Short Term Monitoring Program
NSW, Caringbah Report

February 2013

connecting australian aviation

Version Control

Version Number	Date	Detail
1.0	February 2013	Initial Release.
2.0	May 2013	Updated formatting for table 2.
3.0	January 2014	Figure 5 and L90 values updated due to technical issue.

Deployment Purpose – Caringbah, NSW

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

Jet arrivals onto the north/south runway 34 Left and turboprop departures off the reciprocal runway 16 Right traverse the suburb of Caringbah.

A focus was made on turboprop aircraft utilising the CLIFF THREE departure due to the high volume of these operations during the reporting period.

The purpose of this report is to provide a technical summary of the recorded aircraft noise and operational data collected at Caringbah 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

23/10/2012 12:00pm – 20/11/2012 12:00pm

Environmental Monitoring Unit (EMU) Details

Location	Willarong Road, Caringbah 2229
Latitude	34°2'10.06"S
Longitude	151° 7'14.66"E
EMU Altitude	115ft above mean sea level
Capture Zone	2.5km radius with 6,468ft (above ground level) height for noise data capture
Threshold Settings	56.0 dB(A) to 57.0 dB(A) depending on time of day

Location Images

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

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

Figure 2 Total Movements Captured

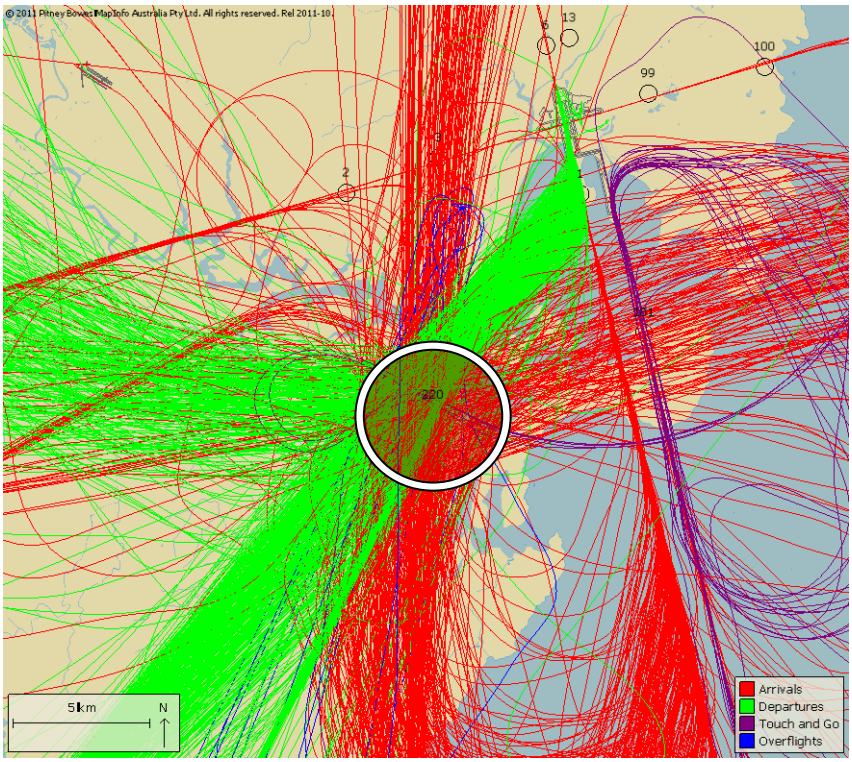


Figure 3 Sydney Airport Turboprop Runway 16 Right CLIFF THREE Departures

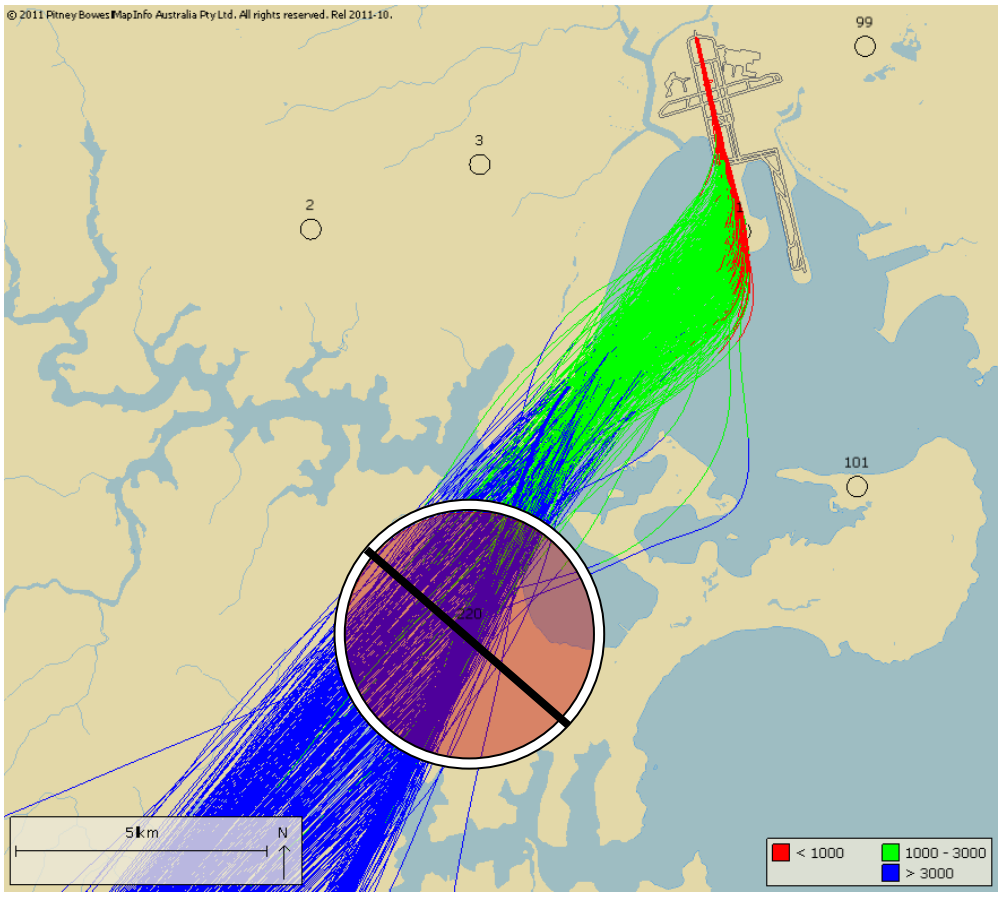
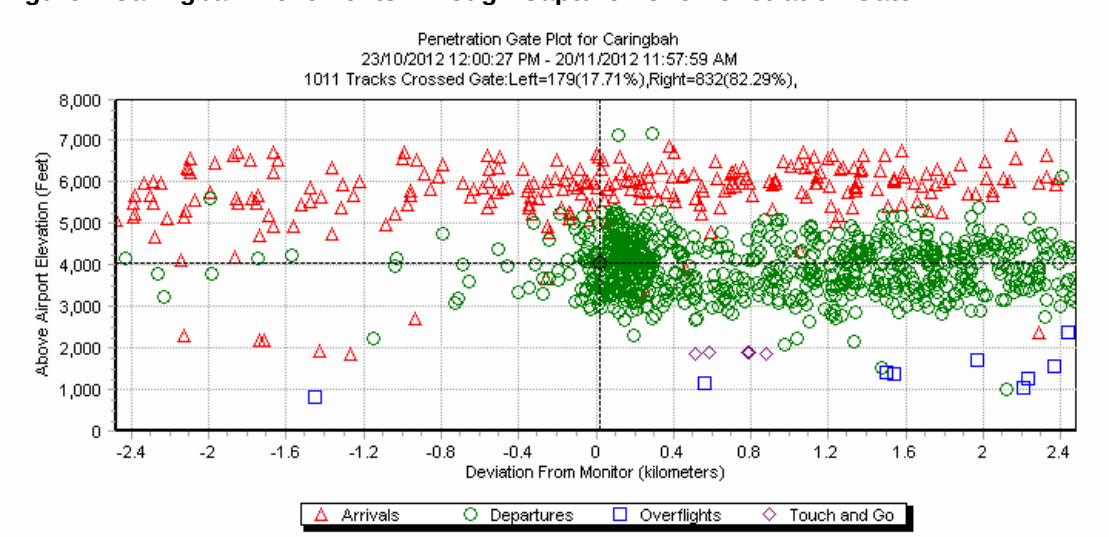


Figure 4 Caringbah Movements Through Capture Zone Penetration Gate



Note: Sydney Airport altitude is 21ft above mean sea level. EMU altitude is 115ft above mean sea level. The EMU altitude should be adjusted from the data shown above in order to draw conclusions about height above ground of aircraft operations.

The black line though 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 (23/10/2012 12:00pm – 20/11/2012 12:00pm)

Type of Operation	Turboprop CLIFF THREE Departures	All Movements
*Number of Movements Through Capture Zone**	486	1,105
Number of Movements with Correlated Noise Events (CNE)	435	693
Correlation Summary	89.51%	62.71%

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

Table 2 Height Above The Monitor Summary

Type of Operation	Min*	Max*	Average*
*Departures Through Capture Zone***	882	7,065	3,855
*Arrivals Through Capture Zone***	1,744	7,015	5,668
*All Operations Through Capture Zone***	703	7,065	4,279

* 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 arrivals typically fly at an altitude of 5,000 to 7,000 feet, whilst turboprop departures are at 2,500 to 5,500 feet.

Table 3 Captured Movements Breakdown By Airport and Aircraft Category

Airport	Jet	Turboprop	Light Propeller	Helicopter	Unknown*	Grand Total
Sydney	241	845	0	3	0	**1089**
Unknown	0	0	0	14	0	**14**
Royal Prince Alfred Hospital	0	0	0	1	0	**1**
Richmond	0	0	0	0	1	**1**
Grand Total	**241**	**845**	**0**	**18**	**1**	**1105**

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

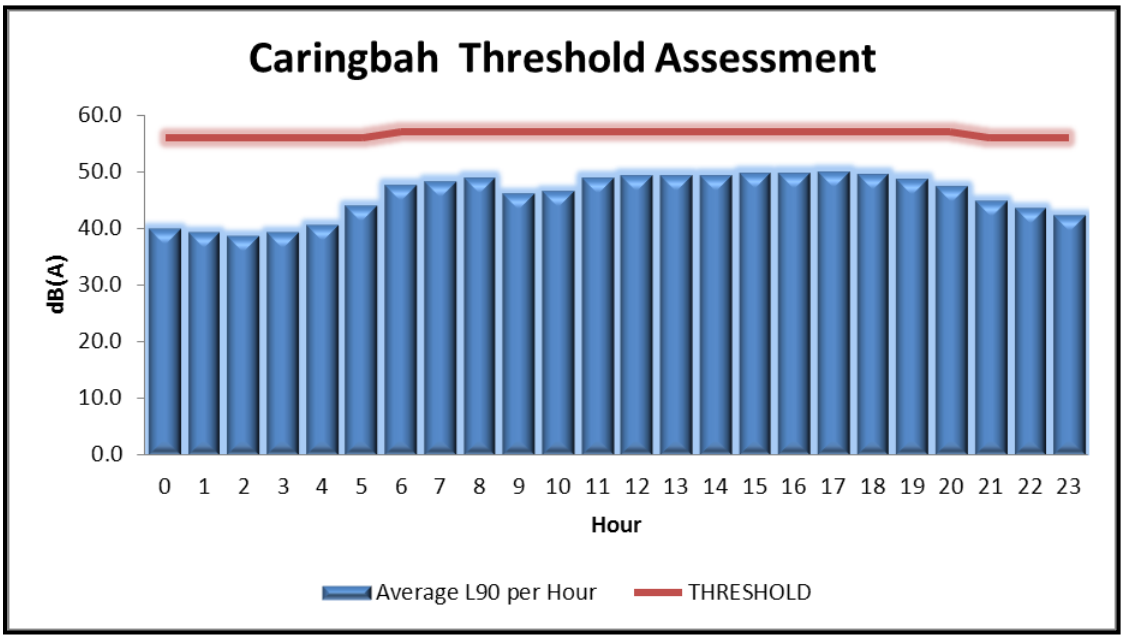
Correlation Summary

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. The correlation results for the Caringbah EMU are shown in Table 1. A correlation summary for all movements of 62% is a reasonable result considering the average altitude and noise levels of the turboprop aircraft passing over the monitor.

Background Noise Levels and Threshold Settings

At the monitoring site, background noise levels are first assessed to determine the appropriate threshold settings for the noise monitor. 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 those turboprop aircraft that flew over the noise monitor and departed off runway 16 Right following the prescribed CLIFF THREE procedure, as well as all aircraft that flew over the noise monitor, 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	
LAeq 24 hr, dBA	55.4
LAeq (night), dBA	47.5
Background Day (L90 dBA)	48.1
Background Night (L90 dBA)	40.6

Table 5 Correlated Noise Events Summary

	Turboprop CLIFF THREE Departures	All Aircraft
Total number of Correlated Noise Events (CNE 24hr)	435	693
Number of Correlated Noise Events at night (CNE night)	0	4
Operational Days	28.0	28.0
Number of Correlated Noise Events (CNExx) day/night	CNExx	CNExx
CNE_{60} – day	397	599
CNE_{60} - night	0	1
CNE_{65} – day	149	202
CNE_{65} – night	0	0
CNE_{70} – day	11	19
CNE_{70} - night	0	0
CNE_{75} – day	2	5
CNE_{75} - night	0	0
CNE_{80} – day	0	0
CNE_{80}- night	0	0
Number of Correlated Noise Events (CNExx) per 24hr period min – max		
CNE_{60}	0 to 34	0 to 52
CNE_{65}	0 to 17	0 to 22
CNE_{70}	0 to 3	0 to 4
CNE_{75}	0 to 1	0 to 2
CNE_{80}	0 to 0	0 to 0
Average Number of Correlated Noise Events (CNExx Ave.) day/night	CNExx Ave.	CNExx Ave.
CNE_{60} Ave. – day	14.18	21.39
CNE_{60} Ave. – night	0.00	0.04
CNE_{65} Ave. – day	5.32	7.21
CNE_{65} Ave. – night	0.00	0.00
CNE_{70} Ave. – day	0.39	0.68
CNE_{70} Ave. – night	0.00	0.00
CNE_{75} Ave. – day	0.07	0.18
CNE_{75} Ave. – night	0.00	0.00

CNE_{80} Ave. – day	0.00	0.00
CNE_{80} Ave. – night	0.00	0.00

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

Table 6 LAmax Summary

Min dB(A)	Max dB(A)	Average dB(A)
57.4	78.0	63.5

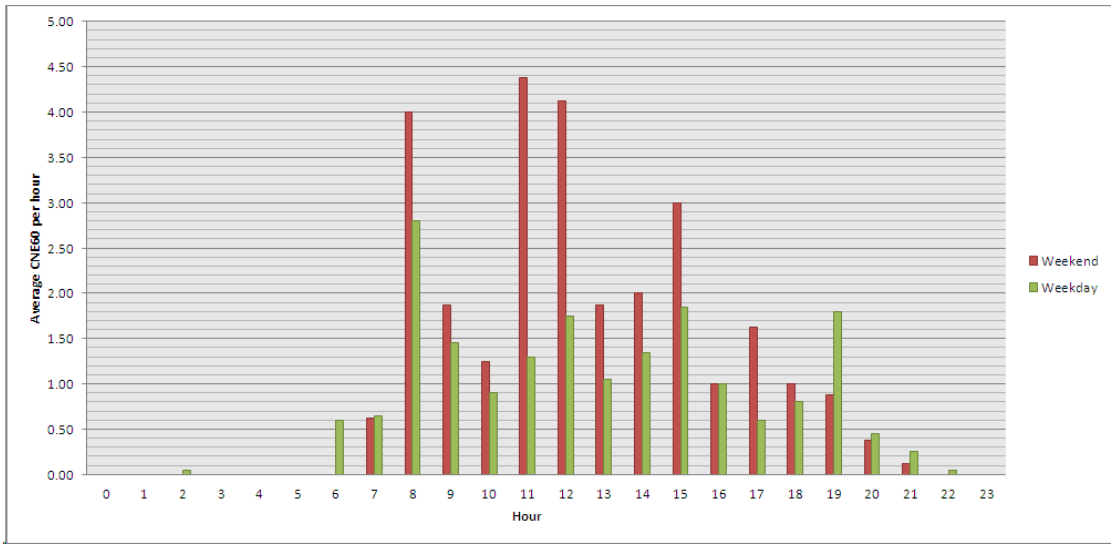
Note: Summary for operations that passed through the correlation zone (2.5km radius with 6,468ft height AGL)

CNE60 Count by Hour

A large number of noise events were between 60dB(A) and 70dB(A). Therefore further investigation was undertaken on the number of correlated noise events that exceed 60dB(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 60dB(A) or above (CNE_{60}) broken down on an hourly basis.

Figure 6 Average CNE60 per Hour for All Operations



The highest number of CNE_{60} in any one hour throughout the reporting period was 9 between 8am and 9am on 26th October 2012.

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 (LAmax) at the Caringbah EMU

Aircraft Type	Airport	Operation Type	Runway	No. Correlated Noise Events	LAmax dB(A)		Highest No. CNE in One Day
					Average	Maximum	
Airbus A380	Sydney	D	16R	1	72.9	72.9	1
Boeing 747-400	Sydney	D	16R	1	71.4	71.4	1
Boeing 737-800	Sydney	D	16R	2	70.3	70.5	1
Airbus A330-300	Sydney	D	16R	1	68.7	68.7	1
Eurocopter EC145	-	O	-	1	66.0	66.0	1
Airbus A330-300	Sydney	A	34L	2	65.6	67.7	1
Aerospatiale ATR 72-500	Sydney	D	16R	94	65.5	73.8	8
Boeing 767-300	Sydney	D	16R	2	65.4	67.3	1

Airbus A330-200	Sydney	A	34L	3	65.3	66.7	1
Aerospatiale ATR 72-500	Sydney	A	34L	1	65.1	65.1	1

Table 8 Top 10 Most Correlated Aircraft Types Over the Caringbah EMU

Aircraft Type	Airport	Operation Type	Runway	No. Correlated Noise Events	LAmax dB(A)		Highest No. CNE in One Day
					Average	Maximum	
Saab 340	Sydney	D	16R	204	63.1	77.2	21
Dash 8-400	Sydney	D	16R	147	63.7	78.0	14
Dash 8-300	Sydney	D	16R	95	63.3	75.0	9
Aerospatiale ATR 72-500	Sydney	D	16R	94	65.5	73.8	8
Super King Air 200	Sydney	D	16R	27	62.7	65.3	3
Jetstream Super 32	Sydney	D	16R	18	62.2	66.2	3
King Air 350	Sydney	D	16R	13	61.6	66.3	2
Fairchild Dornier SA-227DC Metro	Sydney	D	16R	12	63.3	67.0	2
AgustaWestland AW139	-	O	-	10	64.5	77.5	2
Boeing 737-800	Sydney	A	34L	6	61.2	65.2	3

Conclusions

Following recommendations made in 'Review of the Sydney Environmental Monitoring Units', Short Term Monitoring was conducted at Caringbah during the period of 23rd October to 20th November 2012. It was determined the most common aircraft movements to traverse the Caringbah community are turboprop departures operating from Sydney Airport. There were very few non-Sydney Airport movements that flew through the capture zone during the reporting period; these were predominately helicopter aircraft.

Throughout the reporting period the highest number of correlated aircraft noise events exceeding 60dB(A) in one day was 52. On October 26th, 9 events exceeding 60dB(A) occurred during 8am and 9am, this was the greatest number in one hour during the period. Residents in the area of Caringbah were exposed to noise events exceeding 75dB(A) during the hours of day. There was a single correlated noise event that occurred during the hours of night, this was below 65dB(A). The average LAmax during the reporting period was 63.5dB(A), with a max level of 78.0 dB(A) and minimum level of 57.4 dB(A) recorded.

Noise events above 60dB(A) were most common in the weekday hours of 8:00am to 9:00am and on weekends in the period of 8:00am to 4:00pm.

A review of Tables 7 and 8 indicates the most frequent and generally loudest common aircraft types to pass over Caringbah are Regular Public Transport (RPT) aircraft operating in and out of Sydney Airport. A single Eurocopter EC145 (Helicopter) created a noise event that placed it in the top 5 average aircraft noise levels. The ATR 72 features in both the loudest average aircraft noise levels and most frequent aircraft types to fly over the Caringbah EMU.

The correlation summary is reasonable for this monitor considering the diversity and average height of the flight paths over the monitor.

Due to the distinctive flight paths and distance from Sydney Airport, it is not expected the ratio of arrival and departure flights over Caringbah from Sydney Airport 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/)
- use our online form (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)
LAmax	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 if you would like to provide feedback.