

Woolworths Austral South - 260 Eighth Avenue

Development Application

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1 INTRODUCTION

This document has been prepared to present our review of the current architectural drawings for the proposed Woolworths to be located at 260 Eighth Avenue, Austral South. This document will determine the potential acoustic issues related to the project in its current stage and provide advice to facilitate the preparation of DA submission.

This document will investigate the existing ambient environment surrounding the project site, various development options, alternative material uses and indicative construction methodologies with their likely effect on acoustics.

All advice provided in this document is based upon our analysis of the ClarkeHopkinsClarke architectural drawings (*job no. 22108 dated 16/06/2023 rev A*).

2 ACOUSTIC IMPLICATIONS OF THE CONCEPT DESIGN

An acoustic investigation has been carried out and the following potential acoustic issues relating to the proposed development are summarised below:

- Loading dock noise emissions to the external receivers surrounding the project site.
- Car park noise emissions to the external receivers surrounding the site.
- Traffic generation on the local roads surrounding the site.
- Noise emissions from mechanical plant servicing the site (in principle).
- Operational noise emissions to external receivers surrounding the project site.

3 SITE DESCRIPTION AND NEAREST SENSITIVE RECEIVERS

3.1 SITE DESCRIPTION

The proposed construction of the Woolworths Austral South includes an additional 6 tenancy spaces, on-grade car parking and direct to boot spaces. Loading dock access is via Warrawal Avenue and car park access is via Auger Street and the new Warrawal Avenue.

The following trading hours are proposed for the development:

- Woolworths shopping centre operation hours of 6:00am to 12:00am
- Operation of the loading dock between the hours of 7:00am and 10:00pm

Investigation has been carried out by this office in regards to the noise impacts surrounding the proposed development, which is detailed below:

- Future residential receivers located to the north, south and west of the site.
- Future Educational Establishment located north of the site.
- Future community centre located east of the site.

Acoustic Logic note that Austral has been rezoned by the NSW Government as part of the '*South West Growth Area*' which will subdivide existing lots and accommodate for new residential and commercial developments.

See Figure 1 below for an aerial floor plant layout of the proposed Woolworths.

3.2 NEAREST SENSITIVE RECEIVERS

The nearest noise receivers around the site include:

- **R1:** Residential Receivers 1 – Future residential development located south of the site.
- **R2:** Residential Receivers 2 – Future residential development located west of the site.
- **R3:** Residential Receivers 3 – Future residential development located north of the site.
- **E1:** Educational Establishment 1 – Future Educational development located north of the site.
- **C1:** Commercial Receiver 1 – Proposed Future community centre located east of the site.

A site map, measurement description and surrounding receivers are presented in Figure 2.

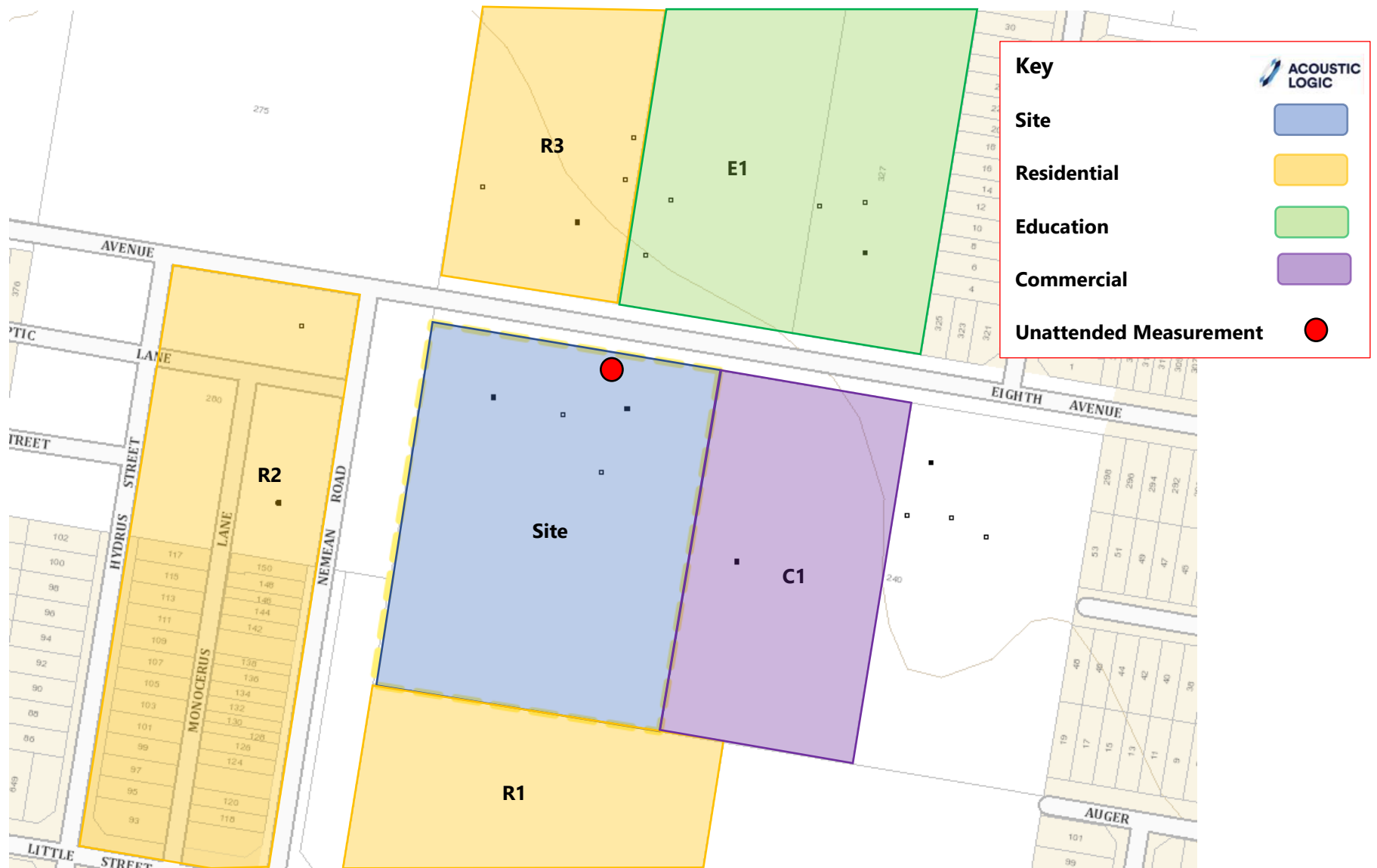


Figure 2 – Project Site (Source: NSW SIX Maps)

4 EXISTING ACOUSTIC ENVIRONMENT

The current acoustic environment is categorised by low background noise levels during the day and medium noise levels during the evening and night.

Acoustic monitoring was conducted onsite to establish the existing noise levels of the project site.

4.1 ENVIRONMENTAL NOISE DESCRIPTORS

Environmental noise constantly varies. Accordingly, it is not possible to accurately determine prevailing environmental noise conditions by measuring a single, instantaneous noise level.

To accurately determine the environmental noise a 15-minute measurement interval is utilised. Over this period, noise levels are monitored on a continuous basis and statistical and integrating techniques are used to determine noise description parameters.

In analysing environmental noise, three principal measurement parameters are used, namely L_{10} , L_{90} and L_{eq} . The L_{10} and L_{90} measurement parameters are statistical levels that represent the average maximum and average minimum noise levels respectively, over the measurement intervals.

The L_{10} parameter is commonly used to measure noise produced by a particular intrusive noise source since it represents the average of the loudest noise levels produced by the source.

Conversely, the L_{90} level (which is commonly referred to as the background noise level) represents the noise level heard in the quieter periods during a measurement interval. The L_{90} parameter is used to set the allowable noise level for new, potentially intrusive noise sources since the disturbance caused by the new source will depend on how audible it is above the pre-existing noise environment, particularly during quiet periods, as represented by the L_{90} level.

The L_{eq} parameter represents the average noise energy during a measurement period. This parameter is derived by integrating the noise levels measured over the 15-minute period. L_{eq} is important in the assessment of environmental noise impact as it closely corresponds with human perception of a changing noise environment; such is the character of environmental noise.

The L_{max} parameter represents the loudest instantaneous sound pressure level during a measurement period.

4.2 BACKGROUND NOISE LEVELS

4.2.1 Measurement Equipment

Unattended noise monitoring was conducted using one Acoustic Research Laboratories Pty Ltd noise logger. The logger was programmed to continuously store statistical noise levels as well as audio files throughout the monitoring period. The equipment was calibrated at the beginning and the end of each measurement using a Rion NC-73 calibrator; no significant drift was detected. All measurements were taken on A-weighted fast response mode. Noise logger data is provided in Section 4.2.3

4.2.2 Measurement Location and Period

The background noise monitor was located on the boundary of 260 Eighth Avenue, Austral South. The monitor was conducted in this location to obtain the most representative noise levels of the highest affected receiver. Monitoring was conducted between Monday the 13th of March and Monday the 27th of March 2023.

4.2.3 Measured Background Noise Levels

NSW EPA's RBL assessment procedure requires determination of background noise levels for each day (the ABL) then the median of the individual days as set out for the entire monitoring period.

Appendix 1 provides detailed results of the unattended noise monitoring. Weather affected data was excluded from the assessment. The processed Rating Background Noise Levels (lowest 10th percentile noise levels during operation time period) are presented in Table 1 below.

Table 1 – Summarised Rating Background Noise Levels

Date	Measured Noise Levels dB(A) $L_{eq}(\text{Period})$		
	Day	Evening	Night
Thursday 30 th March 2023	-	48	38
Friday 31 st March 2023	38	45	43
Saturday 1 st April 2023	38	44	38
Sunday 2 nd April 2023	36	42	41
Monday 3 rd April 2023	36	46	47
Tuesday 4 th April 2023	37	47	45
Wednesday 5 th April 2023	40	44	40
Thursday 6 th April 2023	39	41	36
Friday 7 th April 2023	31	42	44
Saturday 8 th April 2023	34	38	34
Sunday 9 th April 2023	31	34	25
Monday 10 th April 2023	32	33	26
Tuesday 11 th April 2023	40	37	28
Median	36	42	38

The following table summarises the rating background noise levels, determined for the day, evening and night periods as defined in the NPfI.

Table 2 – NPfl Rating Background Noise Levels

Location	Rating Background Noise Level (dB(A) L ₉₀)*		
	Day (7am – 6pm)	Evening (6pm – 10pm)	Night (10pm – 7am)
260 Eighth Avenue, Austral South	36	42 (36)*	38 (36)*

**In line with the requirements of the NSW EPA, "Noise Policy for Industry 2017," the evening and night-time periods have been corrected to be equal to the daytime rating background noise level at the monitoring location*

4.3 SUMMARISED TRAFFIC NOISE MEASUREMENTS

The following noise levels for the site have been established based on the long-term monitoring of the development site.

Table 3 – Traffic Noise Levels

Location	Time of Day	Summarised Traffic Noise Levels – dB(A) L _{eq} *
260 Eighth Avenue, Austral South	Daytime 7am – 10pm	57dB(A) L _{eq} (1hr)
	Night-time 10pm – 7am	52dB(A) L _{eq} (1hr)

*The daytime/night-time noise level difference has been adjusted based on the unattended noise monitoring data.

5 NOISE EMISSIONS ASSESSMENT

5.1 NOISE EMISSIONS CRITERIA

The noise emissions from the project site shall comply with the requirements of the following documents:

- Liverpool City Council – *Liverpool Development Control Plan 2008*
- NSW Environmental Protection Authority (EPA) *Road Noise Policy* (RNP) 2011, and
- NSW EPA *Noise Policy for Industry* (NPfI) 2017

5.1.1 Liverpool City Council – Liverpool Development Control Plan 2008

The Liverpool City Councils document '*Liverpool Development Control Plan 2008*' does not outline noise criteria in relation to noise emissions from commercial developments in a B1 Neighbour Centre of the Austral and Leppington zone.

Further reference is made to the NSW Environmental Protection Authority (EPA) document – '*Noise Policy for Industry (NPfI) 2017*'.

5.1.2 NSW Environmental Protection Authority (EPA) document- '*Noise Policy for Industry (NPfI) 2017*'

The NPfI provides guidelines for assessing noise impacts from developments. The recommended assessment objectives vary depending on the potentially affected receivers, the time of day, and the type of noise source.

The NPfI has two requirements which both have to be complied with, namely an amenity criterion and an intrusiveness criterion.

5.1.2.1 Intrusiveness Criterion

Noise sources covered by this code are mechanical services and plant noise. Section 2.4.3 of the Noise Policy for Industry addresses the effect of changing land use. In the case of Austral South, the further development of residential subdivisions surrounding the proposed Woolworths will significantly affect the background noise levels. The following changes would be expected to impact the existing background noise levels:

- Introduction of local roadways surrounding the site, expected to carry a mixture of local and through traffic.
- New mechanical plant servicing surrounding residential/commercial dwellings.

When considering the effects of changing use, the NSW EPA Noise Policy for Industry states the following:

When land uses in an area are undergoing significant change, for example, residential subdivision with associated development of local and regional roads, the background noise levels would be expected to change, sometimes significantly. The impact of noise from an existing industry on a proposed new residential area should be made using the recommended amenity noise level for the residential land use, not the project intrusiveness level. Where impacts exceed the amenity noise level, consideration should be given to how these impacts can be avoided or mitigated, such as modifying the location of the proposed residential development, placing screening land uses in-between the proposed residences and existing industry, or ensuring residences are built in a manner that provides acceptable indoor noise amenity.

Considering the above, noise emission requirements as detailed in the Noise Policy for Industry will be determined with reference to the amenity noise levels.

5.1.2.2 Amenity Criterion

The guideline is intended to limit the absolute noise level from all noise sources to a level that is consistent with the general environment.

The EPA's NPfl sets out acceptable noise levels for various localities. The recommended noise amenity area is based upon the measured background noise levels at the sensitive receiver. Based on the measured background noise levels detailed in Section 3 combined with the proposed future redevelopment of the site, the Noise Policy for Industry suggests the adoption of the 'suburban' categorisation.

The NPfl requires project amenity noise levels to be calculated in the following manner:

$$L_{Aeq,15min} = \text{Recommended Amenity Noise Level} - 5 \text{ dB(A)} + 3 \text{ dB(A)}$$

The amenity levels appropriate for the receivers surrounding the site are presented in the table below.

Table 4 – EPA Amenity Noise Levels

Type of Receiver	Time of day	Recommended Noise Level dB(A) _{Leq(period)}	Project Amenity Noise Level dB(A) _{Leq(15 minute)}
Residential –Urban*	Day	60	58
	Evening	50	48
	Night	45	43
School Classroom - internal	Noisiest 1-hour period when in use	35	33
Commercial	When in use	65	63

*Note-The urban categorisation as outlined in the NPfl states the following:

Urban – an area with an acoustical environment that:

- Is dominated by 'urban hum' or industrial source noise, where urban hum means the aggregate sound of many unidentifiable, mostly traffic and/or industrial related sound sources....
- Is near commercial districts or industrial districts.

It is stipulated within the Austral Future Precinct Indicative Layout Plan provided by Liverpool City Council, that the future residential population will be classified as 'town centre residential'. For this reason, the future residential receivers surrounding the site will be assessed under the Urban Category.

5.1.2.3 Maximum Noise Level Event Assessment (Sleep Disturbance)

The *NPfl* recommends the following noise limits to mitigate sleep disturbance:

Where the subject development/premises night time noise levels at a residential location exceed:

- $L_{Aeq, 15min}$ 40 dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or
- L_{AFmax} 52 dB(A) or the prevailing RBL plus 15 dB, whichever is the greater,

A detailed maximum noise level event assessment should be undertaken.

The following sleep emergence noise objectives then apply:

Table 5 – Sleep Disturbance Criteria for Residential Receivers

Receiver	Night-time Rating Background Noise Level dB(A) L_{90}	NPI Emergence Level
All Residential Receivers	36	41 dB(A) $L_{eq, 15min}$ 52 dB(A) L_{Fmax}

5.1.3 NSW Environmental Protection Authority (EPA) document – ‘Road Noise Policy (RNP) 2011’

For land use developments with the potential to create additional traffic, the development shall comply with the requirements detailed in the EPA’s *RNP*. The criteria detailed in the table below has been applied to assess the future potential acoustic impacts of increased traffic to be generated from the project site once it is operational.

Table 6 – Criteria for Increased Traffic Generation from the Development

Type of Receiver	Time of Day	Acceptable Traffic Noise Levels
Residential Receivers	Day (7:00am – 10:00pm)	55 dB(A) $L_{eq(1hr)}$ (Local Roads)
School Classrooms		40dB(A) $L_{eq(1hr)}$ (when in use)

Given that measured traffic noise levels currently exceed those in the table above, Section 3.4 of the *RNP* is applicable, which requires noise impacts to be reduced through feasible and reasonable measures. However, in determining what is feasible/reasonable, the policy notes the following:

"For existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level should be limited to 2 dB above that of the corresponding 'no build option'

A detailed maximum noise level event assessment can be undertaken using the NSW EPA *Road Noise Policy* 2011 to satisfy the NSW EPA NPfI 2017 for a development which exceeds the NPfI recommended noise limit for sleep disturbance. The NSW EPA Road Noise Policy 2011 concludes the following:

- *maximum internal noise levels below 50–55 dB(A) are unlikely to awaken people from sleep*
- *one or two noise events per night, with maximum internal noise levels of 65–70 dB(A), are not likely to affect health and wellbeing significantly.*

The following sleep emergence noise objectives then apply:

Table 7 – Sleep Disturbance Criteria for Residential Receivers

Receiver	RNP Emergence Level
All Residential Receivers	55 (internal) dB(A) L_{Fmax}

5.2 SUMMARISED NOISE EMISSION OBJECTIVES

A summary of noise emission objectives for operational noise associated with the proposed development is shown in the table below.

Table 8 – Summarised Noise Emission Objectives

Receiver	Time of Day	Project Noise Emission Objective dB(A)L_{eq}	NPfI/RNP Criteria for Sleep Disturbance
Residential Receivers	Day (7:00am – 6:00pm)	58	-
	Evening (6:00pm – 10:00pm)	48	-
	Night (10:00pm-7:00am)	43	41 dB(A) $L_{eq, 15min}$; 55 (internal)dB(A) L_{Fmax}
School Classroom – (internal)	Noisiest 1-hour period when in use	33 (internal)	-
Commercial	When in Use	63	

5.3 ASSESSMENT OF OPERATIONAL NOISE EMISSIONS

An assessment of operational noise has been conducted and is presented below. The following noise sources are assessed:

- Noise emissions articulated trucks entering and exiting the loading dock for inbound deliveries.
- Noise emissions from articulated trucks manoeuvring at the loading dock.
- Noise emissions from pallet jacks manoeuvring at the loading dock.
- Noise emissions from passenger vehicles manoeuvring in the on-grade carpark.
- Noise emissions from mechanical plant (in principle).
- Key L_{max} events have been separately modelled to determine any influence of night time operations on sleep disturbance. Specifically, car engine starting and door slamming has been modelled as a moving point source at 1m above the on-grade carpark finished floor height to predict the worst affected location where the event may occur.

The following noise emission data for vehicle-related noise sources measured by this office have been used for the assessment. Note that the sound power level below has been adjusted for a tonality penalty per Factsheet C of the Noise Policy for Industry for a reverse beacon, typical of large articulated vehicles. This noise emission level has been obtained from noise measurements carried out at a similar loading dock facility. Noise measurements were obtained using a Norsonics Nor118 sound level analyser set to fast response. The sound level analyser was calibrated before and after the measurements using a Rion NC-73 calibrator with no significant drift detected during the measurement.

Table 9 – Sound Power Levels of Typical Activities

Item	Sound Power Level, dB(A)
Car Manoeuvring @ 10km/h	84 $L_{eq(15 \text{ min})}$
Pallet Jacks @ 5km/h	85 $L_{eq(15 \text{ min})}$
Car Door Slamming	96 L_{max}
Truck Manoeuvring @ 10km/h (medium rigid trucks/ semi-trailers)	100 $L_{eq(15 \text{ min})}$
Truck Reversing @ 5km/h (medium rigid trucks/ semi-trailers)	*105 $L_{eq(15 \text{ min})}$
Truck Air Brake	114 L_{max}

*A 5 dB(A) penalty has been applied for the reversing beacon.

5.3.1 Operational Assumptions

The following information provided to this office, as well as assumptions made by this office, are features of the existing operational noise SoundPlan model:

- AL assumes that in a worst 15-minute period, there will be:
 - Daytime period (7:00am-6:00pm):
 - 2 large truck movements per 15-minutes at the Woolworths Loading Dock.
 - 4 pallet jack movements per 15-minutes at the Woolworths Loading Dock.
 - Evening period (6:00pm-10:00pm):
 - 1 large truck movements per 15-minutes at the Woolworths Loading Dock.
 - 2 pallet jack movements per 15-minutes at the Woolworths Loading Dock.
- Proposed operation of the loading dock will occur between the hours of 7:00am-10:00pm
- Vehicle movements have been calculated based on the assumption that cars entering, exiting and manoeuvring around the carpark will be driving at 10km/h. Trucks reversing and pallet jacks will move at 5km/h.
- 145 vehicles entering and exiting the site via Warrawal Avenue in a worst hour (correlating to 37 movements in a 15-minute period). 225 vehicles entering and exiting the site via Auger Street in a worst hour (correlating to 57 movements in a 15-minute period).
- Night time peak vehicle movements in the on-grade car park have been assumed to be 10% of the typical peak daytime period in the point above.
- Condenser Deck to have a combined sound power level of 90dB(A) running at full speed in the day, evening and night time periods (conservative for night time).

5.3.2 Sleep Disturbance (Intermittent) Noise Assessment

Short duration noise events (door close/car start) are assessed with reference to EPA Sleep Disturbance Guidelines if the loading dock and carpark is to be operational during the night period (10pm-7am).

The following sleep disturbance assessment is conducted with reference to the guidelines set out in Section 5.1. The assessment is based on the following assumptions:

- Car door Slam/Car Start (night-time peak noise event): 96dB(A) L_{max} sound power.

As noted in Section 5.1, sleep disturbance assessment is a two-step process:

Firstly, the peak noise events are assessed with reference to a "Background+15dB(A)" assessment. If this test is passed, the noise emissions should be considered satisfactory.

In the event that the first test cannot be complied with, an assessment is then made of the actual noise level inside the residence (assuming window open) and comparison made to the EPA guidance regarding peak noise events and probability of awakening.

*Note the loading dock is not intended to operate throughout the night-time period (10:00pm-7:00am).

5.4 NOISE GENERATED BY ADDITIONAL TRAFFIC ON PUBLIC ROADS

Noise generated as a result of increased traffic of public roads is assessed with reference to the EPA Road Noise Policy utilising the CoRTN road noise methodology.

Access/egress to the site will be from Warrawal Avenue and Auger Street with the main connecting road being Eighth Avenue. Predictions of traffic noise generation have been made using the following modelling assumptions:

- Automobiles travelling at 50km/h along all roads.
 - For the typical early morning shoulder period (6am – 7am), the following number of vehicle movements are expected.
 - 165 automobile movements and 1 heavy truck movement on Warrawal Avenue.
 - 125 automobile movements on Auger Street.
 - For the typical afternoon shoulder period (5pm - 6pm), the following number of vehicle movements are expected.
 - 330 automobile movements on Warrawal Avenue.
 - 250 automobile movements on Auger Street.
- All inbound and outbound movements of all vehicle types are equally distributed travelling on each road.

The predicted traffic noise level has been modelled using AM and PM peak hour traffic counts from Colston Budd Rogers & Kafes Pty Ltd. Traffic flows were predicted to be between 165 and 330 vehicles per hour for Warrawal Avenue and 125 to 250 vehicles per hour for Auger Street during weekday and afternoon peak hours respectively.

The AADT of the roadway was calculated in the following manner:

- Warrawal Avenue
 - Peak AM/PM 1 hour volumes of 228 vehicles / hour two-way.
 - Off-peak daytime levels of 205 vehicles / hour two way (based on 90% of peak hour flow).
 - Night time average levels of 114 vehicles / hour two way (based on 50% of peak daytime traffic flows)
- Auger Street
 - Peak AM/PM 1 hour volumes of 188 vehicles / hour two-way.
 - Off-peak daytime levels of 169 vehicles / hour two way (based on 90% of peak hour flow).
 - Night time average levels of 94 vehicles / hour two way (based on 50% of peak daytime traffic flows).

The result AADT of all assumed traffic volumes based off the above assumptions is 3,942 for Warrawal Avenue and 3,419 for Auger Street. These traffic volumes were used to predict noise levels at monitoring locations using the CoRTN methodology. A differentiation of 10% trucks to 90% automobiles was used, as this is a conservative approach. Calculated traffic noise levels based on the above assumptions are consistent with those measured on site by long term noise monitoring.

The potential for additional noise from traffic generation associated with the facility were calculated by adding the additional vehicle movements from the site to the calculated traffic volumes.

Noise emissions have been predicted at the worst affected residential receivers and compared against the acoustic criteria set out in Section 5.3. The cumulative traffic noise generation at the worst affected point at each residential receiver is presented below.

Table 10 – Cumulative Traffic Noise Including Noise Generated by Additional Traffic

Receiver Location	Predicted Change in Traffic Noise Levels	Comments
R1	< 2 dB(A) $L_{eq(1hr)}$	Less than 2dB(A) allowable increase as detailed in the EPA Noise Policy Section 3.4
R2		
R3		
E1		

The potential for additional traffic noise generation from the site is negligible in the context of the proposed new roads surrounding the development.

5.5 SOUNDPLAN MODELLING

Noise levels have been predicted at the receiver locations using SoundPlan™ 8.0 modelling software implementing the ISO 9613-2:1996 "Acoustics – Attenuation of Sound During Propagation Outdoors – Part 2: General Method of Calculation" noise propagation standard.

Noise enhancing meteorological effects have been adopted as recommended by the NPfI, noting that the ISO 9613 modelling approach assumes that all receivers are 'downwind' (i.e., that noise enhancing wind conditions are in effect at all times).

Ground absorption was conservatively calculated with a ground factor of 0 for all areas except for localised lawns and greenery of the development fronting Percy Street with a ground factor of 0.6 as recommended in *Engineering Noise Control* (Bies & Hanson).

In line with Factsheet C of the NPfI, penalties for annoying noise characteristics should be applied at the receiver, where applicable. Based on the predicted noise levels, no penalty should be applied (either for tonality, intermittency, or otherwise).

5.5.1 Cumulative Noise from Site Operation – Daytime

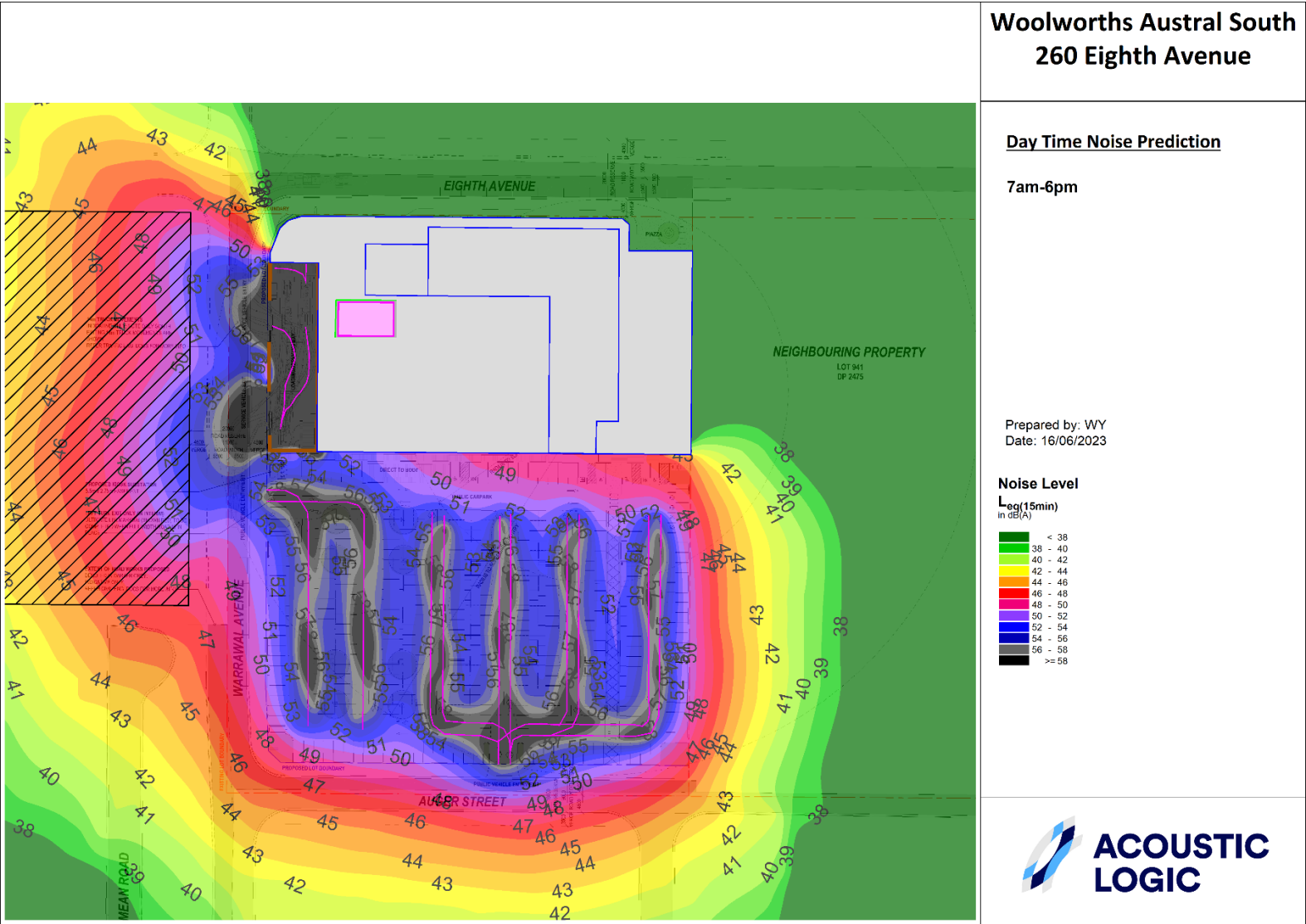


Figure 3 – Overall 2D View Daytime Cumulative Noise Emissions

5.5.2 Cumulative Noise from Site Operation – Evening



Figure 4 – Overall 2D View Evening Cumulative Noise Emissions

5.5.3 Cumulative Noise from Site Operation - Night

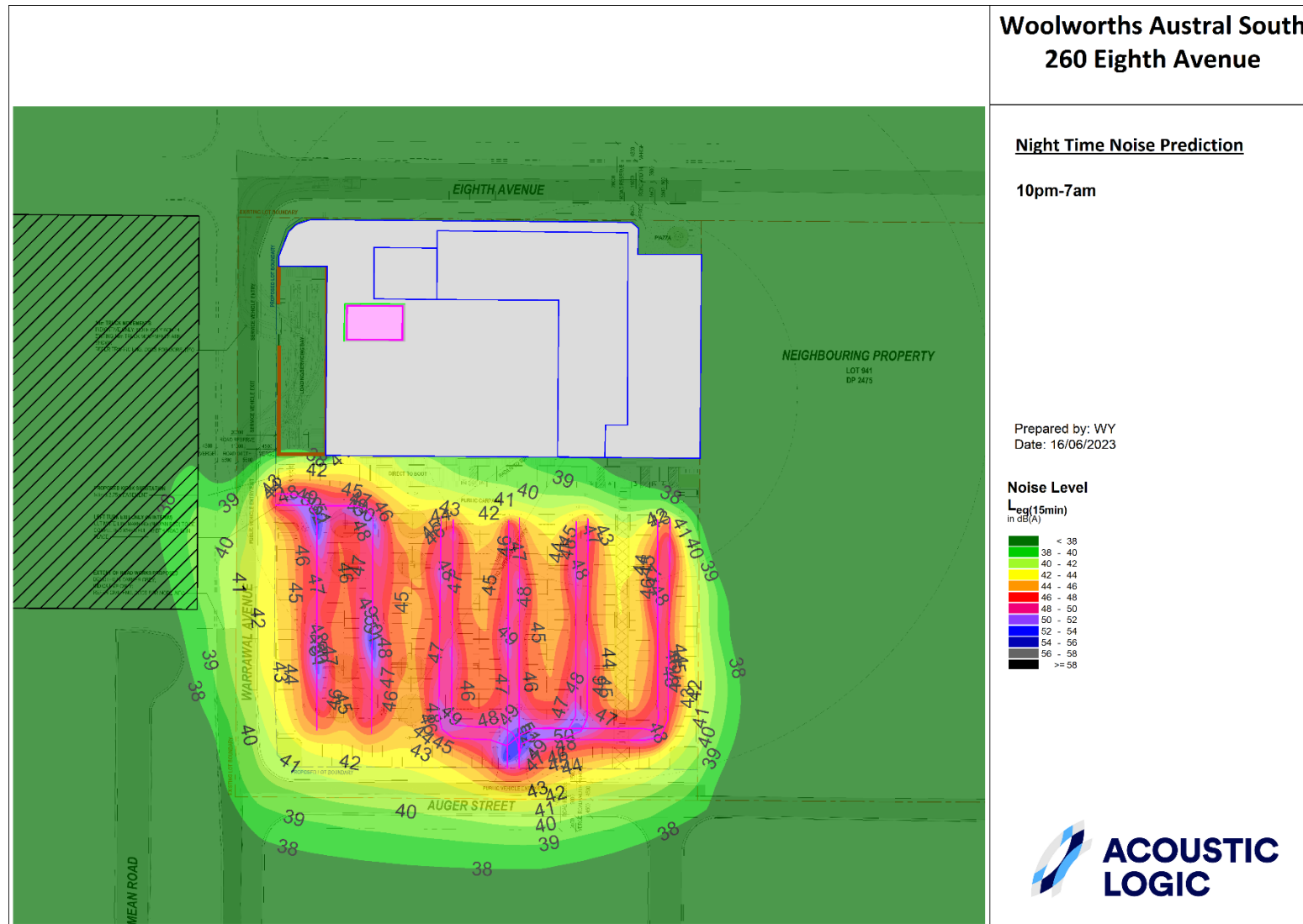


Figure 5 – Overall 2D View Night Cumulative Noise Emissions

5.5.4 Cumulative Noise Modelling Results (Peak L_{Max} Events)

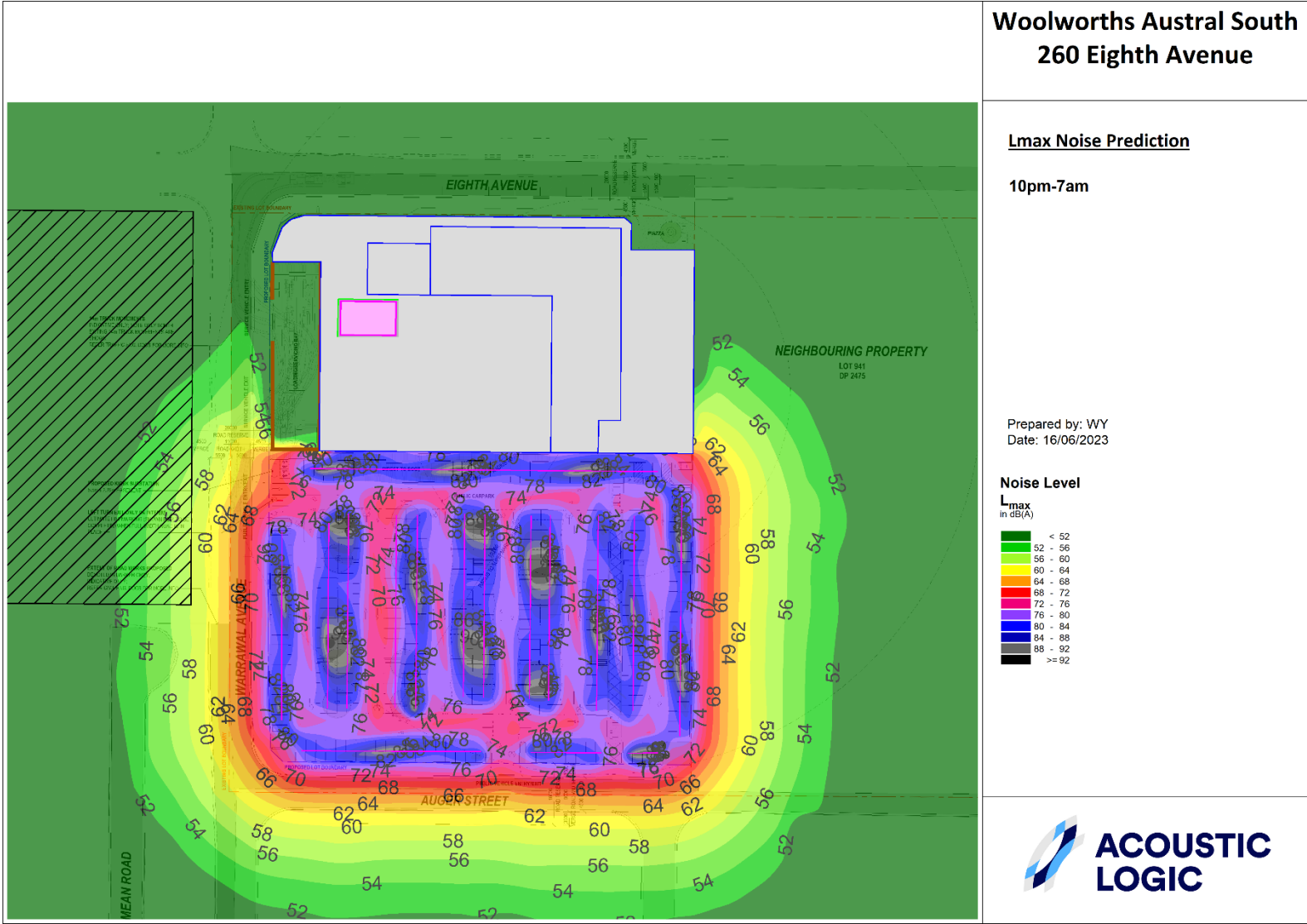


Figure 6 – Overall 2D View L_{Max} Night

5.6 PREDICTED NOISE EMISSIONS SUMMARY

Cumulative noise emission predictions from all operational noise as outlined in Section 5.3 is presented below to the most sensitive receivers around the development. The predicted noise level range at each receiver is summarised below.

Table 11 – Predicted Cumulative Noise Levels for Future Residents

Operational Source	Prediction Location	Predicted Noise Level	Criteria	Comment
Cumulative Noise from Site Operation, Including Loading Dock Usage and Carpark	R1 3m From Boundary	46 dB(A) $L_{eq(15min)}$	58 dB(A) L_{eq} Daytime (7am–6pm)	Meets NSW EPA Noise Emission Requirements*
			48 dB(A) L_{eq} Evening (6pm–10pm)	
		< 38 dB(A) $L_{eq(15min)}$	43 dB(A) L_{eq} Night (10pm–7am)	
Maximum Noise Event from Carpark Activities (Refer Section 5.3.2)		60 dB(A) L_{max}	55 (internal) dB(A) L_{max}	
Cumulative Noise from Site Operation, Including Loading Dock Usage and Carpark	R2 3m From Boundary	50 dB(A) $L_{eq(15min)}$	58 dB(A) L_{eq} Daytime (7am–6pm)	
		48 dB(A) $L_{eq(15min)}$	48 dB(A) L_{eq} Evening (6pm–10pm)	
		44 dB(A) $L_{eq(15min)}$	43 dB(A) L_{eq} Night (10pm–7am)	
Maximum Noise Event from Carpark Activities (Refer Section 5.3.2)		58 dB(A) L_{max}	55 (internal) dB(A) L_{max}	
Cumulative Noise from Site Operation, Including Loading Dock Usage and Carpark	R3 3m From Boundary	41 dB(A) $L_{eq(15min)}$	58 dB(A) L_{eq} Daytime (7am–6pm)	
			48 dB(A) L_{eq} Evening (6pm–10pm)	
		< 38 dB(A) $L_{eq(15min)}$	43 dB(A) L_{eq} Night (10pm–7am)	
Maximum Noise Event from Carpark Activities (Refer Section 5.3.2)		< 52 dB(A) L_{max}	55 (internal) dB(A) L_{max}	

**Section 4.2 of the Noise Policy for Industry states that the residual noise impacts of an individual scenario that is no greater than 2dB(A) above respective criteria is considered negligible and that it would 'not be discernible by the average listener and therefore would not warrant receiver-based treatments or controls'.*

Cumulative Noise from Site Operation, Including Loading Dock Usage and Carpark	E1 Boundary	<38 dB(A)	33dB(A) (internal)	Meets NSW EPA Noise Emission Requirements*
Cumulative Noise from Site Operation, Including Loading Dock Usage and Carpark	C1 Boundary	46 dB(A)	63 dB(A) $L_{eq(15min)}$	

*Typically, a 10dB(A) noise reduction occurs through a window open for natural ventilation

5.6.1 Maximum Noise Event Assessment

Note L_{Max} corrected external noise levels at receiver facades have been presented in the table below. Typically, a 10dB(A) noise reduction occurs through a window open for natural ventilation. The below table presents the corrected maximum noise events to each residential receiver.

Table 12 - Predicted Internal Noise Level L_{max} with Windows Open

Receiver	Predicted External Noise Level L_{max}	Predicted Internal Noise Level L_{max}	Criteria*	Compliance
R1	60 L_{max}	50 L_{max}	55 L_{max}	Yes
R2	58 L_{max}	48 L_{max}		
R3	<52 L_{max}	<42 L_{max}		

5.7 NOISE FROM MECHANICAL PLANT WITHIN PROPOSED SITE GENERALLY

Detailed plant selection has not been undertaken at this stage. Noise emissions from all mechanical services to the closest sensitive receivers should comply with the requirements of Section 5.1. Detailed acoustic review should be undertaken at CC stage to determine acoustic treatments to control noise emissions to satisfactory levels.

5.8 COMPLYING CONSTRUCTIONS AND CONTROLS

Predicted noise levels from the operation of the proposed development show that it is capable of meeting the noise emission requirements during the day and evening operation.

It is recommended that a review and detailed design of all mechanical plant associated with the site be undertaken prior to the issue of a construction certificate to ensure plant noise levels meet the noise emission requirements detailed in Section 5.1. Any review of mechanical plant noise should take into consideration the operational noise levels from the site, such that the cumulative noise does not exceed the PNTL's.

All feasible and reasonable noise mitigation measures have been applied to reduce noise levels and the following recommendations are presented:

- A 6m high acoustic barrier is to be erected around the loading dock as per Figure 7.
- An acoustic roller shutter or similar acoustic system is to be implemented on the exit path of the loading dock as per Figure 7. This acoustic shutter must be closed throughout the evening time period except for the purposes of truck egress.
- All acoustic barriers are to have Stratocell Whisper 100mm or equivalent acoustic absorption panelling facing the loading dock with a related NRC of 1.
- Engines should be turned off during loading and unloading movements, thus effectively having no idling noise during the loading and unloading operations.
- Number of movements in each time period are not to exceed the following:
 - Daytime period (7:00am-6:00pm):
 - 2 large truck movements per 15 minute period at the Woolworths Loading Dock.
 - 4 pallet jack movements per 15 minute period at the Woolworths Loading Dock.
 - Evening period (6:00pm-10:00pm):
 - 1 large truck movements per 15 minute period at the Woolworths Loading Dock.
 - 2 pallet jack movements per 15 minute period at the Woolworths Loading Dock.

Noise modelling predicts that noise emissions will comply to all sensitive receivers. If an increase of the loading dock usage is expected an additional acoustic review will be required.

5.8.1 Acoustic Barrier

Acoustic Logic note that due to the close proximity of the residential receivers to the development, acoustic barriers and shutters surrounding the loading dock is required.

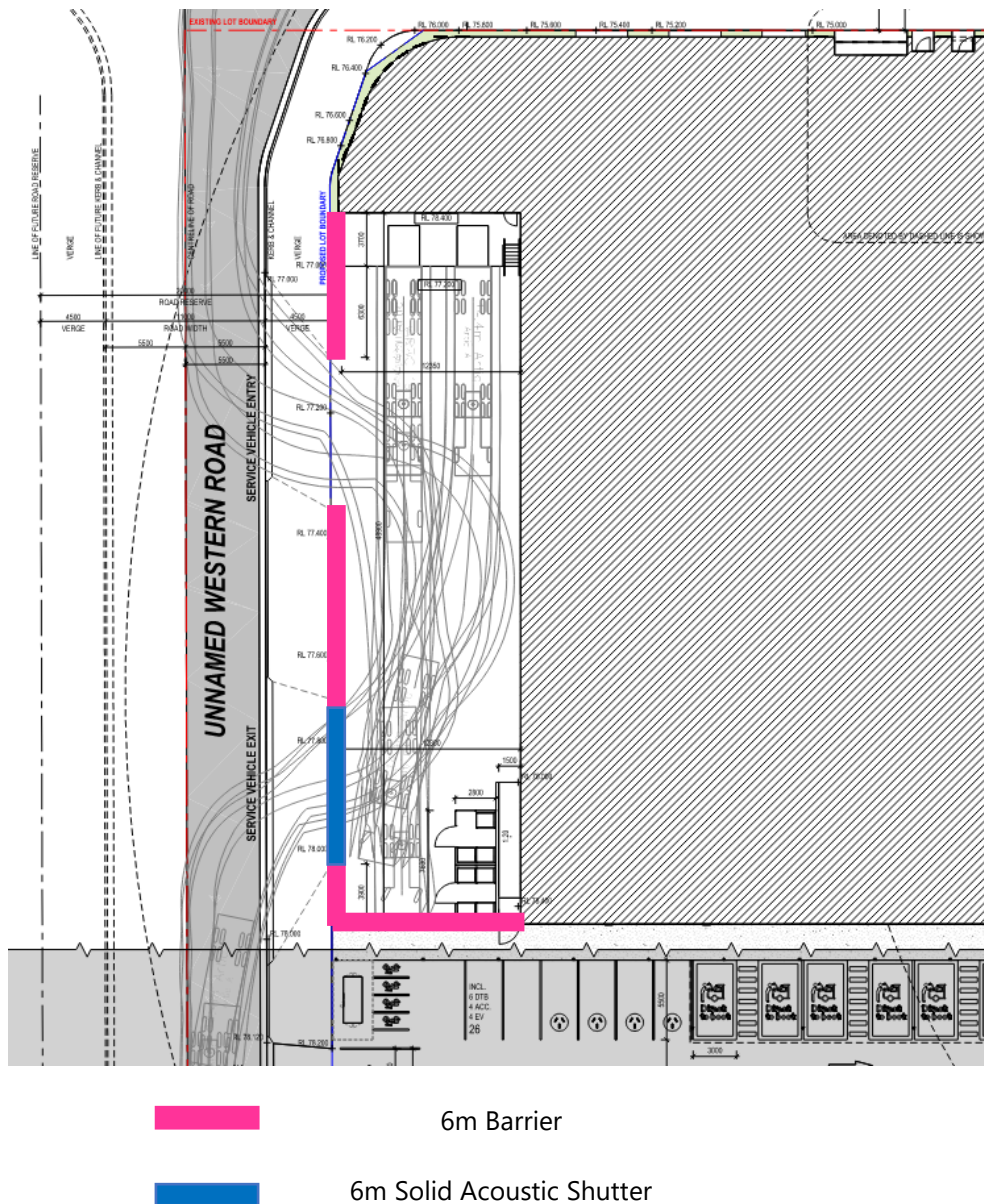


Figure 7 – Proposed Acoustic Barrier

- The recommended acoustic barrier located at the loading dock Figure 7 above. Barriers are to be constructed to the minimum height outlined from the RL presented in the site plan provided to this office.
- Install imperforate acoustic barrier marked the corresponding heights above. The barrier may be constructed of lapped and capped timber, plexiglass, 4mm Perspex, Colourbond, 9mm fibrous cement sheet or equivalent, installed with no gaps between the panels and maximum of a 20mm gap at the bottom to allow water flow if required.
- The recommended acoustic shutter is to be constructed at the minimum height outlined from the RL presented above and are to be constructed of solid aluminium or alike.

6 CONCLUSION

A review of the current concept architectural drawings for the proposed Woolworths to be located at 260 Eighth Avenue, Austral South has been conducted.

Provided that the complying constructions and controls presented in Section 5.8 are adopted, operational noise emissions will satisfy the requirements of the following documents:

- Liverpool City Council – Liverpool Development Control Plan 2008
- NSW Environmental Protection Authority (EPA) Road Noise Policy (RNP) 2011, and
- NSW EPA Noise Policy for Industry (NPfI) 2017

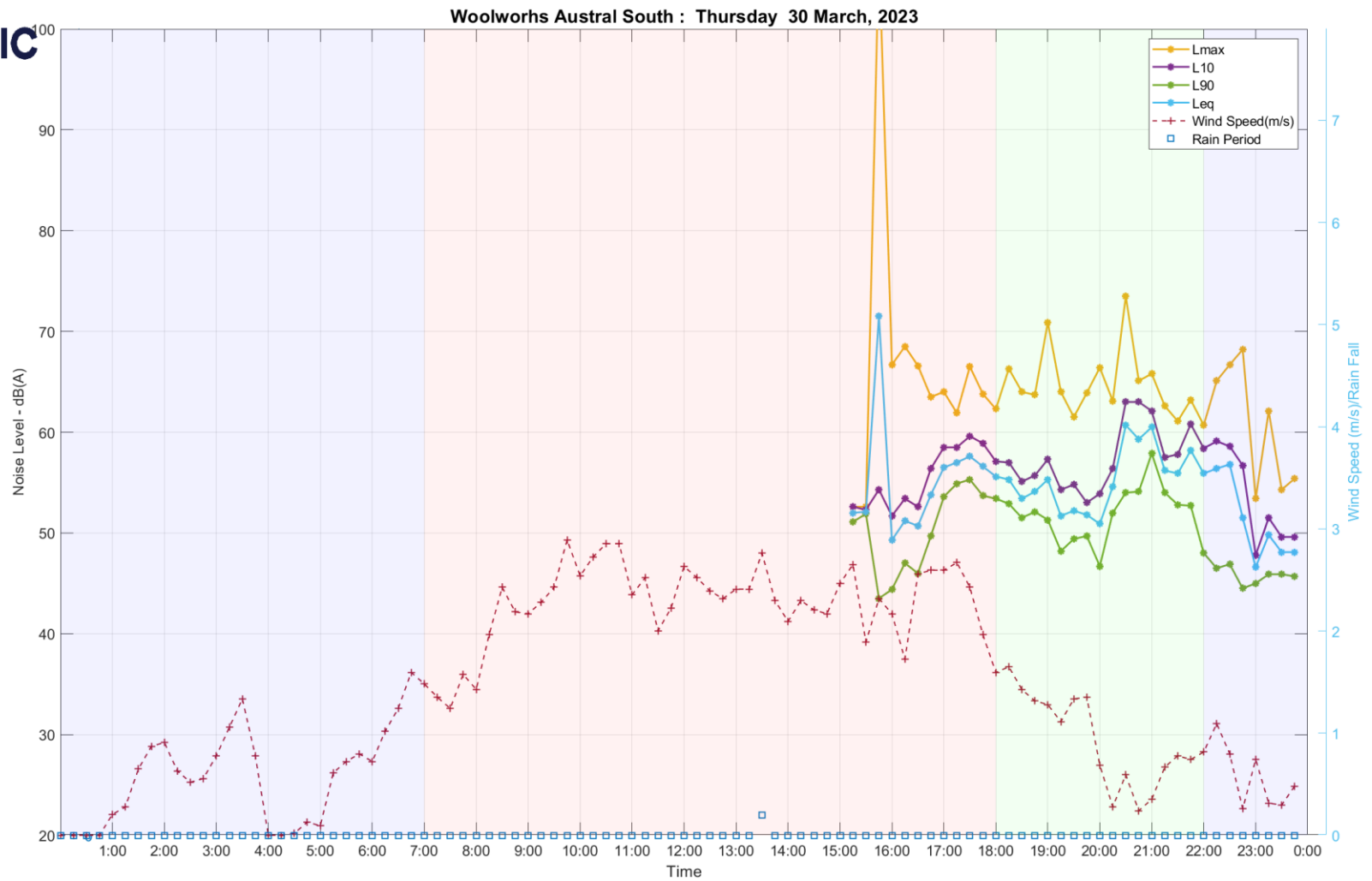
We trust this information is satisfactory. Please contact us should you have any further queries.

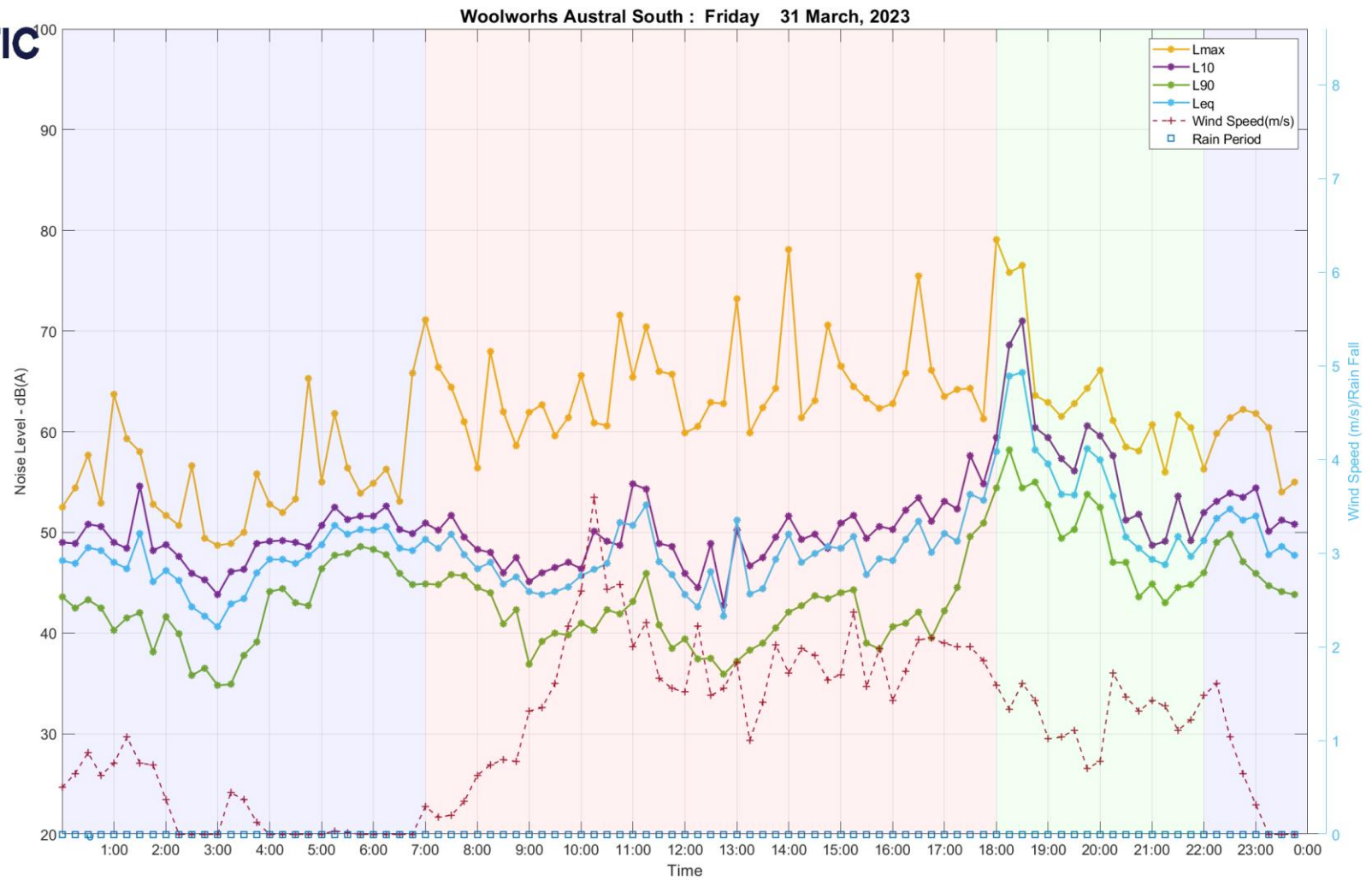
Yours faithfully,

A handwritten signature in black ink, appearing to read 'J Wade', written in a cursive style.

Acoustic Logic Pty Ltd
Justine Wade

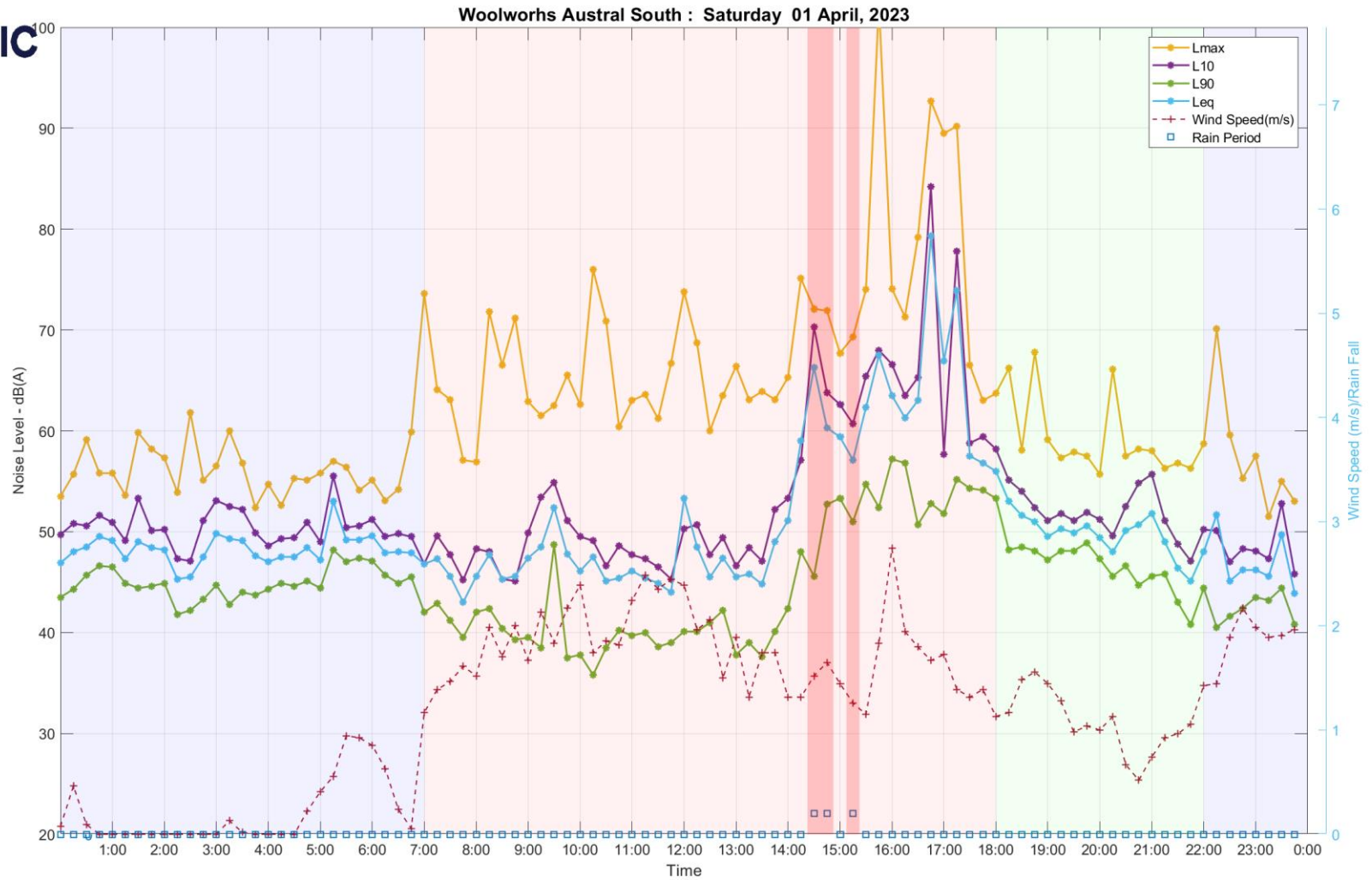
APPENDIX 1 – NOISE MONITORING CHARTS





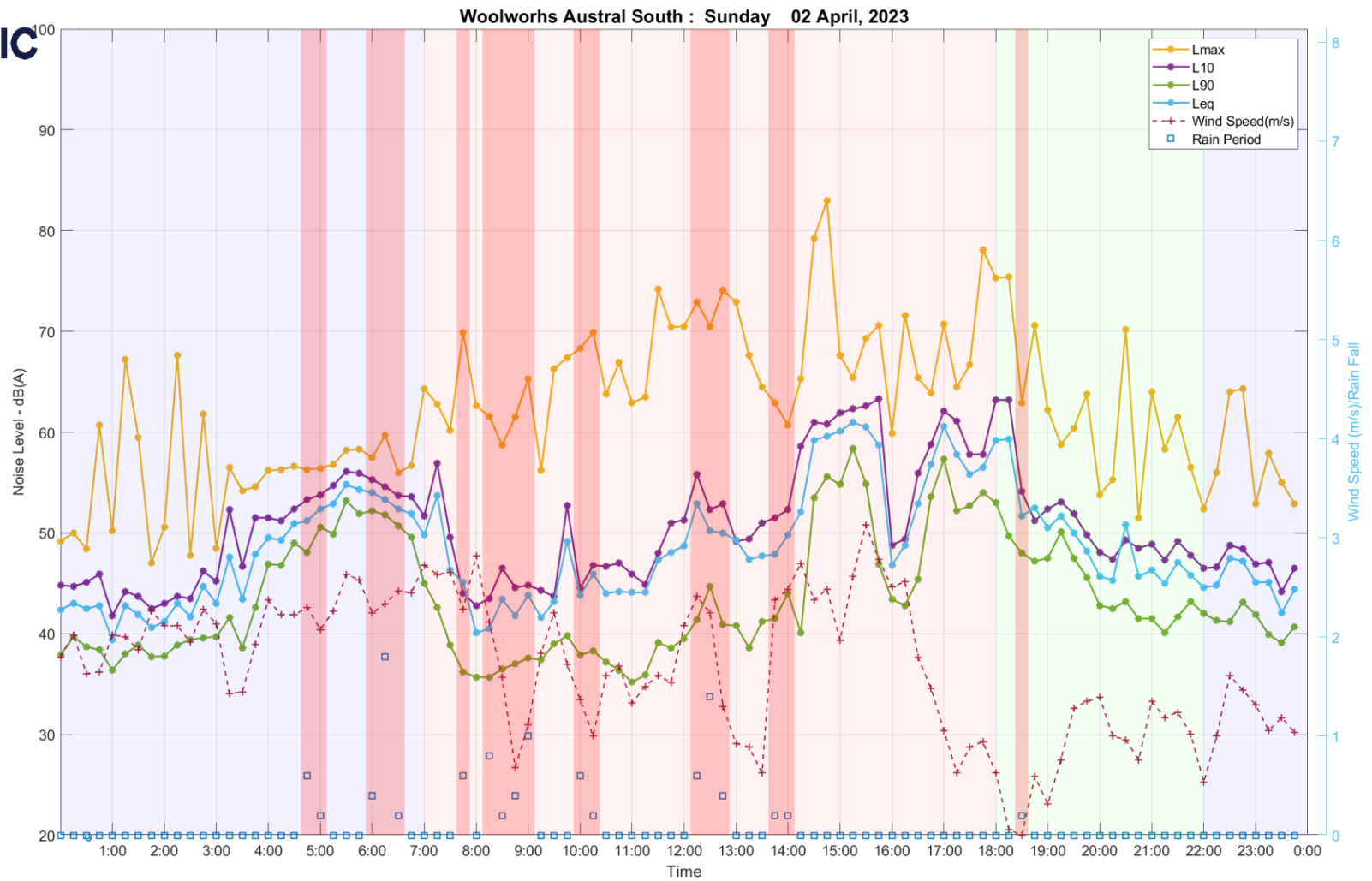


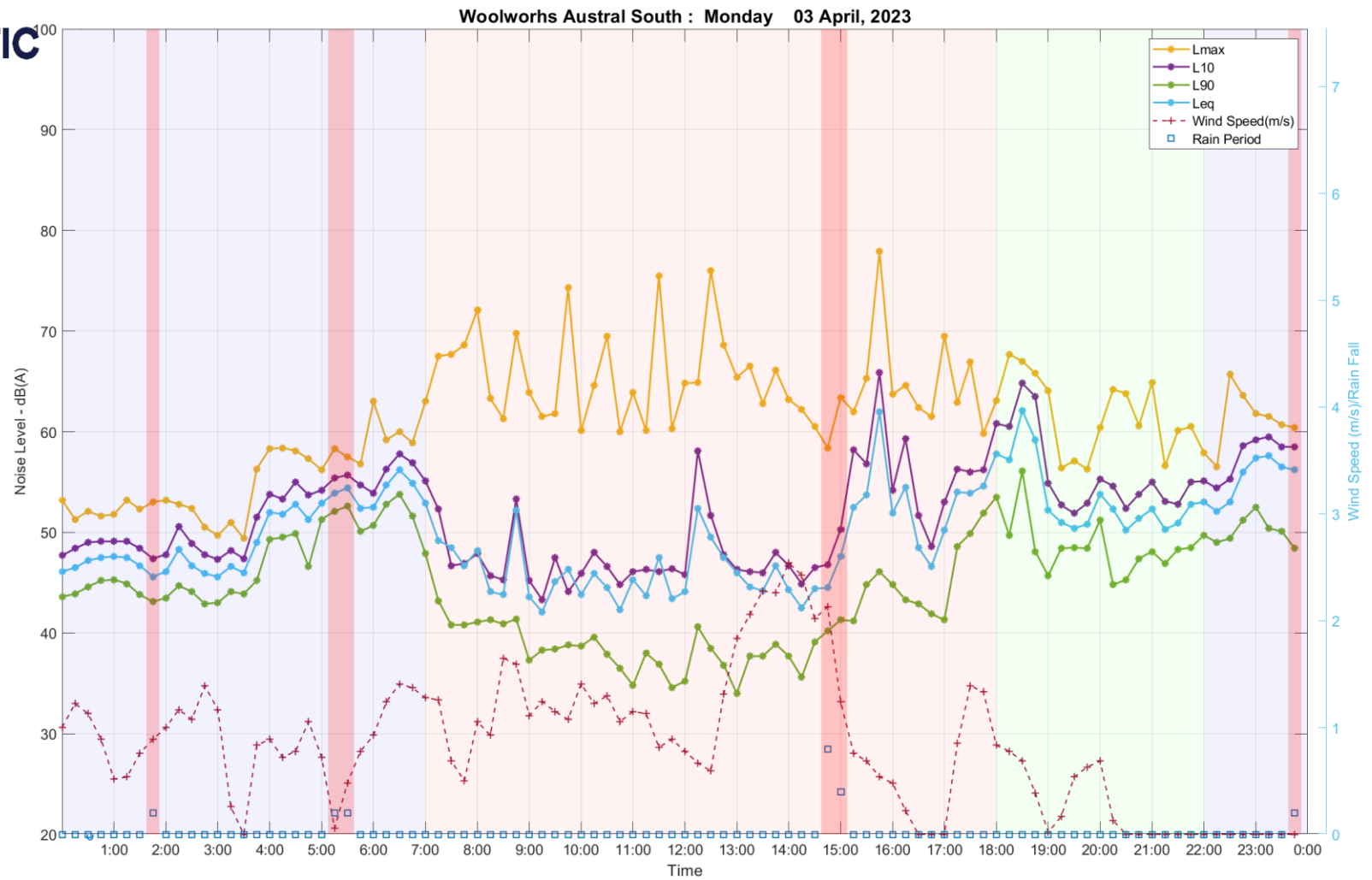
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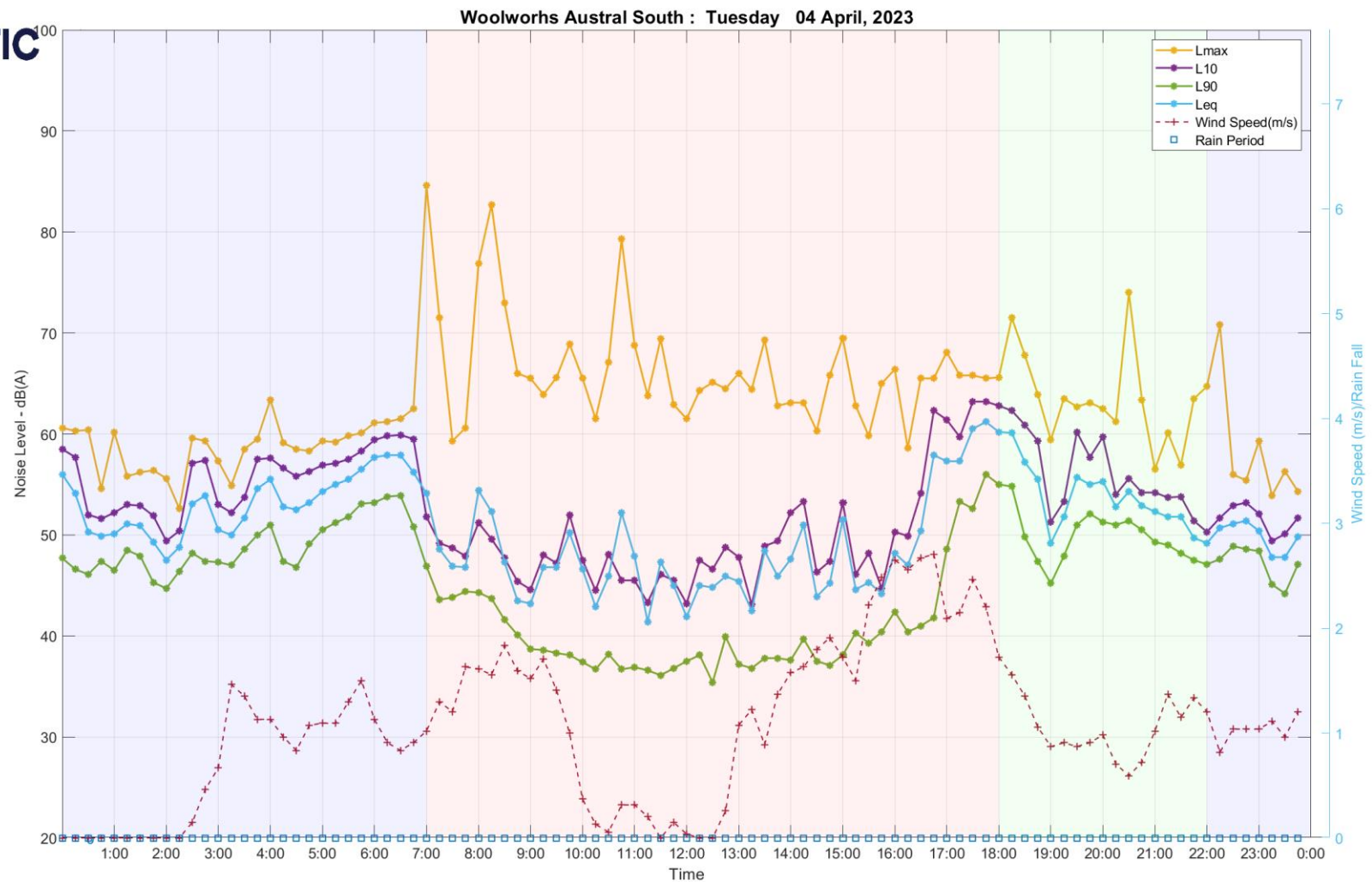


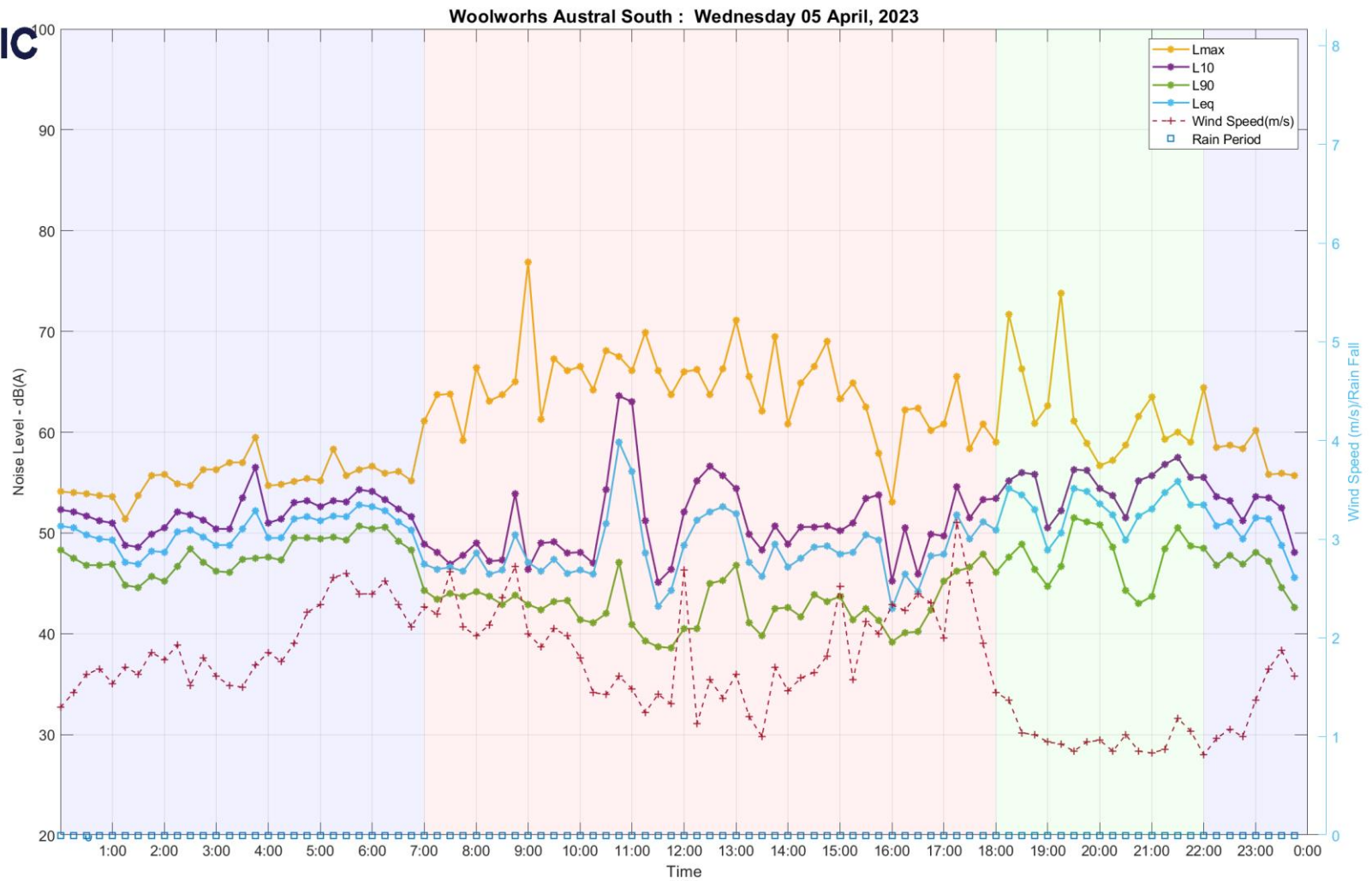


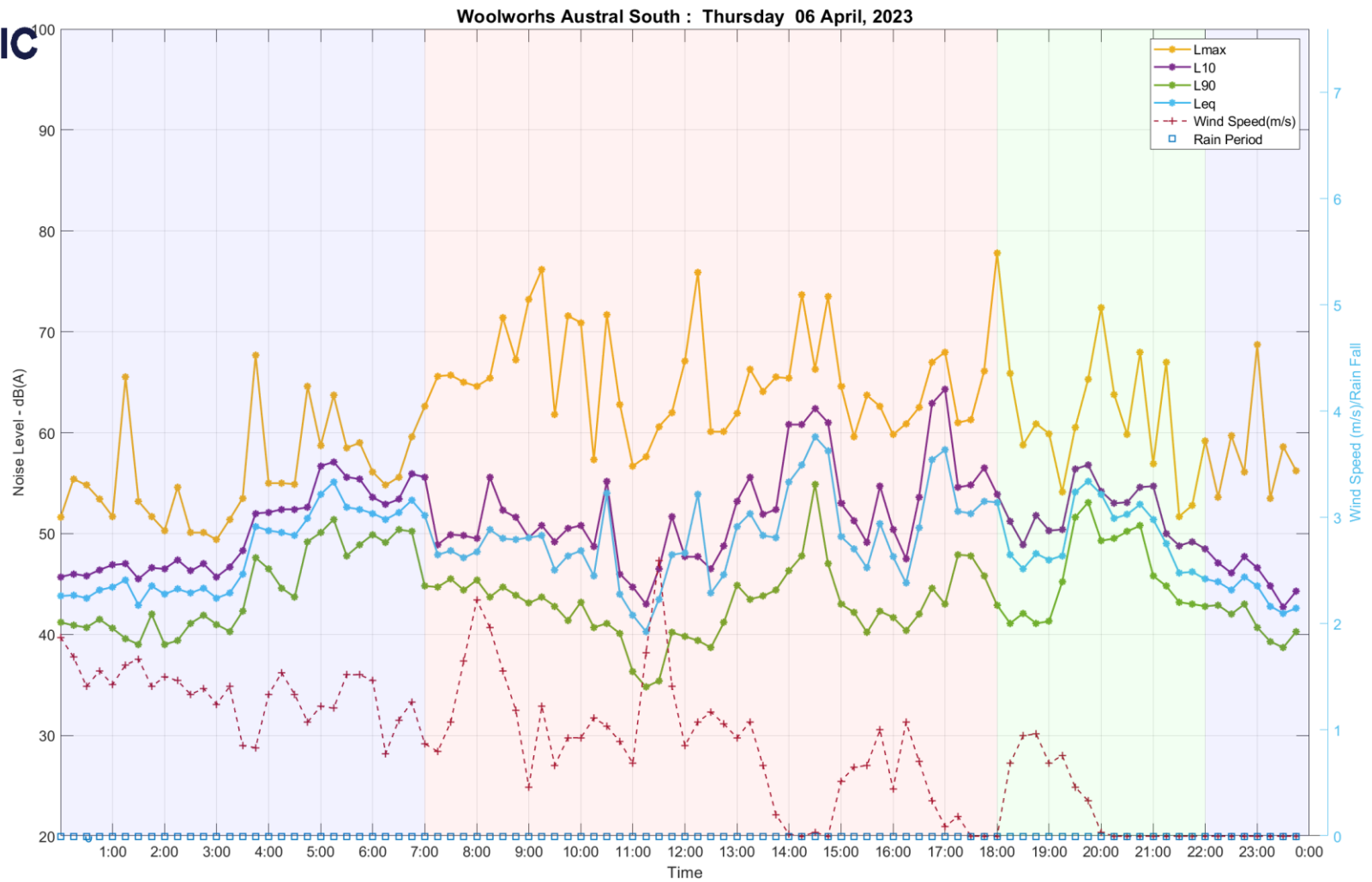
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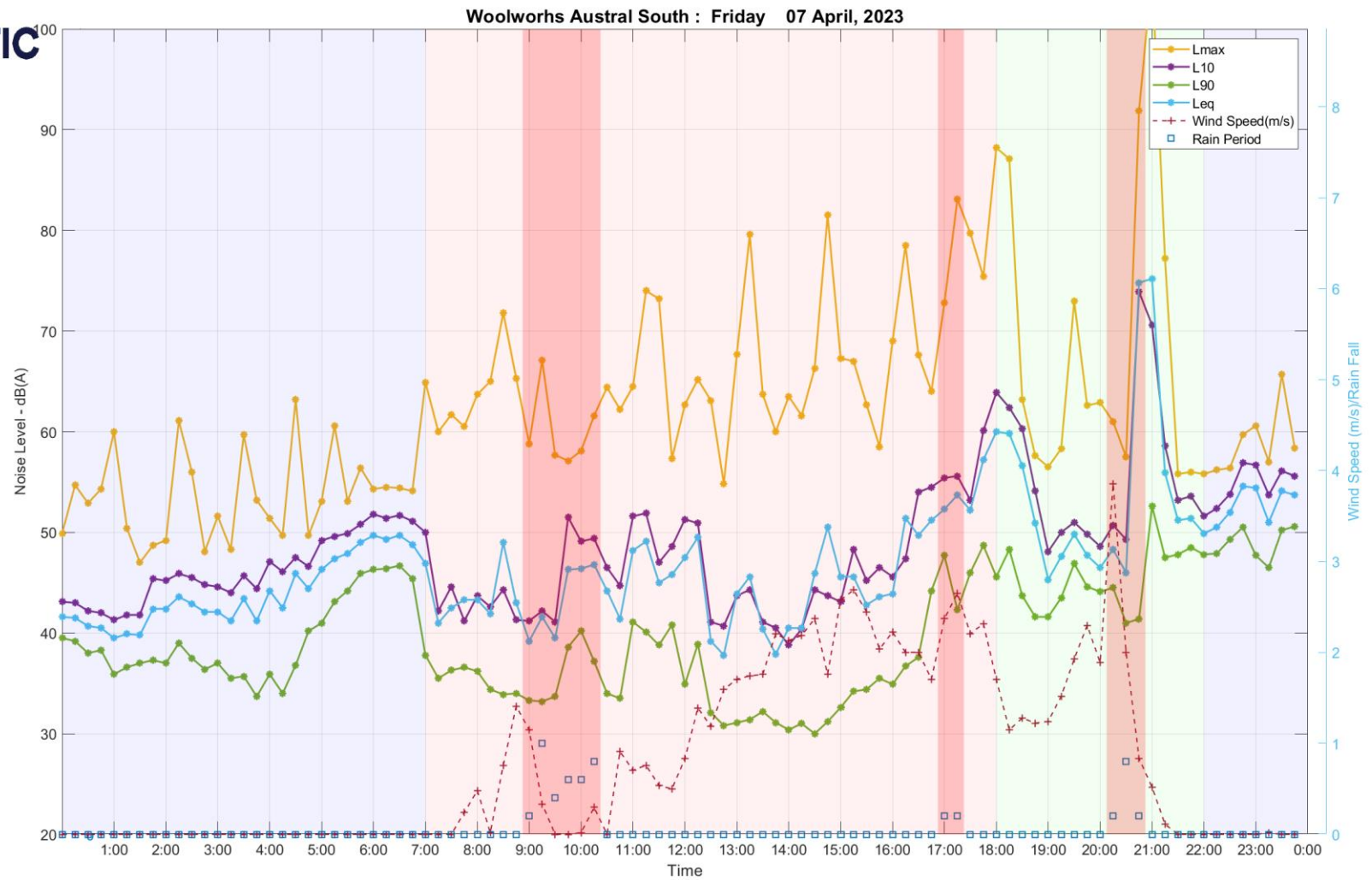






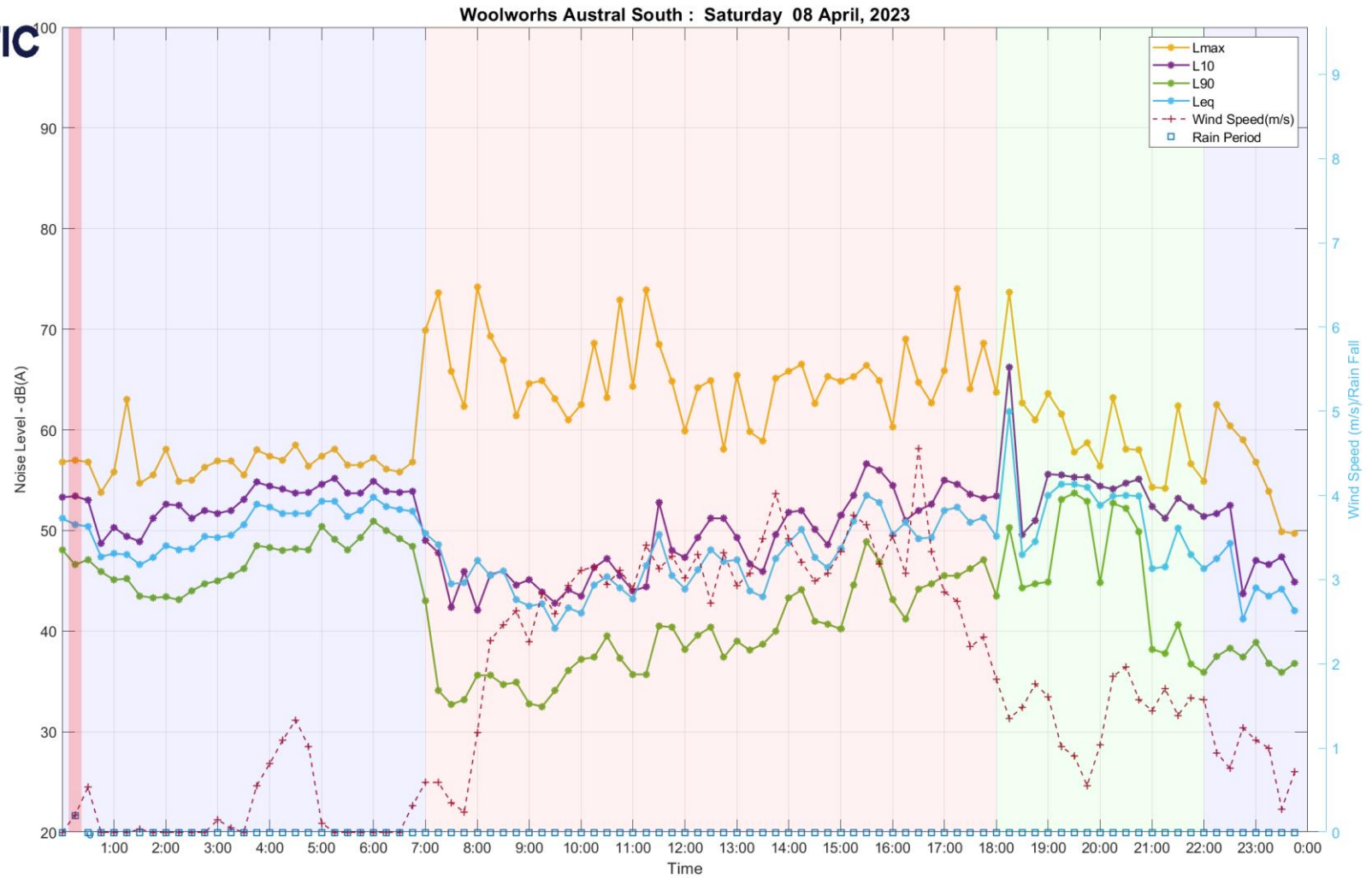


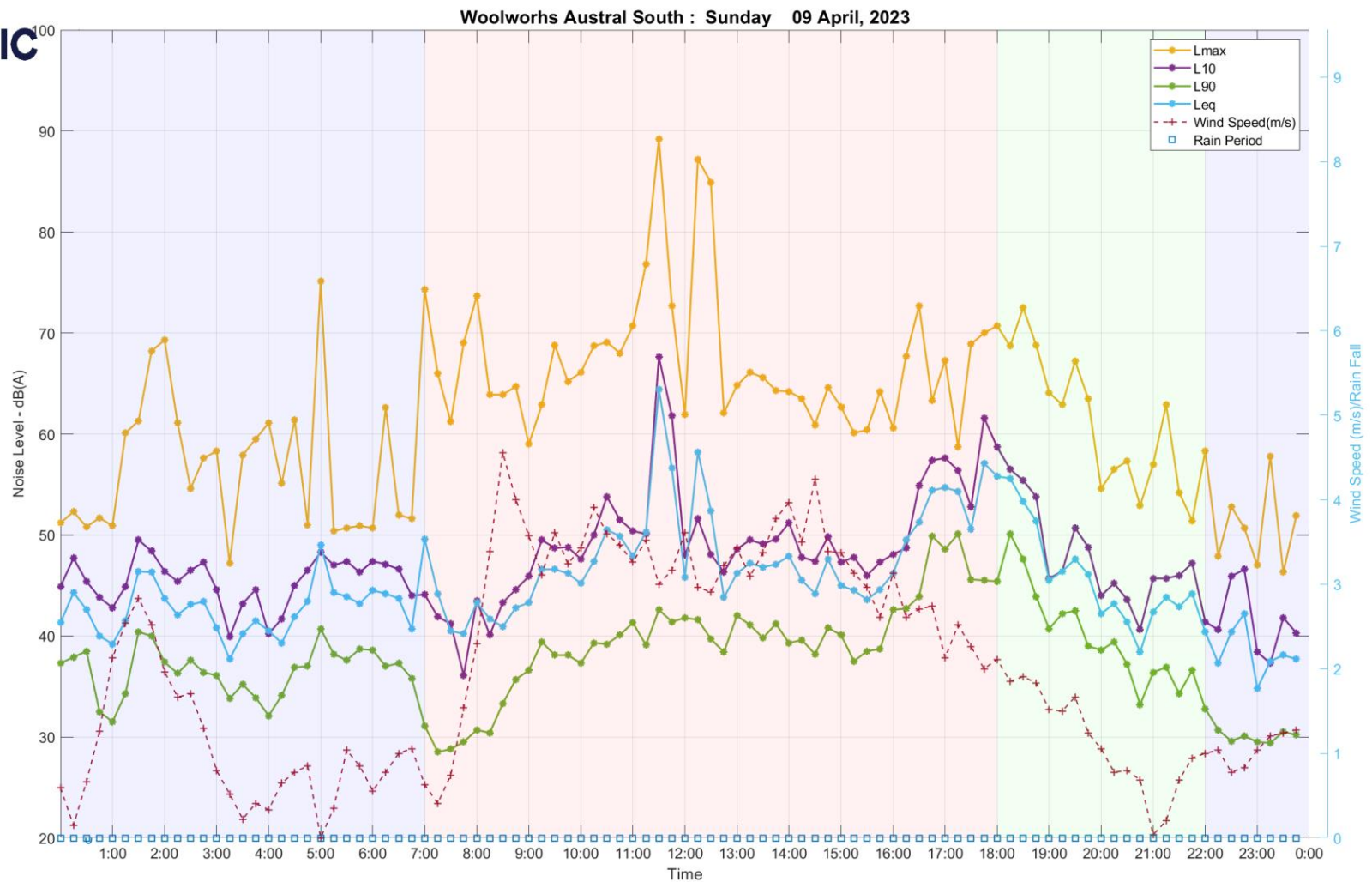






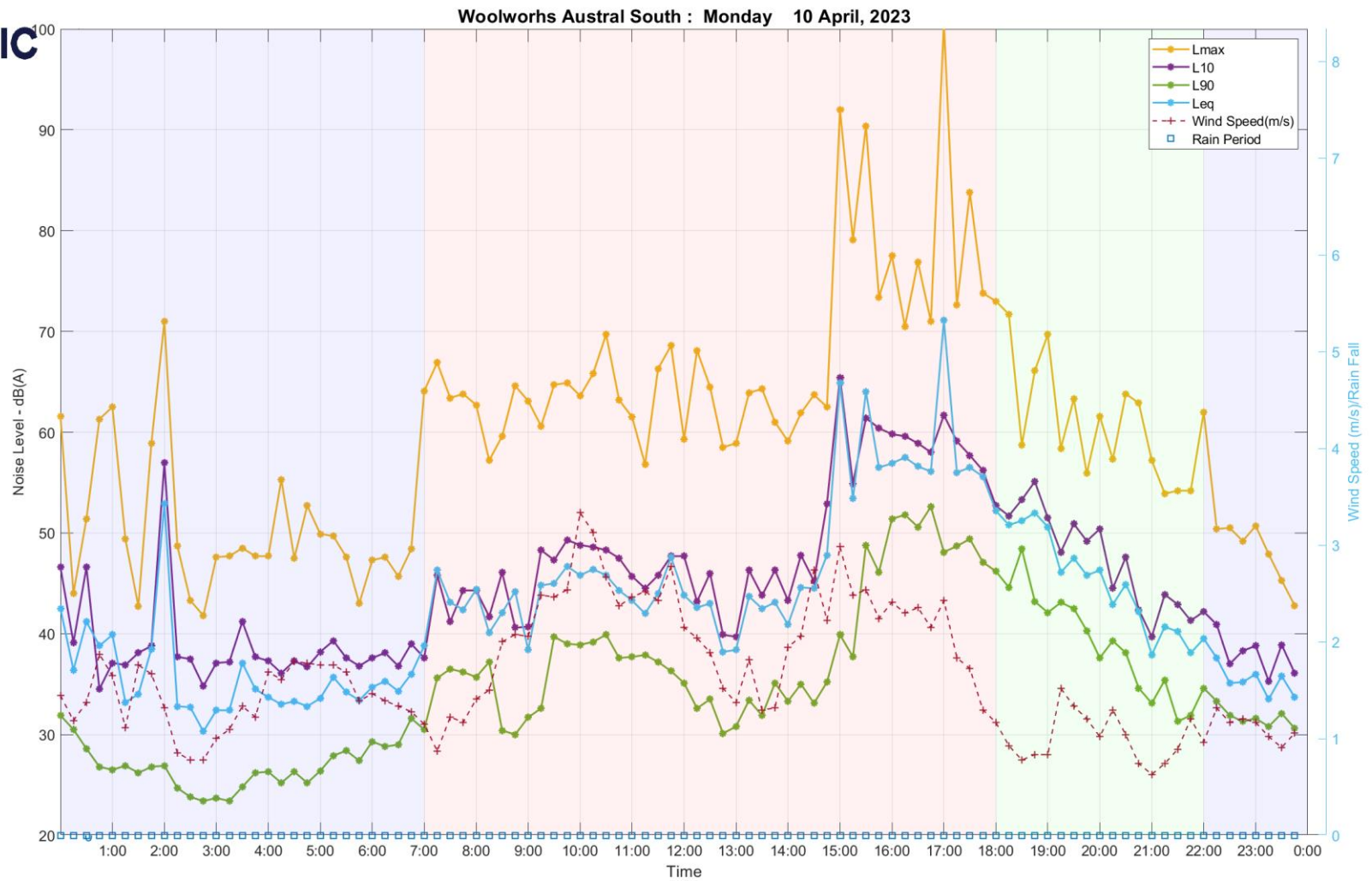
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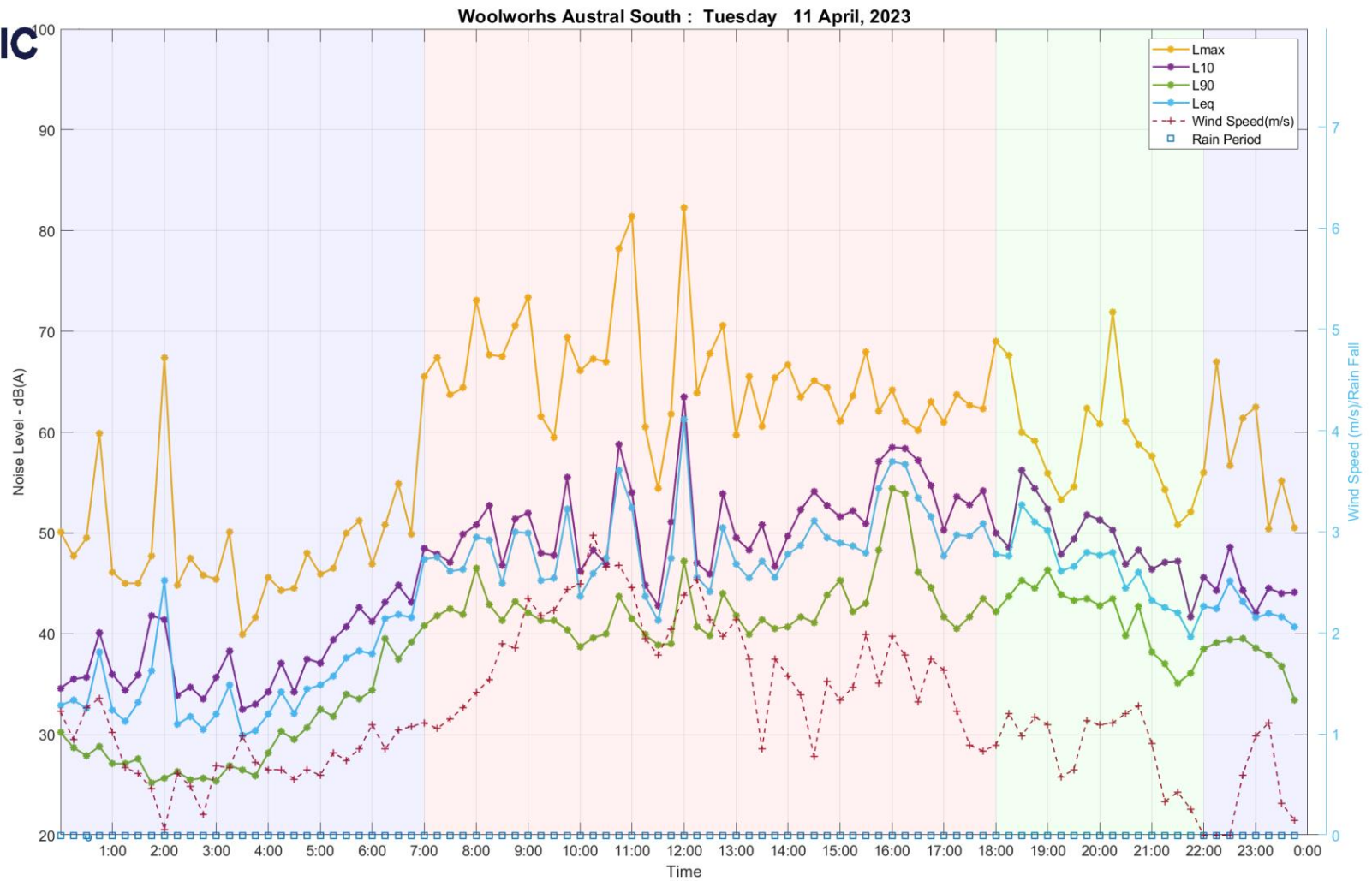


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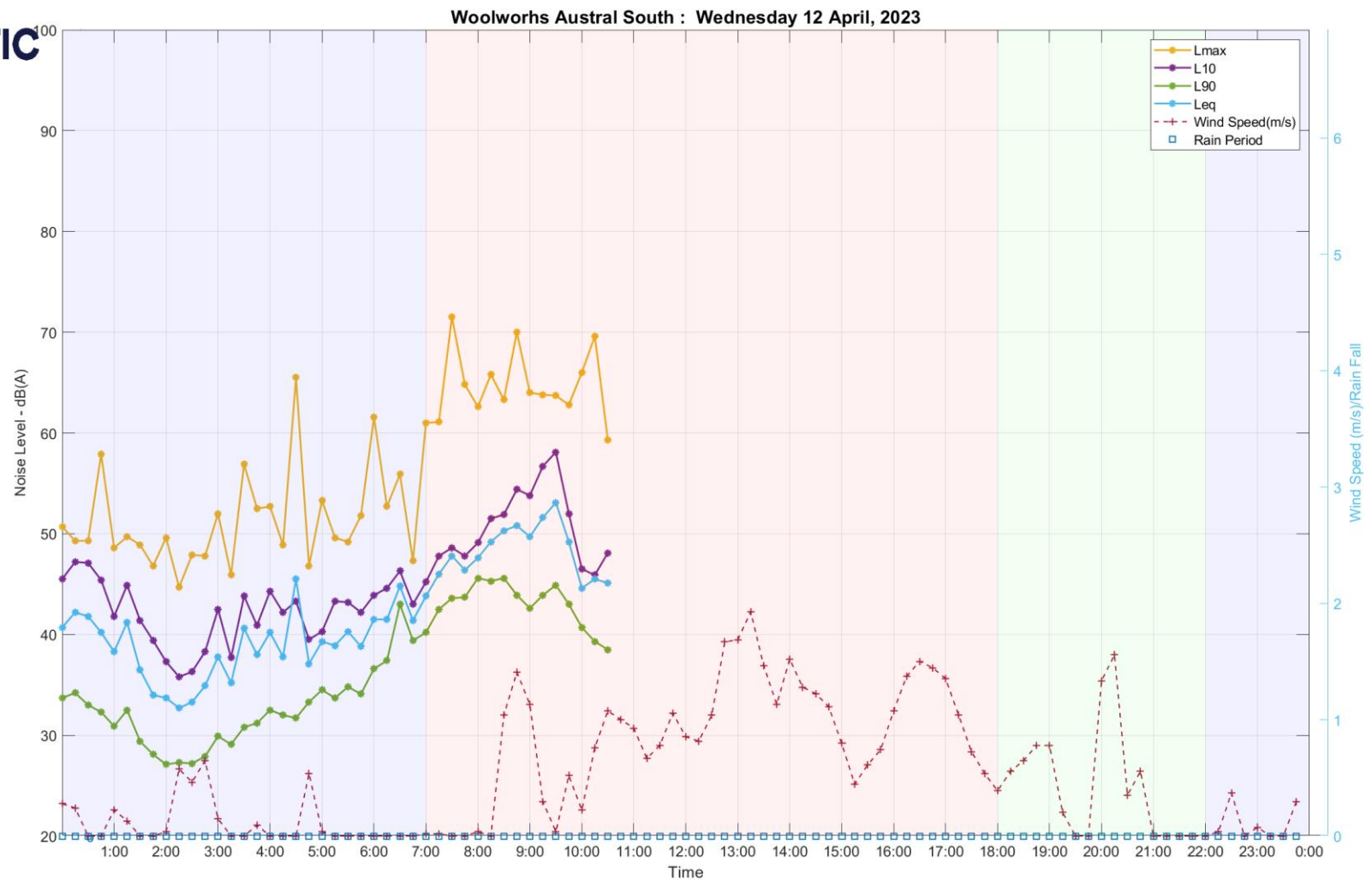


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Wind Speed is corrected using factor 0.6667 based on logger location