

**Unit 2/3 Banbury Office Village
Noral Way, Banbury
OX16 2SB**

**Environmental Noise Survey and
Plant Noise Assessment Report**

24675/PNA Rev 2

17 August 2017

For:
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Document Control

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Appendix A – Acoustic Terminology



1.0 Introduction

New items of plant are proposed at Unit 2/3 Banbury Office Village and Hann Tucker Associates have therefore been instructed to undertake an Environmental Noise Survey and Plant Noise Impact Assessment.

2.0 Site Description

2.1 Location

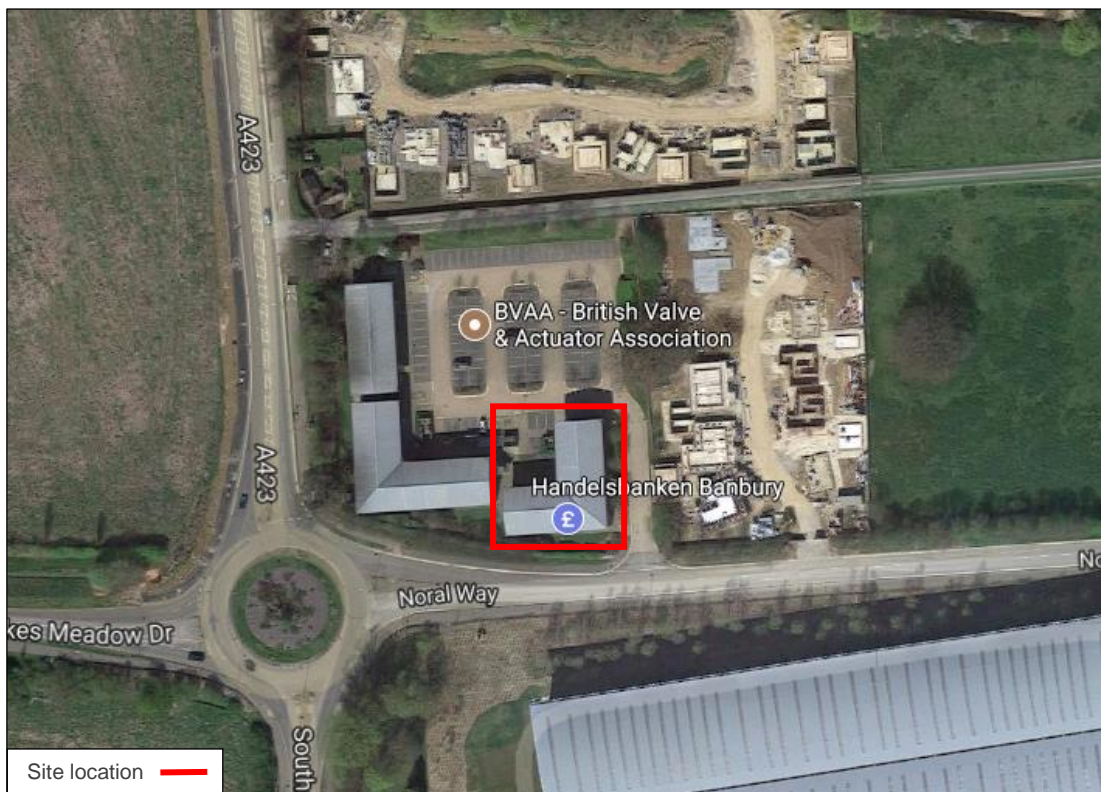
The site is located near the M40 in the north of Banbury as shown on the map below.



Location Map (Map Data ©2017 Google)

2.2 Description

The site is shown in the Site Plan below. The site is a four-storey office building consisting of a block parallel to Noral Way and another block extending to the rear. The site is bounded by Noral Way in the south and Hardwick Hill in the west, with a roundabout to the south west. To the north of the building is a car park and to the east is a new development of three-storey residential buildings approximately 17m from the eastern boundary of the site. The nearest unscreened residential window is located approximately 37m from the proposed plant location.



Site Plan (Map Data ©2017 Google, Photos ©2017 Google)

3.0 Acoustic Terminology

For an explanation of the acoustic terminology used in this report please refer to Appendix A enclosed.

4.0 Project Proposals

We understand the proposed plant comprises new A/C units and condensers to be located in an existing plant compound, as detailed in Section 9.

4.1 Operating Hours

We understand that the operating hours of the proposed plant are 24 hours 7 days per week. It has been stated that condenser units can be set to reduced running for night-time in order to reduce noise emissions. Please advise us if this is not the case.

4.2 Drawings

Our acoustic analyses are based on drawings by Kitson Architecture as detailed in the table below.



Reference	Title	Date
307-002	Site Location Plan, Block Plan, Proposed Plans and Elevations, Fence Detail	31/07/2017

5.0 Local Authority Requirements

The site lies within the jurisdiction of Cherwell District Council. Their advice regarding criteria for atmospheric noise emissions from building service plant is as follows:

“We would be looking for a report in accordance with BS4142:2014 with the rating level not exceeding the existing background level.”

6.0 Survey Methodology

The survey was undertaken by Fauwaz Baig, BEng (Hons).

6.1 Procedure

Fully automated environmental noise monitoring was undertaken from approximately 11:00 hours on 3 August 2017 to approximately 10:15 hours on 4 August 2017.

During the periods we were on site the wind conditions were calm and the sky was generally patchy cloud. We understand that generally throughout the survey period the weather conditions remained similar. These conditions are considered suitable for obtaining representative measurement results.

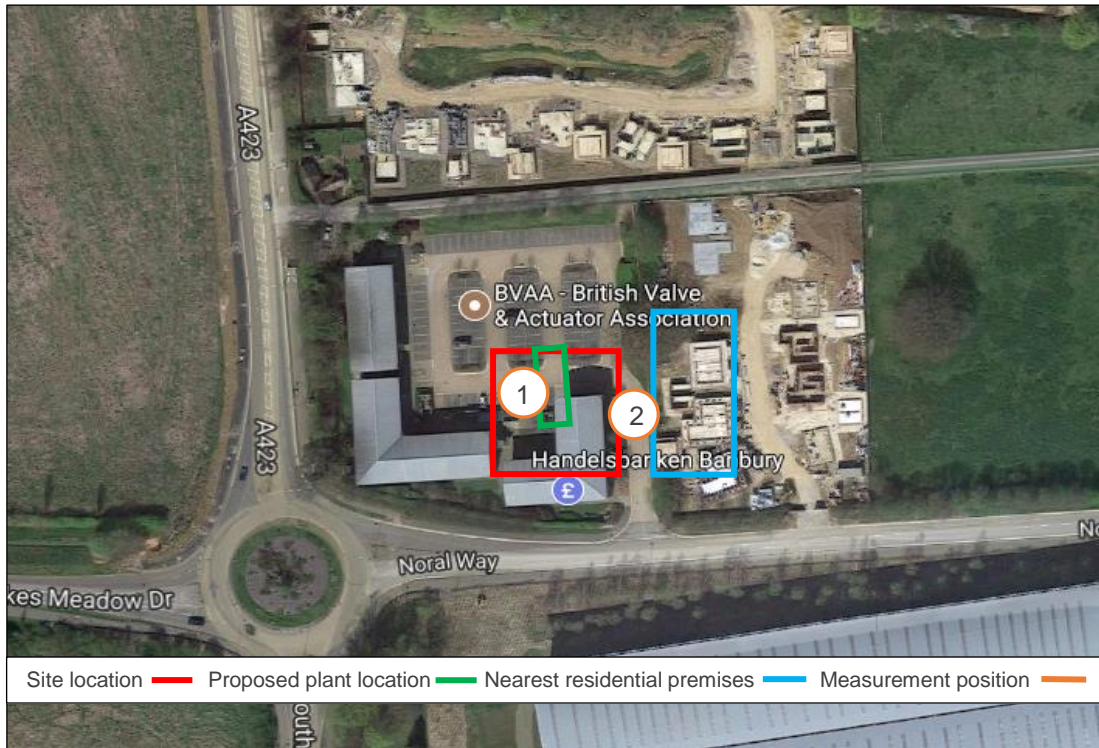
Measurements were taken continuously of the A-weighted (dBA) L_{90} , L_{eq} and L_{max} sound pressure levels over 15 minute periods.

6.2 Measurement Positions

The noise level measurements were undertaken at 2No. positions as described in the table and plan below.



Position No	Description
1	The microphone was attached to a pole and fixed to the timber hit and miss fence at the rear of the site in the courtyard. The microphone was positioned at least 2m from any reflective surfaces and at a height of approximately 2m.
2	The microphone was attached to a pole and fixed to the metal staircase railing towards the eastern boundary of the site. The microphone was positioned at least 2m from any reflective surfaces and at a height of approximately 2m.



Plan Showing Measurement Positions (Photos ©Google 2017, Map Data ©Google 2017)

6.3 Instrumentation

The instrumentation used during the survey is presented in the Table below:



Description	Manufacturer	Type	Serial Number	Calibration
Position 1 Type 1 ½" Condenser Microphone	PCB	377B02	132146	Calibration on 24/07/2017
Position 1 Type 1 Preamp	Larson Davis	PRM902	4215	Calibration on 24/07/2017
Position 1 Type 1 Data Logging Sound Level Meter	Larson Davis	824	3838	Calibration on 24/07/2017
Position 2 Type 1 ½" Condenser Microphone	Larson Davis	2541	8523	Calibration on 10/07/2017
Position 2 Type 1 Preamp	Larson Davis	PRM902	4410	Calibration on 10/07/2017
Position 2 Type 1 Data Logging Sound Level Meter	Larson Davis	824	3701	Calibration on 10/07/2017
Type 1 Calibrator	Bruel & Kjaer	4231	2610161	Calibration on 09/05/2017

Each sound level meter, including the extension cable, was calibrated prior to and on completion of the surveys. No significant changes were found to have occurred (no more than 0.1dB).

Each sound level meter was located in an environmental case with the microphone connected to the sound level meter via an extension cable.

Each microphone was fitted with a windshield.

7.0 Results

The results have been plotted on Time History Graphs 24675/TH1 and 24675/TH2 enclosed, presenting the 15 minute A-weighted (dBA) L_{90} and L_{eq} noise levels at each measurement position throughout the duration of the survey.

The lowest L_{A90} (15 min) measurements recorded during the survey are presented in the table below:



Position	Lowest Measured $L_{A90(15min)}$ Background Noise Level (dB re 2×10^{-5} Pa)	
	Daytime (07:00 – 23:00) Hours	Night-Time (23:00 – 07:00) Hours
1	42 dBA	38 dBA
2	41 dBA	36 dBA

8.0 Plant Noise Emission Criteria

On the basis of the advice of the Local Authority as stated in Chapter 5.0, the aforementioned acoustic standards and guidance and the results of the environmental noise survey, we propose that the following plant noise emission criteria be achieved at 1 metre from the nearest noise sensitive residential window with all plant operating simultaneously.

Plant Noise Emission Criteria (dB re 2×10^{-5} Pa)	
Daytime (07:00 – 23:00 hours)	Night-time (23:00 – 07:00 hours)
37 dBA	32 dBA

The above criteria are to be achieved with all plant operating simultaneously. Please note that the proposed values have taken into account a +4dB correction for tonality following BS4142:2014 Chapter 9.2.

It should be noted that the above are subject to the final approval of the Local Authority.

9.0 Plant Noise Impact Assessment

We understand the proposed plant comprises of four air conditioning units and four condensers as detailed below.

Plant Description	Location	Qty	Plant Make	Model Number
A/C Unit	External	4	Daikin	RZQSG140L9V1
Condenser	External	4	Airedale	CR65



9.1 Plant Noise Data

We understand the manufacturer's noise data for the equipment to be as follows:

Plant Description	Sound Pressure Level (dB re 2x10 ⁻⁵ Pa) at 1 metre at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
A/C Unit	32	40	45	48	47	45	42	29	52
Condenser (@ 960rpm)	39	51	50	61	67	62	54	47	69
Condenser (@ 510rpm)	23	33	35	46	49	39	32	24	51

9.2 Location of Plant

The proposed location of the plant is an existing compound of dimensions 4.2 x 10m in the courtyard of the unit. An existing wall at the north of the compound of 2.8m in length would be retained, while the remaining of the compound will be surrounded by new 1.9m high hit and miss timber fencing on a new 0.15m high concrete slab.

9.3 Plant Noise Impact Assessment

We understand that the proposed units will be operational during daytime/night-time hours.

The following tables summarise our predictions of atmospheric noise emissions from the plantroom louvres to the nearest noise sensitive residential window.

Proposed plant location	Sound Pressure Level (dBA)	
	Daytime (07:00 – 23:00 hours)	Night-time (23:00 – 07:00 hours)
Cumulative Plant Noise Emission	75 @ 1m	60 @ 1m
Distance Correction	-28	-28
Façade Reflection	3	3
Calculated Noise Level at Receptor	50	35

Our calculations indicate that the proposed plant require mitigation measures detailed in Section 9.4 in order to be capable of achieving the requirements of the Local Authority outlined in Section 5.0.



9.4 Mitigation Measures

In order to control plant noise emissions in line with the proposed criterion, we recommend installing an acoustically acceptable (i.e. solid/ imperforate) barrier of at least 2.2m in height to surround the plant. In the proposed plant location, this barrier would potentially offer a 13dB reduction, therefore resulting in noise levels of 37dBA daytime and 22dBA night-time.

As an alternative, we suggest reducing the cumulative noise emission of all plant operating simultaneously by at least 13dBA daytime and 3dBA night-time, through either plant reselection or by using an acoustic enclosure (please see attached suitable suppliers list).

10.0 Conclusions

An environmental noise survey has been undertaken in order to establish the currently prevailing noise levels.

Plant noise emission criteria have been recommended based on the results of the noise survey and with reference to the Local Authority's advice.

An assessment has been carried out to determine the plant noise emissions at the nearest noise sensitive window.

The assessment indicates that the proposed plant, in conjunction with specified attenuation, should be capable of achieving the proposed environmental noise criteria at the nearest noise sensitive residential window.

Appendix A

The acoustic terms used in this report are defined as follows:

dB Decibel - Used as a measurement of sound level. Decibels are not an absolute unit of measurement but an expression of ratio between two quantities expressed in logarithmic form. The relationships between Decibel levels do not work in the same way that non-logarithmic (linear) numbers work (e.g. 30dB + 30dB = 33dB, not 60dB).

dBA The human ear is more susceptible to mid-frequency noise than the high and low frequencies. The 'A'-weighting scale approximates this response and allows sound levels to be expressed as an overall single figure value in dBA. The _A subscript is applied to an acoustical parameter to indicate the stated noise level is A-weighted

It should be noted that levels in dBA do not have a linear relationship to each other; for similar noises, a change in noise level of 10dBA represents a doubling or halving of subjective loudness. A change of 3dBA is just perceptible.

L_{90,T} L₉₀ is the noise level exceeded for 90% of the period *T* (i.e. the quietest 10% of the measurement) and is often used to describe the background noise level.

L_{eq,T} L_{eq,T} is the equivalent continuous sound pressure level. It is an average of the total sound energy measured over a specified time period, *T*.

L_{max} 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.

Sound Pressure Level (L_p) is the sound pressure relative to a standard reference pressure of 2×10^{-5} Pa. This level varies for a given source according to a number of factors (including but not limited to: distance from the source; positioning; screening and meteorological effects).

Sound Power Level (SWL or L_w) is the total amount of sound energy inherent in a particular sound source, independent of its environment. It is a logarithmic measure of the sound power in comparison to a specified reference level (usually 10^{-12} W).

Unit 2/3 Banbury Office Village

Position 1

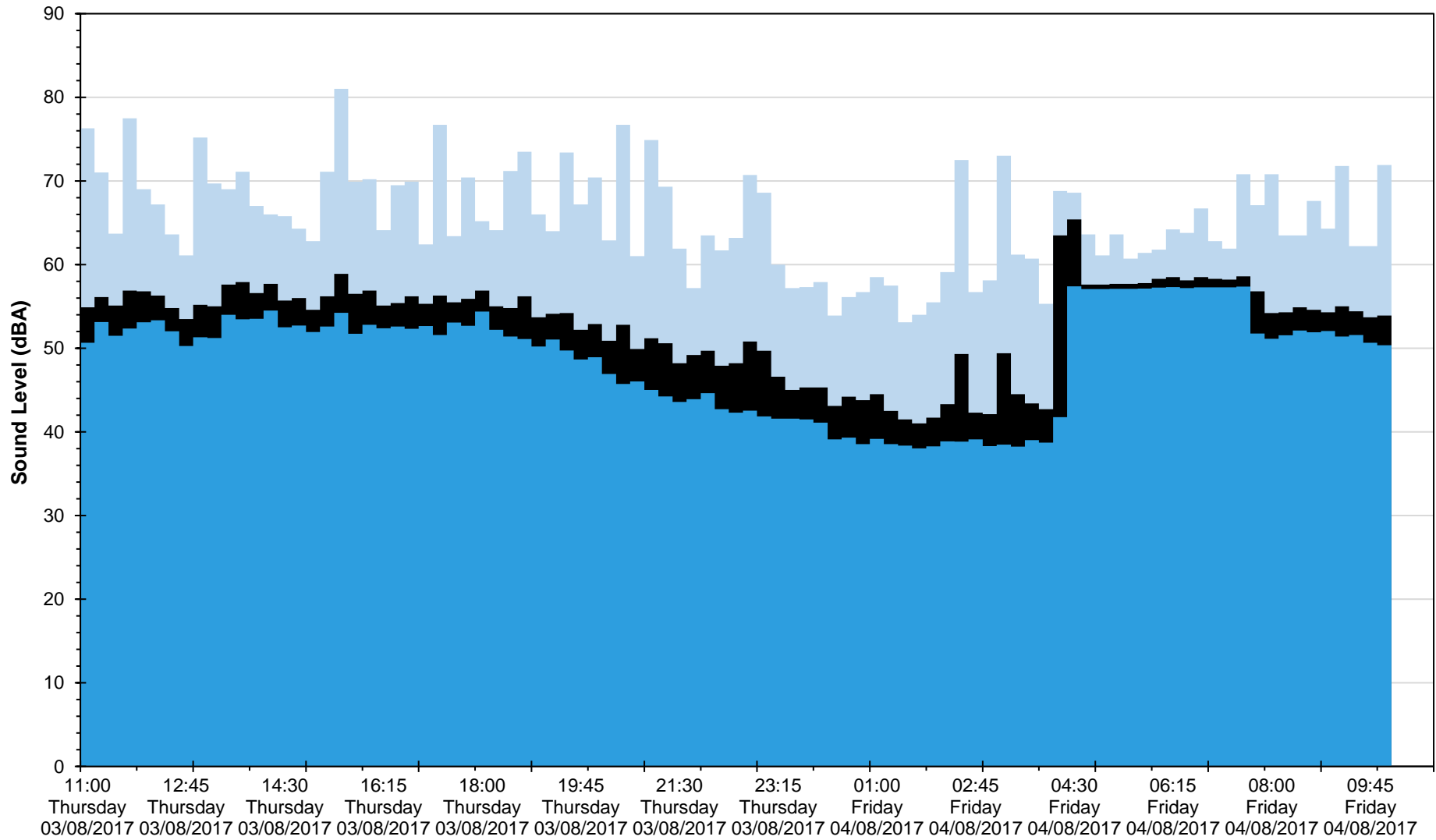
L_{Aeq} , L_{Amax} and L_{A90} Noise Levels

Thursday 3 August 2017 to Friday 4 August 2017

■ L_{Amax}

■ L_{Aeq}

■ L_{A90}



Date and Time

24675/TH1

Unit 2/3 Banbury Office Village

Position 2

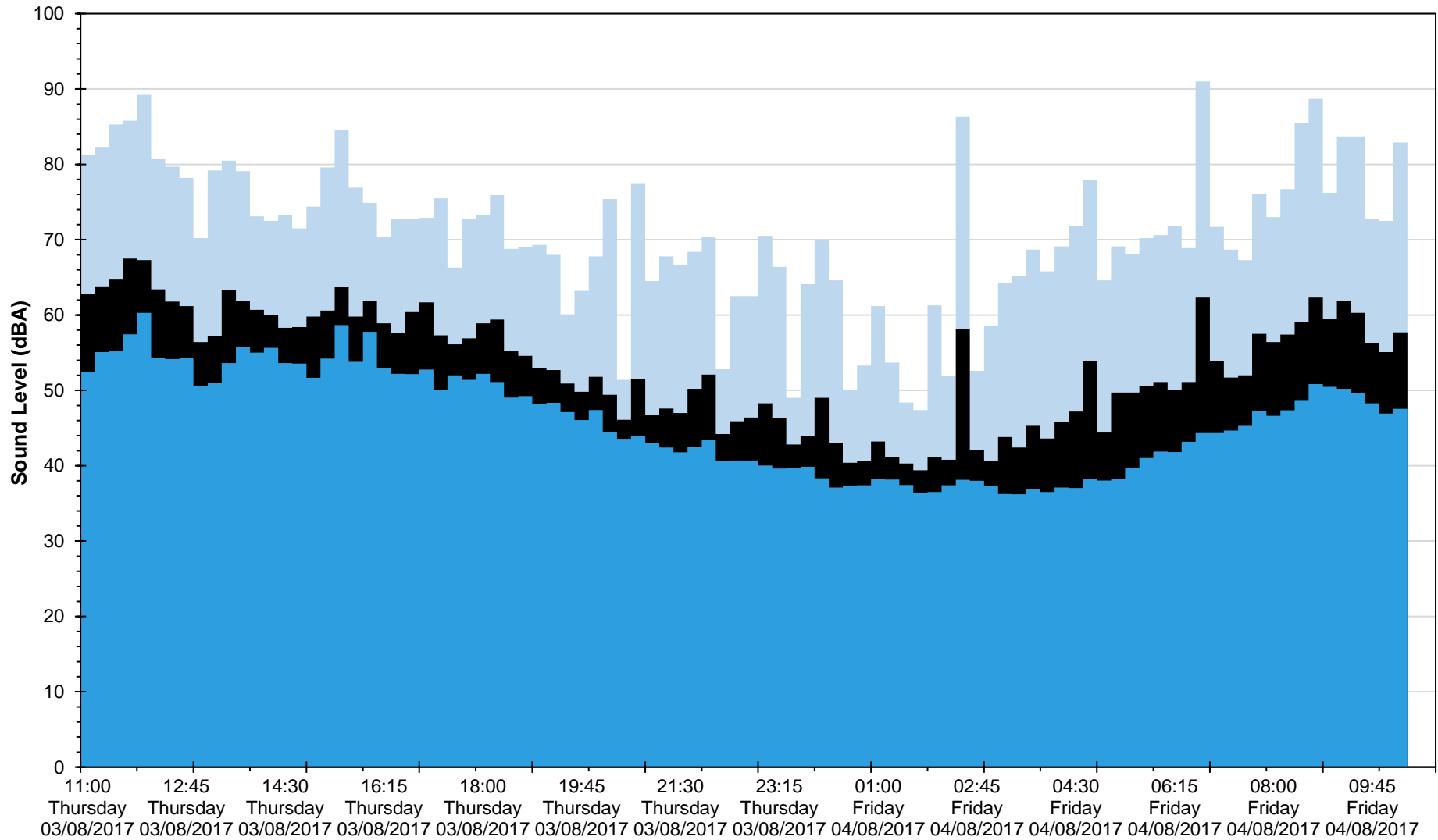
L_{Aeq} , L_{Amax} and L_{A90} Noise Levels

Thursday 3 August 2017 to Friday 4 August 2017

■ L_{Amax}

■ L_{Aeq}

■ L_{A90}



Date and Time

24675/TH2

SUITABLE SUPPLIERS

of

ACOUSTIC ENCLOSURES FOR SMALL AIR CONDITIONING UNITS

Name & Address	Telephone Number	Contact
Environ Technologies Ltd Regus House 1010 Cambourne Business Park Cambourne CB3 6DP	0870 383 3344	Steve Cox
Acoustic Engineering Services (UK) Ltd The Redwood Suite Guardian House Borough Road Godalming Surrey GU7 2AE	01483 495963	Barry Austin Mark Stagg