

Review of the Canberra Region Environmental Monitoring Units

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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.

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1 Executive Summary

Airservices maintains and operates a Noise and Flight Path Monitoring System (NFPMS) as part of its environmental obligations. The NFPMS comprises a number of components, including Environmental Monitoring Units (EMUs) that collect noise data. Airservices periodically conducts a review of the location of the EMUs. This is a key element of the quality management of the NFPMS.

A review of Canberra region Environmental Monitoring Unit (EMU) locations has been conducted in accordance with the Terms of Reference Document (See Appendix A).

The findings of the review are as follows:

- The Canberra region has one permanent EMU location south of the airport. As a result the overall percent of aircraft captured as a noise event in the system is low. This is not a significant issue as flight paths to and from the north from the main runway do not travel over residential areas.
- Sensitive areas around the Canberra region have been identified from analysis of complainant locations and flight paths.
- The NFPMS is in general compliance with the standard for permanent monitoring of aircraft noise in the vicinity of airports(ISO20906:2009), with the following exceptions:
 - o The measurement of wind conditions and flagging of potential wind induced noise events above 10 m/s is not performed.
 - o The NFPMS should be configured to flag or classify noise events that are captured with an angle of elevation of less than 30 degrees.
 - o An estimation of uncertainty within the noise measurements for EMUs with non-ideal conditions is not in place.
- The background noise levels at each location are 15dB or more below the average aircraft maximum levels enabling adequate identification of aircraft movements and compliance with the requirements of ISO20906:2009.
- The EMU configuration in terms of threshold settings, correlation (data capture) zones, missed events and false positives has been determined within the service providers Noise Verification Report. No cause to alter the settings was determined.

Recommendations arising from this review are:

- The current noise monitor located at Jerrabomberra is to remain in its current location with no alteration with settings.
- Weather stations should be integrated onto permanent EMUs to enable compliance with ISO20906:2009.

During the finalisation of this EMU review, the tennis club where EMU 1 is located went through building works. This required the EMU to be decommissioned. A short term monitor was installed at the Jerrabomberra Public School (approximately 300m away) as a stop gap measure.

It was found that community noise from the school was quite high requiring the threshold settings for the replacement monitor to be adjusted. This indicated that the Short Term deployment at the school was not an optimal spot for the permanent EMU 1 replacement.

The results of this EMU review indicate that the general location of the original EMU 1 is acceptable. Therefore EMU 1 will be re-instated. In addition, the Short Term Monitoring Program is currently exploring placement options slightly to the west of EMU 1 to further improve the capture of RNP arrivals as the percentage of RNP arrivals is increasing. Placing the monitor slightly to the west of the current location should also help to improve the captured angle of elevation from RNP operations.

2 Context

Airservices has a legislated obligation, via the Air Services Act (1995), to regard the safety of air navigation as its most important consideration. Subject to that requirement it also has obligations to, as far as practicable; protect the environment from the impact of the operation and use of aircraft. Further, a Ministerial Direction made under this Act requires Airservices to maintain and operate a Noise and Flight Path Monitoring System (NFPMS) at major Australian airports. At present this system operates around Perth, Adelaide, Melbourne/Essendon, Canberra, Sydney, Gold Coast, Brisbane and Cairns airports.

The NFPMS comprises a number of components, including Environmental Monitoring Units (EMUs) that collect noise data. Airservices periodically conducts a review of the location of the EMUs. This is a key element of the quality management of the NFPMS.

3 Purpose

The purpose of this review is to assess the performance of the EMU in the Canberra area against Airservices environmental and business requirements for the management of aircraft noise, including assessing the performance of the EMU against the standard *ISO 20906:2009/Amd 1:2013* which relates to unattended permanent monitoring of aircraft noise in the vicinity of airports. In performing Airservices functions with respect to managing aircraft noise, the placement and individual configuration of each of the EMUs needs to be optimised for the measurement of the impacts of aircraft operations on the local community in the Canberra region. This review assessed the location of the current EMU and makes recommendations about the future use of EMUs.

In order to conduct this review, a period of flight data was selected for analysis. A full year's data was used where possible to eliminate any bias resulting from seasonal variation. The Financial Year 1 July 2013 to 30 June 2014 was used. All analyses in this report relate to that period unless otherwise stated.

4 Scope of Review

As per the review terms of reference (see Appendix A) this review addresses:

- 1) The location of each current EMU,
 - a) With respect to complainants.
 - b) With respect to sensitive regions.
 - c) With respect to flight paths.
 - d) With respect to communications coverage and reliability.
 - e) With respect to ISO 20906:2009.
 - f) Against local environmental conditions.
 - g) For security and access for maintenance.
- 2) Proposed future monitoring sites
- 3) Licensing issues,
- 4) Configuration of each EMU,
 - a) For noise event detection parameters; threshold, pre-trigger, duration.
 - b) For calibration and preventative maintenance.
 - c) Correlation zone.
 - d) For false positives.
 - e) For missed noise events.

In addition to the Terms of Reference, this review will also assess:

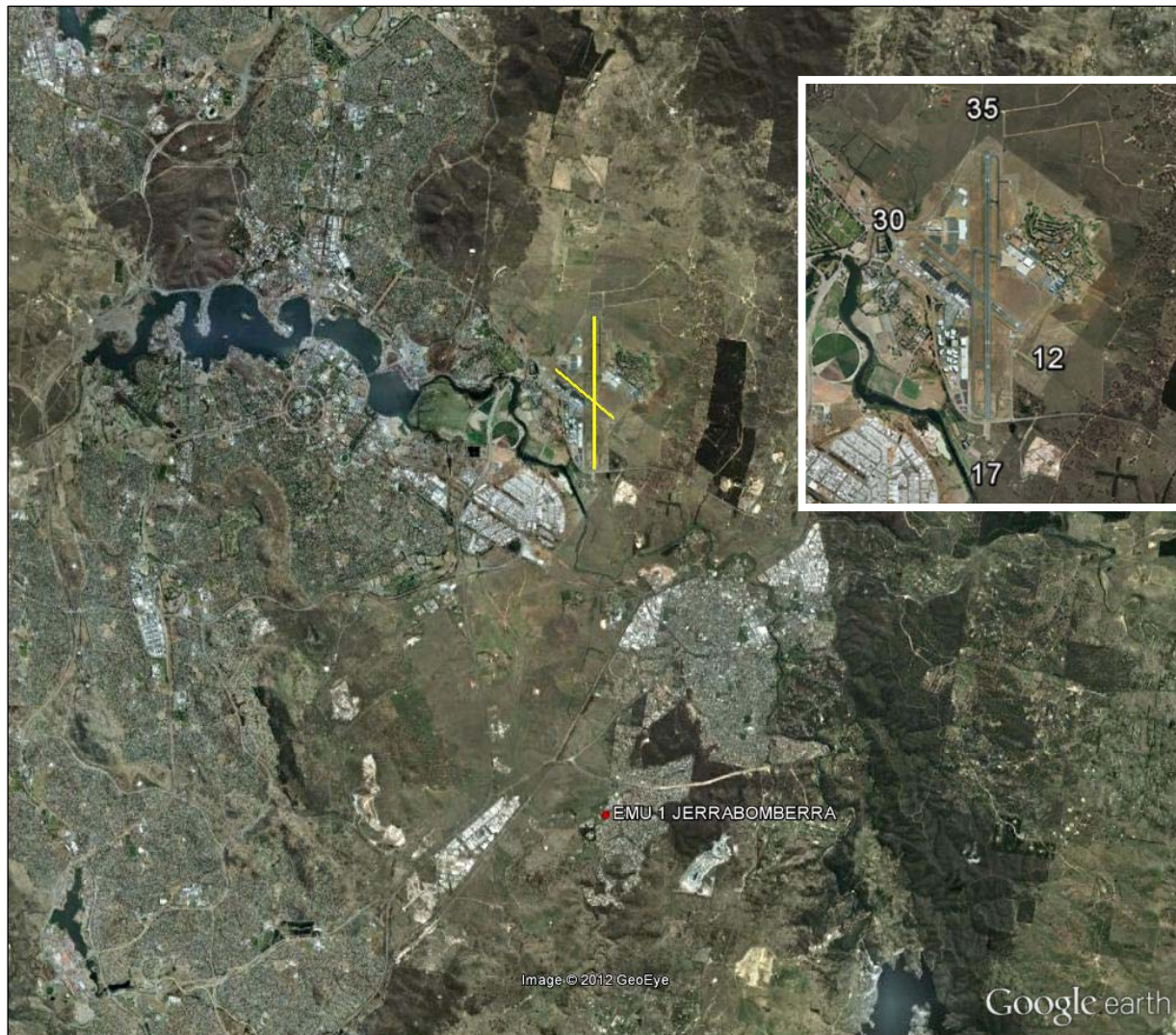
- 5) The adequacy of the NFPMS at Canberra with respect to placement and coverage of noise monitors, and
- 6) The location of the EMU with respect to sensitive land use areas.

5 Canberra EMU Background

The NFPMS has been installed and operating around Canberra since 2002. The Canberra component of the NFPMS currently has 1 installed EMU which is strategically located at Jerrabomberra, south of the airport as shown below in Figure 1.

The suburb of Jerrabomberra is located to the south east of the airport. Other operations in the Canberra area may originate from hospital helipads or the Southcare Helicopter base and adjacent ACT Emergency Services Agency helipads (around 7km south of the airport).

Figure 1: Location of Canberra Airport. Runway orientation for airport is shown in the insert.



The noise monitoring site is shown as a red dot.

6 Current EMU Locations

The exact location of the EMU is given in the table below with details of the runway to which the EMU is aligned, as shown in Figure 1.

Table 1: EMU Location

EMU		Longitude	Latitude	Altitude (m) (above sea level)	Runways Aligned	Distance to Runway end (DL)	Distance to Runway centerline (DS)	Noise Capture Threshold radius (km)
EMU 1	Jerrabomberra	149.1974	- 35.3883	604	17/35	7.6 km	0.2 km	3.5 km

Note: Distance measurements relate to methods described in Australian Standard 2021:2015 *Acoustics – Aircraft noise intrusion – Building siting and construction*. See example in Figure 2 below.

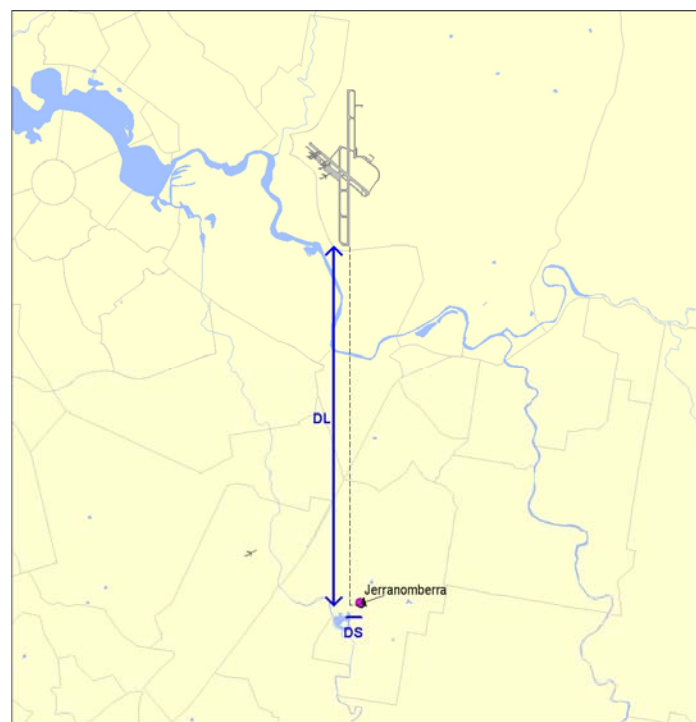


Figure 2: Distance Measurement Example

6.1 Historic EMU Locations

EMU locations have been chosen based on their close proximity to the airport and location under the flight paths at the time of installation.

Table 2: EMU Locations including the Short Term Monitoring Program

EMU		Longitude	Latitude	Runways Aligned	Noise Capture Threshold radius (km)
EMU 260	Googong	-35.4573	149.1929	17/35	22/07/2013 12:00am – 19/08/2013 12:00am

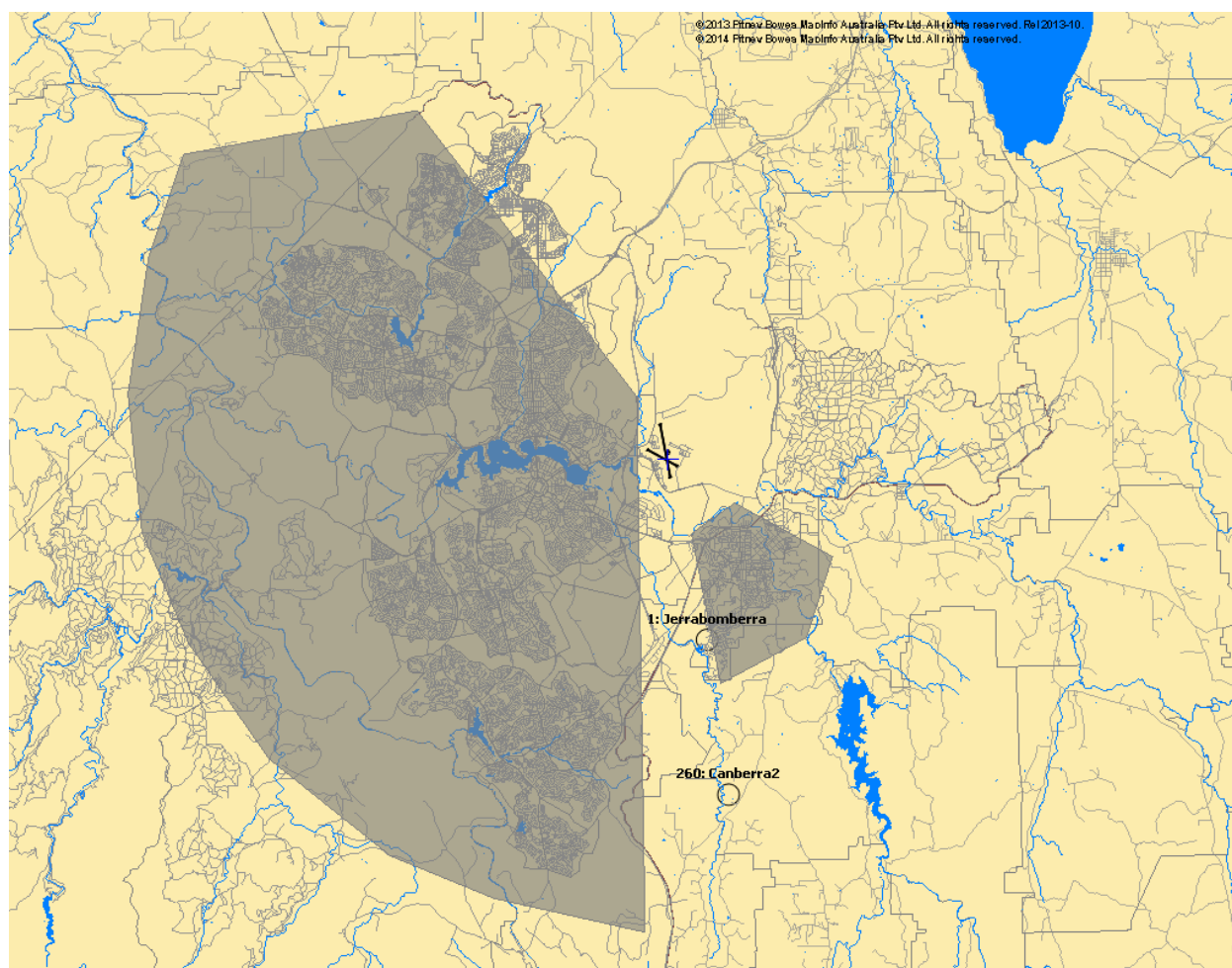


Figure 3: Short term monitoring location from 2013 and 2014, relative to the permanent monitor, EMU 1.

Figure 3 shows the location of all recent short-term monitoring activities and the current Noise Abatement Zones in grey. A report on the 2013 Short Term Monitoring Program conducted at EMU 260 – Googong was released in November 2013 and conclusion from this program included:

- An average LAMax of 67.0 dB(A) was recorded for correlated events
- Significantly the loudest movements recorded related to one-off events including military operations and Canberra Hospital helicopter events. This reflects trends noted in Section 8.3.

The full report for EMU 260 – Googong is available at:

<http://www.airservicesaustralia.com/publications/noise-reports/short-term-monitoring/>

7 Overall Correlated Noise Events and NFPMS Performance

The NFPMS relies on the capture and correlation of aircraft noise, therefore one measure to determine the effectiveness of the EMU system as a whole is to compare the number of flights that do not cause a correlated noise event (CNE) with the total number of movements. This provides an indication of how well the system captures and correlates aircraft noise as a whole and how many movements were potentially missed.

A non event may be caused by:

- a) Aircraft noise levels being too low at the EMU due to aircraft type,
- b) Large distances between the aircraft and the nearest EMU,
- c) Incorrect threshold settings of the EMU, or
- d) Meteorological effects.

High background noise levels have the reverse effect by causing a CNE that may be corrupted by extraneous (non-aircraft) noise.

The following table presents a summary of flights without correlated noise events compared with the total movements from July 2013 to June 2014 on a quarter by quarter basis for the Canberra region.

Table 3: Percentage non-correlated with total movements – Canberra Airport

Operation Type	Aircraft Category	Quarter	Total Movements	No Correlated Event	%
A	Helicopter	Q3_2013	17	14	82%
A	Helicopter	Q4_2013	48	45	94%
A	Helicopter	Q1_2014	45	40	89%
A	Helicopter	Q2_2014	27	22	81%
D	Helicopter	Q3_2013	16	16	100%
D	Helicopter	Q4_2013	39	39	100%
D	Helicopter	Q1_2014	37	36	97%
D	Helicopter	Q2_2014	22	22	100%
T	Helicopter	Q4_2013	4	4	100%
T	Helicopter	Q1_2014	28	26	93%
T	Helicopter	Q2_2014	3	1	33%
A	Jet	Q3_2013	3300	250	8%
A	Jet	Q4_2013	3192	652	20%
A	Jet	Q1_2014	2981	453	15%
A	Jet	Q2_2014	3261	604	19%

Operation Type	Aircraft Category	Quarter	Total Movements	No Correlated Event	%
D	Jet	Q3_2013	3301	3123	95%
D	Jet	Q4_2013	3191	2824	88%
D	Jet	Q1_2014	2987	2694	90%
D	Jet	Q2_2014	3256	2782	85%
T	Jet	Q3_2013	5	1	20%
T	Jet	Q4_2013	8	2	25%
T	Jet	Q1_2014	2	0	0%
T	Jet	Q2_2014	15	10	67%
A	Non-Jet	Q3_2013	5618	1486	26%
A	Non-Jet	Q4_2013	5461	2056	38%
A	Non-Jet	Q1_2014	4955	1348	27%
A	Non-Jet	Q2_2014	5008	1474	29%
D	Non-Jet	Q3_2013	5624	5392	96%
D	Non-Jet	Q4_2013	5433	4868	90%
D	Non-Jet	Q1_2014	4948	4541	92%
D	Non-Jet	Q2_2014	5007	4347	87%
T	Non-Jet	Q3_2013	200	162	81%
T	Non-Jet	Q4_2013	348	322	93%
T	Non-Jet	Q1_2014	263	228	87%
T	Non-Jet	Q2_2014	221	205	93%

Table 4: Percentage non-correlated with total movements – Canberra Hospital and Southcare Helipad

Operation Type	Aircraft Category	Quarter	Total Movements	No Correlated Event	%
A	Helicopter	Q3_2013	108	78	72%
A	Helicopter	Q4_2013	129	98	76%
A	Helicopter	Q1_2014	99	73	74%
A	Helicopter	Q2_2014	68	55	81%
D	Helicopter	Q3_2013	58	39	67%
D	Helicopter	Q4_2013	70	48	69%

D	Helicopter	Q1_2014	44	33	75%
D	Helicopter	Q2_2014	40	23	58%

Note that “unknowns” are excluded from the above tables. Unknowns are usually aircraft that do not have a flight plan recorded in the air traffic control system and are mainly smaller propeller driven aircraft. Overflights recorded in the Canberra region have also been excluded.

The above table shows a high percentage of departing jet movements associated with Canberra airport that do not cause a correlated noise event at EMU 1. This is mainly related to the location of EMU 1. EMU 1 is located to capture movements to the south of the airport from Runway 35 arrivals and some Runway 17 departures. Operations on Runway 12/30 as well as Runway 35 departures and Runway 17 arrivals are not captured by this EMU.

The percent of movements captured by the system could be vastly improved by locating a noise monitor to the north of the airport. However, there are no residential areas directly aligned to the north. Residential areas in the Canberra region are also covered by Noise Abatement Zones shown above in Figure 3. The extension of these zones is outside the scope of this review. There is no recommendation to locate a noise monitor directly north of the airport.

8 Complainants Analysis

Airservices manages complaints and enquiries about aircraft noise and operations through its Noise Complaints and Information Service (NCIS). Complaints, enquiries and requests for information about aircraft operations received by the NCIS are collected and stored in a database for the purpose of complaint management, analysis of issues and identification of causal factors. Each complaint, enquiry or request for information is referred to as a contact and each person who makes contact with the NCIS is referred to as a complainant. Whilst complainant and complaint information recorded by the NCIS is an imperfect indicator of community concern about aircraft noise, it is the most complete and reliable data set available for this analysis.

The following sections analyse complaints about operations at Canberra airport and show where the EMU is positioned in relation to complainants. This data is gathered by the Noise Complaints and Information Service (NCIS) for the financial year from July 2013 to June 2014. The data does not include complainants who contacted other organisations (eg. airports).

8.1 Complainants Density – Canberra Airport

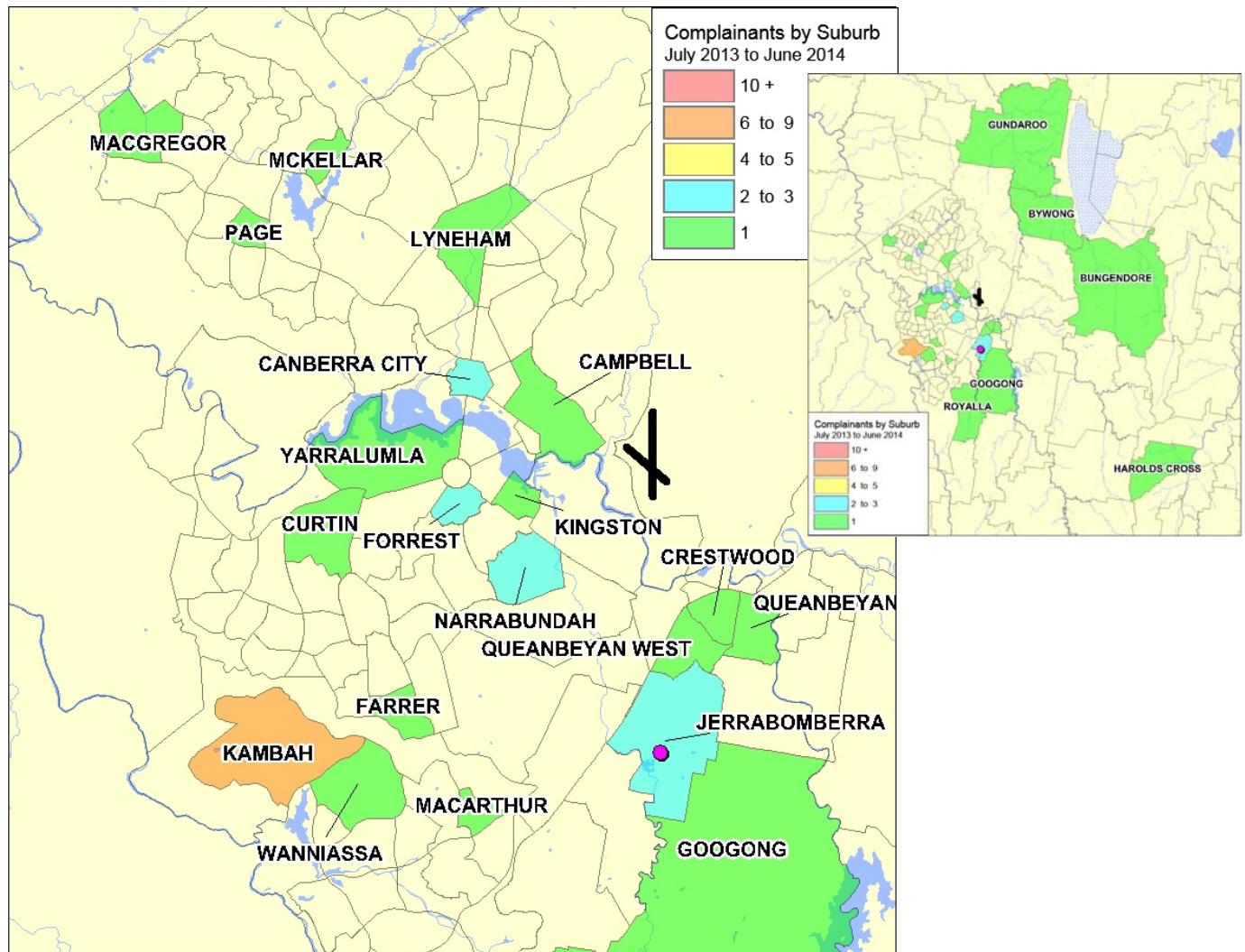


Figure 4: Canberra Airport Complainants July 2013 – June 2014

Figure 4 shows suburbs with the complainants relative to Canberra Airport and the EMU location (pink dot). Complainant suburbs are generally aligned with the runways and flight tracks shown in Section 8.4. However due to the distribution of flight paths in predominantly over non-residential areas, one-off and out of the normal operations across the region do tend to result in complaint distributions which do not follow this flight path, for example the cluster including Kambah, as shown above in Figure 4.

8.2 Complainants Density – Non-Airport Operations in the ACT

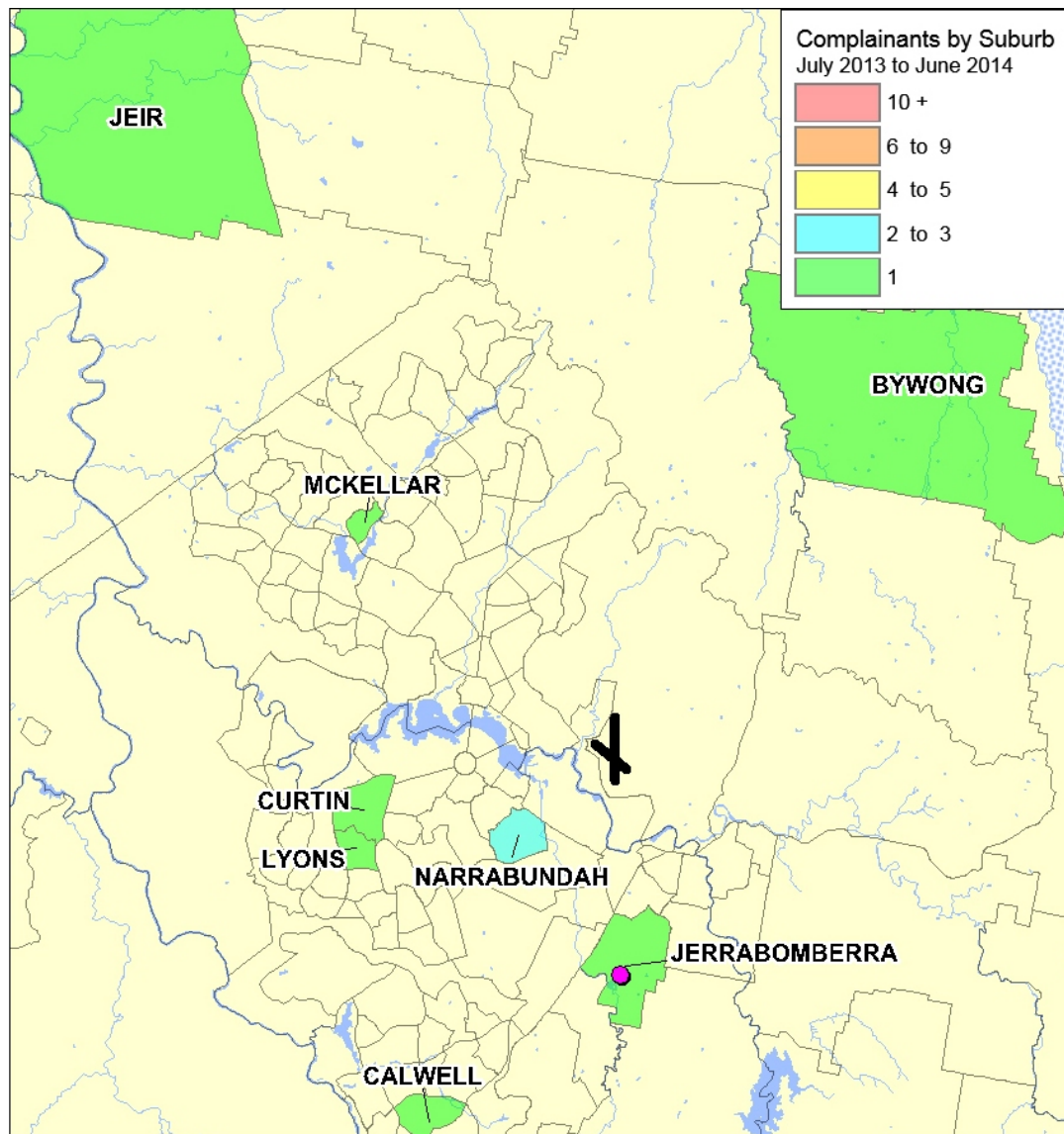


Figure 5: Complainants for non-Airport Operations, July 2013 - June 2014

The above image shows complainants relating to non-airport operations (predominately helicopter activity) in the Canberra region. This includes operations coming from outside the Canberra region, such as Military Fly-overs. The EMU shown above as the pink circle is not located to measure these noise levels.

8.3 Key Issues of Complaints

Figure 6 below shows the issues raised by complainants five or more times for the Canberra region in the 12 months July 2013 – June 2014. It should be noted that a single contact can involve multiple issues (i.e. a complainant may have raised more than one issue when they contacted the NCIS).

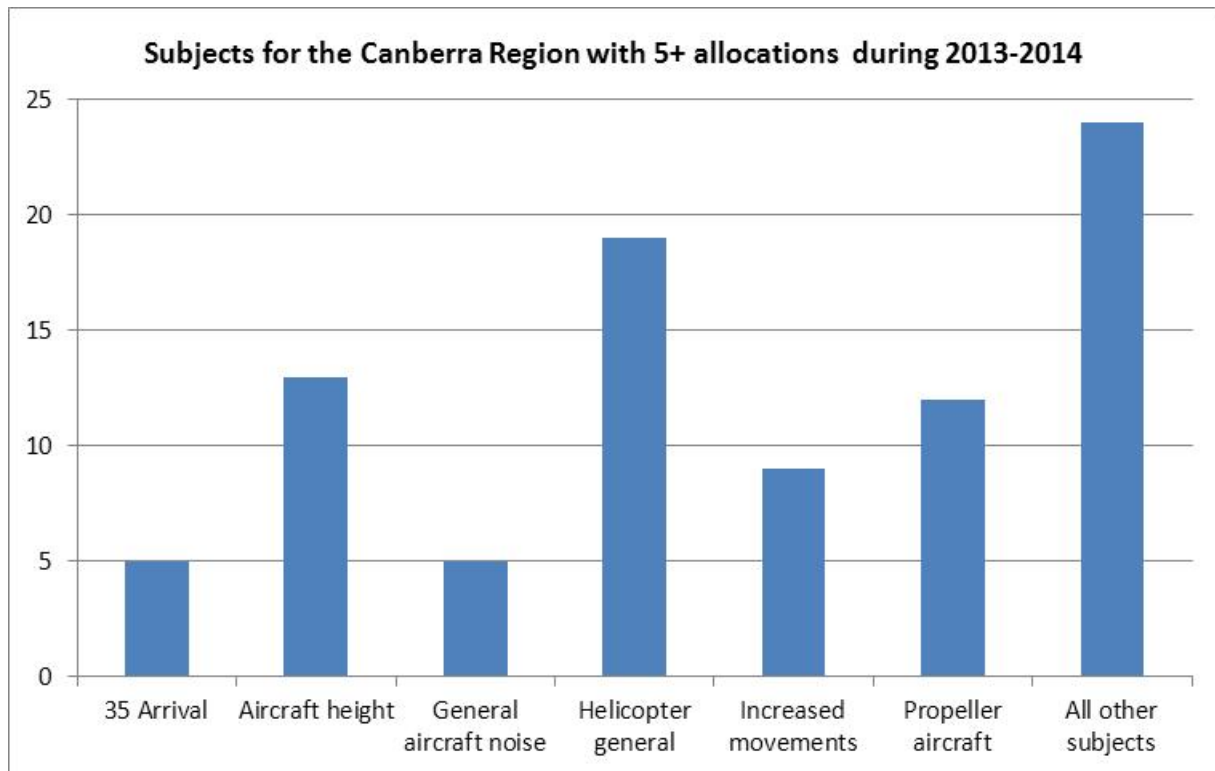


Figure 6: Issues raised 5+ times during July 2013 to June 2014, from the Canberra Region

Key points shown in Figure 6 are:

- A large portion of contacts received by the NCIS from the Canberra region relate to helicopter operations - approximately 20% of all issues raised (28% of all cases relate to helicopter activity). This trend is reflected in the broad distribution of complainant locations both in Figure 4 and Figure 5
- Many of the complainants during this period contacted the NCIS regarding powerline maintenance operations which resulted in low operations over generally unaffected areas of Canberra. These are shown in Figure 4.

Figure 7 below shows the issues raised by complainants five or more times for the Canberra Airport in the 12 months July 2013 – June 2014.

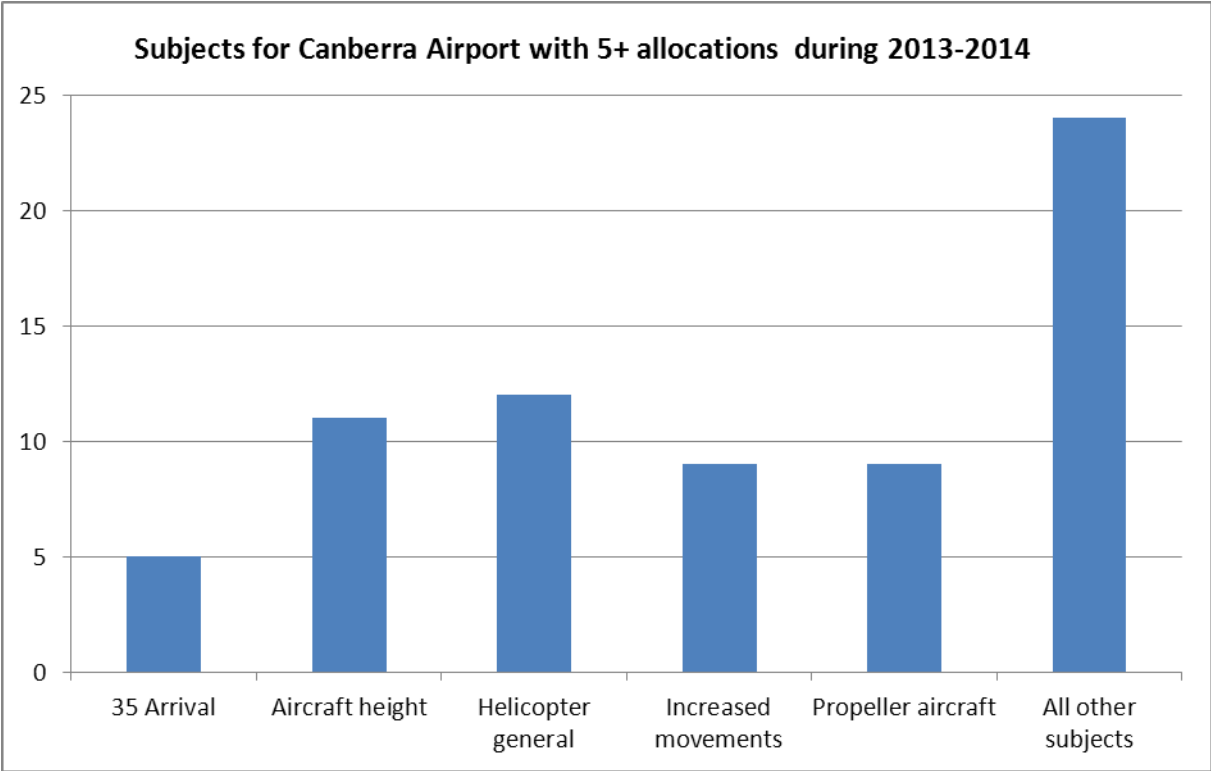


Figure 7: Issues raised 5+ times during July 2013 to June 2014, for Canberra Airport

8.4 Complainants with Respect to Flight Paths – Canberra Airport

Complainants with respect to flight paths at Canberra Airport have been assessed in the following section. The two figures below overlay a sample of jet operations onto complainant location maps. The sample of operations is for a single week from 3 February 2014. The purpose is to show how complainant locations relate to flight paths and EMU locations. Departure and arrival operations have been separated into two figures for clarity. The pink dot shows the EMU location.

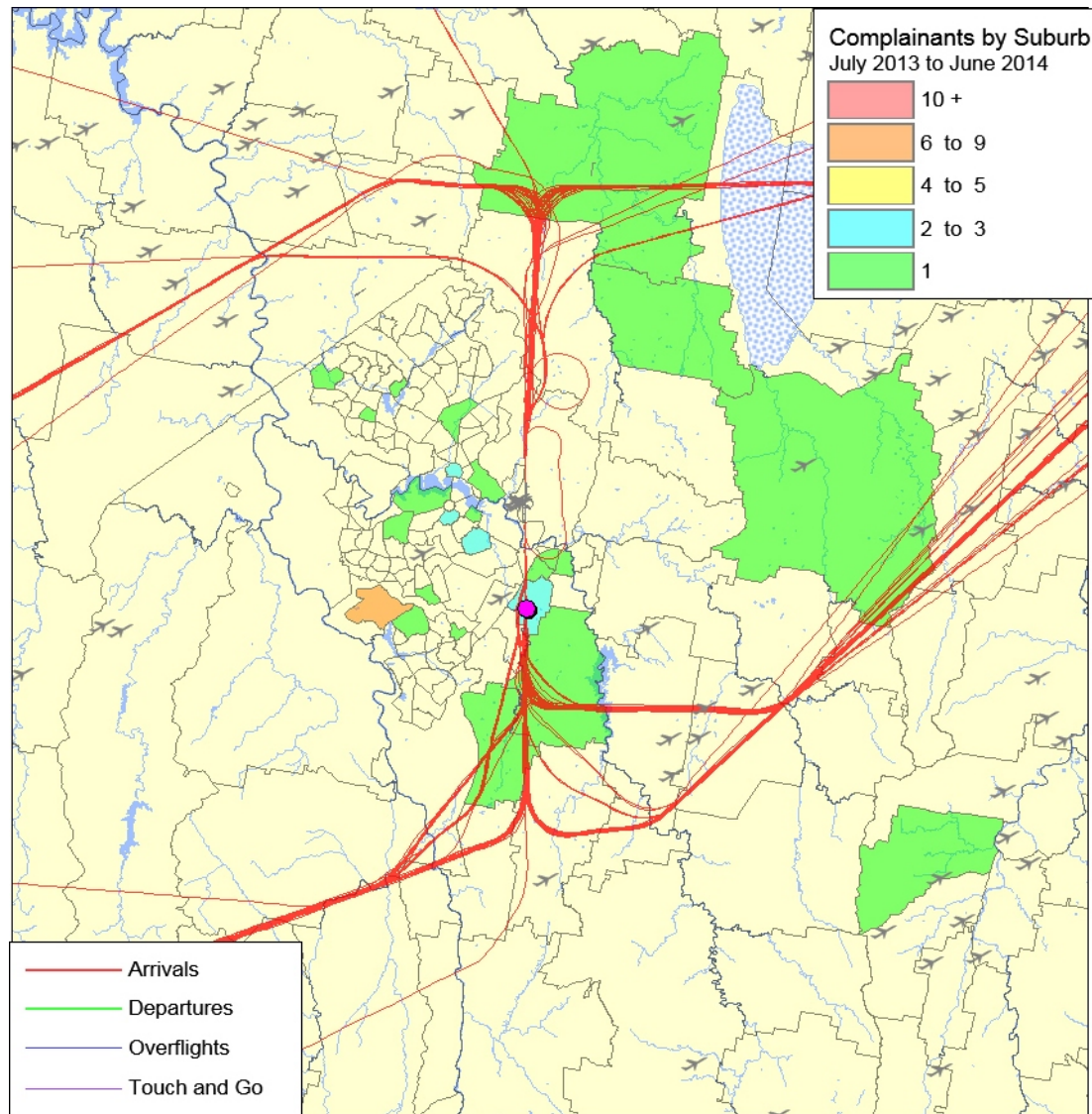


Figure 8: Canberra Airport Complainants with Respect to Jet Arrivals

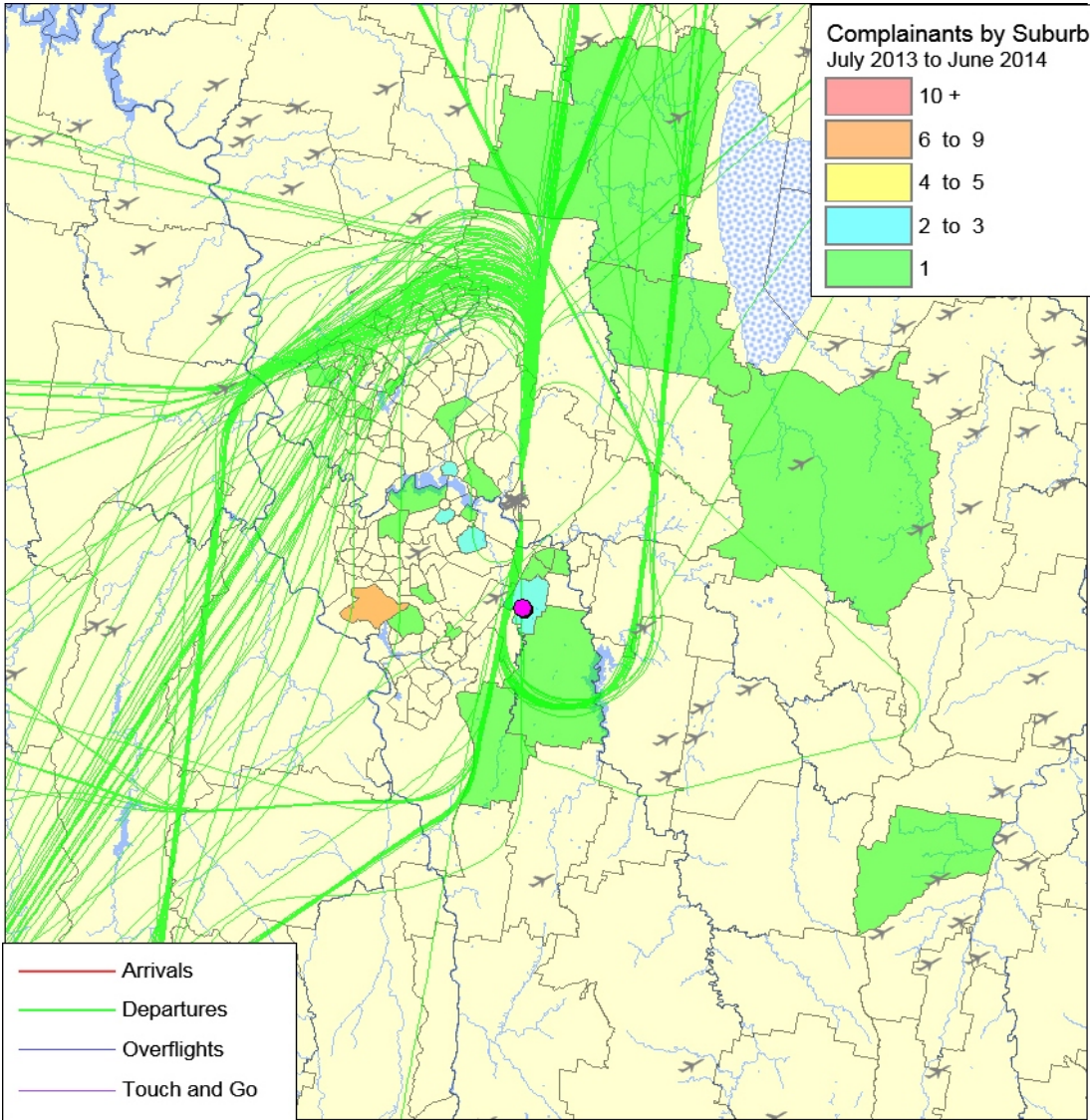


Figure 9: Canberra Airport Complainants with Respect to Jet Departures

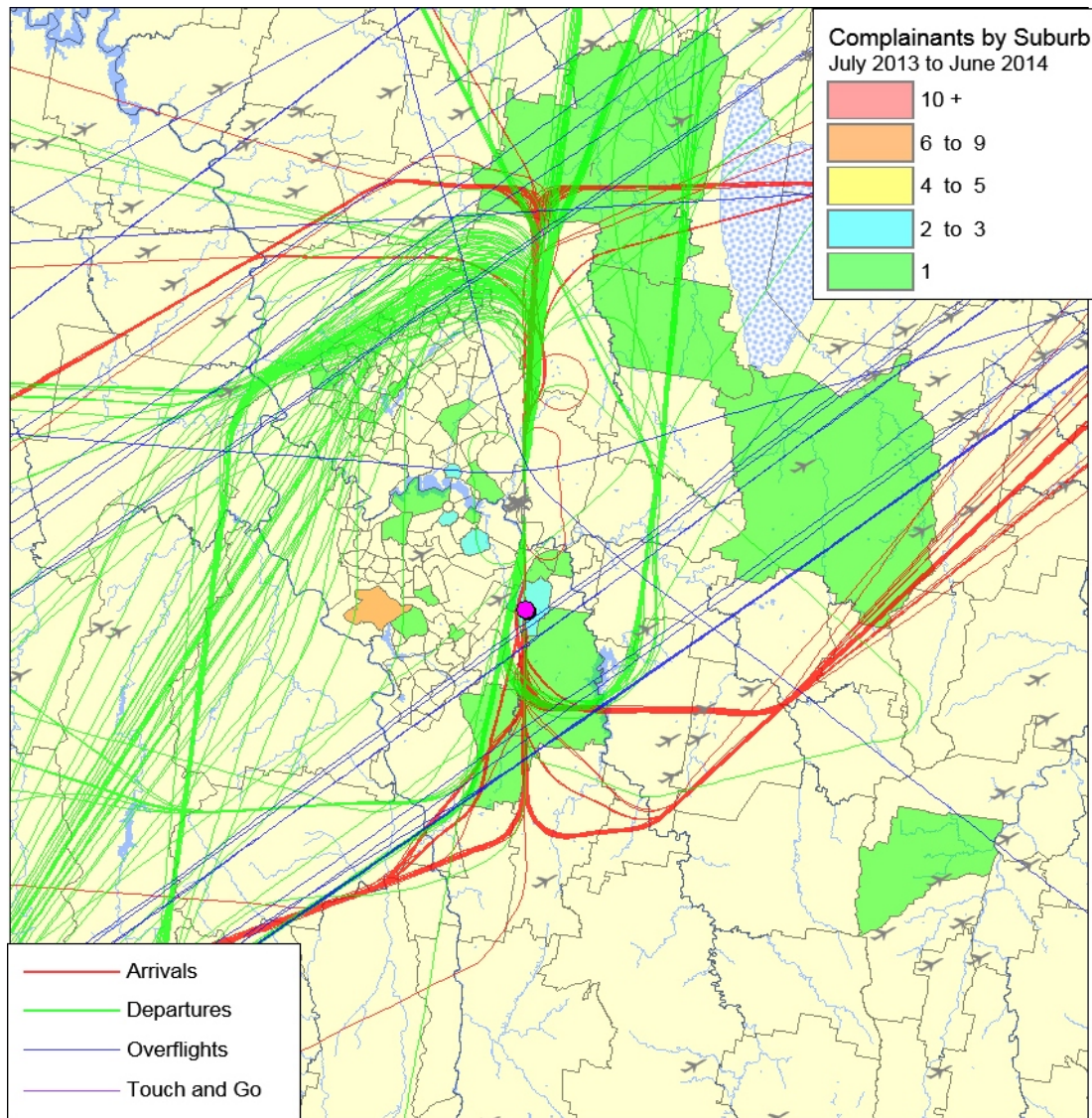


Figure 10: Complainants with Jet Flight Paths

There is a flight path associated with high altitude jet aircraft traffic overflying Canberra between Sydney and Melbourne.

The coloured areas above show that complainants are fairly dispersed within the Canberra area and do not only concentrate underneath flight paths, though there is a degree of this which occurs. This can predominately be explained by the flight paths and preferred runways directing operations over non-residential areas.

Similar analysis was undertaken of non-jet arrivals, departures and other operations for one week from 3 February 2014 in the Canberra monitoring region. These were overlaid on Canberra Airport complainant map (Figure 5). These operations are shown in the following two figures.

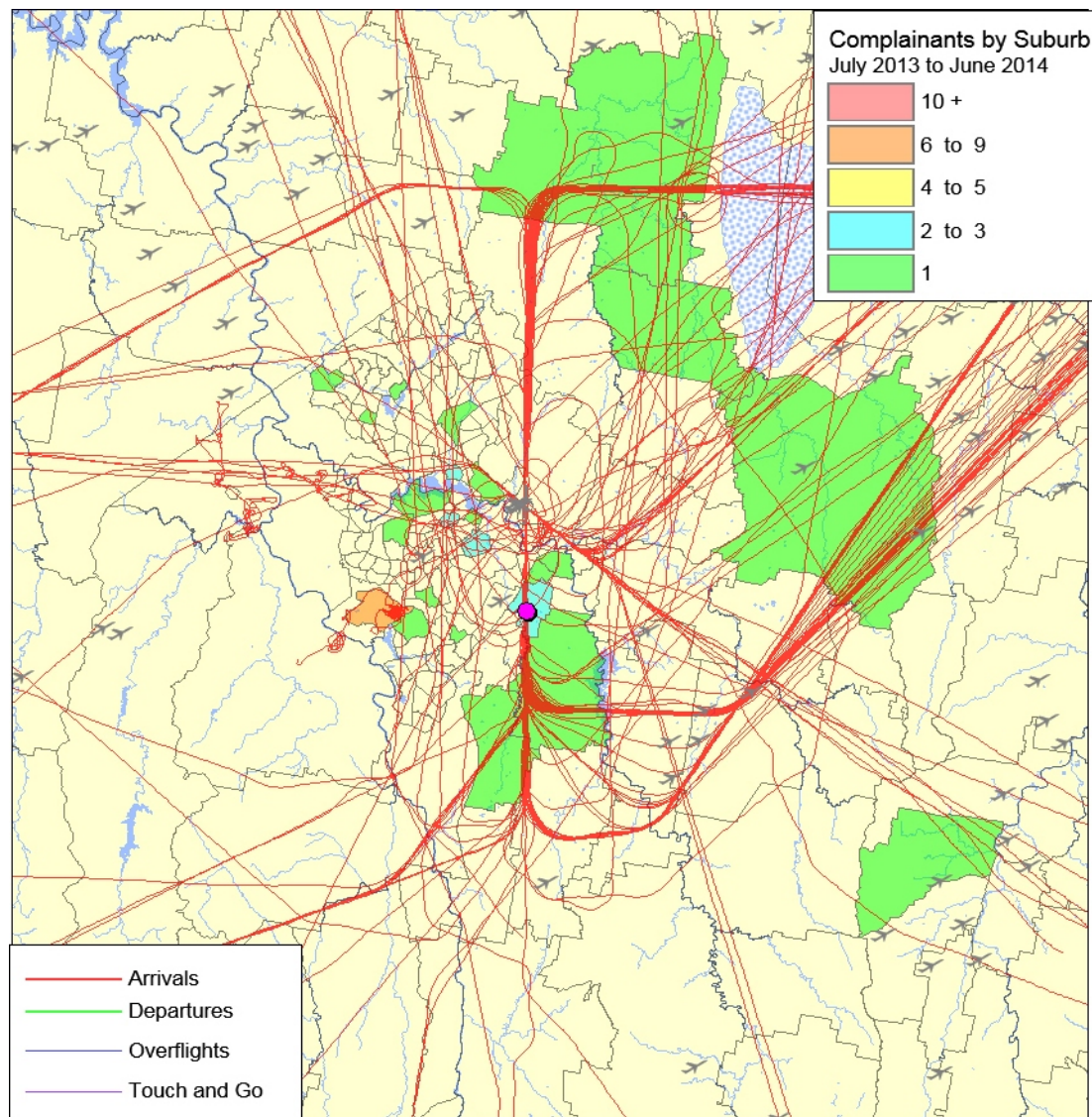


Figure 11: Complainants with Non-Jet Arrivals

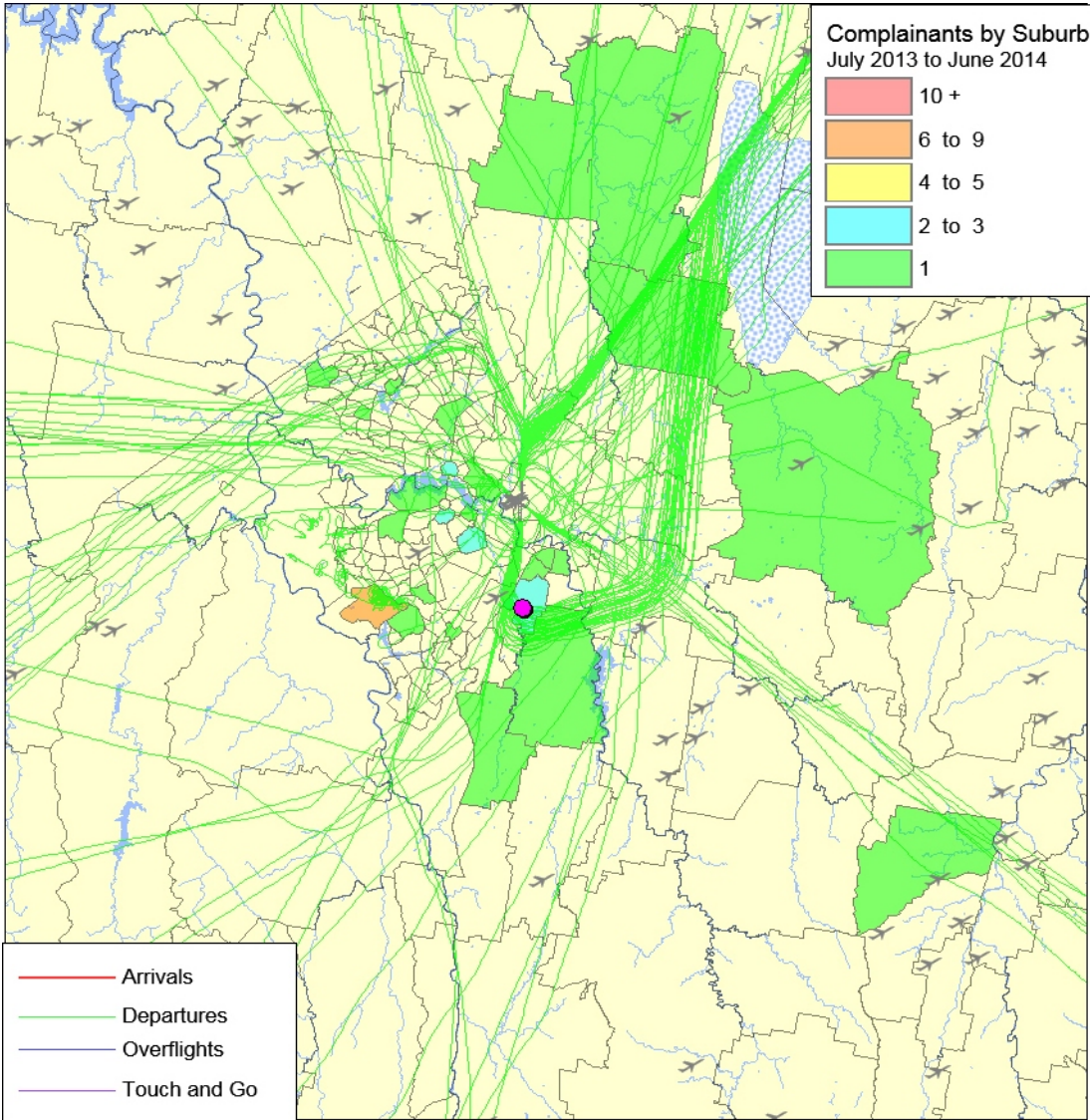


Figure 12: Complainants with Non-Jet Departures

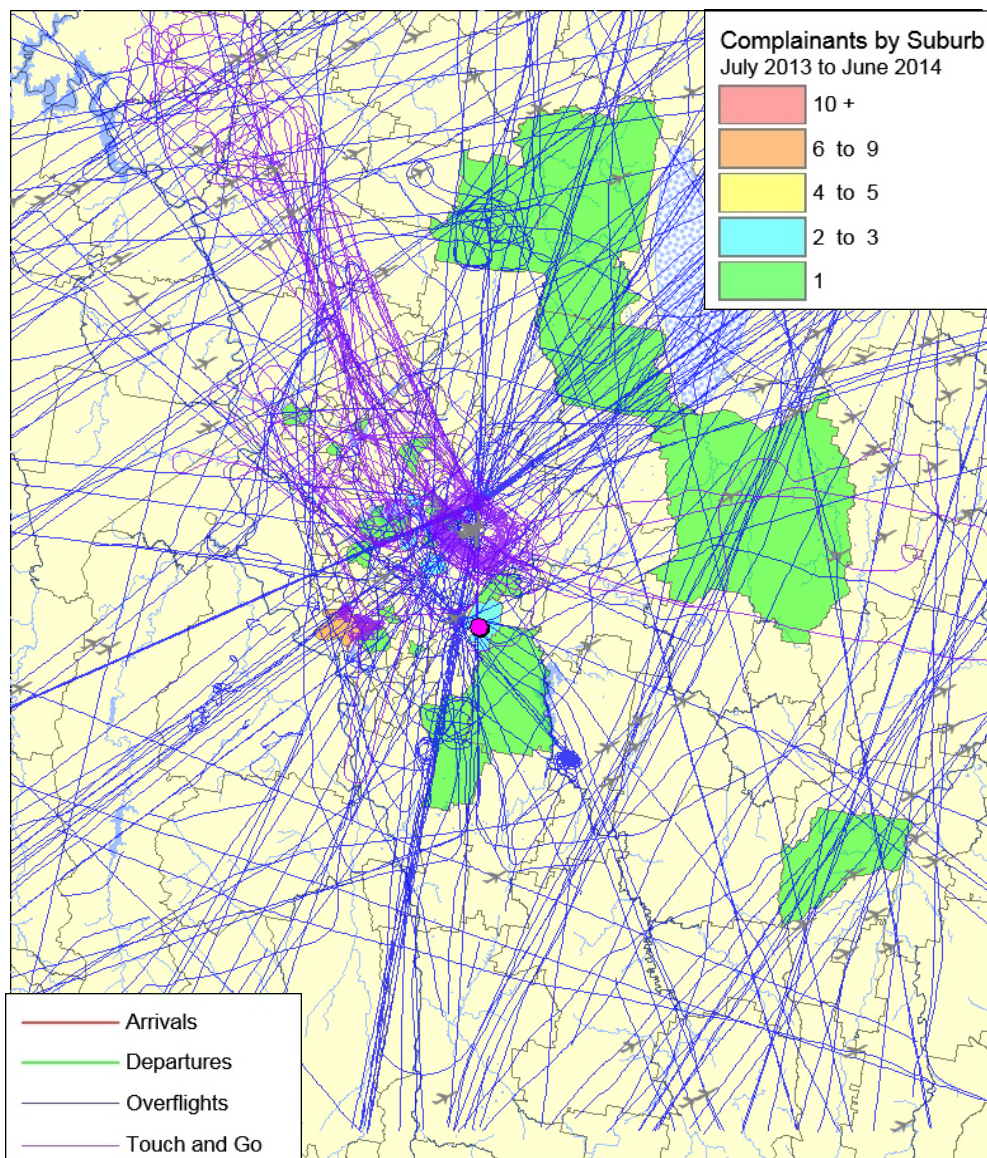


Figure 10: Complainants with Non-Jet Overflights and Touch & Go Operations

Non-jet operations are generally more spread out than jets as shown above. While most areas of Canberra are overflown by aircraft there are distinct jet flight paths.

8.5 Complainants in Relation to EMU Locations

When reviewing the information above, the following observations can be made:

- Complainants are generally spread around the Canberra area with highest numbers directly south of the airport in residential areas.
- Concentration of RPT flight paths over residential areas only occur over Jerrabomberra and Queanbeyan (NSW).

8.6 Population within Capture Threshold

The population within the capture zone of EMUs is assessed below to help determine how useful EMU locations are in relation to community coverage. Also, a map of designated land use is displayed.

The population around the EMU has been calculated using available 2011 census data from the Australian Bureau of Statistics (ABS). The settings of the EMU have been used to determine the population within each capture zone. The capture zones is highlighted below.

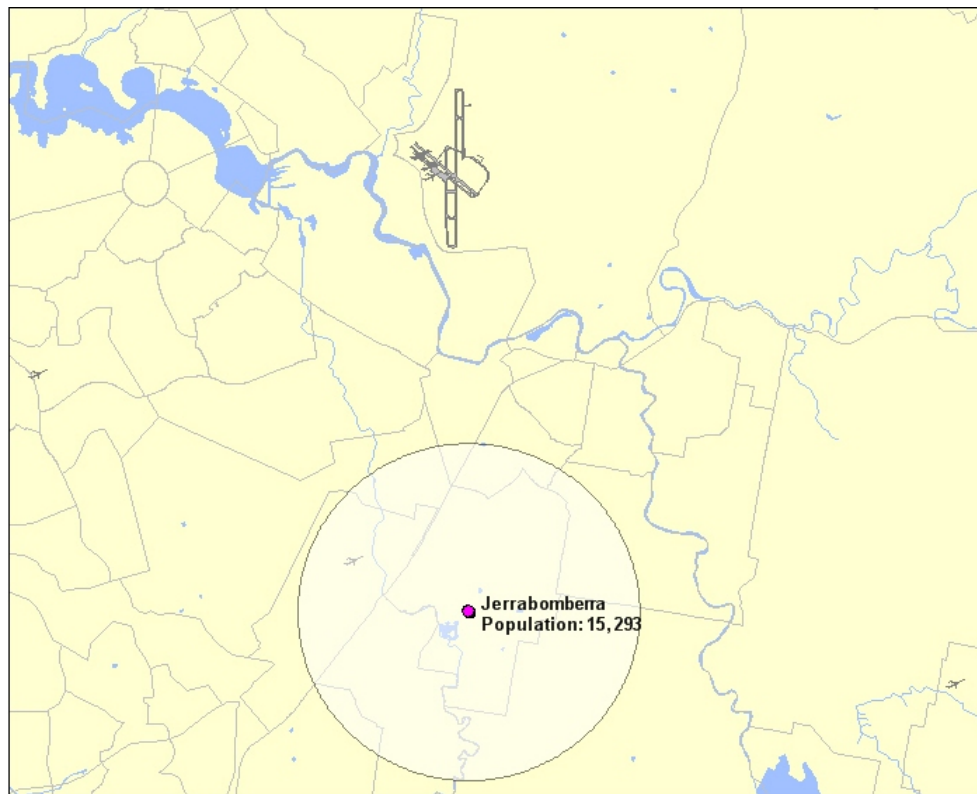


Figure 14: Population Covered by EMU

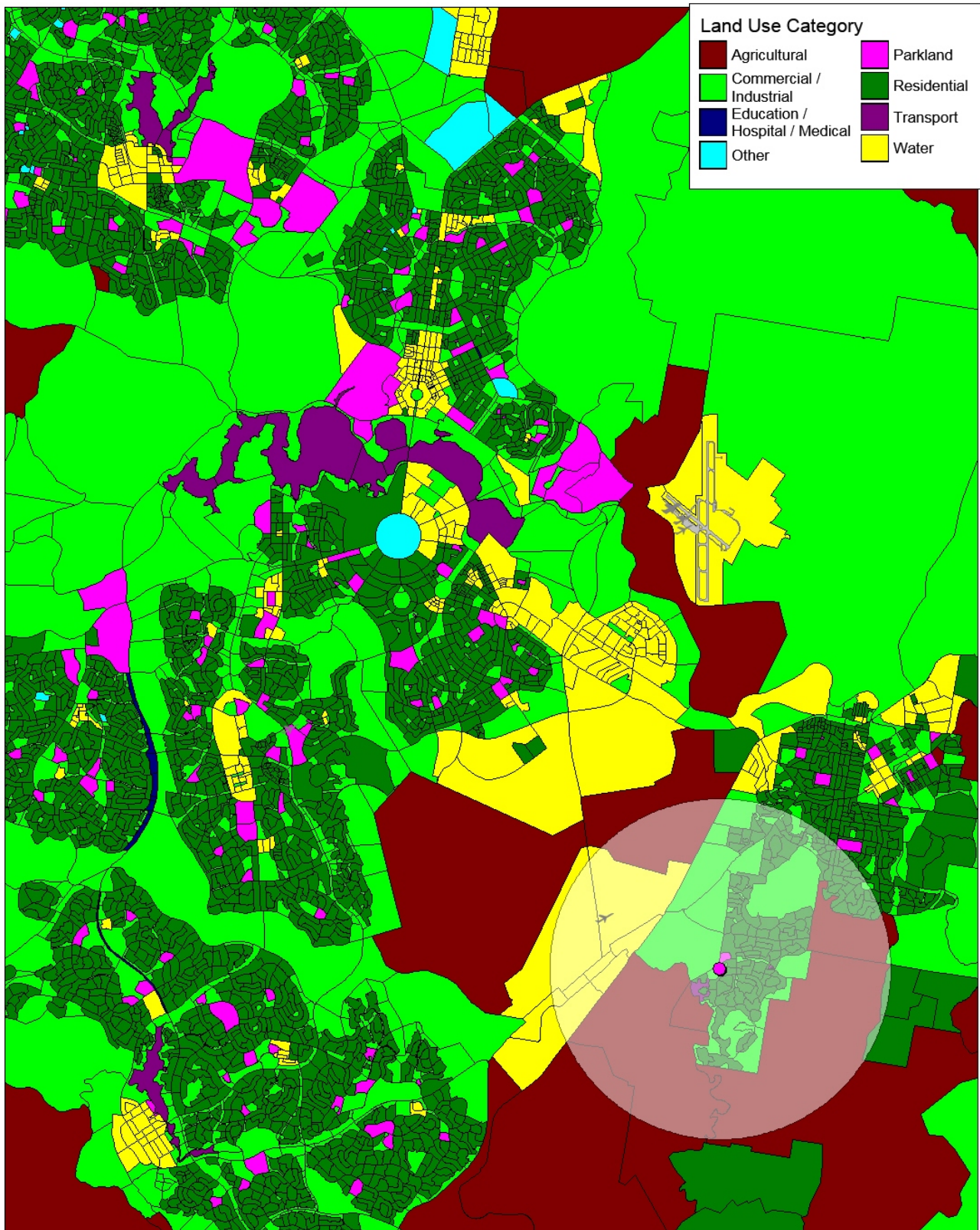


Figure 15 Designated Land Use Areas

The image above shows that the EMU is located in a combined agricultural, commercial and parkland area with a smaller percentage residential. The Canberra region has dense residential areas, surrounded by extensive areas of agriculture and parkland, Figure 8 to Figure 10 show that jet operations generally utilize these non-residential areas as per the jet flight paths.

9 Communications Coverage and Reliability

The following table presents the percentage of days that the EMU was available to collect data over the study period from July 2013 to June 2014. Data loss can occur due to:

- Preventative maintenance,
- Internal calibration,
- Power outages,
- Internal faults within the EMU itself.

Table 5: Analysis of Operational Days – Percentage of Total Possible Number of Days

Number	Location	Q3_2013	Q4_2013	Q1_2014	Q2_2014
1	Jerrabomberra	99.7%	94.7%	98.9%	99.7%

Note that a network outage would not cause data loss unless the outage was excessive. Data is usually restored from the EMU once the network is restored. The above table shows good availability of the system over the study period.

10 EMU Configuration Review and *ISO 20906:2009/Amd 1:2013* Requirements

ISO 20906:2009/Amd 1:2013 relates to unattended permanent monitoring of aircraft noise in the vicinity of airports. To be compliant with this standard, the following site requirements are relevant:

- Aircraft noise should be at least 15dB above the non-aircraft background noise,
- Angle of elevation of aircraft relative to the ground plane is to be greater than 30 degrees,
- The line-of-sight angle to the flight path should be free of any obstructions for at least 70 degrees,
- The microphone is to be 6 m from ground and 10 m from reflecting surfaces (to limit the uncertainty of measured noise data),
- Temperature, relative humidity and precipitation shall be measured at one or more representative sites at or close to the airport and/or the noise monitors,
- Wind conditions should be measured at more than one site to ensure acquisition of data that is representative of wind conditions at the noise monitors,
- Noise events that occur for wind speeds >10 m/s should be flagged by the system,
- Calibration of noise and meteorological instrumentation need to be performed yearly,
- Monitoring of conditions to identify an acceptable level of uncertainty in noise measurements should be undertaken.

The current Noise and Flight Path Monitoring System is in general accordance with the above requirements with the exception of wind conditions and an estimate of uncertainty. Noise events measured during periods of wind speed greater than 10 m/s are currently not flagged. Therefore, the NFPMS runs the risk of reporting on noise levels that may be elevated due to high wind conditions.

10.1 False Positive Analysis

Noise events are analysed to determine whether non-aircraft noise is contributing to the captured noise event. It is performed by comparing noise events from a particular aircraft to an expected average noise level according to the aircrafts distance from the noise monitor. A noise event which is significantly different to the expected level is considered a false positive.

False positive analysis was performed by the service provider using a representative sample of B737-800 that flew to or from Canberra Airport over a certain period. Results of the analysis were provided via a verification report. No cause to change noise monitor settings was identified during the analysis.

10.2 Missed Events

In an ideal installation, all tracks within close proximity to a noise monitor will be matched to a resultant noise event. These noise events are called Correlated Noise Events (CNEs). Each CNE will have an associated track and vice versa.

Complete matching is not expected, however a lack of matches can reveal anomalies that need to be investigated to ensure the system is still functioning as it was intended when first installed. The correlation rates for each monitor were analysed by the Service Provider and results provided via a verification report. The correlation analysis used B738 aircraft over the period of June 2013 that flew within 1000m of the EMU. The monitor was found to be correlating as expected and no cause to alter EMU settings was established.

10.3 EMU Elevation Angle

To be in accordance with ISO20906:2009, aircraft captured by the EMU should have a minimum angle of elevation of 30 degrees. This is to reduce any ground attenuation affects on the noise levels.

An analysis of elevation angle for captured noise events has been performed. Figure 16 and Figure 17 show the horizontal and vertical height of each noise event for various aircraft types. The red line indicates an angle of 30 degrees. Noise events on the graph to the right of the red line have an elevation angle less than the required 30 degrees. The duration of each noise event is also presented with colour grading.

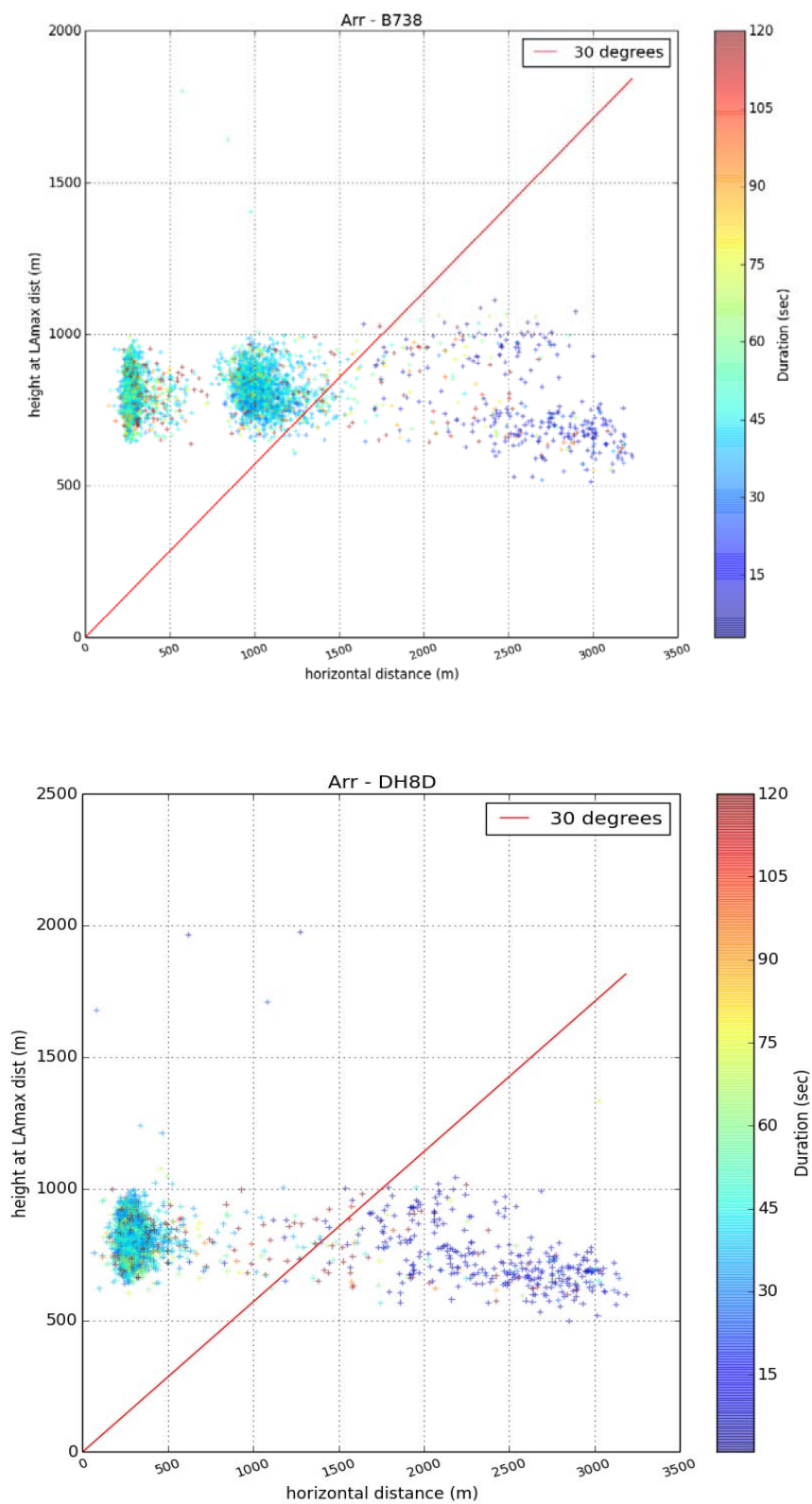


Figure 16: Angle of Elevation (Arrivals)

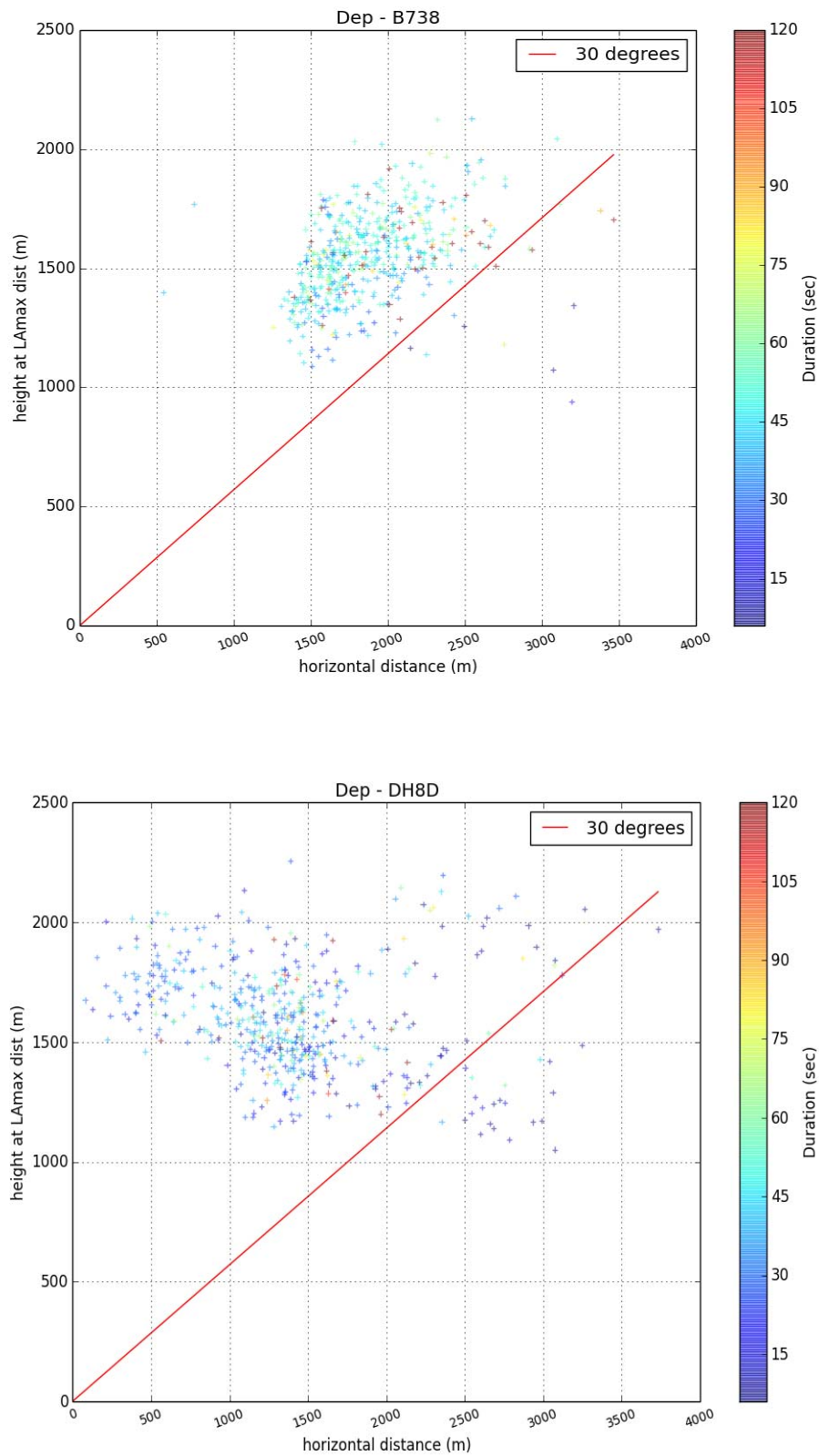


Figure 17: Angle of Elevation (Departures)

The above figures show that the majority of noise measurements captured by EMU 1 have an angle of elevation greater than the required 30 degrees. However some measurements with low elevation angle exist. In the sample data above, around 10% of B738 arrivals were less than the required 30 degrees. These measurements are typically have short duration times of around 6 to 10 seconds.

It is evident that the monitor is picking up short aircraft events early causing multiple noise events per overflight on arrival. It may be possible to reduce the capture radius of the monitor, however this would affect its ability to capture departure noise events. It may also be possible to change the minimum duration time for a noise event to 10 to 15 seconds rather than the current settings of 6 seconds. Further analysis of this should be undertaken to ensure noise events are not missed or double counted.

It is recommended that the NFPMS tags each movement that is below the 30 degree requirement for reporting purposes. This will enable reporting to distinguish between measurements that have a higher degree of uncertainty and those that meet the Standard.

10.4 Background noise levels

ISO 20906:2009/Amd 1:2013 indicates that to provide reliable aircraft noise event detection using a technique based on Sound Level discrimination only; sites should be selected such that the maximum sound pressure level of the quietest aircraft to be detected is at least 15 dB greater than the residual long-term-average sound pressure level (background noise level L_{90} dB(A)). The Noise and Flight Path Monitoring System uses both radar and noise information to correlate noise events, and therefore the requirements of ISO 20906:2009/Amd 1:2013 do not strictly apply however Airservices generally adopts this criterion for permanent EMUs. The level of 15dB above background is considered a reasonable approach and is the level at which the aircraft sound event will be uncontaminated by background noise.

The background noise levels are assessed annually by the NFPMS service provider B&K. The average hourly L_{90} for the monitor, the current threshold and the average LA_{Max} levels for both jets and non-jets during the month of June 2013 can be seen in the images below.

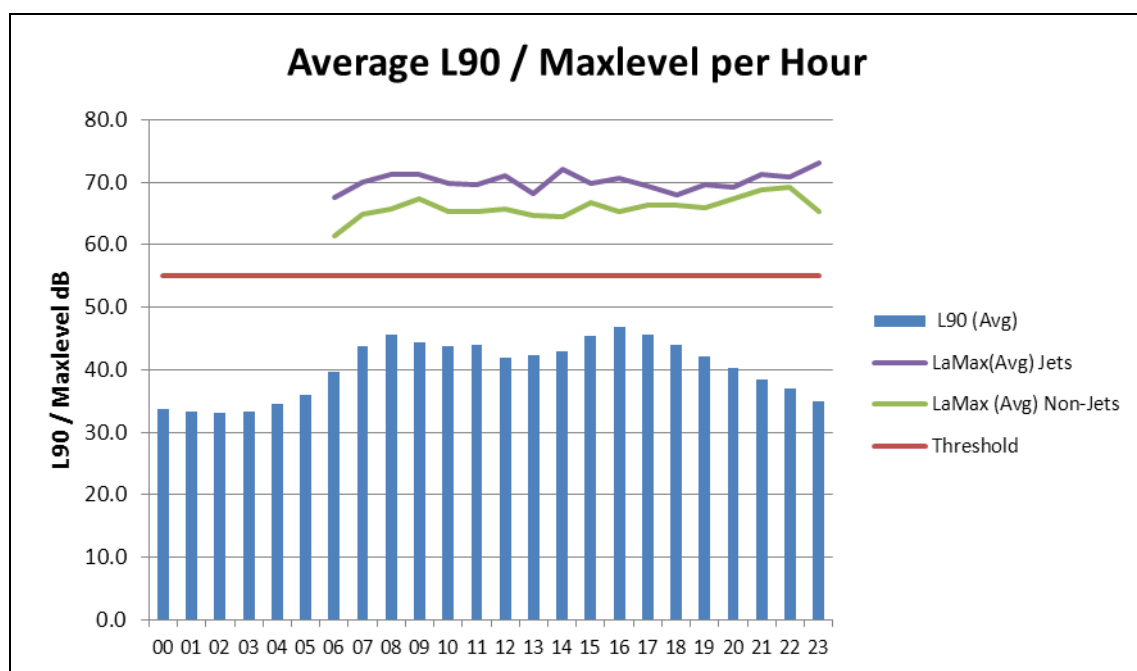


Figure 18: EMU 1 Background Levels

Threshold settings for EMU 1 are well above the background levels. No reason to change the threshold settings of the monitor was found.

10.5 EMU Calibration and Preventative Maintenance

EMU preventative maintenance and site inspection for each permanent site is performed annually. An EMU Maintenance Report is produced by the service provider. During the study period, all preventative maintenance was performed in July 2013.

Table 6: Preventative Maintenance Summary 2013

EMU	Location	Date	Details
1	Jerrabomberra	13/6/2014	Microphone, desiccant, bird spike and wind screen replaced

Automatic calibration checking is performed daily using an electrostatic calibration test. Daily calibration is performed 4 times a day. Calibration checking can also be performed adhoc as required.

Annual acoustic calibration was performed during preventative maintenance. The microphone was replaced during preventative maintenance and calibrated. Calibration results are provided in the EMU Maintenance Report.

The above calibration methods are in accordance with Section 4.8 of ISO 20906:2009/Amd 1:2013.

10.6 EMU Configuration Summary

The configuration of each EMU has been reviewed by the service provider B&K and data provided in a Noise Verification Report. The service provider Noise Verification Report details the configuration of each EMU in relation to:

- Threshold settings for each EMU including noise event detection parameters and trigger settings,
- Noise correlation results including missed events and an analysis of false positives, and
- Calibration and preventative maintenance.

The above information from the service provider's report has been incorporated into sections 10.1, 10.2, 10.4 and 10.5 of this report. The service provider has found no cause to change the current configuration settings of the EMUs.

11 Local Environmental Conditions

Currently, each EMU is not setup to capture meteorological data and therefore the specific local environmental conditions are not available. Computerised Automatic Terminal Information Service (CATIS) weather data is collected at the airport and fed into the NFPMS and is therefore not EMU specific or sufficient for compliance with ISO 20906:2009. The Standard requires that wind speeds at the time of each aircraft noise event are recorded in the reporting of data and that wind speeds above 10 m/s are flagged. The current NFPMS is not compliant with this requirement.

A wind speed of 10 m/s equates to 36 km/hr. Average wind speeds at Canberra do not generally exceed this level; however there are periods of high wind that should be flagged. The following table presents a summary of CATIS weather data collected from ANOMS over July 2013 to June 2014 for comparison with ISO 20906:2009.

Table 7: Weather Summary Data from ANOMS for 2013-2014

Average wind speed (m/s) at Canberra Airport	3.8 (m/s)
Total instances of wind events recorded as > = 36 km/hr within CATIS	95
Total duration of wind events recorded > = 36 km/hr	125 Hours

The table indicates that there is a period of 125 hours over the study period (July 2013 to June 2014) that had potential wind speeds of 36 km/hr or greater at the airport. This equates to a total of around 5.2 days or 1.4% of total available time. The Standard indicates that any correlated noise events captured during this time should have been flagged as having high wind conditions. It is recommended that events during high wind conditions should be flagged.

12 Security and Access for Maintenance

No security incidents were reported for each EMU during the study period (July 2013 to June 2014).

13 EMU Site Licensing Arrangements

A summary of licensing information for the site is given below in Table 8.

Table 8: EMU Licence Arrangement

EMU	Location	Licence Arrangement	Expiry date
1	Jerrabomberra	Queanbeyan City Council	13/12/2020

License arrangements are currently managed by Airservices Property section.

14 General Recommendations

As a result of the above analysis, it is recommended that:

- EMU 1 remains as it is and no calibration changes are required, at this stage.
- Noise events that are captured with an angle of elevation greater than 30 degrees are flagged in the NFPMS.
- Weather data is captured and used to flag noise events that are outside the requirements of ISO20906.

The above recommendations take flight paths, complainants and previous noise studies into consideration.

14.1 Capturing Weather Data

Weather data is currently not captured at any EMUs. Weather station equipment is available through the service provider. It is recommended that a weather station is integrated onto the permanent EMU to enable the NFPMS to achieve full compliance with ISO20906.

Appendix A Terms of Reference

Airservices Australia Review of the Canberra Airport Environmental Monitoring Units

Terms of Reference

Context

Airservices Australia has a legislated obligation, via the Air Services Act (1995), to regard the safety of air navigation as its most important consideration. Subject to that requirement it also has obligations to, as far as practicable; protect the environment from the impact of the operation and use of aircraft. Further, a Ministerial Direction made under this Act requires Airservices to maintain and operate a noise and flight monitoring system (NFPMS) at major Australian airports. At present this system operates around Perth, Adelaide, Melbourne/Essendon, Canberra, Sydney, Gold Coast, Brisbane and Cairns airports.

The NFPMS comprises a number of components, including environmental monitoring units (EMUs) that collect noise data. Airservices Australia periodically conducts a review of the location of the EMUs. This is a key element of the quality management of the NFPMS.

Purpose

To review the performance of each EMU at Canberra Airport against the Airservices Australia's environmental and business requirements for the management of aircraft noise. In performing this function the placement and individual configuration of the each of the EMUs needs to be optimised for the measurement of the impacts of aircraft operations on the local community from operations at Canberra Airport.

This review will assess the location of the current EMUs and make recommendations about the future use of the EMUs.

Scope

The review will address:

1. Current location of the Jerrabomberra EMU
 - a. With respect to complainants
 - b. With respect to sensitive regions
 - c. With respect to flight paths
 - d. With respect to proposed RNP flight paths
 - e. With respect to communications coverage and reliability
 - f. With respect to ISO 20609
 - g. Against local environmental conditions
 - h. For security and access for maintenance
2. Proposed future monitoring sites
3. Licensing - are there any ongoing licensing issues?
4. Configuration of the EMUs

- a. For noise event detection parameters; threshold, pre-trigger, duration
- b. For calibration and preventative maintenance
- c. Correlation zone
- d. For false positives
- e. For missed noise events

Consultation with Interested Parties

Airservices will consult with interested parties via the Canberra Airport Community Aviation Consultation Group.

Appendix B Public Comments

TBD after stakeholder consultation.