

# **Short Term Monitoring Program NSW, Cronulla Report**

May 2013

## Version Control

Version Number	Date	Detail
1.0	May 2013	Initial Release.
2.0	May 2013	Updated table 2 for minimum, maximum and average heights.
3.0	July 2013	CNE 60 removed due to threshold settings.
4.0	January 2014	Figure 5 and L90 figures updated due to technical issue.

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This report contains a summary of data collected over the specified period and is intended to convey the best information available from the NFPMS at the time. The system databases are to some extent dependent upon external sources and errors may occur. All care is taken in preparation of the report but its complete accuracy can not be guaranteed. Airservices Australia does not accept any legal liability for any losses arising from reliance upon data in this report which may be found to be inaccurate.

## **Deployment Purpose – Cronulla, NSW**

Following recommendations made in the 'Review of the Sydney Environmental Monitoring Units' undertaken by Airservices in 2012, Cronulla was selected as a Short Term Monitoring Location.

Jet departures from runway 16 Right are the most common operation type to traverse the suburb of Cronulla.

The purpose of this report is to provide a technical summary of the recorded aircraft noise and operational data collected at Cronulla over a four week period.

An explanation of terms used within this report can be found in the Glossary at the end of the report.

## **Monitoring Period**

25/02/2013 12:00am – 25/03/2013 12:00am

## **Environmental Monitoring Unit (EMU) Details**

Location	Ewos Parade, Cronulla 2230
Latitude	34°3'59.04"S
Longitude	151°9'15.63"E
EMU Altitude	85ft above mean sea level
Capture Zone	2.5km radius with 8,000ft (above ground level) height for noise data capture
Threshold Settings	60.0 dB(A) to 63.0 dB(A) depending on time of day

## **Location Images**

Figures 1 to 3 detail the location of monitors surrounding Sydney Airport and the flight paths used for those operations captured by the Cronulla EMU.

Figure 1 Sydney Fixed Environmental Monitoring Unit Locations and the Cronulla Short Term Monitoring Program Deployment Location



Figure 2 Total Movements Captured

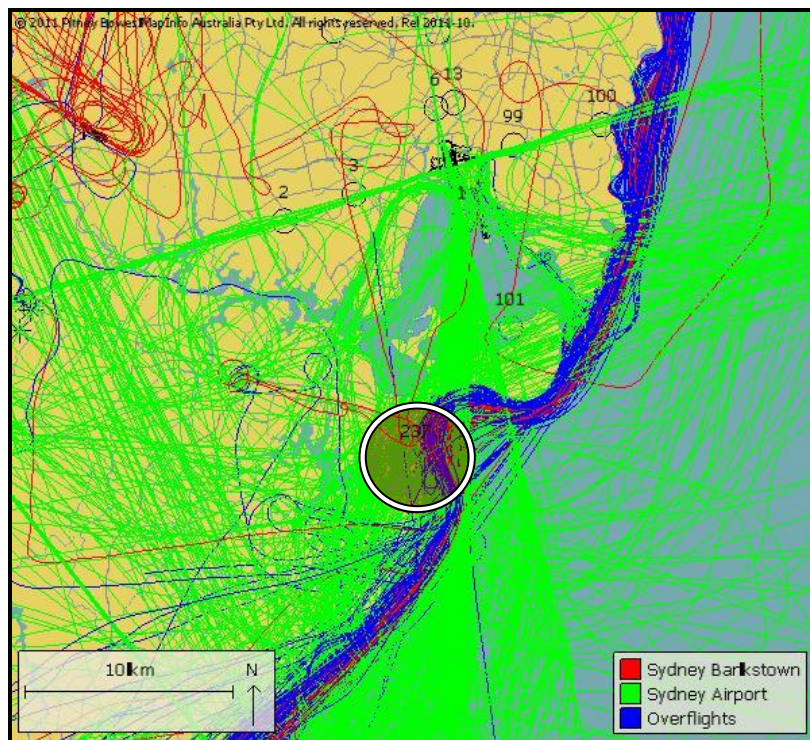


Figure 3 Sydney Airport Movements Captured

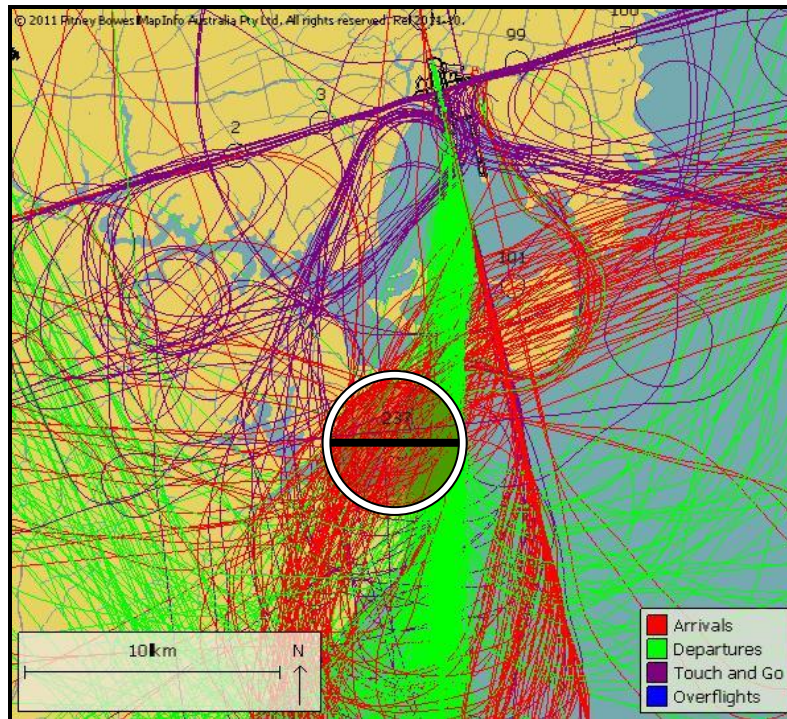
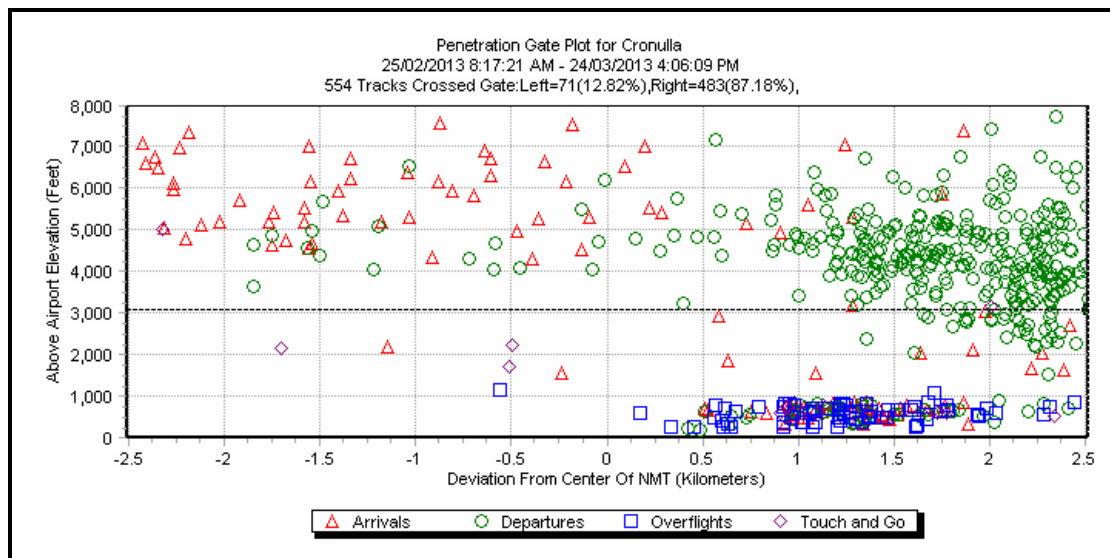


Figure 4 Cronulla Movements Through Capture Zone Penetration Gate



Note: Sydney Airport altitude is 21ft above mean sea level. EMU altitude is 85ft above mean sea level. The EMU altitude should be adjusted using the data shown above in order to draw conclusions about height above ground of aircraft operations.

The black line through the capture zone in Figure 3 depicts the penetration gate location for the plot shown in Figure 4. Some movements through the capture zone failed to penetrate the gate used for analysis due to their entry and exit point through the capture zone. In addition, a single operation may fly through the penetration gate on multiple occasions. Further, operations that are on climb may pass out of the correlation zone and later penetrate the gate at a higher altitude. The opposite is true for arrivals that will penetrate the gate at a higher altitude and later pass through the correlation zone.

## Findings

The following tables present a summary of the operations data.

**Table 1 Movement Summary (25/02/2013 12:00am – 25/03/2013 12:00am)**

Type of Operation	Jet Runway 16R Departures	All Movements
<i>Number of Movements Through Capture Zone*</i>	281	582
<i>Number of Correlated Noise Events (CNE)</i>	113	197
<i>Number of Individual Movements with Correlated Noise Events (CNE)</i>	112	172
<i>Correlation Summary</i>	39.86%	29.55%

\* Includes all aircraft with transponder flying through area, regardless of destination/origin airport.

\*\* May include operations that produced multiple noise events.

**Table 2 Height (in feet, above ground level) Above The Monitor Summary**

Type of Operation	Min*	Max*	Average*
<i>Departures Through Capture Zone**</i>	121	7,761	3,824
<i>Arrivals Through Capture Zone**</i>	244	7,511	3,528
<i>All Operations Through Capture Zone**</i>	121	7,671	3,261

\* Flight tracks are susceptible to an altitude error of up to 200ft which is consistent with normal radar tolerances.

\*\* Includes all airports within Sydney Basin.

Figure 4 shows that jet departures typically fly at an altitude of 3,000 to 5,500 feet.

**Table 3 Captured Movements Breakdown By Airport and Aircraft Category**

Airport	Jet	Turboprop	Light Propeller	Helicopter	Unknown*	Grand Total
<i>Sydney</i>	352	77	0	13	0	<b>442</b>
<i>Bankstown</i>	0	0	9	1	23	<b>33</b>
<i>Other</i>	0	0	32	3	72	<b>107</b>
<b>Grand Total</b>	<b>352</b>	<b>77</b>	<b>41</b>	<b>17</b>	<b>95</b>	<b>582</b>

\*These non-flight planned operations are generally recreational aircraft conducting private flights and will account for the very low altitudes by some aircraft.

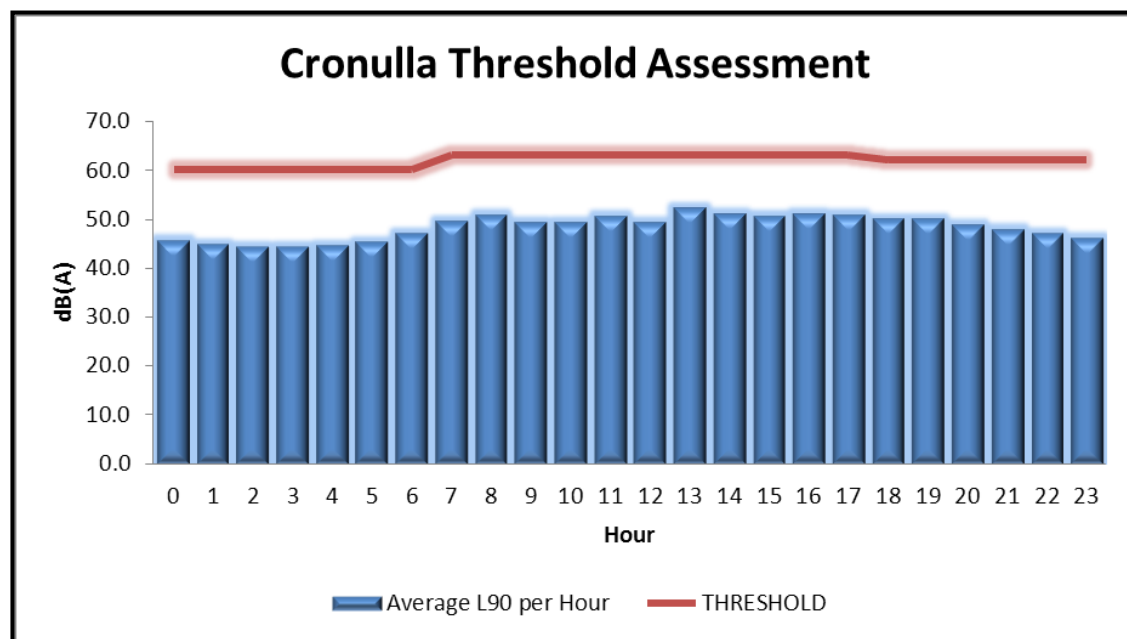
## Correlation Summary

An evaluation of the number of aircraft operations that were matched with noise events recorded by the EMU is an important aspect of assessing performance of the noise monitoring installation. Ideally, all operations passing the EMU within a reasonable proximity will be matched to the appropriate noise event. Whilst complete matching is not expected, a lack of matches will reveal the need to investigate the reason for anomalies. A correlation summary for all movements of 30% is a relatively low result. This result is due to the background level at Cronulla being quite high during the hours of day. Whilst the noise created from the aircraft may be noticeable, they are not loud enough to create a clearly distinguishable noise event above the determined threshold settings shown below in Figure 5.

## Background Noise Levels and Threshold Settings

At the monitoring site, background noise levels are first assessed to determine the appropriate threshold settings for the EMU. The threshold setting must be above the background noise level in order to clearly distinguish aircraft noise events from other noise sources. The result of background noise assessment and threshold settings are provided below in Figure 5.

Figure 5 Background and Threshold Assessment



## Noise Summary

The following tables present a summary of the noise data for aircraft that flew through the capture zone and caused a Correlated Noise Event (CNE). Information is provided for Runway 16R jet departure aircraft that flew over the EMU, as well as all aircraft that flew over the EMU, noting that this area is affected by arrivals, departures and training flights, as shown in Figure 2 and Figure 3.

**Table 4 Noise Summary**

NOISE PARAMETERS	
L <sub>Aeq</sub> 24 hr, dBA	57.8
L <sub>Aeq</sub> (night), dBA	50.6
Background Day (L <sub>90</sub> dBA)	49.8
Background Night (L <sub>90</sub> dBA)	45.1

**Table 5 Correlated Noise Events Summary**

	Jet Runway 16R Departures	All Aircraft
Total number of Correlated Noise Events (CNE 24hr)	113	197
Number of Correlated Noise Events at night (CNE night)	3	4
Operational Days	28.0	28.0
Number of Correlated Noise Events (CNE <sub>xx</sub> ) day/night	CNE <sub>xx</sub>	CNE <sub>xx</sub>
CNE <sub>60</sub> – day*	N/A	N/A
CNE <sub>60</sub> – night*	N/A	N/A
CNE <sub>65</sub> – day	106	176
CNE <sub>65</sub> – night	2	3
CNE <sub>70</sub> – day	27	43
CNE <sub>70</sub> – night	1	1
CNE <sub>75</sub> – day	3	6
CNE <sub>75</sub> – night	1	1
CNE <sub>80</sub> – day	0	0
CNE <sub>80</sub> – night	0	0
Number of Correlated Noise Events (CNE <sub>xx</sub> ) per 24hr period min – max		
CNE <sub>60</sub> *	N/A	N/A
CNE <sub>65</sub>	0 to 49	0 to 51
CNE <sub>70</sub>	0 to 19	0 to 19
CNE <sub>75</sub>	0 to 4	0 to 4
CNE <sub>80</sub>	0 to 0	0 to 0
Average Number of Correlated Noise Events (CNE <sub>xx</sub> Ave.) day/night	CNE <sub>xx</sub> Ave.	CNE <sub>xx</sub> Ave.
CNE <sub>60</sub> Ave. – day*	N/A	N/A
CNE <sub>60</sub> Ave. – night*	N/A	N/A
CNE <sub>65</sub> Ave. – day	3.79	6.29
CNE <sub>65</sub> Ave. – night	0.07	0.11
CNE <sub>70</sub> Ave. – day	0.96	1.54
CNE <sub>70</sub> Ave. – night	0.04	0.04
CNE <sub>75</sub> Ave. – day	0.11	0.21
CNE <sub>75</sub> Ave. – night	0.04	0.04
CNE <sub>80</sub> Ave. – day	0.00	0.00
CNE <sub>80</sub> Ave. – night	0.00	0.00

Note: Day period is from 6:00am to 11:00pm. Night period is 11:00pm to 6:00am.

\* The count of CNE<sub>60</sub> events are not applicable due to the threshold settings of 60-63dB(A) as depicted in Figure 5.



**Table 6 LAm<sub>ax</sub> Summary**

Min dB(A)	Max dB(A)	Average dB(A)
62.9	79.5	68.2

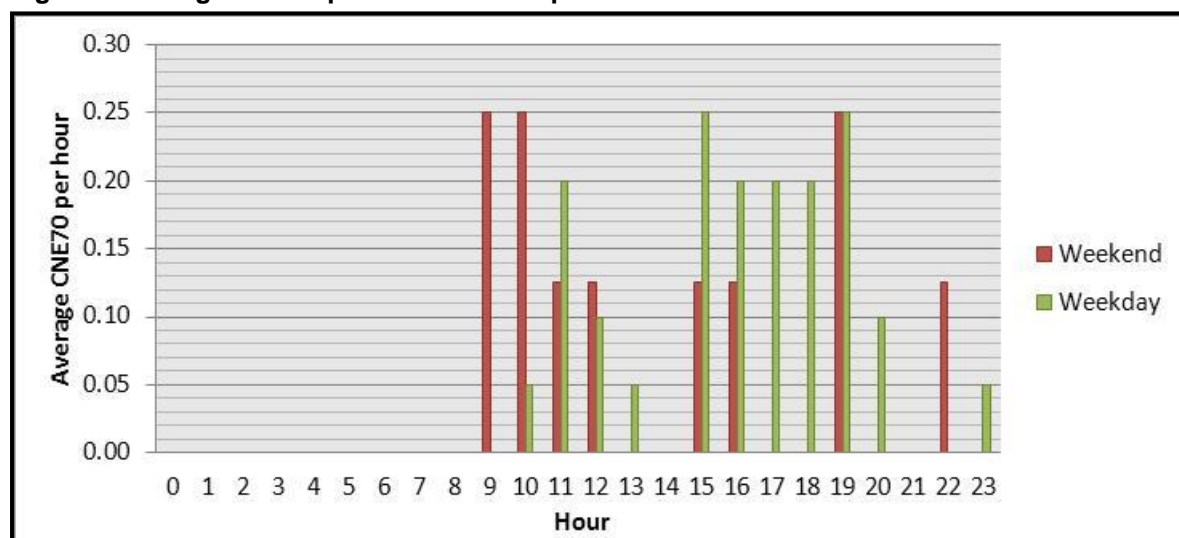
Note: Summary for operations that passed through the correlation zone (2.5km radius with 8,000ft height AGL)

### CNE70 Count by Hour

A large number of noise events were between 70dB(A) and 75dB(A). Therefore further investigation was undertaken on the number of correlated noise events that exceed 70dB(A) to reveal patterns and determine what time of the day the majority of these events occurred.

Figure 6 presents daily average number of noise events 70dB(A) or above (CNE<sub>70</sub>) broken down on an hourly basis.

**Figure 6 Average CNE70 per Hour for All Operations**



The highest number of CNE<sub>70</sub> in any one hour throughout the reporting period was 5 on 28<sup>th</sup> February 2013 between 7pm and 8pm.

### Aircraft Noise Levels

Table 7 presents the top 10 noisiest aircraft types captured by the noise monitor during the reporting period. Table 8 shows the 10 most correlated aircraft types that flew over the noise monitor.

**Table 7 Top 10 Average Aircraft Noise Levels (LAm<sub>ax</sub>) at the Cronulla EMU**

Aircraft Type	Airport	Operation Type	Runway	No. Correlated Noise Events	LAm <sub>ax</sub> dB(A)		Highest No. CNE in One Day
					Average	Maximum	
Piper P28A (P)	Bankstown	T	11R	1	79.0	79.0	1
Unknown (H)	Bankstown	D	Unknown	1	77.3	77.3	1
Unknown (H)	Unknown	O	Unknown	1	74.3	74.3	1
Airbus A340-600 (J)	Sydney	D	16R	1	74.1	74.1	1
Boeing 777-200 (J)	Sydney	D	16R	1	73.2	73.2	1
Boeing 747-400 (J)	Sydney	D	16R	6	72.6	78.2	4
Unknown (H)	Royal North Shore HLS	D	Unknown	1	71.7	71.7	1
McDonnell Douglas MD11 (J)	Sydney	D	16R	2	71.3	71.6	2
Airbus A330-300 (J)	Sydney	D	16R	3	71.1	73.9	1
Unknown (U)	Camden	T	06	2	71.1	74.8	2

**Table 8 Top 10 Most Correlated Aircraft Types Over the Cronulla EMU**

Aircraft Type	Airport	Operation Type	Runway	No. Correlated Noise Events	LAm <sub>ax</sub> dB(A)		Highest No. CNE in One Day
					Average	Maximum	
Embraer E190 (J)	Sydney	D	16R	48	67.8	72.3	11
Unknown (U)	Unknown	O	Unknown	25	68.3	79.5	11
Boeing 737-800 (J)	Sydney	D	16R	25	67.5	72.4	19
Airbus A320 (J)	Sydney	D	16R	10	67.5	71.4	6
SAAB 340 (T)	Sydney	A	34L	7	66.9	69.5	2
Boeing 747-400 (J)	Sydney	D	16R	6	72.6	78.2	4
Boeing 767-300 (J)	Sydney	D	16R	4	69.7	75.8	3
Piper P28A (P)	Sydney	D	06	3	69.4	72.7	3
Cessna C182 (P)	Sydney	A	Unknown	3	65.6	66.1	3
Airbus A330-200 (J)	Sydney	D	16R	3	71.0	72.9	3

**Aircraft Category:** Jet (J), Turboprop (T), Propeller (P), Helicopter (H), Unknown (U)

## Conclusions

Following recommendations made in 'Review of the Sydney Environmental Monitoring Units', Short Term Monitoring was conducted at Cronulla during the period of 25<sup>th</sup> February to 25<sup>th</sup> March 2013. It was determined the most common aircraft movements to traverse the Cronulla community are jet departures operating from Sydney Airport. During the reporting period 33 Bankstown movements passed through the capture zone, these were predominately non-flight planned general aviation operations. 107 operations utilising other ports flew through the capture zone. The majority of these were non-flight planned operations following the Sydney coast line, it is expected that the majority of these are helicopter operations.

Throughout the reporting period the highest number of correlated aircraft noise events exceeding 70dB(A) in one day was 19. On February 28<sup>th</sup> during the period of 7pm and 8pm, 5 events exceeding 70dB(A) occurred, this was the greatest number in one hour during the period. Residents in the area of Cronulla were exposed to a correlated noise events exceeding 75dB(A) during the hours of day and night. There were 3 correlated noise events above 65dB(A) that occurred during the hours of night. The average LAm<sub>ax</sub> during the reporting period was 68.2dB(A), with a max level of 79.5dB(A) and minimum level of 62.9dB(A) recorded.

Noise events above 70dB(A) were most common in the weekday hours of 3:00pm to 4:00pm and 7:00pm to 8:00pm and on weekends in the periods of 9:00am to 11:00am and 7:00pm to 8:00pm.

A review of Tables 7 and 8 indicates the more frequent Sydney operations are on average not as loud as the lower flying Bankstown movements. The most common aircraft types to pass over Cronulla are Regular Public Transport (RPT) aircraft on departure from Sydney Airport. The Boeing 747-400 and Airbus A330-200 feature in both the loudest average aircraft noise levels and most frequent aircraft types to fly over the Cronulla EMU.

The correlation summary of 30% is a relatively low result. Whilst the noise created from the aircraft may be noticeable, the noise events were not loud enough to create a noise event above the determined threshold settings.

Due to the distinctive flight paths and distance from Sydney Airport, it is not expected the ratio of arrival and departure flights over Cronulla will change due to seasonal variation over a twelve month period.

### Further Information

Further information about Airservices noise monitoring program is available on the Airservices website, including reports of the noise and operational data collected by the Noise and Flight Path Monitoring System, as well as fact sheets about topics related to aircraft noise. The website is available at:

<http://www.airservicesaustralia.com/aircraftnoise/>

### Contact us

To lodge a complaint or make an enquiry about aircraft operations, you can

- go to WebTrak ([www.airservicesaustralia.com/aircraftnoise/webtrak/](http://www.airservicesaustralia.com/aircraftnoise/webtrak/))
- use our online form ([www.airservicesaustralia.com/aircraftnoise/about-making-a-complaint/](http://www.airservicesaustralia.com/aircraftnoise/about-making-a-complaint/))
- telephone 1800 802 584 (freecall) or 1300 302 240 (local call –Sydney)
- fax (02) 9556 6641 or
- write to, Noise Complaints and Information Service, PO Box 211, Mascot NSW 1460.

### Glossary of Terms

A	Arrivals
AGL	Above Ground Level
Background noise level (L90)	The sound level in dB(A) that is exceeded 90% of the time
CNE	Correlated noise events - noise events which are matched with aircraft movements
CNExx	Correlated noise events that are equal or greater than the noise level XX dB(A)
D	Departures
Day	6:00am to 11:00pm
EMU	Environmental Monitoring Unit
H	Helicopters
Jet	Jet aircraft
LAeq	Continuous equivalent noise level over a time period
LAeq 24hr	Continuous equivalent noise level over a 24 hour period
LAeq night	Continuous equivalent noise level over the night time period (hours of 11:00pm to 6:00am)
LAmx	Maximum sound level in dB(A)
Local	Operation that departs and arrives at the same airport. Local movements include circuits and training flights.
Movement	An aircraft operation, such as a take-off or landing
Nxx	Average daily number of correlated noise events equal to or greater than XX dB(A)
Night	11:00pm to 6:00am
NFPMS	Noise and Flight Path Monitoring System
Noise Event	A noise that exceeds the threshold sound level for longer than the threshold time that is set
Non-Jet	Non-jet aircraft
O	Overflight i.e. an aircraft movement that flew over the area but did not arrive or depart from the airport of concern
T	Local Operation (Departure & Arrival)

#### Note:

For further information on the metrics used in this report refer to Australian Standard 1055.1–1997 “Acoustics – Description and measurement of environmental noise”.

Airservices welcomes comments about this report. Please contact us via e-mail at [community.relations@airservicesaustralia.com](mailto:community.relations@airservicesaustralia.com) if you would like to provide feedback.