Short Term Monitoring Program
WA, Roleystone Report

November 2012

Version Control

Version Number	Date	Detail
1.0	November 2012	Initial Release.
2.0	August 2013	Table 2 – Comments added.

Deployment Purpose – Roleystone, WA

Roleystone was identified as a sensitive area in the 'Review of the Perth Airport Environmental Monitoring Units' undertaken by Airservices in 2011.

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

20/12/2011 – 16/01/2012

Environmental Monitoring Unit (EMU) Details

Location	Roleystone Primary School
Latitude	32^{O} 06' 34.88" S
Longitude	116^{O} 04' 20.06" E
EMU Altitude	787ft above mean sea level
Capture Zone	1.5km radius with 7,940ft* max altitude
Threshold Settings	45.7 dB(A) to 54.2 dB(A) depending on time of day

*Max altitude approximately 1800ft higher than average altitude. This captured 94% of Runway 03 Arrivals that passed over Roleystone.

Location Images

Figures 1 to 5 details the location of monitors at Perth Airport and the flight paths used for those operations captured by the Roleystone EMU.

Figure 1 Perth Fixed Environmental Monitoring Unit Locations and Roleystone Short Term Monitoring Program Deployment Location

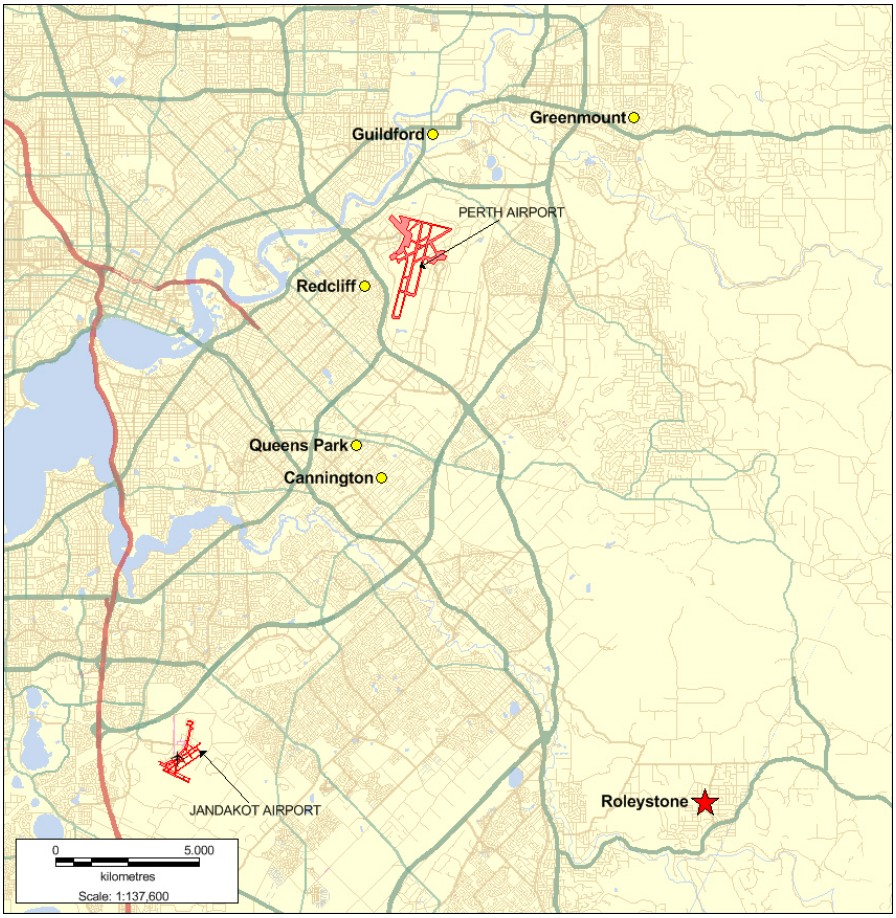


Figure 2 Total Movements Captured

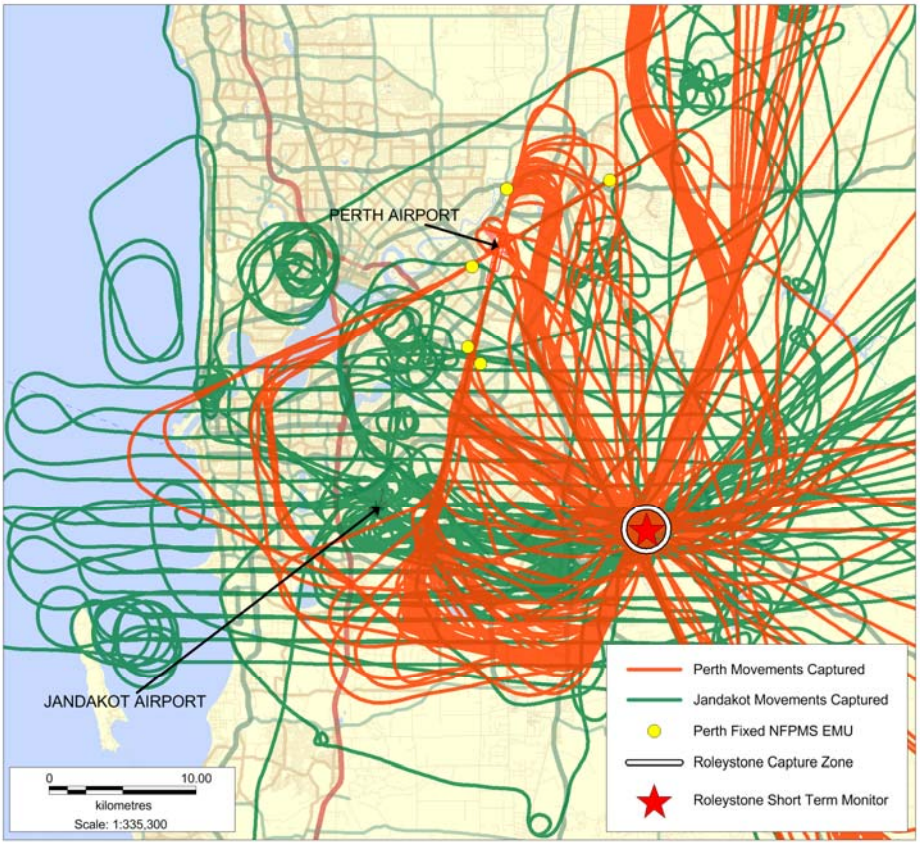


Figure 3 Perth Airport Runway 03 Jet Arrivals Captured

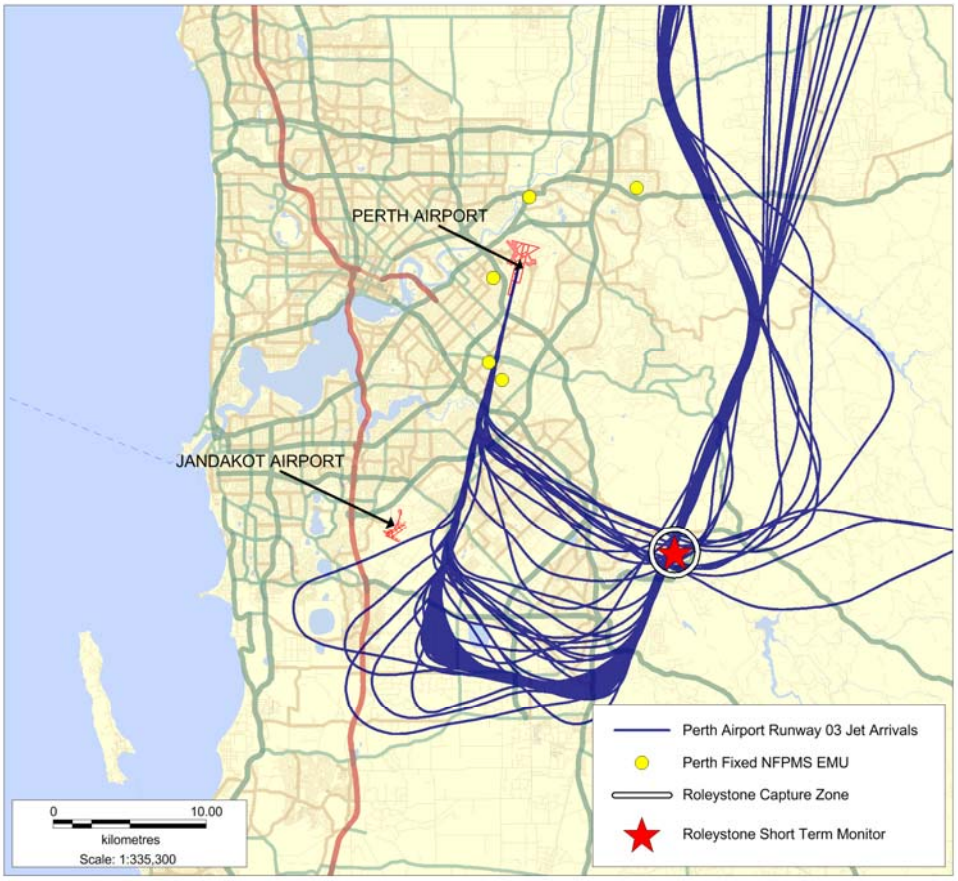


Figure 4 Perth Airport Runway 03 Jet Arrivals Captured

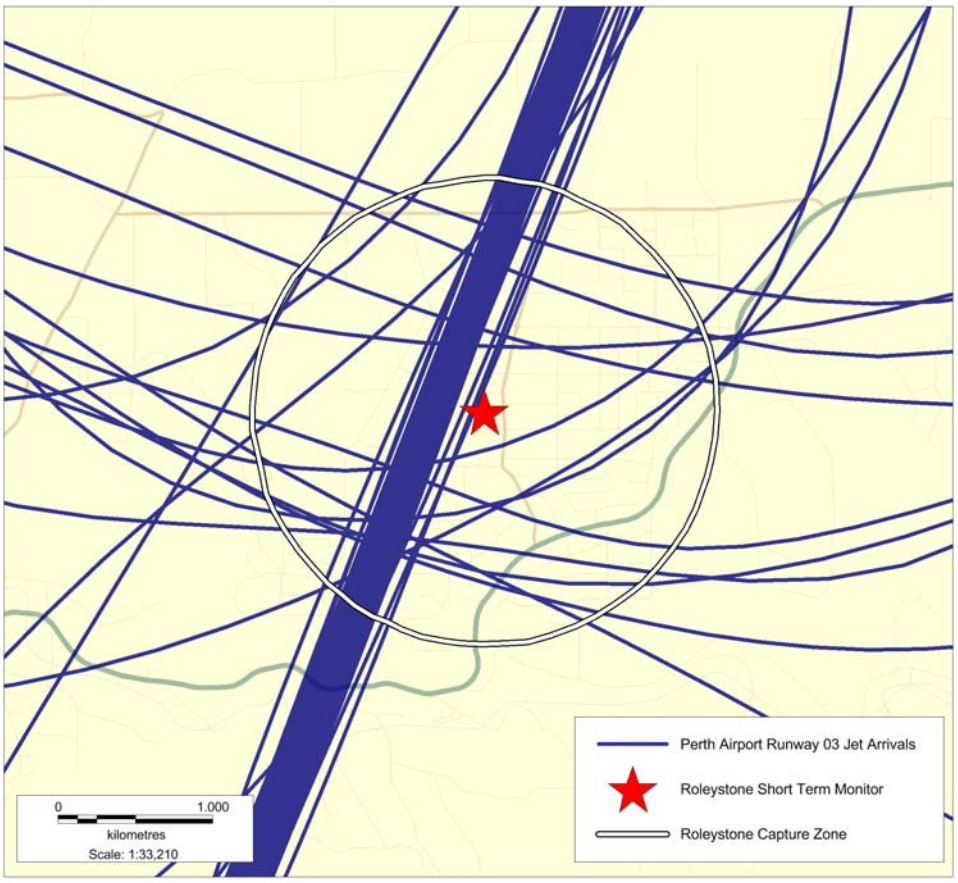
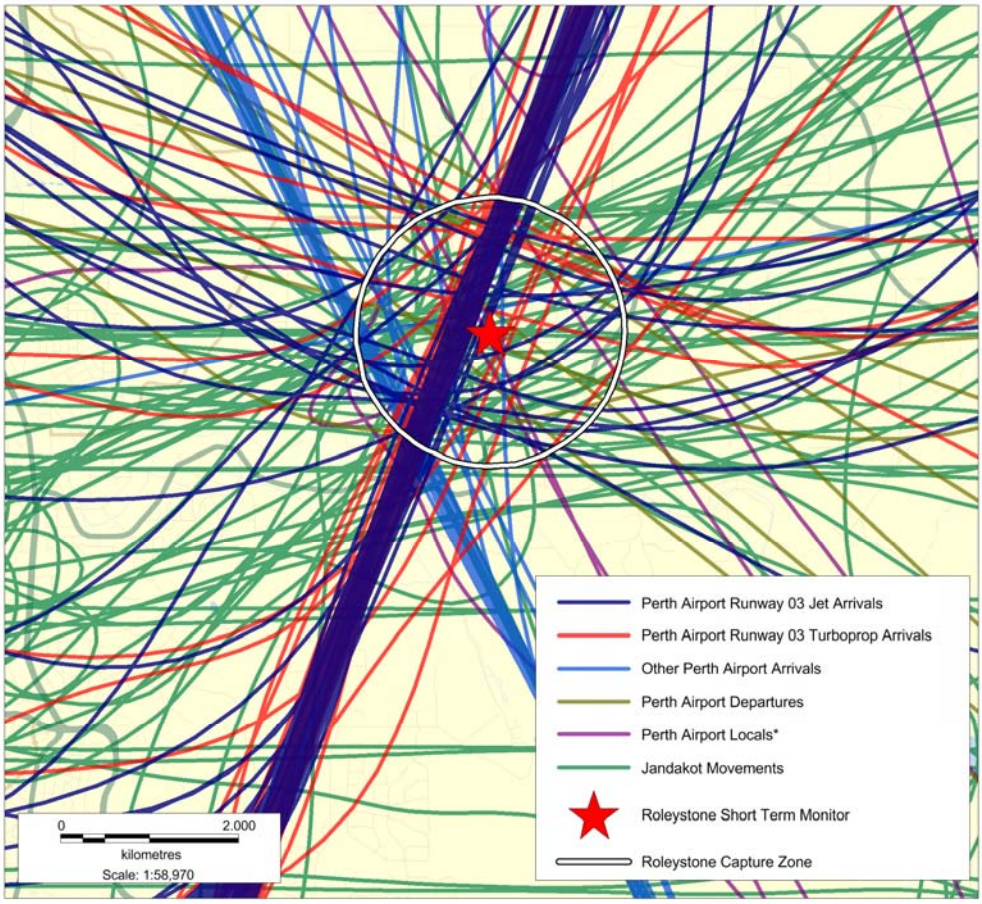


Figure 5 Total Movements Captured



* Includes any operation that departs and arrives at the same airport.

Findings

Table 1 Movement Summary (20/12/2011 – 16/01/2012)

Type of Operation	All Movements	Runway 03 All Arrivals	Runway 03 Jet Arrivals
*Number of Movements**	18,255	1,516	1,088
Number of Movements Through Capture Zone	375	278	244
Number of Movements with Correlated Noise Events (CNE)	168	133	129
Correlation Summary	44.80%	47.84%	52.87%

* Includes all aircraft with transponder flying through area. Regardless of Destination/Origin airport.

- Average altitude of jet arrivals over the noise terminal was 6,150ft. This ranged from 3,391ft to 10,598ft. As altitude is measured from sea level this is not a true representation of the height the aircraft traverses the community. The Roleystone EMU was located 787ft above sea level; therefore the average aircraft height above the noise terminal was 5,350ft with a range from 2,604ft to 9,811ft.
- 44 Jandakot movements flew through the capture zone during the reporting period. These consisted of 10 helicopters, 2 small business jets, 19 light propeller aircraft and 8 turboprop aircraft. The remaining 5 aircraft did not have flight plan information associated with them so no aircraft type or aircraft category was recorded.
- Correlated Noise events of 60dB(A) or above (CNE60) occurred during both the night (11:00pm to 6:00am) and day (6:00am to 11:00pm) periods.

Correlation Summary

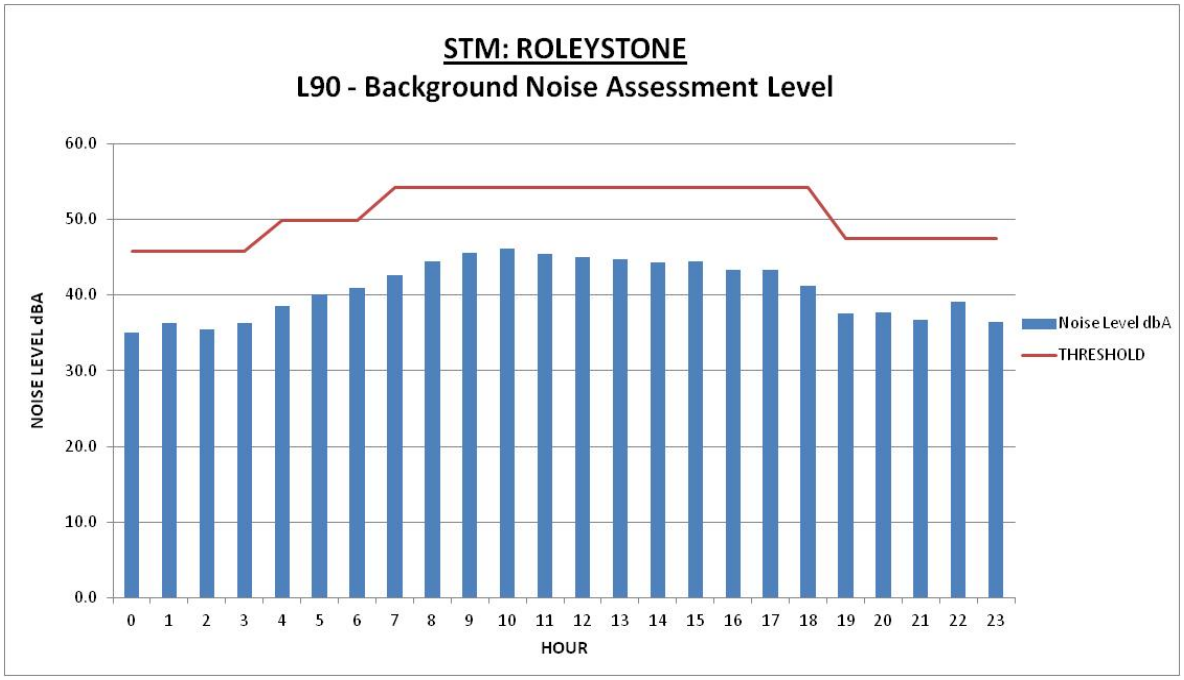
An evaluation of the number of aircraft operations that were matched with noise events recorded by the EMU is an important aspect of assessing performance of the noise monitoring installation. Ideally, all operations passing the EMU within a reasonable proximity will be matched to the appropriate noise 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 Roleystone EMU are shown in Table 1.

A correlation summary of 45% is a low result when compared to other EMUs nationally. Due to jet aircraft being in the arrival phase of flight and generally passing the community 5,000ft above the ground at low power settings, the recorded aircraft noise is within close proximity of the determined threshold level, and therefore the EMU may not correlate all aircraft movements.

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 6.

Figure 6 Background and Threshold Assessment



Noise Summary

The following table presents a summary of the noise data for aircraft that flew through the capture zone and caused a CNE. Information is provided for those aircraft that flew over the EMU and arrived on Runway 03, 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 5.

Table 2 Noise Summary

NOISE PARAMETERS	
LAeq 24 hr, dBA	49.7
LAeq (night), dBA	50.0
Background Day (L90 dBA)	43.1
Background Night (L90 dBA)	35.8

LAeq (night) is abnormally higher than LAeq 24hr following a thunderstorm during the early hours of January 4th 2012. If the night period of January 3rd to 4th is excluded from calculations the LAeq (night) value would be 44.4dBA.

	Jet Arrivals Rwy 03	All Aircraft
Total number of Correlated Noise Events (CNE 24hr)	129	168
Number of Correlated Noise Events at night (CNE night)	31	34
Operational Days	28.0	28.0
Number of Correlated Noise Events (CNExx) day/night	**CNExx**	**CNExx**
CNE_{60} – day	58	83
CNE_{60} - night	9	10
CNE_{65} – day	14	24
CNE_{65} – night	1	2
CNE_{70} – day	0	2
CNE_{70} - night	0	0
CNE_{75} – day	0	0
CNE_{75} - night	0	0
CNE_{80}	0	0
CNE_{90}	0	0
Number of Correlated Noise Events (CNExx) per 24hr period min – max		
CNE_{60}	0 to 13	0 to 15
CNE_{65}	0 to 3	0 to 3
CNE_{70}	0	0 to 1
CNE_{75}	0	0
CNE_{80}	0	0
CNE_{90}	0	0
Average Number of Correlated Noise Events (CNExx Ave.) day/night	**CNExx Ave.**	**CNExx Ave.**
CNE_{60} Ave. – day	2.07	2.96
CNE_{60} Ave. – night	0.32	0.36
CNE_{65} Ave. – day	0.50	0.86
CNE_{65} Ave. – night	0.04	0.07
CNE_{70} Ave. – day	0.00	0.07
CNE_{70} Ave. – night	0.00	0.00
CNE_{75} Ave. – day	0.00	0.00
CNE_{75} Ave. – night	0.00	0.00
CNE_{80} Ave.	0.00	0.00
CNE_{90} Ave.	0.00	0.00

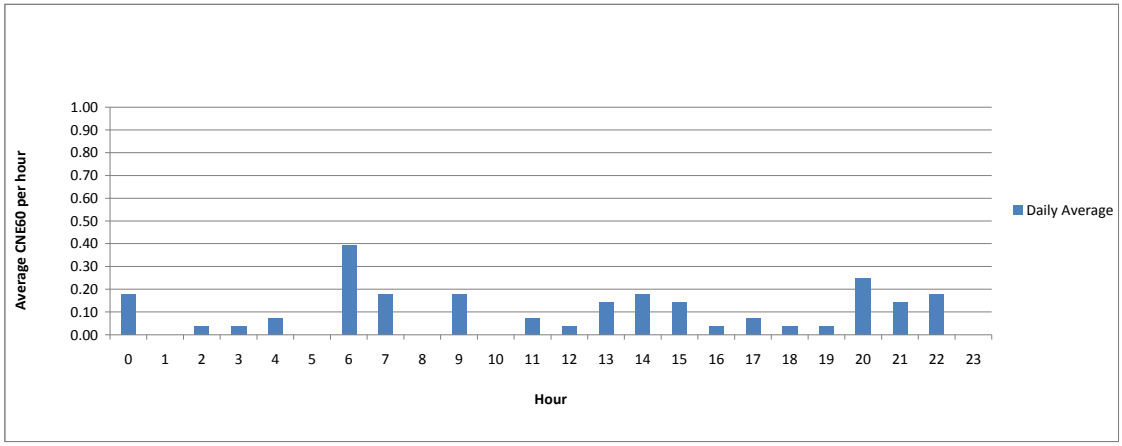
Note: Day period is from 6:00am to 11:00pm. Night period is 11:00pm to 6:00am.

CNE60 Count by Hour

A large number of noise events were between the 60dB(A) and 65dB(A). Therefore further investigation was undertaken on the number of noise events that exceed 60dB(A) to reveal patterns and determine what time of the day the majority of these events occurred. As Roleystone has a low background noise level (35dB-45dB) aircraft noise events greater than 60dB(A) may be more noticeable by the community. Over the course of the Roleystone EMU deployment there was an average less than one event per hour that reached 60dB(A).

Figure 7 presents daily average number of noise events 60dB(A) or above (CNE_{60}) broken down on an hourly basis. The graph focuses on Runway 03 jet arrivals.

Figure 7 Average CNE_{60} per Hour for Runway 03 Jet Arrivals



The highest number of CNE_{60} in any one hour throughout the reporting period was 5 between 8pm and 9pm on 4th January 2012.

Aircraft Noise Levels

Table 3 presents the top 10 noisiest aircraft types captured by the EMU during the reporting period. Table 4 shows the 10 most correlated aircraft types that flew over the EMU.

Table 3 Top 10 Average Aircraft Noise Levels (LAmax) at the Roleystone EMU

Aircraft Type	Airport	Operation Type	Runway	No. Correlated Noise Events	LAmax dB(A)		Highest No. CNE in One Day
					Average	Maximum	
B412	Jandakot	D	H	1	72.5	72.5	1
BE58	Jandakot	A	24R	1	69.5	69.5	1
BK17	Jandakot	T	H	5	66.7	70.5	2
PA31	Jandakot	D	12	1	66.3	66.3	1
BK17	Jandakot	A	H	2	66.0	69.7	1
B738	Perth	D	21	1	65.4	65.4	1
BE36	Jandakot	D	Unknown	1	65.3	65.3	1
AS50	Perth	T	H	3	64.7	66.9	2
C402	Jandakot	A	24R	1	64.4	64.4	1
A332	Perth	A	03	1	64.0	64.0	1

Table 4 Top 10 Most Correlated Aircraft Types Over the Roleystone EMU

Aircraft Type	Airport	Operation Type	Runway	No. Correlated Noise Events	LAmax dB(A)		Highest No. CNE in One Day
					Average	Maximum	
A333	Perth	A	03	33	62.2	69.6	6
A320	Perth	A	03	29	59.2	66.6	6
B738	Perth	A	03	29	60.9	66.4	11
F100	Perth	A	03	11	57.2	61.9	4
B712	Perth	A	03	10	55.1	58.9	3
B772	Perth	A	03	8	60.7	66.3	1
BK17	Jandakot	T	H	5	66.7	70.5	2
E190	Perth	A	03	5	57.4	62.1	3
AS50	Perth	T	H	3	64.7	66.9	2
A343	Perth	A	03	2	61.5	62.0	1

Conclusions

As per the 'Review of the Perth Airport Environmental Monitoring Units', Short Term Monitoring was conducted at Roleystone at the end of 2011. It was determined the most common aircraft movements to traverse the Roleystone community are arrivals operating into Perth Airport utilising runway 03. There were 44 movements to and from Jandakot airport that flew through the capture zone during the reporting period; these were predominately light propeller aircraft.

A review of Tables 3 and 4 indicates that whilst there are fewer General Aviation Jandakot operations that pass over Roleystone, they are generally louder than the more frequent Regular Public Transport (RPT) flights operating into Perth airport. This is due to Jandakot movements generally flying lower to avoid the flight paths used by Jet and Turboprop aircraft operating to and from Perth airport. The most common aircraft type to pass over the Roleystone monitor and create a correlated noise event was the A330-300 with an average noise level of 62.2dB(A).

Throughout the reporting period seven departures from Perth flew through the capture zone; of these operations two were jet aircraft (one a Fokker 100 and the other a Boeing 737-800). The Boeing aircraft registered in the top 10 average loudest aircraft with a recorded LAmax of 65.4dB(A).

The correlation summary is relatively low for this monitor when compared to other fixed monitors located nationally. This is the result of aircraft generally passing the community 5000ft above the ground; therefore the recorded aircraft noise is close to the determined threshold level.

Another factor resulting in a low correlation rate is the distance of Roleystone from Perth airport. The Roleystone deployment is located significantly further than any of the Noise and Flight Path Monitoring System's (NFPMS) fixed monitors, this can be seen in Figure 1. Due to this distance it is unexpected the noise levels would change significantly over a twelve month period due to seasonal variation.

Although the aircraft noise levels are in close proximity of the correlation threshold, the community will still be able to distinguish the aircraft noise. This is due to a combination of low background noise levels and the unique nature of aircraft noise.

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/

Glossary of Terms

A	Arrivals
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
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”.