Strategic Noise Maps for Heathrow Airport 2016

ERCD REPORT 1704

Contents

Summary

1.   This report presents the 2016 strategic noise maps generated for Heathrow Airport to meet the requirements of the Environmental Noise Directive.

2.   The noise modelling used mean flight tracks, lateral dispersions, average flight profiles of aircraft height, speed and thrust, and noise data from the 2016 summer Leq contours analysis.

3.   The 2016 average daily 24-hour traffic movements were 1297.4 (2011: 1317.1).

4.   The area of the 2016 L_{den} 55 dBA contour was 198.0 km^2 (2011: 221.9 km^2), enclosing a population of 683,700 (2011: 766,100).

5.   The 2016 L_{night} 48 dBA contour enclosed an area of 104.7 km^2 and a population of 366,500.

Chapter 1
Introduction

Background

1.1 The EU *Directive 2002/49/EC* relates to the assessment and management of environmental noise, and is also referred to as the 'Environmental Noise Directive' (END). The END requires member states to produce strategic noise maps for the main sources of environmental noise, which include road, rail and air traffic, and industry. This Directive was transposed into UK law by *Statutory Instrument 2006 No. 2238 The Environmental Noise (England) Regulations 2006 (as amended)* (the 'Regulations').

1.2 The Environmental Research and Consultancy Department (ERCD) of the Civil Aviation Authority (CAA) was commissioned by the Department for Transport (DfT) to produce strategic noise maps for Heathrow Airport for 2016 (i.e. 'Round 3' mapping) to meet the requirements of the Regulations. Strategic noise maps for Heathrow were previously produced by ERCD for 2006 ('Round 1') and 2011 ('Round 2') to meet the Regulations (**Ref 1 & 2**, Appendix A).

1.3 The Regulations specify that noise maps are to be produced for the following noise indicators: L_{day}, $L_{evening}$, L_{night}, L_{den} and annual $L_{Aeq,16hr}$. These indicators are based on air traffic movements over the calendar year, unlike the conventional Leq noise contours that are based on movements over the 92-day summer period.

1.4 L_{day} is the equivalent continuous sound level (Leq) for the local time period 0700-1900. $L_{evening}$ and L_{night} are the Leq levels for 1900-2300 and 2300-0700 respectively (local time). L_{den} is the logarithmic average of L_{day}, $L_{evening}$ and L_{night}, with the $L_{evening}$ and L_{night} components weighted by 5 dB and 10 dB respectively. The annual $L_{Aeq,16hr}$ (0700-2300 local time) is derived from the logarithmic average of the L_{day} and $L_{evening}$ results.

1.5 The objectives of this report are to explain the noise modelling methodology used to produce the 2016 strategic noise maps for Heathrow Airport and to present the calculated noise maps and associated area, population and dwelling statistics. At Defra's[1] request, this report presents population and dwelling counts that have been supplied by Defra's consultants.

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[1] The Department for Environment, Food and Rural Affairs (Defra) is responsible for the publication of noise maps for road, rail, airport and industrial noise sources on behalf of the Secretary of State to meet the requirements of the Regulations.

Heathrow Airport

1.6   Heathrow Airport is situated approximately 13 miles (21 km) west of the city of London. It is surrounded by suburban housing, business premises and mixed-use open land to the north and south, suburban housing and business premises to the east, and several large reservoirs, mixed-use open land, housing and business premises to the west (**Figure 1**, Appendix B).

1.7   Heathrow Airport has two runways: Runway 09L/27R to the north, which is 3,901 m long, and Runway 09R/27L to the south, which is 3,660 m long. The Runway 09L landing threshold is displaced by 306 m, and the Runway 09R landing threshold displaced by 307 m.[2] There are four main passenger terminals.[3] The layout of the runways, taxiways and passenger terminals in 2016 is shown in **Figure 2**.[4]

1.8   In the 2016 calendar year there were approximately 475,000 aircraft movements at Heathrow (2011: 481,000) and the airport handled 75.7 million passengers (2011: 69.4 million).[5]

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[2] The runway threshold marks the beginning of the runway available for landing aircraft. A *displaced* threshold is a runway threshold that is not located at the physical end of the runway. A displaced threshold is often employed to give arriving aircraft sufficient clearance over an obstacle.

[3] Terminal 1 closed permanently in June 2015.

[4] UK AIP, AD 2-EGLL-2-1 (18 Aug 2016)

[5] Source: Civil Aviation Authority (www.caa.co.uk/airportstatistics)

Chapter 2
Noise modelling methodology

ANCON model

2.1   Noise contours were calculated with the UK civil aircraft noise model ANCON (version 2.3), which is developed and maintained by ERCD on behalf of the DfT. A technical description of ANCON is provided in R&D Report 9842 (**Ref 3**). The ANCON model is also used for the production of annual contours for Gatwick and Stansted airports, and a number of other UK airports.

2.2   ANCON is fully compliant with the European guidance on noise modelling, ECAC.CEAC Doc 29 (3rd edition), published in December 2005 (**Ref 4**). This guidance document represents internationally agreed best practice as implemented in modern aircraft noise models. An updated 4th edition was published in December 2016 and will be incorporated in future revised ANCON software.

Flight tracks

2.3   Aircraft departing Heathrow are required to follow specific flight paths called Noise Preferential Routes (NPRs) unless directed otherwise by ATC. NPRs were designed to avoid the overflight of built-up areas where possible. They establish a path from the take-off runway to the main UK air traffic routes and form the first part of the Standard Instrument Departure (SID) routes. The Heathrow NPR/SID routes are illustrated in **Figure 3**.

2.4   The departure and arrival flight tracks and associated lateral dispersions used for modelling were based on the mean tracks derived from radar data for the Heathrow 2016 summer Leq contours (**Ref 5**).

Flight profiles

2.5   Average flight profiles of height, speed and thrust versus track distance (for departures and arrivals separately) were modelled for each aircraft type, using the profile data from the Heathrow 2016 summer Leq contours.

2.6   The application of reverse thrust following touchdown was modelled for all ANCON types where applicable. Reverse thrust was included in both the day and night contours.

Noise emissions

2.7   The ANCON model calculates aircraft noise using a noise database expressing SEL as a function of engine power setting and slant distance to the receiver – also known as the 'Noise-Power-Distance' (NPD) relationship. The ANCON noise database is continually reviewed and updated with adjustments made annually when measurements show this to be necessary.

2.8   The noise data used for the Heathrow 2016 END contours were the same as those for the Heathrow 2016 summer Leq contours.

Traffic data

2.9   The strategic noise maps were based on 2016 annual movement data for the following three local time periods:

- 0700-1900 (L_{day})

- 1900-2300 ($L_{evening}$)

- 2300-0700 (L_{night})

2.10   The source of this information was the Heathrow NTK system. Traffic statistics from NTK data were cross-checked with runway logs supplied by NATS[6] and close agreement was found.

2.11   The numbers of average daily departure and arrival movements by ANCON aircraft type, over the L_{day}, $L_{evening}$, L_{night}, L_{den} and annual $L_{Aeq,16hr}$ periods, are summarised in **Tables C1-C5** of Appendix C. Descriptions of ANCON aircraft types can be found in **Table D1** of Appendix D.

2.12   The average daily 24-hour movements at Heathrow in 2016 were 1297.4 (2011:1317.1).

Runway modal splits

2.13   In general, aircraft will take-off and land into a headwind to maximise lift during take-off and landing. The wind direction, which varies over the course of a year, will therefore have an important influence on the usage of runways.[7] The ratio of

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[6] NATS is the provider of air traffic control services to Heathrow.

[7] At Heathrow, a 'westerly preference' for aircraft operations is employed, which means that the airport will operate in westerly mode even if there is a light tailwind. This is done to reduce the use of easterly SIDs, which tend to overfly more populated areas compared to the westerly SIDs.

westerly (Runway 27L/27R) and easterly (Runway 09L/09R) operations is referred to as the *runway modal split*.

2.14   The west / east (W / E) percentage modal splits for each of the 2016 time periods under consideration are summarised in **Table 1**.

Table 1 Heathrow 2016 annual modal splits

Noise metric	Local time period	Modal split (W / E percentage)
L_{day}	0700-1900	70 / 30
$L_{evening}$	1900-2300	72 / 28
L_{night}	2300-0700	70 / 30
L_{den}	0000-2400	70 / 30
$L_{Aeq,16hr}$	0700-2300	70 / 30

Topography

2.15   The topography around Heathrow Airport was modelled by accounting for terrain height. This was achieved by geometrical corrections for source-receiver distance and elevation angles. Other, more complex effects, such as lateral attenuation from uneven ground surfaces and noise screening/reflection effects due to topographical features, were not taken into account.

2.16   ERCD holds OS terrain height data on a 200 metre by 200 metre grid for the whole of England. Interpolation was performed to generate height data at each of the calculation points on the receiver grid used by the ANCON noise model.

Population data

2.17   Estimates of the population and dwellings within the contours have been supplied by Defra (**Ref 6**). Defra utilised population data attained from the mid-year population estimates from the Office of National Statistics (ONS), dated June 2015.

Chapter 3
Results

2016 L_{day} contours

3.1   The Heathrow 2016 L_{day} noise contours (runway modal split 70% west / 30% east) are shown in **Figure 4**. The contours are plotted from 54 to 72 dBA at 3 dB intervals.

3.2   Estimates of the areas, populations and dwellings within the contours are provided in **Table 2**.

Table 2 Heathrow 2016 L_{day} area, population and dwelling estimates

L_{day} (dBA)	Area (km^2)	Population	Dwellings
> 54	185.7	554,900	227,950
> 57	98.7	258,300	97,450
> 60	54.7	118,600	41,350
> 63	31.7	43,100	14,450
> 66	17.8	11,500	3,900
> 69	8.7	2,500	850
> 72	4.7	200	50

Note: Population and dwelling counts have been supplied by Defra.

2016 $L_{evening}$ contours

3.3   The Heathrow 2016 $L_{evening}$ noise contours (runway modal split 72% west / 28% east) are shown in **Figure 5**. The contours are plotted from 54 to 69 dBA at 3 dB intervals.

3.4   Estimates of the areas, populations and dwellings within the contours are provided in **Table 3**.

Table 3 Heathrow 2016 L$_{evening}$ area, population and dwelling estimates

L$_{evening}$ (dBA)	Area (km^2)	Population	Dwellings
> 54	160.6	444,400	176,950
> 57	86.6	208,200	76,650
> 60	48.1	91,600	31,550
> 63	28.2	27,000	9,100
> 66	15.6	6,200	2,250
> 69	7.9	1,300	500

Note: Population and dwelling counts have been supplied by Defra.

2016 L$_{night}$ contours

3.5   The Heathrow 2016 L$_{night}$ noise contours (runway modal split 70% west / 30% east) are shown in **Figure 6**. The contours are plotted from 48 to 66 dBA at 3 dB intervals.

3.6   Estimates of the areas, populations and dwellings within the contours are provided in **Table 4**.

Table 4 Heathrow 2016 L$_{night}$ area, population and dwelling estimates

L$_{night}$ (dBA)	Area (km^2)	Population	Dwellings
> 48	104.7	366,500	150,900
> 51	62.2	182,200	68,300
> 54	33.5	83,100	28,100
> 57	16.8	38,000	12,250
> 60	8.6	10,900	3,350
> 63	4.6	2,000	550
> 66	2.5	100	< 50

Note: Population and dwelling counts have been supplied by Defra.

2016 L_{den} contours

3.7   The Heathrow 2016 L_{den} noise contours (runway modal split 70% west / 30% east) are shown in **Figure 7**. The contours are plotted from 55 to 75 dBA at 5 dB intervals.

3.8   Estimates of the areas, populations and dwellings within the contours are provided in **Table 5**.

Table 5 Heathrow 2016 L_{den} area, population and dwelling estimates

L_{den} (dBA)	Area (km^2)	Population	Dwellings
> 55	198.0	683,700	288,050
> 60	74.5	193,700	72,050
> 65	28.9	45,600	15,050
> 70	9.5	4,500	1,450
> 75	3.4	< 100	< 50

Note: Population and dwelling counts have been supplied by Defra.

2016 annual $L_{Aeq,16hr}$ contours

3.9   The Heathrow 2016 annual $L_{Aeq,16hr}$ noise contours (runway modal split 70% west / 30% east) are shown in **Figure 8**. The contours are plotted from 54 to 72 dBA at 3 dB intervals.

3.10   Estimates of the areas, populations and dwellings within the contours are provided in **Table 6**.

Table 6 Heathrow 2016 annual $L_{Aeq,16hr}$ area, population and dwelling estimates

$L_{Aeq,16hr}$ (dBA)	Area (km^2)	Population	Dwellings
> 54	179.2	533,000	217,500
> 57	95.5	246,600	92,700
> 60	52.9	110,800	38,400
> 63	30.8	38,800	13,000
> 66	17.2	9,900	3,400
> 69	8.5	2,100	750
> 72	4.6	100	< 50

Note: Population and dwelling counts have been supplied by Defra.

Chapter 4
Conclusions

5.1   Strategic noise maps for 2016 have been generated for Heathrow Airport using the ANCON noise model (v2.3).

5.2   The 2016 daily traffic total at Heathrow was 1297.4 movements (2011: 1317.1).

5.3   The 2016 L_{day} 54 dBA contour area was 185.7 km^2, enclosing a population of 554,900.

5.4   The 2016 $L_{evening}$ 54 dBA contour area was 160.6 km^2, enclosing a population of 444,400.

5.5   The 2016 L_{night} 48 dBA contour area was 104.7 km^2, enclosing a population of 366,500.

5.6   The 2016 L_{den} 55 dBA contour area was 198.0 km^2, enclosing a population of 683,700.

5.7   The 2016 annual $L_{Aeq,16hr}$ 54 dBA contour area was 179.2 km^2, enclosing a population of 533,000.

APPENDIX A

References

1. Monkman D J, McMahon J, *London Heathrow Strategic Noise Maps 2006*, ERCD Report 0706, December 2007.

2. Lee J, Edmonds L, Patel J, *Strategic Noise Maps for Heathrow Airport 2011*, ERCD Report 1204, June 2013.

3. Ollerhead J B, Rhodes D P, Viinikainen M S, Monkman D J, Woodley A C, *The UK Civil Aircraft Noise Contour Model ANCON: Improvements in Version 2*, R&D Report 9842, June 1999.

4. European Civil Aviation Conference, *Report on Standard Method of Computing Noise Contours around Civil Airports*, ECAC.CEAC Doc 29, Third edition, December 2005.

5. Civil Aviation Authority, *Heathrow Airport 2016 Summer Noise Contours and Noise Action Plan Contours* , ERCD Report 1701, November 2017.

6. Department for Environment, Food & Rural Affairs, *Airport Noise Action Planning Data Pack 2017: London Heathrow Airport (EGLL)*, July 2017.

APPENDIX B

Figures

Figure 1 Heathrow Airport and the surrounding area
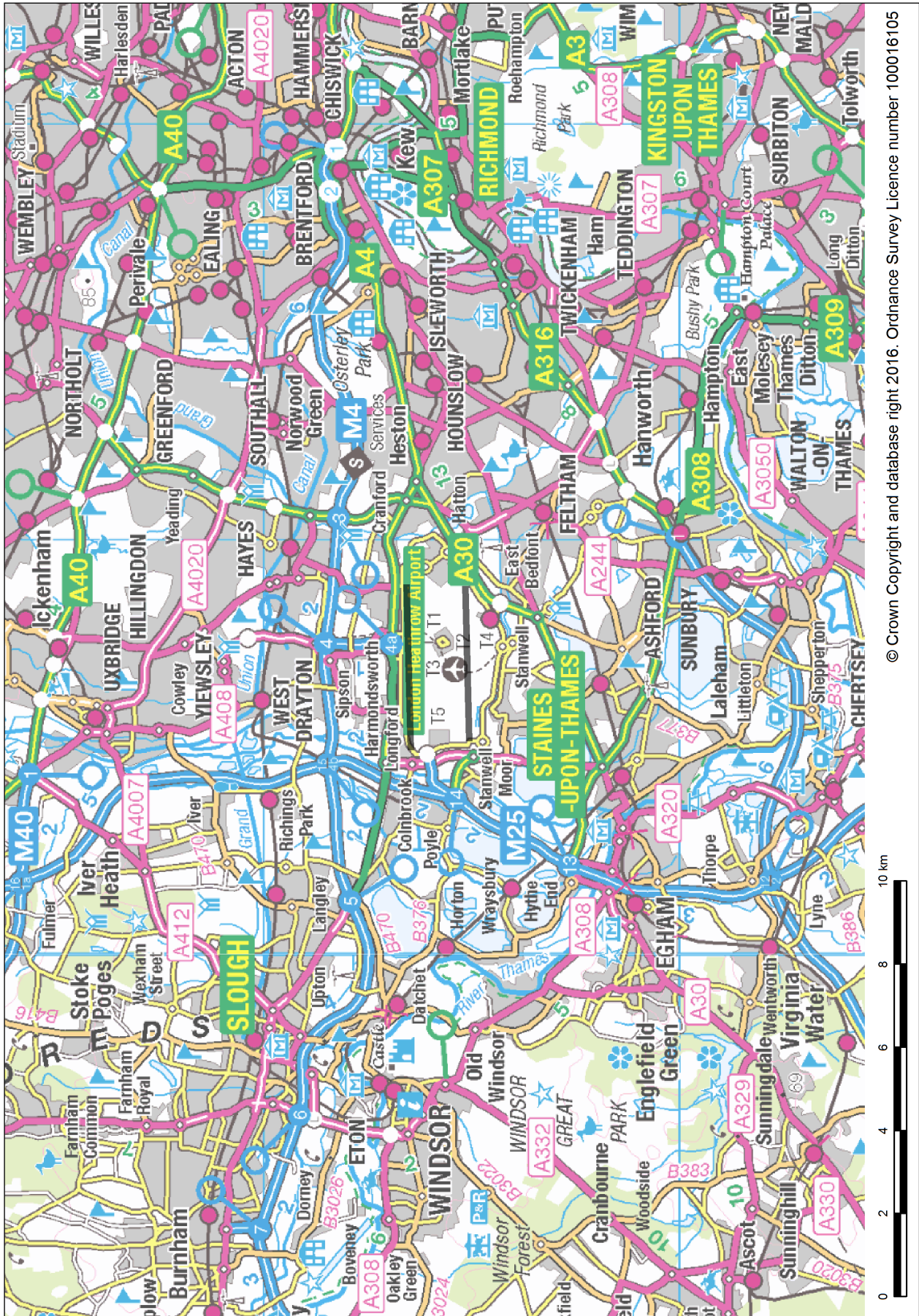
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Figure 2 Heathrow Airport layout in 2016
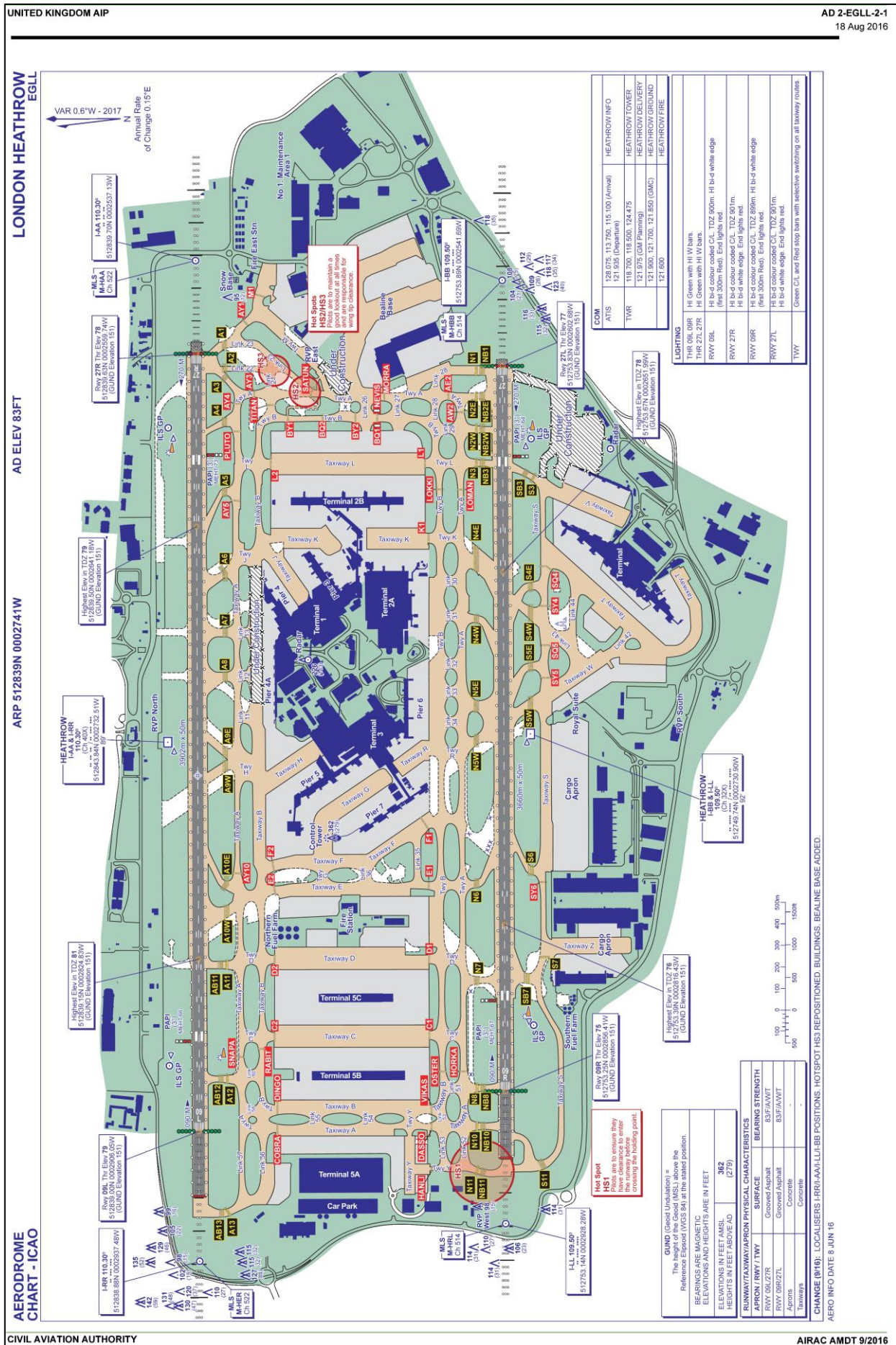
Figure 3 Heathrow NPR/SID routes

ROUTE ABBREVIATIONS

BPK   BROOKMANS PARK
BUZ   BUZAD
CPT   COMPTON
DET   DETLING
GAS   GASGU
GOG   GOGSI
MID   MIDHURST
WOB   WOBUN

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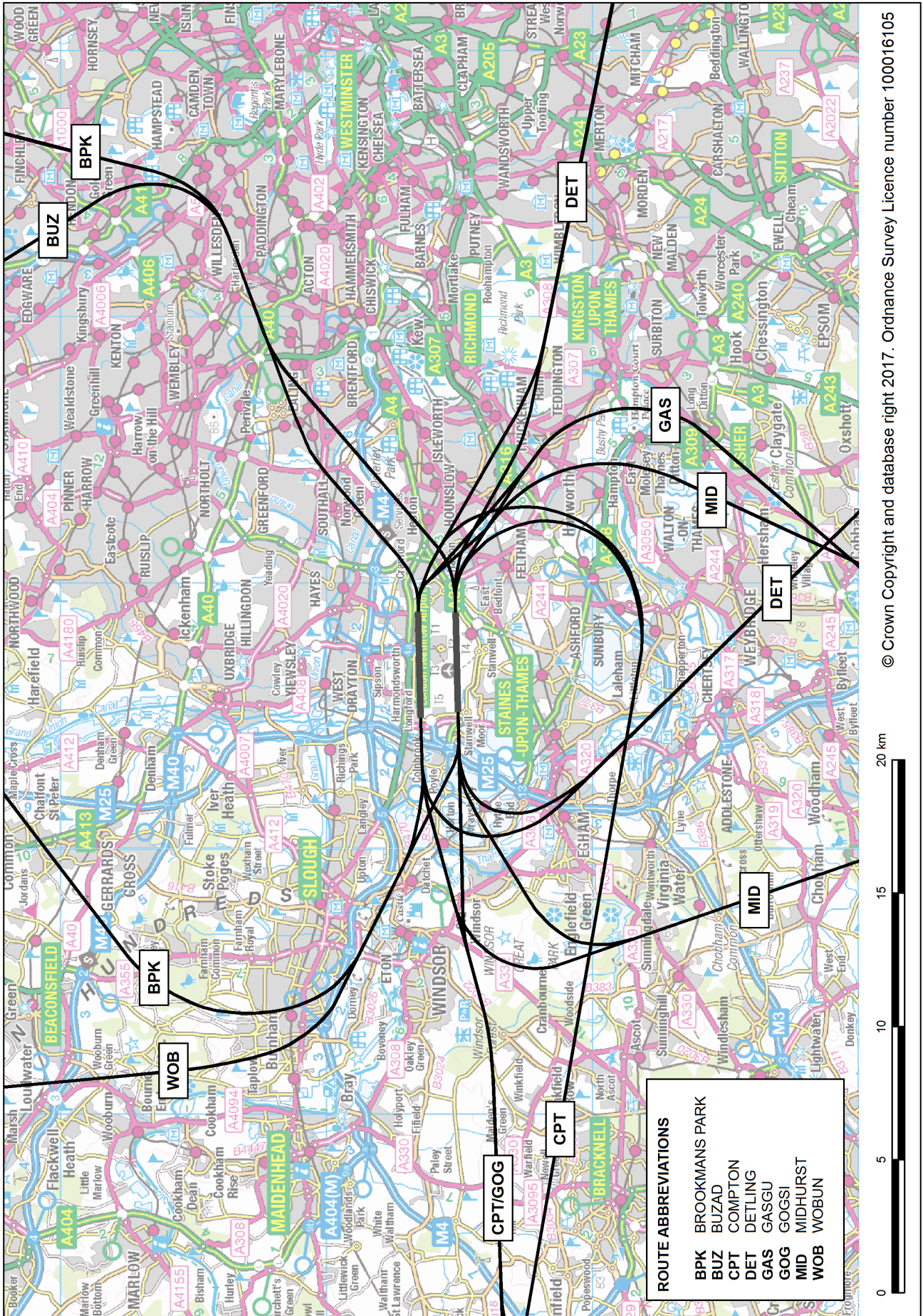
Figure 4 Heathrow 2016 L_{day} 54-72 dBA contours
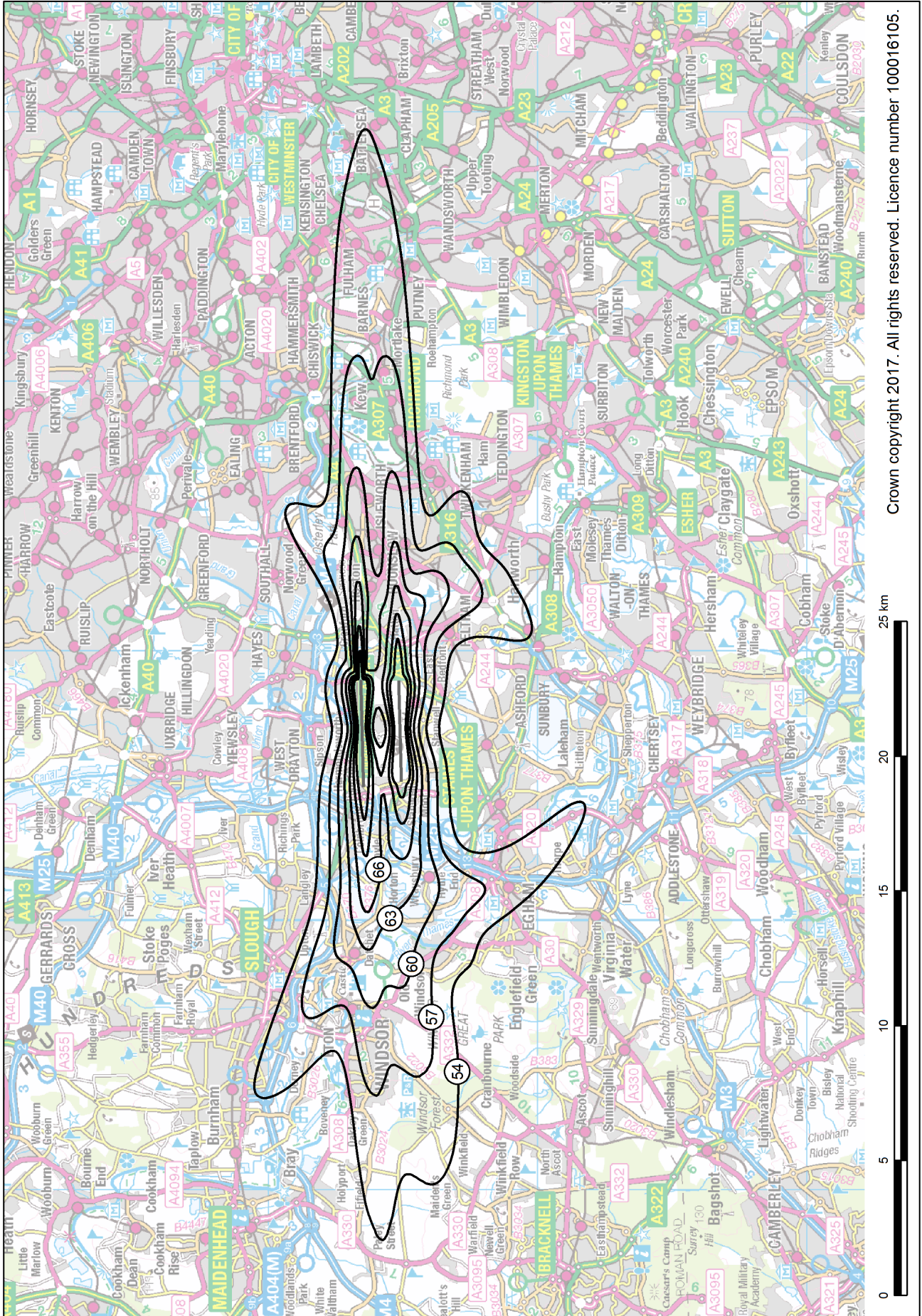
Figure 5 Heathrow 2016 L$_{evening}$ 54-69 dBA contours

Figure 6 Heathrow 2016 L$_{night}$ 48-66 dBA contours
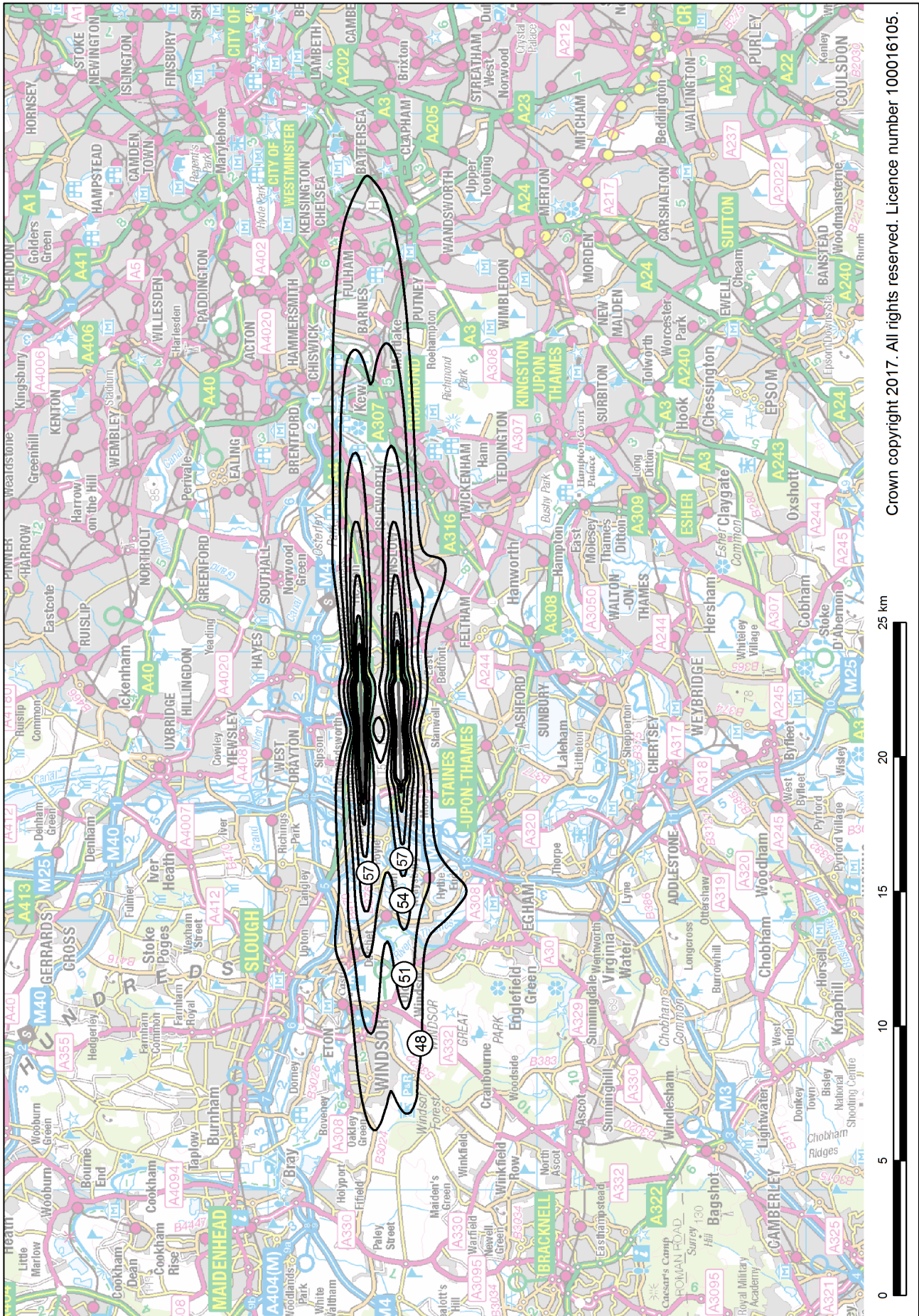
Figure 7 Heathrow 2016 L$_{den}$ 55-75 dBA contours
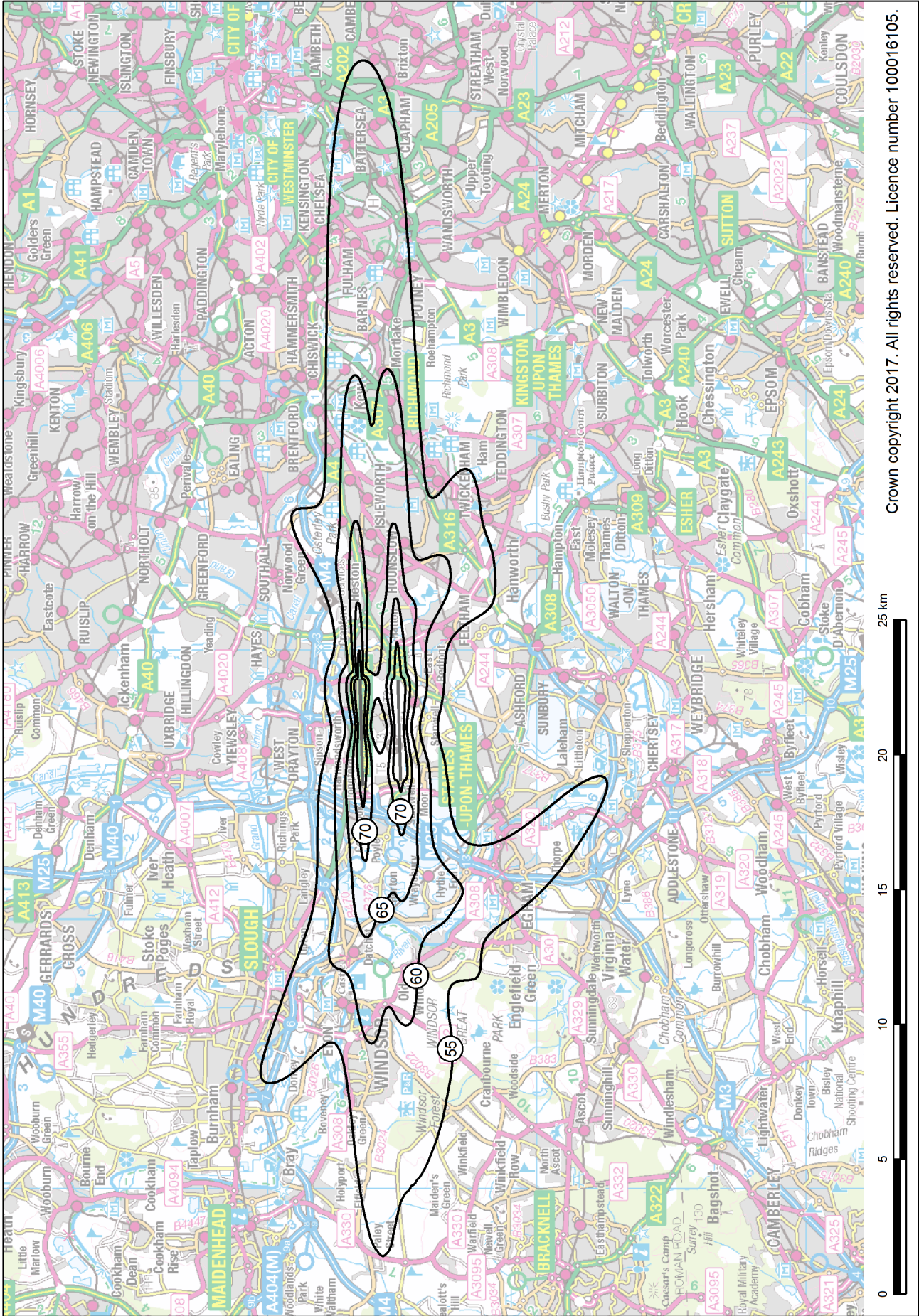
Figure 8 Heathrow 2016 annual L$_{Aeq,16hr}$ 54-72 dBA contours
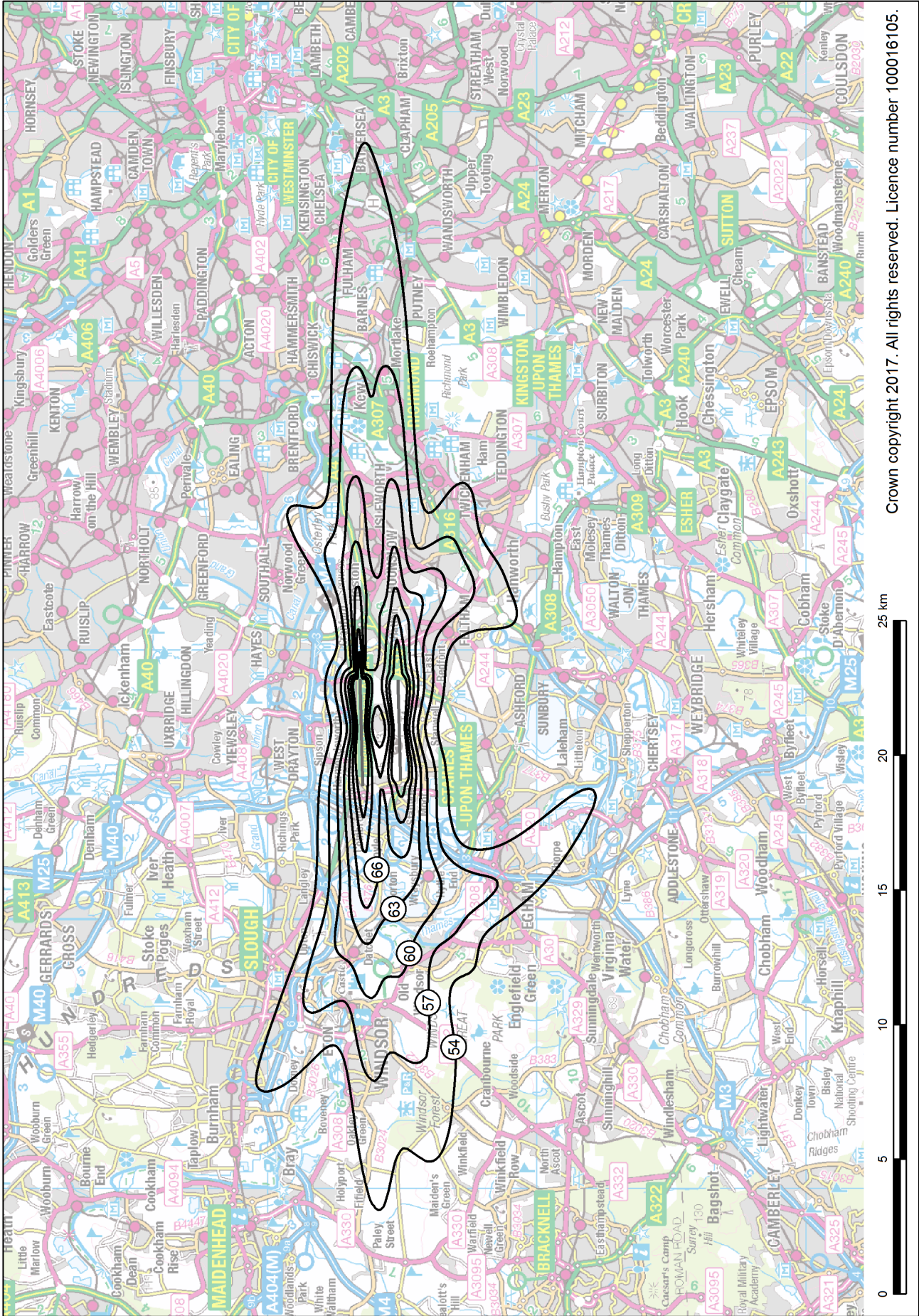
APPENDIX C
Tables

Table C1 Heathrow 2016 annual average 12-hour day (L_{day}) movements

ANCON type	Departure movements	Arrival movements	Total movements
B727	0.0	0.0	0.0
B733	1.5	1.6	3.2
B736	8.2	9.9	18.1
B738	7.6	8.2	15.7
B744G	0.3	0.5	0.8
B744P	0.7	0.8	1.5
B744R	21.2	15.7	36.9
B747	0.0	0.0	0.0
B747SP	0.0	0.0	0.0
B748	0.1	0.1	0.2
B753	0.1	0.1	0.1
B757C	0.0	0.2	0.2
B757E	2.8	1.8	4.6
B757P	0.8	0.4	1.2
B762	0.0	0.0	0.0
B763G	8.7	6.0	14.7
B763P	10.0	7.1	17.1
B763R	10.1	7.3	17.4
B764	4.0	3.4	7.5
B772G	12.3	10.4	22.7
B772P	3.8	3.7	7.5
B772R	13.3	14.4	27.7
B773G	25.8	30.9	56.7
B788	13.8	15.1	28.9
B789	12.7	13.3	26.0
BA46	0.5	0.6	1.1
CRJ900	0.6	0.7	1.4
CS100	0.0	0.0	0.0
EA30	1.1	1.0	2.1
EA31	0.1	0.1	0.1
EA318	1.1	1.1	2.3
EA319C	14.1	13.9	28.0
EA319V	73.9	68.1	142.0

ANCON type	Departure movements	Arrival movements	Total movements
EA320C	47.9	51.7	99.6
EA320neo	0.0	0.0	0.0
EA320V	99.6	89.7	189.3
EA321C	7.1	8.9	16.0
EA321V	39.4	32.8	72.2
EA33	15.4	16.7	32.1
EA34	1.2	1.5	2.7
EA346	5.0	5.0	10.0
EA359	0.3	0.7	1.0
EA38GP	6.8	8.0	14.8
EA38R	9.3	7.7	17.0
ERJ	0.0	0.0	0.0
ERJ170	0.0	0.0	0.0
ERJ190	1.8	2.4	4.3
EXE3	0.2	0.2	0.4
FK10	1.2	1.6	2.8
LTT	0.1	0.1	0.1
STT	0.0	0.0	0.0
Total	**484.7**	**463.1**	**947.7**

Table C2 Heathrow 2016 annual average 4-hour evening (L$_{evening}$) movements

ANCON type	Departure movements	Arrival movements	Total movements
B727	0.0	0.0	0.0
B733	0.2	0.5	0.7
B736	3.7	2.6	6.3
B738	2.6	2.7	5.3
B744G	0.1	0.0	0.2
B744P	0.3	0.2	0.5
B744R	4.7	1.1	5.8
B747	0.0	0.0	0.0
B747SP	0.0	0.0	0.0
B748	0.1	0.0	0.1
B753	0.0	0.0	0.0
B757C	0.1	0.0	0.1
B757E	1.1	2.1	3.2
B757P	0.2	0.2	0.4
B762	0.0	0.0	0.0
B763G	0.1	1.2	1.3
B763P	0.2	0.6	0.8
B763R	1.2	4.7	5.9
B764	0.0	0.5	0.5
B772G	4.6	1.7	6.3
B772P	0.9	0.2	1.2
B772R	3.6	1.4	5.0
B773G	16.7	3.8	20.5
B788	4.8	2.2	7.0
B789	5.7	0.5	6.2
BA46	0.2	0.1	0.2
CRJ900	0.1	0.0	0.1
CS100	0.0	0.0	0.0
EA30	0.6	1.5	2.1
EA31	0.0	0.0	0.0
EA318	0.1	0.0	0.1
EA319C	3.9	4.8	8.7
EA319V	15.5	21.4	36.9

ANCON type	Departure movements	Arrival movements	Total movements
EA320C	16.8	15.9	32.7
EA320neo	0.0	0.0	0.0
EA320V	21.6	33.0	54.5
EA321C	2.9	1.9	4.8
EA321V	7.3	14.4	21.7
EA33	9.1	4.0	13.1
EA34	1.4	0.9	2.3
EA346	2.2	1.0	3.2
EA359	0.6	0.2	0.8
EA38GP	3.6	1.3	4.8
EA38R	5.0	0.1	5.1
ERJ	0.0	0.0	0.0
ERJ170	0.0	0.0	0.0
ERJ190	0.8	0.5	1.3
EXE3	0.1	0.1	0.1
FK10	1.1	0.7	1.8
LTT	0.0	0.0	0.0
STT	0.0	0.0	0.0
Total	**143.9**	**127.9**	**271.8**

Table C3 Heathrow 2016 annual average 8-hour night (L$_{night}$) movements

ANCON type	Departure movements	Arrival movements	Total movements
B727	0.0	0.0	0.0
B733	0.3	0.0	0.4
B736	0.7	0.1	0.7
B738	0.7	0.0	0.8
B744G	0.0	0.0	0.0
B744P	0.1	0.2	0.3
B744R	0.5	9.6	10.2
B747	0.0	0.0	0.0
B747SP	0.0	0.0	0.0
B748	0.0	0.0	0.0
B753	0.0	0.0	0.0
B757C	0.1	0.0	0.1
B757E	0.0	0.0	0.1
B757P	0.0	0.4	0.4
B762	0.0	0.0	0.0
B763G	0.0	1.6	1.6
B763P	0.1	2.6	2.7
B763R	0.9	0.3	1.2
B764	0.0	0.1	0.1
B772G	1.0	5.7	6.7
B772P	0.0	0.9	0.9
B772R	1.1	2.2	3.3
B773G	0.6	8.4	9.0
B788	0.5	1.8	2.3
B789	0.2	4.8	5.0
BA46	0.0	0.0	0.0
CRJ900	0.0	0.0	0.0
CS100	0.0	0.0	0.0
EA30	0.8	0.0	0.8
EA31	0.0	0.0	0.0
EA318	0.0	0.0	0.0
EA319C	1.2	0.5	1.7
EA319V	1.1	1.0	2.2

ANCON type	Departure movements	Arrival movements	Total movements
EA320C	3.3	0.4	3.8
EA320neo	0.0	0.0	0.0
EA320V	2.5	1.0	3.4
EA321C	0.9	0.1	1.0
EA321V	1.2	0.7	1.9
EA33	1.0	4.8	5.8
EA34	0.4	0.7	1.1
EA346	0.2	1.5	1.7
EA359	0.0	0.1	0.1
EA38GP	0.2	1.3	1.5
EA38R	0.1	6.7	6.8
ERJ	0.0	0.0	0.0
ERJ170	0.0	0.0	0.0
ERJ190	0.2	0.0	0.2
EXE3	0.0	0.0	0.0
FK10	0.0	0.0	0.0
LTT	0.0	0.0	0.0
STT	0.0	0.0	0.0
Total	**20.2**	**57.7**	**77.9**

Table C4 Heathrow 2016 annual average 24-hour day (L$_{den}$) movements

ANCON type	Departure movements	Arrival movements	Total movements
B727	0.0	0.0	0.0
B733	2.1	2.1	4.2
B736	12.6	12.6	25.1
B738	10.9	10.9	21.8
B744G	0.5	0.5	0.9
B744P	1.2	1.2	2.3
B744R	26.4	26.4	52.9
B747	0.0	0.0	0.0
B747SP	0.0	0.0	0.0
B748	0.2	0.2	0.3
B753	0.1	0.1	0.1
B757C	0.2	0.2	0.3
B757E	3.9	3.9	7.8
B757P	1.0	1.0	2.0
B762	0.0	0.0	0.0
B763G	8.8	8.8	17.6
B763P	10.3	10.3	20.6
B763R	12.3	12.3	24.6
B764	4.1	4.1	8.1
B772G	17.8	17.8	35.6
B772P	4.8	4.8	9.6
B772R	18.0	18.0	36.0
B773G	43.1	43.0	86.1
B788	19.1	19.1	38.2
B789	18.6	18.6	37.1
BA46	0.7	0.7	1.4
CRJ900	0.7	0.7	1.5
CS100	0.0	0.0	0.0
EA30	2.5	2.5	5.0
EA31	0.1	0.1	0.2
EA318	1.2	1.2	2.4
EA319C	19.2	19.2	38.4
EA319V	90.6	90.5	181.1

ANCON type	Departure movements	Arrival movements	Total movements
EA320C	68.0	68.0	136.1
EA320neo	0.0	0.0	0.0
EA320V	123.6	123.6	247.3
EA321C	10.9	10.9	21.8
EA321V	47.9	47.9	95.8
EA33	25.5	25.5	51.0
EA34	3.1	3.1	6.1
EA346	7.5	7.4	14.9
EA359	1.0	1.0	2.0
EA38GP	10.5	10.5	21.0
EA38R	14.4	14.4	28.9
ERJ	0.0	0.0	0.1
ERJ170	0.0	0.0	0.1
ERJ190	2.9	2.9	5.8
EXE3	0.3	0.3	0.5
FK10	2.3	2.3	4.6
LTT	0.1	0.1	0.2
STT	0.0	0.0	0.0
	648.8	**648.7**	**1297.4**

Table C5 Heathrow 2016 annual average 16-hour day (L$_{Aeq,16hr}$) movements

ANCON type	Departure movements	Arrival movements	Total movements
B727	0.0	0.0	0.0
B733	1.8	2.1	3.8
B736	11.9	12.5	24.4
B738	10.2	10.9	21.0
B744G	0.5	0.5	0.9
B744P	1.0	1.0	2.0
B744R	25.9	16.8	42.7
B747	0.0	0.0	0.0
B747SP	0.0	0.0	0.0
B748	0.2	0.2	0.3
B753	0.1	0.1	0.1
B757C	0.1	0.2	0.3
B757E	3.9	3.9	7.7
B757P	1.0	0.6	1.5
B762	0.0	0.0	0.0
B763G	8.8	7.2	15.9
B763P	10.2	7.7	17.9
B763R	11.4	12.0	23.3
B764	4.1	3.9	8.0
B772G	16.9	12.1	29.0
B772P	4.8	3.9	8.7
B772R	16.9	15.8	32.6
B773G	42.5	34.7	77.2
B788	18.6	17.3	35.9
B789	18.4	13.7	32.2
BA46	0.7	0.7	1.4
CRJ900	0.7	0.7	1.5
CS100	0.0	0.0	0.0
EA30	1.7	2.5	4.2
EA31	0.1	0.1	0.2
EA318	1.2	1.2	2.3
EA319C	18.0	18.7	36.7
EA319V	89.4	89.5	178.9

ANCON type	Departure movements	Arrival movements	Total movements
EA320C	64.7	67.6	132.3
EA320neo	0.0	0.0	0.0
EA320V	121.2	122.7	243.8
EA321C	10.0	10.8	20.8
EA321V	46.7	47.2	93.9
EA33	24.5	20.7	45.2
EA34	2.7	2.3	5.0
EA346	7.2	5.9	13.2
EA359	1.0	0.8	1.8
EA38GP	10.3	9.2	19.6
EA38R	14.3	7.8	22.1
ERJ	0.0	0.0	0.1
ERJ170	0.0	0.0	0.1
ERJ190	2.7	2.9	5.6
EXE3	0.3	0.3	0.5
FK10	2.3	2.3	4.6
LTT	0.1	0.1	0.1
STT	0.0	0.0	0.0
Total	**628.6**	**590.9**	**1219.5**

APPENDIX D

ANCON type descriptions

Table D1 ANCON type descriptions

ANCON type	Description
B717	Boeing 717
B727	Boeing 727 (Chapter 2&3)
B732	Boeing 737-200 (Chapter 2&3)
B733	Boeing 737-300/400/500
B736	Boeing 737-600/700
B738	Boeing 737-800/900
B747	Boeing 747-100 & 200/300 series (certificated to Chapter 3)
B744G	Boeing 747-400 with General Electric CF6-80F engines
B744P	Boeing 747-400 with Pratt & Whitney PW4000 engines
B744R	Boeing 747-400 with Rolls-Royce RB211 engines
B747SP	Boeing 747SP
B748	Boeing 747-8
B753	Boeing 757-300
B757C	Boeing 757-200 with Rolls-Royce RB211-535C engines
B757E	Boeing 757-200 with Rolls-Royce RB211-535E4/E4B engines
B757P	Boeing 757-200 with Pratt & Whitney PW2037/2040 engines
B762	Boeing 767-200
B763G	Boeing 767-300 with General Electric CF6-80 engines
B763P	Boeing 767-300 with Pratt & Whitney PW4000 engines
B763R	Boeing 767-300 with Rolls-Royce RB211 engines
B764	Boeing 767-400
B772G	Boeing 777-200 with General Electric GE90 engines
B772P	Boeing 777-200 with Pratt & Whitney PW4000 engines
B772R	Boeing 777-200 with Rolls-Royce Trent 800 engines
B773G	Boeing 777-200LR/300ER with General Electric GE90 engines
B773P	Boeing 777-300 with Pratt & Whitney PW4000 engines
B773R	Boeing 777-300 with Rolls-Royce Trent 800 engines
B788	Boeing 787-8
B789	Boeing 787-9
BA46	BAe 146/Avro RJ series
CRJ	Bombardier CRJ100/200 series
CRJ700	Bombardier CRJ700 series
CRJ900	Bombardier CRJ900

ANCON type	Description
CS100	Bombardier C Series CS100
DC87	McDonnell Douglas DC-8-70 series
DC10	McDonnell Douglas DC-10
EA30	Airbus A300
EA31	Airbus A310
EA318	Airbus A318
EA319C	Airbus A319 with CFM56 engines
EA319V	Airbus A319 with IAE V2500 engines
EA320C	Airbus A320 with CFM56 engines
EA320V	Airbus A320 with IAE V2500 engines
EA321C	Airbus A321 with CFM56 engines
EA321V	Airbus A321 with IAE V2500 engines
EA33	Airbus A330
EA34	Airbus A340-200/300
EA346	Airbus A340-500/600
EA359	Airbus A350-900
EA38GP	Airbus A380 with Engine Alliance GP7000 engines
EA38R	Airbus A380 with Rolls-Royce Trent 900 engines
ERJ	Embraer ERJ 135/145
ERJ170	Embraer E-170
ERJ190	Embraer E-190
EXE2	Chapter 2 executive jets
EXE3	Chapter 3 executive jets
FK10	Fokker 70/100
L101	Lockheed L-1011 TriStar
L4P	Large four-engine propeller
LTT	Large twin-turboprop
MD11	McDonnell Douglas MD-11
MD80	McDonnell Douglas MD-80 series
SP	Single piston
STP	Small twin-piston
STT	Small twin-turboprop
TU54	Tupolev Tu-154

Glossary

Glossary	
AIP	Aeronautical Information Publication
ANCON	The UK civil aircraft noise contour model, developed and maintained by ERCD.
CAA	Civil Aviation Authority
dB	Decibel units describing sound level or changes of sound level.
dBA	Units of sound level on the A-weighted scale, which incorporates a frequency weighting approximating the characteristics of human hearing.
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport (UK Government)
ERCD	Environmental Research and Consultancy Department
$L_{Aeq,16hr}$	Equivalent sound level of aircraft noise in dBA for the 16-hour day (0700-2300 local time) period. In this study, the *annual* average 16-hour day is modelled.
L_{day}	Equivalent sound level of aircraft noise in dBA for the 12-hour annual average day (0700-1900 local time) period.
L_{den}	Equivalent sound level of aircraft noise in dBA for the 24-hour annual average period with 5 dB weightings for $L_{evening}$ and 10 dB weightings for L_{night}.
Leq	Equivalent sound level of aircraft noise in dBA, often called 'equivalent continuous sound level'.
$L_{evening}$	Equivalent sound level of aircraft noise in dBA for the 4-hour annual average evening (1900-2300 local time) period.
L_{night}	Equivalent sound level of aircraft noise in dBA for the 8-hour annual average night (2300-0700 local time) period.
NPR	Noise Preferential Route
NTK	Noise and Track Keeping monitoring system
SID	Standard Instrument Departure