Environmental Research and Consultancy Department
Civil Aviation Authority

ERCD REPORT 1303

Noise Exposure Contours for Stansted Airport 2012

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Prepared by the Civil Aviation Authority on behalf of the Department for Transport, September 2013

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Summary

This report presents the year 2012 noise exposure contours for London Stansted Airport. The 57 dBA Leq contour area for 2012 based on the actual runway modal split was calculated to be 21.1 km^2, which was 0.5% smaller than in 2011. The population enclosed within the actual 57 dBA contour was unchanged from 2011 at 1,250.

September 2013

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.

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 for 2012) supplied by CACI Information Services.

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Glossary

AIP Aeronautical Information Publication.

ANCON The UK civil aircraft noise contour model, developed and maintained by ERCD.

ATC Air Traffic Control.

CAA Civil Aviation Authority – the UK's independent specialist aviation regulator.

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.

CDA Continuous Descent Approach.

DfT Department for Transport (UK Government).

ERCD Environmental Research and Consultancy Department of the Civil Aviation Authority.

Leq Equivalent sound level of aircraft noise in dBA, often called 'equivalent continuous sound level'. For conventional historical contours this is based on the daily average movements that take place within the 16-hour period (0700-2300 local time) over the 92-day summer period from 16 June to 15 September inclusive.

NPD Noise-Power-Distance.

NPR Noise Preferential Route.

NTK Noise and Track Keeping monitoring system. The NTK system associates radar data from air traffic control radar with related data from both fixed (permanent) and mobile noise monitors at prescribed positions on the ground.

OS Ordnance Survey®, Great Britain's national mapping agency.

SEL The Sound Exposure Level generated by a single aircraft at the measurement point, measured in dBA. This noise metric accounts for the duration of the sound as well as its intensity.

SID Standard Instrument Departure.

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Executive Summary

This report presents noise exposure contours generated for London Stansted Airport for the year 2012. The noise modelling used radar and noise data from Stansted's Noise and Track Keeping (NTK) System. Mean flight tracks and lateral dispersions for each route, and average flight profiles of aircraft height, speed and thrust for each aircraft type, were calculated using these data.

Analysis of the 2012 summer traffic data for Stansted revealed that average daily movements (369.6) decreased by 3% compared to 2011 (381.0).

The area of the 2012 'actual' modal split (85% south-west / 15% north-east) 57 dBA Leq contour decreased by 0.5% to 21.1 km^2 from 2011. This is the lowest area calculated for Stansted since 1990 (1990: 20.1 km^2). The population count of 1,250 within the 2012 actual 57 dBA contour was unchanged from 2011.

The area of the 2012 'standard' modal split (71% south-west / 29% north-east) 57 dBA Leq contour also decreased, by 0.5% to 20.9 km^2 and as such is well below the Planning Condition AN1 contour area limit of 33.9 km^2. The population count within the 57 dBA standard contour was 4% lower compared to 2011 at 1,250.

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1 Introduction

1.1 Background

1.1.1 Each year the Environmental Research and Consultancy Department (ERCD) of the Civil Aviation Authority (CAA) calculates the noise exposure around London Stansted Airport on behalf of the Department for Transport (DfT). A computer model, ANCON, validated with noise measurements, is used to estimate the noise exposure. The model calculates the emission and propagation of noise from arriving and departing air traffic.

1.1.2 The noise exposure metric used is the Equivalent Continuous Sound Level, or Leq 16-hour (0700-2300 local time), which is calculated over the 92-day summer period from 16 June to 15 September. The background to the use of this index is explained in DORA Report 9023 (**Ref 1**).

1.1.3 Noise exposure is depicted in the form of noise contours, i.e. lines joining places of constant Leq, akin to the height contours shown on geographical maps or isobars on a weather chart. In the UK, Leq noise contours are normally plotted at levels from 57 to 72 dBA, in 3 dB steps.[1] The 57 dBA level denotes the approximate onset of significant community annoyance.

1.1.4 This report contains small-scale diagrams of the year 2012 Stansted Leq contours overlaid onto Ordnance Survey® (OS) base maps. Diagrams in Adobe® PDF and AutoCAD DXF format are also available for download from the DfT website[2].

1.1.5 The objectives of this report are to explain the noise modelling methodology used to produce the year 2012 Leq contours for Stansted Airport, to present the calculated noise contours and to assess the changes to the contours relative to the previous year (**Ref 2**).

[1] Aircraft noise contours are also produced on behalf of airports for the specific purpose of meeting the requirements of the Environmental Noise (England) Regulations 2006, which implemented Directive 2002/49/EC, Assessment and Management of Environmental Noise, in England. These are based on annual average values and require the use of different parameters (L_{day}, $L_{evening}$, L_{night}, $L_{eq,16hr}$ and L_{den} at 5 dB steps), so it is not possible to draw meaningful conclusions between the two types of contour maps. Further details about Directive 2002/49/EC are available on the Department for Environment, Food and Rural Affairs website at *www.gov.uk/defra* as well as ERCD Reports 1204, 1205 and 1206 (available from *www.caa.co.uk*), which cover Heathrow, Gatwick and Stansted 2011 noise mapping respectively.

[2] www.gov.uk/dft

1.2 Stansted Airport

1.2.1 Stansted Airport is situated 35 miles (56 km) north-east of London and is surrounded by countryside and small villages to the north, south and east, and by the town of Bishop's Stortford to the west (**Figure 1**).

1.2.2 Stansted Airport has a single runway (04/22), which is 3,049 m long. The landing threshold[3] for Runway 04 is displaced by 300 m. There is one main passenger terminal. The layout of the runway, taxiways and passenger terminal in 2012 is shown in **Figure 2**.[4]

1.2.3 In the 2012 calendar year there were 144,000[5] aircraft movements (2011: 148,000) at Stansted Airport, handling approximately 17.5 million passengers (2011: 18.1 million).[6]

1.2.4 Following the granting of planning permission for the Stansted G1 proposal on 8 October 2008, the following planning condition (Planning Condition AN1) came into force:

> "The area enclosed by the 57dB(A) Leq16hr (0700-2300) contour, when calculated and measured by the Civil Aviation Authority's Aircraft Noise Contour Model 2.3 or as may be amended, shall not exceed 33.9 sq km using the standardised average mode from the date of grant of this permission. Any necessary account shall be taken of this requirement in declaring the capacity of Stansted Airport for the purpose of Council Regulation (EEC) No 95/93 of 18 January 1993 on common rules for the allocation of slots at Community airports. Forecast aircraft movements and consequential noise contours for the forthcoming year shall be reported to the Local Planning Authority annually on the 31st January each year."

1.2.5 Based on the above planning condition, the area of the standard (i.e. 20-year average) runway modal split 57 dBA Leq contour is not to exceed a limit of 33.9 km^2.

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

[4] UK AIP (28 July 11) AD 2-EGSS

[5] To the nearest thousand.

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

2 Noise contour modelling methodology

2.1 ANCON noise model

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

2.1.2 ANCON is fully compliant with the latest European guidance on noise modelling, ECAC.CEAC Doc 29 (3rd edition), published in December 2005 (**Ref 4**). This guidance document represents internationally agreed best practice as implemented in modern aircraft noise models.

2.2 Radar data

2.2.1 The noise modelling carried out by ERCD made extensive use of radar data extracted from Stansted Airport's Noise and Track Keeping (NTK) system. Most large airports have NTK systems, which take data from Air Traffic Control (ATC) radars and combine them with flight information such as call sign, tail number, type and destination. Analyses of departure and arrival flight tracks, and flight profiles, were based on Stansted 2012 summer radar data.

2.3 Flight tracks

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

2.3.2 Associated with each NPR is a lateral swathe, which is defined by a pair of lines that diverge at 10 degrees from a point 2,000 m from start-of-roll, leading to a corridor extending 1.5 km either side of the nominal NPR centreline. Within this swathe the aircraft are considered to be flying on-track. The swathe takes account of various factors that affect track-keeping, including tolerances in navigational equipment, type and weight of aircraft, and weather conditions – particularly winds that may cause drifting when aircraft are turning. Aircraft reaching an altitude of

4,000 ft[7] at any point along an NPR may be turned off the route by ATC onto more direct headings to their destinations – a practice known as 'vectoring'. ATC may also vector aircraft from NPRs below this altitude for safety reasons, including in certain weather conditions (for example, to avoid storms).

2.3.3 Departure and arrival flight tracks were modelled using samples of radar data extracted from the Stansted NTK system over the 92-day summer period, 16 June to 15 September 2012. **Figure 4** shows a sample of radar flight tracks from a day in July 2012. ERCD used in-house radar analysis software to calculate mean departure flight tracks and associated lateral dispersions for each NPR/SID. Arrival tracks for Runways 04 and 22 were modelled using evenly spaced 'spurs' about the extended runway centrelines. The majority of arriving aircraft joined the centrelines at distances between 10 and 18 km from threshold for Runway 04, and between 11 and 24 km from threshold for Runway 22.

2.4 Flight profiles

2.4.1 For each ANCON aircraft type, average flight profiles of height, speed and thrust versus track distance (for departures and arrivals separately) were reviewed and updated where necessary, using 2012 summer radar data. The engine power settings required for the aircraft to follow the average height and speed profiles were calculated from data describing aircraft performance characteristics within each of the different aircraft type categories.

2.4.2 Examination of the 2012 radar data indicated that, as in the preceding years, at distances greater than 10 km from the runway threshold, the average aircraft heights for arrivals on Runway 04 were generally somewhat lower than on Runway 22. This follows the introduction of Continuous Descent Approach (CDA) for Runway 22 arrivals via the Abbott stack from 4 November 1999 and its extension to all Runway 22 arrivals in 2000. Separate Runway 22 and Runway 04 descent profiles were therefore used to describe arrivals for all aircraft types.

2.4.3 The application of reverse thrust following touchdown was modelled for all ANCON types where applicable.

2.5 Noise emissions

2.5.1 At Stansted, the NTK system captures data from both fixed and mobile noise monitors around the airport. Noise event data for individual aircraft operations are then matched to operational data provided by the airport. The Stansted NTK system comprises eight fixed monitors (positioned approximately 6.5 km from

[7] 3,000 ft for those on the 'Buzad' departure routes in the period 0600-2330.

start-of-roll), together with a number of mobile monitors that can be deployed anywhere within the NTK radar coverage area.[8]

2.5.2 The noise data collected are screened by ERCD with reference to several criteria so that only high quality data are used in the analysis. First of all, noise data that lie outside a 'weather window' are discarded. This ensures that the data used are not affected by adverse meteorological conditions such as precipitation and strong winds. Secondly, the maximum noise level of the aircraft event must exceed the noise monitor threshold by at least 10 dB to avoid underestimates of the Sound Exposure Level (SEL)[9]. Thirdly, only measurements obtained of aircraft operations that pass through a 60-degree inverted cone, centred at the noise monitor, are retained in order to minimise the effects of lateral attenuation[10] and lateral directivity[11].

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

2.6 Traffic distributions

2.6.1 The Leq contours are based on the daily average movements that take place during the 16-hour day (0700-2300 local time) over the 92-day period from 16 June to 15 September inclusive. The source of this information is the NTK system, which stores radar data supplemented by daily flight plans. Traffic statistics from NTK data were cross-checked with runway logs supplied by NATS[12] and close agreement was found.

Traffic distribution by noise class

2.6.2 **Table 1** lists the average summer day movements[13] by eight noise classes of aircraft, ranked in ascending order of noise emission, i.e. from least to most noisy, in 2011 and 2012. As in 2011, the vast majority of movements (93%) were by

[8] Further information on the noise monitors can be found in ERCD Report 1004 (**Ref 5**).

[9] The Sound Exposure Level of an aircraft noise event is the steady noise level, which over a period of *one second* contains the same sound energy as the whole event. It is equivalent to the Leq of the noise event normalised to one second.

[10] Lateral attenuation is the excess sound attenuation caused by the ground surface, which can be significant at low angles of elevation.

[11] Lateral directivity is the non-uniform directionality of sound radiated laterally about the roll axis of the aircraft – this is influenced to a large extent by the positioning of the engines.

[12] NATS is the provider of air traffic control services to Stansted Airport.

[13] Includes departures and arrivals.

short-haul 'Chapter 3' and 'Chapter 4'[14] jet aircraft (Noise Class 3); however, their numbers declined by 2% to 344 per day in 2012. (Note: in 2012 an estimated 100% of the aircraft within Noise Class 3 were compliant with the Chapter 4 standard).

2.6.3 There were relatively few movements by aircraft in Noise Classes 2, 4 and 5, and almost insignificant numbers in Noise Classes 1, 6, 7 and 8. Noise Class 2 (i.e. large propeller aircraft) had the second highest number of aircraft, but comprised just 3% of total movements. This was closely followed by Noise Class 5 (second generation wide-body 3/4-engine aircraft e.g. Boeing 747-800), also making up 3% of total movements.

2.6.4 The average number of daily movements at Stansted over the 2012 summer period (369.6) was 3% lower than in 2011 (381.0).

2.6.5 **Figure 5** illustrates the changing distribution of traffic among the eight noise classes over the period from 1988 to 2012 inclusive. The increasing dominance of short-haul Chapter 3 & 4 jet movements (Noise Class 3) over the years at Stansted can be clearly seen.

Traffic distribution by ANCON aircraft type

2.6.6 A more detailed breakdown of the 2012 average summer day movements, indicating the ANCON aircraft types that fall into each noise class, is provided in **Table 2**. Comparison of the daily movement numbers for 2011 and 2012 shows that the largest reduction by far was for the ANCON type EA319C[15], with a decrease of 16 daily movements. The next largest decrease was for the LTT[16], down by four movements per day. The largest *increase* was an additional 9 daily movements for the ANCON type B738[17].

2.6.7 **Figure 6** illustrates the numbers of movements by ANCON aircraft type for the 2012 average summer day. The B738 was clearly the most common ANCON aircraft type at Stansted, with 232 daily movements (63% of total movements), followed by the EA319C, with 66 daily movements (18% of total movements).

2.6.8 The B738 was the noise dominant ANCON type at Stansted because it was responsible for the highest contribution of 'noise energy', which is a function of both aircraft noise level and movement numbers.

[14] Aircraft whose certificated noise levels are classified by the ICAO *Standards and Recommended Practices – Aircraft Noise: Annex 16 to the Convention on International Civil Aviation* into 'Chapter 3' and 'Chapter 4' types - these are typically characterised by modern, quieter, high-bypass turbofan aircraft.

[15] EA319C = Airbus A319 with CFM-56 engines

[16] LTT = 'Large Twin Turboprop'

[17] B738 = Boeing 737-800/900 series

Traffic distribution by SID route

2.6.9 **Figure 7** shows the distribution of departing aircraft by SID route for 2012, including figures from 2011 for comparison. As in the previous year, the Runway 22 BUZ/BKY/CPT SIDs took the highest proportion of departure traffic over the summer period (38%). A significant increase in traffic (+5%) was seen on the Runway 22 DVR/LAM/LYD SIDs in 2012. The BUZ/BKY/CPT SIDs from Runway 04 had the highest reduction of traffic (-4%).

2.7 Runway modal splits

2.7.1 In general, aircraft will take-off and land into a headwind to maximise lift during take-off and maximise deceleration upon landing. The wind direction, which varies over the course of a year, will therefore have an important influence on the usage of runways. The ratio of south-westerly (i.e. Runway 22) and north-easterly (i.e. Runway 04) operations is referred to as the *runway modal split*.

2.7.2 To remove the effect of year-on-year weather fluctuations on aircraft operations and to clarify underlying trends, two sets of contours have been produced for the year 2012:

(i) Contours using the 'actual' modal split over the Leq period; and

(ii) Contours assuming the 'standard' modal split over the Leq period, i.e. the long-term modal split calculated from the 20-year rolling average; for 2012, this is the 20-year period from 1993 to 2012. Use of the standard modal split enables year-on-year comparisons without the runway usage affecting the contour shape.

2.7.3 The actual and standard modal splits for 2012, together with the previous year, are summarised in the following table:

Stansted runway modal splits for 2012 and 2011

Modal split scenario	**% south-west (Runway 22)**	**% north-east (Runway 04)**
Actual 2012	85%	15%
Actual 2011	78%	22%
Standard 2012	71%	29%
Standard 2011	71%	29%

2.7.4 It can be seen that in 2012 the proportion of actual south-westerly movements (Runway 22) increased significantly, by 7%, compared to the previous year. However, the 2012 standard modal split was unchanged from 2011. Historical runway modal splits at Stansted for the past 20 years are summarised in **Figure 8**.

2.8 Topography

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

2.8.2 ERCD holds OS terrain height data[18] on a 200 m by 200 m grid for the whole of England. Interpolation was performed to generate height data at each of the calculation points on the receiver grid used by the ANCON noise model. The terrain heights in the vicinity of Stansted Airport are depicted diagrammatically in **Figure 9**.

2.9 Population and 'Points of Interest' databases

2.9.1 Estimates were made of the numbers of people and households enclosed within the noise contours. The population data used in this report are a 2012 update of the 2001 Census supplied by CACI Limited[19]. 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. The population data points for the area around Stansted Airport are illustrated in **Figure 10**.

2.9.2 Estimates have also been made of the numbers of noise sensitive buildings situated within the contours, using the *InterestMap*™[20] 'Points of Interest' (2012) database. For the purposes of this study, the noise sensitive buildings that have been considered are schools, hospitals and places of worship.

[18] Meridian™ 2

[19] www.caci.co.uk

[20] InterestMap is distributed by Dotted Eyes Ltd and derived from Ordnance Survey 'Points of Interest' data.

3 Noise contour results

3.1 Actual modal split contours

3.1.1 The Stansted 2012 Leq noise contours generated with the actual 2012 summer period runway modal split (85% south-west / 15% north-east) are shown in **Figure 11**. The contours are plotted from 57 to 72 dBA at 3 dB intervals.

3.1.2 The cumulative areas, populations and households within the contours are provided in the table below:

Stansted 2012 actual modal split contours: area, population and household estimates

Leq contour level (dBA)	Area (km^2)	Population	Households
> 57	21.1	1,250	500
> 60	11.1	450	150
> 63	6.0	100	50
> 66	3.0	< 50	< 50
> 69	1.6	0	0
> 72	0.9	0	0

Note: Populations and households are given to the nearest 50.

3.1.3 Estimates of the cumulative numbers of noise sensitive buildings within the actual modal split contours are provided in the table below:

Stansted 2012 actual modal split contours: noise sensitive building estimates

Leq contour level (dBA)	Schools	Hospitals	Places of worship
> 57	2	0	2
> 60	0	0	2
> 63	0	0	0
> 66	0	0	0
> 69	0	0	0
> 72	0	0	0

3.2 Standard modal split contours

3.2.1 The Stansted 2012 Leq noise contours generated with the standard 2012 summer period runway modal split (71% south-west / 29% north-east) are shown in **Figure 12**. The contours are plotted from 57 to 72 dBA at 3 dB intervals.

3.2.2 The cumulative areas, populations and households within the contours are provided in the table below:

Stansted 2012 standard modal split contours: area, population and household estimates

Leq contour level (dBA)	Area (km^2)	Population	Households
> 57	20.9	1,250	500
> 60	11.0	350	150
> 63	5.8	100	50
> 66	3.0	< 50	< 50
> 69	1.6	0	0
> 72	0.9	0	0

Note: Populations and households are given to the nearest 50.

3.2.3 Estimates of the cumulative numbers of noise sensitive buildings within the standard modal split contours are provided in the table below:

Stansted 2012 standard modal split contours: noise sensitive building estimates

Leq contour level (dBA)	Schools	Hospitals	Places of worship
> 57	2	0	2
> 60	0	0	2
> 63	0	0	0
> 66	0	0	0
> 69	0	0	0
> 72	0	0	0

4 Analysis of results

4.1 Actual modal split contours – comparison with 2011 contours

4.1.1 The Stansted 2012 actual modal split Leq contours are compared against the 2011 actual Leq contours in **Figure 13**. The table below summarises the areas, populations and percentage changes from 2011 to 2012:

Stansted actual modal split contours: areas and populations for 2011 and 2012

Leq (dBA)	2011 Area (km^2)	2012 Area (km^2)	Area change (%)	2011 Pop.	2012 Pop.	Pop. change (%)
> 57	21.2	21.1	-0.5%	1,250	1,250	0%
> 60	11.0	11.1	+1%	350	450	+29%
> 63	5.8	6.0	+3%	100	100	0%
> 66	3.0	3.0	0%	50	< 50	(n/a)
> 69	1.6	1.6	0%	0	0	(n/a)
> 72	0.9	0.9	0%	0	0	(n/a)

Note: The actual modal splits in 2011 and 2012 were 78% south-west / 22% north-east and 85% south-west / 15% north-east respectively.

4.1.2 Relative to 2011, the 57 dBA contour area decreased by 0.5%, with slight increases at the 60 and 63 dBA levels. Although total traffic fell by 3%, the proportion of the noise dominant aircraft type B738 increased by 4%, partially offsetting the reductions in EA319C and LTT movements (note: the B738 has a somewhat larger departure noise footprint than the EA319C). The large population increase (+100) for the 60 dBA contour may be attributed to a population data point at Bedlar's Green hamlet just falling inside a slightly wider contour in 2012.

4.1.3 In **Figure 13** it can be seen that the 2012 actual 57 dBA contour has extended to the north-east and shifted towards Little Hallingbury at the south-western end. These changes in shape can be attributed to the higher proportion of westerly movements (see section 2.7.4) and the shift in departure traffic to the DVR/LAM/LYD SIDs described in section 2.6.9.

4.1.4 It should be noted that percentage changes in contour areas are not necessarily accompanied by similar changes in enclosed population because of the uneven distribution of populations around the airport.

4.2 Standard modal split contours – comparison with 2011 contours

4.2.1 The Stansted 2012 standard modal split Leq contours are compared against the 2011 standard Leq contours in **Figure 14**. The following table summarises the areas, populations and percentage changes from 2011 to 2012:

Stansted standard modal split contours: areas and populations for 2011 and 2012

Leq (dBA)	2011 Area (km^2)	2012 Area (km^2)	Area change (%)	2011 Pop.	2012 Pop.	Pop. change (%)
> 57	21.0	20.9	-0.5%	1,300	1,250	-4%
> 60	11.0	11.0	0%	350	350	0%
> 63	5.8	5.8	0%	100	100	0%
> 66	2.9	3.0	+3%	50	< 50	(n/a)
> 69	1.6	1.6	0%	0	0	(n/a)
> 72	1.0	0.9	-10%	0	0	(n/a)

Note: The standard modal splits in 2011 and 2012 were both 71% south-west / 29% north-east.

4.2.2 The 57 dBA contour area decreased by 0.5% in 2012, with the higher contour areas staying mostly at a similar level. Populations dropped by 4% for the 57 dBA contour and remained unchanged for the most part at the higher Leq levels.

4.2.3 It is noted that the 57 dBA Leq standard modal split contour of 20.9 km^2 is well below the Planning Condition AN1 contour area limit of 33.9 km^2 (see section 1.2.4).

4.2.4 The effects of the shift in departure traffic to the DVR/LAM/LYD SIDs can be seen at the south-western end of the 2012 standard 57 dBA contour.

4.2.5 The standard contours normally provide a clearer indication than the actual contours of 'fleet noise level' changes from year to year because they minimise the effect of any difference between the ratios of south-westerly to north-easterly operations.

4.3 Noise contour historical trend

4.3.1 **Figure 15** shows how the actual 57 dBA Leq contour has changed in area and population terms since 1988 by comparison with the total annual (365-day) aircraft movements. (Actual modal split data are used in this figure because standard modal split contours were not produced prior to 1995.)

Movements

4.3.2 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 similar but in 2003 the annual figure rose by 9% over the preceding year. Another rise in 2006 was followed by a slight increase in the annual figure in 2007, representing a peak level.

4.3.3 The total annual movement figure for 2008 dropped by 7% – this can be attributed to the economic downturn and fluctuating oil price. The figure dropped even further in 2009, by 13%, as the global recession continued to impact upon the aviation industry.

4.3.4 Year 2010 saw another large fall in traffic for the third year running, this time by 8%. The volcanic ash crisis in April, industrial action in May, adverse winter weather and a continued reduction in demand for leisure travel were factors causing the decline in traffic.

4.3.5 Annual traffic dropped further in 2011 by 4% and also in 2012 for the fifth year running (also by 4%) as the demand for flights continued to fall.

Areas and populations

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

4.3.7 Areas have generally declined since 2001 following completion of the phase-out of Chapter 2 aircraft. There was a 7% decrease in traffic in 2008 and the area fell by 6% relative to 2007. The area further reduced in 2009 and again in 2010 as total movements dropped substantially. The 2011 and then the 2012 areas dropped to the lowest levels seen at Stansted since 1990 as traffic continued to fall.

4.3.8 From 2001 to 2008, population counts fluctuated within a range from approximately 2,000 to 2,900. The years with higher proportions of south-westerly movements have tended to produce the higher population counts. In 2009 the shift in modal split to a lower proportion of south-westerly movements along with significantly lower movement numbers caused the population count to dip markedly to 1,500. Population counts have further reduced since 2010 following continued reductions in traffic, reaching 1,250 in 2012.

5 Conclusions

5.1 Year 2012 average summer 16-hour day Leq noise exposure contours have been generated for Stansted Airport using the ANCON noise model.

5.2 The results show that the actual modal split 57 dBA Leq contour area decreased by 0.5% to 21.1 km^2 in 2012, from 21.2 km^2 in 2011. Reductions in EA319C and large-twin turboprop movements were partially offset by increases in the numbers of the noise dominant ANCON type B738. The 2012 area of 21.1 km^2 is the smallest area calculated for Stansted since 1990 (1990: 20.1 km^2). The population enclosed within the actual 57 dBA Leq contour was unchanged from 2011 at 1,250.

5.3 Compared to 2011, the 57 dBA Leq standard contour area decreased by 0.5% to 20.9 km^2, which is well within the 33.9 km^2 contour area limit imposed by the Stansted Planning Condition AN1. The population count within the standard contour also dropped, by 4%, to 1,250.

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4 European Civil Aviation Conference
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Table 1 Stansted 2011 and 2012 average summer day movements by noise class

Noise Class	Description	2011	2012	Percentage of total 2012 movements	Change
PROPELLER AIRCRAFT					
1	Small propeller aircraft	0.2	0.4	0%	+0.2 (*)
2	Large propeller aircraft	14.3	10.1	3%	-4.2 (-29%)
CHAPTER 3/4 JETS **					
3	Short-haul aircraft	351.4	343.8	93%	-7.6 (-2%)
4	Wide-body twin-engine aircraft	5.3	4.7	1%	-0.6 (-11%)
5	2nd generation wide-body 3,4-engine aircraft	9.4	9.8	3%	+0.4 (+4%)
LARGE CHAPTER 2/3 JETS					
6	1st generation wide-body 3,4-engine aircraft	0.1	< 0.1	0%	-0.1 (*)
2nd GENERATION TWIN JETS					
7	Narrow-body twin-engine *(including Ch.2 and hushkitted versions)*	0.2	0.2	0%	0.0 (*)
1st GENERATION JETS					
8	Narrow-body 3,4-engine aircraft	0.2	0.6	0%	+0.4 (*)
	TOTAL	**381.0**	**369.6**	**100%**	**-11.4 (-3%)**

* Percentage changes not shown due to low numbers and limited data resolution.
** An estimated 100% of *Noise Class 3* aircraft in 2012 meet the 'Chapter 4' noise standard (2011: 100%).

Note: Totals may not sum exactly due to rounding.

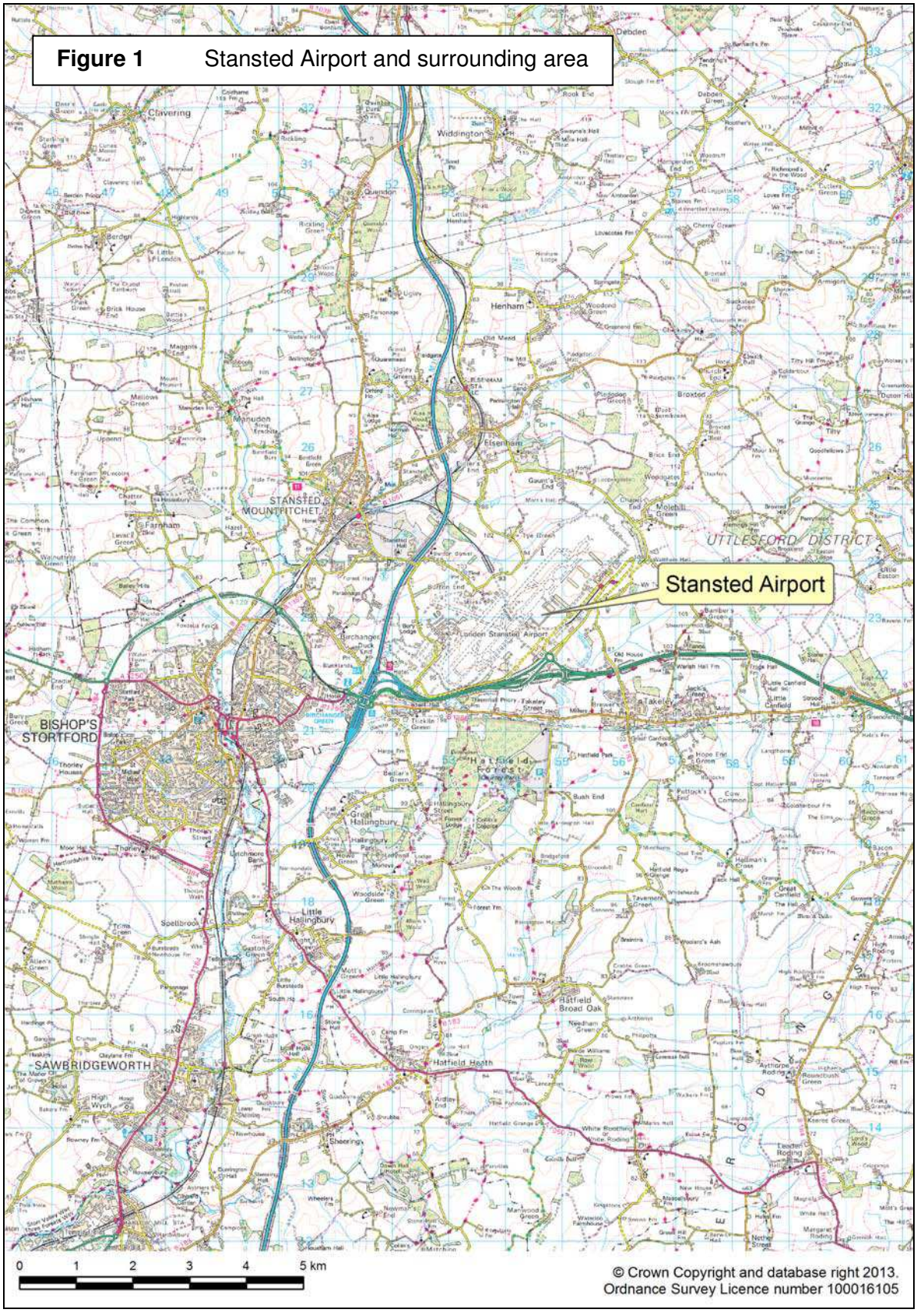
Table 2 Stansted 2011 and 2012 average summer day movements by ANCON aircraft type

Aircraft type	Noise class	ANCON type	2011	2012	Change
Single piston propeller	1	SP	0.1	< 0.1	-0.1
Small twin-piston propeller	1	STP	0.1	0.1	0.0
Small twin-turboprop	1	STT	0.0	0.3	+0.3
Large twin-turboprop	2	LTT	14.1	9.9	-4.2
Large four-engine propeller	2	L4P	0.1	0.2	+0.1
Boeing 737-300/400/500	3	B733	6.2	4.1	-2.1
Boeing 737-600/700	3	B736	1.5	0.9	-0.6
Boeing 737-800/900	3	B738	222.5	231.7	+9.2
Boeing 757-200 (RB211-535C engines)	3	B757C	< 0.1	0.0	0.0
Boeing 757-200 (RB211-535E4/E4B engines)	3	B757E	1.7	1.3	-0.4
Boeing 757-200 (PW2037/2040 engines)	3	B757P	0.2	0.1	-0.1
Boeing 757-300	3	B753	< 0.1	0.0	0.0
BAe 146/Avro RJ	3	BA46	3.0	2.5	-0.5
Airbus A318	3	EA318	0.1	0.2	+0.1
Airbus A319 (CFM-56 engines)	3	EA319C	82.2	66.1	-16.1
Airbus A319 (IAE-V2500 engines)	3	EA319V	8.2	7.8	-0.4
Airbus A320 (CFM-56 engines)	3	EA320C	7.2	5.9	-1.3
Airbus A320 (IAE-V2500 engines)	3	EA320V	3.1	4.5	+1.4
Airbus A321 (CFM56 engines)	3	EA321C	0.1	2.0	+1.9
Airbus A321 (IAE-V2500 engines)	3	EA321V	0.4	< 0.1	-0.4
Executive Business Jet (Chapter 3)	3	EXE3	10.6	14.2	+3.6
Bombardier Regional Jet 100/200	3	CRJ	< 0.1	0.0	0.0
Embraer ERJ 135/145	3	ERJ	2.2	2.0	-0.2
Embraer ERJ 170	3	ERJ170	1.2	0.0	-1.2
Embraer ERJ 190	3	ERJ190	0.7	0.3	-0.4
Fokker 100	3	FK10	< 0.1	< 0.1	0.0
McDonnell Douglas MD80 series	3	MD80	0.3	0.0	-0.3
McDonnell Douglas MD90 series	3	MD90	< 0.1	< 0.1	0.0
Boeing 767-200	4	B762	0.6	0.9	+0.3
Boeing 767-300 (GE CF6-80 engines)	4	B763G	1.7	1.8	+0.1
Boeing 767-300 (PW4000 engines)	4	B763P	0.1	< 0.1	-0.1
Boeing 777-200 (GE GE90 engines)	4	B772G	0.2	0.2	0.0
Boeing 777-200 (RR Trent 800 engines)	4	B772R	< 0.1	0.0	0.0
Boeing 777-200LR/300ER (GE GE90 engines)	4	B773G	1.3	0.4	-0.9
Airbus A300	4	EA30	1.2	1.1	-0.1
Airbus A310	4	EA31	0.1	< 0.1	-0.1
Airbus A330	4	EA33	0.1	0.2	+0.1
Airbus A340-200/300	5	EA34	1.1	0.4	-0.7
Boeing 747-400 (GE CF6-80F engines)	5	B744G	4.1	1.0	-3.1
Boeing 747-400 (PW4000 engines)	5	B744P	0.4	0.7	+0.3
Boeing 747-400 (RR RB211 engines)	5	B744R	< 0.1	0.1	+0.1
Boeing 747SP	5	B747SP	0.2	0.2	0.0
Boeing 747-8	5	B748	0.0	3.2	+3.2
McDonnell Douglas MD-11	5	MD11	3.5	4.2	+0.7
Boeing 747-100/200/300	6	B747	0.1	< 0.1	-0.1
Boeing 737-200 (Chapter 3)	7	B732	0.1	< 0.1	-0.1

Aircraft type	Noise class	ANCON type	2011	2012	Change
Executive Business Jet (Chapter 2)	7	EXE2	< 0.1	0.2	+0.2
Boeing 707	8	B707	0.0	< 0.1	0.0
Boeing 727 (Chapter 3)	8	B727	0.2	0.3	+0.1
McDonnell Douglas DC-8-70	8	DC87	< 0.1	0.1	+0.1
Ilyushin IL-62	8	IL62	0.0	0.1	+0.1
Tupolev Tu-154	8	TU54	0.0	< 0.1	0.0
		TOTAL	**381.0**	**369.6**	**-11.4 (-3%)**

Note: Totals may not sum exactly due to rounding.

Figure 1 Stansted Airport and surrounding area



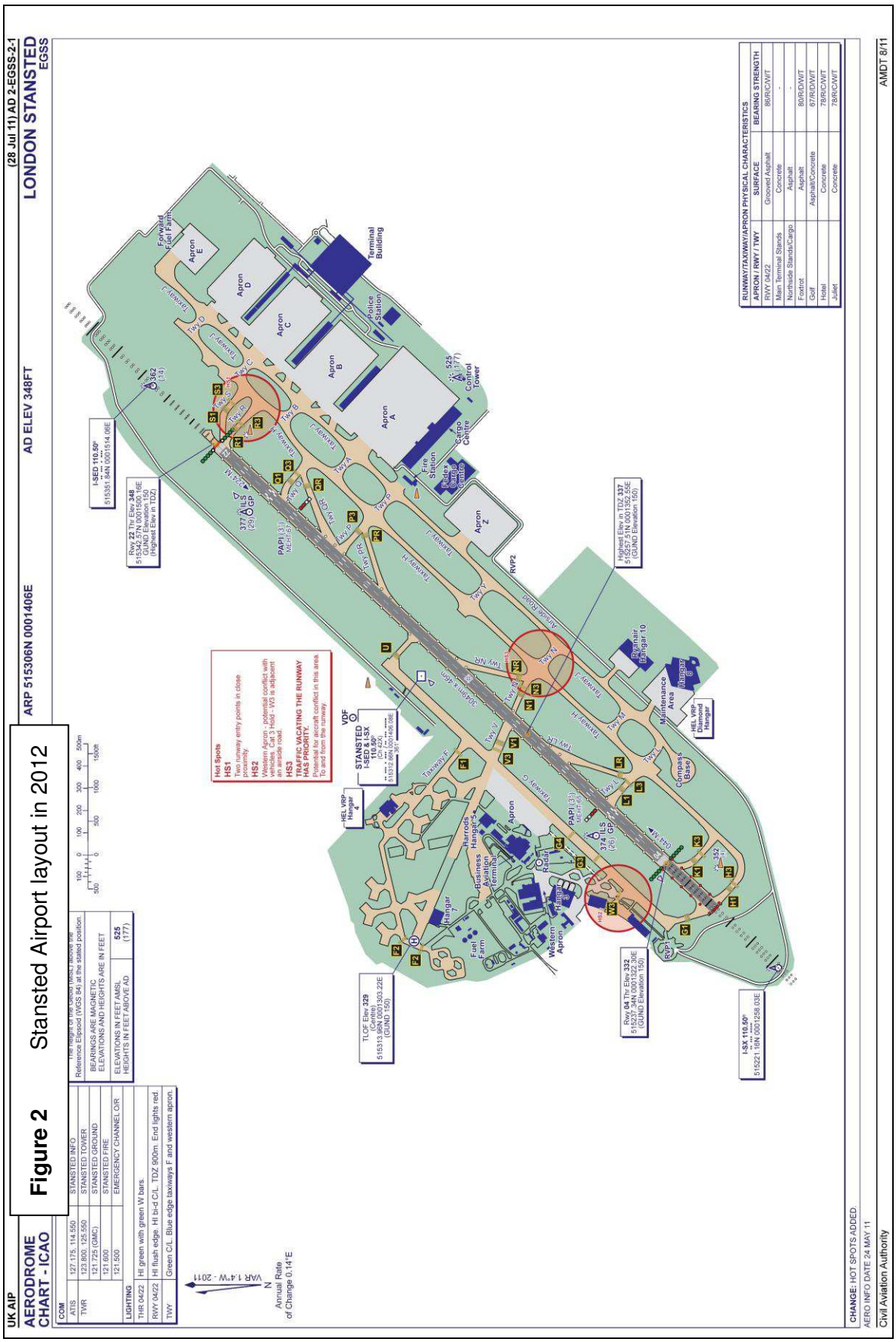


Figure 3 Stansted Standard Instrument Departure (SID) routes

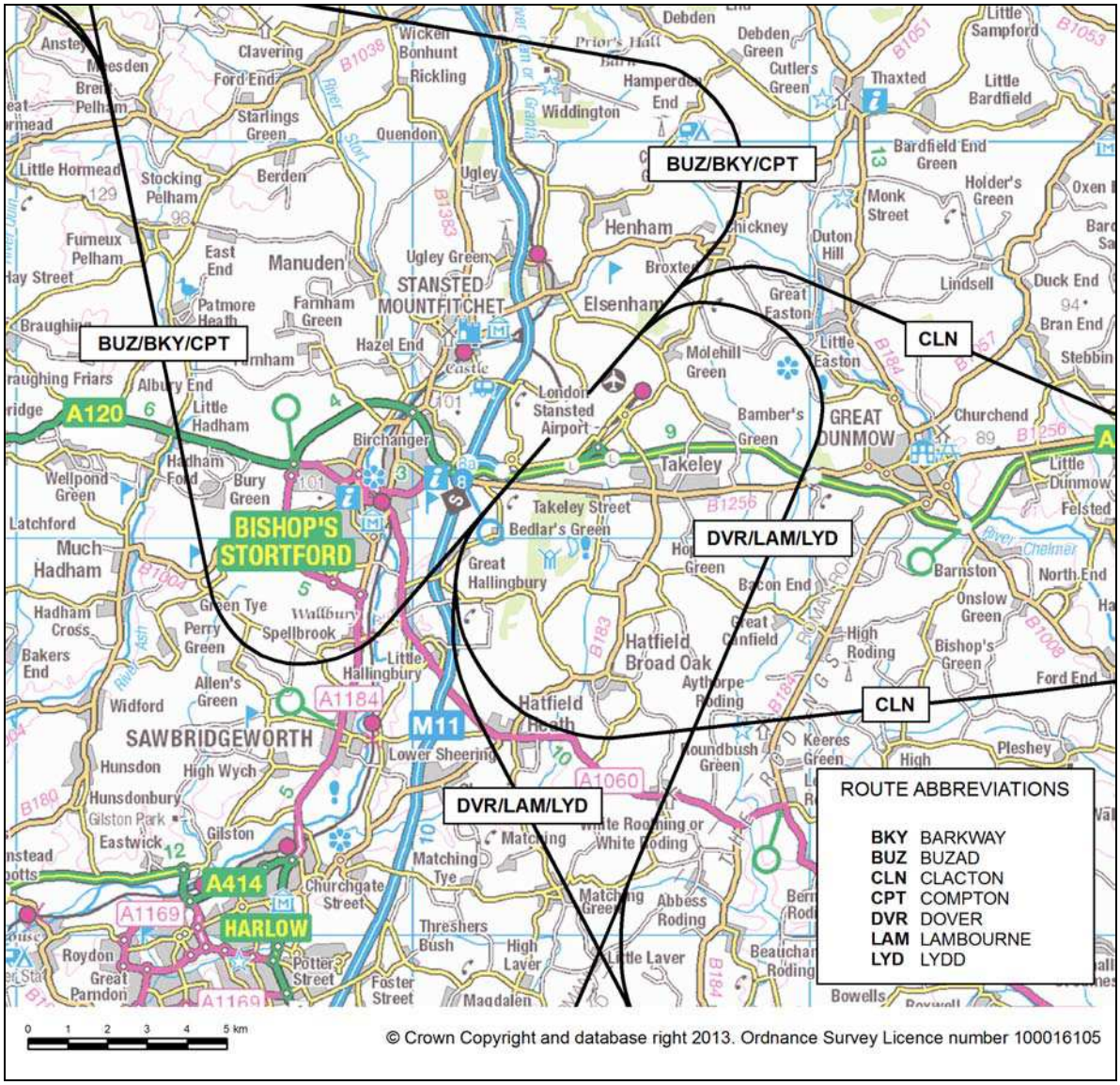


Figure 4 Typical Stansted radar flight tracks

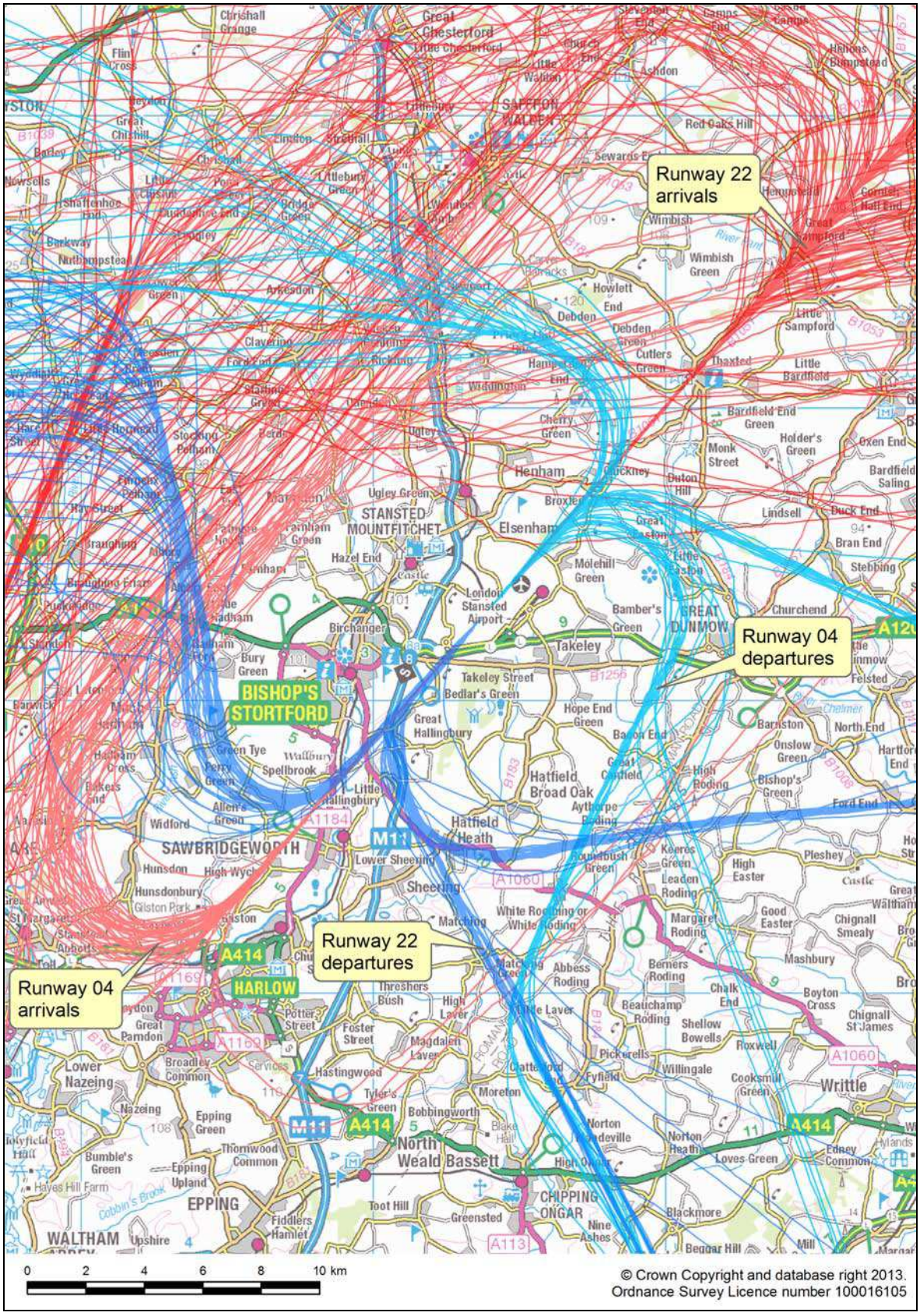
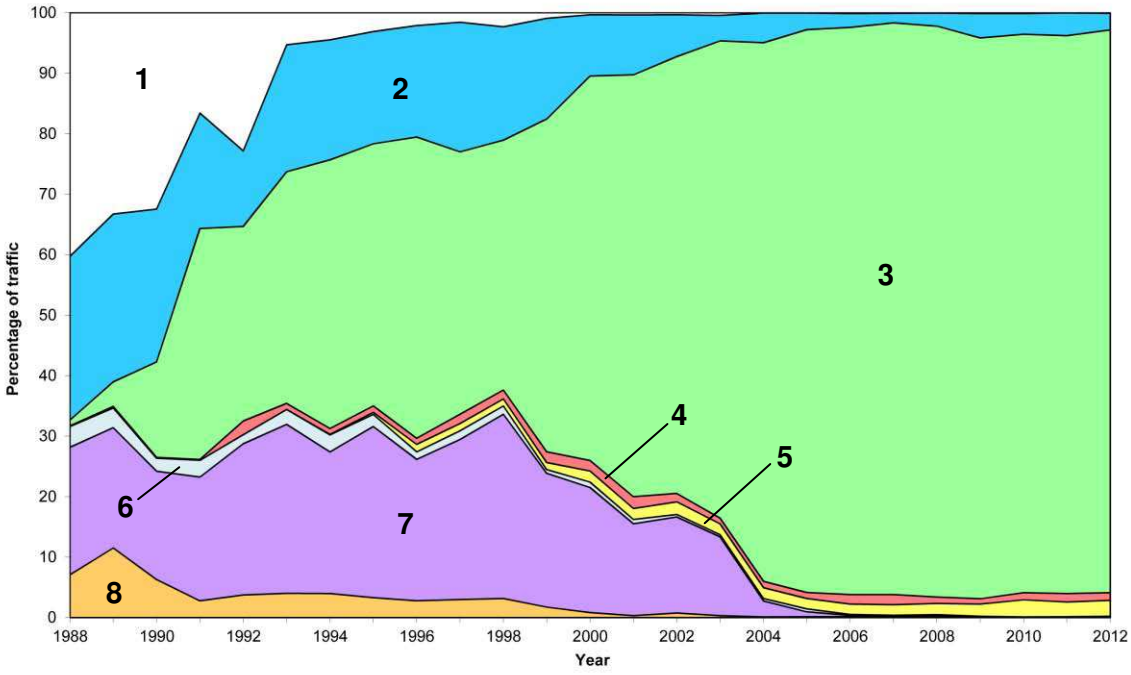


Figure 5 Stansted noise class trend 1988-2012



Note: The percentages from 1990 onwards 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.

Key to noise classes

Propeller aircraft
1 Small props, e.g. single/twin piston and turboprop light aircraft
2 Large props, e.g. 2- and 4-propeller transports, e.g. ATR-42, BAe ATP

Chapter 3/4 jets
3 Short-haul, e.g. Airbus A319, Boeing 737-800
4 Wide-body twins, e.g. Airbus A300, Boeing 767
5 2nd generation wide-body 3/4-engine aircraft, e.g. Boeing 747-400, MD-11

Large Chapter 2/3 jets
6 1st generation wide-body 3/4-engine aircraft, e.g. Boeing 747-200

2nd generation twin jets
7 Narrow body twins (including hushkitted versions), e.g. Boeing 737-200

1st generation jets
8 Narrow body 3/4-engine aircraft (including hushkitted versions), e.g. Boeing 727

Figure 6 Stansted 2012 average summer day movements by ANCON type

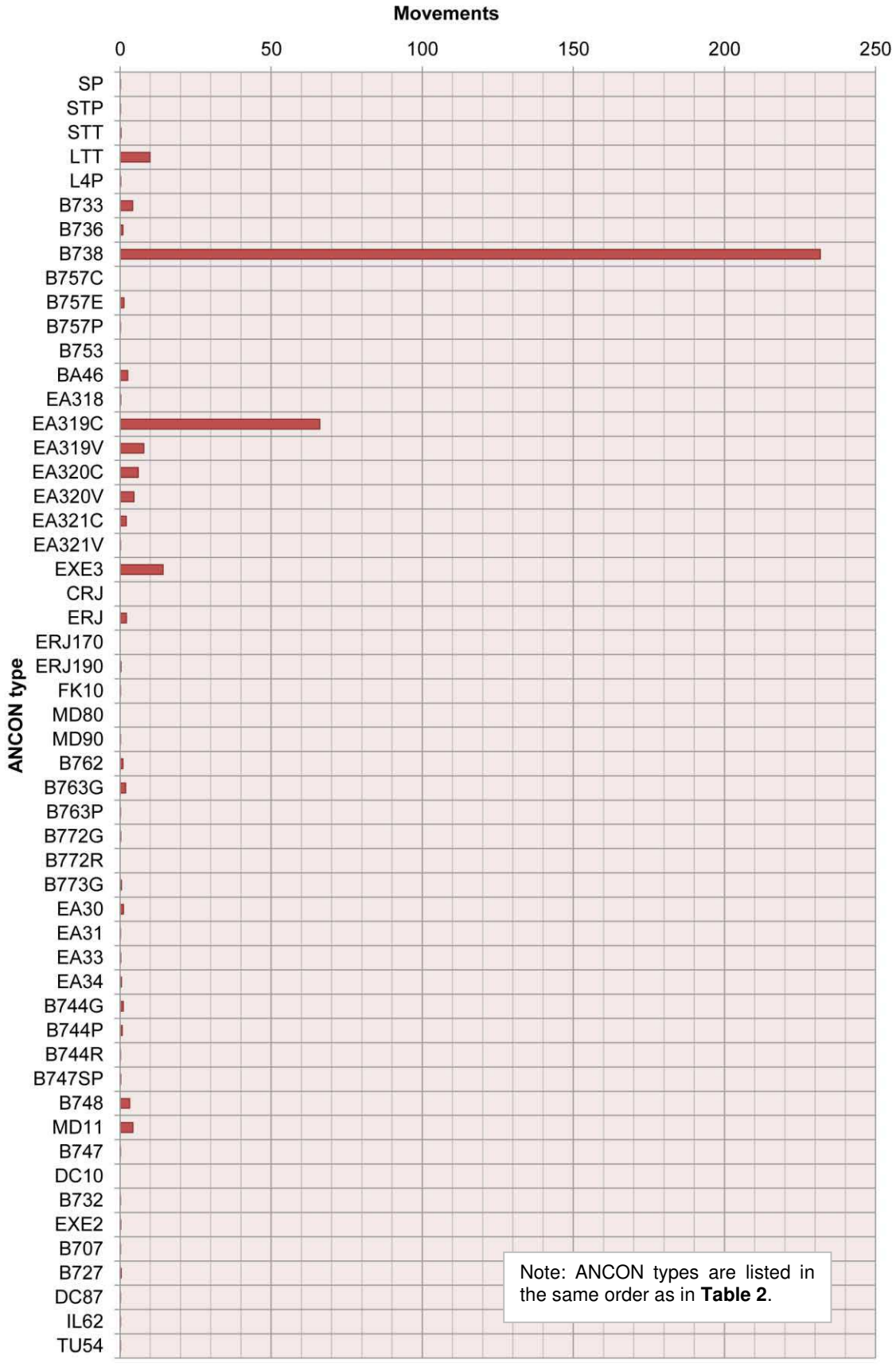


Figure 7 Stansted 2012 and 2011 departure traffic distributions by route

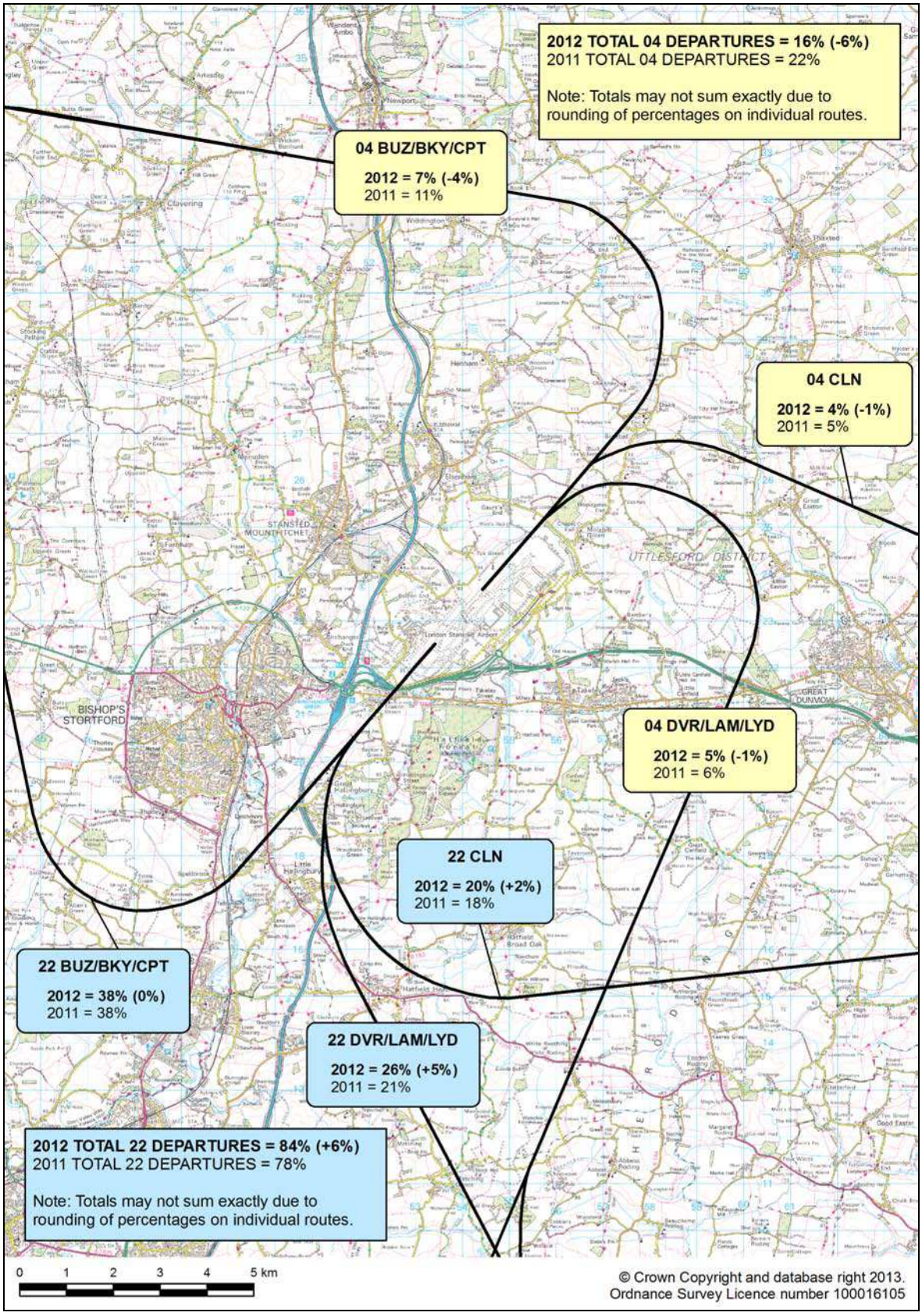


Figure 8 Stansted average summer day runway modal splits 1993-2012

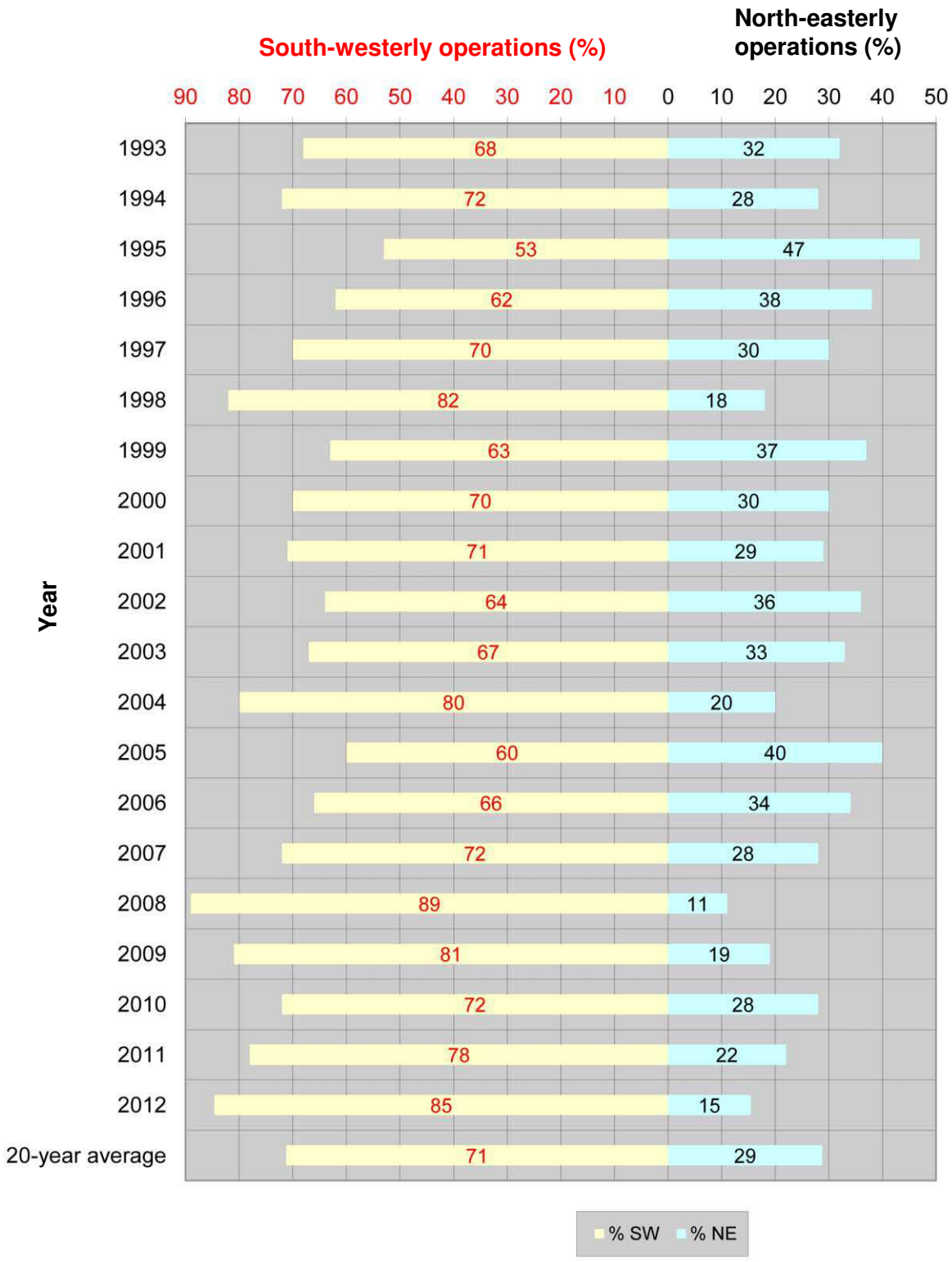


Figure 9 Topography around Stansted Airport

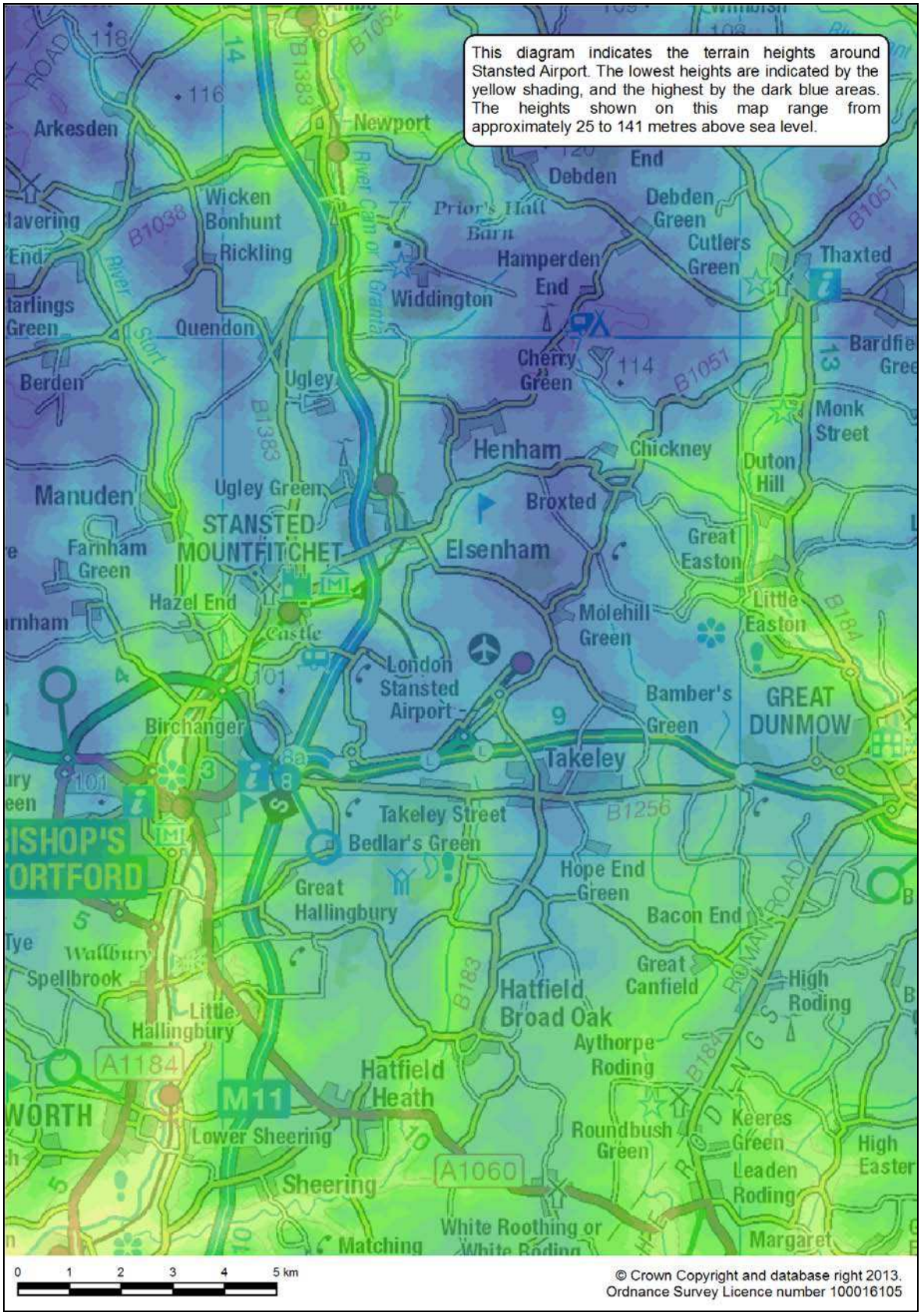


Figure 10 Population data points around Stansted Airport

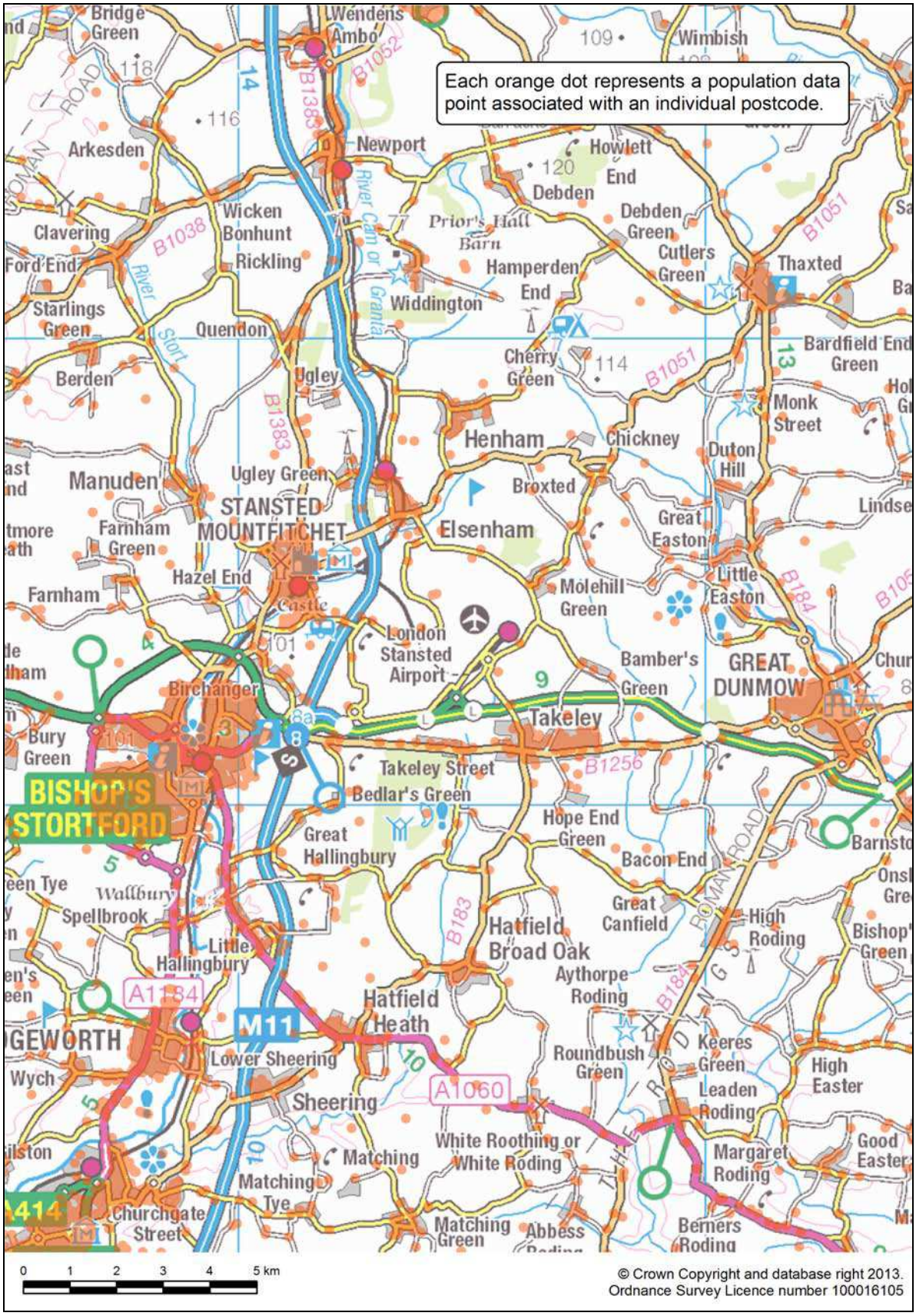


Figure 11 Stansted 2012 actual (85% SW / 15% NE) Leq contours

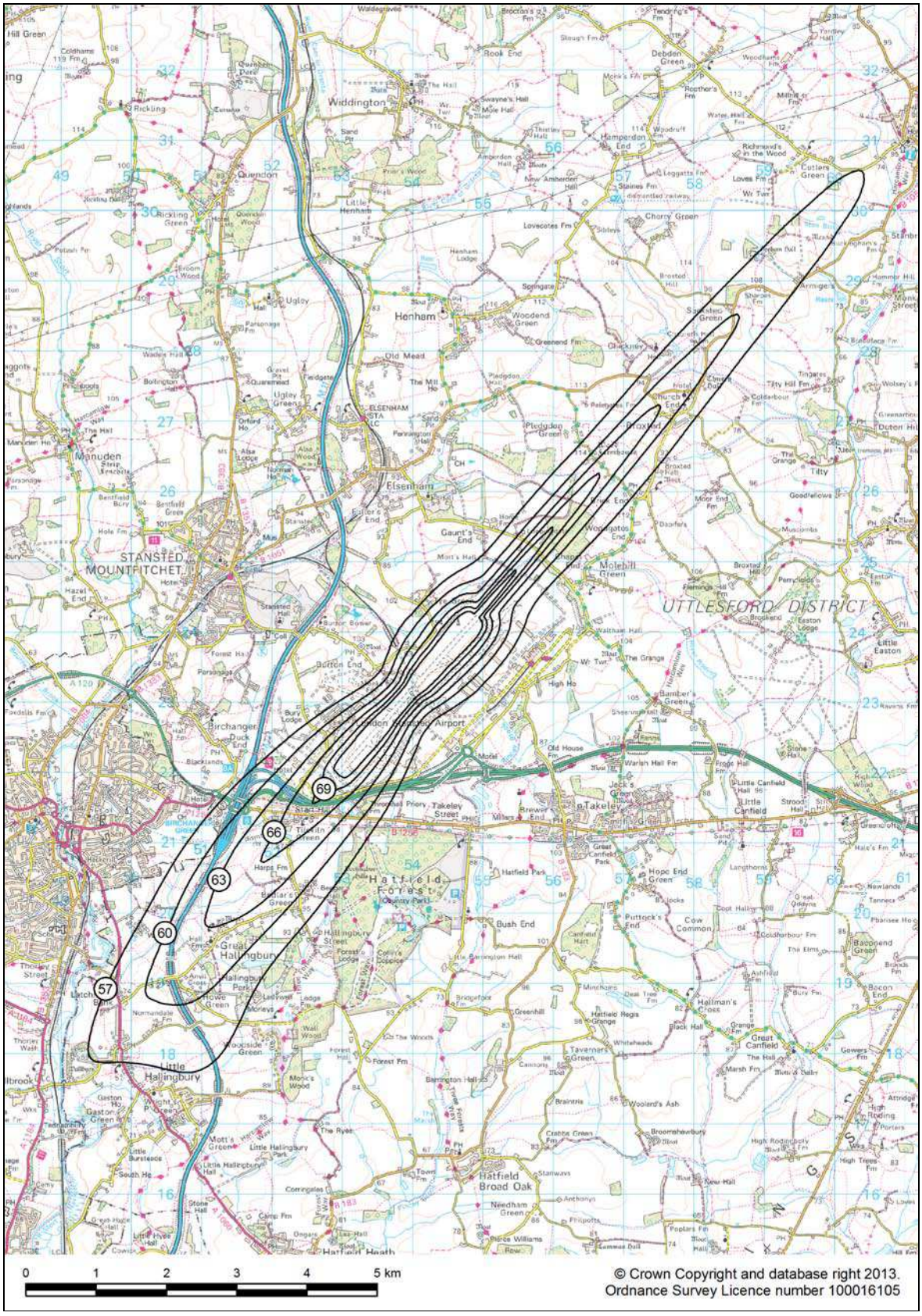


Figure 12 Stansted 2012 standard (71% SW / 29% NE) Leq contours

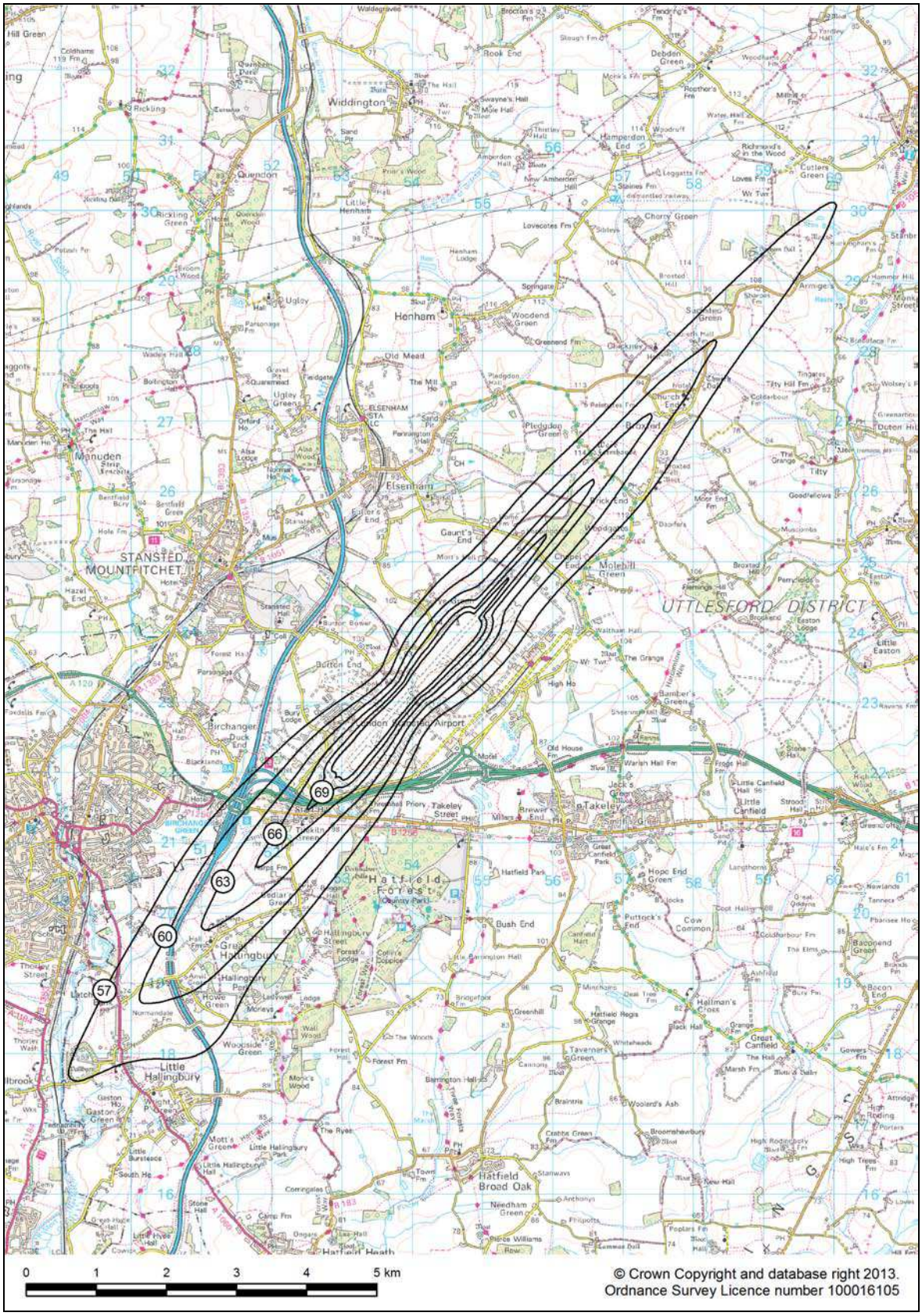


Figure 13 Stansted 2012 actual (85% SW / 15% NE) and 2011 actual (78% SW / 22% NE) Leq contours

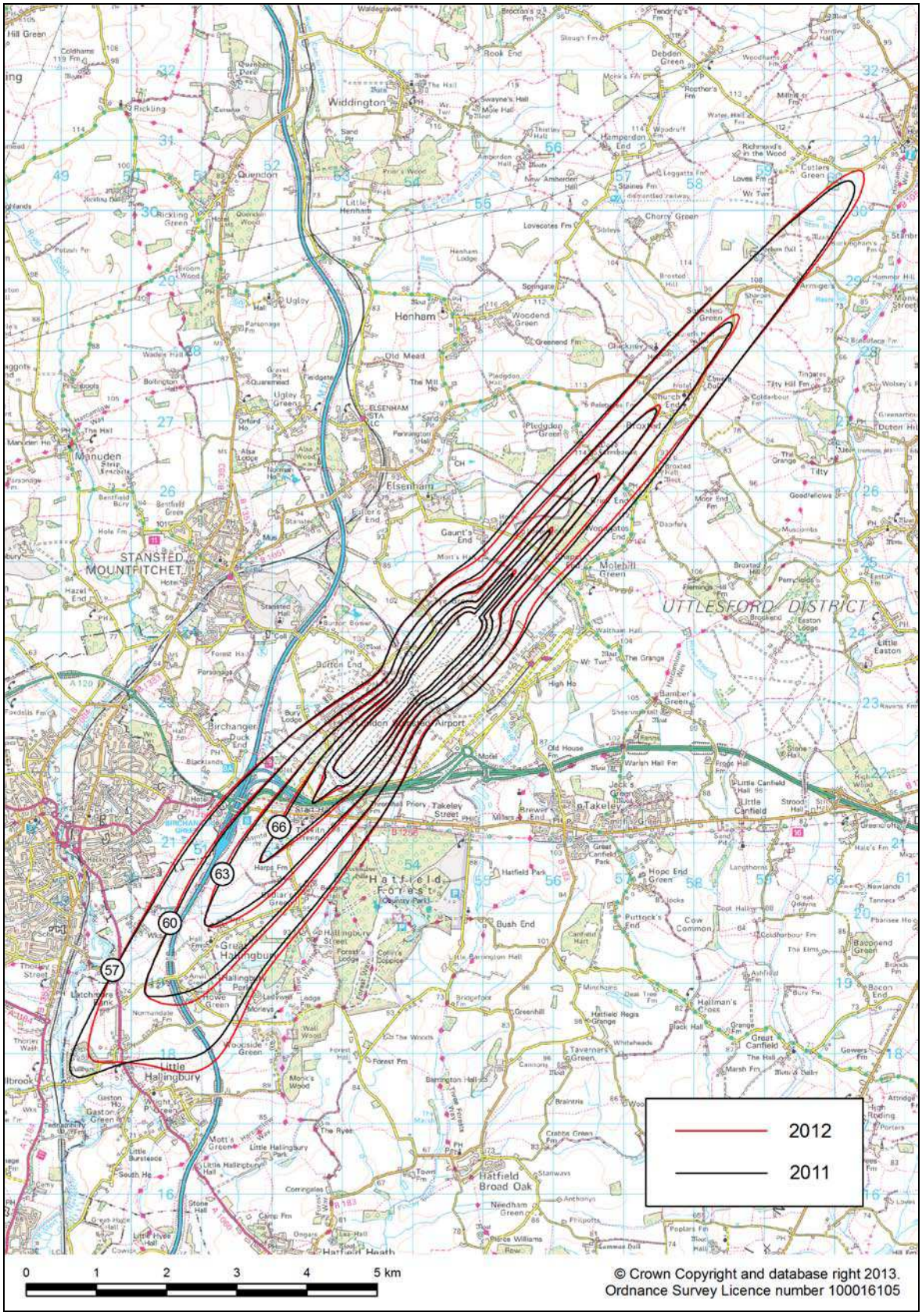
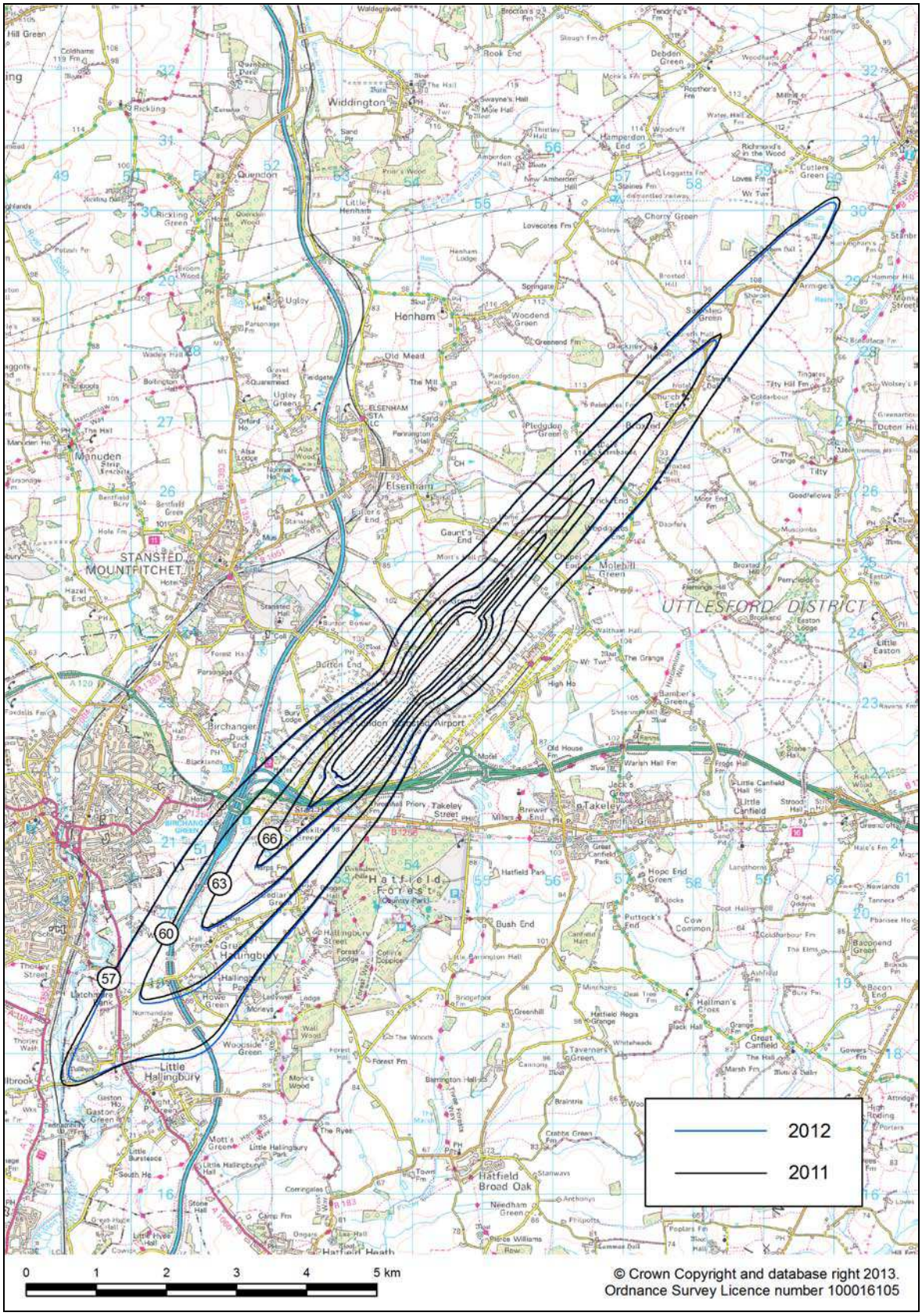


Figure 14 Stansted 2012 standard (71% SW / 29% NE) and 2011 standard (71% SW / 29% NE) Leq contours



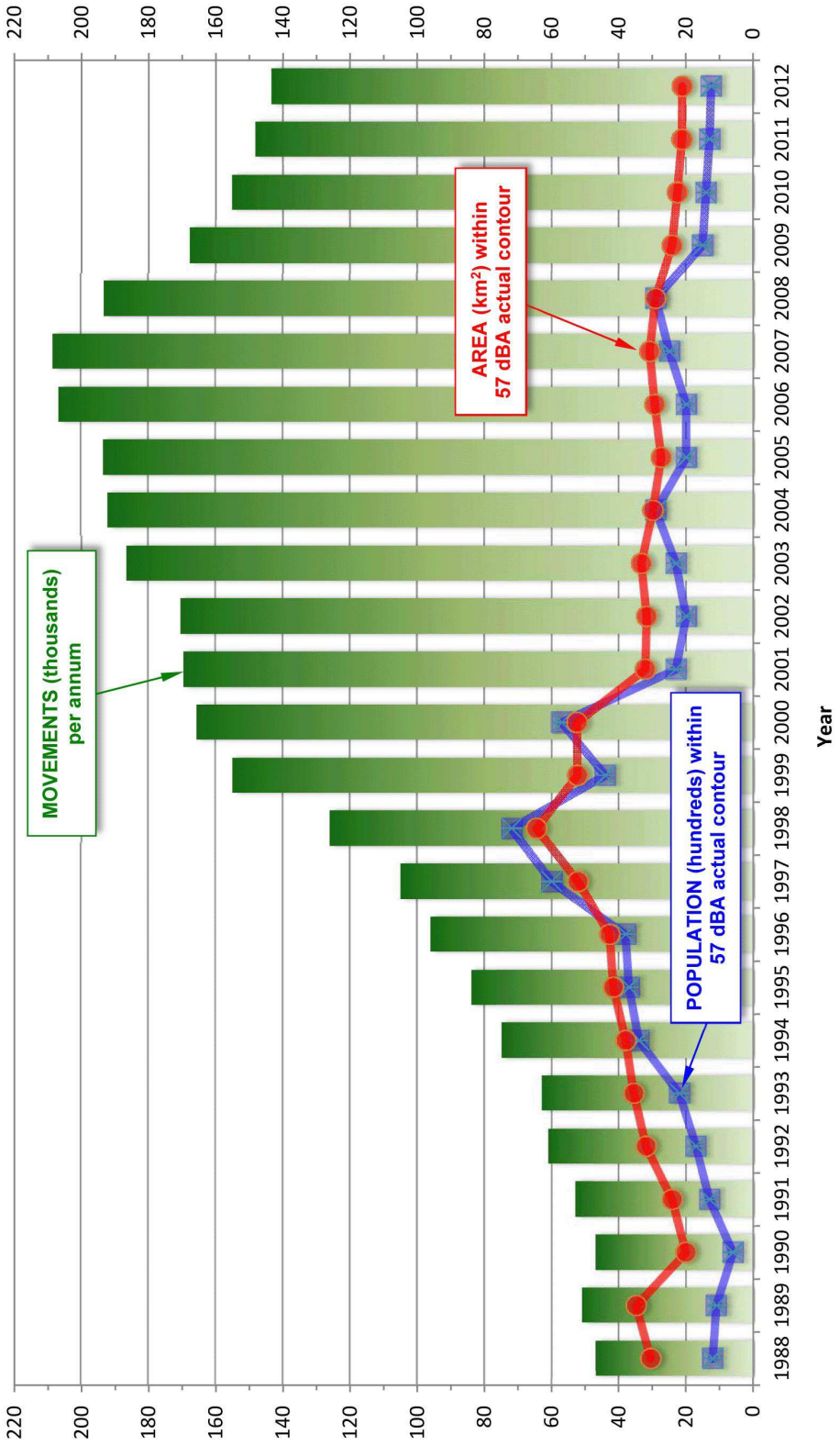


Figure 15 Stansted annual traffic and Leq noise contour area/population trend 1988-2012