

MATER MARIA CATHOLIC COLLEGE, WARRIEWOOD

Acoustic Assessment of proposed student capacity increase

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Avium Pty Limited

TK729-01F02 Acoustic Assessment (r0)

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1 Introduction

Renzo Tonin & Associates was engaged to assess noise impacts associated with the increase in student capacity at Mater Maria Catholic College in Warriewood.

The existing capacity of the school is 850 students with the proposed increase to 1100 students.

There will be no proposed works or extensions to the existing education facilities, however the car park will be increased in capacity to account for the increased student numbers.

This assessment includes an assessment of noise associated with the potential for increased traffic noise associated with the student increase and expansion of the school car park.

This report presents an assessment of the above acoustic components in terms of Council's Development Control Plans, NSW Policies and Guidelines, and Australian Standards.

Further detailed discussion of the identified acoustic factors is set out within this report.

The work documented in this report was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian Standard / NZS ISO 9001. Appendix A contains a glossary of acoustic terms used in this report.

2 Site and Surrounds

The proposed student capacity increase and car park expansion at Mater Maria Catholic College, Warriewood will not involve the construction of additional buildings. Entry to the school is via Forest Road, Warriewood.

The site location is predominantly surrounded by villas and townhouses to the east of the school, and parklands to the north, south and west of the school.

Long term noise monitoring has been undertaken at the site to determine the existing acoustic environment.



Figure 1 – Site and surrounds

3 Measured and predicted noise levels

3.1 Long-term noise survey

An RTA Technology Environmental Noise Logger was set up for the ambient noise survey Friday 1st March to Friday 8th March 2019. The logger was positioned at the northern end of the existing site car park (within the shrubbery) near the entrance to the site from Forest Road. (Refer to Appendix C for more detail).

The noise logger records noise levels on a continuous basis and stores data every fifteen minutes. The noise loggers were calibrated before and after measurements and no significant deviation in calibration was noted. The noise monitoring equipment used here complies with Australian Standard 1259.2-1990 "Acoustics - Sound Level Meters" and is designated as Type 2 instruments suitable for field use.

The dates of measurement and the results obtained from the logger survey are shown in Appendix B.

The design external traffic noise levels are presented below.

Table 1: Measured external noise levels

Facade	Time Period	Design Noise Level LAeq,T
Car Park (near Forest Road entry)	Day time (7am to 6pm)	54 dB(A)

4 Traffic Noise Generation

4.1 Traffic Noise Generated by the Site

A new car park section is proposed for the site beyond the existing car park, north of the existing basketball court. 18 new car parking spaces are proposed.

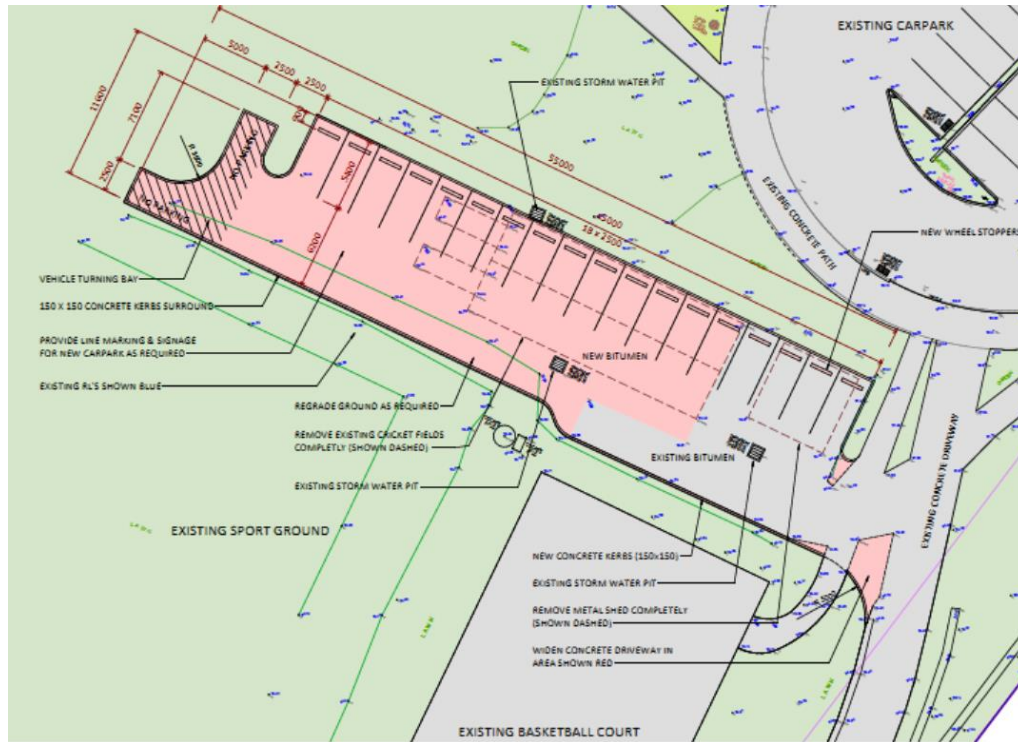


Figure 2 – Proposed new car park layout

In addition, traffic generated by the increase in student numbers has been predicted by Cardno Pty Ltd to be an additional 14 vehicles in the 30-minute morning and afternoon peak school drop-off and pick-up periods.

The predicted traffic volumes are presented below.

Table 2: Predicted traffic volumes

Student capacity	Inbound flow (30 min)
850 students	52 vehicles
1100 students	66 vehicles

4.1.1 Road Traffic Noise Criteria

The Leq noise level or the “equivalent continuous noise level” correlates best with the human perception of annoyance associated with traffic noise. The NSW Road Noise Policy 2011 uses the LAeq(15hr), LAeq(9hr) and LAeq(1hr) to assess traffic noise impact. The Road Noise Policy is used to assess the potential traffic noise impact from the site onto residential receivers only.

Table 3 in the Road Noise Policy, ‘Road Traffic Noise Assessment Criteria for Residential Land Uses’, divides land use developments into different categories and lists the respective noise criteria for each case.

The car park entry to the development site is via Forest Road. The applicable criteria for the day time periods are summarised in Table 3 below.

Table 3: Applicable Road Traffic Noise Criteria, dB(A)

Type of Development	Day (7am-10pm)	Night (10pm-7am)
3. Existing residences affected by additional traffic on existing local roads generated by land use developments.	LAeq(1hr) 55	LAeq(1hr) 50

4.1.2 Predicted Road Traffic Noise – Forest Road

Traffic movements in and out of the development driveway from Forest Road will be the main source of traffic generated by the site. It has been estimated that there will be approximately 14 additional peak hour movements (both school drop off and pick up) generated by the proposed increase in student numbers.

As the source of traffic generation is a school, only the day time traffic generated noise has been assessed. It is not expected that there is any increase in traffic volumes during the night time period.

The existing traffic noise levels which represent residential receivers along Forest Road are presented in Table 4 below, along with the predicted traffic noise generated directly from the proposed development site.

Table 4: Traffic Noise Levels at Residences along Forest Road, dB(A)

Facade	Period	Existing Traffic Noise Level LAeq (1 hr)	Additional Peak Traffic Noise Generated from Site LAeq (1 hr)	Cumulative Traffic Noise Level LAeq (1 hr)
Forest Road	Day time (2.30pm - 3.30pm)	57 dB(A)	51 dB(A)	58 dB(A)

Notes: Existing traffic noise levels based on lower levels during the period as measured at the long term monitoring location. This is considered to be conservative

Traffic noise levels along Forest Road already exceed the criteria stipulated for local roads determined in accordance with the NSW RNP 2011.

Based on the results presented in the above table, it is predicted that overall traffic noise levels along Forest Road will increase by less than 1dB which is considered undetectable to the human ear. Therefore, additional management or treatment is not required as part of the development.

5 Conclusion

Renzo Tonin & Associates have completed an assessment of noise associated with the proposed student capacity increase at Mater Maria Catholic College in Warriewood.

Works include a new car park, but no building upgrades.

The assessment includes an assessment of traffic noise generated by additional cars entering the site and the use of the new car park.

Predictions show that the noise impacts on surrounding residential receivers as a result of the student capacity increase are negligible.

APPENDIX A Glossary of terminology

The following is a brief description of the technical terms used to describe noise to assist in understanding the technical issues presented.

Adverse weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).
Ambient noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.
Assessment period	The period in a day over which assessments are made.
Assessment Point	A point at which noise measurements are taken or estimated. A point at which noise measurements are taken or estimated.
Background noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation, when extraneous noise is removed. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L90 noise level (see below).
Decibel [dB]	The units that sound is measured in. The following are examples of the decibel readings of every day sounds: 0dB The faintest sound we can hear 30dB A quiet library or in a quiet location in the country 45dB Typical office space. Ambience in the city at night 60dB CBD mall at lunch time 70dB The sound of a car passing on the street 80dB Loud music played at home 90dB The sound of a truck passing on the street 100dB The sound of a rock band 110dB Operating a chainsaw or jackhammer 120dB Deafening
dB(A)	A-weighted decibels. The A-weighting noise filter simulates the response of the human ear at relatively low levels, where the ear is not as effective in hearing low frequency sounds as it is in hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter.
dB(C)	C-weighted decibels. The C-weighting noise filter simulates the response of the human ear at relatively high levels, where the human ear is nearly equally effective at hearing from mid-low frequency (63Hz) to mid-high frequency (4kHz), but is less effective outside these frequencies.
Frequency	Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.
Impulsive noise	Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.
Intermittent noise	The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.
L _{Max}	The maximum sound pressure level measured over a given period.
L _{Min}	The minimum sound pressure level measured over a given period.

L ₁	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L ₁₀	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L ₉₀	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
L _{eq}	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.
Reflection	Sound wave changed in direction of propagation due to a solid object obscuring its path.
SEL	Sound Exposure Level (SEL) is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain Leq sound levels over any period of time and can be used for predicting noise at various locations.
Sound	A fluctuation of air pressure which is propagated as a wave through air.
Sound absorption	The ability of a material to absorb sound energy through its conversion into thermal energy.
Sound level meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound pressure level	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone.
Sound power level	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.
Tonal noise	Containing a prominent frequency and characterised by a definite pitch.

APPENDIX B Long-term monitoring results

Location – Existing Car Park

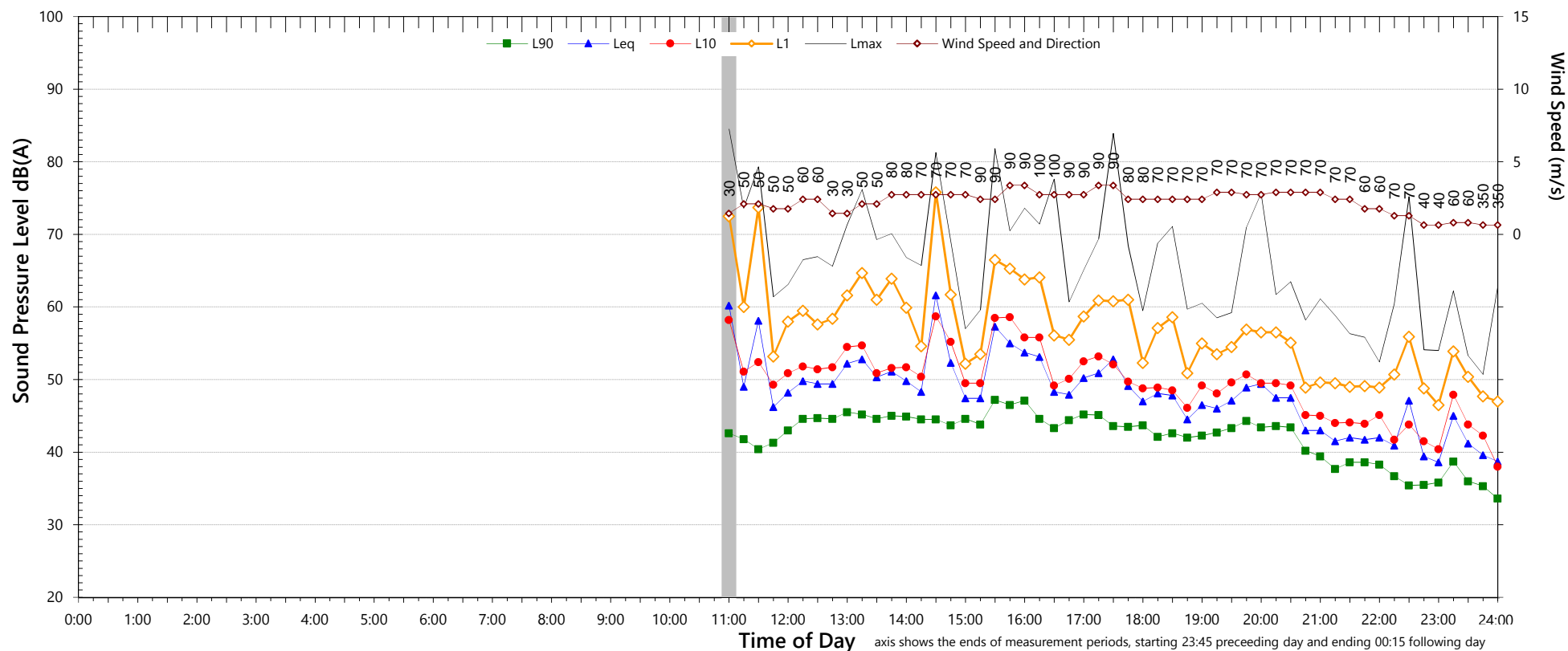
Period – Friday 1st March – Friday 8th March 2019



Unattended Noise Monitoring Results

Mater Maria College existing car park

Friday, 1 March 2019



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	-	38	32
LA _{eq}	-	46	40

Night Time Maximum Noise Levels		(see note 7)	
L _{Max} (Range)	68	to	75
L _{Max} - L _{eq} (Range)	18	to	32

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

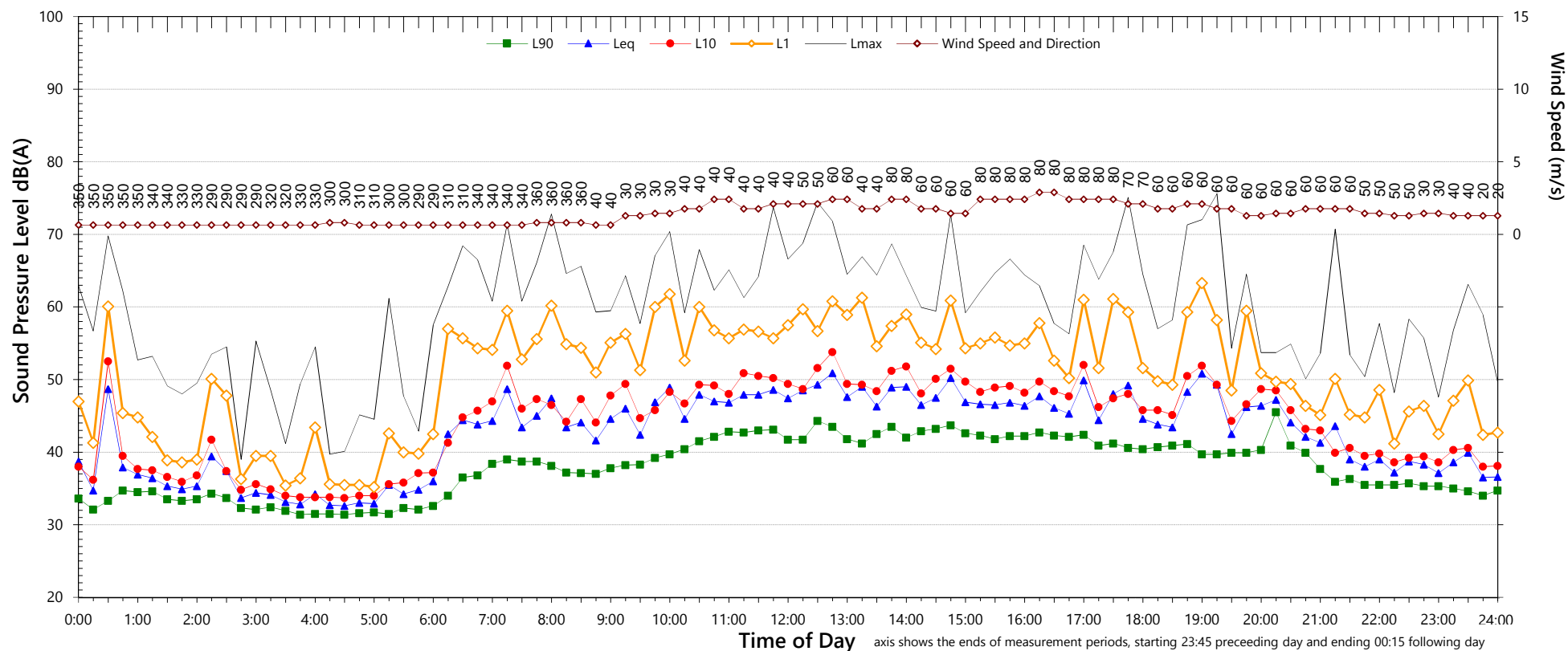
7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	54	43
L _{eq} 1hr upper 10 percentile	57	46
L _{eq} 1hr lower 10 percentile	48	36

Unattended Noise Monitoring Results

Mater Maria College existing car park

Saturday, 2 March 2019



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	38	36	32
L _{Aeq}	47	46	40

Night Time Maximum Noise Levels		(see note 7)	
L _{Max} (Range)	68	to	70
L _{Max} - L _{eq} (Range)	18	to	25

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

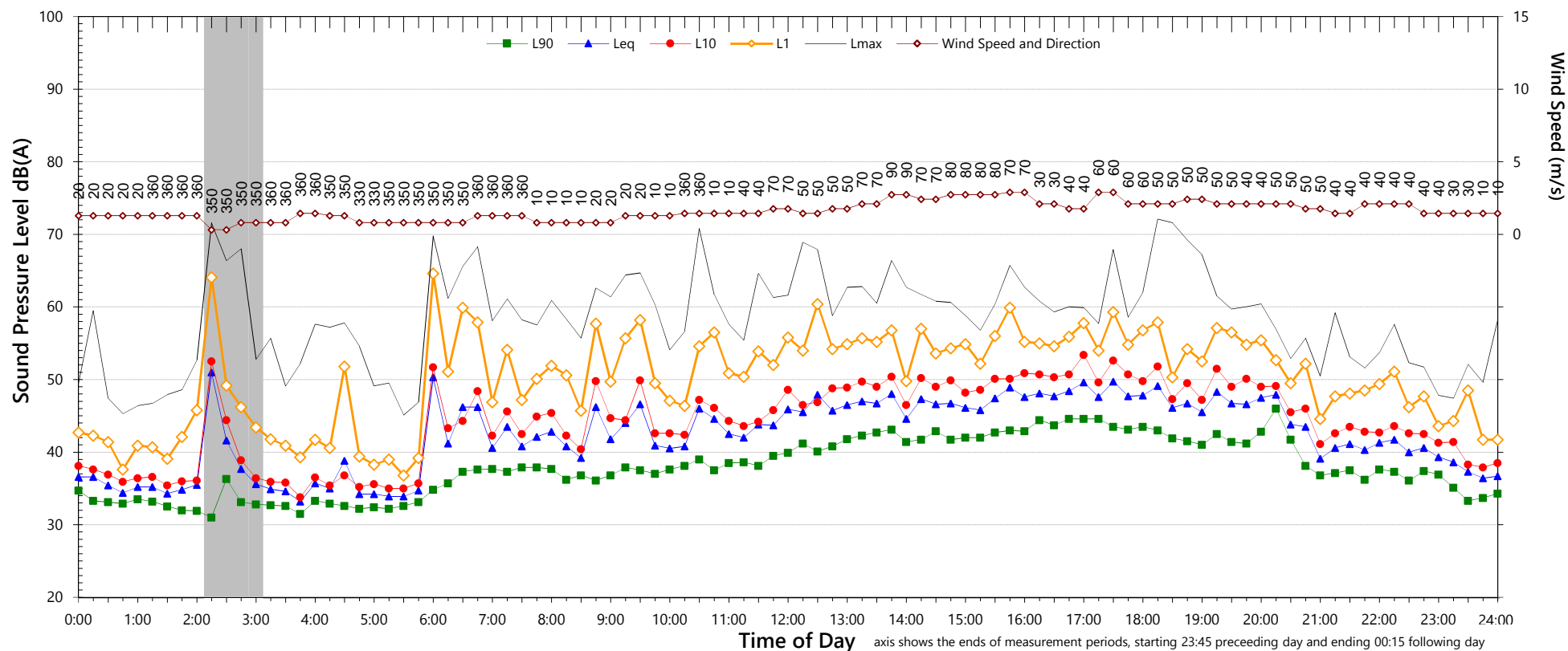
7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	49	43
L _{eq} 1hr upper 10 percentile	51	47
L _{eq} 1hr lower 10 percentile	46	37

Unattended Noise Monitoring Results

Mater Maria College existing car park

Sunday, 3 March 2019



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	37	37	33
LA _{eq}	46	46	41

Night Time Maximum Noise Levels		(see note 7)	
L _{Max} (Range)	68	to	68
L _{Max} - L _{eq} (Range)	16	to	23

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

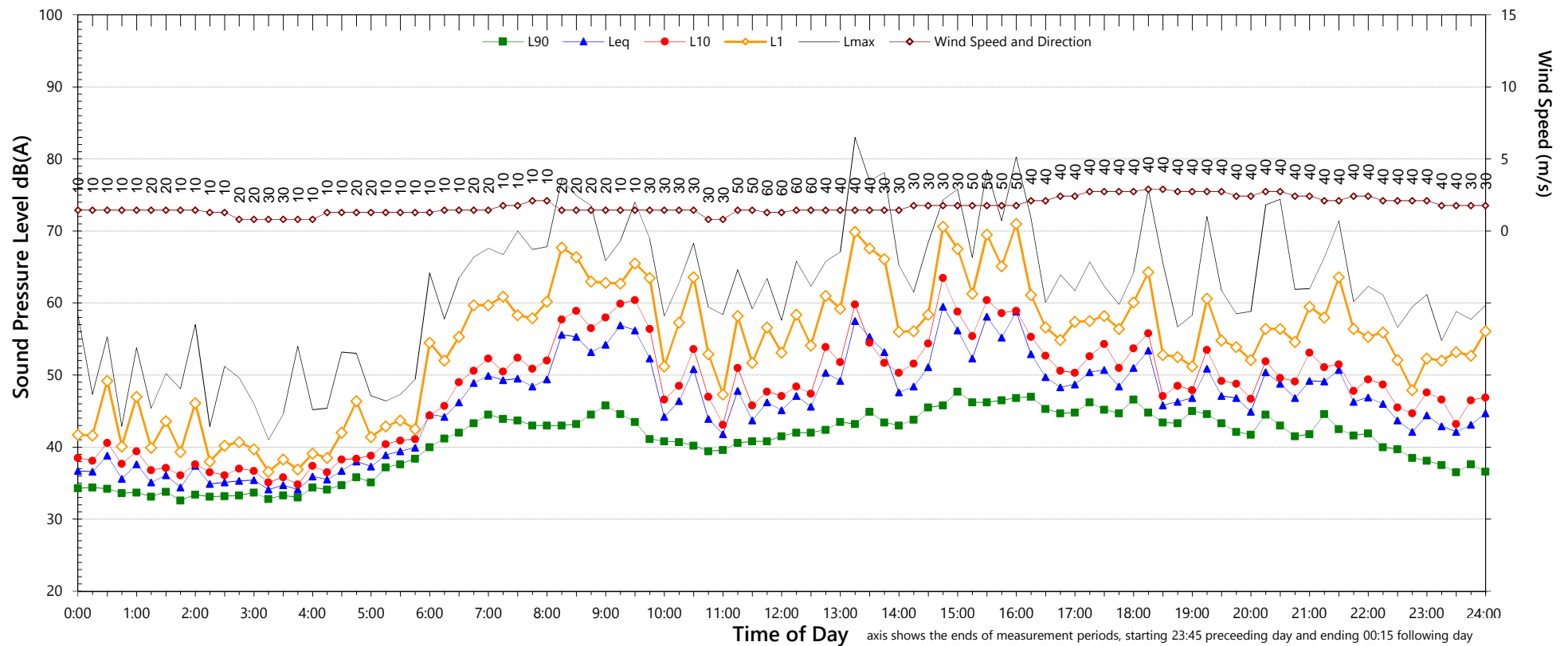
7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	48	43
L _{eq} 1hr upper 10 percentile	51	45
L _{eq} 1hr lower 10 percentile	45	38

Unattended Noise Monitoring Results

Mater Maria College existing car park

Monday, 4 March 2019



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	41	42	33
L _{Aeq}	53	49	42

Night Time Maximum Noise Levels		(see note 7)	
L _{Max} (Range)	68	to	68
L _{Max} - L _{eq} (Range)	16	to	23

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

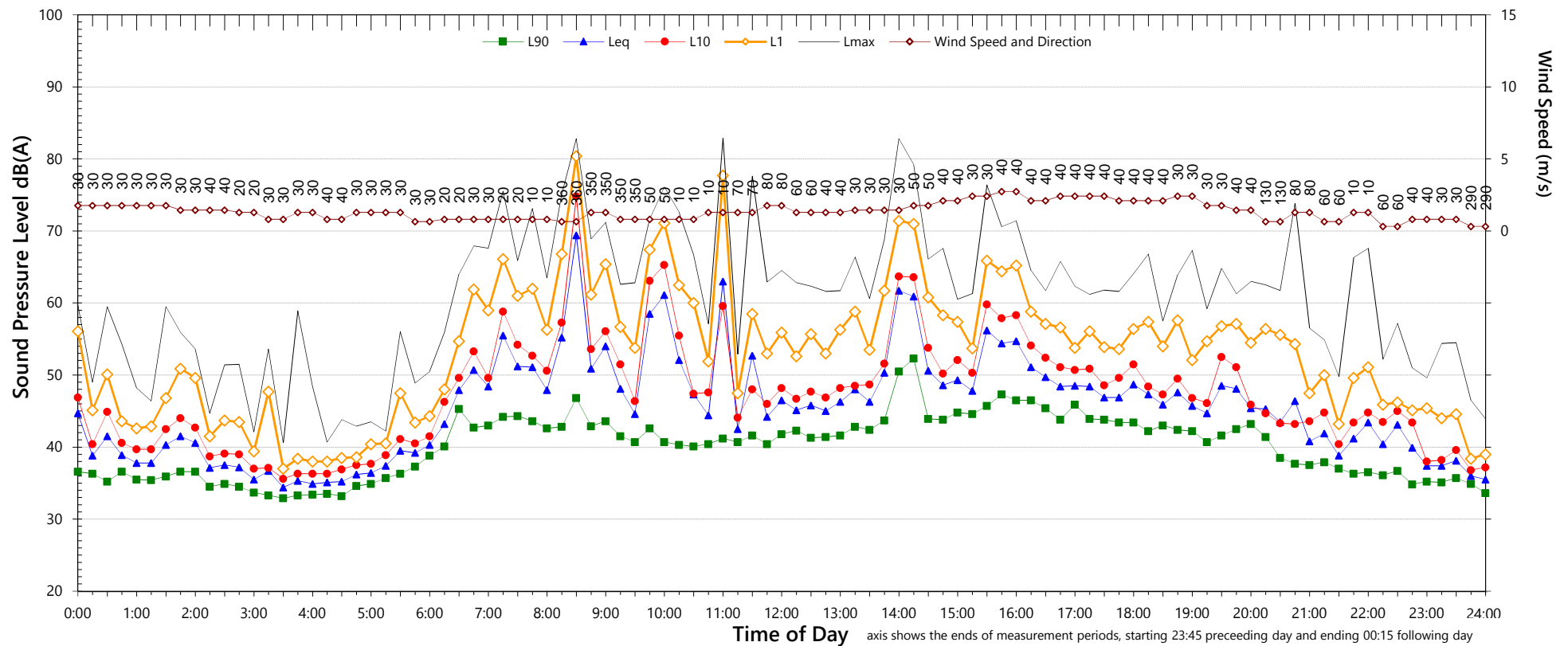
7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	55	45
L _{eq} 1hr upper 10 percentile	58	48
L _{eq} 1hr lower 10 percentile	50	38

Unattended Noise Monitoring Results

Mater Maria College existing car park

Tuesday, 5 March 2019



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	41	37	31
LA _{eq}	57	45	42

Night Time Maximum Noise Levels		(see note 7)	
L _{Max} (Range)	69	to	69
L _{Max} - L _{eq} (Range)	15	to	21

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

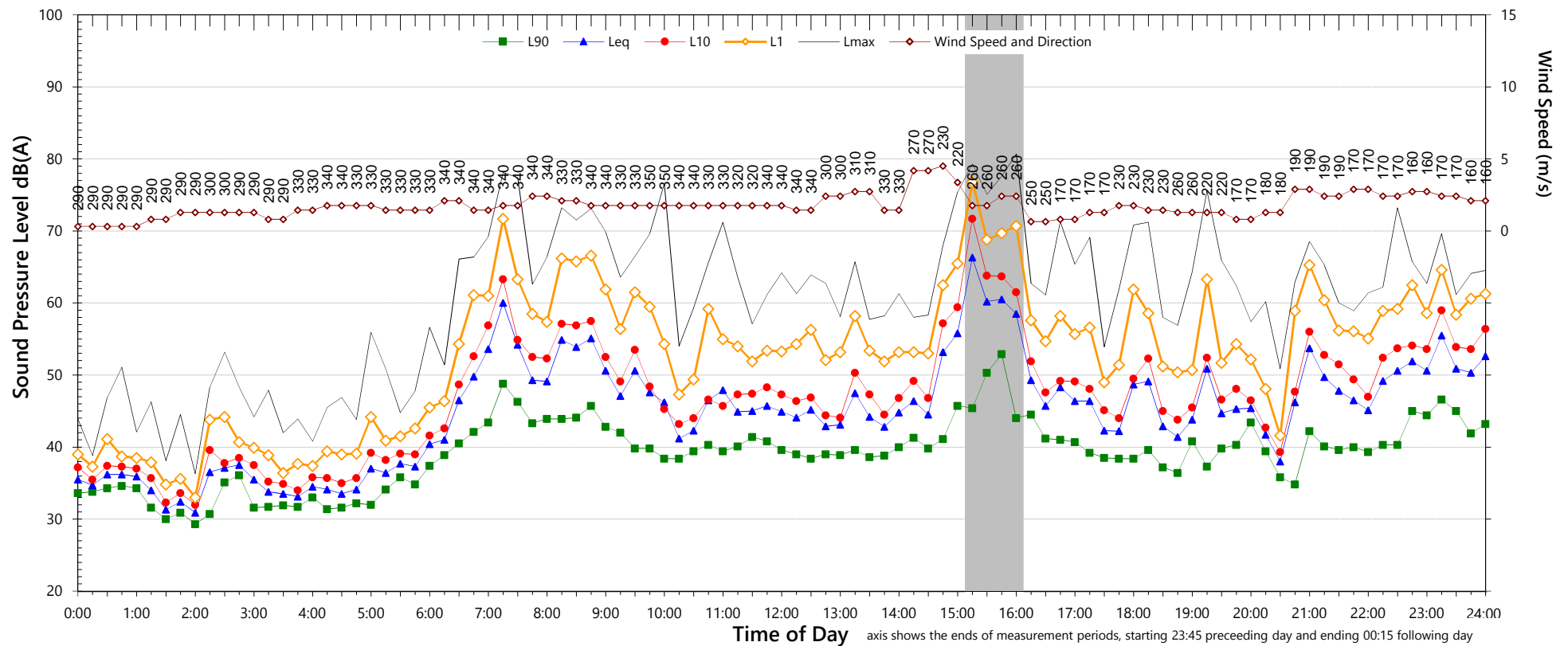
7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	58	44
L _{eq} 1hr upper 10 percentile	60	45
L _{eq} 1hr lower 10 percentile	47	36

Unattended Noise Monitoring Results

Mater Maria College existing car park

Wednesday, 6 March 2019



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	38	36	36
LA _{eq}	50	47	48

Night Time Maximum Noise Levels		(see note 7)	
L _{Max} (Range)	65	to	73
L _{Max} - L _{eq} (Range)	15	to	26

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

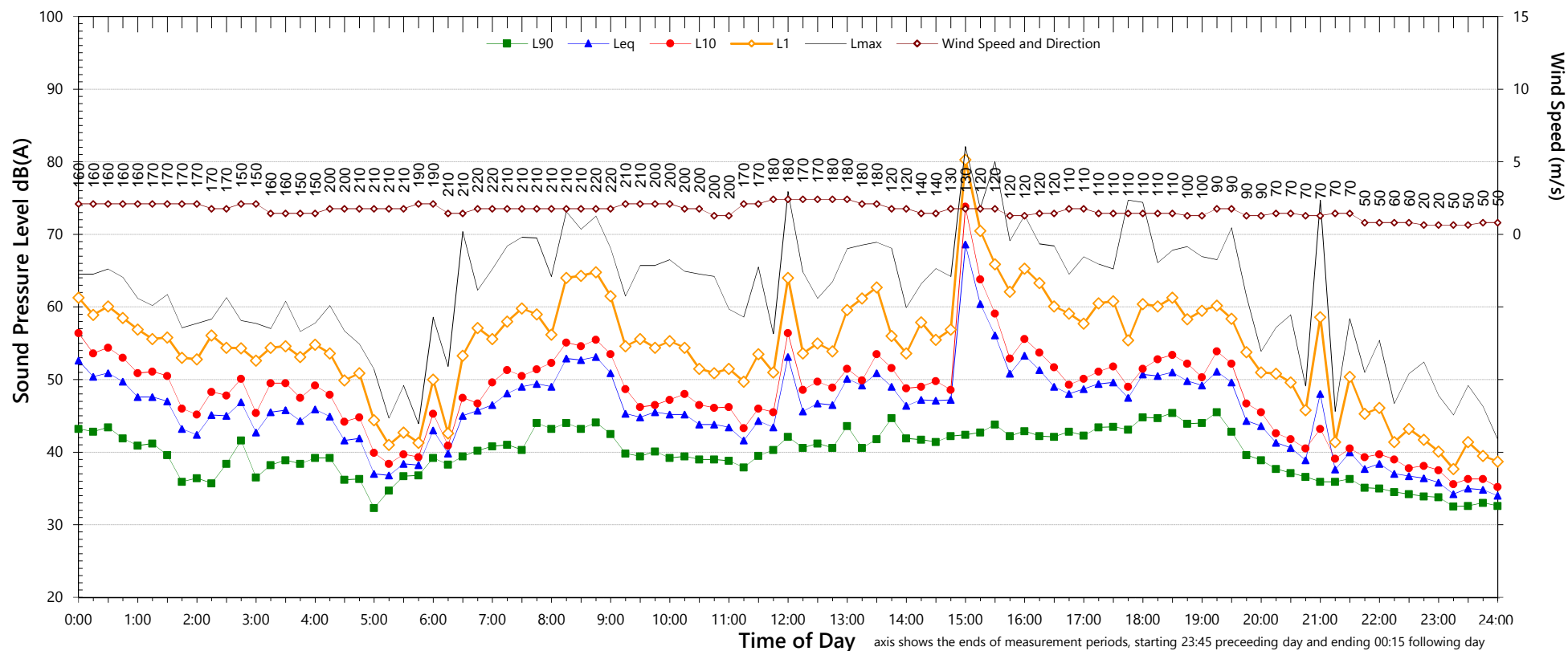
7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	52	50
L _{eq} 1hr upper 10 percentile	56	54
L _{eq} 1hr lower 10 percentile	48	44

Unattended Noise Monitoring Results

Mater Maria College existing car park

Thursday, 7 March 2019



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	39	36	32
L _{Aeq}	54	47	49

Night Time Maximum Noise Levels		(see note 7)	
L _{Max} (Range)	69	to	84
L _{Max} - L _{eq} (Range)	16	to	32

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

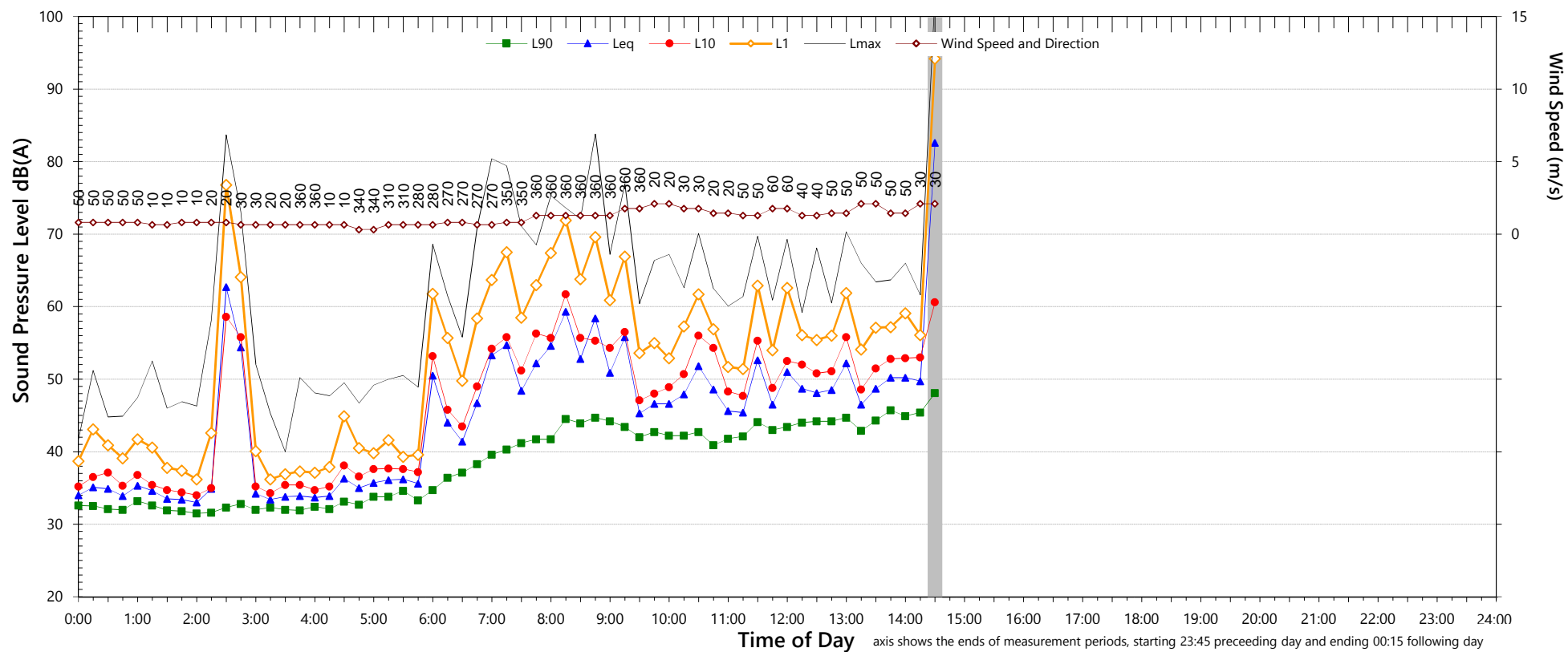
7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	56	51
L _{eq} 1hr upper 10 percentile	57	53
L _{eq} 1hr lower 10 percentile	46	36

Unattended Noise Monitoring Results

Mater Maria College existing car park

Friday, 8 March 2019



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	-	-	-
LA _{eq}	-	-	-

Night Time Maximum Noise Levels		(see note 7)	
L _{Max} (Range)	-	to	-
L _{Max} - L _{eq} (Range)	-	to	-

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	55	-
L _{eq} 1hr upper 10 percentile	57	-
L _{eq} 1hr lower 10 percentile	52	-