

# LOT 106 ASTRA AEROLAB PRECINCT, WILLIAMTOWN

## Acoustic Assessment for DA

10 March 2023

Cox Architecture

TM612-03F02 Acoustic Assessment for DA (r5)

## Document details

Detail	Reference
Doc reference:	TM612-03F02 Acoustic Assessment for DA (r5)
Prepared for:	Cox Architecture
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## Document control

Date	Revision history	Non-issued revision	Issued revision	Prepared	Instructed	Reviewed / Authorised
9.9.2022	Draft issue	0	0	R. Corbett		
16.9.2022	Final Issue	1	2	R. Corbett		
4.2.2023	Amendments	3	4	R. Corbett		
9.3.2023	Amendment to military aircraft design level		5	R Corbett		H Pearce
File Path: R:\AssocSydProjects\TM601-TM650\TM612 rc Lot 106, Astra Aerolab Precinct\Task 3 - Lot 106 DA submission\TM612-03F02 Acoustic Assessment for DA (r5).docx						

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# 1 Introduction

Renzo Tonin & Associates has undertaken an acoustic assessment of the proposed commercial development known as Lot 106 In Lot 11, DP 1036501 of the Astra Aerolab Development at Williamstown as part of the Development Application.

From our assessment of the site location, the following potential acoustic issues were identified:

- Aircraft noise intrusion into the proposed development (particularly the office spaces)
- External noise emissions to neighbours from mechanical plant and equipment and use of the premises;

An acoustic assessment has been undertaken at Astra Aerolab between Wednesday 24th August and Wednesday 31st August 2022 to determine ambient noise levels impacting the proposed development site. In addition, aircraft noise measurements were undertaken at the proposed development site on Tuesday 5th April 2022.

The assessment of the above acoustic components was undertaken in accordance with NSW EPA Noise Policy for Industry (NPfI) and Australian Standards.

The existing aircraft noise levels at the building facades were used to determine the sound insulation rating requirements for the external building elements in accordance with the acoustic criteria nominated for this development.

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....

Appendix A contains a glossary of acoustic terms used in this report.

## 2 Site Description

The proposed commercial development is to be located at Lot 106 In Lot 11, DP 1036501 of the Astra Aerolab Development at Newcastle Airport, Williamstown. The precinct is a current greenfield site that is proposed to house a series of industrial and airport specific commercial developments. This may include a hotel in future stages, however this is yet to be determined.

The development is to consist of a an 8-storey commercial building consisting of ground floor retail and commercial spaces, likely to be food and beverage outlets, and office space. The 1st floor is proposed to be car parking, and base building commercial office space from level 2-7 for potential future fit out.

The nearest residential receivers are rural homes located along Cabbage Tree Road to the south, located approximately 700m from the development site. The existing Mecure Hotel is located approximately 450m to the east of the proposed development site. Built up areas immediately surrounding Newcastle Airport are industrial and commercial, with the RAAF base located to the north of the airport.



Figure 1 – Site and surrounds

## 3 Existing Acoustic Environment

### 3.1 Ambient and Background Noise Survey

An unattended long-term noise monitor was installed at the vacant Lot 109 in Lot 11, DP 1036501 of the Astra Aerolab Development at the approximate centre of the site to determine the existing level of ambient and background noise surrounding the site from Wednesday 24th to Wednesday 31st August 2022. As shown in Figure 1, the noise monitor was installed at Location L1 shown on the map above.

The noise monitor records noise levels on a continuous basis and stored data every fifteen minutes. The monitors 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.

Detailed results of the background and ambient noise monitoring undertaken on site are presented in Appendix B.

Short term noise measurements were also undertaken of aircraft flyovers. These details are presented in Section 4 of this report.

### 3.2 Measured Background Noise

The results of the long-term noise monitoring have been summarised in accordance with the Noise Policy for Industry (NPfI) requirements published by the NSW Environment Protection Authority (EPA) and are presented in Table 2 below.

**Table 1: Measured Site Background Noise Level**

Monitoring Location	Ambient $L_{Aeq}$ Noise Levels			Background $L_{A90}$ Noise Levels		
	Day	Evening	Night	Day	Evening	Night
Lot 109, Astra Aerolab Precinct, Newcastle Airport	57	48	45	37	41	39

Notes:

Day, Evening & Night assessment periods are defined in accordance NSW EPA's NPfI as follows.

1. Day is defined as 7:00am to 6:00pm, Monday to Saturday; 8:00am to 6:00pm Sundays & Public Holidays.
2. Evening is defined as 6:00pm to 10:00pm, Monday to Sunday & Public Holidays
3. Night is defined as 10:00pm to 7:00am, Monday to Saturday; 10:00pm to 8:00am Sundays & Public Holidays

The representative background noise levels ( $L_{A90}$ ) are used in defining external noise emission from the development such as industrial use, mechanical ventilation and air-conditioning systems in accordance to the EPA Noise Policy for Industry.

#### 3.2.1.1 Heading 4

Cross reference to Table 1.

**Table 2:   Caption**

Location	Descriptor	Overall dBA	Octave band centre frequency – Hz (dBZ)								
			31.5	63	125	250	500	1k	2k	4k	8k
M1	L <sub>eq</sub>	76	54	65	67	78	89	90	87	67	76
	L <sub>90</sub>	76	54	65	67	78	89	90	87	67	76
M1	L <sub>eq</sub>	74	54	65	67	78	89	90	87	67	76
	L <sub>90</sub>	72	54	65	67	78	89	90	87	67	76

Notes:

## 4 Aircraft Noise Intrusion

### 4.1 Aircraft Noise Intrusion Criteria

Aircraft noise intrusion from take-off, landing and circuit training operations at civil aerodromes or military airfields is assessed using Australian Standard AS2021-2015 – 'Acoustics – Aircraft Noise Intrusion – Building Siting and Construction'. This section of the report outlines the application of AS2021. The site specific assessment is presented in Section 4.

The scope of AS2021 is stated as:

*This Standard, together with the relevant Australian Noise Exposure Forecast (ANEF) chart provides guidelines for determining-*

*whether the extent of aircraft noise intrusion makes building sites 'acceptable', 'unacceptable' or 'conditionally acceptable' for the types of activity to be, or being, undertaken (Clause 2.3);*

*for 'conditionally acceptable' sites, the extent of noise reduction required to provide acceptable noise levels indoors for the types of activity to be, or being, undertaken; and*

*the type of building construction necessary to provide a given noise reduction, provided that external windows and doors are closed.*

#### 4.1.1 Building site acceptability

AS2021 contains advice on the acceptability of building sites based on Australian Noise Exposure Forecast (ANEF) zones. The ANEF chart provides a predicted cumulative exposure to aircraft flyover noise in communities near aerodromes. The chart presents zones represented by noise contours overlaid on a locality map specific to an airport. The ANEF system was developed as a land use planning tool aimed at controlling encroachment on airports by noise sensitive buildings.

Table 2.1 of AS2021 sets acceptability zones for different building types and land uses. The table categorises building sites as either 'Acceptable', 'Conditionally Acceptable' or 'Unacceptable' relative to different ANEF levels. Table 1 reproduces the sections of AS2021 Table 2.1 relevant to the subject site.

**Table 1: Building site acceptability based on ANEF zones (Table 2.1 of AS2021)**

Building type	ANEF zone of site		
	Acceptable	Conditional	Unacceptable
Commercial Building	Less than ANEF 25	25 to 35 ANEF	Greater than 35 ANEF

Building type	ANEF zone of site		
	Acceptable	Conditional	Unacceptable
Notes:	<p>4. The actual location of the ANEF 20 contour is difficult to define accurately, mainly because of variation in aircraft flight paths. Because of this, the procedure of Clause 2.3.2 may be followed for building sites outside or near the ANEF 20 contour.</p> <p>5. Within ANEF 20 to ANEF 25, some people may find that the land is not compatible with residential or educational uses. Land use authorities may consider that the incorporation of noise control features in the construction of residences or schools is appropriate.</p> <p>6. This Standard does not recommend development in unacceptable areas. However, where the relevant planning authority determines that any development may be necessary within existing built-up areas designated as unacceptable, it is recommended that such development should achieve the required ANR determined according to Clause 3.2. For residences, schools, etc., the effect of aircraft noise on outdoor areas associated with the buildings should be considered.</p>		

**Table 2: Description of building site acceptability**

Zone	Description
Acceptable	If from Table 2.1, the building site is classified as 'acceptable', there is usually no need for the building construction to provide protection specifically against aircraft noise. However, it should not be inferred that aircraft noise will be unnoticeable in areas outside the ANEF 20 contour. (See Notes 1, 2 and 3 of Table 2.1.)
Conditionally Acceptable	If from Table 2.1, the building site is classified as 'conditionally acceptable', the maximum aircraft noise levels for the relevant aircraft and the required noise reduction should be determined from the procedure of Clauses 3.1 and 3.2, and the aircraft noise attenuation to be expected from the proposed construction should be determined in accordance with Clause 3.3 (see Notes 1 and 3 of Table 2.1).
Unacceptable	If, from Table 2.1 the building site is classified as 'unacceptable', construction of the proposed building should not normally be considered. Where in the community interest redevelopment is to occur in such areas, e.g. a hotel in the immediate vicinity of an aerodrome, refer to the notes to Table 2.1.

#### 4.1.2 Indoor design sound levels for determination of aircraft noise reduction

The indoor design sound level for the activity or building type under consideration is outlined in AS2021 Table 3.3. Table 3 reproduces the criteria relevant to the subject site.

**Table 3: Indoor design sound levels for determination of aircraft noise reduction (Table 3.3 from AS2021)**

Building type and activity	Indoor design sound level*, dB(A)
<b>Commercial buildings, offices and shops</b>	
Private offices, conference rooms,	55
Drafting, open offices	65
Typing, data processing	70
Shops, supermarkets, showrooms	75

Building type and activity	Indoor design sound level*, dB(A)
Notes	<p>* These indoor design sound levels are not intended to be used for measurement of adequacy of construction. For measurement of the adequacy of construction against aircraft noise intrusion see Appendix D of the Standard.</p> <ol style="list-style-type: none"> <li>7. The indoor design sound levels in Column 2 are hypothesized values based on Australian experience. A design sound level is the maximum level (dB(A)) from an aircraft flyover which, when heard inside a building by the average listener, will be judged as not intrusive or annoying by that listener while carrying out the specified activity. Owing to the variability of subjective responses to aircraft noise, these figures will not provide sufficiently low interior noise levels for occupants who have a particular sensitivity to aircraft noise.</li> <li>8. Some of these levels, because of the short duration of individual aircraft flyovers, exceed some other criteria published by Standards Australia for indoor background noise levels (see AS/NZS 2107).</li> <li>9. The indoor design sound levels are intended for the sole purpose of designing adequate construction against aircraft noise intrusion and are not intended to be used for assessing the effects of noise. Land use planning authorities may have their own internal noise level requirements which may be used in place of the levels above.</li> <li>10. For opera and concert halls and theatres, and for recording, broadcast and television studios and similar buildings where noise intrusion is unacceptable, specialist acoustic advice should always be obtained.</li> <li>11. Certain activities in schools may be considered particularly noise sensitive and 50 dB(A) may be a more desirable indoor sound level to select for any teaching areas used for such activities. However, the effect of other noise sources should be considered.</li> <li>12. The provisions of this Standard relating to different internal design sound levels for different indoor spaces could result in the use of different construction and materials in contiguous spaces, and require the construction of substantial barriers between habitable spaces, e.g. heavy self-closing internal doors, detracting from the amenity of the building. Therefore consideration should be given to a uniform perimeter insulation approach.</li> </ol>

Given the site is intended as a base build, the 'open offices' criteria has been applied to the façade design of the building. Tenants undertaking their own fit-outs of the space are to be advised to locate private offices and conference rooms at the core of the building, away from the glazed facades to avoid the need to upgrade the façade elements to comply with the Standard.

## 4.2 Aircraft noise assessment

### 4.2.1 Site assessment – building acceptability

Based on the ANEF 2039 chart the subject site is located between the ANEF 30-35 contours, as shown in Figure 2.

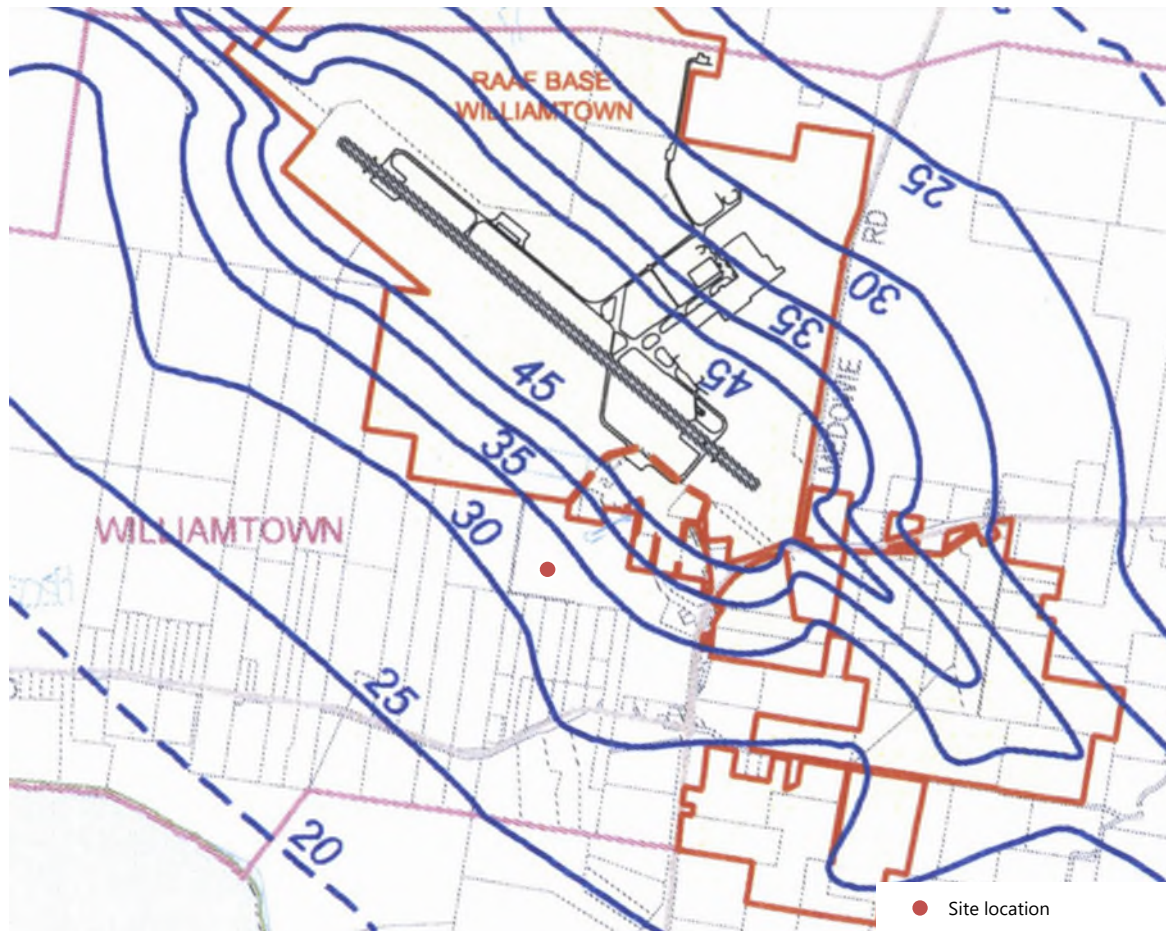


Figure 2: Subject site and ANEF overlay

For the identified ANEF zones, Table 4 summarises the acceptability of proposed uses for the subject site.

Table 4: Acceptability of uses for site

Building type	Less than 20 ANEF	20-25 ANEF	25-30 ANEF	30-35 ANEF	35-40 ANEF	Greater than 40 ANEF
Commercial Building	Acceptable	Acceptable	Conditionally Acceptable	Conditionally Acceptable	Unacceptable	Unacceptable

According to the ANEF map, the property lies within the *Conditionally Acceptable* zone for the commercial development as nominated in Australian Standards AS2021-2015 – “Acoustics – Aircraft Noise Intrusion – Building Siting and Construction”.

## 4.2.2 Maximum aircraft noise levels

### 4.2.2.1 Measured Levels

A continuous noise monitor was set up at the site of 106 Astra Aerolab Precinct on Tuesday 5th April from 12.30pm to 3.30pm to measure aircraft flyovers, including Joint Strike Fighter operations, other military aircraft operations, and commercial aircraft movements. Refer to Appendix B for the location and the results of the monitoring.

A permanent noise monitor is also positioned the south of the proposed site on Cabbage Tree Road [Source: <https://defence.gov.au/AircraftNoise/interactive/Update/wlm.html#9>]. The location of the monitor is shown in the figure below. Events were correlated to measured data to confirm that measured noise levels represent typical maximum noise levels from Newcastle Airport.

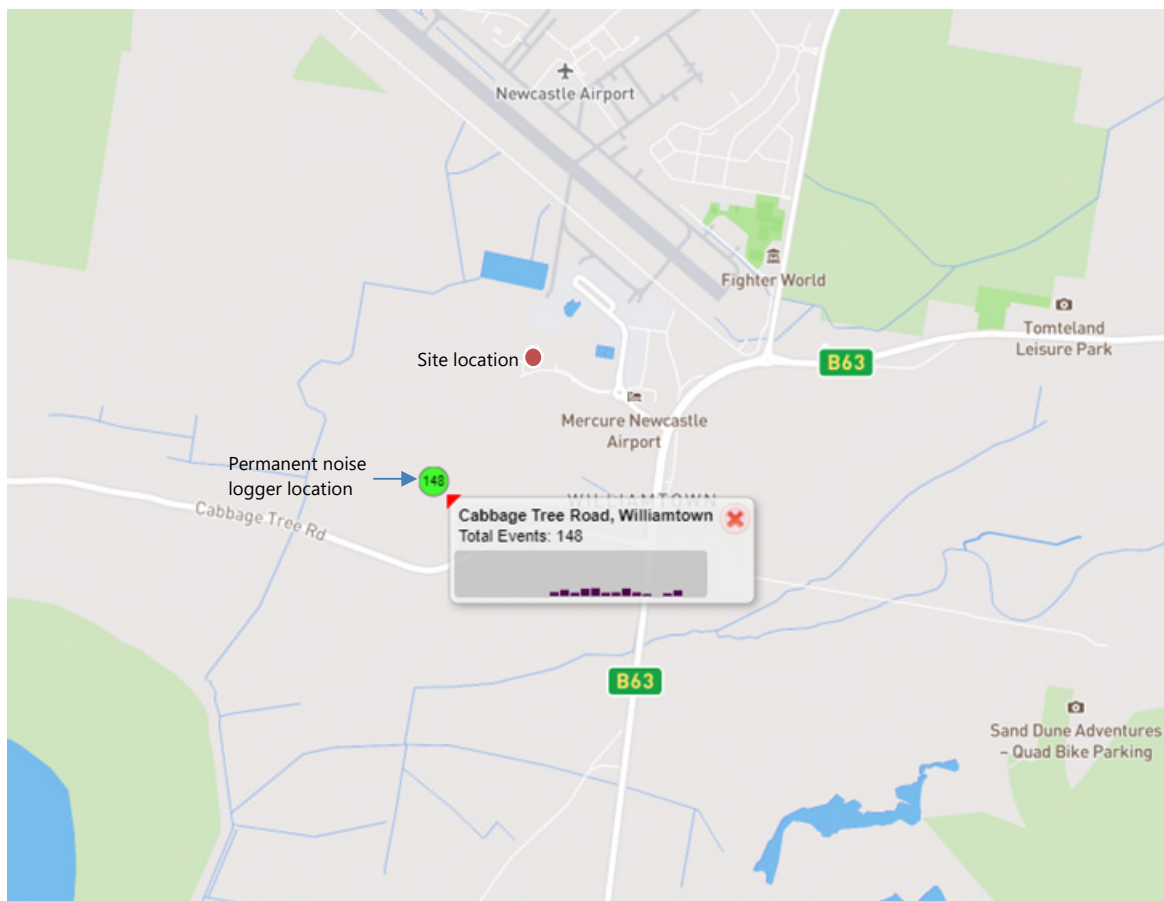


Figure 3- Location of permanent noise logger

### 4.2.2.2 Military Aircraft Indicative Noise tables

In addition to on site measurements and correlation with long term noise monitors in the area, the Military Aircraft Indicative Noise Tables for the F-35A jets (produced by Marshall Day Acoustics dated

23/11/2022) were used to confirm the design noise level at the site. The tables present noise data for Instrument approach (3 degrees), Initial and pitch approach, Departure with military afterburners, and Standard military power departure operations.

The tabulated data is comparable with the data measured on site.

For F-35A departures with afterburners, the Environmental Impact Statement for the F-35A operations prepared by Coffey [Ref: 2010/5747 dated July 2014] identifies that at least 80% of take-off operations of the F-35A aircraft will not use afterburners. This is confirmed via the long term noise monitor located on Cabbage Tree Road, where events suspected of using afterburners are rarely recorded (events over 100dB(A)).

In accordance with clause 3.1.4 of the Standard, "where there is evidence that the particular aircraft type and movement which produced that noise level do not constitute a typical operation, then the noise level can be ignored and the next lowest noise level selected". In accordance with clause 3.1.4, the upper 5% of movements are assumed to "not constitute a typical operation" and were excluded.

From the <https://defence.gov.au/AircraftNoise/interactive> website, Military Jet Aircraft operations typically make up 35-50% of air traffic at Newcastle Airport, which includes F-35A and Hawk 127 aircraft. Therefore, F-35A aircraft take-offs with afterburners would not be considered a typical operation and have been excluded as the design noise level impacting the site.

Information from the monthly reports and biannual reports published by the Department of Defence has also been referred to in establishing the frequency and types of military jet movements.

The next highest noise level is the F-35A take-offs and circuit training with military power, which produce a noise level of **97dB(A)**.

This level is higher than the results measured though onsite measurements, however, will be used as the design external aircraft noise level due to the frequency of this operation.

#### 4.2.2.3 Calculated civil aircraft noise levels - AS2021:2015

Aircraft noise exposure levels were calculated for the development site based on Australian Standard AS2021-2015. Buildings are required to be designed to meet the relevant internal noise levels presented in Table 3. The Aircraft Noise Reduction (ANR) for the building type construction is determined using the maximum external aircraft noise level and the indoor design sound level.

- To determine resultant aircraft noise levels the following factors were considered as specified in the Standard;
- The site's position relative to each runway, including take-off and landing distances and runway centre line offsets;
- Elevation of the site compared with the elevation of the runways; and,
- Type of aircraft and associated maximum noise level during take-off and landing.

Using these factors, the resultant maximum noise levels were determined for each aircraft type. This calculation is not based on ANEF contours but on the location of the site relative to the runway. Newcastle Airport has 1 runway, 12/30, with operations capable in both directions. Take-offs and landings to the south-east most impact the proposed development site.

It should be noted that Newcastle Airport is a mainly domestic airport (including Lord Howe Island and New Zealand) and military base and does not typically see the arrival and departure of larger international jets. In accordance with clause 3.1.4 of the Standard, "where there is evidence that the particular aircraft type and movement which produced that noise level do not constitute a typical operation, then the noise level can be ignored and the next lowest noise level selected". Aircraft types are confirmed via the Newcastle Airport website.

Table 5 below shows the maximum design noise level at the development site.

**Table 5: Maximum Noise Levels at Assessment Location as per AS2021**

Aircraft Type	Mode of Operation	Maximum Noise Level dB(A)
Airbus A320-232	Departure south-east	71
Boeing 737-800	Departure south-east	<b>73</b>
Saab 340	Departure south-east	69
Dash 8	Departure south-east	60
Airbus A320-232	Landing south-east	54
Boeing 737-800	Landing south-east	59
Saab 340	Landing south-east	52
Dash 8	Landing south-east	45

It should be noted that variations in flight paths and aircraft operational characteristics may generate external noise levels greater than calculated here. The noise survey undertaken at the site confirms the noise levels presented above.

Based on the surveys and available data, the maximum typical noise event is from the F-35A take off and circuit training operations with military power, producing a noise level of 97dB(A).

Table 6 below shows the required ANR for areas in the proposed development based on a maximum noise level of 97dB(A).

**Table 6: Required Aircraft Noise Reduction for the Proposed Development**

Area	Required ANR
<b>Commercial buildings, offices and shops</b>	
Private offices, conference rooms,	42
Drafting, open offices	32
Typing, data processing	27
Shops, supermarkets, showrooms	22

### 4.3 Noise Intrusion Recommendations

Appendix G of AS2021:2015 provides one method for determining appropriate building materials and constructions to achieve a required ANR value. While Appendix G is intended to serve only as a guide to the types of construction, it has been used here to demonstrate the ability of proposed building types to satisfy the internal noise levels required of AS2021.

In general, where a specific ANR is required, buildings require external windows and doors to be kept closed, as when opened for ventilation purposes the aircraft noise reduction of the building envelope will be significantly reduced. Where it is necessary to close windows and doors to comply with this Standard, building ventilation should be designed in accordance with the Building Code of Australia on the assumption that windows and doors are not operable. Mechanical ventilation or air conditioning systems complying with AS 1668.2 should be installed.

The ANR is calculated by subtracting the indoor design level from the maximum aircraft noise level. The resulting value is an estimate of the ANR in dB(A) to be achieved by the building's envelope.

AS2021 also provides guidance on the type of construction necessary to achieve the required ANR. Various rooms in a building may require different indoor design levels and consequently different treatment.

For the subject site, in-principle treatment for building construction has been established in order to demonstrate the ability of the buildings to be designed appropriately for the proposed uses.

For typical buildings, the weakest elements of the building construction in regard to noise intrusion are doors and windows (glazed). Table 7 outlines the calculated Weighted Sound Reduction Index (Rw) Ratings for windows, doors, wall structures, and the roof/ceiling structure associated with typical residential building design based on the Maximum Aircraft Noise Level of 89dB(A).

In addition to this, noise calculations were performed using design software developed in this office which take into account external noise levels, facade transmission loss and room sound absorption characteristics. These room characteristics are based on a typical office fit out of a carpet tiled floor and a plasterboard/ ceiling tile ceiling installed. The resulting Rw rating required for each element is summarised in Table 7 below.

Due to the operation of military jets and the design external noise levels, private offices cannot be located along the glazed façade of the building. Private offices, meeting rooms and conference rooms are to be located at the core of the building.

**Table 7: Recommended Forms of Construction**

Occupancy	Facade Element	Proposed Form of Construction	Minimum Required Sound Insulation Rating of Assembly	Laboratory Test Number or Reference
<b>General Office Space (Levels G-8)</b>				
Open Office areas	Windows	Curtain wall glazing (double glazing)	R <sub>w</sub> 40	ESTIMATE
	External Walls	Standard concrete or masonry construction with insulation and plasterboard lining internally	R <sub>w</sub> 55	ESTIMATE
	Roof	Concrete slab, thermal insulation and suspended ceiling tile	R <sub>w</sub> 55	ESTIMATE
<b>Ground Floor Retail/ Cafes</b>				
Living Dining Kitchen	Windows	Floor to ceiling glazing similar to 12.38mm laminated glass or equivalent with full perimeter acoustic seals. Frame of window is not to diminish the acoustic rating of the glazed system.	R <sub>w</sub> 36	ESTIMATE
	External Walls	Standard concrete or masonry construction	R <sub>w</sub> 50	ESTIMATE

By way of explanation, the Sound Insulation Rating  $R_w$  and  $R_w + C_{tr}$  are measures of the noise reduction property of the partition, a higher rating implying a higher sound reduction performance.

LEGEND where no appropriate test certificate exists:-

13. ESTIMATE – The client is advised not to commence detailing or otherwise commit to partition construction systems which have not been tested in an approved laboratory or for which an opinion only is available. Testing of partition construction systems is a component of the quality control of the design process and should be viewed as a priority because there is no guarantee the forecast results will be achieved thereby necessitating the use of an alternative which may affect the cost and timing of the project. No responsibility is taken for use of or reliance upon untested partition construction systems, estimates or opinions. The advice provided here is in respect of acoustics only.
14. ESTIMATE – APPROVED FOR CONSTRUCTION: Use of the form of construction is approved prior to laboratory certification. To complete the quality control of the design process and confirm the acoustical performance of the construction, we recommend testing in a laboratory to confirm the acoustic rating as soon as practicable.
15. ESTIMATE – TEST NOT REQUIRED: Use of the form of construction is approved without laboratory certification. The  $R_w$  and  $R_w + C_{tr}$  of the form of construction exceeds the project requirements.
16. In accordance with Clauses FV5.1 and FV5.2 of Part F5 of the BCA.

NOTES FOR WALL CONSTRUCTIONS:

17. DO NOT daub fix plasterboard directly to masonry walls without express approval.

GENERAL

18. The sealing of all gaps in partitions is critical in a sound rated construction. Use only sealer approved by the acoustic consultant.
19. Check design of all junction details with acoustic consultant prior to construction.
20. Check the necessity for HOLD POINTS with the acoustic consultant to certify that all building details have been correctly interpreted and constructed.
21. The information provided in this table is subject to modification and review without notice.
22. The advice provided here is in respect of acoustics only. Supplementary professional advice may need to be sought in respect of fire ratings, structural design, buildability, fitness for purpose and the like.
23. In wet areas 13mm moisture-resistant plasterboard may be used in lieu of 13mm standard plasterboard.
24. 9mm Villaboard or 9mm fibre cement may be used in lieu of 13mm moisture and fire resistant plasterboard

Before committing to any form of construction or committing to any contractor, advice should be sought from an acoustic consultant to certify that the forms of construction selected comply with the criteria nominated in this report and adequate provisions are made for any variations which may occur as a result of changes to the recommended forms of construction.

The recommendations made above are based on the DA drawings provided. The DA plans are for the building to be delivered as a cold shell, with a future fitout by tenants. Private offices are not to be located on the façade and are to be located at the core of the building in order for private office noise goals to be met.

A full acoustic assessment is to be undertaken during the detailed design phase of the development.

Before committing to any form of construction or committing to any contractor, advice should be sought from an acoustic consultant to certify that the forms of construction selected comply with the criteria nominated in this report and adequate provisions are made for any variations which may occur as a result of changes to the recommended forms of construction.

## 5 Noise Emission

### 5.1 Noise Emission Criteria

#### 5.1.1 Port Stephens DCP

Port Stephens Development Control Plan states that:

*An acoustic report is required for development that has the potential to produce offensive noise, meaning:*

- *that, by reason of its level, nature, character or quality or the time at which it is made, or any other circumstances:*
  - *is harmful to (or is likely to be harmful) to a person who is outside the premises from which it is emitted, or*
  - *interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted*
- *that is of a level, nature, character or quality prescribed by the regulations or that is made at a time, or in other circumstances, prescribed by the regulations, such as the Environmental Protection Authority. 2000, 'NSW Industrial Noise Policy*

It is noted that the NSW EPA's Industrial Noise Policy has been superseded by the NSW EPA's Noise Policy for Industry (NPfI).

The NPfI shall be referred to as the relevant policy for this assessment.

#### 5.1.2 NSW Noise Policy for Industry

Noise impact is assessed in accordance with the NSW 'Noise Policy for Industry' (NPfI), 2017, which replaced the NSW Industrial Noise Policy 2000. The assessment procedure has two components:

- Controlling intrusive noise impacts in the short-term for residences; and
- Maintaining noise level amenity for residences and other land uses.

In accordance with the NPfI, noise impact should be assessed against the project noise trigger level which is the lower value of the project intrusiveness noise levels and project amenity noise levels.

##### 5.1.2.1 Project intrusive noise levels

According to the NPfI, the intrusiveness of a noise source may generally be considered acceptable if the equivalent continuous (energy-average) A-weighted level of noise from the source (represented by the  $L_{Aeq,15min}$  descriptor) does not exceed the background noise level measured in the absence of the source by more than 5dB(A). The project intrusiveness noise level, which is only applicable to residential receivers, is determined as follows:

- $L_{Aeq,15minute}$  Intrusiveness noise level = Rating Background Level ('RBL') plus 5dB(A)

Based on the background noise monitoring results and the proposed operating hours of the facility, the intrusiveness noise levels for residential receivers are reproduced in Table 8 below.

**Table 8 Intrusiveness Noise Levels**

Receiver	Intrusiveness noise level, $L_{Aeq,15min}$		
	Day	Evening	Night
Nearest residents	37 + 5 = 42	41 + 5 = 46	39 + 5 = 44

Notes: Day: 7:00 to 18:00 Monday to Saturday and 8:00 to 18:00 Sundays & Public Holidays  
 Evening: 18:00 to 22:00 Monday to Sunday & Public Holidays  
 Night: 22:00 to 7:00 Monday to Saturday and 22:00 to 8:00 Sundays & Public Holidays

### 5.1.2.2 Amenity noise levels

The project amenity noise levels for different time periods of day are determined in accordance with Section 2.4 of the NPfI. The NPfI recommends amenity noise levels ( $L_{Aq,period}$ ) for various receivers including residential, commercial, industrial receivers and sensitive receivers such as schools, hotels, hospitals, churches and parks. These “recommended amenity noise levels” represent the objective for total industrial noise experienced at receiver location. However, when assessing a single industrial development and its impact on an area, “project amenity noise levels” apply.

The recommended amenity noise levels applicable for the subject area are reproduced in Table 9 overleaf.

**Table 9: Project Amenity Noise Levels**

Type of Receiver	Noise Amenity Area	Time of Day	Recommended amenity noise level, $L_{Aeq}$ , dB(A)
Residential	Suburban	Day	55
		Evening	45
		Night	40
	Urban	Day	60
		Evening	50
		Night	45
Hotels, motels, caretakers' quarters, holiday accommodation, permanent resident caravan parks	See column 4	See column 4	5 dB(A) above the recommended amenity noise level for a residence for the relevant noise amenity area and time of day
Passive recreation (e.g. national park)	All	When in use	50
Active recreation (e.g. school playground, golf course)	All	When in use	55
Commercial premises	All	When in use	65
Industrial premises	All	When in use	70
Industrial interface (applicable only to residential noise amenity areas)	All	When in use	Add 5 dB(A) to recommended noise amenity area

Type of Receiver	Noise Amenity Area	Time of Day	Recommended amenity noise level, $L_{Aeq}$ , dB(A)
------------------	--------------------	-------------	--

- Notes:
1. Daytime 7.00 am to 6.00 pm; Evening 6.00 pm to 10.00 pm; Night-time 10.00 pm to 7.00 am.
  2. On Sundays and Public Holidays, Daytime 8.00 am - 6.00 pm; Evening 6.00 pm - 10.00 pm; Night-time 10.00 pm - 8.00 am.
  3. The  $L_{Aeq}$  index corresponds to the level of noise equivalent to the energy average of noise levels occurring over a measurement period.
  4. The recommended amenity noise levels refer only to noise from industrial sources. However, they refer to noise from all such sources at the receiver location, and not only noise due to a specific project under consideration. The level

To ensure that the total industrial noise level (existing plus new) remain within the recommended amenity noise levels for an area, the project amenity noise level that applies for each new industrial noise source is determined as follows:

- $L_{Aeq,period}$  Project amenity noise level =  $L_{Aeq,period}$  Recommended amenity noise level – 5dB(A)

Furthermore, given that the intrusiveness noise level is based on a 15 minute assessment period and the project amenity noise level is based on day, evening and night assessment periods, the NPfI provides the following guidance on adjusting the  $L_{Aeq,period}$  level to a representative  $L_{Aeq,15minute}$  level in order to standardise the time periods.

- $L_{Aeq,15minute} = L_{Aeq,period} + 3dB(A)$

Note, whilst the NPfI includes the above simplification, in the event this 15 minute amenity level is exceeded, a particular assessment of activities and durations can be conducted to determine the period average noise level.

The project amenity noise levels ( $L_{Aeq, 15min}$ ) applied for this project are reproduced in Table 10 below, based on an 'Urban' Noise Amenity Area.

**Table 10 Project Amenity Noise Levels**

Type of Receiver	Noise Amenity Area	Time of Day	Project Amenity Noise Level, dB(A)	
			$L_{Aeq, Period}$	$L_{Aeq, 15min}$
Residence	Rural	Day	50	37+3=40
		Evening	45	41+3=44
		Night	40	39+3=42
Commercial Premises	All	When in use	65 – 5 = 60	60 + 3 = 63
Active recreation	All	When in use	55 – 5 = 50	55 + 3 = 58
Hotels	Urban	Day	60	37+5+3=45
		Evening	55	41+5+3=49
		Night	50	39+5+3=47

- Notes:
1. Daytime 7.00 am to 6.00 pm; Evening 6.00 pm to 10.00 pm; Night-time 10.00 pm to 7.00 am.
  2. On Sundays and Public Holidays, Daytime 8.00 am - 6.00 pm; Evening 6.00 pm - 10.00 pm; Night-time 10.00 pm - 8.00 am.
  3. The  $L_{Aeq}$  index corresponds to the level of noise equivalent to the energy average of noise levels occurring over a measurement period.
  4. Where a greenfield development is proposed and it can be demonstrated that existing levels of industrial noise are more than 5dB lower than the relevant recommended amenity noise level, then the amenity noise level applies

In accordance with Section 2.4 of the NPfl, the following **exceptions** to the above method to derive the project amenity noise level apply:

1. In areas with high traffic noise levels (see Section 2.4.1 of the NPfl).
2. In proposed developments in major industrial clusters (see Section 2.4.2 of the NPfl).
3. Where the resultant project amenity noise level is 10dB, or more, lower than the existing industrial noise level. In this case the project amenity noise levels can be set at 10dB below existing industrial noise levels if it can be demonstrated that existing industrial noise levels are unlikely to reduce over time.
4. Where cumulative industrial noise is not a necessary consideration because no other industries are present in the area, or likely to be introduced into the area in the future. In such cases the relevant amenity noise level is assigned as the project amenity noise level for the development.

The tabulated NPfl trigger levels are shown on the following page in Table 11.

The following table presents the site-specific noise production criteria for residential receivers from industrial noise sources, including mechanical plant.

**Table 11:  $L_{Aeq}$  Design Criterion for Noise Production from Industrial Premises (EPA NPfI) – at residences and hotels**

	Column 1	Column 2	Column 3	Column 4
Time of Day	Rating Background Level (RBL) $L_{A90}$	Intrusiveness Criterion (RBL+5)	Project Amenity Noise Level $L_{Aeq,15min}$ (PANL)	Project Noise Trigger Level $L_{Aeq,15min}$ dB(A)
Day (7am to 6pm)	37	42	40	40
Evening (6pm to 10pm)	41	46	44	44
Night (10pm to 7am)	39	44	42	42

Explanatory notes:

Column 1 – RBL measured in accordance with the NPfI and outlined in Table 4 above

Column 3 – Project Amenity Noise Level determined based on 'Residential - rural' area in Table 2.2 (Amenity noise levels) of the EPA's NPfI minus 5dB. Hotel receiver is based on 'Hotel – Urban'.

Column 4 – Project Noise Trigger Level is the lower value of project intrusiveness noise level and project amenity noise level

Where necessary, noise amelioration treatment will be incorporated in the design to ensure that noise levels comply with the recommended EPA's INP noise emission criteria noted above.

### 5.1.2.3 Sleep disturbance noise levels

The potential for sleep disturbance from maximum noise level events from premises during the night-time period needs to be considered. In accordance with NPfI, a detailed maximum noise level event assessment should be undertaken where the subject development night-time noise levels at a residential location exceed:

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

Where there are noise events found to exceed the initial screening level, further analysis is undertaken to identify:

- The likely number of events that might occur during the night assessment period,
- The extent to which the maximum noise level exceeds the rating background noise level.

The sleep disturbance noise levels for the project are presented in Table 12.

**Table 12: Sleep disturbance assessment levels**

Receiver type	Assessment Level	Assessment Level $L_{AFmax}$
	$L_{Aeq,15min}$	
Residential/ Hotel	$39 + 5 = 44$	$39 + 15 = 54$

Based on the distances to residential receivers and the hours operation of the development, sleep disturbance levels are unlikely to be exceeded as a result of the use of the site.

## 5.2 Operational Noise Emission from Development

The project noise emission goals were presented in Section 5. This section presents the project noise emission controls.

## 5.3 Use

The use of the site as a commercial building is unlikely to have any impact on the nearest residential receivers given the distance from the site. The nominated noise emission criteria to commercial receivers, including hotels, has been outlined in Table 10 above, however, given the proposed commercial use and the façade design due to aircraft noise, the use of the site as a commercial building is unlikely to impact the amenity of the surrounding commercial receivers.

Food and Beverage outlets located on Ground Level are subject to future Development Applications. Noise associated with use of the F&B premises should be address in their submission.

## 5.4 Mechanical Plant and Equipment

### 5.4.1 Recommended Noise Control Measures for Mechanical Plant

Mechanical plant such as exhaust systems, air-conditioning, mechanical ventilation and refrigeration associated with the development has the potential to impact on nearby noise sensitive properties.

As complete details of mechanical plant are not available at this stage of the development the following in principle noise control advice are provided.

- Acoustic assessment of mechanical services equipment will be required to be undertaken during the detail design phase of the development to ensure that they shall not either singularly or in total emit noise levels which exceed the noise limits in established in Table 11.
- Mechanical plant noise emission can be controllable by appropriate mechanical system design and implementation of common engineering methods that may include any of the following;
  - o procurement of 'quiet' plant

- o strategic positioning of roof and balcony plant equipment away from sensitive neighbouring premises, maximising the intervening shielding between the plant and sensitive neighbouring premises
- o installation of commercially available silencers or acoustic attenuators for air discharge and air intakes of plant
- o acoustically lined and lagged ductwork
- o provide acoustic screens and/or acoustic louvres between plant and sensitive neighbouring premises
- o provide partially enclosed or fully enclosed acoustic enclosure over plant
- o Mechanical plant shall have their noise specifications and proposed locations checked prior to installation
- o Fans shall be mounted on vibration isolators and balanced in accordance with Australian Standard 2625 "Rotating and Reciprocating Machinery - Mechanical Vibration"

#### **5.4.2 Mechanical plant noise assessment (in-principle)**

Rooftop plant at the proposed development may include cooling towers, chillers, exhaust fans, ventilation fans, air handling units and hot and cold water pumps. The following acoustic treatments are to be considered.

- Screening and acoustic louvres around the chiller, pump and cooling tower plant area,
- Acoustic lining to air handling units,
- Attenuators added to exhaust and other ventilation fans where required, and

A full and detailed assessment with fully documented acoustic treatments will be undertaken at the detailed design phase of the development, followed by construction/installation supervision of mechanical plant and equipment acoustic treatment. Compliance testing following the installation of the plant should also be undertaken.

## 6 Construction Noise

The nature of the construction processes proposed for the development does not present difficulties in ensuring that the associated noise limits at surrounding properties are achieved. The major construction activities proposed on this site are concrete pours and general building works.

Construction and building work will be adequately managed so as to minimise disruption to the local community and the environment.

The NSW Interim Construction Noise Guideline sets out management noise levels and time restrictions for construction activities. The aims of the guideline are to control and manage noise on all building sites within the local area.

Since detail of the construction equipment such as exact type, size, number and operating time are not known at this stage, in-principle noise control measures are provided in Section 6.1 below which may be implemented to minimise any noise exceedances to the noise sensitive receptors where that may occur.

### 6.1 General Engineering Noise Control

Implementation of noise control measures, such as those suggested in Australian Standard 2436-1981 "Guide to Noise Control on Construction, Maintenance and Demolition Sites", are expected to reduce predicted construction noise levels. Reference to Australian Standard 2436-1981, Appendix E, Table E1 suggests possible remedies and alternatives to reduce noise emission levels from typical construction equipment. Table E2 in Appendix E presents typical examples of noise reductions achievable after treatment of various noise sources. Table E3 in Appendix E presents the relative effectiveness of various forms of noise control treatment.

Table 13 below presents noise control methods, practical examples and expected noise reductions according to AS2436 and according to Renzo Tonin & Associates' opinion based on experience with past projects.

**Table 13: Relative Effectiveness of Various Forms of Noise Control, dBA**

Noise Control Method	Practical Examples	Typical noise reduction possible in practice		Maximum noise reduction possible in practice	
		AS 2436	Renzo Tonin & Assoc.	AS 2436	Renzo Tonin & Assoc.
Screening	Acoustic barriers such as earth mounds, temporary or permanent noise barriers	7 to 10	5 to 10	15	15
Acoustic Enclosures	Engine casing lagged with acoustic insulation and plywood	15 to 30	10 to 20	50	30
Engine Silencing	Residential class mufflers	5 to 10	5 to 10	20	20
Substitution by alternative process	Use electric motors in preference to diesel or petrol	15 to 25	15 to 25	60	40

The Renzo Tonin & Associates' listed noise reductions are conservatively low and should be referred to in preference to those of AS2436, for this assessment.

To ensure efficient noise attenuation performance is achieved throughout the project, it is recommended acoustic engineers work closely with the construction contractors and carry out preliminary testing prior to commencement of works.

In addition to physical noise controls, the following general noise management measures should be followed:

- Plant and equipment should be properly maintained
- Provide special attention to the use and maintenance of 'noise control' or 'silencing' kits fitted to machines to ensure they perform as intended
- Strategically position plant on site to reduce the emission of noise to the surrounding neighbourhood and to site personnel
- Avoid unnecessary noise when carrying out manual operations and when operating plant
- Any equipment not in use for extended periods during construction work should be switched off
- Noise compliance monitoring for all major equipment and activities on site should be undertaken prior to their commencement of work on site.
- In addition to the noise mitigation measures outlined above, a management procedure would need to be put in place to deal with noise complaints that may arise from construction activities. Each complaint would need to be investigated and appropriate noise amelioration measures put in place to mitigate future occurrences, where the noise in question is in excess of allowable limits.
- Good relations with people living and working in the vicinity of a construction site should be established at the beginning of a project and be maintained throughout the project, as this is of paramount importance. Keeping people informed of progress and taking complaints seriously and dealing with them expeditiously is critical. The person selected to liaise with the community should be adequately trained and experienced in such matters.
- Where noise level exceedances cannot be avoided, then consideration should be given to implementing time restrictions and/or providing periods of repose for neighbouring receptors.

## 7 Conclusion

Renzo Tonin & Associates have completed an assessment of noise emission from and noise intrusion into the proposed commercial development at Lot 106 In Lot 11, DP 1036501 of the Astra Aerolab Development at Newcastle Airport, Williamstown.

Recommendations to comply with noise emission and noise intrusion criteria for the site, including mechanical plant, use of the site and construction noise have been presented in the body of this report.

Façade treatments for the treatment of aircraft noise intrusion to comply with the requirements of Australian Standard AS2021:2015 have been made in Section 4 of this report.

In conclusion, the proposed site is capable of complying with all relevant acoustic criteria through means of standard acoustic treatment and management subject to further acoustic assessment during the detailed design phase.

Appendix A contains a glossary of acoustic terms used in this report.

## 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.																																								
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]	<p>The units that sound is measured in. The following are examples of the decibel readings of common sounds in our daytime environment:</p> <table><tr><td rowspan="2">threshold of hearing</td><td>0 dB</td><td>The faintest sound we can hear</td></tr><tr><td>10 dB</td><td>Human breathing</td></tr><tr><td rowspan="2">almost silent</td><td>20 dB</td><td></td></tr><tr><td>30 dB</td><td>Quiet bedroom or in a quiet national park location</td></tr><tr><td rowspan="2">generally quiet</td><td>40 dB</td><td>Library</td></tr><tr><td>50 dB</td><td>Typical office space or ambience in the city at night</td></tr><tr><td rowspan="2">moderately loud</td><td>60 dB</td><td>CBD mall at lunch time</td></tr><tr><td>70 dB</td><td>The sound of a car passing on the street</td></tr><tr><td rowspan="2">loud</td><td>80 dB</td><td>Loud music played at home</td></tr><tr><td>90 dB</td><td>The sound of a truck passing on the street</td></tr><tr><td rowspan="2">very loud</td><td>100 dB</td><td>Indoor rock band concert</td></tr><tr><td>110 dB</td><td>Operating a chainsaw or jackhammer</td></tr><tr><td rowspan="2">extremely loud</td><td>120 dB</td><td>Jet plane take-off at 100m away</td></tr><tr><td>130 dB</td><td></td></tr><tr><td>threshold of pain</td><td>140 dB</td><td>Military jet take-off at 25m away</td></tr></table>			threshold of hearing	0 dB	The faintest sound we can hear	10 dB	Human breathing	almost silent	20 dB		30 dB	Quiet bedroom or in a quiet national park location	generally quiet	40 dB	Library	50 dB	Typical office space or ambience in the city at night	moderately loud	60 dB	CBD mall at lunch time	70 dB	The sound of a car passing on the street	loud	80 dB	Loud music played at home	90 dB	The sound of a truck passing on the street	very loud	100 dB	Indoor rock band concert	110 dB	Operating a chainsaw or jackhammer	extremely loud	120 dB	Jet plane take-off at 100m away	130 dB		threshold of pain	140 dB	Military jet take-off at 25m away
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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 <sub>Max</sub>	The maximum sound pressure level measured over a given period.
L <sub>Min</sub>	The minimum sound pressure level measured over a given period.
L <sub>1</sub>	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L <sub>10</sub>	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L <sub>90</sub>	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 <sub>eq</sub>	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 L <sub>eq</sub> 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 location and results

Location: Lot 109 Astra Aerolab Precinct

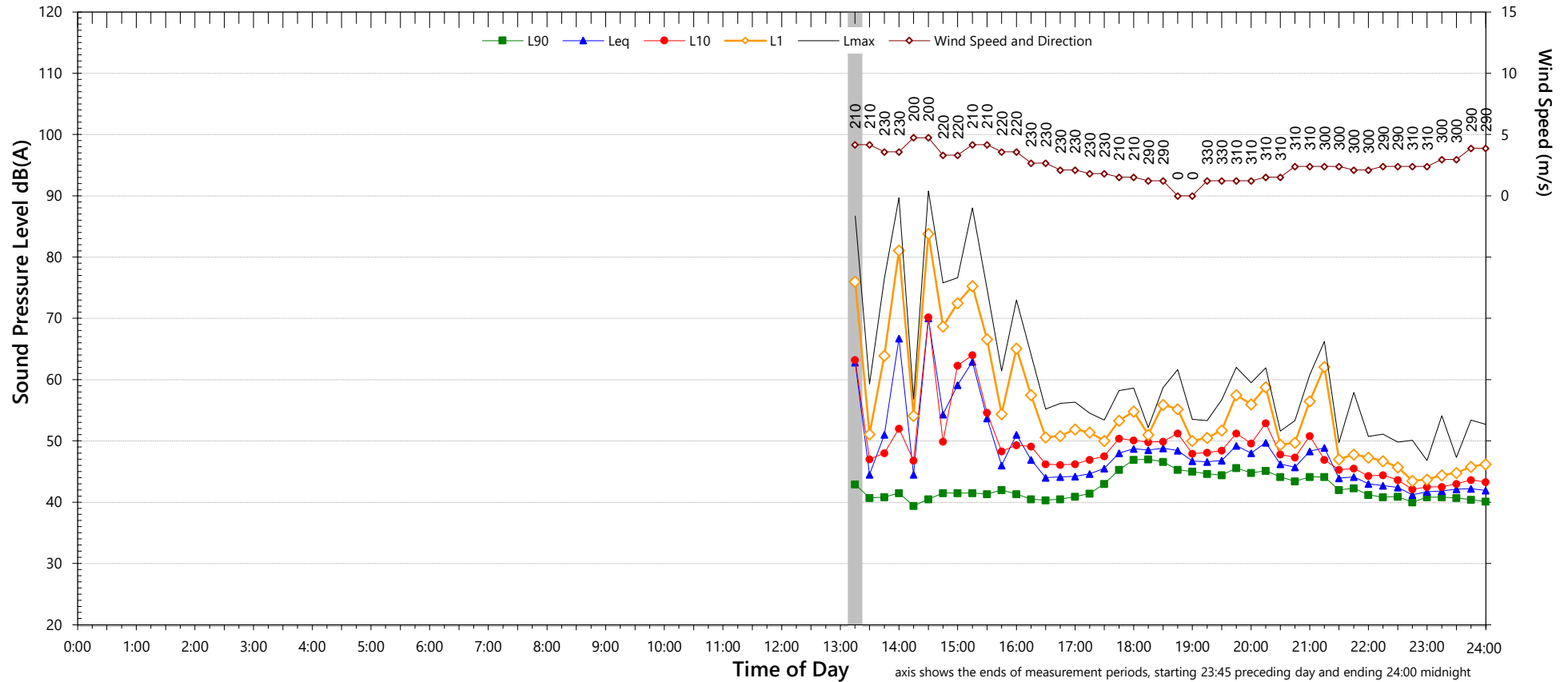
Duration: 24-31 August 2022



# Unattended Noise Monitoring Results

Lot 109 Astra Aerolab Precinct

Wednesday, 24 August 2022



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day <sup>2</sup>	Evening <sup>3</sup>	Night <sup>4,5</sup>
L <sub>A90</sub> ABL	-	42	39
L <sub>Aeq</sub>	-	47	43

Night Time Maximum Noise Levels		(see note 7)	
L <sub>AFMax</sub> (Range)	70	to	70
L <sub>AFMax</sub> - L <sub>Aeq</sub> (Range)	20	to	20

Notes:

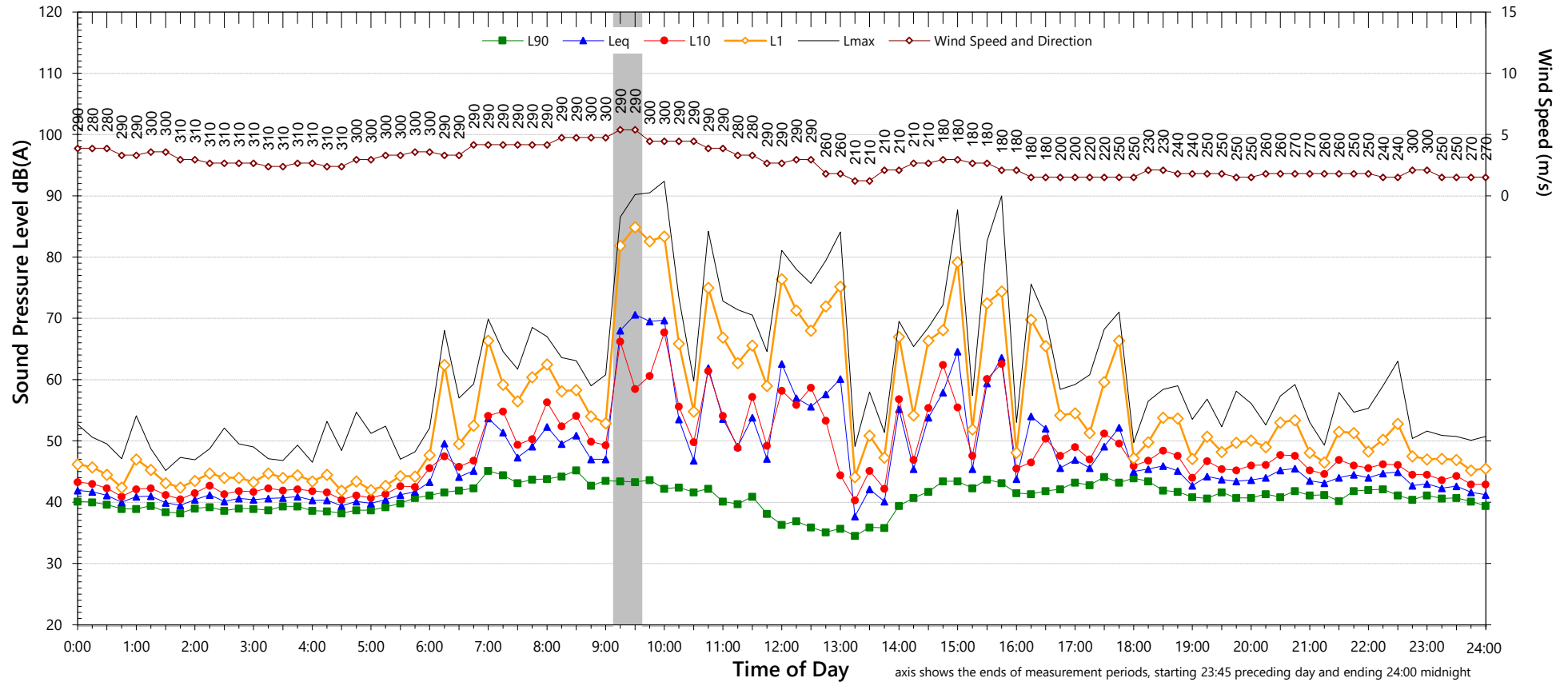
- Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
- "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days
- "Evening" is the period from 6pm till 10pm
- "Night" relates to the remaining periods
- "Night" relates to period from 10pm on this graph to morning on the following graph.
- Graphed data measured in free-field; tabulated results facade corrected
- 1-hour values for L<sub>AFMax</sub> are shown only where L<sub>AFMax</sub> > 65dB(A) and where L<sub>AFMax</sub> - L<sub>Aeq</sub> ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night <sup>5</sup>
	7am-10pm	10pm-7am
L <sub>Aeq</sub> 15 hr and L <sub>Aeq</sub> 9 hr	-	46
L <sub>Aeq</sub> 1hr upper 10 percentile	-	46
L <sub>Aeq</sub> 1hr lower 10 percentile	-	43

# Unattended Noise Monitoring Results

Lot 109 Astra Aerolab Precinct

Thursday, 25 August 2022



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day <sup>2</sup>	Evening <sup>3</sup>	Night <sup>4,5</sup>
L <sub>A90</sub> ABL	36	41	39
L <sub>Aeq</sub>	59	44	44

Night Time Maximum Noise Levels		(see note 7)	
L <sub>AFMax</sub> (Range)	67	to	67
L <sub>AFMax</sub> - L <sub>Aeq</sub> (Range)	18	to	19

Notes:

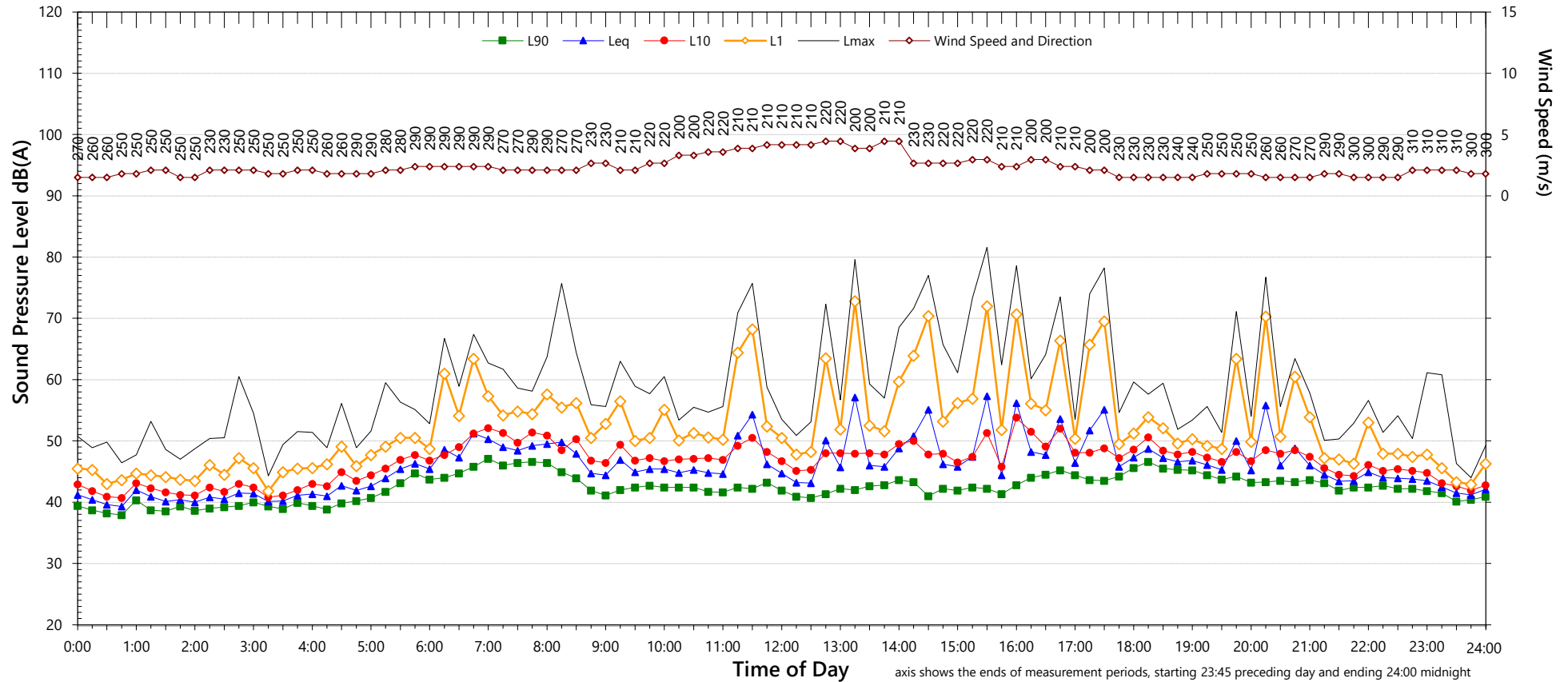
- Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
- "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days
- "Evening" is the period from 6pm till 10pm
- "Night" relates to the remaining periods
- "Night" relates to period from 10pm on this graph to morning on the following graph.
- Graphed data measured in free-field; tabulated results facade corrected
- 1-hour values for L<sub>AFMax</sub> are shown only where L<sub>AFMax</sub> > 65dB(A) and where L<sub>AFMax</sub> - L<sub>Aeq</sub> ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night <sup>5</sup>
	7am-10pm	10pm-7am
L <sub>Aeq</sub> 15 hr and L <sub>Aeq</sub> 9 hr	60	47
L <sub>Aeq</sub> 1hr upper 10 percentile	62	49
L <sub>Aeq</sub> 1hr lower 10 percentile	47	43

# Unattended Noise Monitoring Results

Lot 109 Astra Aerolab Precinct

Friday, 26 August 2022



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day <sup>2</sup>	Evening <sup>3</sup>	Night <sup>4,5</sup>
L <sub>A90</sub> ABL	41	42	40
L <sub>Aeq</sub>	50	48	44

Night Time Maximum Noise Levels		(see note 7)	
L <sub>AFMax</sub> (Range)	72	to	74
L <sub>AFMax</sub> - L <sub>Aeq</sub> (Range)	17	to	28

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

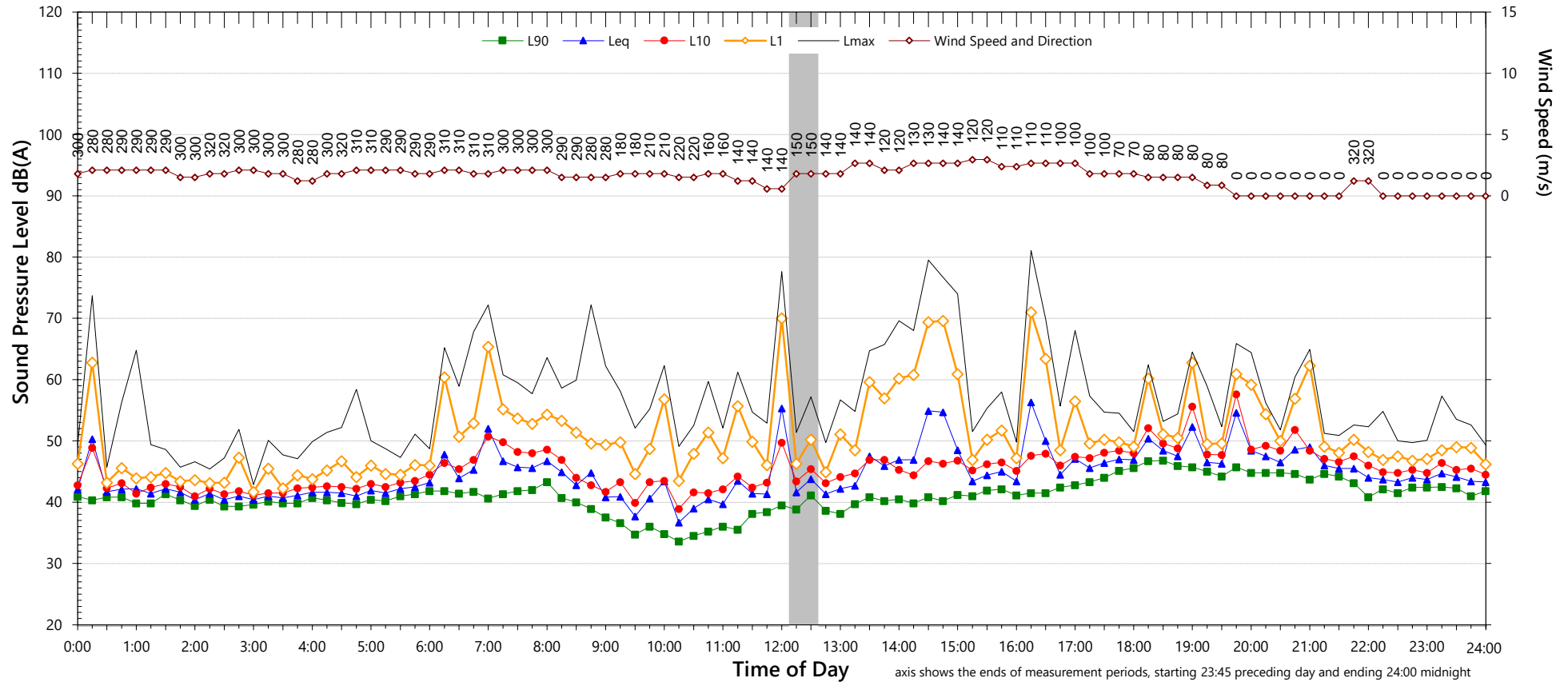
7. 1-hour values for L<sub>AFMax</sub> are shown only where L<sub>AFMax</sub> > 65dB(A) and where L<sub>AFMax</sub> - L<sub>Aeq</sub> ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night <sup>5</sup>
	7am-10pm	10pm-7am
L <sub>Aeq</sub> 15 hr and L <sub>Aeq</sub> 9 hr	52	46
L <sub>Aeq</sub> 1hr upper 10 percentile	54	49
L <sub>Aeq</sub> 1hr lower 10 percentile	48	44

# Unattended Noise Monitoring Results

Lot 109 Astra Aerolab Precinct

Saturday, 27 August 2022



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day <sup>2</sup>	Evening <sup>3</sup>	Night <sup>4 5</sup>
L <sub>A90</sub> ABL	35	43	37
L <sub>Aeq</sub>	48	49	43

Night Time Maximum Noise Levels		(see note 7)	
L <sub>AFMax</sub> (Range)	67	to	68
L <sub>AFMax</sub> - L <sub>Aeq</sub> (Range)	16	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

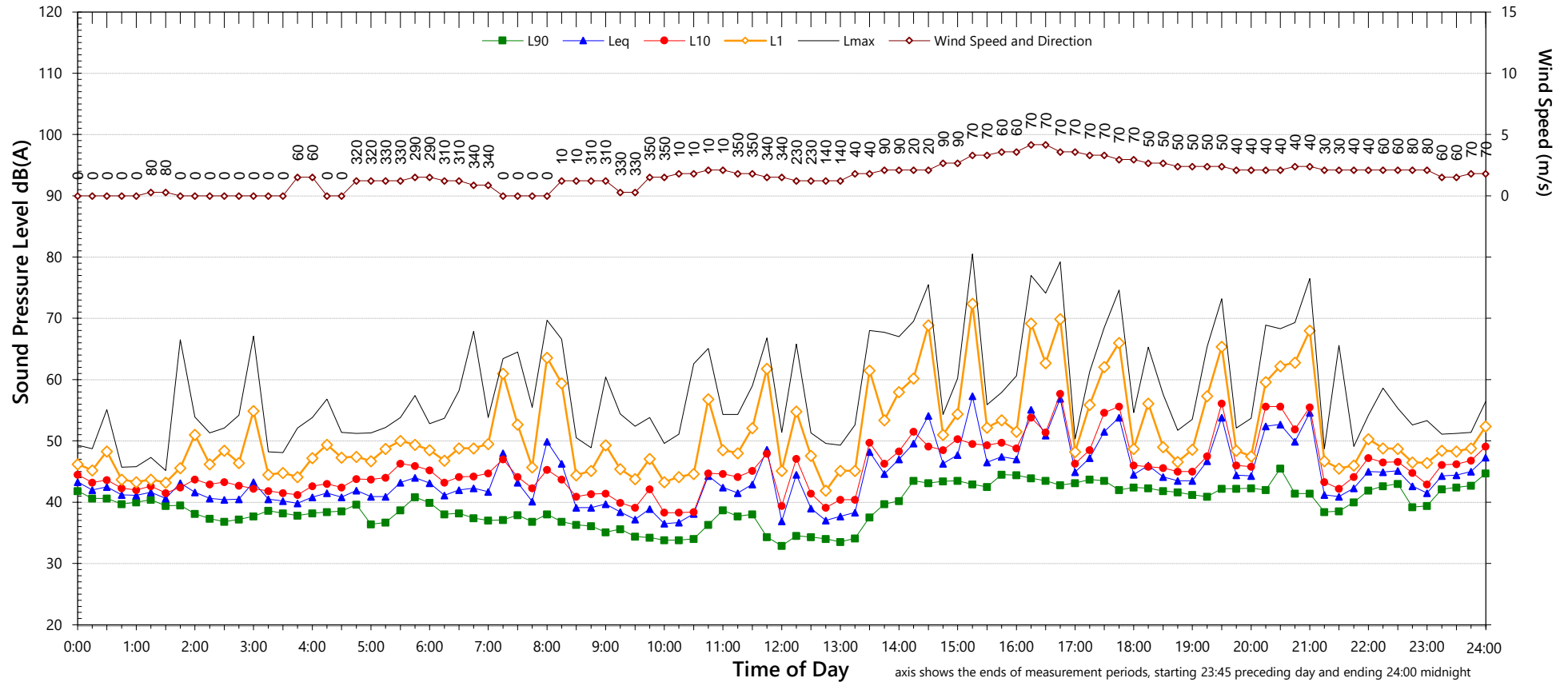
7. 1-hour values for L<sub>AFMax</sub> are shown only where L<sub>AFMax</sub> > 65dB(A) and where L<sub>AFMax</sub> - L<sub>Aeq</sub> ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night <sup>5</sup>
	7am-10pm	10pm-7am
L <sub>Aeq</sub> 15 hr and L <sub>Aeq</sub> 9 hr	51	45
L <sub>Aeq</sub> 1hr upper 10 percentile	54	46
L <sub>Aeq</sub> 1hr lower 10 percentile	44	44

# Unattended Noise Monitoring Results

Lot 109 Astra Aerolab Precinct

Sunday, 28 August 2022



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day <sup>2</sup>	Evening <sup>3</sup>	Night <sup>4,5</sup>
L <sub>A90</sub> ABL	34	39	39
L <sub>Aeq</sub>	49	49	48

Night Time Maximum Noise Levels		(see note 7)	
L <sub>AFMax</sub> (Range)	72	to	72
L <sub>AFMax</sub> - L <sub>Aeq</sub> (Range)	17	to	18

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

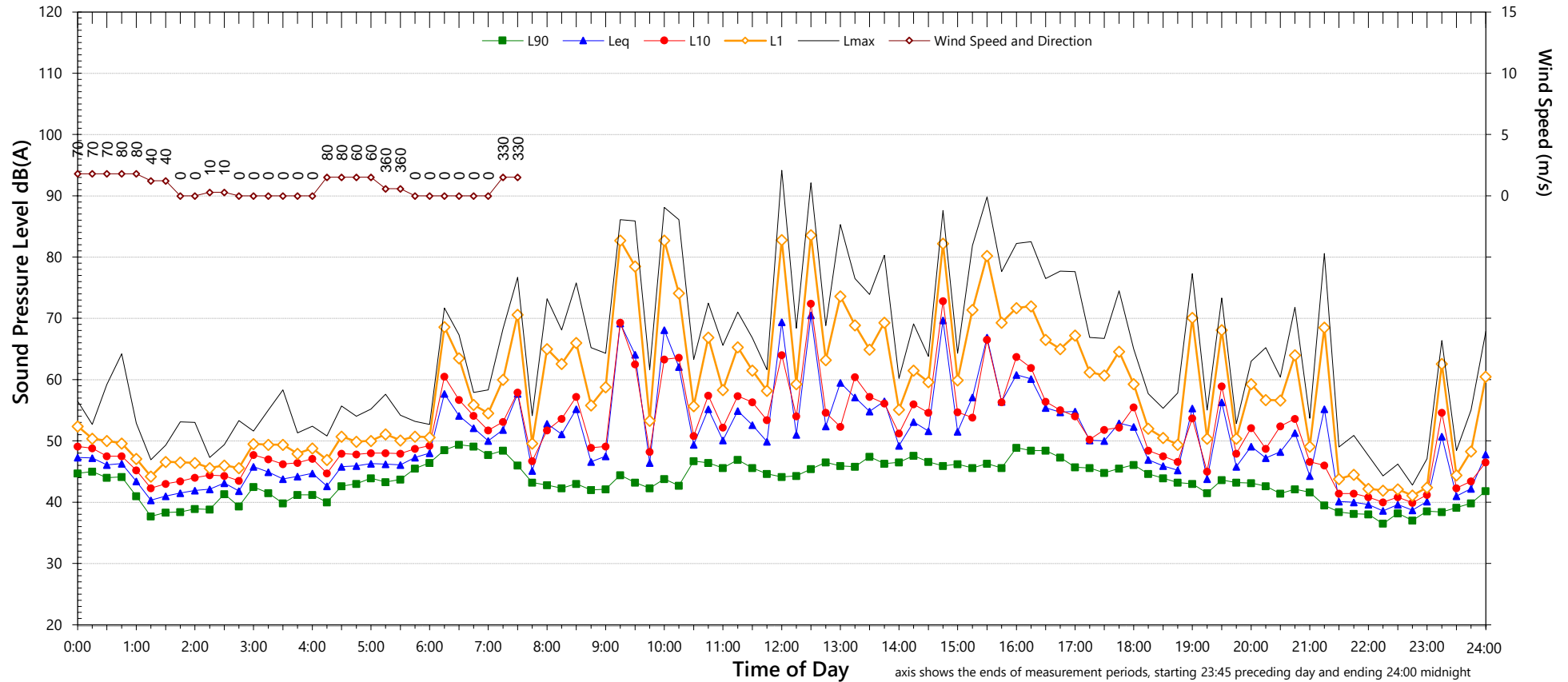
7. 1-hour values for L<sub>AFMax</sub> are shown only where L<sub>AFMax</sub> > 65dB(A) and where L<sub>AFMax</sub> - L<sub>Aeq</sub> ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night <sup>5</sup>
	7am-10pm	10pm-7am
L <sub>Aeq</sub> 15 hr and L <sub>Aeq</sub> 9 hr	51	50
L <sub>Aeq</sub> 1hr upper 10 percentile	55	51
L <sub>Aeq</sub> 1hr lower 10 percentile	43	46

# Unattended Noise Monitoring Results

Lot 109 Astra Aerolab Precinct

Monday, 29 August 2022



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day <sup>2</sup>	Evening <sup>3</sup>	Night <sup>4,5</sup>
L <sub>A90</sub> ABL	43	38	37
L <sub>Aeq</sub>	62	50	46

Night Time Maximum Noise Levels		(see note 7)	
L <sub>AFMax</sub> (Range)	68	to	75
L <sub>AFMax</sub> - L <sub>Aeq</sub> (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

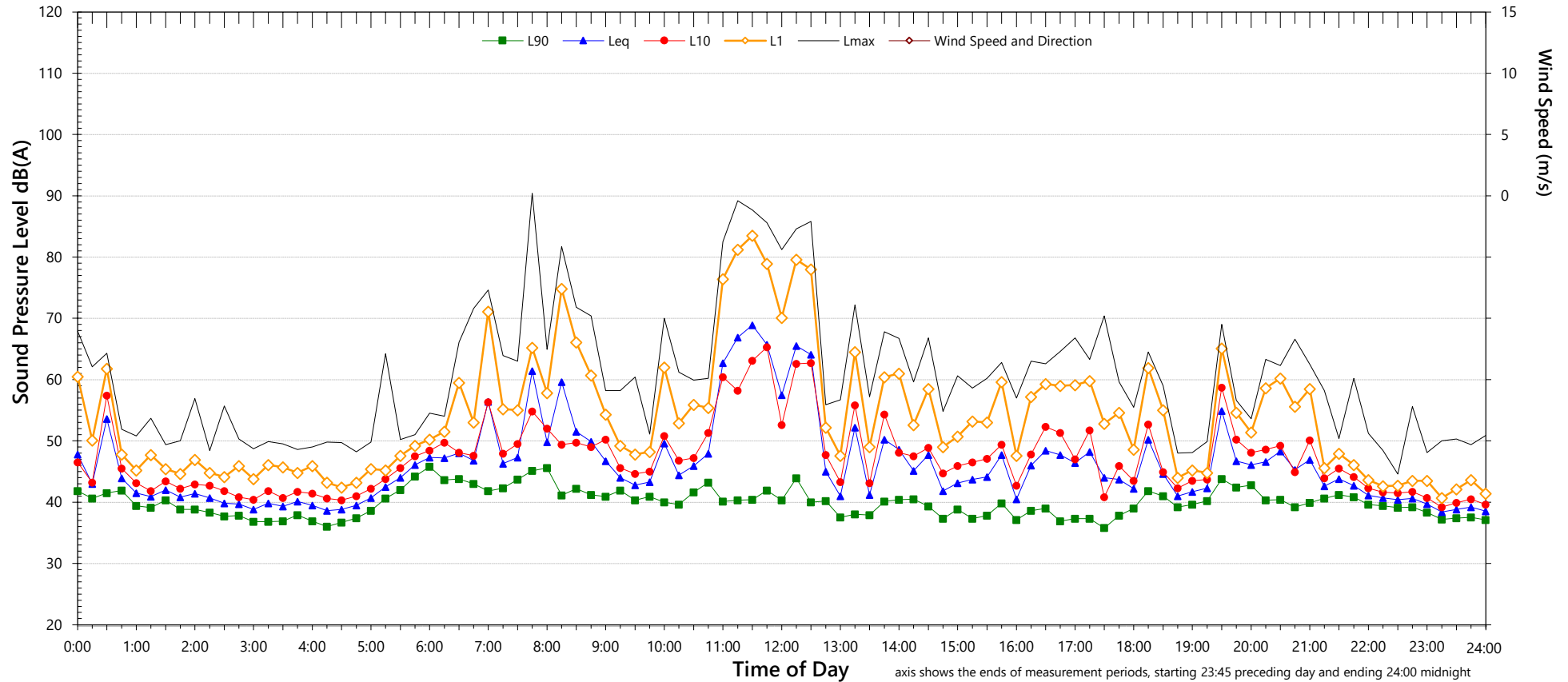
7. 1-hour values for L<sub>AFMax</sub> are shown only where L<sub>AFMax</sub> > 65dB(A) and where L<sub>AFMax</sub> - L<sub>Aeq</sub> ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night <sup>5</sup>
	7am-10pm	10pm-7am
L <sub>Aeq</sub> 15 hr and L <sub>Aeq</sub> 9 hr	63	48
L <sub>Aeq</sub> 1hr upper 10 percentile	67	52
L <sub>Aeq</sub> 1hr lower 10 percentile	52	42

# Unattended Noise Monitoring Results

Lot 109 Astra Aerolab Precinct

Tuesday, 30 August 2022



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day <sup>2</sup>	Evening <sup>3</sup>	Night <sup>4,5</sup>
L <sub>A90</sub> ABL	37	39	37
L <sub>Aeq</sub>	58	47	45

Night Time Maximum Noise Levels		(see note 7)	
L <sub>AFMax</sub> (Range)	69	to	77
L <sub>AFMax</sub> - L <sub>Aeq</sub> (Range)	15	to	28

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

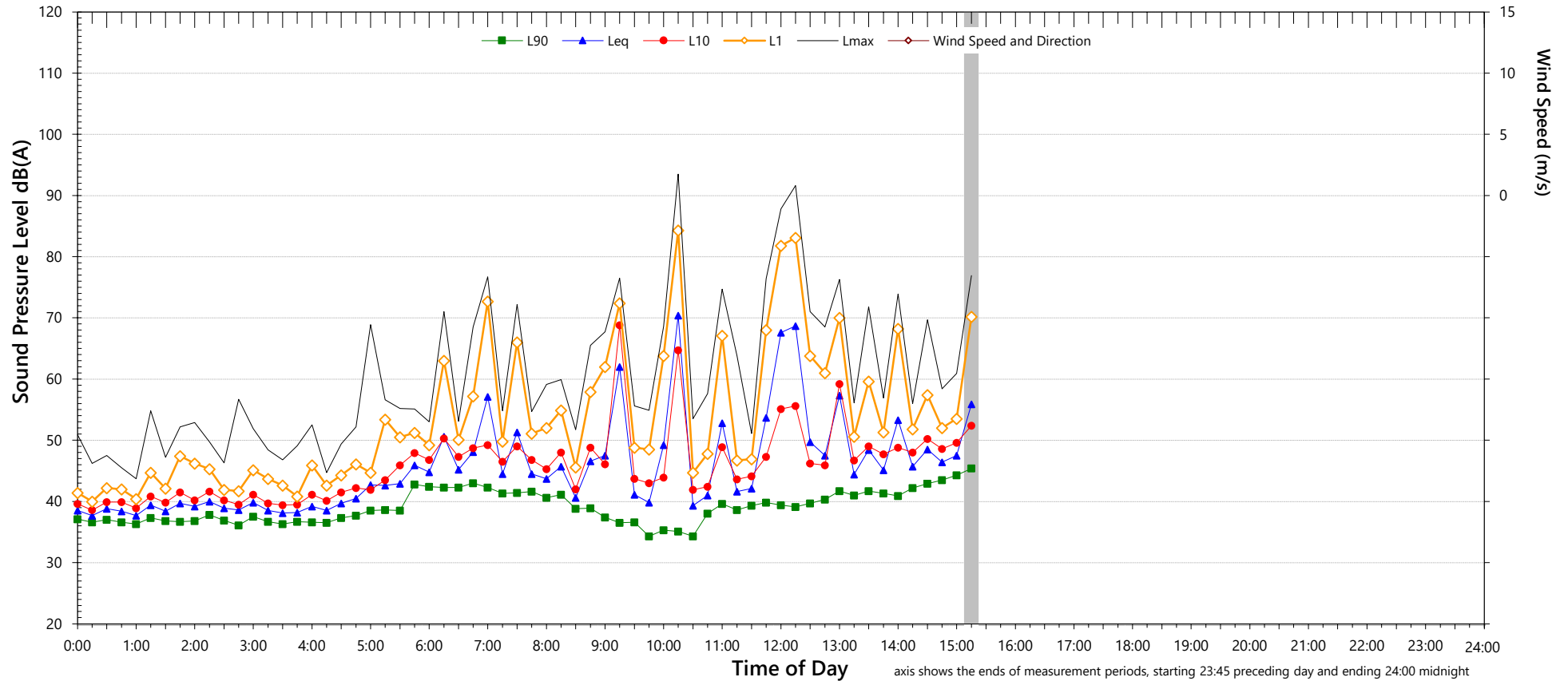
7. 1-hour values for L<sub>AFMax</sub> are shown only where L<sub>AFMax</sub> > 65dB(A) and where L<sub>AFMax</sub> - L<sub>Aeq</sub> ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night <sup>5</sup>
	7am-10pm	10pm-7am
L <sub>Aeq</sub> 15 hr and L <sub>Aeq</sub> 9 hr	59	47
L <sub>Aeq</sub> 1hr upper 10 percentile	62	48
L <sub>Aeq</sub> 1hr lower 10 percentile	47	41

# Unattended Noise Monitoring Results

Lot 109 Astra Aerolab Precinct

Wednesday, 31 August 2022



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day <sup>2</sup>	Evening <sup>3</sup>	Night <sup>4,5</sup>
L <sub>A90</sub> ABL	-	-	-
L <sub>Aeq</sub>	-	-	-

Night Time Maximum Noise Levels		(see note 7)	
L <sub>AFMax</sub> (Range)	-	to	-
L <sub>AFMax</sub> - L <sub>Aeq</sub> (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. 1-hour values for L<sub>AFMax</sub> are shown only where L<sub>AFMax</sub> > 65dB(A) and where L<sub>AFMax</sub> - L<sub>Aeq</sub> ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night <sup>5</sup>
	7am-10pm	10pm-7am
L <sub>Aeq</sub> 15 hr and L <sub>Aeq</sub> 9 hr	-	-
L <sub>Aeq</sub> 1hr upper 10 percentile	-	-
L <sub>Aeq</sub> 1hr lower 10 percentile	-	-