

SHARPS REDMORE

ACOUSTIC CONSULTANTS ▪ Established 1990



Report

**47 Circuit Lane, Reading,
RG30 3HB**

Environmental Noise
Assessment of Commercial
Plant

Prepared by

Dominic Attwell BEng(Hons), MIOA

Date 26th March 2018

Project No 1817721

T 01473 730073

E contact@sharpsredmore.co.uk

W sharpsredmore.co.uk

Regional Locations

South England (Head Office),
North England, Wales, Scotland

Sharps Redmore Partnership Limited

Registered in England No. 2593855

Directors

TL Redmore BEng(Hons), MSc, PhD, MIOA;
RD Sullivan BA(Hons), PhD, CEng, MIOA, MAAS, MASA;
DE Barke MSc, MIOA;
KJ Metcalfe BSc(Hons), MIOA



Contents

- 1.0 Executive Summary
- 2.0 Introduction
- 3.0 Assessment Methodology and Criteria
- 4.0 Survey Details and Assessment

Appendices

- Appendix A Plans
- Appendix B Noise Survey Results and Attenuation Figures

1.0 Executive Summary

- 1.1 A noise assessment has been carried out at 47 Circuit Lane, Reading to assist with retrospective change of use of 2 Nos. Outbuildings for Dental Laboratory Production Business Purposes.
- 1.2 This report comments on noise levels as a result of the functioning plant and a review has been carried out of government policy and guidance to determine the appropriate assessment methodology. In this instance, the most appropriate standard is British Standard BS 4142:2014, "Methods for rating and assessing industrial and commercial sound". This has been used to derive appropriate assessment criteria.
- 1.3 Sharps Redmore have concluded that the resultant level is 13 dB below existing background levels in a worst-case hour and this means that the plant has no adverse noise impact at the nearest sensitive garden providing up-keep of the existing garden fence.

2.0 Introduction

- 2.1 Sharps Redmore has been instructed by Nicki Broderick on behalf of Southcote Dental Laboratories to undertake an environmental noise assessment of commercial plant being operated in a residential garden at Circuit Lane, Reading.
- 2.2 It is understood that a retrospective change of use is being sought for the outbuildings situated at the rear of the existing residential house for a dental production business, which has been run from the premises by the owners since 2012.
- 2.3 The Local Authority's (Reading Borough Council) Environmental Health Department have requested that a BS 4142:2014 assessment should be undertaken to determine the impact (if any) of the proposal on the nearest residential properties; in particular the external compressor situated on Building A's south-eastern façade.
- 2.4 As per BS 4142:2014: "Methods for Rating and Assessing Industrial and Commercial Sound" a noise survey of the commercial plant has been undertaken at the site and compared to existing background and ambient levels representative of the nearest noise sensitive premises to inform a daytime assessment.
- 2.5 A plan showing the site layout, plant location and noise measurement positions is included in Appendix A and Appendix B includes a graph showing the 24 hour noise survey results and relevant calculations figures.
- 2.6 Section 3 discusses the Government's Planning Policy and relevant guidance and standards relevant to the case. The details of the survey methodology and the results are discussed in Section 4.

3.0 Assessment Methodology and Criteria

National Policy

- 3.1 The National Planning Policy Framework (NPPF) sets out the Government's economic, environmental and social planning policies for England and "these policies articulate the Government's vision of sustainable development." In respect of noise, Paragraph 123 of the NPPF states the following:

"Planning policies and decisions should aim to:

- avoid noise from giving rise to significant adverse impacts²⁷ on health and quality of life as a result of new development;
- mitigate and reduce to a minimum other adverse impacts²⁷ on health and quality of life arising from noise from new development, including through the use of conditions;
- recognise that development will often create some noise and existing business wanting to develop in continuance of their business should not have unreasonable restrictions put on them because changes in nearby land uses since they were established;²⁸ and
- identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason"

- 3.2 It can be seen that the NPPF reinforces the March 2010 DEFRA publication, "Noise Policy Statement for England" (NPSE), which states three policy aims, as follows:

"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- avoid significant adverse impacts on health and quality of life;
- mitigate and minimise adverse impacts on health and quality of life; and
- where possible, contribute to the improvement of health and quality of life."

- 3.3 Together, the first two aims require that no significant adverse impact should occur and that, where a noise level which falls between a level which represents the lowest observable adverse effect and a level which represents a significant observed adverse effect, then according to the explanatory notes in the statement:

"... all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life whilst also taking into consideration the guiding principles of sustainable development. This does not mean that such effects cannot occur."

²⁷ See Explanatory note to the Noise Policy Statement for England (Department for the Environment, Food and Rural Affairs).

²⁸ Subject to the provisions of the Environmental Protection Act 1990 and other relevant law.

3.4 It is possible to apply objective standards to the assessment of noise and the effect produced by the introduction of a certain noise source may be determined by several methods, as follows:

- i) The effect may be determined by reference to guideline noise values. British Standard (BS) 8233:2014 and World Health Organisation (WHO) *"Guidelines for Community Noise"* contain such guidelines.
- ii) Alternatively, the impact may be determined by considering the change in noise level that would result from the proposal, in an appropriate noise index for the characteristic of the noise in question. There are various criteria linking change in noise level to effect. This is the method that is suited to, for example, the assessment of noise from road traffic because it is capable of displaying impact to all properties adjacent to a road link irrespective of their distance from the road.
- iii) Another method is described within BS 4142:2014 to determine the significance of sound impact from sources of industrial and/or commercial nature. The sources that the newly revised standard is intended to assess are sound from industrial and manufacturing processes, sound from fixed plant installations, sound from loading and unloading of goods at industrial and/or commercial premises and the sound from mobile plant and vehicles, such as forklift, train or ship movements.

Guideline noise values

3.5 There are a number of guidance documents that contain recommended guideline noise values. These are discussed below.

3.6 British Standard 8233:2014 is principally intended to assist in the design of new dwellings; however, the Standard does state that it may be used in the assessment of noise from new sources being brought to existing dwellings.

3.7 The WHO advice is the most useful, comprehensive, and pertinent advice in this case, because it is not specific to the circumstances of the assessment. Instead, it provides guidance on acceptable limits in, for example, schools, dwellings and offices from noise occurring within the community.

3.8 The WHO guideline values are appropriate to what are termed "critical health effects". This means that the limits are at the lowest noise level that would result in any psychological or physiological effect. They are, as defined by NPSE, set at the Lowest Observed Adverse Effect Level (LOAEL), but do not define the level above which effects are significant (the SOAEL). Compliance with the LOAEL should, therefore, be seen as a robust aim.

3.9 The National Physical Laboratory document *"Health Effect based noise assessment methods; a review and feasibility study"*, (September 1998) contains an "interpretation" of the WHO guidelines (then in draft form) for the DETR. The summary of this section of the NPL report states *"In essence, the WHO guidelines represent a consensus view of international expert opinion on the lowest threshold noise levels below which the occurrence rates of particular effects can be assumed to be negligible. Exceedances of the WHO guideline values do not necessarily imply significant noise impact and indeed, it may be that significant impacts do not occur until much higher degrees of noise exposure are reached"* (paragraph 5.4).

- 3.10 The World Health Organisation/BS 8233 guideline noise values are summarised in the Table 3.1 below:

Table 3.1: WHO/BS 8233 guideline noise values

Document	Level	Guidance
World Health Organisation "Community Noise 2000"	$L_{AeqT} = 55 \text{ dB}$	Serious annoyance, daytime and evening. (Continuous noise, outdoor living areas)
	$L_{AeqT} = 50 \text{ dB}$	Moderate annoyance, daytime and evening. (Continuous noise, outdoor living areas).
	$L_{AeqT} = 35 \text{ dB}$	Moderate annoyance, daytime and evening. (Continuous noise, dwellings, indoors)
	$L_{AeqT} = 30 \text{ dB}$	Sleep disturbance, night-time (indoors)
	$L_{Amax} = 60 \text{ dB}$	Sleep disturbance, windows open at night. (Noise peaks outside bedrooms, external level).
	$L_{Amax} = 45 \text{ dB}$	Sleep disturbance at night (Noise peaks inside bedrooms, internal level)
BS 8233:2014 "Sound Insulation and noise reduction for buildings"	$L_{AeqT} = 55 \text{ dB}$	Upper limit for external steady noise. (gardens and patios).
	$L_{AeqT} = 50 \text{ dB}$	Desirable limit for external steady noise. (gardens and patios).
	$L_{Aeq \text{ 16 hours}} = 35 \text{ dB}$	Resting, living room day. (Internal – steady noise)
	$L_{Aeq \text{ 16 hours}} = 40 \text{ dB}$	Dining, dining room day. (Internal – steady noise)
	$L_{Aeq \text{ 16 hour}} = 35 \text{ dB}$	Sleeping, bedroom day (Internal – steady noise)
	$L_{Aeq \text{ 8 hours}} = 30 \text{ dB}$	Sleeping, bedroom night (Internal – steady noise)

- 3.11 For L_{AeqT} criteria the time base (T) given in the documents is 16 hours for daytime limits and 8 hours for night time limits.

Changes in noise level

- 3.12 Changes in noise levels of less than 3 dBA are not perceptible under normal conditions and changes of 10 dBA are equivalent to a doubling of loudness. This guidance has been accepted by inspectors, at inquiry, to encompass changes in noise levels in the index L_{AeqT} .
- 3.13 Table 3.2 below shows the response to changes in noise (known as a semantic scale); this table has been developed from general consensus opinion of acousticians.

Table 3.2: Change in noise level

Change in noise level L_{AeqT} dB	Response	Impact
<3	Imperceptible	None
3 – 5	Perceptible	Slight/moderate
6 – 10	Up to a doubling	Moderate/significant
11 – 15	More than a doubling	Substantial
>15	-	Severe

- 3.14 Where the existing ambient noise level is already above the criteria developed from the various guidance documents, it may be considered unreasonable to adopt such criteria. It would be reasonable, however, given the above statement, to consider criteria which do not exceed the existing noise climate, thus giving rise to an overall 3 dB increase i.e. the minimum perceptible. If it is less than the minimum perceptible it cannot be described as disturbing or to affect the amenity of residents.

British Standard 4142:2014

- 3.15 This British Standard enables the significance of sound impact to be determined in relation to industrial and commercial sources. The significance of sound impact is to be determined according to the following two stage process:
- 1) Assess background and residual noise levels; predict new noise levels, apply correction to predicted levels, as appropriate to arrive at a rating level and compare this rating level to the existing background level. Use this to make an initial estimate of impact; and
 - 2) Consider this level difference in the context of the site.
- 3.16 Matters which the standard recommends are relevant in order to consider context are, as shown in Table 3.3 below:

Table 3.3: BS 4142 notes on context

Factor	BS 4142 commentary	Notes
Absolute level of sound	<i>For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low.</i> <i>Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is</i>	Guidance on appropriate or significant absolute levels such as L_{Aeq} values for day or night or L_{Amax} values for night time can be found in the World Health Organisation's "Guidelines for Community Noise" and in British Standard BS 8233: 2014 "Guidance on sound insulation and noise reduction for buildings".

Factor	BS 4142 commentary	Notes
	<i>especially true at night.</i> <i>Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse.</i>	When existing levels are low, particularly at night, absolute levels will often provide a better assessment tool. At night, the L_{Amax} factor will often be the key parameter to assess potential sleep disturbance.
The character and level of the residual sound compared to the character and level of the specific sound.	<i>Consider whether it would be beneficial to compare the frequency spectrum and temporal variation of the specific sound with that of the ambient or residual sound, to assess the degree to which the specific sound source is likely to be distinguishable and will represent an incongruous sound by comparison to the acoustic environment that would occur in the absence of the specific sound. Any sound parameters, sampling periods and averaging time periods used to undertake character comparisons should reflect the way in which sound of an industrial and/or commercial nature is likely to be perceived and how people react to it.</i>	Experience and judgement will generally provide an excellent guide to determine the extent to which a specific sound might stand out or be in keeping with the existing surroundings. Whilst a technical assessment of character is sometimes desirable, it is also possible to consider character without the need for technical comparisons.
Sensitivity of receptor	<i>The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:</i> <i>i) facade insulation treatment;</i> <i>ii) ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and</i> <i>iii) acoustic screening.</i>	If the existing noise sensitive premises (NSP) already have good quality windows (acoustically) and alternative means of ventilation or screening, then this needs to be considered. The intrinsic sensitivity of a particular use is also relevant. For example, whether the NSP is a school, office or dwelling is relevant.

3.17 The potentially noisy activity in this situation is the external compressor:

3.18 The most appropriate method of assessing the potential impact of noise from this kind of operation is by reference to the methodology in BS 4142:2014.

4.0 Assessment and Survey Details

- 4.1 Attended and unattended monitoring was undertaken in the garden of 47 Circuit Lane over a 24 hour period between 13th – 14th March 2018; the measurement positions are shown in Figure A1 in Appendix A. Unattended measurements were made at Position 2, representative of daytime background noise levels at the nearest noise sensitive gardens, and close proximity source measurements were made at Position 1.
- 4.2 The noise source in question (henceforth referred to as the ‘compressor’) is currently placed at ground level within a chip-board sealed box on the eastern exterior of Building A. For the purpose of this assessment the box was ignored and noise measurements were taken with the lid kept open.
- 4.3 The instrument used to carry out the noise survey was a Norsonic 118, Type 1 precision sound level meter (SLM); with a microphone set at a height of 1.5m above ground level.
- 4.4 The SLM was set to measure the following “A” weighted parameters: L_{Aeq} , L_{A10} , L_{A90} and L_{Amax} . The measurement sample period was typically 15 minutes. Immediately before and after the measurements were carried out, the SLM was calibrated using the acoustic calibrator with no noticeable drift.
- 4.5 The weather during the survey period was suitable for noise monitoring.
- 4.6 A summary of the baseline noise levels are shown in Table 4.1 below.

Table 4.1: Summary of measurements taken at long term monitoring Position 2

Survey results summary (13-14/03/2018)	
Typical $L_{Aeq, 16hr}$ day, dB	Typical lowest daytime background level ($L_{A90, 1hour}$), dB
49	39

Full data is shown graphically in in Figure B1 Appendix B.

BS 4142:2014 Assessment

- 4.7 Following the guidance in BS 4142:2014 the noise source was measured at 1m (Position 1 in Figure A1 in Appendix A) with it operating at full power. This was repeated several times and measurements were taken at the same position with the equipment switched off.
- 4.8 The average ambient noise level with the unit on was 48 dB, L_{Aeq} at 1 metre from the unit and the residual noise level (when equipment was switched off) was 44 dB, L_{Aeq} .
- 4.9 It is understood that the compressor is very rarely in operation, only used during daytime hours and typically only operational a few minutes in a given day (if at all). To ensure a robust assessment, a worst case hour is considered, with the equipment functioning for 10% of that time (6 minutes).
- 4.10 The nearest sensitive receptor to the source in question is the adjacent residential garden. The rear of the garden is situated within 2m of the compressor separated by wooden garden fence (of approximately 1.6 – 1.8m).

- 4.11 The following table (Table 5.2) describes the steps taken to assess the impact of the equipment at the worst-case receptor.

Table 4.2: BS 4142 Assessment Breakdown

BS 4142 - Assessment of compressor		
Results	Sound Level, dB	Relevant clause
Residual noise level (plant not operating), L_{Aeq}	44	7.3.3
Measured ambient sound level (plant operating), L_{Aeq}	48	7.3.1
Specific sound Level (compressor), L_{Aeq}	45	7.3.4
Acoustic feature correction	0	9.2
On time correction (assuming runs 6 minutes in a worst-case hour)	-10	7.2
Rating Level	35	9.2
Background Sound Level (plant not operating), L_{A90}	39	8.3
Barrier attenuation, dB	-9	See Figure A2
Resultant level at nearest sensitive receptor	26	
Resultant level is 13 dB below background in a worst-case hour		

- 4.12 For the purposes of BS 4142:2014 if the plant were to operate 10 dB above the measured background level this could indicate a significant adverse impact (known as the Significant Observable Adverse Effect Level or "SOAEL"). Similarly the Lowest Observable Adverse Effect Level (LOAEL) is usually set at 0 dB above background. Therefore in this context the compressor satisfies the requirement of the standard, being 13 dB below the LOAEL.
- 4.13 It is however understood that Reading Borough Council seek to prevent ambient level creep by requiring any new plant to be 10 dB below the background noise level at the nearest sensitive receptor. The unit in question satisfies this local aim.

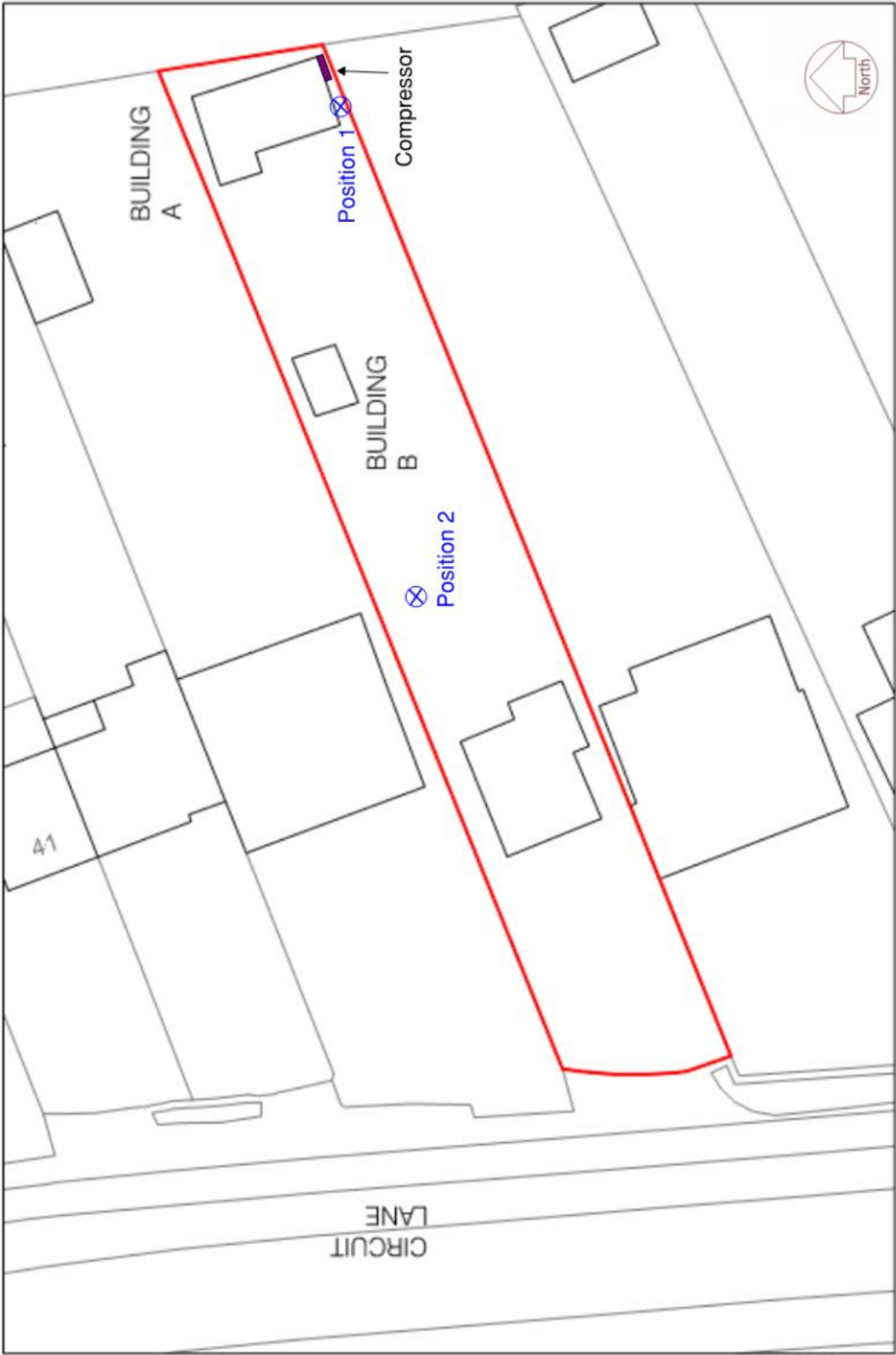
Conclusions

- 4.14 The results have been assessed using BS 4142:2014 as the most appropriate method for rating and assessing industrial sound. Based on the results obtained it can be demonstrated that the compressor can operate without any adverse or significant impact from noise at the nearest residential amenity space when compared to the representative background levels measured.
- 4.15 No further mitigation is required however the garden fence separating the plant to the south eastern receptor will need to be maintained to a good standard to ensure continued effective screening.

APPENDIX A

PLANS

Figure A1: Site map indicating noise source and survey measurement positions



APPENDIX B

NOISE SURVEY RESULTS & ATTENUATION FIGURES

Figure B1: Graph of survey results for Position 2 (13th – 14th March 2018)

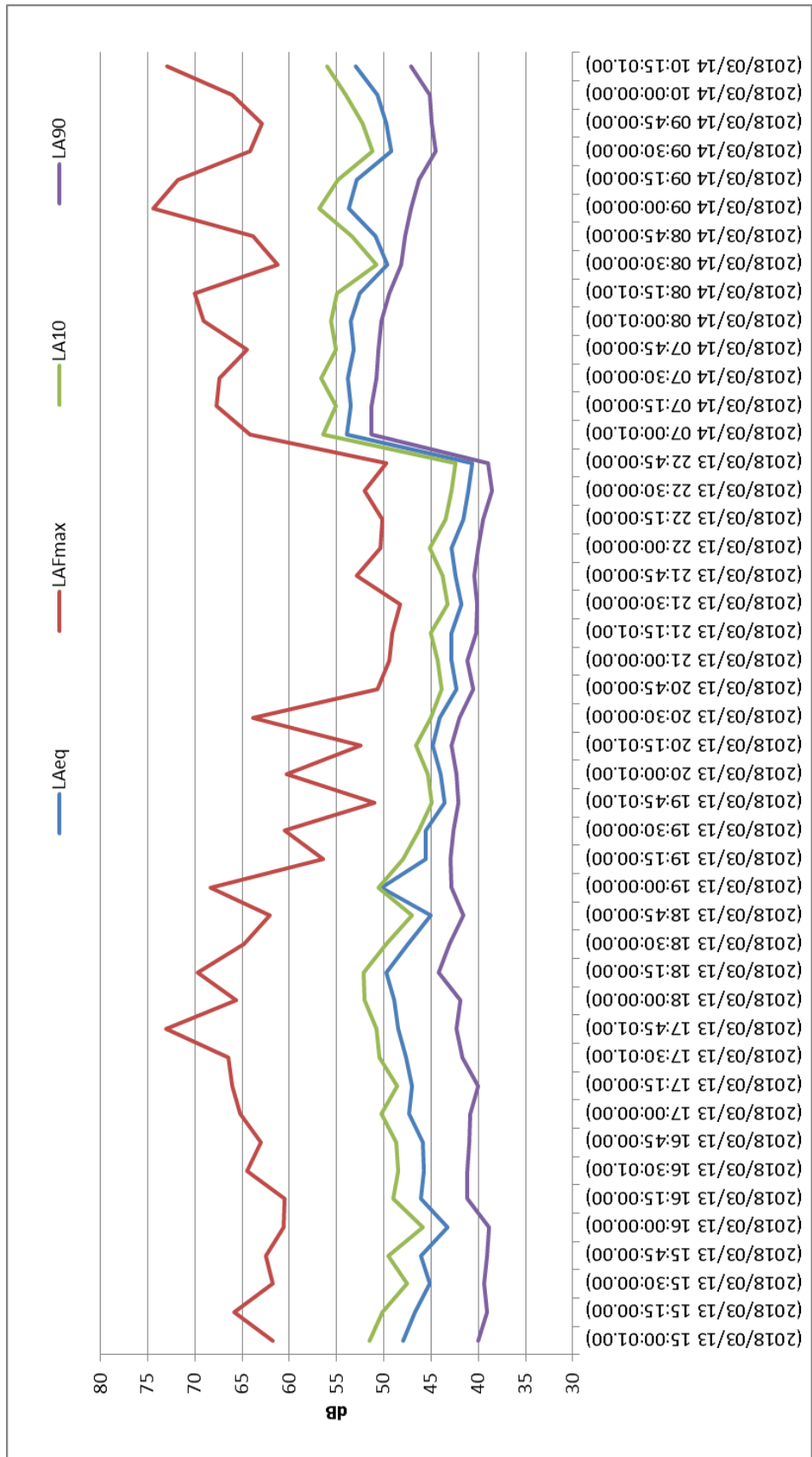
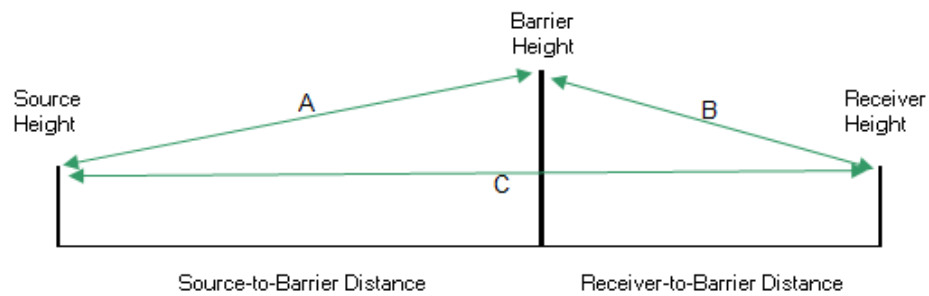


Figure B2: Garden fence attenuation calculation

Date:	20.03.2018
Project:	Circuit Lane, Reading
Project No:	1817721

User input these cells



Source-to-Barrier Distance	15 m
Receiver-to-Barrier Distance	2.0 m

Source Height	0.7 m
Receiver Height	2.0 m
Barrier Height	1.7 m

Path difference = 0.092 m
 $(a + b) - c$

Frequency - Hz	63	125	250	500	1K	2K	4K	8K	Attenuation
Attenuation - dB	6	6	8	9	11	14	17	19	9.2 dBA