

**OCCUPATIONAL AND ENVIRONMENTAL  
MEDICINE WING**

NOISE AND VIBRATION DIVISION

Report: OEM/38/22

Date: Mar 23

**A REPORT ON A MILITARY AVIATION NOISE  
CONTOUR OF AIRCRAFT ACTIVITY AT RAF  
WADDINGTON**



*(Original signed)*

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Head of the Noise and Vibration Division

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**OCCUPATIONAL AND ENVIRONMENTAL MEDICINE WING  
NOISE AND VIBRATION DIVISION**

ROYAL AIR FORCE CENTRE OF AVIATION MEDICINE

Report No: OEM/38/22

**A REPORT ON A MILITARY AVIATION NOISE CONTOUR OF AIRCRAFT ACTIVITY  
AT RAF WADDINGTON**

**Executive Summary**

1. The Noise and Vibration Division of the Royal Air Force Centre of Aviation Medicine was tasked by Chief Environmental and Safety Officer (CESO) RAF to produce a Military Aviation Noise Contour for RAF Waddington. This was undertaken in accordance with Joint Service Publication 418 and included station-based and visiting aircraft activity.

2. A Military Aviation Noise Contour was produced using a combination of the Federal Aviation Administration's Aviation Environmental Design Tool Version 3d and Noisemap Suite software packages.

3. The Military Aviation Noise Contour shown at Annex A should be used as a basis for assessing the noise environment around RAF Waddington. The contours show the combined impact of station-based and visiting aircraft at RAF Waddington in 2019. This baseline year was chosen as it is considered a representative year of normal operations.

**Distribution**

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## Annex

A. RAF Waddington Military Aviation Noise Contour for  $L_{Aeq,16hr}$  without night movements and  $L_{Aeq,16hr}$  with night movements.

# **OCCUPATIONAL AND ENVIRONMENTAL MEDICINE WING NOISE AND VIBRATION DIVISION**

ROYAL AIR FORCE CENTRE OF AVIATION MEDICINE

Report No: OEM/38/22

## **A REPORT ON A MILITARY AVIATION NOISE CONTOUR OF AIRCRAFT ACTIVITY AT RAF WADDINGTON**

Author: [REDACTED]

### **Introduction**

1. The Noise and Vibration Division (NVDiv) of the Royal Air Force Centre of Aviation Medicine (RAF CAM) was tasked by Chief Environmental and Safety Officer (CESO) RAF to produce a Military Aviation Noise Contour (MANC) for RAF Waddington.

### **Background**

2. RAF Waddington in Lincolnshire is one of the RAF's busiest stations as the hub of UK Intelligence, Surveillance, Target Acquisition and Reconnaissance (ISTAR) and the main operating base for airborne intelligence aircraft and systems. It is located beside the village of Waddington, 4.2 miles south of Lincoln. In 2019 (the year on which the MANC in this report is based), RAF Waddington was home to Shadow R1 (14 Sqn), Sentinel R1 (V(AC) Sqn), E-3D Sentry (8 Sqn) and RC-135 Rivet Joint (51 Sqn). A selection of other military aircraft also visited RAF Waddington during 2019.

3. RAF Waddington has one runway (02/20), which is 2839m long and 58m wide<sup>1</sup>.

4. An environmental noise survey of RAF Waddington was conducted in 1996 by NVDiv under the Noise Insulation Grant Scheme (NIGS). This was produced using physically measured data and is detailed in report OEM/39/96<sup>2</sup>. NVDiv later produced a prediction model using Integrated Noise Model (INM) software to investigate the impact of relocating the RAF Aerobatic Team (RAFAT) from RAF Scampton to RAF Waddington. This is detailed in report OEM/03/07<sup>3</sup>.

### **Relevant Legislation and Guidance**

5. The primary legislation regarding environmental noise is set out in the Environmental Protection Act 1990<sup>4</sup>. The MOD has exemption from clause 79(1)(g) of this Act [smoke and noise emitted from premises for operational and training activities so as to be prejudicial to health or a nuisance (this exemption extends to Scotland and Northern Ireland)]. MOD policy regarding environmental noise is outlined in JSP 418 Leaflet 04-1: Environmental Noise<sup>5</sup>, which states that the MOD must mitigate, as far as reasonably practicable, the effects of the environmental noise which its activities produce.

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<sup>1</sup> UK MIL AIP, WADDINGTON, AD 2-EGXW-1-1, dated Jul 2020.

<sup>2</sup> NVDiv Report: IHMT/39/96, dated Apr 1996.

<sup>3</sup> NVDiv Report: OEM/03/07, dated Apr 2007.

<sup>4</sup> Environmental Protection Act 1990.

<sup>5</sup> JSP 418 Leaflet 04-1: Environmental Noise.

6. The MANC at Annex A was created in accordance with the Environmental Noise Regulations 2006, No. 2238, Statutory Instruments<sup>6</sup>.

## Scope and Discussion

7. The MANC at Annex A includes combined total aircraft flight movements for station-based and visiting aircraft at RAF Waddington during 2019. It also includes Engine Ground Run (EGR) operations for station-based aircraft.

8. Exercise Cobra Warrior took place at RAF Waddington from approximately 19 Aug 19 – 26 Sept 19. This involved both station-based and visiting aircraft, including several fast jets. Most fast jet movements at RAF Waddington during 2019 were attributable to this exercise.

## Analysis

9. The MANC detailed at Annex A was created using a combination of the Federal Aviation Administration's (FAA's) Aviation Environmental Design Tool (AEDT) and Noisemap Suite software. These are internationally recognised noise prediction packages that are used for the modelling of civil / commercial aircraft operations. AEDT 3d and BaseOps (the Noisemap Graphical User Interface (GUI)) 7.365 were used, which allow a three-dimensional geometric model of the airfield to be constructed including the runway, flight tracks and aircraft flight profiles<sup>7</sup>. Aircraft noise models work by taking a core dataset of Noise-Power-Distance (NPD) source levels and then predicting the noise levels emitted from the modelled aircraft. The final AEDT and Noisemap contour grids were combined using NMPlot software to generate the overall contours.

10. In order to produce a representative MANC, station held data is required (e.g. aircraft movement figures). In accordance with JSP 418, this data must cover a period of at least 12 months. The RAF Waddington station data used to produce the MANC at Annex A was taken from 01 Jan 19 – 31 Dec 19. The baseline year of 2019 was chosen as it is considered a representative year of normal operations. The total number of aircraft flight movements over this period was obtained from Air Traffic Control (ATC) and broken down into Average Daily Movement (ADM) figures.

11. Flight tracks, profiles and EGR data was supplied to NVDiv by station personnel from 14 Sqn, V(AC) Sqn, 8 Sqn, 51 Sqn and ATC.

12. AEDT and Noisemap contain built-in aircraft flight profiles from the International Civil Aviation Organisation (ICAO), Base of Aircraft Operation version 3, and the Air Noise and Performance (ANP) databases from the European Union Aviation Safety Agency. These databases were utilised alongside custom defined profiles to model all aircraft.

13. General airfield data such as runway end locations and elevations was obtained from AIDU publications<sup>8</sup>.

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<sup>6</sup> Environmental Noise Regulations 2006, No. 2238, Statutory Instruments.

<sup>7</sup> Altitude, speed and engine power setting at different distances from the runway threshold.

<sup>8</sup> UK MIL AIP, WADDINGTON, AD 2-EGXW-1-1, dated Jul 2020.

## Results

14. The RAF Waddington MANC is shown at Annex A. This includes contours for the following time domains and noise indices:

- $L_{Aeq,16hr}$  without night – 16 hour averaged noise metric, excluding night movements.
- $L_{Aeq,16hr}$  with night – 16 hour averaged noise metric, including night movements to allow comparison with NVDiv historical contours.





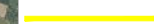


## Recommendations

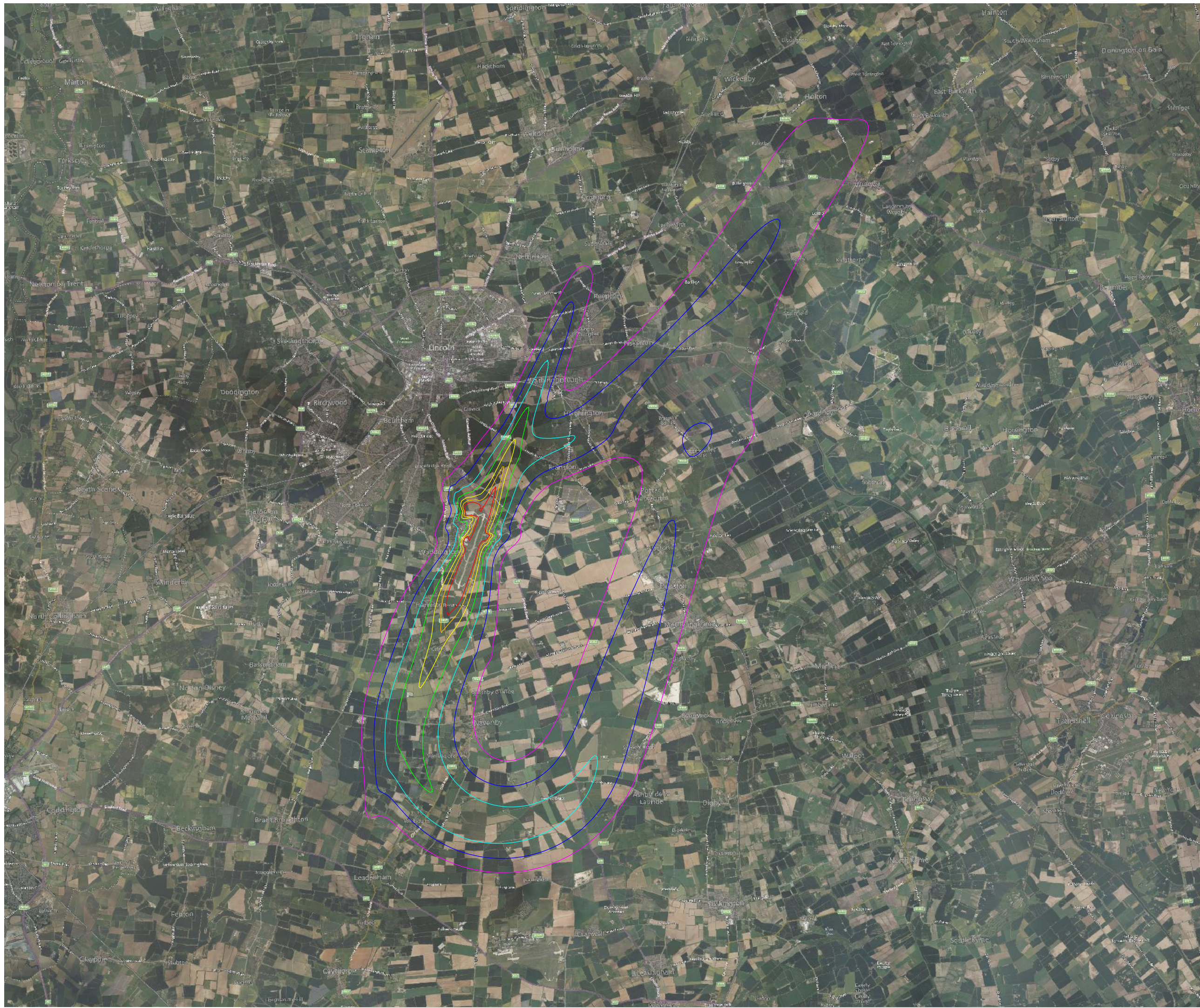
15. It is recommended that the MANC at Annex A is used as a basis for assessing the noise environment around RAF Waddington.



ANNEX A-1 TO  
OEM/38/22  
DATED MAR 23

Key

-  - 54dB  $L_{Aeq, 16hr}$  contour.
-  - 57dB  $L_{Aeq, 16hr}$  contour.
-  - 60dB  $L_{Aeq, 16hr}$  contour.
-  - 63dB  $L_{Aeq, 16hr}$  contour.
-  - 66dB  $L_{Aeq, 16hr}$  contour.
-  - 69dB  $L_{Aeq, 16hr}$  contour.
-  - 72dB  $L_{Aeq, 16hr}$  contour.



PROJECT  
RAF Waddington MANC

TITLE  
 $L_{Aeq, 16hr}$  Without Night Noise Contours

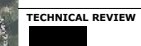
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DRAWN BY  


DATE  
Mar 23

REVISION  
1

CAD FILE  
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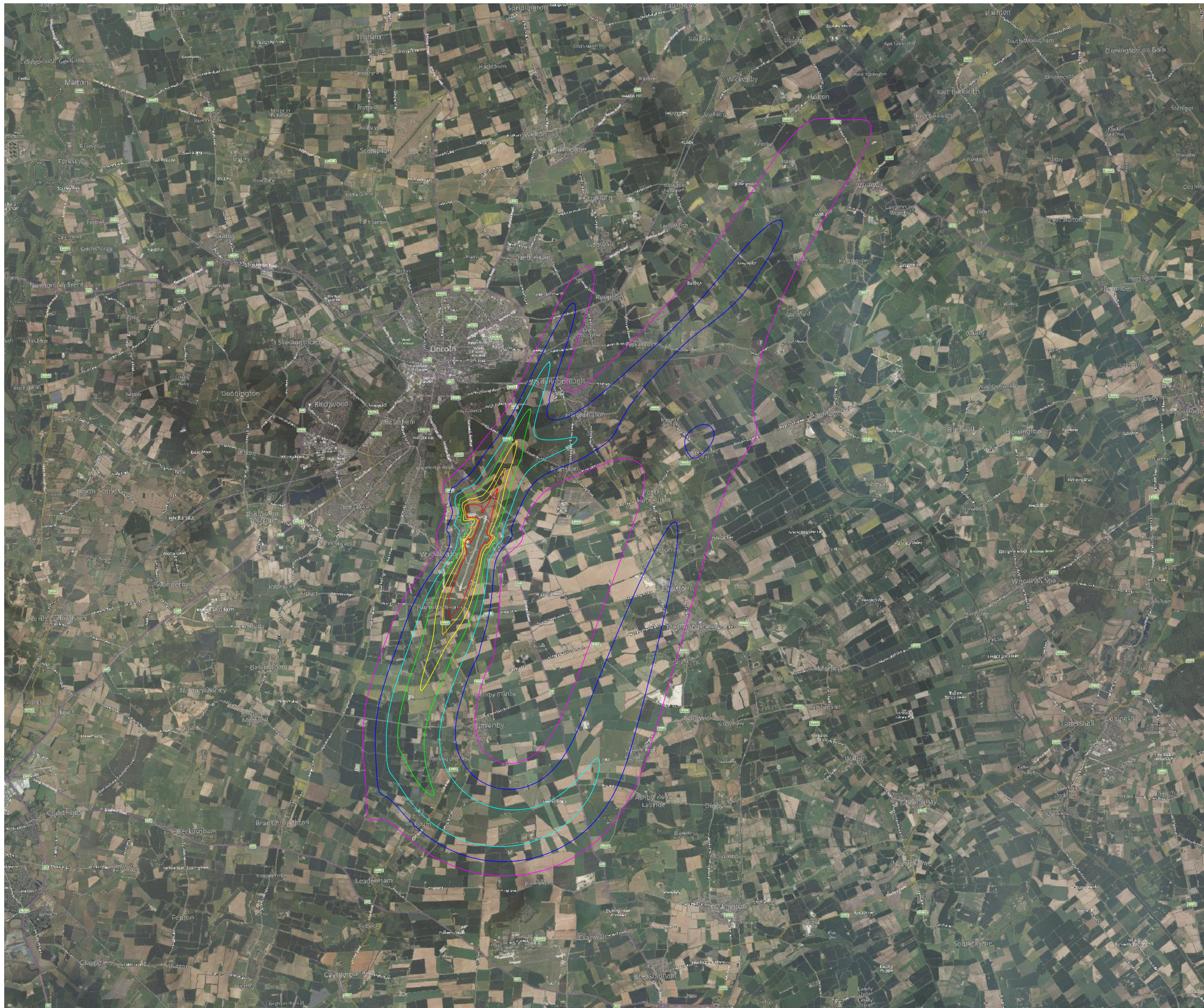
TECHNICAL REVIEW  


CLASSIFICATION  
Unclassified

# ANNEX A-2 TO OEM/38/22 DATED MAR 23

## Key

- - 54dB  $L_{Aeq, 16hr}$  contour.
- - 57dB  $L_{Aeq, 16hr}$  contour.
- - 60dB  $L_{Aeq, 16hr}$  contour.
- - 63dB  $L_{Aeq, 16hr}$  contour.
- - 66dB  $L_{Aeq, 16hr}$  contour.
- - 69dB  $L_{Aeq, 16hr}$  contour.
- - 72dB  $L_{Aeq, 16hr}$  contour.



PROJECT  
RAF Waddington MANC

TITLE  
 $L_{Aeq, 16hr}$  With Night Noise Contours

DRAWING NUMBER 1	DRAWN BY [Redacted]
DATE Mar 23	REVISION 1

CAD FILE  
N/A

TECHNICAL REVIEW  
[Redacted]

CLASSIFICATION  
Unclassified