

Australian Super Hornet Air Quality Monitoring Plan

Version 2.0



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AMENDMENT HISTORY

Version	Date	Minister's Approval Date	Comments
1.0	09 Oct 2012	27 April 2014	First issue. 01 Jun 12 – Submitted to DSEWPaC for approval.
2.0	04 Sep 2020		Full review: - New format. - Changes to support introduction of the EA-18G. - Changed to show compliance with monitoring requirements. - Incorporation of recommendations from 2019 audit.

ANNUAL REVIEW

Year	Date	Reviewer
2021		
2022		
2023		
2024		
2025		

DOCUMENT CONTROL

The document is to be reviewed annually by RAAF Amberley Air Base Executive Officer or their delegate, in consultation with relevant Force Element Group and other applicable stakeholders. Annual reviews do not need the Environment Minister's approval.

Reviews are to occur with 'Track Changes' function engaged. All reviews **must** be provided to the Environment and Energy Manager in Air Force Headquarters before being sent for signature of the Senior Australian Defence Force Officer.

Should there be significant changes in the document, the 'Tracked Changes' document is to be provided to the Environment Department via the Environment and Energy Manager. The document will be reviewed prior to approval. A new version will be issued and approval **must** be gained from the Environment Minister's office before being published. Once approval is received, this document **must** be published on the [Aircraft Noise](https://www.defence.gov.au/AirCraftNoise/Environment/PublicEnvironmentReport.asp)¹ webpage within three (3) months.

¹ Webpage link [<https://www.defence.gov.au/AirCraftNoise/Environment/PublicEnvironmentReport.asp>]

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F/A-18F AND EA-18G AIR QUALITY MONITORING PLAN

PURPOSE

1. The purpose of this Air Quality Monitoring Plan is to outline how Defence will comply with Condition 4 of the Environment Minister's approval of Super Hornet flying operations at RAAF Base Amberley.

BACKGROUND

2. Beginning in March 2010 the Royal Australian Air Force (RAAF) introduced into service 24 F/A-18F Super Hornet aircraft at RAAF Base Amberley. In accordance with the requirements of the Environment Protection and Biodiversity Conservation Act 1999, operation of the Super Hornet was approved by the Minister for Environment Protection, Heritage and the Arts (the Environment Minister) subject to the Department of Defence meeting conditions attached to the approval. The approval was supported by outcomes of the 2009 Public Environment Report² which included two rounds of public consultation. In April 2014 the Environment Department issued a variation to the original conditions attached to the approval³.

3. Under the conditions attached to the approval, the Department of Defence is required to implement the following plans and strategies for operation of the Super Hornet at RAAF Base Amberley:

- a. Super Hornet Noise Management Plan
- b. Noise Monitoring and Complaints Handling Strategy
- c. Super Hornet Noise Mitigation and Complaint Resolution Strategy
- d. Air Quality Monitoring Plan⁴.

4. This document addresses the requirements for the Air Quality Monitoring Plan. The requirements were defined in Condition 4 as provided in the 2010 approval, and were carried over into the 2014 variation to the approval.

5. From February 2017 the Royal Australian Air Force has operated 12 EA-18G Growler aircraft 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.

APPLICABILITY

6. The Super Hornet Air Quality Monitoring Plan applies to operation of RAAF F/A-18F Super Hornet and E/A-18G Growler aircraft at RAAF Base Amberley. As the F/A-18F and EA-18G share the same fundamental airframe design and use the same engines, use of 'Super Hornet' within this plan refers to both the F/A-18F and the EA-18G.

² The [final PER](https://www.defence.gov.au/AirCraftNoise/_Master/Docs/Environment/Final%20Super%20Hornet%20PER.pdf) can be accessed from the [Department of Defence Aircraft Noise](https://www.defence.gov.au/AirCraftNoise/_Master/Docs/Environment/Final%20Super%20Hornet%20PER.pdf) website [https://www.defence.gov.au/AirCraftNoise/_Master/Docs/Environment/Final%20Super%20Hornet%20PER.pdf]

³ [Conditions of approval](https://www.defence.gov.au/AirCraftNoise/_Master/Docs/Environment/Australian%20Super%20Hornet%20-%20Variation%20notice.pdf) can be accessed from the [Department of Defence Aircraft Noise](https://www.defence.gov.au/AirCraftNoise/_Master/Docs/Environment/Australian%20Super%20Hornet%20-%20Variation%20notice.pdf) website [https://www.defence.gov.au/AirCraftNoise/_Master/Docs/Environment/Australian%20Super%20Hornet%20-%20Variation%20notice.pdf]

⁴ All plans and strategies can be accessed from the [Department of Defence Aircraft Noise](https://www.defence.gov.au/AirCraftNoise/Environment/PublicEnvironmentReport.asp) website [https://www.defence.gov.au/AirCraftNoise/Environment/PublicEnvironmentReport.asp]

SCOPE

7. The scope of this Plan is defined by the requirements of Condition 4 of the Environment Minister's approval of Super Hornet flying operations at RAAF Base Amberley:
 - a. Monitoring air quality using a sensitive receiver(s) in close proximity to, or on, RAAF Base Amberley;
 - b. Validating the accuracy of Super Hornet air quality impacts modelled in the Public Environment Report;
 - c. Should the measured air quality values exceed relevant air quality objectives, a commitment to working with the relevant State authorities to determine sources of pollutants and potential mitigation measures;
 - d. Making available the results of rain tank water quality testing conducted in accordance with the Public Environment Report;
 - e. Identifying and implementing appropriate measures to mitigate rainwater quality contamination in the event that contamination is found to occur as a result of Super Hornet operations.
8. Annex A provides a cross-referenced table that details how this plan addresses each scope item listed above.

COMPLIANCE WITH THIS PLAN

9. This plan replaces the F/A-18F Super Hornet Air Quality Monitoring Plan Version 1.0 dated 09 October 2012. Compliance with the Super Hornet Air Quality Monitoring Plan Version 2.0 is required in accordance with Condition 4. This plan takes effect once approved by the Environment Minister, in accordance with Condition 8.

RECORD KEEPING

10. Accurate records substantiating all activities associated with the implementation of this plan must be maintained. These records must be made available upon request and may be subject to internal and external audits, or used to verify compliance with the conditions of approval.

**SUMMARY OF LIKELY SUPER HORNET AIR QUALITY IMPACTS FROM THE PUBLIC
ENVIRONMENT REPORT**

11. The Public Environment Report described the existing air environment by reviewing air quality data collected by the Queensland Department of Environment and Resource Management (DERM) at their Flinders View air quality monitoring station. Air quality is generally good with concentrations of NO₂, SO₂, ozone and PM₁₀ below the ambient air quality goals in the Queensland Environment Protection Policy (Air) [EPP(Air)]. The Public Environment Report highlighted the key findings of a DERM investigation (1997) regarding regional air dispersion patterns in south-east Queensland:
- a. During summer, sea breezes carry pollutants from Brisbane towards Ipswich in the afternoon and these emissions can stagnate west of Ipswich in the evening. In the morning, these pollutants are transported back towards Brisbane.
 - b. During winter, pollutants from Brisbane travel south-west to Ipswich in the evening and return to Brisbane the following morning.
12. This regional air dispersion pattern significantly influences the air quality in the Ipswich area, including RAAF Base Amberley.
13. The potential air impacts of Super Hornet at RAAF Base Amberley were assessed by estimating emissions for a worst case hour of operations and modelling these emissions to predict the concentrations at modelled locations. The worst case intensive hour modelling used for Super Hornet operations at RAAF Base Amberley was 14 aircraft taking-off in one hour.
14. The Public Environment Report concluded that the potential for air quality impacts from Super Hornet operations are very small. Local air quality is more likely to be influenced by other sources, including regional air dispersion. The predicted concentrations from Super Hornet operations were higher than for F-111 operations because more aircraft can potentially take off each hour. The methodology used for the assessment was considered conservative, and it was concluded that there is a low risk of new air quality impacts from Super Hornet operations at RAAF Base Amberley.
15. Given the minimal predicted air quality impacts of Super Hornet flying operations at Amberley, no specific impact mitigation measures were proposed.
16. Air quality monitoring has been conducted to date for the following 4 periods:
- a. June 2014 to May 2015
 - b. June 2015 to May 2016
 - c. June 2016 to May 2017
 - d. July 2018 to December 2018
17. Analysis of the air quality data found there were no exceedances of air quality objectives on any days where there were Super Hornet movements. However, the record of movements throughout all monitoring periods showed movements below the number required to validate the air quality model in accordance with Condition 4b.

PUBLIC CONSULTATION - ISSUES RAISED AND DEFENCE RESPONSES

18. As part of the public consultation process for the Draft Public Environment Report, concerns were raised about the air quality impacts of Super Hornet flying operations in relation to the effects on water quality in rainwater tanks.
19. One submission highlighted that fuel dumping and additional flight movements may have impacts on water quality. It was noted that residents to the south, west and north of RAAF Base Amberley only have access to rainwater tanks as a source of drinking water and dams for watering livestock.
20. Defence responded that the Super Hornet aircraft is capable of releasing fuel during flight in order to reduce the weight of the aircraft for a safe landing. This is only done in emergency situations and in accordance with strict procedures. Fuel dumping is completed no lower than 6,000 ft (1,820m) above ground level, preferably over the sea. Fuel jettisoned at these heights vaporises almost immediately and disperses into the air.
21. Another submission expressed concerns about impacts on water quality in rainwater tanks and proposed a testing regime on selected properties to provide an assurance that before and after effects on water quality will not be negative.
22. Defence responded that potential impacts to water quality in rainwater tanks from military aircraft operations have been studied previously, for example at RAAF Base Williamstown. At Williamstown, water samples were taken from 20 tanks near flight paths and three control samples away from the area. These samples were tested for hydrocarbons (essentially kerosene) present in fuel, metals and formaldehyde. Evidence from Williamstown suggest that there needs to be careful consideration of the indicators/markers used in the testing/monitoring as some indicators do not have a direct correlation with other possible contaminants. All of the sampled water was within guidelines for suitability for drinking. No petroleum hydrocarbons were detected, suggesting that there is no detectable contamination of rainwater tank water from hydrocarbons present in aircraft fuel and exhaust emissions. Metals, at low concentrations, were found in some samples, but there was no correlation between their presence and aircraft flight paths.
23. Although the previous study found no relationship between aircraft overflight and quality of water in rainwater tanks, Defence recognises the concerns of the community around RAAF Base Amberley. To address these concerns, in 2009, Defence undertook water quality testing of selected rainwater tanks⁵. This was achieved through collection of water samples from rainwater tanks near current flight paths and control samples from areas away from the area.
24. Defence repeated the tests in 2012 or 2013, following the arrival of all 24 Super Hornets. The second round of testing was to allow assessment of any impact as a result of the introduction of the Super Hornet.

⁵ The [2010 water quality report](https://www.defence.gov.au/AirCraftNoise/_Master/Docs/Environment/Rainwater-Tank-Testing-2010.pdf) can be accessed from the [Department of Defence Aircraft Noise](https://www.defence.gov.au/AirCraftNoise/_Master/Docs/Environment/Rainwater-Tank-Testing-2010.pdf) website [https://www.defence.gov.au/AirCraftNoise/_Master/Docs/Environment/Rainwater-Tank-Testing-2010.pdf]

25. In accordance with the F/A-18F Super Hornet Air Quality Monitoring Plan Version 1.0⁶:
- a. Water sampling was completed within a one week period during dry-weather conditions. Water samples were analysed for the following constituents based on likely emissions from aircraft:
 - (1) Metals (Arsenic, Beryllium, Cadmium, Chromium, Nickel, Lead, Zinc);
 - (2) Formaldehyde;
 - (3) Total Petroleum Hydrocarbons (C10-C36); and
 - (4) Polycyclic Aromatic Hydrocarbons (phenanthrene, fluoranthene, pyrene, anthracene, benzo(a)pyrene, benzo(a)fluoranthene, chrysene, anthanthrene and naphthalene).
 - b. Results were assessed against Australian Drinking Water Guidelines (National Health and Medical Research Council and Agricultural and Resource Management Council of Australian and New Zealand, 2011) and formed the baseline for comparison of water quality results following introduction of the Super Hornet fleet.

⁶ The [AQMP V1](https://www.defence.gov.au/AirCraftNoise/_Master/Docs/Environment/Air%20Quality%20Monitoring%20Plan.pdf) can be accessed from the [Department of Defence Aircraft Noise](https://www.defence.gov.au/AirCraftNoise/_Master/Docs/Environment/Air%20Quality%20Monitoring%20Plan.pdf) website
[https://www.defence.gov.au/AirCraftNoise/_Master/Docs/Environment/Air%20Quality%20Monitoring%20Plan.pdf]

AIR QUALITY MONITORING

Requirement 1: Monitor air quality near a sensitive receiver in close proximity to or on RAAF Base Amberley.

26. Defence will establish an air monitoring station(s) near a sensitive receiver in close proximity to or on RAAF Base Amberley to monitor air quality. The Public Environment Report identified seventeen locations as potentially sensitive to air quality impacts from Super Hornet flying operations.

27. AECOM conducted an Air Quality Monitoring Station Site Selection analysis for the Australian Super Hornet operations at RAAF Base Amberley (dated 23 May 2014). In accordance with the Air Quality Monitoring Plan site selection criteria and the requirements of Australian Standard *AS/NZS 3580.1.1:2007 – Methods for sampling and analysis of ambient air Part 1.1: Guide to siting air monitoring equipment*, the site selection analysis nominated a preferred monitoring location. As a result of the site selection process, the preferred and selected location for the air quality monitoring station was identified as a grassed area on the western side of the parking lot behind building A052, shown as “Monitoring Location” in Figure 1, at the end of this section. Coordinates of the monitoring station are: 27° 38’ 24.92” S, 152° 41’ 39.02” E.

28. Defence will engage the services of a consultant with suitable expertise to undertake air quality monitoring and reporting. The consultant will be selected based on task appreciation, methodology, relevant experience and value for money. The consultant will determine the optimal location for a monitoring station based on relevant siting criteria including, but not limited to:

- a. proximity to aircraft takeoff flight paths;
- b. domestic and residential emitters (principally traffic),
- c. prevailing winds;
- d. access to services (electricity and telecommunications);
- e. landholder consent; and
- f. arrangements to secure the monitoring equipment.

29. The air quality objectives for the Air Quality Monitoring Plan are taken from the Public Environment Report. They are the relevant air quality objectives specified in the Queensland Environment Protection (Air) Policy 2008 [EPP (Air)], as shown in Table 1. The EPP (Air) air quality objectives are consistent with the National Environment Protection Measure (NEPM) for Ambient Air Quality standards.

Requirement 2: A process for validation of the accuracy of Super Hornet air quality impacts modelled in the PER of the action.

30. Consultants will be engaged by Defence to collect, evaluate and report the air quality data collected from the air quality monitoring station. The results will be the production of an Air Quality Monitoring Report which is planned to be published annually, during testing periods. The report will evaluate the accuracy of the predictions about Super Hornet air quality impacts as modelled in the Public Environment Report. The report will also compare the measured air quality data to the air quality objectives identified above in Table 1.

31. The annual Air Quality Monitoring Report will be tabled to the local community through the Amberley Consultative Working Group (ACWG), which includes representatives from Federal, State and Local governments, community leaders and interested members of the community. The annual Air Quality Monitoring Report will be made available on the Aircraft Noise website⁷.

Table One: Relevant Air Quality Objectives from EPP(Air)

Table 1: Standards for Pollutants

Column 1 Item	Column 2 Pollutant	Column 3 Averaging period	Column 4 Maximum concentration standard	Column 5 Maximum allowable exceedances
1	Carbon monoxide	8 hours	9.0 ppm	1 day a year
2	Nitrogen dioxide	1 hour 1 year	0.12 ppm 0.03 ppm	1 day a year None
3	Photochemical oxidants (as ozone)	1 hour 4 hours	0.10 ppm 0.08 ppm	1 day a year 1 day a year
4	Sulfur dioxide	1 hour 1 day 1 year	0.20 ppm 0.08 ppm 0.02 ppm	1 day a year 1 day a year None
5	Lead	1 year	0.50 µg/m ³	None
6	Particles as PM ₁₀	1 day 1 year	50 µg/m ³ 25 µg/m ³	None None
7	Particles as PM _{2.5}	1 day 1 year	25 µg/m ³ 8 µg/m ³	None None

Source: <https://www.legislation.gov.au/Details/F2016C00215>

⁷ All plans and strategies can be accessed from the [Department of Defence Aircraft Noise](https://www.defence.gov.au/AirCraftNoise/Environment/PublicEnvironmentReport.asp) [https://www.defence.gov.au/AirCraftNoise/Environment/PublicEnvironmentReport.asp]

32. The air quality monitoring and reporting will occur for a minimum period of 3 years. Sufficient data must be collected in order to determine the accuracy of the air quality impacts predicted in the PER. A failure to validate the accuracy of the air quality impact predictions published in the PER would warrant the air quality monitoring and reporting to continue.

33. Monitoring and reporting has occurred for the following periods:

- a. June 2014 to May 2015
- b. June 2015 to May 2016
- c. June 2016 to May 2017

34. The reports could not confirm the accuracy of the air quality predictions in the PER, citing there were insufficient movement numbers recorded during the three years to draw conclusions.

a. Further monitoring and reporting was undertaken for July – December 2018, but again there were insufficient movement numbers recorded to draw conclusions.

35. In order to validate the accuracy of the air quality impact predictions published in the PER, either the air quality monitoring and reporting must continue, or a review of the historical data be performed using a more accurate methodology to calculate historical movements data.

Requirement 3: Should the measured air quality values exceed relevant air quality objectives, a commitment to working with the relevant State authorities to determine sources of pollutants and potential mitigation measures.

36. Should the measured air quality values exceed relevant air quality objectives Defence will work with the relevant authorities to determine sources of pollutants and enact reasonable mitigation measures.

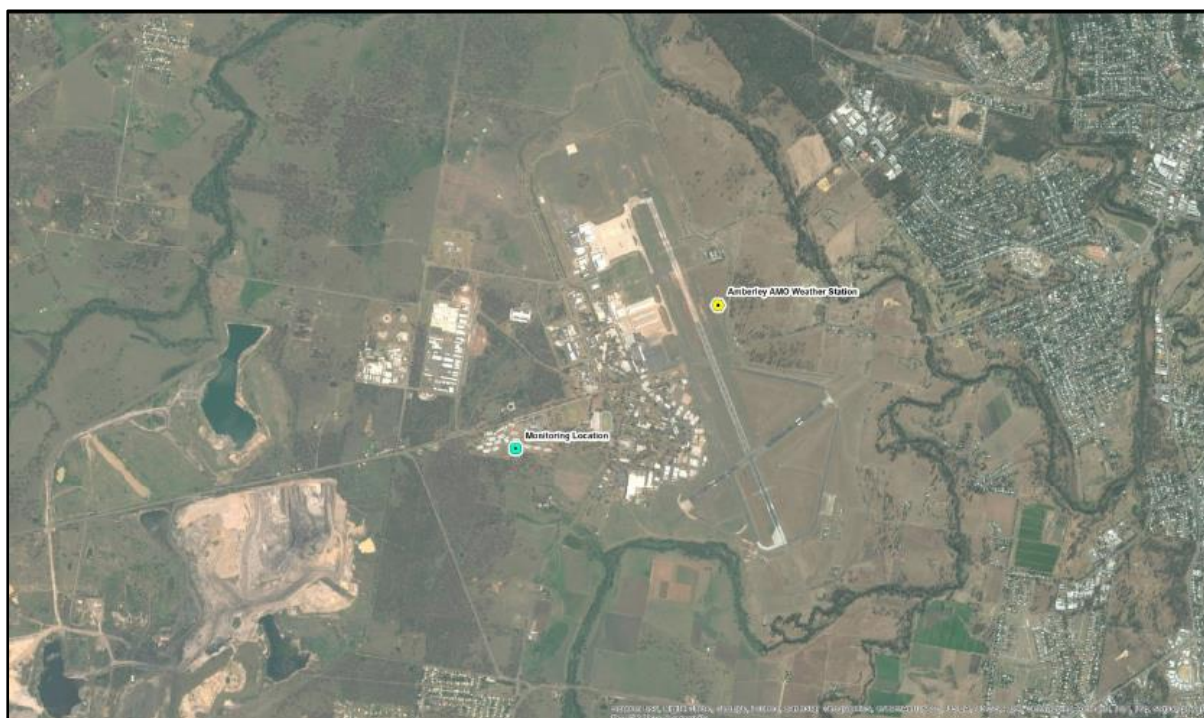


Figure 1: Location of monitoring station (green) in relation to weather station (yellow)

RAIN TANK WATER MONITORING

Requirement 4: An undertaking to post the results of rain tank water quality testing conducted in accordance with the Public Environment Report on an appropriate website for public information.

37. In 2009, prior to the introduction of Super Hornet, Defence conducted a first round of rain tank water testing.

38. A report describing the results of the rainwater tank water quality testing is available on the Aircraft Noise website⁸. A copy is available from the Ipswich Library, 40 South Street, Ipswich. Members of the public may also request a copy of the report by contacting the RAAF Base Amberley Air Base Command Post.

Requirement 5: In the event that rainwater contamination is found to occur as a result of the proposal, identification and implementation of appropriate measures to mitigate the contamination.

39. The water quality tests were repeated between November 2013 and February 2014⁹, following the introduction of all 24 F/A-18F aircraft. The results showed there was no detectable relationship between the ASH operations at RAAF Base Amberley and the concentration of contaminants in water samples from rainwater tanks in the vicinity of the base. No further water quality monitoring is planned.

⁸ The [2010 water quality report](https://www.defence.gov.au/AirCraftNoise/_Master/Docs/Environment/Rainwater-Tank-Testing-2010.pdf) can be accessed from the [Department of Defence Aircraft Noise](https://www.defence.gov.au/AirCraftNoise/) website [https://www.defence.gov.au/AirCraftNoise/_Master/Docs/Environment/Rainwater-Tank-Testing-2010.pdf]

⁹ The [2013 water quality report](https://www.defence.gov.au/AirCraftNoise/_Master/Docs/Environment/Rainwater-Tank-Testing-2013.pdf) can be accessed from the [Department of Defence Aircraft Noise](https://www.defence.gov.au/AirCraftNoise/) website [https://www.defence.gov.au/AirCraftNoise/_Master/Docs/Environment/Rainwater-Tank-Testing-2013.pdf]

ANNEX A – CROSS REFERENCE TO CONDITIONS OF APPROVAL

Condition	Evidence to address condition
4. The person taking the action must provide for approval by the Environment Minister an Air Quality Monitoring Plan that includes:	Extant – The Australian Super Air Quality Monitoring Plan v1.0 was released in 2012 and is located on the Aircraft Noise ¹⁰ . V2.0, once approved, will be released in 2020.
a. Monitoring air quality near a sensitive receiver in close proximity to or on RAAF Base Amberley;	Paragraph 24 to 26 of the Australian Super Air Quality Monitoring Plan v2.0. To be reviewed by 2021.
b. A process for validation of the accuracy of Super Hornet air quality impacts modelled in the Public Environment Report of the action;	Paragraph 27 to 29 of the Australian Super Air Quality Monitoring Plan v2.0. To be reviewed by 2021.
c. Should the measured air quality values exceed relevant air quality objectives, a commitment to working with the relevant State authorities to determine sources of pollutants and potential mitigation measures;	Paragraph 30 of the Australian Super Air Quality Monitoring Plan v2.0. To be reviewed by 2021.
d. An undertaking to post the results of rain tank water quality testing conducted in accordance with the Public Environment Report on an appropriate website for public information;	Paragraph 31 to 32 of the Australian Super Air Quality Monitoring Plan v2.0. To be reviewed by 2021.
e. In the event that rainwater contamination is found to occur as a result of the proposal, identification and implementation of appropriate measures to mitigate the contamination.	Paragraph 33 of the Australian Super Air Quality Monitoring Plan v2.0. To be reviewed by 2021.

¹⁰ Webpage link [https://www.defence.gov.au/AirCraftNoise/_Master/Docs/Environment/ASH-Noise-Management-Plan.pdf]

DEFINITIONS

Definitions applicable to the Variation to Conditions attached to Approval of the Australian JSF Flying Operations, RAAF Base, Amberley, QLD (EPBC 2008/4410)¹¹, and this Air Quality Monitoring Plan:

<i>Approved</i>	A document approved in writing by the Environment Minister.
<i>Environment Department</i>	The Australian government department administering the Environment Protection and Biodiversity Conservation Act 1999.
<i>Environment Minister</i>	The minister responsible for administration of the Environment Protection and Biodiversity Conservation Act 1999.

¹¹ Webpage link [https://www.defence.gov.au/AirCraftNoise/_Master/Docs/Environment/Australian%20Super%20Hornet%20-%20Variation%20notice.pdf]