ARUP

Subject Hexham Rd noise monitor report

Date 19 November 2018 **Job No/Ref** AAc/262962-00/H04

1 Introduction

This report summarises the data collected by the mobile noise monitoring terminal (NMT) installed at Hexham Rd near Newcastle International Airport for the period 1st May – 30th September 2018. Unless otherwise specified, all data has been summarised across the five-month period.

The mobile NMT was supplied by Brüel & Kjær (model 3655-C) and is installed at 296 Hexham Rd, NE15 9QX.

2 Noise metrics

The NMT collects data using a variety of noise metrics. Data collected using the equivalent continuous sound level ($L_{Aeq,T}$) and maximum noise level ($L_{Amax,S}$) has been summarised in this report.

2.1 Decibels (dB and dBA)

The ratio of sound pressures which we can hear is a ratio of 10^6:1 (one million to one). For convenience, therefore, a logarithmic measurement scale is used. The resulting parameter is called the 'sound pressure level' (L_p) and the associated measurement unit is the decibel (dB). As the decibel is a logarithmic ratio, the laws of logarithmic addition and subtraction apply.

Weighted sound pressure levels, which correlate well with the subjective response to sound are measured in dB(A). The 'A' weighting follows the frequency response of the human ear, which is less sensitive to low and very high frequencies than it is to those in the range 500Hz to 4kHz.

In some statistical descriptors the 'A' weighting forms part of a subscript, such as L_{A10}, L_{A90}, and L_{Aeq} for the 'A' weighted equivalent continuous noise level.

2.2 Equivalent continuous sound level ($L_{Aeq,T}$)

An index for assessment for overall noise exposure is the equivalent continuous sound level, $L_{Aeq,T}$. This is a notional steady level which would, over a given period of time, deliver the same sound energy as the actual time-varying sound over the same period. Hence fluctuating levels can be described in terms of a single figure level.

The subscript T refers to the time period over which the metric is defined. In the UK, daytime aircraft noise is typically measured by calculating the equivalent continuous sound level over 16 hours (07:00 to 23:00) to give a single figure ($L_{Aeq,16h}$). Night-time aircraft noise is typically measured over an 8 hour night period (23:00 to 07:00) to give a single figure ($L_{Aeq,8h}$). Separate assessment for day and night recognises that daytime and night-time noise can lead to quite different effects (principally daytime annoyance and night-time sleep disturbance) and thus it is better to define and measure daytime and night-time noise separately.

$L_{Aeq,16h}$ was adopted in 1990 on the basis of the 1982 Aircraft Noise Index Study (ANIS, published in 1985). The reference time period is an average summer day (07:00 to 23:00), from June 16th to September 15th. The summer day period is used because people are more likely to have their windows open or be outdoors, and because aviation activity is generally at its most intense during the summer periods. Furthermore, warmer summer temperatures can adversely affect aircraft performance due to reduced lift resulting in less efficient flight which can lead to increased noise exposure compared to other times of year.

The World Health Organization (WHO) use the L_{Aeq} metric in their Guidelines for Community Noise and Night Noise Guidelines for Europe. Research has found that annoyance and other health effects correlate with the L_{Aeq} metric. This was confirmed by the most recent large-scale research study in the UK on aircraft noise (Survey of Noise Attitudes 2014: Aviation, SoNA[1]) which found that annoyance correlated well with the average summer day $L_{Aeq,16h}$, and there was no evidence found to suggest that any of the other metrics studied correlated better with annoyance than $L_{Aeq,16h}$. The SoNA research study suggests that adverse effects of annoyance can be observed from as low as 51 $dBL_{Aeq,16h}$. This research has fed into the draft Airspace Policy, and its consultation response[2], which proposes a Lowest Observable Adverse Effect Level (LOAEL)[3] of 51 $dBL_{Aeq,16h}$. A night-time LOAEL of 45 $dBL_{Aeq,8h}$ is also proposed in the draft policy, based on the Government's current monetisation methodology (known as WebTAG) and the World Health Organization's methodological guidance for estimating the burden of disease from environmental noise.

2.3 Maximum noise level (L_{Amax})

L_{Amax} is the maximum noise level identified during an event or a measurement period. Experimental data has shown that the human ear does not generally register the full loudness of transient sound events of less than 125ms duration and fast time weighting (F) has an exponential time constant of 125ms which reflects the ear's response. Slow time weighting (S) has an exponential time constant of 1s and is used to allow more accurate estimation of the average sound level on a visual display.

The maximum level measured with fast time weighting is denoted as $L_{Amax,F}$. The maximum level measured with slow time weighting is denoted $L_{Amax,S}$.

3 Summary of noise monitoring terminal data

3.1 Number of aircraft, aircraft types and associated noise levels

Figure 1 shows the number of aircraft movements recorded by the NMT in each 24 hour period. Figure 2 shows the aircraft types that were registered by the NMT. The average maximum noise level ($dBL_{Amax,S}$) of each of these aircraft types is shown in Figure 3. Aircraft types with less than 10 movements in the five-month period have not been included. Note that the R22 (Robinson 22) is a helicopter.

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[1] https://publicapps.caa.co.uk/modalapplication.aspx?appid=11&mode=detail&id=7744
[2]https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/653801/consultation-response-on-uk-airspace-policy-web-version.pdf
[3] The LOAEL as it relates to noise and as defined by the Noise Policy Statement for England is the noise level above which adverse effects on health and quality of life can be detected

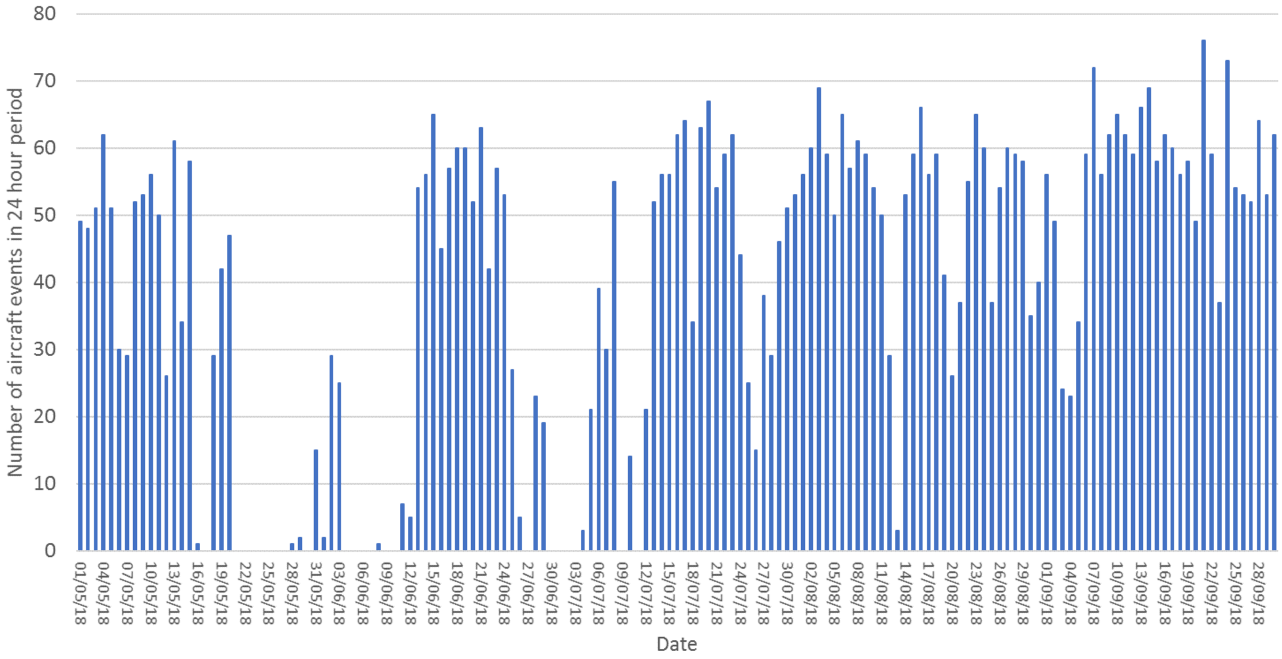

Figure 1: Number of aircraft events recorded by the NMT in a 24 hour period

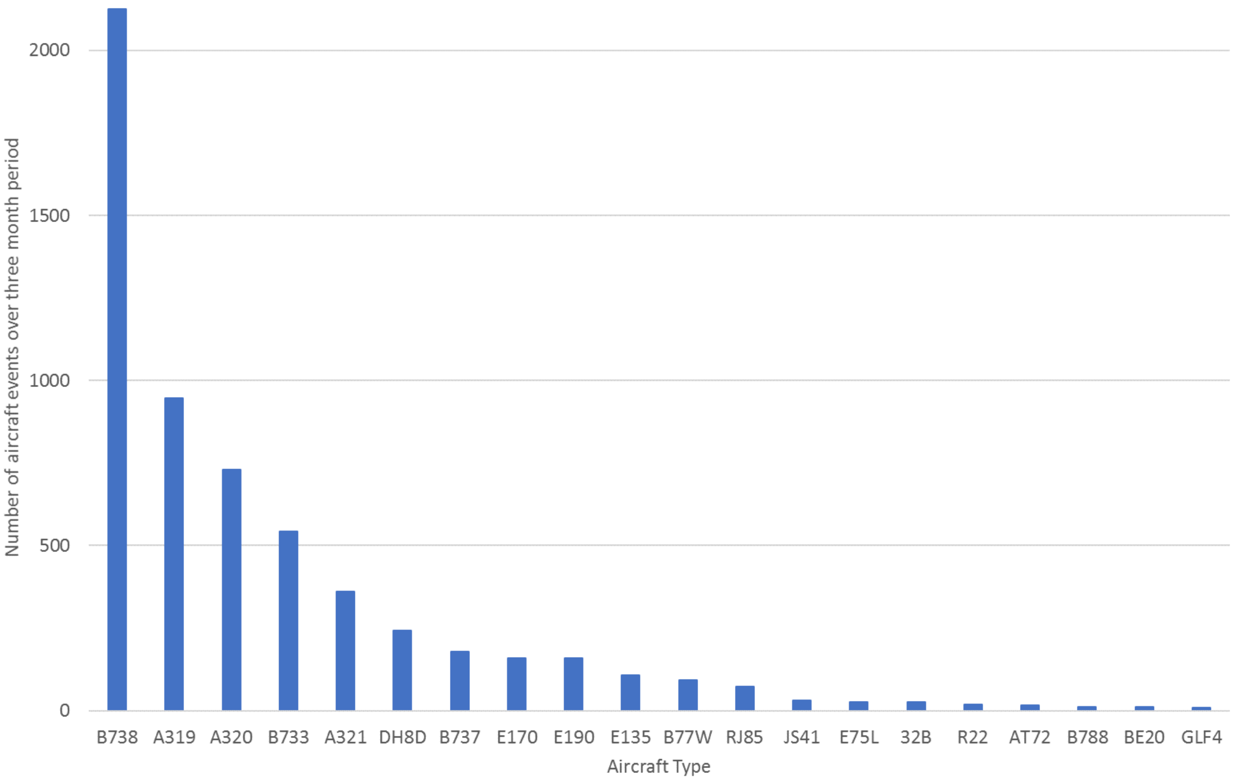

Figure 2: Aircraft types registered by the NMT

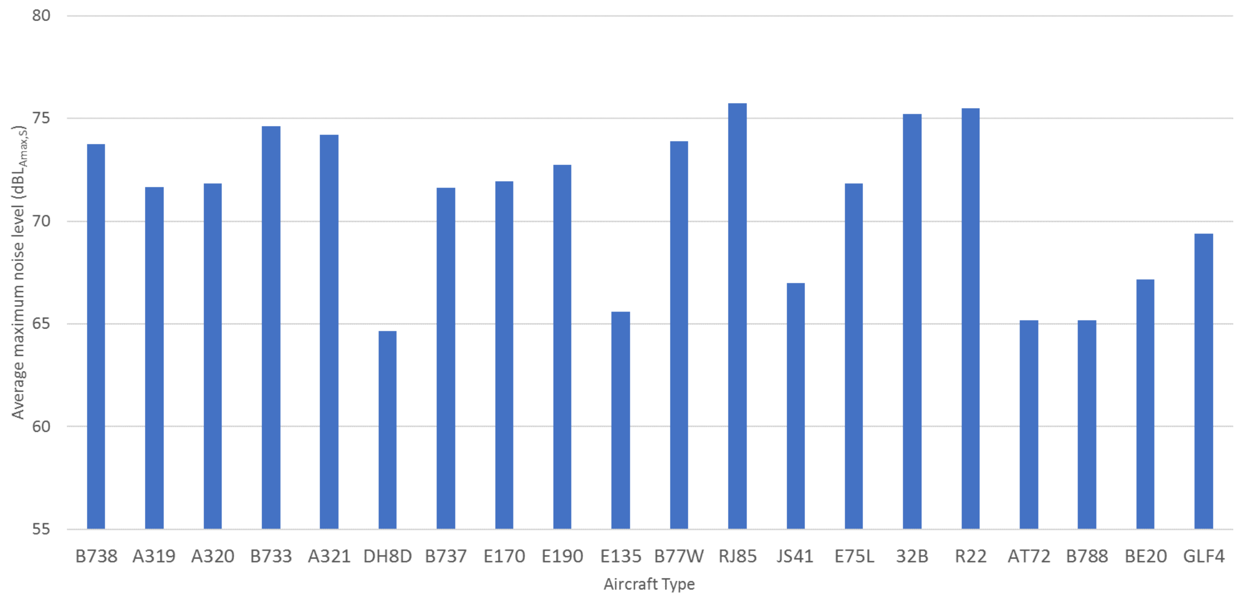

Figure 3: Average maximum noise level (dBL$_{Amax,S}$) per aircraft type 1st May – 30th September 2018.

3.2 Aircraft altitude

Figure 4 shows the range of aircraft altitudes (AMSL) recorded by the NMT.

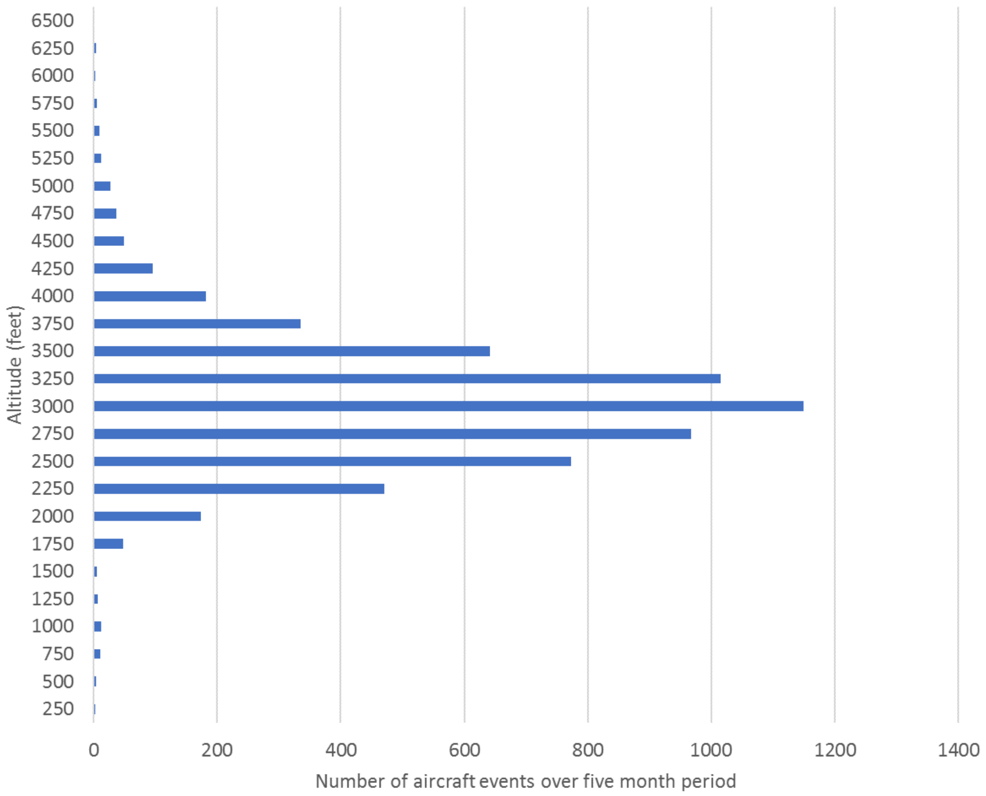

Figure 4: Range of aircraft altitudes recorded by the NMT

3.3 Aircraft event noise levels

Figure 5, Figure 6 and Figure 7 show the range of aircraft event maximum noise levels measured by the NMT during the day (07:00 – 19:00), evening (19:00 – 23:00) and night (23:00 – 07:00) 1st May – 30th September 2018.

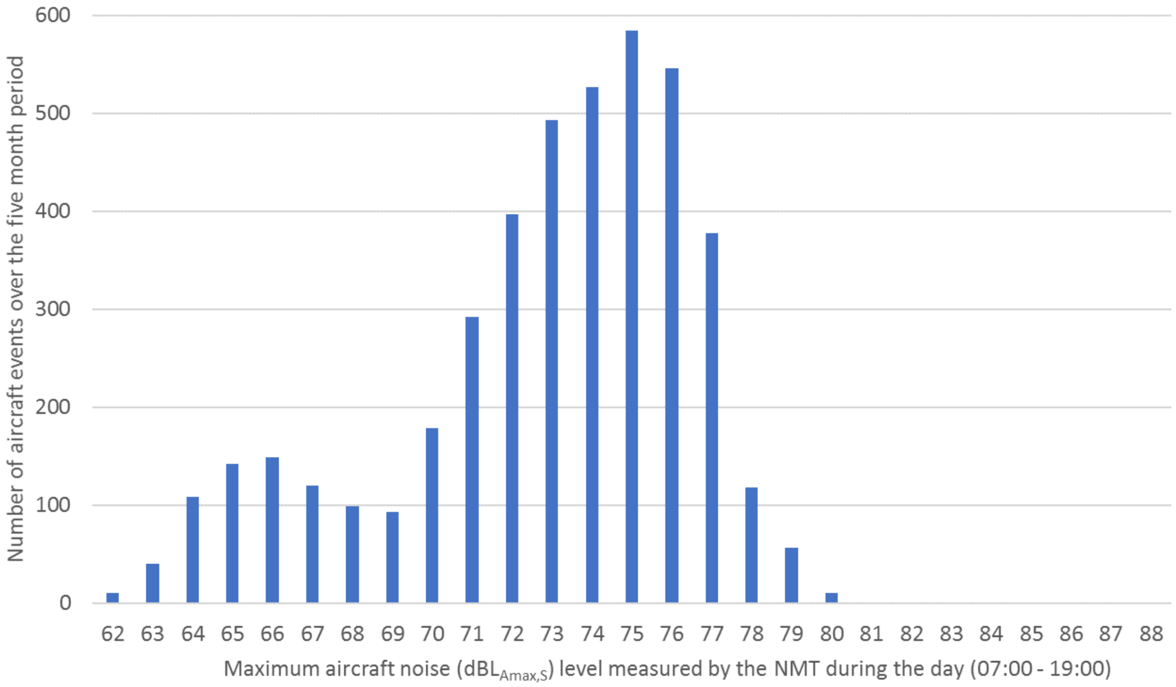

Figure 5: Range of aircraft event maximum noise levels measured during the day (07:00 – 23:00) 1st May – 30th September 2018.

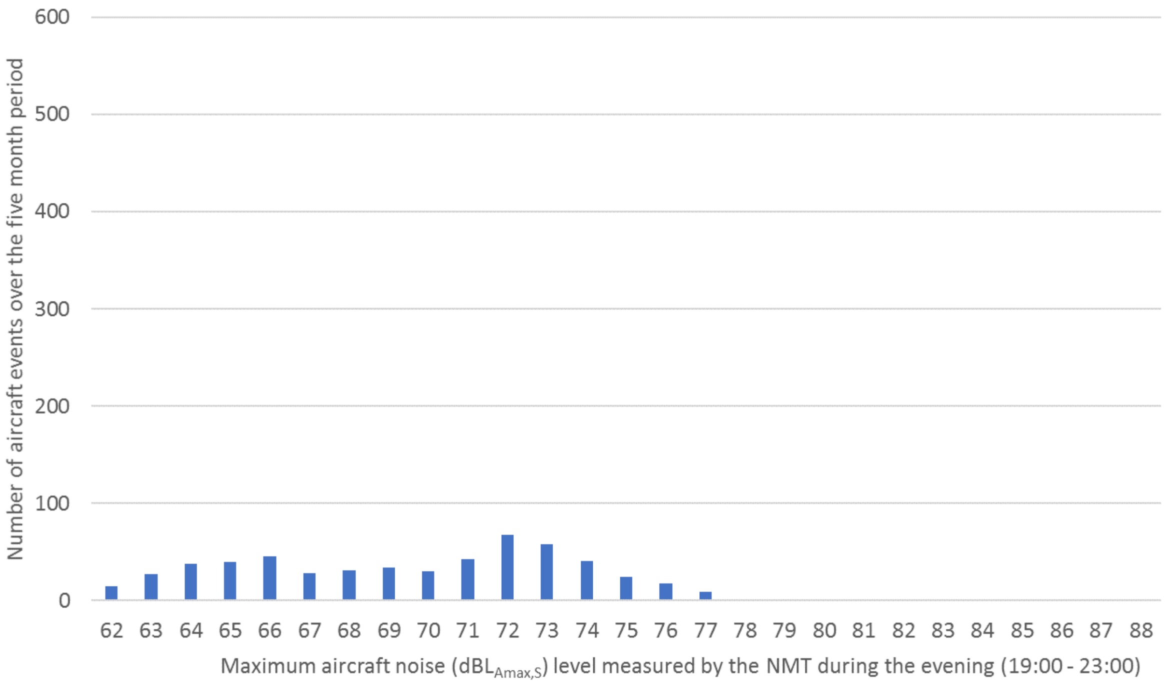

Figure 6: Range of aircraft event maximum noise levels measured during the evening (19:00 – 23:00)

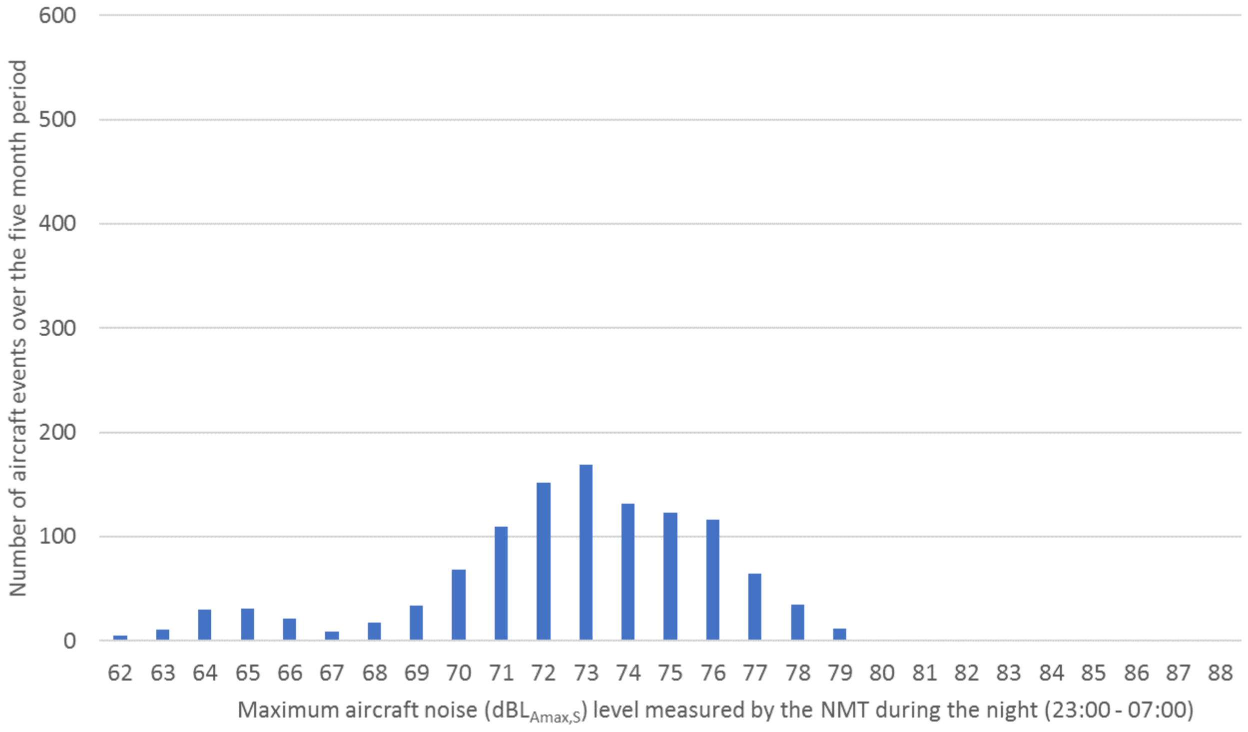

Figure 7: Range of aircraft event maximum noise levels measured during the night (23:00 – 07:00)

3.4 Average hourly sound level

Figure 8 shows the hourly noise levels averaged over the five-month period for aircraft noise, community noise (all noise excluding aircraft noise events) and the total noise (aircraft and community noise together).

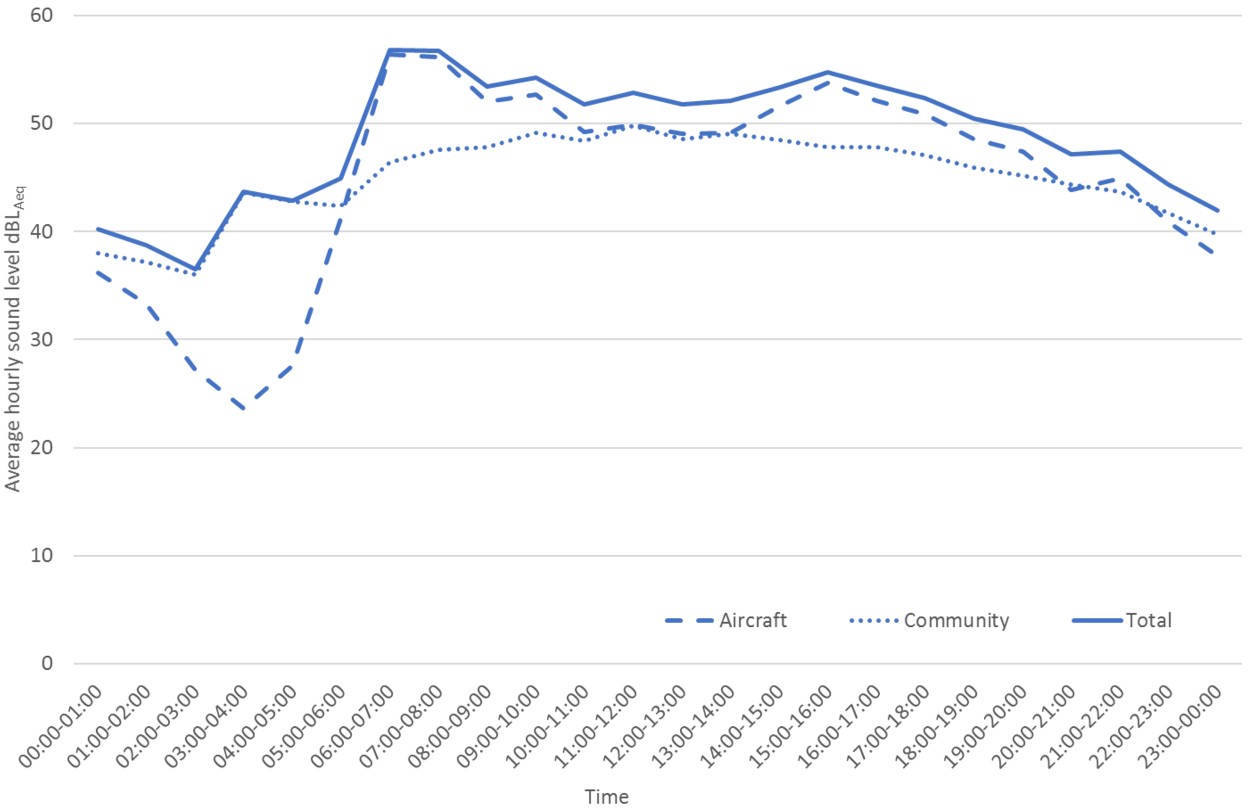

Figure 8: Hourly sound levels averaged over five-month period

3.5 Daily $L_{Aeq,16h}$ and $L_{Aeq,8h}$ noise levels

Date	$dBL_{Aeq,16h}$	$dBL_{Aeq,8h}$		Date	$dBL_{Aeq,16h}$	$dBL_{Aeq,8h}$		Date	$dBL_{Aeq,16h}$	$dBL_{Aeq,8h}$
01/05/18	49	51		01/06/18	0	49		01/07/18	0	0
02/05/18	48	51		02/06/18	50	49		02/07/18	0	0
03/05/18	47	47		03/06/18	0	0		03/07/18	0	0
04/05/18	52	47		04/06/18	0	0		04/07/18	37	48
05/05/18	53	49		05/06/18	0	0		05/07/18	48	45
06/05/18	50	49		06/06/18	0	0		06/07/18	51	49
07/05/18	49	48		07/06/18	0	30		07/07/18	50	49
08/05/18	52	50		08/06/18	0	0		08/07/18	52	28
09/05/18	53	47		09/06/18	0	0		09/07/18	0	51
10/05/18	52	49		10/06/18	0	0		10/07/18	40	0
11/05/18	52	50		11/06/18	45	0		11/07/18	0	47
12/05/18	49	49		12/06/18	38	49		12/07/18	47	48
13/05/18	52	49		13/06/18	52	47		13/07/18	53	49
14/05/18	50	51		14/06/18	52	47		14/07/18	52	48
15/05/18	52	0		15/06/18	53	48		15/07/18	52	48
16/05/18	24	0		16/06/18	52	49		16/07/18	53	51
17/05/18	0	49		17/06/18	53	47		17/07/18	53	50
18/05/18	49	49		18/06/18	52	49		18/07/18	50	49
19/05/18	51	48		19/06/18	52	47		19/07/18	54	48
20/05/18	51	0		20/06/18	52	50		20/07/18	53	49
21/05/18	0	0		21/06/18	53	51		21/07/18	53	49
22/05/18	0	0		22/06/18	51	48		22/07/18	53	49
23/05/18	0	0		23/06/18	52	49		23/07/18	53	49
24/05/18	0	0		24/06/18	52	47		24/07/18	51	50
25/05/18	0	0		25/06/18	48	0		25/07/18	47	48
26/05/18	0	0		26/06/18	46	0		26/07/18	45	48
27/05/18	0	0		27/06/18	0	48		27/07/18	51	0
28/05/18	26	0		28/06/18	48	49		28/07/18	52	47
29/05/18	31	0		29/06/18	47	0		29/07/18	53	48
30/05/18	0	0		30/06/18	0	0		30/07/18	52	50
31/05/18	48	0						31/07/18	52	48

Date	dB$L_{Aeq,16h}$	dB$L_{Aeq,8h}$		Date	dB$L_{Aeq,16h}$	dB$L_{Aeq,8h}$
01/08/18	52	48		01/09/18	52	48
02/08/18	53	49		02/09/18	52	50
03/08/18	53	49		03/09/18	49	51
04/08/18	53	49		04/09/18	48	51
05/08/18	52	47		05/09/18	50	50
06/08/18	53	50		06/09/18	53	50
07/08/18	53	49		07/09/18	55	48
08/08/18	53	49		08/09/18	52	47
09/08/18	52	49		09/09/18	52	47
10/08/18	53	48		10/09/18	54	49
11/08/18	52	47		11/09/18	53	49
12/08/18	50	0		12/09/18	53	48
13/08/18	34	50		13/09/18	53	48
14/08/18	52	49		14/09/18	53	49
15/08/18	52	48		15/09/18	53	47
16/08/18	53	49		16/09/18	52	47
17/08/18	52	47		17/09/18	53	50
18/08/18	51	48		18/09/18	52	47
19/08/18	50	49		19/09/18	50	49
20/08/18	50	0		20/09/18	52	48
21/08/18	51	47		21/09/18	55	47
22/08/18	52	48		22/09/18	53	50
23/08/18	53	48		23/09/18	52	50
24/08/18	53	51		24/09/18	53	49
25/08/18	51	48		25/09/18	52	46
26/08/18	52	48		26/09/18	50	48
27/08/18	52	50		27/09/18	52	49
28/08/18	53	50		28/09/18	53	49
29/08/18	53	50		29/09/18	51	48
30/08/18	50	49		30/09/18	53	-
31/08/18	52	48				

Table 1: $L_{Aeq,16h}$ and $L_{Aeq,8h}$ noise levels for the day and night for each date during the measurement period

4 Summary

This report summarises the data collected by the mobile noise monitoring terminal (NMT) installed at Hexham Rd near Newcastle International Airport for the period 1st May – 30th September 2018.

Summary information on the number of aircraft movements and their associated noise levels have been provided. Daily and nightly $L_{Aeq,16h}$ and $L_{Aeq,8h}$ noise levels have been summarised over the five month period. When the wind is blowing from an easterly direction (typically around 30% of the time), aircraft take off from the runway in the opposite direction for safety reasons and little or no aircraft fly near the Hexham Rd noise monitor. That is why there are some periods with little or no aircraft movements recorded by the monitor and hence very low (or zero) noise levels when average over the daytime or night-time period.

As set out in this report, evidence suggests that adverse effects on health and quality of life can be detected above the Lowest Observable Adverse Effect Level (LOAEL) of 51 dB$L_{Aeq,16h}$ during the day and 45 dB$L_{Aeq,8h}$ during the night. The 51 dB$L_{Aeq,16h}$ LOAEL was derived from the SoNA study which looked at, amongst other metrics, the $L_{Aeq,16h}$ metric assessed over a 92 day (three month) summer average, taking into account the typical distribution of easterly and westerly modes of operation. SoNA concluded that there is "no evidence found to support a change from the current practice of basing $L_{Aeq,16h}$ on an average summer day". The use of $L_{Aeq,16h}$ and $L_{Aeq,8h}$ metrics is required by Government policy and is standard practice in measuring and assessing the effects of aviation noise on health and quality of life.

The three-month summer average $L_{Aeq,16h}$ measured by the Hexham Rd noise monitor is 51 dB$L_{Aeq,16h}$. The three-month summer average $L_{Aeq,8h}$ measured by the Hexham Rd noise monitor is 48 dB$L_{Aeq,8h}$.

The Government's current aviation policy as it relates to noise compensation is set out in the Aviation Policy Framework (APF) and the Consultation Response on UK Airspace Policy. These policies state that the Government expects airport operators to offer financial assistance towards acoustic insulation to residential properties which are exposed to levels of noise of 63 dB$L_{Aeq,16h}$ or more as a result of a change in airspace or infrastructure.