Environmental Research and Consultancy Department
Directorate of Airspace Policy
Civil Aviation Authority

ERCD Report 0603

Noise Exposure Contours for Stansted Airport 2005

D J Monkman
D P Rhodes
J Deeley

Prepared by the Civil Aviation Authority on behalf of the Department for Transport, London, December 2006

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SUMMARY

This report describes the calculations of the aircraft noise exposure around London Stansted Airport for the year 2005 and compares both the input data and the resulting contours, together with the areas and populations within the contours, with those for 2004.

Prepared by the CAA on behalf of the Department for Transport, December 2006

The authors of this report are employed by the Civil Aviation Authority. The work reported herein was carried on behalf of the Department for Transport.

Any views expressed are not necessarily those of the Secretary of State for Transport.

Population data used in this report are based on 2001 Census data (updated in 2003 and 2004) supplied by CACI Information Services.

EXECUTIVE SUMMARY

For every year, the Environmental Research and Consultancy Department (ERCD) of the Civil Aviation Authority estimates the noise exposures around the London Airports (Heathrow, Gatwick and Stansted) on behalf of the Department for Transport (DfT). The magnitude and extent of the aircraft noise around these airports are depicted on maps by *contours* of constant aircraft noise index (Leq) values. The contours are generated by a computer model validated with noise measurements, which calculates the emissions and propagation of noise from arriving and departing air traffic.

This report presents the results for London Stansted Airport for the year 2005 and compares both the air traffic information and the noise contours with those for 2004. As for 2004, the 2005 contours shown in this report take into account the topography around Stansted by accounting for terrain height in the modelling process.

Estimates of the populations within the 2004 contours are based on the 2001 census (updated by CACI in 2003), populations within the 2005 contours are also based on the 2001 census but updated by CACI in 2004.

The average daily aircraft movement rate was 0.8% higher in 2005 than in 2004. The actual modal split in 2005 was 60% south-west - 40% north-east compared with 80% south-west - 20% north-east in 2004. The standard modal split (20 year average) in 2005 was 73% south-west – 27% north-east.

Relative to 2004, the total area within the 2005 terrain adjusted 57 dBA Leq (16-hour) contour decreased by 8.4% and the population by 31%.

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1 INTRODUCTION

1.1 The amount of aircraft noise experienced by people living around London (Stansted) Airport during the summer (mid June – mid September) of each year is estimated by the Environmental Research and Consultancy Department of the Civil Aviation Authority on behalf of the Department for Transport (DfT). The noise exposure measure is the Equivalent Continuous Sound Level, Leq (16-hour) in dBA. The background to the use of this index is explained in DORA Report 9023 (Ref 1). The method by which noise maps, or contours of Leq, are prepared using the ANCON Noise Model is described in DORA Report 9120 and R&D Report 9842 (Refs 2 and 3). Following work into updating European noise modelling guidance, which has culminated in an updated ECAC Document 29[1] ('Methodology for Computing Noise Contours around Civil Airports'), the ANCON model itself was also amended prior to production of the 2005 contours.

1.2 The updated ANCON Noise Model (version 2.3) now incorporates revised algorithms for an improved lateral attenuation adjustment. These revised lateral attenuation algorithms, together with other improvements to the ANCON noise model are described in a separate document (Ref 4). The effects of the changes on the 2005 contours are discussed in paragraph 3.2.3 but more detailed comparisons of the effects of the changes on the contours are given in Reference 4. Technical terms used here are described in those references.

1.3 This document contains small scale (1:150,000) diagrams of the 2005 Stansted Leq contours. Contours overlaid on Ordnance Survey (OS) digital maps, or in AutoCad DXF format, are available for download from the Department for Transport website at www.dft.gov.uk. Additionally, printed contours overlaid on OS maps to scale 1:50,000 are available for purchase from the Department for Transport, Aviation Environmental Division, Zone 1/22, Great Minster House, 76 Marsham Street, London, SW1P 4DR, telephone 020 7944 5494, e-mail address aed@dft.gsi.gov.uk.

1.4 This report provides supporting information and compares both the aircraft operations and the resulting noise contours with those for 2004 (Ref 5).

1.5 New analyses of radar and noise data were undertaken in 2005, and the calculations incorporate revised mean tracks and associated dispersions for departing aircraft, together with revised 'spurs' to model the arrival flight track dispersion. Height/speed departure and arrival profiles have also been updated for each aircraft type where the data has shown this to be necessary.

1.6 To remove the effect of year-on-year weather fluctuations on aircraft operations in order to clarify underlying trends, two sets of contours for 2005 have been generated; (i) the *actual* modal split and (ii) the "*standard"* modal split. In 2005 the actual modal split was 60% south-west - 40% north-east compared to 80% south-west - 20% north-east in 2004. For 2004 the standard modal split was 74% south-west - 26% north-east (based on the 20 year Leq period average 1985 to 2004 inclusive); for 2005 the standard modal split was 73% south-west - 27% north-east (based on the 20 year Leq period average 1986 to 2005 inclusive). This report compares both actual and standard contours for 2004 and 2005.

1.7 As in 2004, the 2005 contours shown in this report take into account the topography around Stansted by accounting for terrain height in the modelling process. This was

[1] ECAC Document 29 3rd Edition was approved by the Directors General in December 2005 and published on the ECAC web site (www.ecac-ceac.org) in July 2006. ERCD played a major role in the production of the proposal, in particular the formulation and implementation of revised algorithms for an improved lateral attenuation adjustment.

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. ERCD holds terrain height data[2] obtained from Ordnance Survey on a 200m by 200m grid for England and Wales. Interpolation was performed to generate height data at each of the calculation points on the 100m by 50m receiver grid for use by the ANCON noise model.

2 AIRCRAFT OPERATIONS

2.1 Flight Tracks

2.1.1 For the purpose of computing noise contours, Stansted traffic has, in previous years, been divided into non-circuit and circuit movements. Non-circuit movements were flights to/from another airport whilst circuit movements were those made by training flights involving 'touch and go' or 'go-around' operations for which separate flight profiles of height and speed versus track distance were defined. There were no circuit movements at Stansted during the 2004 and 2005 Leq periods.

2.1.2 The 2005 calculations were based on updated mean tracks and track dispersions for all outbound routes from Runways 23 and 05 (see Figure 1 for route designations). These were determined from radar data (extracted from the airport's Noise and Track Keeping (NTK) monitoring system) for the summer of 2005.

2.1.3 Radar measurements of arrival tracks between the stack and Runways 23 and 05 confirmed that the continued use of evenly spaced 'spurs' remained a realistic method for modelling the dispersion of arrival tracks about the extended runway centre lines. The 2005 measurements of arrivals on Runway 23 showed that, within the area of interest, 59% of aircraft approached from the western side of the airport and 41% from the eastern side of the airport. The comparable percentages for arrivals on Runway 05 were 89% from the western side and 11% from the eastern side of the airport. For Runway 23 the spur route segments joined the runway extended centre-line at distances ranging from 10 to 26 kilometres from touchdown, for Runway 05 the distances ranged from 9 to 26 kilometres.

2.2 Flight Profiles and Noise Emissions

2.2.1 For 2005, the average flight profiles of height and speed versus track distance for each aircraft type were reviewed, and updated where necessary, for both departures and arrivals. Noise event levels were then determined from a database expressing SEL[3] as a function of engine power setting and slant distance to the receiver – the so-called 'noise-power-distance (NPD)' relationship. The engine power settings required for the aircraft to follow the measured average height and speed profiles were calculated from data describing aircraft performance characteristics within each of the different aircraft type categories.

2.2.2 Following extensive noise measurements of arrivals to Stansted (and Heathrow and Gatwick) in 2005, the Airbus A320 family of aircraft have had their noise levels increased slightly (by about 1dB) at distances ranging from 8 to 20 kilometres from the landing runway threshold.

2.2.3 Examination of the 2005 radar data indicated that, as in the preceding years, at distances greater than 10 kilometres to touchdown, the average aircraft heights for

[2] Meridian® 2 data revised 2005.

[3] Sound Exposure Level in dBA; a measure of noise event level which accounts for both the duration and intensity of noise.

arrivals on Runway 05 were generally somewhat lower than on Runway 23. This follows the introduction of Continuous Descent Approach (CDA) procedures for Runway 23 arrivals via the Abbott stack from the 4 November 1999 and the extension to all Runway 23 arrivals in 2000 (section 2.21 paragraph 10, AD2-EGSS-1-11 of the UK AIP). Accordingly, for the 2005 calculations, separate Runway 23 and 05 descent profiles were used to describe arrivals by all aircraft types at Stansted.

2.3 Traffic Distribution by Aircraft Type and Route

2.3.1 The aircraft movements conventionally used to determine Leq are the daily averages of those which take place in the 16-hour day, 0700-2300 local time, during the 92-day period 16 June to 15 September inclusive. Table 1, which displays the distribution of movements by aircraft type, shows that the 2005 average Leq 16-hour day movement rate was 0.8% higher than in 2004.

2.3.2 Table 2 compares the distribution of aircraft departures by route for 2004 and 2005. The percentages of use of each runway direction - the actual modal splits for 2005 were 60% south-west - 40% north-east, compared with 80% south-west - 20% north-east in 2004.

2.3.3 The table below lists the 'average summer day' movements by eight noise classes of aircraft (ranked in ascending order of noise emission, i.e. from least to most noisy) during 2004 and 2005. Table 1 and Figure 2 (at the end of the Report) state which specific aircraft types fall into which categories.

NOISE CLASS	AIRCRAFT	AVERAGE NUMBER 2004	AVERAGE NUMBER 2005	PERCENTAGE OF TOTAL 2005 MOVEMENTS	CHANGE AS PERCENTAGE OF TOTAL 2004 MOVEMENTS
	PROPELLER AIRCRAFT				
1	Small props	0.4	0.4	0.1	0.0
2	Large props	23.9	13.4	2.7	-2.1
	CHAPTER 3 JETS				
3	Short-haul	436.3	459.5	93.1	+4.7
4	Wide-body twins	5.2	4.9	1.0	-0.1
5	2nd gen wide body multis*	8.8	8.5	1.7	-0.1
	LARGE CHAPTER 2/3 JETS				
6	1st gen wide-body multis*	1.9	2.4	0.5	+0.1
	2 nd GENERATION TWIN JETS				
7	Narrow body twins (including Chapter 2 and hushkitted versions)	12.9	3.9	0.8	-1.8
	1 st GENERATION JETS				
8	Narrow body multis (including hushkitted versions)	0.6	0.8	0.2	0.0
	TOTAL MOVEMENTS	490.0	493.8	100.0**	+0.8**

* Multi-engined (3 or 4) aircraft
** May not sum exactly due to rounding

2.3.4 Short haul Chapter 3 jets (noise class 3) showed the largest percentage increase in movements per average summer day rising from 436.3 in 2004 to 459.5 in 2005. Operations by large propeller aircraft (noise class 2) and 2nd generation narrow body twins (noise class 7) showed the largest percentage reductions in 2005. It can be seen from Table 1 that, within noise class 3, movements by B737-300/400/500 have decreased sharply whilst those by B737-800/900 and A319C show a significant increase.

2.3.5 Figure 2 illustrates the changing distribution of traffic (both circuit and non-circuit prior to 2002) among these classes over the eighteen years from 1988 to 2005[4] inclusive.

3 NOISE CONTOURS

3.1 'Actual' contours

3.1.1 The actual Leq contours for 2005 (i.e. those depicting actual terrain adjusted average mode Leq exposures), from 57 to 72 dBA in steps of 3dB, are overlaid on a background map in Figure 3. In Figure 4 three of these, for 57, 63 and 69 dBA Leq, are compared with the contours for 2004.

3.1.2 The total areas and populations[5] enclosed by each of the contours are listed below:

Leq LEVEL dBA	AREA SQ KM		PERCENTAGE CHANGE	POPULATION 000's		PERCENTAGE CHANGE
	2004 ACTUAL	2005 ACTUAL		2004 ACTUAL (2003 CACI data)	2005 ACTUAL (2004 CACI data)	
>57	29.9	27.4	-8.4	2.9	2.0	-31.0
>60	17.5	15.7	-10.3	1.0	1.0	0.0
>63	9.9	8.7	-12.1	0.3	0.3	*
>66	5.4	4.6	-14.8	0.1	<0.1	*
>69	2.8	2.4	-14.3	<0.1	<0.1	*
>72	1.4	1.3	-7.1	<0.1	<0.1	*

* Percentage changes not shown because of the relatively low numbers and limited resolution of the estimates.

Despite the slight increase in traffic, the areas within the actual 2005 Leq contours all decreased ranging from 7.1% at 72 dBA Leq to 14.8% at 66 dBA Leq. Based on the 2004 CACI data, the population within the terrain adjusted 2005 57 dBA Leq contour decreased by 31% relative to 2004 (using the earlier 2003 CACI data would have yielded the same percentage decrease). Percentage changes in contour areas are not necessarily accompanied by similar changes in enclosed population because the contours may be different in shape as well as size and movement of contour line(s) from year to year, especially in or around relatively highly populated areas, can cause a disproportionate change in enclosed population.

[4] The 1990 to 2005 percentages shown in Figure 2 relate to the average 16 hour Leq-day; before 1990 the percentages relate to the average 12 hour NNI-day (0700-1900 Local Time). Also, the percentages before 1992 are based on departures only, from 1992 they relate to total movements.

[5] The population estimates shown in this Report are based on 2001 census data (updated by CACI Ltd in 2003 and 2004). Note also that area and population figures presented in this Report are cumulative.

3.1.3 It can be seen from Figure 4 that the 2005 contours to the north east of the airport (associated mainly with arrivals to Runway 23) have shortened whilst those to the south west of the airport (associated with arrivals to Runway 05) have elongated slightly. The 2005 57 dBA Leq contour associated with departures from Runway 23 on the DVR and CLN routes has diminished relative to 2004. All these changes are most noticeable for the 57 dBA Leq contour and reflect, to a large extent, the change in modal split between 2004 and 2005.

3.2 'Standard' contours

3.2.1 In Figure 5 the standard terrain adjusted 2005 contours (57, 63 and 69 dBA Leq) are compared with the standard contours for 2004. These show what the noise exposures would have been if the 2005 and 2004 modal split had mirrored a long-term rolling average modal split. The 2004 standard contours were based on the 20 year average modal split from 1985 to 2004 inclusive of 74% south-west / 26% north-east; those for 2005 were based on the 20 year average modal split from 1986 to 2005 inclusive which was 73% south-west / 27% north-east. The associated areas and populations are displayed below:

Leq LEVEL dBA	AREA SQ KM		PERCENTAGE CHANGE	POPULATION 000's		PERCENTAGE CHANGE
	2004 STANDARD	2005 STANDARD		2004 STANDARD (2003 CACI data)	2005 STANDARD (2004 CACI data)	
>57	29.7	27.5	-7.4	2.7	1.9	-29.6
>60	17.4	15.8	-9.2	1.0	1.0	0.0
>63	9.9	8.7	-12.1	0.3	0.3	*
>66	5.4	4.7	-13.0	0.1	0.1	*
>69	2.7	2.4	-11.1	<0.1	<0.1	*
>72	1.4	1.3	-7.1	<0.1	<0.1	*

* Percentage changes not shown because of the relatively low numbers and limited resolution of the estimates.

The areas within the standardised 2005 terrain adjusted Leq contours are all lower than those for the standardised 2004 contours ranging from a 7.1% decrease at 72 dBA Leq to 13.0% at 66 dBA Leq. Based on the 2004 CACI data the population within the 57 dBA Leq contour decreased by 29.6% (using the earlier 2003 CACI data would have yielded the same result).

3.2.2 The standard contours provide a clearer indication than the actual contours of 'fleet noise level' changes because they minimise the effect of any difference between the ratios of south-westerly to north-easterly operations for the two years. It can be seen from Figure 5 that the standard terrain adjusted 2005 contours to the north east of the airport (mainly associated with arrivals to Runway 23) are slightly smaller than those for 2004 (mainly noticeable for the 57 dBA Leq contour). The 2005 contours to the south west of the airport are generally very similar to those for 2004 but the 2005 57 dBA Leq associated with departures from Runway 23 on the DVR/CLN routes has diminished slightly. The reductions in area within the 2005 contours reflect the change in fleet mix between 2004 and 2005. It can be seen from Table 1 that movements by the B737-300/400/500's have reduced markedly in 2005 whilst those for the B737-800, 900 and A319C have increased. Although the B737-800, 900 and A319C are generally larger aircraft than the B737-300/400/500 they are marginally quieter on both departure and arrival so despite the slight increase in traffic in 2005

the areas enclosed by the contours have decreased. The population enclosed within the 2005 standard terrain corrected 57 dBA Leq contour is also lower than that for 2004.

3.2.3 It can also be seen from Figure 5 that in 2005 there has been a slight 're-distribution' of noise to the sides of the runway (most noticeable at 57 dBA Leq). This is a consequence of the revised lateral attenuation algorithms, together with the other improvements, used for the 2005 contours (ANCON Version 2.3). The effects of the changes on the 2005 contours due to the updated model are discussed in more detail in Reference 4.

4 STANSTED TRAFFIC AND NOISE: HISTORICAL TRENDS

4.1 Figure 6 shows how the average mode 57 dBA Leq contours, based on actual modal splits[6], have changed since 1988 by comparison with the *total annual* aircraft movements.

4.2 Annual movements at Stansted rose steadily between 1990 and 2001 showing particularly rapid growth between 1997 and 1999. The number of movements in 2001 and 2002 were very similar but in 2003 the annual figure rose by 9.3% over the preceding year. The total annual movement figure for 2005 was 0.7% higher than that for 2004.

4.3 Up to 1998, areas and populations within the 57 dBA Leq contours have generally risen in line with movements but in 1999, despite the high traffic growth, the area within the 57 dBA Leq contour fell by 19%. This decrease was attributable to fewer operations of older, noisier, Chapter 2 aircraft – in particular those by the BAC 1-11 which fell by 64% in that year.

4.4 Despite the slight increase in traffic in 2005, the area within the 57 dBA Leq contour decreased relative to 2004.

[6] Actual modal split data are used in this figure because contours based on standard modal split are a relatively recent innovation and data prior to 1995 are not available.

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5 Monkman D J, Rhodes D P, Deeley J
Noise Exposure Contours for Stansted Airport 2004
ERCD Report 0503, August 2005

Table 1:

DISTRIBUTION OF STANSTED AVERAGE DAILY AIRCRAFT MOVEMENTS BY TYPE 0700-2300 LOCAL TIME, 16 JUNE - 15 SEPTEMBER

AIRCRAFT TYPE(S)	NOISE CLASS	AVERAGE NUMBER 2004	AVERAGE NUMBER 2005	PERCENTAGE OF TOTAL 2005 MOVEMENTS	CHANGE AS PERCENTAGE OF TOTAL 2004 MOVEMENTS
Small Props	1	0.4	0.4	0.1	0.0
Large Props	2	23.9	13.4	2.7	-2.1
B737-300, 400, 500	3	157.9	52.1	10.6	-21.6
B737-600, 700	3	38.6	32.5	6.6	-1.2
B737-800, 900	3	190.0	247.0	50.0	+11.6
B757E (RB211-535E4, E4B)	3	6.7	6.4	1.3	-0.1
B757C (RB211-535C)	3	0.1	0.0	0.0	0.0
B757P (Pratt & Whitney)	3	0.2	0.2	0.0	0.0
BAe146	3	4.4	5.7	1.2	+0.3
A319C (CFM-56)	3	3.2	74.8	15.1	+14.6
A319V (IAE-V2500)	3	0.1	0.1	0.0	0.0
A320C (CFM-56)	3	5.7	4.6	0.9	-0.2
A320V (IAE-V2500)	3	3.1	4.2	0.9	+0.2
A321C (CFM56)	3	4.7	6.5	1.3	+0.4
A321V (IAE-V2500)	3	1.0	1.8	0.4	+0.2
Business Jet (Ch 3)	3	11.5	9.7	2.0	-0.4
Embraer EMB 135/145	3	0.5	1.2	0.2	+0.1
F100	3	6.6	7.7	1.6	+0.2
MD80	3	2.0	5.0	1.0	+0.6
B767-200	4	0.3	0.2	0.0	0.0
B767-300G (General Electric)	4	2.4	1.9	0.4	-0.1
B767-300P (Pratt and Whitney)	4	0.1	0.0	0.0	0.0
B777-200G (General Electric)	4	0.2	0.2	0.0	0.0
A300	4	1.8	1.7	0.3	0.0
A310	4	0.1	0.2	0.0	0.0
A330	4	0.3	0.7	0.1	+0.1
B747-400G (General Electric)	5	3.9	3.9	0.8	0.0
B747-400P (Pratt and Whitney)	5	0.2	0.0	0.0	0.0
B747SP	5	0.4	0.2	0.0	0.0
MD11	5	4.3	4.4	0.9	0.0
B747-200, 300 (Ch 3)	6	1.6	2.4	0.5	+0.2
Tristar	6	0.3	0.0	0.0	-0.1
B737-200 (Ch3)	7	12.7	3.8	0.8	-1.8
DC9 (Ch 3)	7	0.1	0.0	0.0	0.0
Business Jet (Ch 2)	7	0.1	0.1	0.0	0.0
B707, DC8*	8	0.1	0.2	0.0	0.0
B727 (Ch 3)	8	0.4	0.3	0.1	0.0
Tu154M*	8	0.0	0.3	0.1	+0.1
VC10, IL62*	8	0.1	0.0	0.0	0.0
TOTAL MOVEMENTS		490.0	493.8	100.0**	+0.8**

* In 2004 and 2005 all Chapter 3 versions
** May not sum exactly due to rounding

Table 2:

PERCENTAGE OF STANSTED AVERAGE DAILY DEPARTURES
BY ROUTE* (0700-2300 LOCAL TIME, 16 JUNE - 15 SEPTEMBER)

SOUTH WESTERLY DEPARTURE ROUTE	PERCENTAGE OF TOTAL DEPARTURES 2004	PERCENTAGE OF TOTAL DEPARTURES 2005	CHANGE (% OF TOTAL)
BUZ/BKY/CPT	41.3	32.6	-8.7
CLN	22.3	12.4	-9.9
DVR/LAM/LYD	16.4	15.0	-1.4
VFR**	0.0	0.0	0.0
PERCENTAGE SOUTH WEST	80.0	60.0	-20.0
NORTH EASTERLY DEPARTURE ROUTE	PERCENTAGE OF TOTAL DEPARTURES 2004	PERCENTAGE OF TOTAL DEPARTURES 2005	CHANGE (% OF TOTAL)
BUZ/BKY/CPT	10.1	21.6	+11.5
CLN	5.5	8.5	+3.0
DVR/LAM/LYD	4.4	9.9	+5.5
VFR**	0.0	0.0	0.0
PERCENTAGE NORTH EAST	20.0	40.0	+20.0

* See Figure 1.
** Refers to aircraft (normally small non-jets) flying under Visual Flight Rules.

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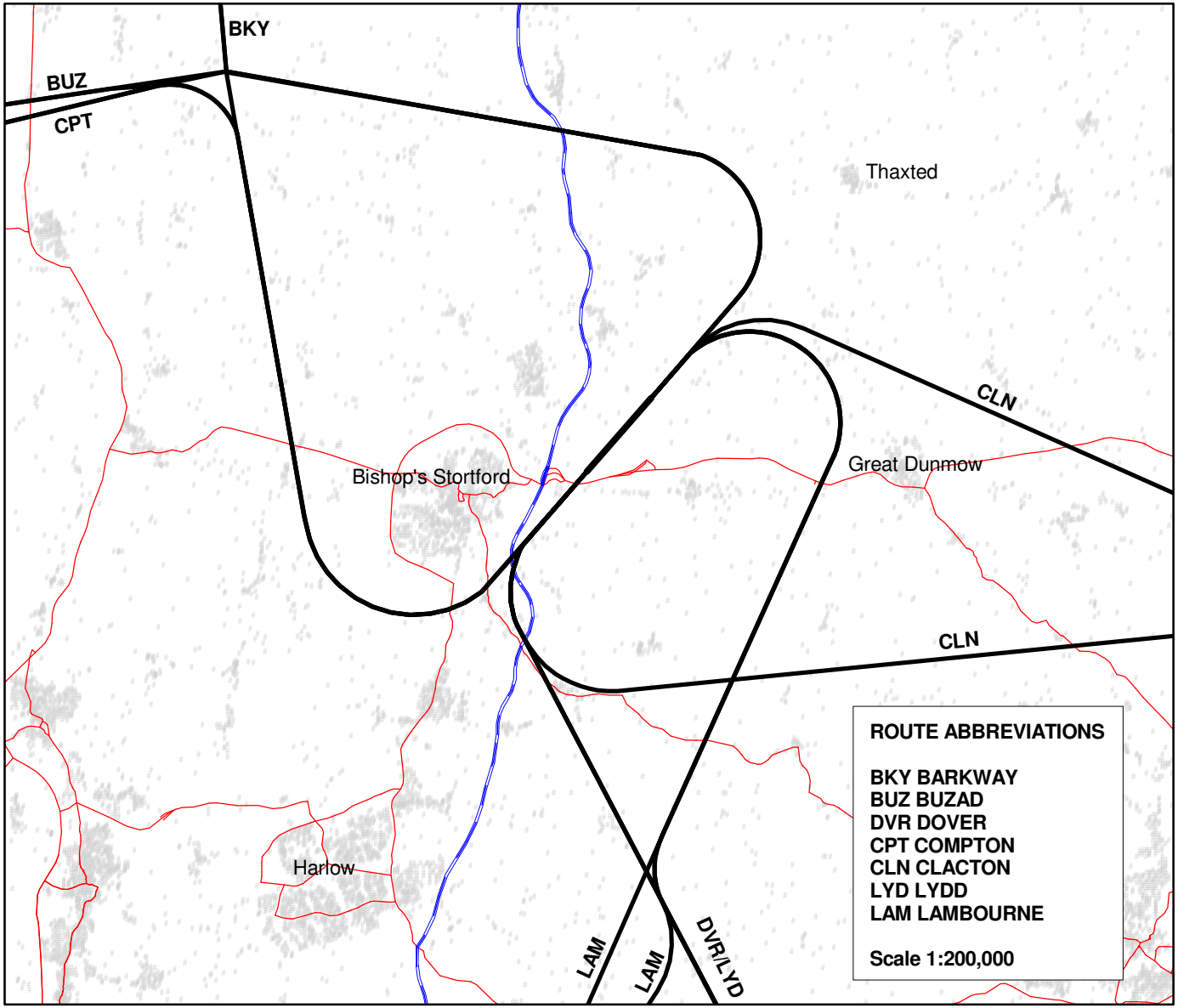
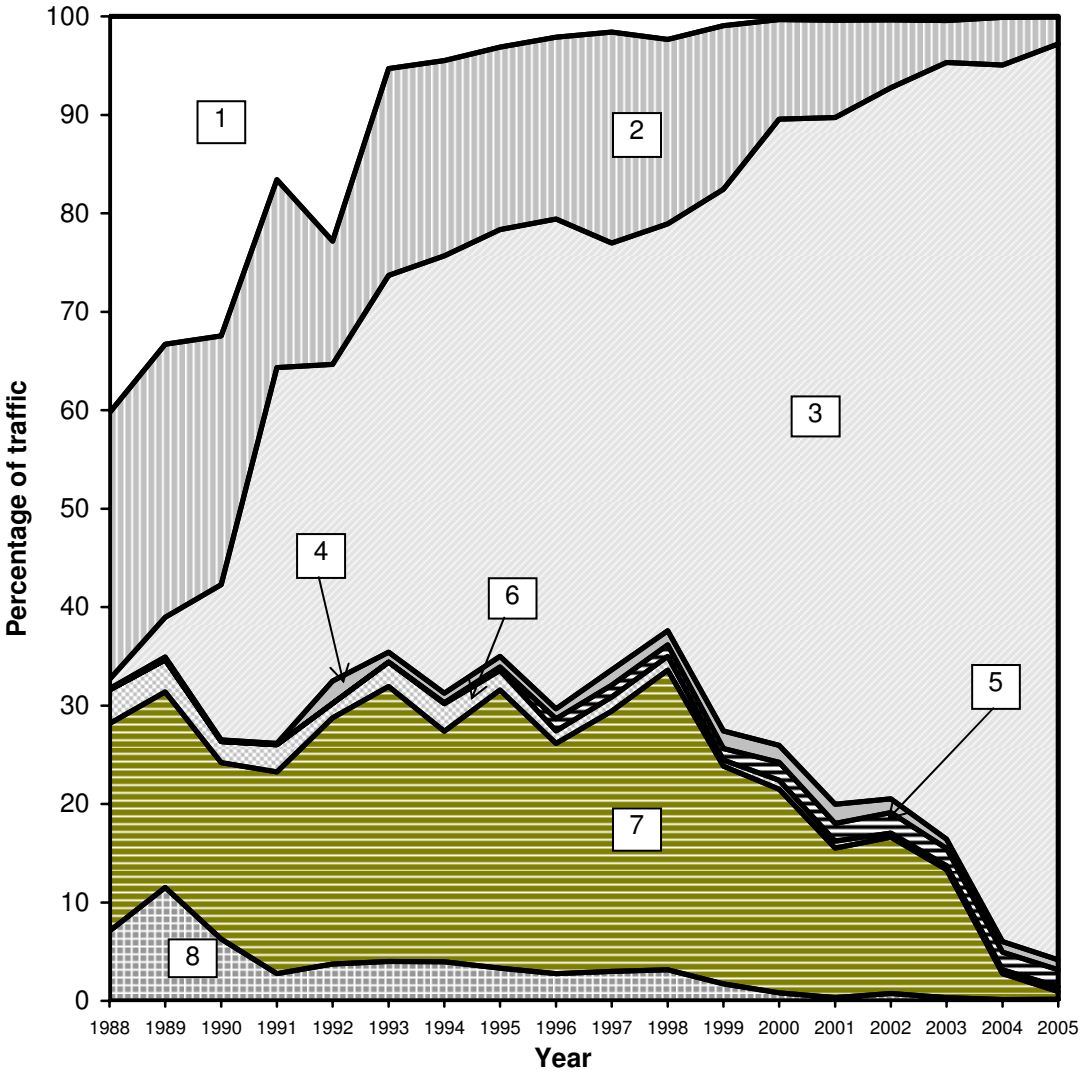


Figure 1: London Stansted Airport Standard Instrument Departure Routes



Propeller aircraft:

1 Small props: Single and twin pistons and turboprop light, business and commuter aircraft

2 Large props: 2- & 4-propeller transports; eg SF340 BAe-ATP, ATR42, F50, HS748, Saab 2000, Electra, Hercules, Viscount, Vanguard

Chapter 3 jets:

3 Short-haul: eg A320, BAe146, B717, B737-300, B757, F100, MD80, RJ50, re-engined narrow-bodies, some business jets

4 Wide-body twins: A300, A310, A330, B767, B777

5 2nd gen. wide-body multis*: A340, MD11, B747-400

Large Chapter 2/3 jets:

6 1st gen. wide-body multis* (Chapter 2 & 3): 'Classic' 747, Tristar, DC-10, An124, IL76, IL86

2nd generation twin jets:

7 Narrow body twins (including hushkitted versions): eg F28, BAC1-11, DC-9, B737-200, Tu134, other business jets

1st generation jets: (including hushkitted versions)

8 eg Trident, B707, DC-8, B727, IL62, Tu154

* Multi = 3- or 4- engined aircraft

Figure 2: Noise Class of Stansted aircraft 1988 - 2005

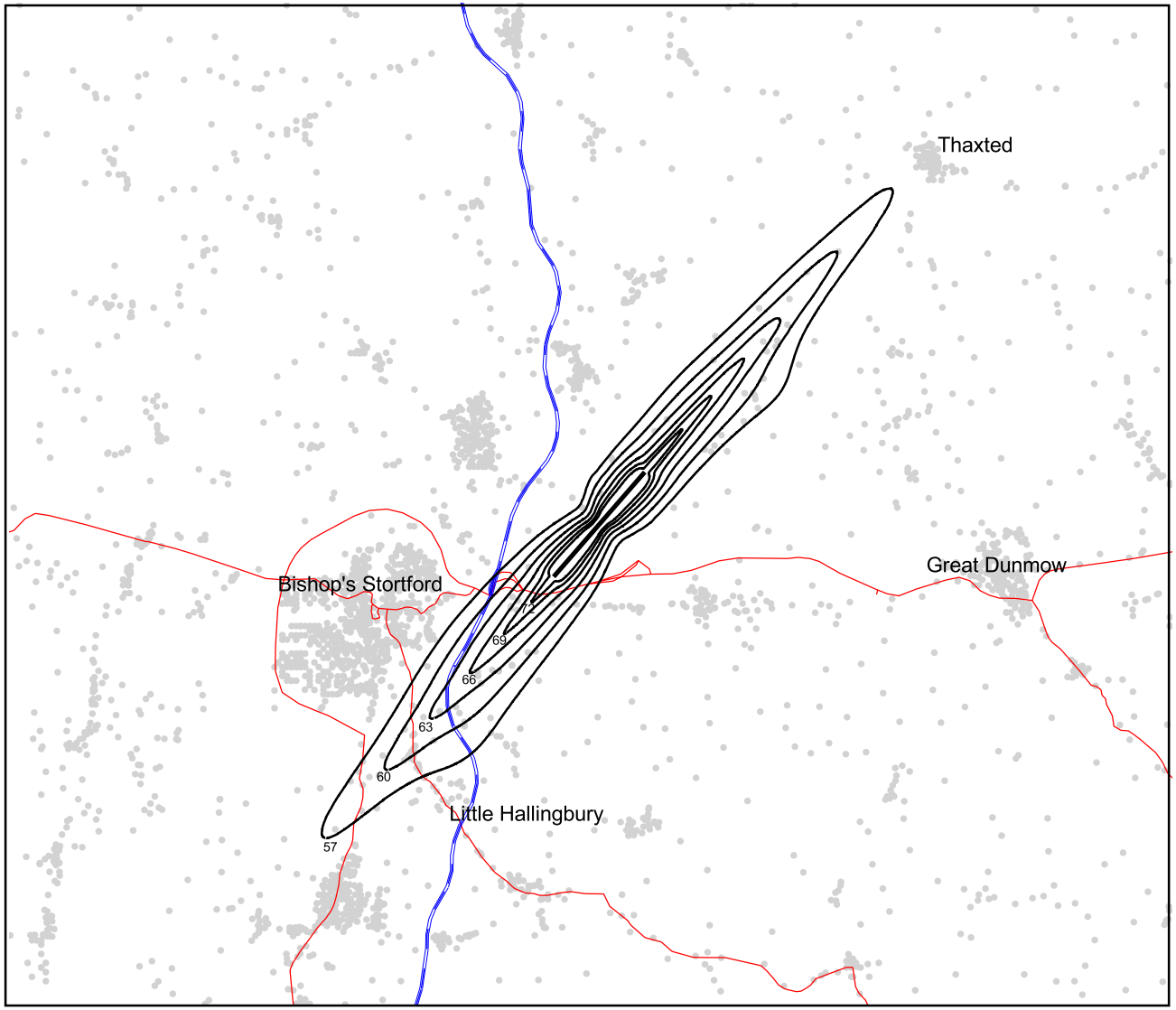


Figure 3: Stansted actual 2005 average mode (60% SW - 40% NE) terrain adjusted 16 hr Leq on population map

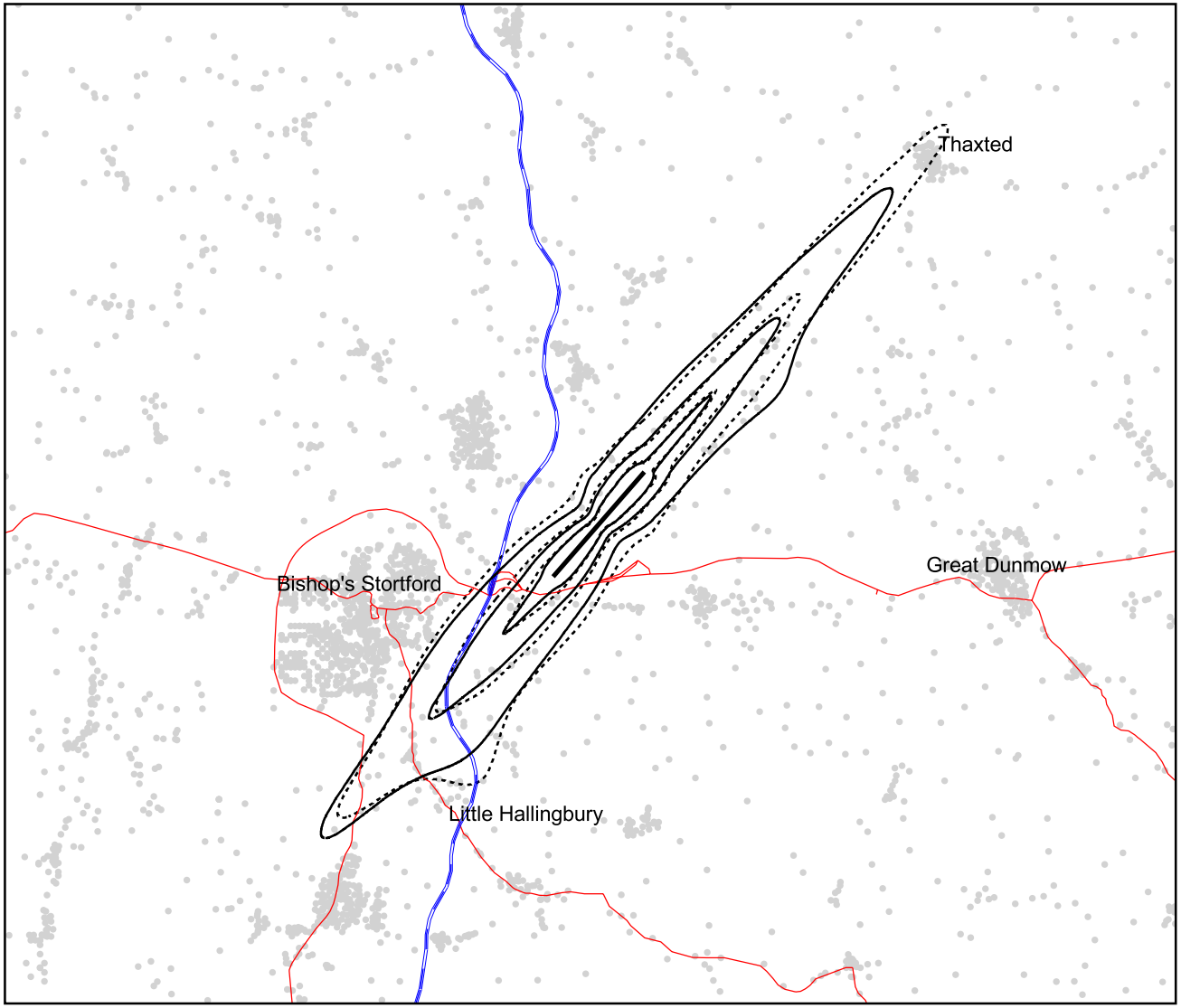


Figure 4: Stansted actual 57, 63 and 69 Leq contours - 2004 dotted (80% SW - 20% NE) - 2005 solid (60% SW - 40% NE)

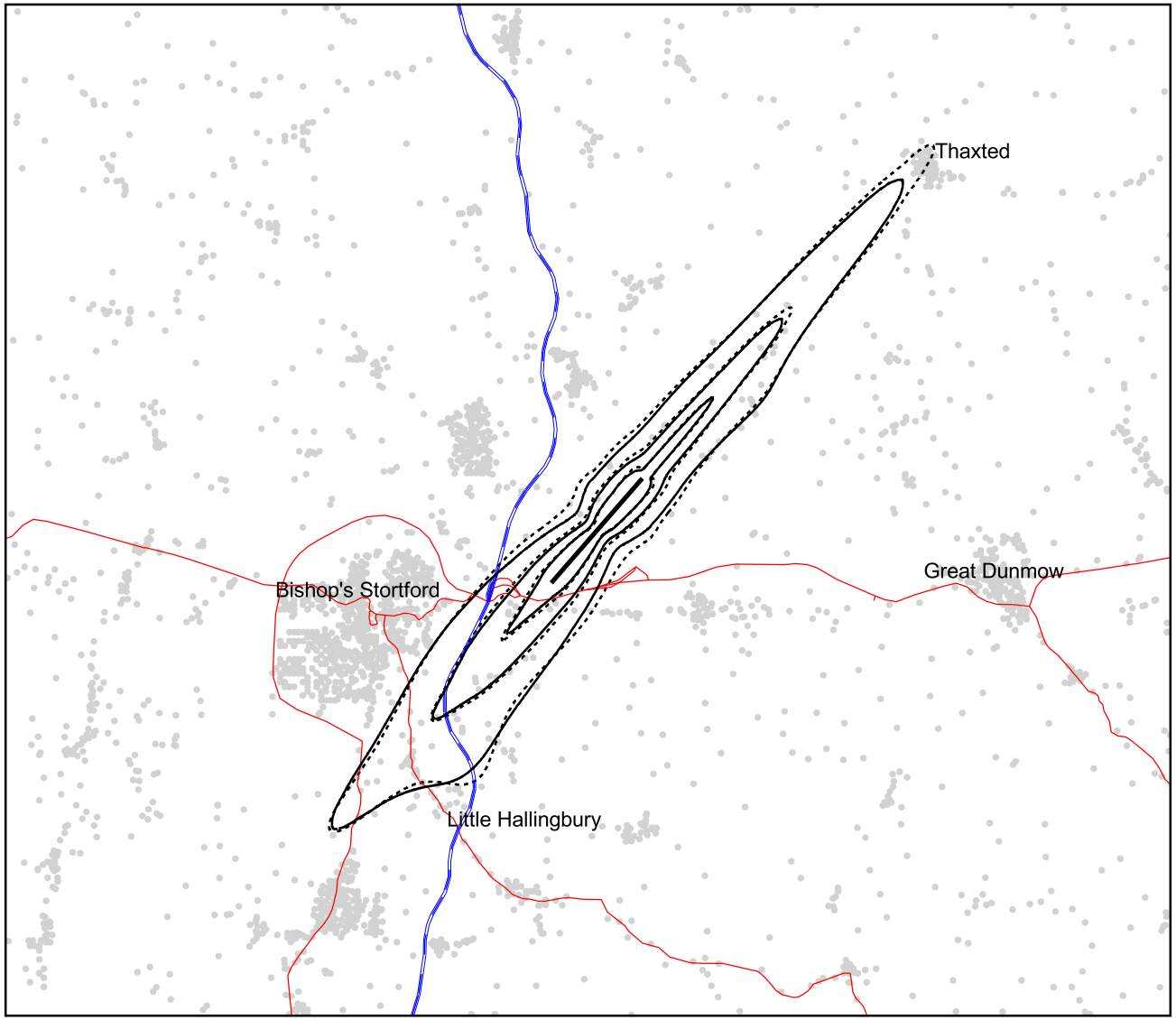


Figure 5: Stansted standard 57, 63 and 69 Leq contours - 2004 dotted (74% SW - 26% NE) - 2005 solid (73% SW - 27% NE)

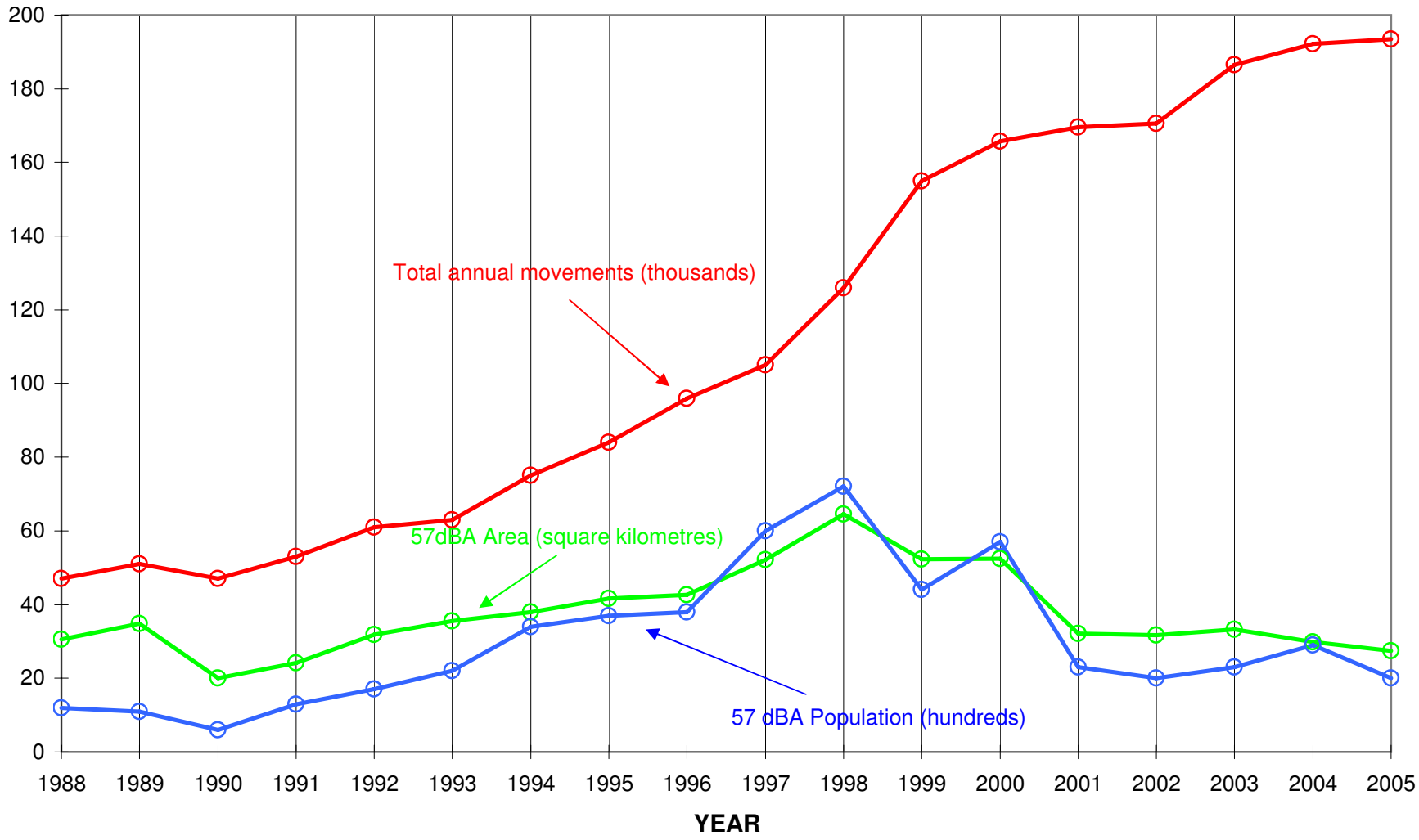


Figure 6: Stansted traffic and noise 1988 - 2005