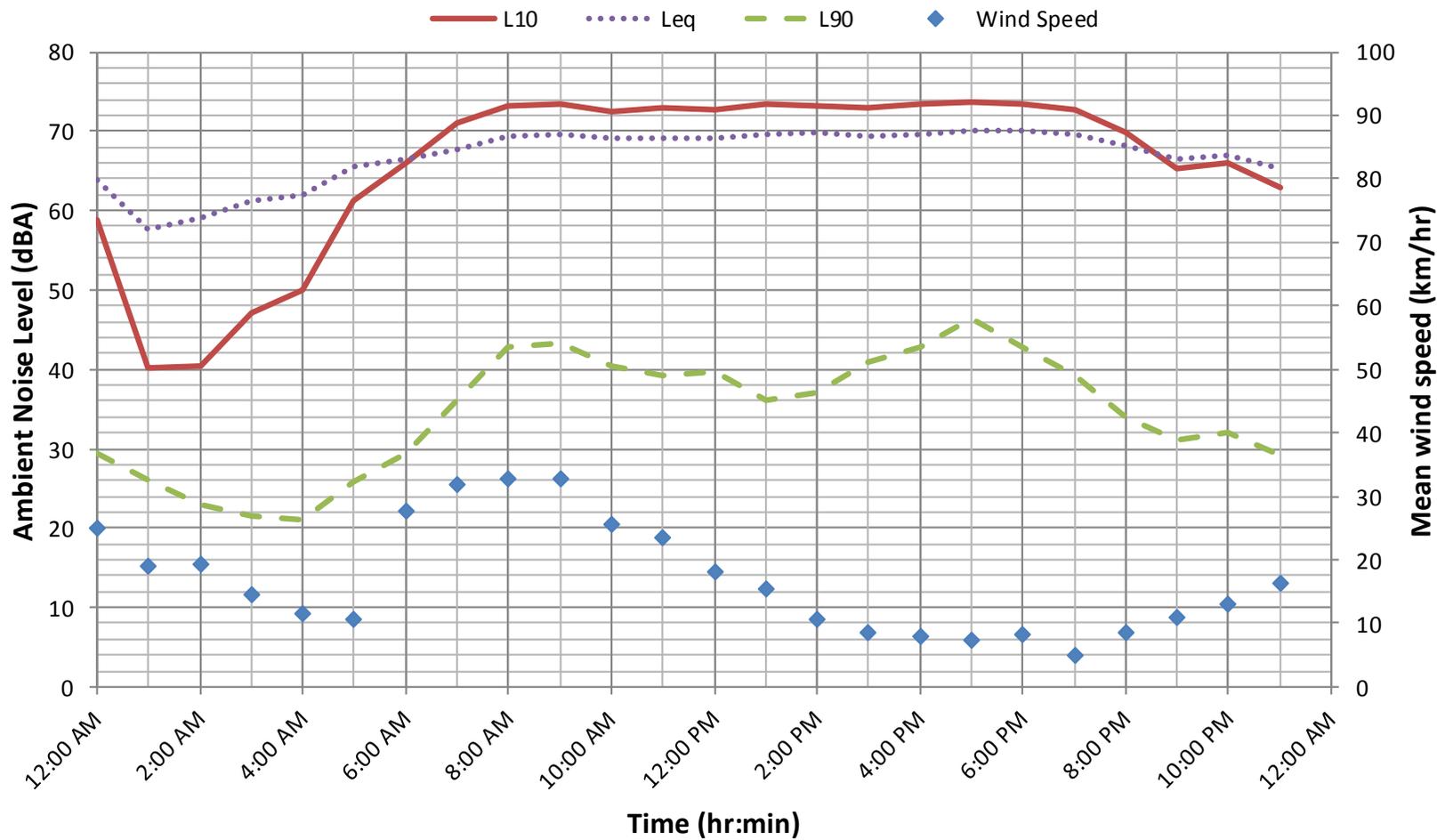


Figure 7: 5885 Great Northern Highway, Bindoon - 14/12/2017

5885 Great Northern Highway, Bindoon

Friday 15/12/2017

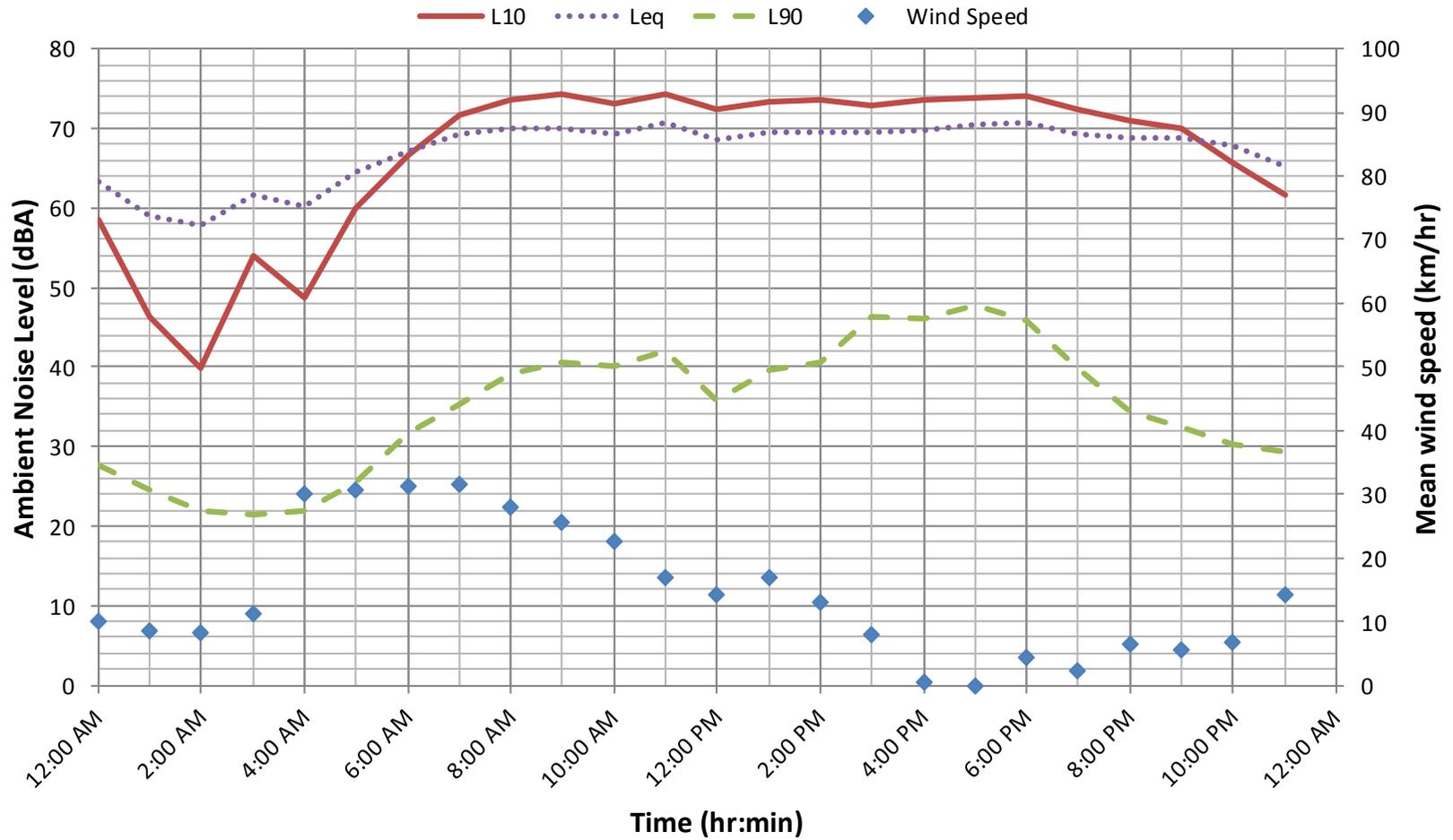


Figure 8: 5885 Great Northern Highway, Bindoon - 15/12/2017

B.3.1.4 Location 1.4

Description	Details
Noise Logger	Acoustics Research Laboratories Ngara Noise Logger Serial Number: 878060
Measurement duration	12 December 2017 – 21 December 2017
Location	Lot 18, 5077 Great Northern Highway Bindoon
Coordinates (Easting; Northing)	410,144; 6,518,732
Photo	

Date	Time	L _{Aeq} , 1 hr dB	L _{A10} , 1 hr dB	L _{A90} , 1 hr dB
13-12-17	12:00 AM	59	53	25
13-12-17	1:00 AM	59	51	27
13-12-17	2:00 AM	50	41	31
13-12-17	3:00 AM	59	47	33
13-12-17	4:00 AM	55	45	33
13-12-17	5:00 AM	62	61	34
13-12-17	6:00 AM	65	68	37
13-12-17	7:00 AM	67	71	42
13-12-17	8:00 AM	67	72	44
13-12-17	9:00 AM	67	71	45
13-12-17	10:00 AM	65	69	43
13-12-17	11:00 AM	67	70	41
13-12-17	12:00 PM	65	69	44
13-12-17	1:00 PM	64	66	39
13-12-17	2:00 PM	64	68	43
13-12-17	3:00 PM	66	69	45

Date	Time	L _{Aeq} , 1 hr dB	L _{A10} , 1 hr dB	L _{A90} , 1 hr dB
13-12-17	4:00 PM	65	69	48
13-12-17	5:00 PM	67	71	49
13-12-17	6:00 PM	66	70	46
13-12-17	7:00 PM	66	70	43
13-12-17	8:00 PM	66	68	41
13-12-17	9:00 PM	66	69	42
13-12-17	10:00 PM	63	63	36
13-12-17	11:00 PM	63	61	36
14-12-17	12:00 AM	61	53	32
14-12-17	1:00 AM	55	42	30
14-12-17	2:00 AM	55	45	31
14-12-17	3:00 AM	58	47	32
14-12-17	4:00 AM	59	49	30
14-12-17	5:00 AM	63	61	33
14-12-17	6:00 AM	65	68	37
14-12-17	7:00 AM	67	71	45
14-12-17	8:00 AM	67	72	45
14-12-17	9:00 AM	68	72	46
14-12-17	10:00 AM	66	70	43
14-12-17	11:00 AM	66	70	41
14-12-17	12:00 PM	66	69	39
14-12-17	1:00 PM	65	69	37
14-12-17	2:00 PM	65	69	39
14-12-17	3:00 PM	65	68	39
14-12-17	4:00 PM	66	70	47
14-12-17	5:00 PM	67	70	49
14-12-17	6:00 PM	67	71	48
14-12-17	7:00 PM	67	71	44
14-12-17	8:00 PM	65	68	40
14-12-17	9:00 PM	63	65	39
14-12-17	10:00 PM	63	63	36
14-12-17	11:00 PM	61	60	34
15-12-17	12:00 AM	60	55	27
15-12-17	1:00 AM	56	45	22
15-12-17	2:00 AM	55	43	21
15-12-17	3:00 AM	58	48	22
15-12-17	4:00 AM	58	50	24
15-12-17	5:00 AM	63	60	24

Date	Time	L _{Aeq} , 1 hr dB	L _{A10} , 1 hr dB	L _{A90} , 1 hr dB
15-12-17	6:00 AM	65	69	40
15-12-17	7:00 AM	67	71	43
15-12-17	8:00 AM	68	72	46
15-12-17	9:00 AM	67	72	43
15-12-17	10:00 AM	66	70	40
15-12-17	11:00 AM	67	71	39
15-12-17	12:00 PM	65	69	38
15-12-17	1:00 PM	66	69	41
15-12-17	2:00 PM	65	69	46
15-12-17	3:00 PM	66	69	49
15-12-17	4:00 PM	66	70	48
15-12-17	5:00 PM	67	70	48
15-12-17	6:00 PM	68	71	47
15-12-17	7:00 PM	66	70	43
15-12-17	8:00 PM	66	68	41
15-12-17	9:00 PM	66	68	40
15-12-17	10:00 PM	65	64	38
15-12-17	11:00 PM	63	61	36

5077 Great Northern Highway, Bindoon

Wednesday 13/12/2017

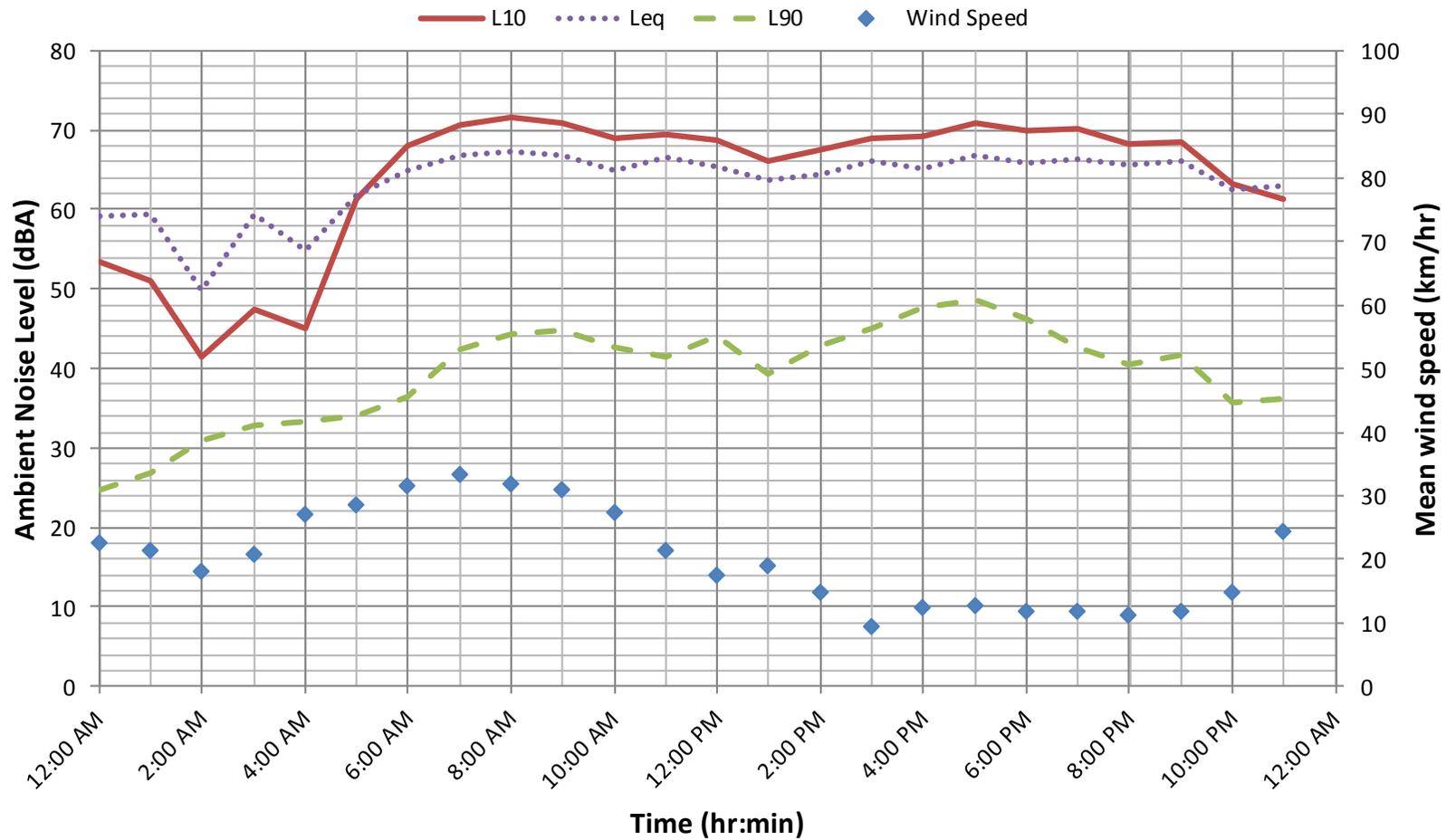


Figure 9: 5077 Great Northern Highway - 13/12/2017

5077 Great Northern Highway, Bindoon

Thursday 14/12/2017

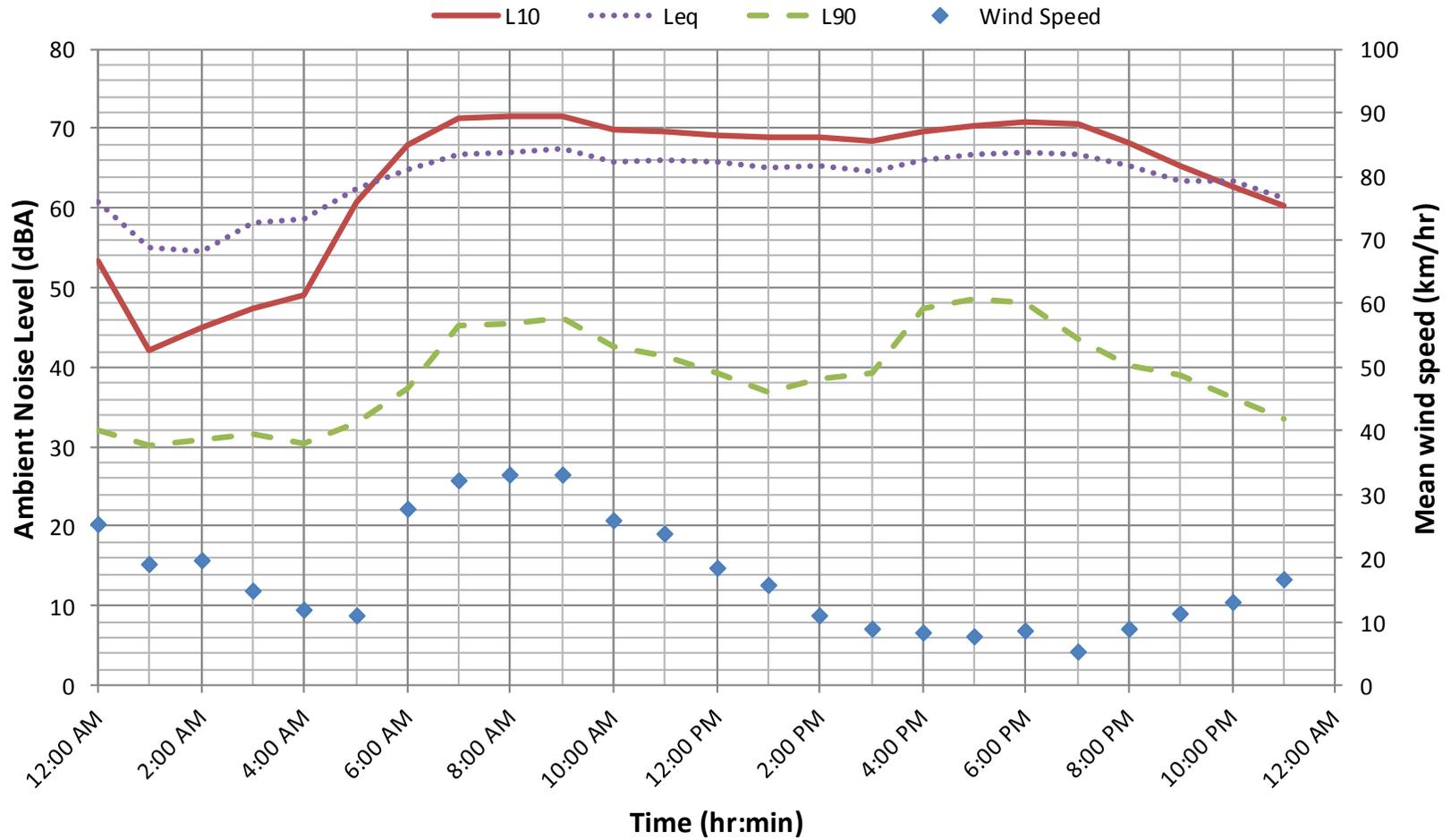


Figure 10: 5077 Great Northern Highway - 14/12/2017

5077 Great Northern Highway, Bindoon

Friday 15/12/2017

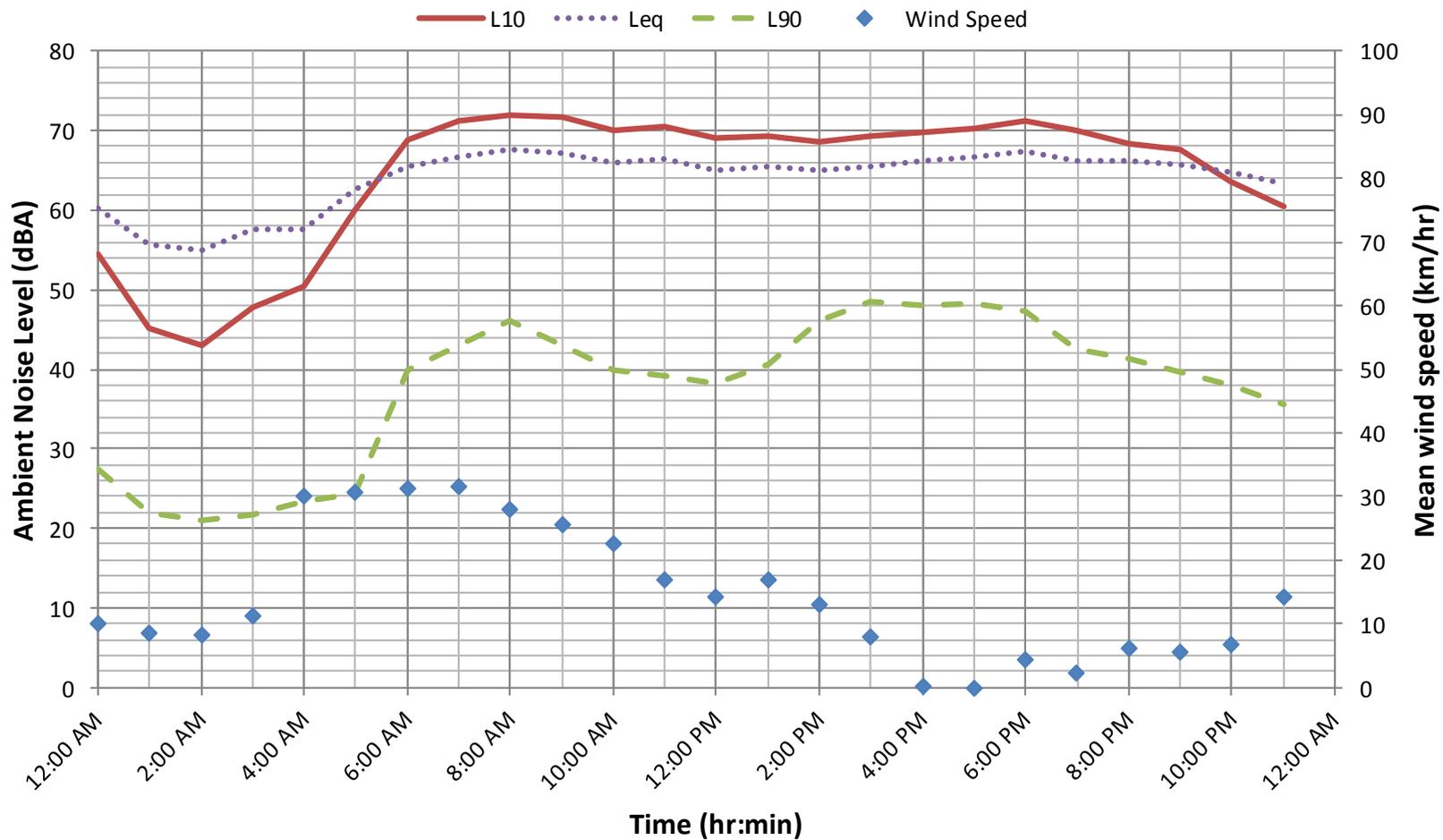


Figure 11: 5077 Great Northern Highway - 15/12/2017

B.3.1.5 Location 1.5

Description	Details
Noise Logger	RTA Technology Pty Ltd RTA04 Noise Logger Serial Number: RTA04-008
Measurement duration	12 December 2017 – 21 December 2017
Location	Lot 151, 21 Sandleford Drive, Chittering
Coordinates (Easting; Northing)	411,187; 6,519,710
Photo	

Date	Time	L _{Aeq, 1 hr} dB	L _{A10, 1 hr} dB	L _{A90, 1 hr} dB
13-12-17	12:00 AM	53	50	30
13-12-17	1:00 AM	49	41	29
13-12-17	2:00 AM	54	46	30
13-12-17	3:00 AM	51	48	27
13-12-17	4:00 AM	56	55	29
13-12-17	5:00 AM	59	62	36
13-12-17	6:00 AM	61	65	39
13-12-17	7:00 AM	62	65	42
13-12-17	8:00 AM	60	63	41
13-12-17	9:00 AM	59	63	40
13-12-17	10:00 AM	61	63	39
13-12-17	11:00 AM	60	62	37
13-12-17	12:00 PM	59	62	39
13-12-17	1:00 PM	60	63	39
13-12-17	2:00 PM	61	63	42
13-12-17	3:00 PM	61	63	45
13-12-17	4:00 PM	61	65	45

Date	Time	L _{Aeq} , 1 hr dB	L _{A10} , 1 hr dB	L _{A90} , 1 hr dB
13-12-17	5:00 PM	61	64	47
13-12-17	6:00 PM	61	64	43
13-12-17	7:00 PM	61	63	40
13-12-17	8:00 PM	61	63	41
13-12-17	9:00 PM	58	60	38
13-12-17	10:00 PM	58	58	37
13-12-17	11:00 PM	56	51	30
14-12-17	12:00 AM	52	41	22
14-12-17	1:00 AM	52	42	19
14-12-17	2:00 AM	54	40	20
14-12-17	3:00 AM	54	43	21
14-12-17	4:00 AM	58	54	28
14-12-17	5:00 AM	59	61	34
14-12-17	6:00 AM	59	64	40
14-12-17	7:00 AM	61	64	44
14-12-17	8:00 AM	61	64	43
14-12-17	9:00 AM	59	62	41
14-12-17	10:00 AM	60	62	39
14-12-17	11:00 AM	58	61	34
14-12-17	12:00 PM	59	62	32
14-12-17	1:00 PM	60	63	35
14-12-17	2:00 PM	59	62	35
14-12-17	3:00 PM	61	64	42
14-12-17	4:00 PM	61	64	45
14-12-17	5:00 PM	62	65	44
14-12-17	6:00 PM	62	65	43
14-12-17	7:00 PM	70	64	42
14-12-17	8:00 PM	61	60	42
14-12-17	9:00 PM	58	60	40
14-12-17	10:00 PM	57	59	38
14-12-17	11:00 PM	57	57	34

21 Sandleford Drive, Chittering

Wednesday 13/12/2017

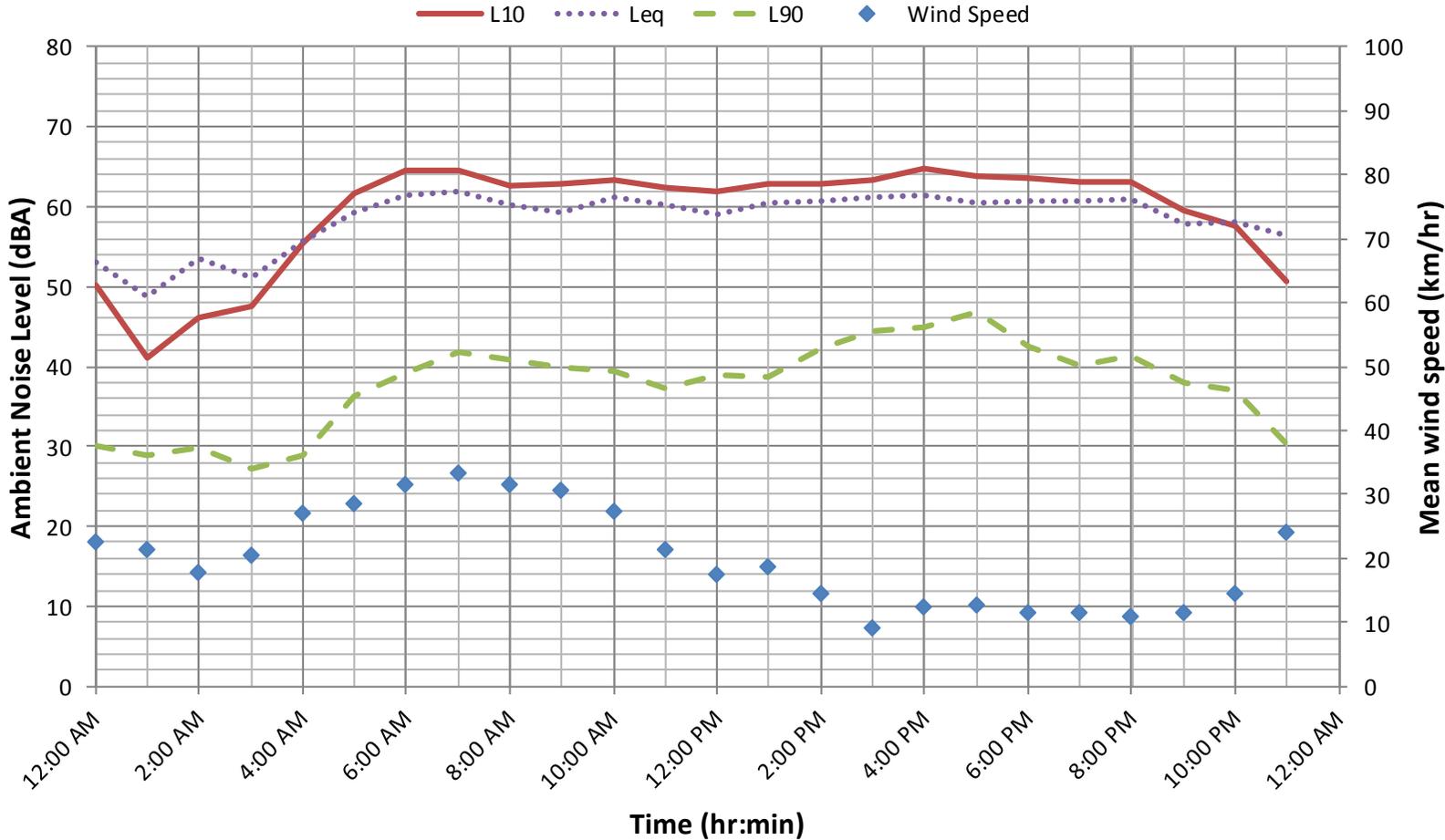


Figure 12: 21 Sandleford Drive, Chittering – 13/12/2017

21 Sandelford Drive, Chittering

Thursday 14/12/2017

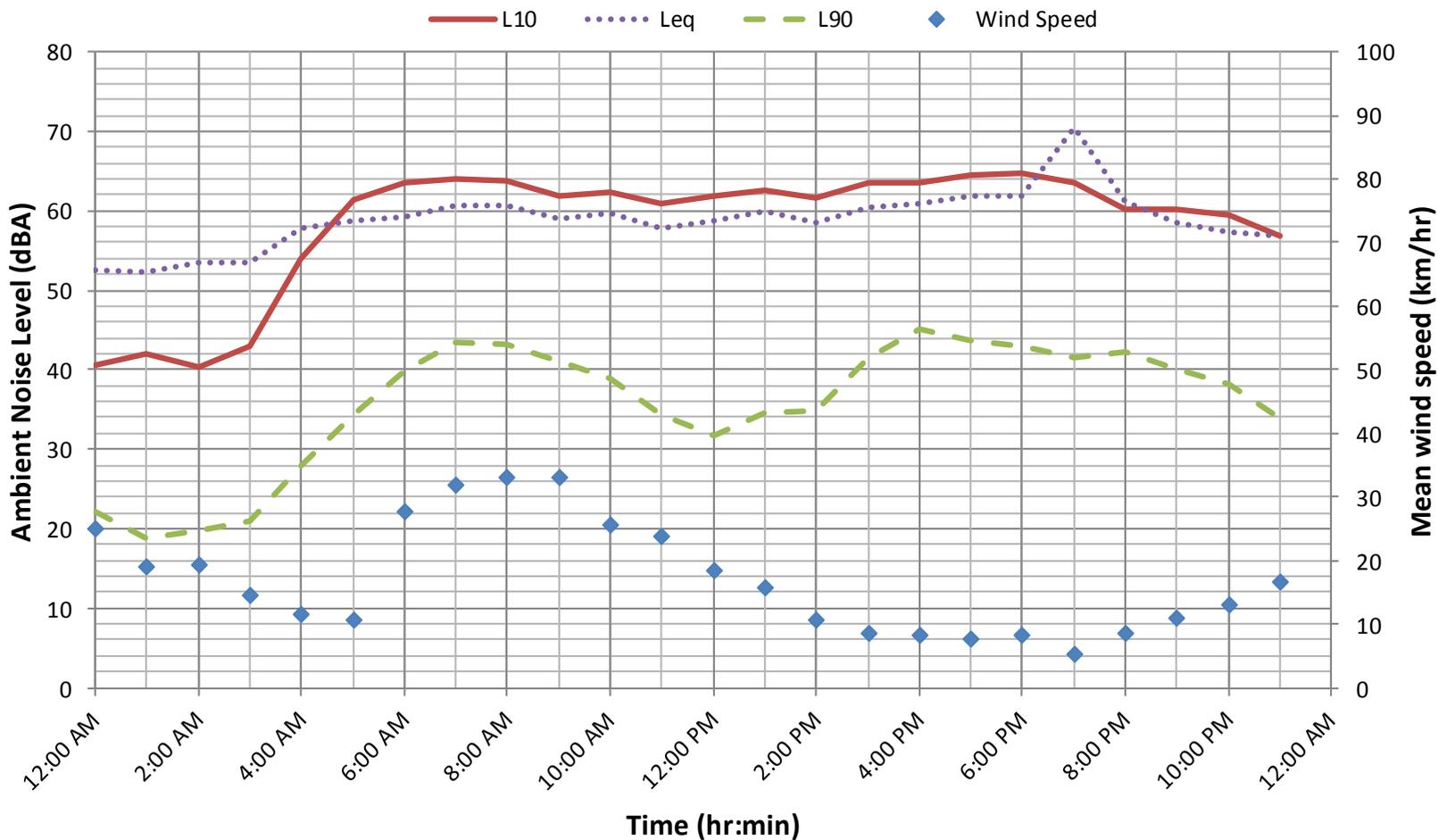


Figure 13: 21 Sandelford Drive, Chittering – 14/12/2017

B.4 Measured Noise Levels along Future Alignment

Environmental noise monitoring was undertaken at 10 locations between January and March 2018. The purpose of this was to compare current noise levels in the area with projected future noise levels once the Bindoon Bypass has been constructed.

These ten locations were chosen as representative locations for all dwellings and/or buildings along the Bindoon Bypass alignment as of January 2018 and were spread evenly along the alignment. Monitors were placed at approximately 1m from buildings where suitable. Noise measurements were undertaken at 8 of these sites over a 10-day period, while two sites were monitored for only 4 days because of land access constraints.

A summary of the noise measurements, including location, recording period and selected days for analysis is presented below in Table 7-9.

Table 7-9: Measured Noise Data along Proposed Alignment

Measurement Position		L _{Aeq,16hours} (day) dB	L _{Aeq,8hours} (night) dB
2.1	Lot 1, 537 Teatree Rd, Bindoon	43	40
2.2	Lot 36, 620 Gray Rd, Bindoon	43	40
2.3	Lot 502, 737 Crest Hill Rd, Mooliabeenee	48	43
2.4	Lot M1364, 16 Cullalla Rd, Mooliabeenee	57	45
2.5	Lot 1, 428 Gingilling Rd, Mooliabeenee	47	43
2.6	Lot 53, 644 Gingilling Rd, Wannamal	47	37
2.7	Lot 1, 2261 Bindoon-Moora Rd, Wannamal	49	40
2.8	Lot 3, 2087 Bindoon-Moora Rd, Wannamal	61	36
2.9	Lot 2917, 75 Kangaroo Gully Rd, Wannamal	51	37
2.10	Lot 3281, 9071 GNH, Wannamal	42	31

B.4.1 Details of noise measurement locations along future alignment

B.4.1.1 Location 2.1

Description	Details
Noise Logger	Acoustics Research Laboratory Ngara Noise Logger Serial Number: 878061
Measurement duration	22 January – 1 February 2018
Location	Lot 1, 537 Teatree Rd Bindoon
Coordinates (Easting; Northing)	408,851; 6,523,828
Photo	

Date	Time	L _{Aeq, 1 hr} dB	L _{A10, 1 hr} dB	L _{A90, 1 hr} dB
23-01-18	1:00 AM	40	42	31
23-01-18	2:00 AM	44	46	34
23-01-18	3:00 AM	45	48	34
23-01-18	4:00 AM	46	49	34
23-01-18	5:00 AM	39	41	31
23-01-18	6:00 AM	43	45	34
23-01-18	7:00 AM	47	50	37
23-01-18	8:00 AM	44	46	34
23-01-18	9:00 AM	42	45	32
23-01-18	10:00 AM	44	46	33
23-01-18	11:00 AM	40	41	29
23-01-18	12:00 PM	37	38	27
23-01-18	1:00 PM	38	40	26
23-01-18	2:00 PM	42	43	29
23-01-18	3:00 PM	43	42	27
23-01-18	4:00 PM	41	44	28
23-01-18	5:00 PM	44	47	34

Date	Time	L _{Aeq} , 1 hr dB	L _{A10} , 1 hr dB	L _{A90} , 1 hr dB
23-01-18	6:00 PM	42	44	35
23-01-18	7:00 PM	38	40	31
23-01-18	8:00 PM	34	35	29
23-01-18	9:00 PM	32	32	27
23-01-18	10:00 PM	32	34	28
23-01-18	11:00 PM	43	46	30
24-01-18	12:00 AM	55	51	34
24-01-18	1:00 AM	54	55	41
24-01-18	2:00 AM	54	57	44
24-01-18	3:00 AM	51	53	41
24-01-18	4:00 AM	50	52	39
24-01-18	5:00 AM	49	51	39
24-01-18	6:00 AM	46	49	36
24-01-18	7:00 AM	43	46	33
24-01-18	8:00 AM	46	45	34
24-01-18	9:00 AM	39	41	30
24-01-18	10:00 AM	41	42	31
24-01-18	11:00 AM	67	38	26
24-01-18	12:00 PM	38	38	26
24-01-18	1:00 PM	39	38	25
24-01-18	2:00 PM	42	41	25
24-01-18	3:00 PM	43	45	29
24-01-18	4:00 PM	46	48	38
24-01-18	5:00 PM	47	50	39
24-01-18	6:00 PM	48	51	40
24-01-18	7:00 PM	40	41	30
24-01-18	8:00 PM	33	35	29
24-01-18	9:00 PM	34	36	29
24-01-18	10:00 PM	33	35	27
24-01-18	11:00 PM	32	33	25
25-01-18	12:00 AM	30	33	24
25-01-18	1:00 AM	30	33	26
25-01-18	2:00 AM	31	34	25
25-01-18	3:00 AM	28	29	22
25-01-18	4:00 AM	25	27	20
25-01-18	5:00 AM	27	30	21
25-01-18	6:00 AM	33	34	25
25-01-18	7:00 AM	33	34	28

Date	Time	L _{Aeq} , 1 hr dB	L _{A10} , 1 hr dB	L _{A90} , 1 hr dB
25-01-18	8:00 AM	35	34	28
25-01-18	9:00 AM	39	38	26
25-01-18	10:00 AM	35	36	26
25-01-18	11:00 AM	48	38	25
25-01-18	12:00 PM	37	39	25
25-01-18	1:00 PM	41	43	27
25-01-18	2:00 PM	43	45	31
25-01-18	3:00 PM	47	50	35
25-01-18	4:00 PM	48	50	40
25-01-18	5:00 PM	46	48	37
25-01-18	6:00 PM	44	45	35
25-01-18	7:00 PM	38	40	31
25-01-18	8:00 PM	35	36	30
25-01-18	9:00 PM	35	37	27
25-01-18	10:00 PM	32	35	27
25-01-18	11:00 PM	32	34	26
26-01-18	12:00 AM	31	33	26

537 Teatree Road, Bindoon

Tuesday 23/01/2018

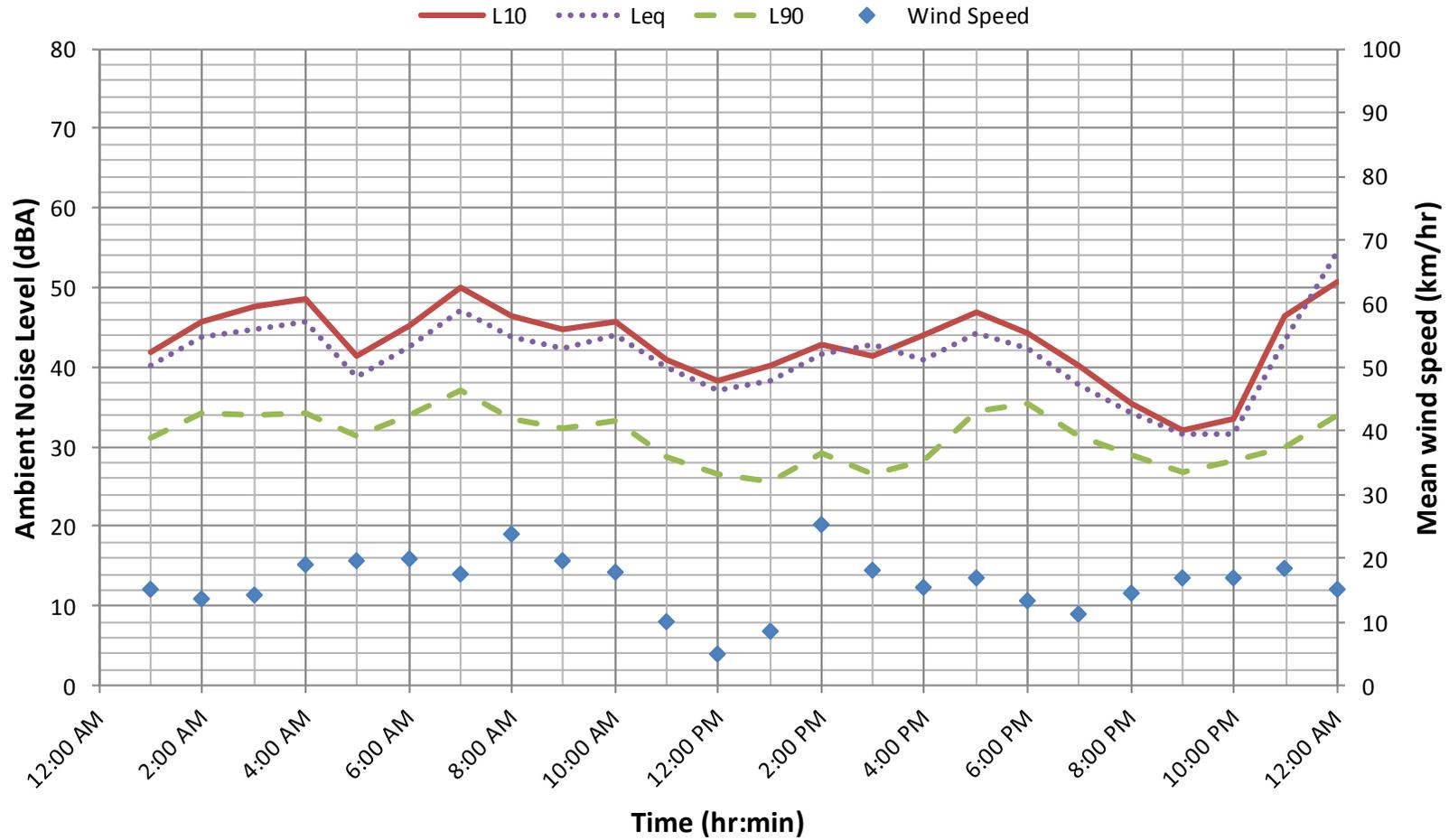


Figure 14: 537 Teatree Road, Bindoon - 23/01/2018

537 Teatree Road, Bindoon

Wednesday 24/01/2018

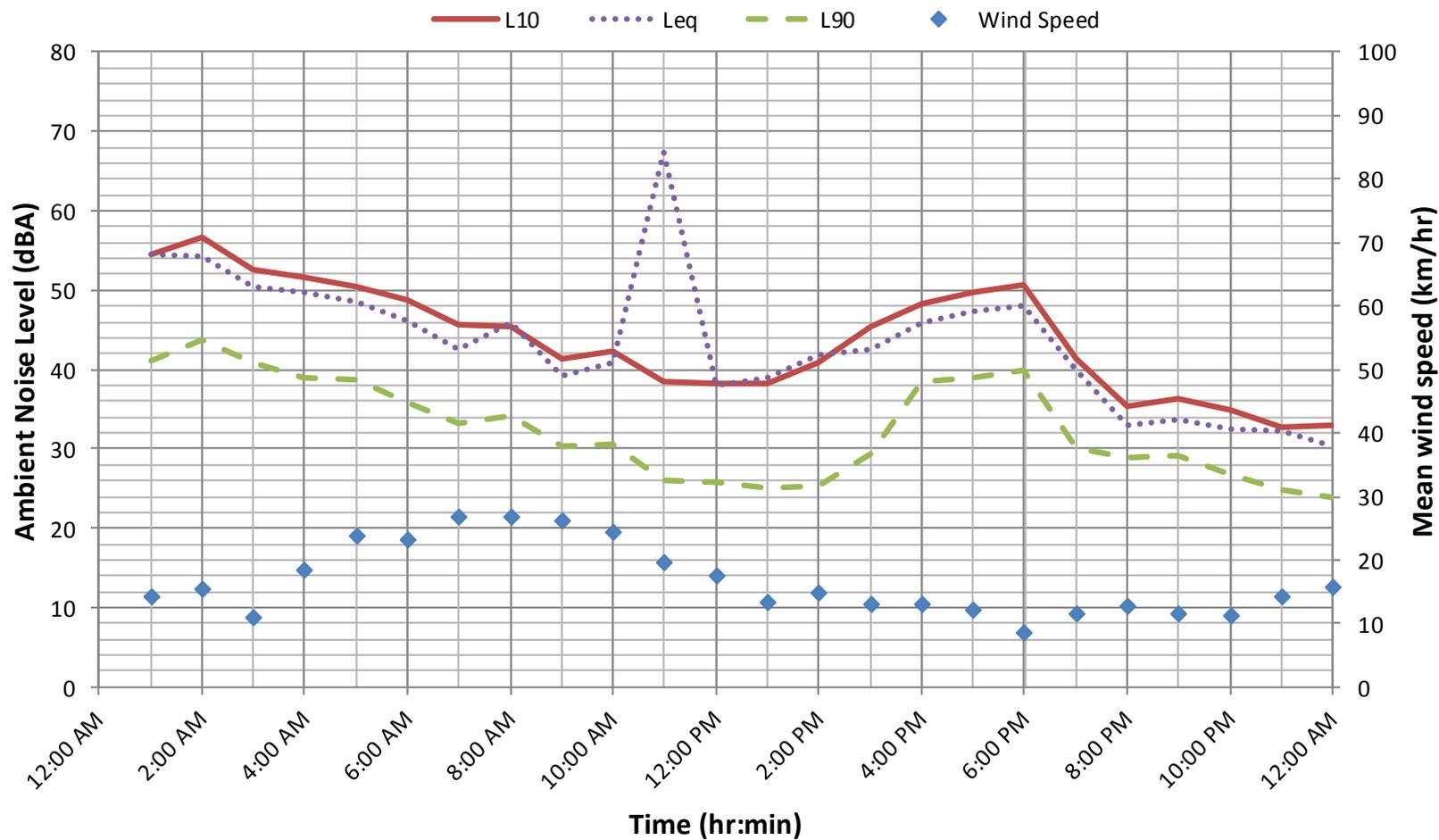


Figure 15: 537 Teatree Road, Bindoon - 24/01/2018

537 Teatree Road, Bindoon

Thursday 25/01/2018

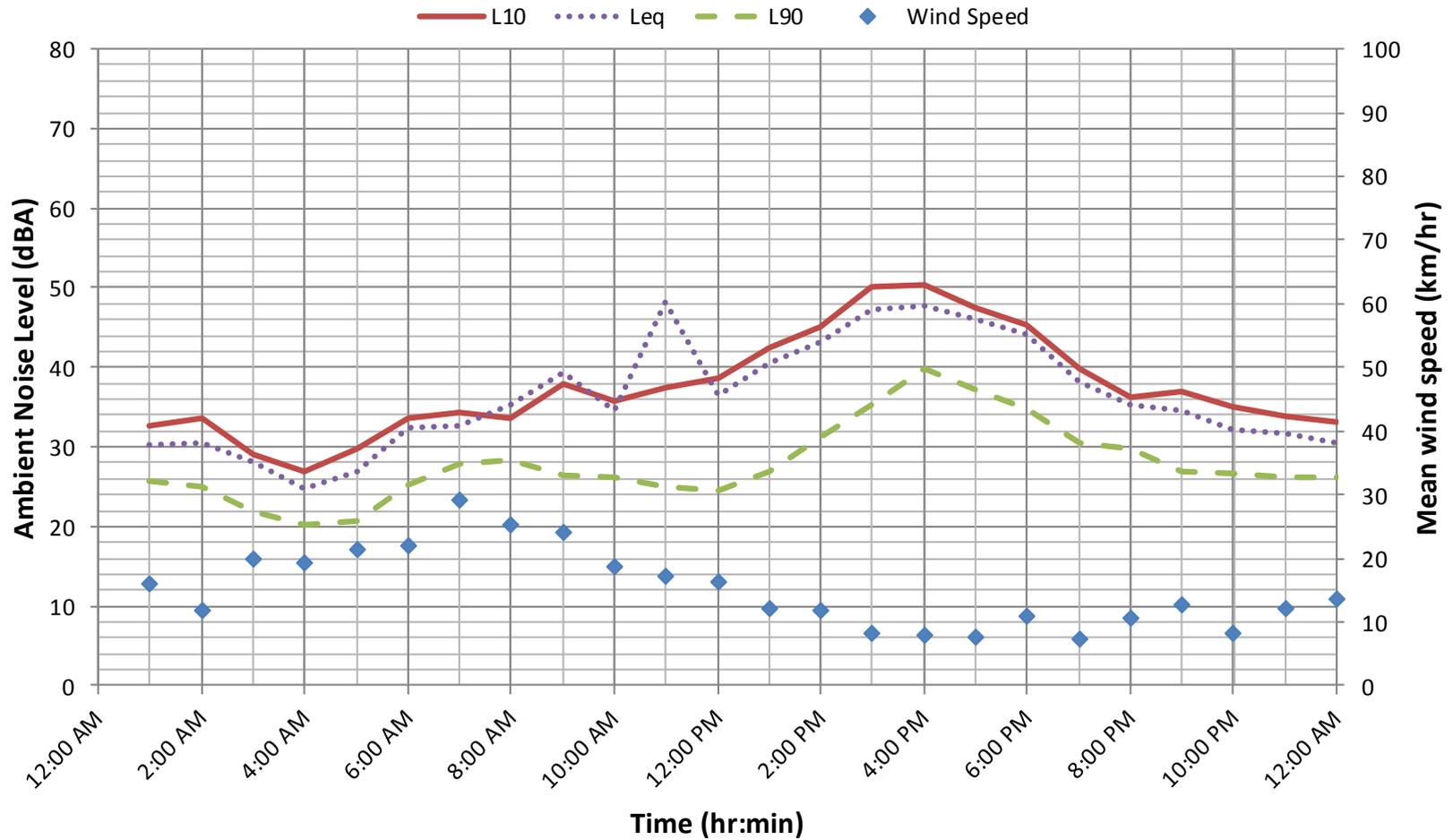


Figure 16: 537 Teatree Road, Bindoon - 25/01/2018

B.4.1.2 Location 2.2

Description	Details
Noise Logger	Acoustics Research Laboratory Ngara Noise Logger Serial Number: 878061
Measurement duration	19 February – 1 March 2018
Location	Lot 36, 620 Gray Rd Bindoon
Coordinates (Easting; Northing)	408,330; 6,528,822
Photo	

Date	Time	L _{Aeq} , 1 hr dB	L _{A10} , 1 hr dB	L _{A90} , 1 hr dB
21-02-18	1:00 AM	46	48	41
21-02-18	2:00 AM	46	49	42
21-02-18	3:00 AM	46	48	41
21-02-18	4:00 AM	45	47	41
21-02-18	5:00 AM	44	46	39
21-02-18	6:00 AM	40	42	35
21-02-18	7:00 AM	39	41	34
21-02-18	8:00 AM	41	43	36
21-02-18	9:00 AM	43	45	37
21-02-18	10:00 AM	46	43	35
21-02-18	11:00 AM	40	41	31
21-02-18	12:00 PM	35	36	30
21-02-18	1:00 PM	40	38	30
21-02-18	2:00 PM	36	38	29
21-02-18	3:00 PM	38	37	29
21-02-18	4:00 PM	33	33	29
21-02-18	5:00 PM	47	41	29
21-02-18	6:00 PM	40	41	34

Date	Time	L _{Aeq} , 1 hr dB	L _{A10} , 1 hr dB	L _{A90} , 1 hr dB
21-02-18	7:00 PM	41	36	30
21-02-18	8:00 PM	37	38	34
21-02-18	9:00 PM	35	36	34
21-02-18	10:00 PM			
21-02-18	11:00 PM	32	34	30
22-02-18	12:00 AM	28	31	23
22-02-18	1:00 AM	23	23	19
22-02-18	2:00 AM	23	21	19
22-02-18	3:00 AM	21	21	19
22-02-18	4:00 AM	30	21	19
22-02-18	5:00 AM	24	23	20
22-02-18	6:00 AM	35	34	21
22-02-18	7:00 AM	33	36	26
22-02-18	8:00 AM	39	37	28
22-02-18	9:00 AM	33	35	28
22-02-18	10:00 AM	34	34	28
22-02-18	11:00 AM	46	40	30
22-02-18	12:00 PM	40	42	30
22-02-18	1:00 PM	48	44	37
22-02-18	2:00 PM	47	48	39
22-02-18	3:00 PM	47	47	40
22-02-18	4:00 PM	55	47	39
22-02-18	5:00 PM	43	44	35
22-02-18	6:00 PM	40	41	33
22-02-18	7:00 PM	36	37	30
22-02-18	8:00 PM	44	39	36
22-02-18	9:00 PM	37	38	35
22-02-18	10:00 PM	37	38	34
22-02-18	11:00 PM	33	34	31
23-02-18	12:00 AM	32	33	30
28-02-18	1:00 AM	28	26	21
28-02-18	2:00 AM	25	25	19
28-02-18	3:00 AM	33	36	27
28-02-18	4:00 AM	38	40	34
28-02-18	5:00 AM	39	41	36
28-02-18	6:00 AM	41	44	37
28-02-18	7:00 AM	42	44	37
28-02-18	8:00 AM	43	46	39

Date	Time	L _{Aeq} , 1 hr dB	L _{A10} , 1 hr dB	L _{A90} , 1 hr dB
28-02-18	9:00 AM	50	47	39
28-02-18	10:00 AM	44	46	38
28-02-18	11:00 AM	42	44	36
28-02-18	12:00 PM	38	40	32
28-02-18	1:00 PM	35	37	31
28-02-18	2:00 PM	36	38	30
28-02-18	3:00 PM	45	46	31
28-02-18	4:00 PM	38	36	30
28-02-18	5:00 PM	39	36	30
28-02-18	6:00 PM	34	34	29
28-02-18	7:00 PM	35	37	30
28-02-18	8:00 PM	40	40	37
28-02-18	9:00 PM	42	39	36
28-02-18	10:00 PM	37	39	35
28-02-18	11:00 PM	33	34	30
01-03-18	12:00 AM	35	37	32

620 Gray Road, Bindoon

Wednesday 21/02/2018

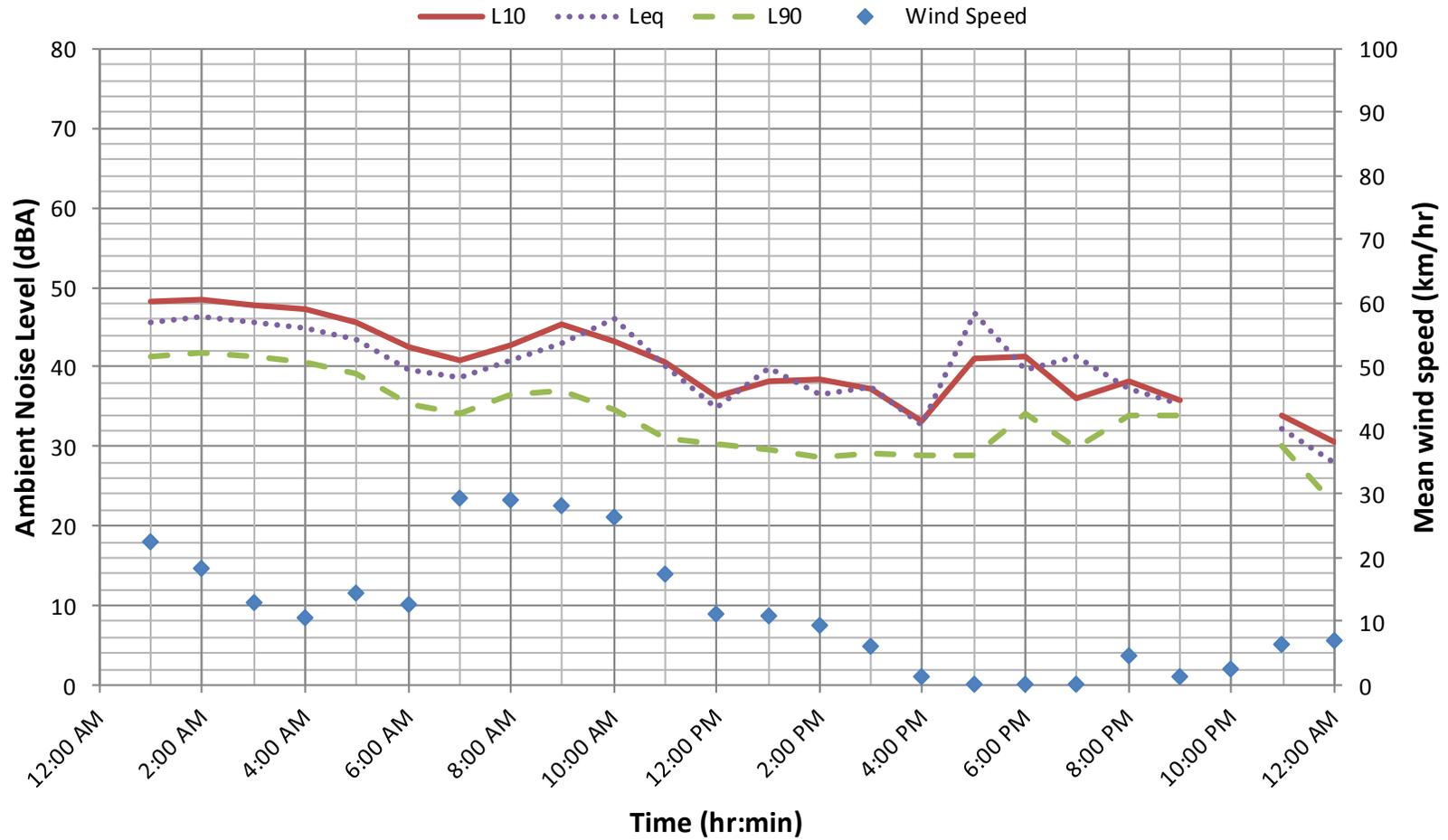


Figure 17: 620 Gray Road, Bindoon - 21/02/2018

620 Gray Road, Bindoon

Thursday 22/02/2018

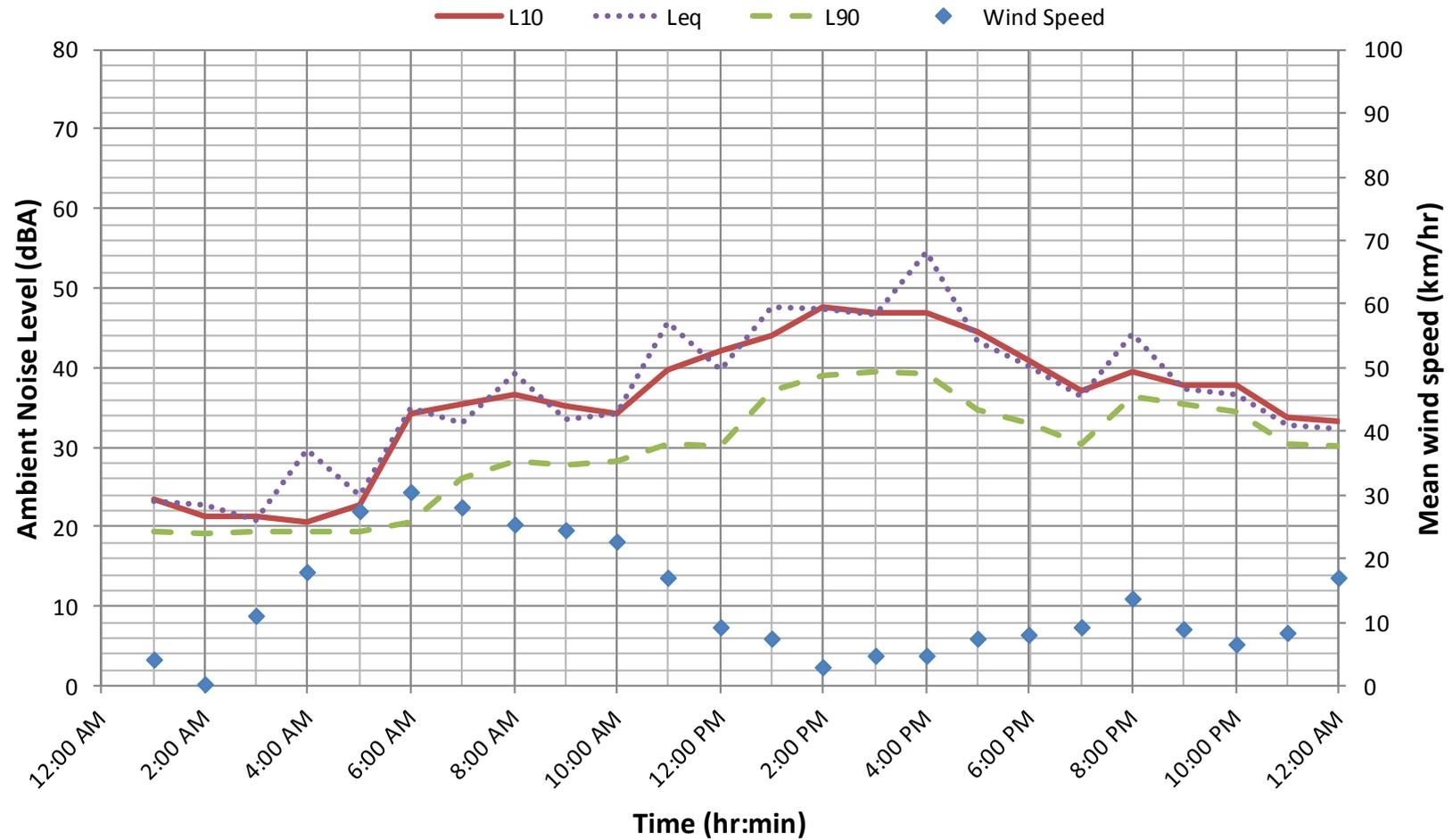


Figure 18: 620 Gray Road, Bindoon - 22/02/2018

620 Gray Road, Bindoon

Wednesday 28/02/2018

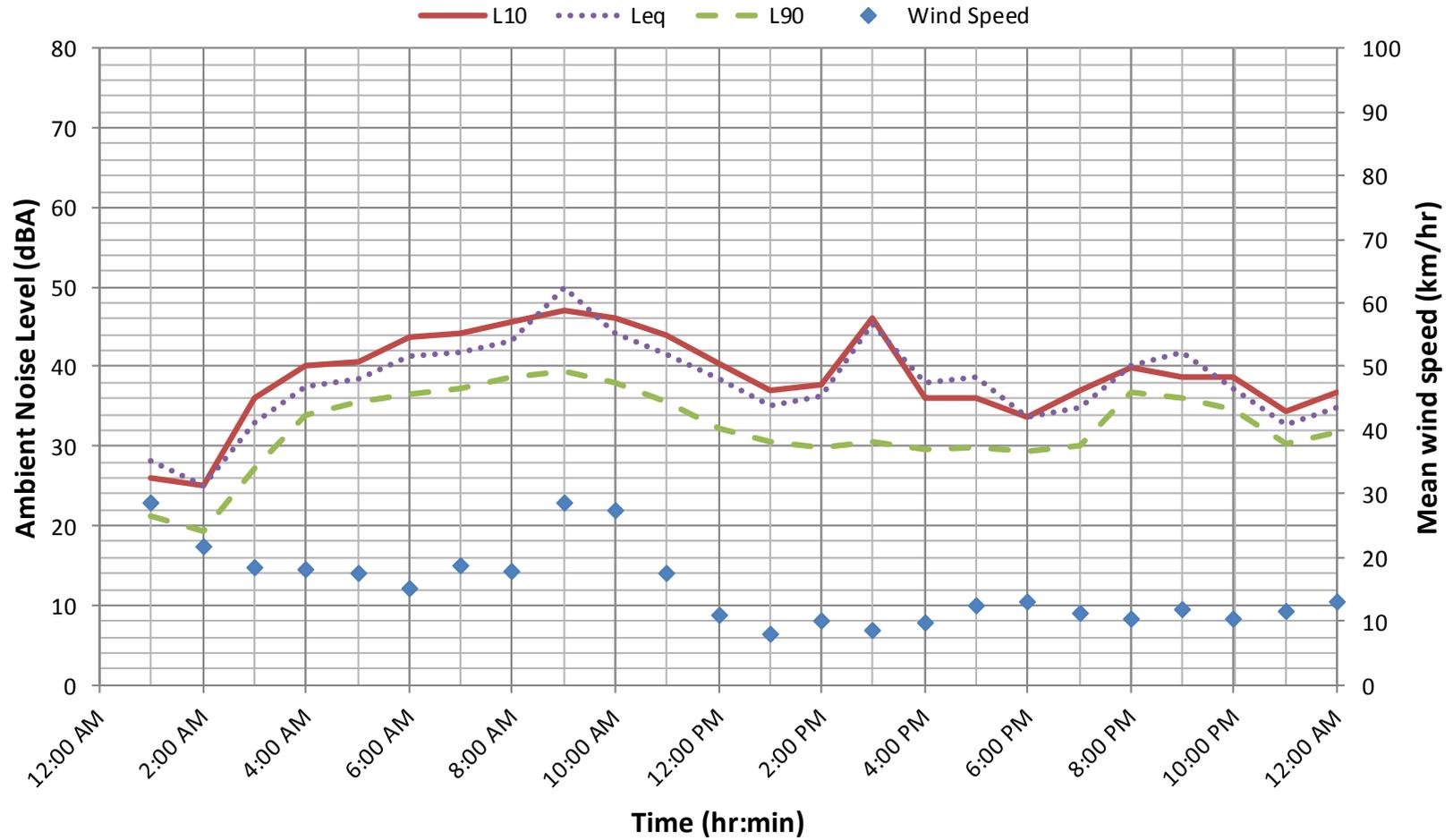


Figure 19: 620 Gray Road, Bindoon - 28/02/2018

B.4.1.3 Location 2.3

Description	Details
Noise Logger	RTA Technology Pty Ltd RTA04 Noise Logger Serial Number: RTA04-008
Measurement duration	22 January - 1 February 2018
Location	Lot 502, 737 Crest Hill Rd Mooliabeenee
Coordinates (Easting; Northing)	409,183; 6,533,408
Photo	

Date	Time	L _{Aeq, 1 hr} dB	L _{A10, 1 hr} dB	L _{A90, 1 hr} dB
23-01-18	1:00 AM	47	49	43
23-01-18	2:00 AM	43	44	40
23-01-18	3:00 AM	44	46	39
23-01-18	4:00 AM	38	42	31
23-01-18	5:00 AM	45	47	32
23-01-18	6:00 AM	41	45	33
23-01-18	7:00 AM	53	51	38
23-01-18	8:00 AM	44	46	36
23-01-18	9:00 AM	49	53	38
23-01-18	10:00 AM	45	47	33
23-01-18	11:00 AM	46	50	35
23-01-18	12:00 PM	48	49	37
23-01-18	1:00 PM	58	64	49
23-01-18	2:00 PM	52	55	36
23-01-18	3:00 PM	47	54	34
23-01-18	4:00 PM	54	55	51
23-01-18	5:00 PM	48	52	38

Date	Time	L _{Aeq, 1 hr} dB	L _{A10, 1 hr} dB	L _{A90, 1 hr} dB
23-01-18	6:00 PM	51	50	36
23-01-18	7:00 PM	36	39	30
23-01-18	8:00 PM	50	51	48
23-01-18	9:00 PM	49	50	48
23-01-18	10:00 PM	45	46	44
23-01-18	11:00 PM	48	49	47
24-01-18	12:00 AM	47	48	45
24-01-18	1:00 AM	45	47	42
24-01-18	2:00 AM	46	49	40
24-01-18	3:00 AM	45	48	41
24-01-18	4:00 AM	39	42	32
24-01-18	5:00 AM	42	46	33
24-01-18	6:00 AM	40	43	32
24-01-18	7:00 AM	42	45	32
24-01-18	8:00 AM	44	47	35
24-01-18	9:00 AM	48	50	34
24-01-18	10:00 AM	43	46	33
24-01-18	11:00 AM	45	47	35
24-01-18	12:00 PM	43	46	36
24-01-18	1:00 PM	45	49	35
24-01-18	2:00 PM	56	63	35
24-01-18	3:00 PM	50	51	40
24-01-18	4:00 PM	50	53	43
24-01-18	5:00 PM	44	45	37
24-01-18	6:00 PM	46	47	36
24-01-18	7:00 PM	39	41	31
24-01-18	8:00 PM	49	49	47
24-01-18	9:00 PM	49	49	47
24-01-18	10:00 PM	46	48	45
24-01-18	11:00 PM	46	48	41
25-01-18	12:00 AM	42	44	40
25-01-18	1:00 AM	38	40	31
25-01-18	2:00 AM	39	41	24
25-01-18	3:00 AM	27	32	19
25-01-18	4:00 AM	37	39	20
25-01-18	5:00 AM	46	51	23
25-01-18	6:00 AM	43	46	27
25-01-18	7:00 AM	50	46	30

Date	Time	L _{Aeq} , 1 hr dB	L _{A10} , 1 hr dB	L _{A90} , 1 hr dB
25-01-18	8:00 AM	46	46	30
25-01-18	9:00 AM	39	42	29
25-01-18	10:00 AM	42	44	30
25-01-18	11:00 AM	44	46	38
25-01-18	12:00 PM	43	46	37
25-01-18	1:00 PM	43	44	40
25-01-18	2:00 PM	46	50	40
25-01-18	3:00 PM	48	50	43
25-01-18	4:00 PM	50	50	42
25-01-18	5:00 PM	45	47	38
25-01-18	6:00 PM	44	46	38
25-01-18	7:00 PM	40	41	31
25-01-18	8:00 PM	56	50	47
25-01-18	9:00 PM	47	49	44
25-01-18	10:00 PM	44	46	41
25-01-18	11:00 PM	40	42	34
26-01-18	12:00 AM	43	34	32

737 Crest Hill Road, Mooliabenee

Tuesday 23/01/2018

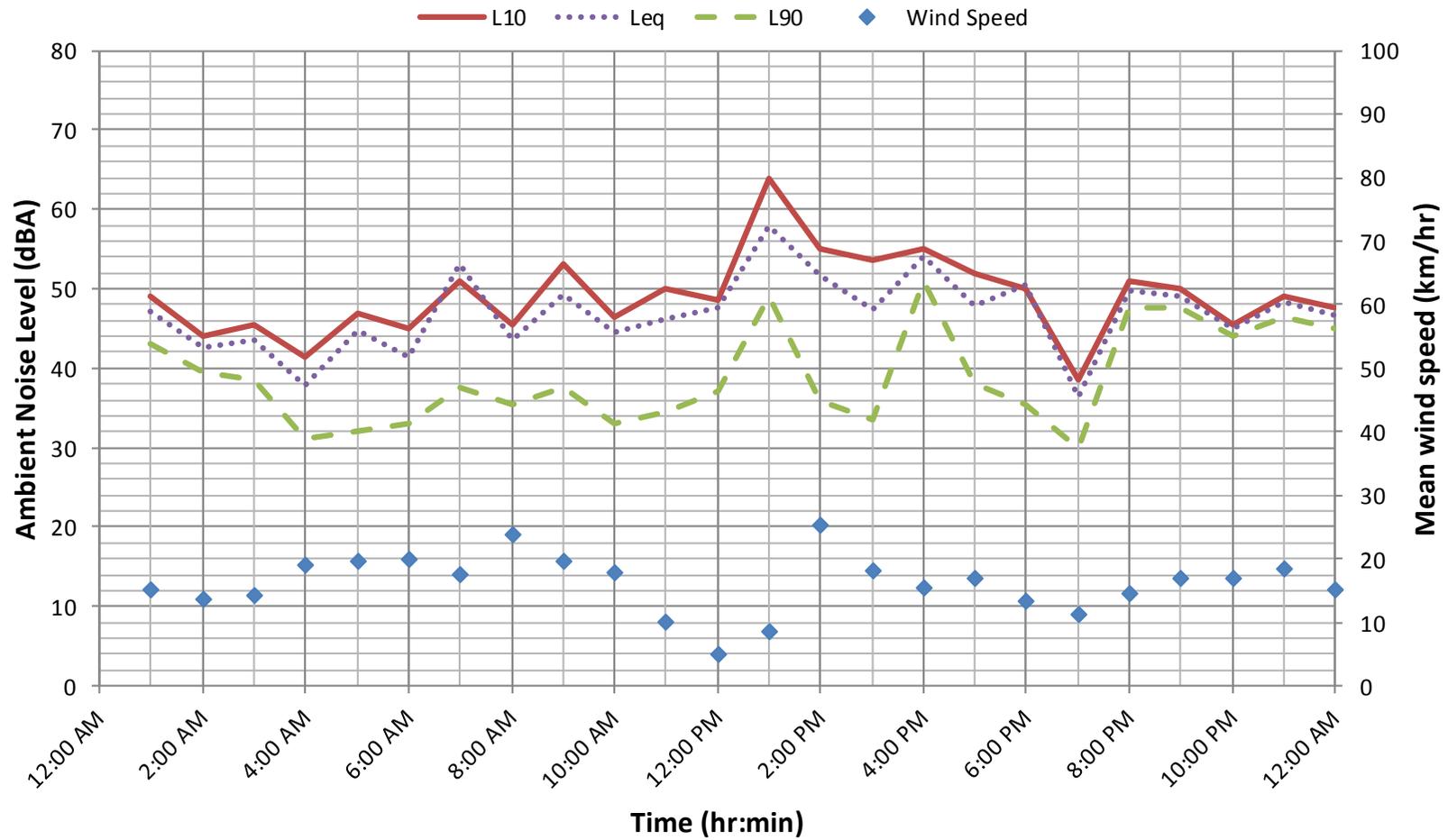


Figure 20: 737 Crest Hill Road, Mooliabenee - 23/01/2018

737 Crest Hill Road, Mooliabenee

Wednesday 24/01/2018

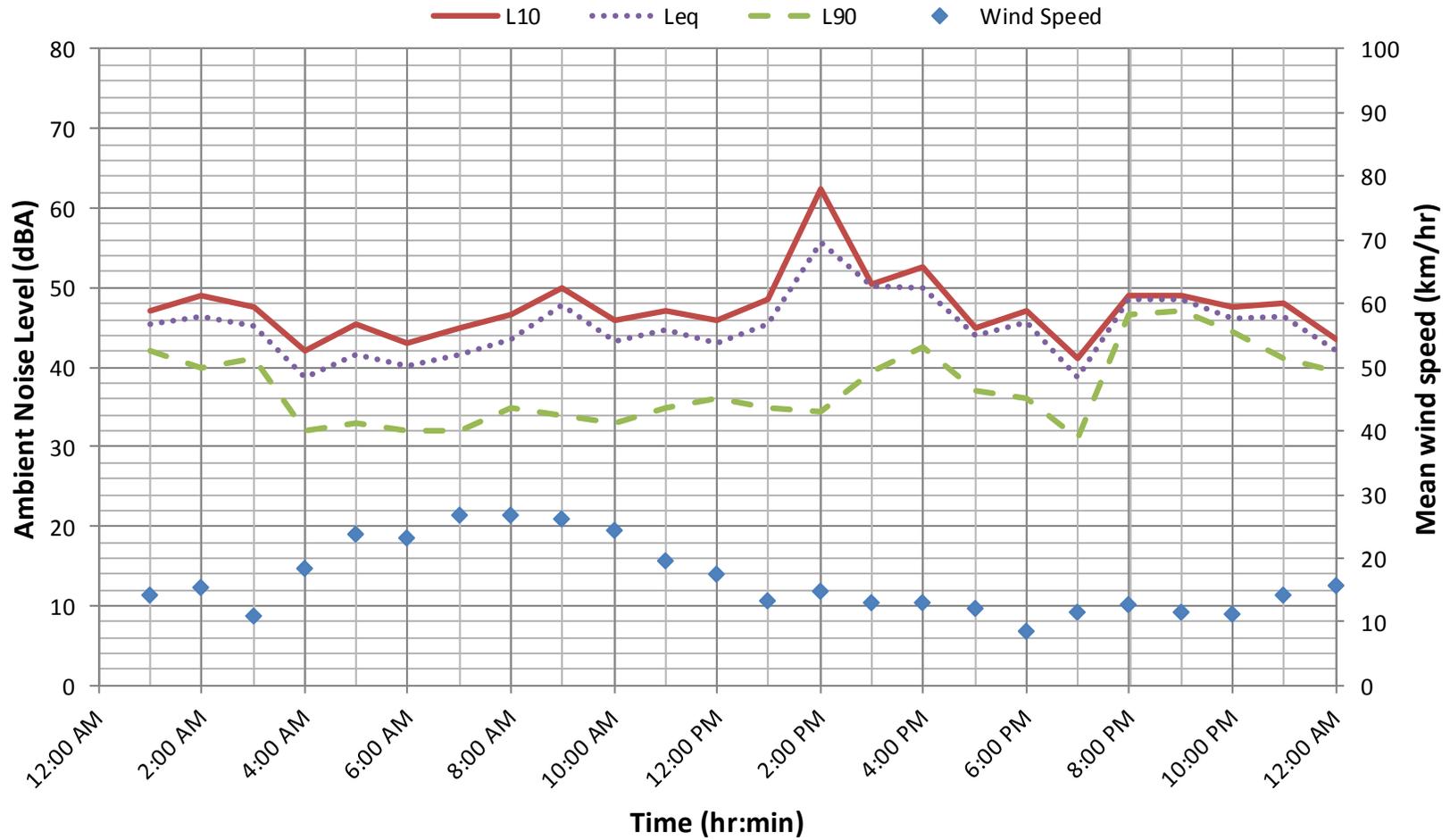


Figure 21: 737 Crest Hill Road, Mooliabenee - 24/01/2018

737 Crest Hill Road, Mooliabeenee

Thursday 25/01/2018

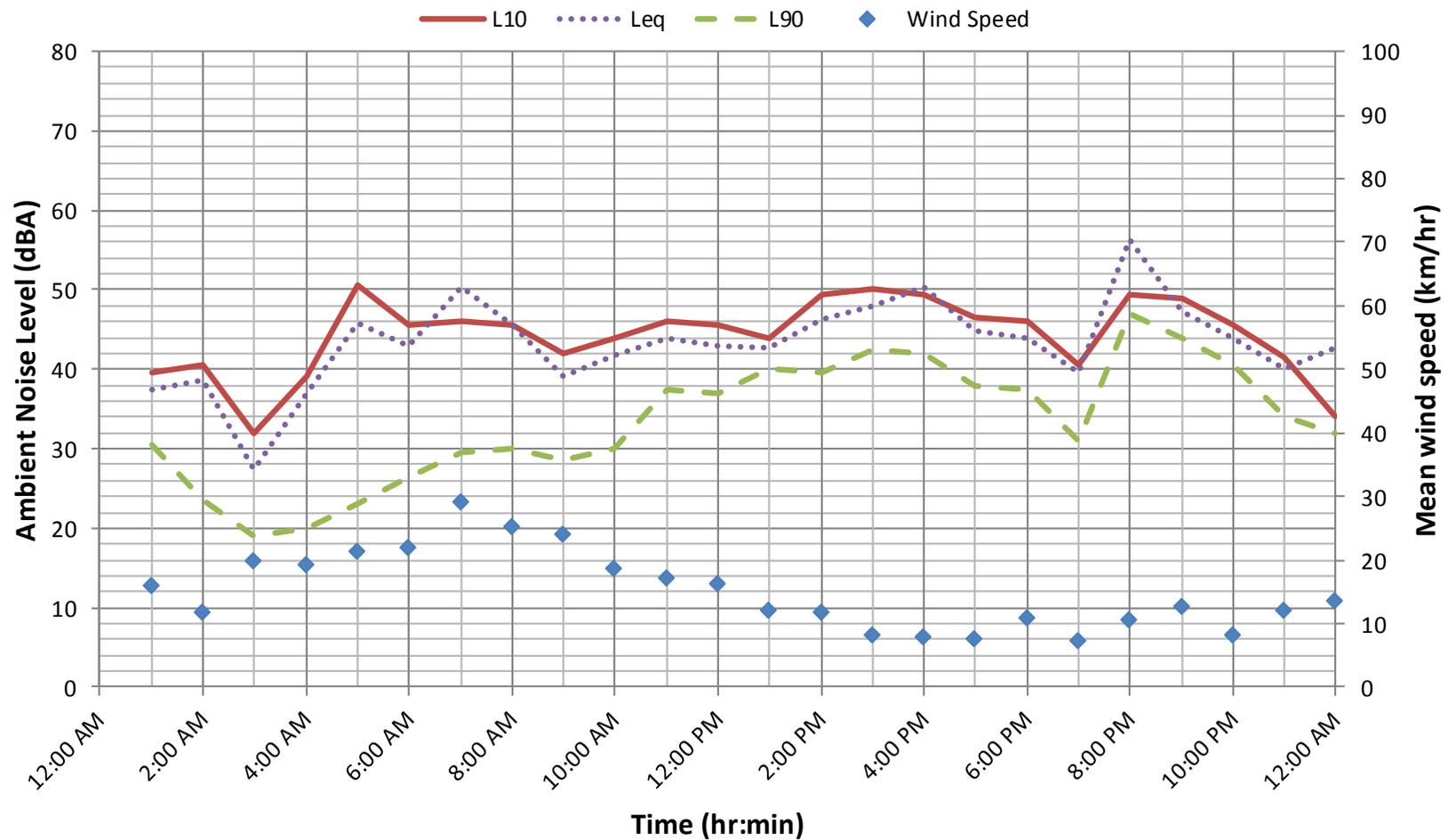


Figure 22: 737 Crest Hill Road, Mooliabeenee - 25/01/2018

B.4.1.4 Location 2.4

Description	Details
Noise Logger	Acoustics Research Laboratory Ngara Noise Logger Serial Number: 87807F
Measurement duration	15 February –1 March 2018
Location	Lot M1364, 16 Cullalla Rd Mooliabeenee
Coordinates (Easting; Northing)	408,112; 6,534,671
Photo	

Date	Time	L _{Aeq} , 1 hr dB	L _{A10} , 1 hr dB	L _{A90} , 1 hr dB
16-02-18	1:00 AM	46	50	40
16-02-18	2:00 AM	51	54	48
16-02-18	3:00 AM	48	50	46
16-02-18	4:00 AM	46	48	42
16-02-18	5:00 AM	42	45	38
16-02-18	6:00 AM	42	44	35
16-02-18	7:00 AM	38	41	31
16-02-18	8:00 AM	44	46	38
16-02-18	9:00 AM	66	70	45
16-02-18	10:00 AM	61	65	42
16-02-18	11:00 AM	67	72	36
16-02-18	12:00 PM	66	72	44
16-02-18	1:00 PM	63	70	41
16-02-18	2:00 PM	58	64	40
16-02-18	3:00 PM	59	65	49
16-02-18	4:00 PM	62	67	44

Date	Time	L _{Aeq} , 1 hr dB	L _{A10} , 1 hr dB	L _{A90} , 1 hr dB
16-02-18	5:00 PM	63	68	38
16-02-18	6:00 PM	38	40	28
16-02-18	7:00 PM	42	39	24
16-02-18	8:00 PM	46	48	41
16-02-18	9:00 PM	46	48	41
16-02-18	10:00 PM	41	43	36
16-02-18	11:00 PM	37	40	32
17-02-18	12:00 AM	40	43	33
21-02-18	1:00 AM	48	51	41
21-02-18	2:00 AM	49	52	43
21-02-18	3:00 AM	48	51	43
21-02-18	4:00 AM	48	50	43
21-02-18	5:00 AM	44	47	40
21-02-18	6:00 AM	41	45	36
21-02-18	7:00 AM	46	45	38
21-02-18	8:00 AM	45	47	40
21-02-18	9:00 AM	43	45	37
21-02-18	10:00 AM	42	45	36
21-02-18	11:00 AM	43	46	34
21-02-18	12:00 PM	50	54	38
21-02-18	1:00 PM	48	53	30
21-02-18	2:00 PM	50	53	34
21-02-18	3:00 PM	63	70	46
21-02-18	4:00 PM	54	56	50
21-02-18	5:00 PM	56	59	47
21-02-18	6:00 PM	56	60	42
21-02-18	7:00 PM	43	46	37
21-02-18	8:00 PM	43	47	33
21-02-18	9:00 PM	38	42	30
21-02-18	10:00 PM	31	33	27
21-02-18	11:00 PM	27	29	21
22-02-18	12:00 AM	28	25	20
28-02-18	1:00 AM	23	24	20
28-02-18	2:00 AM	23	24	20
28-02-18	3:00 AM	33	36	25
28-02-18	4:00 AM	37	39	31
28-02-18	5:00 AM	37	40	33
28-02-18	6:00 AM	42	45	36

Date	Time	L _{Aeq} , 1 hr dB	L _{A10} , 1 hr dB	L _{A90} , 1 hr dB
28-02-18	7:00 AM	44	46	38
28-02-18	8:00 AM	46	48	41
28-02-18	9:00 AM	47	50	41
28-02-18	10:00 AM	45	47	40
28-02-18	11:00 AM	43	46	38
28-02-18	12:00 PM	46	50	37
28-02-18	1:00 PM	51	53	45
28-02-18	2:00 PM	45	50	33
28-02-18	3:00 PM	51	54	41
28-02-18	4:00 PM	50	53	44
28-02-18	5:00 PM	50	52	45
28-02-18	6:00 PM	50	53	43
28-02-18	7:00 PM	41	38	27
28-02-18	8:00 PM	45	48	41
28-02-18	9:00 PM	41	44	34
28-02-18	10:00 PM	35	38	26
28-02-18	11:00 PM	36	40	23
01-03-18	12:00 AM	33	38	23

16 Cullalla Road, Mooliabenee

Friday 16/02/2018

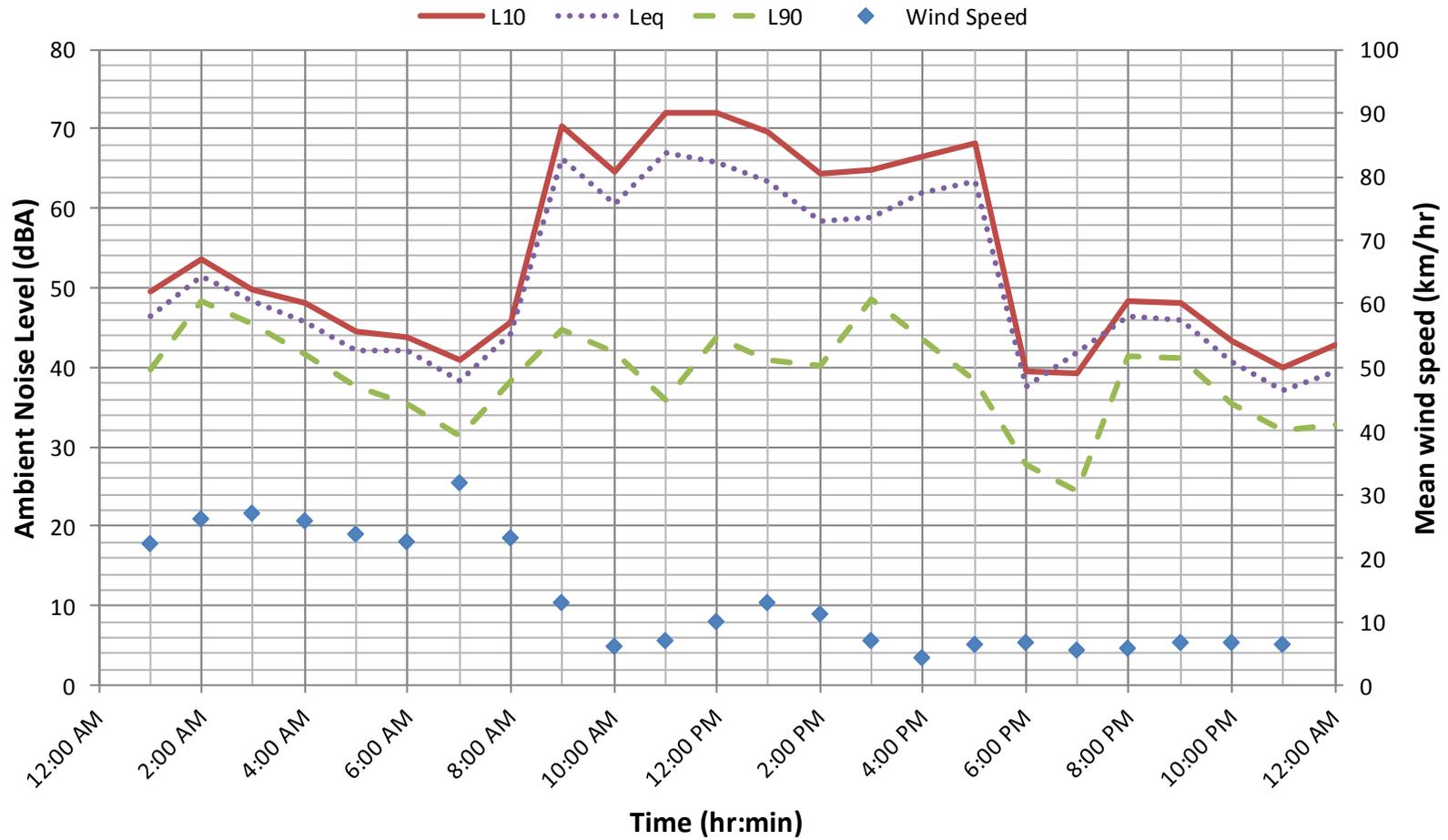


Figure 23: 16 Cullalla Road, Mooliabenee - 16/02/2018

16 Cullalla Road, Mooliabeenee

Wednesday 21/02/2018

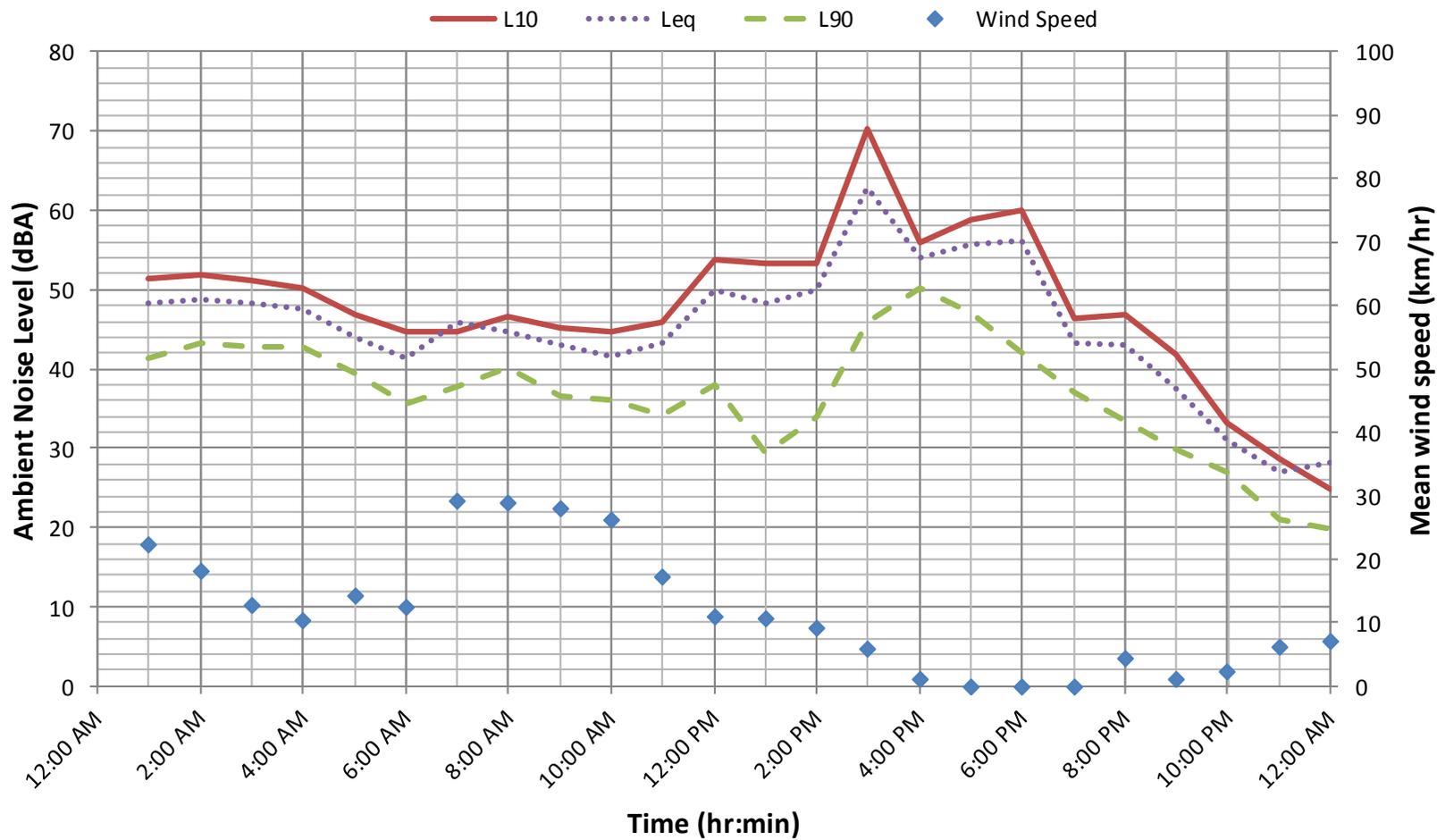


Figure 24: 16 Cullalla Road, Mooliabeenee – 21/02/2018

16 Cullalla Road, Mooliabeenee

Wednesday 28/02/2018

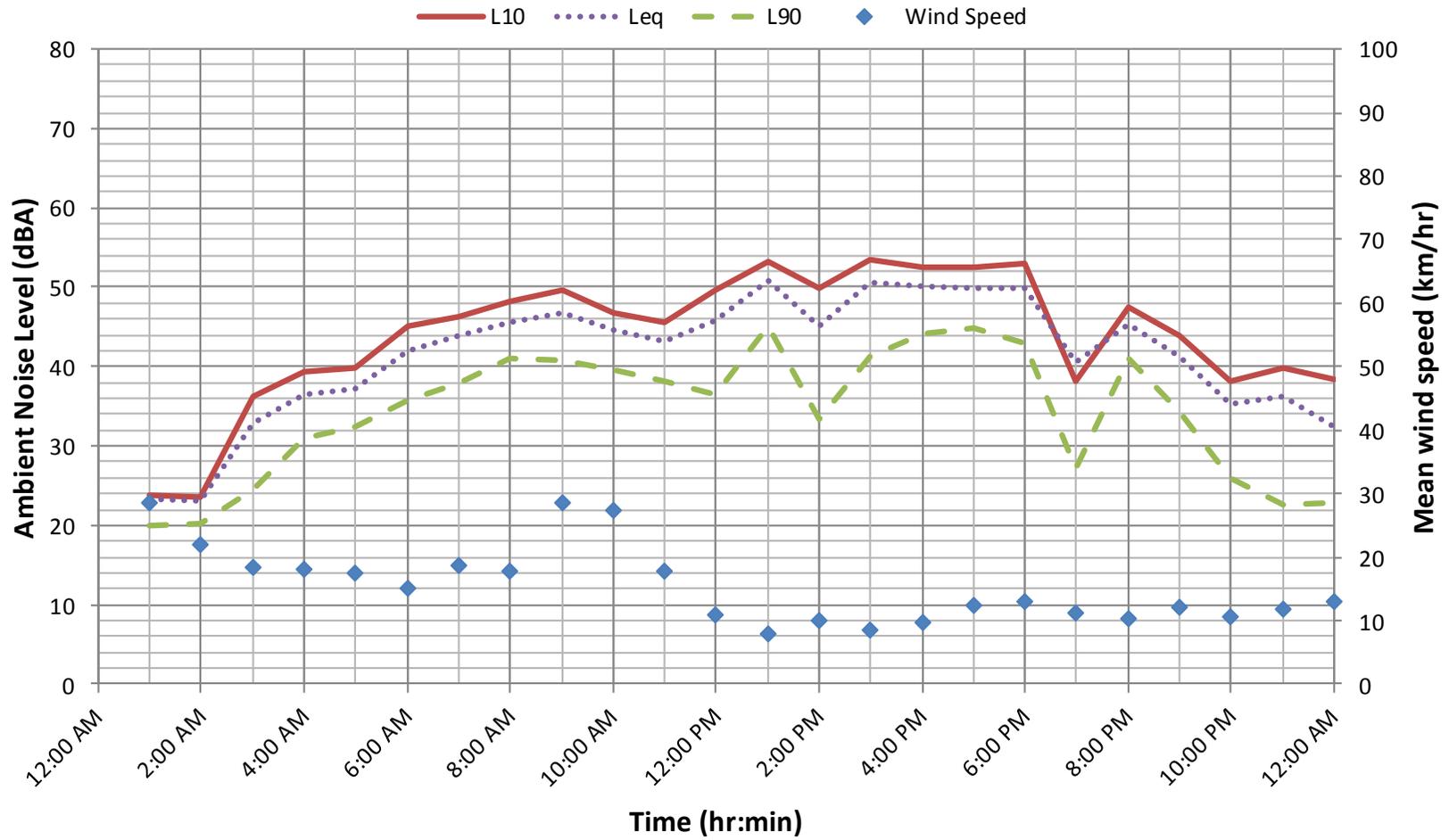


Figure 25: 16 Cullalla Road, Mooliabeenee – 28/02/2018

B.4.1.5 Location 2.5

Description	Details
Noise Logger	Acoustics Research Laboratory Ngara Noise Logger Serial Number: 878060
Measurement duration	22 January - 1 February 2018
Location	Lot 1, 428 Gingilling Rd Mooliabeenee
Coordinates (Easting; Northing)	408,746; 6,542,385 -31.250 116.040
Photo	

Date	Time	L _{Aeq} , 1 hr dB	L _{A10} , 1 hr dB	L _{A90} , 1 hr dB
23-01-18	1:00 AM	47	48	44
23-01-18	2:00 AM	46	48	43
23-01-18	3:00 AM	44	46	38
23-01-18	4:00 AM	41	44	34
23-01-18	5:00 AM	39	42	30
23-01-18	6:00 AM	47	49	38
23-01-18	7:00 AM	46	49	36
23-01-18	8:00 AM	49	51	41
23-01-18	9:00 AM	55	59	38
23-01-18	10:00 AM	51	53	34
23-01-18	11:00 AM	43	44	32
23-01-18	12:00 PM	43	43	33
23-01-18	1:00 PM	40	42	34
23-01-18	2:00 PM	43	45	37
23-01-18	3:00 PM	43	45	39

Date	Time	L _{Aeq} , 1 hr dB	L _{A10} , 1 hr dB	L _{A90} , 1 hr dB
23-01-18	4:00 PM	44	46	38
23-01-18	5:00 PM	47	46	39
23-01-18	6:00 PM	43	45	37
23-01-18	7:00 PM	44	45	41
23-01-18	8:00 PM	47	49	42
23-01-18	9:00 PM	50	51	47
23-01-18	10:00 PM	48	49	45
23-01-18	11:00 PM	48	52	44
24-01-18	12:00 AM	47	49	44
24-01-18	1:00 AM	46	48	43
24-01-18	2:00 AM	46	49	42
24-01-18	3:00 AM	43	46	37
24-01-18	4:00 AM	39	43	31
24-01-18	5:00 AM	42	44	36
24-01-18	6:00 AM	42	45	35
24-01-18	7:00 AM	49	52	37
24-01-18	8:00 AM	50	52	39
24-01-18	9:00 AM	50	52	35
24-01-18	10:00 AM	45	46	33
24-01-18	11:00 AM	50	52	33
24-01-18	12:00 PM	42	44	31
24-01-18	1:00 PM	42	44	34
24-01-18	2:00 PM	42	44	37
24-01-18	3:00 PM	45	46	36
24-01-18	4:00 PM	47	49	41
24-01-18	5:00 PM	49	49	40
24-01-18	6:00 PM	42	44	36
24-01-18	7:00 PM	38	41	34
24-01-18	8:00 PM	48	50	40
24-01-18	9:00 PM	48	50	47
24-01-18	10:00 PM	46	48	43
24-01-18	11:00 PM	43	43	41
25-01-18	12:00 AM	41	43	38
25-01-18	1:00 AM	40	43	34
25-01-18	2:00 AM	38	42	27
25-01-18	3:00 AM	32	37	23
25-01-18	4:00 AM	27	30	21
25-01-18	5:00 AM	30	30	22

Date	Time	L _{Aeq} , 1 hr dB	L _{A10} , 1 hr dB	L _{A90} , 1 hr dB
25-01-18	6:00 AM	46	44	33
25-01-18	7:00 AM	48	50	32
25-01-18	8:00 AM	50	50	40
25-01-18	9:00 AM	43	43	30
25-01-18	10:00 AM	42	41	29
25-01-18	11:00 AM	37	40	30
25-01-18	12:00 PM	39	41	31
25-01-18	1:00 PM	37	41	31
25-01-18	2:00 PM	45	47	35
25-01-18	3:00 PM	45	48	40
25-01-18	4:00 PM	48	50	42
25-01-18	5:00 PM	46	49	39
25-01-18	6:00 PM	44	47	36
25-01-18	7:00 PM	42	44	37
25-01-18	8:00 PM	46	48	40
25-01-18	9:00 PM	45	46	42
25-01-18	10:00 PM	42	43	40
25-01-18	11:00 PM	37	39	33
26-01-18	12:00 AM	32	34	26

428 Gingilling Road, Wannamal

Tuesday 23/01/2018

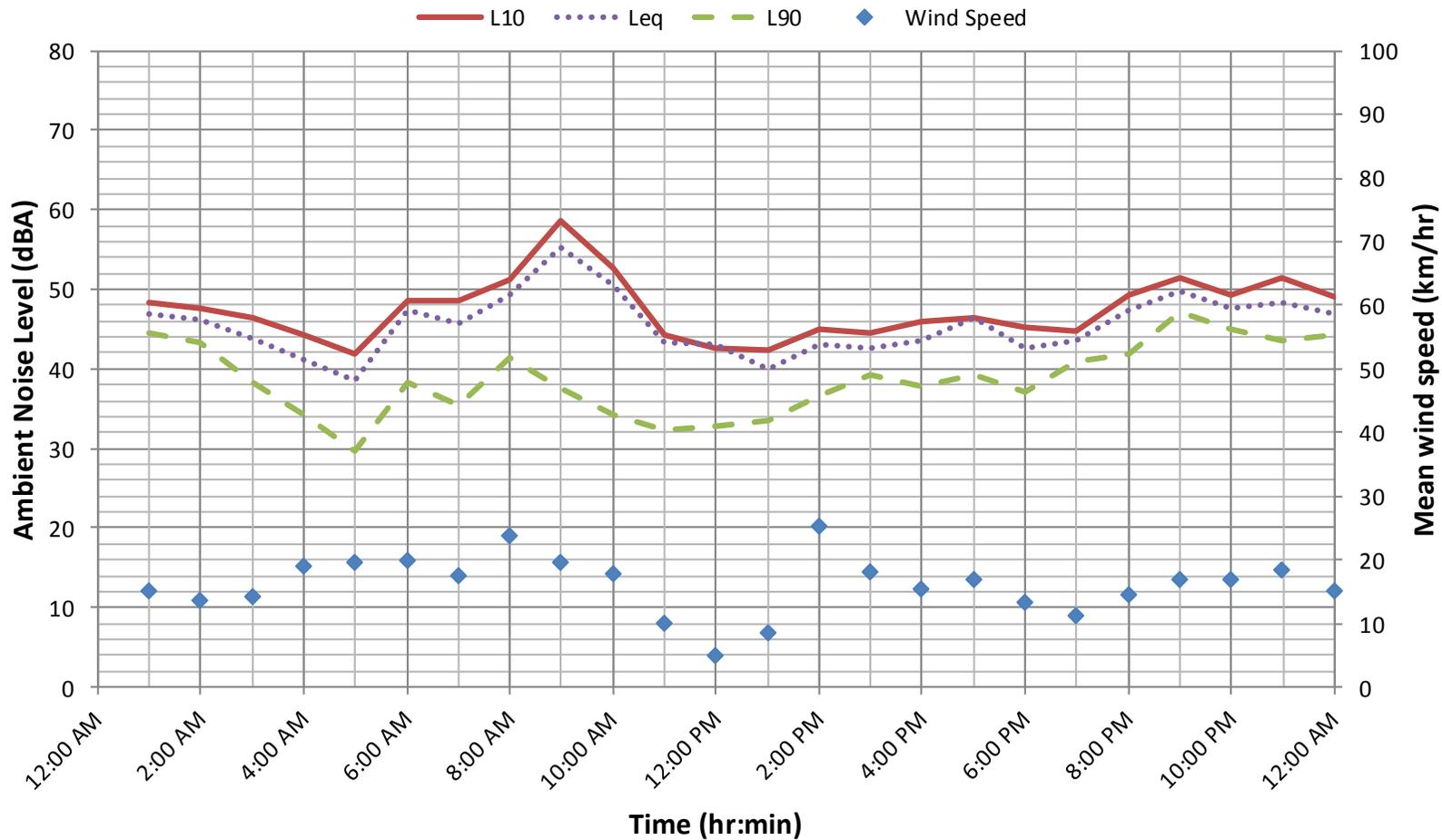


Figure 26: 428 Gingilling Road, Wannamal – 23/01/2018

428 Gingilling Road, Wannamal

Wednesday 24/01/2018

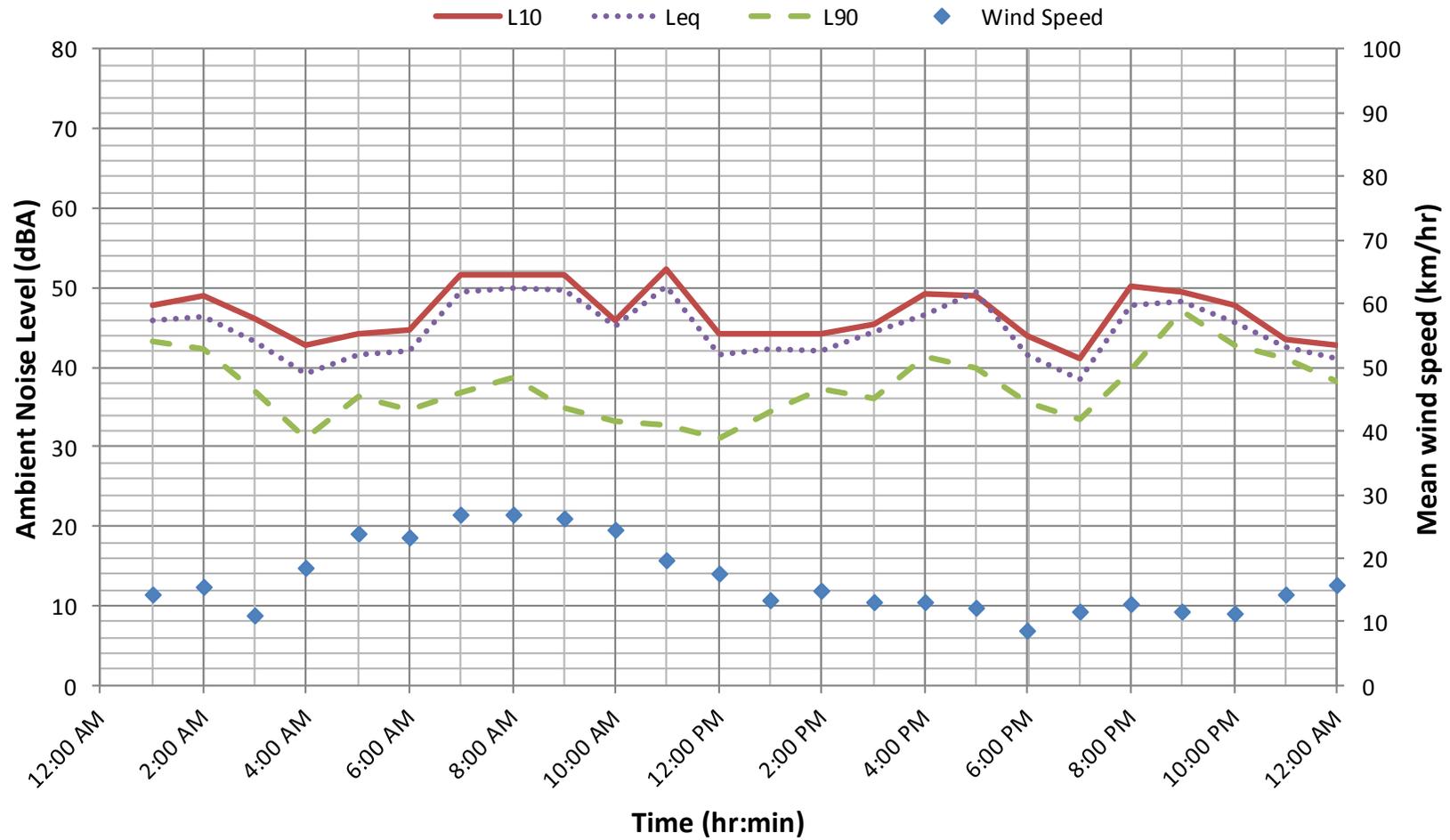


Figure 27: 428 Gingilling Road, Wannamal – 24/01/2018

428 Gingilling Road, Wannamal

Thursday 25/01/2018

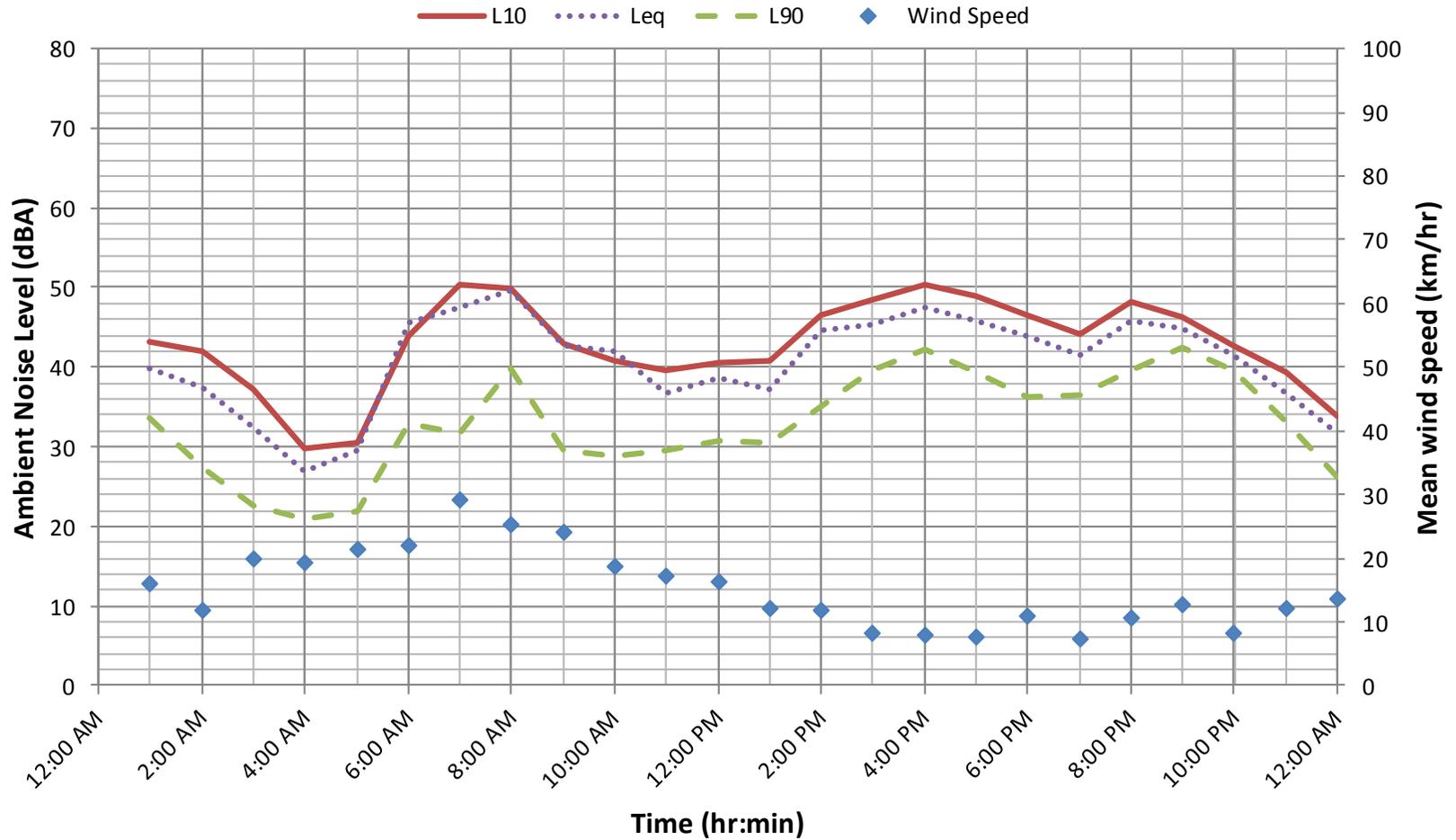


Figure 28: 428 Gingilling Road, Wannamal – 25/01/2018

B.4.1.6 Location 2.6

Description	Details
Noise Logger	Acoustics Research Laboratory Ngara Noise Logger Serial Number: 878060
Measurement duration	19 February –1 March 2018
Location	Lot 53, 644 Gingilling Rd Wannamal
Coordinates (Easting; Northing)	408,423; 6,545,373
Photo	

Date	Time	L _{Aeq} , 1 hr dB	L _{A10} , 1 hr dB	L _{A90} , 1 hr dB
21-02-18	1:00 AM	44	46	37
21-02-18	2:00 AM	42	44	37
21-02-18	3:00 AM	42	44	38
21-02-18	4:00 AM	39	41	35
21-02-18	5:00 AM	39	42	35
21-02-18	6:00 AM	40	42	33
21-02-18	7:00 AM	41	41	32
21-02-18	8:00 AM	43	46	36
21-02-18	9:00 AM	42	44	36
21-02-18	10:00 AM	45	46	35
21-02-18	11:00 AM	42	44	34
21-02-18	12:00 PM	43	42	33
21-02-18	1:00 PM	43	44	34
21-02-18	2:00 PM	43	44	41
21-02-18	3:00 PM	41	43	34
21-02-18	4:00 PM	40	38	34

Date	Time	L _{Aeq, 1 hr} dB	L _{A10, 1 hr} dB	L _{A90, 1 hr} dB
21-02-18	5:00 PM	43	41	34
21-02-18	6:00 PM	43	43	35
21-02-18	7:00 PM	60	43	37
21-02-18	8:00 PM	36	39	33
21-02-18	9:00 PM	34	37	30
21-02-18	10:00 PM	31	33	29
21-02-18	11:00 PM	32	33	29
22-02-18	12:00 AM	32	32	28
22-02-18	1:00 AM	31	33	28
22-02-18	2:00 AM	32	36	27
22-02-18	3:00 AM	29	29	26
22-02-18	4:00 AM	30	29	25
22-02-18	5:00 AM	27	28	25
22-02-18	6:00 AM	35	37	26
22-02-18	7:00 AM	42	44	31
22-02-18	8:00 AM	41	42	29
22-02-18	9:00 AM	43	44	31
22-02-18	10:00 AM	43	46	35
22-02-18	11:00 AM	44	46	35
22-02-18	12:00 PM	43	44	35
22-02-18	1:00 PM	48	47	36
22-02-18	2:00 PM	50	52	38
22-02-18	3:00 PM	51	52	43
22-02-18	4:00 PM	50	51	40
22-02-18	5:00 PM	47	49	40
22-02-18	6:00 PM	46	45	36
22-02-18	7:00 PM	39	41	33
22-02-18	8:00 PM	35	37	31
22-02-18	9:00 PM	34	38	28
22-02-18	10:00 PM	32	34	27
22-02-18	11:00 PM	32	34	26
23-02-18	12:00 AM	38	32	23
27-02-18	1:00 AM	37	41	22
27-02-18	2:00 AM	36	37	27
27-02-18	3:00 AM	26	28	22
27-02-18	4:00 AM	25	28	21
27-02-18	5:00 AM	30	29	22
27-02-18	6:00 AM	38	37	23

Date	Time	L _{Aeq} , 1 hr dB	L _{A10} , 1 hr dB	L _{A90} , 1 hr dB
27-02-18	7:00 AM	40	43	28
27-02-18	8:00 AM	37	39	28
27-02-18	9:00 AM	39	42	31
27-02-18	10:00 AM	54	48	34
27-02-18	11:00 AM	53	44	30
27-02-18	12:00 PM	40	42	29
27-02-18	1:00 PM	42	43	31
27-02-18	2:00 PM	38	40	32
27-02-18	3:00 PM	38	40	33
27-02-18	4:00 PM	41	40	32
27-02-18	5:00 PM	41	43	33
27-02-18	6:00 PM	45	44	36
27-02-18	7:00 PM	40	39	30
27-02-18	8:00 PM	34	36	27
27-02-18	9:00 PM	30	33	25
27-02-18	10:00 PM	32	32	24
27-02-18	11:00 PM	27	28	23
28-02-18	12:00 AM	26	27	23

644 Gingilling Road, Mooliabeenee

Wednesday 21/02/2018

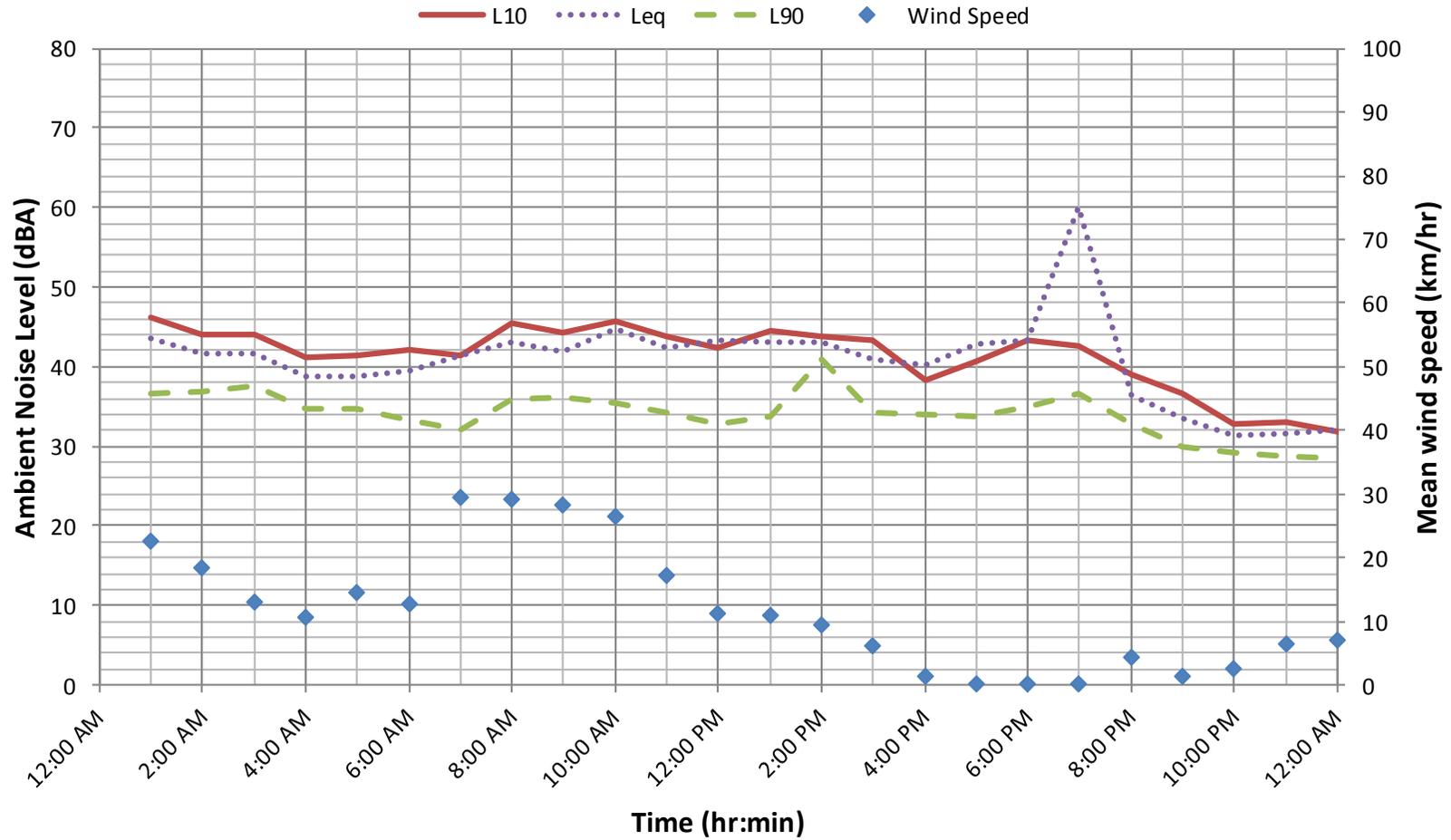


Figure 29: 644 Gingilling Road, Mooliabeenee - 21/02/2018

644 Gingilling Road, Mooliabeenee

Thursday 22/02/2018

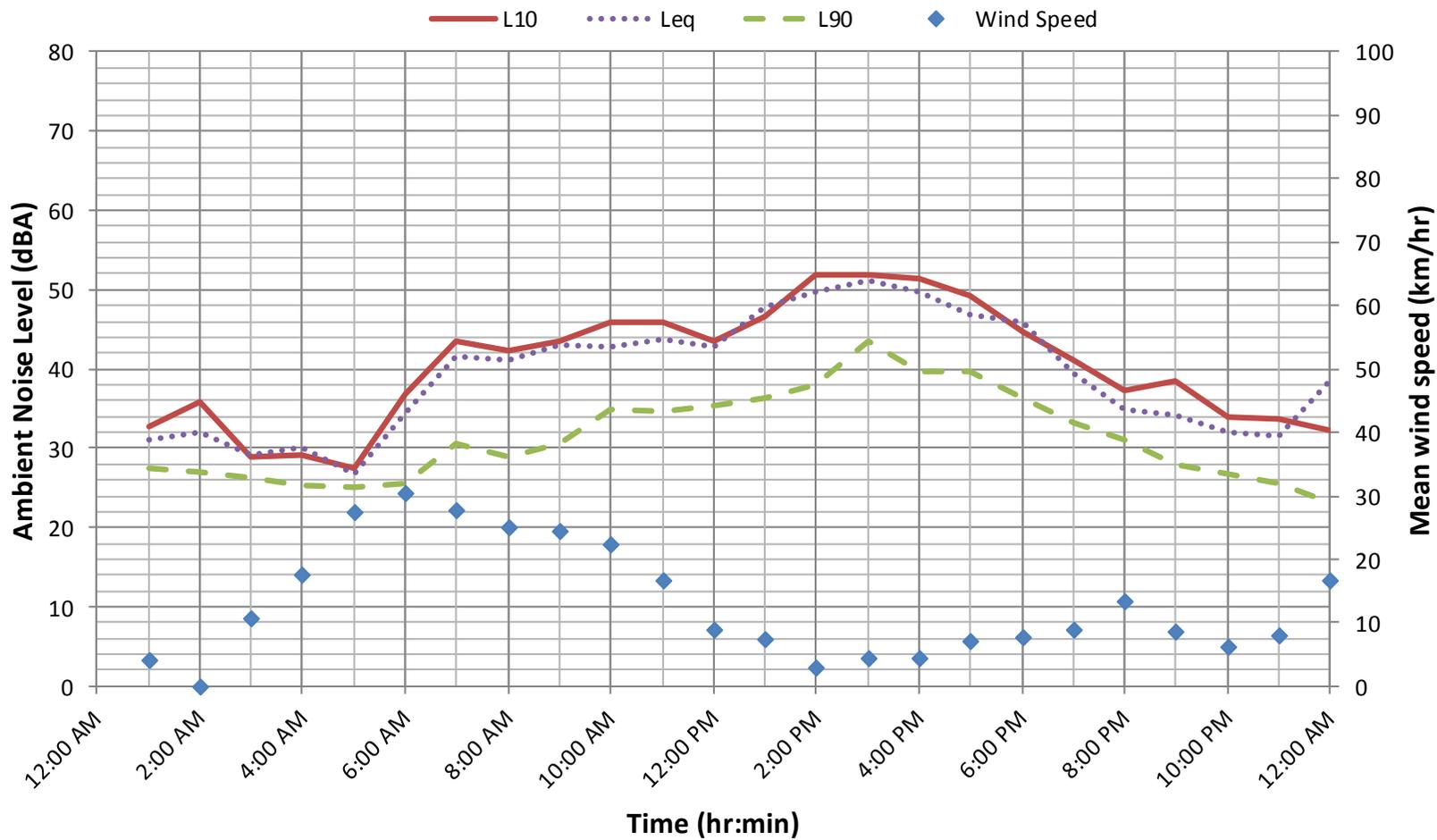


Figure 30: 644 Gingilling Road, Mooliabeenee - 22/02/2018

644 Gingilling Road, Mooliabenee

Tuesday 27/02/18

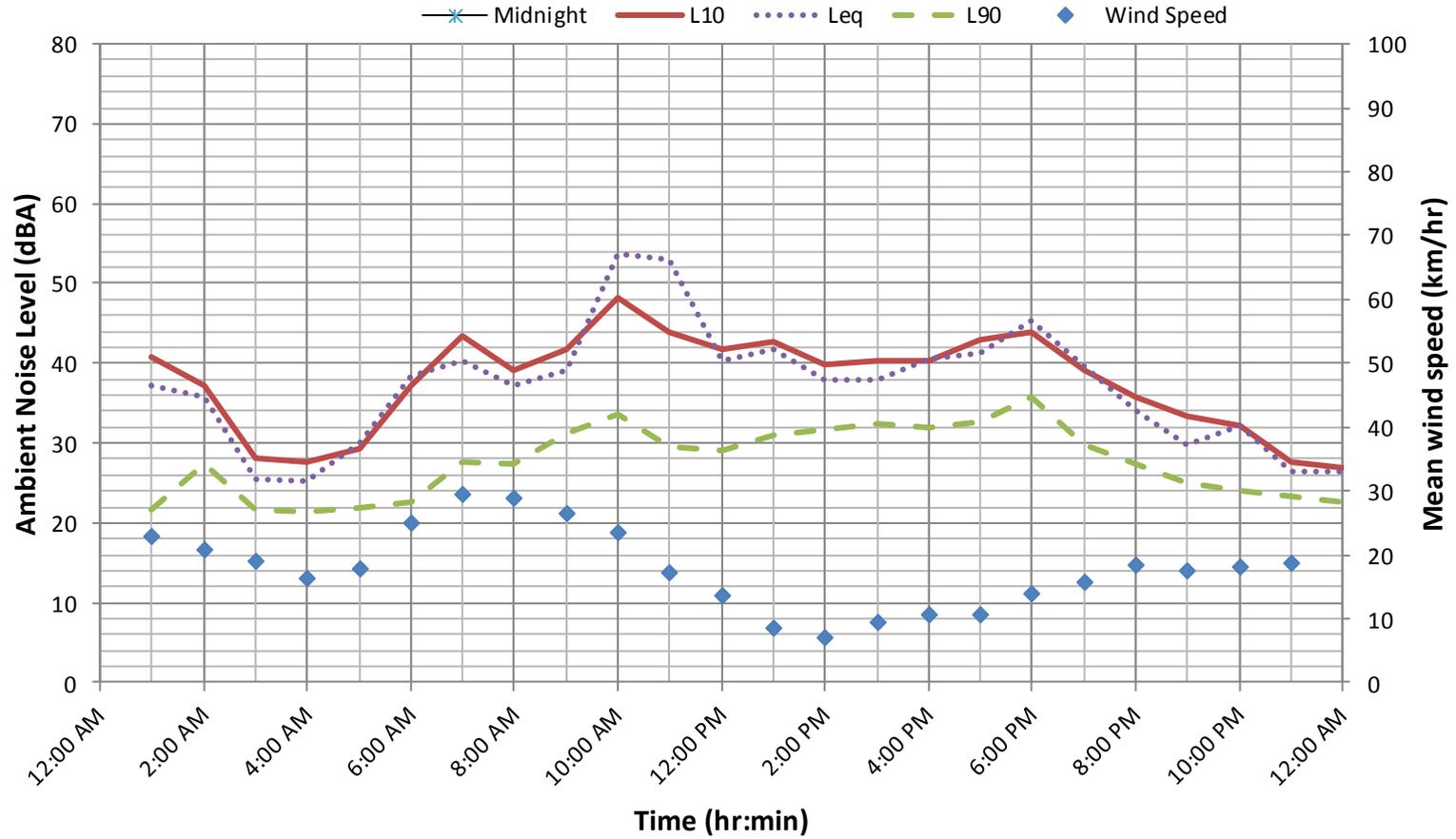


Figure 31: 644 Gingilling Road, Mooliabenee - 27/02/2018

B.4.1.7 Location 2.7

Description	Details
Noise Logger	Acoustics Research Laboratory Ngara Noise Logger Serial Number: 878061
Measurement duration	5 – 15 February 2018
Location	Lot 1, 2261 Bindoon-Moora Rd Wannamal
Coordinates (Easting; Northing)	411,436; 6,548,696
Photo	

Date	Time	L _{Aeq} , 1 hr dB	L _{A10} , 1 hr dB	L _{A90} , 1 hr dB
08-02-18	1:00 AM	35	29	21
08-02-18	2:00 AM	37	29	21
08-02-18	3:00 AM	35	29	24
08-02-18	4:00 AM	27	30	24
08-02-18	5:00 AM	44	38	26
08-02-18	6:00 AM	45	48	26
08-02-18	7:00 AM	50	54	35
08-02-18	8:00 AM	50	53	36
08-02-18	9:00 AM	50	53	40
08-02-18	10:00 AM	54	56	39
08-02-18	11:00 AM	58	57	37
08-02-18	12:00 PM	48	50	34
08-02-18	1:00 PM	46	48	29
08-02-18	2:00 PM	45	47	26
08-02-18	3:00 PM	43	45	26

Date	Time	L _{Aeq} , 1 hr dB	L _{A10} , 1 hr dB	L _{A90} , 1 hr dB
08-02-18	4:00 PM	46	45	24
08-02-18	5:00 PM	44	44	24
08-02-18	6:00 PM	46	49	24
08-02-18	7:00 PM	47	50	26
08-02-18	8:00 PM	39	39	25
08-02-18	9:00 PM	39	37	22
08-02-18	10:00 PM	42	34	21
08-02-18	11:00 PM	39	31	21
09-02-18	12:00 AM	28	24	20
12-02-18	1:00 AM	39	24	20
12-02-18	2:00 AM	34	30	21
12-02-18	3:00 AM	35	36	28
12-02-18	4:00 AM	37	39	30
12-02-18	5:00 AM	45	43	31
12-02-18	6:00 AM	51	51	29
12-02-18	7:00 AM	50	53	31
12-02-18	8:00 AM	52	54	35
12-02-18	9:00 AM	53	53	31
12-02-18	10:00 AM	48	51	28
12-02-18	11:00 AM	46	47	27
12-02-18	12:00 PM	45	46	25
12-02-18	1:00 PM	43	45	26
12-02-18	2:00 PM	44	46	24
12-02-18	3:00 PM	42	45	25
12-02-18	4:00 PM	43	45	28
12-02-18	5:00 PM	46	47	36
12-02-18	6:00 PM	45	45	35
12-02-18	7:00 PM	42	45	28
12-02-18	8:00 PM	40	41	25
12-02-18	9:00 PM	48	53	24
12-02-18	10:00 PM	41	44	20
12-02-18	11:00 PM	42	37	20
13-02-18	12:00 AM	37	28	20
14-02-18	1:00 AM	33	22	19
14-02-18	2:00 AM	31	21	19
14-02-18	3:00 AM	36	23	19
14-02-18	4:00 AM	31	25	20
14-02-18	5:00 AM	40	37	27

Date	Time	L _{Aeq} , 1 hr dB	L _{A10} , 1 hr dB	L _{A90} , 1 hr dB
14-02-18	6:00 AM	45	44	29
14-02-18	7:00 AM	52	50	31
14-02-18	8:00 AM	51	54	37
14-02-18	9:00 AM	51	54	39
14-02-18	10:00 AM	49	52	36
14-02-18	11:00 AM	49	50	35
14-02-18	12:00 PM	49	49	40
14-02-18	1:00 PM	51	51	41
14-02-18	2:00 PM	51	51	49
14-02-18	3:00 PM	52	52	49
14-02-18	4:00 PM	52	52	49
14-02-18	5:00 PM	51	52	49
14-02-18	6:00 PM	51	51	49
14-02-18	7:00 PM	51	51	49
14-02-18	8:00 PM	50	50	48
14-02-18	9:00 PM	50	51	49
14-02-18	10:00 PM	51	51	49
14-02-18	11:00 PM	49	51	30
15-02-18	12:00 AM	34	35	20

2261 Bindoon-Moora Road, Wannamal

Thursday 08/02/2018

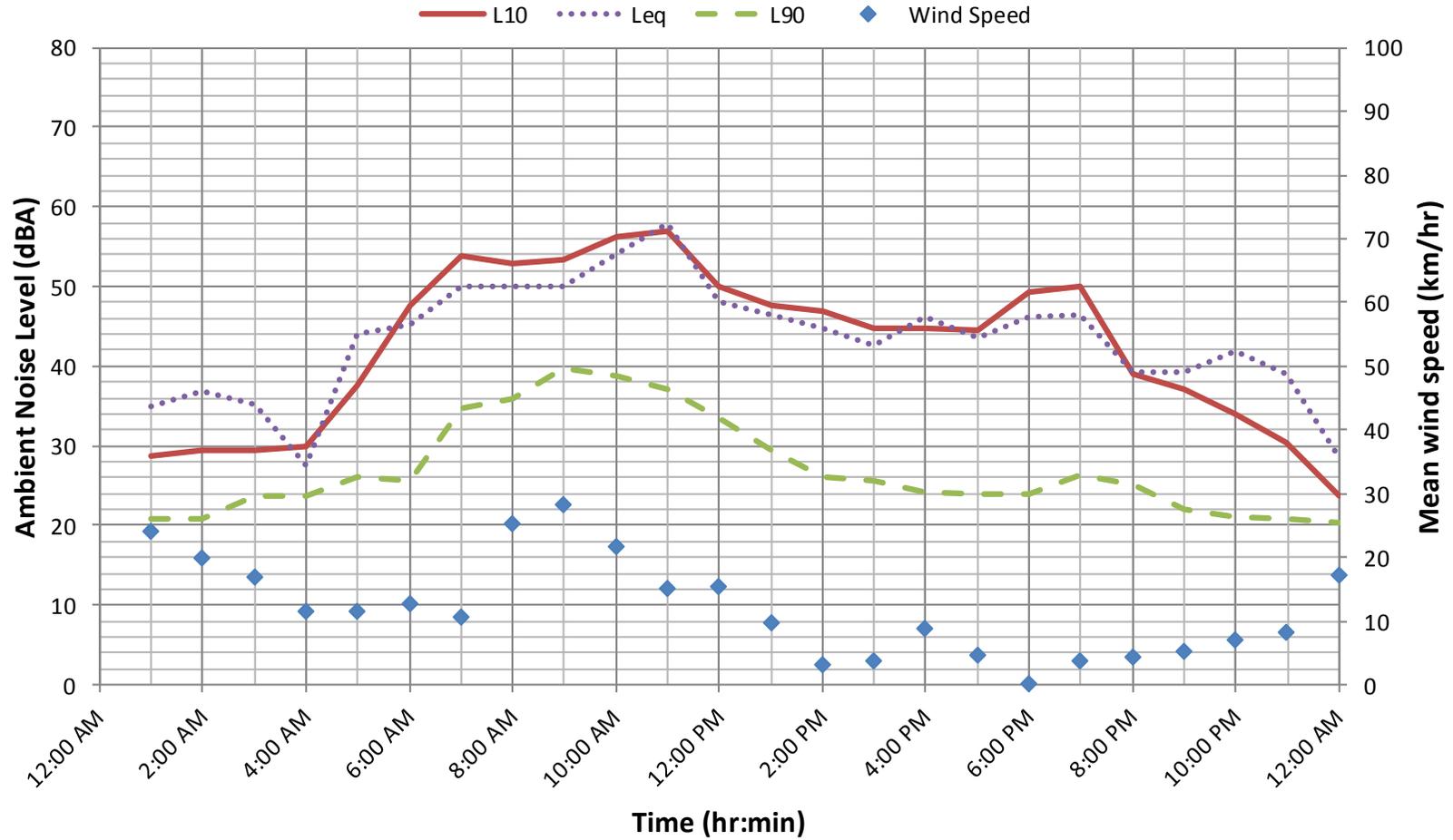


Figure 32: 2261 Bindoon-Moora Road, Wannamal – 08/02/2018

2261 Bindoon-Moora Road, Wannamal

Monday 12/02/2018

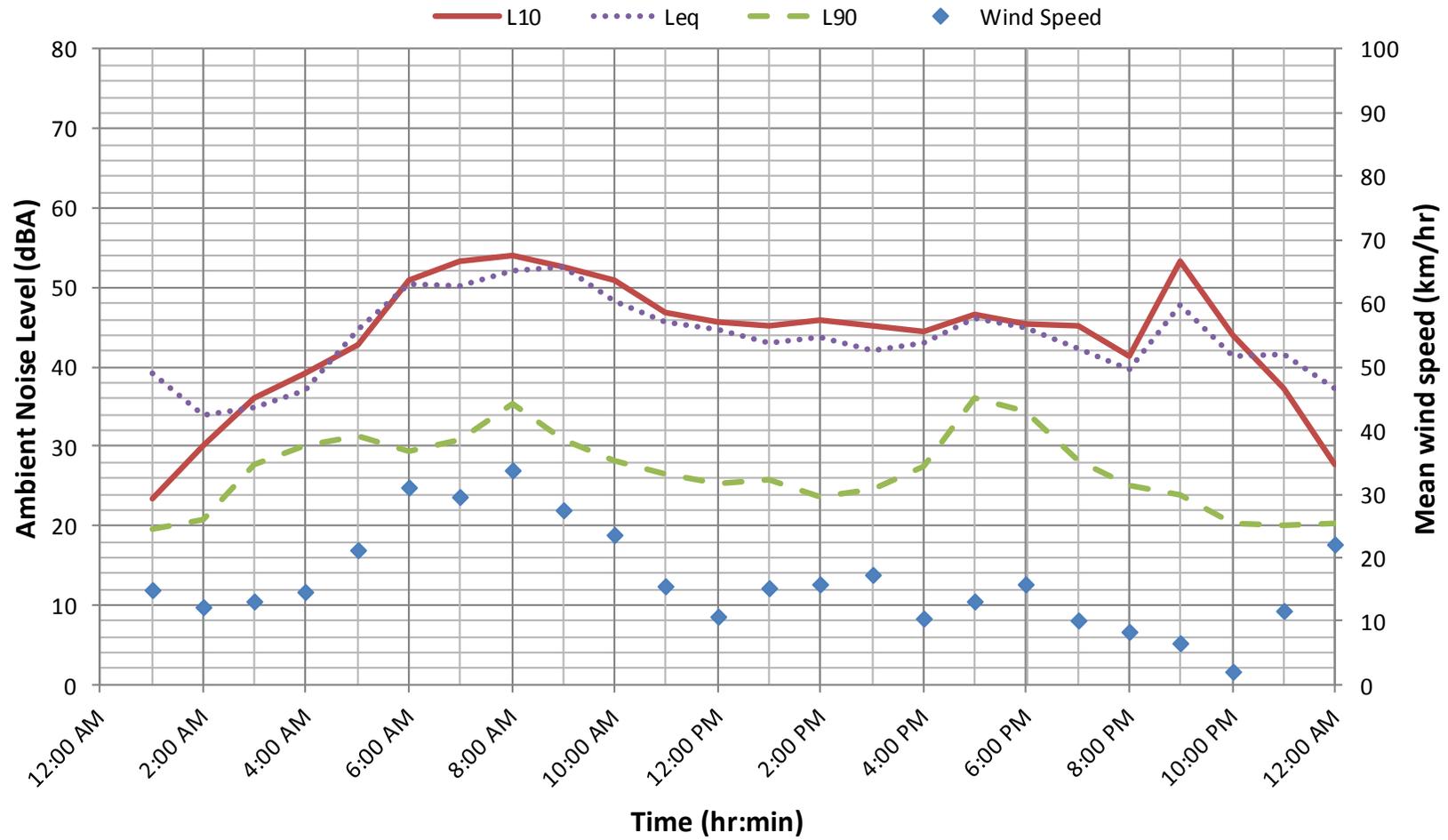


Figure 33: 2261 Bindoon-Moora Road, Wannamal – 12/02/2018

2261 Bindoon-Moora Road, Wannamal

Wednesday 14/02/2018

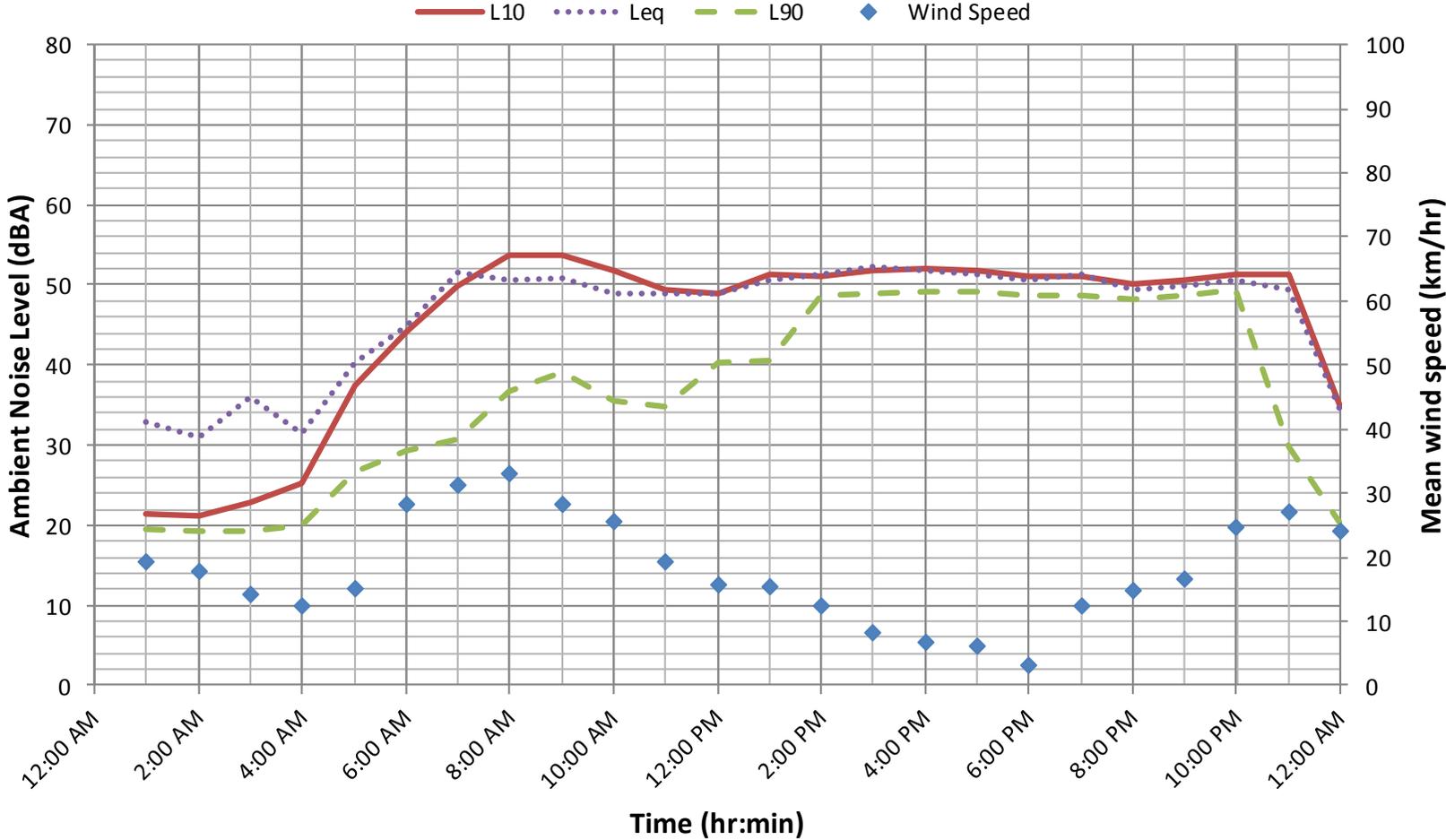


Figure 34: 2261 Bindoon-Moora Road, Wannamal - 14/02/2018

B.4.1.8 Location 2.8

Description	Details
Noise Logger	Acoustics Research Laboratory Ngara Noise Logger Serial Number: 878060
Measurement duration	5 – 15 February 2018
Location	Lot 3, 2087 Bindoon-Moora Rd Wannamal
Coordinates (Easting; Northing)	412,629; 6,547,240
Photo	

Date	Time	L _{Aeq, 1 hr} dB	L _{A10, 1 hr} dB	L _{A90, 1 hr} dB
08-02-18	1:00 AM	33	36	25
08-02-18	2:00 AM	33	37	24
08-02-18	3:00 AM	33	37	26
08-02-18	4:00 AM	32	35	25
08-02-18	5:00 AM	36	38	26
08-02-18	6:00 AM	51	50	31
08-02-18	7:00 AM	48	49	33
08-02-18	8:00 AM	57	60	42
08-02-18	9:00 AM	53	56	39
08-02-18	10:00 AM	72	53	38
08-02-18	11:00 AM	67	49	37
08-02-18	12:00 PM	46	48	36
08-02-18	1:00 PM	61	46	32
08-02-18	2:00 PM	46	42	28
08-02-18	3:00 PM	39	40	27
08-02-18	4:00 PM	70	57	27
08-02-18	5:00 PM	50	45	26
08-02-18	6:00 PM	49	45	29
08-02-18	7:00 PM	50	49	27
08-02-18	8:00 PM	65	46	32

Date	Time	L _{Aeq} , 1 hr dB	L _{A10} , 1 hr dB	L _{A90} , 1 hr dB
08-02-18	9:00 PM	34	37	29
08-02-18	10:00 PM	33	36	25
08-02-18	11:00 PM	29	31	25
09-02-18	12:00 AM	34	35	28
12-02-18	1:00 AM	33	32	24
12-02-18	2:00 AM	41	43	24
12-02-18	3:00 AM	43	46	34
12-02-18	4:00 AM	40	43	30
12-02-18	5:00 AM	35	38	26
12-02-18	6:00 AM	68	49	28
12-02-18	7:00 AM	50	51	35
12-02-18	8:00 AM	47	48	37
12-02-18	9:00 AM	43	45	34
12-02-18	10:00 AM	39	42	31
12-02-18	11:00 AM	62	41	28
12-02-18	12:00 PM	35	37	26
12-02-18	1:00 PM	35	38	26
12-02-18	2:00 PM	41	37	26
12-02-18	3:00 PM	44	38	26
12-02-18	4:00 PM	41	44	30
12-02-18	5:00 PM	46	48	40
12-02-18	6:00 PM	46	48	39
12-02-18	7:00 PM	46	46	35
12-02-18	8:00 PM	46	43	33
12-02-18	9:00 PM	33	36	26
12-02-18	10:00 PM	30	33	25
12-02-18	11:00 PM	28	30	24
13-02-18	12:00 AM	28	30	24
14-02-18	1:00 AM	28	28	23
14-02-18	2:00 AM	28	27	22
14-02-18	3:00 AM	30	26	22
14-02-18	4:00 AM	30	32	22
14-02-18	5:00 AM	43	46	32
14-02-18	6:00 AM	46	48	37
14-02-18	7:00 AM	50	50	36
14-02-18	8:00 AM	55	52	38
14-02-18	9:00 AM	46	48	36
14-02-18	10:00 AM	47	48	36

Date	Time	L _{Aeq} , 1 hr dB	L _{A10} , 1 hr dB	L _{A90} , 1 hr dB
14-02-18	11:00 AM	44	45	33
14-02-18	12:00 PM	42	44	30
14-02-18	1:00 PM	39	40	28
14-02-18	2:00 PM	38	40	26
14-02-18	3:00 PM	43	41	25
14-02-18	4:00 PM	39	39	26
14-02-18	5:00 PM	44	43	28
14-02-18	6:00 PM	44	47	29
14-02-18	7:00 PM	67	58	38
14-02-18	8:00 PM	70	62	31
14-02-18	9:00 PM	28	29	25
14-02-18	10:00 PM	29	32	24
14-02-18	11:00 PM	27	27	23
15-02-18	12:00 AM	27	28	23

2087 Bindoon-Moora Road, Wannamal

Thursday 08/02/2018

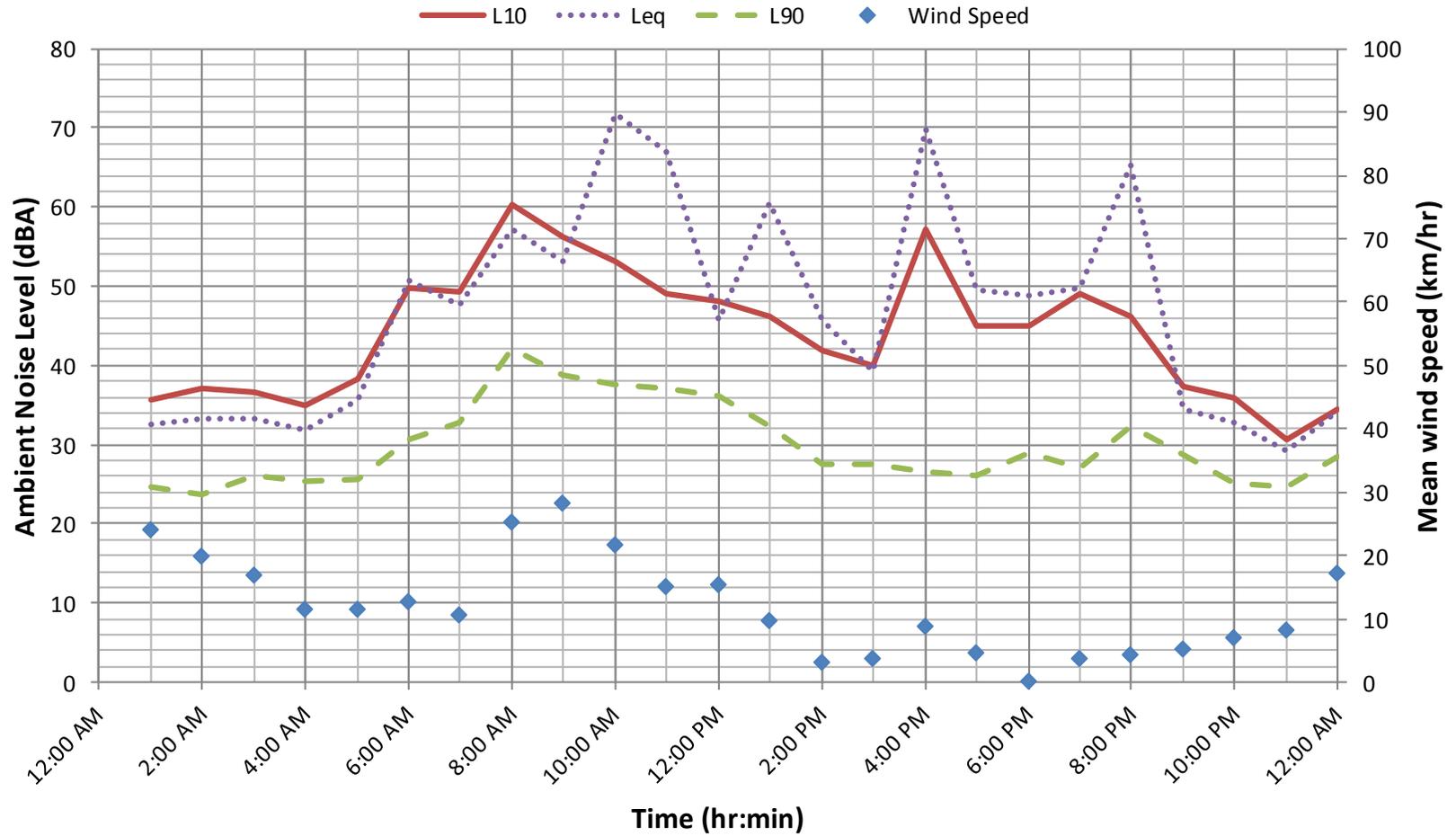


Figure 35: 2087 Bindoon-Moora Road, Wannamal - 08/02/2018

2087 Bindoon-Moora Road, Wannamal

Monday 12/02/2018

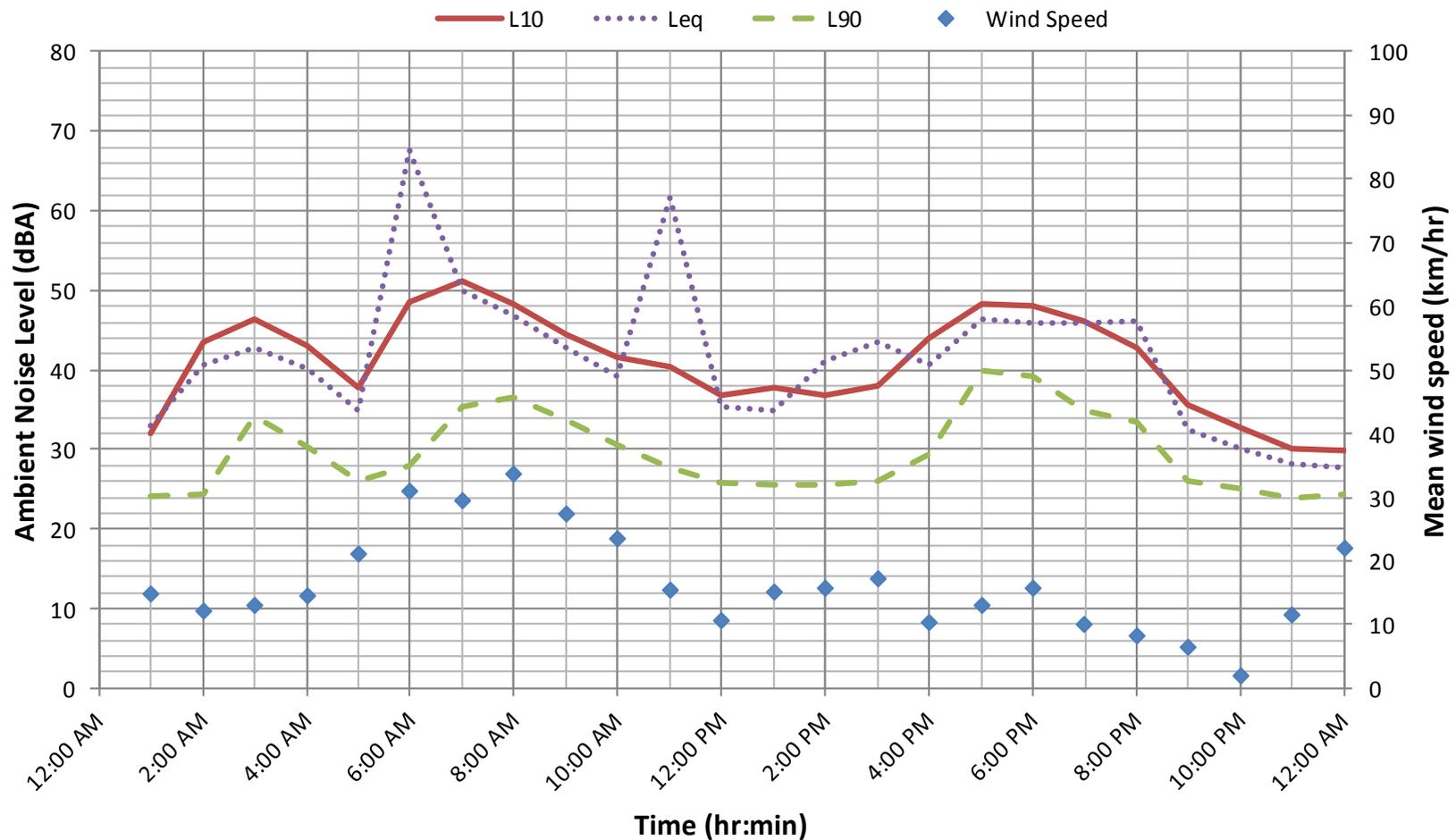


Figure 36: 2087 Bindoon-Moora Road, Wannamal - 12/02/2018

2087 Bindoon-Moora Road, Wannamal

Wednesday 14/02/2018

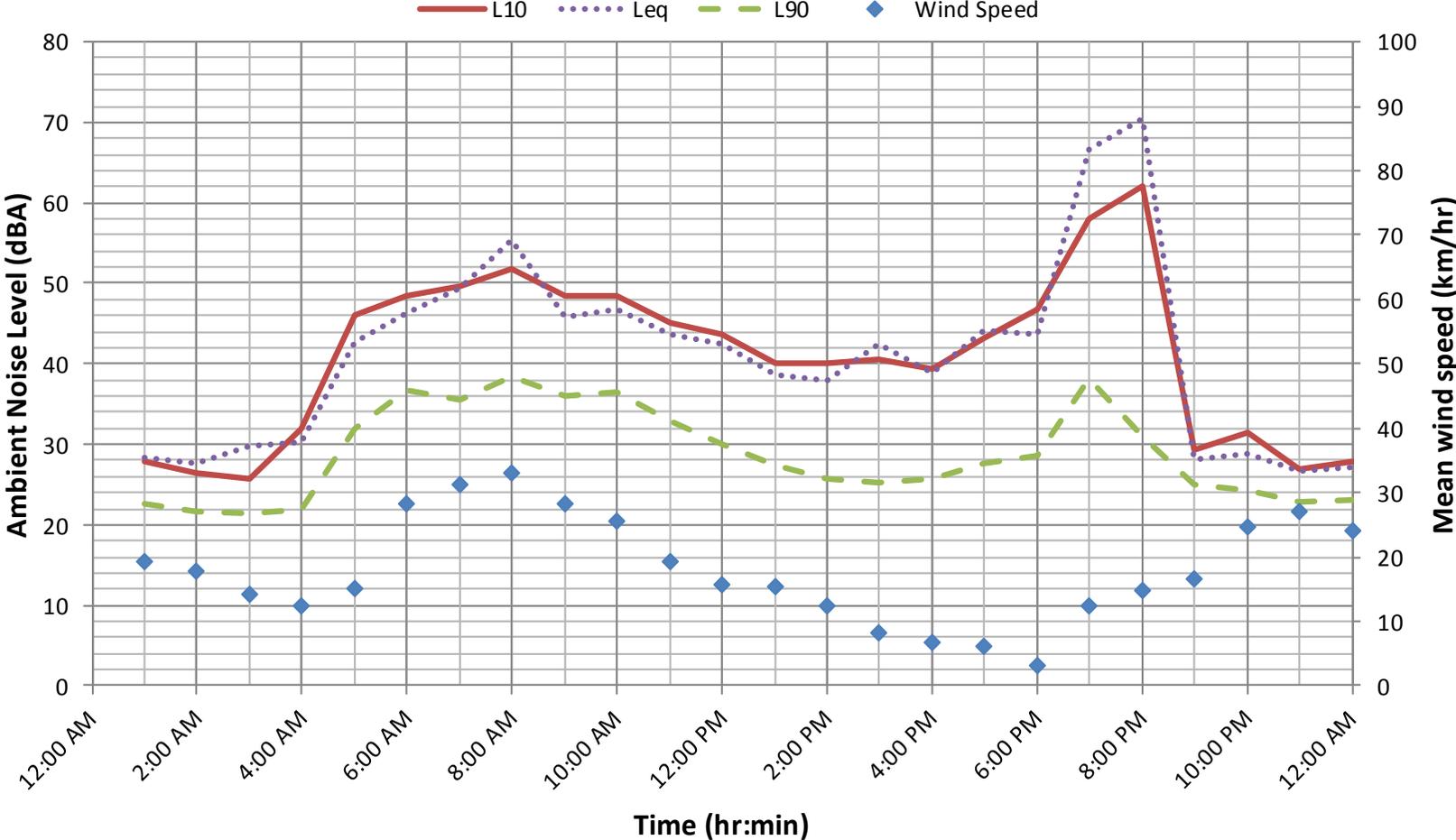


Figure 37: 2087 Bindoon-Moora Road, Wannamal - 14/02/2018

B.4.1.9 Location 2.9

Description	Details
Noise Logger	Acoustics Research Laboratory Ngara Noise Logger Serial Number: 87807F
Measurement duration	5 – 15 February 2018
Location	Lot 2917, 75 Kangaroo Gully Rd Wannamal
Coordinates (Easting; Northing)	413,546; 6,548,176
Photo	

Date	Time	L _{Aeq} , 1 hr dB	L _{A10} , 1 hr dB	L _{A90} , 1 hr dB
08-02-18	1:00 AM	32	33	29
08-02-18	2:00 AM	33	34	30
08-02-18	3:00 AM	33	34	28
08-02-18	4:00 AM	31	33	26
08-02-18	5:00 AM	32	34	27
08-02-18	6:00 AM	41	40	28
08-02-18	7:00 AM	42	41	30
08-02-18	8:00 AM	49	46	35
08-02-18	9:00 AM	51	54	37
08-02-18	10:00 AM	57	60	41
08-02-18	11:00 AM	49	50	39
08-02-18	12:00 PM	50	49	39
08-02-18	1:00 PM	44	47	37
08-02-18	2:00 PM	50	54	36
08-02-18	3:00 PM	53	54	53
08-02-18	4:00 PM	53	54	52

Date	Time	L _{Aeq} , 1 hr dB	L _{A10} , 1 hr dB	L _{A90} , 1 hr dB
08-02-18	5:00 PM	54	54	53
08-02-18	6:00 PM	54	54	53
08-02-18	7:00 PM	54	56	52
08-02-18	8:00 PM	53	53	52
08-02-18	9:00 PM	50	53	39
08-02-18	10:00 PM	44	47	38
08-02-18	11:00 PM	43	47	38
09-02-18	12:00 AM	37	39	34
12-02-18	1:00 AM	36	36	32
12-02-18	2:00 AM	36	38	33
12-02-18	3:00 AM	41	45	36
12-02-18	4:00 AM	38	40	33
12-02-18	5:00 AM	35	37	31
12-02-18	6:00 AM	37	40	30
12-02-18	7:00 AM	46	51	33
12-02-18	8:00 AM	50	53	41
12-02-18	9:00 AM	45	47	42
12-02-18	10:00 AM	46	47	39
12-02-18	11:00 AM	48	53	40
12-02-18	12:00 PM	54	54	53
12-02-18	1:00 PM	53	54	52
12-02-18	2:00 PM	53	54	52
12-02-18	3:00 PM	53	54	52
12-02-18	4:00 PM	53	54	52
12-02-18	5:00 PM	53	54	52
12-02-18	6:00 PM	54	54	52
12-02-18	7:00 PM	53	54	52
12-02-18	8:00 PM	50	53	40
12-02-18	9:00 PM	41	43	40
12-02-18	10:00 PM	41	42	38
12-02-18	11:00 PM	40	42	35
13-02-18	12:00 AM	36	38	33
14-02-18	1:00 AM	34	39	24
14-02-18	2:00 AM	30	27	24
14-02-18	3:00 AM	31	26	24
14-02-18	4:00 AM	32	35	24
14-02-18	5:00 AM	41	45	34
14-02-18	6:00 AM	47	50	37

Date	Time	L _{Aeq} , 1 hr dB	L _{A10} , 1 hr dB	L _{A90} , 1 hr dB
14-02-18	7:00 AM	45	48	38
14-02-18	8:00 AM	48	51	41
14-02-18	9:00 AM	50	53	42
14-02-18	10:00 AM	47	48	38
14-02-18	11:00 AM	44	46	36
14-02-18	12:00 PM	45	44	37
14-02-18	1:00 PM	50	53	35
14-02-18	2:00 PM	53	54	52
14-02-18	3:00 PM	53	54	52
14-02-18	4:00 PM	53	54	52
14-02-18	5:00 PM	53	54	53
14-02-18	6:00 PM	55	56	53
14-02-18	7:00 PM	53	54	52
14-02-18	8:00 PM	53	53	52
14-02-18	9:00 PM	50	53	40
14-02-18	10:00 PM	39	40	37
14-02-18	11:00 PM	38	38	37
15-02-18	12:00 AM	35	38	32

75 Kangaroo Gully Road, Wannamal

Thursday 08/02/2018

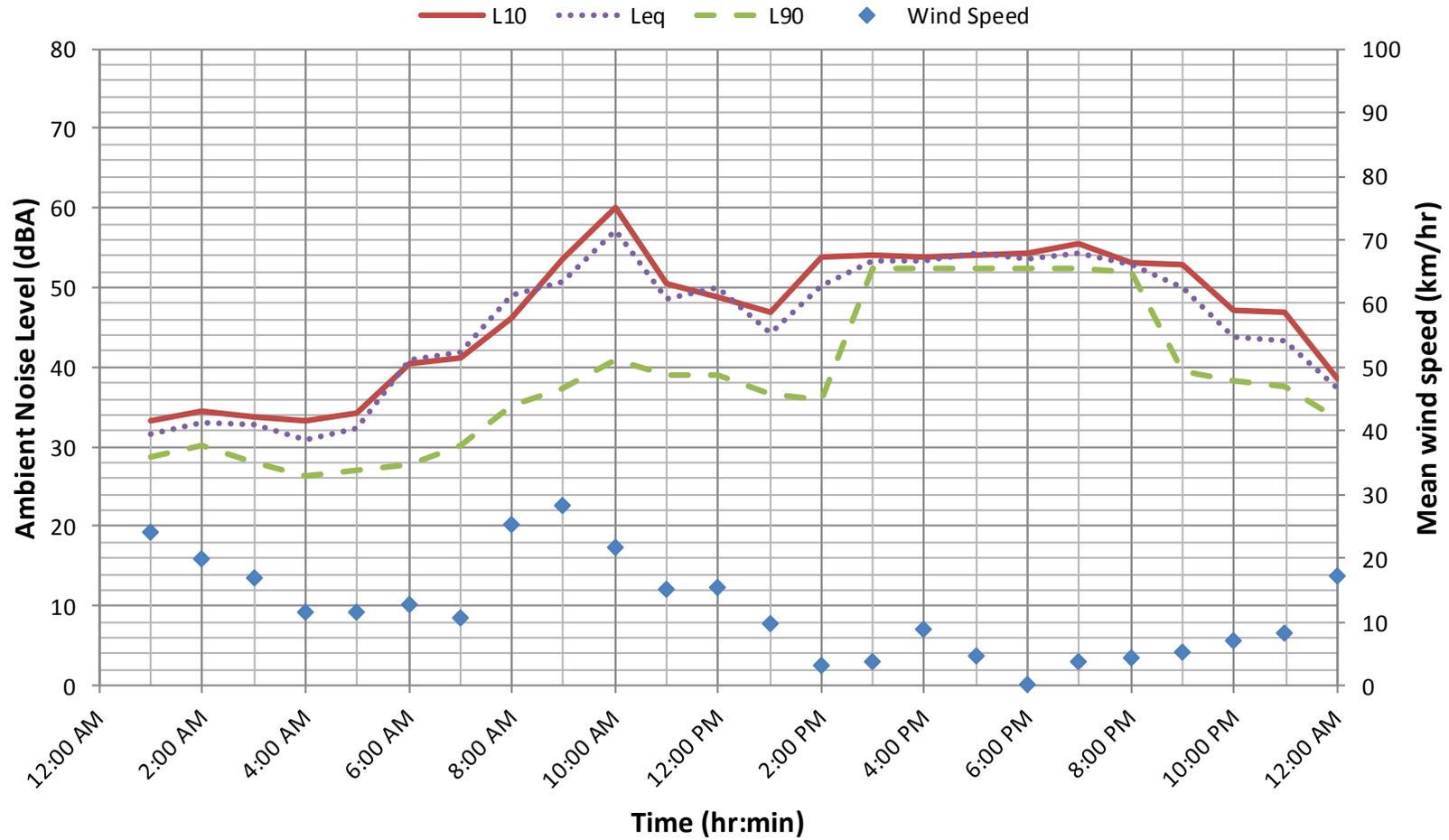


Figure 38: 75 Kangaroo Gully Road, Wannamal - 08/02/2018

75 Kangaroo Gully Road, Wannamal

Monday 12/02/2018

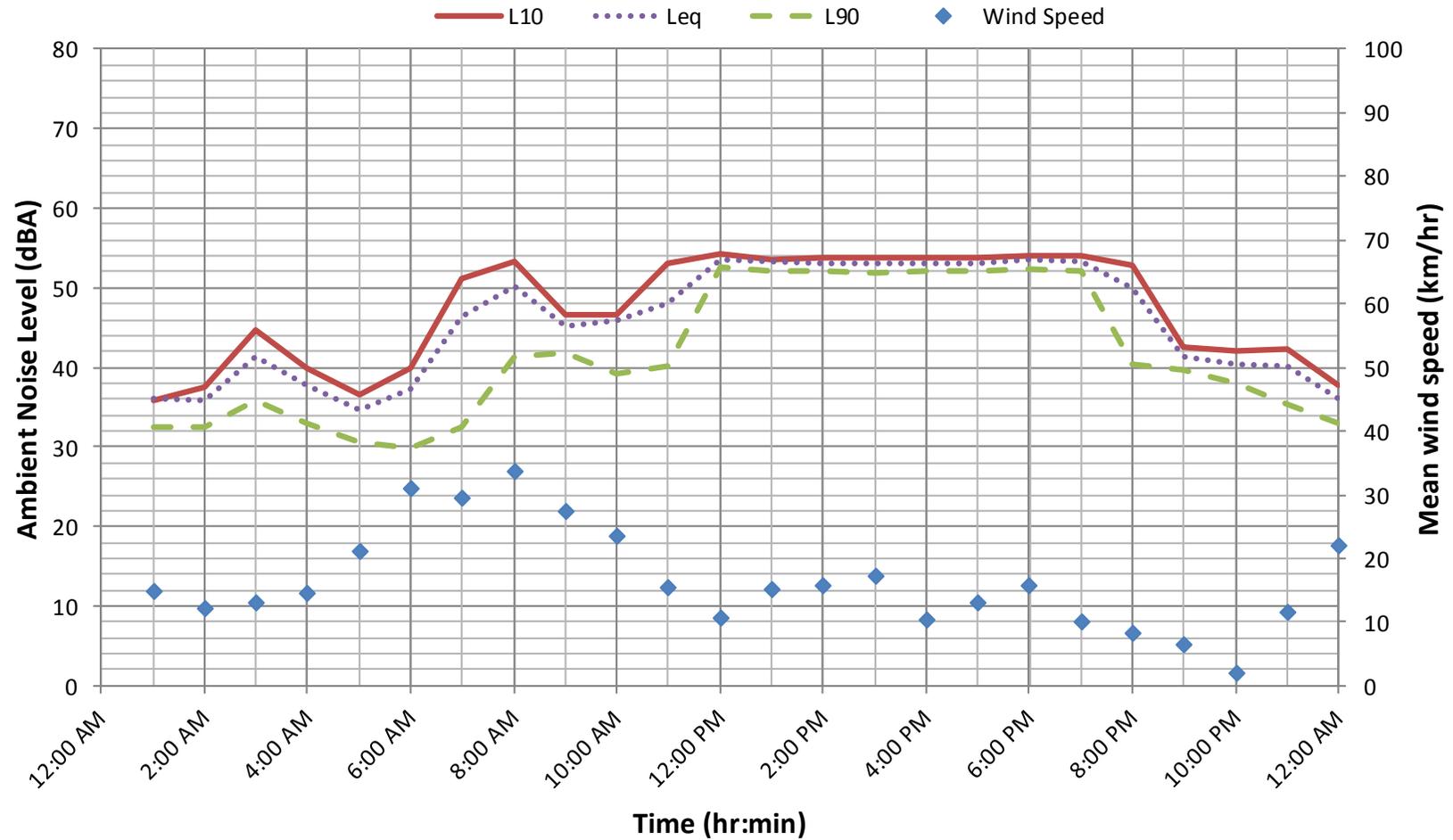


Figure 39: 75 Kangaroo Gully Road, Wannamal - 12/02/2018

75 Kangaroo Gully Road, Wannamal

Wednesday 14/02/2018

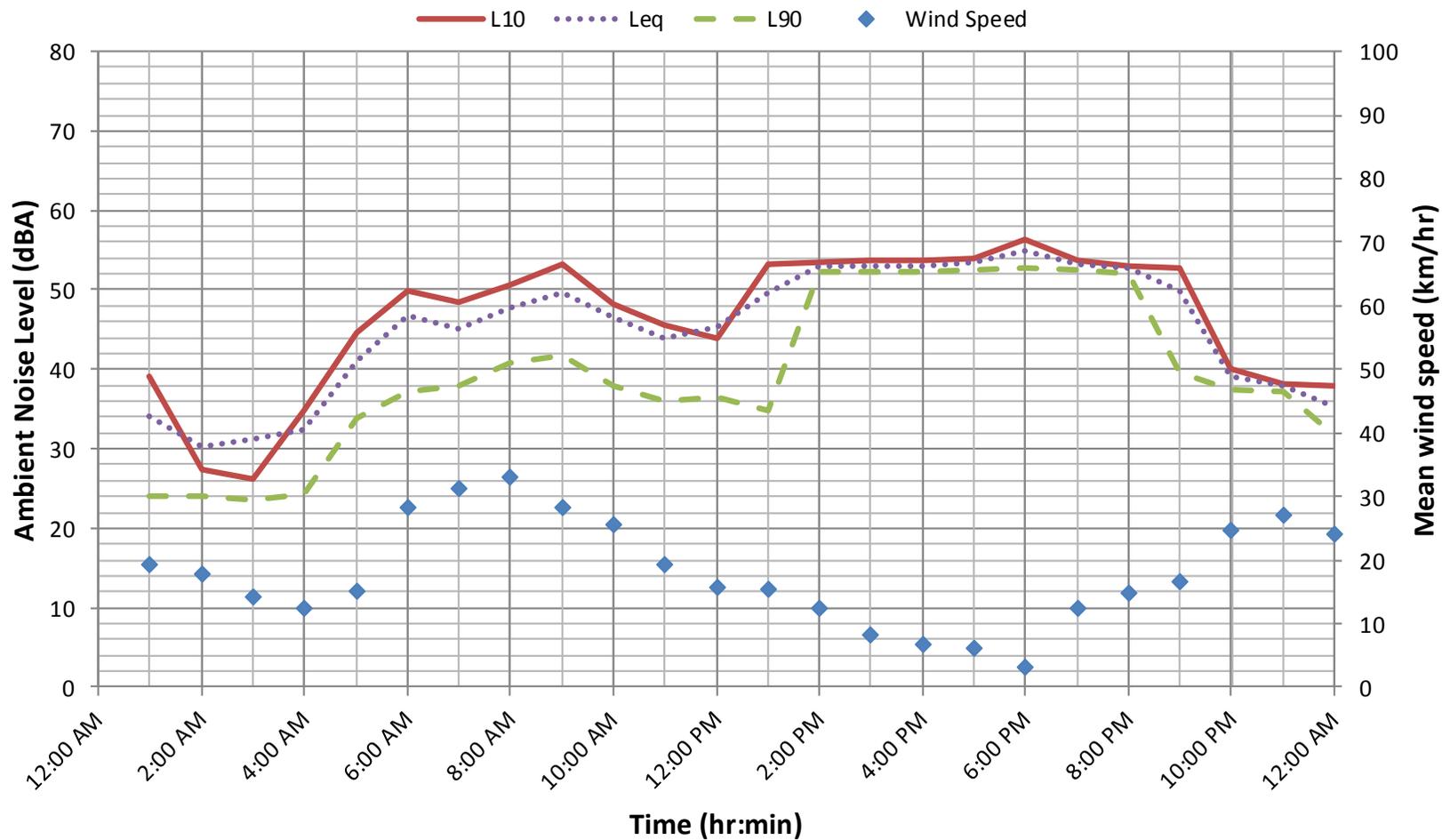


Figure 40: 75 Kangaroo Gully Road, Wannamal - 14/02/2018

B.4.1.10 Location 2.10

Description	Details
Noise Logger	Acoustics Research Laboratory Ngara Noise Logger Serial Number: 878060
Measurement duration	1 – 12 March 2018
Location	Lot 3281, 9071 Great Northern Highway Wannamal
Coordinates (Easting; Northing)	420,354; 6,551,491
Photo	

Date	Time	L _{Aeq, 1 hr} dB	L _{A10, 1 hr} dB	L _{A90, 1 hr} dB
01-03-18	3:00 PM	40	41	28
01-03-18	4:00 PM	42	44	32
01-03-18	5:00 PM	41	43	34
01-03-18	6:00 PM	43	45	37
01-03-18	7:00 PM	37	39	33
01-03-18	8:00 PM	40	41	35
01-03-18	9:00 PM	37	39	33
01-03-18	10:00 PM	34	37	31
01-03-18	11:00 PM	34	37	30
02-03-18	12:00 AM	31	34	27
02-03-18	1:00 AM	32	32	27
02-03-18	2:00 AM	30	30	26
02-03-18	3:00 AM	30	31	26
02-03-18	4:00 AM	30	32	26
02-03-18	5:00 AM	33	35	26
02-03-18	6:00 AM	40	41	27

Date	Time	L _{Aeq} , 1 hr dB	L _{A10} , 1 hr dB	L _{A90} , 1 hr dB
02-03-18	7:00 AM	45	43	31
02-03-18	8:00 AM	42	44	35
02-03-18	9:00 AM	44	46	35
02-03-18	10:00 AM	45	46	35
02-03-18	11:00 AM	46	48	34
02-03-18	12:00 PM	46	47	33
02-03-18	1:00 PM	45	46	34
02-03-18	2:00 PM	44	44	32
07-03-18	1:00 AM	30	33	24
07-03-18	2:00 AM	30	30	25
07-03-18	3:00 AM	30	32	23
07-03-18	4:00 AM	31	34	23
07-03-18	5:00 AM	24	25	22
07-03-18	6:00 AM	36	35	22
07-03-18	7:00 AM	44	40	26
07-03-18	8:00 AM	39	37	27
07-03-18	9:00 AM	37	39	29
07-03-18	10:00 AM	38	40	31
07-03-18	11:00 AM	38	40	31
07-03-18	12:00 PM	43	44	32
07-03-18	1:00 PM	41	44	31
07-03-18	2:00 PM	39	42	31
07-03-18	3:00 PM	40	43	33
07-03-18	4:00 PM	42	46	33
07-03-18	5:00 PM	41	43	35
07-03-18	6:00 PM	43	43	35
07-03-18	7:00 PM	40	38	34
07-03-18	8:00 PM	39	42	35
07-03-18	9:00 PM	38	40	31
07-03-18	10:00 PM	33	37	26
07-03-18	11:00 PM	35	38	26
08-03-18	12:00 AM	29	31	24
08-03-18	1:00 AM	27	30	22
08-03-18	2:00 AM	26	30	22
08-03-18	3:00 AM	32	33	22
08-03-18	4:00 AM	38	42	23
08-03-18	5:00 AM	39	44	23
08-03-18	6:00 AM	39	43	26

Date	Time	L _{Aeq} , 1 hr dB	L _{A10} , 1 hr dB	L _{A90} , 1 hr dB
08-03-18	7:00 AM	46	47	34
08-03-18	8:00 AM	52	54	33
08-03-18	9:00 AM	44	46	30
08-03-18	10:00 AM	42	46	31
08-03-18	11:00 AM	47	46	32
08-03-18	12:00 PM	45	46	32
08-03-18	1:00 PM	42	45	32
08-03-18	2:00 PM	42	44	30
08-03-18	3:00 PM	40	43	31
08-03-18	4:00 PM	45	46	34
08-03-18	5:00 PM	44	45	38
08-03-18	6:00 PM	40	42	34
08-03-18	7:00 PM	37	38	33
08-03-18	8:00 PM	38	41	34
08-03-18	9:00 PM	37	40	29
08-03-18	10:00 PM	33	36	30
08-03-18	11:00 PM	33	35	29
09-03-18	12:00 AM	31	34	24

9071 Great Northern Highway, Wannamal

Thursday 1/3/2018 15:00 to Friday 2/3/2018 14:00

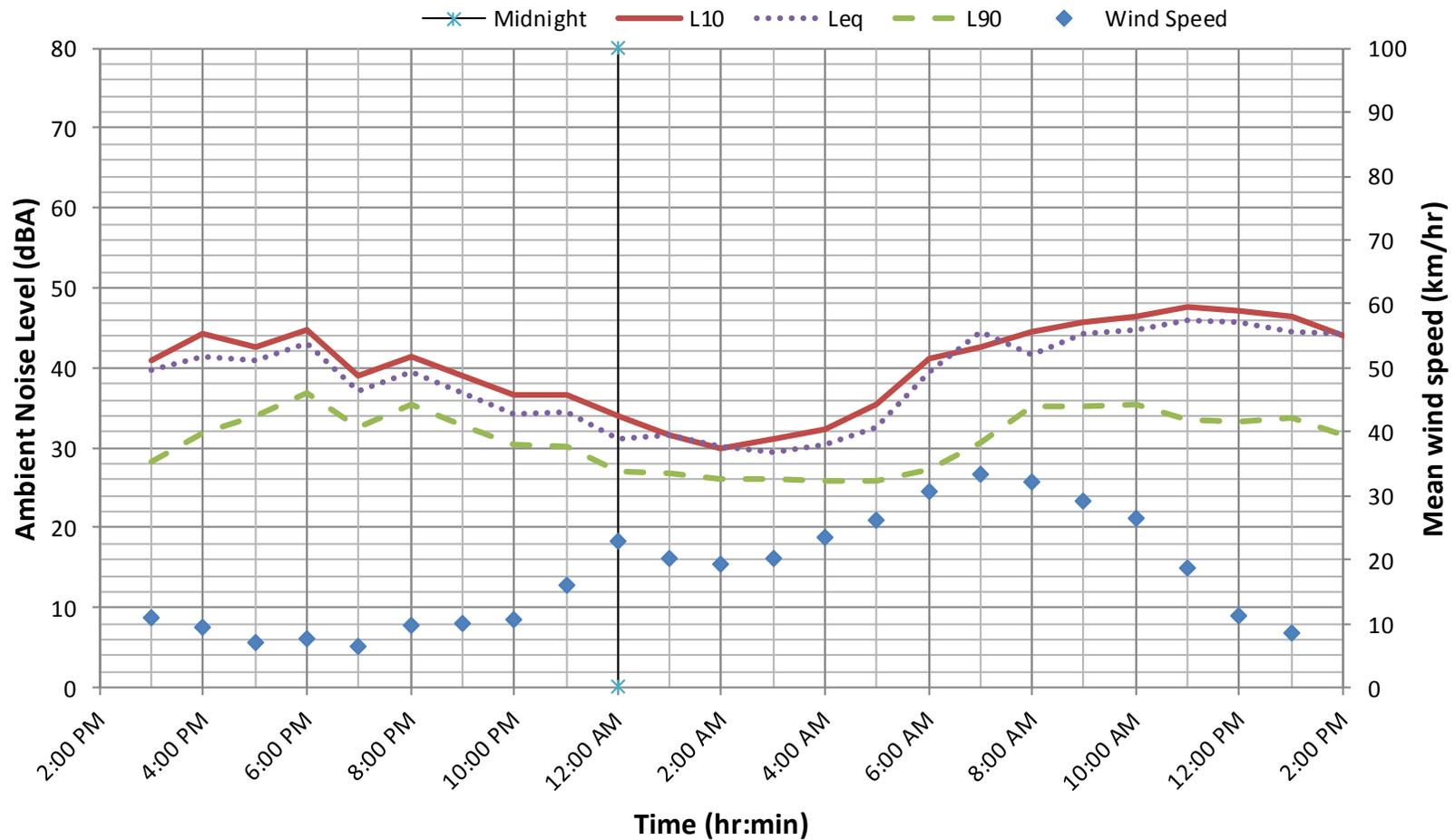


Figure 41: 9071 Great Northern Highway, Wannamal – 01/03/2018 to 02/03/2018

9071 Great Northern Highway, Wannamal

Wednesday 07/02/2018

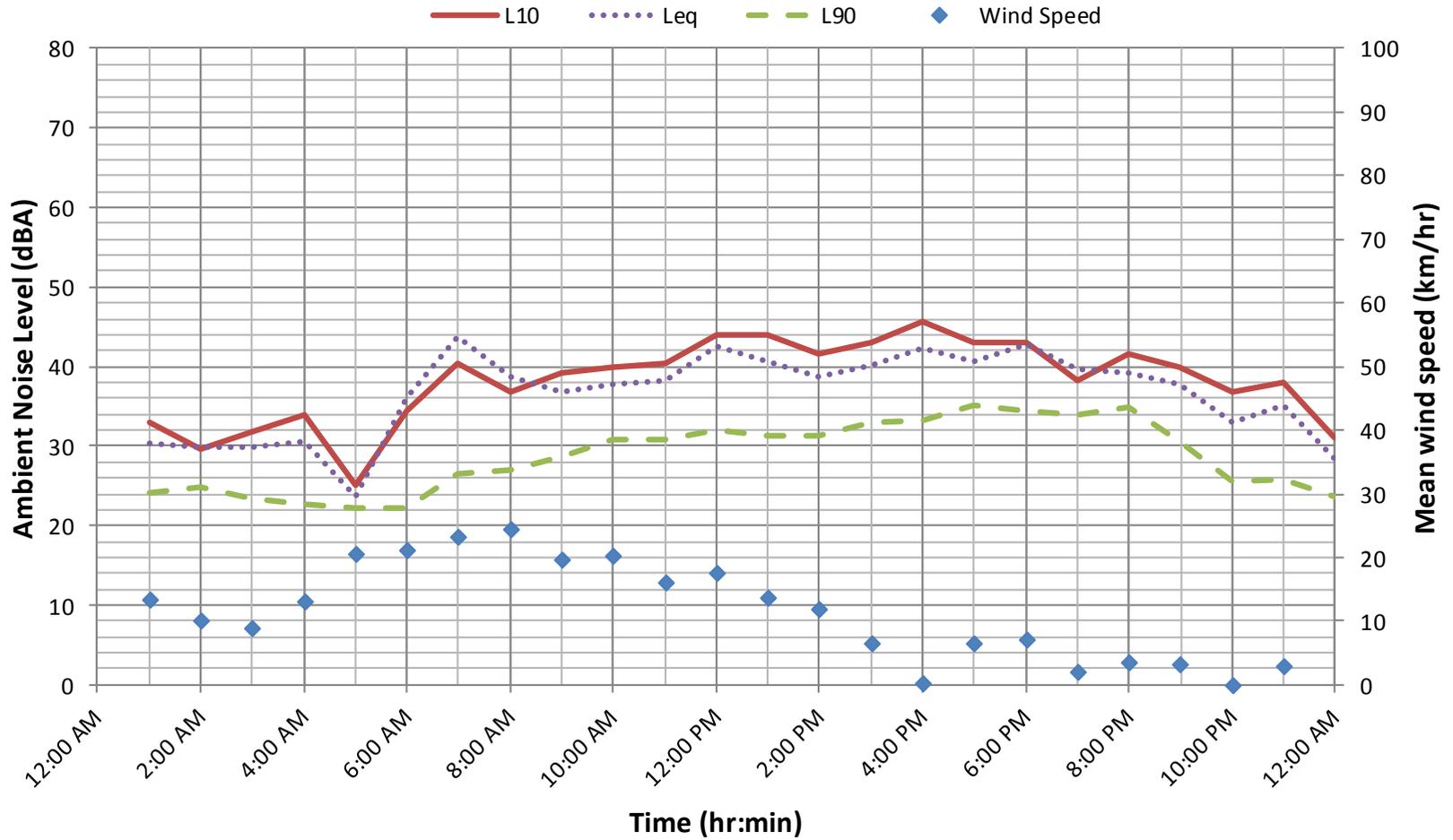


Figure 42: 9071 Great Northern Highway, Wannamal – 07/03/2048

9071 Great Northern Highway, Wannamal

Thursday 08/02/2018

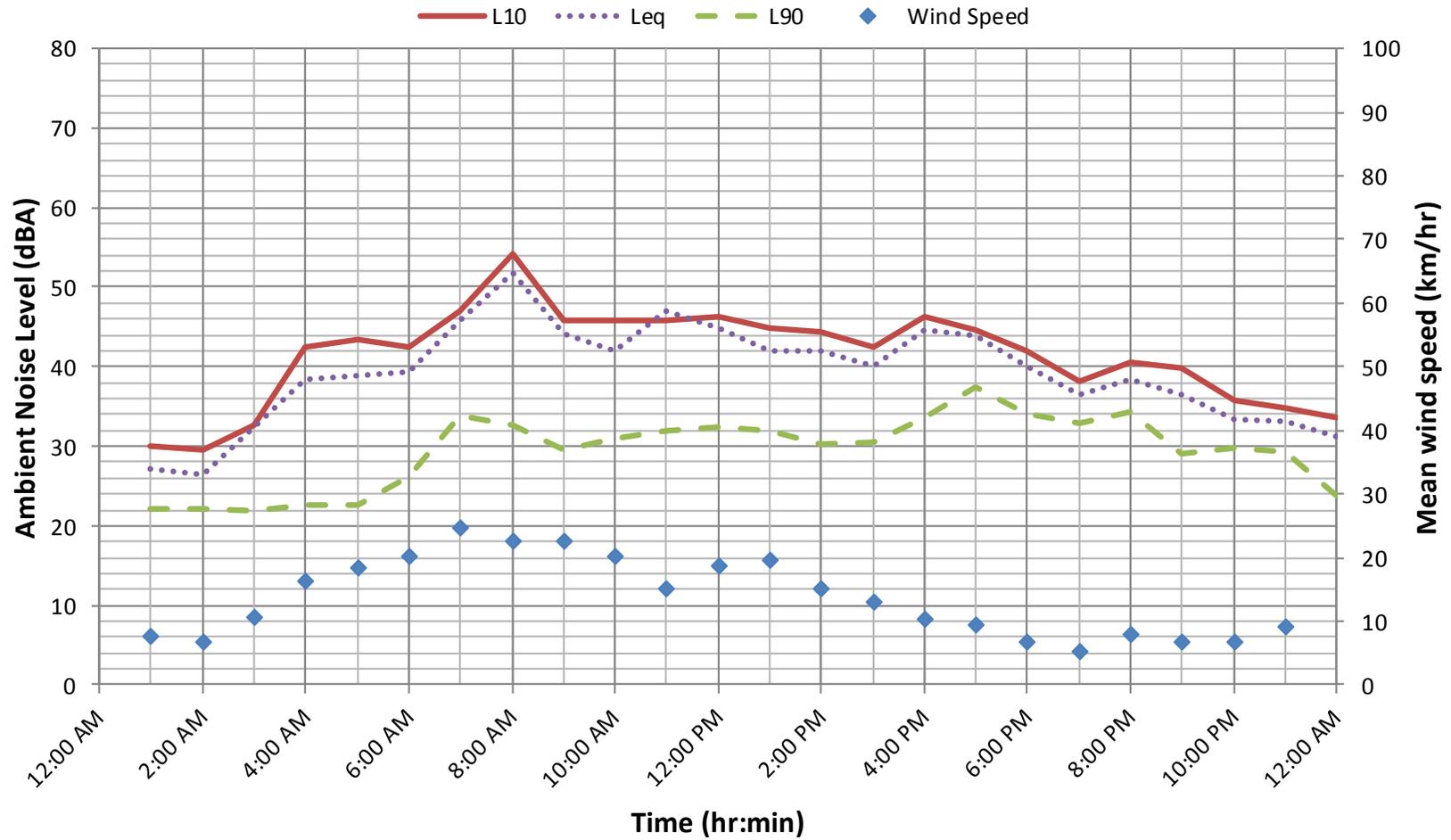
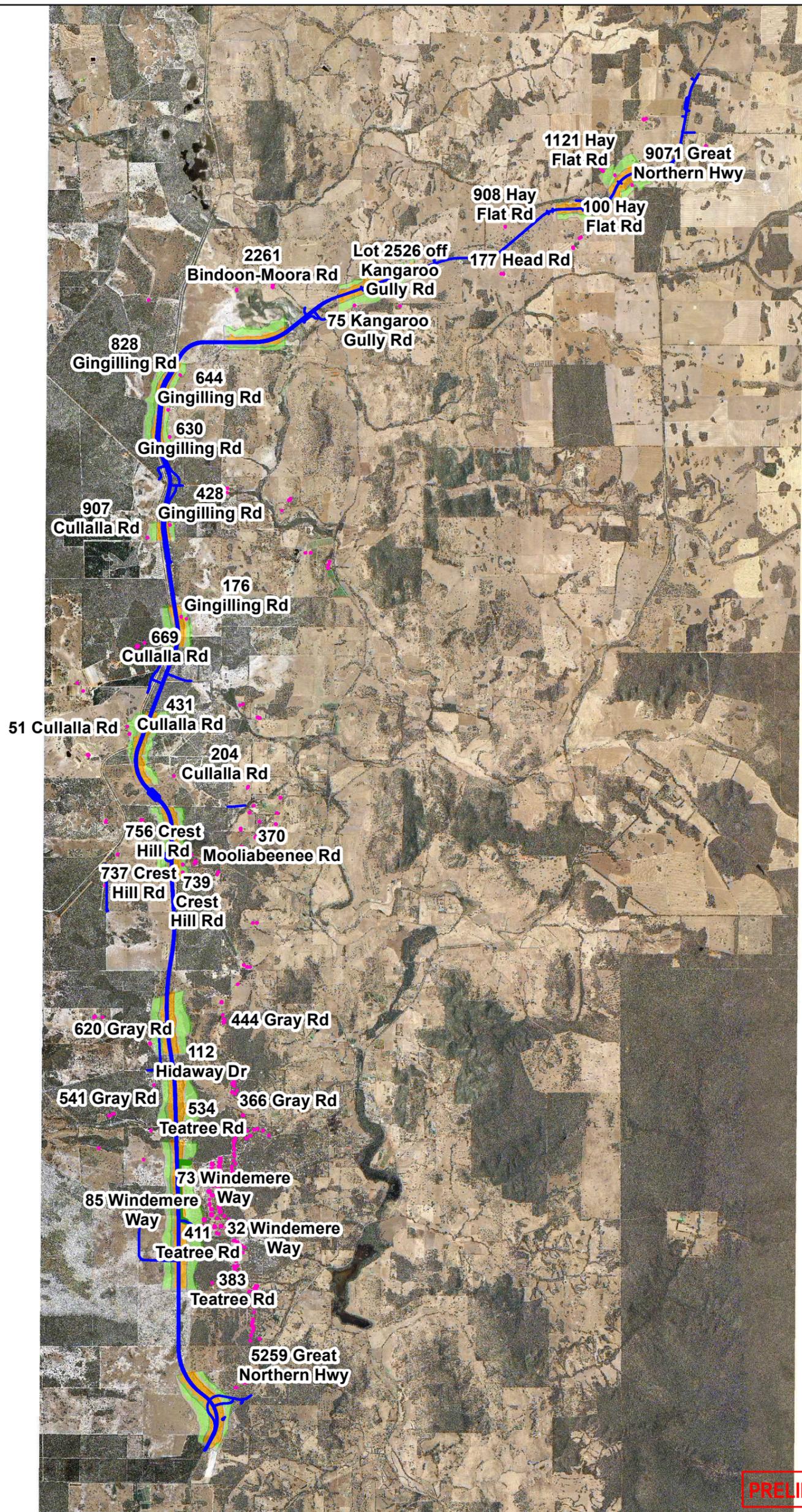


Figure 43: 9071 Great Northern Highway, Wannamal - 08/03/2048

Appendix C. Noise Contours - Proposed Bindoon Bypass Alignment



PRELIMINARY PLAN ONLY

Legend

- Proposed Bindoon Bypass Centreline
- Noise Sensitive Receivers
- Noise protection wall

Predicted Night Time Noise Level including Facade Correction

- <50 dBA
- 50-55 dBA
- >55 dBA

Data Source: Main Roads WA, Landgate

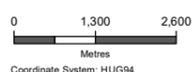


Joint Venture Partners:

Arup Pty Ltd
Level 14 Exchange Tower
2 The Esplanade
Perth WA 6000
Tel +61 8 9327 8300 Fax +61 8 9481 1334
www.arup.com

Jacobs Group (Australia) Pty Ltd
Durack Centre, 263 Adelaide Terrace,
Perth WA 6000
Tel +61 8 9469 4400 Fax +61 8 9469 4488
www.jacobs.com

© Main Roads Western Australia



Scale at A3
1:113,427

Coordinate System: HUG94



Main Roads Western Australia

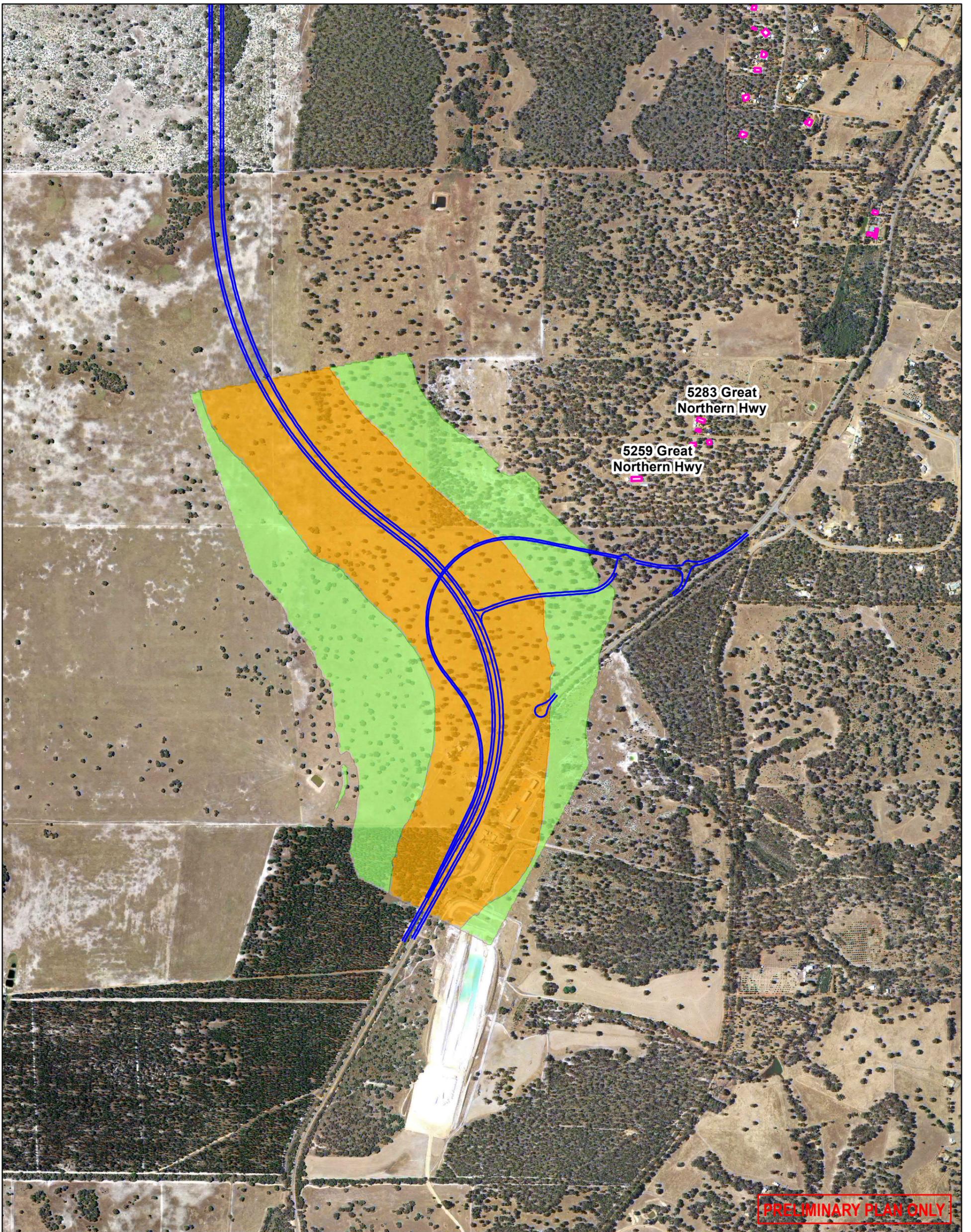
Great Northern Highway
Mucchea to Wubin Upgrade Stage 2

Predicted Night Time Traffic Noise Level along Proposed Bindoon Bypass

Drawing No: GNH-CN12-EN01-DRG-9101 Issue A

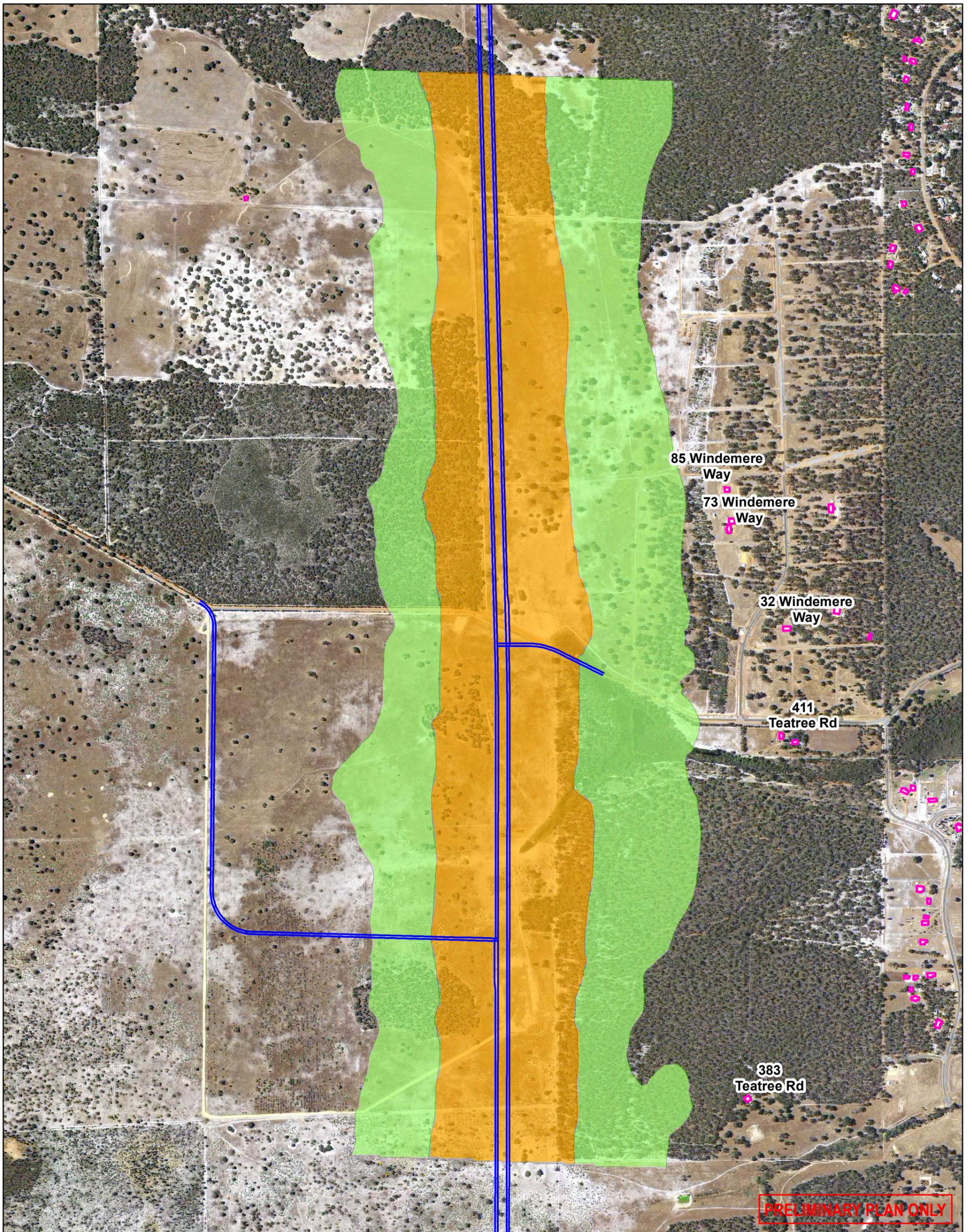
Task No: Noise Assessment Drawing Status / Other: Draft / Other Info

Date	By	Chkd	Appd
10/08/2018	MFR	FB	LMB



PRELIMINARY PLAN ONLY

<p>Legend</p> <p>— Proposed Bindoon Bypass Centreline</p> <p>▭ Noise Sensitive Receivers</p> <p>Predicted Day Time Noise Level including Facade Correction</p> <p><55 dBA</p> <p>55-60 dBA</p> <p>>60 dBA</p>	<p>Joint Venture Partners:</p> <p>Arup Pty Ltd Level 14 Exchange Tower 2 The Esplanade Perth WA 6000 Tel +61 8 9327 8300 Fax +61 8 9481 1334 www.arup.com</p> <p>Jacobs Group (Australia) Pty Ltd Durack Centre, 263 Adelaide Terrace, Perth WA 6000 Tel +61 8 9469 4400 Fax +61 8 9469 4488 www.jacobs.com</p> <p>© Main Roads Western Australia</p>	<p>ARUP TRADING AS ASJV JACOBS</p>	<p>Predicted Day Time Traffic Noise Level along Proposed Bindoon Bypass</p> <p>Drawing No: GNH-CN12-EN01-DRG-9102 Issue: A</p> <p>Task No: Noise Assessment Drawing Status / Other: Draft / Other Info</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>Date: 10/08/2018</td> <td>By: MFR</td> <td>Chkd: FB</td> <td>Appd: LMB</td> </tr> </table>	Date: 10/08/2018	By: MFR	Chkd: FB	Appd: LMB
Date: 10/08/2018	By: MFR	Chkd: FB	Appd: LMB				
Data Source: Main Roads WA, Landgate	<p>0 150 300 Metres</p> <p>Scale at A3: 1:12,563</p> <p>Coordinate System: HUG94</p>	<p>Client: Main Roads Western Australia</p> <p>Project: Great Northern Highway Muchea to Wubin Upgrade Stage 2</p>					



Legend

- Proposed Bindoon Bypass Centreline
- Noise Sensitive Receivers

Predicted Day Time Noise Level including Facade Correction

- <55 dBA
- 55-60 dBA
- >60 dBA

Data Source: Main Roads WA, Landgate

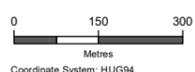


Joint Venture Partners:

Arup Pty Ltd
Level 14 Exchange Tower
2 The Esplanade
Perth WA 6000
Tel +61 8 9327 8300 Fax +61 8 9481 1334
www.arup.com

Jacobs Group (Australia) Pty Ltd
Durack Centre, 263 Adelaide Terrace,
Perth WA 6000
Tel +61 8 9469 4400 Fax +61 8 9469 4488
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Scale at A3
1:12,580

Coordinate System: HUG94



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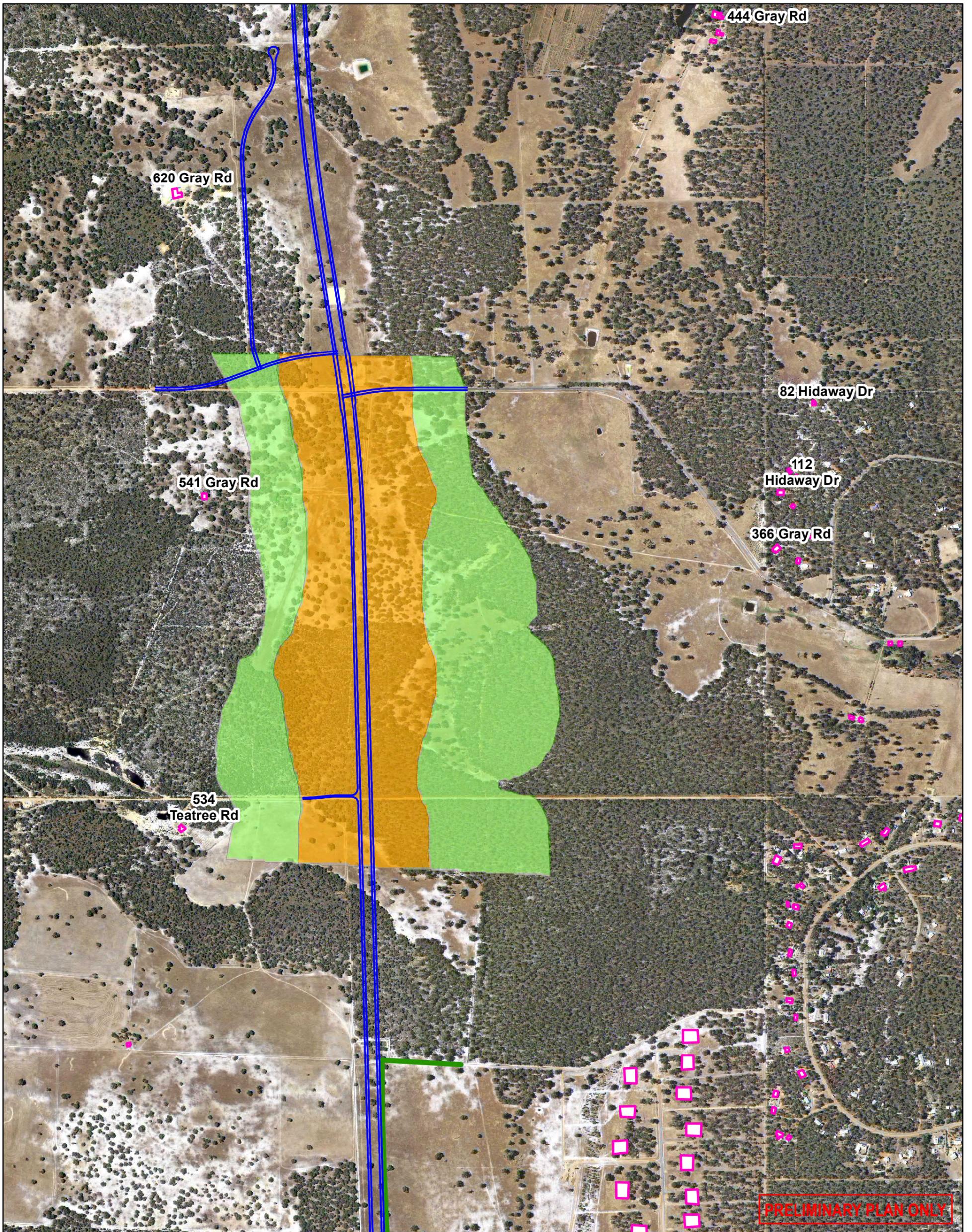
Great Northern Highway
Muchoa to Wubin Upgrade Stage 2

**Predicted Day Time Traffic
Noise Level along
Proposed Bindoon Bypass**

Drawing No: GNH-CN12-EN01-DRG-9103 Issue A

Task No: Noise Assessment Drawing Status / Other: Draft / Other Info

Date	By	Chkd	Appd
20/08/2018	MFR	FB	LMB



Legend

- Proposed Bindoon Bypass Centreline
- Noise Sensitive Receivers
- Noise protection wall

Predicted Day Time Noise Level including Facade Correction

- <55 dBA
- 55-60 dBA
- >60 dBA

Data Source: Main Roads WA, Landgate

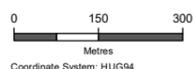


Joint Venture Partners:

Arup Pty Ltd
Level 14 Exchange Tower
2 The Esplanade
Perth WA 6000
Tel +61 8 9327 8300 Fax +61 8 9481 1334
www.arup.com

Jacobs Group (Australia) Pty Ltd
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Perth WA 6000
Tel +61 8 9469 4400 Fax +61 8 9469 4488
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Scale at A3
1:12,563

Coordinate System: HUG94



Main Roads Western Australia

Great Northern Highway
Muchea to Wubin Upgrade Stage 2

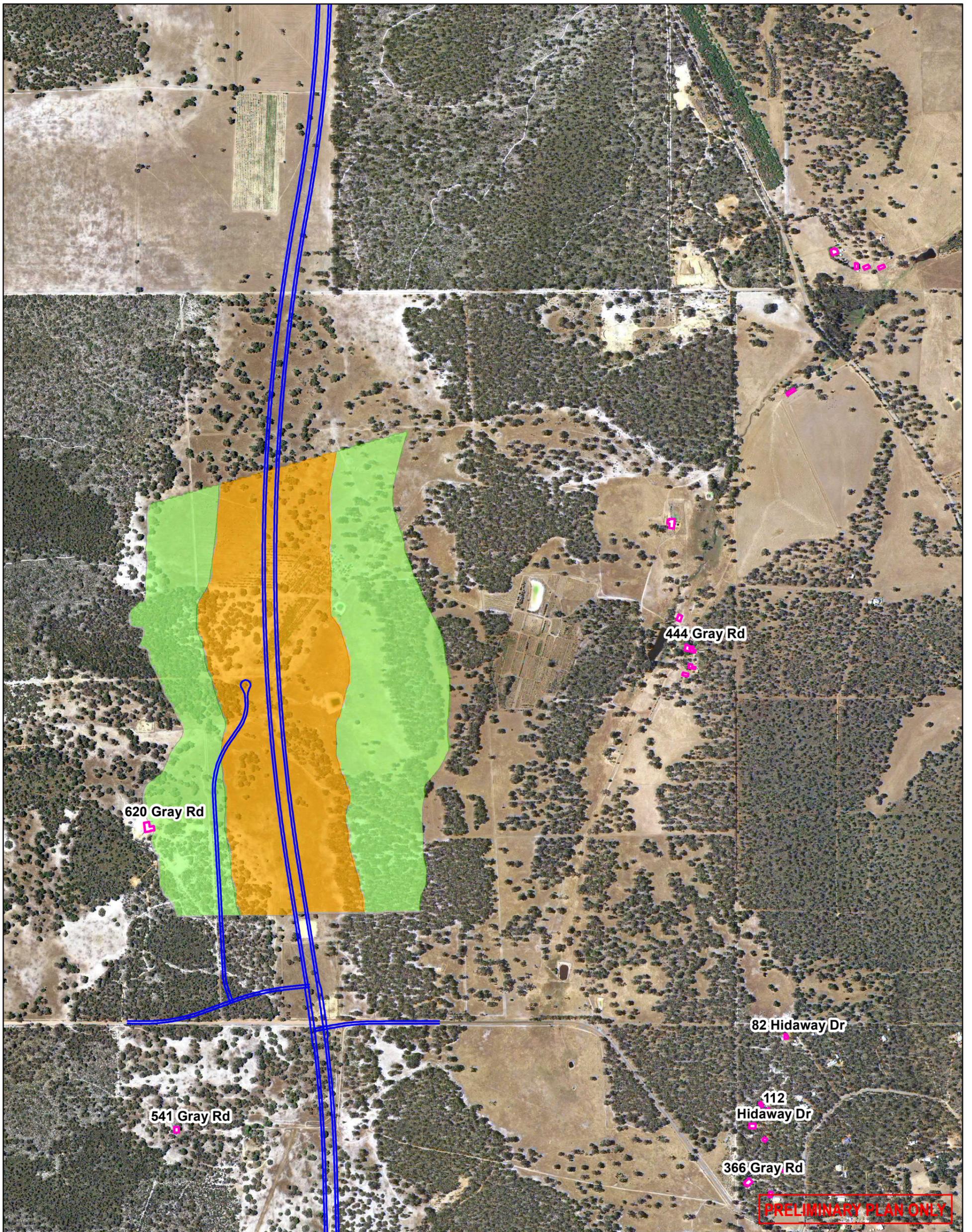
Predicted Day Time Traffic Noise Level along Proposed Bindoon Bypass

Drawing No: GNH-CN12-EN01-DRG-9104 Issue A

Task No: Noise Assessment Drawing Status / Other: Draft / Other Info

Date	By	Chkd	Appd
10/08/2018	MFR	FB	LMB

PRELIMINARY PLAN ONLY



Legend

- Proposed Bindoon Bypass Centreline
- Noise Sensitive Receivers

Predicted Day Time Noise Level including Facade Correction

- <55 dBA
- 55-60 dBA
- >60 dBA

Data Source: Main Roads WA, Landgate

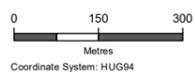


Joint Venture Partners:

Arup Pty Ltd
Level 14 Exchange Tower
2 The Esplanade
Perth WA 6000
Tel +61 8 9327 8300 Fax +61 8 9481 1334
www.arup.com

Jacobs Group (Australia) Pty Ltd
Durack Centre, 263 Adelaide Terrace,
Perth WA 6000
Tel +61 8 9469 4400 Fax +61 8 9469 4488
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Scale at A3
Project
1:12,563

Coordinate System: HUG94



Main Roads Western Australia

Client
Project
Great Northern Highway
Muchea to Wubin Upgrade Stage 2

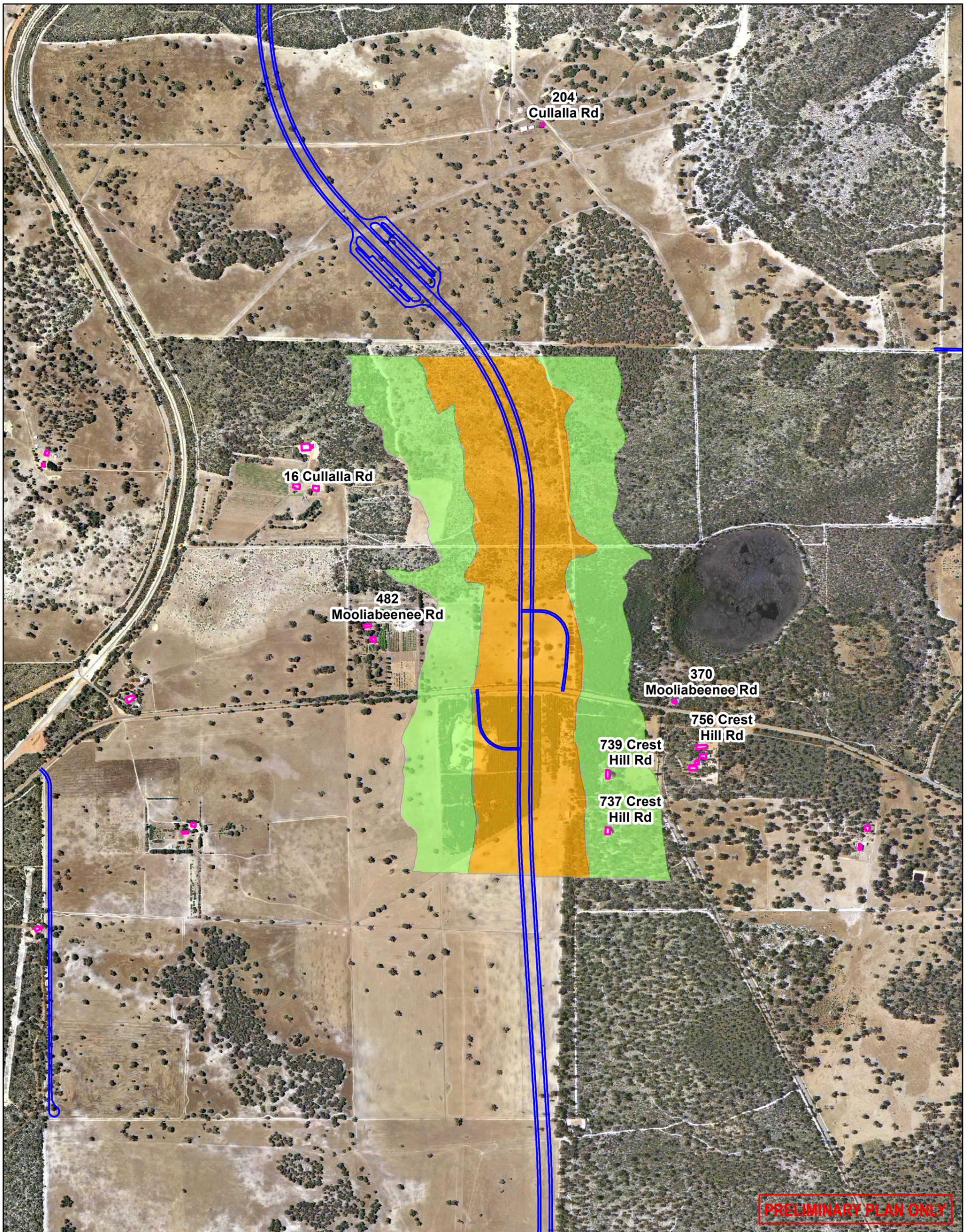
Predicted Day Time Traffic Noise Level along Proposed Bindoon Bypass

Drawing No: GNH-CN12-EN01-DRG-9105 Issue: A

Task No: Noise Assessment Drawing Status / Other: Draft / Other Info

Date	By	Chkd	Appd
10/08/2018	MFR	FB	LMB

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Legend

- Proposed Bindoon Bypass Centreline
- Noise Sensitive Receivers

Predicted Day Time Noise Level including Facade Correction

- <55 dBA
- 55-60 dBA
- >60 dBA

Data Source: Main Roads WA, Landgate

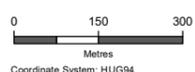


Joint Venture Partners:

Arup Pty Ltd
Level 14 Exchange Tower
2 The Esplanade
Perth WA 6000
Tel +61 8 9327 8300 Fax +61 8 9481 1334
www.arup.com

Jacobs Group (Australia) Pty Ltd
Durack Centre, 263 Adelaide Terrace,
Perth WA 6000
Tel +61 8 9469 4400 Fax +61 8 9469 4488
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Project
1:12,563

Coordinate System: HUG94



Main Roads Western Australia

Client
Project
Great Northern Highway
Muchea to Wubin Upgrade Stage 2

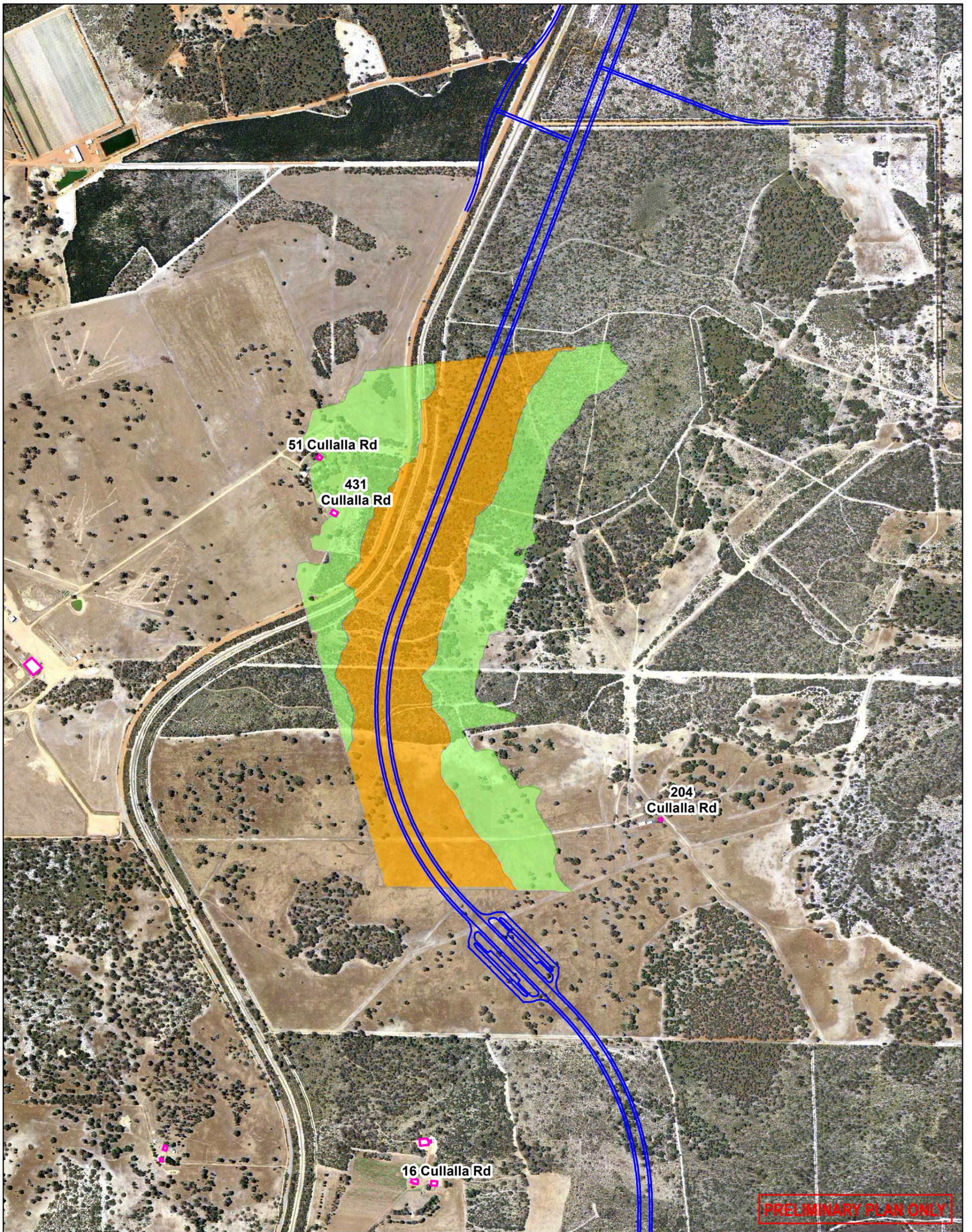
**Predicted Day Time Traffic
Noise Level along
Proposed Bindoon Bypass**

Drawing No: GNH-CN12-EN01-DRG-9106 Issue A

Task No: Noise Assessment Drawing Status / Other: Draft / Other Info

Date	By	Chkd	Appd
10/08/2018	MFR	FB	LMB

PRELIMINARY PLAN ONLY



Legend

- Proposed Bindoon Bypass Centreline
- Noise Sensitive Receivers

Predicted Day Time Noise Level including Facade Correction

- <55 dBA
- 55-60 dBA
- >60 dBA

Data Source: Main Roads WA, Landgate

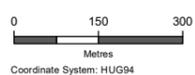


Joint Venture Partners:

Arup Pty Ltd
Level 14 Exchange Tower
2 The Esplanade
Perth WA 6000
Tel +61 8 9327 8300 Fax +61 8 9481 1334
www.arup.com

Jacobs Group (Australia) Pty Ltd
Durack Centre, 263 Adelaide Terrace,
Perth WA 6000
Tel +61 8 9469 4400 Fax +61 8 9469 4488
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Scale at A3
1:12,563

Coordinate System: HUG94



Main Roads Western Australia

Client
Project
Great Northern Highway
Muchoa to Wubin Upgrade Stage 2

**Predicted Day Time Traffic
Noise Level along
Proposed Bindoon Bypass**

Drawing No: GNH-CN12-EN01-DRG-9107 Issue: A

Task No: Noise Assessment Drawing Status / Other: Draft / Other Info

Date	By	Chkd	Appd
10/08/2018	MFR	FB	LMB

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