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## NOISE IMPACT ASSESSMENT

Prepared: 8<sup>th</sup> April 2013

Registered in England Company No.  
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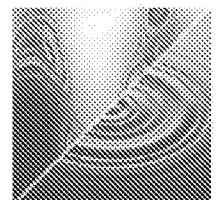
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## 1. INTRODUCTION

Planning approval is being sought for the installation of two new condensing units to the rear of the Chapel at 17 Elm Grove South, Barnham, PO22 0EJ.

Alan Saunders Associates has been commissioned by J&J Design to undertake an environmental noise survey in order to measure the prevailing background noise climate at the site.

The assessment will be undertaken in general accordance with the methodology set out in BS4142:1997 *Method for rating industrial noise affecting mixed residential and industrial areas* in accordance with the planning requirements of Arun District Council.

Measurements were also used to assess the impact of vehicle movements in the proposed car parks.

## 2. SURVEY PROCEDURE & EQUIPMENT

A survey of the existing background noise levels was undertaken at the location shown in site plan AS7370/SP1, approximately 2m above ground level. This was location was both secure and representative of the background noise levels at the nearest receiver.

Measurements of consecutive 5-minute  $L_{Aeq}$ ,  $L_{Amax}$ ,  $L_{A10}$  and  $L_{A90}$  sound pressure levels were taken between 12:55 hours on Tuesday 19<sup>th</sup> March 2013 and 18:15 hours on Monday 25<sup>th</sup> March 2013.

The noise levels recorded during the survey are considered to be representative of the current noise climate.

The following equipment was used during the course of the survey:

- Norsonic data logging sound level meter type 116;
- Norsonic sound level calibrator type 1253.

The calibration of the sound level meter was verified before and after use. No calibration drift was detected.

There were periods of rain during the survey. Data relating to these periods have been excluded from the assessment, however.

Measurements were made generally in accordance with ISO 1996-2:2007 *Acoustics - Description, measurement and assessment of environmental noise – Part 2: Determination of environmental noise levels*.

Please refer to Appendix A for details of the acoustic terminology used throughout this report.

### 3. RESULTS

Figures AS7370/TH1-TH7 show the  $L_{Aeq}$ ,  $L_{Amax}$ ,  $L_{A10}$  and  $L_{A90}$  sound pressure levels as time histories at the measurement position.

It is understood that the condensing units will only be operational during the hours shown below; these are indicated on the time histories. The arithmetic average of the background noise levels during the operational periods are shown in Table 3.1 below.

| Operational Period |               |                 | Average $L_{A90,5mins}$ |
|--------------------|---------------|-----------------|-------------------------|
| Sunday             | 05:15 - 06:30 | Weekly          | 39                      |
| Sunday             | 15:00 - 15:45 | Alternate weeks | 46                      |
| Monday             | 18:15 - 19:15 | Weekly          | 42                      |
| Friday             | 19:15 - 20:30 | Monthly         | 46                      |

**Table 3.1 – Plant operational times**

These periods are indicated on the environmental noise time histories.

### 4. ASSESSMENT METHODOLOGY

BS4142:1997 *Method for rating industrial noise affecting mixed residential and industrial areas* compares the measured and analysed noise levels of the industrial or fixed plant noise with the existing typical background noise level. Risks or “likelihoods” of complaints arising are apportioned to the differences between noise levels.

Allowances and penalties are used when making the analyses, including corrections for equipment operating periods and acoustic features (e.g. intermittent operation, tonal sounds, impulsive sounds such as hammering).

The assessment method requires the comparison of the “Rating Level” with the underlying typical background noise at the nearest noise sensitive receiver.

The difference between the “Rating Level” and the “Background Noise Level” is referred to as the “Assessment Level” throughout this report and can be equated to a notional “likelihood of complaints” occurring. The greater the Assessment Level, the greater the risk of complaints. The standard range of ‘risk’ is summarised in BS4142 as follows:

- Around +10 dB is representative of conditions where “complaints are likely”;
- Around +5 dB is representative of conditions where the “likelihood of complaints arising is of marginal significance”;
- Around –10 dB is representative of conditions where there is a “positive indication that complaints are unlikely”.

Commonly, there is a degree of interpolation made between these values. For example, a difference of –5 dB to 0 dB might be equated to a low risk of complaints.

## 5. PREDICTED NOISE IMPACT

### 5.1 Proposed Plant

The selected condensing units to be installed at the property have been confirmed as:

- 2 no. Daikin condensing units type RZQSG100LV1

Noise levels generated by the type RZQSG100LV1 condensers have been confirmed by the manufacturer as follows:

| Freq (Hz)   | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 | dB(A) |
|-------------|----|-----|-----|-----|------|------|------|------|-------|
| RZQSG100LV1 | 55 | 62  | 60  | 55  | 51   | 46   | 41   | 35   | 57    |

Table 5.1 - Source noise data ( $L_p$  @ 1m) for the condensers

[dB ref. 20µPa]

It is understood that the plant is to be located at the rear of the building and will be housed in a 1.8m high close-boarded timber fence enclosure.

### 5.2 BS4142 Assessment

Following an inspection of the environs, the most affected residential dwelling is the neighbouring property, no. 15. Although the rear, 1<sup>st</sup> floor windows overlook the site, there is no direct line of sight to the plant units due to screening provided by the chapel itself and the proposed enclosure.

The noise levels at the nearest residential receiver have been calculated using the noise data above with corrections made for location of the units, distance propagation of the sound field and a screening loss for the enclosure.

A 5dB acoustic feature correction has been allowed for any possible distinguishing characteristics to ensure a robust assessment.

Noise emissions are assessed in Table 5.2, the full calculations are shown in Appendix B.

| Noise Source                                         | $L_{Aeq, 5min}$ |
|------------------------------------------------------|-----------------|
| Specific Noise Level                                 | 29 dB           |
| Acoustic Feature Correction                          | 5 dB            |
| <b>Rating Noise Level</b>                            | <b>34 dB</b>    |
| Background Noise Level ( $L_{A90}$ )                 | 39 dB           |
| <b>Assessment Level</b>                              | <b>-5 dB</b>    |
| <b>BS4142 Assessment: "a low risk of complaints"</b> |                 |

Table 5.2 – BS4142 assessment calculation

## 6. CAR PARK ACTIVITY NOISE

It is understood that provision will be made for car parking at the rear and at the front, providing spaces for 10 cars in total. Access to the rear would be via the western side of the building.

The surface of the car parks will be paved, noise from cars manoeuvring into car parks is likely be consistent or lower than traffic on the adjacent main road.

The impact on the neighbouring residential property from car doors closing in the proposed car parks would be similar to that from cars parked on the main road at similar distances. The chapel car park will benefit from the timber fence providing screening.

Using Alan Saunders Associates library data of noise from car door slams, a maximum level of  $L_{Amax}$  82dB at 1m has been used to predict a noise level of 55dB outside the receiver's nearest window. This is considered a worst case level as car doors simply being closed normally are likely to be much quieter than this.

Ambient  $L_{Amax}$  levels measured at the monitoring location are approximately 55-65dB  $L_{Amax}$ . Predicted levels therefore are well in keeping with ambient levels and within the 60dB guideline values for night-time  $L_{Amax}$  events stated in *WHO Guidelines for Community Noise*.

## 7. CONCLUSIONS

An environmental noise survey has been undertaken at 17 Elm Grove South, Barnham by Alan Saunders Associates between Friday 15<sup>th</sup> March and Tuesday 26<sup>th</sup> March 2013.

Measurements have been undertaken to establish the current background noise climate during the hours of operation.

Alan Saunders Associates has undertaken an assessment of noise impact resulting from the proposed works in accordance with the methodologies described in BS4142:1997 *Method for rating industrial noise affecting mixed residential and industrial areas*.

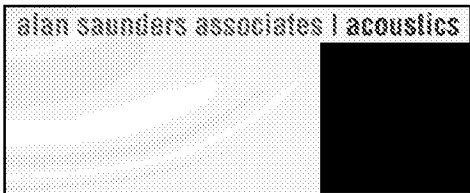
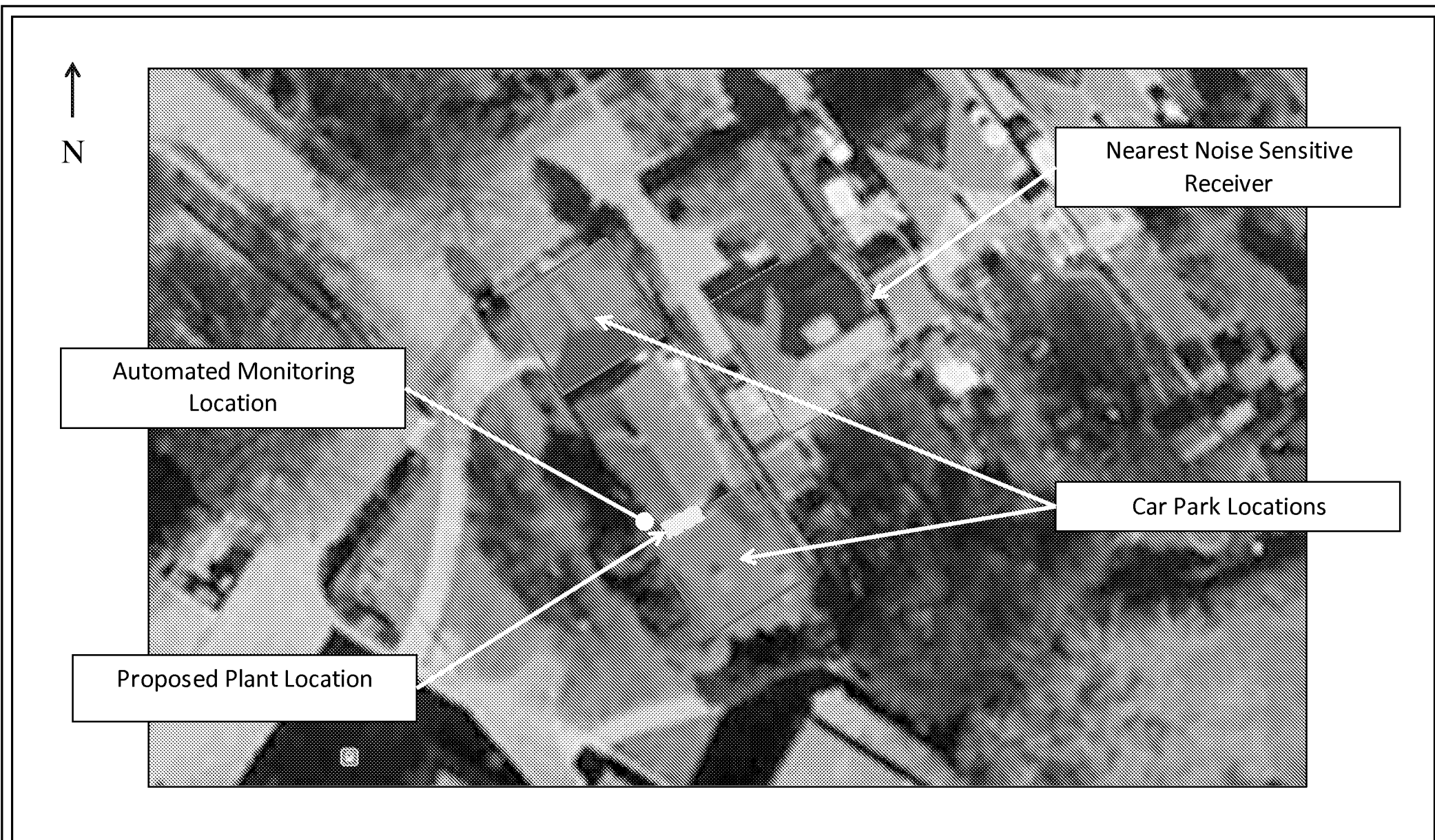
Data for the proposed plant have been used to predict the noise impact on nearest residential receiver.

Measurements made of the prevailing noise climate at the proposed site have shown that the noise impact of the condensing units, in accordance with BS4142, indicates a "low risk of complaints".

There is unlikely to be any significant adverse noise impact due to cars using the proposed development.

**Alex Arnold AMIOA**

**ALAN SAUNDERS ASSOCIATES**



**Project:**  
17 Elm Grove South, Barnham

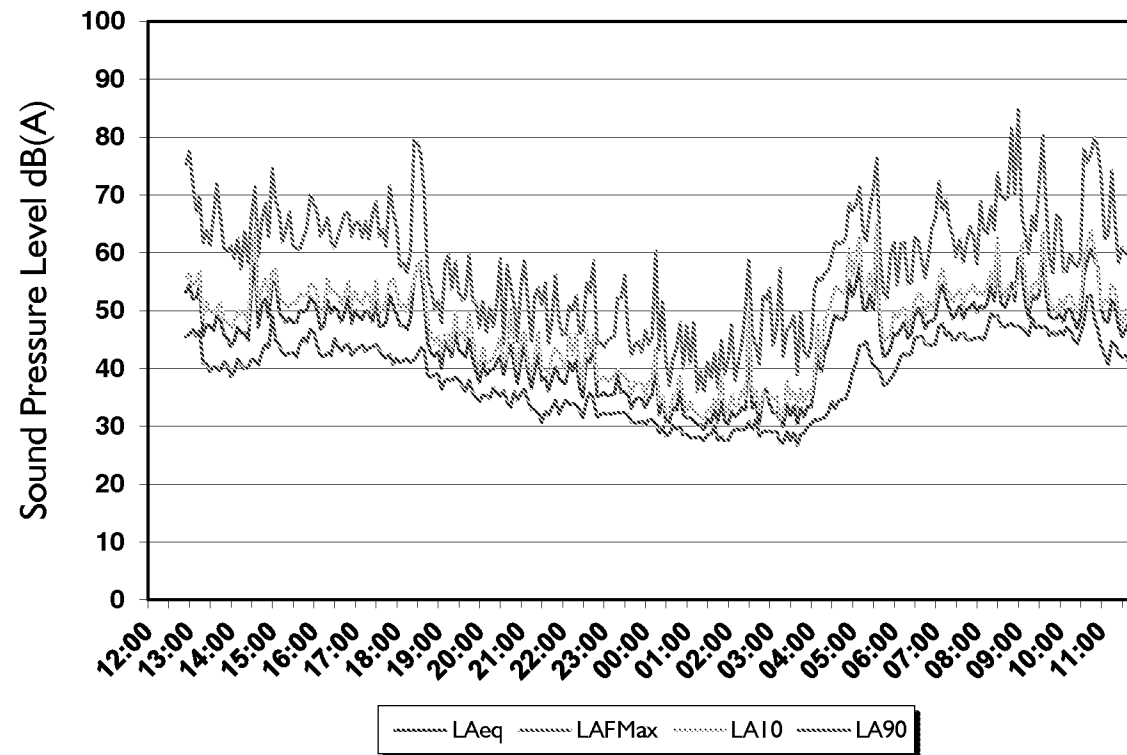
**Title:**  
Indicative Site Plan

**Figure:**  
AS7370/SP1

**Date:**  
08/04/2013

## 17 Elm Grove South, Barnham

### Environmental Noise Time History

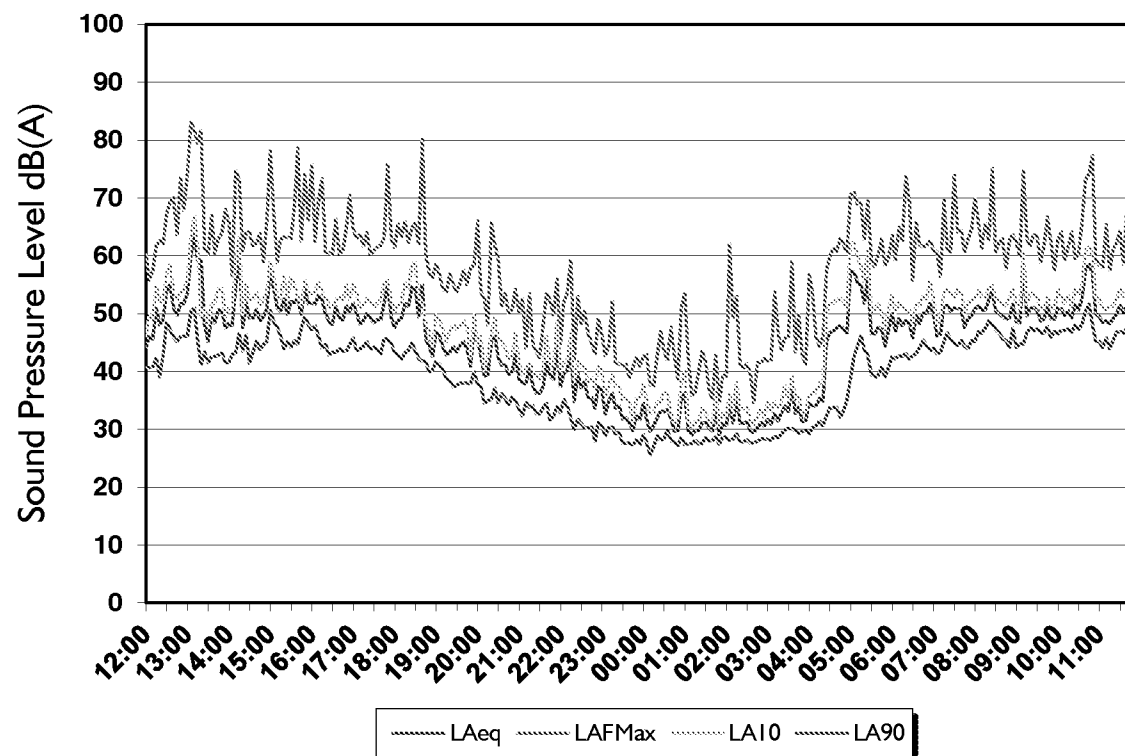


**Tuesday 19 March to Wednesday 20 March 2013**

Figure AS7370/TH1

## 17 Elm Grove South, Barnham

### Environmental Noise Time History

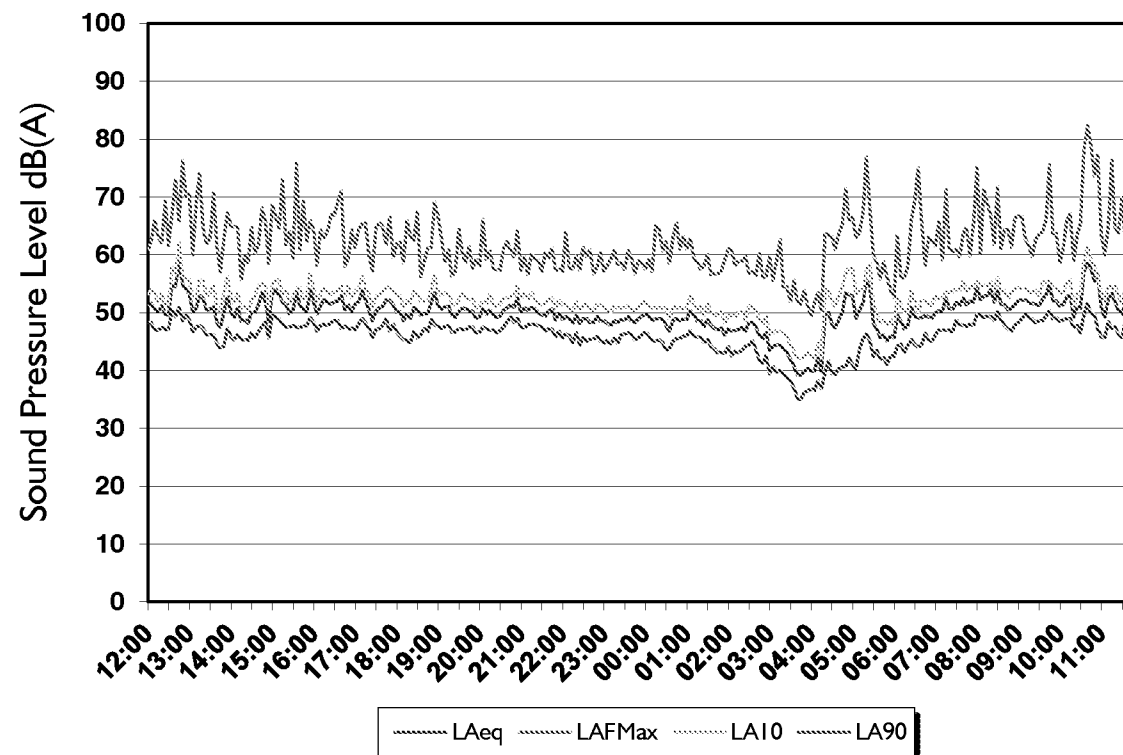


**Wednesday 20 March to Thursday 21 March 2013**

Figure AS7370/TH2

## 17 Elm Grove South, Barnham

### Environmental Noise Time History

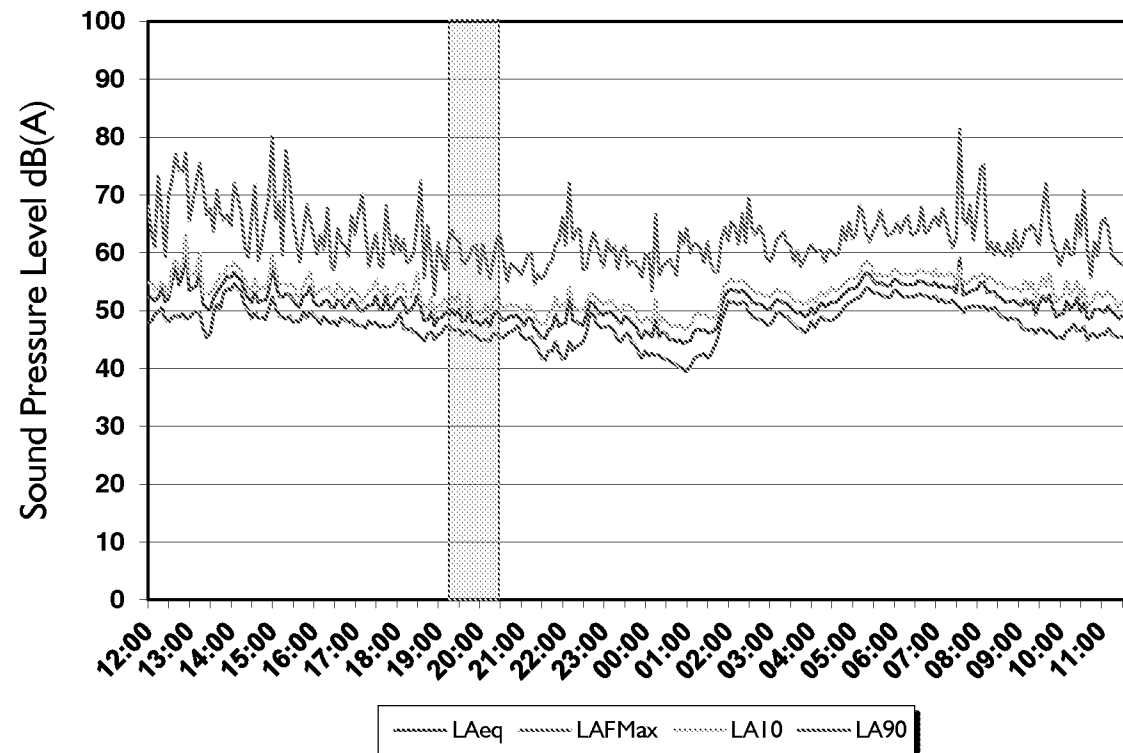


Thursday 21 March to Friday 22 March 2013

Figure AS7370/TH3

# 17 Elm Grove South, Barnham

## Environmental Noise Time History

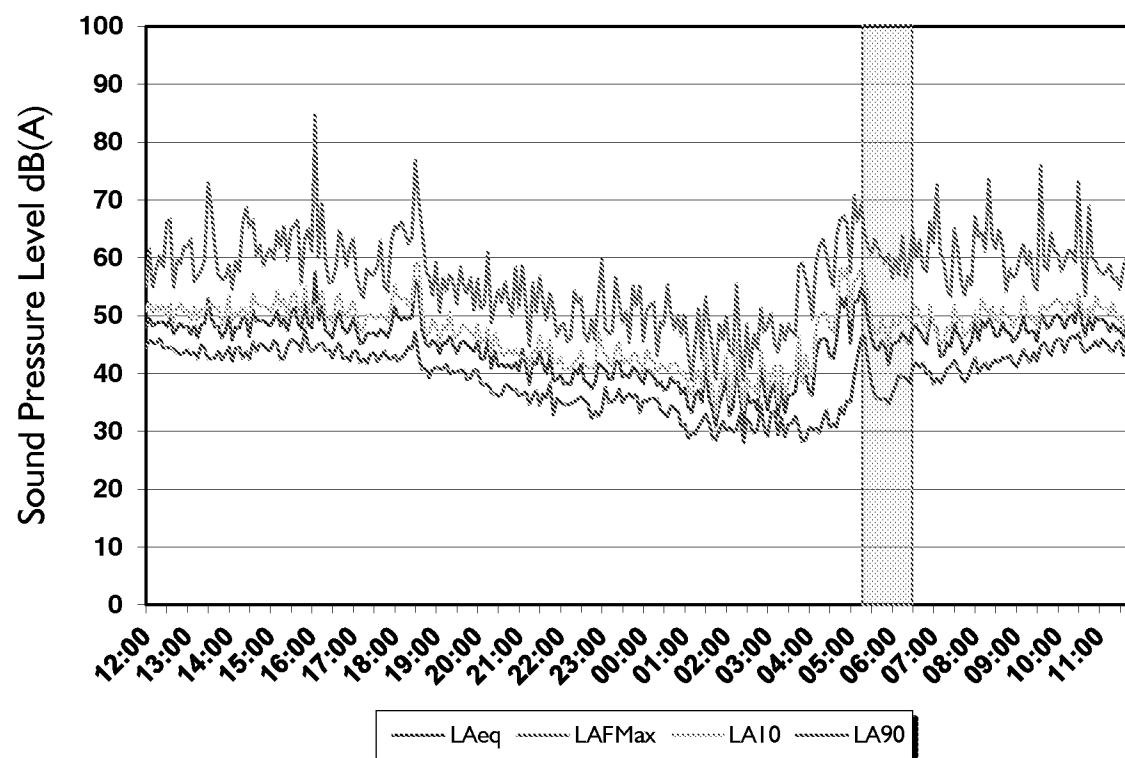


Friday 22 March to Saturday 23 March 2013

Figure AS7370/TH4

# 17 Elm Grove South, Barnham

## Environmental Noise Time History

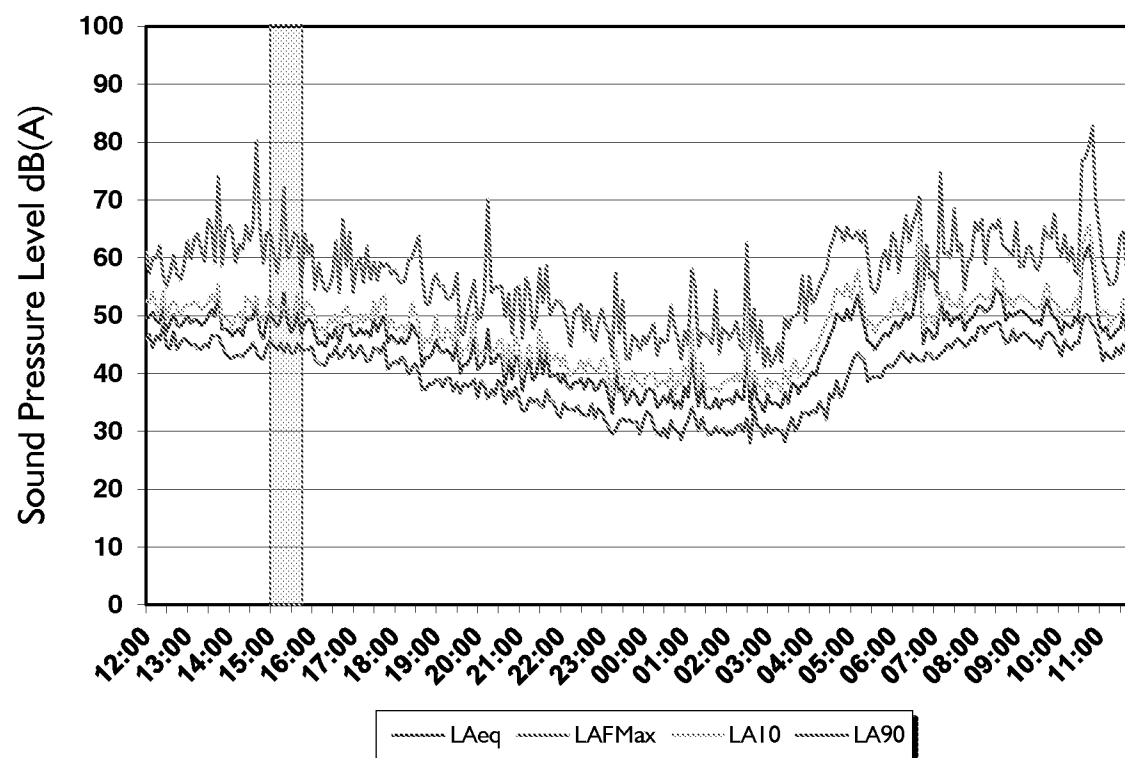


**Saturday 23 March to Sunday 24 March 2013**

Figure AS7370/TH5

## 17 Elm Grove South, Barnham

### Environmental Noise Time History

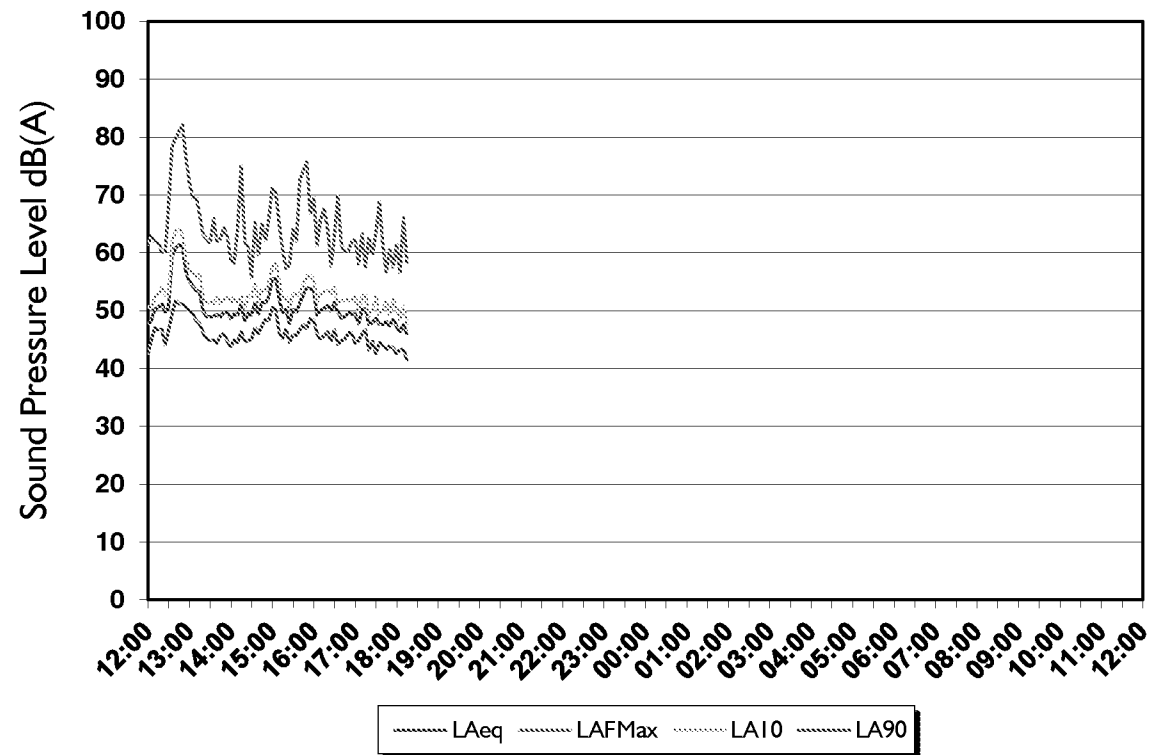


**Sunday 24 March to Monday 25 March 2013**

Figure AS7370/TH6

## 17 Elm Grove South, Barnham

### Environmental Noise Time History



**Monday 25 March to Tuesday 26 March 2013**

Figure AS7370/TH7

# APPENDIX A

## ACOUSTIC TERMINOLOGY & HUMAN RESPONSE TO BROADBAND NOISE

### 1.0 ACOUSTIC TERMINOLOGY

The annoyance produced by noise is dependent upon many complex interrelated factors such as 'loudness', its frequency (or pitch) and any variations in its level. In order to have some objective measure of the annoyance, scales have been derived to allow for these subjective factors.

|                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>dB (A):</b>                                        | The human ear is more susceptible to mid-frequency noise than the high and low frequencies. To take account of this when measuring noise, the 'A' weighting scale is used so that the measured noise corresponds roughly to the overall level of noise that is discerned by the average human. It is also possible to calculate the 'A' weighted noise level by applying certain corrections to an un-weighted spectrum. The measured or calculated 'A' weighted noise level is known as the dB(A) level.                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b><math>L_{10}</math> &amp; <math>L_{90}</math>:</b> | <p>If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The <math>L_n</math> indices are used for this purpose, and the term refers to the level exceeded for n% of the time, hence <math>L_{10}</math> is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, <math>L_{90}</math> is the average minimum level and is often used to describe the background noise.</p> <p>It is common practice to use the <math>L_{10}</math> index to describe traffic noise, as being a high average, it takes into account the increased annoyance that results from the non-steady nature of traffic noise.</p>                                                                                                                                                                                                     |
| <b><math>L_{eq}</math>:</b>                           | <p>The concept of <math>L_{eq}</math> (equivalent continuous sound level) has up to recently been primarily used in assessing noise in industry but seems now to be finding use in defining many other types of noise, such as aircraft noise, environmental noise and construction noise.</p> <p><math>L_{eq}</math> is defined as a notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the actual, fluctuating sound measured over that period (e.g. 8 hour, 1 hour, etc).</p> <p>The use of digital technology in sound level meters now makes the measurement of <math>L_{eq}</math> very straightforward.</p> <p>Because <math>L_{eq}</math> is effectively a summation of a number of noise events, it does not in itself limit the magnitude of any individual event, and this is frequently used in conjunction with an absolute noise limit.</p> |
| <b><math>L_{max}</math>:</b>                          | $L_{max}$ is the maximum sound pressure level recorded over the period stated. $L_{max}$ is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the $L_{eq}$ noise level.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>D</b>                                              | The sound insulation performance of a construction is a function of the difference in noise level either side of the construction in the presence of a loud noise source in one of the pair of rooms under test. $D$ , is therefore simply the <i>level difference</i> in decibels between the two rooms in different frequency bands.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b><math>D_w</math></b>                               | $D_w$ is the <i>Weighted Level Difference</i> The level difference is determined as above, but weighted in accordance with the procedures laid down in BS EN ISO 717-1.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b><math>D_{nT,w}</math></b>                          | $D_{nT,w}$ is the <i>Weighted Standardised Level Difference</i> as defined in BS EN ISO 717-1 and represents the <i>weighted level difference</i> , as described above, corrected for room reverberant characteristics.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b><math>C_{tr}</math></b>                            | $C_{tr}$ is a spectrum adaptation term to be added to a single number quantity such as $D_{nT,w}$ , to take account of characteristics of a particular sound.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b><math>L'_{nT,w}</math></b>                         | $L'_{nT,w}$ is the <i>Weighted Standardised Impact Sound Pressure Level</i> as defined in BS EN ISO 717-2 and represents the level of sound pressure when measured within room where the floor above is under excitation from a calibrated tapping machine, corrected for the receive room reverberant characteristics.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

# APPENDIX A

## ACOUSTIC TERMINOLOGY & HUMAN RESPONSE TO BROADBAND NOISE

### 2.0 OCTAVE BAND FREQUENCIES

In order to determine the way in which the energy of sound is distributed across the frequency range, the International Standards Organisation have agreed on "preferred" bands of frequency for sound measurement and analysis. The widest and most commonly used band for frequency measurement and analysis is the Octave Band. In these bands, the upper frequency limit is twice the lower frequency limit, with the band being described by its "centre frequency" which is the average (geometric mean) of the upper and lower limits, eg. 250 Hz octave band runs from 176 Hz to 353 Hz. The most commonly used bands are:

|                                 |    |     |     |     |      |      |      |      |
|---------------------------------|----|-----|-----|-----|------|------|------|------|
| Octave Band Centre Frequency Hz | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 |
|---------------------------------|----|-----|-----|-----|------|------|------|------|

### 3.0 HUMAN PERCEPTION OF BROADBAND NOISE

Because of the logarithmic nature of the decibel scale, it should be borne in mind that noise levels in dB(A) do not have a simple linear relationship. For example, 100dB(A) is not twice as loud as 50 dB(A) sound level. It has been found experimentally that changes in the average level of fluctuating sound, such as traffic noise, need to be of the order of 3dB(A) before becoming definitely perceptible to the human ear. Data from other experiments have indicated that a change in sound level of 10 dB(A) is perceived by the average listener as a doubling or halving of loudness. Using this information, a guide to the subjective interpretation of changes in traffic noise level can be given.

#### INTERPRETATION

| Change in Sound Level dB(A) | Subjective Impression                             | Human Response   |
|-----------------------------|---------------------------------------------------|------------------|
| 0 to 2                      | Imperceptible change in loudness                  | Marginal         |
| 3 to 5                      | Perceptible change in loudness                    | Noticeable       |
| 6 to 10                     | Up to a doubling or halving of loudness           | Significant      |
| 11 to 15                    | More than a doubling or halving of loudness       | Substantial      |
| 16 to 20                    | Up to a quadrupling or quartering of loudness     | Substantial      |
| 21 or more                  | More than a quadrupling or quartering of loudness | Very Substantial |

### 4.0 EARTH BUNDS AND BARRIERS - EFFECTIVE SCREEN HEIGHT

When considering the reduction in noise level of a source provided by a barrier, it is necessary to establish the "effective screen height". For example if a 3 metre high barrier exists between a noise source and a listener, with the barrier close to the listener, the listener will perceive the noise source is louder, if he climbs up a ladder (and is closer to the top of the barrier) than if he were standing at ground level. Equally if he sat on the ground the noise source would seem quieter than it was if he were standing. This may be explained by the fact that the "effective screen height" is changing with the three cases above, the greater the effective screen height, in general, the greater the reduction in noise level.

Where the noise sources are various roads, the attenuation provided by a fixed barrier at a specific property will be greater for roads close to the barrier than for roads further away.

# APPENDIX B

## NOISE EMISSIONS CALCULATIONS

63      125      250      500      1k      2k      4k      8k      dB(A)

### Calculation 1: External plant to nearest residential receiver

|                                         |        |           |           |           |           |           |           |          |          |           |
|-----------------------------------------|--------|-----------|-----------|-----------|-----------|-----------|-----------|----------|----------|-----------|
| Sound Pressure Level                    | at 1 m | 55        | 62        | 60        | 55        | 51        | 46        | 41       | 35       | 57        |
| No. of Units                            | 2      | 3         | 3         | 3         | 3         | 3         | 3         | 3        | 3        |           |
| Distance Propagation                    | 11     | -21       | -21       | -21       | -21       | -21       | -21       | -21      | -21      |           |
| Screening                               |        | -6        | -7        | -8        | -10       | -13       | -15       | -15      | -15      |           |
| <b>Level at nearest receiver window</b> |        | <b>31</b> | <b>37</b> | <b>34</b> | <b>27</b> | <b>21</b> | <b>13</b> | <b>8</b> | <b>2</b> | <b>29</b> |

### Calculation 2: Predicted internal levels for car door slams

|                                         |        |           |           |           |           |           |           |           |           |           |
|-----------------------------------------|--------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Sound Pressure Level                    | at 1 m | 83        | 80        | 84        | 82        | 73        | 73        | 69        | 64        | 82        |
| Distance Propagation                    | 13     | -22       | -22       | -22       | -22       | -22       | -22       | -22       | -22       |           |
| Screening                               |        | -5        | -5        | -5        | -5        | -5        | -5        | -5        | -5        |           |
| <b>Level at nearest receiver window</b> |        | <b>55</b> | <b>52</b> | <b>56</b> | <b>54</b> | <b>46</b> | <b>46</b> | <b>42</b> | <b>37</b> | <b>55</b> |