

Australian Super Hornet Annual Noise Report 2021



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ADDENDUM 1

Addendum to: *Australian Super Hornet Annual Noise Report 2021*, dated 14 February 2023

Effective Date: 1 December 2025

Purpose: To correct reporting of Australian Super Hornet compliance regarding the number of average daily noise events exceeding 100 dB(A). The Addendum shows that the average number of noise events at 100 dB(A) or higher per flying day is less than 0.1 noise events, which is well below the modelled less than 5 noise events per day and requirements of the Australian Super Hornet Noise Management Plan.

Background

Annual Noise Reports are required as part of the *Environment Protection and Biodiversity Conservation Act (EPBC) 1999* approval conditions.

A review in 2025 of the Australian Super Hornet Annual Noise Reports 2021-2023 identified that the reporting of average daily noise events exceeding 100 dB(A) was inconsistent with the modelling used in the *2009 Public Environment Report (PER)*, which informed the EPBC approval conditions.

Changes:

This addendum corrects statements in the executive summary and conclusion, and two data tables in Appendix H of the Australian Super Hornet Annual Noise Report to accurately report compliance with conditions relating to noise events at 100 dB(A) or higher per flying day.

- Paragraph 52, Table Four, and Paragraph 53 of Annex H of the report are deleted and replaced with the following text and tables:

52. The 2009 Public Environment Report (PER) forecast on average less than five events exceeding 100 dB(A) per flying day at each noise terminal. N100 noise event data per flying day is shown in Table Four.

Table Four: N100 Noise Event Data per day from 2011 to 2021

N100 daily average	PER estimate	2011	2012	2013	2014	2015	2016
Willowbank Cemetery	< 5	0.02	0.06	0.01	0.00	nil	0.01
Kholo Gardens	< 5	nil	nil	nil	nil	nil	nil
Walloon PS	< 5	nil	0.01	nil	nil	0.01	0.00
Yamanto COC	< 5	0.04	0.03	0.01	0.03	0.02	0.03
N100 daily average	PER estimate	2017	2018	2019	2020	2021	
Willowbank Cemetery	< 5	0.02	0.01	0.00	0.00	0.01	
Kholo Gardens	< 5	nil	nil	nil	nil	nil	
Walloon PS	< 5	nil	0.00	0.00	0.01	0.01	
Yamanto COC	< 5	0.02	0.03	0.02	0.07	0.03	

53. Table Four shows actual daily N100 noise events at the noise terminals to be well below forecast of less than 5.

A review of the L_{max} charts in the PER show that some terminals are relatively close to the 100 dB(A) contour and therefore noise events at a level 100 dB(A) or higher may occur, and typically under conditions favourable for noise propagation.

The total number of events in 2021 at a noise level 100 dB(A) or higher is shown in Table (NEW). The data shows that there were very few noise events exceeding 100 dB(A) in 2021.

Table (NEW): N100 Noise Event Data per year from 2011 to 2021

N100 annual	2011	2012	2013	2014	2015	2016
Willowbank Cemetery	4	14	2	1	0	2
Kholo Gardens	0	0	0	0	0	0
Walloon PS	0	3	0	0	2	1
Yamanto COC	10	7	3	6	4	8
N100 annual	2017	2018	2019	2020	2021	
Willowbank Cemetery	4	3	1	1	2	
Kholo Gardens	0	0	0	0	0	
Walloon PS	0	1	1	2	2	
Yamanto COC	4	6	5	15	7	

Justification

Existing text in Paragraph 52 of the *Australian Super Hornet Annual Noise Report 2021* states 'The 2009 Public Environment Report (PER) forecast zero events at all noise terminals that would exceed 100 dB(A)'. This implies there would be no events exceeding 100 dB(A) at any of the noise terminals.

However, Figure E-Four of the *Australian Super Hornet Annual Noise Report 2021* (page 43), shows that the minimum contour is '5 events per day' above 100 dB(A). This means in areas outside/beyond the contour, there would be 'less than 5 events per day' at a noise level 100 dB(A) or higher.

Using the data from Figure E-Four of the report, the correct interpretation of Figure E-Four and resulting statement is:

The 2009 Public Environment Report (PER) forecast less than five events exceeding 100 dB(A) per flying day at each noise terminal.

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DISCLAIMER

This report contains a summary of data collected over the specified period and is intended to convey the best information available from the Noise Flight Path and Monitoring System 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 cannot be guaranteed. The Department of Defence and the Noise Flight Path and Monitoring System project contractors do not accept any legal liability for any losses arising from reliance upon data in this report which may be found to be inaccurate.

The Noise Flight Path and Monitoring System does not provide "Aircraft noise levels" as defined in AS2021-2015.

DEFINITIONS

Metric	Description
dB	The Sound Pressure Level (SPL) expressed on a logarithmic scale.
dB(A)	The A-weighted dB that is frequency adjusted to replicate the sound detected by the human ear.
L _{Amax}	The single event maximum A-weighted sound level reached during an aircraft movement.
L _{Amax low value}	The lowest L _{Amax} value in a range of L _{Amax} values for particular operations.
L _{Amax high value}	The highest L _{Amax} value in a range of L _{Amax} values for particular operations.
L _{Amax average value}	The arithmetical average of a range of L _{Amax} values from the L _{Amax low value} to the L _{Amax high value} for particular operations.
L _{Aeq}	The 'equivalent noise level' (L _{Aeq}) is the energy equivalent noise level measured in A-weighted decibels (dB(A)). It is a time-averaged sound level; a single-number value that expresses the time-varying sound level for the specified period as though it were a constant sound level with the same total sound energy as the time-varying level. Consequently the L _{Aeq} is the constant noise level that if continued over the sample period would have the same energy as the actual varying, measured sound level. The time period needs to be specified and can be one hour, 24 hours or the operational hours of the base.
Number Above (NA)	The NA contour for an airport represents the number of noise events occurring greater than a particular dB(A) level over a specified time period. As example, the N70 contour depicts the number of aircraft noise events above 70 dB(A) for an average day.

EXECUTIVE SUMMARY

1. The 2021 Australian Super Hornet¹ Annual Noise Report is the eleventh in a series of Annual Noise Reports required by the Australian Super Hornet Noise Monitoring and Complaints Handling Strategy. This report monitors Air Force compliance with the Australian Super Hornet Noise Management Plan (ASHNMP), and assesses the noise measured around Royal Australian Air Force (RAAF) Base Amberley against the 2009 Public Environment Report modelling.
2. Assessment of military fast jet movements was made through analysis of data processed by the Noise and Flight Path Monitoring System (NFMPS). In 2021 a total of 6821 Super Hornet movements were identified against a 2009 Public Environment Report forecast of 4648 movements, and the Australian Super Hornet ASHNMP V 4.0 forecast of 7700 movements².
3. Assessment of flight path information identified a predominate adherence to planned departure and recovery profiles. A small number of departures to the north were required to conduct turns after take-off earlier than planned when operating in accordance with Air Traffic Control (ATC) instructions. These variations are in accordance with the unforeseeable variations as described in the ASHNMP. There were no operations on the secondary runway, which last occurred in 2014 due to runway repair works required on the primary runway.
4. In 2021, the number of N70 and N85 noise event detections at the four Noise Monitoring Terminals in the Amberley area were significantly lower than the forecast in the 2009 Public Environment Report, with the exception of N70 noise events at Yamanto which were at the top of the forecast range despite the number of movements exceeding the PER forecast by 30 percent. N85 noise events at all Noise Monitoring Terminal locations were significantly lower than the 2009 forecast.
5. A review of noise event data over the eleven-year period 2011 to 2021 identified that the rate of N70 and N85 per 4648 movements (the 2009 Public Environment Report forecast movement rate) has slightly increased for 2021 compared to previous years. This reflects continued adherence to robust noise management strategies employed by Number 82 Wing operating the Super Hornet.

¹ For the purposes of this report, 'Super Hornet' includes both the F/A-18F and EA-18G (Growler), unless otherwise specified.

² This number does not include 200 visiting fast-jets.

BACKGROUND

6. The Australian Government announced in March 2007, the acquisition of 24 F/A-18F Super Hornets to replace the F-111 capability at RAAF Base Amberley.

7. In accordance with the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* a Public Environment Report (commonly referred to as PER) was completed in December 2009. The Public Environment Report addressed potential environmental impacts resulting from Australian Super Hornet flying operations at RAAF Base Amberley.

8. In March 2010 the Minister for Environment Protection, Heritage and the Arts (the Environment Minister) approved Super Hornet flying operations at Amberley subject to ten conditions, which was later varied to nine conditions in 2014. Condition 1 required the RAAF to submit an Australian Super Hornet Noise Management Plan (ASHNMP) for approval by the Environment Minister.

9. Condition 2 required the Air Force to produce a Noise Monitoring and Complaints Handling Strategy which resulted in the installation of a NFPMS at RAAF Base Amberley. The purpose of the NFPMS at RAAF Base Amberley was to:

- a. Identify noise emissions associated with all military aircraft operations at the Base
- b. Assist Defence to manage aircraft noise exposure over land in the vicinity of the Base
- c. Provide information on aircraft noise emissions to the public in a format that is easy to read and understand.

10. The Noise Monitoring and Complaints Handling Strategy required the drafting of an Annual Super Hornet noise report that compared the NFPMS quarterly reports with the ASHNMP. The reason for the report was to evaluate the accuracy of the noise modelling undertaken for the Public Environment Report and monitor compliance with the ASHNMP. It was also to provide a tool to assist Defence in managing aircraft noise exposure in the vicinity of RAAF Base Amberley.

11. In September 2020 an updated ASHNMP V4.0 was published on the Defence website³. This plan:

- a. removed superfluous background information
- b. Changes to support introduction of the EA-18G
- c. Second round noise modelling
- d. Updated base map
- e. A more accurate depiction of existing Instrument Approach flight paths
- f. Incorporation of recommendations from the 2019 audit

12. This updated version of the noise management plan forecast 6748 annual Super Hornet movements in 2020 and forecast up to 200 additional movements by visiting military fast jets. This 2020 annual report is based on this version of the NMP.

³ See the ASHNMP V4.0 at webpage link <https://defence.gov.au/AirCraftNoise/Environment/PublicEnvironmentReport.asp>

13. In 2016, updated noise modelling was conducted at RAAF Base Amberley in support of the 2029 Australian Noise Exposure Forecast process. All aircraft types operating from RAAF Base Amberley were incorporated.

14. From February 2017, 12 EA-18G Growler aircraft have operated from RAAF Base Amberley, alongside the 24 F/A-18F Super Hornet aircraft. The EA-18G Growler is a derivative of the F/A-18F Super Hornet and shares the same overall airframe design and uses the same engines.

15. This report is to be tabled at the Amberley Consultative Working Group (ACWG) and as such provides an opportunity to inform the public on recommendations made during the reporting period. Such recommendations include those made during the period two audit associated with Condition 5 of the Super Hornet flying operations at RAAF Base Amberley. Annex B to this report contains the recommendations made by the Aircraft Noise Ombudsman (ANO) in the Compliance Audit of Australian Super Hornet Flying Operations at RAAF Base Amberley, dated October 2019. Annex C demonstrates performance against aspects of the ASHNMP as highlighted by the ANO.

PURPOSE

16. The purpose of the Annual Super Hornet Noise Report is to evaluate the accuracy of noise modelling undertaken for the 2009 Public Environment Report and monitor compliance with the ASHNMP. This report provides useful comparisons between the NFPMS measured data in successive years and identifies trends and changes in aircraft operation, flight paths and noise impact. In addition, this report provides an opportunity to report publicly on actions and recommendations taken in relation to the Conditions of Approval for Australian Super Hornet Flying Operations at RAAF Base Amberley.

IDENTIFICATION OF SUPER HORNET FLIGHT PATH DATA AND CALCULATION OF MOVEMENTS

17. The NFPMS consists of four Noise Monitoring Terminals (NMT) located strategically around RAAF Base Amberley, with the locations selected after wide consultation as part of the Public Environment Report process. Noise recognition techniques are applied to the NMT recorded noise data and then correlated with data provided through the ATC surveillance radar system to delineate military fast jet movements and to determine movement counts. Determination of visiting military fast jet movement data as a subset of total military fast jet movements is achieved through analysis of RAAF Base Amberley movement data. The four locations are as follows and shown at Figure One.

- a. Willowbank Lawn Cemetery
- b. Kholo Botanical Gardens, Muirlea
- c. Walloon Primary School
- d. Christian Outreach Centre, Yamanto.

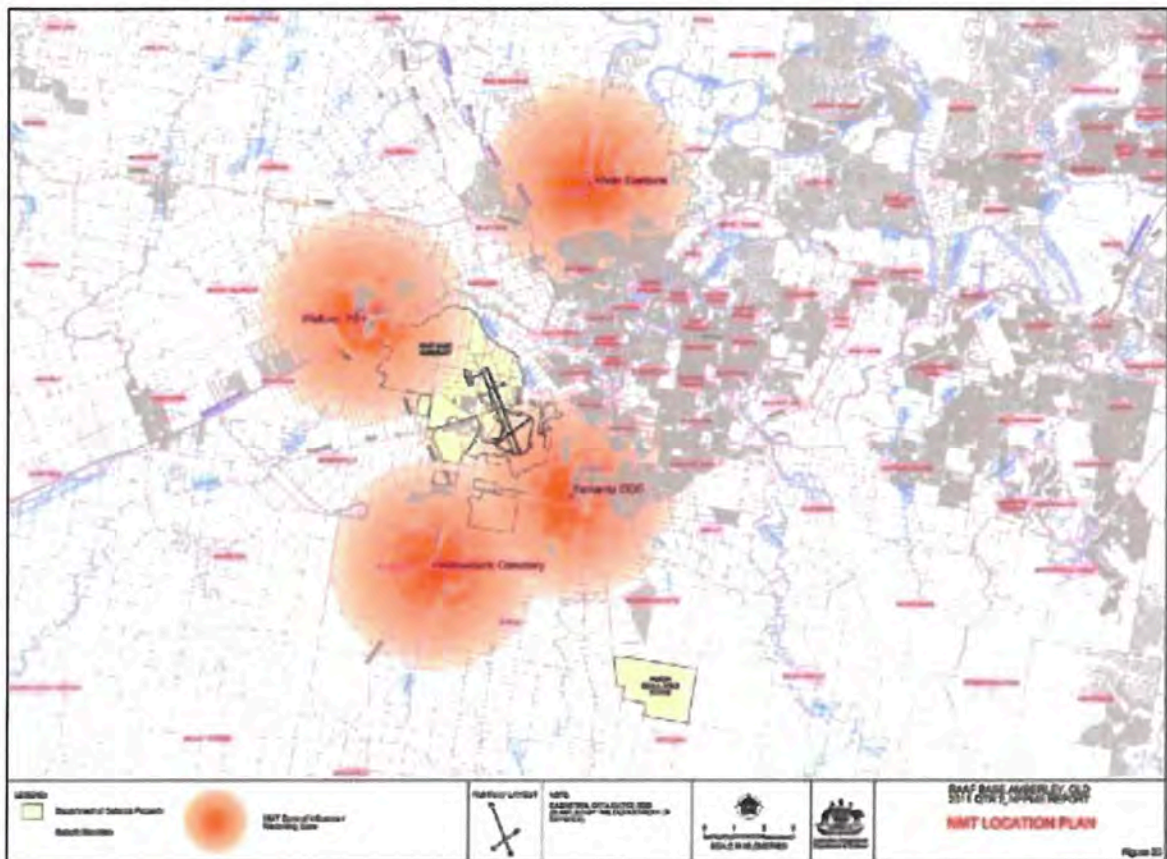


Figure One: Noise Monitoring Terminal Locations

LIMITATIONS IN FLIGHT DATA AVAILABILITY

18. Accurate determination of aircraft types that generate noise events captured by the NMTs is achieved by comparison of noise events with known radar tracking data and application of noise recognition techniques. During 2021 there were a number of periods of radar data outages that required sole reliance on noise recognition techniques as the discriminating determinant. The periods of outage were:

- a. 12/08/21 10:00 – 12/08/21 20:00
- b. 17/08/21 10:00 – 18/08/21 10:00
- c. 24/11/21 09:49 – 24/11/21 14:00

EVALUATION OF FLIGHT PATHS

19. The evaluation of flight paths for the calendar year 2021 was undertaken against the requirements contained in the ASHNMP Version 4.0⁴. These flight paths are unchanged from the previous version of the Noise Management Plan. The following elements of the plan have been assessed using the NFPMS data:

- a. departure paths,
- b. arrival paths,
- c. altitude limitations, and
- d. number and timing of Super Hornet movements.

20. In addition, records show compliance with, transit routes, and engine runs as indicated in the Noise Management Plan.

AMBERLEY RUNWAY ORIENTATION AND USE

21. Figure Two shows the runway orientation at RAAF Base Amberley.

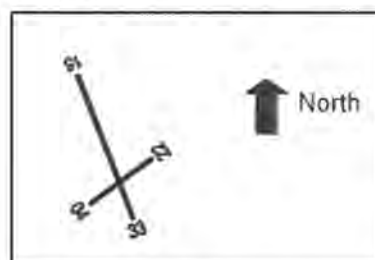


Figure Two: RAAF Base Amberley Runway Orientation

22. Super Hornet operations are conducted on Runway 15/33. Runway 04/22 is only used in exceptional circumstances, such as in an emergency, or when Runway 15/33 is obstructed. Table One shows that in 2021, Super Hornet operations only utilised runways 15/33, with no operations detected on runways 04/22.

⁴ Promulgated September 2020 Available at webpage link [https://defence.gov.au/AircraftNoise/_Master/Docs/Environment/ASH-Noise-Management-Plan.pdf].

Table One: Total Movements per Runway in 2021

	Arrivals	Departures	Circuits	Total	Usage %
RWY 33	1305	1256	111	2672	39%
RWY 15	1940	2003	206	4149	61%
RWY 22	0	0	0	0	0%
RWY 04	0	0	0	0	0%
TOTAL	3245	3259	317	6821	100%

DEPARTURE PATHS

23. Standard Super Hornet departure flight paths flown in 2021 are illustrated in Annex C. Departure paths are predominately flown with turns to the west of the centreline of the runway to minimise noise impact on the western suburbs of Ipswich whilst gaining altitude. Departures from Runway 33, facing to the north-west, are required to maintain runway heading (no turn) until reaching 7.4 kilometres to minimise the noise impact on the Walloon and Thagoona townships. Figure Three shows the departure tracks from RAAF Base Amberley in 2021. This demonstrates a robust adherence to the departure routing requirements specified in the Noise Management Plan over the year.

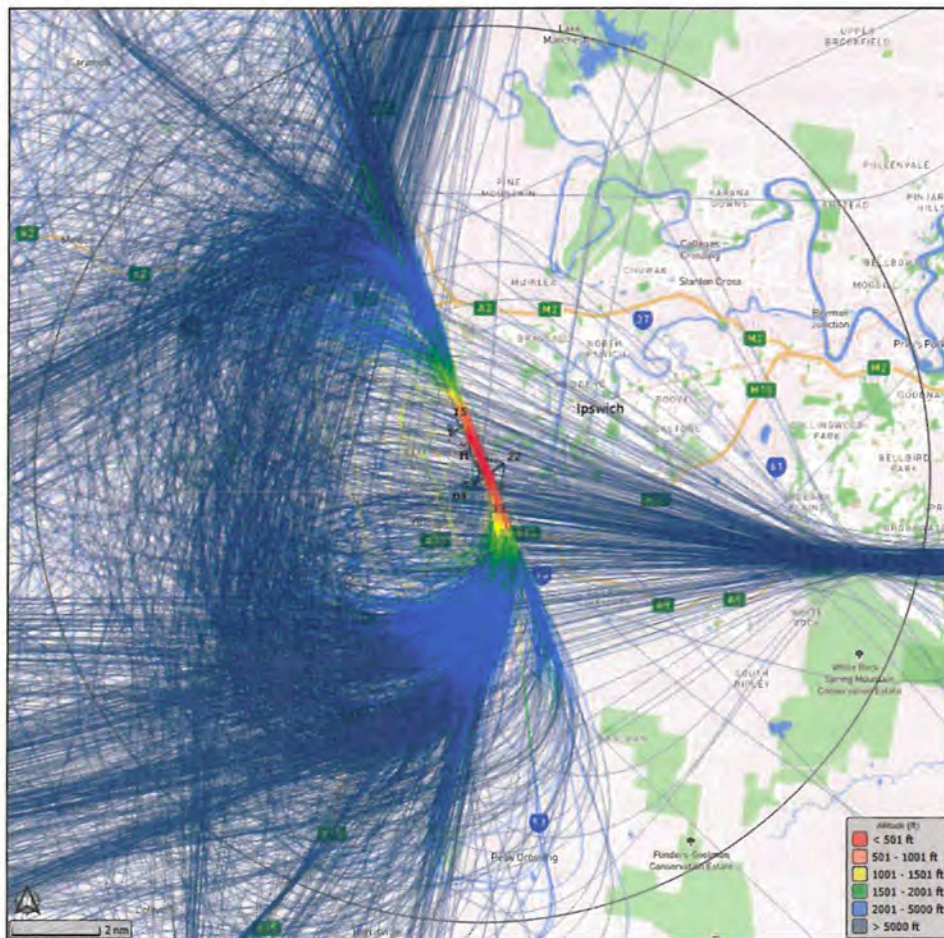


Figure Three: Super Hornet Departures Plot 2021

24. **Turn to the right after take-off runway 33.** The Noise Management Plan requires that departures from runway 33 to training airspace to the west, south and south east of Amberley turn to the west (left turn) to gain altitude before departing to the training airspace. Departures to the training airspace in the north east and east can turn right for departure after reaching the 7.4 kilometre point on runway heading. This requirement is reflected in 82WG SI (OPS) 03-01-01 F/A-18F & EA-18G Standard Operating Procedures. There were no departures identified in 2021 that did not adhere to this requirement.

25. **Early turn after take-off runway 33.** The Noise Management Plan requires departures off runway 33 to maintain runway heading (no turn) until reaching 7.4 kilometres (4 nautical miles). This requirement is reflected in 82WG SI (OPS) 03-01-01 F/A-18F & EA-18G Standard Operating Procedures. The requirement for aircrew familiarity with the guidance provided in the Noise Management Plan is stated in 82WG SI (OPS) 03-03 Fly Neighbourly Policy, however aircrew are required to comply with ATC instructions at all times due to safety reasons. In 2021 a total of 109 military fast jet departures were identified as turning to the west before reaching 7.4 kilometres on runway heading. These early turns were only conducted when instructed by ATC in managing positive aircraft separation. Early turns from Runway 33 to the west are identified in the Noise Management Plan as unforeseeable variations that can be expected from time to time due to weather and/or ATC direction. Early turns after take-off from runway 33 are shown at Figure Four.

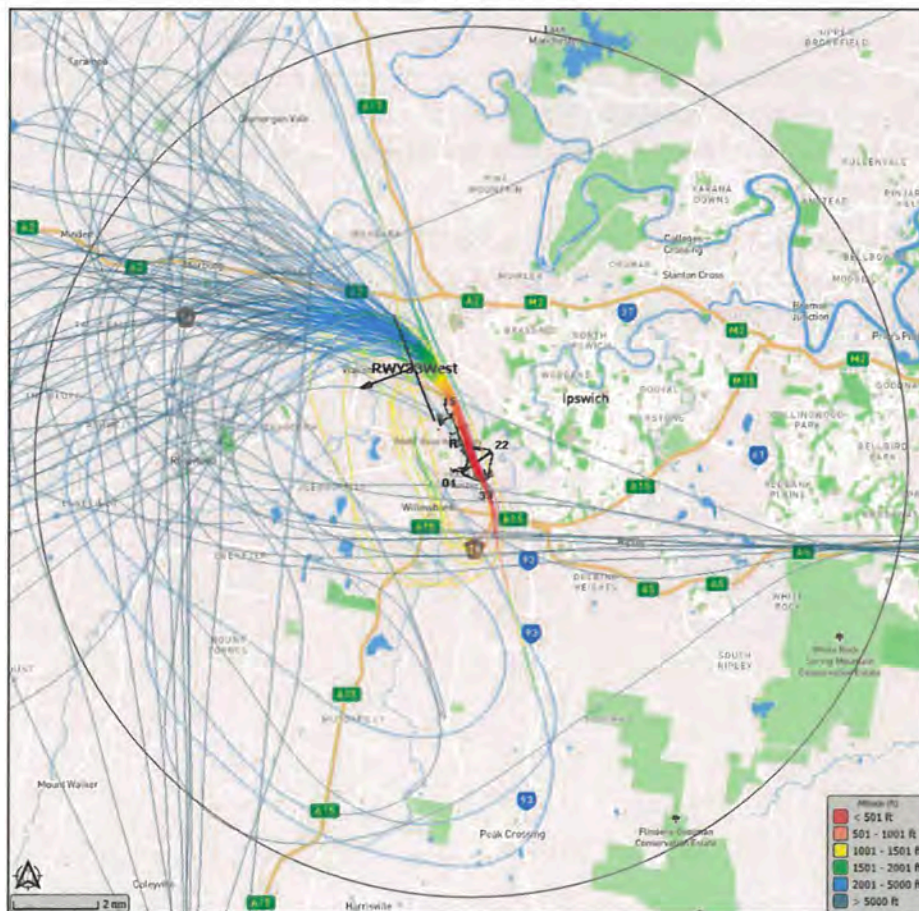


Figure Four: Early turns for departures to the west off runway 33

26. **Turn to the left after take-off runway 15.** The Noise Management Plan requires that departures off runway 15 turn to the west (right turn) to gain altitude before departing to the training airspace. In 2021 there were no departures identified that turned left after take-off from runway 15.

27. The Noise Management Plan requires that Instrument departures for Runway 33 will be in accordance with the published instrument departure procedure that requires aircraft to reach 1,100 feet (ft) before commencing a left-hand turn to their ATC assigned heading. All instrument departures for Runway 33 have been in accordance with the published instrument departure procedures; however, the current departure procedures as amended by RAAF Aeronautical Information Service (AIS-AF) no longer require an aircraft to reach 1,100 ft before commencing a left turn. The current published requirement is to turn at or above 900 ft or 800 ft depending on which procedure is being flown. In any case, the aircraft is still required to reach 7.4 kilometres (4 nautical miles) before commencing the turn, which would typically see a Super Hornet at an altitude of 2000-3000 ft thereby meeting the intent of the original requirement. Further details are outlined in the ASH noise management plan v4.0.

ARRIVAL PATHS

28. Planned Super Hornet arrival flight paths are illustrated in Annexes D to F. In 2021, 68 percent of arrivals were by the Initial and Pitch procedure, which compares with an estimate of 80 percent in the 2009 Public Environment Report and a revised estimate of 70 percent in ASHNMP V4.0. In 2021, the 16 percent of arrivals flown as straight in approaches were due to poor weather, training requirements, ATC instruction, or operational needs (e.g. aircraft malfunction). When required for aircrew training, a number of circuits may be flown at the end of a mission.

29. Figure Six shows the arrival tracks to RAAF Base Amberley in 2021. This demonstrates a robust adherence to the arrival routing requirements specified in the Noise Management Plan, including all circuits flown to the west of the airfield.

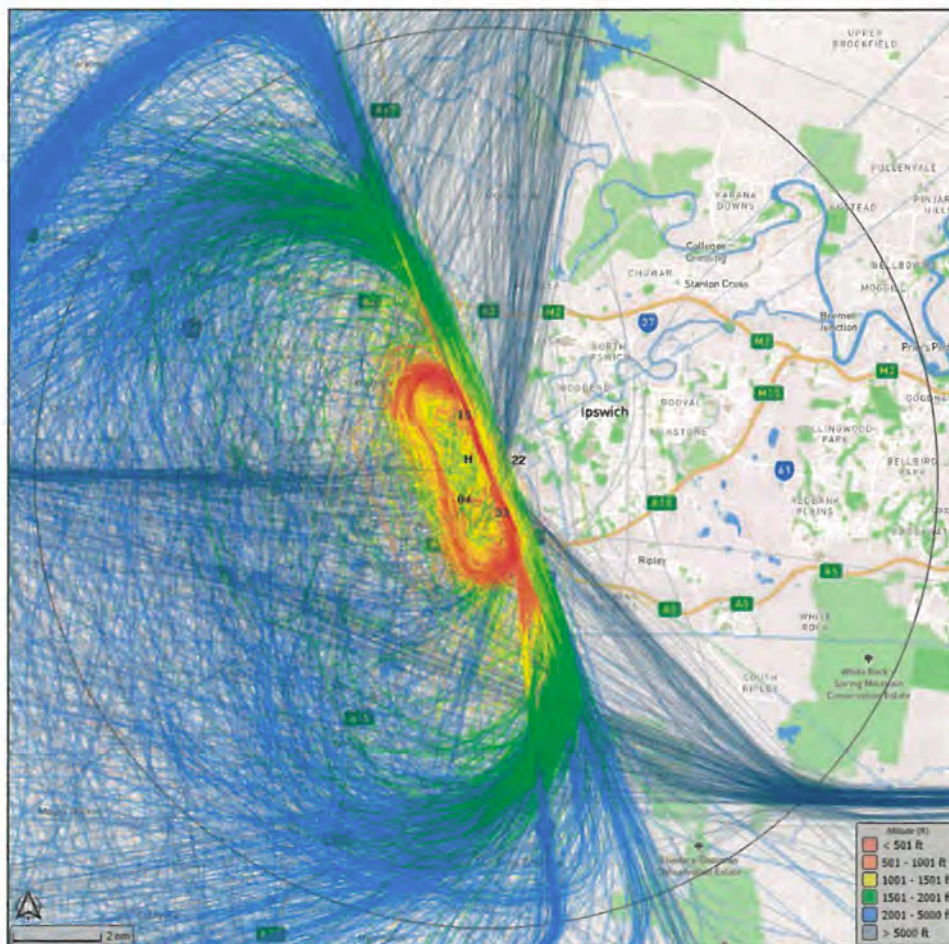


Figure Six: Super Hornet Arrivals Plot 2021

ALTITUDE LIMITATIONS

30. The ASHNMP limits Super Hornet aircraft to not flying below 450 metres (1,500 ft) within 18.5 kilometres (10 nautical miles) of RAAF Base Amberley, except when landing, taking off or in the circuit. In 2021 there were no operations detected operating below this altitude within 10 nautical miles of RAAF Base Amberley.

TRANSIT ROUTES

31. The transit routes for Super Hornet to the eastern training areas have been constructed to minimise the noise impact on the civilian population of Brisbane. The transit route to the training area to the west of Amberley is based on the 'fly neighbourly'⁵ concept which is documented in 82WG SI (OPS) 03-03 and ACG SI (OPS) 03-03 Fly Neighbourly Policies. Most transits to and from all areas are conducted above 15,000 ft above mean sea-level with transit below this level only conducted if instructed by ATC. 82WG SI(OPS) 03-01-01 F/A-18F & EA-18G Standard Operating Procedures requires that any transits between Amberley and Brisbane required to be conducted below 10,000ft (e.g. Due weather or ATC requirements) are conducted at speeds not above 250 KIAS unless otherwise directed by ATC for operational reasons.

⁵ See webpage link [https://www.defence.gov.au/aircraftnoise/_Master/Docs/Default/Fly%20Neighbourly%20Policy.pdf]

ENGINE RUNS

32. The ASHNMP limits Super Hornet routine flight-line engine runs above 80% power between 10:00 pm and 6:00 am. This requirement is promulgated in 82WG SI (LOG) 03-19 Aircraft Engine Ground Run Page 5, para 22 (L3361914) which refers to AMB SI (OPS) 05-04 Airfield Ground Operations (L3581575) for stipulated curfew timings. A review of the 'Fly Neighbourly' component of the Fast Jet Monthly activity reports indicate that this practice has been adhered to.

33. The ASHNMP limits Super Hornet high power engine runs at the Engine Test Cell 3 (ETC-3). High power engine runs involve the running of engines at an average of 95% power for up to 30 minutes. This practice is limited to:

- a. a maximum of ten events per year unless approved by Senior Australian Defence Force Officer (SADFO) Amberley as a foreseeable variation, and
- b. high power engine runs will not take place between 10:00 pm and 6:00 am.

34. In 2021, 29 tests were conducted at ETC-3. All tests were within the approved window of operation. The 'Fly Neighbourly' component of the Fast Jet Monthly activity reports developed through the NFPMS indicate no engine runs occurred at ETC-3 between 10:00pm and 6:00 am for Super Hornets or Growlers.

NUMBER AND TIMING OF SUPER HORNET MOVEMENTS

35. In general, Super Hornet operations occur on weekdays, with night flying when scheduled, typically occurring on Monday to Thursday nights. Flying is forecast to occur over 46 weeks of the year with operations planned between 07:00am and 11:00pm, with no practice circuits flown after 10:00pm. Weekend flying day or night, can occur in circumstances detailed in the Variations sections of the ASHNMP. Normally this is associated with operational requirements or events of public significance such as ANZAC day flypasts.

36. A 'movement' is a single take-off or landing by a single aircraft, hence one aircraft departing from and then returning to the airfield will generate two movements. Circuits conducted are counted as two movements.

37. The ASHNMP forecast a total of 7700 Super Hornet movements from RAAF Base Amberley in 2021. A total of 6821 Super Hornet movements were identified by the NFPMS equating to flying less than the forecast total by 11 percent. A 'normal flying' day described in the 2009 Public Environment Report is represented as 20 movements, consisting of 10 departures and 10 arrivals. The 2021 movement total of 6821 represents an average flying day movement total of 29. Movement data for 2011 to 2021 is shown at Table Two.

Table Two: Super Hornet Annual Movement Data

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Noise Management Plan forecast	4648	4648	4648	4648	4648	5261	5903	6495	6748	6748	7700
Super Hornet movements	3744	4476	4481	5968	5276	5883	3863	4166	6039	5863	6821
Percentage of NMP forecast	81%	96%	96%	128%	114%	112%	65%	64%	89%	87%	89%
Average Day movements - 2009 PER	20	20	20	20	20	20	20	20	20	20	20
Actual Average Day movements	16.3	19.5	19.5	25.9	22.9	25.6	16.8	18.1	26.3	25.5	29.7
Actual Average Day Standard Deviation		8.7	11.9	13.0	10.6	11.9	10.4	6.5	14.6	11.3	7.1

38. It is noted that whilst there is an increase in daily movements, the noise impact has not increased above the predicted levels. This is discussed later in this report.

RESPIRE FROM FLYING OPERATIONS

39. The ASHNMP forecasts that Super Hornet operations would occur over 46 weeks of the year. Except as allowed by the approved variations specified in the plan, flying was planned to occur on weekdays with no night flying intended on Friday nights. In 2021 there were four weeks identified with no Super Hornet movements, and a further 2 weeks with less than 30 movements. Figure Seven shows Super Hornet movements by week in 2021.

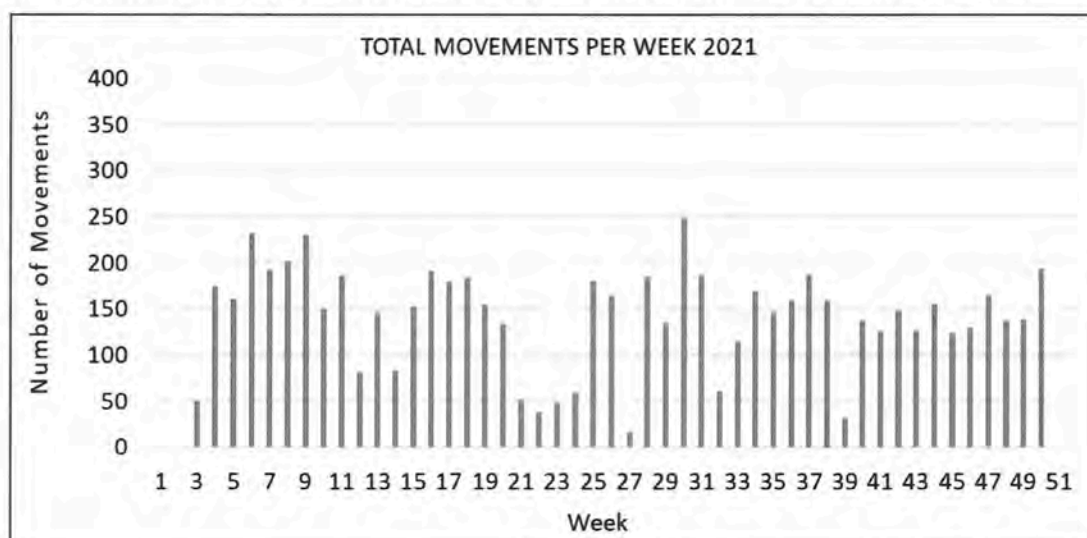


Figure Seven: Super Hornet Movements by Week

40. The ASHNMP forecast that flying operations would occur on weekdays, except as allowed in the Variations section of the plan. In 2021 there were a total of 140 movements identified by the NFMPS on Saturday and Sunday. Movements by day are shown in Figure Eight. All weekend movements were promulgated on the SADFO approved base flying program.

- a. The majority of the 140 aircraft movements that occurred on weekends were on 18, 24, 25 and 31 July 2021. Over these dates, there were 124 Super Hornets and Growlers movements generated by aircraft participating in Exercise Talisman Sabre 2021 from RAAF Base Amberley. Exercise Talisman Sabre is a bilateral combined Australian and United States (US) training activity⁶.
- b. There were six Super Hornet weekend movements On 25 April 2021 as 82 Wing provided support to the civil community for the observance of ANZAC Day
- c. On 5 June 2021, there were two movements associated with Super Hornet aircraft returning from Exercise Arnhem Thunder in Darwin as tasked by Higher Headquarters Task Order.
- d. On 4 December 2021, there were 8 Growler movements associated with a 6 Squadron (SQN) flying and Air to Air refuelling display for the 33SQN Family Day as per the SADFO authorised Base Flying programme.

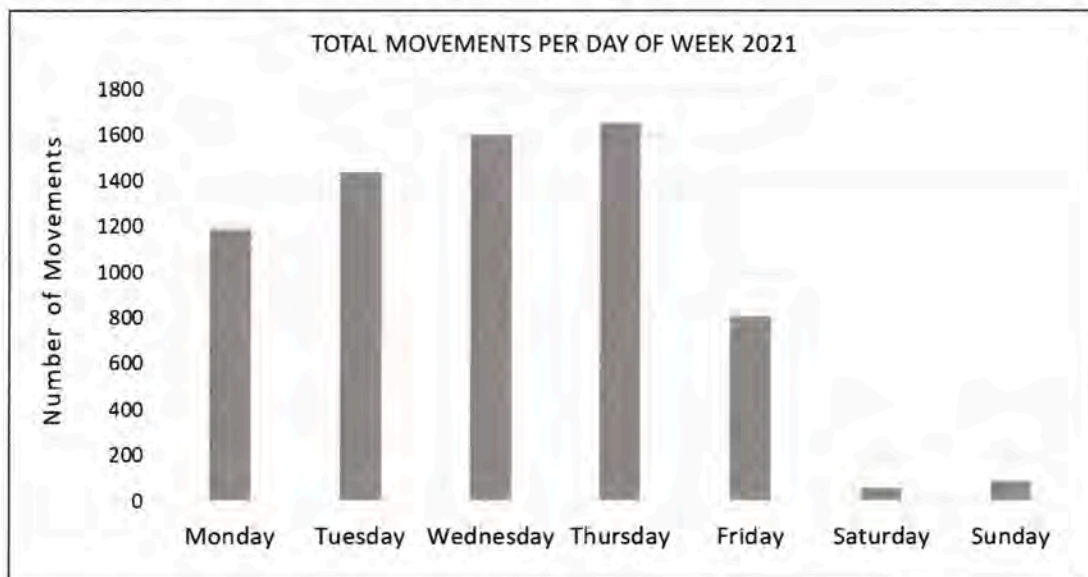


Figure Eight: Super Hornet Movements by Day

41. The ASHNMP forecast that all operations would occur between 07:00am and 11:00pm, with no practice circuits flown after 10:00pm. Additionally it was forecast in the 2009 Public Environment Report that 20 percent of movements would occur between 7:00pm and 11:00pm. In 2021, there were no movements identified operating outside the planned flying period, and movements after 7:00pm were 8% compared to the 20% forecast. There were no circuits flown after 10:00pm in 2021.
42. The ASHNMP states that Super Hornet night flying (activity between 7pm and 7am), when scheduled, will typically occur on Monday to Thursday night. In 2021 there were no occasions where Super Hornets night flying occurred on Fridays (evening) or on the weekend.

⁶ Community information can be found at webpage link [\[Talisman Sabre 21 | Sectors | Defence\]](#)

EVALUATION OF SUPER HORNET NOISE IMPACT

43. Noise Contour Maps were produced in the 2009 Public Environment Report. These contour maps show geographical boundaries for specified numbers of movements per average flying day that are expected to exceed a nominated noise threshold in decibels (dB). The average flying day is defined as 20 movements which is determined by dividing total annual movements in the 2009 Public Environment Report (4648) by 230 flying days (5 days a week for 46 weeks).

44. Two rounds of noise modelling have since been conducted, with the first round incorporating changes to Super Hornet flight paths and profiles that were developed based on a review of outcomes in previous annual noise reports⁷ between 2011 and 2015. Whilst noise modelling from the first round did not show a significant increase in overall noise footprint compared to the 2009 Public Environment Report, it was determined that further changes to Super Hornet instrument approach recovery profiles would achieve an improved outcome, particularly to the north west of RAAF Base Amberley. The noise modelling outcomes included in Enclosure One to this report reflect the maps derived from this second round of noise modelling outputs. The second-round noise modelling does not show a significant increase in noise footprint compared to the 2009 Public Environment Report. Maps for N70, N85 and N100 are also shown in Enclosure One.

45. The N70 contour map represents a noise threshold which can be likened to the noise expected from a busy restaurant or suburban traffic from the footpath. The N85 contour map represents a noise threshold that would require a person to raise their voice when talking to a person 1.2 metres away and can be likened to the noise expected from heavy city traffic. The N100 contour map represents a noise level that can be likened to the noise expected from a chainsaw or jackhammer in close proximity.

46. The ASHNMP V4.0 increased the forecast annual Super Hornet movements in 2021 from 6748 in V3.0 of the noise management plan to 7700. Analysis determined that the modelling conducted in 2009 was pessimistic in relation to the actual noise impact and therefore facilitated an increase to forecast maximum movement rate whilst remaining within the noise impact footprint modelled in 2009.

47. Annex H provides a detailed analysis of N70, N85, N100 noise events, and a comparison of noise events adjusted to match a baseline of movements from 2011.

⁷ See the Australian Super Hornet Annual Noise Reports from 2011 at webpage link
[<https://www.defence.gov.au/AirCraftNoise/Environment/PublicEnvironmentReport.asp>]

CONCLUSION

48. The 2021 Australian Super Hornet Annual Noise Report evaluated the accuracy of the noise exposure modelling undertaken as part of the 2009 Public Environment Report process and monitored compliance with the ASHNMP developed for the Super Hornet. Data was drawn from 2021 data produced by the NFPMS installed at RAAF Base Amberley.

49. The report identifies that there was robust adherence to the flight path management procedures specified in the ASHNMP, and that planned periods of respite were achieved. Although the annual movement numbers in 2021 exceeded the forecast in the 2009 Public Environment Report, the noise effect of the Super Hornet across the monitoring terminals was significantly less than forecast overall, indicating that the 2009 Public Environment Report modelling was pessimistic⁸.

⁸ The pessimistic results in the 2009 Public Environment Report provided the flexibility to increase the forecast movement rate in V3.0 of the Noise Management Plan without exceeding the forecast noise impacts. The noise modelling from the 2029 Australian Noise Exposure Forecast provides more accurate outcomes. Lessons identified from operating the Super Hornet have been incorporated into the modelling process.

ANNEX A – SUMMARY OF RAAF BASE AMBERLEY AIRCRAFT NOISE OMBUDSMAN REVIEWS

1. The aircraft noise ombudsman referred a single aircraft noise complaint relevant to RAAF Base Amberley involving Super Hornet aircraft in February 2021.
2. An investigation occurred in February 2021. The complaint related to fast jet flying activities within the RAAF Base Amberley Western Training Airspace. The complainant claims to experience constant aircraft noise. The complainant was advised to contact the ANO if not satisfied with the advice provided. The ANO reviewed the complaint and found that the complainant's property is within an approved flying area and that the aircraft had operated within approved procedures. The ANO found that the complaint was correctly documented and found no fault in the process. The ANO closed the complaint without further recommendations for Defence.

ANNEX B – RECOMMENDATIONS FROM 2019 COMPLIANCE AUDIT

1. The 2019 Aircraft Noise Ombudsman (ANO) report on the Compliance to Conditions for aircraft noise management found that Defence was meeting the intent of the Conditions of Approval and is managing aircraft noise issues effectively at RAAF Base Amberley. It was noted that RAAF Base Amberley was compliant with four of the eight conditions, non-compliant with three and one was not applicable. Lack of robust administrative procedures and documented evidence to demonstrate compliance was determined to be the cause of noncompliance.
2. The ANO identified 54 separate requirements to be assessed under the audit criteria. Of these, Defence was compliant with 39 requirements, non-compliant with nine, four were not applicable and two requirements were classified as undetermined due to a lack of evidence to establish a definitive finding.
3. In May 2020 the ANO released an Addendum to the 2019 audit due to an update in Independent Audit and Audit Report Guidelines. The update removed the 'undetermined' category. As such, the ANO determined that in each case where an 'undetermined' finding had been made, it would be revised to be 'non-compliant'. Noting this, of the 54 requirements Defence was compliant with 39 requirements, non-compliant with 11 and four were not applicable.
4. The ANO's conclusion remained unchanged from the original 2019 Audit in that Defence has complied with the intent of the Conditions of Approval in relation to managing the effects of aircraft noise on the community and the environment.
5. The ANO made nine recommendations and two suggestions aimed at improving Defence's compliance with the Conditions of Approval, all of which were accepted by Defence. The outcomes of their implementation is shown in Table B1 .

TABLE B1. DEFENCE REMEDIATION OF ANO RECOMMENDATIONS

ANO Recommendations	Defence Remediation Action
1. Defence should establish robust administrative systems that ensure it obtains the required approvals for changes to its activities prior to implementing those changes. These systems should ensure annual reviews are conducted that would enable the identification and early rectification of any non-compliances.	Completed
2. Defence should re-instate or adopt new or additional record management practices to ensure it can demonstrate its compliance with the Conditions of Approval and the requirements of the plans and strategies required by these Conditions.	Completed

ANO Recommendations	Defence Remediation Action
3. Defence should: a. Review its draft version 4.0 Noise Management Plan in light of the findings of this audit report, the questions and comments made to date by the Department of the Environment and Energy, and in consideration of any other changes or assumptions that may be now relevant; b. Ensure the revised Noise Management Plan retains a level of detail that is appropriate to its purpose as a public account of Defence's planned noise management activities and includes an appropriate requirement to regularly review the plan in light of any outcomes of its Noise Monitoring Program; c. Set out clearly the changes compared to the version 3.0 Noise Management Plan and outline the reasons for these; d. Re-submit the revised version 4.0 Noise Management Plan for approval in line with Condition 8 of its approval.	Completed
4. Defence should regularly review its Noise Management Plan, with consideration to be given to relevant matters, including but not limited to: a. Any foreseeable variations approved by the Senior Australian Defence Force Officer - Amberley; b. Any changes to Super Hornet flying operations limitations or planning assumptions, which occur as a result of evaluation of the noise monitoring outcomes and the complaints process detailed in the Noise Monitoring and Complaints Handling Strategy; and c. The results of audits of compliance with its Conditions of Approval for Australian Super Hornet Flying Operations.	Completed

ANO Recommendations	Defence Remediation Action
5. Defence should use its Annual Super Hornet Noise Reports to explicitly evaluate noise outcomes against the noise modelling undertaken for the Public Environment Report 2009, and also for any subsequent approved noise modelling undertaken.	Completed
6. Defence should table its Annual Super Hornet Noise Reports at the Amberley Consultative Working Group meetings and ensure this is minuted.	The 2020 ASH Annual Noise Report was not tabled at the Amberley Consultative Working Group due COVID.
7. Defence should regularly review its Noise Monitoring and Complaints Handling Strategy, with consideration to be given to relevant matters, including but not limited to: a. Any changes to the Noise Management Plan and Noise Mitigation and Complaints Resolution Strategy; b. Those arising through the complaints process detailed in the Noise Monitoring and Complaints Handling Strategy; and c. The results of audits of compliance with its Conditions of Approval for Australian Super Hornet Flying Operations.	Completed. Conducted annually as part of the RAAF Base Amberley aircraft noise management plans, and through the Amberley consultative working group.
8. Defence should identify and implement an effective method for publicly reporting on its actions in response to recommendations made in relation to its Conditions of Approval for Australian Super Hornet Flying Operations.	Completed. This annex is that feedback.

ANO Recommendations	Defence Remediation Action
9. Defence should regularly review its Noise Mitigation and Complaints Resolution Strategy, with consideration to be given to relevant matters, including but not limited to: a. Any changes to the Noise Management Plan and Noise Monitoring and Complaints Handling Strategy; b. Those arising through the complaints process detailed in the Noise Monitoring and Complaints Handling Strategy; and c. The results of audits of compliance with its Conditions of Approval for Australian Super Hornet Flying Operations (note: Amendment made to wording of this recommendation).	Completed. Conducted annually as part of the RAAF Base Amberley aircraft noise management plans, and through the Amberley consultative working group.
Improvement Suggestion 1. Defence should include commentary in its Annual Super Hornet Reports that explains any reported activities where compliance with the Conditions of Approval is not otherwise readily apparent from the information in the report.	Defence has reviewed the 2021 ASHNMP and is confident that the report explains how Defence has complied with the Conditions of Approval.
Improvement Suggestion 2. Defence should include data and commentary in its Annual Super Hornet Reports that explicitly demonstrates its performance against each aspect of the Noise Management Plan requirements.	Defence has reviewed the 2021 ASHNMP and is confident that the data and commentary included in the report explains its performance against each aspect of the NMP requirements.

ANNEX C – CROSS REFERENCE TO AUSTRALIAN SUPER HORNET NOISE MANAGEMENT PLAN

Requirement	Evidence
NMP-01: Page 11 - The Senior ADF Officer (SADFO) – Amberley will publish and maintain on the internet, all related plans and strategies within three months of their individual Approval	The ASHNMP V4.0 is published on the Aircraft Noise webpage ⁹ .
NMP-02: Page 12 - Approximately 70% of Super Hornet flights will be conducted at RAAF Base Amberley, its Main Operating Base.	Table Two (page 14) shows that this has been exceeded by 19% [using the same calculations from the 2019 ANO audit = movements/NMP forecast = 6821/7700 ≈ 89% Whilst movements remains below the forecast, a revision to the statement of “70% of flights” should occur.
NMP-03: Page 12 and 13 - Super Hornet operations will be conducted on Runway 15/33. Runway 04/22 will only be used by Super Hornet in exceptional circumstances, such as in an emergency, or when Runway 15/33 is obstructed.	This is supported by Table One (page 9) which shows that Runways 04/22 were not used by the Super Hornets in 2021.
NMP-04: Page 12 - In general, Super Hornet operations will occur on weekdays and night flying, when scheduled, will typically occur on Monday to Thursday nights. Weekend flying day or night, will occur in circumstances detailed in the ‘Variations’ section, detailed from paragraph 52 to 56.	Super Hornet operations will typically occur on weekdays – this is supported by figure seven (page 14) but note that 140 movements occurred over the weekend (para 40 on page 14). The vast bulk of this flying (128 movements) occurred over three weekends in July as part of Exercise TALISMAN SABRE Super Hornet night flying (defined as activity between 7pm and 7am), when scheduled, only occurred on Monday to Thursday nights. Refer paras 41 and 42 (page 15) for details...
NMP-05: Page 12 - Air Force generally operates Super Hornets at RAAF Base Amberley for approximately 46 weeks of the year, with scheduled breaks from flying through the year	As shown on figure 7 (page 14), Air Force flew 48 weeks of Super Hornet operations in 2021, exceeding the expected rate of effort by two weeks.

⁹ See webpage link [<https://www.defence.gov.au/AirCraftNoise/Environment/PublicEnvironmentReport.asp>]

Requirement	Evidence
NMP-06: Page 12 - Super Hornet aircraft generally follow standard flight paths and altitudes when operating within the vicinity of Amberley. Instrument approach and departures are required to be performed in accordance with published aeronautical navigation procedures that are subject to change. When a change occurs, the Super Hornet will operate in accordance with the new published procedure, and this NMP will be updated at the next review with the new flight profile. As detailed in the Variations section, there are also a small number of specific circumstances where these standard profiles may not be followed.	Super Hornet aircraft will generally follow standard flight paths and altitudes when operating within the vicinity of Amberley – this is supported by para 23-29 (page 9-11) Instrument approach and departures are required to be performed in accordance with published procedures – this is supported by para 23-29 (page 9-11). When a change occurs, the Super Hornet will operate in accordance with the published procedure and the relevant Noise Management Plan will be updated at the next annual review – see para 27 (page 11) and NMP-01 (above).
NMP-07: Page 13 - The transit routes for Super Hornet to the eastern training areas have been constructed to minimise the noise impact on the civilian population of Brisbane. The transit route to the training area to the west of Amberley is based on the 'fly neighbourly' concept and most departures are conducted above 15,000 ft above mean sea-level	This is supported by para 31 (page 12) where most transits to and from all areas are conducted above 15,000 ft above mean sea-level with transit below this level only conducted if instructed by ATC.
NMP-08: Page 13 - Super Hornet aircraft will not fly below 1,500 ft (450 m) within 10 nm (18.5 km) of RAAF Base Amberley, except when landing, taking off or in the circuit.	This is supported by para 30 (page 12) where no operations were detected operating below this altitude within 10 nautical miles of RAAF Base Amberley.
NMP-09: Page 13 - Runway 15 Operations. For departures to the east of runway centre-line, Super Hornets will not make a left-hand turn, to the east, after take-off from Runway 15 before climbing towards Brisbane. Super Hornets will instead turn right and climb to altitude to the west of Amberley before transiting east at high altitude.	This is supported by para 26 (page 11) where no departures were identified that turned left after takeoff from runway 15.
NMP-10: Page 13 - Runway 33 Operations. For departures to the east of runway centre-line, Super Hornets may climb straight ahead until reaching an approved transit altitude to the east. When unable to achieve this altitude in accordance with published procedures, Super Hornets will turn left and climb to the west of Amberley before transiting east at high altitude.	This is supported by para 24 (page 10) where no departures were identified that did not adhere to this requirement.

Requirement	Evidence
NMP-11: Page 13 - For Runway 33 visual departures, Super Hornets will delay all turns to the west until 4nm (7.4 km) after take-off to avoid overflying Walloon and Thagoona.	This is shown in para 25 (page 10) where 109 military fast jet departures were identified as turning to the west before reaching 7.4 kilometres on runway heading. These early turns were only conducted when instructed by ATC in managing positive aircraft separation and are identified as unforeseeable variations that can be expected from time to time due to weather and/or ATC direction.
NMP-12: Page 13 - Instrument departures for Runway 33 will be in accordance with the published instrument departure procedure that requires aircraft to reach 1,100 ft before commencing a left hand turn to their ATC assigned heading	Para 27 (page 11) shows that all instrument departures for Runway 33 have been in accordance with the published instrument departure procedures however; the current departure procedures as amended by RAAF in AIS-AF no longer require an aircraft to reach 1,100 ft before commencing a left turn. The current published requirement is to turn at or above 900 ft or 800 ft depending on which procedure is being flown. In any case, the aircraft is still required to reach 7.4 kilometres (4 nautical miles) before commencing the turn, which would typically see a Super Hornet at an altitude of 2000-3000 ft thereby meeting the intent of the original requirement.
NMP-13: Page 14 - The use of afterburner by the Super Hornet is permitted to ensure aircraft safety but with due consideration to the additional noise generated and in-line with Air Force Fly Neighbourly Policy.	It is recognised that afterburner are used for departures due to safety reasons. Both the movement rate and noise events on Table Three (page 38) indicate that Super Hornet operation is within the 2009 Public Environment Report estimates.

Requirement	Evidence
NMP-14: Page 14 - Planned Super Hornet arrival flight paths (that is, aircraft returning to land at the Base) for visual procedures (in good weather). The majority of arrivals will be via an Initial and Pitch procedure. Initial and Pitch procedures are conducted at Amberley as the preferred arrival method as they provide the most efficient and safe mechanism for recovery. Approximately 5% of arrivals in good weather will be via straight-in approaches. During poor weather, or for training, Super Hornets will recover via published instrument arrival flight paths, which connect with published instrument approach procedures to the active runway. These published procedures are used in poor weather when the runway cannot be seen from the air until close to landing.	This is supported by para 28 (page 11) where 68 percent of arrivals were by the Initial and Pitch procedure which compares with an estimate of 80 percent in the 2009 Public Environment Report and a revised estimate of 70 percent in the ASHNMP V4.0. The 16 percent of arrivals flown as straight in approaches were due to poor weather, training requirements, ATC instruction, or operational needs (e.g. aircraft malfunction). When required for aircrew training, a number of circuits may be flown at the end of a mission
NMP-15: Page 14 - All Super Hornet landing circuits are planned to be flown to the west of Runway 15/33. Circuits will only be flown over Ipswich in exceptional circumstances. Circuits will be flown at 1,500 ft (450 m) unless required for training or under stress of weather. Circuit flight paths are illustrated at Annex H.	This is supported by para 29 and shown in Figure Five (page 11).
NMP-16: Page 8 – the number of night flying movements as a fraction of total movements has historically been less than 15% since the Australian Super Hornet introduction to service. The 2009 PER predicted up to 20%, however Air Force currently has no plan to deviate from the historic status quo out to 2019/2020. Super Hornet flying operations at RAAF Base Amberley will be planned to comply with the following limits: a. no continuous practice circuits will be flown between 10:00 pm and 7:00 am, and b. no flights will depart from or arrive at the Base between 11:00 pm and 7:00 am unless in exceptional circumstances.	This is supported by para 41 (page 15) where movements after 7:00pm were 10% compared to the 20% forecast and no circuits flown after 10:00pm in 2021.

Requirement	Evidence
NMP-17: Page 15 - An average Super Hornet flying day will involve around 20 movements, though the actual number of movements per day may vary considerably. On some days, there will be no Super Hornet flights; on others, the number of movements may increase to 50 or more.	Table Two (page 14) shows that there were 26 movements/day which is “around 20 movement”. Para 38 (page 14) notes the noise impact has not increased above the predicted levels.
NMP-19: Page 16 – Routine flight-line engine running above 80% power restricted between 10:00 pm and 6:00 am.	This is supported by para 33-34 (page 13) where records indicate that this was adhered to.
NMP-20: Page 16 - High power engine running at ETC 3 involves the running of engines at an average of 95% power for up to 30 minutes and are limited to: a maximum of ten events per year unless approved by SADFO Amberley as a foreseeable variation; and high power engine running will not take place between 10:00 pm and 6:00 am.	This is supported by para 33-34 (page 13) where records indicate that this was adhered to.
NMP-21: Page 17 - Foreseeable variations to the planned Super Hornet flying operations described will require approval of the Senior Australian Defence Force Officer (SADFO) – Amberley or a promulgated delegate. In deciding whether to approve a foreseeable variation, the SADFO Amberley will consider the potential environmental effects against the operational need.	This is not intended to be reported on in the Annual Noise Report.
NMP-22: Page 17 - In the event that variations are to become longstanding practices, in accordance with the Variation of Approval (Condition 8), Air Force is to seek approval for changes to the NMP from Government.	This is not intended to be reported on in the Annual Noise Report.
NMP-23: Page 19 – Defence will conduct ongoing annual assessments of aircraft noise measures as part of normal Air Force Base management practice. In the event measures are found to be ineffective, additional measures will be implemented and then reviewed. This process will continue until such time that the measures are found to be effective.	Noise assessments are conducted as part of the ongoing Work Health and Safety program. This is not intended to be reported on in the Annual Noise Report.
NMP-24: Page 20 - The ASHNMP is available on the following website http://www.defence.gov.au/AirCraftNoise/Environment/PublicEnvironmentReport.asp .	The approved ASHNMP V4.0 is available at the listed address.

Requirement	Evidence
NMP-25: Page 20 - Wherever possible, Air Force will advise the public when there will be significant events, which result in peak periods of aircraft noise, or when there are significant changes to the Super Hornet flying operations outlined above. Significant changes are those that are either permanent, or are temporary but result in noticeable, prolonged changes to noise profiles. When significant events occur or significant changes are made, Air Force will inform the public, as time permits, through the following: a. the Amberley Consultative Working Group; b. media releases to all local media outlets, including local newspapers; and c. updates to the RAAF Base Amberley web page. Wherever possible, advance notification will be provided of significant events. On occasion, security requirements may preclude advance notification. In this case, Air Force will endeavour to provide a subsequent explanation of the reason for the event. Air Force will advise the public of known planned variations (except where security requirements preclude this) on the RAAF Base Amberley webpage. Air Force will attempt to report all variations to planned Super Hornet flying operations (foreseeable and unforeseeable) on the RAAF Base Amberley webpage as soon as practical, but within one month of them occurring.	ACWG Minutes ¹⁰ , media releases, RAAF Flying Activities ¹¹ and Aircraft Noise Map ¹² website support this. Foreseeable and unforeseeable variations are reported throughout this Annual Noise Report.

¹⁰ See webpage link [<https://www.airforce.gov.au/about-us/bases/qld/amberley/amberley-consultative-working-group>]

¹¹ See webpage link [<https://www.airforce.gov.au/operations/flying-operations/flying-activity>]

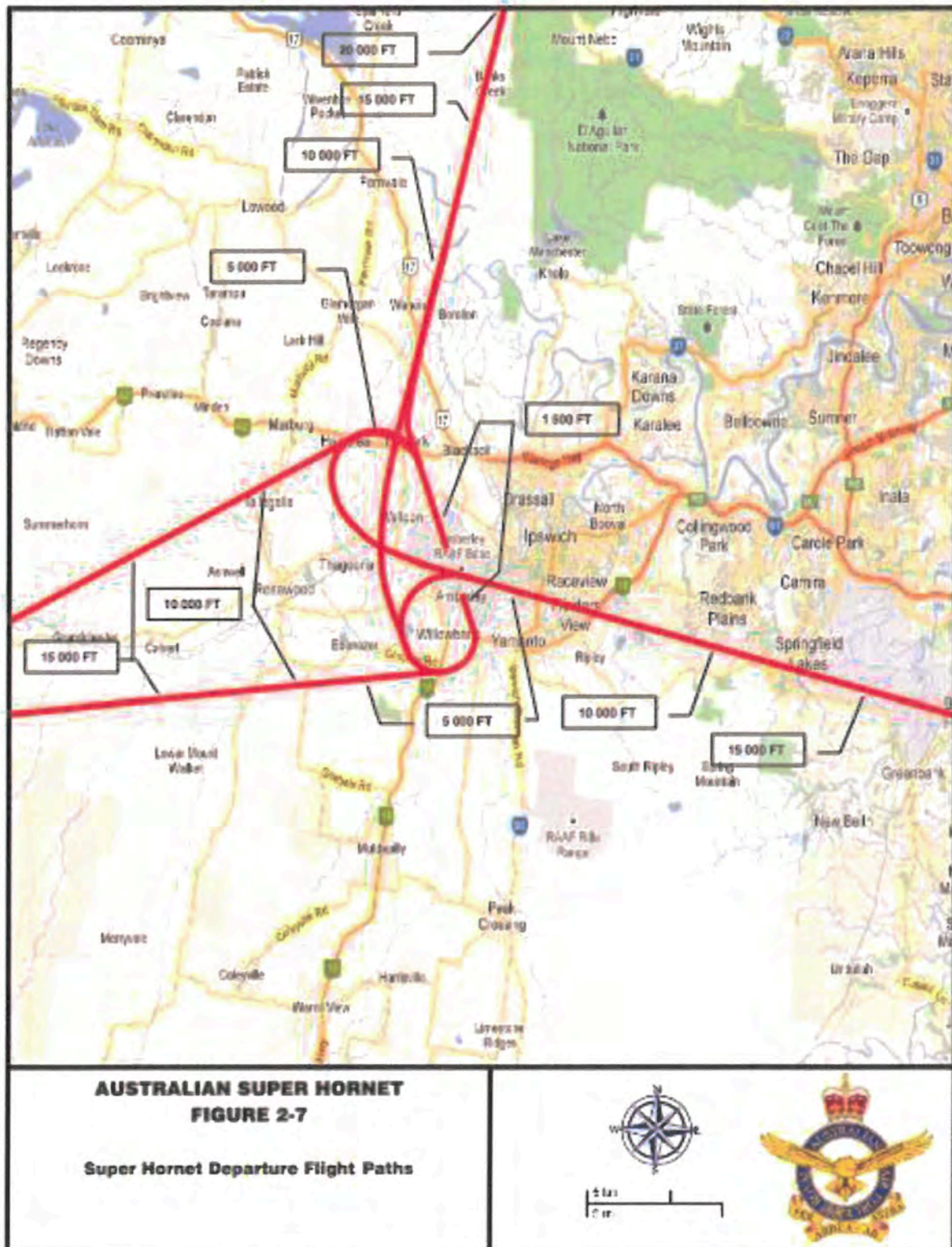
¹² See webpage link [<https://aircraftnoisemap.airforce.gov.au/assets/site.html?507#base/5>]

Requirement	Evidence
NMP-26: Page 21 - The Super Hornet NMP will be reviewed annually. The review will consider: a. any foreseeable variations approved by the SADFO-Amberley, b. any changes to Super Hornet flying operations limitations or planning assumptions, which occur as a result of the complaints process detailed in the Noise Monitoring and Complaints Handling Strategy; and c. the results of audits of compliance with the 2009 PER conditions of approval. Where a review of this Plan identifies a need to modify this Plan, a revised Plan will be submitted to Government for approval. Until such time the new Plan is approved flying operations should adhere to the most recently approved Plan	This is not intended to be reported on in the Annual Noise Report.
NMP-27: Page 21 - Condition 9 of the Variation of Approval requires Air Force to maintain a formal documentation trail to enable the substantiation of activities associated with or relevant to the conditions of approval, including measures taken to implement the management plans required by the approval. To satisfy the requirement of Condition 9, and Recommendation 1 of the 2015 ANO Review, Air Force will maintain the required documents and copies of relevant communications on the DRMS document management system.	Documentation is not intended to be reported on in the Annual Noise Report.
NMCHS-05: Page 9 - RAAF Amberley Air Base Executive Officer is to coordinate the compilation of an Annual Super Hornet Noise Report that compares the NFPMS quarterly reports with the ASHNMP. The Annual Super Hornet Noise Reports are to evaluate the accuracy of noise modelling undertaken for the PER and monitor compliance with the ASHNMP.	The Annual Noise Report supports this.
NMCHS-06: Page 9 - Annual Super Hornet Noise Reports will be tabled at the Amberley Consultative Working Group (ACWG). Additionally, the Annual Super Hornet Noise Reports and minutes of the ACWG meetings are to be made available on the RAAF Amberley internet website.	This is supported by para 15 (page 6).

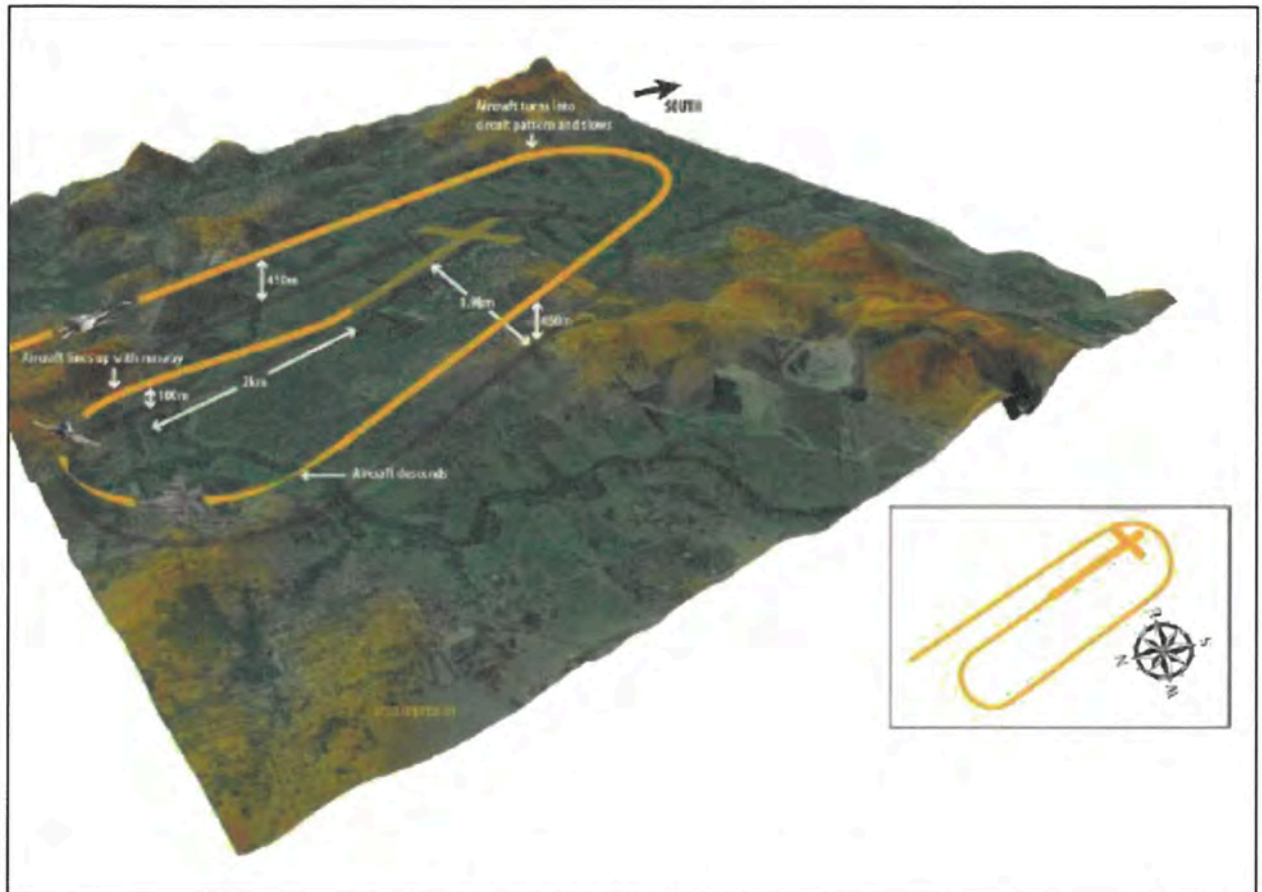
Requirement	Evidence
NMCHS-16: Page 12 - Annual Super Hornet Noise Reports are to be published on the website < http://www.airforce.gov.au/bases/amberley.aspx > within three months of report completion.	This website has since been changed and all reports are available at the Aircraft Noise webpage ¹³ . This was amended in the 2020 annual review of the Noise Monitoring and Complaints Handling (NMCHS) strategy.

¹³ See webpage link [<https://www.defence.gov.au/AirCraftNoise/Environment/PublicEnvironmentReport.asp>]

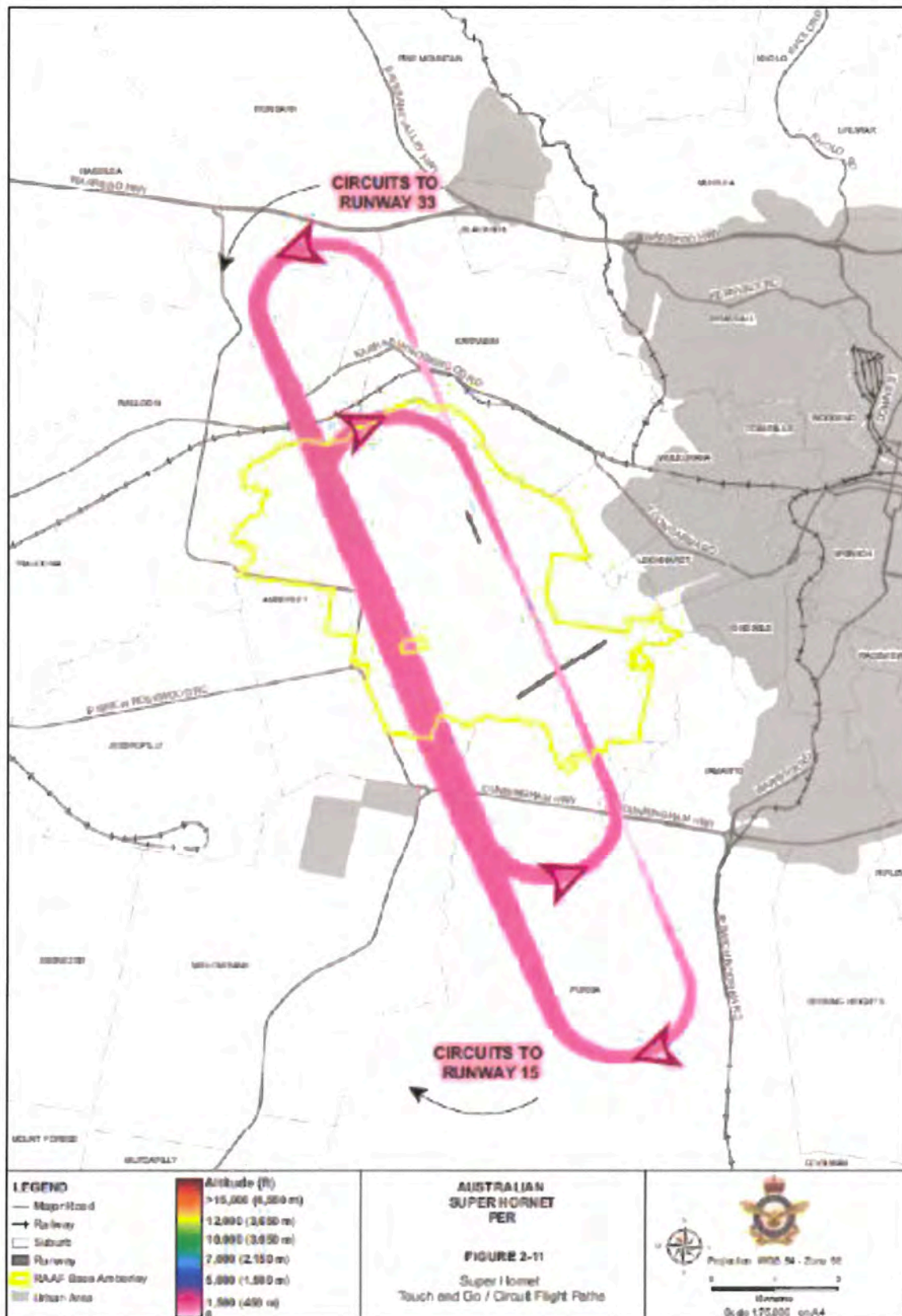
ANNEX D – SUPER HORNET DEPARTURE FLIGHT PATHS



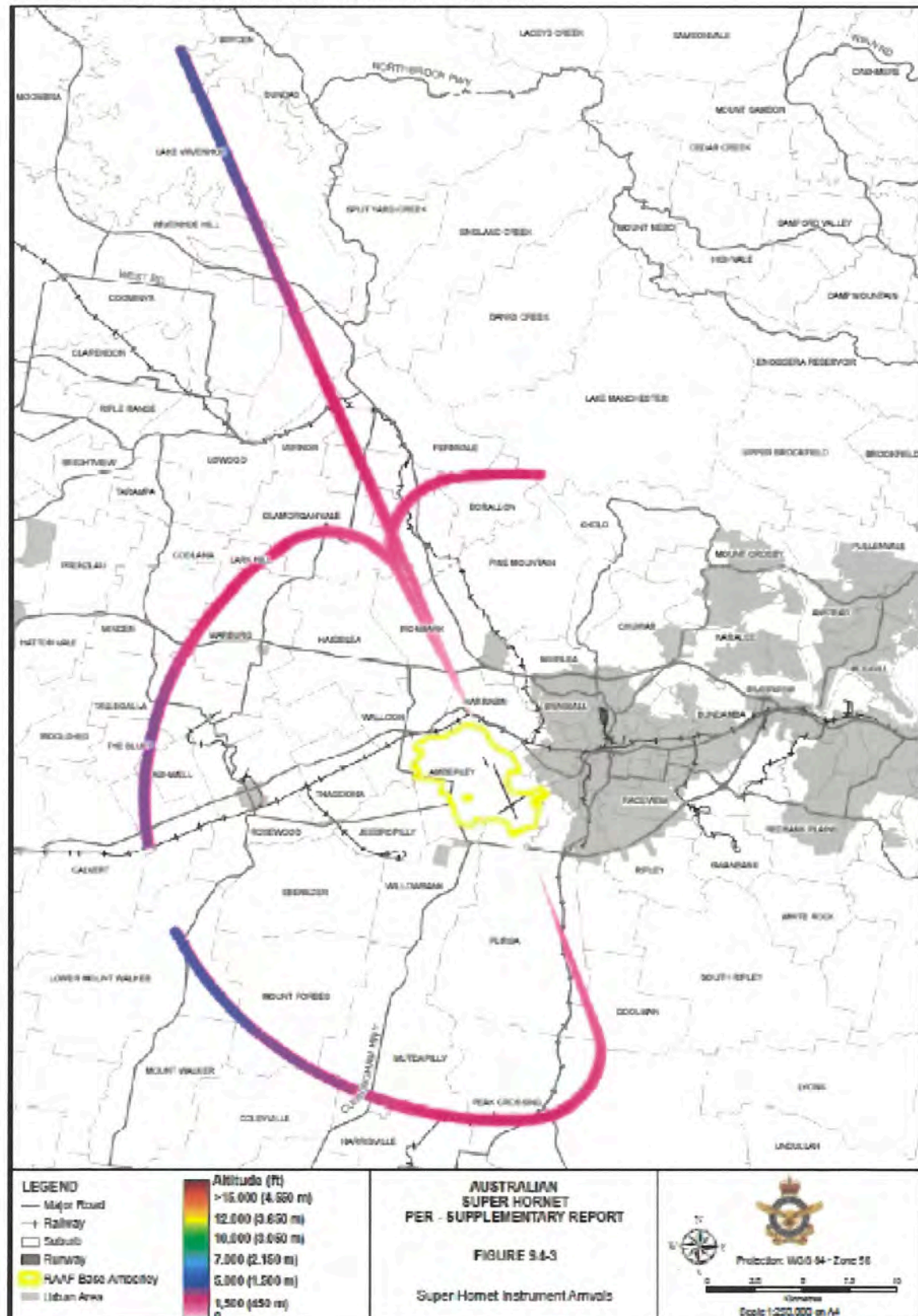
ANNEX E – SUPER HORNET INITIAL AND PITCH



ANNEX F – SUPER HORNET CIRCUIT PATTERN



ANNEX G – SUPER HORNET INSTRUMENT ARRIVALS



ANNEX H – ANALYSIS OF NOISE EVENTS

N70 AND N85 NOISE EVENTS

50. N70 and N85 noise event data per forecast flying day¹⁴ for the four noise monitoring terminals from 2011 to 2021 is shown at Table Three¹⁵. The top row of the table shows the annual movements for each year, with second and third rows showing the percentage of movements compared to the 2009 Public Environment Report (PER estimate) and the applicable Noise Management Plan forecast (NMP forecast) for each year. Annual noise event results below the minimum forecast are shown in green font. The highest noise event value for each location over the eleven years is highlighted yellow.

Table Three: N70 and N85 Noise Event Data from 2011 to 2021

	Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
	Annual Movements	3744	4476	4481	5968	5276	5883	3863	4166	6039	5863	6821
	% of 2009 PER forecast	81%	96%	96%	128%	114%	127%	83%	90%	130%	126%	147%
	% of NMP forecast	81%	96%	96%	128%	114%	112%	65%	64%	89%	87%	89%
N70	PER estimate											
Willowbank Cemetery	15 to < 20	7.8	10.0	8.0	10.8	8.4	10.4	6.4	8.4	10.9	10.5	12.6
Kholo Gardens	5 to < 10	0.3	0.5	0.2	0.3	0.2	0.5	0.2	0.3	0.6	0.2	0.2
Walloon PS	15 to < 20	8.7	11.7	8.5	7.8	5.3	3.5	2.5	2.6	3.9	3.9	4.4
Yamanto COC	15 to < 20	13.2	15.3	12.7	17.3	15.4	16.1	9.9	12.0	15.6	18.1	20.1
N85	PER estimate											
Willowbank Cemetery	< 5	1.4	1.7	1.3	1.1	0.9	0.9	0.7	1.0	1.6	1.6	1.7
Kholo Gardens	< 5	0.01	0.03	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Walloon PS	< 5	0.5	0.6	0.4	0.4	0.4	0.5	0.3	0.2	0.4	0.3	0.4
Yamanto COC	10 to < 15	4.5	5.6	5.0	6.3	5.6	5.7	3.0	5.1	5.7	6.3	7.6

51. Analysis of Table Three identifies the following observations:

¹⁴ Total annual noise events divided by 230 flying days (46 weeks at 5 days a week)

¹⁵ An event that exceeds 85 dB will also be counted as a 70dB exceedance; i.e. N85 exceedances are a subset of N70 exceedances

- a. The N70 and N85 events at all four monitoring locations between 2019 and 2021 are reflective of the increase in Super Hornet movements compared to previous years.
- b. N70 events at Willowbank, Kholo Gardens and Walloon are below the minimum of the forecast range in every year.
- c. N70 events at Yamanto have slightly exceeded the forecast range in 2021 despite a peak 47 percent overfly of the 2009 Public Environment Report forecast movements.
- d. N85 events at Willowbank are more than 60 percent below the forecast maximum in every year
- e. N85 events at Kholo Gardens and Walloon are more than 80 percent below than forecast maximum in every year
- f. N85 events at Yamanto are more than 30 percent below the minimum of the forecast range despite the overfly of the 2009 Public Environment Report forecast movements from 2014 to 2016, and 2019 to 2021.

N100 NOISE EVENTS

52. The 2009 Public Environment Report forecast zero events at all noise terminals that would exceed 100dB. Table Four shows annual total¹⁶ N100 noise events for each monitoring terminal location.

Table Four: N100 Noise Events Data from 2011 to 2021

N100	PER est	TOTAL	2011	2012	2013	2014	2015	2016
Willowbank Cemetery	0	shows count / peak dB	4 / 103.9	14 / 104.9	2 / 102.6	1 / 100.3	0	2 / 103.3
Kholo Gardens	0		0	0	0	0	0	0 / 88.1
Walloon PS	0		0	3 / 103.7	0	0	2 / 104.9	1 / 104.9
Yamanto COC	0		10 / 103.9	7 / 105.5	3 / 103.3	6 / 101.5	4 / 102.8	8 / 102.8

N100	PER est	TOTAL	2017	2018	2019	2020	2021
Willowbank Cemetery	0	shows count / peak dB	4 / 107.2	3 / 105.3	1 / 100.5	1 / 100.6	2 / 100.9
Kholo Gardens	0		0 / 86.7	0 / 82.2	0 / 84.3	0 / 83.7	0 / 84.8
Walloon PS	0		0 / 98.9	1 / 107.4	1 / 101.0	2 / 101.7	2 / 105.7
Yamanto COC	0		4 / 103.1	6 / 104.8	5 / 103.0	15 / 103.3	7 / 101.8

¹⁶ Total events for the calendar year – not average day data events as shown in Table Two

53. Analysis of Table Four identifies that N100 noise events reduced at Yamanto in 2021 compared to 2020. The number of N100 events remained constant at the other three NMT locations. Although the N100 contours in the 2009 Public Environment Report forecast zero events at the terminal locations, review of the LMax charts in the PER show that the Yamanto and Willowbank terminals are relatively close to the LMax 100 contour, reflecting the terminals proximity to the runway. Accordingly, the small number of LMax 100 exceedances at these locations are likely to be generated when weather conditions cause maximum noise impact, such as low overcast cloud layers, combined with strong westerly winds in respect of the Yamanto terminal.

NOISE EVENTS ADJUSTED TO 2011 BASELINE

54. Table Five below shows the Table Three noise event data adjusted to show a rate of noise event occurrences baselined against a common movement total for each year of 4648 movements. This reflects the projected N70, N85 and N100 noise event occurrences contained within the 2009 Public Environment Report. Therefore, this data does not show actual detected noise event data per year at each terminal, but is intended to show how the rate of noise events has changed from year to year. In effect, this analysis enables an assessment of the effectiveness of changes in how the Super Hornet is operated from a noise generation perspective.

Table Five: Noise Events Adjusted to 4648 Movements per Year

	Annual Movements	4648	4648	4648	4648	4648	4648	4648	4648	4648	4648	4648
N70	PER estimate	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Willowbank Cemetery	15 to less than 20	9.7	10.4	8.3	8.4	7.4	9.7	7.7	9.4	8.4	8.4	10.0
Kholo Gardens	5 to less than 10	0.3	0.5	0.2	0.2	0.2	0.4	0.3	0.3	0.5	0.1	0.2
Walloon PS	15 to less than 20	10.8	12.2	8.8	6.1	4.7	2.7	3.0	2.9	3.0	3.1	3.5
Yamanto COC	15 to less than 20	16.4	15.8	13.2	13.5	13.6	12.8	11.9	13.4	12.0	14.3	15.9
N85	PER estimate	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Willowbank Cemetery	less than 5	1.8	1.7	1.4	0.8	0.8	0.7	0.8	1.1	1.3	1.3	1.3
Kholo Gardens	less than 5	0.01	0.03	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Walloon PS	less than 5	0.6	0.7	0.5	0.3	0.4	0.4	0.4	0.2	0.3	0.2	0.3
Yamanto COC	10 to less than 15	5.6	5.8	5.2	4.9	5.0	4.5	3.7	5.6	4.4	5.0	6.0

55. Analysis of Table Four identifies the following observations:
- a. 2012 was the worst year for rate of N70 and N85 noise events (and N100 from Table Four).
 - b. Noise events at Kholo Gardens remain insignificant.
 - c. Rate of N70 noise events at Walloon have decreased year on year from 2012 and remains consistent in recent years.
 - d. Rate of N70 noise events at Yamanto and Willowbank have increased in 2021 compared to previous years.
 - e. Rate of N85 noise events at Willowbank and Walloon are less than 80 percent of forecast maximum every year.
 - f. Rate of N85 noise events at Yamanto is the highest since 2011, but is still below the forecast rate.

ENCLOSURE ONE – AUSTRALIAN NOISE EXPOSURE FORECAST, RAAF AMBERLEY 2029

1. The following pages show the 2017 noise modelling outcomes for RAAF Base Amberley based on the projected total aircraft movements in 2029, which provides a long term planning horizon for land planning authorities. The modelling includes the F/A-18F and EA-18G movements and visiting military fast jet movements forecast in this plan, as well as other aircraft operating from RAAF Base Amberley such as the C-17 cargo aircraft and the KC-30 air to air refuelling aircraft.

2. **LMax Map.** The LMax map (Figure E-One) shows the variance of aircraft maximum noise levels that can be experienced at any particular location. As the map shows, maximum noise occurrences could range from once per year to many times per day. It is intended to demonstrate that noise may be heard at some distances from RAAF Base Amberley, even if only occasionally.

3. Review of the 2016 LMax map identified an excessive area of high noise results to the north-west of RAAF Base Amberley. To reduce this 'hot spot' one of the instrument approaches to runway 15 was modified by moving the approach ground track to the north-west further away from the base. The outcome of this is that aircraft will be able to remain higher above the ground on this new track, and more significantly will be able to delay configuring the aircraft for landing (landing gear down) until established on final approach, which removes the need for higher power settings to the north-west of the airfield. Additionally, the instrument approach to runway 33 was also modified by moving the start point further south to reduce noise impact to the west.

4. The current LMax map reflects the revised flight profiles.

5. **'Number Above' Maps.** Number Above maps show the number of times per day aircraft noise may reach a nominated decibel level, based on an average flying day. An average flying day is total annual aircraft movements averaged over 230 days, which equates to five flying days a week for 46 weeks per year. Maps are provided for:

- a. 70 A-weighted decibels (dB(A)) (Figure E-Two),
- b. 85dB(A) (Figure E-Three), and
- c. 100dB(A) (Figure E-Four).

6. Of note, these maps include all aircraft types operating from RAAF Base Amberley, not just the F/A-18F and the EA-18G.

7. For comparison purposes the noise event data from the 2009 Public Environment Report is included, noting that these 2009 maps only included the F/A-18F movements. The comparison identifies that at the 70 decibel and 85 decibel levels there is a modest expansion of the footprint to the north and south-west which is predominately driven by the overall increase in annual movements resulting in a higher average day movement rate. However, the revised flight tracks and vertical profiles incorporated into the 2017 modelling show there is a reduction in average day noise events to the east over Ipswich and to the west of the base, despite the increase in planned movements. At the 100 decibel level, there is no overall increase in noise footprint despite the increase in planned annual movements.

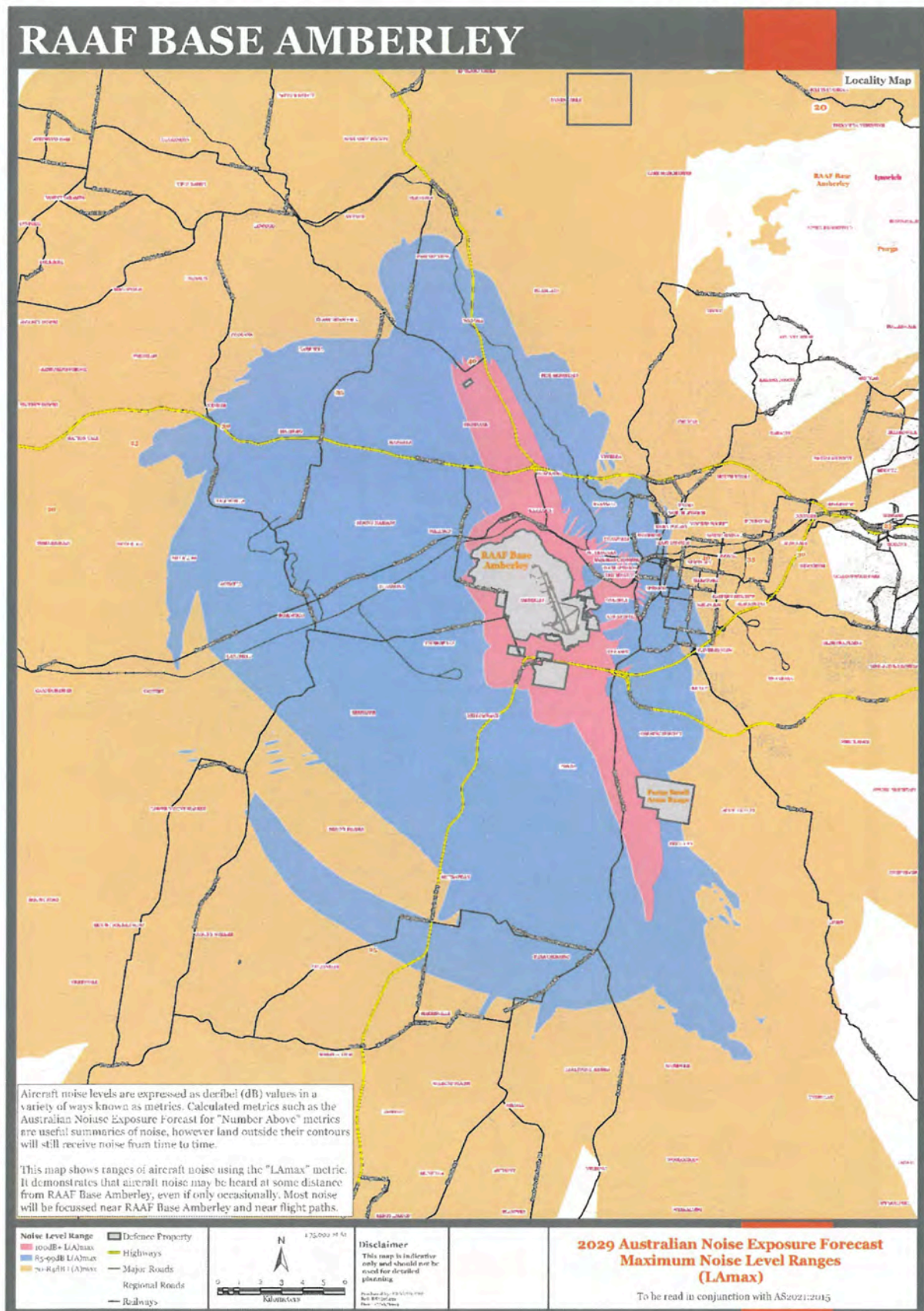


Figure E-One: Lmax Map, RAAF Base Amberley, ANEF 2029

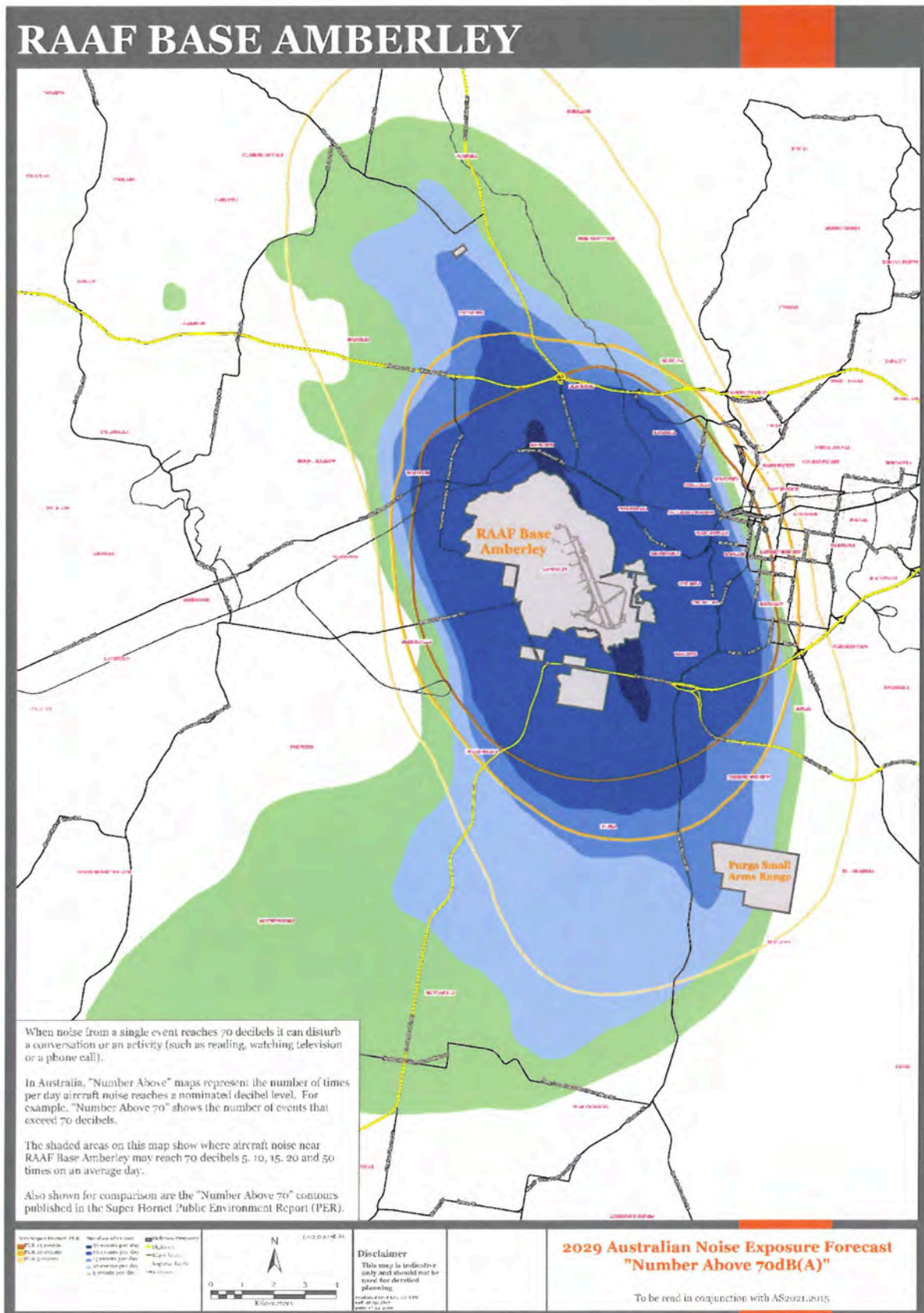


Figure E-Two: Number Above 70 dB(A) Map, RAAF Base Amberley, 2029 ANEF

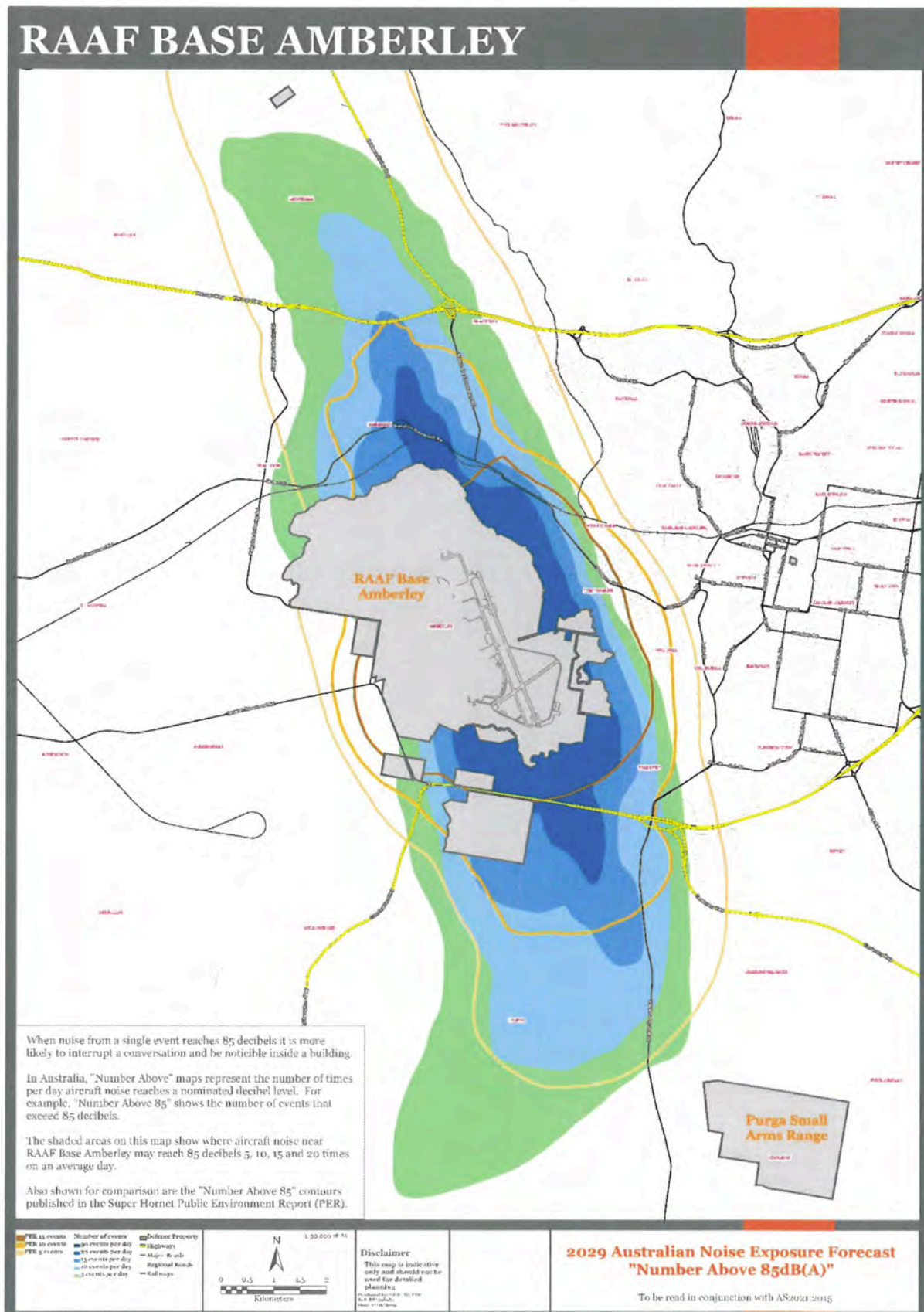


Figure E-Three: Number Above 85 dB(A) Map, RAAF Base Amberley, 2029 ANEF

