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

ERCD Report 0503

Noise Exposure Contours for Stansted Airport 2004

D J Monkman
D P Rhodes
J Deeley

Prepared by the Civil Aviation Authority on behalf of the Department for Transport, London, August 2005

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

File Reference
4ER/2/1/1

ERCD REPORT 0503

Noise Exposure Contours for Stansted Airport 2004

D J Monkman
D P Rhodes
J Deeley

SUMMARY

This report describes the calculations of the aircraft noise exposure around London Stansted Airport for the year 2004 and compares both the input data and the resulting contours, together with the areas and populations within the contours, with those for 2003.

Prepared by the CAA on behalf of the Department for Transport, August 2005

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

Population data used in this report are based on 2001 Census data (updated in 2002 and 2003) 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 2004 and compares both the air traffic information and the noise contours with those for 2003. As for 2003, the 2004 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 2003 contours are based on the 2001 census (updated by CACI in 2002), populations within the 2004 contours are also based on the 2001 census but updated by CACI in 2003.

The average daily aircraft movement rate was 1.7% higher in 2004 than in 2003. The actual modal split in 2004 was 80% south-west - 20% north-east compared with 67% south-west - 33% north-east in 2003. The standard modal split (20 year average) in 2004 was 74% south-west – 26% north-east.

Relative to 2003, the total area within the 57 dBA Leq (16-hour) contour decreased by 10.2%, however the population within this contour increased by 26%.

CONTENTS **Page No**

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, R&D Report 9842 and ERCD Report 0104[1] (Refs 2, 3 and 4 respectively). Technical terms used here are described in those references.

1.2 This document contains small scale (1:150,000) diagrams of the 2003 Stansted Leq contours. Contours overlaid on OS maps to scale 1:50,000, or in AutoCad DXF format on CD-ROM, are available for purchase from the Department for Transport, Aviation Environmental Division, Zone 1/33, Great Minster House, 76 Marsham Street, London SW1P 4DR, telephone 020-7944-5494, e-mail address aed@dft.gsi.gov.uk. The previous practice of producing translucent acetate overlays to scale 1:50,000 has now been discontinued.

1.3 This report provides supporting information and compares both the aircraft operations and the resulting noise contours with those for 2003 (Ref 5).

1.4 New analyses of radar and noise data were undertaken in 2004, 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.

1.5 To remove the effect of year-on-year weather fluctuations on aircraft operations in order to clarify underlying trends, two sets of contours for 2004 have been generated; (i) the *actual* modal split and (ii) the "*standard"* modal split. In 2004 the actual modal split was 80% south-west - 20% north-east compared to 67% south-west - 33% north-east in 2003. For 2003 the standard modal split was 74% south-west - 26% north-east (based on the 20 year Leq period average 1984 to 2003 inclusive); for 2004 the standard modal split remained unchanged at 74% south-west - 26% north-east (based on the 20 year Leq period average 1985 to 2004 inclusive). This report compares both actual and standard contours for 2003 and 2004.

1.6 As in 2003, the 2004 contours shown in this report take into account the topography around Stansted by accounting for terrain height in the modelling process. This was achieved by geometrical corrections for source-receiver distance and elevation angles, other more complex effects such as lateral attenuation from uneven ground surfaces and noise screening/reflection effects due to topographical features were not taken into account. ERCD holds terrain height data[2] obtained from Ordnance Survey on a 200m by 200m grid for England and Wales. Interpolation was

---

[1] Work on this Report has, for some time, been integrated into updating European Noise Modelling Guidance, which will culminate in an updated ECAC.CEAC Document 29, 'Methodology for Computing Noise Contours around Civil Airports'. A proposal from the AIRMOD Technical Subgroup was considered by Directors General in Summer 2004 and a draft report Volumes 1 and 2 has been published on the ECAC web site (www.ecac-ceac.org). 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.

[2] Meridian® 2 data revised 2003.

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 2003 and 2004 Leq periods.

2.1.2 The 2004 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 2004.

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 2004 measurements of arrivals on Runway 23 showed that, within the area of interest, 62% of aircraft approached from the western side of the airport and 38% from the eastern side of the airport. The comparable percentages for arrivals on Runway 05 were 88% from the western side and 12% from the eastern side of the airport. For Runway 23 the spur route segments joined the runway extended centre-line at distances ranging from 9 to 25 kilometres from touchdown, for Runway 05 the distances ranged from 9 to 20 kilometres.

2.2 Flight Profiles and Noise Emissions

2.2.1 For 2004, 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 Examination of the 2004 radar data indicated that, as in the preceding years, at distances greater than 10 kilometres to touchdown, the average aircraft heights for 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 2004 calculations, separate Runway 23 and 05 descent profiles were used to describe arrivals by all aircraft types at Stansted.

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

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 2004 average Leq 16-hour day movement rate was 1.7% higher than in 2003.

2.3.2 Table 2 compares the distribution of aircraft departures by route for 2003 and 2004. The percentages of use of each runway direction - the actual modal splits for 2004 were 80% south-west - 20% north-east, compared with 67% south-west - 33% north-east in 2003.

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 2003 and 2004. 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 2003	AVERAGE NUMBER 2004	PERCENTAGE OF TOTAL 2004 MOVEMENTS	CHANGE AS PERCENTAG OF TOTAL 2003 MOVEMENTS
	PROPELLER AIRCRAFT				
1	Small props	2.1	0.4	0.1	-0.4
2	Large props	20.4	23.9	4.9	+0.7
	CHAPTER 3 JETS				
3	Short-haul	380.1	436.3	89.0	+11.7
4	Wide-body twins	4.6	5.2	1.1	+0.1
5	2nd gen wide body multis*	8.5	8.8	1.8	+0.1
	LARGE CHAPTER 2/3 JETS				
6	1st gen wide-body multis*	1.8	1.9	0.4	0.0
	2 nd GENERATION TWIN JETS				
7	Narrow body twins (including Chapter 2 and hushkitted versions)	62.8	12.9	2.6	-10.4
	1 st GENERATION JETS				
8	Narrow body multis (including hushkitted versions)	1.5	0.6	0.1	-0.2
	TOTAL MOVEMENTS	481.8	490.0	100.0**	+1.7**

* 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 380.1 in 2003 to 436.6 in 2004. Operations by 1st and 2nd generation jets (noise classes 7 and 8) both decreased in 2004.

2.3.5 Figure 2 illustrates the changing distribution of traffic (both circuit and non-circuit prior to 2002) among these classes over the seventeen years from 1988 to 2004[4] inclusive.

3 NOISE CONTOURS

3.1 'Actual' contours

3.1.1 The actual Leq contours for 2004 (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 2003.

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
	2003 ACTUAL	2004 ACTUAL		2003 ACTUAL (2002 CACI data)	2004 ACTUAL (2003 CACI data)	
>57	33.3	29.9	-10.2	2.3	2.9	+26.0
>60	19.9	17.5	-12.1	1.3	1.0	-23.1
>63	11.7	9.9	-15.4	0.5	0.3	*
>66	6.6	5.4	-18.2	0.2	0.1	*
>69	3.5	2.8	-20.0	<0.1	<0.1	*
>72	1.8	1.4	-22.2	<0.1	<0.1	*

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

Despite the increase in traffic, the areas within the actual 2004 Leq contours all decreased ranging from 10.2% at 57 dBA Leq to 22.2% at 72 dBA Leq. Based on the 2003 CACI data, the population within the terrain adjusted 2004 57 dBA Leq contour increased by 26% relative to 2003 (using the earlier 2002 CACI data would have yielded the same percentage increase). 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.

3.1.3 It can be seen from Figure 4 that the 2004 contours to the north east of the airport have elongated whilst those to the south west of the airport have diminished (most noticeably for the 57 dBA Leq contour). This is due to a combination of effects; the change in modal split and the large change in fleet mix between aircraft in noise class 3 (specifically the B737-800/900 which increased by 32.5%) and noise class 7 (specifically the B737-200 Ch3 which decreased by 79.7%), between 2003 and 2004. The elongation of the 57dBA Leq contour to the north east of the airport (to encroach Thaxted) generally reflects the 13% increase in arrivals to Runway 23. The 2004

[4] The 1990 to 2004 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 2002 and 2003). Note also that area and population figures presented in this Report are cumulative.

contours to the south west of the airport, reflecting 80% of the departures from Runway 23 and 20% of the arrivals to Runway 05 have generally diminished.

3.1.4 Although departures from Runway 23 increased by 13% in 2004, the potential increase in contours has not materialised. This is because the departure noise footprint for the B737-800/900 is substantially smaller than that for the B737-200 Ch3 aircraft (even though the –800/900 is a larger aircraft than the –200 Ch3). However, the arrival noise footprint for the B737-800/900 is only marginally smaller than that for the B737-200 Ch3 and therefore the relatively large reduction in the Stansted contours to the south west (associated mostly with departures) does not occur to the north east of the airport (where the contours are mainly associated with arrivals). The increase in population within the 2004 57 dBA Leq contour is because this contour encroached into Thaxted, a relatively highly populated area to the north east of the airport.

3.2 'Standard' contours

3.2.1 In Figure 5 the standard terrain adjusted 2004 contours (57, 63 and 69 dBA Leq) are compared with the standard contours for 2003. These show what the noise exposures would have been if the 2004 and 2003 modal split had mirrored a long-term rolling average modal split. The 2003 standard contours were based on the 20 year average modal split from 1984 to 2003 inclusive of 74% south-west / 26% north-east; those for 2004 were based on the 20 year average modal split from 1985 to 2004 inclusive which was also 74% south-west / 26% north-east. The associated areas and populations are displayed below:

Leq LEVEL dBA	AREA SQ KM		PERCENTAGE CHANGE	POPULATION 000's		PERCENTAGE CHANGE
	2003 STANDARD	2004 STANDARD		2003 STANDARD (2002 CACI data)	2004 STANDARD (2003 CACI data)	
>57	33.5	29.7	-11.3	2.9	2.7	-6.9
>60	20.0	17.4	-13.0	1.3	1.0	-23.1
>63	11.7	9.9	-15.4	0.5	0.3	*
>66	6.6	5.4	-18.2	0.2	0.1	*
>69	3.5	2.7	-22.9	<0.1	<0.1	*
>72	1.8	1.4	-22.2	<0.1	<0.1	*

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

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 2004 contours to the south west of the airport (mainly associated with departures from Runway 23) are smaller than those for 2003. As stated in paragraph 3.1.2, this is because the departure noise footprint for the B737-800/900 is substantially smaller than that for the B737-200 Ch3 aircraft. The standard terrain adjusted 2004 contours to the north east of the airport (mainly associated with arrivals to Runway 23) are very similar to those for 2003 because the arrival noise footprint for the B737-800/900 is only marginally smaller than that for the B737-200 Ch3 and therefore the relatively large reduction in the Stansted contours to the south west (associated mostly with departures) is not

replicated. The enclosed populations within the terrain corrected 2004 contours are also lower than those for 2003.

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 2004 was about 3.1% higher than that for 2003 compared with the 1.7% increase for the 16 hour average summer day.

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 increase in traffic in 2004, the area within the 57 dBA Leq contour decreased slightly relative to 2003 although the population within this contour increased. This population increase was mainly due to the increase in the number of operations to/from Runway 23 in 2004, which caused the contour to encroach into Thaxted.

[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.

REFERENCES

1 Critchley J B, Ollerhead J B
The Use of Leq as an Aircraft Noise Index
DORA Report 9023

2 Ollerhead J B
The CAA Aircraft Noise Contour Model: ANCON Version 1
DORA Report 9120

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

4 Smith M J T, Ollerhead J B, Rhodes D P, White S, Woodley A C
Development of an Improved Lateral Attenuation Adjustment
for the UK Aircraft Noise Contour Model, ANCON
ERCD Report 0104 (to be superseded by updated Document 29)

5 Monkman D J, Rhodes D P, Deeley J
Noise Exposure Contours for Stansted Airport 2003
ERCD Report 0403

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 2003	AVERAGE NUMBER 2004	PERCENTAGE OF TOTAL 2004 MOVEMENTS	CHANGE AS PERCENTAGE OF TOTAL 2003 MOVEMENTS
Small Props	1	2.1	0.4	0.1	-0.4
Large Props	2	20.4	23.9	4.9	+0.7
B737-300,400,500	3	149.8	157.9	32.2	+1.7
B737-600,700	3	14.7	38.6	7.9	+5.0
B737-800,900	3	143.4	190.0	38.8	+9.7
B757E (RB211-535E4, E4B)	3	7.6	6.7	1.4	-0.2
B757C (RB211-535C)	3	0.1	0.1	0.0	0.0
B757P (PW engines)	3	0.3	0.2	0.0	0.0
BAe146	3	30.3	4.4	0.9	-5.4
A319C (CFM-56)	3	1.9	3.2	0.7	+0.3
A319V (IAE-V2500)	3	0.1	0.1	0.0	0.0
A320C (CFM-56)	3	8.0	5.7	1.2	-0.5
A320V (IAE-V2500)	3	2.0	3.1	0.6	+0.2
A321C (CFM56)	3	4.0	4.7	1.0	+0.1
A321V (IAE-V2500)	3	0.5	1.0	0.2	+0.1
Business Jet (Ch 3)	3	12.4	11.5	2.3	-0.2
ERJ Embraer EMB 135/145	3	2.2	0.5	0.1	-0.4
F100	3	0.1	6.6	1.3	+1.3
MD80	3	2.7	2.0	0.4	-0.1
B767-200	4	0.6	0.3	0.1	-0.1
B767-300G (General Electric)	4	1.7	2.4	0.5	+0.1
B767-300P (Pratt and Whitney)	4	0.0	0.1	0.0	0.0
B777-200G (General Electric)	4	0.2	0.2	0.0	0.0
A300	4	1.2	1.8	0.4	+0.1
A310	4	0.8	0.1	0.0	-0.1
A330	4	0.1	0.3	0.1	0.0
B747-400G (General Electric)	5	3.3	3.9	0.8	+0.1
B747-400P (Pratt and Whitney)	5	0.1	0.2	0.0	0.0
B747SP	5	0.3	0.4	0.1	0.0
MD11	5	4.8	4.3	0.9	-0.1
B747-200, -300 (Ch 3)	6	1.4	1.6	0.3	0.0
DC10	6	0.2	0.0	0.0	0.0
Tristar	6	0.2	0.3	0.1	0.0
B737-200 (Ch3)	7	62.5	12.7	2.6	-10.3
DC9 (Ch 3)	7	0.1	0.1	0.0	0.0
Business Jet (Ch 2)	7	0.2	0.1	0.0	0.0
B707, DC8*	8	0.4	0.1	0.0	-0.1
B727 (Ch 3)	8	0.5	0.4	0.1	0.0
Tu154M*	8	0.6	0.0	0.0	-0.1
VC10,IL62*	8	0.0	0.1	0.0	0.0
TOTAL MOVEMENTS		481.8	490.0	100.0**	+1.7**

* In 2003 and 2004 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 2003	PERCENTAGE OF TOTAL DEPARTURES 2004	CHANGE (% OF TOTAL)
BUZ/BKY/CPT	37.3	41.3	+4.0
CLN	19.5	22.3	+2.8
DVR/LAM/LYD	10.2	16.4	+6.2
VFR**	0.0	0.0	0.0
PERCENTAGE SOUTH WEST	67.0	80.0	+13.0
NORTH EASTERLY DEPARTURE ROUTE	PERCENTAGE OF TOTAL DEPARTURES 2003	PERCENTAGE OF TOTAL DEPARTURES 2004	CHANGE (% OF TOTAL)
BUZ/BKY/CPT	17.5	10.1	-7.4
CLN	9.2	5.5	-3.7
DVR/LAM/LYD	6.3	4.4	-1.9
VFR**	0.0	0.0	0.0
PERCENTAGE NORTH EAST	33.0	20.0	-13.0

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

Intentionally Blank

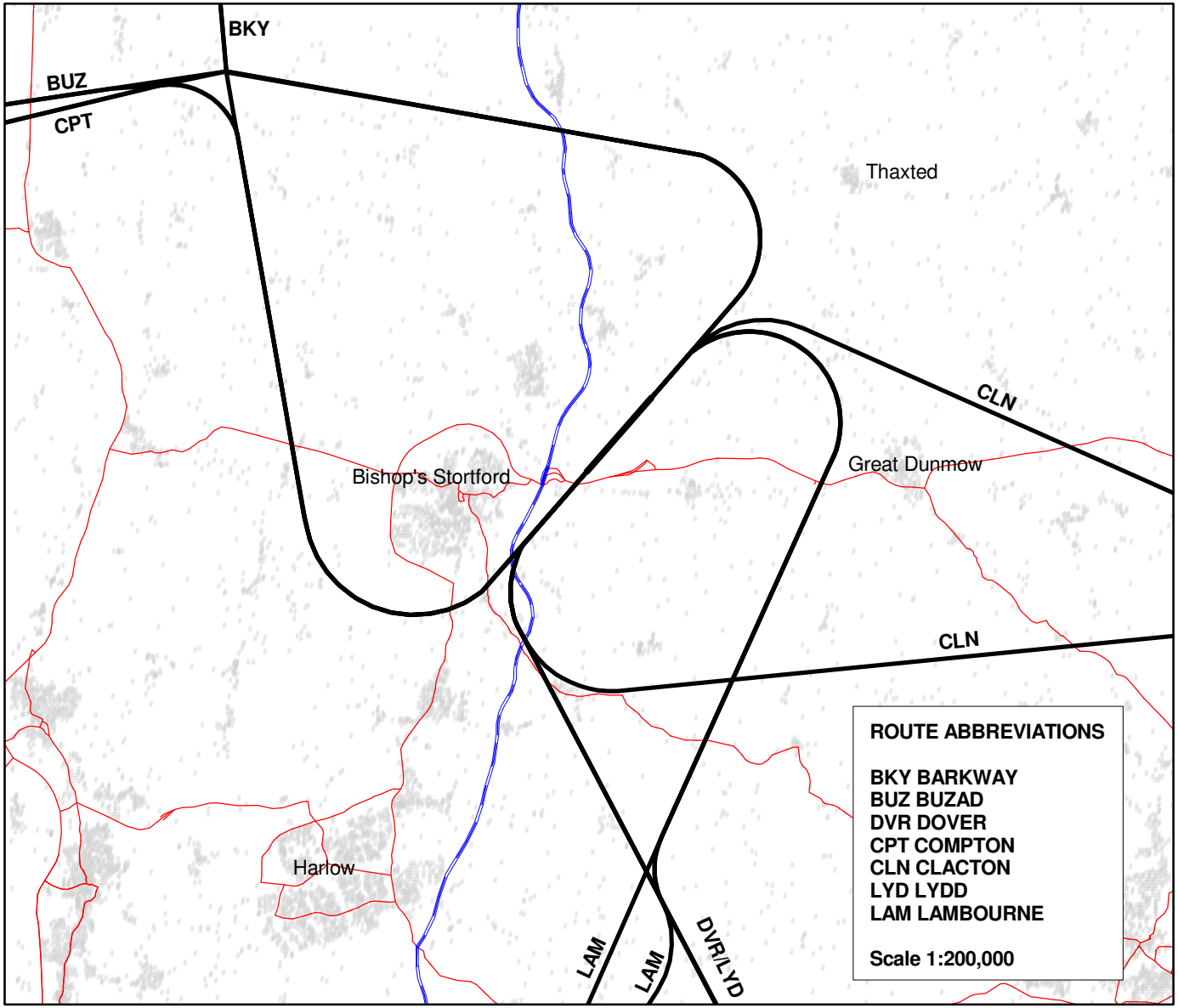
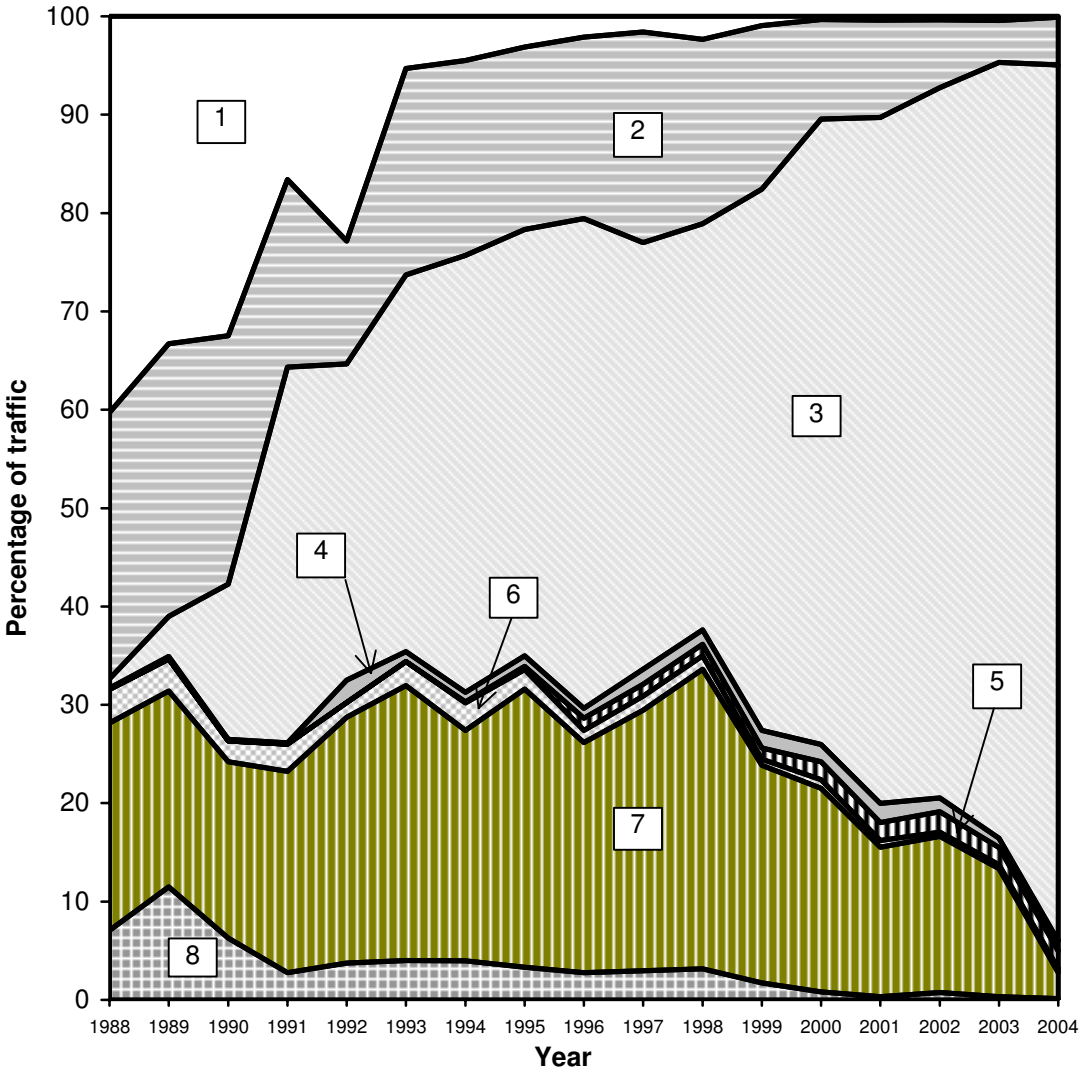


Figure 1: London Stansted Airport Standard Instrument Departure Routes



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 - 2004

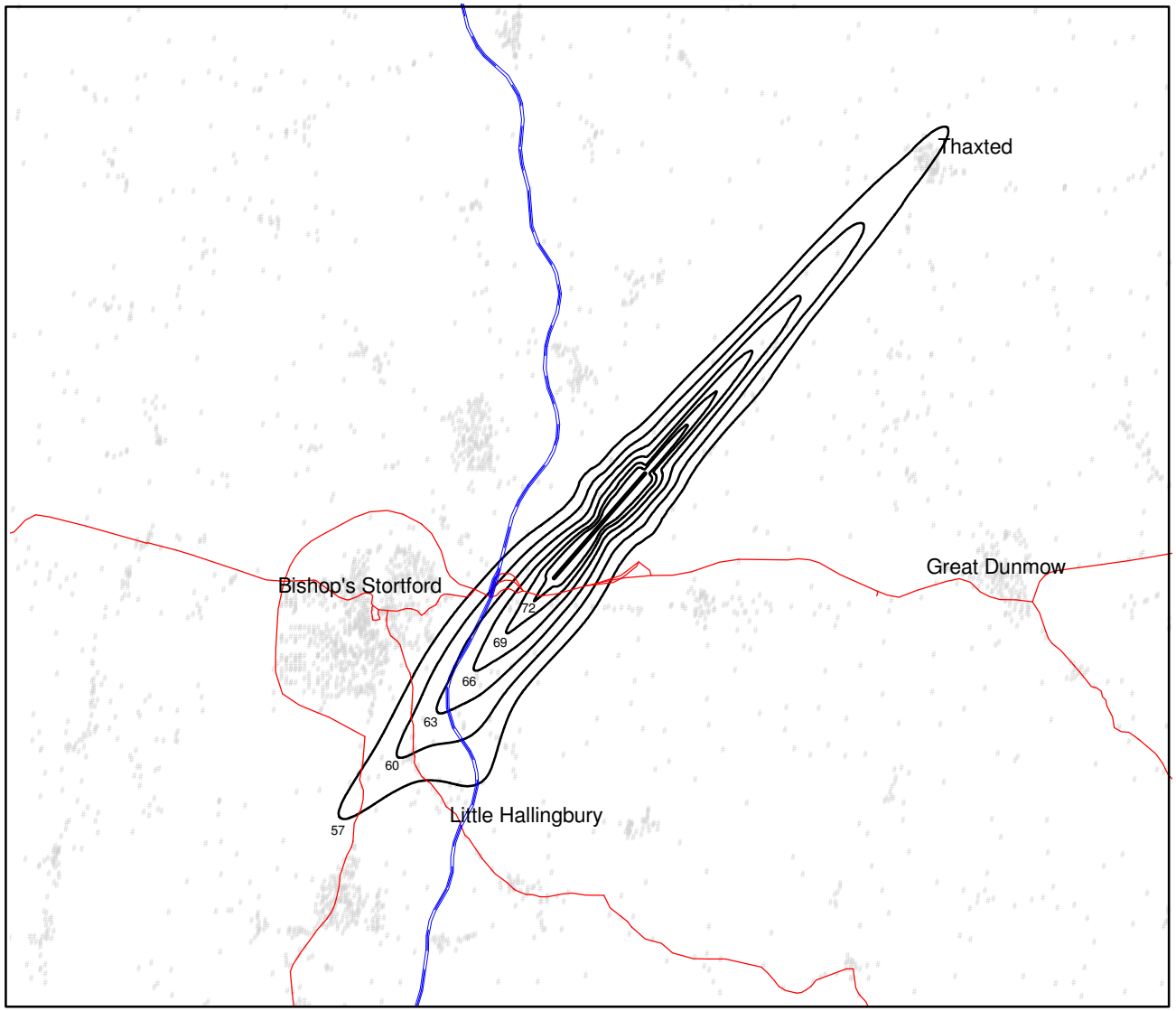


Figure 3: Stansted actual 2004 average mode (80% SW - 20% NE) terrain adjusted 16 hr Leq on population map

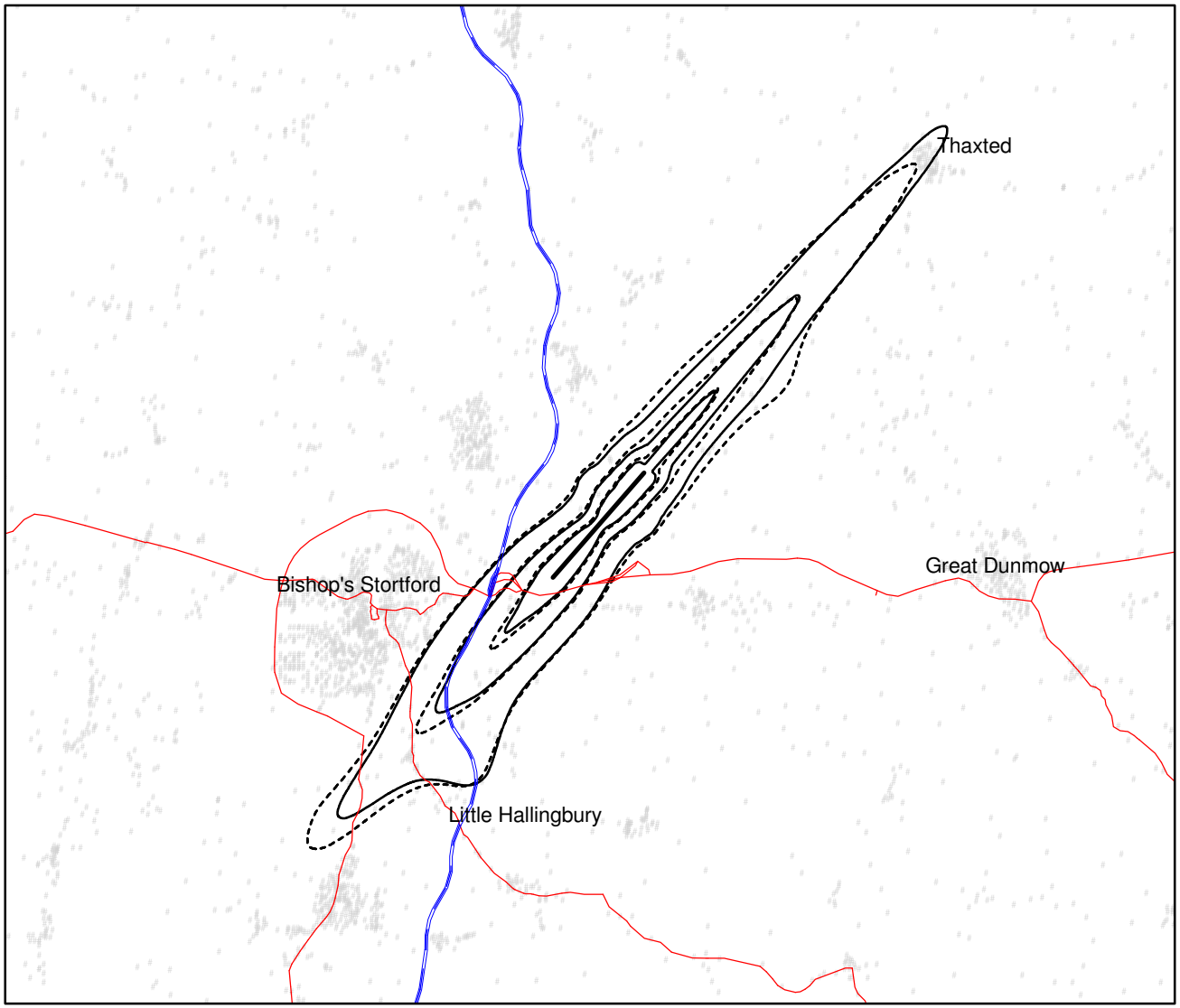


Figure 4: Stansted actual 57, 63 and 69 Leq contours - 2003 dotted (67% SW - 33% NE) - 2004 solid (80% SW - 20% NE)

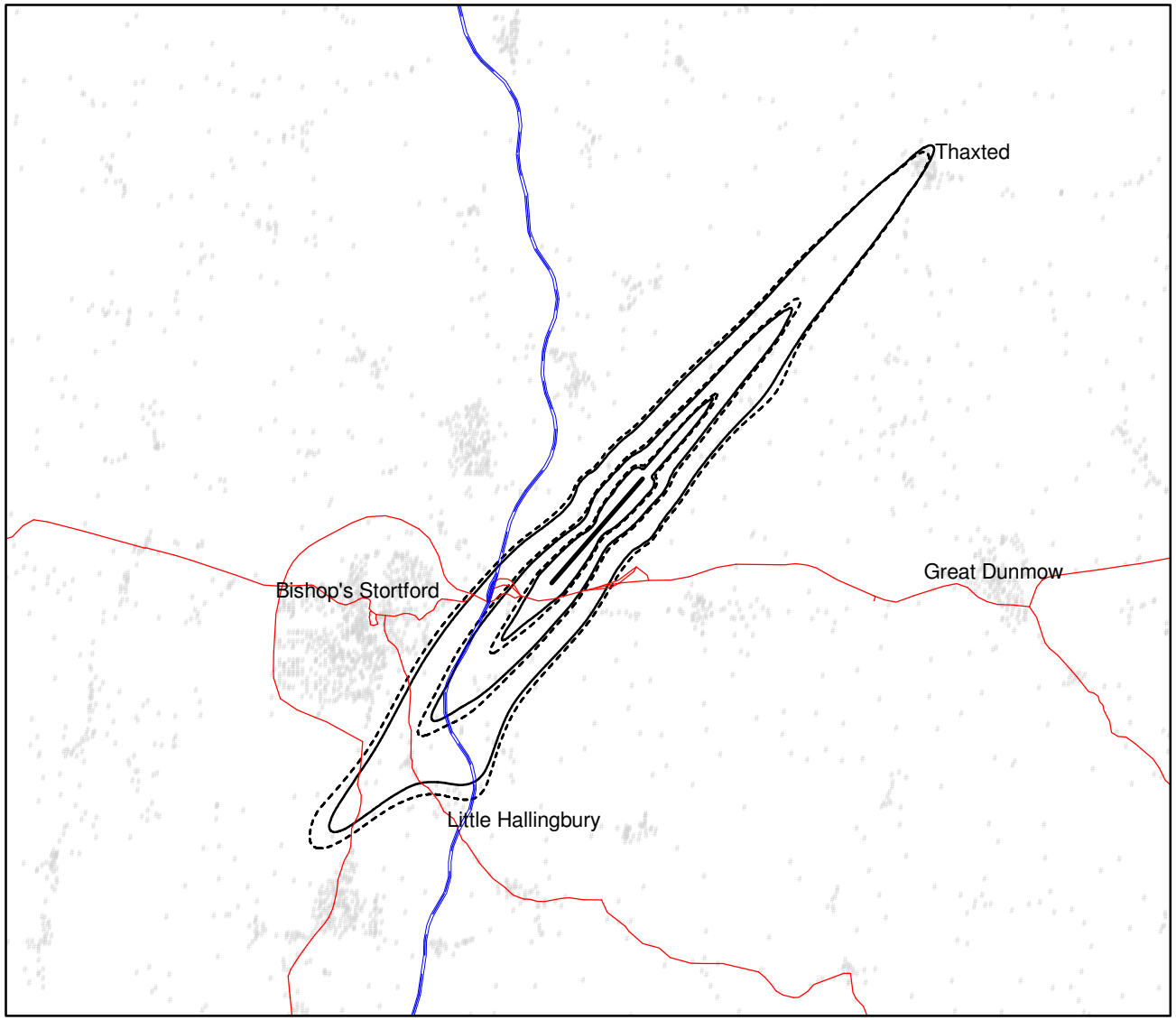


Figure 5: Stansted standard 57, 63 and 69 Leq contours - 2003 dotted (74% SW - 26% NE) - 2004 solid (74% SW - 26% NE)

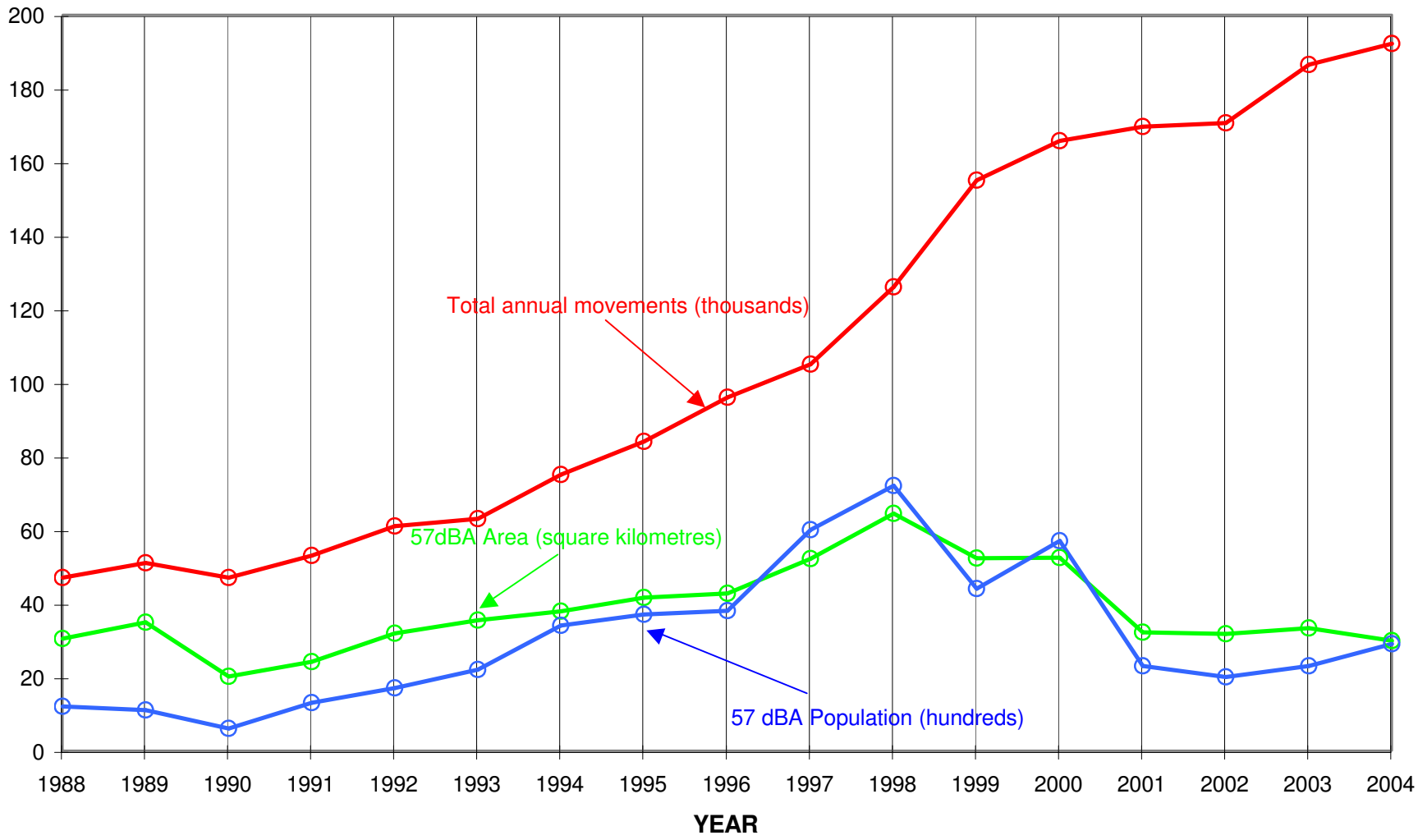


Figure 6: Stansted traffic and noise 1988 - 2004