

Noise Action Plan Contours for Heathrow Airport 2014

ERCD REPORT 1504



Published by the Civil Aviation Authority, 2015

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Summary

1. This report presents year 2014 L_{day} , L_{evening} , L_{night} , L_{den} and $L_{\text{eq},6.5\text{hr night}}$ noise contours for Heathrow Airport, and compares them with the contours from year 2013. 'Number-Above' N65 annual 16-hour day and N60 annual 8-hour night contours have also been produced for the first time. Long-term trends from years 2006 to 2014 are examined. This study was commissioned by Heathrow Airport Limited as part of their ongoing Noise Action Plan commitments.
2. Aircraft movements during the 2014 L_{day} period rose marginally by 0.4%, but there were small percentage movement decreases for the L_{evening} (-1%), L_{night} (-2%) and $L_{\text{eq},6.5\text{hr night}}$ (-2%) periods. Total movements over the 2014 L_{den} annual average 24-hour period (1292.8) were effectively unchanged from the previous year (2013: 1293.1). The largest increase in movements by aircraft type over the average 24-hour period was for the Airbus A320 with IAE V2500 engines (+23 movements). There were also increases for the Boeing 777-300ER with General Electric engines (+21) and the Boeing 787-8 (+17). The Airbus A380 had an increase of 5 movements in 2014. The largest decreases in movements were for the Airbus A319 with IAE V2500 engines (-17) and the Boeing 777-200 with Rolls-Royce engines (-11). There were also reductions in movements by the B747-400 with Rolls-Royce engines (-7) and the B747-400 with Pratt & Whitney engines (-3).
3. The percentage of aircraft in the fleet mix meeting the 'Chapter 4' noise standard has risen from 94% in 2006 to 99% in 2014.
4. The modelling results showed that L_{day} , L_{evening} , L_{night} and L_{den} contour band areas in 2014 were mostly lower than in 2013. (Cumulative contour areas were all lower in 2014 compared to 2013). This can be attributed primarily to the decreases in movements by the noise dominant B747-400 aircraft and replacement by quieter types such as the Airbus A380 and Boeing 777-300ER. The year 2014 $L_{\text{eq},6.5\text{hr night}}$ 48 dBA contour area decreased by 11% (following a significant reduction in B747-400 movements) to 36.3 km², which was the smallest area ever and well within the 55 km² contour area objective set by the current night flying restrictions regime.
5. The 2014 L_{day} , L_{evening} , L_{night} and L_{den} contours showed population changes that were not always in line with the area reductions described above. However, significant population decreases were observed for all L_{evening} contour bands and most L_{night} bands. L_{den} population counts were lower in 2014, apart from at the 60-65 dBA and >75 dBA bands. Percentage changes for the household counts at the higher contour bands were generally greater than the corresponding population percentage changes because there were fewer people per household

on average in 2014, especially in areas closer in to the airport. The year 2014 $L_{eq,6.5hr\ night}$ 48 dBA population and household counts reduced in line with the area reduction.

6. In terms of trends for the *outermost contour band* for each of the noise metrics, the L_{day} areas have been fairly steady since 2009. L_{day} populations and households have also remained at similar levels since 2011, following the low in 2010. However, for $L_{evening}$ the area has declined for the third successive year since 2011 in line with the movement reductions, with populations and households also exhibiting the same trend. L_{night} areas and movements have remained at a similar level since 2011, but the population count increased in 2013 and 2014 after the 2013 population database update, which was based on the latest 2011 Census. For L_{den} , the contour area has not changed significantly since 2009, although populations and households have shown some declines since 2011. Apart from a dip in 2010, aircraft movements over the L_{den} period have been at a comparable level since 2006. The $L_{eq,6.5hr\ night}$ contour area has been relatively low since 2011. The decline in population and households seen up to 2012 reversed in 2013, following an extension of the contour in line with the northern runway over parts of west London (due to the southern runway resurfacing programme and the higher percentage of westerly operations in 2013), and also the major 2013 population database update. However, the significant area decrease in 2014 was largely responsible for bringing the population and household counts back down to near 2012 levels.
7. Between the 2006 base year and 2014 there has been a 41% reduction in movements by the noise dominant B747-400 aircraft over the average 24-hour period. Newer aircraft types such as the Airbus A380 and Boeing 787 were not in service in 2006, but by 2014 there were on average 30 movements of the Airbus A380 and 22 movements of the Boeing 787 over the 24-hour day.
8. The 2014 *cumulative* contour areas were below 2006 levels for all the noise metrics under consideration. For example, the 2014 L_{den} 55 dBA contour area of 210.7 km² was 14% smaller than the 2006 area of 244.7 km². Despite the area decreases, population counts in some cases were actually slightly higher in 2014. This was due to significant population encroachment between 2006 and 2014 in some of the areas around Heathrow. Had the population database remained the same between 2006 and 2014, the population and household counts for 2014 would have all been much lower than in 2006. For example, the L_{den} 55 dBA population count would have fallen by 18% and the L_{night} 50 dBA population count by 13%.
9. An analysis of L_{den} noise changes between 2006 and 2014 (assuming constant 2006 base year runway modal splits) revealed that most areas within the 2014 L_{den} 55 dBA contour have experienced noise reductions of up to 2-3 dB. There were a few areas that were exposed to increases in noise levels. A small area

over Egham had a noise change of more than 1 dB as a result of the mean tracks for the westerly DVR SID routes having shifted further to the west in 2014 compared to 2006, together with a higher usage of the westerly DVR route from the northern runway compared to the southern runway. A small area over Windsor Great Park also experienced some noise changes of more than 1 dB due to the use of the westerly departure trial routes in 2014 (note: the trials ended in November 2014).

10. An analysis of L_{night} noise changes between 2006 and 2014 (assuming a constant 2006 base year L_{night} runway modal split and removing the effects of the northern runway resurfacing programme in 2014) showed that most areas experienced reductions in noise levels of up to 2-3 dB. However, a small area north of Egham had an increase of up to 1 dB, which was a result of the positioning of the DVR mean tracks in 2014 as mentioned above.
11. 'Number-Above' N65 annual 16-hour day and N60 annual 8-hour night contours have also been produced for the first time, for the years 2006, 2013 and 2014. The results show that the number of noise events greater than 65 dBA L_{max} during the day and greater than 60 dBA L_{max} during the night have decreased between the 2006 base year and 2013/2014, reflecting the phase-out of the noisiest aircraft types (e.g. the Boeing 747-400 variants) over this period. For example, the N65 day 50 events contour area for 2014 was 14% smaller than in 2006, and the N60 night 10 events contour area for 2014 was 7% smaller than in 2006.

Chapter 1

Introduction

- 1.1 This report presents the year 2014 noise exposure contours that have been generated for the Heathrow Airport Ltd (HAL) Noise Action Plan by the Environmental Research and Consultancy Department (ERCD) of the Civil Aviation Authority (CAA). Noise contours have been produced for the following noise metrics: L_{day} , $L_{evening}$, L_{night} , L_{den} and $L_{eq,6.5hr\ night}$. For the first time, 'Number-Above' N65 and N60 contours have also been produced for the annual 16-hour day and 8-hour night periods respectively, for the years 2006, 2013 and 2014.
- 1.2 The L_{day} , $L_{evening}$, L_{night} and L_{den} contours are based on annual movement data for the 2014 calendar year, whilst the $L_{eq,6.5hr\ night}$ contour is based on data from the combined 2014 summer and 2014-15 winter night quota seasons (i.e. the period 30 March 2014 – 29 March 2015).
- 1.3 The year 2014 Noise Action Plan contours are compared with those from 2013 (Ref 1) to assess the changes in area, population and households enclosed. The long-term contour trends from 2006 to 2014 are also examined.

Chapter 2

Noise modelling methodology

ANCON model

- 2.1 The noise contours were calculated with the latest version of the UK civil aircraft noise model ANCON (version 2.3), which is developed and maintained by ERCD on behalf of the Department for Transport (DfT). A technical description of the ANCON model can be found in R&D Report 9842 (Ref 2).

Flight tracks and profiles

- 2.2 Mean departure and arrival ground tracks generated for the 2014 summer period (for the DfT annual noise exposure contours) were employed in the modelling. A number of Heathrow departure trial routes were in operation over 2014 and these were also modelled (note: the departure trials ended in November 2014). Additional departure mean tracks were calculated for trial routes that were operational outside of the 2014 summer period, but within the 2014 annual period modelled for this study.
- 2.3 Average flight profiles of height, speed and thrust were based on data from the 2014 summer period.

Traffic data

- 2.4 The contours were calculated using movement data extracted from the Heathrow Noise and Track Keeping (NTK) system, which stores radar data supplemented by daily flight plans. Breakdowns of the aircraft movements by ANCON aircraft type for the average 12-hour day (0700-1900 local time), 4-hour evening (1900-2300 local time), 8-hour night (2300-0700 local time), 24-hour day and 6.5-hour night (2330-0600 local time) are summarised in Tables C1-C5 of Appendix C. Detailed descriptions of the individual ANCON aircraft types are provided in Table D1 of Appendix D.
- 2.5 The annual average 24-hour daily movements for the base year 2006 (Ref 3) and years 2009-2014 are summarised below in Table 1. It can be seen that total movements decreased in both 2009 and 2010 relative to 2006, before rising significantly (by 6%) in 2011 to a level 1% above the 2006 total. Movements then dropped back slightly to a level 1% below that in 2006 in years 2012 to 2014. The 24-hour movements have therefore been relatively steady since 2006 apart from the dip in 2010, when the total was 5% below the 2006 level.

Table 1 Heathrow annual average 24-hour movements for years 2006 & 2009-2014

Year	Total movements	Percentage change relative to <u>2006</u>
2006	1307.6	(n/a)
2009	1277.2	-2%
2010	1245.8	-5%
2011	1317.1	+1%
2012	1297.9	-1%
2013	1293.1	-1%
2014	1292.8	-1%

Aircraft noise classes

2.6 The 2014 fleet mix can be considered in terms of aircraft ‘Noise Class’ categories, which are ranked in ascending order of noise emission, i.e. from the quietest to the noisiest. Noise Class percentage breakdowns are summarised in Table 2 for the annual average 24-hour period, along with percentages from the 2006 base year for comparison.

Table 2 Heathrow 2014 annual average 24-hour movements by Noise Class

Noise Class	Description	2014 total	2014 percentage	2006 percentage
1	Small propeller	0.1	0%	0%
2	Large propeller	0.1	0%	1%
3	Short-haul jet (e.g. A319, A320, B737-800)	814.6	63%	65%
4	Wide-body twin (e.g. B777, B787, A330)	337.0	26%	18%
5	2 nd generation wide-body 3,4 engine (e.g. B747-400, A380)	141.0	11%	15%
6	1 st generation wide-body 3,4 engine (e.g. B747-100)	0.0	0%	0%
7	2 nd generation narrow-body twin (e.g. B737-200)	0.0	0%	0%
8	1 st generation narrow-body 3,4 engine (e.g. B727)	0.0	0%	0%
	Total	1292.8	100%	100%

Note: Totals may not sum exactly due to rounding.

2.7 It can be seen that virtually all movements were within Noise Classes 3, 4 and 5. The proportion of short-haul jet aircraft (Noise Class 3) fell slightly by 2% between 2006 and 2014. There was also a reduction in the proportion of 2nd

generation wide-body 3- or 4-engine types (Noise Class 5), by 4%. However, the proportion of wide-body twin-engine aircraft (Noise Class 4) increased by 8% between 2006 and 2014.

- 2.8 The chart in Figure 1 of Appendix B illustrates the breakdown of total movements by Noise Class for years 2006 and 2009-2014. Movements over the annual average 24-hour period in 2014 by ANCON aircraft type are summarised in Table C4. These are described in the following paragraphs.
- 2.9 Around two-thirds of movements in 2014 were within Noise Class 3, i.e. short-haul aircraft such as the Airbus A319/320/321. Numbers within Noise Class 3 dropped between 2006 and 2010, but increased in 2011 to a level slightly higher than in 2006, before dropping back to near 2009 levels in 2013 and 2014 (Figure 1). The ANCON type EA320V had the highest increase in 2014 per 24-hour day (+23 movements), which was offset by decreases in the EA319V (-17 movements).
- 2.10 The next largest grouping was Noise Class 4, i.e. modern wide-body twin-engine aircraft (e.g. Boeing 777-200/300, Boeing 787-8), which accounted for about a quarter of total movements in 2014. These have risen steadily in frequency between 2009 and 2014 (Figure 1). The largest increase in 2014 was for the B773G (+21 movements). The number of B787-8 movements also rose, by 17. The largest decrease within Noise Class 4 was for the B772R, which was down by 11 movements.
- 2.11 Movements of the Noise Class 5 grouping, i.e. 2nd generation wide-body 3- and 4-engine aircraft (e.g. B747-400), decreased in both 2009 and 2010, and since the small rise seen in 2011, have declined through to 2014 (Figure 1). The largest reduction in 2014 was for the B744R ANCON type (-7 movements), followed by the B744P (-3 movements). There was, however, an increase in Airbus A380 movements (+5). Around a tenth of total movements were within Noise Class 5 in 2014.

Fleet mix by ICAO noise chapter

- 2.12 An analysis of the certification noise levels of the aircraft operating at Heathrow in the 2014 annual period indicated that approximately 99% of the fleet were compliant with the ICAO 'Chapter 4' noise standard, with the remainder meeting the 'Chapter 3' noise standard.
- 2.13 In the 2006 base year the estimated percentage of 'Chapter 4'-compliant aircraft was 94%, and by 2009 this had risen slightly to 95%. The figure was higher in 2010 and 2011 (96% in both years), and in 2012 and 2013 the compliance level had reached 97%. The compliance level was at its highest in 2014 at 99%.

Runway modal splits

2.14 The noise contours were modelled with the 2014 actual runway modal splits, which are summarised in Table 3 along with the modal splits for the previous year, and also the 5-year average. In 2014 there were 3% more westerly movements over the average 24-hour period compared to 2013.

Table 3 Heathrow runway modal splits

Time period	2014 split (W/E percentage)	2013 split (W/E percentage)	5-year average (W/E percentage)
12-hour day	69 / 31	67 / 33	69 / 31
4-hour evening	70 / 30	64 / 36	69 / 31
8-hour night	69 / 31	69 / 31	71 / 29
24-hour day	70 / 30	67 / 33	70 / 30
6.5-hour night	67 / 33	76 / 24	70 / 30

Note: the 6.5-hour night covers the period from the end of March in one year to the end of March in the following year. The 5-year average is calculated over the period 2010-2014.

2.15 A higher proportion of easterly movements at Heathrow tends to cause a decrease in contour area. During easterly operations, departures from Runway 09L are restricted, resulting in the majority of departures operating from Runway 09R and landings are on Runway 09L. This concentrates traffic onto fewer flight paths, reducing the contour area.

Population database

2.16 Estimates were made of the numbers of people and households enclosed within the noise contours. The population data used in this report for the 2014 contours are a 2014 update of the latest 2011 Census supplied by CACI Limited¹.

2.17 The CACI population database contains data referenced at the postcode level. Population and household numbers associated with each postcode are assigned to a single co-ordinate located at the postcode’s centroid.

2.18 Within the extent of the year 2014 L_{den} 55 dBA cumulative contour, the population count was 0.4% higher with the 2014 population database compared to the 2013 database, thus the 2014 update of the population database had a marginal effect on the total population counted within the 55 dBA contour.

¹ www.caci.co.uk

Chapter 3

Results

2014 contour results and comparisons with 2013

- 3.1 The following Noise Action Plan contours for year 2014 are displayed in Figures 2-6 respectively (as the black lines), overlaid onto the 2013 contours (the red lines):
- L_{day} , from 55 to 75 dBA in 5 dB steps;
 - L_{evening} , from 55 to 75 dBA in 5 dB steps;
 - L_{night} , from 50 to 70 dBA in 5 dB steps;
 - L_{den} , from 55 to 75 dBA in 5 dB steps;
 - $L_{\text{eq},6.5\text{hr night}}$, 48 dBA.
- 3.2 The estimated areas, populations and households within the above 2014 contours are summarised in Tables 4-8, along with the results for 2013. As already noted, the 2014 population and household figures are based on a 2014 update of the 2011 Census supplied by CACI Ltd. (The 2013 population and household figures are based on a 2013 update of the 2011 Census).
- 3.3 The statistics for L_{day} , L_{evening} , L_{night} and L_{den} are presented in 5 dB contour bands (e.g. 55-60 dBA), in line with the requirements of the Environmental Noise Directive, and are not cumulative as is the case for the average summer day L_{eq} contours published by the DfT.
- 3.4 However, for reference purposes, the 2013 and 2014 results are also provided in *cumulative* format in Tables C6-C10 of Appendix C. In addition, a comparison between the cumulative 2006 base year and 2014 results is provided in Tables C11-C15. All the population and household figures in these tables are based on CACI data.
- 3.5 Percentage changes in contour area are not necessarily accompanied by similar changes in enclosed population and households because populations are unevenly distributed around the airport. Thus the population counts can be highly sensitive to changes in contour shape.
- 3.6 Changes in contour population counts from year to year are also influenced by the effects of the annual update to the population database. Within the region bounded by the 2014 L_{den} 55-60 dBA contour band, there was a 0.1% population decrease between 2013 and 2014 (with households 2% lower). However, at the higher contour bands, whilst populations increased by 2% within both the 2014 L_{den} 60-65 dBA and 65-70 dBA contours from the database update, households increased by 3% and 13% respectively. This can be attributed to the fact that

average population-to-household ratios were lower with the 2014 database than with the 2013 database in regions close to the airport, e.g. the ratio was 2.7 persons per household within the 2014 L_{den} 65-70 dBA contour band with the 2014 database, and 2.9 persons per household within the same contour band using the 2013 database. The population-to-household ratios also increased at the higher contour bands, e.g. the ratio was 2.4 within the 2014 L_{den} 55-60 dBA contour band and 2.7 within the 65-70 dBA contour band, reflecting changes in residential housing type and usage within smaller contour band areas/population samples closer to Heathrow.

L_{day} contours

- 3.7 Total movements in the 2014 L_{day} period increased slightly, by 0.4%, from 2013 (see Table C1). The largest movement increases were for the EA320V (+18), B773G (+16) and B788 (+13) aircraft types. They were offset by reductions in movements of the EA319V (-13), B772R (-8), EA321C (-7) and EA321V (-6). The noise dominant B747-400 aircraft had 3 fewer movements overall in 2014, whilst Airbus A380 movements increased by 4.
- 3.8 The outermost 55-60 dBA band area for L_{day} was 1% smaller in 2014, and there were decreases for the higher bands of up to 3% (Table 4). (Note: the *cumulative* L_{day} contour areas reduced at all levels by up to 3%, as shown in Table C6). The area changes can be attributed to the replacement of the noise dominant B747-400 aircraft by quieter types such as the Airbus A380. Population counts were 1% higher than in 2013 for the two outer contour bands. Because of the lower population-to-household ratios in 2014 at the higher contour bands, significant increases in household counts were observed for these bands.

Table 4 Heathrow 2013 and 2014 L_{day} contour band area, population and household estimates

L_{day} (dBA)	2013 area	2014 area	Change in area	2013 pop	2014 pop	Change in pop	2013 house	2014 house	Change in house
55 – 60	104.0	102.9	-1%	325.9	330.3	+1%	132.3	133.8	+1%
60 – 65	34.0	33.9	0%	103.6	104.4	+1%	37.2	39.8	+7%
65 – 70	16.5	16.2	-2%	18.9	18.4	-3%	6.3	6.9	+10%
70 – 75	4.9	4.8	-2%	1.9	2.1	+11%	0.6	0.8	+33%
> 75	3.0	2.9	-3%	< 0.1	< 0.1	(n/a)	< 0.1	< 0.1	(n/a)

Note: Areas are given in km², and populations (pop) and households (house) in thousands. The 2013 and 2014 population/household counts are based on 2013 and 2014 CACI updates of the 2011 Census respectively.

- 3.9 The 2014 L_{day} contours are compared against the 2013 L_{day} contours in Figure 2. The 55 dBA contour lobes that turn to the north have retracted, due to movement decreases of more than 20% by the noise dominant B747-400 aircraft on the

Runway 27L/27R WOB/BPK and Runway 09L/09R BUZ/BPK routes. A widening of the 55 dBA contour can be seen over the eastern side of Windsor Great Park – this was caused by aircraft using the westerly departure trial routes which replaced the CPT, SAM and MID routes during part of the year.

L_{evening} contours

- 3.10 Movements in the 2014 L_{evening} period fell by 1% from 2013 (see Table C2). The largest reductions in movements were for the EA319V (-4), EA321V (-3), B744R (-3) and B763R (-3) aircraft types. These changes were offset by movement increases for the EA320V (+4), B773G (+3) and EA319C (+2).
- 3.11 The areas of the L_{evening} contour bands decreased by 3-7% in 2014 (Table 5). (Note: the *cumulative* L_{evening} contour areas reduced at all levels by up to 7%, as shown in Table C7). This can be attributed primarily to the replacement of the noise dominant Boeing 747-400 aircraft by quieter types such as the Boeing 777-300ER. Significant reductions in population count were seen at all contour bands.

Table 5 Heathrow 2013 and 2014 L_{evening} contour band area, population and household estimates

L _{evening} (dBA)	2013 area	2014 area	Change in area	2013 pop	2014 pop	Change in pop	2013 house	2014 house	Change in house
55 – 60	94.6	91.5	-3%	291.9	271.2	-7%	116.3	108.3	-7%
60 – 65	30.6	29.7	-3%	89.5	83.9	-6%	31.6	31.9	+1%
65 – 70	15.1	14.2	-6%	14.2	11.6	-18%	4.8	4.4	-8%
70 – 75	4.4	4.2	-5%	1.1	0.8	-27%	0.4	0.3	-25%
> 75	2.9	2.7	-7%	0.0	0.0	(n/a)	0.0	0.0	(n/a)

Note: Areas are given in km² and populations/households in thousands. The 2013 and 2014 population/household counts are based on 2013 and 2014 CACI updates of the 2011 Census respectively.

- 3.12 The 2014 L_{evening} contours are compared against the 2013 L_{evening} contours in Figure 3. Similar to L_{day}, the 55 dBA departure contour lobes turning to the north have retracted in 2014 following the reductions in B747-400 aircraft movements. The north-east contour lobe associated with easterly BUZ/BPK departures is markedly smaller because of the additional effect of the lower proportion of easterly movements in 2014. The 55 dBA contour tip to the east of the airport caused by westerly landings has enlarged because of the 6% higher proportion of westerly movements in 2014. The changes to the shape of the 55 dBA contour over Windsor Great Park can be attributed to the use of the westerly departure trial routes in 2014.

L_{night} contours

- 3.13 Movements during the 2014 L_{night} period fell by 2% from 2013 (see Table C3). Arrivals made up three-quarters of the L_{night} movement total. The largest movement decreases were for the B744R (-2) and B772G (-2) aircraft types. Increases in movements were seen for the B773G (+2) and B788 (+2).
- 3.14 The area of the outermost L_{night} contour band increased by 3%, though the other contour band areas decreased significantly, by up to 15% (Table 6). (Note: the *cumulative* L_{night} contour areas reduced at all levels, by up to 11%, as shown in Table C8). The 3% area increase for the 50-55 dB band can be attributed in part to the shift in departures and arrivals to the southern runway at night, following the 2014 northern runway resurfacing programme. The area decreases at the other bands can be explained by the 2% fall in overall L_{night} movements and especially to the reduction in movements of the noise dominant B744R aircraft type. Population changes were largely in line with the area changes.

Table 6 Heathrow 2013 and 2014 L_{night} contour band area, population and household estimates

L _{night} (dBA)	2013 area	2014 area	Change in area	2013 pop	2014 pop	Change in pop	2013 house	2014 house	Change in house
50 – 55	46.5	47.9	+3%	148.4	153.7	+4%	60.0	61.6	+3%
55 – 60	20.1	18.1	-10%	57.3	49.7	-13%	19.8	18.7	-6%
60 – 65	6.3	5.8	-8%	11.4	11.0	-4%	3.6	4.1	+14%
65 – 70	2.0	1.7	-15%	1.9	1.1	-42%	0.5	0.4	-20%
> 70	1.5	1.4	-7%	0.0	0.0	(n/a)	0.0	0.0	(n/a)

Note: Areas are given in km² and populations/households in thousands. The 2013 and 2014 population/household counts are based on 2013 and 2014 CACI updates of the 2011 Census respectively.

- 3.15 The 2014 L_{night} contours are compared against the 2013 L_{night} contours in Figure 4. It can be seen that arrival noise dominates in the night period. Also noticeable is the shift in noise from the northern to the southern runway in 2014, which causes the contour tips associated with landings on the southern runway to extend both to the west and east. This was a consequence of the resurfacing work carried out on the northern runway in 2014 (following the resurfacing programme for the southern runway in 2013), as mentioned earlier.

L_{den} contours

- 3.16 Overall 24-hour aircraft movements in 2014 were effectively unchanged from 2013, being less than 0.1% lower (see Table C4). Reductions in movements of the EA319V (-17), B772R (-11) and EA321V (-10) aircraft were offset by increases for the EA320V (+23), B773G (+21) and B788 (+17). The most

significant change was a 10% reduction in movements of the noise dominant B747-400 aircraft.

- 3.17 The area of the outermost L_{den} contour band for 2014 decreased by 5% from 2013 (Table 7), whilst some of the higher contour bands also showed decreases of up to 6%.

Table 7 Heathrow 2013 and 2014 L_{den} contour band area, population and household estimates

L_{den} (dBA)	2013 area	2014 area	Change in area	2013 pop	2014 pop	Change in pop	2013 house	2014 house	Change in house
55 – 60	140.7	133.0	-5%	547.8	504.8	-8%	232.8	210.7	-9%
60 – 65	47.0	47.0	0%	149.2	152.2	+2%	57.3	59.8	+4%
65 – 70	21.9	20.5	-6%	47.9	42.1	-12%	16.4	15.9	-3%
70 – 75	6.9	6.5	-6%	5.9	5.1	-14%	1.9	1.9	0%
> 75	3.9	3.7	-5%	0.1	0.2	+100%	< 0.1	0.1	(n/a)

Note: Areas are given in km^2 and populations/households in thousands. The 2013 and 2014 population/household counts are based on 2013 and 2014 CACI updates of the 2011 Census respectively.

- 3.18 (Note: the *cumulative* L_{den} contour areas reduced at all levels by up to 6%, as shown in Table C9). The area decreases can be attributed primarily to the reduction in movements of the noise dominant B747-400 aircraft and replacement by quieter types such as the Airbus A380 and Boeing 777-300ER. Changes in population counts were generally in line with the changes in area.
- 3.19 The 2014 L_{den} contours are compared against the 2013 L_{den} contours in Figure 5. It can be seen that the changes to the L_{den} 55 dBA contour shape between 2013 and 2014 are similar to those seen for L_{day} . The 55 dBA contour lobes that are formed by departures turning to the north have retracted, following reductions in movements of the noise dominant B747-400 aircraft. The contour tip to the west from easterly arrivals has retreated with the lower proportion of easterly movements. Also seen is an expansion to the 55 dBA contour over Windsor Great Park, which resulted from the use of the westerly departure trial routes in 2014.

$L_{eq,6.5hr}$ night contours

- 3.20 Movements over the 6.5-hour night period decreased by 2% in 2014 (see Table C5). The largest reduction was for the B744R ANCON aircraft type, down by one movement per night. There was also an overall decrease of one movement per night for the B777-200 aircraft series. The decreases were partially offset by small increases of less than one movement for the B773G, EA38R, B763P and B788 ANCON aircraft types.

3.21 The 48 dBA $L_{eq,6.5hr\ night}$ contour area in 2014 of 36.3 km² was 11% smaller than in 2013 (see Table 8), mainly due to the 21% reduction in movements for the noise dominant aircraft type, the B744R. This area was the smallest ever calculated and well within the 55 km² contour area objective set by the current night noise restrictions regime.

Table 8 Heathrow 2013 and 2014 $L_{eq,6.5hr\ night}$ contour band area, population and household estimates

$L_{eq,6.5hr\ night}$ (dBA)	2013 area	2014 area	Change in area	2013 pop	2014 pop	Change in pop	2013 house	2014 house	Change in house
> 48	41.0	36.3	-11%	133.3	107.5	-19%	48.1	41.5	-14%

Note: Areas are given in km² and populations/households in thousands. The 2013 and 2014 population/household counts are based on 2013 and 2014 CACI updates of the 2011 Census respectively.

3.22 The 2014 $L_{eq,6.5hr\ night}$ 48 dBA contour is compared against the 2013 contour in Figure 6. The shift in noise from the northern runway to the southern runway, as a result of the northern runway resurfacing programme in 2014, can be clearly seen.

Long-term contour trends

3.23 The long-term area, population and household trends for the outermost contour band are shown graphically in Figures 7-11 for L_{day} , $L_{evening}$, L_{night} , L_{den} and $L_{eq,6.5hr\ night}$ respectively, for the base year 2006 and years 2009 through to 2014 (note: the population and household trends are all based on updated CACI data). The percentage of westerly and easterly movements (i.e. the runway modal split) has also been indicated by the dashed lines on the charts.

3.24 Some significant factors that had an effect on the contours between 2006 and 2014 include the following:

- 2006: 'Chapter 4' compliance at 94%;
- 2009: B747-400 movements were 21% lower than in 2006;
- 2010:
 - disruption from volcanic ash crisis, ATC strikes and adverse winter weather;
 - total movements 5% lower than in 2006;
 - low in percentage of westerly movements;
- 2011: total movements 6% higher than in 2010;
- 2013:
 - southern runway resurfacing programme at night;
 - low in percentage of westerly movements;

- 2014:
 - northern runway resurfacing programme at night;
 - 'Chapter 4' compliance reached 99%;
 - westerly departure trials between August and November, and easterly departure trials between July and November.

- 3.25 There was a downward trend for the L_{day} area, population and households from 2006 through to 2010 (Figure 7), when movements also fell to a low and the percentage of easterly operations was unusually high. However, a slight increase in area in 2011 was accompanied by a significant increase in populations and households, which to a large extent was due to the update to the population database in 2011, and also to the 5% higher proportion of westerly movements. Since 2011, the L_{day} area, population and households have been relatively steady. The proportion of westerly movements was at its lowest in 2010 and 2013. Apart from 2010, total movements have been relatively steady, in the range of approximately 940-960 per 12-hour day.
- 3.26 The L_{evening} area showed a downward trend through to 2010 before rising slightly in 2011, but since then, has been falling steadily (Figure 8). Movement numbers in the evening period have also been on the decline since 2011. Populations and households fell significantly in 2009, but increased in 2010 and 2011, before dropping back ever since in tandem with the movement and area reductions. The 2013 population did not fall as much as expected following the area decrease because of the major update to the 2013 population database. The proportion of westerly operations was at its lowest in 2010 and 2013.
- 3.27 The L_{night} area was at a similar level to 2006 in 2009 and 2010, before dropping back slightly in subsequent years to a steady level (Figure 9). Over this period L_{night} movements have been in the range of 75-78 per night. There was a downward trend in the population and households from 2009 to 2012, which followed the 2009 high. However, the population count rose significantly in 2013 after the major update to the 2013 population database and also increased again in 2014.
- 3.28 The L_{den} area fell between 2006 and 2009 as movements of the noise dominant B747-400 aircraft fell by 21%, but has stayed at a similar level since 2009 (Figure 10). The L_{den} population and households declined from 2006 through to 2010, but increased somewhat in 2011 despite the area staying almost constant, mainly due to the effects of the update to the 2011 population database, and also to a higher proportion of westerly movements. Since 2011, the population and household counts have shown a downward trend. The frequency of movements has been fairly steady since the 2006 base year apart from a dip in 2010, when disruption from volcanic ash, ATC strikes and adverse winter weather meant that

movements were 5% below 2006 levels. There were lows in the proportions of westerly operations in 2010 and 2013.

- 3.29 The $L_{eq,6.5hr\ night}$ area fell between 2006 and 2009, increased significantly in 2010, but then dropped markedly in 2011 (Figure 11). From 2011 to 2013 the area was relatively steady, but then reduced significantly in 2014. Movement numbers have changed little since 2011. The population and household counts have moved in tandem with the area changes from 2006 to 2011. However, in 2012 the populations fell despite the area increase as parts of the contour retracted from densely populated areas of west London. The area reduced slightly in 2013, but populations and households increased considerably from an extension of the contour over west London in line with the northern runway (due to the southern runway resurfacing programme and a higher percentage of westerly operations in 2013), and also because of the major 2013 population database update. The area and population/household counts declined in 2014 following a significant reduction in B744R movements.

Cumulative noise contours

- 3.30 The cumulative results in Tables C11-C15 of Appendix C indicate that year 2014 contour areas were below the 2006 base year levels across all the noise metrics. For example, the $L_{den\ 55\ dBA}$ contour area in 2014 was 210.7 km², 14% smaller than the 2006 $L_{den\ 55\ dBA}$ area of 244.7 km².
- 3.31 However, in some cases the 2014 populations were only slightly lower (or even higher) than in 2006. This was due to significant population encroachment between 2006 and 2014 in the areas around Heathrow. To illustrate the impact of encroachment, year 2014 population and household counts have also been produced assuming that the population database had remained unchanged from 2006. These are highlighted in blue in Tables C11-C15. This secondary set of numbers confirms that the population and household counts would have dropped substantially across all the noise metrics had there not been population encroachment between 2006 and 2014. For example, the $L_{den\ 55\ dBA}$ population count would have fallen by 18% and the $L_{night\ 50\ dBA}$ population count by 13%.
- 3.32 To eliminate the effects of the modal split changes between 2006 and 2014, year 2014 contours have also been modelled using the 2006 base year modal splits. The areas and populations (for both the 2014 and 2006 population databases) within the outermost cumulative contour are summarised in Table C16, for each noise metric. The differences between the 2006 and 2014 modal splits were generally small, except for the 6.5-hour night period where there were 6% more westerly movements in 2006. The results show that the modal split changes had little (or insignificant) effect on the contour areas across all metrics, and only caused at most a 1% increase in population counts (except for the 6.5-hour night where the increase was 6%).

- 3.33 Movements by the noise dominant B747-400 aircraft have decreased from 135 movements per 24-hour day in 2006 (Ref 3) to 80 movements in 2014, a 41% reduction. Newer aircraft types such as the Airbus A380 and Boeing 787 were not in service in 2006, but by 2014 there was an average of 30 movements of the Airbus A380 and 22 movements of the Boeing 787 per 24-hour day.
- 3.34 A diagram comparing the 2006 and 2014 L_{den} contours can be found in Figure 12. The contour lobes associated with departures turning to the north have shortened considerably, following the significant phase-out of the noise dominant B747-400 aircraft types. A similar effect is seen on the contour lobe formed by westerly departures turning to the south (on the DVR route). Westerly arrival movements occurred on the northern runway more in 2006 than in 2014, thus the contour lobes to the east of the airport in 2006 are more extensive along the Runway 27R extended centreline. The contour shape changes over Windsor Great Park are a result of the use of the westerly departure trial routes in 2014.

Noise change diagrams

- 3.35 In order to identify the areas where noise levels have increased or decreased, excluding the effect of weather patterns on runway usage, a 'noise change' map has been produced that compares the noise exposure between the year 2006 and 2014 L_{den} noise contours, *assuming the 2006 runway modal splits in both cases*² (Figure 13). The year 2014 L_{den} 55 dBA contour (assuming the 2006 modal split) has been taken as the outer boundary of the areas of noise change being considered.
- 3.36 As expected, most areas have experienced noise reductions of up to 2-3 dB following the replacement of older, noisier aircraft types. A few areas have seen noise increases, but they were of mostly less than 1 dB. The region immediately to the south-west of Windsor showed noise increases that can be largely attributed to the CPT SID routes being more heavily used in 2014 than in 2006. The noise increase of greater than 1 dB over a small part of Egham can be explained by: (a) the positioning of the westerly mean tracks for the DVR SIDs in 2014, which were further to the west than in 2006, and (b) a higher proportion of movements on the westerly DVR route from the *northern runway*³ in 2014 compared to 2006. A small region over Windsor Great Park experienced an increase in noise of more than 1 dB. This was due to the use of the westerly departure trial routes, ending in November 2014. There were also increases of less than 1 dB in the vicinity of the southern runway's extended centreline, to the

² That is, the 2014 L_{day} , $L_{evening}$ and L_{night} contours (the constituent parts of 2014 L_{den}) have been modelled with the 2006 L_{day} , $L_{evening}$ and L_{night} runway modal splits respectively.

³ The westerly DVR mean track from the northern runway is positioned slightly further to the west in the Egham area than the westerly DVR mean track from the southern runway.

east of the airport. This can be attributed to a relatively higher usage of the southern runway for westerly landings in 2014 compared to 2006.

3.37 A similar noise change diagram has also been produced for L_{night} (see Figure 14), in which both the effects of: (a) weather patterns on runway usage, and (b) the northern runway resurfacing programme in 2014, have been removed by assuming the 2006 L_{night} modal split (72% west / 28% east) and the 2006 north-south runway traffic split. The year 2014 L_{night} 50 dBA contour with the above adjustments has been taken as the outer boundary of the noise changes. It can be seen that the majority of areas show reductions in noise level of up to 2-3 dB. The contour lobe to the west of airport that points southwards (just north of Egham) is an area which is exposed to an increase in noise of predominantly 1 dB or less. The noise increase was caused mainly by the Runway 27L/27R DVR SID mean tracks being positioned further to the west in 2014 than in 2006.

N65 annual 16-hour day contours

3.38 'Number-Above' N65 contours (i.e. contours showing the number of aircraft noise events above 65 dBA L_{max}) have been produced for the 2014 annual average 16-hour day period (0700-2300 local time) and also for the previous years 2006 and 2013.

3.39 The N65 contours for the three years are overlaid in Figure 15 (note: only the 50, 200 and 500 noise event levels are shown in the diagram, for clarity). The estimated cumulative areas, populations and households are summarised in Table 9 for N65 values of 50, 100, 200 and 500.

Table 9 Heathrow annual average 16-hour day N65 cumulative contour area, population and household estimates

N65	2006 area	2013 area	2014 area	2006 pop	2013 pop	2014 pop	2006 house	2013 house	2014 house
> 50	223.6	195.7 (-12%)	191.7 (-14%)	589.6	514.0 (-13%)	510.0 (-14%)	259.9	202.6 (-22%)	202.9 (-22%)
> 100	120.3	112.0 (-7%)	113.2 (-6%)	304.6	307.9 (+1%)	315.1 (+3%)	130.9	119.7 (-9%)	125.0 (-5%)
> 200	64.6	58.4 (-10%)	63.0 (-2%)	128.8	145.5 (+13%)	167.4 (+30%)	53.8	52.9 (-2%)	64.5 (+20%)
> 500	10.8	8.8 (-19%)	8.2 (-24%)	0.7	0.5 (-29%)	0.4 (-43%)	0.3	0.2 (-33%)	0.2 (-33%)

Note: Areas are given in km² and populations/households in thousands. The 2006 population/household counts are based on a 2006 CACI update of the 2001 Census. The 2013 and 2014 population/household counts are based on 2013 and 2014 CACI updates of the 2011 Census respectively. Percentage changes for 2013 and 2014 (shown in brackets) are relative to 2006.

3.40 The results show that the N65 contour areas have reduced significantly between 2006 and 2013/2014, reflecting the gradual phase-out of the noisiest types such as the B747-400 aircraft variants and replacement by quieter types such as the Airbus A380. For example, the 50 events N65 contour area for 2014 was 14% smaller than in 2006. However, population counts have not fallen in all cases as a result of population encroachment around the airport, as already seen in the earlier L_{den} contour results. The 8% larger area of the 200 events N65 contour in 2014 compared to 2013 can be attributed to the higher proportion of westerly movements in 2014 (especially during the evening period), which had the effect of extending the arrival contour lobes to the east of the airport.

N60 annual 8-hour night contours

3.41 ‘Number-Above’ N60 contours (i.e. contours showing the number of aircraft noise events above 60 dBA L_{max}) have been produced for the 2014 annual average 8-hour night period (2300-0700 local time) and also for the previous years 2006 and 2013.

3.42 The N60 contours for the three years are overlaid in Figure 16 for the noise event levels 10, 20 and 50. The estimated cumulative areas, populations and households are summarised in Table 10 for the N60 values of 10, 20 and 50.

Table 10 Heathrow annual average 8-hour night N60 cumulative contour area, population and household estimates

N60	2006 area	2013 area	2014 area	2006 pop	2013 pop	2014 pop	2006 house	2013 house	2014 house
> 10	190.2	181.9 (-4%)	177.0 (-7%)	858.1	867.6 (+1%)	843.8 (-2%)	397.2	366.4 (-8%)	354.6 (-11%)
> 20	92.3	90.4 (-2%)	85.2 (-8%)	405.6	435.9 (+7%)	426.6 (+5%)	183.3	178.3 (-3%)	176.7 (-4%)
> 50	3.7	0.3 (-92%)	0.1 (-97%)	< 0.1	0.0 (n/a)	0.0 (n/a)	< 0.1	0.0 (n/a)	0.0 (n/a)

Note: Areas are given in km² and populations/households in thousands. The 2006 population/household counts are based on a 2006 CACI update of the 2001 Census. The 2013 and 2014 population/household counts are based on 2013 and 2014 CACI updates of the 2011 Census respectively. Percentage changes for 2013 and 2014 (shown in brackets) are relative to 2006.

3.43 The results show that the N60 contour areas have reduced between 2006 and 2013/2014, reflecting the gradual phase-out of the noisiest types such as the B747-400 aircraft. For example, the 10 events N60 contour area for 2014 was 7% smaller than in 2006. However, population counts have risen in some cases due to the effects of population encroachment around Heathrow.

Chapter 4

Conclusions

- 4.1 Aircraft movements at Heathrow in 2014 were marginally higher during the L_{day} period, but slightly lower for L_{evening} , L_{night} and $L_{\text{eq},6.5\text{hr night}}$ compared with 2013. Overall 24-hour L_{den} movements in 2014 were effectively unchanged from 2013.
- 4.2 The area of the outermost L_{day} contour band in 2014 was 1% smaller than in 2013, with decreases of up to 3% also seen for the other L_{day} contour bands. Significant area reductions for all contour bands were observed for 2014 L_{evening} . The area of the outermost 2014 L_{night} contour band was 3% larger, but significant decreases occurred at the higher contour bands. The 2014 L_{den} area was 5% lower than in 2013 for the outermost contour band, with decreases of up to 6% at some of the other contour bands. The *cumulative* contour areas all reduced for the above noise metrics. The area decreases can be attributed primarily to reductions in movements of the B747-400 aircraft variants and replacement by quieter types, such as the Airbus A380 and B777-300ER. The 2014 $L_{\text{eq},6.5\text{hr night}}$ 48 dBA contour area fell to 36.3 km², also mainly due to a reduction in movements by B747-400 aircraft. This area was the smallest ever calculated and well within the 55 km² contour area objective set by the current night flying restrictions regime.
- 4.3 The 2014 L_{day} , L_{evening} , L_{night} and L_{den} contours showed population changes from 2013 that were not necessarily in line with the area changes described above. However, population decreases were evident for all L_{evening} contour bands and most L_{night} contour bands. L_{den} population counts were lower in 2014 apart from at the 60-65 dBA and >75 dBA bands. Percentage changes for the household counts of the inner contour bands were generally greater than the corresponding population percentage changes because there were fewer people per household on average in 2014, in regions close to the airport. The populations and households within the 2014 $L_{\text{eq},6.5\text{hr night}}$ 48 dBA contour decreased in line with the area reduction.
- 4.4 In terms of trends for the outermost contour band for each of the noise metrics, the L_{day} areas have been fairly steady since 2009 after the initial high in 2006. The smallest L_{day} area in 2010 coincided with a low in aircraft movements and a relatively high percentage of easterly movements. L_{day} populations and households reached a bottom in 2010, but after rising in 2011 have remained relatively steady since. The L_{evening} area, population and households decreased after 2011, in line with movement decreases. For L_{night} , aircraft movements and contour areas have been relatively stable since 2011. The L_{night} population and household counts followed a downward trend from 2009 to 2012, but

populations, in particular, increased significantly in 2013 and 2014 after the population database update of 2013, which was derived from the latest 2011 Census. L_{den} contour areas have been fairly flat since 2009, although populations and households trended downwards after 2011. Aircraft movements in the L_{den} period have been at a similar level since 2006, apart from a dip in 2010. The $L_{eq,6.5hr\ night}$ area has stayed at a relatively low level since 2011, whilst movements over this period have also been steady. Following two years of decreases, the population rose sharply in 2013 due to an extension of the contour over west London in line with the northern runway (due to the southern runway resurfacing programme and higher percentage of westerly operations in 2013) and the major 2013 population database update. However, in 2014 the population count returned to near 2012 levels as the contour area reduced significantly.

- 4.5 The 2014 *cumulative* contour areas were significantly below 2006 levels for all the noise metrics. However, the populations within the 2014 contours were in some cases higher than the 2006 figures, due to the effects of population encroachment in the areas around Heathrow between 2006 and 2014. However, had the population database remained the same as in 2006, the 2014 population and household counts would have all been substantially lower than in 2006.
- 4.6 An analysis of L_{den} noise changes between 2006 and 2014, assuming 2006 base year modal splits in both cases, indicated that most areas have experienced noise reductions of up to 2-3 dB. A few areas experienced a noise increase of up to 1 dB, with a small part of Egham being exposed to an increase of greater than 1 dB due to a shift in the positioning of the westerly DVR departure mean tracks in 2014 relative to 2006, coupled with a higher proportion of traffic using the westerly DVR route from the northern runway. The use of the westerly departure trial routes in 2014 also caused a small area over Windsor Great Park to be exposed to a noise increase of more than 1 dB.
- 4.7 An analysis of L_{night} noise changes between 2006 and 2014, assuming both constant 2006 base year modal splits and the 2006 north-south runway distributions (to eliminate the effects of the northern runway resurfacing programme in 2014), showed that there have been reductions in noise of up to 2-3 dB in most areas. A small area to the north of Egham was exposed to a noise increase of up to 1 dB, primarily due to changes in the positioning of the westerly DVR mean tracks as described above for L_{den} .
- 4.8 'Number-Above' annual average 16-hour day N65 and annual average 8-hour night N60 contours, produced for years 2006, 2013 and 2014, showed that the number of noise events greater than 65 dBA L_{max} during daytime and higher than 60 dBA L_{max} at night have decreased between 2006 and 2013/2014. This reflects the gradual phase-out of the noisiest aircraft types such as the B747-400 aircraft and replacement by quieter types.

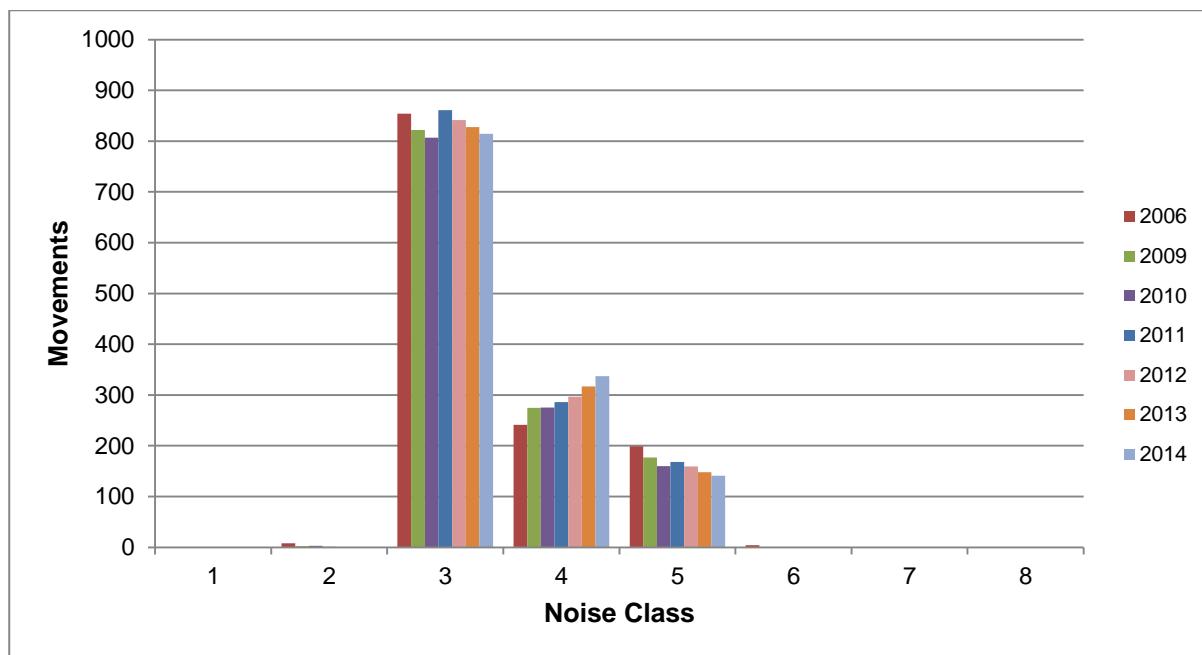
APPENDIX A**References**

1. ERCD Report 1404, Noise Action Plan Contours for Heathrow Airport 2013, Civil Aviation Authority, January 2015.
2. R&D Report 9842, The UK Civil Aircraft Noise Contour Model ANCON: Improvements in Version 2, Civil Aviation Authority, June 1999.
3. ERCD Report 0706, London Heathrow Airport Strategic Noise Maps 2006, Civil Aviation Authority, December 2007.

APPENDIX B

Figures

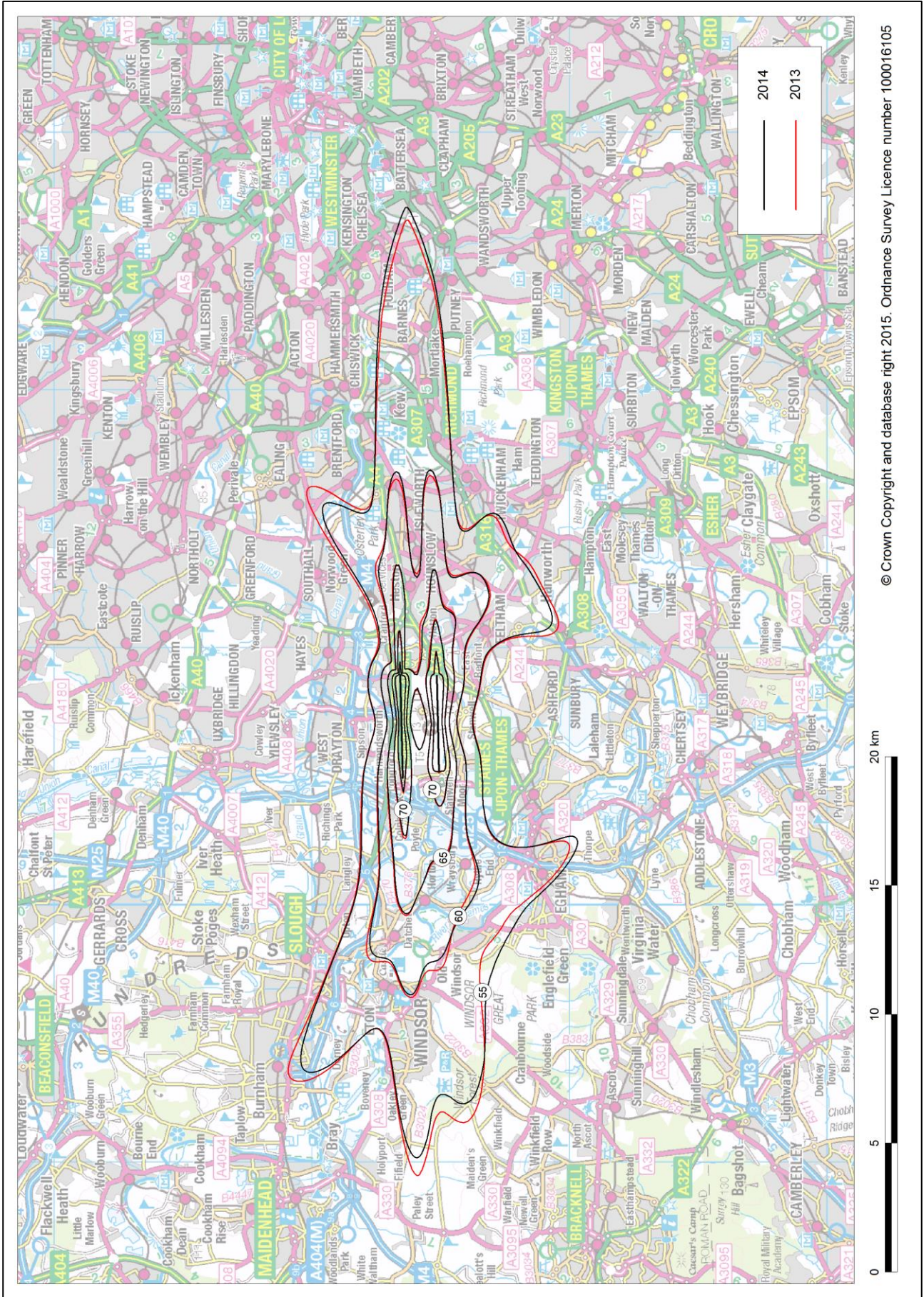
Figure 1 Heathrow annual average 24-hour movements by Noise Class



Note: Noise Class descriptions are given below:

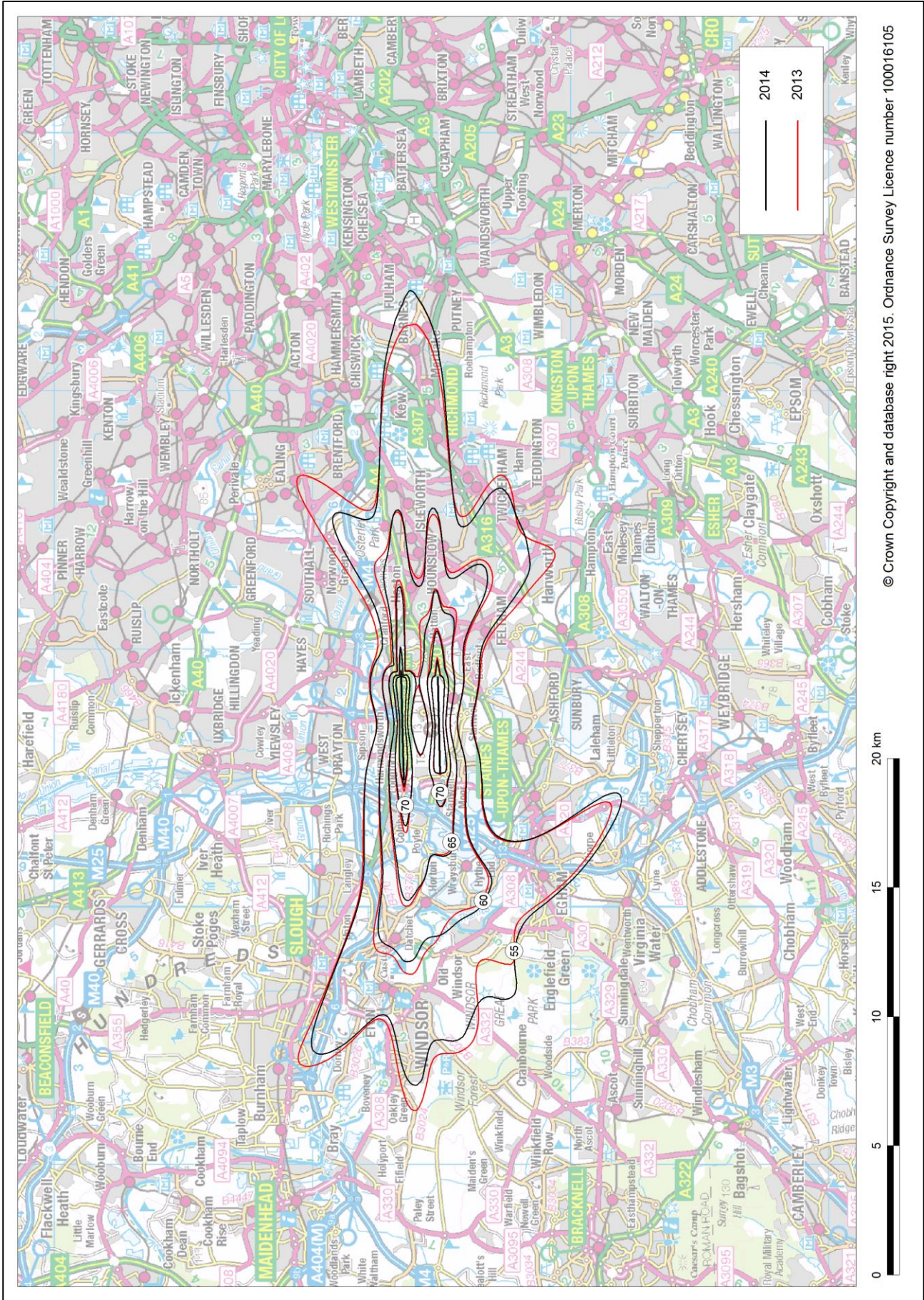
Noise Class	Description
1	Small propeller
2	Large propeller
3	Short-haul jet (e.g. A319, A320, B737-800)
4	Wide-body twin (e.g. B777, B787, A330)
5	2 nd generation wide-body 3,4 engine (e.g. B747-400, A380)
6	1 st generation wide-body 3,4 engine (e.g. B747-100)
7	2 nd generation narrow-body twin (e.g. B737-200)
8	1 st generation narrow-body 3,4 engine (e.g. B727)

Figure 2 Heathrow 2014 and 2013 L_{day} noise contours



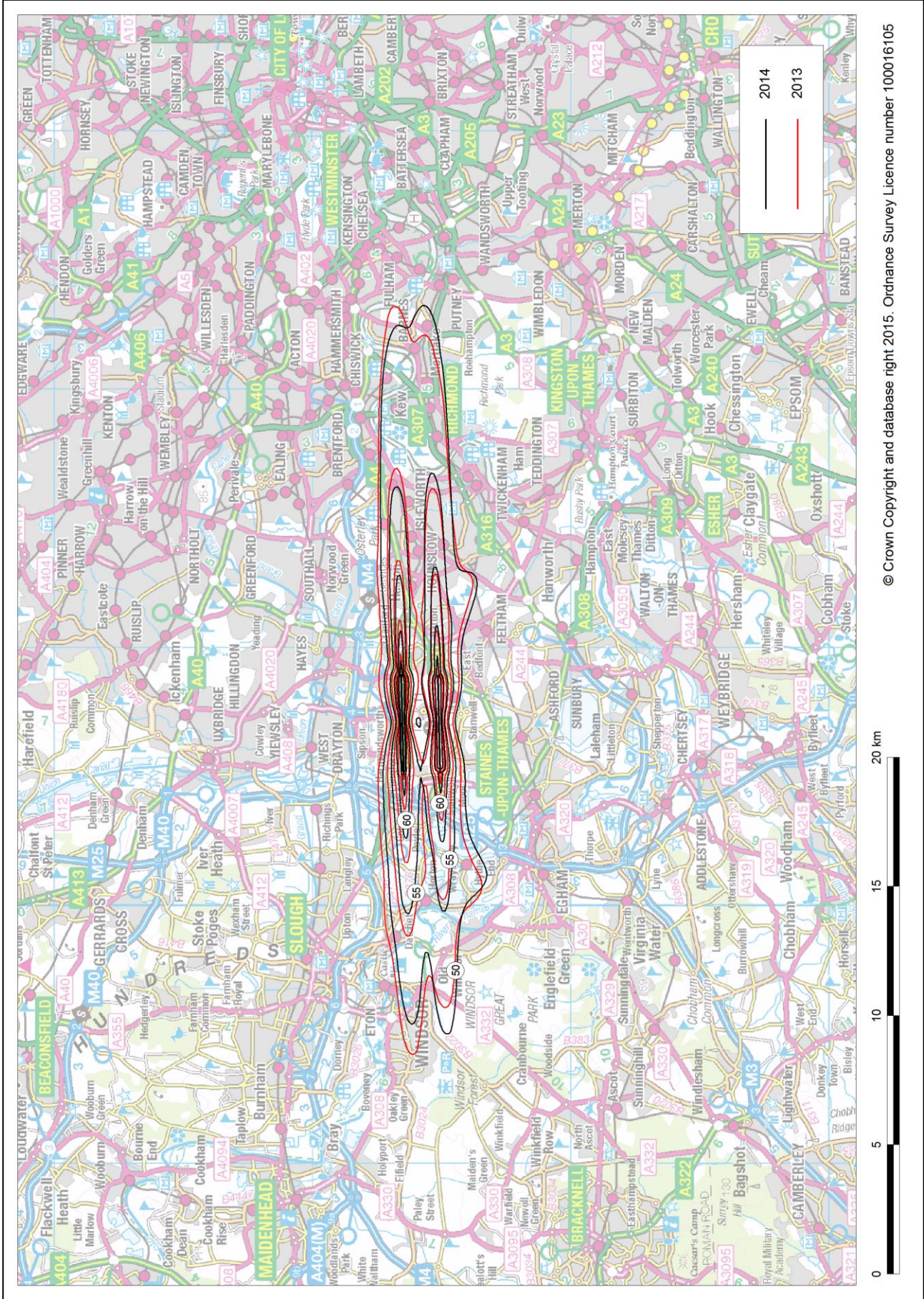
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Figure 3 Heathrow 2014 and 2013 Leveing noise contours



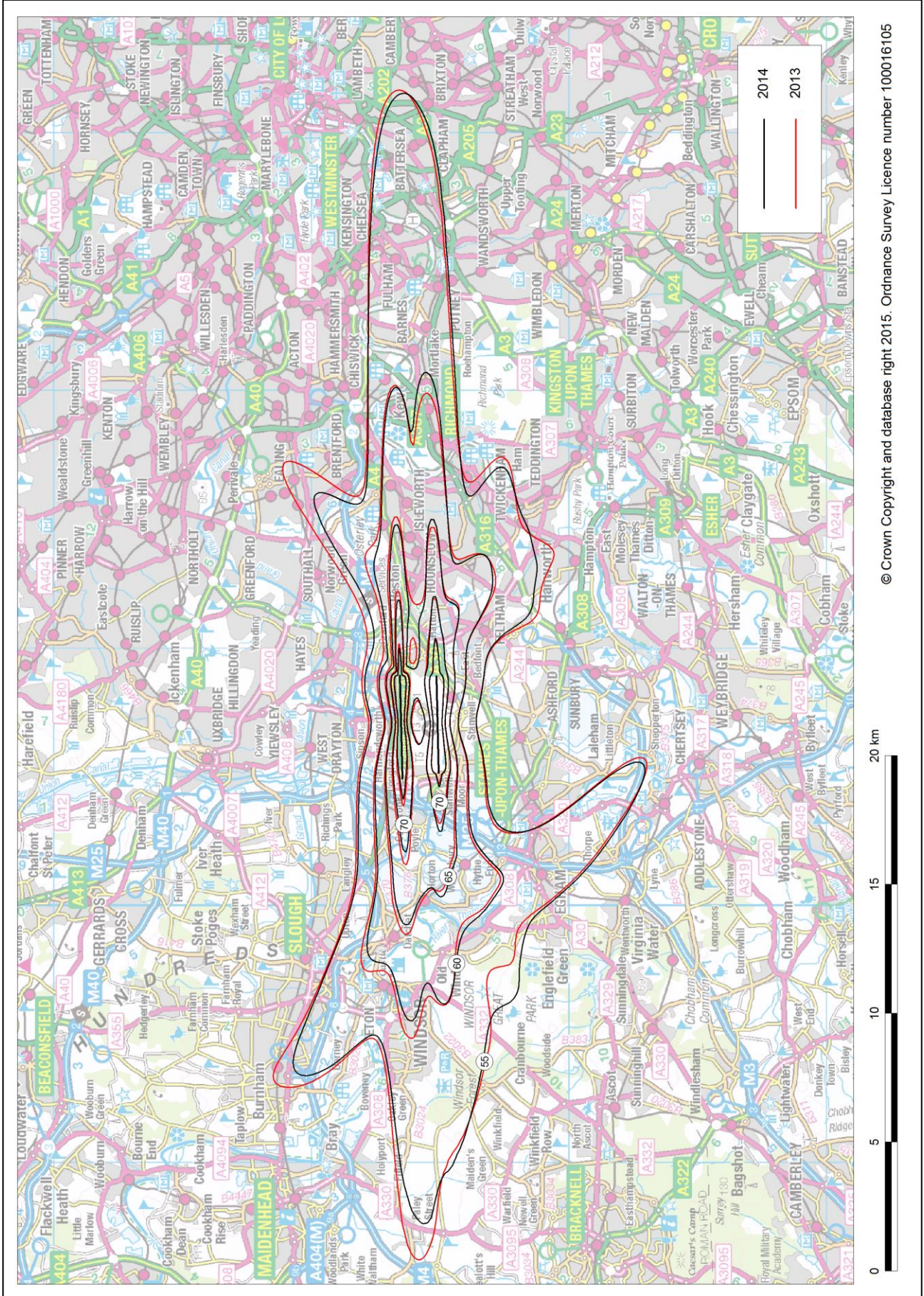
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Figure 4 Heathrow 2014 and 2013 L_{night} noise contours



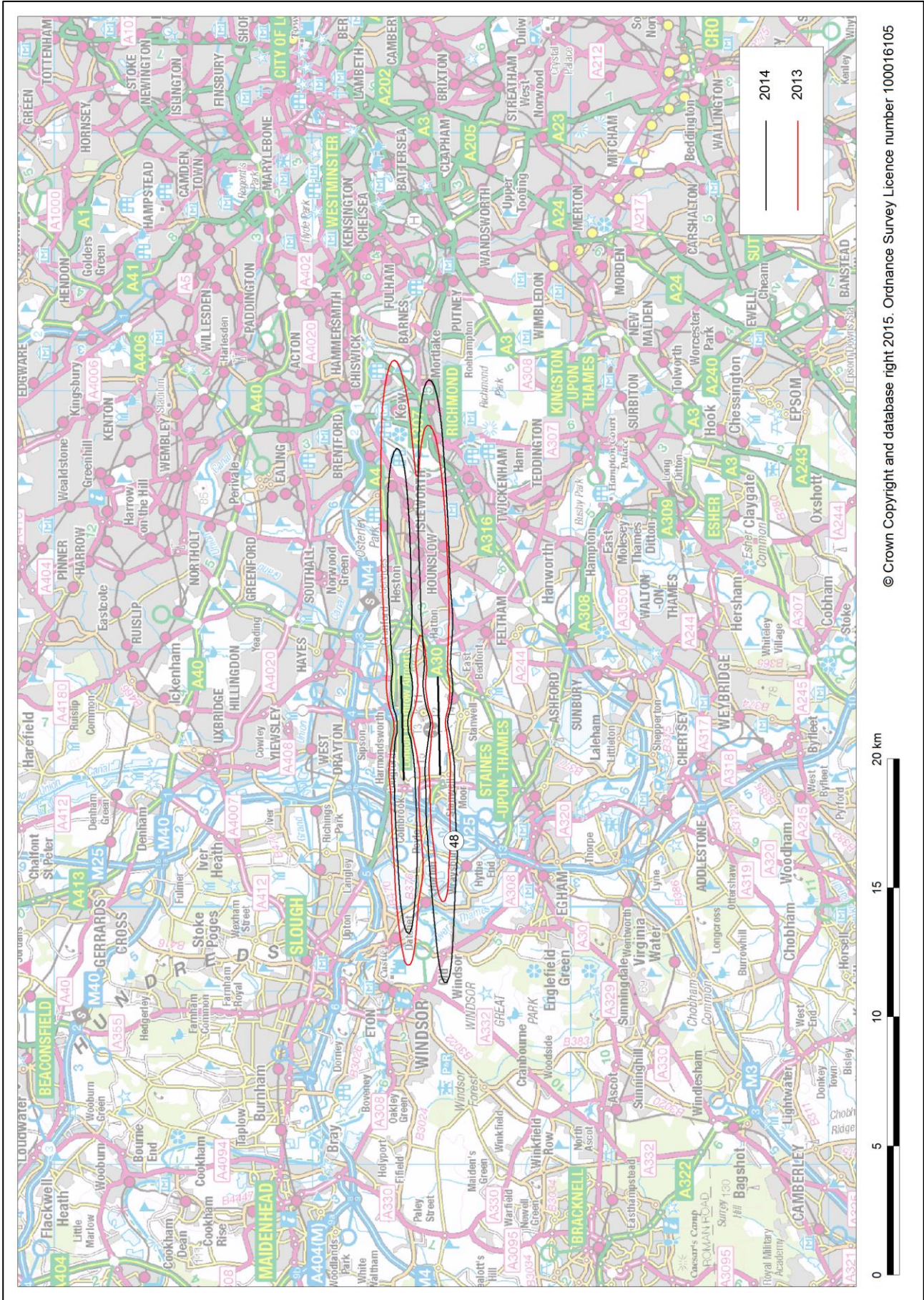
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Figure 5 Heathrow 2014 and 2013 L_{den} noise contours



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Figure 6 Heathrow 2014 and 2013 $L_{eq,6.5hr}$ night noise contours



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Figure 7 Heathrow 2006 to 2014 L_{day} 55-60 dBA area, population and household trends

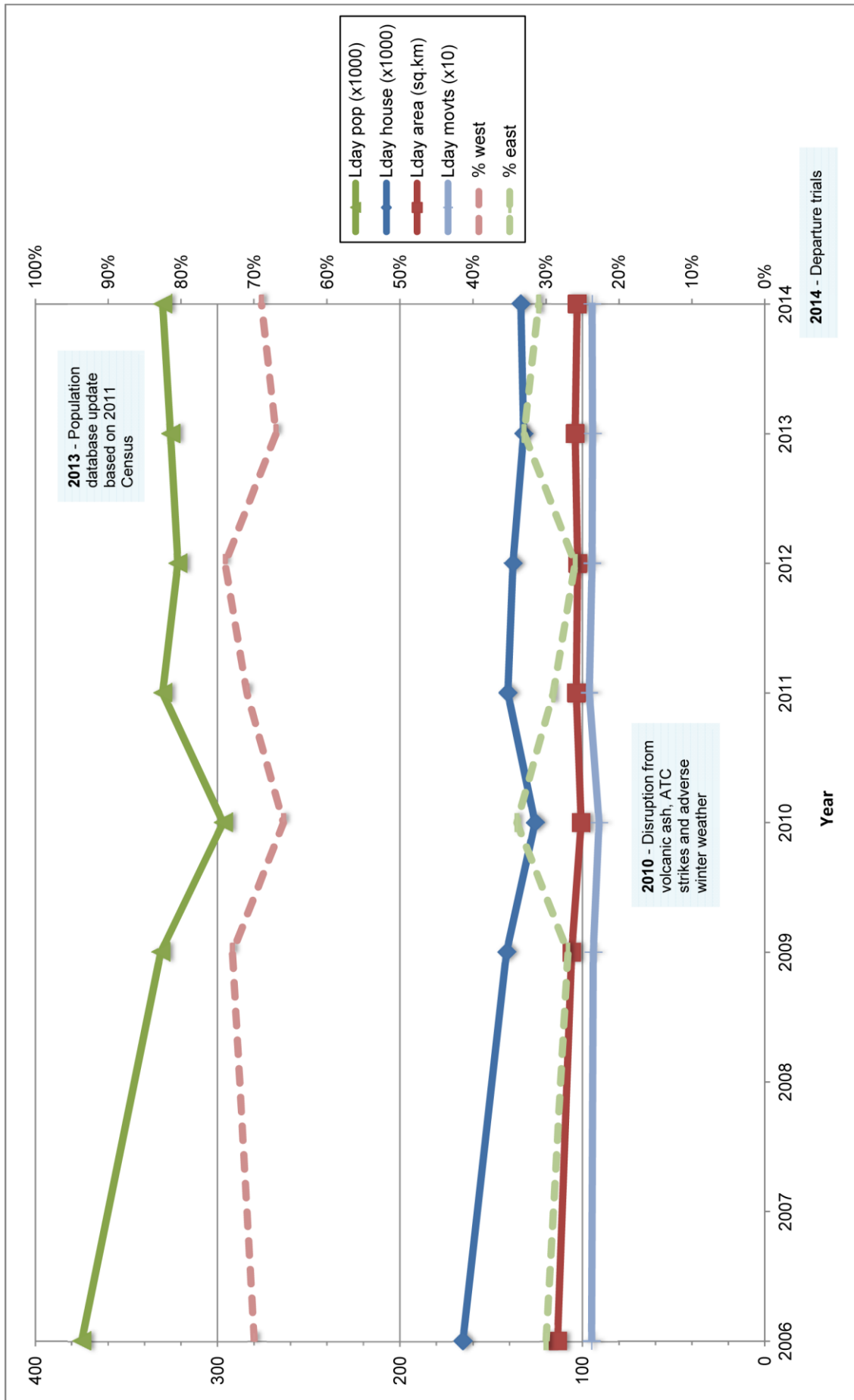


Figure 8 Heathrow 2006 to 2014 L_{evening} 55-60 dBA area, population and household trends

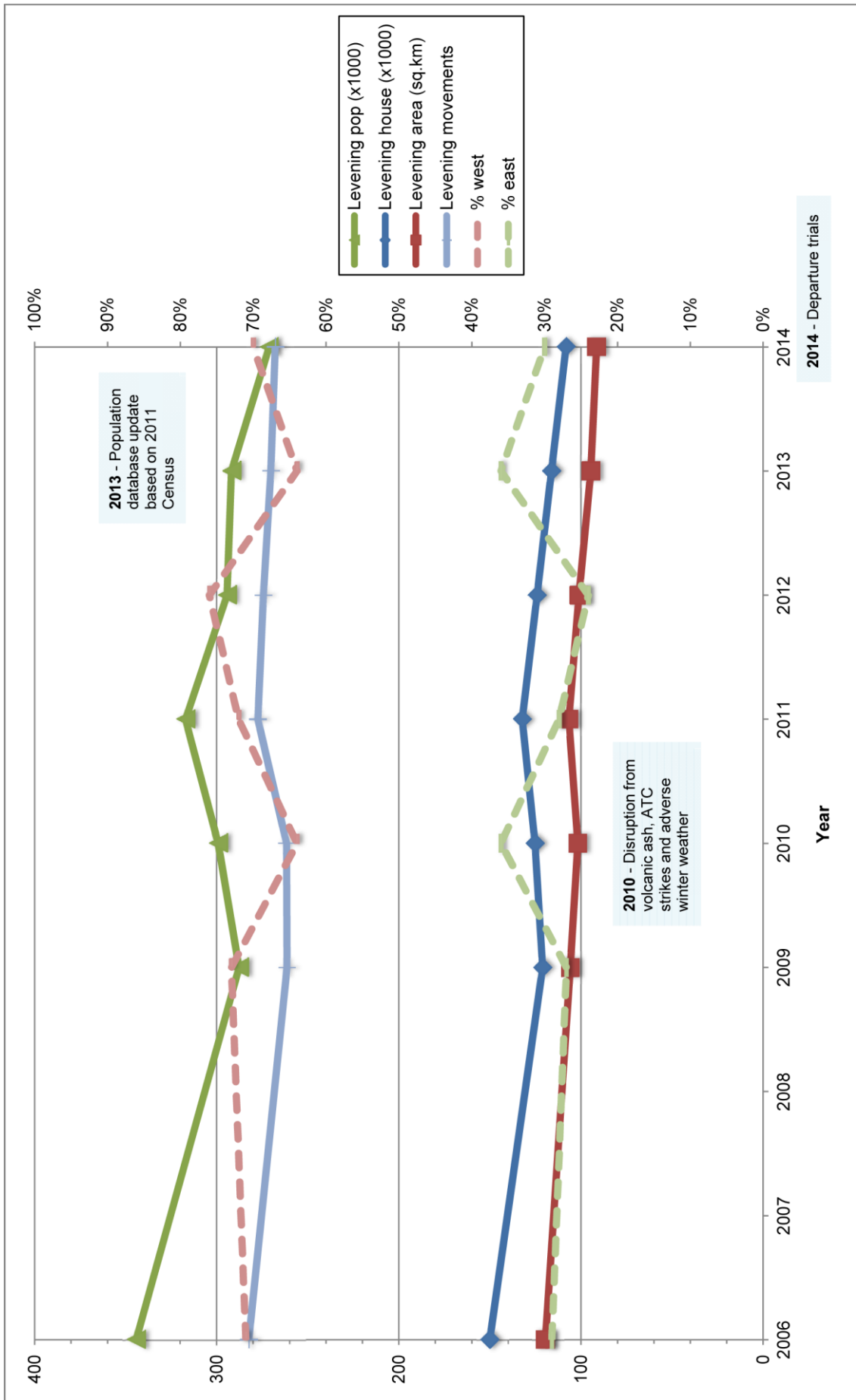


Figure 9 Heathrow 2006 to 2014 L_{night} 50-55 dBA area, population and household trends

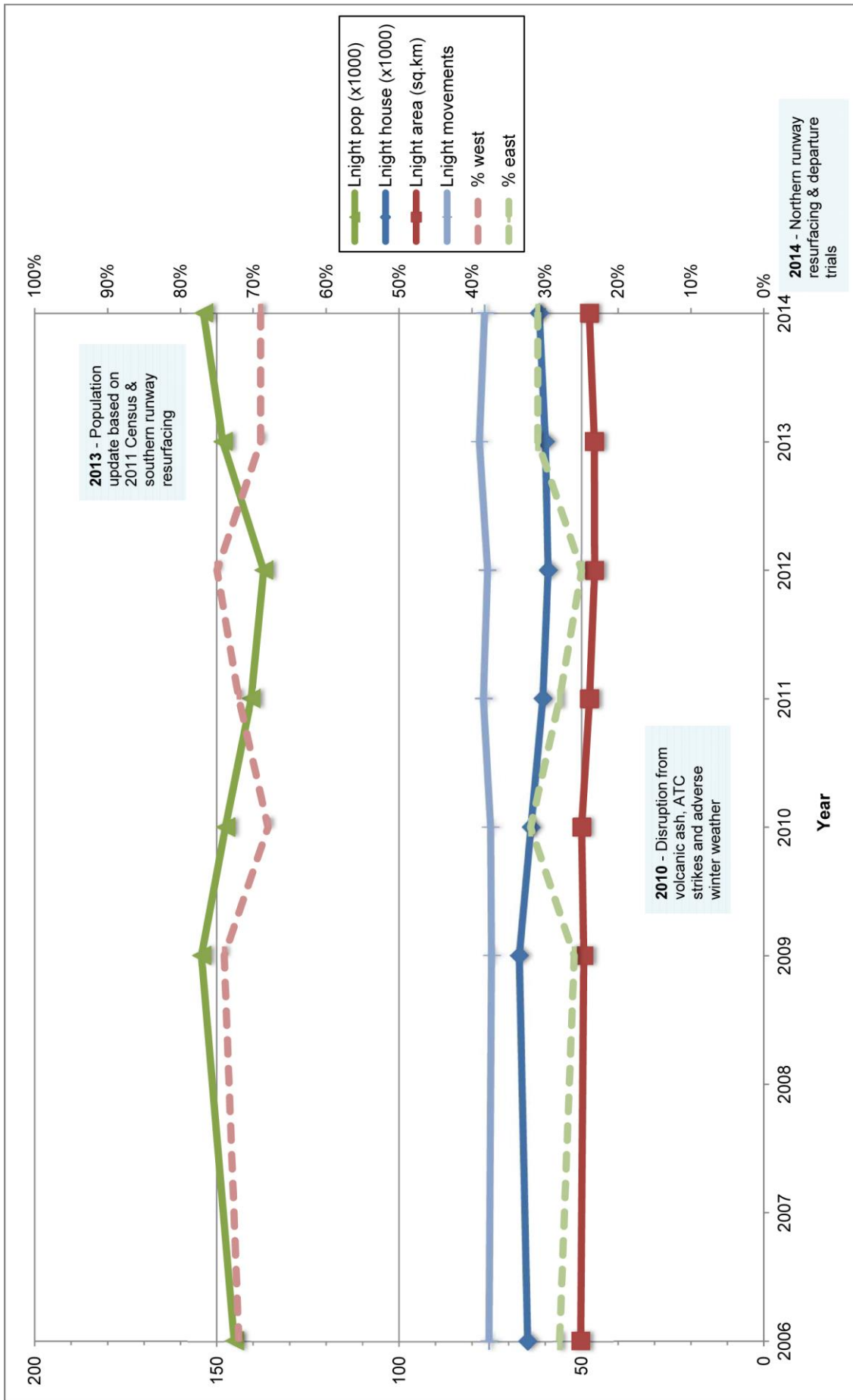


Figure 10 Heathrow 2006 to 2014 L_{den} 55-60 dBA area, population and household trends

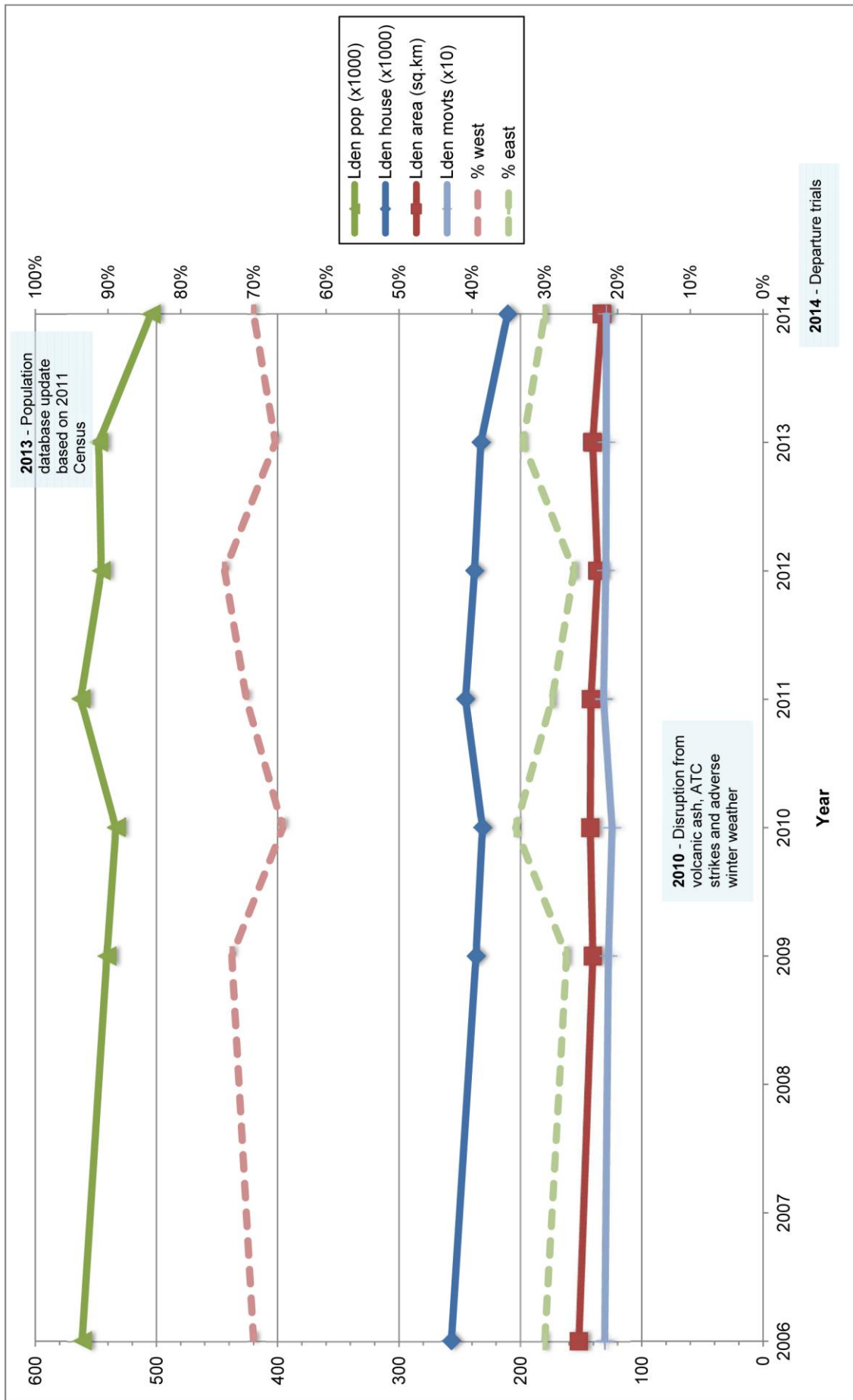


Figure 11 Heathrow 2006 to 2014 $L_{eq,6.5hr}$ night 48 dBA area, population and household trends

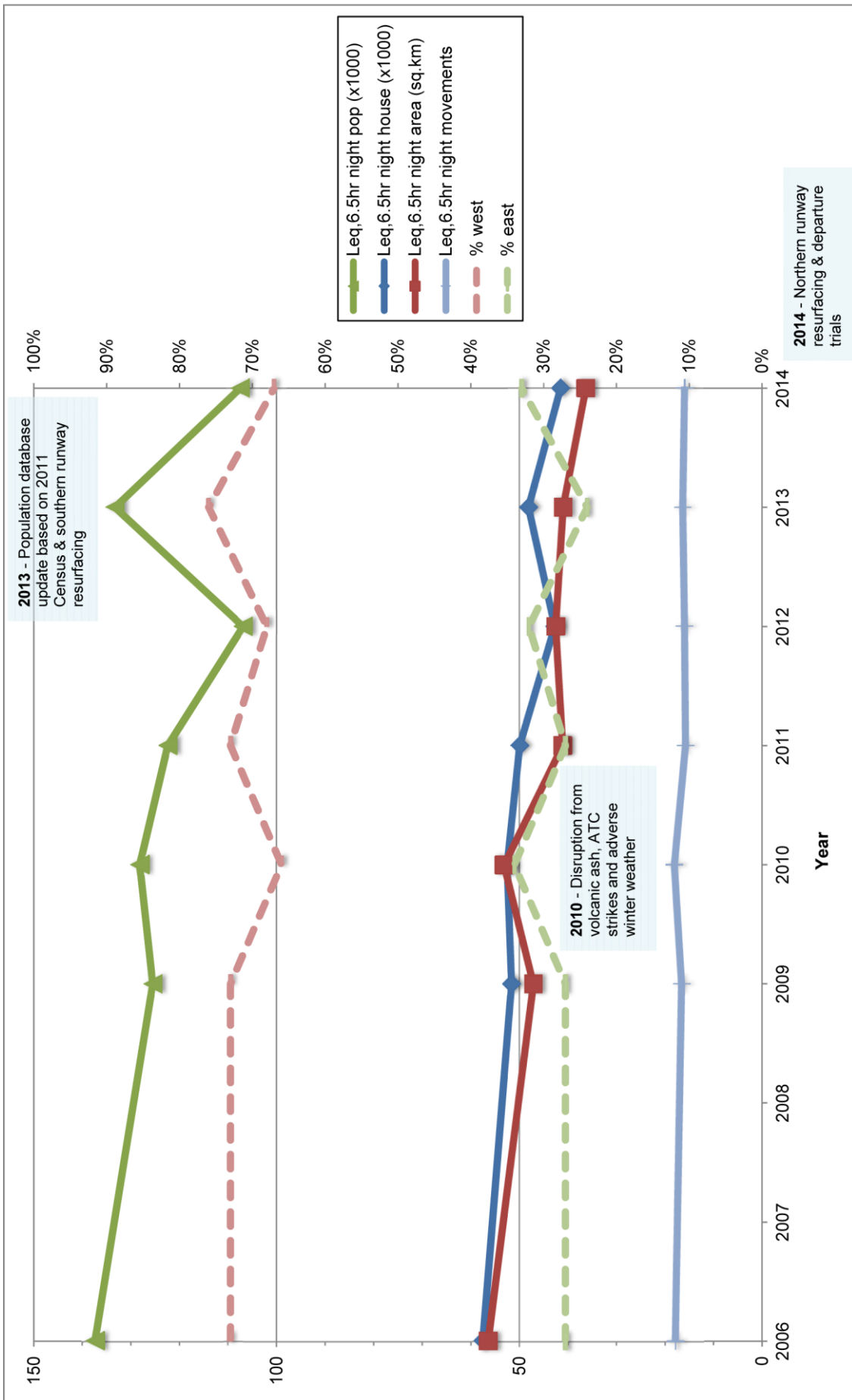
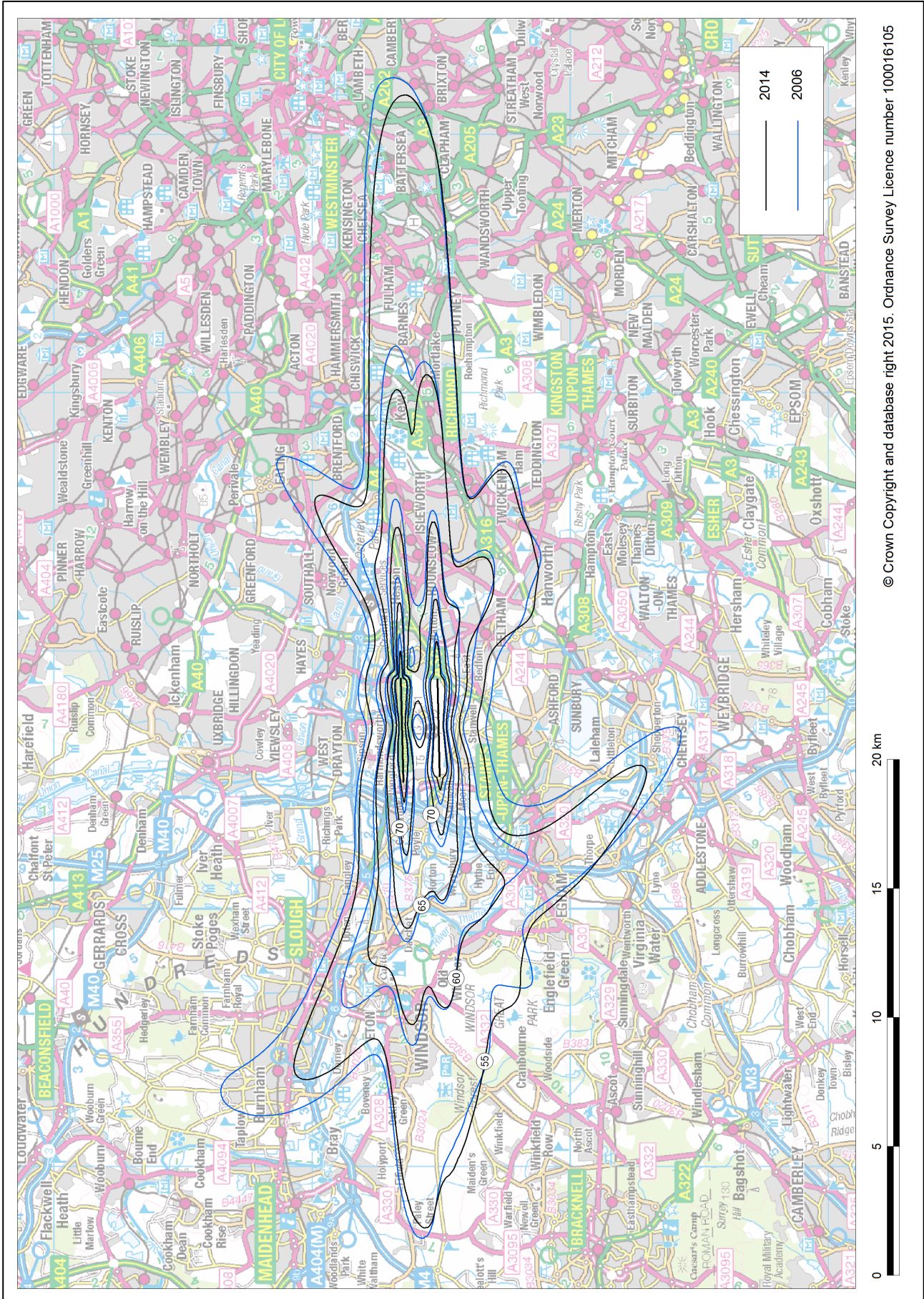
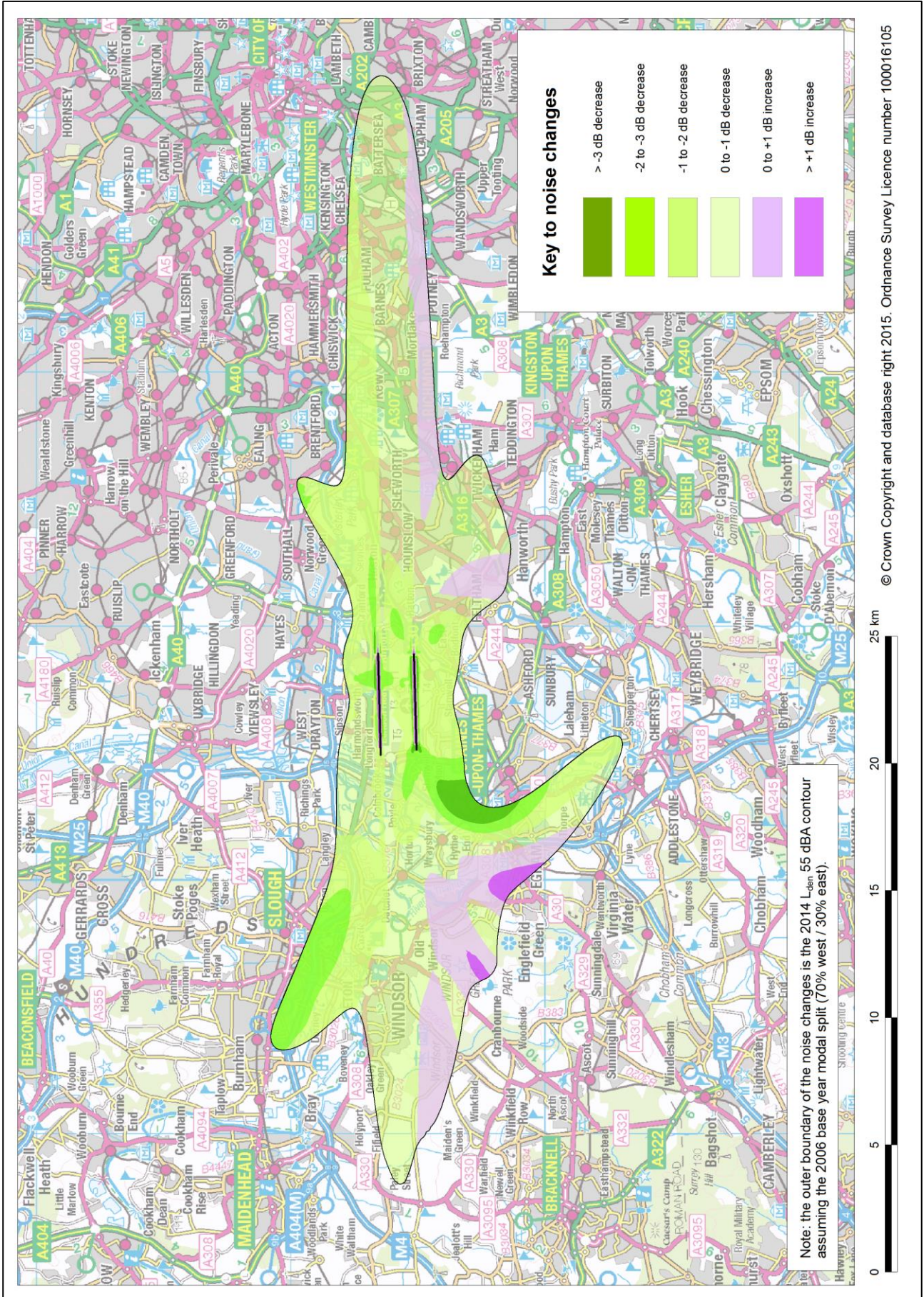


Figure 12 Heathrow 2014 and 2006 L_{den} noise contours



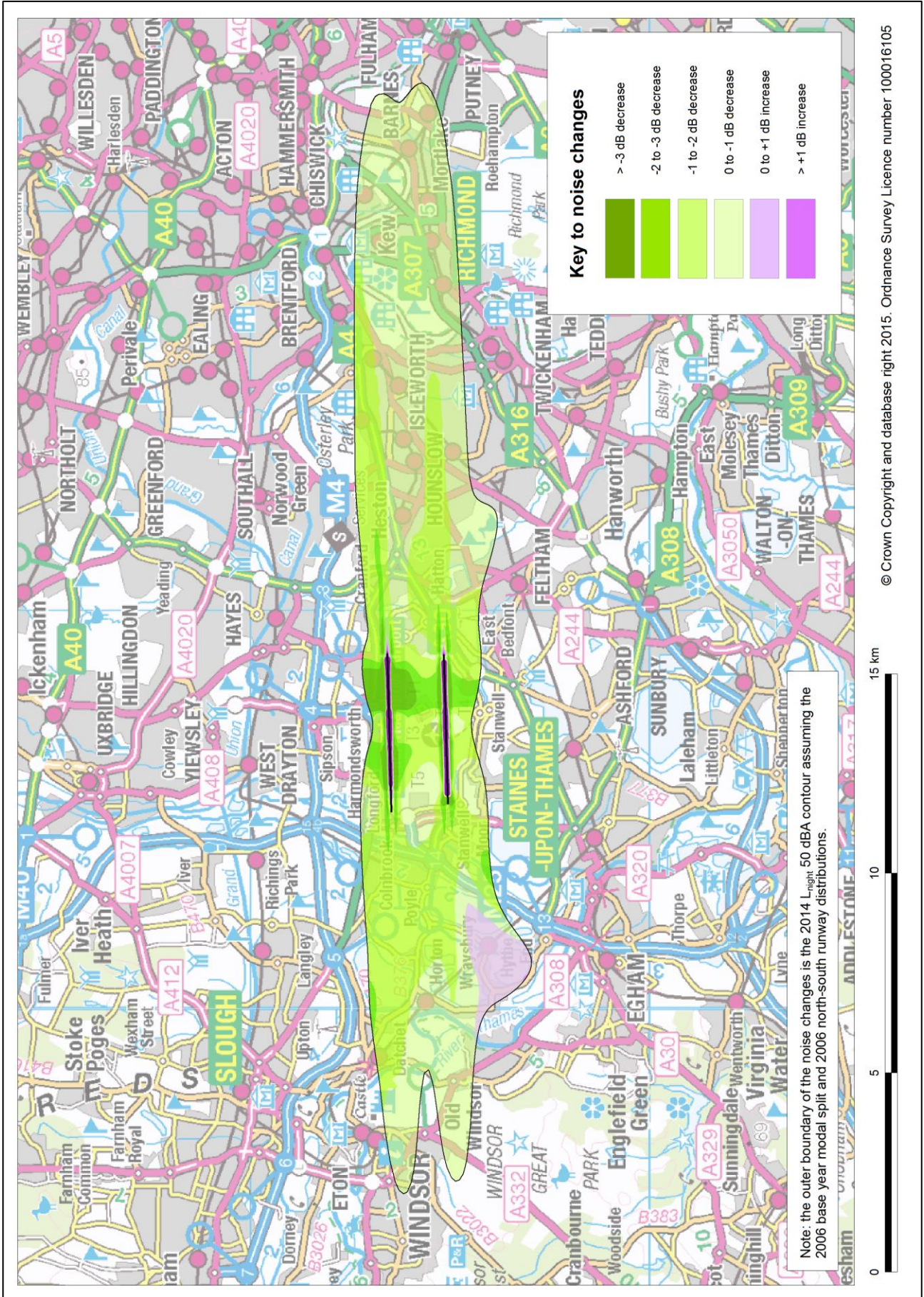
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Figure 13 Heathrow noise change map for 2014 vs 2006 L_{den} (assuming 2006 L_{den} modal split 70% W / 30% E)



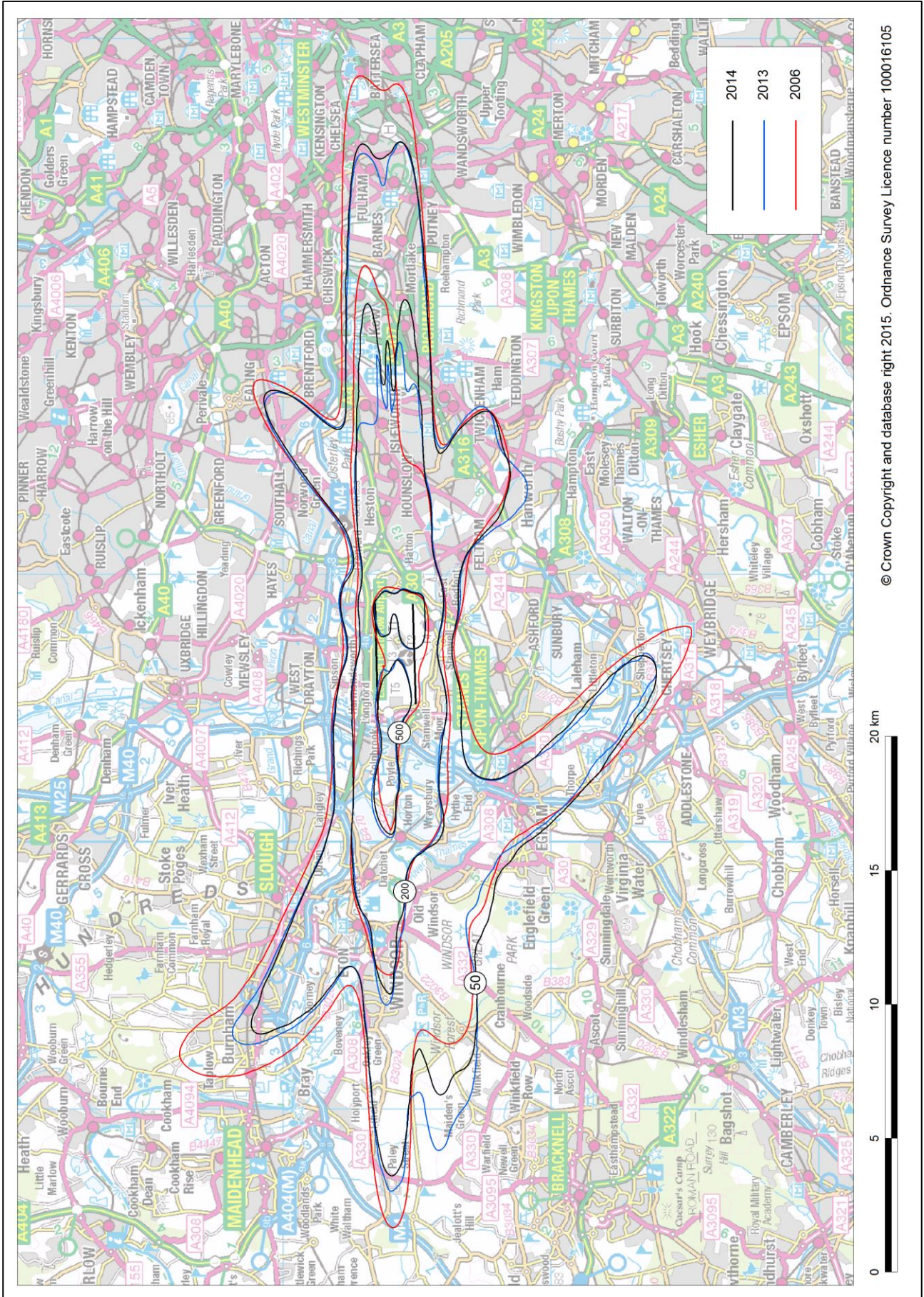
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Figure 14 Heathrow noise change map for 2014 vs 2006 L_{night} modal split 72% W / 28% E and 2006 north-south runway distribution



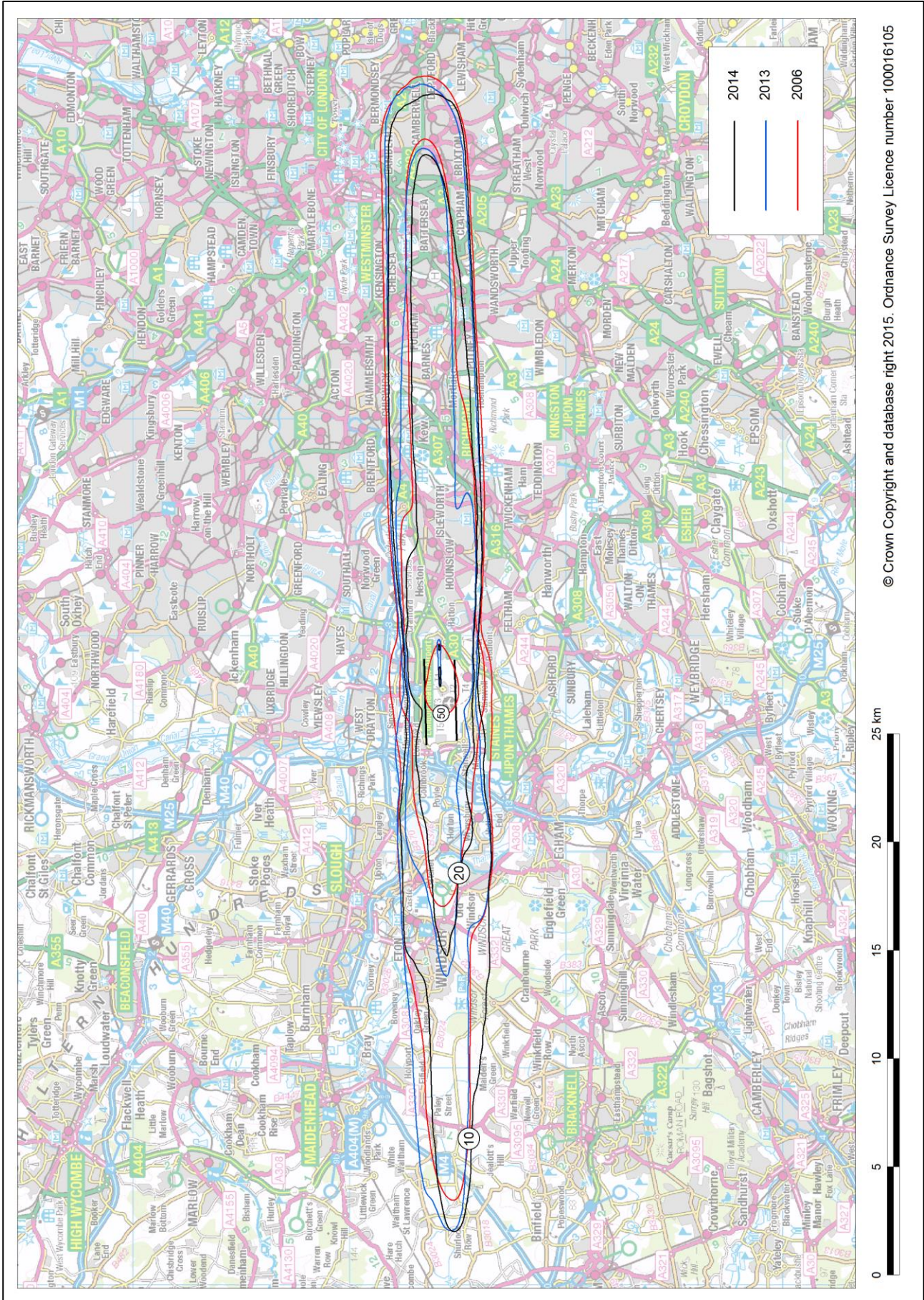
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Figure 15 Heathrow 2014, 2013 and 2006 annual 16-hour day N65 contours



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Figure 16 Heathrow 2014, 2013 and 2006 annual 8-hour night N60 contours



APPENDIX C

Tables

Table C1 Heathrow 2013 & 2014 annual 12-hour day traffic movements by ANCON type

ANCON type	2013 departs	2014 departs	Change departs	2013 arrivals	2014 arrivals	Change arrivals	2013 total	2014 total	Change total
B717	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	+0.1
B727	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B733	4.8	2.4	-2.5	4.9	2.4	-2.5	9.7	4.7	-4.9
B736	8.3	7.7	-0.6	9.9	9.5	-0.4	18.2	17.2	-1.0
B738	8.5	8.5	-0.1	9.4	9.0	-0.4	17.9	17.5	-0.4
B744G	4.7	5.3	+0.6	4.5	4.8	+0.3	9.2	10.1	+0.9
B744P	1.5	0.4	-1.2	1.5	0.6	-0.9	3.0	0.9	-2.1
B744R	27.2	26.6	-0.6	22.6	21.3	-1.3	49.8	47.9	-1.9
B747	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B747SP	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B748	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B753	0.1	0.1	0.0	0.1	0.1	0.0	0.2	0.1	-0.1
B757C	0.0	0.0	0.0	0.2	0.2	0.0	0.2	0.2	0.0
B757E	6.4	3.8	-2.6	3.9	2.3	-1.6	10.2	6.1	-4.2
B757P	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B762	0.3	0.0	-0.3	0.5	0.1	-0.4	0.7	0.1	-0.6
B763G	7.9	8.9	+1.0	5.2	6.0	+0.7	13.1	14.9	+1.8
B763P	7.3	9.5	+2.2	5.8	6.5	+0.7	13.0	16.0	+2.9
B763R	16.1	15.0	-1.1	15.0	12.5	-2.6	31.1	27.5	-3.6
B764	6.3	4.9	-1.4	4.8	3.7	-1.1	11.1	8.7	-2.5
B772G	16.7	14.1	-2.6	11.9	12.0	+0.1	28.6	26.2	-2.4
B772P	4.2	4.3	+0.1	3.6	4.2	+0.6	7.8	8.5	+0.7
B772R	19.6	14.9	-4.7	19.0	15.7	-3.3	38.6	30.6	-8.0
B773G	18.1	26.6	+8.5	24.0	31.6	+7.7	42.0	58.2	+16.1
B773P	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B773R	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B788	2.2	8.5	+6.4	2.4	9.2	+6.8	4.6	17.7	+13.2
B789	0.0	0.1	+0.1	0.0	0.1	+0.1	0.0	0.3	+0.3
BA46	0.6	0.7	+0.1	0.6	0.7	+0.1	1.3	1.5	+0.2
CRJ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CRJ900	0.6	0.6	0.0	0.7	0.7	0.0	1.4	1.3	0.0
EA30	1.2	1.2	-0.1	1.3	1.2	-0.1	2.5	2.3	-0.2

ANCON type	2013 departs	2014 departs	Change departs	2013 arrivals	2014 arrivals	Change arrivals	2013 total	2014 total	Change total
EA31	0.1	0.1	0.0	0.2	0.3	+0.1	0.3	0.4	+0.1
EA318	1.4	1.0	-0.4	0.9	1.0	+0.1	2.3	1.9	-0.3
EA319C	18.7	21.1	+2.4	18.0	21.5	+3.4	36.7	42.5	+5.8
EA319V	86.2	79.2	-7.0	78.1	72.1	-5.9	164.2	151.3	-12.9
EA320C	47.8	48.7	+1.0	48.6	50.0	+1.4	96.4	98.7	+2.3
EA320V	83.4	92.6	+9.2	74.0	83.1	+9.0	157.4	175.6	+18.2
EA321C	14.2	10.6	-3.6	16.0	12.6	-3.4	30.2	23.2	-7.0
EA321V	37.2	33.8	-3.3	32.2	29.5	-2.7	69.4	63.3	-6.1
EA33	15.6	13.9	-1.6	17.8	16.5	-1.3	33.4	30.5	-2.9
EA34	2.6	2.6	0.0	4.2	3.0	-1.2	6.7	5.6	-1.2
EA346	5.3	4.9	-0.3	7.1	7.1	0.0	12.4	12.1	-0.3
EA38GP	3.0	3.2	+0.2	3.3	3.5	+0.2	6.3	6.8	+0.4
EA38R	2.9	4.5	+1.6	3.0	4.6	+1.6	6.0	9.2	+3.2
ERJ	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
ERJ170	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-0.1
ERJ190	1.6	1.6	0.0	1.7	1.8	+0.2	3.3	3.5	+0.2
EXE2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EXE3	0.5	0.3	-0.2	0.5	0.3	-0.2	1.0	0.7	-0.3
FK10	1.1	1.7	+0.6	2.0	2.8	+0.8	3.1	4.5	+1.4
L4P	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LTT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MD11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MD80	0.5	0.0	-0.5	0.5	0.0	-0.5	1.0	0.0	-1.0
STT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TU54	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	484.7	484.1	-0.6	460.1	464.3	+4.2	944.8	948.4	+3.5
									(+0.4%)

Note: Changes and totals have been calculated *before* rounding.

Table C2 Heathrow 2013 & 2014 annual 4-hour evening traffic movements by ANCON type

ANCON type	2013 departs	2014 departs	Change departs	2013 arrivals	2014 arrivals	Change arrivals	2013 total	2014 total	Change total
B717	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B727	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B733	0.8	0.3	-0.5	1.2	0.7	-0.5	2.0	1.0	-1.0
B736	3.4	3.7	+0.3	1.8	1.9	+0.1	5.2	5.6	+0.4
B738	2.3	2.1	-0.2	2.1	2.3	+0.2	4.4	4.4	0.0
B744G	0.6	0.3	-0.3	0.2	0.1	-0.1	0.8	0.4	-0.4
B744P	0.5	0.4	-0.1	0.3	0.3	0.0	0.8	0.6	-0.1
B744R	8.8	6.2	-2.6	1.2	1.1	-0.1	10.0	7.3	-2.7
B747	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B747SP	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B748	0.0	0.1	+0.1	0.0	0.0	0.0	0.0	0.1	+0.1
B753	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.0
B757C	0.4	0.3	-0.1	0.5	0.4	0.0	0.9	0.7	-0.1
B757E	1.3	1.2	-0.1	2.7	2.1	-0.6	4.0	3.3	-0.7
B757P	0.3	0.2	-0.1	0.1	0.2	+0.1	0.4	0.4	0.0
B762	0.2	0.1	-0.1	0.0	0.0	0.0	0.2	0.1	-0.1
B763G	0.4	0.6	+0.2	1.6	2.0	+0.4	2.0	2.6	+0.6
B763P	0.5	0.2	-0.3	0.6	1.0	+0.4	1.1	1.2	+0.1
B763R	4.6	2.8	-1.7	6.3	5.6	-0.7	10.9	8.4	-2.5
B764	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
B772G	3.4	4.6	+1.1	1.0	1.7	+0.7	4.4	6.2	+1.8
B772P	1.0	1.0	0.0	0.2	0.1	-0.1	1.2	1.2	-0.1
B772R	4.7	3.8	-0.9	1.7	0.8	-0.9	6.4	4.6	-1.8
B773G	12.9	15.2	+2.3	2.3	2.8	+0.5	15.2	18.0	+2.8
B788	0.4	2.0	+1.6	0.1	0.1	0.0	0.5	2.1	+1.6
B789	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BA46	0.2	0.1	-0.1	0.1	0.1	-0.1	0.3	0.1	-0.2
CRJ900	0.2	0.1	-0.1	0.1	0.0	0.0	0.2	0.1	-0.1
EA30	0.3	0.3	0.0	0.9	1.0	+0.1	1.2	1.3	+0.1
EA31	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.0
EA318	0.0	0.0	0.0	0.4	0.0	-0.4	0.5	0.0	-0.4
EA319C	5.0	6.4	+1.4	6.3	7.3	+1.0	11.3	13.7	+2.4

ANCON type	2013 departs	2014 departs	Change departs	2013 arrivals	2014 arrivals	Change arrivals	2013 total	2014 total	Change total
EA319V	18.6	17.4	-1.2	27.1	24.2	-2.9	45.7	41.7	-4.1
EA320C	14.6	16.0	+1.4	16.4	17.2	+0.8	31.0	33.2	+2.2
EA320V	18.0	19.7	+1.7	27.9	30.2	+2.2	45.9	49.9	+4.0
EA321C	4.4	3.5	-0.9	3.3	2.5	-0.8	7.7	6.0	-1.7
EA321V	8.3	7.2	-1.0	14.3	12.5	-1.8	22.6	19.7	-2.8
EA33	8.7	9.5	+0.8	3.5	3.8	+0.2	12.2	13.3	+1.1
EA34	2.1	1.4	-0.7	0.5	0.2	-0.2	2.5	1.6	-0.9
EA346	6.4	6.1	-0.3	1.6	1.4	-0.2	8.0	7.5	-0.5
EA38GP	1.8	1.8	0.0	1.2	1.1	0.0	2.9	3.0	0.0
EA38R	3.7	4.7	+1.0	0.5	0.2	-0.3	4.2	4.9	+0.7
ERJ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ERJ170	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-0.1
ERJ190	0.5	0.4	-0.2	0.6	0.3	-0.3	1.2	0.7	-0.5
EXE3	0.1	0.1	0.0	0.1	0.1	0.0	0.3	0.2	-0.1
FK10	1.3	1.7	+0.4	0.4	0.6	+0.2	1.7	2.3	+0.6
L4P	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LTT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MD80	0.1	0.0	-0.1	0.1	0.0	-0.1	0.2	0.0	-0.2
STT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	140.8	141.9	+1.1	129.5	126.0	-3.5	270.3	267.9	-2.4
									(-1%)

Note: Changes and totals have been calculated *before* rounding.

Table C3 Heathrow 2013 & 2014 annual 8-hour night traffic movements by ANCON type

ANCON type	2013 departs	2014 departs	Change departs	2013 arrivals	2014 arrivals	Change arrivals	2013 total	2014 total	Change total
B733	0.5	0.5	0.0	0.0	0.0	0.0	0.5	0.5	0.0
B736	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0
B738	0.7	0.7	0.0	0.0	0.0	0.0	0.7	0.7	0.0
B744G	0.0	0.0	0.0	0.5	0.7	+0.3	0.5	0.8	+0.3
B744P	0.2	0.1	-0.1	0.4	0.1	-0.4	0.6	0.2	-0.5
B744R	0.9	0.7	-0.2	13.2	11.4	-1.8	14.2	12.1	-2.0
B747	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B748	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B753	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B757C	0.3	0.3	0.0	0.0	0.0	0.0	0.3	0.3	0.0
B757E	0.0	0.0	0.0	1.2	0.6	-0.5	1.2	0.7	-0.5
B757P	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B762	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B763G	0.0	0.1	0.0	1.4	1.7	+0.2	1.5	1.7	+0.3
B763P	0.0	0.1	0.0	1.5	2.4	+0.9	1.5	2.5	+1.0
B763R	1.9	1.2	-0.7	1.4	1.1	-0.3	3.3	2.3	-1.0
B764	0.0	0.0	0.0	1.5	1.3	-0.3	1.6	1.3	-0.3
B772G	0.8	1.1	+0.3	8.1	6.3	-1.8	9.0	7.4	-1.6
B772P	0.0	0.0	0.0	1.5	1.1	-0.4	1.5	1.1	-0.4
B772R	0.6	0.7	+0.1	4.3	3.0	-1.2	4.8	3.7	-1.1
B773G	0.8	0.5	-0.3	5.4	8.1	+2.6	6.2	8.5	+2.3
B788	0.0	0.4	+0.4	0.2	1.7	+1.6	0.2	2.2	+1.9
B789	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BA46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CRJ900	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EA30	0.6	0.6	0.0	0.0	0.0	0.0	0.7	0.6	0.0
EA31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EA318	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EA319C	1.3	1.8	+0.5	0.6	0.6	0.0	1.8	2.3	+0.5
EA319V	2.0	1.7	-0.3	1.7	2.0	+0.4	3.7	3.7	0.0
EA320C	3.2	2.8	-0.3	0.3	0.5	+0.2	3.5	3.3	-0.1
EA320V	1.3	1.7	+0.4	0.9	0.9	0.0	2.2	2.6	+0.4

ANCON type	2013 departs	2014 departs	Change departs	2013 arrivals	2014 arrivals	Change arrivals	2013 total	2014 total	Change total
EA321C	0.9	1.1	+0.2	0.2	0.1	-0.1	1.1	1.1	+0.1
EA321V	1.8	1.3	-0.5	0.7	0.5	-0.2	2.5	1.8	-0.7
EA33	0.7	0.7	0.0	3.6	3.9	+0.3	4.3	4.6	+0.3
EA34	0.4	0.0	-0.4	0.4	0.7	+0.3	0.8	0.8	-0.1
EA346	0.6	0.4	-0.2	3.5	2.9	-0.6	4.1	3.3	-0.8
EA38GP	0.2	0.2	0.0	0.5	0.5	0.0	0.7	0.7	0.0
EA38R	0.6	0.3	-0.3	3.8	4.8	+1.0	4.4	5.1	+0.7
ERJ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ERJ170	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ERJ190	0.2	0.2	0.0	0.0	0.0	0.0	0.2	0.2	0.0
EXE2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EXE3	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.0	-0.1
FK10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
L4P	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LTT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MD80	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
STP	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
STT	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.0
Total	21.0	19.5	-1.5	57.0	57.1	+0.1	78.0	76.6	-1.4
									(-2%)

Note: Changes and totals have been calculated *before* rounding.

Table C4 Heathrow 2013 & 2014 annual 24-hour day traffic movements by ANCON type

ANCON type	2013 departs	2014 departs	Change departs	2013 arrivals	2014 arrivals	Change arrivals	2013 total	2014 total	Change total
B717	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	+0.1
B727	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B733	6.1	3.1	-3.0	6.1	3.1	-3.0	12.2	6.2	-6.0
B736	11.7	11.4	-0.3	11.7	11.4	-0.3	23.4	22.9	-0.6
B738	11.5	11.3	-0.2	11.6	11.3	-0.2	23.1	22.6	-0.5
B744G	5.2	5.6	+0.3	5.2	5.6	+0.4	10.5	11.2	+0.7
B744P	2.2	0.9	-1.3	2.2	0.9	-1.3	4.4	1.8	-2.6
B744R	36.9	33.5	-3.4	37.0	33.8	-3.2	73.9	67.3	-6.6
B747	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B747SP	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B748	0.0	0.1	+0.1	0.0	0.1	+0.1	0.0	0.2	+0.2
B753	0.1	0.1	0.0	0.1	0.1	0.0	0.3	0.2	-0.1
B757C	0.7	0.6	0.0	0.7	0.6	0.0	1.3	1.3	-0.1
B757E	7.7	5.0	-2.7	7.7	5.0	-2.7	15.4	10.0	-5.4
B757P	0.3	0.2	-0.1	0.1	0.2	+0.1	0.4	0.4	0.0
B762	0.5	0.2	-0.3	0.5	0.2	-0.3	1.0	0.3	-0.7
B763G	8.3	9.6	+1.3	8.3	9.6	+1.3	16.6	19.2	+2.6
B763P	7.8	9.8	+2.0	7.8	9.9	+2.0	15.7	19.7	+4.0
B763R	22.5	19.1	-3.5	22.7	19.1	-3.6	45.3	38.2	-7.1
B764	6.4	5.0	-1.4	6.4	5.0	-1.3	12.7	10.0	-2.7
B772G	21.0	19.8	-1.2	21.0	20.0	-1.0	42.0	39.8	-2.2
B772P	5.3	5.4	+0.1	5.3	5.4	+0.1	10.6	10.8	+0.2
B772R	24.9	19.4	-5.5	24.9	19.5	-5.4	49.8	38.9	-10.9
B773G	31.8	42.3	+10.5	31.7	42.5	+10.8	63.4	84.7	+21.3
B773P	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B773R	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B788	2.6	11.0	+8.4	2.6	11.0	+8.4	5.2	22.0	+16.7
B789	0.0	0.1	+0.1	0.0	0.1	+0.1	0.0	0.3	+0.3
BA46	0.8	0.8	0.0	0.8	0.8	0.0	1.6	1.6	+0.1
CRJ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CRJ900	0.8	0.7	-0.1	0.8	0.7	-0.1	1.6	1.4	-0.2
EA30	2.2	2.1	-0.1	2.2	2.1	-0.1	4.4	4.3	-0.1

ANCON type	2013 departs	2014 departs	Change departs	2013 arrivals	2014 arrivals	Change arrivals	2013 total	2014 total	Change total
EA31	0.2	0.3	0.0	0.2	0.3	+0.1	0.4	0.5	+0.1
EA318	1.4	1.0	-0.4	1.4	1.0	-0.4	2.7	2.0	-0.8
EA319C	24.9	29.2	+4.3	24.9	29.3	+4.4	49.9	58.6	+8.7
EA319V	106.8	98.3	-8.5	106.8	98.4	-8.4	213.6	196.7	-16.9
EA320C	65.5	67.5	+2.0	65.4	67.7	+2.3	130.9	135.2	+4.3
EA320V	102.6	113.9	+11.3	102.9	114.1	+11.3	205.5	228.1	+22.6
EA321C	19.5	15.2	-4.3	19.5	15.2	-4.3	39.0	30.4	-8.6
EA321V	47.3	42.4	-4.9	47.2	42.5	-4.7	94.5	84.9	-9.6
EA33	24.9	24.1	-0.8	24.9	24.2	-0.7	49.9	48.4	-1.5
EA34	5.1	4.0	-1.1	5.1	4.0	-1.1	10.1	8.0	-2.1
EA346	12.3	11.4	-0.8	12.3	11.5	-0.8	24.5	22.9	-1.6
EA38GP	5.0	5.2	+0.2	5.0	5.2	+0.2	10.0	10.4	+0.4
EA38R	7.3	9.6	+2.3	7.4	9.6	+2.2	14.6	19.2	+4.6
ERJ	0.1	0.0	0.0	0.1	0.0	0.0	0.2	0.1	-0.1
ERJ170	0.1	0.0	-0.1	0.1	0.0	-0.1	0.2	0.0	-0.1
ERJ190	2.3	2.2	-0.1	2.3	2.2	-0.1	4.6	4.3	-0.3
EXE2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EXE3	0.7	0.5	-0.2	0.7	0.5	-0.2	1.4	0.9	-0.4
FK10	2.4	3.4	+1.0	2.4	3.4	+1.0	4.8	6.7	+1.9
L4P	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LTT	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-0.1
MD11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MD80	0.6	0.0	-0.6	0.6	0.0	-0.6	1.3	0.0	-1.2
STP	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
STT	0.1	0.1	0.0	0.1	0.1	0.0	0.2	0.1	-0.1
TU54	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	646.5	645.4	-1.1	646.7	647.4	+0.8	1293.1	1292.8	-0.3
									(0%)

Note: Changes and totals have been calculated *before* rounding.

Table C5 Heathrow 2013 & 2014 6.5-hour night traffic movements by ANCON type

ANCON type	2013 departs	2014 departs	Change departs	2013 arrivals	2014 arrivals	Change arrivals	2013 total	2014 total	Change total
B733	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B736	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B738	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
B744G	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B744P	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B744R	0.2	0.2	0.0	5.1	4.0	-1.1	5.3	4.2	-1.1
B753	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B757C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B757E	0.0	0.0	0.0	0.0	0.1	+0.1	0.0	0.1	+0.1
B757P	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B762	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B763G	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0
B763P	0.0	0.0	0.0	0.3	0.7	+0.4	0.3	0.7	+0.4
B763R	0.2	0.1	-0.1	0.1	0.1	0.0	0.2	0.1	-0.1
B764	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B772G	0.2	0.2	0.0	1.1	0.9	-0.2	1.3	1.0	-0.3
B772P	0.0	0.0	0.0	0.5	0.1	-0.5	0.5	0.1	-0.5
B772R	0.1	0.1	0.0	0.8	0.5	-0.3	0.9	0.6	-0.2
B773G	0.1	0.1	0.0	2.1	2.7	+0.6	2.2	2.8	+0.6
B788	0.0	0.0	0.0	0.0	0.3	+0.3	0.0	0.3	+0.3
B789	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BA46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EA30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EA319C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EA319V	0.1	0.0	0.0	0.1	0.1	0.0	0.2	0.2	0.0
EA320C	0.0	0.1	0.0	0.0	0.1	0.0	0.1	0.1	0.0
EA320V	0.1	0.0	0.0	0.2	0.2	+0.1	0.2	0.3	0.0
EA321C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EA321V	0.1	0.2	0.0	0.1	0.1	-0.1	0.3	0.2	0.0
EA33	0.1	0.1	0.0	0.0	0.1	0.0	0.2	0.2	0.0
EA34	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
EA346	0.1	0.1	0.0	0.9	1.0	0.0	1.0	1.0	0.0

ANCON type	2013 departs	2014 departs	Change departs	2013 arrivals	2014 arrivals	Change arrivals	2013 total	2014 total	Change total
EA38GP	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EA38R	0.1	0.1	0.0	2.9	3.4	+0.5	3.0	3.5	+0.5
ERJ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ERJ190	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EXE3	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
FK10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LTT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MD80	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
STP	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
STT	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Total	1.8	1.5	-0.3	14.6	14.5	-0.1	16.4	16.0	-0.3
									(-2%)

Note: Changes and totals have been calculated *before* rounding.

Table C6 Heathrow 2013 & 2014 L_{day} cumulative contour area, population and household estimates

L_{day} (dBA)	2013 area	2014 area	Change in area	2013 pop	2014 pop	Change in pop	2013 house	2014 house	Change in house
> 55	162.5	160.6	-1%	450.3	455.1	+1%	176.4	181.3	+3%
> 60	58.4	57.7	-1%	124.4	124.8	0%	44.1	47.5	+8%
> 65	24.4	23.9	-2%	20.8	20.5	-1%	7.0	7.7	+10%
> 70	7.9	7.7	-3%	1.9	2.1	+11%	0.6	0.8	+33%
> 75	3.0	2.9	-3%	< 0.1	< 0.1	(n/a)	< 0.1	< 0.1	(n/a)

Table C7 Heathrow 2013 & 2014 L_{evening} cumulative contour area, population and household estimates

L_{evening} (dBA)	2013 area	2014 area	Change in area	2013 pop	2014 pop	Change in pop	2013 house	2014 house	Change in house
> 55	147.7	142.3	-4%	396.7	367.5	-7%	153.1	145.0	-5%
> 60	53.1	50.8	-4%	104.8	96.3	-8%	36.7	36.6	0%
> 65	22.4	21.1	-6%	15.3	12.4	-19%	5.2	4.7	-10%
> 70	7.3	6.9	-5%	1.1	0.8	-27%	0.4	0.3	-25%
> 75	2.9	2.7	-7%	0.0	0.0	(n/a)	0.0	0.0	(n/a)

Table C8 Heathrow 2013 & 2014 L_{night} cumulative contour area, population and household estimates

L_{night} (dBA)	2013 area	2014 area	Change in area	2013 pop	2014 pop	Change in pop	2013 house	2014 house	Change in house
> 50	76.5	74.8	-2%	219.0	215.5	-2%	83.9	84.7	+1%
> 55	30.0	27.0	-10%	70.6	61.8	-12%	23.9	23.2	-3%
> 60	9.9	8.9	-10%	13.3	12.1	-9%	4.1	4.5	+10%
> 65	3.5	3.1	-11%	1.9	1.1	-42%	0.5	0.4	-20%
> 70	1.5	1.4	-7%	0.0	0.0	(n/a)	0.0	0.0	(n/a)

Note: Areas are given in km², and populations (pop) and households (house) in thousands. The 2013 and 2014 population/household counts are based on 2013 and 2014 CACI updates of the 2011 Census respectively.

Table C9 Heathrow 2013 & 2014 L_{den} cumulative contour area, population and household estimates

L_{den} (dBA)	2013 area	2014 area	Change in area	2013 pop	2014 pop	Change in pop	2013 house	2014 house	Change in house
> 55	220.4	210.7	-4%	750.9	704.3	-6%	308.5	288.3	-7%
> 60	79.7	77.7	-3%	203.1	199.5	-2%	75.7	77.6	+3%
> 65	32.7	30.6	-6%	53.9	47.4	-12%	18.4	17.9	-3%
> 70	10.8	10.2	-6%	6.0	5.2	-13%	2.0	2.0	0%
> 75	3.9	3.7	-5%	0.1	0.2	+100%	< 0.1	0.1	(n/a)

Table C10 Heathrow 2013 & 2014 $L_{eq, 6.5hr\ night}$ cumulative contour area, population and household estimates

$L_{eq, 6.5hr\ night}$ (dBA)	2013 area	2014 area	Change in area	2013 pop	2014 pop	Change in pop	2013 house	2014 house	Change in house
> 48	41.0	36.3	-11%	133.3	107.5	-19%	48.1	41.5	-14%

Note: Areas are given in km² and populations/households in thousands. The 2013 and 2014 population/household counts are based on 2013 and 2014 CACI updates of the 2011 Census respectively.

Table C11 Heathrow 2006 & 2014 L_{day} cumulative contour area, population and household estimates

L _{day} (dBA)	2006 area	2014 area	Change in area	2006 pop	2014 pop	Change in pop	2006 house	2014 house	Change in house
> 55	177.7	160.6	-10%	485.6	455.1 (392.8)	-6% (-19%)	210.5	181.3 (168.5)	-14% (-20%)
> 60	64.0	57.7	-10%	111.0	124.8 (98.5)	+12% (-11%)	44.9	47.5 (39.7)	+6% (-12%)
> 65	27.2	23.9	-12%	24.1	20.5 (17.1)	-15% (-29%)	9.2	7.7 (6.6)	-16% (-28%)
> 70	9.3	7.7	-17%	2.8	2.1 (1.6)	-25% (-43%)	1.0	0.8 (0.6)	-20% (-40%)
> 75	3.5	2.9	-17%	< 0.1	< 0.1 (< 0.1)	(n/a) (n/a)	< 0.1	< 0.1 (< 0.1)	(n/a) (n/a)

Table C12 Heathrow 2006 & 2014 L_{evening} cumulative contour area, population and household estimates

L _{evening} (dBA)	2006 area	2014 area	Change in area	2006 pop	2014 pop	Change in pop	2006 house	2014 house	Change in house
> 55	185.6	142.3	-23%	450.5	367.5 (313.6)	-18% (-30%)	192.6	145.0 (132.2)	-25% (-31%)
> 60	66.1	50.8	-23%	106.3	96.3 (77.5)	-9% (-27%)	42.4	36.6 (30.9)	-14% (-27%)
> 65	28.1	21.1	-25%	20.5	12.4 (10.7)	-40% (-48%)	7.9	4.7 (4.2)	-41% (-47%)
> 70	10.0	6.9	-31%	2.4	0.8 (0.6)	-67% (-75%)	1.0	0.3 (0.3)	-70% (-70%)
> 75	3.8	2.7	-29%	< 0.1	0.0 (0.0)	(n/a) (n/a)	< 0.1	0.0 (0.0)	(n/a) (n/a)

Note: Areas are given in km², and populations (pop) and households (house) in thousands. The 2006 population/household counts are based on a 2006 CACI update of the 2001 Census. The 2014 population/household counts are based on a 2014 CACI update of the 2011 Census. Estimates for 2014 data using the 2006 population database are shown in blue.

Table C13 Heathrow 2006 & 2014 L_{night} cumulative contour area, population and household estimates

L _{night} (dBA)	2006 area	2014 area	Change in area	2006 pop	2014 pop	Change in pop	2006 house	2014 house	Change in house
> 50	84.4	74.8	-11%	207.2	215.5 (180.8)	+4% (-13%)	88.9	84.7 (76.9)	-5% (-13%)
> 55	34.2	27.0	-21%	62.0	61.8 (49.5)	0% (-20%)	24.1	23.2 (19.2)	-4% (-20%)
> 60	11.9	8.9	-25%	16.3	12.1 (10.1)	-26% (-38%)	6.0	4.5 (3.5)	-25% (-42%)
> 65	4.5	3.1	-31%	1.7	1.1 (0.9)	-35% (-47%)	0.6	0.4 (0.3)	-33% (-50%)
> 70	1.8	1.4	-22%	< 0.1	0.0 (0.0)	(n/a) (n/a)	< 0.1	0.0 (0.0)	(n/a) (n/a)

Table C14 Heathrow 2006 & 2014 L_{den} cumulative contour area, population and household estimates

L _{den} (dBA)	2006 area	2014 area	Change in area	2006 pop	2014 pop	Change in pop	2006 house	2014 house	Change in house
> 55	244.7	210.7	-14%	756.1	704.3 (622.9)	-7% (-18%)	338.5	288.3 (277.9)	-15% (-18%)
> 60	92.7	77.7	-16%	194.6	199.5 (162.7)	+3% (-16%)	81.6	77.6 (68.1)	-5% (-17%)
> 65	37.1	30.6	-18%	54.3	47.4 (37.8)	-13% (-30%)	21.4	17.9 (14.8)	-16% (-31%)
> 70	13.7	10.2	-26%	9.6	5.2 (3.8)	-46% (-60%)	3.5	2.0 (1.4)	-43% (-60%)
> 75	5.0	3.7	-26%	0.7	0.2 (0.1)	-71% (-86%)	0.3	0.1 (< 0.1)	-67% (n/a)

Note: Areas are given in km² and populations/households in thousands. The 2006 population/household counts are based on a 2006 CACI update of the 2001 Census. The 2014 population/households data are based on a 2014 CACI update of the 2011 Census. Estimates for 2014 data using the 2006 population database are shown in blue.

Table C15 Heathrow 2006 & 2014 $L_{eq, 6.5hr\ night}$ cumulative contour area, population and household estimates

$L_{eq, 6.5hr\ night}$ (dBA)	2006 area	2014 area	Change in area	2006 pop	2014 pop	Change in pop	2006 house	2014 house	Change in house
> 48	56.4	36.3	-36%	137.4	107.5 (84.7)	-22% (-38%)	57.5	41.5 (34.5)	28% (-40%)

Notes:

- Areas are given in km^2 and populations/households in thousands. The 2006 population/household counts are based on 2006 CACI update of the 2001 Census. The 2014 population/household counts are based on a 2014 CACI update of the 2011 Census. Estimates for 2014 using the 2006 population database are shown in blue.
- The 2006 results were based on data recorded over the 2006 calendar year. The 2014 results were based on data recorded from 30 March 2014 to 29 March 2015.

Table C16 Heathrow 2014 cumulative contour areas and populations assuming 2006 modal splits and 2006 population database

Scenario	Modal split year (W/E split)	Population database year	Area (km ²)	Population (thousands)
L_{day}				
2014 L _{day} 55 dB	2014 (69/31)	2014	160.6	455.1
2014 L _{day} 55 dB	2006 (70/30)	2014	160.7 (0%)	458.3 (+1%)
2014 L _{day} 55 dB	2006 (70/30)	2006	160.7	395.4
2006 L _{day} 55 dB	2006 (70/30)	2006	177.7	485.6
L_{evening}				
2014 L _{evening} 55 dB	2014 (70/30)	2014	142.3	367.5
2014 L _{evening} 55 dB	2006 (71/29)	2014	142.6 (0%)	367.6 (0%)
2014 L _{evening} 55 dB	2006 (71/29)	2006	142.6	313.9
2006 L _{evening} 55 dB	2006 (71/29)	2006	185.6	450.5
L_{night}				
2014 L _{night} 50 dB	2014 (69/31)	2014	74.8	215.5
2014 L _{night} 50 dB	2006 (72/28)	2014	74.8 (0%)	215.7 (0%)
2014 L _{night} 50 dB	2006 (72/28)	2006	74.8	180.4
2006 L _{night} 50 dB	2006 (72/28)	2006	84.4	207.2
L_{den}				
2014 L _{den} 55 dB	2014 (70/30)	2014	210.7	704.3
2014 L _{den} 55 dB	2006 (70/30)	2014	210.4 (0%)	708.7 (+1%)
2014 L _{den} 55 dB	2006 (70/30)	2006	210.4	627.7
2006 L _{den} 55 dB	2006 (70/30)	2006	244.7	756.1
L_{eq,6.5hr night}				
2014 L _{eq,6.5hr night} 48 dB	2014 (67/33)	2014	36.3	107.5
2014 L _{eq,6.5hr night} 48 dB	2006 (73/27)	2014	36.6 (+1%)	114.2 (+6%)
2014 L _{eq,6.5hr night} 48 dB	2006 (73/27)	2006	36.6	91.4
2006 L _{eq,6.5hr night} 48 dB	2006 (73/27)	2006	56.4	137.4

Explanatory notes:

The table above shows the following information for the outermost cumulative contour of each noise metric:

- 1st row - 2014 area and population for the actual 2014 modal split and using the 2014 population database;
- 2nd row - effect on the above area and population if the 2006 modal split is assumed;
- 3rd row - effect on the population if the 2006 population database is also now assumed;
- 4th row - 2006 area and population with the actual 2006 modal split and the 2006 population database, for reference.

Area and population percentage changes for the 2nd row (shown in brackets) are relative to the 1st row figures. Changes in the modelling parameter relative to the row above are shaded in blue.

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
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
DC87	McDonnell Douglas DC-8-70 series

ANCON type	Description
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
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-engined 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	
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.
DfT	Department for Transport (UK Government)
END	Environmental Noise Directive
ERCD	Environmental Research and Consultancy Department
ICAO	International Civil Aviation Organization
L_{day}	Equivalent sound level of aircraft noise in dBA for the annual average 12-hour day period (0700-1900 local time).
L_{den}	Equivalent sound level of aircraft noise in dBA for the annual average 24-hour period with 5 dB weightings for $L_{evening}$ and 10 dB weightings for L_{night} .
L_{eq}	Equivalent sound level of aircraft noise in dBA, often called 'equivalent continuous sound level'.
$L_{eq,6.5hr\ night}$	Equivalent sound level of aircraft noise in dBA for the average 6.5-hour night quota period (2330-0600 local time).
$L_{evening}$	Equivalent sound level of aircraft noise in dBA for the annual average 4-hour evening period (1900-2300 local time).
L_{max}	Maximum sound level of a noise event.
L_{night}	Equivalent sound level of aircraft noise in dBA for the annual average 8-hour night period (2300-0700 local time).
N60	Number of aircraft noise events exceeding a maximum sound level of 60 dBA.
N65	Number of aircraft noise events exceeding a maximum sound level of 65 dBA.
NTK	Noise and Track Keeping monitoring system.
SID	Standard Instrument Departure