



MARSHALL DAY
Acoustics



361-365 NORTH ROCKS RD
REZONING ACOUSTIC ASSESSMENT

Rp 001 r04 20190410 | 30 March 2021

Project: **361-365 NORTH ROCKS RD**

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Report No.: **Rp 001 r04 20190410**

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1.0 INTRODUCTION

It is proposed to rezone an existing site located at 361-365 North Rocks Road, North Rocks, NSW for future subdivision as residential and community use. The site is situated to the south of the M2 Motorway and to the north of North Rocks Road. The extent of the subject site is shown in Figure 1 and Appendix C.

The site is currently occupied by non-residential uses including education facilities and is to be rezoned to facilitate a predominantly residential development comprising dwellings, aged care, a sports oval and community uses, and a limited amount of commercial use.

This report assesses the traffic noise levels likely to be experienced at the residential and aged care lots within the development as they pertain to the rezoning. Noise from the M2 Motorway and North Rocks Road have been considered in this assessment.

The recommendations in this report are designed to comply with the State Environmental Planning Policy (Infrastructure) 2007 (the SEPP) as well as The Hills Development Control Plan 2012 (the DCP).

Conclusions in this report are based on calculations and inspections carried out by Marshall Day Acoustics (MDA), in addition to:

- Site layout and base plans provided by Mecone, in Appendix C
- Projected traffic volumes and M2 noise barrier heights based on *M2 Upgrade Project Environment Assessment*, (ref: M2U-REP-30-00-EN002A-01) prepared by AECOM dated May 2010
- Project traffic volumes for North Rocks Road based on traffic flow data provided by the Client

This report has been updated on 23 March 2021 to reflect updated site graphics and minor text changes.

2.0 SITE DESCRIPTION

The site is located at 361-365 North Rocks Road, North Rocks and is situated to the south of the M2 Motorway and to the north of sub-arterial road known as North Rocks Road.

The extent of the subject site is shown in Appendix C.

The proposed development will include the following:

- Residential dwellings – Single story, double story and multi-level buildings up to 7 levels
- Independent living
- Aged care
- Commercial/retail
- Community landscape and facilities:
 - o Oval
 - o Village green
 - o Wetland Park
 - o Bushland interface
 - o Northern park
 - o Passive park
 - o Community green
 - o Stringybark park

A masterplan layout is shown in Figure 1, with seven level apartments to the north (towards the M2 Motorway) and four to six level development to the south (adjacent North Rocks Road).

Figure 1: Masterplan layout, as provided by Mecon



3.0 ENVIRONMENTAL NOISE SURVEY

A noise survey was conducted in accordance with the NSW EPA's Noise Policy for Industry (NPfI). A survey of traffic noise is required to calculate the potential for traffic noise intrusion to the proposed dwellings on the subject site.

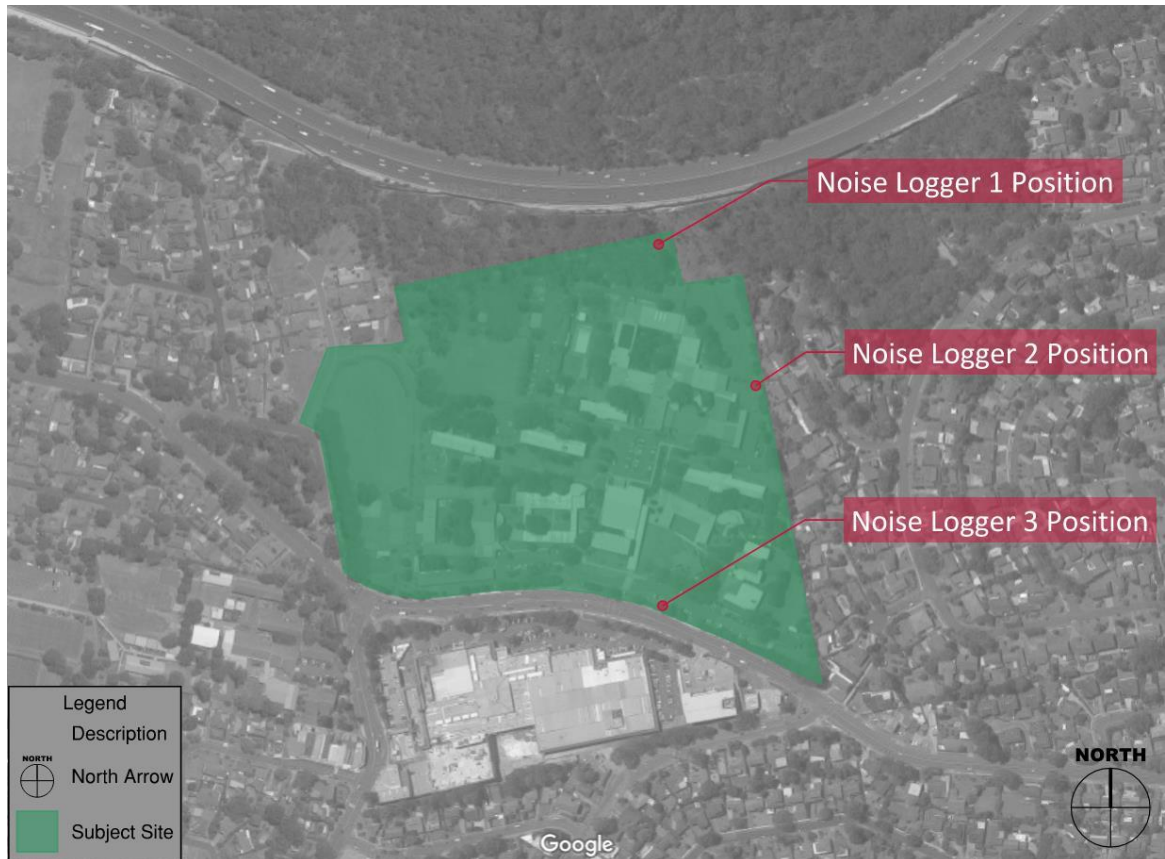
Three unattended noise loggers were deployed within the vicinity of the subject site to provide existing reference levels for calibration and verification of the accuracy of the noise model. Noise levels were measured for the M2 Motorway and North Rocks Road. Each logger was calibrated before and after the survey with no significant drift observed.

Baseline ambient noise levels and traffic noise levels were measured between 14 June 2019 and 27 June 2019.

The following logging equipment was used for the noise survey:

- Logger 1: Serial no: ARL- 316-707-022
- Logger 2: Serial no: ARL- 316-707-018
- Logger 3: Serial no: ARL- 316-707-019
- The location of the noise loggers is provided in Figure 2.

Figure 2: Site Layout and Noise logger locations



In the NPfl the background noise level is known as the Rating Background Level (RBL). The RBL and L_{Aeq} noise levels are calculated from the acquired data for the Day, Evening and Night periods as defined in the NPfl.

A full set of the noise survey charts for each logger is provided in Appendix E for reference. A summary of the measured noise levels is provided in Table 1 below.

Table 1: Noise survey summary - dB

Period	Time Period	RBL L_{A90} , dB	L_{Aeq} , dB
<i>Logger 1</i>			
Day	0700-1800hrs	54	58
Evening	1800-2200hrs	52	56
Night	2200-0700hrs	44	56
<i>Logger 2</i>			
Day	0700-1800hrs	42	53
Evening	1800-2200hrs	41	51
Night	2200-0700hrs	35	49
<i>Logger 3</i>			
Day	0700-1800hrs	55	69
Evening	1800-2200hrs	54	68
Night	2200-0700hrs	40	64

4.0 NOISE ASSESSMENT GUIDELINES

4.1 Road traffic impacts on the site

The site is covered by *The Hills DCP 2012 Part B Section 2: Residential* which does have reference to some internal noise criteria, including reference to the now superseded EPA Environmental Criteria for Road Traffic Noise (1999).

State Environmental Planning Policy (Infrastructure) 2007 applies to sites affected by roads with daily traffic in excess of 20,000 vehicles, which includes both the M2 and North Rocks Road. With regards to the application of the SEPP we note that Part 1 Section 8 of the SEPP, *Relationship to other environmental planning instruments*, notes that “if there is an inconsistency between this Policy and any other environmental planning instrument, whether made before or after the commencement of this Policy, this Policy prevails to the extent of the inconsistency”. As such we have assessed the site in accordance with the SEPP criteria.

Guidelines for the application of the SEPP are provided by the NSW Department of Planning & Environment (DPE) in their document, *Development Near Rail Corridors and Busy Roads – Interim Guideline*. The internal noise criteria applicable to residential buildings are detailed in Table 3.1 of the Interim Guideline, reproduced in Table 2 below.

Table 2: DPE/SEPP - Noise criteria for road traffic impact

Type of occupancy	Noise Level, L_{Aeq} dB	Applicable time-period
Residential - Sleeping areas (bedrooms)	35	Night 10pm to 7am
Residential - Other habitable rooms (excl. garages, kitchens, bathrooms and hallways)	40	At any time
Educational Institutions including child care centres	40	When in use
Places of Worship	40	When in use
Hospitals – wards	35	When in use
Hospitals – other noise sensitive areas	45	When in use

Note: airborne noise is calculated as $L_{eq}(9h)(Night)$ and $L_{eq}(15h)(Day)$.

The DPE Interim Guidelines require that “If internal noise levels with windows or doors open exceed the criteria by more than 10 dBA, the design of the ventilation for these rooms should be such that occupants can leave windows closed, if they so desire, and also to meet the ventilation requirements of the Building Code of Australia”.

4.2 Site noise emission criteria - Noise Policy for Industry

At this stage, an assessment relating to noise emissions from the site is not required. However, we have provided future noise criteria for noise emissions from the site to be used during DA and Detailed Design Stages. The NSW EPA’s Noise Policy for Industry (NPfI) is commonly used by Councils in assessing noise generated by commercial or industrial facilities.

The NPfI outlines noise levels to be complied with for noise generated by commercial activities forming part of the development. The NPfI provides guidance on noise trigger levels for Intrusive noise as well as Amenity noise levels. The Amenity noise level is based on noise levels that are acceptable for Urban areas, while the Intrusive noise levels are based on the existing Rating Background Noise Level (RBL + 5 dB).

Table 3 below summarises the NPfI measures and guidelines to provide an assessment noise trigger level relevant to the site. A full derivation of these measures is provided in Appendix B.

Table 3: NPfI Derivation for Assessment noise levels

Receiver	Period	Project Noise Trigger Level, $L_{Aeq, 15min}$, dB
Residential	Day	47
	Evening	46
	Night	40
Commercial	When in use	63

5.0 PREDICTED NOISE LEVELS – TRAFFIC NOISE

5.1 Modelling procedures and assumptions

Traffic noise levels across the site have been predicted with SoundPLAN v8.1, using the Calculation of Road Traffic Noise (CoRTN) methodology.

The base plan used in the model is based on data provided by the client is presented in Appendix C. Terrain elevation data was extracted from Google Earth. Where fences/noise barriers of a particular height are indicated, they are based on heights above these ground contours (unless otherwise stated). MDA notes the existing noise barrier adjacent to the M2 Motorway has been modelled with a height of 7.2 m above ground level as prescribed in the *M2 Upgrade Project Environment Assessment prepared by AECOM*.

5.1.1 Traffic volumes

Traffic volume data has been taken from the *M2 Upgrade Project Environment Assessment*, prepared by AECOM dated May 2010 and traffic flow data provided by the client for North Rocks Road.

The traffic flow data provided by the Client contains only peak hour traffic volumes for North Rocks Road. The SEPP/DPE criteria are in terms of overall Day and Night levels so our noise calculations of road traffic noise require daily traffic flows. In the absence of the relevant data for North Rocks Road, we have applied a nominal correction factor for converting traffic volumes from peak hour to AADT, multiplying the peak hour flow by 10.

The traffic data is provided as 2021 levels for the M2 and 2026 for North Rocks Road. For consistency we have applied a correction for 3% yearly flow increase to calculate a 2026 volume estimate for the M2 in order that both roads are predicted to the same year.

No data has been provided regarding heavy vehicle use of North Rocks Road. Our calculations have assumed 7.5% heavy vehicle flow.

The above assumptions should be confirmed by a traffic engineer.

A summary of the traffic data used for modelling is presented in Table 4.

Table 4: Traffic data used for road model

Road	Road Type	AADT (2026)	Peak hour volumes	Heavy Vehicle %
M2 Motorway	Freeway/Arterial	Eastbound: 56062	N/A	14%
		Westbound: 58462		
North Rocks Road	Sub-arterial	33170	3317	7.5%

The noise predictions from CoRTN are in terms of $L_{10,18hr}$ descriptors while the criteria for the site are in terms of L_{Aeq} (equivalent noise levels). Based on previous noise logging measurements at similar sites, the following conversion factors in Table 5 have been applied.

Table 5: Conversion from L_{10} to L_{eq}

Conversion from	Conversion to	Conversion factor
$L_{10(18hr)}$	$L_{eq(15hr)}$ Day	-3dB
$L_{10(18hr)}$	$L_{eq(9hr)}$ Night	-7dB

5.1.2 Building construction

Buildings have been modelled as per the preliminary architectural designs provided by the Client. All town houses have been modelled as 1, 2 and 3 story buildings and apartment buildings range from 4 to 7 levels.

Unless otherwise stated the following dwelling construction in Table 6 is assumed, and reflects a typical modern residential dwelling construction:

Table 6: Assumed house construction

Building element	Construction
External walls	Double brick, brick veneer or lightweight system with minimum acoustic rating of R_w 45
Roof	Either steel with anticon or tiled with sarking
Ceiling insulation	R3.0 batts
Ceiling	Flush plasterboard
Glazed Windows and Doors	Min 4mm thickness glass, no special acoustic seals

5.1.3 Receiver heights

Receiver heights are based on 1.5 m above the floor levels of each building level, with each floor assumed to be 3.0 m high (floor to floor).

5.2 Modelling results

Appendix D shows future 2026 road traffic noise contour plots at both ground level (1.5 m) and at first floor (4.5 m) receiver heights.

The noise contours plots are presented in a range from $L_{Aeq(15hr)}$ 50 dB to 70 dB to provide an indication of the proposed dwellings most effected by traffic noise from the M2 and North Rocks Road.

Noise levels impacting the southern façades of buildings fronting North Rocks Road are predicted to be in the order of 65 to 68 dB $L_{Aeq(15hr)}$ Day. These levels will reduce around the sides and rear of buildings structures and will reduce with distance from the road. Noise levels are generally below 55 dB $L_{Aeq(15hr)}$ Day once around 80 m from the road edge.

Noise levels impacting the northern façades of the northernmost buildings on the site, towards the M2 Motorway, range from around 55 dB $L_{Aeq(15hr)}$ Day at ground level up to around 67 dB $L_{Aeq(15hr)}$ Day. The noise levels increase at higher floors as the existing M2 noise barrier provides shielding to lower floors.

6.0 DISCUSSION AND RECOMMENDATIONS

6.1 Physical noise controls – Noise control barriers

We have been advised by the client that there is no current proposal to provide an acoustic barrier between North Rocks Road and the development. As a result any reductions in road traffic noise levels to the development would need to be via architectural upgrades to buildings.

As shown in Appendix D the existing 7.2 m noise barrier between the M2 and the site shields the lower floors of northern receivers from M2 traffic noise impacts. No modifications to this barrier are proposed so impacts on upper floors would need to be mitigated via architectural upgrades to buildings to be developed at a later stage.

6.2 Architectural treatments

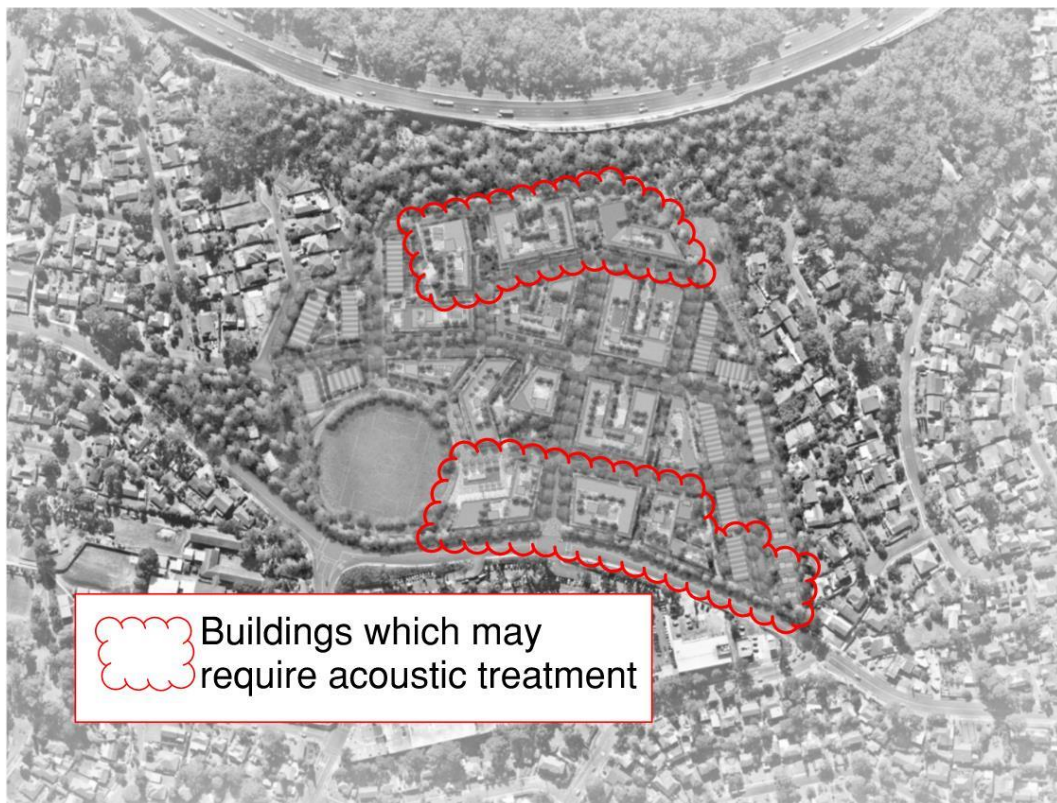
Where noise impacts to a building are moderate, they may be able to comply with the internal limits simply by closing the windows (with standard glazing and construction). Where this is the case alternative ventilation must be provided to allow occupants the option of closing the windows while maintaining suitable fresh air flow. This approach may be required for some dwellings on the site.

A number of future buildings facing North Rocks Road and the M2 will exceed the external criteria by a greater amount which will likely require acoustically upgraded façade construction to some areas. This may include acoustically upgraded glazing, external doors and other façade elements, in addition to alternative ventilation.

A mark-up of buildings that are likely to require acoustic treatment is provided in Figure 3, Based on the current masterplan layout. A detailed acoustic design assessment will be required as part of a Development Application submission which will allow acoustic controls allowing compliance to be developed.

Where alternate ventilation is required this may involve acoustically treated vents, mechanical driven fresh air systems, air-conditioning (incorporating fresh air) or some other design to provide fresh air to the space. This should be considered during the design of the dwelling. In addition the mechanical ventilation systems must be compliant with the Building Code of Australia and AS1668. Any mechanical plant should be designed to comply with any Council stipulated external noise limits for mechanical plant noise.

Figure 3: Mark-up of buildings likely to require acoustic treatment



6.3 External private open space

The Hills DCP does not provide a specific requirement for acoustic amenity in outdoor spaces in the site. We note however that it would be good practice to provide residences with private open space that is acoustically appropriate. In the past an external assessment (from the superseded EPA Environmental Criteria for Road Traffic Noise, ECRTN) was commonly applied, being an external Daytime criterion of $L_{Aeq}(15hr)$ 55 dB (including a +2.5 dB allowance for façade reflection).

As presented in our noise contour plots in Appendix D the external noise criterion may be exceeded for some residential areas adjacent to North Rocks Road or the M2 Motorway. However, we note that in all cases the buildings themselves can be used to provide screening for outdoor space. The retention of this approach should be considered during the future design of dwellings.

7.0 CONCLUSION

MDA has conducted an acoustic masterplan assessment for the proposed North Rocks Rd development.

Evaluation of road traffic noise levels indicates that acoustic mitigation design will need to be included in the future development of the project particularly with respect to noise from the M2 Motorway and North Rocks Rd.

The client has indicated that there is no current proposal for the inclusion of noise control barriers or the modification of existing barriers. On this basis the primary means for control of noise ingress to internal spaces will be via architectural treatments, expected to include façade and glazing upgrades and alternative ventilation.

MDA has conceptually identified areas within the masterplan in which architectural treatments are likely to be required.

It will be the responsibility of the design team for the ongoing project to develop appropriate noise control design measures to ensure the development is capable of complying with applicable noise criteria and statutory approvals. Attention should also be paid to external private open spaces.

APPENDIX A GLOSSARY OF TERMINOLOGY

SPL or L_p	<u>Sound Pressure Level</u> A logarithmic ratio of a sound pressure measured at distance, relative to the threshold of hearing (20 μPa RMS) and expressed in decibels.
dB	<u>Decibel</u> The unit of sound level. Expressed as a logarithmic ratio of sound pressure P relative to a reference pressure of $P_r=20 \mu\text{Pa}$ i.e. $\text{dB} = 20 \times \log(P/P_r)$
dB(A)	The unit of sound level which has its frequency characteristics modified by a filter (A-weighted) so as to more closely approximate the frequency bias of the human ear.
A-weighting	The process by which noise levels are corrected to account for the non-linear frequency response of the human ear.
$L_{Aeq}(t)$	The equivalent continuous (time-averaged) A-weighted sound level. This is commonly referred to as the average noise level. The suffix "t" represents the time period to which the noise level relates, e.g. (8 h) would represent a period of 8 hours, (15 min) would represent a period of 15 minutes and (2200-0700) would represent a measurement time between 10 pm and 7 am.
$L_{A90}(t)$	The A-weighted noise level equalled or exceeded for 90% of the measurement period. This is commonly referred to as the background noise level. The suffix "t" represents the time period to which the noise level relates, e.g. (8 h) would represent a period of 8 hours, (15 min) would represent a period of 15 minutes and (2200-0700) would represent a measurement time between 10 pm and 7 am.

APPENDIX B EPA NOISE ASSESSMENT DETAILED DERIVATION

In NSW, the NPfI is the guideline for assessing noise emissions from industrial facilities. Whilst the NPfI is intended for the assessment of large industrial premises scheduled by the EPA it is also used by some Councils and consent authorities to assess smaller commercial sites. The NPfI sets out a procedure where an industrial facility can be assessed against a series of noise levels. In the NPfI, these project specific noise levels are derived from an analysis of the background noise environment and zoning information.

The background noise levels for this project are summarised in Table 7 below. In the NPfI, the background noise level is called the Rating Background Level (RBL).

Table 7: NPfI time periods and measured Rating Background Levels

Period	Time of day	RBL LA90, 15min dB	LAeq, 15min dB
Day	0700-1800hrs	42	53
Evening	1800-2200hrs	41	51
Night	2200-0700hrs	35	49

Intrusiveness noise levels

The intrusiveness noise assessment is applicable to residential receivers and is based on knowledge of the background noise level at the receiver location. The Intrusiveness Noise Level is the background noise level at the nearest noise sensitive location plus 5dB. Therefore, the noise emissions from the premises are considered to be intrusive if the A-weighted source noise level ($L_{Aeq, 15min}$) is greater than the background noise level (L_{A90}) plus 5dB.

Based upon the data for summarised in Table 7, the Intrusiveness Noise Levels have been calculated in accordance with the NPfI and are presented in Table 8 below.

Table 8: Derived Intrusiveness Noise Levels

Period	Rating Background Level, LA90, 15min dB	Intrusiveness Noise Level (RBL + 5 dB), LAeq, 15 min dB
Day	42	47
Evening	41	46
Night	35	40

Amenity noise levels

The Amenity Noise Levels are designed to prevent industrial noise continually increasing above an acceptable level. The initial stage in determining the amenity level is to correct the acceptable noise levels set for the appropriate amenity area with the baseline noise monitoring.

A review of the noise levels measured indicates that the residential noise environment is typical of an Urban area with mostly traffic related noise sources. Further modification is undertaken to account for standardisation of the assessment time periods (as detailed in Section 2.2 of the NPfI). The resultant levels and the relevant modifications are detailed in Table 9 below.

Table 9: Derived Amenity noise levels

Receiver	Period	Recommended Amenity Noise Level $L_{Aeq, \text{Period}}$ dB	Modified Amenity Noise Level $L_{Aeq, 15\text{min}}$ dB
Residential (Urban)	Day	60	58
	Evening	50	48
	Night	45	43
Commercial	When in use	65	63

Source: Table 2.2 NSW Noise Policy for Industry

Determination of Project Noise Trigger Levels

The final process in determining the operational noise limits for the development is to derive the Project Noise Trigger Levels. The Project Noise Trigger Levels are levels that, if exceeded, would indicate a potential noise impact on the community, and so 'trigger' a management response; for example, further investigation of mitigation measures.

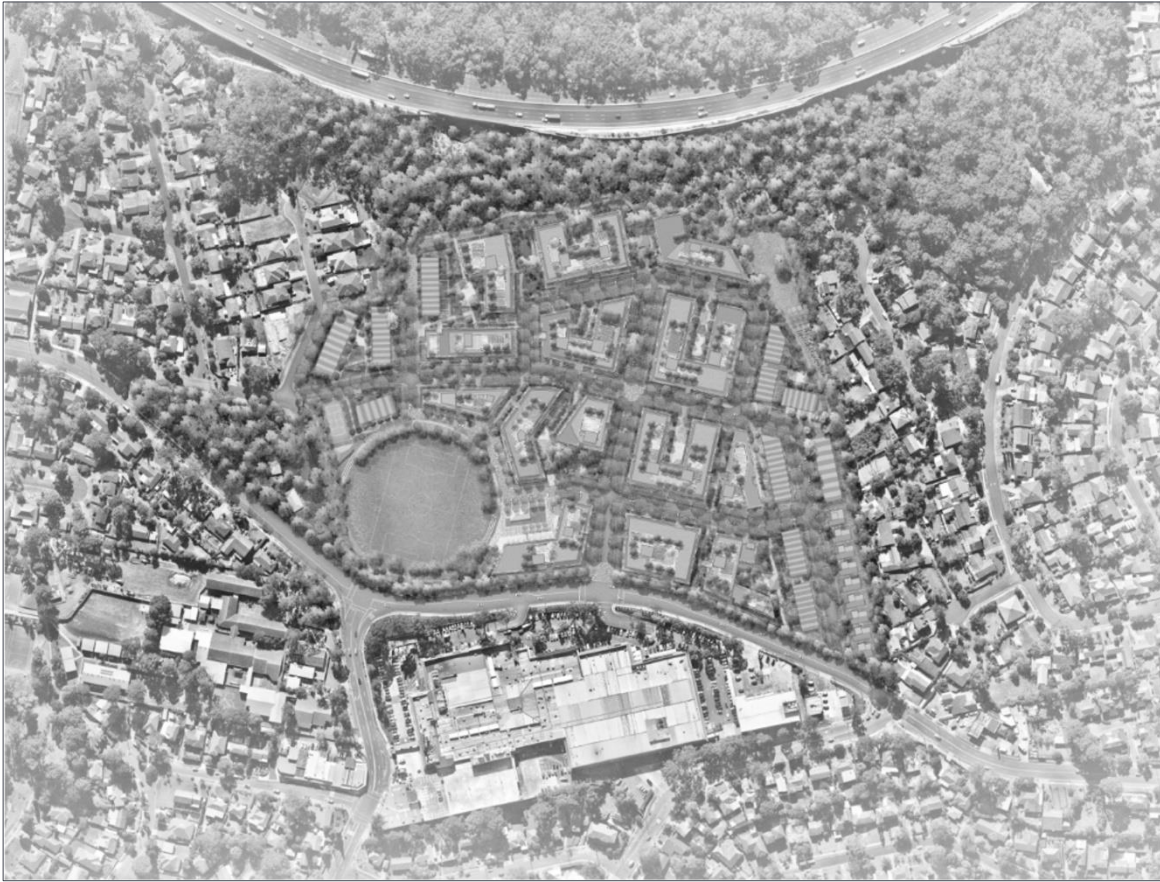
The Project Noise Trigger Levels are derived by selecting the more stringent of either the Intrusiveness or Amenity noise levels. For residential receivers each assessment time period is evaluated individually. For commercial receivers, only the Amenity noise level applies. The Project Noise Trigger Levels applicable to the Subject site are shown in Table 10.

Table 10: Project Noise Trigger Levels

Receiver	Period	Project Noise Trigger Level, $L_{Aeq, 15\text{min}}$, dB
Residential	Day	47
	Evening	46
	Night	40
Commercial	When in use	63

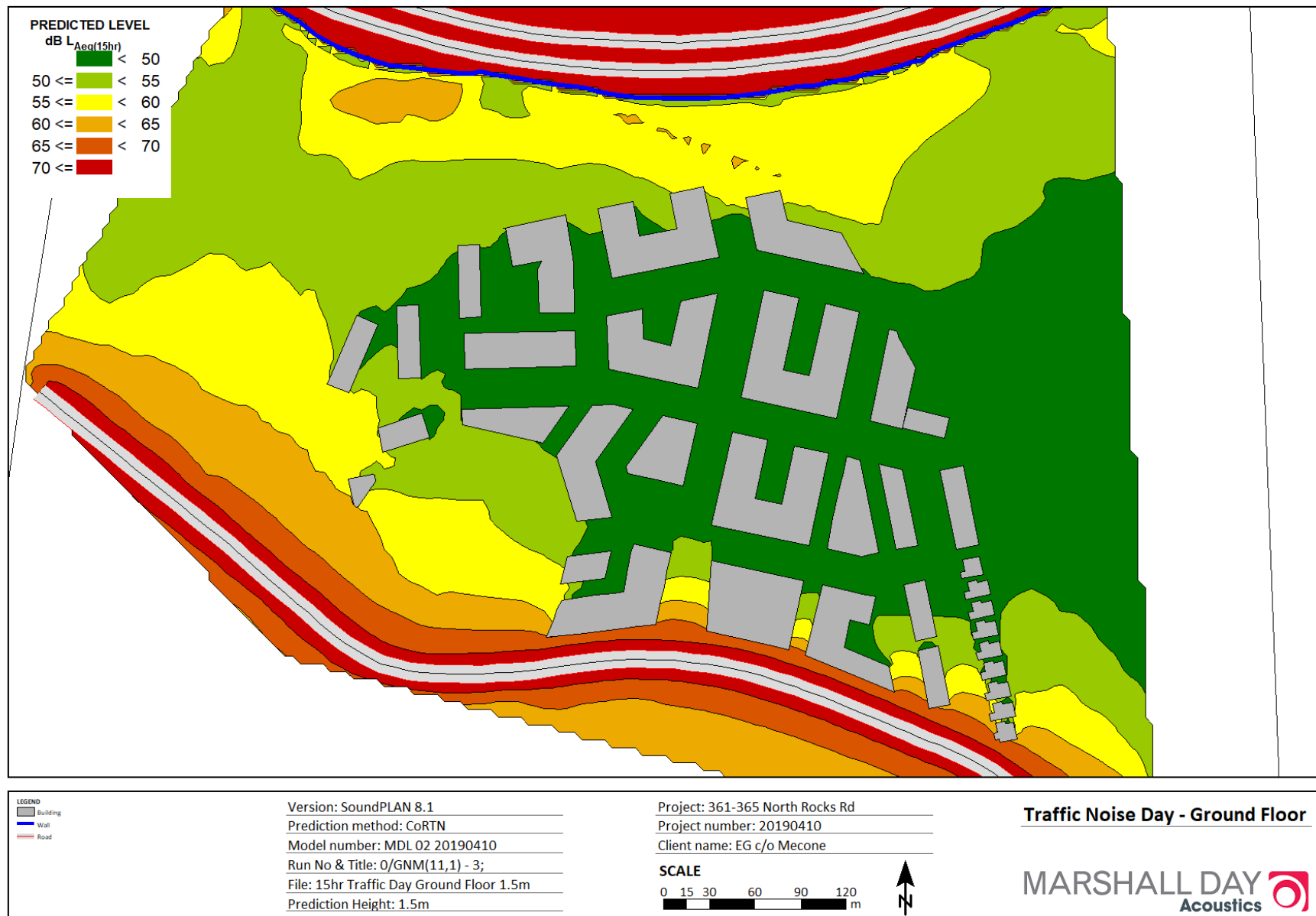
The NPfI Project Trigger Noise Levels are applicable at the property boundary of the nearest affected receivers.

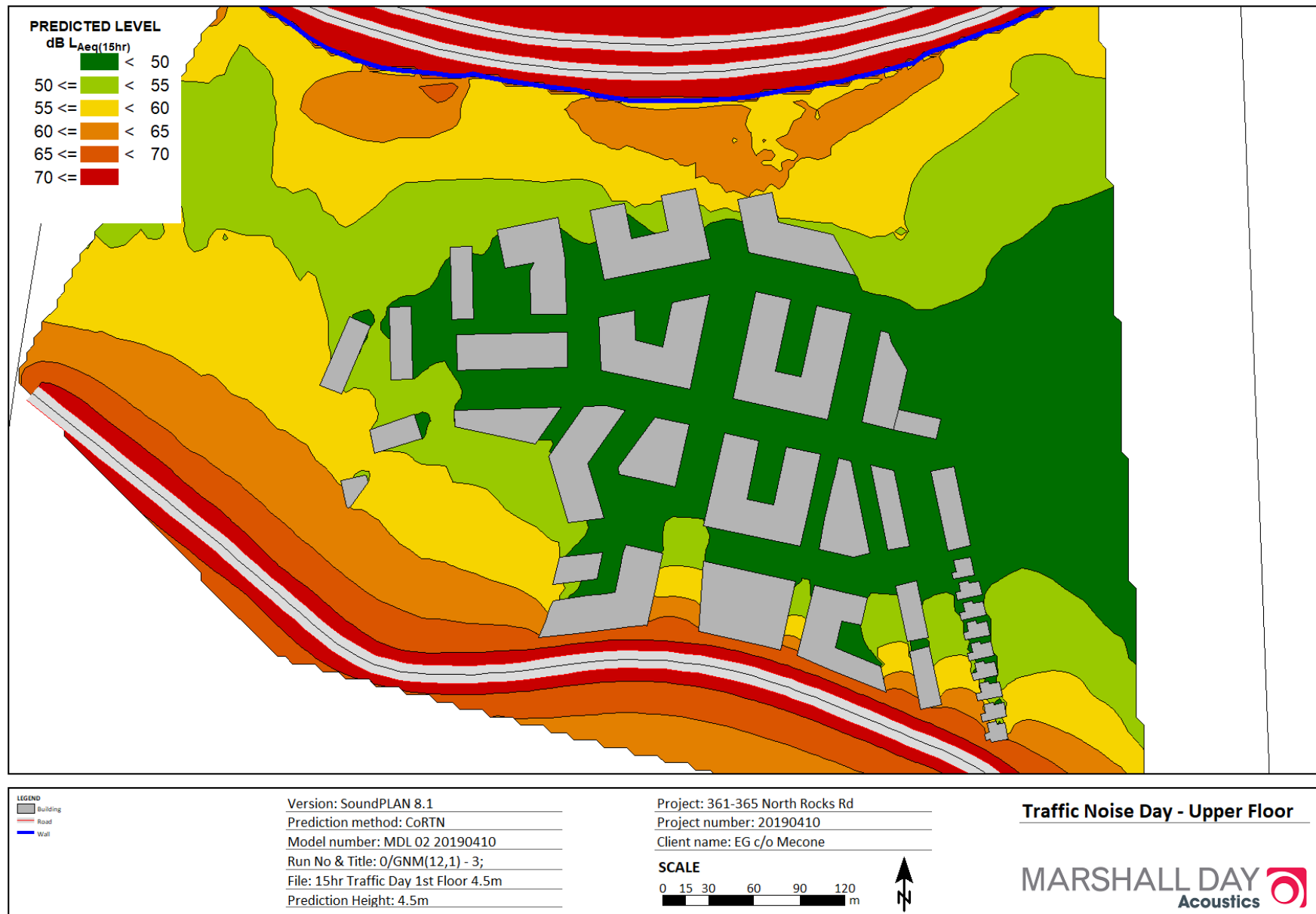
APPENDIX C MASTER PLAN LAYOUT



APPENDIX D NOISE CONTOUR MAPS

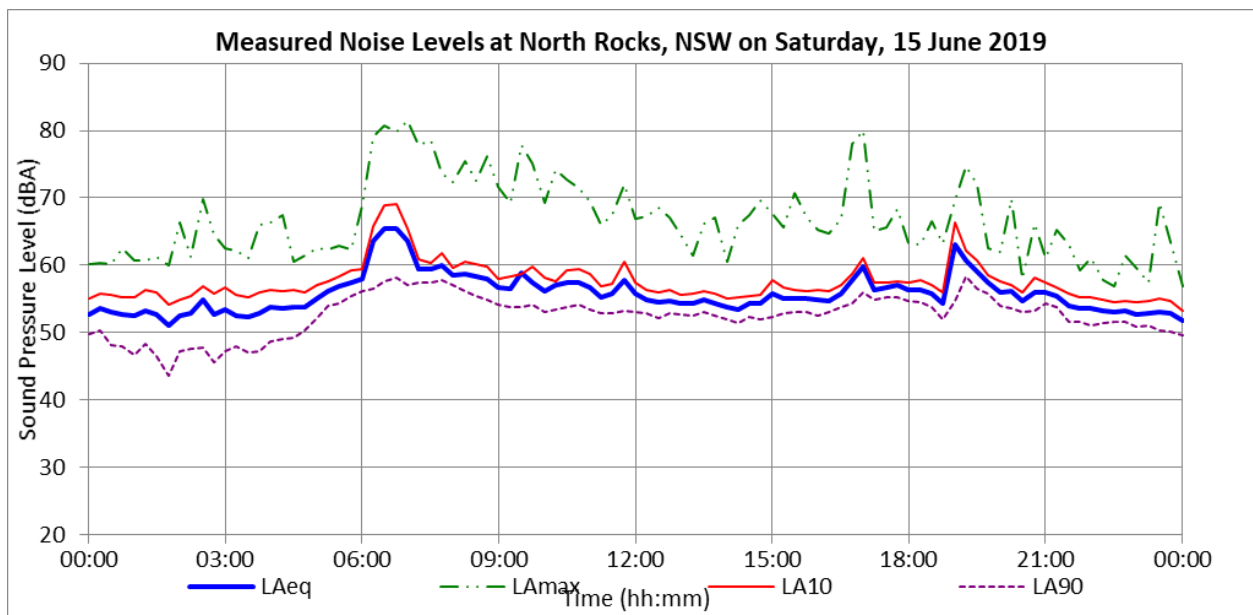
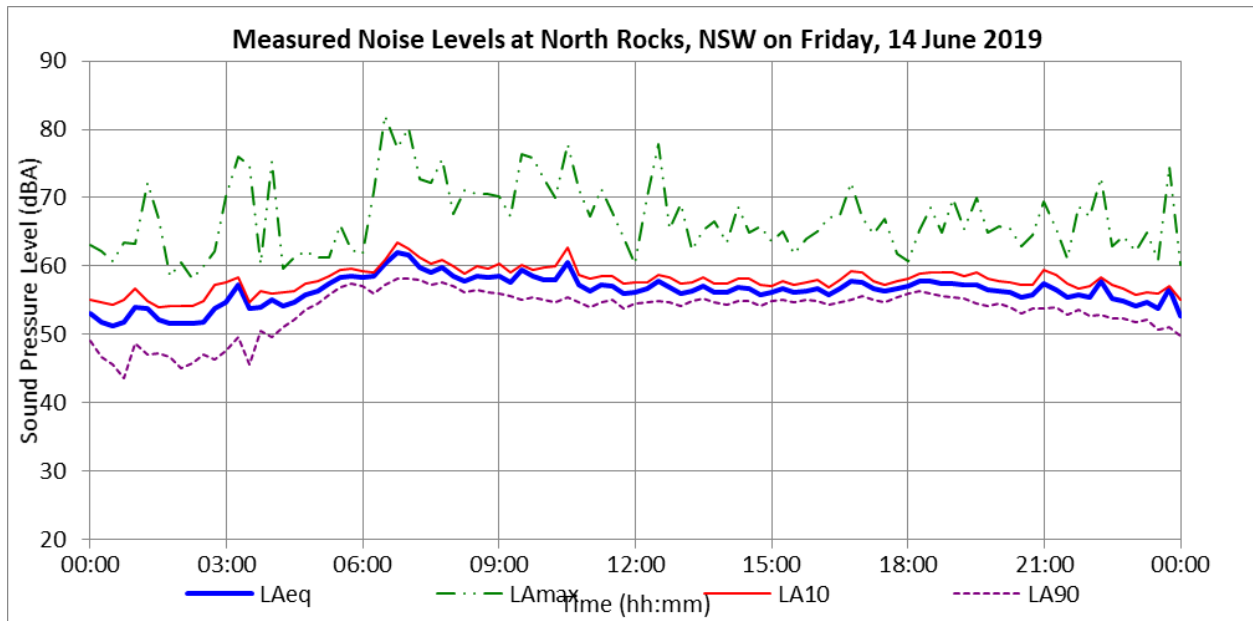
Note: Contours do not include façade reflection.

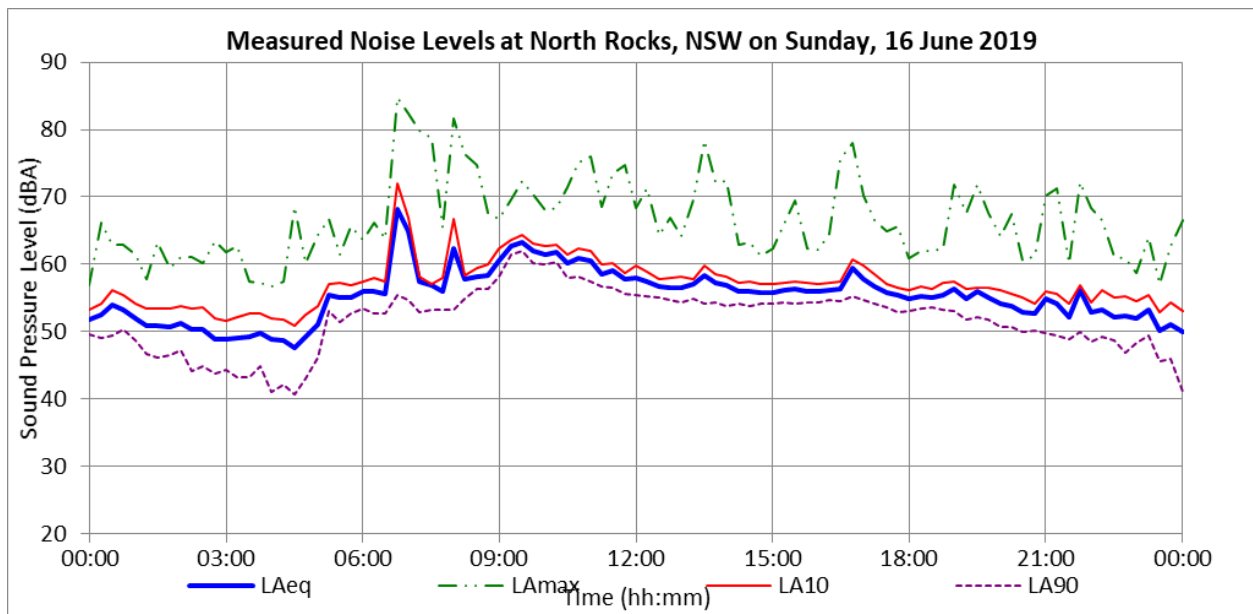
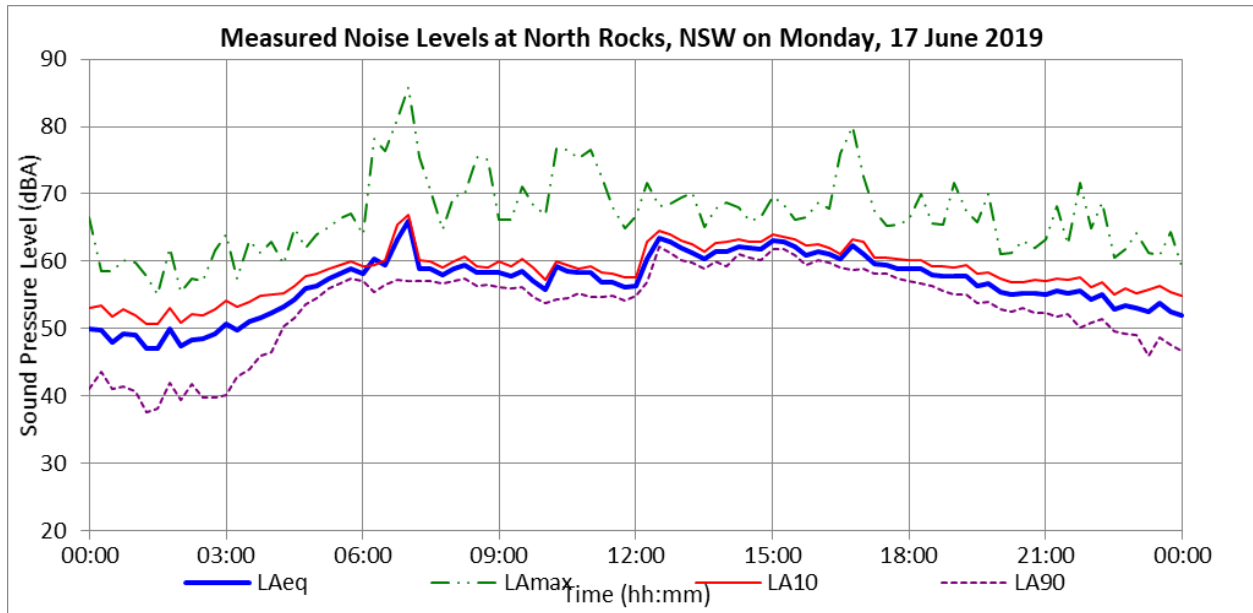


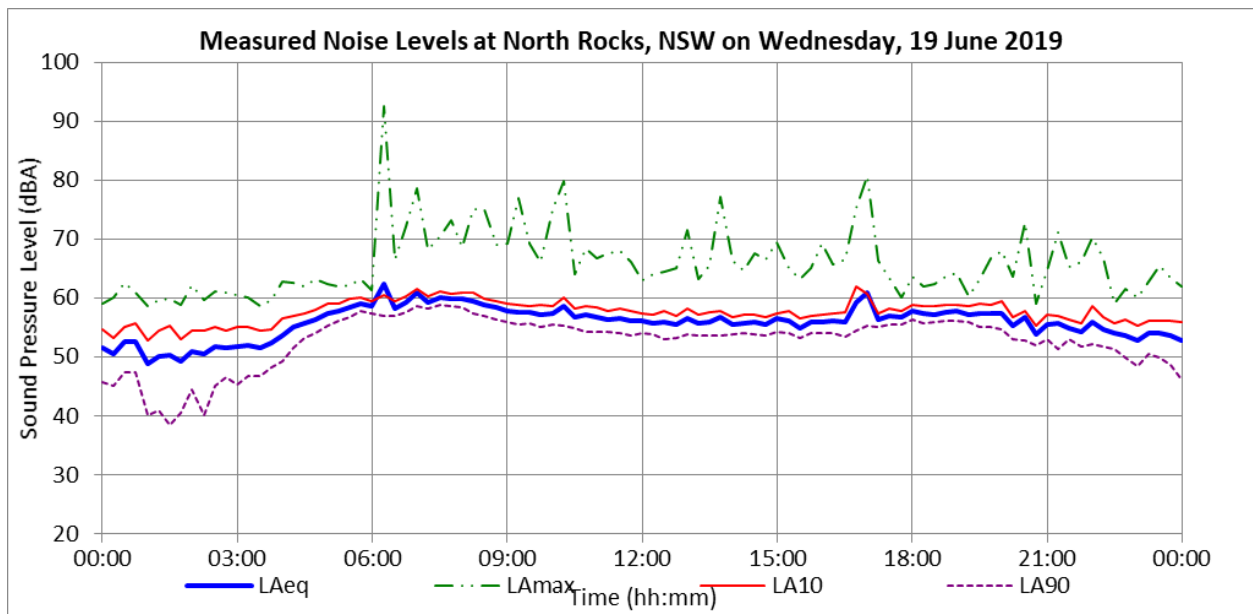
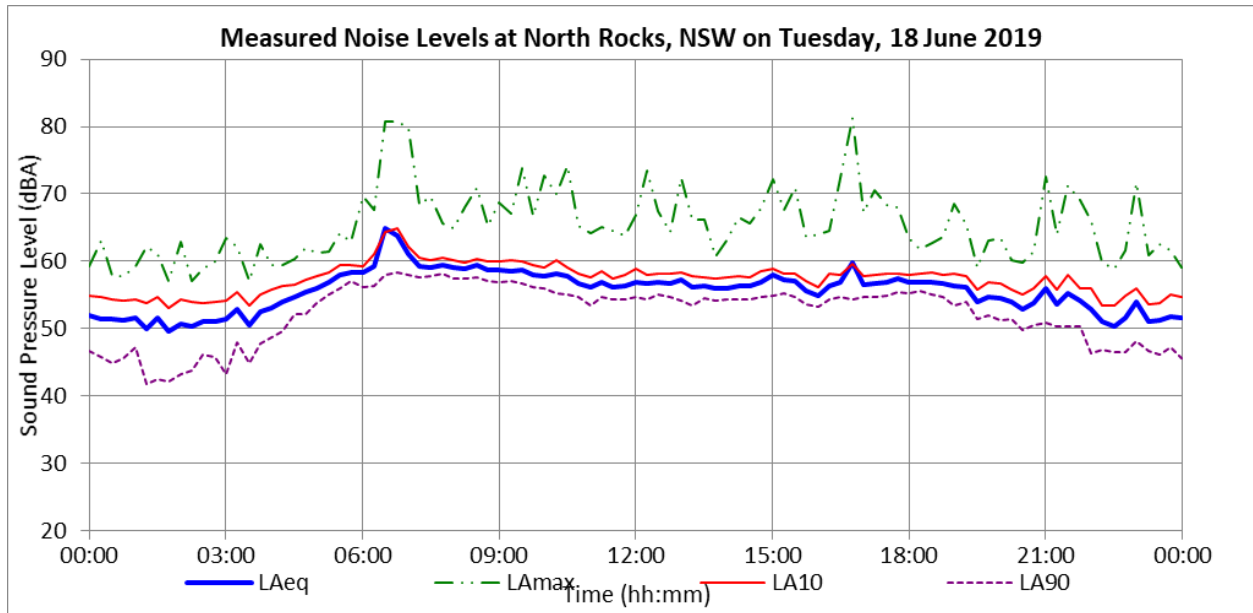


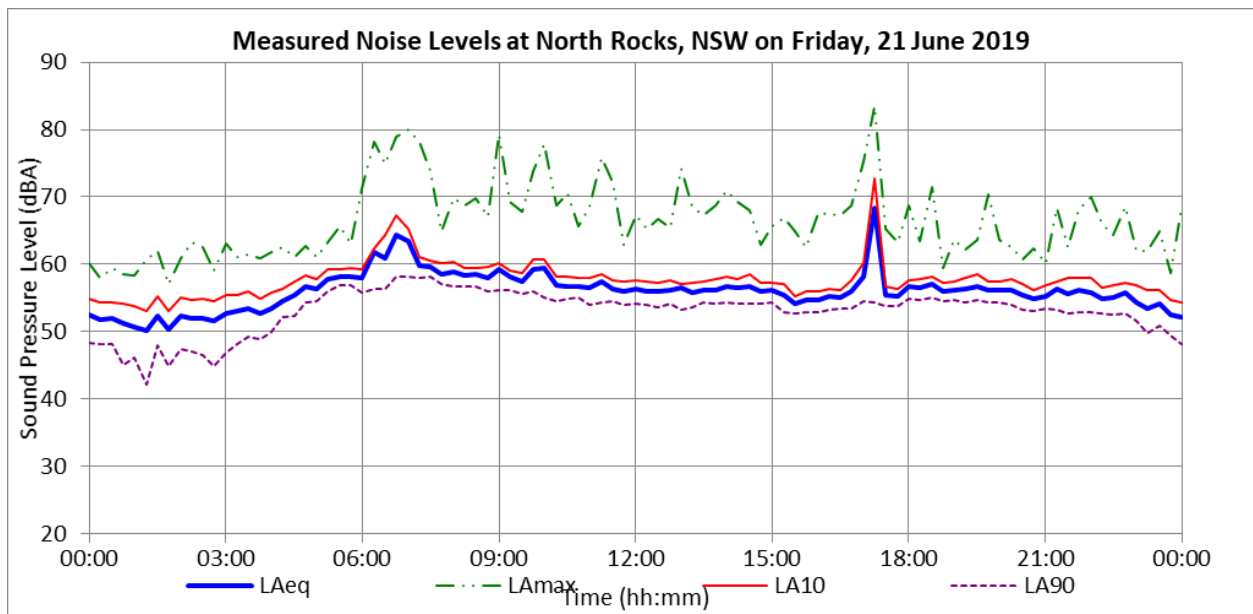
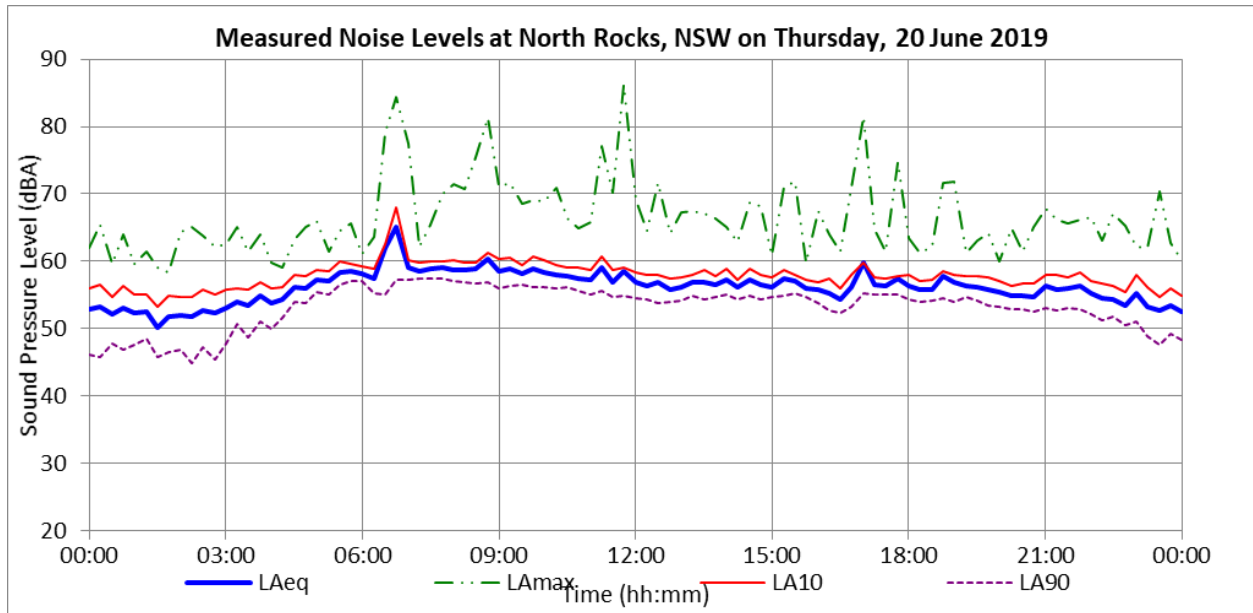
APPENDIX E NOISE LOGGING DATA

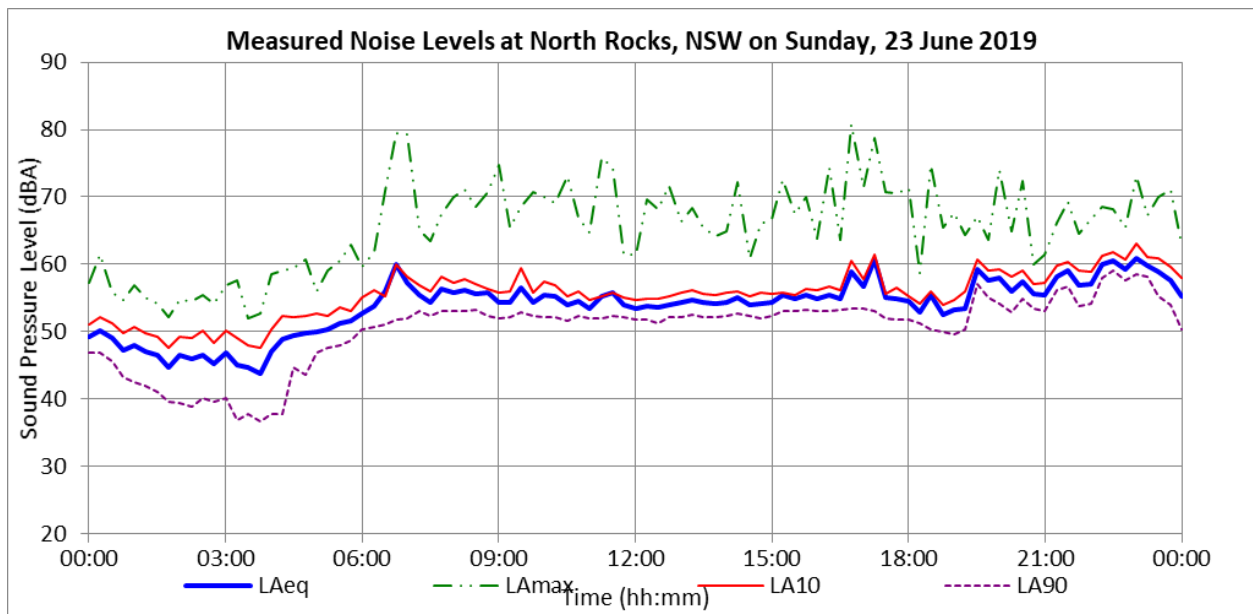
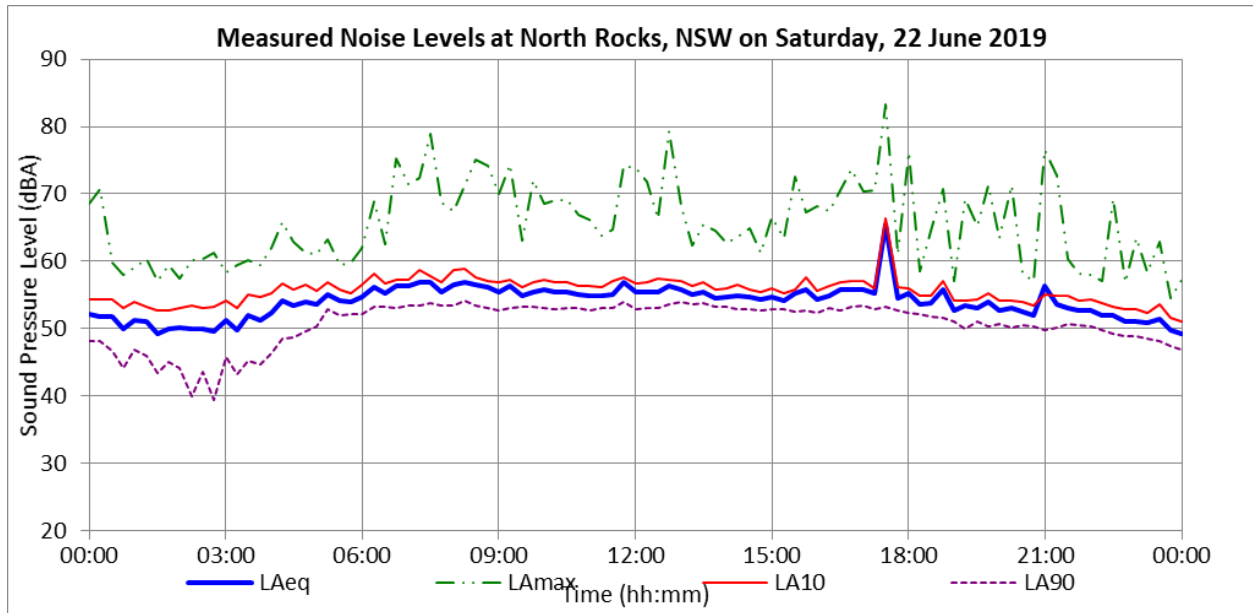
E1 Logger 1 – Noise Survey Summary

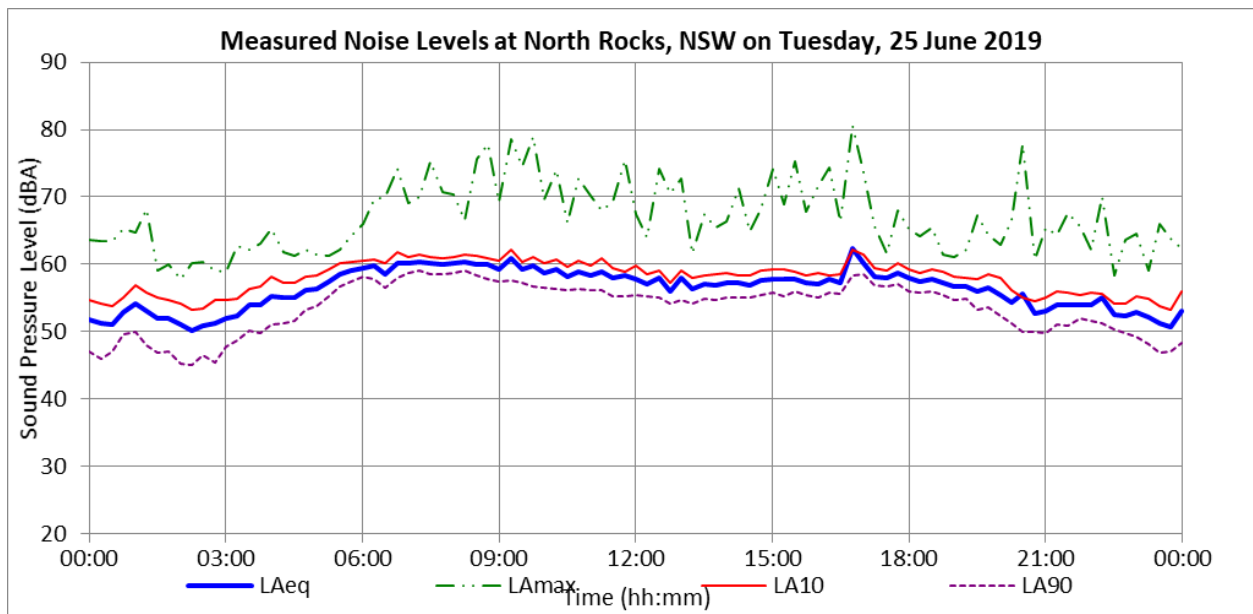
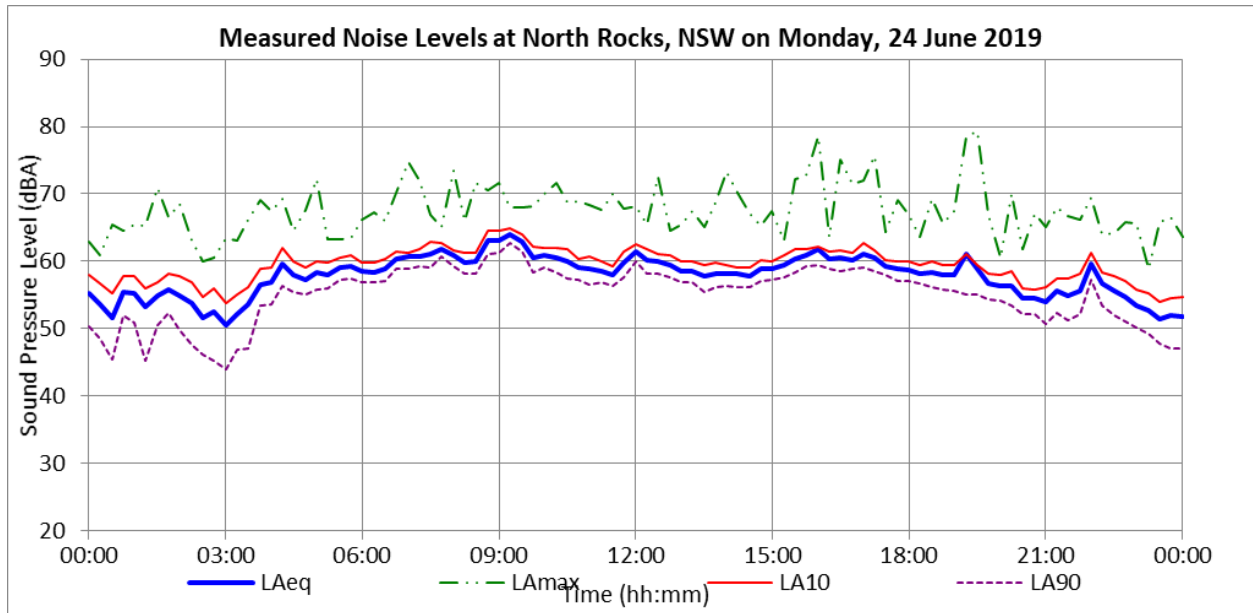


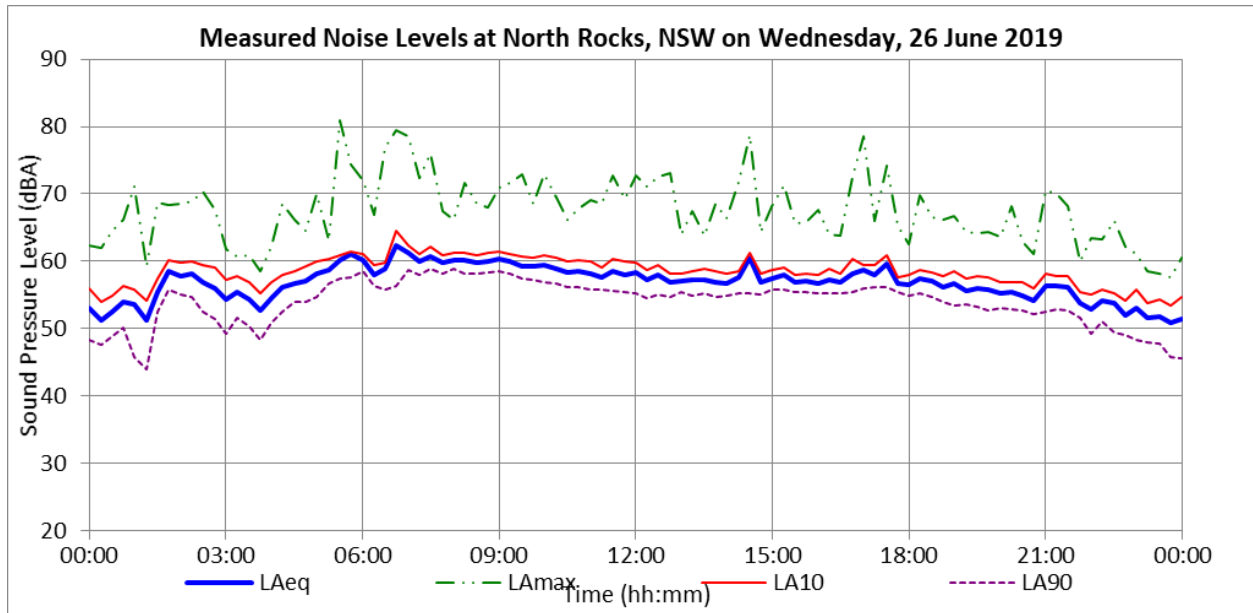




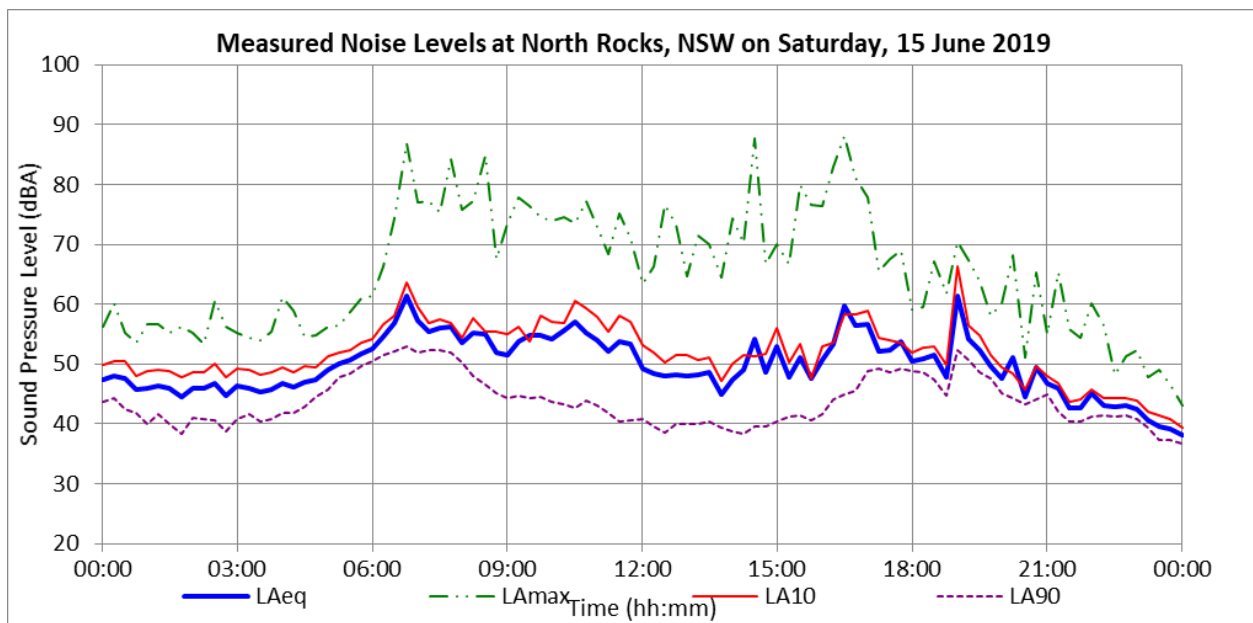
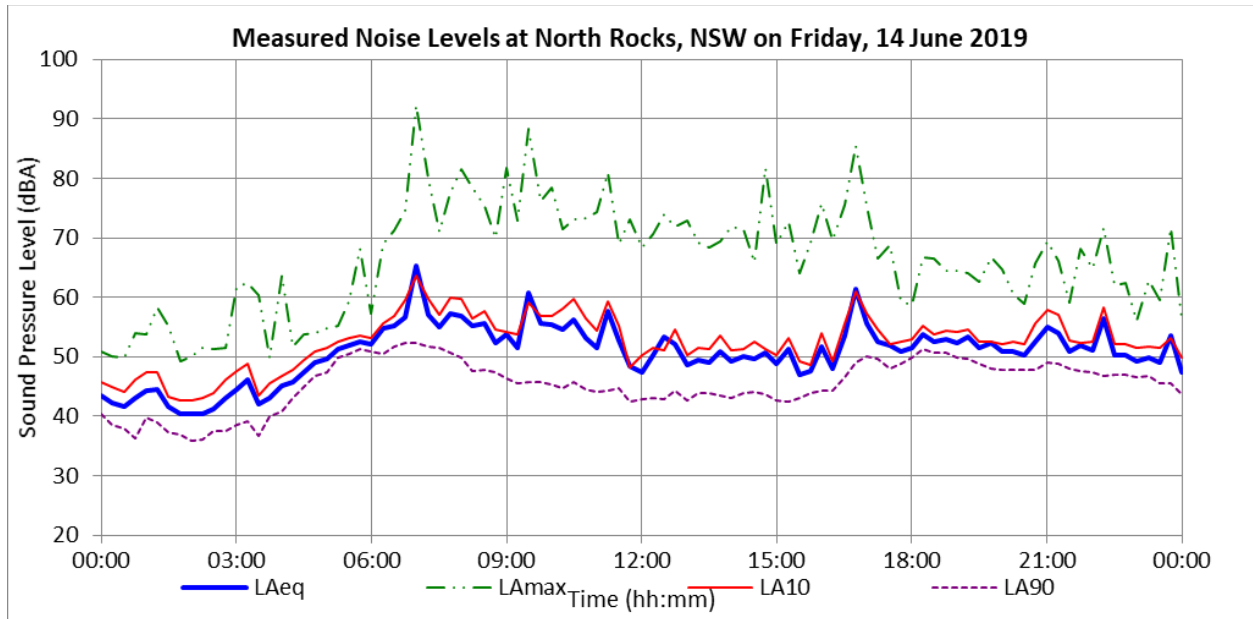


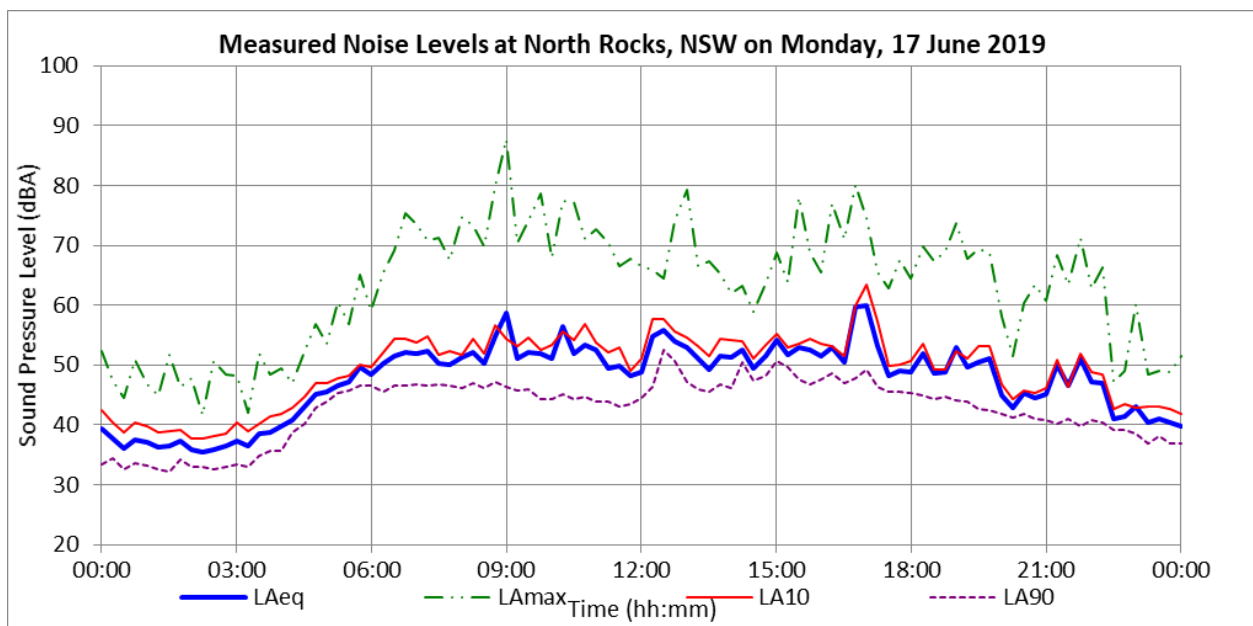
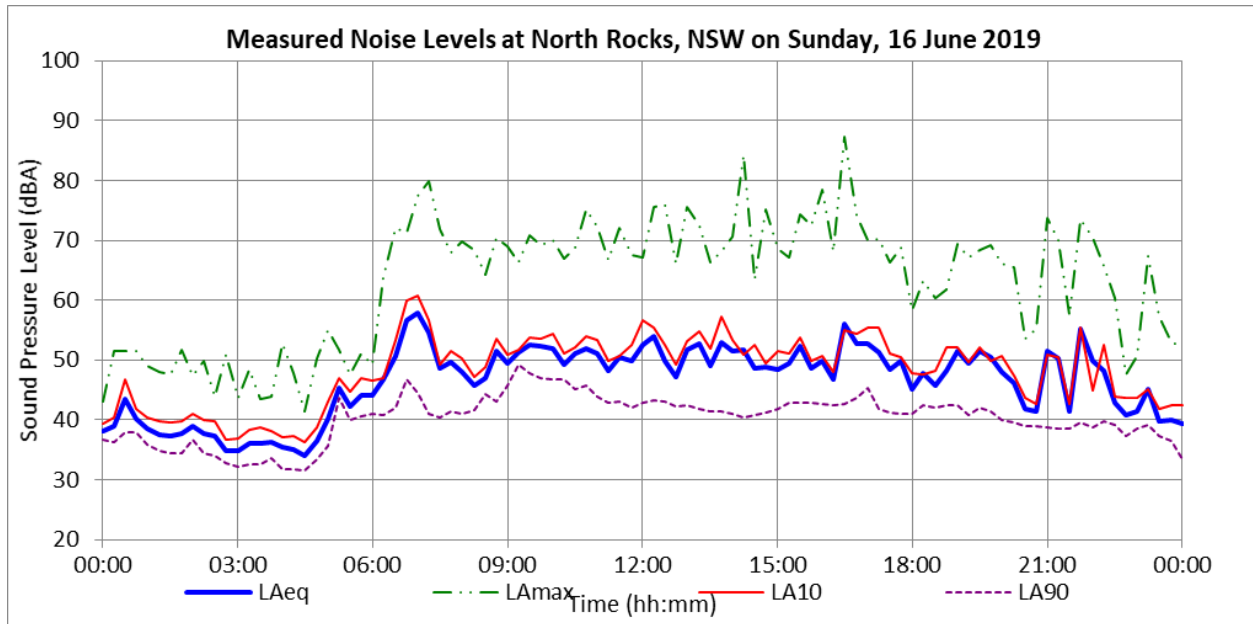


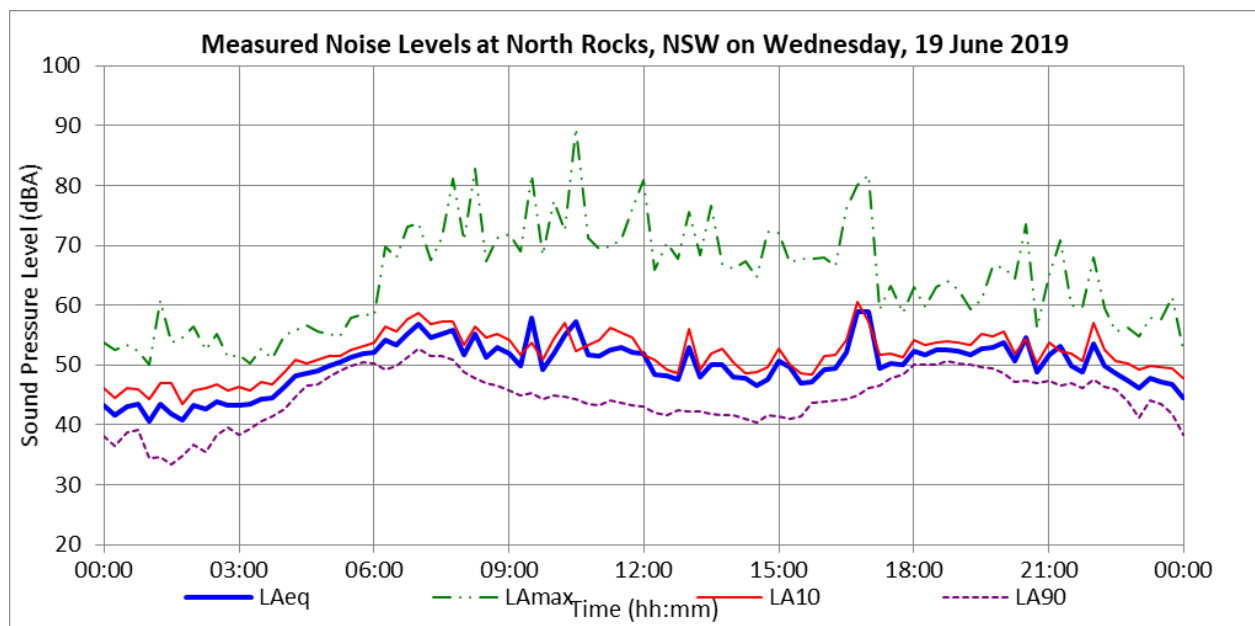
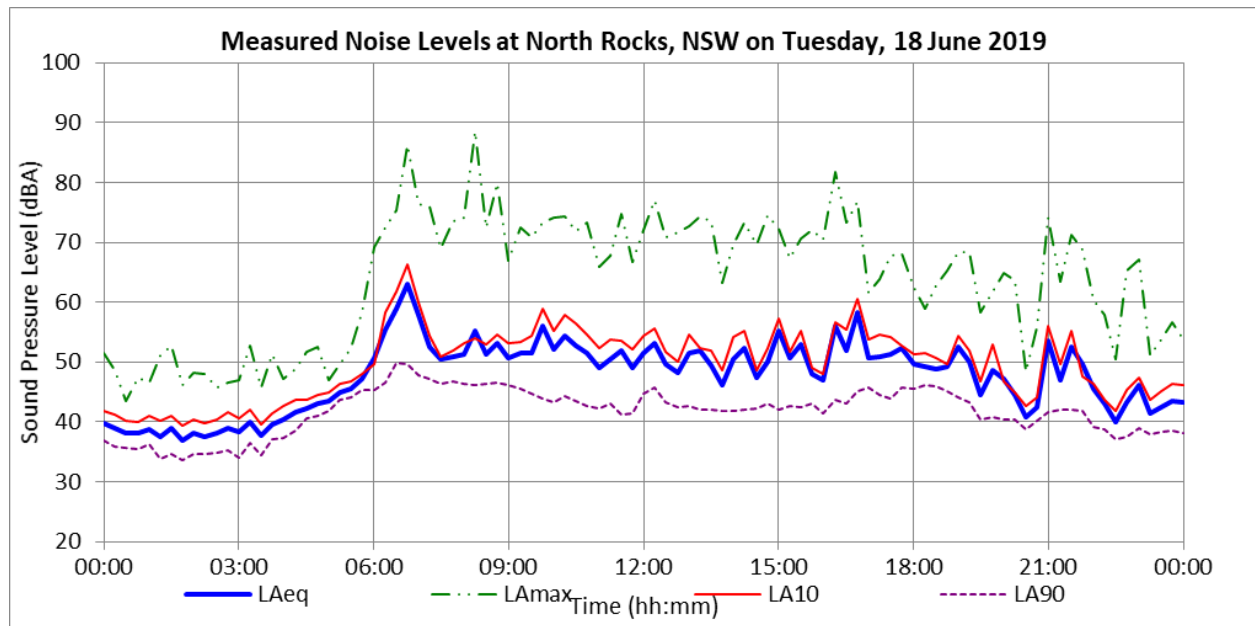


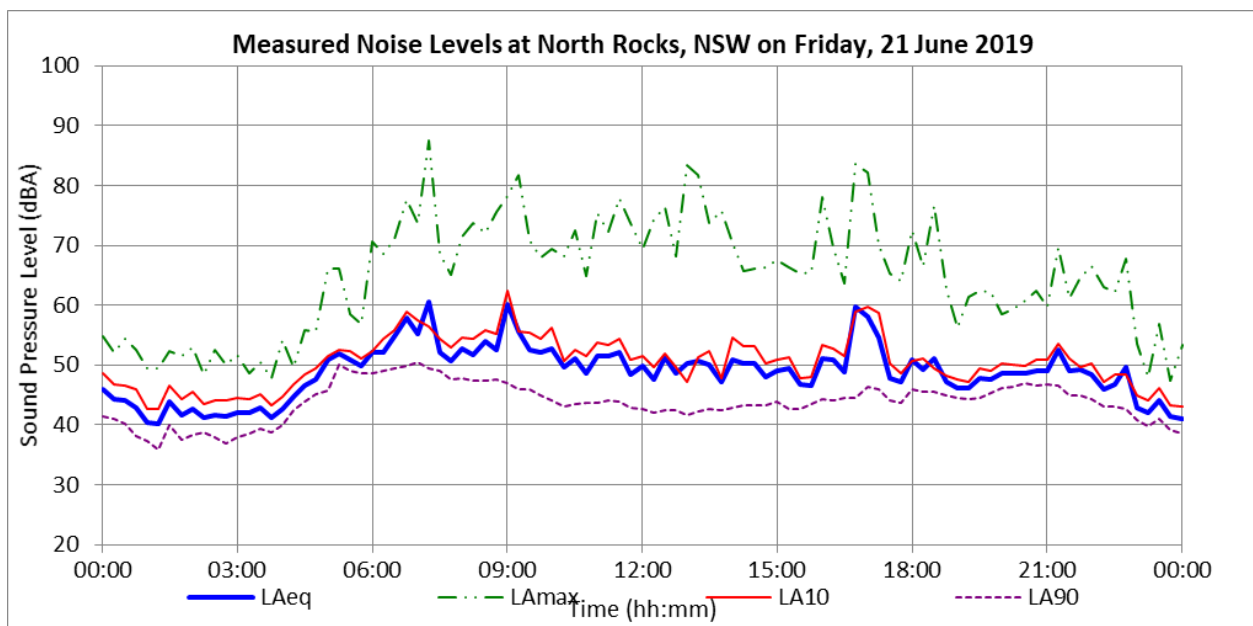
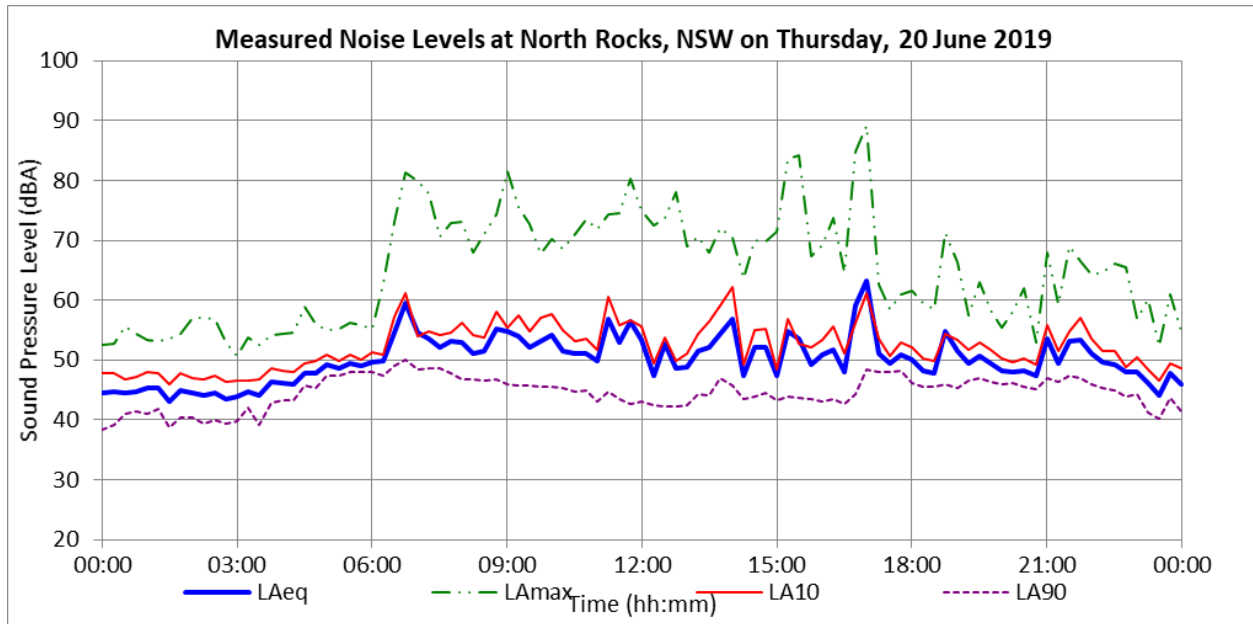


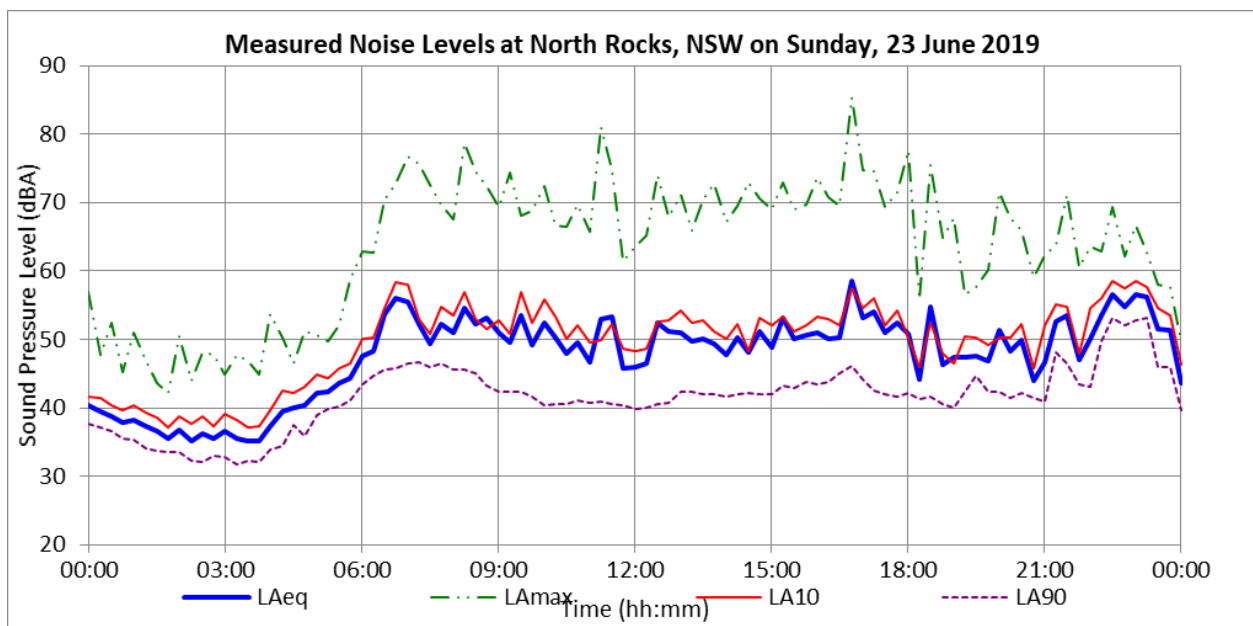
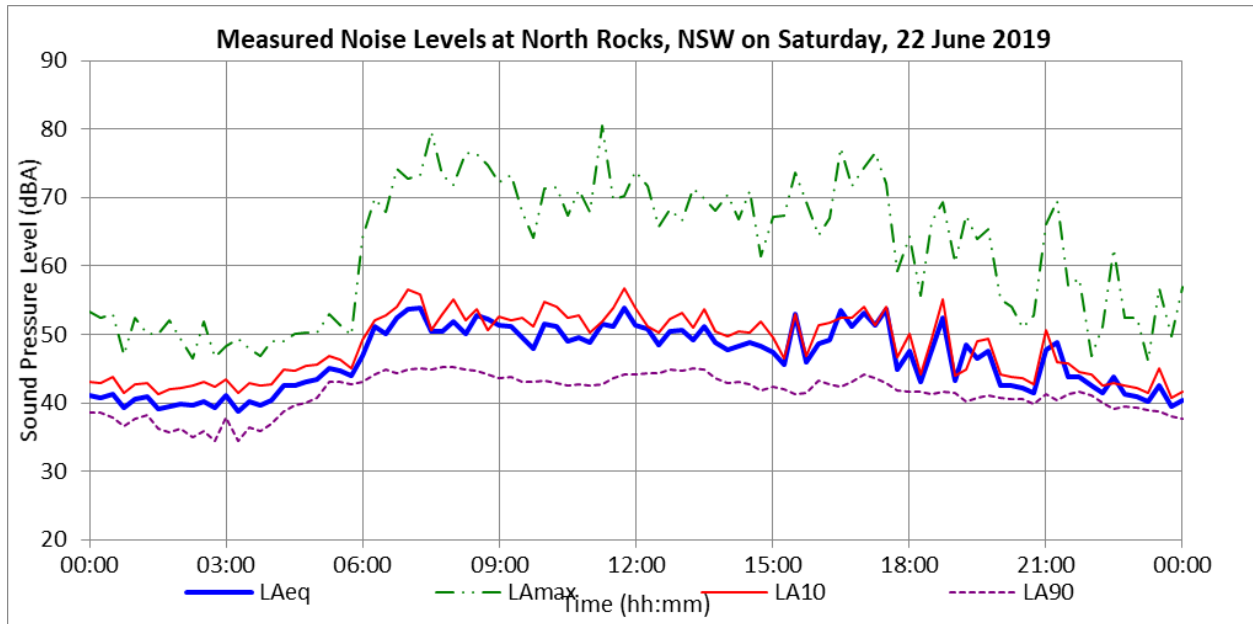
E2 Logger 2 – Noise Survey Summary

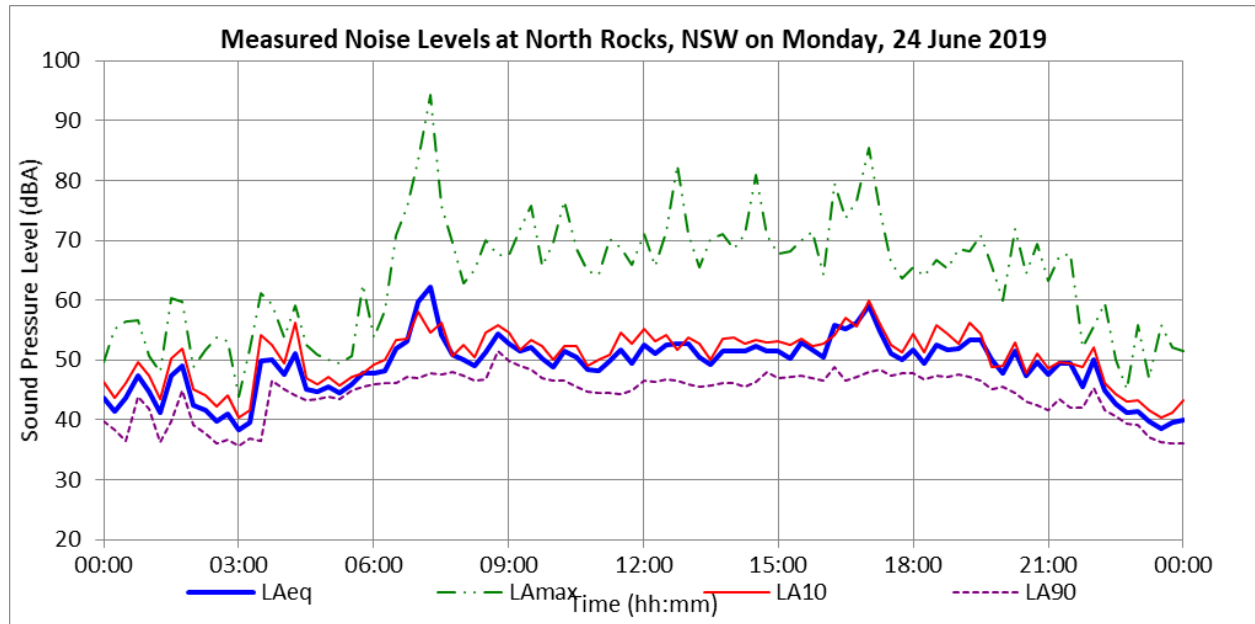












E3 Logger 3 – Noise Survey Summary

