Gas House, Raby Estates

Noise impact assessment

9153.1

18th August 2021

Revision B

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A	First issue	EC	21st June 2021
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1 Contents

2 Summary

2.1 This report has been prepared in support of a Planning Application for the conversion of an existing Gas House building on the Raby Estate to a new Energy Centre.

2.2 Background sound levels have been measured at a position considered representative of the identified noise-sensitive receptors, which has been used to set the noise emission limits for the proposed plant associated with the Energy Centre.

2.3 Plant details have not been made available and therefore the cumulative maximum noise levels for plant within the Energy Centre have been calculated to achieve the noise emission limits at the noise-sensitive receptors.

2.4 Based on the calculation results, all plant items to be installed in the Energy Centre shall be specified such that the cumulative noise shall not cause the internal noise level within the Energy Centre to exceed 74 dB(A) as calculated.

2.5 The potential noise impact is calculated and rated in accordance with BS 4142.

2.6 If the limits for internal noise levels are met, Energy Centre is likely to have a low impact on the nearest noise sensitive receptors and would be considered to be a LOAEL in alignment with the NPSE aims.

4 Introduction

4.1 The conversion of an existing building to a new Energy Centre has been proposed on the Raby Estate; the site location is shown in Figure 1.

4.2 Apex Acoustics has been commissioned to undertake a noise survey and assessment of the noise from mechanical plant associated with the development in support of a Planning Application.

4.3 The scope of our instruction includes:

- Measurement of the existing noise environment over a 24-hour period at a location representative of the nearest noise-sensitive receptor;
- Calculation of maximum noise levels for plant within the Energy Centre to satisfy the aims of the NPPF and NPSE.

4.4 This report presents the evaluation of the potential noise impact from the proposed plant at the nearest noise-sensitive receptor (NSR).

4.5 The NSRs are identified as the residential properties to the east of the proposed Energy Centre on Keverstone Bank.

4.6 The potential noise impact is calculated and rated according to the BS 4142 methodology, Reference 1.

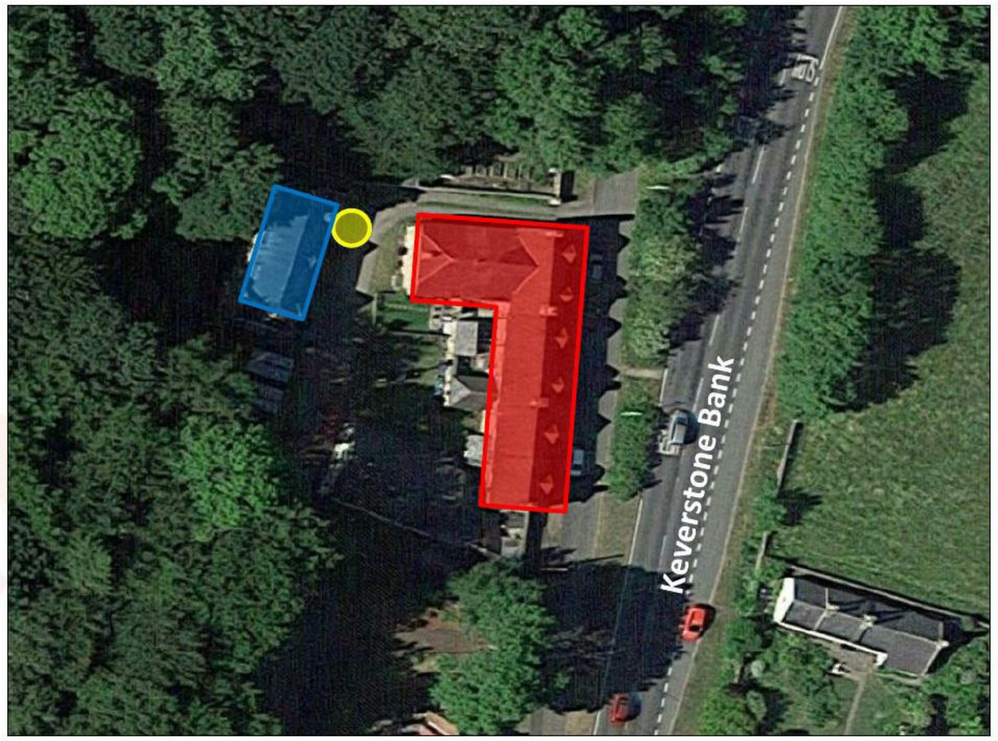


Figure 1: Proposed site (blue), measurement position (yellow) and identified NSR (red)

5 Planning policy and noise criteria

5.1 **National Planning Policy Framework (NPPF)**

5.2 The National Planning Policy Framework (NPPF) Reference 2, sets out the Government's planning policies for England and how these should be applied. It provides a framework within which locally-prepared plans for housing and other development can be produced. In respect of noise, Paragraph 170, 180 and 182 of the NPPF states the following:

5.3 Paragraph 170:

"e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution…"

5.4 Paragraph 180:

"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; … "

5.5 Paragraph 182:

"Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed."

5.6 **Noise Policy Statement for England (NPSE)**

5.7 The Noise Policy Statement for England, Reference 3, 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."

5.8 The NPSE defines adverse noise impact as follows:

- No Observed Effect Level (NOEL)
  This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.
- Lowest Observed Adverse Effect Level (LOAEL)
  This is the level above which adverse effects on health and quality of life can be detected.
- Significant Observed Adverse Effect Level (SOAEL)
  This is the level above which significant adverse effects on health and quality of life occur

5.9 The first two aims of the NPSE 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."

5.10 **Planning Practice Guidance – Noise**

5.11 Further Government guidance on how planning can manage potential noise impact in new development is outlined in Planning Practice Guidance (PPG-N) notes on the Government website: www.gov.uk/guidance/noise--2

5.12 **BS 4142**

5.13 The terminology used in BS 4142 to describe the various levels of potential adverse impact is respect to the PPG-N noise hierarchy, are summarised Appendix A.

6 Existing acoustic environment

6.1 The existing acoustic environment was measured for a 24-hour period from 10:22 hours on the 1st June 2021.

6.2 The measurement position is shown in Figure 1.

6.3 The microphone was located 2.2 metres above ground level and away from other reflecting surfaces such that the measurements are considered free-field.

6.4 Data was recorded in single-octave band frequencies at one-second intervals throughout the 24-hour measurement period.

6.5 The most significant noise sources were road traffic noise from Keverstone Bank and birdsong.

6.6 During the measurement period, weather conditions were dry with wind speeds of less than 5 m/s.

6.7 The equipment used is listed in Table 1.

Equipment	Model	Serial no.
Sound Level Meter	NTi XL2	A2A-05832-E0
Calibrator	Larson Davis CAL 200	9462

Table 1: Equipment used

6.8 Both meter and calibrator have current calibration certificates traceable to national standards. The sound level meter has been calibrated within the last two years and calibrator has been calibrated within the last year in accordance with the guidance of BS 4142; calibration certificates are available on request.

6.9 The equipment was field-calibrated before and after the measurements with no significant drift in sensitivity noted.

6.10 **Residual sound level, L_r**

6.11 As the specific sound source under assessment is not yet operating on-site, the existing acoustic environment measured during the survey period is the L_r.

6.12 A time history of the measured L_r is shown in Appendix B.

6.13 **Background sound level**

6.14 The background sound level, $L_{A90,\ 15\text{-}min}$ is calculated from the L_r, $L_{Aeq,}$ 15-min with results shown in Table 5 of Appendix B.

6.15 Statistical analysis is undertaken of the results of all the $L_{A90,\ 15\text{-}min}$ data following the guidance of BS 4142, to determine a background sound level considered to be representative of the assessment period. Results of the analysis are shown in Figure 3 and Figure 4 in Appendix B.

6.16 Based on the statistical analysis results, the background sound level considered representative of the daytime and night time assessment periods are shown in Table 2.

Assessment period	$L_{A90,15min}$ (dB)
Daytime (07:00 – 23:00 hrs)	47
Night time (23:00 – 07:00 hrs)	39

Table 2: Background sound levels representative of the assessment periods

7 Noise impact assessment

7.1 **Noise emission limits**

7.2 Noise levels from the proposed plant are proposed to not exceed 39 dB(A) at the nearest noise sensitive receptor.

7.3 This is equal to the measured night-time background noise level, and therefore would indicate the likelihood of a LOAEL once the plant has been installed.

7.4 **Assumptions**

7.5 The plant is assumed to operate continuously throughout the daytime and night-time.

7.6 The closest distance from the Energy Centre and noise sensitive receptor has been taken as 10 m.

7.7 The building envelope (including façade, windows and doors) of the Energy Centre have been assumed to provide sound reduction index, R, of 15 dB(A). This is considered to be a conservative estimate of the sound insulation that the existing Gas House building can provide, and is considered to provide a robust noise impact assessment.

7.8 **Maximum noise levels for proposed plant**

7.9 Plant details have not been made available and therefore the cumulative maximum noise levels for plant within the Energy Centre have been calculated.

7.10 Based on the resultant noise level from the plant, L_R, not exceed the background level of 39 dB(A) at the nearest NSR, the following equation was used to provide distance correction in order to determine the noise level from the plant directly outside the Energy Centre:

$$Noise\ level\ outside\ Energy\ Centre = L_R - 20\log(r)$$

Where r is the distance between the Energy Centre and the noise sensitive receptor, 10 m.

7.11 The maximum internal noise levels for plant were calculated using the following equation:

$$Maximum\ internal\ noise\ level\ from\ plant = Noise\ level\ outside\ Energy\ Centre + R$$

7.12 The following summarises the calculation results as described above:

Parameter	Equation	Value	Description
L_R	-	39 dB(A)	Resultant level from plant at nearest noise sensitive receptors, equal to the measured background sound level
R	-	10 m	Distance between the nearest noise sensitive receptor and the façade of the Energy Centre
L_w	L_R - 20log(r)	59 dB(A)	Noise level from plant outside of the Energy Centre
R	-	15 dB(A)	Sound reduction index of the Gas House building envelope
-	L_w - R	74 dB(A)	Maximum internal noise level inside the Energy Centre

Table 3: Parameters used in calculations

7.13 As can be seen above, the calculated maximum cumulative noise level for all plant within the Energy Centre is 74 dB(A).

7.14 The maximum internal noise level refer to cumulative noise of all plant sound sources operating simultaneously.

8 Conclusion

8.1 The maximum cumulative noise level for the plant inside the Energy Centre has been calculated and the impact on the nearest noise sensitive receptors has been assessed.

8.2 Considering the context of the existing acoustic environment the assessment result indicates that the cumulative internal noise levels from plant should not exceed 74 dB(A).

8.3 This would indicate the likelihood of a low impact which would be considered to be a LOAEL in alignment with the NPPF and NPSE aims.

9 References

1 BS 4142 2014: A1+2019, Method for rating and assessing industrial and commercial sound.

2 National Planning Policy Framework, Ministry of Housing, Communities & Local Government, February 2019.

3 Noise Policy Statement for England, Department for Environment, Food and Rural Affairs, March 2010.

4 ISO 12913-1:2014 Acoustics, Soundscape, Part 1: Definition and conceptual framework

Appendix A Noise exposure hierarchy

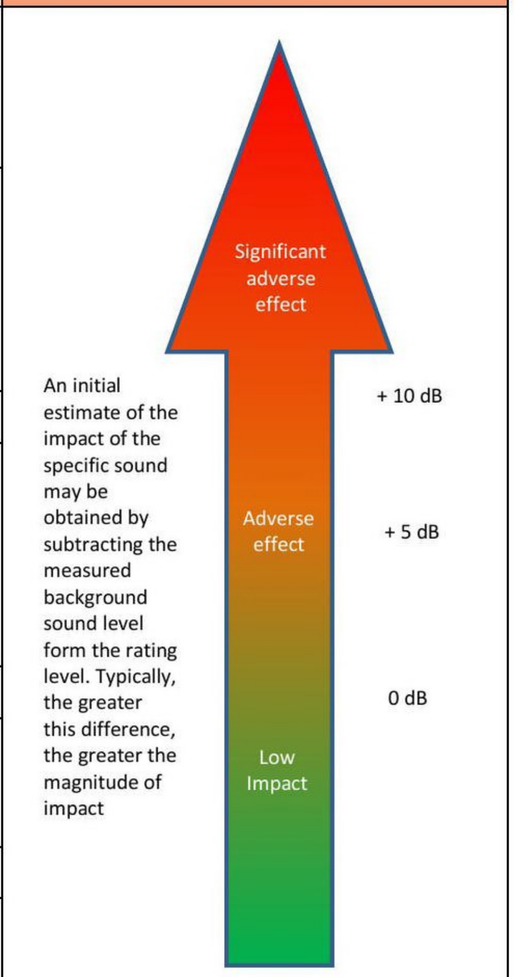
Planning Practice Guidance - Noise				BS 4142: Initial estimate of external noise risk significance
Noise	***Example of outcomes***	***Increasing effect level***	***Action***	
Present and very distributive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	**Prevent**	
Present and distributive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	**Avoid**	
Significant Observed Adverse Effect Level (SOAEL)				
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	**Mitigate and reduce to a minimum**	
Lowest Observed Adverse Effect Level (LOAEL)				
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	**No specific measures required**	
No Observed Adverse Effect Level (NOAEL)				
Not present	No effect	No Observed Effect	**No specific measures required**	
No Observed Effect Level (NOEL)				

Table 4: PPG-N Noise Exposure Hierarchy and BS 4142 initial estimate of impact

Appendix B Residual and background sound levels

B.1 Residual sound level time history, $L_{Aeq,\ 5\text{-}min}$

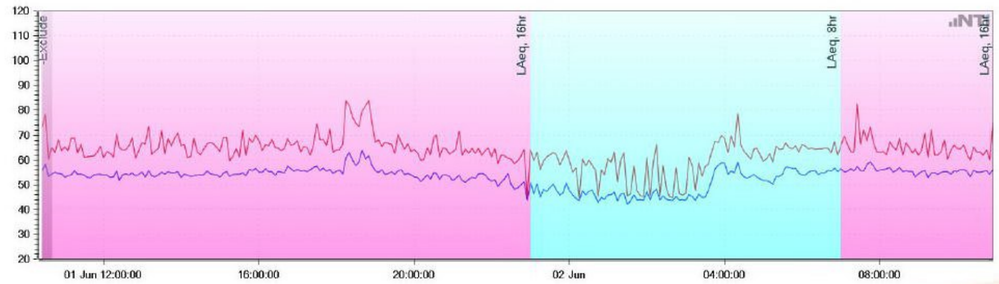


Figure 2: Residual sound level time history, $L_{Aeq,\ 5\text{-}min}$ (dB) shown as blue

B.2 Background sound level data, $L_{A90,\ 15\text{-}min}$

B.3 The measured daytime and night time $L_{A90,15min}$ levels are shown in Table 5.

Date and Time (hh:mm)	$L_{A90,15\text{-}min}$ (dB)	Time (hh:mm)	$L_{A90,15\text{-}min}$ (dB)	Time (hh:mm)	$L_{A90,15\text{-}min}$ (dB)
01/06/2021 10:30	48	01/06/2021 18:45	50	02/06/2021 03:00	44
01/06/2021 10:45	47	01/06/2021 19:00	47	02/06/2021 03:15	44
01/06/2021 11:00	47	01/06/2021 19:15	46	02/06/2021 03:30	45
01/06/2021 11:15	49	01/06/2021 19:30	48	02/06/2021 03:45	52
01/06/2021 11:30	46	01/06/2021 19:45	42	02/06/2021 04:00	50
01/06/2021 11:45	49	01/06/2021 20:00	43	02/06/2021 04:15	50
01/06/2021 12:00	45	01/06/2021 20:15	45	02/06/2021 04:30	50
01/06/2021 12:15	46	01/06/2021 20:30	45	02/06/2021 04:45	48
01/06/2021 12:30	48	01/06/2021 20:45	45	02/06/2021 05:00	47
01/06/2021 12:45	48	01/06/2021 21:00	41	02/06/2021 05:15	47
01/06/2021 13:00	45	01/06/2021 21:15	40	02/06/2021 05:30	53
01/06/2021 13:15	47	01/06/2021 21:30	43	02/06/2021 05:45	49
01/06/2021 13:30	48	01/06/2021 21:45	40	02/06/2021 06:00	48
01/06/2021 13:45	46	01/06/2021 22:00	43	02/06/2021 06:15	47
01/06/2021 14:00	47	01/06/2021 22:15	44	02/06/2021 06:30	48
01/06/2021 14:15	47	01/06/2021 22:30	41	02/06/2021 06:45	49
01/06/2021 14:30	47	01/06/2021 22:45	43	02/06/2021 07:00	48
01/06/2021 14:45	48	01/06/2021 23:00	42	02/06/2021 07:15	49
01/06/2021 15:00	47	01/06/2021 23:15	40	02/06/2021 07:30	51
01/06/2021 15:15	47	01/06/2021 23:30	41	02/06/2021 07:45	51
01/06/2021 15:30	48	01/06/2021 23:45	40	02/06/2021 08:00	51
01/06/2021 15:45	50	02/06/2021	41	02/06/2021 08:15	50
01/06/2021 16:00	50	02/06/2021 00:15	40	02/06/2021 08:30	49
01/06/2021 16:15	47	02/06/2021 00:30	39	02/06/2021 08:45	46
01/06/2021 16:30	51	02/06/2021 00:45	39	02/06/2021 09:00	49
01/06/2021 16:45	50	02/06/2021 01:00	39	02/06/2021 09:15	49
01/06/2021 17:00	51	02/06/2021 01:15	39	02/06/2021 09:30	50
01/06/2021 17:15	51	02/06/2021 01:30	39	02/06/2021 09:45	48
01/06/2021 17:30	49	02/06/2021 01:45	43	02/06/2021 10:00	51
01/06/2021 17:45	50	02/06/2021 02:00	39	02/06/2021 10:15	50
01/06/2021 18:00	49	02/06/2021 02:15	39	02/06/2021 10:30	51
01/06/2021 18:15	52	02/06/2021 02:30	44	02/06/2021 10:45	50
01/06/2021 18:30	52	02/06/2021 02:45	41	-	

Table 5: Measured background sound levels, $L_{A90,\ 15\text{-}min}$

B.4 Analysis to determine the typical background sound level representative of the daytime and night-time period is undertaken following the guidance of BS 4142, with results shown in Figure 3 and Figure 4 respectively.

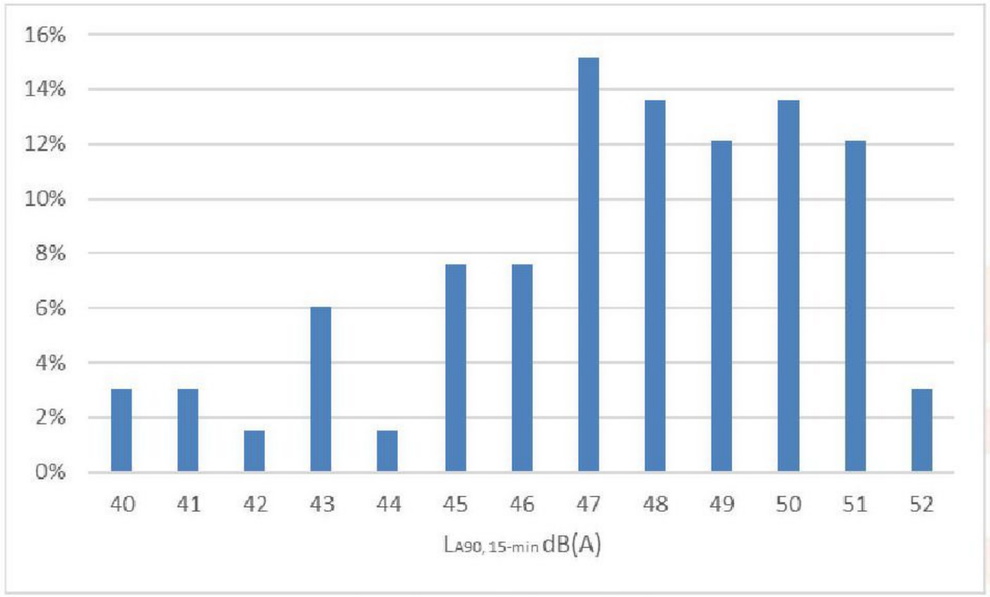


Figure 3: Analysis of daytime background levels, $L_{A90,\ 15\text{-}min}$

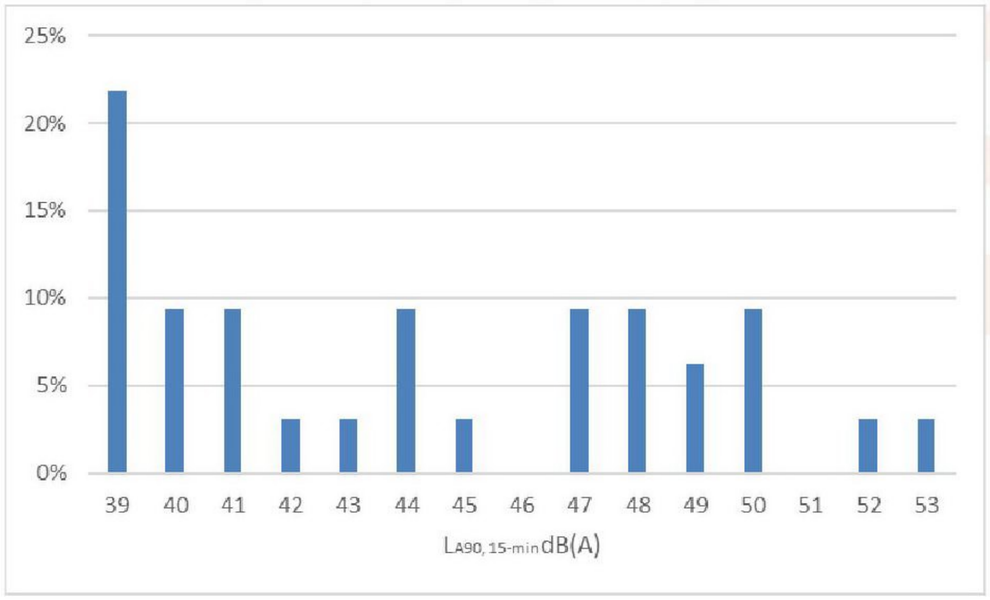


Figure 4: Analysis of night-time background levels, $L_{A90,\ 15\text{-}min}$

Appendix C Context of acoustic environment

C.1 The context can be expressed in relation with the soundscape, as defined in BS ISO 12913-1, Reference 4.

C.2 ISO 12913-1 states that:

C.3 "The context may influence soundscape through the auditory sensation, the interpretation of auditory sensation and the responses to the acoustic environment."

C.4 The process of experiences that describe soundscape and illustrated in Figure 5.

C.5 The acoustic environment is defined as being:

C.6 "… the sound from all sound sources modified by the environment. Modification by the environment includes effects on sound propagation, resulting for example from meteorological conditions, absorption, diffraction, reverberation and reflection."

C.7 The auditory sensation is described as:

C.8 "… a function of neurological processes that begin when auditory stimuli reach the receptors of the ear. This is the first stage in detecting and representing the acoustic environment. Auditory sensation is influenced by masking, spectral contents, temporal patterns and spatial distribution of the sound sources."

C.9 The interpretation of auditory sensation refers to

C.10 "… unconscious and conscious processing of the auditory signal to create useful information, which may lead to awareness or understanding of the acoustic environment. Awareness of the acoustic environment, in context, represents an experience of the acoustic environment."

C.11 Responses describe the short-term reactions and emotions while the outcomes refer to the overall, long-term consequences facilitated or enabled by the acoustic environment.

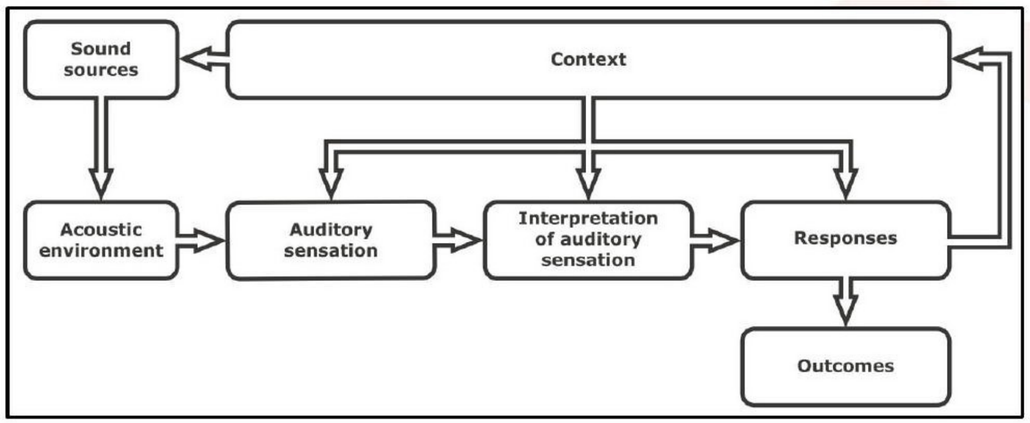


Figure 5: Elements in the perceptual construct of soundscape

C.12 The Planning Practice Guidance notes on noise state that the impact is categorised as SOAEL when "noticeable and disruptive". It details:

C.13 "The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise."

C.14 Such effect is typically defined as a difference between the BS 4142 rating level and the background level of +10 dB, depending on the context, and should be avoided on a regular basis.

Appendix D Professional qualifications and competence

D.1 All Apex Acoustics consultants work under the close supervision of a member who holds qualification in acoustics and is a member of the IOA.

D.2 This can be verified by searching the Institute of Acoustics' list of Members, available here, with the surname of the consultant.

http://www.ioa.org.uk/membership-check

D.3 Apex Acoustics is a member of the Association of Noise Consultants (ANC). The ANC is a trade organisation which seeks to raise the standards of acoustic consultancy and as such there are barriers to entry to ensure member's competency.

D.4 This report has been completed and checked by an appropriately qualified and experienced acoustic consultant.