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Technical Report:

Site Survey & Noise Impact
Assessment for Gravesend BESS off
Thames Way, Norfleet, Gravesend
DA11 8HL

dBc 11086

Noise Impact Assessment

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Rev 1	Draft for approval	31 st July 2025



1. Executive Summary

- 1.1. dB Consultation Limited (dBc) has produced a noise impact assessment, in accordance with BS 4142 methodology, to accompany the planning application for a new BESS development on land adjacent to Thames Way, Norfleet, Gravesend DA11 8HL.
- 1.2. The assessment considered four receptor locations, NSR1 to NSR4, surrounding the site, as shown in Fig.1.
- 1.3. The acoustic environment at the receptor locations comprised of road, rail and air traffic noise, sewage works noise, commercial noise, bird song, footfall and conversation.
- 1.4. Ambient and background sound monitoring was undertaken at three locations, P1, P2 and P3 at times between 30th June and 3rd July 2025.
- 1.5. The presentative night-time background sound levels, used in the assessment, were $L_{A90,15min}$ 51dB at NSR1 and NSR4, $L_{A90,15min}$ 42dB at NSR2 and $L_{A90,15min}$ 43dB at NSR3. **See Section 6 for details.**
- 1.6. The specific sound levels at NSR1 to NSR4 were determined by noise model for two different scenarios, no fence/fence installed. **See Section 5 for details.**
- 1.7. The assessment indicates a low impact at all receptor locations with or without the proposed acoustic fence installed. **See Section 7 for details.**
- 1.8. At all the receptors the specific sound level is **significantly** below the lowest and average night-time ambient sound levels measured at P1, P2 and P3.
- 1.9. For residential receptors, NSR2 and NSR3, it is unlikely that the BESS noise emission would disturb sleep.
- 1.10. The acoustic fence does provide a benefit to the receptors but may only be required when Local Authority acoustic criteria is known.
- 1.11. The assesment shows that there is no need to install the inverters with a silencer kit.
- 1.12. No mitigation measures are required for this development.

2. Introduction

- 2.1. Speedgreen (Thames Way) Limited will submit a planning application for a Battery Energy Storage Site (BESS) on land adjacent to Thames Way, Norfleet, Gravesend DA11 8HL.
- 2.2. The site will consist of 20no. Solbank 3.0 BESS, 10no. SMA SC 4600 UP with Silencer Kit and 1no. 132Kv/50MVA transformer.
- 2.3. dBc Ltd has been commissioned to construct a noise model and undertake a BS 4142:2014 noise impact assessment to accompany the planning application.
- 2.4. The site surveys were conducted by Samantha Riley of dB Consultation Limited.
- 2.5. The noise model and report has been constructed and written by Mick Lane BSC (Hons) DipIOA MIOA of dB Consultation Limited (dBc), a practicing acoustician for over 18 years, Full Member of the Institute of Acoustics (MIOA) and experienced in noise assessment in many industrial and commercial sectors.
- 2.6. The report has been reviewed by Danny Blacklock BEng(Hons) MSc CEng MIOA MIET Managing Director at dB Consultation Limited, a practicing acoustician for over 25 years, Full Member of the Institute of Acoustics (MIOA) and experienced in noise assessment in many industrial and commercial sectors.



3. Relevant Standards and References

BS 4142:2014 A1-2019 Method for rating and assessing industrial and commercial sound

- 3.1. BS 4142 provides a robust method for 'rating' external noise levels from factories, industrial premises, or fixed installations of an industrial nature. The methods described in this British Standard use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.
- 3.2. The method is based on the difference between the background noise level without the industrial noise and the specific noise level of the industrial noise source at the receiver location.
- 3.3. The noise level from the industrial source (referred to as the specific noise level) can be weighted to determine a rating level by adding acoustic penalties for tonality, intermittency, impulsivity or acoustic features that make the sound distinctive, penalties are applied for their impact at the receptor location. These methods refer to a sliding scale between +0dB up to +9dB, depending on the severity and can be combined for different acoustical features.
- 3.4. The background noise level is then subtracted from the rating level (the specific noise level plus any acoustic penalties) and the difference used to assess the impact, as shown in the Table 1 below.

Difference	Assessment
Around +10dB or more	Indication of Significant Adverse Impact
Around +5dB	Indication of an Adverse Impact
0dB or below	Indication of Low Impact

Table 1: Explanation of BS 4142:2014 assessment terms

- 3.5. BS 4142 Section 11 Note 2 states that '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 especially true at night'.



4. Site Layout

- 4.1. The site, marked in red, is sandwiched between Thames Way (A226), Northfleet and a Thames Water Sewage Works. Ebbsfleet International railway is to the north west, Springhead Enterprise Park is to the south-east. The acoustic environment is dominated by road traffic, plant on the sewage works and commercial area and birdsong. The four receptor locations NSR1 to NSR4 and three sound monitoring locations P1, P2 and P3 have been marked.



Fig. 1: Site location and surrounding area

4.2. Fig. 2 shows a detailed plan of the Gravesend BESS.

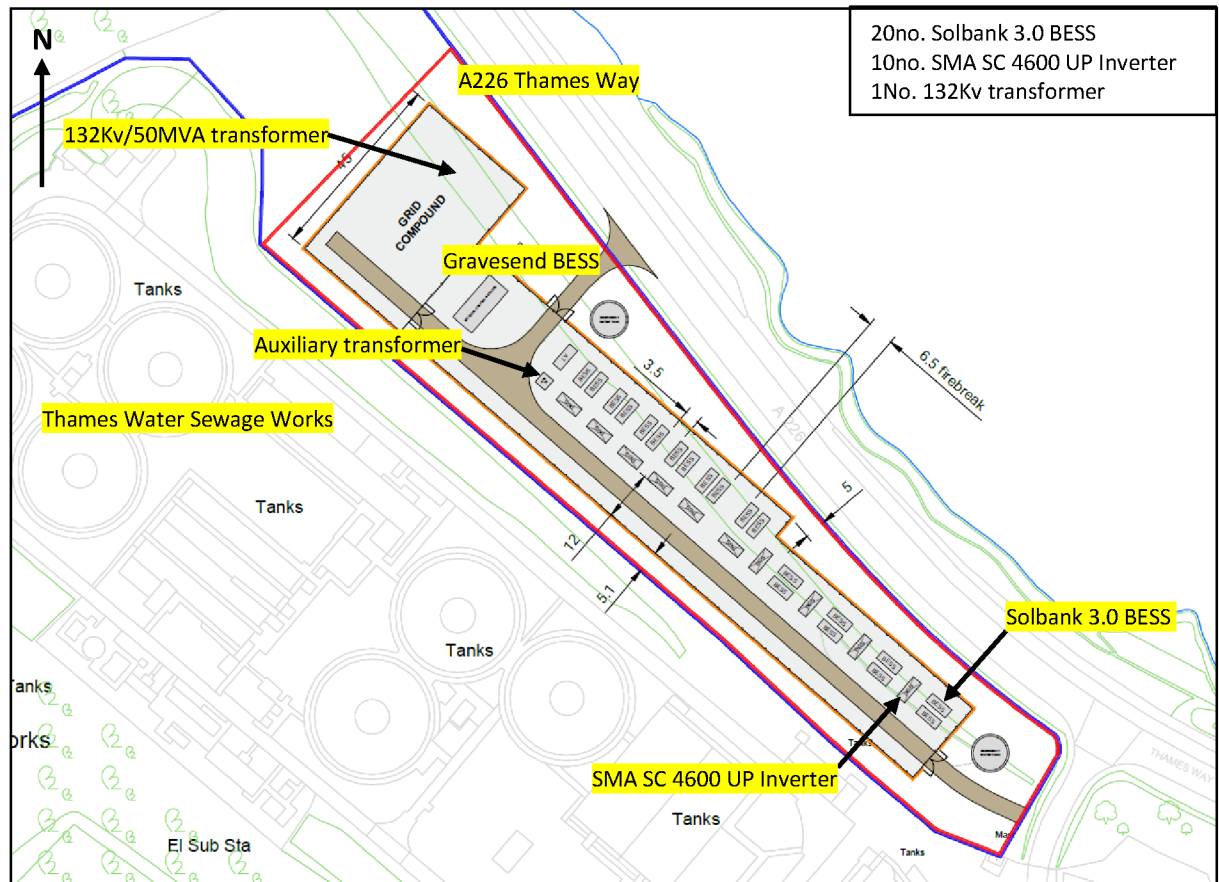


Fig. 2: Gravesend BESS Layout

5. Specific Sound Level

- 5.1. The specific sound level was determined at the four receptor locations using a CadnaA noise model.
- 5.2. The BESS equipment has been assumed to operate at 100% power rating (60% cooling fan speed) for any time period during the day or night. A night-time (23:00 – 07:00) assessment has been undertaken.
- 5.3. The client supplied the details and sound power levels for the BESS equipment see Table 2 below.

Equipment	Quantity	Sound Power Level L_{WA} dB
Solbank 3.0 BESS (60% fan speed)	20	75.8
SMA SC4600 UP Inverter (no silencer)	10	91.9
132kV/50MVA transformer	1	68.0 (ONAN) 86.0 (ONAF)
Auxiliary transformer	1	65.0 (ONAN)

Table 2: BESS equipment sound power levels

- 5.4. From previous studies, dBc has the one third octave spectral breakdown of the BESS (report reference: *0.5P SolBank3.0 Noise Test Report_CSI_RevA April 2024*) and Inverter (report reference: *TR_EMCS3950UP-XT_Acoustic_10E5023*) sound emission.
- 5.5. The transformers were modelled at 100Hz emission only.
- 5.6. The client has indicated that following the granting of permission, if required to meet acoustic criteria, they would consider the erection of a 4mH acoustic fence around the BESS and Grid compounds.
- 5.7. dBc has determined receptor specific sound levels **with** and **without** the fence in place.

5.8. Fig. 3 to 6 show the plans and dimensions of the BESS equipment.

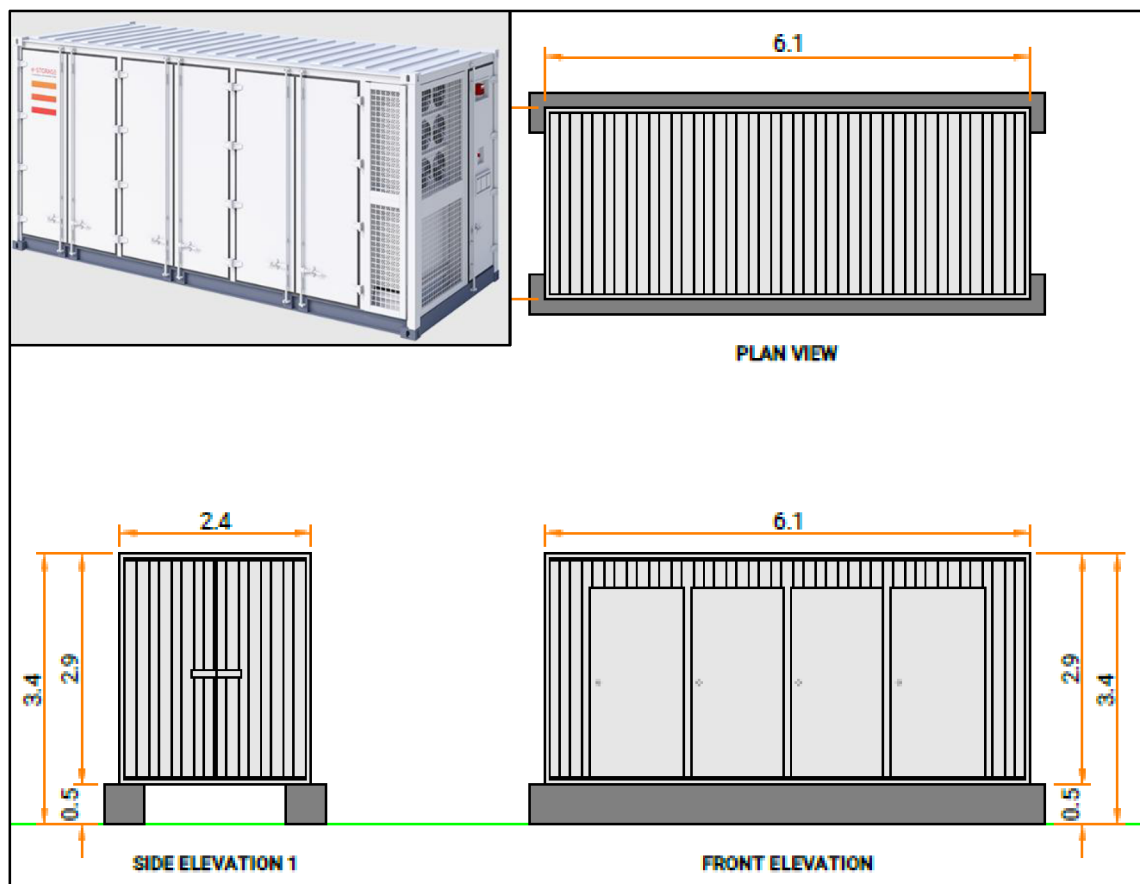


Fig. 3: Solbank 3.0

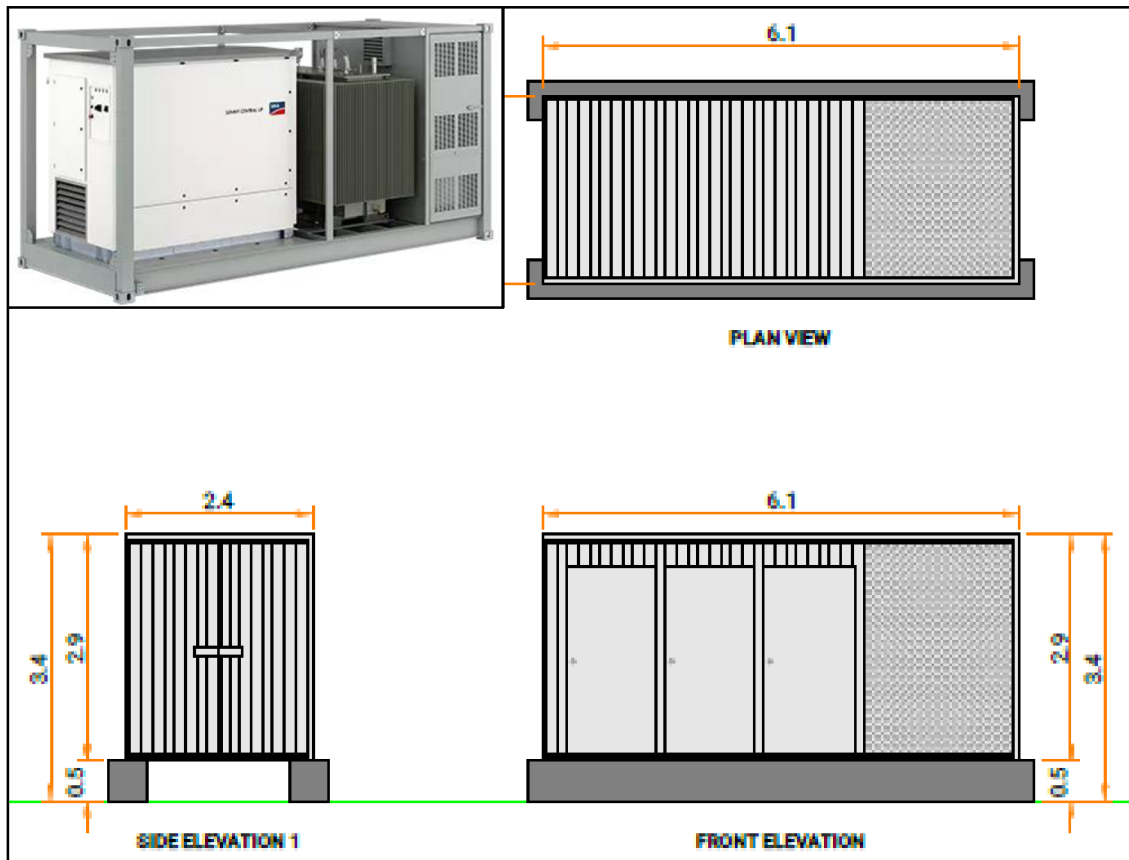


Fig. 4: SMA SC4600 UP Inverter

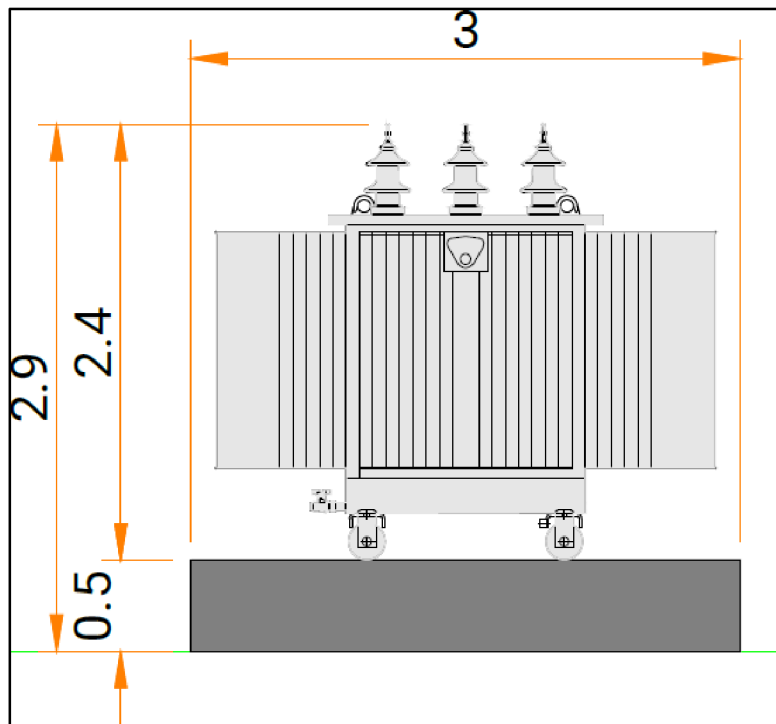


Fig. 5: Auxiliary Transformer

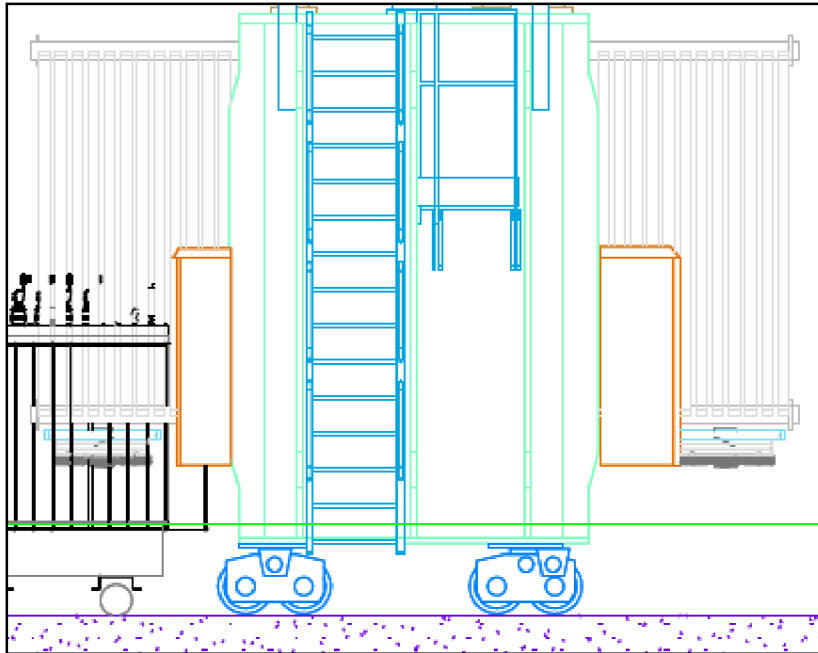


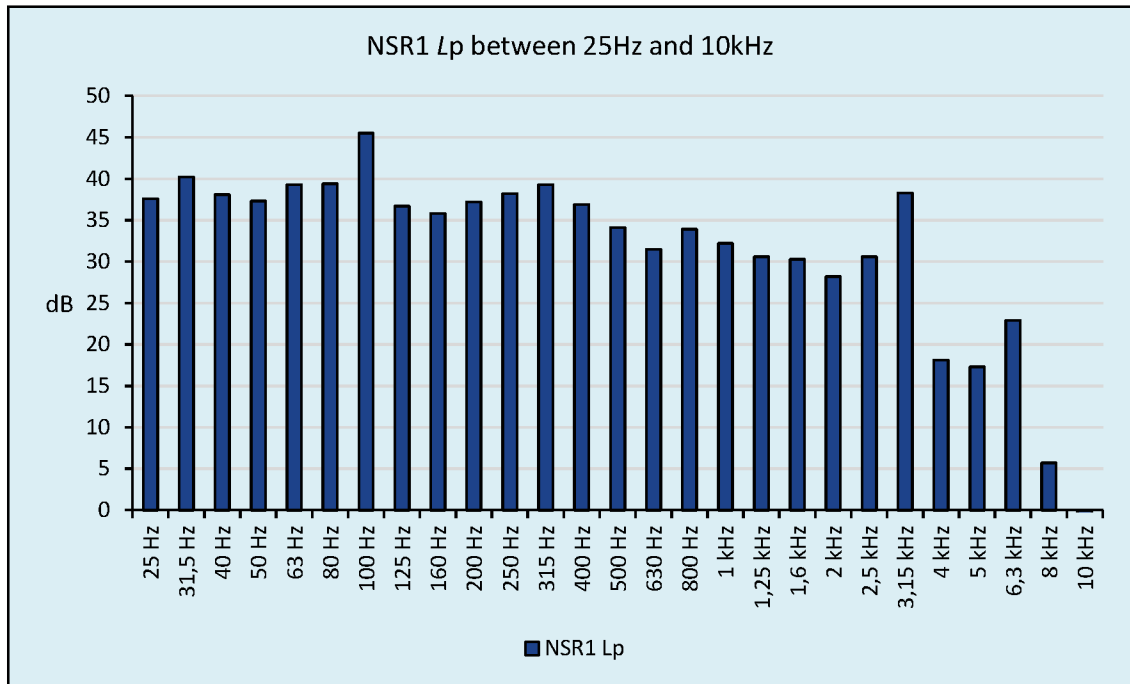
Fig. 6: Auxiliary Transformer

- 5.9. The model was set up to determine the worst-case scenario sound levels at the receptor locations.
- 5.10. The on site and intervening ground between site and receptors was deemed hard and reflective (0.00).
- 5.11. One order of reflection was used in the calculations.
- 5.12. Table 3 shows the model determined specific sound levels, L_{pA} in dB at NSR1 to NSR4.

Receptor	No Fence	Fence Installed
NSR1	44	40
NSR2	30	26
NSR3	32	31
NSR4	44	39

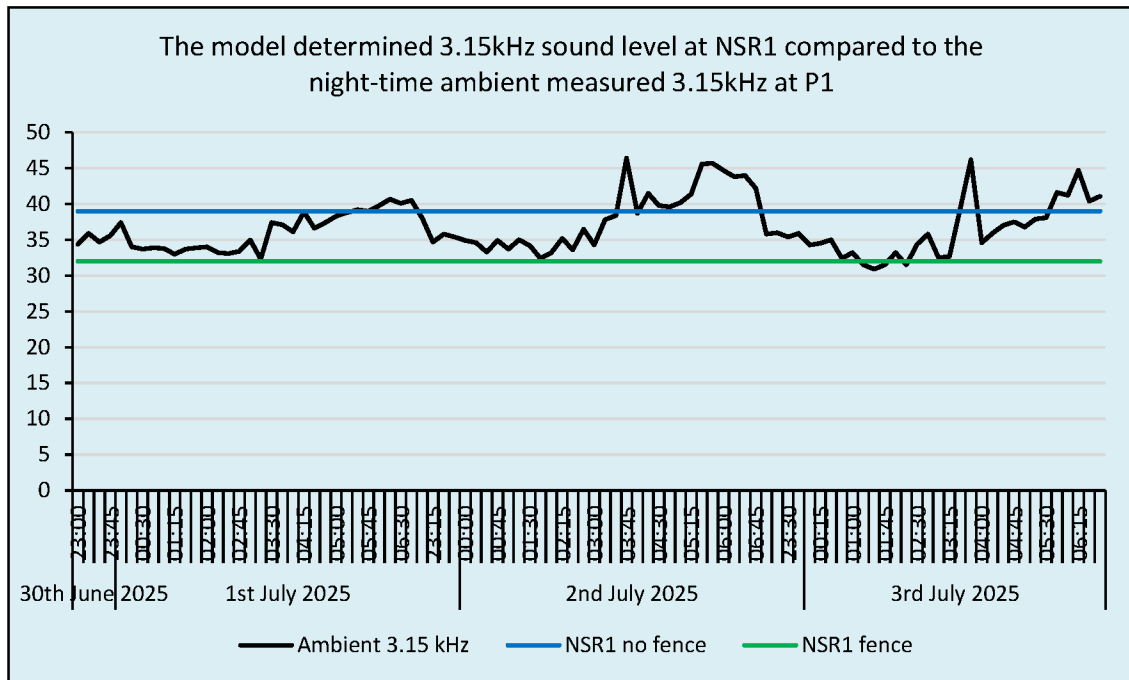
Table 3: Specific sound levels in dB

- 5.13. The BESS sound emission is not impulsive and does not show distinct intermittency as implied in BS 4142 because the equipment cycles on/off in periods between 2hr to 4hr which is greater than the night-time assessment period of 15min.
- 5.14. Graph 1 below shows the model calculated L_p for frequencies between 25Hz and 10kHz at NSR1.



Graph 1: NSR1 L_p levels

- 5.15. The noise emission of the BESS chiller fans is dominated by 100Hz and from the inverters is a whirr at 3.15kHz.
- 5.16. Using methodology in ANNEX C of BS 4142 the specific sound level at NSR1 and NSR4 shows a discrete frequency spectral component (tone) at 3.15kHz with and without the fence installed. At NSR2 and NSR3 this tone is insignificant. The 100Hz level is elevated but not a distinct tone so assessment of 3.15Hz has been prioritised for assigning tonal penalties in this assessment.
- 5.17. Graph 2 shows the model determined L_p (3.15kHz) at NSR1 plotted against the night-time $L_{eq,15min}$ (3.15kHz) noise levels measured at P1.



Graph 2: NSR1 and P1 3.15kHz comparison in dB

- 5.18. Graph 2 does show some of the surrounding noise sources produced elevated 3.15kHz noise.
- 5.19. The graph also shows that at certain periods of the night-time the NSR1 3.15kHz levels would be above the ambient measured levels for more than 15min therefore a 6dB penalty has been added for tonality to produce rating level for assessment for both no fence/fence scenarios.

6. Background Sound Levels

- 6.1. Ambient and background sound levels were measured at three locations P1, P2 and P3 to determine representative background sound levels for the BS 4142 assessment at the four receptor locations, NSR1 to NSR4.
- 6.2. The monitoring locations are shown in Fig.1 page 7. The details of the monitoring are shown in Table 4 below.

Location	Survey Date & Time	Equipment	Receptor
P1	18:45 30 th June 2025 to 09:45 3 rd July 2025 (unmanned)	Nor140 sound level meter serial number 1407786 Acoustic calibrator Nor1255 serial number 125525754	NSR1 – Commercial offices Towers Thompson Limited NSR4 – Thames Way Office
P2	22:45 30 th June 2025 to 00:45 1 st July 2025 (manned)	Nor140 sound level meter serial number 1403084 Acoustic calibrator CEL284/2 serial number 09412061	NSR2 – Rectory Cottage
P3	01:00 1 st July 2025 to 03:00 1 st July 2025 (manned)	Nor140 sound level meter serial number 1403084 Acoustic calibrator CEL284/2 serial number 09412061	NSR3 – 2-12 Paris Drive

Table 3: Sound Monitoring Information

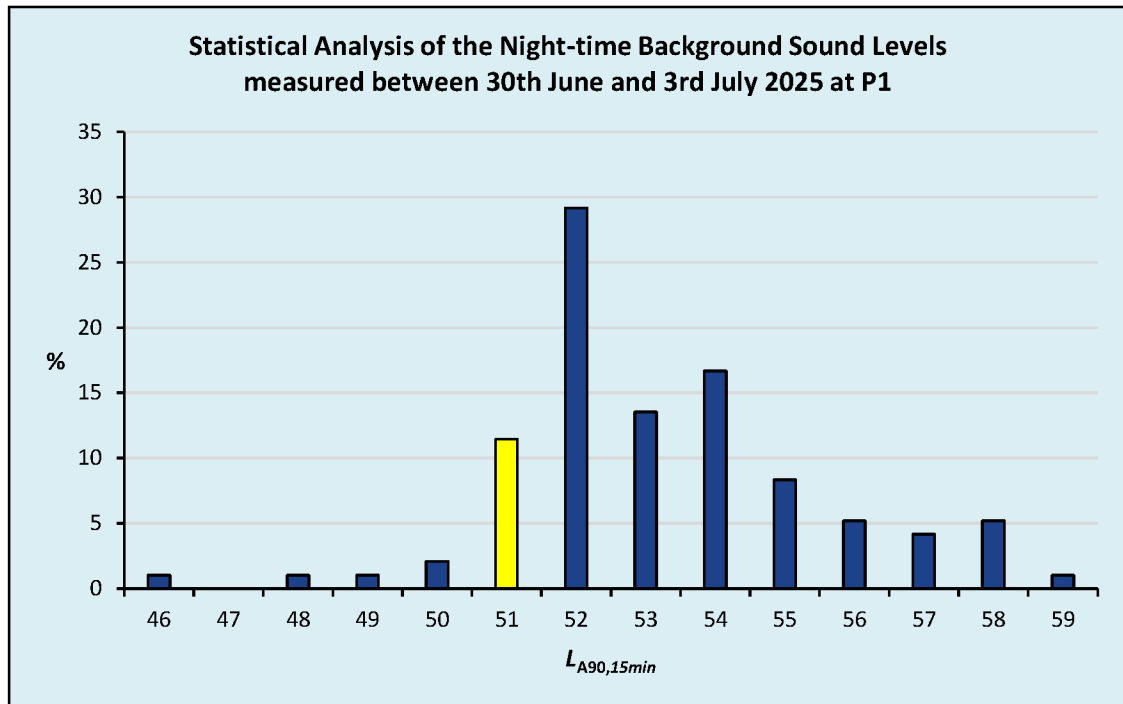
- 6.3. The sound level meters were field calibrated to 114dB at 1000Hz before and after the monitoring periods, the meters showed no drift in sensitivity.
- 6.4. The meters and calibrators have been calibrated at a UKAS accredited laboratory within the last two years and calibration certificates are available upon request.
- 6.5. The acoustic environment at the three monitoring locations was comprised of road, rail and air traffic, plant noise, bird noise.
- 6.6. The BESS will operate any time of day so the meters were set to measure in 15min time periods required for night-time assessment.
- 6.7. The weather during the monitoring period is summarised in Table 5 below.

Date	Time	Details	Temperature (°C)	Wind Speed (m/s)	Wind Direction
30 th June	07:00 – 23:00	Dry, sunny, warm	23 – 30	2.2 – 4.0	S/SE
30 th June/1 st July	23:00 – 07:00	Dry, clear skies	21 – 23	0.9 – 1.8	S then N
1 st July	07:00 – 23:00	Dry, sunny, warm	22 – 32	1.8 – 4.5	S/SE
1 st /2 nd July	23:00 – 07:00	Dry, cloudy	19 – 22	2.7 – 3.1	SE/NE
2 nd July	07:00 – 23:00	Sunny Intervals, light rain	19 – 24	2.2 – 4.5	N/NW
2 nd /3 rd July	23:00 – 07:00	Dry, cloudy	14 – 18	3.1 – 4.0	N/NW
3 rd July	07:00 – 23:00	Dry, sunny intervals	15 – 23	2.2 – 3.6	N

Table 5: Weather

- 6.8. Light rain on the 2nd July occurred during the day so did not affect the night-time background sound levels used in the assessment.

6.9. Following methodology in Section 8 of BS 4142, Graph 3 shows the statistical analysis of the background sound levels, $L_{A90,15min}$ measured at P1.



Graph 3: Statistical analysis of background sound levels at P1

6.10. The receptor locations NSR1 and NSR4 are adjacent to one another and a little further back from the A226 Thames Way so from the measurements a background sound level, $L_{A90,15min}$ of 51dB was used in the assessment for NSR1 and NSR4. The ambient sound levels, $L_{Aeq,15min}$ during this time ranged between 56 and 66 dB with an average of 61dB(A).

6.11. Table 6 shows the measured ambient and background sound levels at P2 and P3.

Location	Start Time	Ambient Sound Levels $L_{Aeq,15min}$	Background Sound Levels $L_{A90,15min}$
P2	22:45	55	45
	23:00	55	45
	23:15	57	47
	23:30	56	45
	23:45	57	45
	00:00	59	44
	00:15	54	44
	00:30	54	44
	00:45	53	42
P3	01:00	49	44
	01:15	46	43
	01:30	50	44
	01:45	46	44
	02:00	45	43
	02:15	46	43
	02:30	45	43
	02:45	46	43

Table 6: P2 and P3 sound Levels in dB

6.12. The highlighted levels in Table 6 will be used in the assessment for NSR2 and NSR3.

7. BS 4142 Assessment

- 7.1. Table 7 shows an example of the BS 4142 assessment for BESS noise emission at NSR1 with no fence installed.

Results	Level	BS 4142 Relevant Clause	Commentary
Measured Ambient Sound Level	N/A	7.3.1	No ambient sound level
Residual Sound Level	N/A	7.3.2	No residual sound level
Background Sound Level	$L_{A90,15min} = 51\text{dB}$	8.1.2	Representative background sound level derived from 15min at P1
Assessment made relevant 15min (night-time)		7.2	Site will operate anytime of day
Specific Sound Level	$L_{PA} = 44\text{dB}$	7.3.6	Model determined
Rating Level	50dB	9.2	6dB added for tonality
Background Sound Level	51dB	8.1.1	
Excess of rating over background sound level	-1dB	11	Assessment indicates a low impact at the NSR1.
Uncertainty of assessment	Low	10	The background sound level was determined over three night periods. The specific sound level was model determined as the worst case scenario.

Table 7: BS 4142:2014 daytime assessment of the kitchen extraction unit specific sound level at NSR1.

- 7.2. The assessments at the other receptors was carried out in the same way. The assessments are summarised below. All levels are in dB.

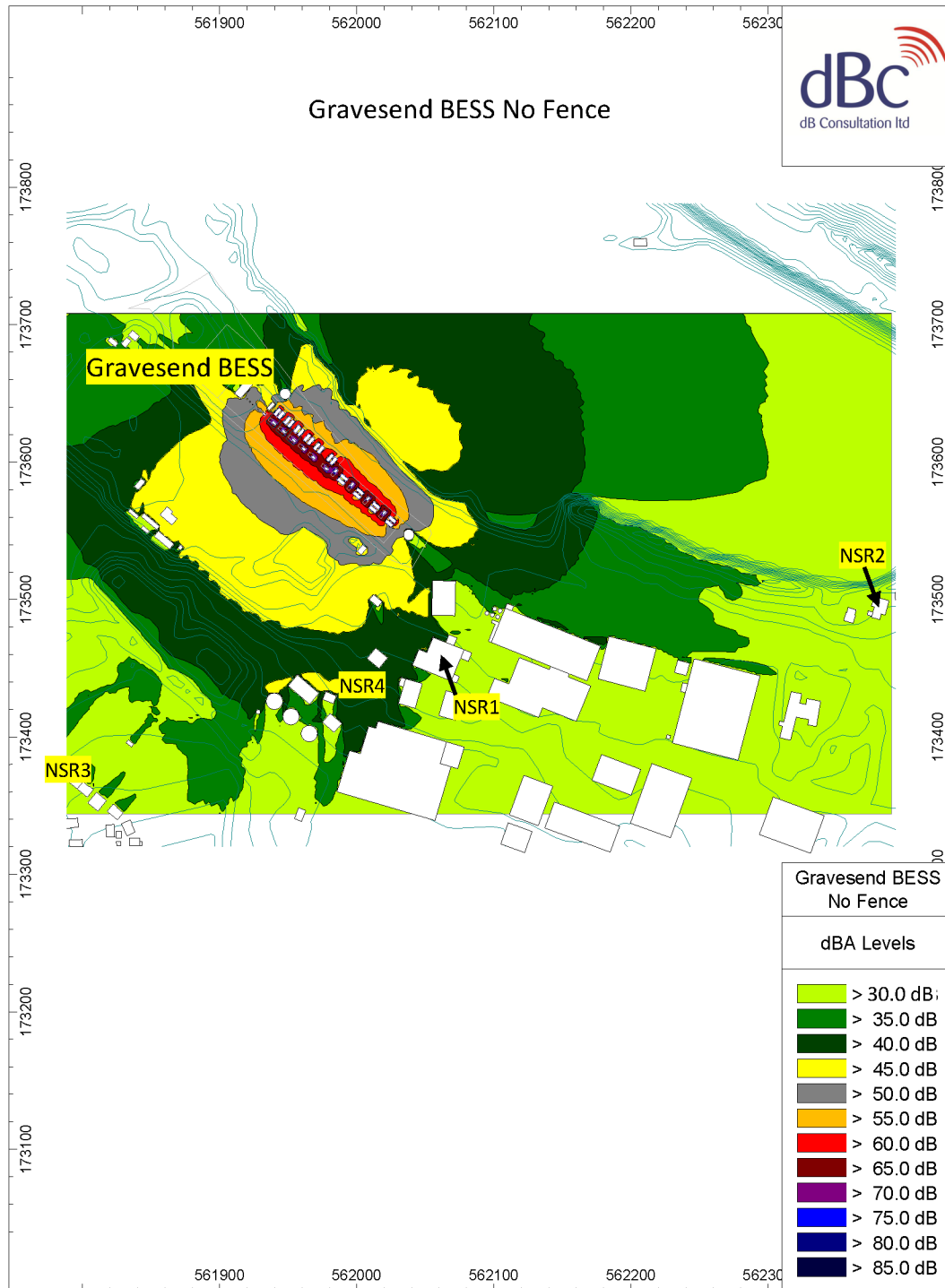
No Fence						
Receptor	Specific Sound Level	Penalties	Rating Level	Background Sound Level	Rating – Background	BS 4142 assessment
NSR1	44	+6	50	51	-1	Low Impact
NSR2	30	0	30	42	-12	Low Impact
NSR3	32	0	32	43	-11	Low Impact
NSR4	44	+6	50	51	-1	Low Impact
Fence Installed						
Receptor	Specific Sound Level	Penalties	Rating Level	Background Sound Level	Rating – Background	BS 4142 assessment
NSR1	40	+6	46	51	-5	Low Impact
NSR2	26	0	26	42	-16	Low Impact
NSR3	31	0	31	43	-12	Low Impact
NSR4	39	+6	45	51	-6	Low Impact

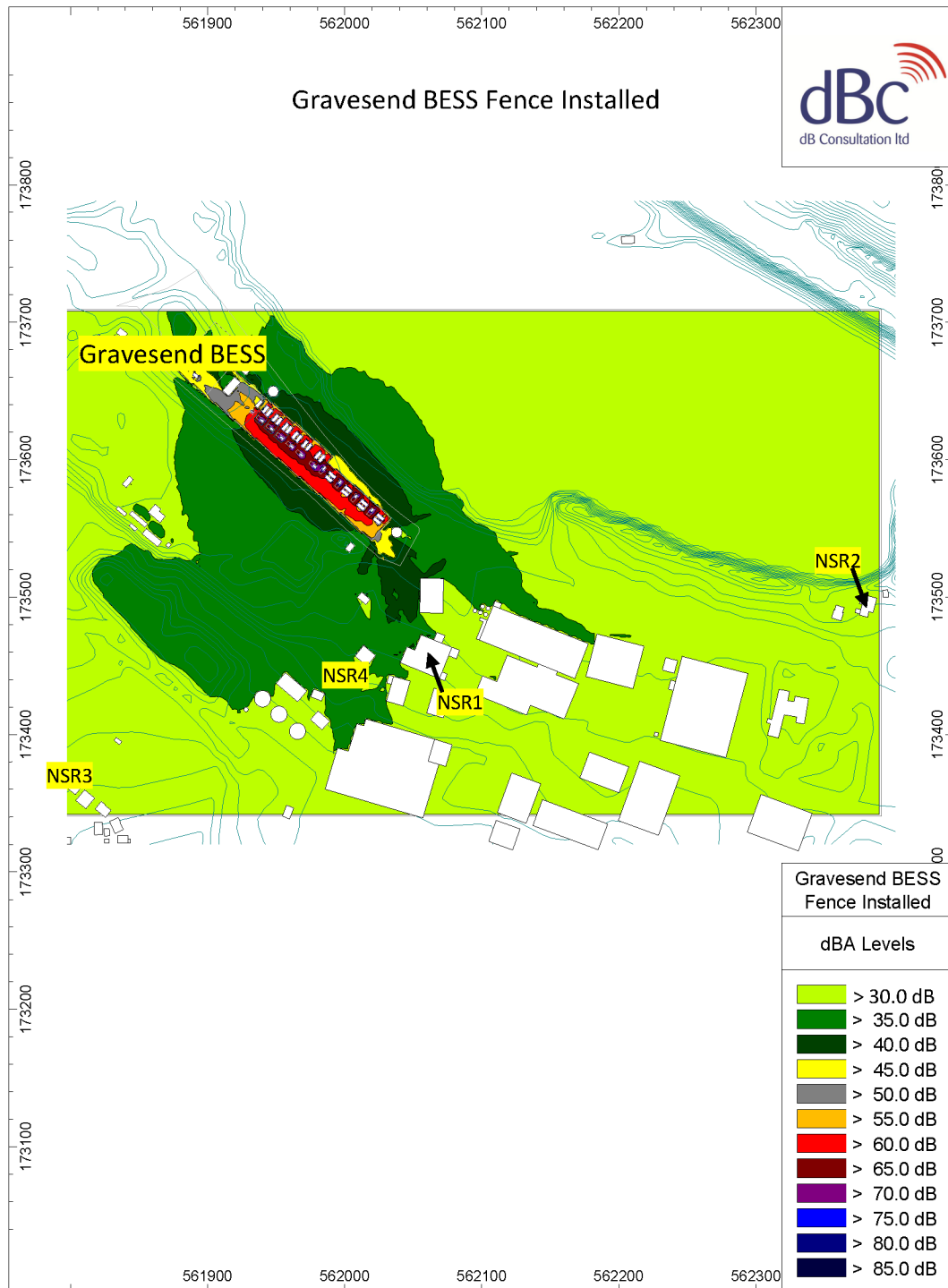
Table 8: BS 4142 assessment summary

- 7.3. The assessment indicates a low impact at all receptor locations with or without the fence installed.
- 7.4. At all the receptors the specific sound level is **significantly** below the lowest and average night-time ambient sound levels measured at P1, P2 and P3.
- 7.5. For residential receptors, NSR2 and NSR3, it is unlikely that the BESS noise emission would disturb sleep.
- 7.6. The acoustic fence does provide a benefit to the receptors but may only be required dependent on Local Authority criteria.
- 7.7. The assesment shows that there is no need to install the inverters with a silencer kit.



8. Model Images





9. Glossary of Acoustic Terminology

dB(A)

The human ear is less sensitive to low (below 125Hz) and high (above 16kHz) frequency sounds. A sound level meter can be used to duplicate the ear's variable sensitivity to sound across a spectrum of frequencies. This is achieved by building a filter into the instrument with a similar frequency response to that of the average ear. This is called an "A-weighting filter". Measurements of sound made with this filter are called A-weighted sound level measurements and the unit is dB(A).

$L_{eq,T}$

The sound from noise sources often fluctuates widely during a given period of time. An average value can be measured, the equivalent sound pressure level L_{eq} . The L_{eq} is the equivalent sound level which would deliver the same sound energy as the actual fluctuating sound measured in the same time period (T).

$L_{10,T}$

This is the minimum level exceeded for not more than 10% of the time period (T). This parameter is often used as a "not to exceed" criterion for noise.

$L_{90,T}$

This is the minimum level exceeded for not more than 90% of the time period (T). This parameter is often used as a descriptor of "background noise" for environmental impact studies.

L_{fmax}

This is the maximum sound pressure level that has been measured over a period using a fast time constant.

Octave Bands

In order to completely determine the composition of a sound it is necessary to determine the sound level at each frequency individually. Usually, values are stated in octave bands. The audible frequency region is divided into 10 such octave bands whose centre frequencies are defined in accordance with international standards.



Addition of noise from several sources

Noise from different sound sources combine, on a logarithmic scale, to produce a sound level higher than that from any individual source. Two equally intense sound sources operating together produce a sound level which is 3dB higher than one alone and 3 identical sources produce a 5dB higher sound level.

Attenuation by distance

Sound which propagates from a point source in free air attenuates by 6dB for each doubling of distance from the noise source. Sound energy from line sources (e.g. stream of cars) drops off by 3dB for each doubling of distance.

Subjective impression of noise

Sound intensity is not perceived directly at the ear; rather it is transferred by the complex hearing mechanism to the brain where acoustic sensations can be interpreted as loudness. This makes hearing perception highly individualised. Sensitivity to noise also depends on frequency content, time of occurrence, duration of sound and psychological factors such as emotion and expectations. The following table is a reasonable guide to help explain increases or decreases in sound levels for many acoustic scenarios.

Change in sound level (dB)	Change in perceived loudness
1	Imperceptible
3	Just barely perceptible
6	Clearly noticeable
10	About twice as loud
20	About 4 times as loud

Barriers

Outdoor barriers can be used to reduce environmental noises, such as traffic noise. The effectiveness of barriers is dependent on factors such as its distance from the noise source and the receiver, its height and its construction.

Reverberation control

When sound falls on the surfaces of a room, part of its energy is absorbed and part is reflected back into the room. The amount of reflected sound defines the reverberation of a room, a characteristic that is critical for spaces of different uses as it can affect the quality of audio signals such as speech or music. Excess reverberation in a room can be controlled by the effective use of sound-absorbing treatment on the surfaces, such as fibrous ceiling boards, curtains and carpets.

