Survey of Noise Attitudes 2014: Aircraft Noise and Annoyance, Further Analysis

CAP 2250

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Chapter 1

Introduction

1.1 The Survey of Noise Attitudes (SoNA) 2014[1] study was commissioned by the Department for Transport, in order to obtain new and updated evidence on attitudes to aviation noise around airports in England, and how they relate to the UK aircraft noise exposure indices.

1.2 The overall aims of the Survey of Noise Attitudes (SoNA) 2014 were to:

- Obtain new and updated evidence on attitudes to aviation noise around airports in England, including the effects of aviation noise on annoyance, wellbeing and health.
- Obtain new and updated evidence on what influences attitudes to aviation noise, and how attitudes vary, particularly how attitudes vary with long-term noise exposure (L_{Aeq}), but also other non-acoustic factors that may influence attitudes, such as location and time of day, and socio-economic group of respondents.
- Examine whether the currently used measure of annoyance, L_{Aeq}, is the appropriate measure of annoyance for measuring the impact on people living around major airports.
- Consider the appropriateness of the policy threshold for significant community annoyance from aviation noise.
- Provide baseline results that can be used for a programme of regular surveys of attitudes to aviation noise.

1.3 The results from SoNA 2014 were originally published in 2017 but updated in the CAP1506 Survey of Noise Attitudes 2014: Aircraft second edition, published in 2021. These are summarised in Chapter 2.

Aims of this Further Analysis

1.4 The analysis in this report builds on that in CAP1506, using the same study population and includes:

[1] "Survey of Noise Attitudes (SoNA) 2014, CAP 1506 Second Edition, Civil Aviation Authority, Month Year.

- Exploration of the effects of runway alternation and respite on annoyance.
- Further exploration of non-acoustic factors such as:
  - Annoyance responses from respondents in dwellings with and without gardens/outside space.
  - Responses from people living in flats versus houses.
  - Complaints – association between making complaints, annoyance and noise exposure.
  - Surroundings (presence of green spaces nearby).
  - Percentage of time spent at home in the day.
- Exploration of respondents who were exposed to a change in aircraft noise in the year prior to the study.
- Spontaneous dislikes - identification at what noise exposure aircraft noise becomes more disliked than other dislike responses.

1.5 The structure of this report is as follows:

- The background to this study, including a summary of the original findings from the 2014 study, is presented in Chapter 2.
- Overview of methodology including study design, questionnaire design and respondent sampling technique, described in Chapter 3.
- Chapter 4 provides an explanation of respite, including operating modes and runway alternation and how respite is quantified with respect to Heathrow airport and its system of runway alternation. Statistical analysis of respite and annoyance responses is also given in this chapter.
- Non-acoustic factors are further explored in Chapter 5. These include types of dwelling (houses versus flats), access to outside space, whether any complaints were made regarding aircraft noise, what respondents like about their surroundings, amount of time spent at home[2] and whether there was any change in exposure to aircraft noise prior to the study.
- Chapter 6 explores the concept of spontaneous dislikes, examining the level of noise exposure at which respondents spontaneously mention disliking aircraft noise more frequently compared to other noise sources or other neighbourhood issues.

[2] Please note the survey was carried out in 2014, i.e. prior to the increase in homeworking caused by the COVID19 pandemic.

- Chapter 7 provides a summary of findings and conclusions.
- Appendix A provides a Glossary to the report, giving definitions of the more commonly used technical terms concerning aircraft and airport operations used here.
- Appendix B presents the full SoNA 2014 Questionnaire used in the study.
- Appendix C describes an explanation of how respite from arrival and departure operations is calculated.

Chapter 2

Background

2.1 As detailed in CAP 1506 paragraph 3.1-3.3, in 2013, Defra ran the first Survey of Noise Attitudes (SoNA 2013), a face-to-face survey within England to establish current attitudes to noise, in particular attitudes from road traffic and neighbour noise sources and a section that could focus on different areas of interest without impacting on the backwards compatibility of the rest of the questionnaire. In 2013, that section concentrated on entertainment noise. SoNA 2013 found that just over two-thirds of respondents reported hearing aircraft, airport or airfield noise, with 3% giving very or extreme ratings for being bothered, annoyed or disturbed.

2.2 The Department for Transport (DfT) commissioned the 2014 SoNA study. SoNA 2014 is a continuation of SoNA 2013. In this instance, it was decided that the variable section in the 2014 survey (Appendix B) should consider civil aircraft noise in order to obtain up-to-date and detailed information regarding attitudes to aircraft noise. The Civil Aircraft Noise (CAN) section was introduced in 2014 alongside the other sections on road and neighbourhood noise and replaced the previous entertainment noise section. It was not made explicit to respondents at the start of the survey that the focus of the study was aircraft noise in order to minimise potential bias.

2.3 The sample for SoNA 2014 could not be nationally representative as sampled residents had to live within different noise contour bands near airports. Face-to-face interviews from a representative sample of approximately 2,000 adults aged 18 and over were collected from those living in residential dwellings in proximity to nine of the largest airports in England (as defined by aircraft movements), and where noise from aircraft is estimated to be more than 51 dB $L_{Aeq,16h}$ during an average summer day.

2.4 The sampling was designed such that one-third of the interviews were carried out in the 51-54 dB $L_{Aeq,16h}$ band, and two-thirds for noise exposure in the >54 dB $L_{Aeq,16h}$ band (stratification based on estimated population numbers

falling within these bands). This was done to increase statistical power at higher noise exposure levels, where populations decrease as noise exposure levels increase.

2.5 Ipsos Mori conducted the fieldwork, and the CAA performed the data analyses and produced the report CAP 1506.

2.6 The main findings from SoNA 2014 were:

- The study compared reported mean annoyance scores[3] against average summer-day noise exposure defined using four different noise indicators: $L_{Aeq,16h}$, L_{den}, N70 and N65.
- Evidence was found that mean annoyance score correlated well with average summer day noise exposure, $L_{Aeq,16h}$ (r^2=0.87). There was no evidence found to suggest that any of the other indicators L_{den}, N70 or N65 (r^2=0.66-0.73) correlated better with annoyance than $L_{Aeq,16h}$.
- Of the average-day modes, the existing 92-day summer average mode was found to correlate better (r^2=0.88) than shorter average modes (r^2=0.69-83). There was therefore no evidence found to support a change from the current practice of basing $L_{Aeq,16h}$ on an average summer day.
- Mean annoyance score and the likelihood of being highly annoyed were found to increase with increasing noise exposure ($L_{Aeq,16h}$). The relationship found was close to linear, though annoyance levels plateau at low exposure and do not reach zero annoyance.
- Annoyance scores were found to be comparable with those found for the Attitudes to Noise from Aviation Sources in England (ANASE) restricted sites, but lower than found by the full ANASE study, and higher than found by the Aircraft Noise Index Study (ANIS).
- For a given noise exposure, a lower proportion of respondents was found to be highly annoyed than compared with ANASE, the results of which were considered unreliable. For a given noise exposure, a higher proportion of respondents was found to be highly annoyed than compared with ANIS.

[3] Survey data was gathered during October 2014 to February 2015.

- Noise exposure and reported annoyance were compared against self-reported health rating (5-point scale) and the Short Warwick-Edinburgh Mental Wellbeing Scale (SWEMWBS), a measure of well-being. Poorer health ratings and lower SWEMWBS scores were found to be associated with annoyance, but not with noise exposure.
- Evidence was found that non-acoustic factors such as noise sensitivity, approximated social grade, and expectations – both prior to moving to an area exposed to aircraft noise and in the future – influence reported aircraft noise annoyance and these non-acoustic factors may be as important as the noise exposure level.

2.7 The DfT requested CAA to explore what further analysis might be carried out to extract more information from the dataset.

Chapter 3

Methodology

3.1 A detailed explanation and description of the survey methodology in SoNA 2014 is provided in CAP 1506. The analyses in this report use the same survey data, therefore the survey methodology remains the same as that described in CAP 1506, with new regression analyses performed on additional variables but with the same annoyance data from the original dataset. A brief summary of the survey methodology is given in this chapter, and the analysis methodologies are described along with the results in the subsequent chapters 4, 5 and 6.

3.2 The survey questionnaire, as provided in Appendix C of CAP 1506 (and reproduced in Appendix B of this report), comprised of five sections:

1) A general section
2) An optional Road Traffic Noise section
3) An optional Neighbourhood Noise section
4) A Civil Aircraft Noise section
5) A Health section

3.3 The civil aircraft noise section included two questions on noise annoyance that sought responses on a 5-point scale and an 11-point scale, recommended by ICBEN[4] and ISO[5] respectively. Such questions explicitly sought views on annoyance due to aircraft noise. The survey also asked residents early in the interview '*Is there anything you particularly dislike about this neighbourhood?*' and specifically looked (without prompting) for responses mentioning aircraft or aircraft noise.

[4] Fields et al (2001). Fields JM, De Jong JM, Gjestland T, Flindell IH, Job RFS, Kurra S, Lercher P, Vallet M, Yano T, Guski R, Felscher-Suhr U, Schumer R (2001). Standardized general-purpose noise reaction questions for community noise surveys: research and a recommendation. J Sound Vibr 242: 641-679.

[5] International Standards Organization (2003). Acoustics - Assessment of noise annoyance by means of social and socio-acoustic surveys, ISO/TS 15666:2003.

3.4 The SoNA 2014 questionnaire design was both peer-reviewed and underwent cognitive testing to confirm people's understanding of the questions asked, and to identify any need for questionnaire improvement and simplification.

3.5 Fieldwork was conducted between 5 October 2014 and 8 February 2015. The survey selected respondents at random, according to the populations around the sample airports. All eligible households were located within the pre-defined noise exposure areas, with a minimum noise threshold being set at 51 dB $L_{Aeq,16h}$, in order to ensure that estimated noise exposure information remained reliable[6]. Noise contour information was provided to allow Ipsos MORI's in-house sampling unit to draw up the appropriate sample in each of the nine areas around the following airports:

- Birmingham (BHX)
- East Midlands (EMA)
- Gatwick (LGW)
- Heathrow (LHR)
- London City (LCY)
- Luton (LTN)
- Manchester (MAN)
- Newcastle (NCL)
- Stansted (STN)

3.6 The design was adapted to a clustered sample for noise levels less than 54 dB $L_{Aeq,16h}$, but remained unclustered for noise levels greater than 54 dB $L_{Aeq,16h}$.

3.7 The sample was allocated in proportion to the population exposed at each airport, thus the sampling initially defined was mainly comprised of people living around London Heathrow, since the majority of people exposed to aircraft noise in England live around Heathrow airport.

3.8 In addition, the sample was modified to undertake disproportionate sampling by noise level, with two-thirds of the sample allocated to noise levels above 54 dB $L_{Aeq,16h}$ and one third in the band 51-54 dB $L_{Aeq,16h}$. Without this adjustment the

[6] White et al (2019). White S, Beaton D, McMahon J & Rhodes D P, 'Measurement and modelling of aircraft noise at low levels', ERCD Report 1006, Civil Aviation Authority, July 2019.

51-54 dB $L_{Aeq,16h}$ band would have accounted for almost 50 percent of the survey, substantially affecting coverage at higher noise exposure levels. Additionally, it was agreed to disproportionately sample by airports, driven by the need to increase the sample size at Gatwick Airport for subset analysis purposes[7], and the desire to keep the proportion of addresses in the sample around airports other than Heathrow and Gatwick as near to their true proportions as possible.

3.9 The Civil Aircraft Noise section was preceded by a question checking that respondents were resident during summer 2014. As 122 interviewees were not resident during summer 2014, they were excluded. The remaining sample across all airports was 1,877 interviews. A combination of population density and size of airport meant that the majority of respondents live around Heathrow airport (two-thirds of respondents, three-quarters of weighted responses).

[7] This was looked at, but sample sizes were not considered sufficient to carry out a robust analysis.

Chapter 4

Respite

Introduction

4.1 This chapter presents the analysis and results relating to whether participants receive respite from aircraft noise events.

4.2 Respite refers to predictable periods of relief from aircraft noise. Relief is any period where an observer experiences a break from aircraft noise, whether predictable or unpredictable, so respite is a particular type of relief. Heathrow Airport Limited has commissioned significant research into respite to date. One of the findings reported in 2017[8] from active listening experiments was that differences of at least 7-8 dB between the average maximum noise levels of two sequences of aircraft flyover events[9] may be needed to provide a valuable break from aircraft noise.

4.3 Consideration was given to respite arising from different airport operating modes and runway alternation at Heathrow Airport.

Operating Modes

4.4 Aircraft noise exposure is affected by the direction of use of the runway(s) at an airport. All single runway airports have two operating directions, often referred to as operating modes. The direction in which aircraft fly when arriving at or departing from an airport depends on the direction of the wind. For safety reasons, aircraft are generally required to take-off and land into wind in order to ensure safe operation. For airports with a runway orientated predominantly

[8] Respite from aircraft noise: Overview of recent research, Anderson Acoustics in association with Systra and Arup, prepared for Heathrow Airport Ltd. May 2017.

[9] The researchers played to the subjects two sequences of aircraft sounds which they considered to be representative of the typical variation in sound levels that occur at Heathrow or any other airport. The aircraft sounds “occurred approximately every 50 seconds for 7 or 8 minutes’ duration, with ‘normal’ background noise”.

east-west, a westerly prevailing wind (i.e. a wind blowing from the west) requires westerly operations (i.e. aircraft flying into the wind, meaning arriving from the east and taking-off to the west). Conversely, an easterly prevailing wind requires easterly operations, with aircraft arriving from the west and taking off to the east into a wind blowing from the east. The equivalent applies for airports with a predominantly north-south orientated runway. The proportion of time the airport spends in either a westerly or easterly operating mode (or northerly or southerly operating mode respectively) is typically referred to as the modal split.

4.5 Heathrow Airport operates with a 'westerly preference' during the day which means that even during periods of light easterly winds, aircraft will continue to take off and land in a westerly direction. This was introduced in the 1960s to reduce the number of aircraft taking off in an easterly direction over London, the most heavily populated side of the airport.

4.6 Even with a westerly preference, the operating mode which will be in use at any future time is not predictable, so strictly speaking, changing operating modes offers only noise relief, not respite, to those people who experience a difference in noise level due to a change in operating mode. As such, for this part of the analysis, the effect of operating mode on peoples' attitudes to noise has not been assessed, focusing instead on the mechanism which offers actual respite, i.e. runway alternation.

Runway alternation

4.7 Heathrow airport, with its two runways, alternates the runway used for arrivals and departures during periods of westerly operations. Runway alternation does not occur during easterly operations due to the existence of the Cranford Agreement which prevents aircraft from routinely taking off from the northern runway in an easterly direction[10].

[10] The Cranford Agreement was a binding commitment the UK government made in 1952 to the residents of Cranford to reduce the impact of aircraft noise on residents. It prohibited, under normal Heathrow Airport operations, easterly aeroplane take-offs (i.e. towards central London) on the northern runway. (Source: London Borough of Hillingdon, background to article 'Planning application for the practical ending of the Cranford Agreement').

4.8 Daytime westerly runway alternation follows a daily cycle and a fortnightly cycle. The daily alternation cycle starts at 06:00, where the airport uses one runway for take-offs and the other for landings. However, the hour between 06:00 and 07:00 is the busiest time of the day for arrivals, so the airport can use both runways for landings during this period, and thus calculation of noise exposure and respite was calculated from 07:00. At 15:00, roughly halfway through Heathrow's working day, the airport swaps the runways over until the last aircraft departs at the end of the day (around 23:00). This morning and evening pattern of runway use continues for the rest of the week, and the following week the pattern is switched completely. What was done after 15:00 during the previous week, is now done between 07:00 and 15:00, and vice versa.

4.9 Although, like Heathrow, Manchester Airport also has two runways, alternation is not used due to local circumstances. Therefore, consideration has only been given to respondents at Heathrow.

Quantifying Respite

4.10 The hypothesis is that there will be an association between SoNA survey responses to certain questions and the amount of respite experienced by a respondent due to westerly runway alternation. To investigate this, the amount of respite experienced by the SoNA respondents living near Heathrow has been quantified based on operations during summer 2014 at Heathrow. Specifically, westerly arrival and departure operations were considered for only those days where all operations were westerly, i.e. days where there was a mixture of easterly and westerly operations were not included.

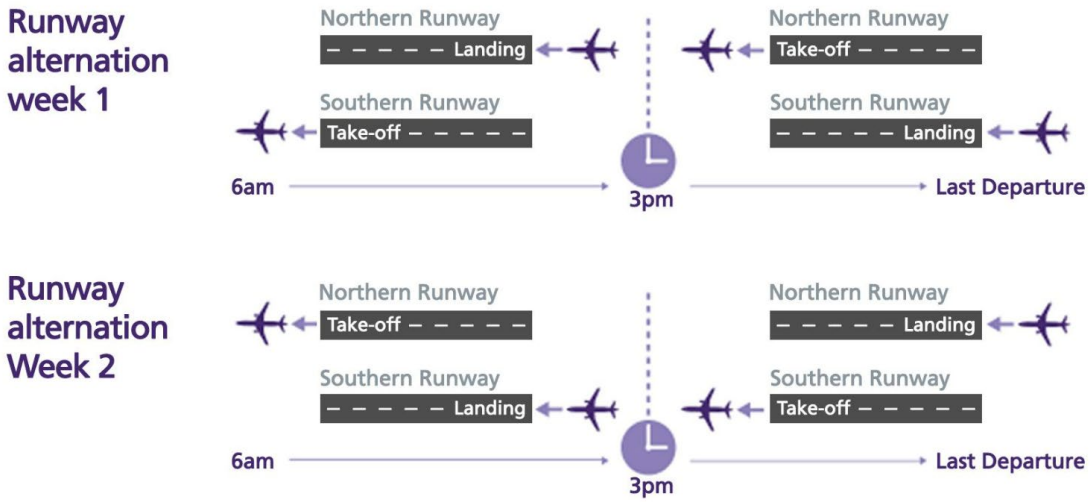
4.11 There are four westerly runway alternation patterns, described according to which runway (27L or 27R)[11] is designated for arrivals during either the morning (07:00-15:00) or afternoon (from 15:00 until the last departure of the day) period. To represent all four westerly runway alternation patterns, noise levels at grid and respondent locations were calculated for the above-mentioned westerly arrival and departure operations for the following scenarios:

[11] For westerly operations at Heathrow: Runway 27L is the southern runway; Runway 27R is the northern runway

- Morning period when 27R is the designated runway for arrivals (and 27L is used for departures)
- Afternoon period when 27R is the designated runway for arrivals (and 27L is used for departures)
- Morning period when 27L is the designated runway for arrivals (and 27R is used for departures)
- Afternoon period when 27L is the designated runway for arrivals (and 27R is used for departures)

4.12 The runway alternation pattern is illustrated in Figure 1, reproduced from the Heathrow Airport website[12].

Figure 1: Heathrow Airport Runway Alternation



4.13 The contours calculated from the results for each of these four scenarios are presented in Figure 2. Contours at lower noise exposure are not illustrated in order to make the figure clearer, since the noise differences between the different operating modes decreases further from the airport, but this factor was accounted for in the study.

4.14 The morning and afternoon periods are both eight hours in duration, but the arrival contour lobes to the east of the airport show that more noise is produced during the morning than the afternoon. This is because of differences in the fleet

[12] https://www.heathrow.com/company/local-community/noise/operations/runway-alternation

mix, with the majority of longhaul flights from Asia, serviced by noisier widebody aircraft, arriving in the morning.

4.15 Sometimes at Heathrow, the need arises to alleviate a current or anticipated build-up of flights being held in the holding stacks. When this happens, Government rules permit the air traffic service provider, NATS, to temporarily land aircraft on both runways concurrently. This is called Tactically Enhanced Arrivals Mode (TEAM) and is allowed after 07:00 on westerly days for up to six arrivals per hour on what was otherwise the departure runway. Separate to this, and as mentioned above (paragraph 4.8), the airport is also able to use both runways for arrivals between 06:00 - 07:00 without limit since this is the busiest hour of the day for arrivals into Heathrow.

4.16 The arrivals that land on the departure runway are referred to as *out-of-alternation* arrivals. These operations, although beneficial to the smooth operation of the airport, reduce the amount of noise respite that would otherwise be provided by total adherence to the runway alternation pattern.

4.17 The effect of out-of-alternation arrivals have been incorporated in this study by modelling these operations on the runway where the operation took place, i.e. on the respective departure runway.

4.18 Results for the scenarios listed in paragraph 4.11 were obtained for $L_{Aeq,8h}$[13] and average L_{ASmax}[14]. Separately for the two metrics, the results at each respondent location were then compared for the following pairs of scenarios. The lowest of

[13] Throughout this report, $L_{Aeq,8h}$ refers the average summer day noise exposure for the morning period 07:00-15:00 or the evening period 15:00-23:00 and should not be confused with the average summer night period $L_{Aeq,8h}$.

[14] For practical reasons, i.e. to avoid experimental scenarios requiring several hours of participation, the Heathrow Airport Limited research used differences in L_{ASmax} between successive noise events over a short timeframe to inform attitudes to aircraft noise respite. The outputs of this research were, nevertheless, considered applicable to average summer day noise exposure, $L_{Aeq.}$ However, for detailed acoustic reasons, at a given residential location, the calculated decibel difference due to flightpath alternation differs for $L_{Aeq,8h}$ and L_{ASmax} noise metrics. Because of the intended application of the Heathrow research, the findings were considered applicable to respite measured in terms of $L_{Aeq,8h}$, as a starting point, before exploring different values.

the four differences at each location was selected to represent the amount of respite experienced. The four pairs of scenarios of arrival designations are:

- Morning when 27L designated vs Morning when 27R designated
- Morning when 27L designated vs Evening when 27R designated
- Evening when 27L designated vs Morning when 27R designated
- Evening when 27L designated vs Evening when 27R designated

4.19 Comparisons between the Morning and Evening scenarios for a given designated runway were not considered representative of real effects, since they do not occur on any given day, so these comparisons were not included. A noise respite category to be used in the statistical analysis was assigned to each respondent location according to the following criteria applying to the minimum differences described in paragraph 4.18. This was done separately for $L_{Aeq,8h}$ and average L_{ASmax}:

- minimum difference is less than 4 dB
- minimum difference is at least 4 dB but less than 9 dB
- minimum difference is at least 9 dB

4.20 These categories were chosen based on the finding of Heathrow Airport's Respite Working Group, which defined less than 4 dB as 'little or no respite', at least 4 dB but less than 9 dB as 'noticeable respite' and at least 9 dB as 'meaningful respite'. The Working Group found, from their field studies, that 'after having been told about managed respite, and for areas with average aircraft noise levels above 57 dB $L_{Aeq,16h}$ where respondents expressed benefit of respite it was *valued* above 9 dB and *noticed* between 4 dB and 9 dB.'[15] In this further analysis, the 9 dB threshold was sensitivity-tested using values of 8 dB and 7 dB respectively.

4.21 Further detail on the methodology used to assign respite categories to respondent locations is provided in Appendix C. Figure 3 and Figure 4 present the respondent locations with their respective respite categories (based on $L_{Aeq,8h}$ and L_{ASmax} respectively) to illustrate where different amounts of respite

[15] Ibid 8.

are experienced due to westerly runway alternation. The $L_{Aeq,8h}$ morning noise contours are also plotted at 60 and 63 dB levels for context.

Figure 2: Heathrow 2014 $L_{Aeq,8h}$ morning and evening summer average noise contours

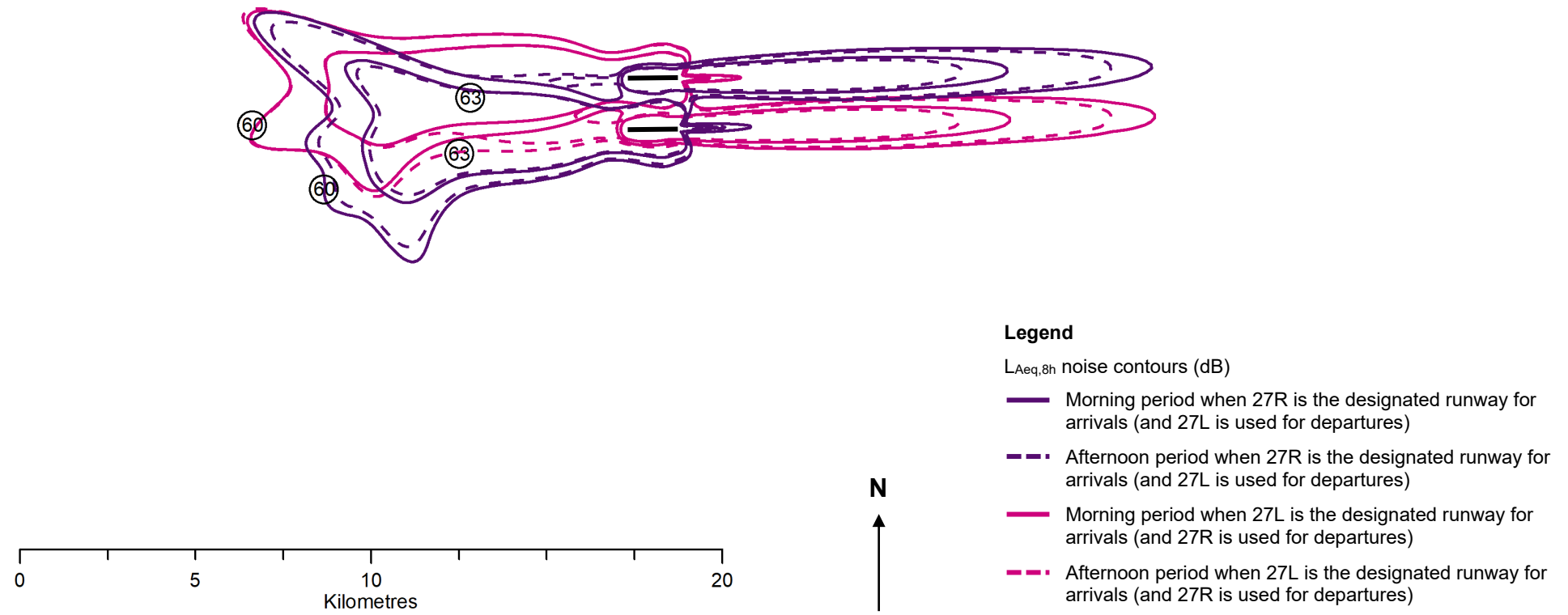


Figure 3: Heathrow 2014 westerly summer average morning noise contours and respite noise categories at respondent locations (based on $L_{Aeq,8h}$)

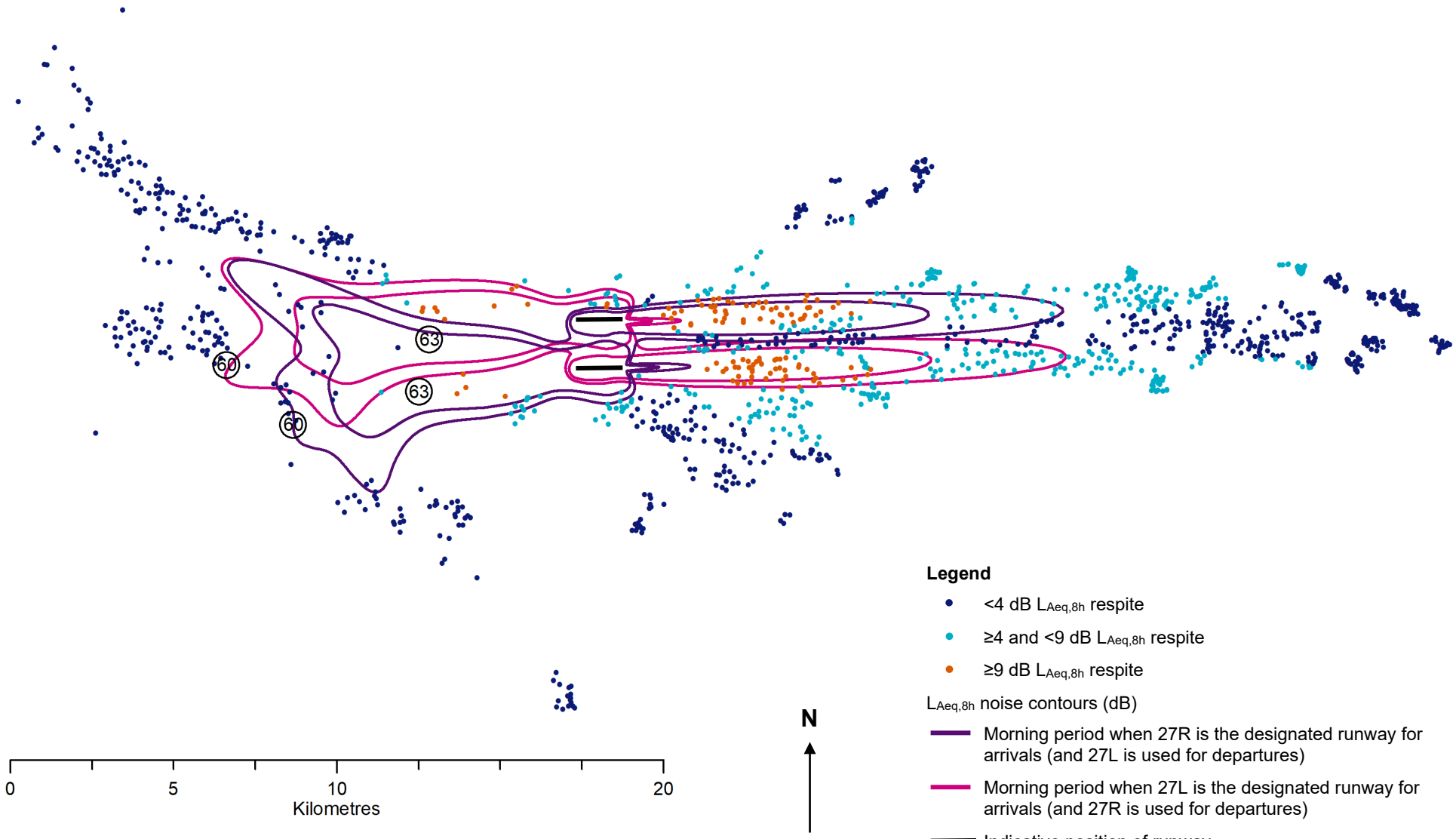
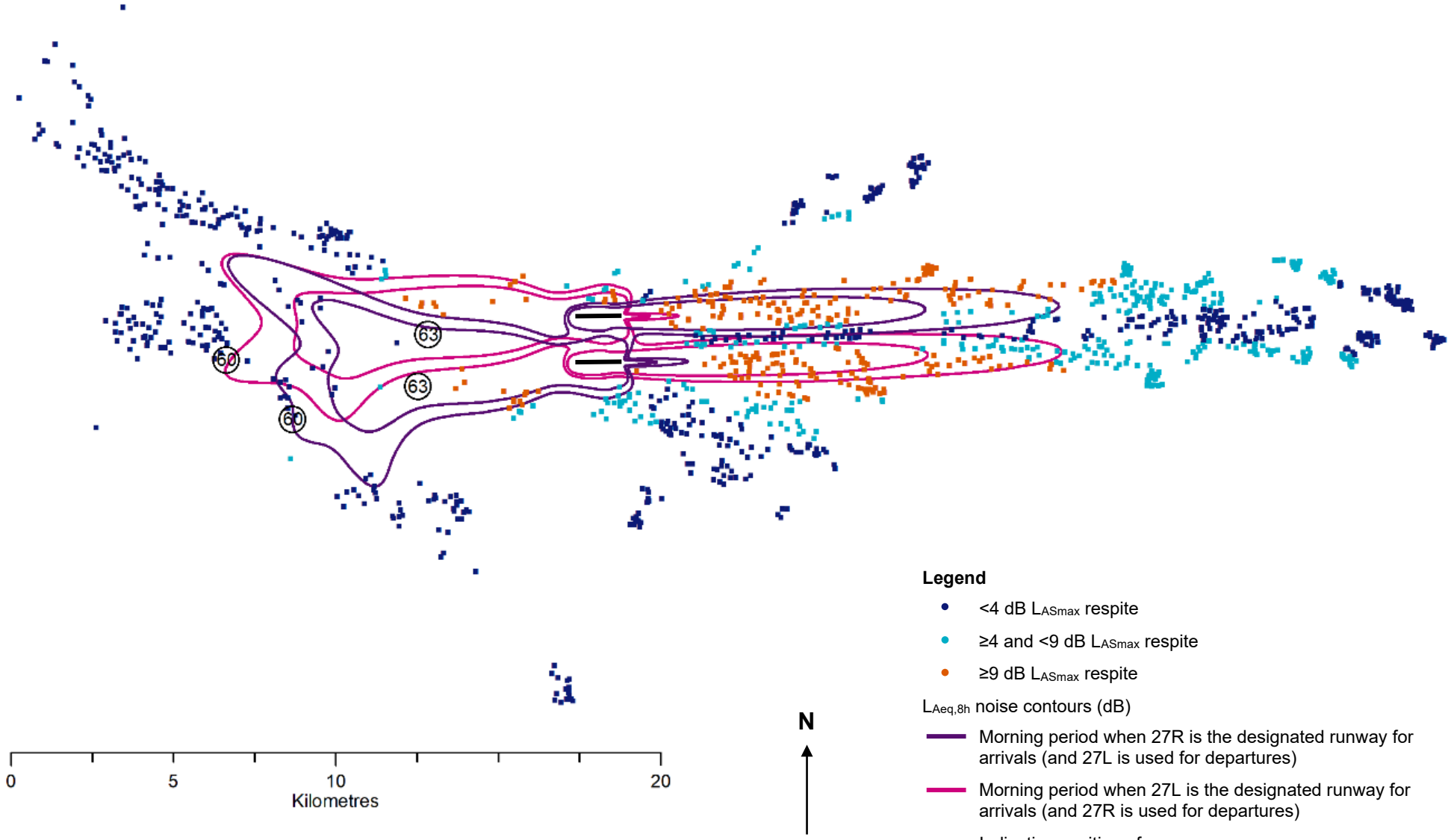


Figure 4: Heathrow 2014 westerly summer average morning noise contours and respite noise categories at respondent locations (based on L_{ASmax})



Respite statistical analysis

4.22 CAN34 is the question from which the aircraft noise-induced annoyance scores were obtained from respondents and is an 11-point scale, which is an ISO standard in annoyance research.

CAN34. *Thinking about this summer, what number from 0 to 10 best shows how much you were bothered, disturbed or annoyed by noise from aeroplanes?*
[Showcard CAN34]

0 Not at all	1	2	3	4	5	6	7	8	9	10 Extremely
○	○	○	○	○	○	○	○	○	○	○

○ Don't know ○ Don't hear

4.23 The mean annoyance scores from Question CAN34 were obtained in each of the average summer day noise bands, for those people experiencing **no respite** (<4 dB), **some** (≥4 and <9 dB), and **much** (≥9 dB) respite for arrivals and departures, respectively. The respite noise exposure differences were also computed for $L_{Aeq,8h}$ and L_{ASmax} noise exposure.

4.24 Further explanation of how respondents experiencing respite for arrivals and departures respectively are separated in the analysis is given in Appendix C.

Arrivals

4.25 The results are given in Table 1 to Table 3 for respondents affected by arrivals only based on $L_{Aeq,8h}$ respite on westerly operations.

Table 1: Mean annoyance scores (CAN34) for people experiencing no arrival respite (based on $L_{Aeq,8h}$ respite noise exposure)

Average summer day $L_{Aeq,16h}$ (dB)	N	Mean annoyance score	95% Confidence Interval
48-51	11	2.00	1.57
51-54	165	1.72	1.24
54-57	98	4.20	0.61
57-60	31	4.35	1.12
60-63	6	7.00	0.89
>63	3	6.67	0.67
Total	**314**	**-**	**-**

Table 2: Mean annoyance scores (CAN34) for people experiencing some arrival respite (based on $L_{Aeq,8h}$ respite noise exposure)

Average summer day $L_{Aeq,16h}$ (dB)	N	Mean annoyance score	95% Confidence Interval
48-51	16	2.25	1.22
51-54	119	2.87	0.47
54-57	118	4.51	0.57
57-60	46	5.46	0.88
60-63	26	5.88	1.01
>63	7	6.71	2.46
Total	**332**	**-**	**-**

Table 3: Mean annoyance scores (CAN34) for people experiencing much arrival respite (based on $L_{Aeq,8h}$ respite noise exposure)

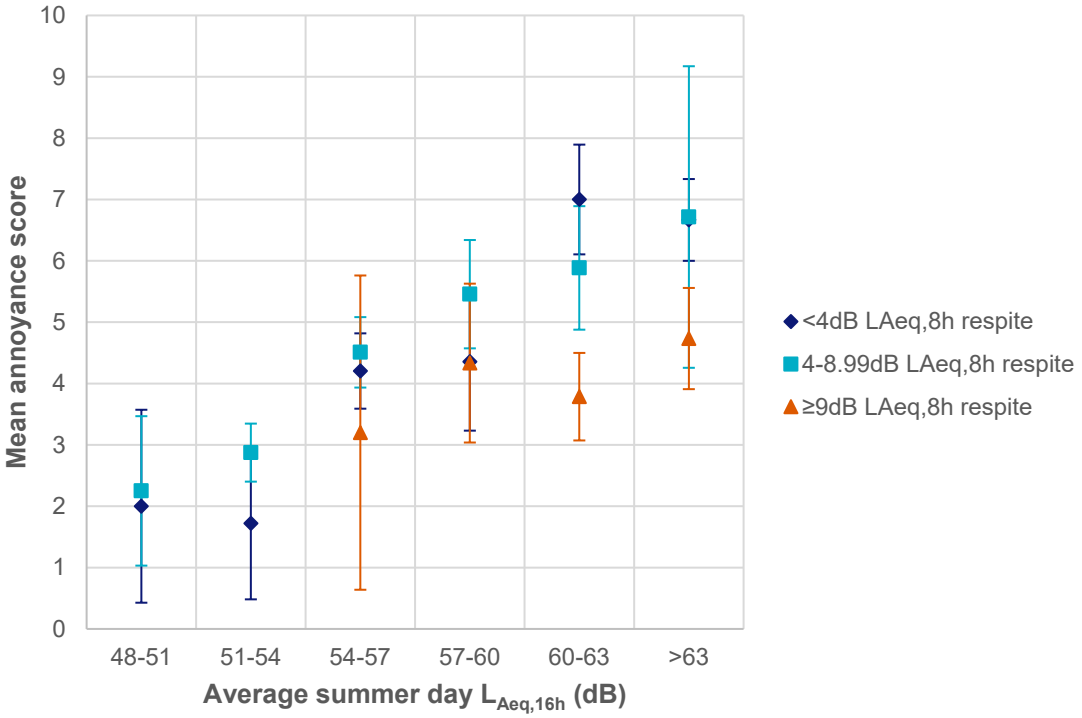
Average summer day $L_{Aeq,16h}$ (dB)	N	Mean annoyance score	95% Confidence Interval
48-51	-	-	-
51-54	-	-	-
54-57	5	3.20	2.56
57-60	24	4.33	1.29
60-63	42	3.79	0.71
>63	45	4.73	0.82
Total	**116**	**-**	**-**

4.26 These tables show that 59% (448) of the sample of 762 respondents experienced at least some respite based on the thresholds defined in paragraph 4.23. They also show that much arrival respite corresponds to notable reductions in mean annoyance scores compared to where there is some or no arrival respite. Comparing Tables 1 and 2 suggests that only in the 60-63 dB band does adding some respite reduce mean annoyance scores compared to the no respite case. Note that sample sizes are small (≤11) for some bands, so these results should be considered indicative rather than conclusive.

4.27 Figure 5 illustrates the mean annoyance scores as a function of average summer day $L_{Aeq,16h}$ noise exposure for each of the respite categories (none,

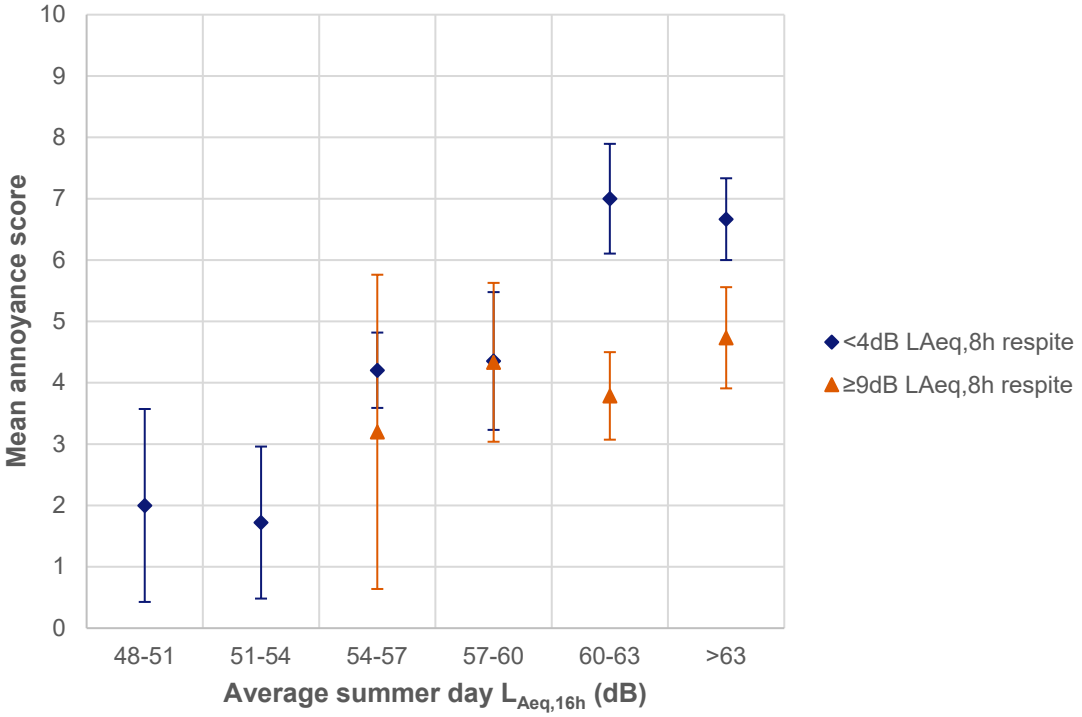
some and much respite) from arrivals noise, based on $L_{Aeq,8h}$ respite noise exposure.

Figure 5: Plot of CAN34 mean annoyance scores in SoNA 2014 survey as a function of average summer day $L_{Aeq,16h}$ noise exposure for respondents experiencing no, some or much respite from arrivals noise based on $L_{Aeq,8h}$ respite noise exposure



4.28 Figure 6 illustrates the effect of removing the 'some' respite category from Figure 5, simply in order to make the comparison between the <4 dB (no respite) and ≥9 dB (much respite) categories clearer. In the higher noise levels a clear separation between the two categories in terms of mean annoyance score can be observed.

Figure 6: Plot of CAN34 mean annoyance scores in SoNA 2014 survey as a function of average summer day $L_{Aeq,16h}$ noise exposure for respondents experiencing no or much respite from arrivals noise based on $L_{Aeq,8h}$ respite noise exposure



4.29 Tables 4 to 6 indicate the number of respondents in each noise band receiving no, some or much respite from arrivals noise based on the noise indicator L_{ASmax}.

Table 4: Mean annoyance scores (CAN34) for people experiencing no arrival respite (based on L_{ASmax})

Average summer day $L_{Aeq,16h}$ (dB)	N	Mean annoyance score	95% Confidence Interval
48-51	11	2.00	1.57
51-54	117	2.41	0.48
54-57	70	4.24	0.76
57-60	22	4.09	1.30
60-63	4	7.00	1.41
>63	-	-	-
Total	**225**	**-**	**-**

Table 5: Mean annoyance scores (CAN34) for people experiencing some arrival respite (L_{ASmax})

Average summer day $L_{Aeq,16h}$ (dB)	N	Mean annoyance score	95% Confidence Interval
48-51	16	2.25	1.22
51-54	120	1.68	1.68
54-57	98	4.28	0.63
57-60	27	5.52	1.10
60-63	9	5.22	1.56
>63	7	7.71	1.04
Total	**277**	**-**	**-**

Table 6: Mean annoyance scores (CAN34) for people experiencing much arrival respite (L_{ASmax})

Average summer day $L_{Aeq,16h}$ (dB)	N	Mean annoyance score	95% Confidence Interval
48-51	-	-	-
51-54	47	3.04	0.79
54-57	53	4.60	0.80
57-60	52	4.83	0.89
60-63	61	4.57	0.68
>63	47	4.68	0.82
Total	**260**	**-**	**-**

4.30 These tables show that 70% (537) of the sample of 762 respondents experienced at least some respite based on the thresholds defined in paragraph 4.23. These results for the L_{ASmax} indicator suggest that at average summer day noise levels of 60-63 dB $L_{Aeq,16h}$, some arrival respite corresponds to a reduction in mean annoyance scores compared to where there is no arrival respite with a further reduction where there is much arrival respite. Above 57 dB $L_{Aeq,16h}$ there is some reduction in annoyance with much respite compared with some respite. At lower average summer day noise levels, respite does not appear to give benefit on this basis. Note, however, that sample sizes are small (≤11) for some bands, so these results should be considered indicative rather than conclusive.

Departures

4.31 Table 7 to Table 9 illustrate the mean annoyance scores and number of respondents per average summer day $L_{Aeq,16h}$ noise exposure for those respondents experiencing no, some or much respite from departure noise, based on $L_{Aeq,8h}$ noise exposure.

Table 7: Mean annoyance scores (CAN34) for people experiencing no departure respite ($L_{Aeq,8h}$)

Average summer day $L_{Aeq,16h}$ (dB)	N	Mean annoyance score	95% Confidence Interval
48-51	18	1.28	0.60
51-54	103	2.34	0.48
54-57	90	3.60	0.51
57-60	61	4.03	0.78
60-63	20	4.65	1.42
>63	20	4.70	1.58
Total	**312**	**-**	**-**

Table 8: Mean annoyance scores (CAN34) for people experiencing some departure respite ($L_{Aeq,8h}$)

Average summer day $L_{Aeq,16h}$ (dB)	N	Mean annoyance score	95% Confidence Interval
48-51	-	-	-
51-54	1	0.00	-
54-57	16	1.31	0.57
57-60	13	2.85	1.63
60-63	9	2.44	1.57
>63	1	0.00	-
Total	**40**	**-**	**-**

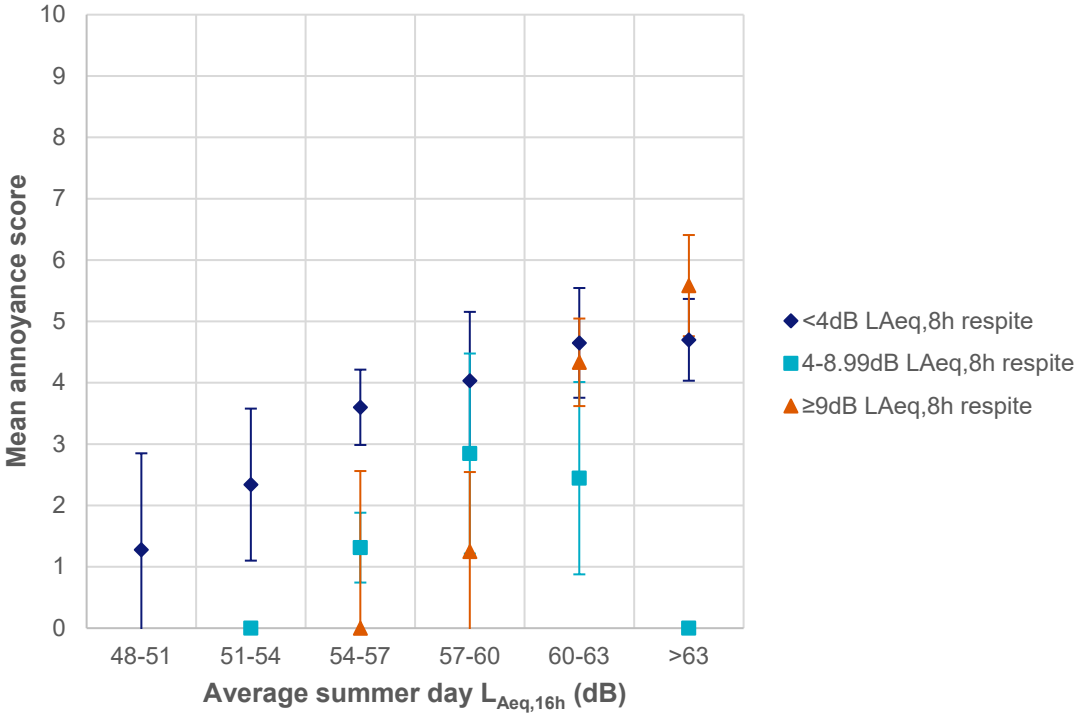
Table 9: Mean annoyance scores (CAN34) for people experiencing much departure respite ($L_{Aeq,8h}$)

Average summer day $L_{Aeq,16h}$ (dB)	N	Mean annoyance score	95% Confidence Interval
48-51	-	-	-
51-54	-	-	-
54-57	1	0.00	-
57-60	4	1.25	0.96
60-63	3	4.33	2.67
>63	12	5.58	2.18
Total	**20**	**-**	**-**

4.32 The tables above show that 16% (60) of the sample of 372 respondents experienced at least some respite based on the thresholds defined in paragraph 4.23. The results indicate that at average summer day noise levels below 60 dB $L_{Aeq,16h}$, some departure respite corresponds to reductions in mean annoyance scores compared to where there is no departure respite, with a further reduction where there is much respite. At higher average summer day noise levels, the mean anoyance score appears to increase with increasing respite. Note that sample sizes are small (≤11) for some bands, so these results should be considered indicative rather than conclusive.

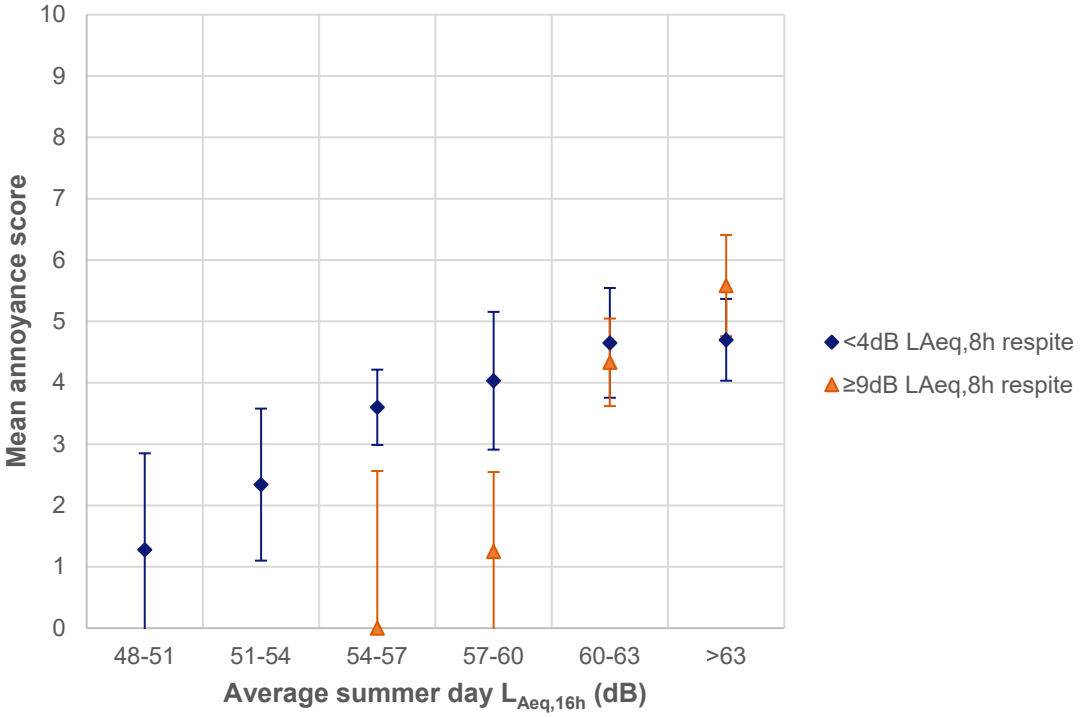
4.33 Figure 7 illustrates the mean annoyance scores as a function of average summer day $L_{Aeq,16h}$ noise exposure for each of the respite categories (none, some and much respite) from departure noise, based on $L_{Aeq,8h}$ respite noise exposure.

Figure 7: Plot of CAN34 mean annoyance scores in SoNA 2014 survey as a function of average summer day $L_{Aeq,16h}$ noise exposure for respondents experiencing no, some or much respite from departure noise based on $L_{Aeq,8h}$ respite noise exposure



4.34 Figure 8 illustrates the effect of removing the 'some' respite category from Figure 7, simply in order to make the comparison between the <4 dB and ≥9 dB respite categories clearer. In the lower noise levels, where results are available, a clear separation between the two categories in terms of mean annoyance score can be observed.

Figure 8: Plot of CAN34 mean annoyance scores in SoNA 2014 survey as a function of average summer day $L_{Aeq,16h}$ noise exposure for respondents experiencing no or much respite from departure noise based on $L_{Aeq,8h}$ respite noise exposureCAN



4.35 Table 10 to Table 12 indicate the number of respondents in each noise band receiving no, some or much respite from departures noise based on the noise indicator L_{ASmax}.

Table 10: Mean annoyance scores (CAN34) for people experiencing no departure respite (L_{ASmax})

Average summer day $L_{Aeq,16h}$ (dB)	N	Mean annoyance score	95% Confidence Interval
48-51	18	1.28	0.60
51-54	103	2.34	0.48
54-57	84	3.45	0.50
57-60	57	4.07	0.82
60-63	18	4.78	1.56
>63	20	4.70	3.54
Total	**300**	**-**	**-**

Table 11: Mean annoyance scores (CAN34) for people experiencing some departure respite (L_{ASmax})

Average summer day $L_{Aeq,16h}$ (dB)	N	Mean annoyance score	95% Confidence Interval
48-51	-	-	-
51-54	1	0.00	-
54-57	19	2.63	1.33
57-60	12	3.25	1.74
60-63	6	2.50	2.05
>63	1	0.00	-
Total	**39**	**-**	**-**

Table 12: Mean annoyance scores (CAN34) for people experiencing much departure respite (L_{ASmax})

Average summer day $L_{Aeq,16h}$ (dB)	N	Mean annoyance score	95% Confidence Interval
48-51	-	-	-
51-54	-	-	-
54-57	4	1.25	1.50
57-60	9	1.89	1.22
60-63	8	3.38	1.56
>63	12	5.58	2.18
Total	**33**	**-**	**-**

4.36 The tables above show that 19% (72) of the sample of 372 respondents experienced at least some respite based on the thresholds defined in paragraph 4.23.

Multivariate Logistic Regression Analysis

4.37 A multivariate logistic regression was performed to see if there were any significant associations between the amount of departure respite received and being highly annoyed (calculated using CAN34). It was found that there was no statistical association between departure respite and annoyance responses (and therefore there are no Figures to illustrate this). This is likely due to the small number of respondents (72, as stated above) in the SoNA survey that experienced respite departure noise differences of 4-8.99 dB $L_{Aeq,8h}$/L_{ASmax} and

at least 9 dB $L_{Aeq,8h}$/L_{ASmax}. Thus, the following analysis considered only arrival noise respite.

4.38 With regard to westerly arrival noise, when the 'much' respite threshold was ≥9 dB $L_{Aeq,8h}$, the results of the regression analysis indicated that there was a significant association between being highly annoyed, as measured by responses to CAN34, noise exposure and no respite (OR=REF[16]; p<0.005) and much respite (OR=0.284; p<0.005). The category 'some' respite was not significantly associated with being highly annoyed. In other words, the findings indicate that a certain amount of respite is needed to be experienced before respite has a beneficial effect, i.e. by reducing the likelihood of being highly annoyed. It may be that small amounts of respite may reduce the likelihood of being highly annoyed, however, the SoNA 2014 sample size was too small to determine any association.

4.39 The addition of the non-acoustic factor noise sensitivity (measured by Question 7b – See Appendix B) into the regression model as a confounding variable, resulted in the no respite condition and the much respite condition (≥9 dB $L_{Aeq,8h}$) both being significantly associated with being highly annoyed. No respite (OR=REF; p<0.005) and much respite (OR=0.208; p<0.005). This suggests that even if a respondent's sensitivity to noise is taken into account, providing much respite still reduces their level of annoyance.

4.40 The further addition of the non-acoustic variable relating to socio-economic status (measured by Question H13) resulted in the above results remaining significant at the same 'p' levels. This indicates that when controlling for both noise sensitivity and socioeconomic status, there remains a significant interaction between aircraft noise exposure, the amount of respite (either no respite or at ≥9 dB $L_{Aeq,8h}$) and annoyance responses. That is, respite appears to have a benefical effect on people no matter their socioeconomic status or how sensitive they are to aircraft noise.

[16] See Glossary for an explanation of 'REF'.

4.41 Irrespective of controlling for noise sensitivity and socio-economic status, the category some respite (4-8.99 dB $L_{Aeq,8h}$ of respite) was not found to have a statistically significant effect on being highly annoyed, compared with experiencing no respite (OR=1.123, p=0.66).

4.42 To investigate whether a lower level of respite would also result in a significant association, the above logistic regression analysis was repeated with the respite threshold for 'much respite' set at ≥8 dB $L_{Aeq,8h}$ (compared with ≥9 dB $L_{Aeq,8h}$ previously). The results are given in Table 13 and Table 14 (the 'no respite' results shown in Table 1 still apply), and Figure 9 illustrates the mean annoyance scores as a function of average summer day $L_{Aeq,16h}$ noise exposure for the <4 dB and ≥8 dB respite categories.

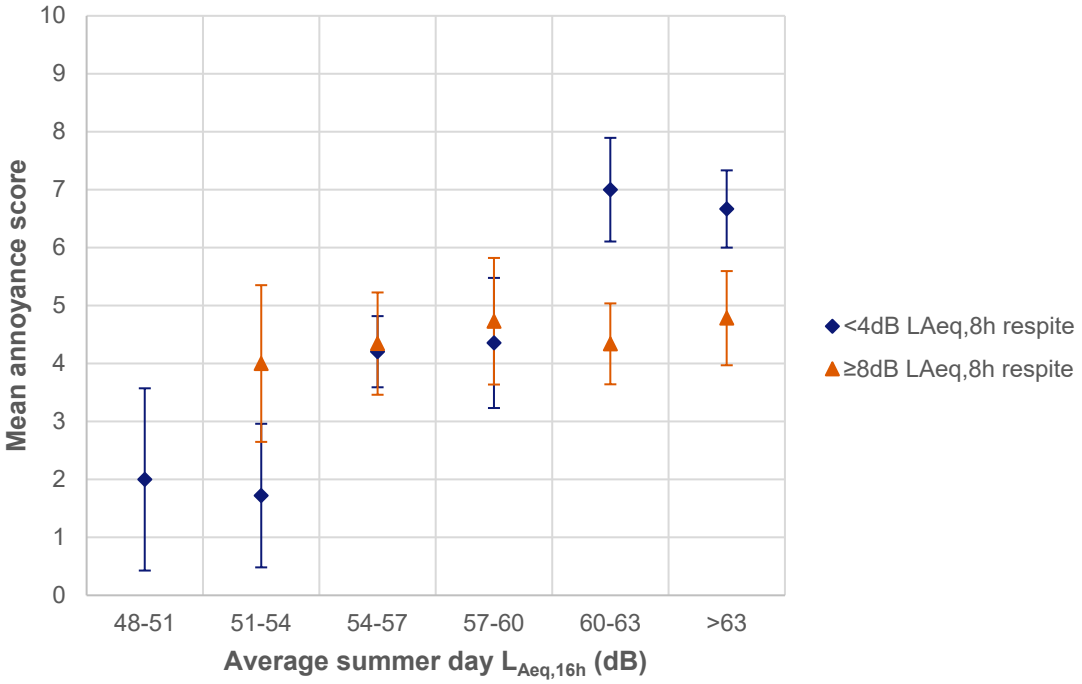
Table 13: Mean annoyance scores (CAN34) for people experiencing some arrival respite (based on $L_{Aeq,8h}$ respite noise exposure, with 'much respite' threshold set at ≥8 dB)

Average summer day $L_{Aeq,16h}$ (dB)	N	Mean annoyance score	95% Confidence Interval
48-51	16	2.25	1.22
51-54	104	2.71	0.50
54-57	91	4.49	0.69
57-60	33	5.45	0.97
60-63	15	5.47	1.41
>63	6	6.67	2.91
Total	**265**	**-**	**-**

Table 14: Mean annoyance scores (CAN34) for people experiencing much arrival respite (based on $L_{Aeq,8h}$ respite noise exposure, with 'much respite' threshold set at ≥8 dB)

Average summer day $L_{Aeq,16h}$ (dB)	N	Mean annoyance score	95% Confidence Interval
48-51	-	-	-
51-54	15	4.00	1.35
54-57	32	4.34	0.88
57-60	37	4.73	1.09
60-63	53	4.34	0.70
>63	46	4.78	0.81
Total	**183**	**-**	**-**

Figure 9: Plot of CAN34 mean annoyance scores in SoNA 2014 survey as a function of average summer day $L_{Aeq,16h}$ noise exposure for respondents experiencing no or much respite from arrivals noise based on $L_{Aeq,8h}$ respite noise exposure and 'much respite' threshold



4.43 The results indicated that there was a borderline significance for the 'much' respite condition (≥8 dB $L_{Aeq,8h}$) (OR=0.494; p=0.056). This suggests that lowering the level of respite reduces the potentially beneficial effect, although benefit is seen above 60 dB. It was therefore decided to further analyse this respite definition, with the inclusion of non-acoustic factors within the regression models.

4.44 When making comparisons between annoyance responses from respondents with and without respite, it is important to consider that the way respite is implemented at Heathrow means that respondents with and without respite will tend to live in different geographic locations and thus may have different characteristics, some of which may affect their annoyance rating. It is standard practice, where possible, to add these factors into regression modelling, so that the effects of these factors can be taken into account. The inclusion of noise sensitivity in the model resulted in the no respite condition and the much respite condition (≥8 dB $L_{Aeq,8h}$) now both being significantly associated with being

highly annoyed. No respite (OR=REF; p<0.005) and much respite (OR=0.376; p<0.05). In other words, taking into account the noise sensitivity of the respondents suggests that this lower level of respite (≥8 dB $L_{Aeq,8h}$) may provide a significant benefit in reducing annoyance, though not as much as that provided by the higher level (>9 dB $L_{Aeq,8h}$).

4.45 Socio-economic status was then added to the regression model. The no respite condition remained significant (OR=REF; p<0.05), as did the 'much' respite condition (OR=0.437; p<0.05). This result confirms that when controlling for the non-acoustic confounding variables of noise sensitivity and socio-economic status, there is significant association with aircraft noise-induced annoyance when receiving no respite and 'much respite' at a level of ≥8 dB $L_{Aeq,8h}$. This indicates that the lower level of respite (≥8 dB $L_{Aeq,8h}$) appears to have a benefical effect on people no matter their socioeconomic status or how sensitive they are to aircraft noise, though the higher level of respite (≥9 dB $L_{Aeq,8h}$) is likely to have a greater beneficial effect.

4.46 The analysis was repeated, this time lowering the muchnoise respite threshold to 7 dB $L_{Aeq,8h}$. This time, no significant association was found between the likelihood of being highly annoyed and those experiencing at least 7 dB $L_{Aeq,8h}$ noise respite and those experiencing less than 4 dB $L_{Aeq,8h}$ noise respite. It is possible that the SoNA sample size was insufficient to identify a statistically significant effect at this level of noise respite, however the results indicate that at least 8 dB $L_{Aeq,8h}$ respite is likely to be necessary to have a beneficial effect on whether people are highly annoyed by aircraft noise.

4.47 As noted in footnote 14, the respite values resulting from the Heathrow research were based on differences in L_{ASmax} levels of successive noise events. For the preceding analysis these values were considered applicable to differences in $L_{Aeq,8h}$. When the same regression analysis was performed using the noise indicator L_{ASmax}, no significant interaction was found between any of the respite categories 'none', 'some' or 'much' and being highly annoyed. This result remained the same whether the 'much' respite threshold was set at ≥8 or ≥9 dB L_{ASmax}. For a given value of L_{ASmax} respite, the corresponding $L_{Aeq,8h}$ is around

2 dB lower[17]. Thus, the thresholds of at least 8 dB and 9 dB L_{ASmax} correspond to values of 6.1 dB and 7.0 dB $L_{Aeq,8h}$ respite respectively.

4.48 The findings of no significance are therefore consistent with the earlier findings and indicate that for the SoNA 2014 survey, the threshold of respite at which being highly annoyed is reduced is statistically significant at 8 dB $L_{Aeq,8h}$, or 10.2 dB L_{ASmax}, thus about 1 dB higher than found by the Heathrow research. The overall findings for levels of $L_{Aeq,8h}$ and L_{ASmax} respite are summarised in Table 15.

Table 15: Minimum respite levels that were found to result in statistically significant odds of being highly annoyed as a function of $L_{Aeq,8h}$ and L_{ASmax} respite noise exposure from SoNA 2014

$L_{Aeq,8h}$ respite (dB)	L_{ASmax} respite (dB)	SoNA 2014 findings
9.0	11.3	Has a significant effect on being highly annoyed
8.0	10.2	Has a significant effect on being highly annoyed
7.0	9.0	Does not have a significant effect on being highly annoyed
6.1	8.0	Does not have a significant effect on being highly annoyed

4.49 Based on the logistic regression models, the dose response functions for the percentage highly annoyed as a function of average summer day $L_{Aeq,16h}$ noise exposure, without and with ≥9 dB and ≥8 dB $L_{Aeq,8h}$ respite noise exposure are presented in Table 16 and Table 17 respectively for westerly arrival operations only.

[17] For two flight paths a given distance apart, the difference in noise respite between the two flight paths is not the same in terms of the L_{ASmax} and $L_{Aeq,8h}$, nor is the difference between the two metrics constant, since it is also dependent on the height of the aeroplane as well as the distance between the two flight paths.

Table 16: Percentage Highly Annoyed for no respite (<4 dB $L_{Aeq,8h}$ respite) and 'much respite' at the threshold of ≥9 dB $L_{Aeq,8h}$, accounting for noise sensitivity and socio-economic status (westerly arrivals)

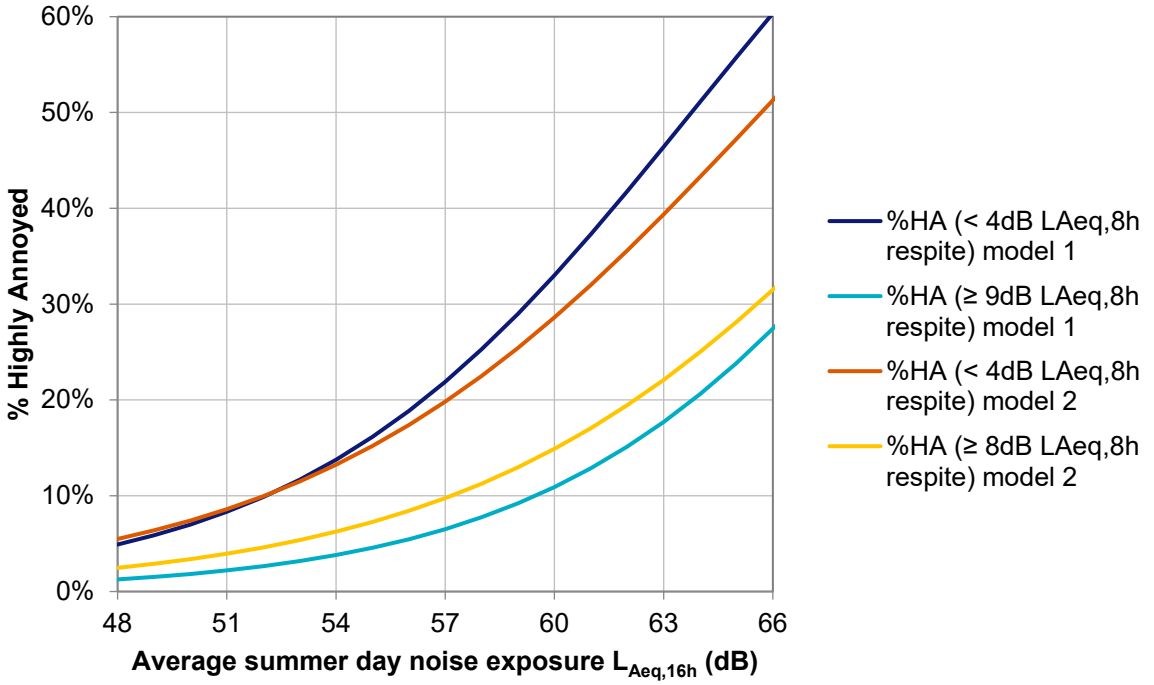
Average summer day $L_{Aeq,16h}$ (dB)	% Highly Annoyed (no respite)	% Highly Annoyed (much respite)	Difference in % Highly Annoyed (no respite – much respite)
48	4.9%	1.3%	3.6%
49	5.9%	1.5%	4.3%
50	7.0%	1.8%	5.2%
51	8.3%	2.2%	6.1%
52	9.9%	2.6%	7.2%
53	11.7%	3.2%	8.5%
54	13.8%	3.8%	9.9%
55	16.1%	4.6%	11.6%
56	18.8%	5.5%	13.4%
57	21.9%	6.5%	15.4%
58	25.3%	7.7%	17.5%
59	29.0%	9.2%	19.8%
60	33.0%	10.9%	22.1%
61	37.3%	12.9%	24.4%
62	41.8%	15.1%	26.7%
63	46.4%	17.7%	28.7%
64	51.1%	20.6%	30.5%
65	55.8%	23.8%	31.9%
66	60.3%	27.4%	32.9%
67	64.7%	31.3%	33.4%
68	68.9%	35.5%	33.4%

Table 17: Percentages of Highly Annoyed for no respite (<4 dB $L_{Aeq,8h}$) and 'much respite' at the threshold of ≥8 dB $L_{Aeq,8h}$, accounting for noise sensitivity and socio-economic status (westerly arrivals)

Average summer day $L_{Aeq,16h}$ (dB)	% Highly Annoyed (no respite)	% Highly Annoyed (much respite)	Difference in % Highly Annoyed (no respite – much respite)
48	5.5%	2.5%	3.0%
49	6.4%	2.9%	3.5%
50	7.4%	3.4%	4.0%
51	8.6%	3.9%	4.6%
52	9.9%	4.6%	5.3%
53	11.5%	5.4%	6.1%
54	13.2%	6.2%	7.0%
55	15.2%	7.3%	7.9%
56	17.4%	8.4%	9.0%
57	19.8%	9.7%	10.1%
58	22.5%	11.3%	11.2%
59	25.4%	13.0%	12.5%
60	28.6%	14.9%	13.7%
61	32.0%	17.1%	14.9%
62	35.6%	19.5%	16.1%
63	39.4%	22.1%	17.3%
64	43.3%	25.0%	18.3%
65	47.3%	28.1%	19.1%
66	51.3%	31.5%	19.8%
67	55.3%	35.1%	20.2%
68	59.2%	38.8%	20.4%

4.50 The tabular data above for westerly arrivals are plotted in Figure 10. Although the definition of no respite (<4 dB $L_{Aeq,8h}$) remains unchanged between the two models, the change in definition of those experiencing 'much' respite (i.e. from ≥9 dB to ≥8 dB), changes the logistic model, resulting in different functions for the 'without respite' condition, though they are essentially the same between 48 dB and 54 dB $L_{Aeq,16h}$.

Figure 10: Dose response relationships between aircraft noise exposure and % HA for respite thresholds of ≥8 dB and ≥9 dB $L_{Aeq,8h}$ when controlling for non-acoustic factors noise sensitivity and socio-economic status (westerly arrivals)



4.51 The horizontal distance between the dark blue and light blue lines (≥9 dB $L_{Aeq,8h}$ respite) can be seen to increase with increasing noise dose, indicating that the value of respite increases with noise dose.

4.52 Considering the 10% Highly Annoyed level for the ≥9 dB $L_{Aeq,8h}$ threshold, this translates to 52 dB without respite, and 59.5 dB $L_{Aeq,16h}$ with respite. Therefore, this means that having 'much' respite is equivalent to a reduction in overall \noise exposure of around 7.5 dB $L_{Aeq,16h}$ compared to those that do not receive any respite.

4.53 The orange and yellow lines refer to equivalent results with ≥8 dB $L_{Aeq,8h}$ respite for the 'much' respite category. The 10% Highly Annoyed level without respite is at a noise level of 52 dB $L_{Aeq,16h}$. This becomes 57 dB $L_{Aeq,16h}$ with respite. The equivalent reduction in overall noise exposure in this scenario is around 5 dB $L_{Aeq,16h}$.

Chapter 5

Further Exploration of Non-Acoustic Factors

Introduction

5.1 This chapter addresses the following study objective:

> "Obtain new and updated evidence on what influences attitudes to aviation noise, and how attitudes vary, particularly how attitudes vary with L_{Aeq}, but also other non-acoustic factors that may influence attitudes, such as location and time of day, and socio-economic group of respondents."

5.2 Past UK and international surveys have shown[18,19] that whilst there is a high correlation between cumulative noise exposure and mean annoyance or the percentage highly annoyed, there is considerable variation in annoyance responses that is not associated with noise exposure.

5.3 The identification and the relative contribution of non-acoustic factors may yield additional factors for consideration in noise management and in setting policy. Secondly, consideration of non-acoustic factors is important since they can obscure or confound the relationship between annoyance and noise exposure. By separating out and including the effects of other variables in the model used for estimating the likelihood of annoyance it may be possible to reduce uncertainty and increase confidence in the relationship between noise exposure and annoyance.

5.4 This chapter builds further on the analysis presented in CAP 1506, and includes analysis of the following non-acoustic factors:

- Examining annoyance responses from respondents in dwellings with and without gardens/outside space
- Looking at responses from people living in flats versus houses

[18] Brooker et al (1985) DR Report 8402. United Kingdom Aircraft Noise Study: Main Report.

[19] Schultz T J. (1978) 'Synthesis of social surveys on noise annoyance', Journal of Acoustical Society of America, 64, p. 377-405.

- Complaints – association between making complaints, annoyance and noise exposure
- Surroundings (presence of green spaces nearby)
- Percentage of time spent at home in the day
- Whether there is a change in exposure to noise (in the last one year)

Access to Outside Space

5.5 Having access to outdoor space can be an important aspect of quality of life, but when outside, people can be exposed to aircraft noise without the benefit of the noise insulation of the building in which they live. This question sought to find out whether having access to outdoor space is associated with people's attitudes to aircraft noise. This was addressed by asking the following question:

A3: Do you have use of an outdoor space such as a garden, terrace or balcony here?

5.6 The results are given in Table 18, which shows the mean annoyance scores (CAN34) for those people who do not have outside space associated with their home.

Table 18: Mean CAN34 score with no outside space, categorised by average summer day $L_{Aeq,16h}$

Average summer day $L_{Aeq,16h}$ (dB)	N	Mean annoyance score	95% Confidence Interval
48-51	23	1.97	0.86
51-54	171	0.84	1.88
54-57	76	3.42	0.60
57-60	33	4.06	1.08
60-63	11	3.64	1.34
>63	14	4.59	1.56
Total	**329**	**-**	**-**

5.7 Table 19 shows the mean annoyance scores (CAN34) for those people who have outside space associated with their home.

Table 19: Mean CAN34 score with outside space, categorised by average summer day noise exposure ($L_{Aeq,16h}$)

Average summer day $L_{Aeq,16h}$ (dB)	N	Mean annoyance score	95% Confidence Interval
48-51	56	2.08	0.74
51-54	621	2.57	0.21
54-57	438	3.79	0.67
57-60	228	4.37	0.42
60-63	117	4.71	0.56
>63	58	5.34	0.75
Total	**1,518**	**-**	**-**

5.8 The results indicate that annoyance scores are slightly higher for those people with use of private outdoor space. A multivariate logistic regression was performed to see if there were any significant associations between having the use of private outdoor space and being highly annoyed (calculated using CAN34). The results indicate that there is a significant association between annoyance, noise exposure, and having the use of private outdoor space (garden, terrace or balcony) OR=2.064 ($p<0.005$) compared with having no use of private outdoor space (reference category). The analysis shows that people with use of private outdoor space are more likely to be highly annoyed at a given noise exposure than those without use of private outdoor space. The inference is that the impact of aircraft noise on the use of private outdoor space adds to the annoyance experienced, compared with those who have no use of private outdoor space.

5.9 The regression model was then amended to control for age and socio-economic status. The results indicate that access to outdoor space decreases in significance, OR=1.738, ($p<0.05$), once age and socio-economic status were added to the model.

5.10 The non-acoustic factor noise sensitivity was then applied to the regression model of annoyance, noise exposure ($L_{Aeq,16h}$) access to outdoor space, controlling for age, socio-economic status and noise sensitivity. When controlling for noise sensitivity, age and socio-economic status, the effect of outdoor space on being highly annoyed increased slightly OR=1.875 ($p<0.05$),

compared with noise-sensitivity omitted. This re-emphasises that people living with access to outdoor space are more likely to be highly annoyed at a given noise exposure than those without access, after controlling for noise sensitivity, age and socio-economic status.

5.11 The type of dwelling was also examined within this regression model. Respondents were asked about their type of dwelling. The survey recorded different types of flats and houses, however for the purposes of this analysis, the data were re-grouped into two categories, House or Flat. The logisitic regression was then performed for the likelihood of being highly annoyed as a function of average summer day noise exposure ($L_{Aeq,16h}$), access to outdoor space, controlling for age, socio-economic status, noise sensitivity and whether respondents lived in a house or flat. The results of this regression indicate that the variable 'access to outdoor space' loses all significance ($p>0.05$) when house/flat is included in the model, with dwelling type instead being significant (House OR=1.619 $p<0.05$). This result is not surprising, since there is a high degree of association between access to outdoor space and those respondents that live in houses. In other words, people living in houses are more likely to be highly annoyed than those living in flats given that houses are more likely to have outdoor space than flats.

Surroundings/outdoor space

5.12 Respondents were asked about what they like about their neighbourhood and were free to answer in any way they chose. In this study, interest was given to the number of people who mentioned their surroundings, in particular, open or green spaces and whether there is a relationship between satisfaction with surroundings and attitudes to aircraft noise. This was examined using the following analysis.

Question A4 asked: ***Is there anything you particularly like about this neighbourhood?***

5.13 There were no pre-coded answers for this question; rather, respondents were free to give any answer they chose, which were then retrospectively coded into groups of answers.

5.14 Of the 63 responses coded for Question A4, two codes made reference to green spaces:

- A4_11: Accessibility / convenience / closeness - countryside / open / green spaces / parks
- A4_49: Parks / gardens / open spaces / green spaces

5.15 A logistic regression was performed using CAN34 highly annoyed, with respondents placed in one of two categories, those who indicated they liked access to outdoor space via A4_11 and A4_49, and those who did not. The model controlled for noise sensitivity. Average summer day noise exposure continued to be significantly associated with being highly annoyed (OR=1.142, $p<0.001$). Access to outdoor space as answered in Question A4 was found to be significantly associated with being highly annoyed (OR=1.856, $p<0.05$).

Type of dwelling: House or flat?

5.16 Earlier analysis looked at dwelling type as a confounding factor with regard to having use of private outdoor space. It seemed logical to investigate whether the type of dwelling respondents lived in had any association with annoyance due to aircraft noise. Houses are more likely to have gardens or outdoor space, and therefore this variable could have an impact on any association. Question A2 asked about the type of dwelling that respondents live in. The possible responses were:

i. Flat: purpose-built
ii. Flat: conversion
iii. Maisonette (flat on two or more floors): purpose-built
iv. Maisonette (flat on two or more floors): conversion
v. Bungalow: detached
vi. Bungalow: semi-detached (incl. linked semi-detached) / end terrace
vii. Bungalow: mid-terrace
viii. House with two or more storeys: detached
ix. House with two or more storeys: semi-detached (incl. linked semi-detached) / end terrace
x. House with two or more storeys: mid-terrace
xi. Cluster home (a home joined to others at the back as well as the sides(s))
xii. Other

5.17 Responses i – iv. were grouped as flats, with those responding in categories v. – x. defined as houses. Any responses with xi or xii were excluded.

5.18 Logistic multivariate regression was applied to the data, with a significant association found between being highly annoyed and whether respondents lived in a house or flat (House OR=2.191, $p<0.001$, Flat as reference category). In other words, a respondent living in a house was over twice as likely to be highly annoyed by aircraft noise than a respondent living in a flat. When the variable having use of private outdoor space was introduced as a check, the significance remained between whether the respondent lives in a house or flat (House OR=1.990, $p<0.005$, Flat as reference category) but for access to outdoor space, no significance with annoyance scores was observed. This confirms the findings in the previous section, suggesting that the type of dwelling mediates the results for access to outdoor space and the association with annoyance.

5.19 When age is added to the regression model, type of dwelling remains significantly associated with being highly annoyed (House OR=1.731, $p<0.05$).

5.20 With the addition of socioeconomic status, dwelling type remained statistically associated with the likelihood of being highly annoyed (House OR=1.610, $p<0.05$).

5.21 Finally, the effect of dwelling ownership was examined, using a logistic regression model with variables highly annoyed, average summer day noise exposure and whether respondents owned their dwelling, or rented. Home ownership was also significantly associated with being highly annoyed (Owned OR=1.869, $p<0.001$). When noise sensitivity and dwelling type were introduced into the model, home ownership was no longer significantly associated with annoyance. This is likely due to an association between dwelling type and ownership. 75% of flats were rented, whilst only 28% of houses were rented.

Complaints

5.22 This analysis investigated any association between aircraft noise annoyance and complaints made.

Question 23b asked:

Which things have you or anyone else in your household done about the noise from aeroplanes within the last 5 years?

5.23 There were a wide range of possible answers to this question, including complaining to the following channels:

- an airport, airport owner or airport operator
- one or more airlines
- the Civil Aviation Authority
- a newspaper or TV/radio station
- a resident's association
- the Environmental Health Department in the Local Authority (Council)
- another Local Authority (Council) Department
- a Government Department
- the Police
- a Councillor
- a Member of Parliament
- someone else, (please specify)

5.24 A multivariate regression test was performed for the likelihood of being highly annoyed, based on CAN34, using the variables, average summer day noise exposure, $L_{Aeq,16h}$, whether a complaint was made (yes/no), noise sensitivity and age.

5.25 A significant association was found between being highly annoyed and having made a noise complaint (OR=6.342, $p<0.001$), whilst controlling for noise sensitivity and age. There were some respondents, of course, who were highly annoyed and did not make a complaint, and others who were not highly annoyed and did make a complaint.

Working at home

5.26 This section investigates the annoyance responses from people working at home. Those respondents working at home may experience a larger noise dose at that location, compared to those people who travel to a different place of work.

Question H9a asked ***"Do you ever work from home?[20]"***.

5.27 A multivariate logistic regression was undertaken of being highly annoyed, based on CAN34, average summer day noise exposure $L_{Aeq,16h}$ and working at home, controlling for noise sensitivity and socio-economic status. There was no significant association between working at home and being highly annoyed.

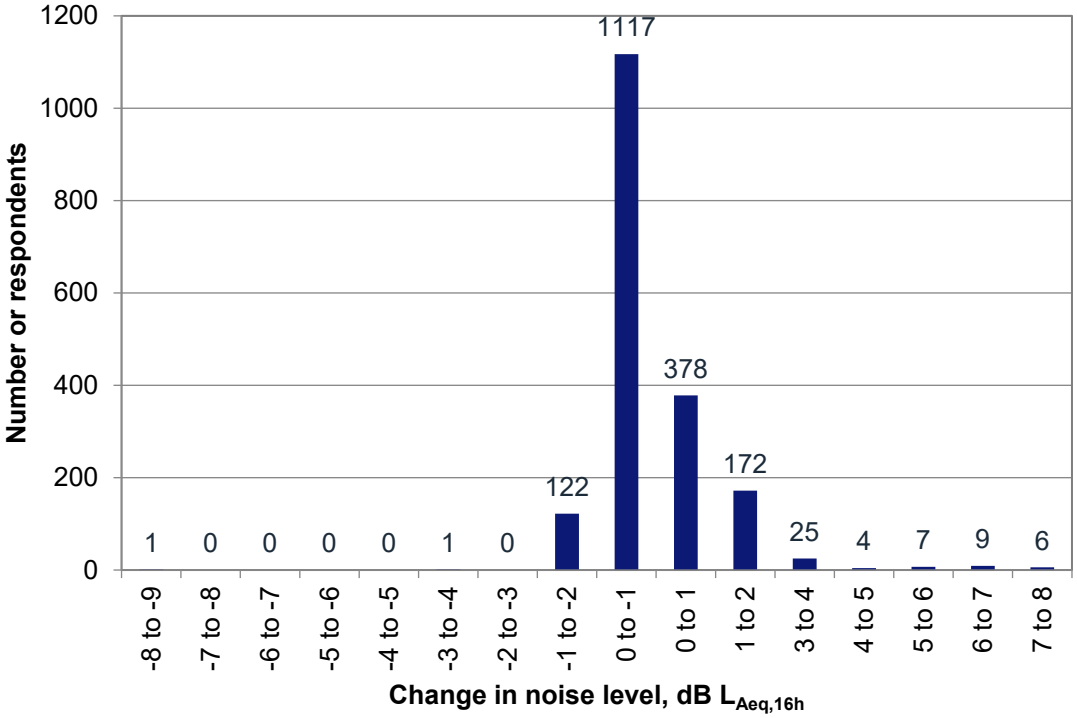
5.28 It is possible that respondents to question H9a answered, yes, even if they only occasionally worked from home. Question H9b asked respondents how many days they worked from home, but was only asked for those that said yes to question Question H9a; 369 respondents. Consequently, the sample was not large enough to undertake a logistic regression analysis on the number of days worked at home, whilst also controlling for noise sensitivity and socio-economic status.

Change in noise exposure between 2013 and 2014

5.29 To investigate whether respondents had experienced a change in aircraft noise dose since the year preceding the study, the change in average summer day noise exposure between 2013 and 2014 was calculated for each respondent (Figure 11). 88% of respondents experienced a change of less than 1 dB $L_{Aeq,16h}$. A change of less than 1 dB is considered to be a negligible change as it has been found that people are, on average, only just able to perceive differences in noise exposure of up to 1 dB under controlled conditions. Furthermore, the uncertainties inherent in noise modelling mean that predictions of absolute differences of less than 1 dB have limited validity.

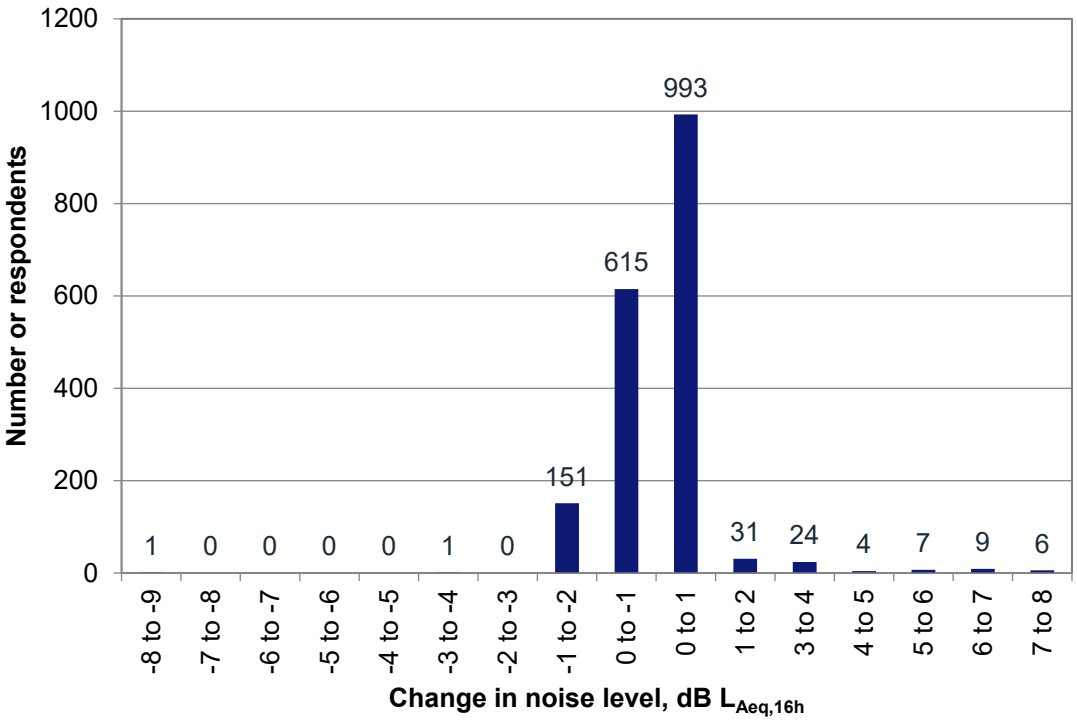
[20] The survey was conducted in 2014, prior to the COVID-19 pandemic.

Figure 11: Number of respondents exposed to change in noise level between 2013 and 2014 (N=1,842)



5.30 The change in noise calculated and shown in Figure 11, includes changes due to changing runway usage (modal split) from summer 2013 to summer 2014, based on changes in the prevailing wind. In order to identifying underlying changes, e.g. due to the mix of aircraft operating and any airspace changes, the summer 2013 noise exposure was adjusted to the same runway usage (modal split) as summer 2014. The numbers of respondents experiencing different changes in average summer day noise exposure, $L_{Aeq,16h}$ are shown graphically in Figure 12.

Figure 12: Number of respondents exposed to change in noise level between 2013 and 2014, adjusted to 2014 runway modal split (N=1,842)



5.31 A larger proportion (95%) of respondents experienced a change of less than ±1 dB $L_{Aeq,16h}$ after excluding the effect of runway modal split changes between 2013 and 2014.

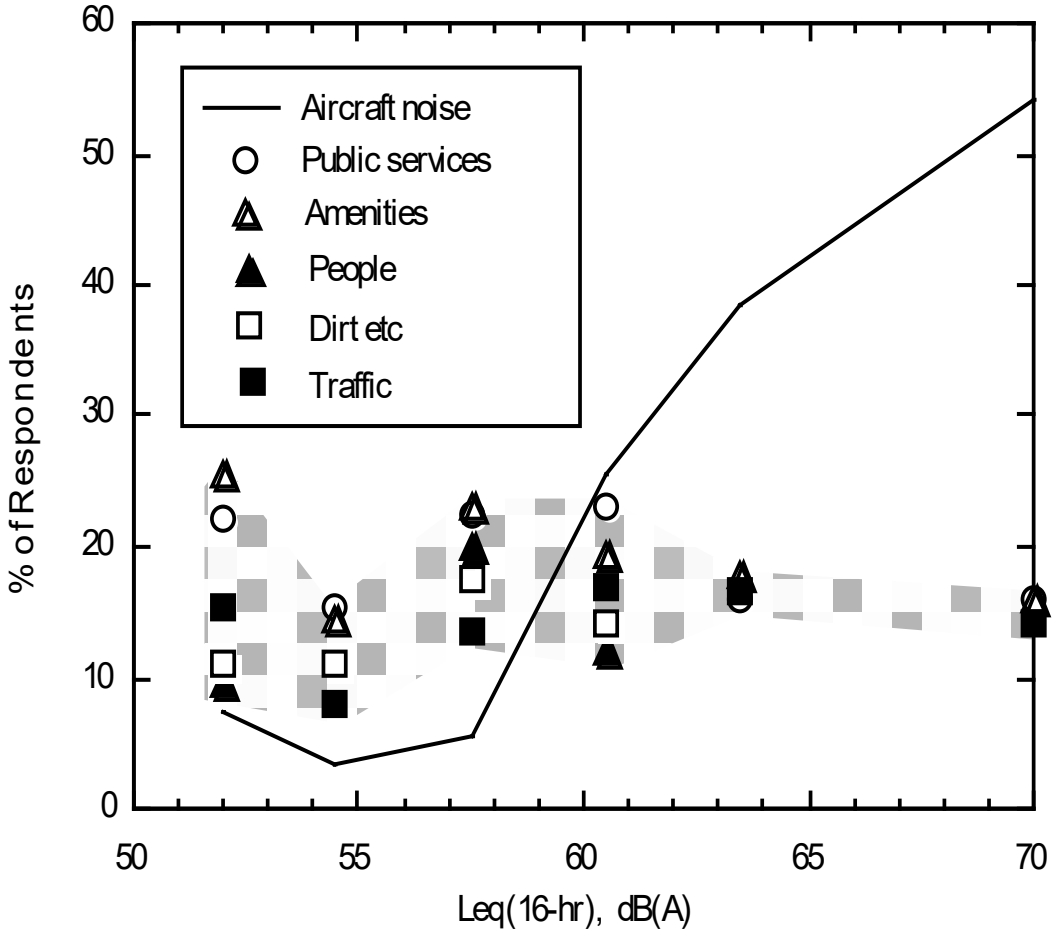
5.32 It was intended that a regression analysis would be performed on the data relating to respondents who had experienced an increase in aircraft noise in the year prior to the SoNA survey, to assess whether there was a significant association between this increased noise dose and annoyance responses to aircraft noise. However, due to the small sample sizes in the categories of significant change in aircraft noise, it was not possible to perform any further meaningful analysis on the data.

Chapter 6

Spontaneous Dislikes

6.1 The findings of the 1982 Aircraft Noise Index Study (ANIS) were adopted into policy in 1990. A major part of this adoption was the finding in ANIS that respondents spontaneously expressing a dislike of aircraft noise, begin to dominate all other dislikes between 57 dB and 60 dB $L_{Aeq,16h}$ (Figure 13).

Figure 13: 1982 Aircraft Noise Index Study (ANIS) Spontaneous Dislikes



6.2 Seeking views on aircraft noise through a question on spontaneous dislikes is no longer regarded as best practice, with ICBEN and ISO since settling on a question seeking views on how 'bothered, disturbed or annoyed' an individual is by a particular noise source.

6.3 Although SoNA 2014 sought views using the ICBEN annoyance question, using both 5-point semantic and 11-point numerical scales, it also asked about spontaneous likes and dislikes, to enable comparison with the 1982 study.

6.4 Question A4 sought views on spontaneous likes. Question A5 in the questionnaire, sought views on spontaneous dislikes:

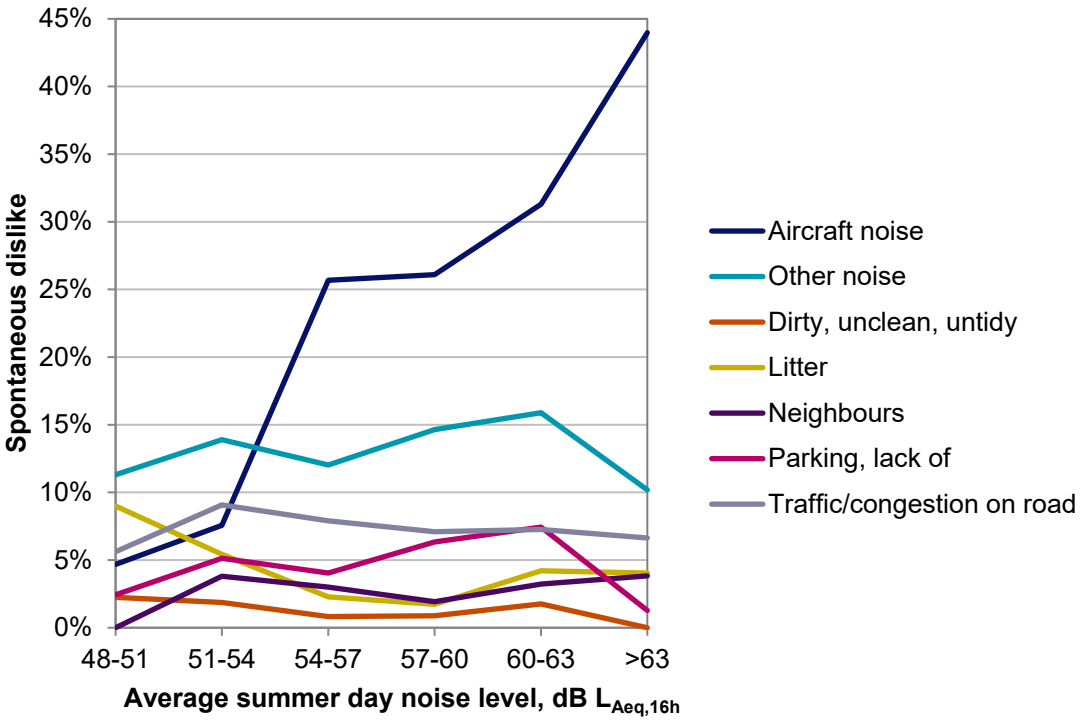
Question A5: Is there anything you particularly dislike about this neighbourhood?

6.5 This was an open question, alongside question A4 (likes). Responses were grouped into 69 categories. Many of these were unique with a single response. For the analysis, six possible responses in addition to aircraft noise were selected that included:

- Other noise
- Dirty, unclean, untidy neighbourhood
- Litter
- Neighbours
- Lack of parking
- Traffic congestion

6.6 Figure 14 illustrates the relationships between the percentage of respondents indicating spontaneous dislike of aircraft noise and other factors against aircraft noise exposure ($L_{Aeq,16h}$). This method can be employed within surveys to obtain a genuine unprovoked response from respondents on a particular topic, in this case, before any sections on aircraft noise, or noise from other sources, had been introduced.

Figure 14: Percent of residents spontaneously mentioning disliking aircraft noise versus $L_{Aeq,16h}$ (all airports)



6.7 Figure 14 shows that the spontaneous dislike of aircraft noise continues to rise with average summer day aircraft noise exposure ($L_{Aeq,16h}$) and dominates all other dislikes somewhere around 54 dB $L_{Aeq,16h}$. This is approximately 3 dB $L_{Aeq,16h}$ lower than the 1982 ANIS finding, and is consistent with the change SoNA 2014 found in the average summer day noise exposure level where 10% of residents were found to be highly annoyed (57 to 54 dB $L_{Aeq,16h}$). In addition, the point at which aircraft noise becomes the dominant dislike occurs at a similar noise exposure at which 10% of residents are found to be highly annoyed.

Chapter 7

Summary

Aims of the study

7.1 The aim of this report was to further explore the data collected in the Survey of Noise Attitudes (SoNA 2014) with reference to noise respite, examination of non-acoustic factors, and spontaneous dislikes of various factors within the neighbourhood, including aircraft noise. The aims of the study were:

- Exploration of the effects of runway alternation and noise respite on attitudes to aircraft noise
- Further exploration of non-acoustic factors such as:
  - Annoyance responses from respondents in dwellings with and without gardens/outside space
  - Responses from people living in flats versus houses
  - Surroundings (presence of green spaces nearby)
  - Complaints – association between making complaints, annoyance, and noise exposure
  - Percentage of time spent at home in the day
  - Exploration of whether people were exposed to a change in aircraft noise in the year prior to the study
- Spontaneous dislikes - identification of the average summer day noise exposure at which aircraft noise is more disliked than other factors that are commonly disliked

Runway alternation and respite

7.2 At London Heathrow airport, since the early 1970s, during westerly operations, the landing and take-off runways have been alternated on a daily and weekly basis, providing predictable periods of noise relief, known as noise respite. The amount of noise respite can be quantified by calculating the difference in noise exposure between each half day, eight-hour period. The alternation scheme means that residents under the alternation flight paths experience respite during the morning (07:00-15:00) one week and then in the late afternoon and evening

in the following week (15:00-23:00). The mix of aircraft operations differs slightly in the morning and afternoon/evening periods, meaning that the amount of noise respite experienced also varies slightly between a morning and afternoon/evening period. For this analysis, the quantitative amount of noise respite was defined as the minimum experienced across any alternation period.

7.3 The analysis shows that of the sample, 16% experienced at least some departure noise respite at Heathrow (based on thresholds defined using $L_{Aeq,8h}$), despite the fact that runway alternation applies to both departure and arrival operations. The reason for this is that soon after leaving the airport boundary on take-off, all departure routes were originally designed to converge onto a single noise preference departure route, this being in keeping with the historic principle of concentrating noise onto few departure routes. As a consequence, it was not possible to establish any association between departure noise respite and noise attitudes.

7.4 Arrival runway alternation, however, provides at least some predictable noise respite at Heathrow under the westerly arrival flight paths for 59% of the sample (again based on $L_{Aeq,8h}$ thresholds). Although the arrival flight paths are a fixed distance apart (1.5 km, 0.8 nm), the noise relief provided between the alternating arrival flight paths is not constant. As aircraft descend to lower height, the noise difference between the two flight paths increases. Conversely, further out, the noise difference diminishes. In Richmond, for example, the noise difference between the two flight paths is approximately 8-9 dB $L_{Aeq,8h}$, but by Clapham Junction is has reduced to 3-5 dB $L_{Aeq,8h}$.

7.5 Residents exposed to westerly arrival noise were grouped into three categories:

i) Those experiencing less than 4 dB $L_{Aeq,8h}$ respite,

ii) Those experience at least 4 dB $L_{Aeq,8h}$ respite, but less than 9 dB $L_{Aeq,8h}$ respite,

iii) Those experience at least 9 dB $L_{Aeq,8h}$ respite

7.6 These categories are based on findings of the Heathrow Airport noise respite working group, that established, that these values of noise respite offer ‘little or no respite’, ‘noticeable respite’ and ‘meaningful respite’. These categories were defined as none, some and much respite respectively in this further analysis.

7.7 A logistic regression model was applied to the SoNA 2014 data, where it was found that respondents that experienced at least 9 dB $L_{Aeq,8h}$ noise respite were less likely to be highly annoyed. The finding remained statistically significant after controlling for noise sensitivity and socio-economic status. Residents that experienced less than 4 dB $L_{Aeq,8h}$ noise respite or 4-8.99 dB $L_{Aeq,8h}$ noise respite were not found to have any statistically significant effect on the likelihood of being highly annoyed. Dose response functions were developed from the logistic regression model. For residents experiencing no landing noise respite, 10% highly annoyed accorded with an average summer day noise exposure of 52 dB $L_{Aeq,16h}$. For residents experiencing at least 9 dB $L_{Aeq,8h}$ noise respite, 10% highly annoyed accorded with an average summer day noise exposure of 59.5 dB $L_{Aeq,16h}$, a shift of 7.5 dB $L_{Aeq,16h}$ for the same annoyance response.

7.8 The analysis was repeated, this time lowering the upper noise respite threshold from at least 9 dB $L_{Aeq,8h}$ to at least 8 dB $L_{Aeq,8h}$. When controlling for noise sensitivity and socio-economic status, those experiencing at least 8 dB $L_{Aeq,8h}$ noise respite were found to be less likely to be highly annoyed. Dose response functions were developed from the logistic regression model. For residents experiencing no landing noise respite, 10% highly annoyed accorded with an average summer day noise exposure of 52 dB $L_{Aeq,16h}$. For residents experiencing at least 8 dB $L_{Aeq,8h}$ noise respite, 10% highly annoyed accorded with an average summer day noise exposure of 57 dB $L_{Aeq,16h}$, a shift of 5 dB $L_{Aeq,16h}$, for the same annoyance response.

7.9 The above findings indicate that a minimum amount of respite is needed to be experienced before respite has a beneficial effect, i.e. by reducing the likelihood of being highly annoyed. The higher level of respite (≥9 dB $L_{Aeq,8h}$) is likely to have a greater beneficial effect than the lower level (≥8 dB $L_{Aeq,8h}$). Additionally, respite appears to have a benefical effect on people no matter their socioeconomic status or how sensitive they are to aircraft noise.

7.10 The analysis was repeated, this time lowering the upper noise respite threshold to 7 dB $L_{Aeq,8h}$. No significant association was found between the likelihood of being highly annoyed and those experiencing at least 7 dB $L_{Aeq,8h}$ noise respite and those experiencing less than 4 dB $L_{Aeq,8h}$ noise respite. This indicates that

at least 8 dB $L_{Aeq,8h}$ respite is likely to be necessary to have a beneficial effect on whether people highly annoyed by aircraft noise. Because there is significant variability between individual responses in SoNA 2014, it is possible that the SoNA sample size was insufficient to identify a statistically significant effect at this level (7 dB $L_{Aeq,8h}$) of noise respite.

Annoyance responses from respondents in dwellings with and without gardens/outside space

7.11 Respondents were categorised based on their having use of private outdoor space. Mean annoyance scores were visibly higher for those residents with such use. Logistic regression analysis showed that the likelihood of being highly annoyed increased and was statistically associated with having use of private outdoor space. In other words, people with use of private outdoor space are more likely to be highly annoyed at a given noise exposure than those without use of private outdoor space. The inference is that the impact of aircraft noise on the use of private outdoor space adds to the annoyance experienced, compared with those who have no use of private outdoor space.

7.12 When controlling for age and socioeconomic status, the result remained statistically significant, and still indicated that having use of private outdoor space increased the likelihood of being highly annoyed at a given noise exposure compared with not having such use.

7.13 When additionally controlling for noise sensitivity, as well as age and socio-economic status, the likelihood of being highly annoyed remained statistically associated with having use of private outdoor space. The inference is that the impact of aircraft noise on the use of private outdoor space adds to the annoyance experienced, compared with those who have no use of private outdoor space.

7.14 The type of dwelling was also examined within this regression model. Respondents were asked about their type of dwelling. The survey recorded different types of flats and houses, however for the purposes of this analysis, the data were re-grouped into two categories, House or Flat. The logistic regression was then performed for the likelihood of being highly annoyed as a function of average summer day noise exposure ($L_{Aeq,16h}$), having use of private

outdoor space, controlling for age, socio-economic status, noise sensitivity and whether respondents lived in a house or flat. The results of this regression indicated that the variable 'having use of outdoor space' loses all significance when house/flat is included in the model, with dwelling type instead being significant. This result is not surprising, since there is a high degree of association between having use of outdoor space and those respondents that live in houses (i.e. houses are more likely to have outdoor space than flats).

Surroundings/Green space

7.15 Respondents were asked about what they like about their neighbourhood and were free to answer in any way they chose. In this study, interest was given to the number of people who mentioned their surroundings, in particular, open or green spaces and whether there is a relationship between satisfaction with surroundings and attitudes to aircraft noise. Respondents were categorised as to whether they had access countryside/open/green space/parks or parks/gardens/open space/green spaces, and those that did not. Access to green space was found to be significantly associated with being highly annoyed.

Dwelling type and ownership

7.16 A significant association was found between being highly annoyed and whether respondents lived in a house or flat, and annoyance scores. Respondents living in houses were more highly annoyed than those living in flats for the same aircraft noise exposure. This significance remained when controlling for having use of private outdoor space, but having use of private outdoor space itself was no longer significant, as noted previously. This significance of dwelling type remained when controlling for age and socio-economic status.

7.17 Dwelling ownership was examined, using a logistic regression model with variables highly annoyed, average summer day noise exposure and whether respondents owned their dwelling, or rented. Home ownership was also significantly associated with being highly annoyed. When noise sensitivity and dwelling type were introduced into the model, home ownership was no longer significantly associated with annoyance. This is likely due to an association between dwelling type and ownership. 75% of flats were rented, whilst only 28% of houses were rented. The reason for the increased likelihood of being highly

annoyed that is associated with those residents living in houses, owning houses or with use of private outdoor space, is a complex matter because these factors are interelated.

Complaints

7.18 A multivariate regression test was performed for the likelihood of being highly annoyed, based on CAN34, using the variables, average summer day noise exposure, $L_{Aeq,16h}$, whether a complaint was made (yes/no), noise sensitivity and age.

7.19 A significant association was found between being highly annoyed and having made a noise complaint whilst controlling for noise sensitivity and age. There were some respondents, of course, who were highly annoyed and did not make a complaint, and others who were not highly annoyed and did make a complaint.

Working at home

7.20 No significant association between working at home and being highly annoyed was found, when controlling for noise sensitivity and socio-economic status. This is likely to be due to a small portion of the SoNA sample (369) that stated they worked from home[21].

Change in noise between 2013 and 2014

7.21 The change is noise was assessed between 2013 and 2014. 88% of respondents were estimated to have experienced a change of less than 1 dB $L_{Aeq,16h}$ between 2013 and 2014. This meant there was insufficient sample size that experienced a significant noise change in the preceding year to SoNA 2014 to assess whether this had any influence on noise attitudes.

Spontaneous Dislikes

7.22 The 1982 ANIS survey sought views on respondents' spontaneous dislikes, i.e. they were asked an open question and shown no pre-defined list of answers to select from, instead all the answers spontaneously provided were recorded and

[21] The survey was conducted in 2014, prior to the COVID-19 pandemic.

categorised post survey. The most common answers spontaneously expressed were a dislike of aircraft noise, other noise, dirty surroundings, litter, neighbours, lack of parking and road traffic levels. Unsurprisingly, the proportion expressing a dislike remained approximately constant, except for aircraft noise, where the 1982 ANIS survey found the proportion increased with increasing aircraft noise exposure and was the most disliked aspect for noise exposure above 57 dB $L_{Aeq,16h}$.

7.23 The same open question regarding what residents disliked in their neighbourhood was asked in SoNA 2014. As in the 1982 ANIS, all dislikes except aircraft noise remained approximately constant regardless of average summer day noise exposure. However, the proportion of respondents spontaneously mentioning aircraft noise rises from 8% spontaneously disliking aircraft noise at 51-54 dB $L_{Aeq,16h}$ to 26% between 54-57 dB $L_{Aeq,16h}$. Around 54 dB $L_{Aeq,16h}$, aircraft noise dominates all other dislikes. This is approximately 3 dB $L_{Aeq,16h}$ lower than the 1982 ANIS finding, and is consistent with the change in average summer day noise exposure where 10% of residents were found to be highly annoyed. In addition, the point at which aircraft noise becomes the dominant dislike occurs at a similar noise exposure at which 10% of residents are found to be highly annoyed.

Conclusion

7.24 The first two aims from CAP 1506 SoNA 2014 were to:

- Obtain new and updated evidence on attitudes to aviation noise around airports in England, including the effects of aviation noise on annoyance, wellbeing and health.
- Obtain new and updated evidence on what influences attitudes to aviation noise, and how attitudes vary, particularly how attitudes vary with L_{Aeq}, but also other non-acoustic factors that may influence attitudes, such as location and time of day, and socio-economic group of respondents.

7.25 This report has also addressed these aims and expanded on the previous work in CAP 1506 by examining further non-acoustic factors and their association with aircraft noise along with the factors that may act as mediators and

investigated the average summer day noise exposure at which annoyance with aircraft noise appears to be more pertinent than other neighbourhood issues.

7.26 A major finding is that Heathrow's runway alternation system, that provides noise respite – predictable periods of noise relief, is found to be associated with a reduced likelihood of being highly annoyed in relation to those primarily affected by westerly arrivals. Dose response functions estimating the likelihood of being highly annoyed are presented for residents experiencing no respite and respite of at least 8 dB $L_{Aeq,8h}$.

Appendix A

Glossary of terms

Abbreviations	
ANASE	Aircraft Noise Attitudes Study in England (2002 survey reported 2007)
ANIS	Aircraft Noise Index Study (1982 survey reported in 1985)
dB	Decibel
dBA	Decibel A-weighted scale
$L_{Aeq,T}$	Equivalent continuous sound level, for period of time, T
$L_{Aeq,16h}$	Equivalent continuous sound level, 07:00-23:00
$L_{Aeq,8h}$	Equivalent continuous sound level, over 8-hour period
L_{ASmax}	Maximum single event noise level (time weighted slow)
N65	Number of events of 65 dB L_{ASmax} or more during an average summer day (07:00-23:00)
N70	Number of events of 70 dB L_{ASmax} or more during an average summer day (07:00-23:00)
NNAS	National Noise Attitude Survey
OR	Odds-Ratio. The output from a logistic regression analysis is an odds-ratio. In statistics, the odds ratio is one of three main ways to quantify how strongly the presence or absence of property ‘A’ (highly annoyed or not) is associated with the presence or absence of property ‘B’ (the non-acoustic factor) in a given population. If the odds-ratio is greater than 1 then having property ‘A’ is considered to be associated with having property ‘B’ in the sense that the having ‘B’ raises the odds of having ‘A’. Odds ratios and their associated significance level show only association and do not indicate causality, i.e. whether or not A causes B or B causes A
R^2	A statistical measure of the ‘goodness-of-fit’ of the data to the regression trendline.
REF	Reference state for the independent variable used in logistic regression, i.e. OR = 1
SEL	Sound Exposure Level
SoNA	Survey of Noise Attitudes
SWEMWBS	Short Warwick-Edinburgh Mental-Wellbeing Score

Appendix B

SoNA 2014 Questionnaire

SECTION A
A1. *How long have you lived in this home?*
○ Less than 6 months
○ 6 months - 1 year
○ 1 - 2 years
○ 2 - 5 years
○ 5 - 10 years
○ 10 years or more
○ Don't know

{If less than 6 months, ask A1a. Otherwise go to filter before A1b.}
A1a. *How many months is that?*
[Write in. If less than one month, code as 0.]
{Open text box. Single number allowed, within the range 0-5.}
{If coded less than "10 years or more" at A1, ask A1b.}
A1b. *And how long have you lived in this area?*
[If asked, "area" can be interpreted as a district, borough or town.]
○ Less than 6 months
○ 6 months - 1 year
○ 1 - 2 years
○ 2 - 5 years
○ 5 - 10 years
○ 10 years or more
○ Don't know

A2. [Code type of dwelling, checking with the respondent as necessary.]
○ Flat: purpose-built
○ Flat: conversion
○ Maisonette (flat on two or more floors): purpose-built
○ Maisonette (flat on two or more floors): conversion
○ Bungalow: detached
○ Bungalow: semi-detached (incl. linked semi-detached) / end terrace
○ Bungalow: mid-terrace
○ House with two or more storeys: detached
○ House with two or more storeys: semi-detached (incl. linked semi-detached) / end terrace
○ House with two or more storeys: mid-terrace
○ Cluster home (a home joined to others at the back as well as the sides(s))
○ Other
{If flat/maisonette, ask A2a, else go to A3.}
A2a. [Code: On which floor of the building is the entrance to this particular flat/maisonette? i.e. not the entrance to the building as a whole. Enter number of floor. Enter -1 for basement and 0 for ground floor.]
{Open text box. Single number allowed, within the range -1 to 50.}
A2b [Code: What is immediately above the flat or maisonette?
[If the dwelling is a maisonette, this means above the upper storey of the maisonette.]
☐ Flat roof
☐ Loft space (for storage only) and pitched roof
☐ Pitched roof forming the ceiling of a room in the dwelling
☐ One or more other flats/maisonettes
A3. *Do you have use of an outdoor space such as a garden, terrace or balcony here?*
[Includes shared facilities if private.]
☐ Yes – garden
☐ Yes – balcony

☐ Yes – terrace
o No – none§
A3a. *On the whole, how much do you like living in this neighbourhood? Please provide your answer on a scale of 1 to 7, where 1 equals definitely like and 7 equals definitely don't like.*
[Showcard A3a]
○ 1 Definitely like
○ 2
○ 3
○ 4
○ 5
○ 6
○ 7 Definitely don't like
○ Don't know
A4. *Is there anything you particularly like about this neighbourhood?*
[Do not read out or show the screen. Try to fit respondent's reply to precodes as much as possible.]
☐ Any mention of quietness / peacefulness / freedom from noises or sources of noise
☐ Any mention of sounds/noises that are liked
☐ Any positive mention of airport, air travel or aircraft
☐ Everything
☐ Any other features that are liked (specify)
{Open text box, text scrolls along if too long for the box.}
☐ Nothing liked§
☐ Don't know§
A5. *Is there anything you particularly dislike about this neighbourhood?*
[Do not read out or show the screen. Try to fit respondent's reply to precodes as much as possible.]
☐ Any mention of disliking aircraft noise
☐ Any mention of disliking other noise (e.g. it's noisy / noise not liked / noise effects / lack of peace & quiet)
☐ Any mention of disliking quietness (or disliking absence of noise/sounds)
☐ Any mention of disliking being close to an airport, without mentioning noise {Go to A5a.}
☐ Potential source of noise [Specify and code below if a potential source of noise.] {Go to A5b.}
☐ Any other features that are disliked [Specify and code below if anything else disliked.]
☐ Nothing disliked§
☐ Don't know§
{Ask A5a and/or A5b as routed from A5. Otherwise skip to A6.}

A5a. *You mentioned that you dislike being close to the airport. What is it in particular that you dislike?*
○ Dislike is wholly or partly about noise
○ Dislike is not about noise

A5b. *You mentioned that you dislike {{from A5: open text}}*
[Read out only the potential source(s) of noise, not anything that is specifically mentioned as a noise, or anything that clearly has nothing to do with noise.]
What is it in particular that you dislike?
○ Dislike is wholly or partly about noise
○ Dislike is not about noise

A6. *This card shows a number of different problems that some people may have with their local environment. Would you please pick up to five that you are personally most affected by?*
[Showcard A6]
☐ Pollution of rivers, lakes, the sea, beaches, etc.
☐ Air pollution from traffic or local industry/agriculture
☐ Loss of natural environment – gardens, green spaces or plant/animal life
☐ Traffic congestion, parking, speed or danger
☐ Extreme weather (e.g. flooding, drought, high winds, snow and ice)
☐ Dust and dirt
☐ Smells
☐ Litter and/or rubbish
☐ Pests, including wild/feral animals, birds, insects or fouling by animals other than dogs
☐ "Light pollution" from streetlights, floodlights, security lights, shops, and other artificial light from outside the home
☐ Fouling by dogs
☐ Noise
☐ None of these§

In the rest of the questionnaire I'm going to ask you questions about when you are at home. {If A3 answered "garden, balcony or terrace", say:} *By that, I mean inside your home or outdoors at home, for example {{A3 response}}*[22] *This applies throughout the remainder of the interview.*
A7a. Now please think for a moment about all the sounds that come from outside your own home – whether they are sounds that you like or noises that you dislike. Overall, do these sounds make it better or worse to be living here for you personally?
[If asked, this includes noise from inside neighbours' homes.]
[Showcard A7a]
○ 1 Definitely better
○ 2
○ 3
○ 4 Neither better nor worse
○ 5
○ 6
○ 7 Definitely worse
○ Don't know

A7b. *How sensitive would you say you are to noise?*
[Showcard A7b]
○ 1 Not at all sensitive
○ 2
○ 3
○ 4
○ 5
○ 6
○ 7 Very sensitive
○ Don't know

A8a. *Thinking about the last 12 months or so, when you are here at home, how much does noise from outside your own home bother, disturb or annoy you?*

[22] Wherever this text insert appears, CAPI inserts "in your garden, on your balcony, on your terrace" or whatever part of this is relevant, given the answer to A3.

[If asked, this includes noise from inside neighbours' homes.]
[Showcard A8a]
- ○ Not at all
- ○ Slightly
- ○ Moderately
- ○ Very
- ○ Extremely
- ○ Don't know
- ○ Don't hear

{If A8a coded "Not at all" or "Don't know", ask A8a(i). Otherwise go to A8b.}
A8a(i). Is that because you never hear any noise from outside your own home?
- ○ Never hear noise from outside my home
- ○ Hear noise from outside my home, but it does not bother, disturb or annoy me at all
- ○ Don't know

A8b. *Next is a 0-to-10 opinion scale for how much noise from outside your own home bothers, disturbs or annoys you when you are here at home. If you are not at all annoyed choose 0; if you are extremely annoyed choose 10; if you are somewhere in between, choose a number between 0 and 10.*
[If asked, this includes noise from inside neighbours' homes.]
[If respondent states that they do not hear any noise, then code 98, for don't know code 99.]

A8b. *Thinking about the last 12 months or so, what number from 0 to 10 best shows how much you are bothered, disturbed or annoyed by noise from outside your own home?*
[Showcard A8b][23]

0 Not at all	1	2	3	4	5	6	7	8	9	10 Extremely
○	○	○	○	○	○	○	○	○	○	○

○ Don't know ○ Don't hear
{If A8b coded "Not at all or "Don't know", ask A8b(i). Otherwise go to filter after A8b(i).}

[23] All columns the same width.

A8b(i). Is that because you never hear any noise from outside your own home?
- ○ Never hear noise from outside my home
- ○ Hear noise from outside my home, but it does not bother, disturb or annoy me at all
- ○ Don't know

{If "Not at all", "Don't hear" or "Don't know" at A8a and 8-10 at A8b
or
"Very" or "Extremely" at A8a and "Not at all", "Don't hear" or "Don't know" at A8b,
new screen and insert instruction:}
[You have coded conflicting responses at A8a and A8b. Please clarify with respondent and recode A8a and/or A8b if appropriate. Press next to amend or confirm codes.]
From this point on, I'm going to be asking about sounds and noises only. The next few questions are about different types of noise. I will show you a few examples of each type of noise that you might have heard, but by no means do these cover all possibilities, they are examples only.
[*Allow the respondent a few seconds to look at the picture, before asking the question.]*
A9a. *Thinking about the last 12 months or so, when you are here at home, how much does noise from aircraft, airports or airfields, bother, disturb or annoy you?*
[Showcards A9a-A9o]
- ○ Not at all
- ○ Slightly
- ○ Moderately
- ○ Very
- ○ Extremely
- ○ Don't know
- ○ Don't hear

{If A9a coded "Not at all" or "Don't know" ask A10a.}
A10a. Is that because you never hear any noise from aircraft, airports or airfields?
- ○ Never hear noise from this source
- ○ Hear noise from this source, but it does not bother, disturb or annoy me at all
- ○ Don't know

{Repeat A9b-n and (where appropriate) A10b-n for the following noise categories, replacing "*aircraft, airports or airfields"*, in this order and with the relevant show screens.}
A9b. trains or railway stations [Picture Card A9b]
A9c. road traffic [Picture Card A9c]
A9d. sea, river or canal traffic [Picture Card A9d]
A9e. building, construction, demolition, renovation or roadworks [Picture Card A9e]
A9f. neighbours (inside their homes) [Picture Card A9f]
A9g. neighbours (outside their homes) [Picture Card A9g]
A9h. other people nearby [Picture Card A9h]
A9i. sports [Picture Card A9i]
A9j. other entertainment or leisure [Picture Card A9j]
A9k. industrial sites [Picture Card A9k]
A9l. other commercial premises [Picture Card A9l]
A9m. forestry, farming or agriculture [Picture Card A9m]
A9n. community buildings and spaces [Picture Card A9n]

A9o. *Thinking about the last 12 months or so, when you are here at home, does noise from any other source outside your home bother, disturb or annoy you?*
○ Yes
○ No

{If A9o coded "No" skip to A11.}
[If respondent does not mention at least one specific source of noise, prompt for one.
Ensure source is external to the respondent's home.
If more than one source is mentioned, ask for the one that most bothers, disturbs or annoys the respondent.
Write in one selected other noise source. Enter source of noise, e.g. "owls", not "noise from owls".]

{Open text box.}

[Fit to a precoded type if possible, by going back to the relevant A9 question, otherwise maintain "Any other noise" code and tick one box below.]
○ Military activity (other than vehicles on the road or aircraft/airfields)
○ Wild birds
○ Wild animals
○ Weather (e.g. wind, rain, storms)
○ Running water (e.g. rivers, waterfalls) or waves
○ Wind turbines (other than those belonging to a neighbouring home)
○ Other

A11. *I would now like you to think about all these types of noise that I have been asking about. Taking all these noises together, please look at the statements on this card and tell me which one best describes the extent to which noise spoils your home life.*
[Showcard A11]
○ Not at all
○ Not very much
○ A little
○ Quite a lot
○ Totally
○ Don't know

{RTN Section asked if road traffic noise bothers, disturbs or annoys at least "Slightly" (codes 2-5 at A9c).
NN Section asked if noise from neighbours (inside their homes) and/or neighbours (outside their homes) and/or other people nearby bothers, disturbs or annoys at least "Slightly" (codes 2-5 at 9f-h).

[Read out:]
The following questions ask you to reflect over the last year or so about noises you might have heard when you have been here at this home.
{If A3 answered "Yes", say:} *Please remember that when we say "at home", we mean "when you have been at home, either inside your home or {{A3 response}} at home".*

SECTION RTN – ROAD TRAFFIC NOISE

I would now like to ask you some questions specifically about noise from road traffic.

PICTURECARD RTN1

RTN1. *What are the three particular kinds of road traffic noise that most bother, disturb or annoy you? So, thinking about these sorts of things...*

[Unprompted – code specific noise source – please try to use the precoded list.]

{Allow one to three to be coded.}

☐ No particular noise type[§24]

Traffic Noises

☐ Vehicles starting / stopping / ticking over (at traffic lights, crossings, etc.)
☐ Engine revving
☐ Air brakes
☐ Brake/tyre squeal
☐ Vehicles accelerating / going too fast
☐ Car alarms
☐ Vehicle reversing/turning signals
☐ Noisy exhausts
☐ Loose/faulty parts rattling, whining, etc.
☐ Police / ambulance / fire engine sirens
☐ Noise from irregularities in the road surface – drain covers, traffic calming, cobbles, etc.
☐ Vehicles collecting rubbish, recycling or scrap
☐ Ice cream van chimes
☐ Other music from vehicles
☐ Vehicle horns
☐ Road accidents
☐ Congestion
☐ The background "hum" of road traffic
☐ Informal / illegal motor sports or racing
☐ Pedestrian crossing signals
☐ Any other kind of noise from traffic

{Open text box, text scrolls along if too long for the box.}

☐ Any other kind of noise from traffic

{Open text box, text scrolls along if too long for the box.}

☐ Any other kind of noise from traffic

{Open text box, text scrolls along if too long for the box.}

Noises from types of road

☐ Motorways
☐ Other dual carriageway roads
☐ Single carriageway main roads
☐ Residential/estate roads/country lanes
☐ Car parks
☐ Any other kind of road

{Open text box, text scrolls along if too long for the box.}

☐ Any other kind of road

{Open text box, text scrolls along if too long for the box.}

Vehicles

☐ Heavy lorries
☐ Smaller lorries
☐ Delivery vans
☐ Buses / coaches
☐ Private cars / taxis
☐ Motor bikes / scooters
☐ Refuse collection
☐ Electric vehicles
☐ Horse drawn vehicles
☐ Any other kind vehicle

{Open text box, text scrolls along if too long for the box.}

☐ Any other kind of vehicle

{Open text box, text scrolls along if too long for the box.}

☐ Any other kind of vehicle

{Open text box, text scrolls along if too long for the box.}

THERE ARE NO QUESTIONS RTN2 NOR RTN3

[24] In effect, this functions as a "Don't know" code in RTN1, NN1 and OSN1.

RTN4. *Does noise from road traffic interfere with any of these aspects of your home life? Please just read out the letters that apply*
[IF YES AT A3 - Showcard RTN4 VERSION 1]
[IF NO AT A3 - Showcard RTN4 VERSION 2]

1	Studying or working at home	○
2	Having a conversation (including on the phone or online[25])	○
3	Quiet leisure activities such as reading, writing or resting	○
4	Listening to TV, radio or music	○
5	Other leisure activities that involve you making a noise such as gaming or making music	○
6	Being able to use every room in the home	○
7	{If yes at A3:}[26] Spending time outdoors at home	○
8	Having the windows or doors open	○
9	Sleeping patterns such as the time you go to bed or get up, or being kept awake	○
	None of these	
	Don't know	

{Go to next noise type. If no others filtered in from A9, go to Section CAN.}

[25] Interviewer briefing/notes to say this includes computer-based calls, audio or audio-visual (e.g. Skype) here and for analogous questions in other sections.

[26] {Shading of the rows skips to the next row if this row is omitted. CAPI did not select garden, balcony or terrace according to answer at A3.}

SECTION NN – NEIGHBOUR NOISE

I would now like to ask you some questions specifically about noise from neighbours and other people when they are nearby.

PICTURECARD NN1

NN1. *What are the three particular kinds of noise from neighbours and other people nearby that most bother, disturb or annoy you?*

So, thinking about these sorts of things...

[Unprompted – code specific noise source – please try to use the precoded list.]

{Allow one to three to be coded.}

☐ No particular noise type§

SUB-HEADING: Noise from inside neighbours' homes

☐ Radio, TV and music (from inside neighbouring homes or outside)
☐ Neighbours' fireworks
☐ Parties (held inside neighbouring homes or outdoors (without fireworks))
☐ Voices / shouting / arguments (from inside other homes or from outside)
☐ Neighbours doing DIY inside (hammering, drilling, etc.)
☐ Alarms (e.g. burglar, fire or smoke)
☐ Phones/mobiles ringing (from inside or outside)*
☐ Dogs (from inside or outside)*
☐ Other domestic animals / pets (from inside or outside)*
☐ Neighbours' footsteps, electric sockets / switches, doors banging, or other banging on walls or floors
☐ Domestic equipment (vacuum cleaners, washing machines, dishwashers, tumble dryers, boilers, etc.)
☐ Any other noise from neighbours inside their homes

{Open text box, text scrolls along if too long for the box.}

SUB-HEADING: Noise from outside neighbours' homes

☐ Neighbours' wind turbine, air conditioning, generator, heat pump, etc.
☐ Noises from people in neighbouring gardens

{Open text box, text scrolls along if too long for the box.}

☐ Cutting/pruning/grinding trees in gardens or in the street or communal areas
☐ Neighbours and other people nearby putting out bins or waste for recycling
☐ Neighbours working outside (DIY, gardening, repairing vehicles, etc.)
☐ Waste collection or wheelie bin cleaning services
☐ Other deliveries or collections (e.g. post, supermarkets, mail/online orders)
☐ Neighbours' vehicles (e.g. doors slamming, starting up, driving off)
☐ Any other noise from neighbours outside their homes

{Open text box, text scrolls along if too long for the box.}

SUB-HEADING: Other noises from people nearby

☐ Any other noise from people nearby who are not neighbours

{Open text box, text scrolls along if too long for the box.}

{If "Other domestic animals and pets" is one of the chosen options, then clarify by asking NN1a.}

NN1a. *What other type of animal or pet is this?*
[Write in animal types and code below.]

{Open text box, text scrolls along if too long for the box.}

☐ Cat
☐ Cockerel
☐ Other bird
☐ Other type
○ Don't know

{If any chosen option could emanate from either inside the neighbour's house, or outside (marked * at NN1) then clarify by asking NN1b, with as many rows in the response table as are required.}

NN1b. *Were you thinking about noise from inside someone's home or from outside, when you selected …?*
[Read out noise types and code response.]

	Inside	Outside	Both
{{Noise type from NN1}}	○	○	○
{{Noise type from NN1}}	○	○	○

NN4. D*oes noise from neighbours and other people when they are nearby interfere with any of these aspects of your home life? Please just read out the letters that apply.*
[IF YES AT 13 - Showcard NN4 VERSION 1]
[IF NO AT 13 - Showcard NN4 VERSION 2]

1	Studying or working at home	○
2	Having a conversation (including on the phone or online[27])	○
3	Quiet leisure activities such as reading, writing or resting	○
4	Listening to TV, radio or music	○
5	Other leisure activities that involve you making a noise such as gaming or making music	○
6	Being able to use every room in the home	○
7	{If yes at A3:}[28] Spending time outdoors at home	○
8	Having the windows or doors open	○
9	Sleeping patterns such as the time you go to bed or get up, or being kept awake	○
	None of these	○
	Don't know	○

{Go to next noise type. If no others filtered in from A9, go to Section CAN.}

[27] Interviewer briefing/notes to say this includes computer-based calls, audio or audio-visual (e.g. Skype) here and for analogous questions in other sections.

[28] {Shading of the rows skips to the next row if this row is omitted. CAPI did not select garden, balcony or terrace according to answer at A3.}

SECTION CAN – CIVIL AVIATION NOISE[29]
SCREENER IF RESPONDENT HAS LIVED IN HOME FOR LESS THAN 6 MONTHS – CODE 1 AT QUESTION A1

S1: *Can I just check – have you lived in this home since mid-June 2014?*
Yes – CONTINUE WITH QUESTION PREAMBLE AND FROM CAN1
No (if no – only the following questions get asked CAN15a, CAN15b, , CAN21a,(and b/c depending on ans to 21a), CAN22d, CAN23a/b/c/ CAN 22D, CAN26a, b, CAN 28, CAN29, CAN30, 31)
PLEASE REFER TO TEXT BEFORE CAN 21 FOR THOSE WHO HAVE RESIDED IN HOME AFTER MID-JUNE 2014 – THEY WON'T GET THE TEXT BELOW – BUT A VARIANT OF IT.

I would now like to ask more about noise specifically from large and small commercial and private aeroplanes. That means I would like you to ignore any noise you hear from any helicopters or from military aircraft, for this section of the interview.
These questions are also specifically about your experiences during this summer. By summer I mean the period roughly from mid-June to mid-September 2014.
{If A3 answered "garden, balcony or terrace", say:} *Also, please remember that when we say "at home", we mean when you have been at home, either inside your home or {{A3 response}} at home.*
So, to confirm, this is what we are now talking about.
[Showcard CANP]
Response to aircraft noise
CAN1. *So, thinking about this summer, when you were here at home, how much did each of these different types of noise from aeroplanes bother, disturb or annoy you?*
[Showcard CAN1]

	Not at all	Slightly	Moderately	Very	Extremely	Don't know
Overall noise of all kinds, from aeroplanes	○	○	○	○	○	○
Noise from aeroplanes on the ground at an airport (e.g. taxiing planes, engine testing)	○	○	○	○	○	○
Noise from aeroplanes taking off and climbing	○	○	○	○	○	○
Noise from aeroplanes descending and landing	○	○	○	○	○	○
Noise from aeroplanes in flight	○	○	○	○	○	○
Noise from aeroplanes during the day (7 a.m. - 11 p.m.)	○	○	○	○	○	○
Noise from aeroplanes during the night (11 p.m. - 7 a.m.)	○	○	○	○	○	○

{If "Not at all" or don't know to any item at CAN1 ask CAN1a for each item a not at all or dk response is given before moving on to the next item.}
CAN1a. *Is that because you did not hear this kind of noise?*
○ I did not hear this kind of noise
○ I did hear this kind of noise but it did not bother, disturb or annoy me at all
○ Don't know

{If CAN1 (iii) and (iv) given an equal rating other than "Not at all" or "Don't know", ask CAN1c before moving on to the next item.}
CAN1c. *You gave "*descending and landing" *the same rating as "taking off and climbing" – is that because they affect you equally or because you are not sure whether the aeroplanes were arriving or departing?*
○ Affected equally
○ Not sure whether the aeroplanes were arriving or departing
○ Don't know

[29] This is the policy topic for 2014 and is more detailed but restricted in scope than Section AN.

{If coded "Not at all", Don't know" or "Don't hear" to all CAN1,ask only CAN 8, CAN15a, CAN15b, 17a/b, can21a-c, 21d and CAN23a, CAN23b, CAN23c, CAN26a, CAN26b, CAN28, CAN29, CAN30, CAN31 AND CAN34 then go to section HL as per specification

THERE IS NO QUESTION CAN 2

CAN3. *Looking at this card, and still thinking about the summer, could you tell me when you were most bothered, disturbed or annoyed, at home, by noise from aeroplanes?*[30]
[If asked, tell respondents they should tick the box if any part of the period applies.]
[Showcard CAN3[31]]

	6 a.m. – 7 a.m.	7 a.m. – 12 noon	12 noon – 7 p.m.	7 p.m. – 11 p.m.	11 p.m. – midnight	midnight – 6 a.m.
Mon-Fri	☐	☐	☐	☐	☐	☐
Sat	☐	☐	☐	☐	☐	☐
Sun	☐	☐	☐	☐	☐	☐

	midnight – 6 a.m.	6 a.m. – 7 a.m.	7 a.m. – 12 noon	12 noon – 7 p.m.	7 p.m. – 11 p.m.	11 p.m. – midnight
Mon-Fri	☐	☐	☐	☐	☐	☐
Sat	☐	☐	☐	☐	☐	☐
Sun	☐	☐	☐	☐	☐	☐

{If CAN3 unanswered, ask CAN3a.}
CAN3a. *Is there definitely no particular time of day or day of the week?*
○ Yes – no particular time/day
○ No – there was a particular time/day [Recode CAN3.] {Go back to CAN3.}
CAN4. *Looking at this card, and thinking about a typical week during the summer, could you tell me any times and days when you do not know about the noise because you were usually not at home then?*
{Show only the periods not coded at CAN3.}
[Showcard CAN3 again][32]
CAN5. H*ow often, on average, were you bothered, disturbed or annoyed by noise from aeroplanes in summer? Was it …*
[Read out and code first to apply.]
○ *Every day*
○ *Most days*
○ *A few days a week*
○ *At least once a week*
○ *At least once a month*
○ *Less often*
○ Don't know
CAN6. *And how often, on average, did you hear noise from aeroplanes in summer? Was it …*
[Read out and code first to apply.]
○ *Every day*
○ *Most days*
○ *A few days a week*
○ *At least once a week*
○ *At least once a month*
○ *Less often*
○ Don't know
{If response to CAN6 is less often than CAN5, ask CAN6a}

[30] The order in which the periods are listed here (and in CAN4) needs to be agreed following the pilot survey, with these two alternatives each being tested in half the sample.

[31] This showcard will require two versions – one for each version of the question

CAN6a. *I've recorded that you were bothered, disturbed or annoyed {{answer to CAN5}} but that you only heard the noise from aeroplanes {{answer at CAN6}}. Can I just check if that is correct?*

○ Yes correct {continue}
○ No not correct {present the following instruction to interviewers.}

[Either recode CAN6 or go back and recode CAN5.]

CAN7. *Did noise from aeroplanes interfere with any of these aspects of your home life in the summer? Please just read out the letters that apply*

[Showcard CAN7]

		Yes
A	*Studying or working at home*	○
B	*Having a conversation (including on the phone or online[33])*	○
C	*Quiet leisure activities such as reading, writing, resting*	○
D	*Listening to TV, radio or music*	○
E	*Other leisure activities that involve you making a noise such as gaming or making music*	○
F	*Being able to use every room in the home*	○
G	*{If has garden, balcony or terrace at A3} Spending time outdoors at home*	○
H	*Having the windows or doors open*	○
I	*Enjoying the local parks and open spaces*	○
J	*Having friends or family round*	○
K	*Spending time outdoors in the neighbourhood*	○
L	*Sleeping patterns such as the time you go to bed or get up, or being kept awake*	○
	None of these	

{If "Yes" to "Sleeping patterns", ask CAN7a.}

CAN7a. *Over the summer, how often was your sleep affected in some way by noise from aeroplanes? This could include being kept awake or woken up, or changing the times when you go to bed or get up.*

[Read out and code first to apply.]

○ *Every day*
○ *Most days*
○ *A few days a week*
○ *At least once a week*
○ *At least once a month*
○ *Less often*
○ Don't know

[33] Interviewer briefing/notes to say this includes computer-based calls, audio or audio-visual (e.g. Skype) here and for analogous questions in other sections.

CAN7b. *Thinking about the summer, when you were here at home, what number from 0 to 10 best shows the degree to which your sleep was disturbed by noise from aeroplanes?*
[Showcard CAN7b][34]

0 Not at all disturbed	1	2	3	4	5	6	7	8	9	10 Extremely disturbed
○	○	○	○	○	○	○	○	○	○	○

○ Don't know

CAN8. *Did noise from aeroplanes have any of these effects on your household?*

[Read out]	Yes	No	Not applicable	Don't know
It frightened you	○	○		○
It frightened your children	○	○	○ {Skip next item}	○
It woke your children	○	○		○
It bothered, disturbed or annoyed someone else in the household	○	○	○ {Skip next item}	○
It woke someone else in the household	○	○		○
It upset or woke your pets	○	○	○	○

THERE IS NO QUESTION CAN 9

{If code 2-5 at CAN1i, ask CAN10. Otherwise go to CAN11a.}
CAN10. *Which one of the following issues, to do with aeroplane noise this summer, concerned you the most? And the next most ...?*
[Showcard CAN10] . Encourage the respondent to avoid tied ranks but allow if necessary.

☐ Flights at night (11 p.m. to 7 a.m.)
☐ Flights during the evening (7 p.m. to 11 p.m.)
☐ Flights during the day (7 a.m. to 7 p.m.)
☐ Flights that don't seem to be on the expected flight path
☐ The number of flights
☐ The loudness of the aeroplanes
☐ A lack of quiet between individual flights
☐ Not knowing when there will be times during the day without aeroplane noise

○ No (other) issues
○ Don't know

[34] All columns the same width.

CAN11a. *How much would you say you were bothered, disturbed or annoyed by the noise from aeroplanes this summer, while it was going on?*
[Showcard CAN11a]
- ○ Not at all
- ○ Slightly
- ○ Moderately
- ○ Very
- ○ Extremely
- ○ Don't know
- ○ Don't hear

CAN11b. *And how much, if at all, do you feel that the noise from aeroplanes spoiled your home life this summer in general, not just when the noise was going on?*
[Showcard CAN11b]
- ○ Not at all
- ○ Slightly
- ○ Moderately
- ○ Very
- ○ Extremely
- ○ Don't know
- ○ Don't hear

THERE IS NO QUESTION CAN 12
THERE IS NO QUESTION CAN 13
CAN13a. *Thinking about next summer, do you expect that noise from aeroplanes will be more next summer or less?*
[Showcard CAN13a]
- ○ 1 Expect it to be less
- ○ 2
- ○ 3
- ○ 4 Expect it to be roughly the same
- ○ 5
- ○ 6
- ○ 7 Expect it to be more
- ○ Don't know

THERE IS NO QUESTION CAN 14

Modification of exposure inside the home – behavioural aspects

~CAN15a. *What kind of windows do you have in the room where you sleep?*
[Probe and code all that apply.]

	Single-glazed	Secondary glazed/double glazed or better'	Don't know
Openable	☐	☐	☐
Non-openable	☐	☐	☐

~CAN15b. *What kind of windows do you have in the other room where you spend most time at home?*
[Probe and code all that apply.]

	Single-glazed	Secondary glazed/double glazed or better'	Don't know
Openable	☐	☐	☐
Non-openable	☐	☐	☐

If not lived here since mid-June 2014 – go to CAN21a
THERE IS NO QUESTION CAN16
CAN17a. *Did you ever close the windows, or keep the windows closed, for any of these reasons during the summer?* [If yes, probe to code which reasons.]
[Showcard CAN17a]
☐ Noise from aeroplanes
☐ Other noise coming in through the window
☐ To keep warm or save energy
☐ Other reasons to do with conditions outdoors (e.g. smoke, odours, wind, rain)
☐ Security
☐ Safety (e.g. to prevent children falling out)
☐ To keep pets in
☐ To keep animals/insects/pests out
☐ Habit/preference for no particular reason
☐ Window not openable
☐ Other (please specify)
{Single-line open text box – text scrolls along if too long for box.}
☐ None of these§
CAN17b. *Were there times when you wanted to have a window open anywhere in your home for any of these reasons, but you had it closed to keep out noise from aeroplanes?*
[Showcard CAN17b, probe for which reasons apply.]
Would have liked to have the window open …
☐ To keep cool
☐ To avoid condensation
☐ For fresh air / to prevent odour
☐ To talk to someone or hear what is happening outside
☐ Out of habit or preference for no particular reason
☐ Other (please specify)
{Single-line open text box – text scrolls along if too long for box.}
☐ No, none of these§
CAN18a. *When your windows were closed, were you sometimes still able to hear noise from aeroplanes?*
○ Yes
○ No
○ Don't know

Check on whether summer is the worst time of year

CAN19. *Does noise from aeroplanes bother, disturb or annoy you the same amount all year round or more in certain seasons?*
[Probe as necessary for which seasons.]
☐ Spring
☐ Summer
☐ Autumn
☐ Winter

o All year round – SINGLE CODE ONLY
☐ No particular season – SINGLE CODE ONLY
☐ Don't know§

THERE IS NO QUESTION CAN 20
FOR THOSE NOT RESIDENT SINCE AT LEAST MID-JUNE 2014/THE SUMMER
I would now like to ask you a few questions about noise specifically from large and small commercial and private aeroplanes. That means I would like you to ignore any noise that you hear from any helicopters or from military aircraft, for this section of the interview.
So just to confirm, this is what we are now talking about
SHOWCARD CANP
Actions taken
I would now like you to think about anything else you have done or tried to do about noise from aeroplanes – in general, not just this summer.
This will be modified for those who have not resided in home since mid-June as follows: *I would like you to think about anything you have done or tried to do about noise from aeroplanes in general.*
~CAN21a. *As far as you know, has any work such as this been done on this home, to try to keep noise out?*
[Showcard CAN21a]
☐ Changes to the windows
☐ Changes to the ceiling or roof
☐ Changes to the walls
☐ Mechanical ventilation installed
☐ Any other changes [Write in]
{Open text box, text scrolls along if too long for the box.}
☐ Don't know§
{If nothing done, skip to CAN22d.}

CAN21b. *Was it done mainly because of noise from aeroplanes, mainly because of some other noise or mainly for some other reason?*

○ Noise from aeroplanes
○ Other noise
○ Other reason [Write in]
{Open text box, text scrolls along if too long for the box.}
○ Don't know

~CAN21c. *And how was the work paid for?*
[Showcard CAN21c]

☐ Done before you moved in
☐ Paid for by you or someone else in your household
☐ Paid for by an airport
☐ Paid for by central Government or local authority (Council)
☐ Paid for by someone else [Write in]
{Open text box, text scrolls along if too long for the box.}
☐ Don't know§

{If only "Done before you moved in" coded, go to filter before CAN22.}
CAN21d. *And when was the work done?*
[Showcard CAN21d]

☐ Since this summer
☐ During this summer
☐ Before this summer
☐ Don't know§

~CAN22d. *Have you or anyone in your household done any of the things on this card about noise from aeroplanes (remembering that this does not include helicopters or military aircraft), whilst living in this home, within the last five years?*
[Showcard CAN22d]

○ Yes (Go to CAN23a)
○ No (Go to CAN26a)
○ Don't know (Go to CAN26a)

~CAN23a. *And was it about noise in the summer, other times of year, or both?*

○ Summer
○ Other times of year
○ Both
○ Don't know

~CAN23b. *Which of these things on this card have you or anyone else in your household done about the noise from aeroplanes within the last five years?*
[Showcard CAN23b]
☐ Made our own noise (e.g. playing music) so that we could not hear the noise from elsewhere
☐ Used earplugs or headphones to avoid hearing the noise
☐ Started, signed or participated in a campaign, protest or petition
☐ Took advice, e.g. from Citizens Advice Bureau, another advice or legal organisation
☐ Went on holiday
☐ Went to somewhere quiet outdoors in the area (e.g. a park, open space or country area)
☐ Went to somewhere quiet outdoors away from the area (e.g. a park, open space or country area)
☐ Went to another town
☐ Used a different room at home
☐ Went to someone else's home
☐ Went to somewhere else indoors (e.g. a library or place of worship)

Complained/wrote/spoke to:
☐ an airport, airport owner or airport operator
☐ one or more airlines
☐ the Civil Aviation Authority
☐ a newspaper or TV/radio station
☐ a resident's association
☐ the Environmental Health Department in the Local Authority (Council)
☐ another Local Authority (Council) Department
☐ a Government Department
☐ the Police
☐ a Councillor
☐ a Member of Parliament[35]
☐ someone else, (please specify)
{Open text box, text scrolls along if too long for the box.}
☐ Did something else to stop the noise being made or heard (please specify)
{Open text box, text scrolls along if too long for the box.}
☐ Exactly the same action taken as reported earlier {skip to CAN24}
☐ Don't know
~CAN23c. *Was the issue resolved to your satisfaction when you {{Action from CAN23b}}, only partially or not at all?*
[If multiple action of the same kind about exactly the same issue, code final outcome.]
○ Yes
○ Partially
○ Not at all
○ Don't know
Confounding factors
~CAN26a. *Have you taken any flights from any UK airport, for either work or leisure, in the past five years?*
[If yes, probe for how often.]
○ Yes, more than once a year
○ Yes, but only about once a year or less
○ No, not at all
○ Don't remember
{If Yes, ask CAN26b. Otherwise go to CAN28}.
~CAN26b. *Have you used [INSERT NAME OF AIRPORT FROM SAMPLE] Airport for either work or leisure flights in the past five years?*
[If yes, and if "more than once a year" at CAN26a, probe for how often.]
○ Yes, more than once a year
○ Yes, but only about once a year or less
○ No, not at all
○ Don't remember

[35] If respondent asks, this includes UK Parliament, European Parliament and Scottish, Welsh or Northern Irish devolved government.

CAN28. *Are you aware of any of the following?*
[Read out]
☐ *[INSERT NAME OF AIRPORT FROM SAMPLE] Airport Consultative Committee*
☐ *[INSERT NAME OF AIRPORT FROM SAMPLE] Airport Noise Action Plan*
☐ *[INSERT NAME OF AIRPORT FROM SAMPLE] Airport Master Plan*
☐ *[INSERT NAME OF AIRPORT FROM SAMPLE] Airport website information on noise*
☐ Any *[INSERT NAME OF AIRPORT FROM SAMPLE] Airport schemes that provide direct benefits to residents, for example for sound insulation, relocation or noise compensation*
☐ *None of these*§

~CAN29. *Are you aware of any attempts by [INSERT NAME OF AIRPORT FROM SAMPLE] Airport or the airlines to improve control of the noise from aeroplanes?*
○ Yes [Prompt and write in.]
{Open text box. “Return” key can be used within the box.}.
○ No

~CAN30. *Are you aware of anything that [INSERT NAME OF AIRPORT FROM SAMPLE] Airport has sponsored or supported in the local community?*
○ Yes [Prompt and write in.]
{Open text box. “Return” key can be used within the box.}.
○ No

~CAN31 *To what extent do you agree or disagree with the following statements?*
[Showcard CAN31]

INTERVIEWER NOTE: THESE WILL BE IN A DIFFERENT ORDER EACH TIME – THE INTERVIEWER READS OUT THE OPTIONS, AND THE RESPONDENT WILL ANSWER FROM STRONGLY AGREE TO STRONGLY DISAGREE	Strongly disagree	Disagree	Not sure	Agree	Strongly agree
Noise from aeroplanes is bad for the health of myself or my household	○	○	○	○	○
Noise from aeroplanes is bad for children's education at the local schools	○	○	○	○	○
Aeroplanes cause air pollution around here	○	○	○	○	○
Having an airport in the area is good for the local economy	○	○	○	○	○
I worry about plane crashes around here	○	○	○	○	○
Noise from aeroplanes makes my home less valuable	○	○	○	○	○
Having an airport in the area makes my home more valuable	○	○	○	○	○
It is convenient to have an airport in the area	○	○	○	○	○
Air travel harms the environment	○	○	○	○	○
I like flying	○	○	○	○	○
I worry about more land being taken over by the airport	○	○	○	○	○
I like watching the aeroplanes	○	○	○	○	○

Final ratings

ASK IF LIVED AT HOME SINCE MID-JUNE 2014.
CAN32. *Thinking again about just this summer – so from mid-June to mid-September – how much did noise from aeroplanes bother, disturb or annoy you in each of these locations?*
[Showcard CAN32]

	Not at all	Slightly	Moderately	Very	Extremely	Don't know	Don't hear
Noise from aeroplanes while indoors at home	○	○	○	○	○	○	○
{If "Yes" at A3:} Noise from aeroplanes while outdoors at home	○	○	○	○	○	○	○
Noise from aeroplanes while outdoors around the neighbourhood	○	○	○	○	○	○	○
Overall noise from aeroplanes at home and around the neighbourhood.	○	○	○	○	○	○	○

{If "Not at all" or "Don't know" to any item at CAN32, ask CAN32a before moving on to the next item.}

CAN32a. *Is that because you did not hear this kind of noise?*
- ○ I did not hear this kind of noise
- ○ I did hear this kind of noise but it did not bother, disturb or annoy me at all
- ○ Don't know

To sum up your answers, I would like you to use a 0-to-10 opinion scale for how much noise from aeroplanes bothered, disturbed or annoyed you when you were here at home this summer. If you were not at all annoyed, choose 0; if you were extremely annoyed, choose 10; if you were somewhere in between, choose a number between 0 and 10.
[If respondent states that they do not hear any noise, then code 98, for don't know code 99.]

THERE IS NO QUESTION CAN 33
CAN34. *Thinking about this summer, what number from 0 to 10 best shows how much you were bothered, disturbed or annoyed by noise from aeroplanes?*
[Showcard CAN34][36]

0 Not at all	1	2	3	4	5	6	7	8	9	10 Extremely
○	○	○	○	○	○	○	○	○	○	○

○ Don't know ○ Don't hear

SECTION HL – INDIVIDUAL HEALTH
I would now like to ask you a few questions about your health today.
HL1. *In general, would you say your health is:*
[Showcard HL1]
- ○ Excellent
- ○ Very good
- ○ Good
- ○ Fair
- ○ Poor
- ○ Don't know

HL2. *Do you often feel tired and not rested in the morning?*
- ○ Yes
- ○ No

HL3. *During the past month, how often have you taken medicine (prescribed or "over the counter") to help you sleep because of noise?*
[Showcard HL3]
- ○ Not during the past month
- ○ Less than once a week
- ○ Once or twice a week
- ○ Three or more times a week
- ○ Would rather not say

[36] All columns the same width.

HL4. *I'm going to read out some statements about feelings and thoughts. For each one, please tell me how often, if at all, you have felt this way over the last two weeks. Please read out the letter that applies?*
[Showcard HL4]

[Show on screen in random order.]	A) All of the time	B) Often	C) Some of the time	D) Rarely	E) None of the time	F) Don't know/ refused
I've been feeling optimistic about the future	○	○	○	○	○	○
I've been feeling useful	○	○	○	○	○	○
I've been feeling relaxed	○	○	○	○	○	○
I've been dealing with problems well	○	○	○	○	○	○
I've been thinking clearly	○	○	○	○	○	○
I've been feeling close to other people	○	○	○	○	○	○
I've been able to make up my own mind about things	○	○	○	○	○	○

Source: Warwick–Edinburgh Mental Well-being Scale (WEMWBS)

SECTION H – HOUSEHOLD INFORMATION
I would like to finish by asking you a few questions about this home and your household.
SoNA2013 items
H2. *In what year was your home originally built?*
[Prompt if necessary.]
○ Before 1919
○ 1919 – 1940
○ 1941 – 1960
○ 1961 – 1990
○ 1991 – 2000
○ 2001 – 2010
○ 2011 – 2014
○ Don't know
H3. *Which of these applies to your home?*
[Showcard H3]
○ Being bought on a mortgage
○ Owned outright by household
○ Rented from local authority
○ Rented from housing association
○ Rented from private landlord
○ Shared ownership
○ Tied to employment
○ Other
○ Refused

H4a. *How did you come to be living here?*
[Showcard H4a]
- ○ My choice
- ○ Choice made with someone else in the household
- ○ Choice made by someone else in the household
- ○ Choice made by landlord (e.g. Local Authority, housing association)
- ○ Choice made by someone else outside the household, e.g. employer
- ○ Other (please specify)

{Open text box. "Return" key can be used within the box.}

Refused[§]

H4a(ii). *Prior to moving here, were you aware of a possibility of hearing noise from the airport?*
[Showcard H4a(ii)]
- ○ I have always lived here
- ○ No
- ○ Yes, but the noise was more than I expected
- ○ Yes, and the noise was roughly what I expected
- ○ Yes, but the noise was less than I expected
- ○ Yes, but the noise has got worse since I moved here

Don't know
Refused

H4b. *Which (if any) of these things do you not like about living in this home?*
[Showcard H4b]
- ☐ Not knowing the neighbourhood
- ☐ Being far from family/friends
- ☐ Being far from work
- ☐ Being far from your own community
- ☐ The neighbours
- ☐ Crime/violence/gangs/youths/drug dealers
- ☐ The local schools
- ☐ The transport links
- ☐ Lack of parks, lakes, countryside or other open spaces
- ☐ The shops
- ☐ Not enough parking
- ☐ Other local facilities
- ☐ Dog fouling
- ☐ Traffic/roads/close to roads
- ☐ Litter
- ☐ Generally dislike the neighbourhood
- ☐ None of these[§]

H4c. *And which (if any) of these things do you see as good things about living in this home?*
[Showcard H4c]
- ☐ Born in this neighbourhood
- ☐ Being near family/friends
- ☐ Being near work
- ☐ Being near your own community
- ☐ Friendly area/good neighbours/community spirit
- ☐ Safety/low crime
- ☐ The local schools
- ☐ The transport links
- ☐ Parks, lakes, countryside or other open spaces
- ☐ The shops
- ☐ Other local facilities
- ☐ Generally clean and tidy
- ☐ Generally like the neighbourhood
- ☐ None of these[§]

H5. *Which of these age groups are you in?*
[Showcard H5]
- ○ 18 – 19 years
- ○ 20 – 24 years
- ○ 25 – 34 years

¡ 35 – 44 years
○ 45 – 54 years
○ 55 – 64 years
○ 65 – 74 years
○ 75 years or older
○ Refused

H6. [Code respondent gender.]
○ Male
○ Female

H7a. *Please tell me if you have other household members in the following age categories?*
[Showcard H7a]
☐ Under 1
☐ 1-4 years
☐ 5-10 years
☐ 11-15 years
☐ 16-17 years
☐ 18-19 years
☐ 20-24 years
☐ 25-34 years
☐ 35-44 years
☐ 45-54 years
☐ 55-64 years
☐ 65-74 years
☐ 75 years or older
☐ None§
☐ Refused§

{If any coded at H7a, ask H7b.}
H7b. *How many people in each age group, other than yourself, live in this household?*
[Probe for each displayed age group.]

	1	2	3	4	5	6	7	8	9	10+
{{Age group}}	○	○	○	○	○	○	○	○	○	○

○ Refused§

H8. *Which of these best describes your current situation?*
[Showcard H8]
○ Working full time (30 hours a week or more)
○ Working part time
○ Unemployed and looking for work
○ Retired from paid work altogether
○ In full-time education
○ Looking after the home or family
○ Something else
○ Refused

{If working full or part time, ask H9a. Otherwise go to filter before H10a.}
H9a. *Do you ever work from home?*
○ Yes
○ No

{If "Yes" at H9a, ask H9b. Otherwise go to H9c.}
H9b. *How many days in a typical week do you work from home?*
○ Less than 3
○ 3 to 4
○ 5 to 7
○ Varies
○ Don't know

H9c. *Which of the following times of day do you normally work?*
[Showcard H9c]
○ Mostly during the day
○ Mostly in the evenings
○ Mostly at night

¡ Varying shift patterns
○ Don't know

Airport-related employment
{If working, ask H10a.}
H10a. *Does your work include any of these kinds of employment?*
[Showcard H10a]
☐ Working for an airport
☐ Working for an airline
☐ Working for another company that does business at an airport
☐ Work that is not at an airport but gets some benefit from the airport being there
☐ Other work related to the aircraft or air travel industry.
☐ None of these§
{If retired, ask H10b.}
H10b *Did your work, before you retired, include any of these kinds of employment?*
[Showcard H10b]
☐ Working for an airport
☐ Working for an airline
☐ Working for another company that does business at an airport
☐ Work that is not at an airport but gets some benefit from the airport being there
☐ Other work related to the aircraft or air travel industry.
☐ None of these§
{If anyone else aged 16+ in the household at H7a, ask H10c.}
H10c *Does anyone else in the household have work that includes any of these kinds of employment?*
[Showcard H10c]
☐ Working for an airport
☐ Working for an airline
☐ Working for another company that does business at an airport
☐ Work that is not at an airport but gets some benefit from the airport being there
☐ Other work related to the aircraft or air travel industry.
☐ None of these§
SoNA2013 items
ASK ALL

ALL QUESTIONS BELOW BASED ON CIE, WHETHER RESPONDENT OR ANOTHER MEMBER OF HOUSEHOLD.
IF THE CIE IS RETIRED AND RECEIVES A PENSION FROM THEIR LAST COMPANY, QUESTIONS SHOULD BE BASED ON THEIR POSITION WHILST WORKING AT THE COMPANY
IF THE CIE IS A WIDOW/WIDOWER AND THEIR LARGEST SOURCE OF INCOME IS A PENSION FROM THEIR PARTNERS LAST COMPANY, QUESTIONS SHOULD BE BASED ON THEIR PARTNERS POSITION WHILST WORKING AT THE COMPANY
NOW COLLECT DETAILS OF RESPONDENT'S JOB .
THE CHIEF INCOME EARNER IS :
THERE IS NO QUESTION H11

H12a. *What type of firm do you work for?*

{Open text box, text scrolls along if too long for the box.}
○ Refused
H12b. *What do you do? What does the work involve?*

{Open text box, text scrolls along if too long for the box.}
○ Refused
H12c. *Is the work manual/non manual?*
○ Manual
○ Non manual
○ Refused

H12d. *Are you an employee or self employed?*
○ Employed

¡ Self employed
○ Refused

H12e. *Do you have any position/rank/grade in the organisation? (PROMPT: Foreman, Sergeant, Manager, Chief Executive etc.)*

{Open text box, text scrolls along if too long for the box.}
○ Refused

H12f. *How many people work at the same place?*

{Allow numerals only}
○ Refused

H12g. *How many people are you responsible for?*

{Allow numerals only}
○ Refused

H12h. [Type in any other relevant information regarding people they are responsible for.]
(E.G. OTHER SALESMEN, MANAGERS, CLERICAL OR MANUAL WORKERS)

{Open text box, text scrolls along if too long for the box.}
○ Refused

H12i. *What is the job title of the person you report to?*

{Open text box, text scrolls along if too long for the box.} {Allow numerals only}
○ Refused

H12i. *What qualifications do you have that are relevant to your job?*
[COLLECT ALL AND PROBE FOR LEVEL E.G. BELOW, AT, ABOVE DEGREE LEVEL]1

{Open text box, text scrolls along if too long for the box.}	{Allow numerals only}

○ Refused

H13. *Occupation of Chief Income Earner*
{SUMMARISE RESPONSES TO H12 IN BOX BELOW}

Type of firm:	
Job:	
Employment status:	
No. of people at place of work:	
No. of people responsible for:	
Qualifications:	
Position/rank/grade:	
Report to:	

[CIE/Respondent is in group ...][37]
○ A
○ B
○ C1
○ C2
○ D
○ E

H14a. *The Department for the Environment, Food and Rural Affairs (Defra) and the Department for Transport (DfT) would like to combine the answers you have given with other information on local noise and noise sources. To do this they would need to know your full address, and I need to ask your permission for us to include your address with the survey data.*
I can guarantee that your address will only be used by Defra and DfT and people working on behalf of Defra and DfT, and will only be used to combine your answers with information about noise. Is it OK to include your address with the survey data or would you prefer not?
○ Yes – can include address
○ No – would prefer not

H14b. *There are no plans at present for any follow-up interview to this survey, but if there were in future would you be prepared to take part in further research on similar topics for Defra or DfT?*
Your address details may be passed on to Defra and/ or DfT to be used by either themselves or another research organisation – they will only be used for research purposes
○ Yes – prepared to take part
○ No – would prefer not

H15a. [Record: Is the respondent address exactly as given in the Contact Sheet?]
○ Yes {Ask H15b.}
○ No {Skip to H15c.}

[37] Standard social group classification.

H15b. [Enter name, address and telephone details, explain to respondent that we ask for phone number so that a certain percentage of interviews can be checked – explain that if they do not want to be called for further research by {{fieldwork contractor}} this number will not be passed on to other {{fieldwork contractor}} researchers. Ensure you write in the full address and postcode (this is on your sample list).]

Title:	{Drop-down: Mr / Mrs / Miss / Ms}
Name:	{Open text box}
Phone number:	{0nnnn nnnnnn required} [Enter 01, 02 or 03 for a landline, 07 for a mobile then 3 further digits, a space and the rest of the phone number, e.g. 02072 890901.]
Phone type:	{Drop-down: Home / Mobile / Ex-directory / Refused}

{Go to H16.}

H15c. [Enter name and telephone details, explain to respondent that we ask for phone number so that a certain percentage of interviews can be checked – explain that if they do not want to be called for further research by {{fieldwork contractor}} this number will not be passed on to other {{fieldwork contractor}} researchers.]

Title:	{Drop-down: Mr / Mrs / Miss / Ms}
Name:	{Open text box}
Phone number:	{0nnnn nnnnnn required} [Enter 01, 02 or 03 for a landline, 07 for a mobile then 3 further digits, a space and the rest of the phone number, e.g. 02072 890901.]
Phone type:	{Drop-down: Home / Mobile / Ex-directory / Refused}

H16. *If we needed to check anything about any of your answers would it be all right if we contacted you again?*

- ○ Yes
- ○ No

Appendix C

Calculation of Respite from Arrival and Departure Operations

The analysis presented in section 4 of this report separately considers respondents experiencing respite from arrival and departure operations. This appendix explains how people experiencing respite from arrival and departure operations respectively is calculated.

As explained in section 4, $L_{Aeq,8h}$ and L_{ASmax} were calculated at grid and respondent locations for westerly operations occurring during the 92-day summer period in 2014 for the following scenarios which represent all four of the westerly runway alternation patterns:

- Morning period when 27R is the designated runway for arrivals (and 27L is used for departures)
- Afternoon period when 27R is the designated runway for arrivals (and 27L is used for departures)
- Morning period when 27L is the designated runway for arrivals (and 27R is used for departures)
- Afternoon period when 27L is the designated runway for arrivals (and 27R is used for departures)

The grid results for the $L_{Aeq,8h}$ metric were used to produce the illustrative noise contours presented in Figure 2, Figure 3 and Figure 4.

The $L_{Aeq,8h}$ and L_{ASmax} results at each respondent location were handled separately. For each metric, comparisons were made between the following pairs of scenarios:

- Morning when 27L designated vs Morning when 27R designated
- Morning when 27L designated vs Evening when 27R designated
- Evening when 27L designated vs Morning when 27R designated
- Evening when 27L designated vs Evening when 27R designated

So as not to overestimate the degree of respite, a conservative approach was taken to represent the amount of respite experienced by the lowest of the four differences at each respondent location.

There are a further two comparisons which could have been made, i.e. between the Morning and Evening scenarios for a given designated runway:

- Morning when 27L designated vs Evening when 27L designated
- Morning when 27R designated vs Evening when 27R designated

Because the Heathrow Airport runway alternation system never schedules these pairs of scenarios to occur during any given day, they were not considered to be representative of real effects, hence comparisons were not made between these pairs of scenarios.

A noise respite category to be used in the statistical analysis was assigned to each respondent location according to the following criteria applying to the minimum differences described in paragraph 4.18. This was done separately for $L_{Aeq,8h}$ and average L_{ASmax}:

- minimum difference is less than 4 dB
- minimum difference is at least 4 dB but less than 9 dB
- minimum difference is at least 9 dB

For this analysis, there was a need to differentiate between noise due to arrival and departure operations. To explain, consider an example where a respondent is located beneath the westerly arrival route. The aircraft noise levels here would be much higher for the arriving aircraft overhead than for the departure operations occurring several miles away from the respondent. A respondent's perception here would be driven by the arriving aircraft. Accordingly, the modelled departure noise levels at this location were tens of decibels lower than the noise levels modelled for the arriving aircraft.

To account for this when establishing the noise respite category, the comparisons between scenarios were undertaken for noise calculation results for arrival and departure operations separately. This does not, however, fully solve the problem, as within any given pair of scenarios there will still be respondent locations exposed to very low noise levels due to being located far from where the aircraft are operating, and these datapoints should be excluded from the respective analysis of respite due to arrival or departure noise.

To implement this, a threshold noise level was set. If the minimum $L_{Aeq,8h}$ noise level across the four modelled scenarios was below this level at any given respondent location, then that respondent datapoint was excluded from the subsequent statistical analysis. The threshold level was set at 45 dB $L_{Aeq,8h}$; typical of ambient noise levels in urban and semi-urban areas.

The same filtering based on the 45 dB $L_{Aeq,8h}$ threshold was also applied to the L_{ASmax} analysis.