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THE CAUSEWAY
STAINES
MIDDLESEX
TW18 3AL

TELEPHONE: 01784 464404
FACSIMILE: 01784 465447

A REPORT OF MONITORING OF
AIRCRAFT NOISE FROM STANSTED AIRPORT
AT WARESIDE, HERTFORDSHIRE,
BETWEEN JUNE AND AUGUST 2006

Employer: Stansted Airport Ltd

Report author: .....
Dr. R. Peters
Principal Consultant

Approved by : .....
A. V. H. Holdich
Director

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Summary

A mobile Noise Monitoring Terminal (NMT) was deployed by Stansted Airport between 1st June and 31st August 2006 at Wareside in Hertfordshire. The site is about 3 km north east of Ware, at Helham Green, and approximately 20 km south west of Stansted Airport. It is understood that Ware Town Council provided Stansted Airport with the address at Helham Green as their suitable site for the placement of a mobile noise monitor for Ware.

The aim of this report is to present the results of this three month noise monitoring exercise and to interpret the results in a way that places the contribution of the noise from aircraft using Stansted in the context of the overall noise climate from all other sources.

The NMT records noise data relating to all noise events which exceed a selected threshold noise level for a selected minimum period of time. These selected conditions were 56 dBA for 15 seconds.

These noise events are then compared by the airport's GEMS (Global Environmental Management System) noise and track keeping computer system with radar tracks of aircraft arriving at or departing from Stansted Airport. Only those noise events which are matched with Stansted aircraft tracks are called aircraft noise events, and those that are not matched are designated as residual noise events. The remainder of the noise at the site, i.e. that noise which is not captured as noise events, (because it fails to meet the capture conditions of being above 56 dBA for 15 seconds) is also classified as residual noise.

Therefore wherever reference is made to aircraft noise events within this document it should be understood that these relate only to aircraft using Stansted airport. Any noise arising from aircraft travelling to or from any other airport will be included as residual noise.

In addition to gathering data about noise events the NMT also collects and stores, on an hourly basis, information about the total level of noise at the site from all sources.

A total of 4342 aircraft noise events occurred during 72 of the days in the three month period, i.e. an average of about 60 aircraft noise events per day on those days, or 47 aircraft noise events per day on average over all days in the period. All but 29 of these aircraft noise events were due to arriving aircraft.

On those days that aircraft noise events occurred, the numbers of aircraft noise events did not show any obvious correlation with day of the week or weekends. The highest numbers of aircraft noise events per hour occurred during the evening, between 18.00 and 19.00 hours (local time).

A total of 2431 non-aircraft noise events (called residual noise events in this report) occurred over the three month period, an average of about 26 residual noise events per day. Therefore aircraft noise events outnumbered residual noise events by a ratio of almost two to one (1.8:1).

The daily average maximum noise level (L_{ASmax}) of aircraft noise events ranged between 59 dBA and 68 dBA, with an average of 63 dBA, but showed no significant day to day variation throughout the period. The average maximum noise levels of residual noise events were about 1dBA higher than aircraft noise events, with a similar daily average variation.

The total noise climate at the site may be characterised by average hourly values of various noise percentile levels, and by the average (or equivalent) noise level (L_{Aeq}). These values are fairly constant during the daytime (with average values of L_{AS10} of 51 dBA, L_{AS90} of 39 dBA. and LAeq of 52 dBA), but falling to lower levels in the late evening, night-time and early morning periods.

The daily average (L_{Aeq}) level of the total noise at the site is a combination of that due to aircraft noise events and that due to residual noise. The residual noise provides the major component, with the average level due to aircraft noise events being typically between 5 and 10 dBA below the average (L_{Aeq}) level of total noise at the site. The residual noise is a combination of the noise from residual noise events and the residual noise, not captured as noise events, i.e. all other noise recorded by the monitor that did not exceed the trigger level for the required minimum time period.

Therefore although each individual aircraft noise event is likely to be clearly audible and distinguishable, aircraft noise events in total make only a relatively minor contribution to the average (L_{Aeq}) level of total noise at the site.

The average maximum noise level (L_{ASmax}) during aircraft noise events does not vary significantly with aircraft type for the aircraft types which make up most of the aircraft noise events.

The information presented in this report will serve as a baseline for comparison with any future noise level surveys in this format that may be undertaken at this location.

1.0 Introduction

1.1 A mobile Noise Monitoring Terminal (NMT) was deployed by Stansted Airport for a three-month period in 2006, from 1st June to 31st August.

1.2 The site is east of Ware, at Helham Green. On days when aircraft are taking off from Stansted to the east, aircraft arriving at Stansted fly overhead and are audible, as are some over-flights, i.e. aircraft not using Stansted airport. Other noise which is also audible at the site includes road traffic noise, birdsong and noise from a dog barking next door. It is understood that Ware Town Council provided Stansted Airport with the address at Helham Green as their suitable site for the placement of a mobile noise monitor for Ware.

1.3 The aims of this report are:

- to present the results of the three month noise monitoring survey, and
- to interpret the results in a way that places the contribution of the noise from passing aircraft using Stansted airport in the context of the overall noise climate from all other sources, and
- to provide a baseline for comparison with any future noise surveys in this format that may be undertaken at this location.

1.4 A glossary of technical terms used in this report is given in the Appendix 2.

2.0 Data from the Noise Monitoring Terminal

2.1 The NMT always records all noise from all sources. It has, however, the facility to capture and show separately all noise events that meet particular pre-set conditions. This facility is used to capture noise events likely to arise from aircraft flying near to the monitor. The pre-set condition used for this study is that the noise must exceed a level of 56 dBA for a minimum duration of 15 seconds. This is arrived at following preliminary noise measurements at the site, and is broadly similar to conditions set for other such studies. It is of course likely that noise arising form activities other than aircraft using Stansted Airport will occasionally cause noise events to be captured.

2.2 To determine which of all those events are due to aircraft using Stansted Airport their GEMS (Global Environmental Management System) 'noise to track' matching software

compares all captured noise events with all Stansted Airport's air traffic radar tracks. Noise events that are matched to aircraft are combined to provide a measure of 'aircraft noise' and noise events that are not matched to aircraft are included with 'all other noise' (i.e. that noise which is not captured as noise events, because it fails to meet the capture conditions of being above 56 dBA for 15 seconds), and is called residual noise.

2.3 Therefore wherever reference is made to aircraft noise events within this document it should be understood that these relate only to aircraft using Stansted airport. Any noise arising from aircraft travelling to or from any other airport will be included as residual noise.

2.4 The selection of the threshold conditions (noise level and time period) which trigger the capture of a noise event is a compromise judgement designed to include as much of the noise from passing aircraft as possible whilst at the same time excluding, as far as possible, noise from other sources. For this survey a threshold trigger level 56 dBA for a duration of at least 15 seconds was used.

2.5 The following information is recorded for each noise event: date, time, duration, L_{ASmax} and SEL values, and, in addition, for aircraft noise events, event type (arrival/ departure), departure route, runway used, and aircraft type.

2.6 In addition to gathering data about noise events the NMT also collects and stores information on an hourly basis about the total level of noise at the site from all sources (including that from aircraft movements), and from individual noise events.

2.7 Because the noise level is usually not constant, but varies continuously throughout each hour it is necessary to describe the total noise level statistically in terms of a measure of the average noise level throughout the hour (and called the hourly continuous equivalent noise level, L_{Aeq}) and also in terms of a series of hourly percentile levels. The most important of these is the L_{AS90}, which is the noise level exceeded for 90% of each hour. This level of noise is conventionally taken to be a measure of the background noise level for each hour, and is the more or less constant level of noise which underlies the variations caused by various transient sources including aircraft.

3.0 Analysis of Noise Monitoring Survey Results

The numbers of noise events (i.e. both aircraft noise and residual noise events)

3.1 There were 1962 aircraft noise events in June, 1488 in July and 892 in August; a total of 4342 over the three month period.

3.2 These aircraft noise events occurred on 24 days in June, 23 days in July and 25 days in August, i.e. a total of 72 days out of 92, or 78 % of the days in the three month period.

3.3 The average number of aircraft noise events per day for the 72 days on which such events occurred is 60 (60.3) per day, or an average of 47 (47.2) over each day of the 92 days of the three month period.

3.4 All but 29 of the 4342 aircraft noise events were due to arrivals, arising from 59 different types of aircraft. This is to be expected bearing in mind the location of the site (please see map at Appendix 1) which is to the south west of the airport and not near to any of the westerly departure routes. Therefore the site is unlikely to be regularly affected by noise from departures (taking off to the west) under prevailing westerly wind conditions, but will be overflown by arriving aircraft from the west when the wind is from the east.

3.5 There were 1000 residual noise events in June, 705 in July and 726 in August; a total of 2431 during the three month period.

3.6 Residual noise events occurred on every day, the average number of which varied between 6 and 67 per day. There were, on average, 26 such events per day.

3.7 Aircraft noise events outnumbered residual noise events by a ratio of about two to one (1.8:1).

3.8 Figures 1, 2 and 3 show the total number of aircraft noise events occurring each day during the months June to August 2006. The number of aircraft noise events varied from 1 to 173 per day. The figures also shows the day of the week on which aircraft

noise events occur and it can be seen that there is no obvious correlation between the number of aircraft noise events and the day of the week or weekend, or with public holidays.

3.9 Figure 4 indicates the average distribution of numbers of aircraft noise events throughout the day, showing that the highest numbers occur in the evening, between 18.00 and 19.00 hours. Eighteen aircraft noise events occurred between midnight and 06.00 hours during the three month period. The reason for the peak in numbers in the evening is not known, although it may be related to the fact that this site is predominantly affected by arriving aircraft, as explained in paragraph 3.4 above, but a definitive explanation would require further investigation beyond the scope of this report.

Maximum noise levels of aircraft and residual noise events

3.10 The NMT recorded the maximum noise level (measured using the 'A' frequency weighting and the Slow (S) time weighting) produced by each aircraft noise event, (L_{ASmax}). These values ranged from 60 dBA to 80 dBA, but 90% of the events lay within a smaller range of 60 to 70 dBA. Figure 5 indicates the daily average L_{ASmax} value of aircraft noise events recorded during August, 2006, (with the other months showing a similar pattern). It can be seen that the daily average maximum level ranges between 59 dBA and 67 dBA with an average value of 63 dBA. A statistical distribution of LASmax values for the three month period is shown in Figure 6.

3.11 The NMT also records the maximum noise level (L_{ASmax}) of each residual noise event. These values were in the range from 56 dBA to 112 dBA, but 90% of the events were less than 75 dBA. The daily average L_{ASmax} values varied from 60 dBA to 67 dBA with an average value of 64 dBA.

3.12 Therefore the L_{ASmax} values of residual noise events covered a wider range than those of the aircraft noise events, with the daily average level being 1 dB higher.

Duration of aircraft and residual noise events

3.13 The duration of 90% of the aircraft noise events was between 15 seconds and 37 seconds, with an average value of 27 seconds. The duration of 90% of the residual noise events was between 15 seconds and 55 seconds, with an average value of 43 seconds.

Total noise climate

3.14 The NMT also recorded the total noise level (i.e. from all sources, including aircraft and residual noise events) each hour, measured in terms of the hourly values of L_{Aeq} (representing the average noise level over the hour) and the following statistical percentile levels: L_{AS10}, L_{AS50}, L_{AS90} and L_{AS99}, where, for example L_{AS10} is the noise level (measured using the 'A' frequency weighting (i.e. in dBA) and the Slow (S) time weighting) exceeded for 10% of the 1 hour measurement time interval). Figure 7 shows these values averaged over the June to August 2006 survey period for each hour of the day.

3.15 It can be seen that the value of each index is fairly constant during the daytime period, from about 07.00 hours to 19.00 hours but then falls off outside these times (i.e. in the late evening, night-time and early morning periods.)

3.16 The average index values for the daytime period between 07.00 and 19.00 hours and over the 24 hours are shown in the table below:

Noise Index	Average value of noise Index / dBA	
	07.00 to 19.00 hours	over 24 hours
L_{AS10}	51	48
L_{AS50}	44	41
L_{AS90}	39	36
L_{AS99}	36	34
L_{Aeq}	52	49

3.17 For a period of one hour L_{AS10} is the noise level exceeded for 6 minutes, and L_{AS90} is the level exceeded for 54 minutes, so that noise levels at or below the L_{AS90} value occur for

6 minutes in the hour. Thus for a typical hour in the daytime the total noise level would exceed 51 dBA for 6 minutes, and would be below 39 dBA for 6 minutes, and below 36 dBA for 36 seconds (1% of an hour) each hour. The hourly average noise level between 07.00 and 19.00 hours was 52 dBA.

The contribution of aircraft and residual noise events to the total noise climate

3.18 In addition to L_{ASmax} values the NMT also recorded the Single Event Noise Level (SEL) for each aircraft noise event. This parameter relates to the amount of sound energy in each event, and may be used to calculate the average or equivalent aircraft noise level (L_{Aeq}) due to aircraft noise events over a period of time (hour, day or month). Although this average noise level bears little relationship to the aircraft noise as heard, which occurs in short bursts of noise at higher levels rather than as a much lower continuous average level, it is, nevertheless, a useful parameter for comparative purposes.

3.19 Figure 8 shows a comparison between the average hourly L_{Aeq} values of the total noise throughout the three month period, and the corresponding L_{Aeq} values of aircraft noise calculated from noise event SEL values. It can be seen that for the period from 06.00 hours to midnight, when most of the aircraft noise events occur, the total noise level varies between 46 dBA and 55 dBA, with an average of about 51 dBA, and that the level due to aircraft noise events is, on average about 6 dBA lower than this. The difference between the total noise levels and that due to aircraft noise events is due to the level of residual noise. This may be calculated and is also shown in Figure 8. The level of residual noise is a combination of the noise from residual noise events and from other residual noise, not captured as noise events, i.e. all other noise recorded by the monitor that did not exceed the trigger level for the required minimum time period.

3.20 Figure 9 shows a comparison between the average daily L_{Aeq} values of the total noise throughout the three month period, and the corresponding L_{Aeq} values of aircraft noise calculated from noise event SEL values. The daily average total noise usually ranges between 45 dBA and 50 dBA, except for a few days (6) when it is higher, up to 60 dBA. The daily average noise level due to aircraft noise events fluctuates very widely; this is because the number of events varies (on days when events occur at all) from one event to 173 events per day, and to help demonstrate this correlation the number of events each day is also shown in figure 9. It can be seen that, on days when there are a significant numbers of aircraft noise events (say greater then 30) the average noise

level due to these aircraft noise events is about 45 dBA, and between 5 and 10 dBA below the total noise level. As explained in the preceding paragraph the difference between the total noise level and that due to aircraft noise events is due to the level of residual noise. This may be calculated and is also shown in Figure 9. The level of residual noise is a combination of the noise from residual noise events and the residual noise not captured as noise events, i.e. all other noise recorded by the monitor that did not exceed the trigger level for the required minimum time period.

3.21 The conclusion to be drawn from the previous two paragraphs and from figures 8 and 9 is that the average level of noise from aircraft noise events makes only a relatively minor contribution to the average level of total noise at the site, although each individual aircraft noise event is likely to be clearly audible and distinguishable.

Aircraft types contributing to aircraft noise events

3.22 Fifty nine different aircraft types contributed to the total number of 4342 aircraft noise events which occurred during the three month period. Figure 10 shows the numbers of events from 36 types of aircraft, comprising all those types for which there were at least 10 events over the three month period, together with another seven types for which the average LASmax value was significantly higher than average. Each aircraft type shown in Figure 10 is described by a 3 character source code. A list of these codes is given in Appendix 3.

3.23 Although 59 different aircraft were involved in total, 50% of the events arose from only two types of aircraft (Boeing 737-800: 1668 events, Airbus A319: 1009 events), almost seventy five percent of events arise from only five types of aircraft, and 90% of events occur as a result of only 13 aircraft types.

3.24 Figure 11 shows the average L_{ASmax} value for each aircraft type, and it can be seen that there is very little variation among the most commonly occurring aircraft types. Although there are some aircraft types which produce significantly higher values of L_{ASmax} there are only very small numbers of these types of events.

4.0 Summary and Conclusions

4.1 Aircraft noise events occurred during 72 days of the three month period with an average of 60 aircraft noise events per day for those days, and a total of 4342 such events. The numbers of aircraft noise events did not show any obvious correlation with weekday or weekend or public holidays. The highest numbers of aircraft noise per hour occurred in the evening, between 18.00 and 19.00 hours (local time). All but 29 of the aircraft noise events were due to arriving aircraft.

4.2 Aircraft noise events outnumbered non-aircraft noise events, called residual noise events in this report, (of which there were 2431 during the monitoring period, an average of 26 each day) by a ratio of about 2 to 1 (1.8:1).

4.3 The daily average maximum noise level of aircraft noise events ranged between 59 dBA and 68 dBA, but showed no significant variation throughout the period, with, on average, the maximum noise levels of residual noise events being about 1 dBA higher.

4.4 The total noise climate at the site may be characterised by average hourly values of various noise percentile levels and by the average (or equivalent) noise level. These values are fairly constant during the daytime (with values of L_{AS10} of 51 dBA, L_{AS90} of 39 dBA. and L_{Aeq} of 52 dBA) but falling to lower levels in the late evening night-time and early morning periods.

4.5 The average noise level due to aircraft noise events is typically between 5 and 10 dBA below the average level of total noise at the site. The difference between the total noise levels and those due to aircraft noise events is due to the level of residual noise, which is a combination of the noise from residual noise events and the residual noise not captured as noise events, i.e. all other noise recorded by the monitor that did not exceed the trigger level for the required minimum time period.

4.6 Therefore although each individual aircraft noise event is likely to be clearly audible and distinguishable, aircraft noise events make only a relatively minor contribution to the average level of total noise at the site.

4.7 The average maximum noise level (L_{ASmax}) during events does not vary significantly with aircraft type for the relatively few aircraft types which make up most of the aircraft noise events.

4.8 The information presented in this report will serve as a baseline for comparison with any future noise level surveys at this location.

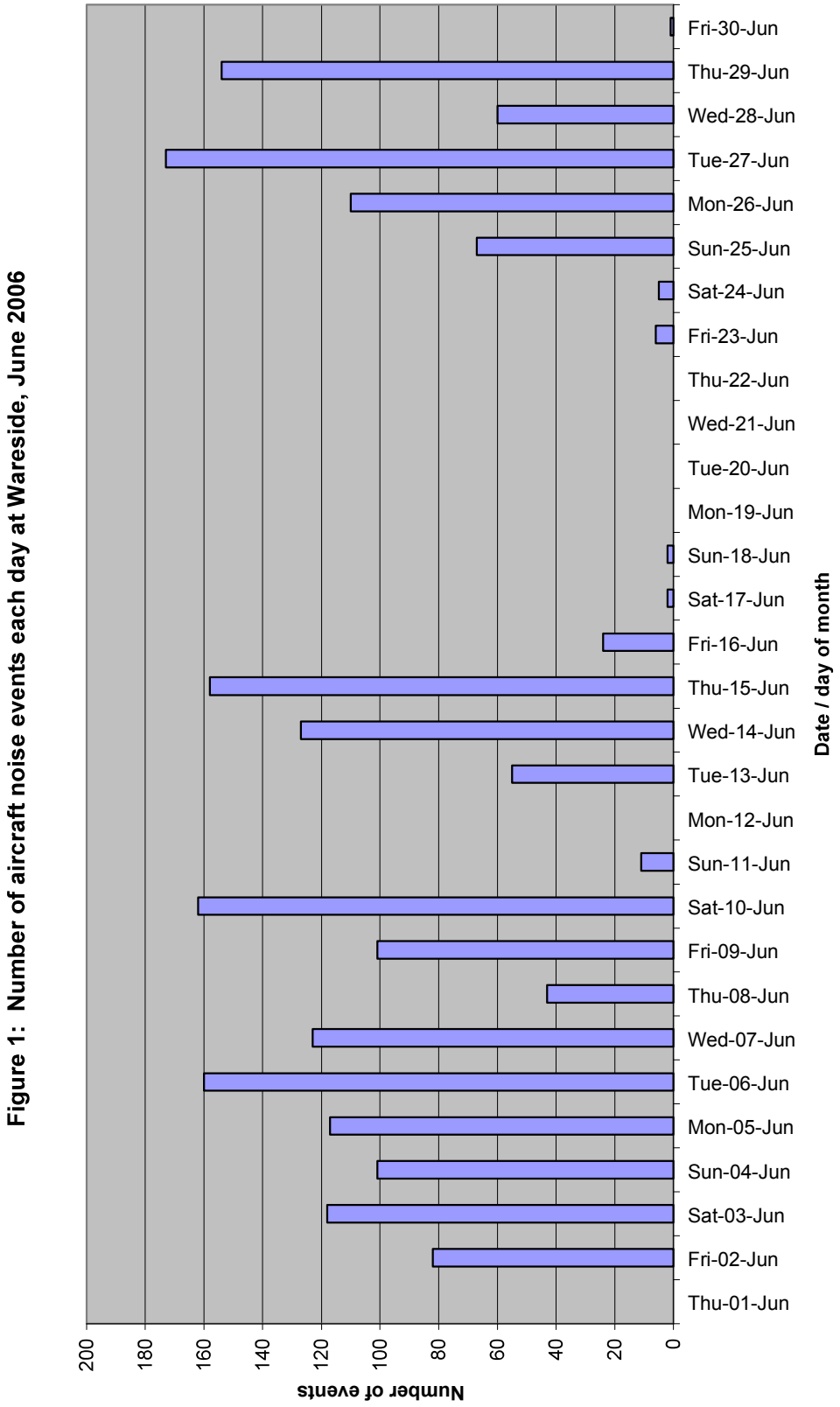

Figure 1: Number of aircraft noise events each day at Wareside, June 2006

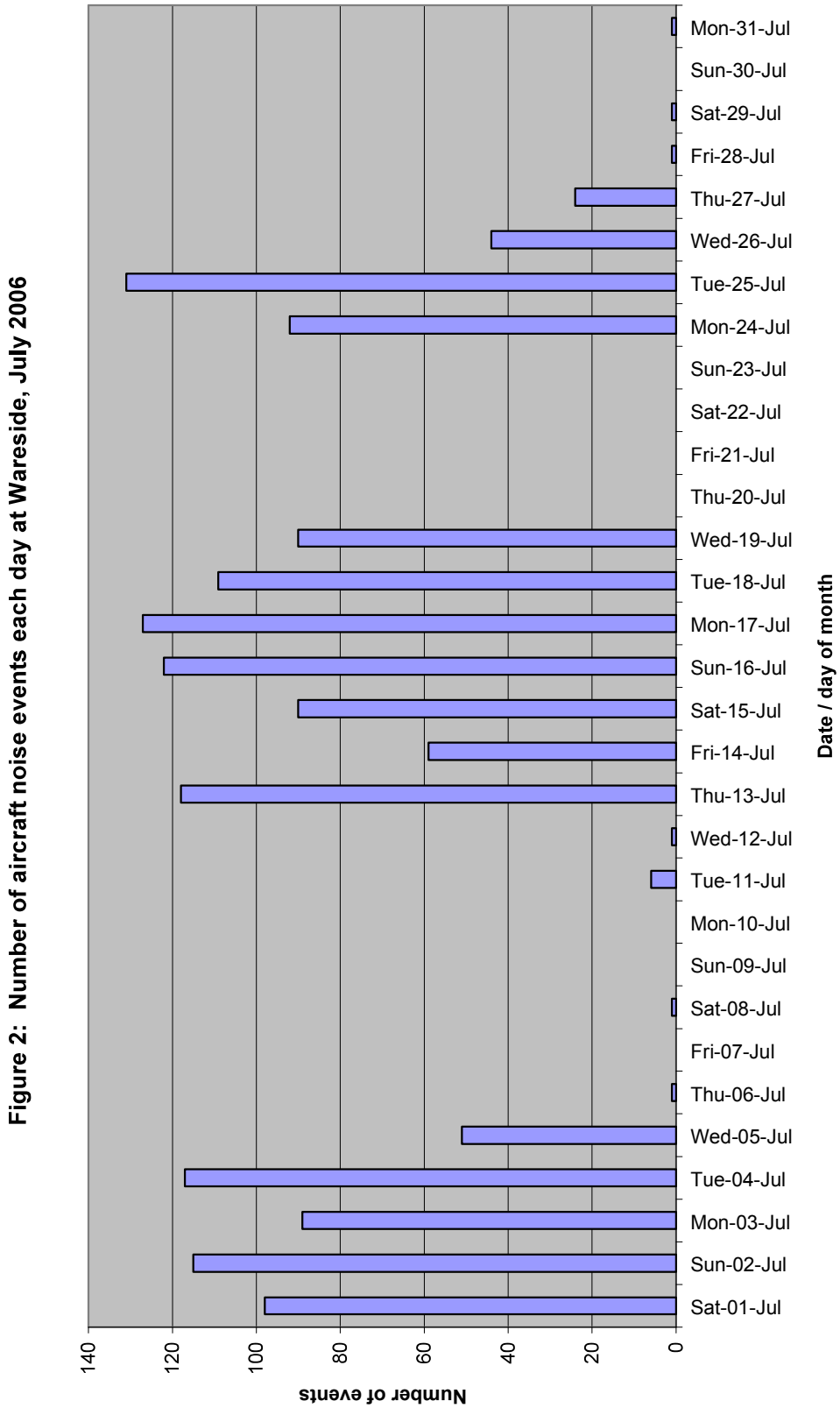

Figure 2: Number of aircraft noise events each day at Wareside, July 2006

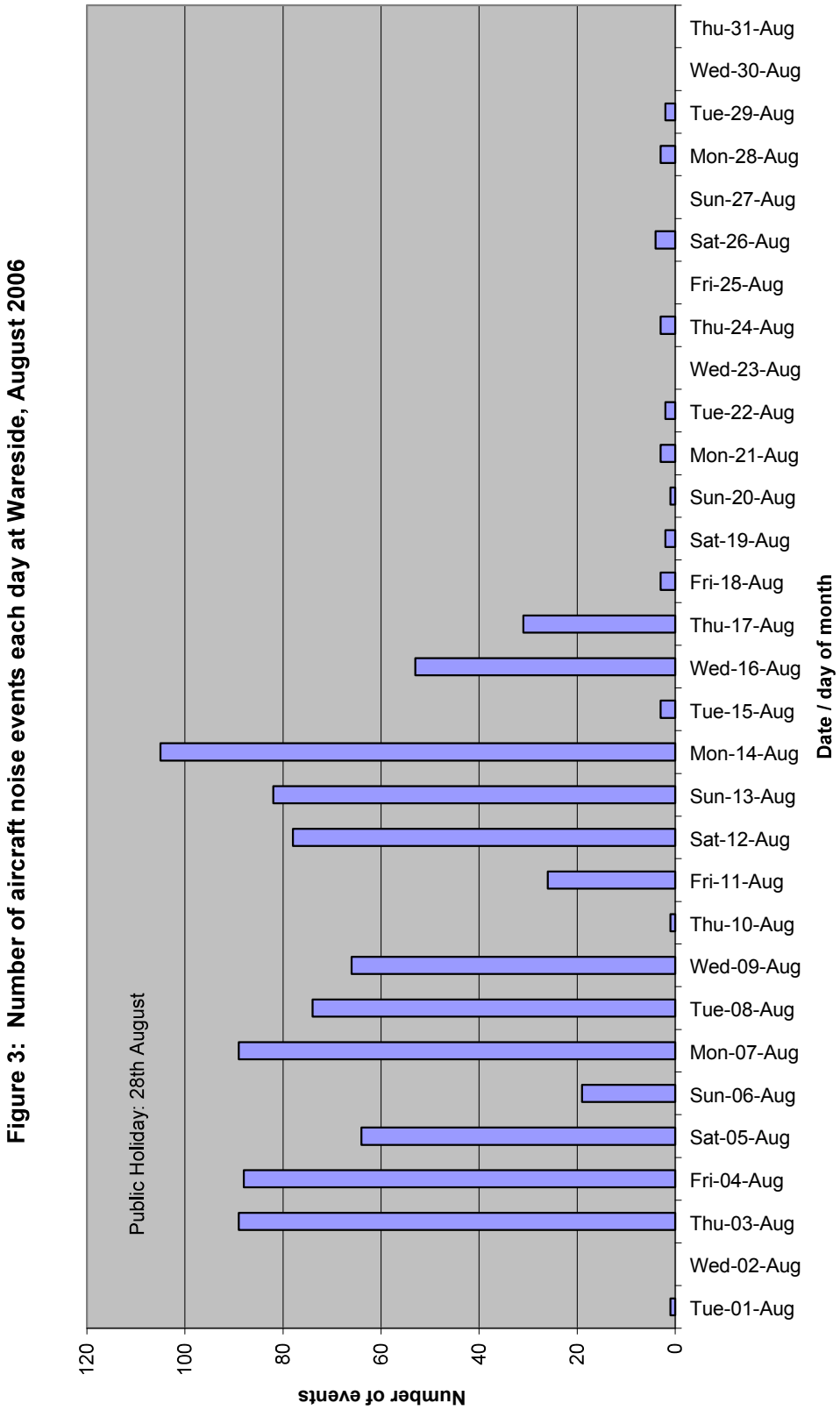

Figure 3: Number of aircraft noise events each day at Wareside, August 2006

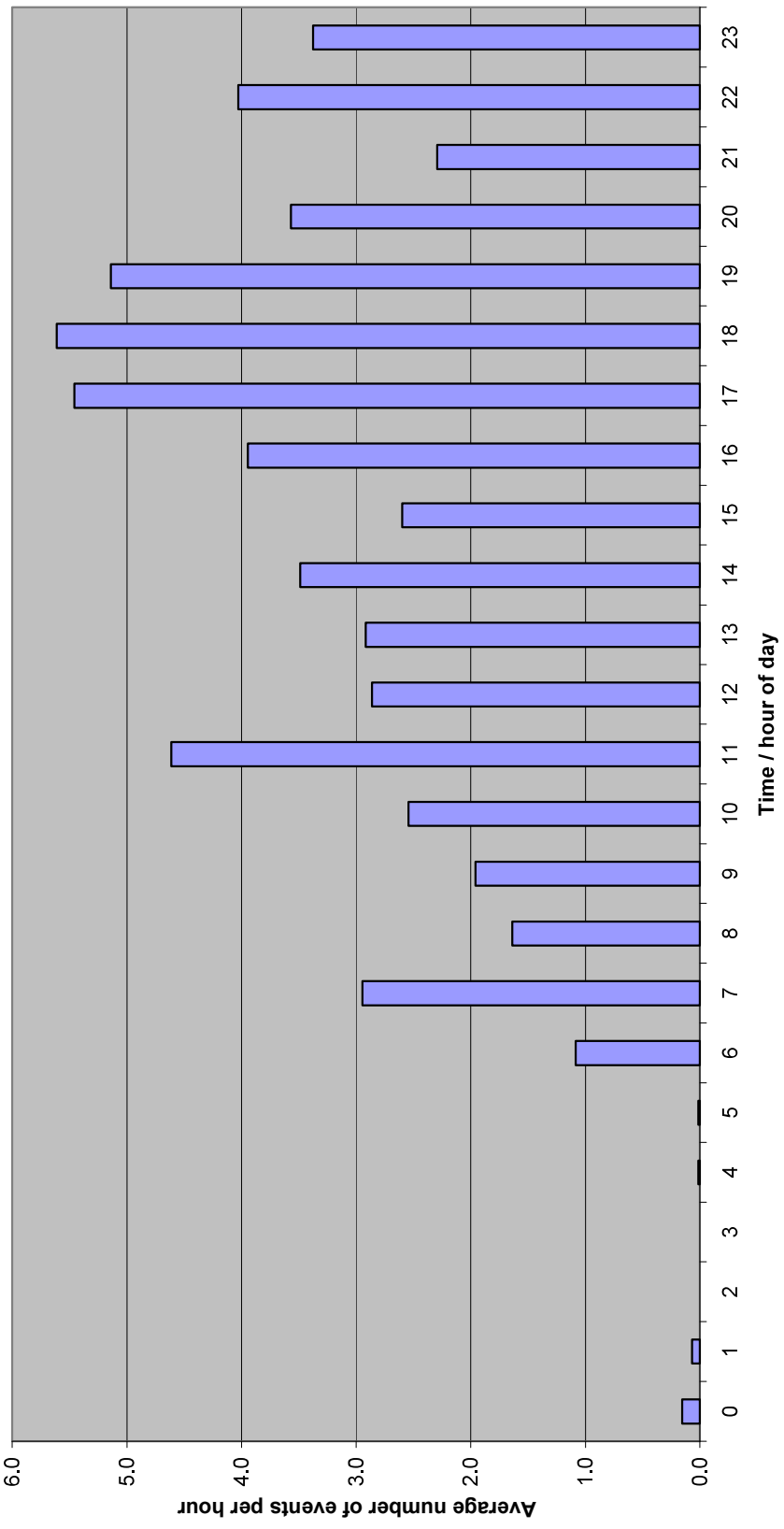

Figure 4: Average number of aicraft noise events each hour throughout the day, June to August 2006

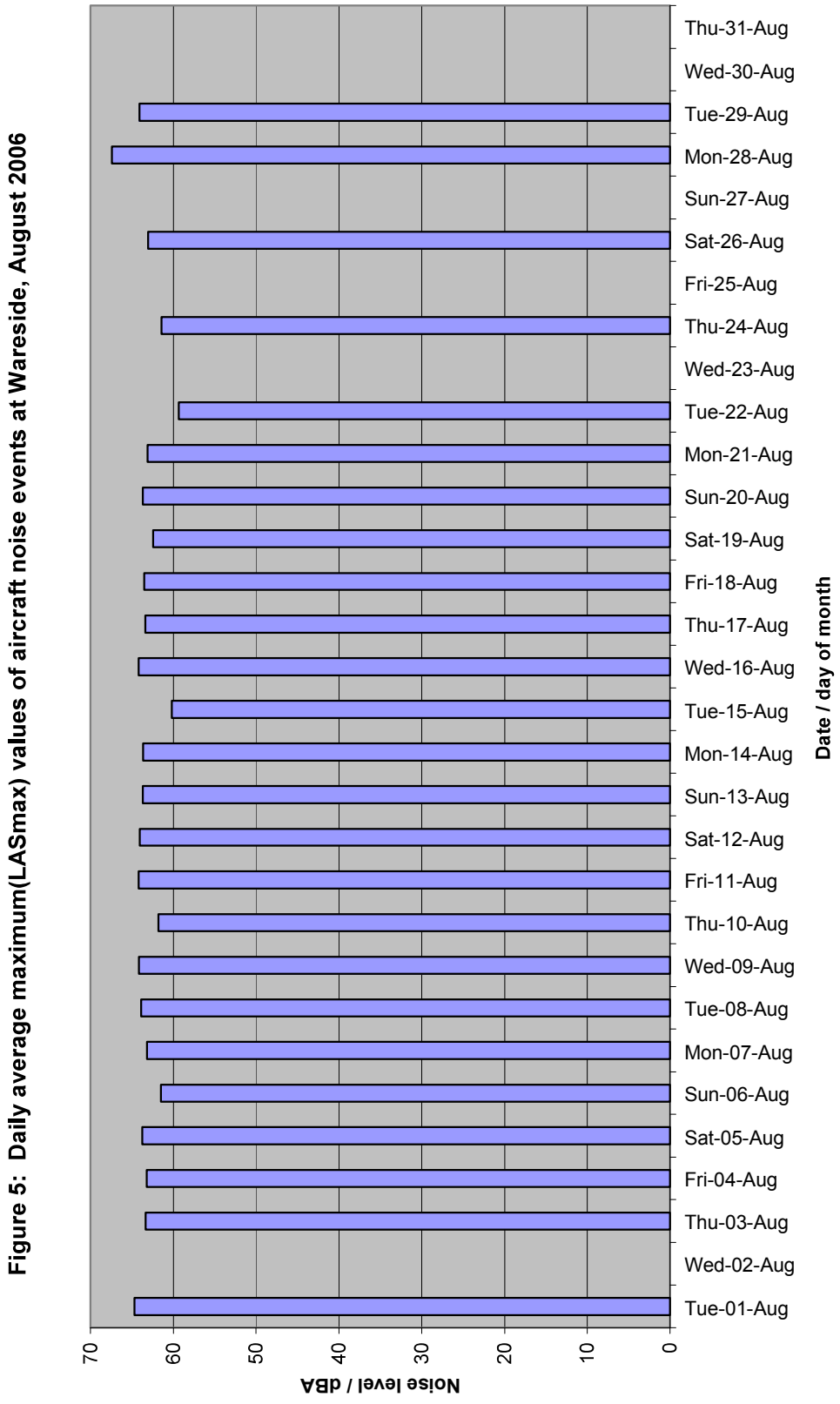

Figure 5: Daily average maximum(LASmax) values of aircraft noise events at Wareside, August 2006

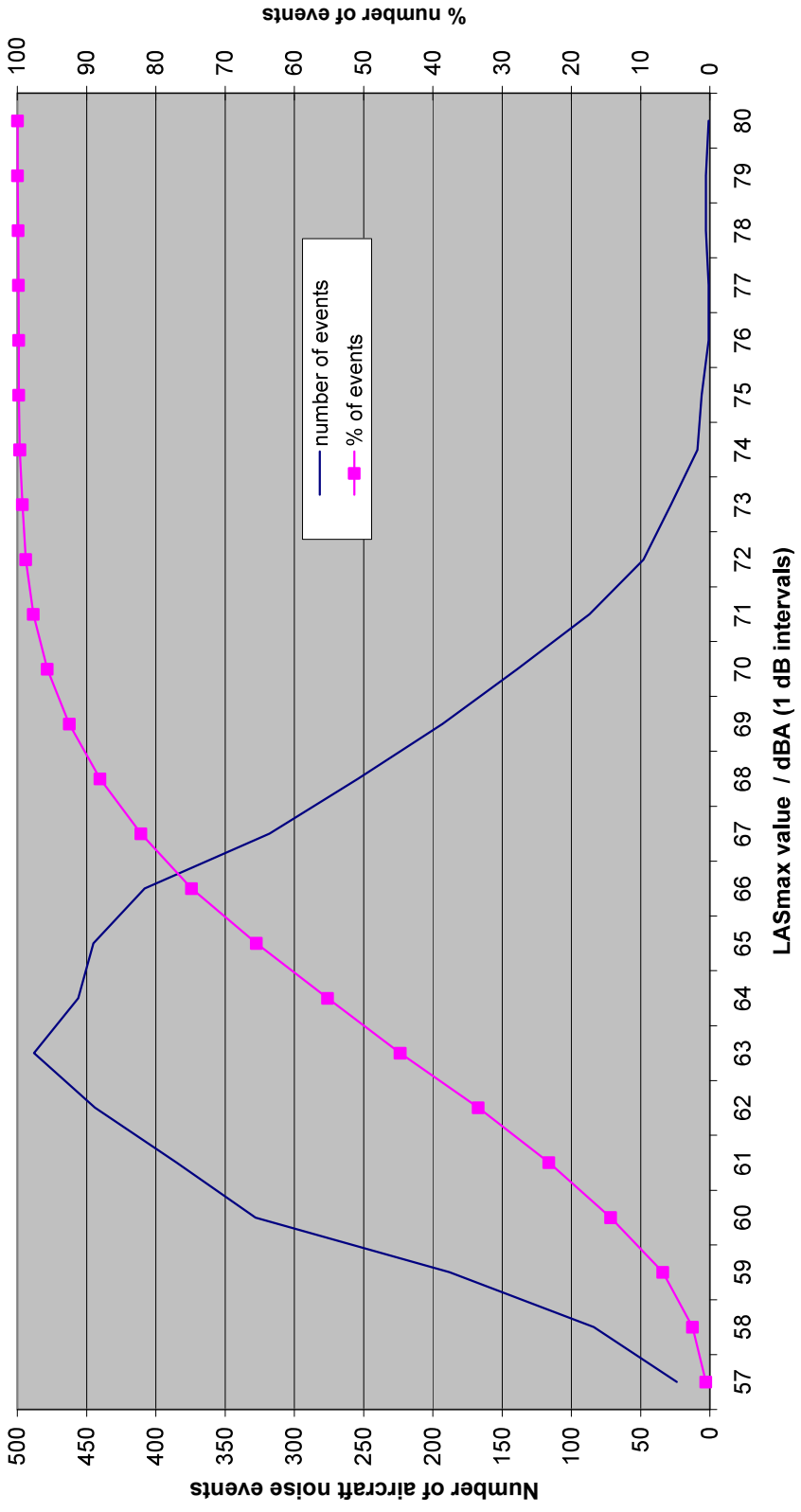

Figure 6: Statistical analysis of maximum noise levels (LASmax) of aircraft noise events at Wareside, June to August 2006

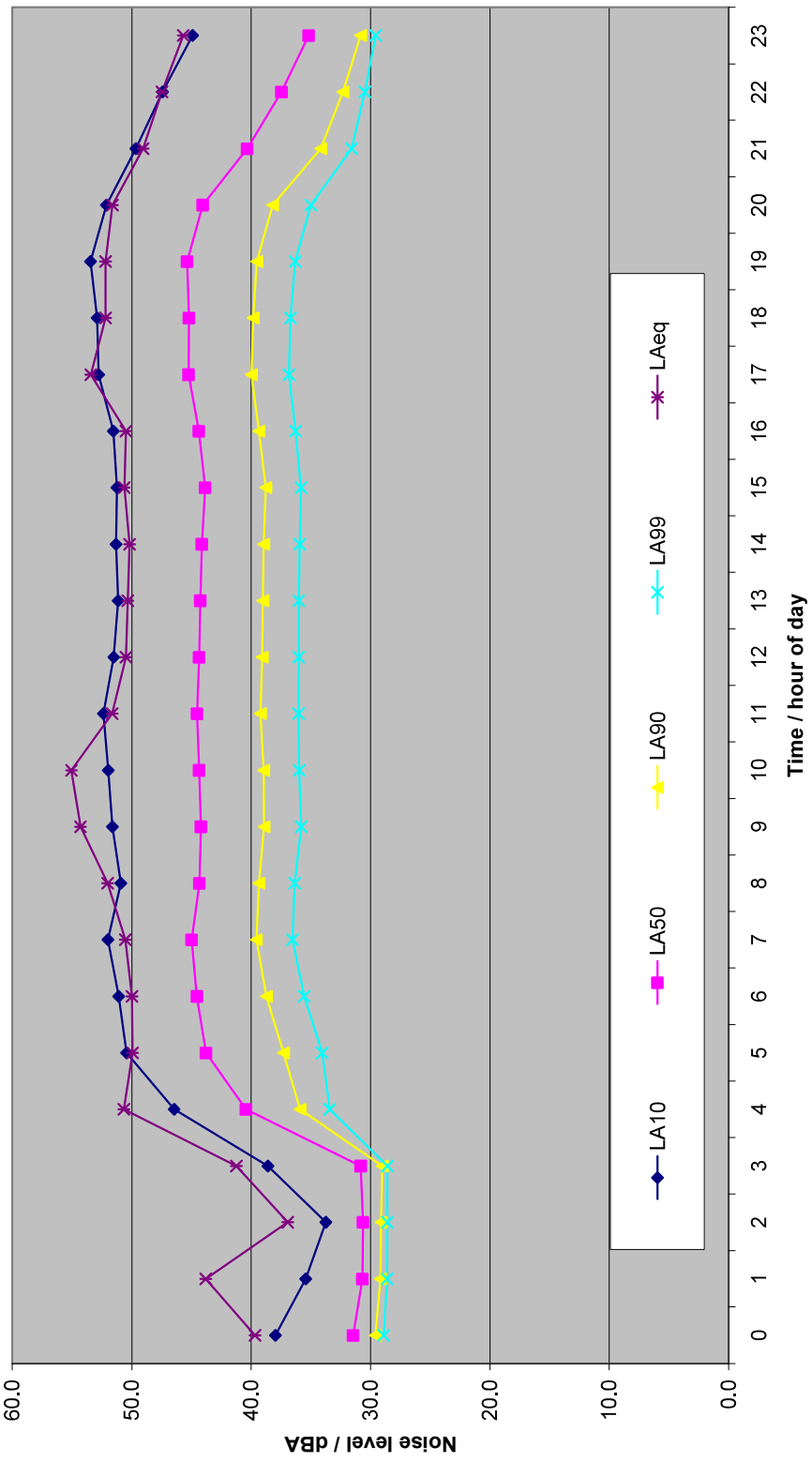

Figure 7: Average hourly noise climate values throughout the day at Wareside, June to August 2006

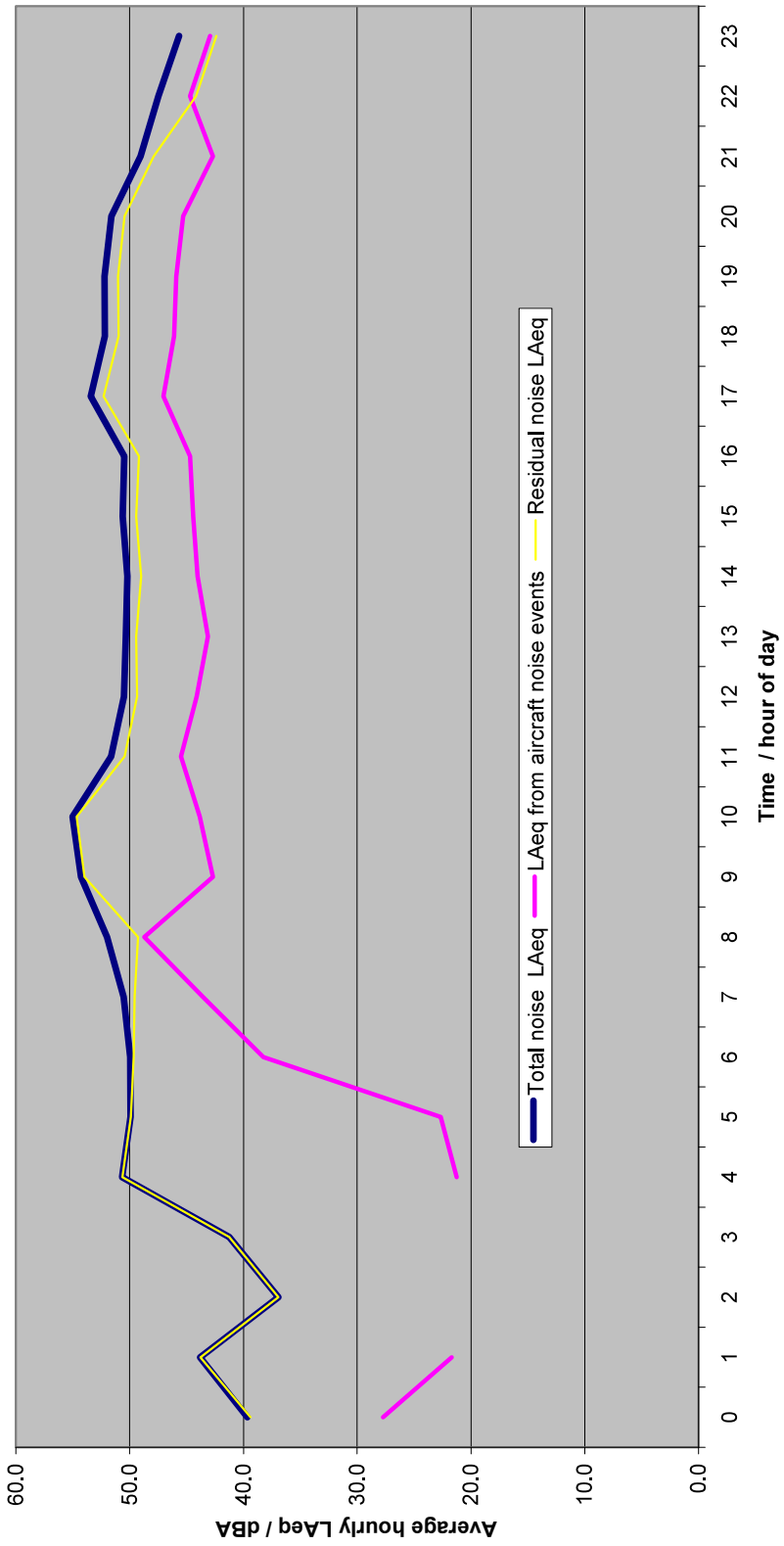

Figure 8: Comparison of average hourly total noise LAeq with that from aircraft noise events and from residual noise, at Wareside, June to August 2006

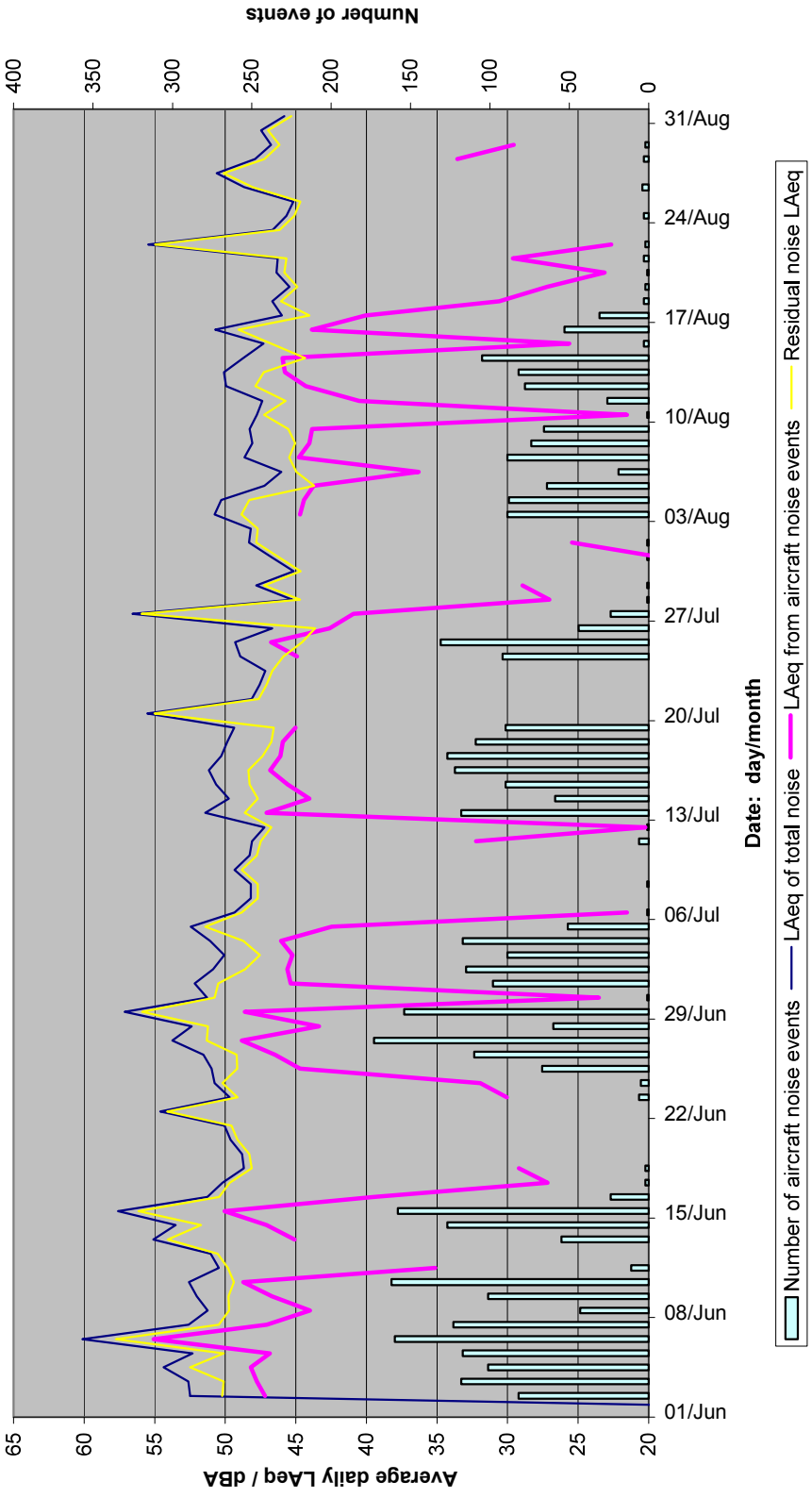

Figure 9: Comparison of average daily total noise LAeq with that from aircraft noise events at Wareside, June to August 2007

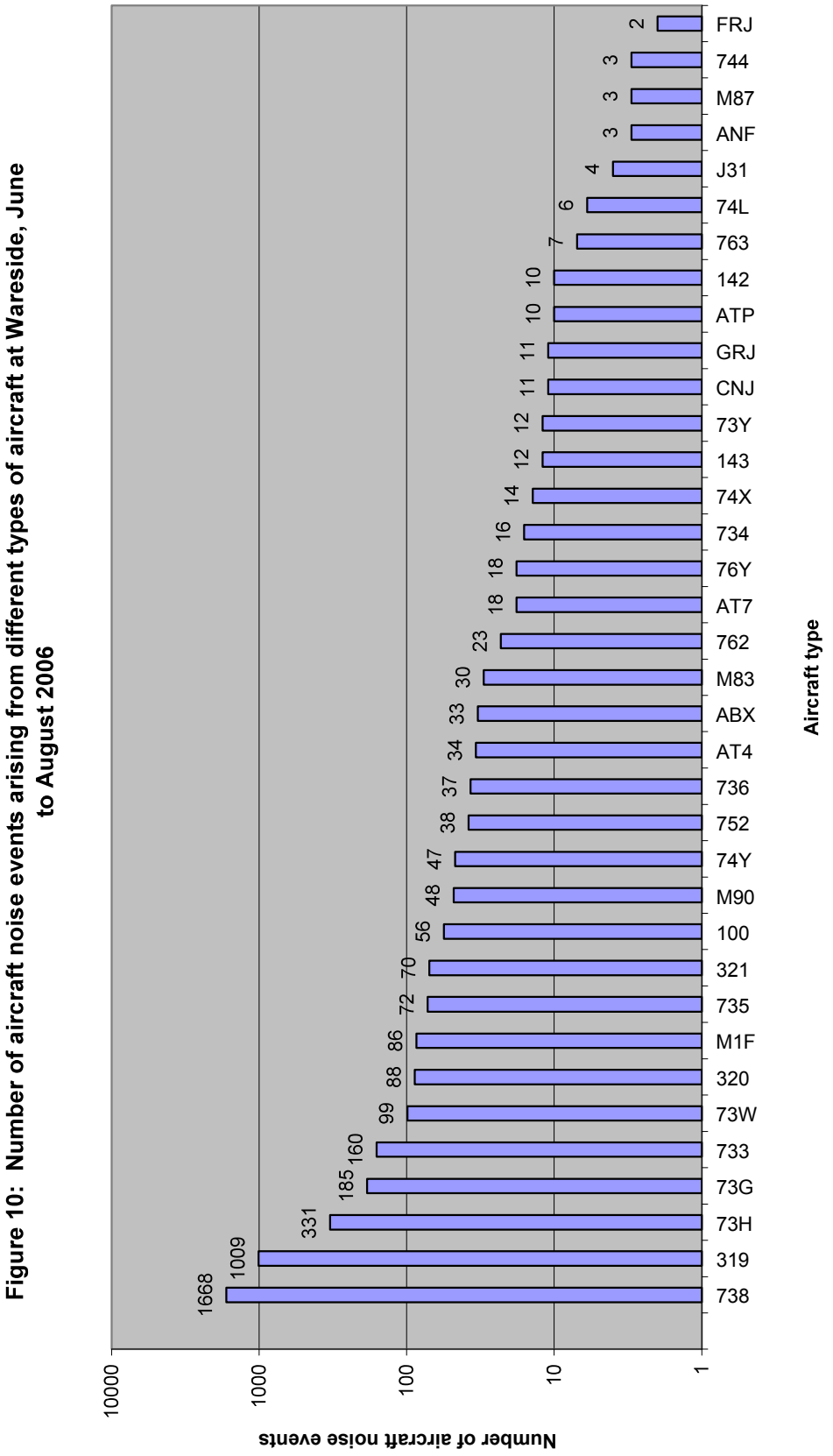

Figure 10: Number of aircraft noise events arising from different types of aircraft at Wareside, June to August 2006

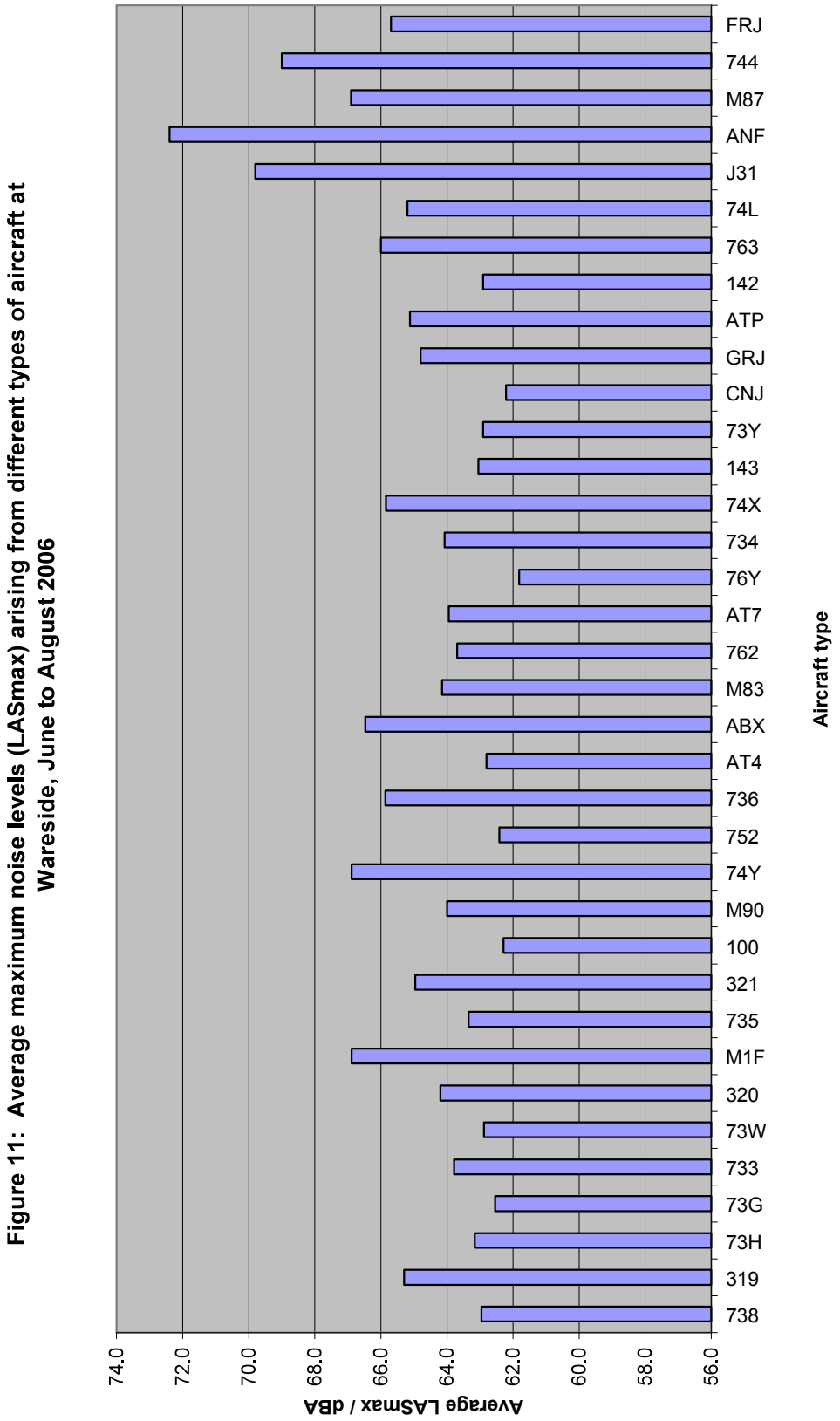

Figure 11: Average maximum noise levels (LASmax) arising from different types of aircraft at Wareside, June to August 2006

APPENDIX 1

MAP OF SITE

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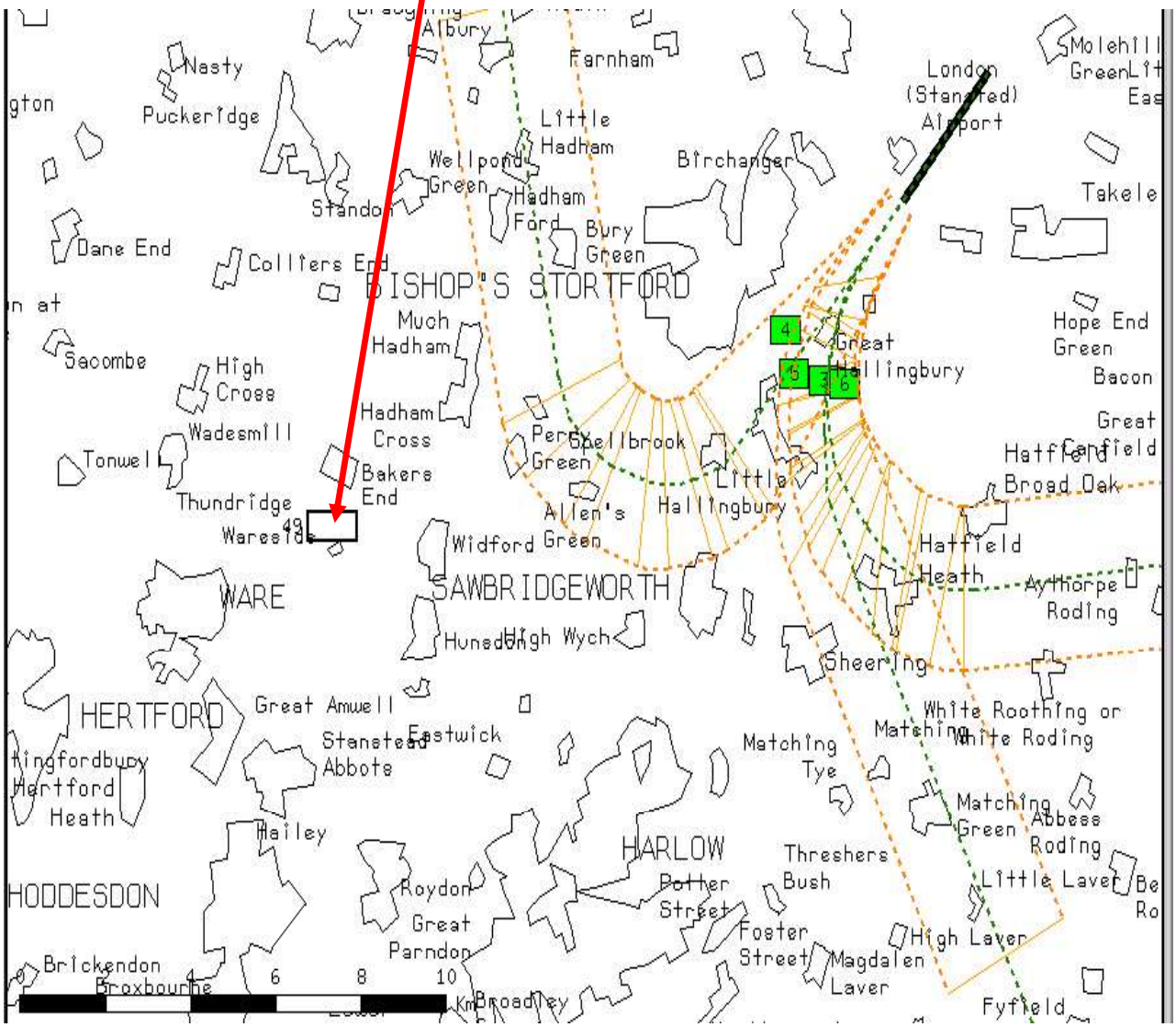
THE GREEN BUSINESS CENTRE
THE CAUSEWAY
STAINES
MIDDLESEX
TW18 3AL

TELEPHONE: 01784 464404
FACSIMILE: 01784 465447

Map showing location of noise monitor (49) at Wareside



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APPENDIX 2

GLOSSARY OF ACOUSTIC TERMS

THE GREEN BUSINESS CENTRE
THE CAUSEWAY
STAINES
MIDDLESEX
TW18 3AL

TELEPHONE: 01784 464404
FACSIMILE: 01784 465447

GLOSSARY OF TERMS

This glossary is presented in two parts. The first part contains definitions relating specifically to the context of this report, followed, in the second part, by a more general glossary of acoustic terms.

Definitions relating specifically to the context of this Report:

Aircraft Noise events — Noise events which have been matched by the GEMS noise and track keeping system to radar tracks in the vicinity of the NMT from aircraft arriving at or departing from Stansted airport.

Aircraft noise level — The average noise level derived from aircraft noise events, aggregated into hourly, daily or monthly average (LAeq) values.

Applied Acoustic Design (AAD)

Acoustic consultants retained by FEU

Average L_{ASmax} level

The arithmetic average of the L_{ASmax} values of all the events (of a particular type i.e. either aircraft noise or community noise) which occur over a particular period of time (eg hour, day or month).

Flight Evaluation Unit (FEU)

The unit within BAA which monitors all aircraft movements to ensure compliance with Department for Transport noise regulations relating to track keeping, noise abatement and night flights, and which also provides a means of investigating and responding to complaints and enquiries from the public.

GEMS NTK System — Global Environmental Management System.

The software data analysis system currently in use (since January 2000) at the airport.

Noise event — A burst of noise at a high level which satisfies the noise event capture conditions for a particular NMT, i.e. which exceeds the pre-set trigger noise level (in this report 60 dBA) for a pre-set time interval (in this report 10 seconds).

Noise events are detected, captured and stored by the NMT, and following subsequent processing by the NTK system are classified in this report as either aircraft noise events or community noise events

Noise Monitoring Terminal (NMT)

The noise measurement and analysis system installed at each site consisting of a precision grade sound level meter (Larson Davis type 870) inside a weather proof and tamper proof metal cabinet connected

to an outdoor microphone located at a height of approximately 3.5 m above ground level.

NTK system — Noise and Track Keeping system.

A software system able to match noise events recorded by the NMTs with aircraft tracks.

Residual noise — All noise arriving at the NMT microphone apart from aircraft noise events, i.e. comprising residual noise events and all other noise which does not satisfy the trigger conditions for capture as a noise event.

Residual Noise events

Those noise events which have not been matched by the NTK system to aircraft tracks using Stansted Airport in the vicinity of the NMT.

Statistical frequency Analysis (of L_{ASmax} noise levels)

An analysis of a group of L_{ASmax} values giving the numbers of events (or percentages of total numbers) at different dBA levels

Total noise — All noise arriving at the NMT microphone, i.e. not only including all noise events (both aircraft and residual) but also all other noise which does not satisfy the trigger conditions for capture as a noise event.

Total noise level — The average or continuous equivalent level (L_{Aeq}) of the total noise at the site, recorded each hour by the NMT, which may also be aggregated into daily or monthly values.

Total noise climate

The level of the total noise at the NMT microphone varies with time. Over a particular period of time e.g. one hour, this variation may be described in terms of a number of different noise indices including the average or equivalent noise level, maximum and minimum noise level values and various percentile levels.

Such a description constitutes the noise climate at the site over that period of time.

The NMT records the following total noise indices every hour: L_{Aeq}, L_{ASmax}, L_{AS10}, L_{AS50}, L_{AS90} and L_{AS99}.

A general Glossary of acoustic Terms:

A-weighting — A method of producing a single figure measure of a broad band noise (as opposed to the 8 or 9 figures which make up an octave band spectrum) which takes into account, in an approximate way at least, the frequency response of the human hearing system. The idea is that sound levels measured in this way should give an indication of the loudness of the sound.

A-weighted sound pressure level (dBA).

The value of the sound pressure level, in decibels, measured using an A-weighting electronic circuit built into the sound level meter. The vast majority of noise measurements are carried out in this way.

decibel scale — The decibel scale is the scale on which sound pressure levels are commonly measured. It is a logarithmic scale and is used for convenience to compress the audible range of sound pressures into a manageable range, from 0 dB to 140 dB. The zero of the scale, 0 dB, corresponds to the notional threshold of hearing, 0.00002 Pa, and the upper limit, 140 dB, corresponds to 20 Pa, which would cause immediate damage to the ear.

Equivalent continuous sound level ($L_{Aeq,T}$), also called the Average noise level.

The $L_{Aeq,T}$ represents a measure of the 'average' sound level over the measurement period. It corresponds to the steady continuous level of sound which, over the same period of time, T, would contain the same amount of (A-weighted) sound energy as the time varying noise.

This is the most common method of measuring time varying noise, and within certain limits gives the best correlation with human response to noise, for example with annoyance.

Frequency — The frequency of a musical note is what gives it its pitch. It is the number of cycles of the fluctuating sound pressure which occur each second, and is measured in cycles per second, Hertz (Hz). The human ear can detect frequencies in the range 20 to 20000 Hz.

Most noises are a mixture of all frequencies, called broad-band noise.

$L_{AS90,T}$

This is the most commonly used of many possible statistical measures of a time varying noise. It is the 90th percentile of the statistical noise level distribution, or, more simply, the noise level that is exceeded for

90% of the measurement time (T). Thus over one hour for example it represents the noise level which is exceeded for all but (the quietest) six minutes of that hour.

It is commonly used as a measure of the background noise in any given situation, against which the level of any new, potentially intrusive source of noise is often compared. Background noise itself often varies with time and so the $L_{A90,T}$ is almost universally used as the best measure of the 'more or less always present' noise level which underlies short term variations from other sources of noise.

Maximum sound pressure level ($L_{ASmax,T}$)

This is the highest value of the time weighted sound pressure level, (measured using the A frequency weighting and the Slow time weighting) which occurred during the measurement period, T. It is commonly used to measure the effect of very short duration bursts of noise, such as for example sudden bangs, shouts, car horns, emergency sirens etc. which audibly stand out from the general level of, say, traffic noise, but because of their very short duration, maybe only a very small fraction of a second, may not have any effect on the $L_{Aeq,T}$ value.

In the context of this report the L_{ASmax} value for each aircraft noise event and community noise event is monitored

Noise — Unwanted sound

Octave band spectra — In order investigate the frequency content of broad band sounds, called its frequency spectrum, measurements of sound pressure are carried out over a range of frequency bands. The most common method is to split the audio frequency range into 8 or 9 octave bands. An octave is a frequency range from one particular frequency to double that frequency.

Octave band measurements are not referred to in this report.

Percentile noise level, (L_{ASN}, where N is a number between 0 and100)

The noise level which is exceeded for N% of the measurement period. For example, a value of $L_{A10,1hour}$ of 57 dBA means that in that hour the noise level was at or above 57 dBA for 6 minutes (i.e.10% of an hour), or alternatively, was at or below 57 dBA for 54 minutes.

Sound exposure level (SEL)

This is a measure of the A-weighted sound energy used to describe single noise events such as the passing of a train or aircraft; it is the A-weighted sound pressure level which, if occurring over a period of one second, would contain the same amount of A-weighted sound energy as the event.

SEL values for events may be used to calculate the average noise level over a period of time (hour, day or month)

Sound pressure

sound is a disturbance or fluctuation in air pressure, and sound pressure, measured in Pascals (Pa), is used as a measure of the magnitude of the sound. The human ear can detect sound pressures in the range from 0.00002 Pa to 20 Pa. This is an enormously wide range and so for convenience sound pressures are commonly measured on a decibel (dB) scale.

Time varying noise

When the level of noise varies with time, as is often the case, for example with noise from road traffic, various measures or noise indices as they are called are used to give a single figure description of the noise over a given period of time. The three most commonly used noise indices are the $L_{Aeq,\,T}$ the $L_{A90,T}$ and the $L_{Amax,T}$ values.

In all three cases the 'L' stands for the level of the sound in decibels, the 'A' for the fact that it is the A- weighted value, and the 'T' for the time period over which the noise is measured, for example 5min, 1 hour, 24 hour etc.

Time weighting (Fast (F) and Slow (S))

An exponential function of time, of a specified time constant, that weights the square of the instantaneous sound pressure. (Defined in BS EN 61672 – 1:2003).

There are two time constants defined in BS EN 61672 – 1:2003, designated Fast (F) and Slow (S), and noise indices such as the maximum, or percentile noise levels which are based on instantaneous time-weighted sound pressure should indicate which time weighting has been used in the measurement.

In this report, in line with standard practice for aircraft noise measurement, it is the Slow (S) time weighting that has been used, hence reference is made to L_{ASmax} and to L_{AS90}.

APPENDIX 3

LIST OF AIRCRAFT IDENTIFICATION SOURCE CODES

AAD
applied
acoustic
design

THE GREEN BUSINESS CENTRE
THE CAUSEWAY
STAINES
MIDDLESEX
TW18 3AL

TELEPHONE: 01784 464404
FACSIMILE: 01784 465447

List of Aircraft Identification Codes

100	Fokker 100
142	BAe 146-200
143	BAe 146-300
313	Airbus A310-300
319	Airbus A319
320	Airbus A320
321	Airbus A321
332	Airbus A330-200
346	Airbus A340-600
721	Boeing 727-100
722	Boeing 727-200
732	Boeing 737-200
733	Boeing 737-300
734	Boeing 737-400
735	Boeing 737-500
736	Boeing 737-600
738	Boeing 737-800
73G	Boeing 737-700
73H	Boeing 737-800 (winglets)
73W	Boeing 737-700 (winglets)
73Y	Boeing 737-300 Freighter
744	Boeing 747-400
74L	Boeing 747SP
74X	Boeing 747-200 Freighter
74Y	Boeing 747-400 Freighter
752	Boeing 757-200
762	Boeing 767-200
763	Boeing 767-300
76Y	Boeing 767-300 Freighter
ABX	Airbus A300 Freighter
ANF	Antonov AN-12 Freighter
AR1	Avro RJ-100
AR8	Avro RJ-85
AT4	ATR-42
AT7	ATR-72
ATP	BAe ATP
BE2	Beech B200
CCJ	Bombardier Challenger
CCX	Bombardier Global Express
CNJ	Cessna Citation
CR2	Bombardier CRJ-200
CR9	Bombardier CRJ-900
D38	Dornier 328
DF3	Dassault Falcon 50/900
EM2	Embraer Brasillia
ER3	Embraer RJ-135
F50	Fokker 50
FRJ	Dornier 328 Jet
GRJ	Gulfstream II/III/IV/V
H25	Hawker HS-125
J31	BAe Jetstream 31
LRJ	Bombardier Learjet 23/24/25/31/35/40/45/55/60

M1F	Boeing (McDonnell Douglas) MD11 Freighter
M82	Boeing (McDonnell Douglas) MD82
M83	Boeing (McDonnell Douglas) MD83
M87	Boeing (McDonnell Douglas) MD87
M90	Boeing (McDonnell Douglas) MD90
PA2	Piper
S20	Saab 2000
TU5	Tupolev TU-154