Stout House, Croftdown Road, London, NW5

BS 4142 Noise Impact Assessment

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Prepared for:	Kaye Stout
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1. Executive Summary

Introduction

This executive summary outlines the findings from a detailed noise impact assessment undertaken by Heyda Ltd for Kaye Stout Tate at Stout House, adjacent to 1 Regency Lawn, Croftdown Road, London, NW5 1HF. The study was initiated to assess the noise impact of a proposed new external air source heat pump plant, which is intended to supply heating and hot water to the proposed new residential development on the site, ensuring adherence to both national and local planning policies. The evaluation was conducted following the guidelines of British Standard 4142:2014 for Rating and Assessing Industrial and Commercial Sound.

Objective

The objective of this assessment was to evaluate the potential noise impact from the operation of new external plant equipment on the nearest noise-sensitive receptors. The aim is to confirm compliance with the specific noise criteria established by the London Borough of Camden, thereby ensuring that the proposed development does not lead to unacceptable noise impacts within the residential area.

Assessment Methodology

The methodology employed in this assessment included:

- An initial site appraisal and desk study to identify potential noise sources and sensitive receptor locations.
- Detailed environmental sound surveys to establish baseline sound levels at locations representative of the nearest noise-sensitive receptors.
- Quantitative analysis using sound level measurements and predictive calculations to assess the noise impact of the new external plant.
- Application of BS 4142 correction features for tonality, impulsivity, and intermittency, to accurately characterize the sound environment and assess the rating level of site operations.

Findings

The assessment has identified effective measures to mitigate the noise impact of the new external plant on the surrounding environment. Key findings include:

- The proposed placement and proposed noise control strategies for the external ASHP unit are likely to ensure compliance with local planning requirements for noise impact.
- The use of an acoustic enclosure is expected to reduce noise levels at the nearest noise-sensitive receptors to acceptable levels.
- Predicted noise levels, with the recommended mitigation measures in place, indicate that the operation of the external plant will have no more than a low impact on the surrounding residential area, aligning with the acceptable thresholds defined by the London Borough of Camden and BS 4142:2014.

Conclusion

The comprehensive noise impact assessment conducted in line with BS 4142:2014+A1 demonstrates that the proposed new external plant, with the implementation of the recommended noise control measures, is expected to satisfy the relevant local authority noise criteria. The findings affirm that the proposed development can be accomplished without resulting in an unacceptable noise impact on nearby noise-sensitive receptors. This conclusion supports the principle of sustainable development and ensures that the development of the new dwelling can proceed without compromising the acoustic comfort or quality of life of the local community.

2. Introduction

Heyda Ltd has been commissioned by Kaye Stout to conduct a detailed noise impact assessment for the proposed new external plant noise sources at Stout House, adjacent to 1 Regency Lawn, Croftdown Road, London, NW5 1HF, as required as part of a Section 73 application.

The proposed Stout House development, comprising the development of the currently open site to provide a new single residential dwelling, falls under the jurisdiction of the London Borough of Camden and has been approved (planning reference 2024/2360/P). However, a separate Section 73 application is required in relation to the proposed ASHP associated with the development, to which this assessment pertains.

The proposed site is situated in a suburban residential area, and is surrounded by residential properties, with the neighbouring property at 1 Regency Lawn being the nearest noise-sensitive receptor.

The objective of this report is to provide a comprehensive BS 4142 noise impact assessment in compliance with both national and local planning policies. This entails:

- Reviewing relevant policy, standards, and guidelines.
- Defining the noise criteria specifically for this project.
- Describing the site location and the nature of the existing operations.
- Offering both qualitative and quantitative analysis of baseline sound conditions.
- Assessing the noise impact of the proposed new external plant noise sources on existing receptors.
- Drawing conclusions and offering recommendations for compliance.

Given the report's technical nature, a glossary of terms is included in Appendix A to aid understanding for all readers.

3. Policy, Standards and Guidance Documents

3.1. Document Summary

This section outlines the core policy documents, standards, and guidelines that have been instrumental in shaping the noise assessment strategy for the project. These documents provide the foundation for our methodology, ensuring that our analysis aligns with current best practices and regulatory expectations.

- **National Planning Policy Framework (2023):** Sets out the government's planning policies for England and how these are expected to be applied, emphasising the importance of avoiding and mitigating adverse impacts of noise.
- **Noise Policy Statement for England (2010):** Provides the overarching policy framework aimed at improving the acoustic environment and managing noise within the context of sustainable development.
- **Planning Practice Guidance – Noise (2019):** Offers detailed guidance on how noise impacts should be assessed and managed, facilitating decision-making in the planning system.
- **Camden Local Plan (2017):** Specific to the local context, this details the criteria for noise impact assessments within the London Borough of Camden, ensuring developments meet local standards for noise and vibration control.
- **British Standard 4142:2014** – Method for Rating and Assessing Industrial and Commercial Sound: The key technical standard used for evaluating the potential impact of sound from industrial and commercial sources on noise-sensitive receptors, guiding the assessment of sound levels and mitigation measures.

Further details on these documents are presented in Appendix B.

3.2. Summary of Assessment Approach

Our assessment methodology for this report has been meticulously designed to align with BS 4142 standards, ensuring a thorough and systematic evaluation of the likely noise impacts from the operation of the proposed new external plant noise sources. The approach encompasses the following steps:

- **Initial Site Appraisal:** Conducting a preliminary assessment in accordance with BS 4142 guidelines to understand the site's acoustic environment and identify potential noise sources.
- **Sound Survey:** Performing detailed background sound measurements at locations representative of the nearest noise-sensitive receptors.
- **Analysis of Measured Sound Levels:** Analysing the collected sound data to ascertain the typical background sound level (dB $L_{A90,T}$), for key time periods.
- **Estimating Noise Emissions:** Calculations of the expected noise levels based on the proposed layouts and manufacturer plant noise data.
- **Impact Assessment:** Evaluating the noise impact by comparing the expected rating level of the site's specific sound sources against the background sound levels.

4. Site Location and Proposals

4.1. Site Description

The site is situated adjacent to 1 Regency Lawn, Croftdown Road, London, NW5 1HF, within the London Borough of Camden. The location is situated in a relatively high-end suburban location.

The surrounding context is as follows:

- **North:** Croftdown Road residential road and dwellings beyond.
- **East:** The residential dwelling 21 Croftdown Road
- **South:** Open ground, with residential uses beyond.
- **West:** The residential dwelling at 1 Regency Lawn, identified as the nearest sensitive receptor

Figure 1 illustrates the positioning of the proposed development relative to 1 Regency Lawn, designated as receptor R1, and provides a visual representation of the site's geographical context and its proximity to the nearest noise-sensitive receptor.

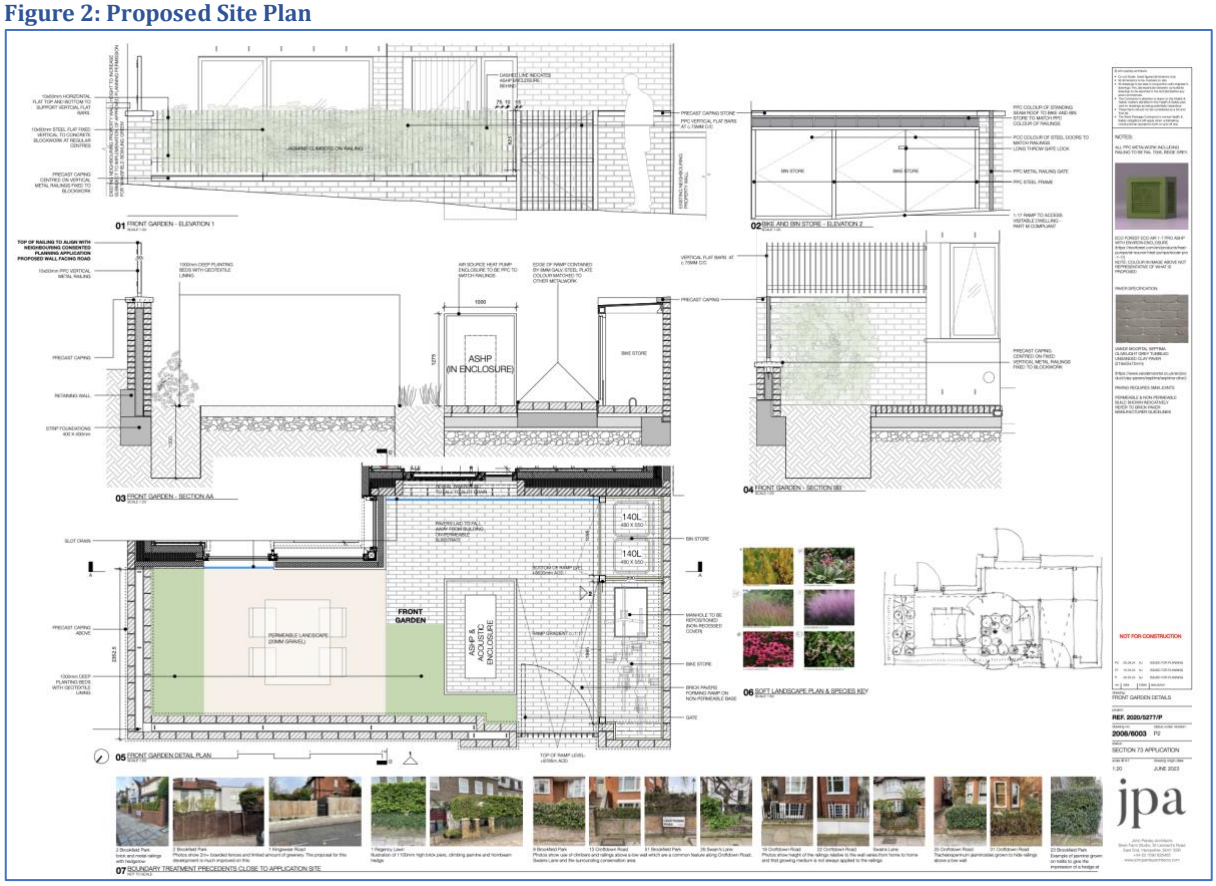
Figure 1: Site Location and Nearest Noise Sensitive Receptor

4.2. Proposed Development

The proposed Stout House development (planning ref: 2024/2360/P) comprises the construction of a three-storey residential dwelling directly adjacent to 1 Regency Lawn, Croftdown Road, London NW5 1HF. The consented development, to which this Section 73 application pertains, is intended to be heated via the provision of an ASHP, which is to be located in the front garden of the new dwelling.

Figure 2 shows the proposed development, indicating the proposed location of the external plant, as follows:

Figure 2: Proposed Site Plan



5. Initial Appraisal

5.1. Introduction

Commencing the BS 4142 assessment involves an initial appraisal to gauge the context for evaluation. Sam Laws BSc MIoA, an experienced assessor, has undertaken this critical first step.

5.2. Desk Study

A desk study of the application site and local context has been carried out to inform the survey and assessment, as follows.

5.2.1. Determining assessment locations

Utilising a variety of mapping tools and site plans, we've pinpointed the locations of noise-sensitive receptors surrounding the site to ensure a focused and accurate assessment.

5.2.2. Background sound determination

An evaluation of potential sound sources around the proposed development suggests that road traffic from nearby residential roads, along with occasional air traffic and typical suburban sounds like birdsong, will contribute to the ambient sound.

A tailored methodology has been developed to accurately capture representative background sound levels at the closest receptor site, employing long-term unattended monitoring to ensure a full picture of the fluctuating background noise levels is established.

5.2.3. Specific sound level determination

Given the site's proposed operations, we have identified specific sound levels by using the proposed layouts and manufacturer plant noise data to calculate back to the receptor locations.

5.2.4. Hours of use

Operational hours for the proposed plant are likely to vary depending on the external temperature, however it is assumed that they could operate 24 hours a day, 7 days a week as a worst-case.

5.2.5. Context and sensitivity of the assessment locations

The receptors are residential dwellings in suburban locations and are therefore considered to be sensitive. Existing sources of noise are likely to provide a continuous low level background sound level with a spectrum not dissimilar to that of an ASHP unit, and therefore the proposals are not expected to result noise which is significantly different in character to other sounds that are otherwise audible in the location (provided the noise level is not too high).

6. Sound Measurements

6.1. Sound Survey Overview

An environmental sound survey has been undertaken by Heyda Ltd to determine the prevailing sound levels in the vicinity of the nearest noise-sensitive receptors. This survey consisted of long-term unattended measurements at one position.

The measurements were carried out between Tuesday 20th and Wednesday 21st August 2024.

6.2. Survey Methodology

The environmental sound survey was undertaken using suitable measurement instrumentation configured to log sound pressure levels in each octave frequency band every 100 ms. The sound data was then analysed to determine the following parameters for each relevant time interval (T):

- **dB $L_{Aeq,T}$**: The A-weighted equivalent continuous sound pressure level over the measurement period, T. This parameter represents the average sound level during the period.
- **dB $L_{A90,T}$**: The A-weighted sound pressure level exceeded for 90% of the measurement period, T, often referred to as the "background sound level".

Environmental sound measurements were taken at the positions shown in Table 1 and Figure 3.

Table 1: Sound Measurement Positions

Position reference	Position description	Microphone height above local ground level	Condition
MP1	Within the front garden of 1 Regency Lawn.	1.5m	Free-field

Figure 3: Sound Measurement Positions

6.3. Measurement Equipment

All acoustic measurement equipment used during the sound survey conformed to Type 1 specification of British Standard 6167. Details of the sound measurement instrumentation used are shown in Table 2.

The meter had been calibrated by a UKAS accredited laboratory within the previous 24 months. The calibration level was also checked at the start and end of the survey using a field calibrator (which had been suitably calibrated by an accredited laboratory).

No significant drift in the calibration over the course of the survey (≤0.1 dB). The calibrator used had itself been calibrated by a UKAS accredited calibration laboratory within the twelve months preceding the measurements.

The microphone was fitted with protective windshield for the measurements.

Table 2: Sound Measurement Equipment

Item	Manufacturer/Model Type	Serial Number
Sound Level Meter	NTi Audio XL2	A2A-23886-E1
Preamplifier	NTi Audio MA220	13950
Microphone	NTi Audio MC230A	A25920
Calibrator	NTi Audio CAL200	21547

6.4. Observations

The sources of sound that contributed to environmental sound climate were noted during our time on site. The observations were as follows:

- Road traffic was the dominant source of noiuse at the site, being adjacent to Croftdown Road.
- In the absence of road traffic movements along Croftdown Road, the dominant source of sound was distant road and rail traffic using the surrounding road/rail network.
- Birdsong and pedestrian activity was also a source at the site.
- Occasional aircraft movements were observed.

6.5. Weather Conditions

The weather conditions during the survey were observed and noted as being suitable for environmental sound measurement, being dry with only light winds.

6.6. Measurement Results

Table 3 presents the measurement results obtained during the survey at the unattended measurement position. A full time history graph is provided in Appendix C.

Table 3: Summary of Measured Sound Levels at MP1

Survey Date	Period (T)	Equivalent continuous SPL $L_{Aeq,T}$ (dB)	Typical background sound level $L_{A90,T}$ (dB)
20/08/2024	Daytime (07:00 – 23:00)	51	42
	Night-time (23:00 – 07:00)	45	34

In accordance with BS4142:2014+A1 guidance, the typical L_{A90} sound levels presented above have been derived following a detailed statistical analysis of the measured sound levels over the relevant daytime and night-time periods. The typical background noise level is not, by definition, the lowest.

As would be expected, there is variation in the typical background sound levels on different days, and this will be due to changes in road traffic flows on nearby roads, as well as changes in the wind direction.

The typical background noise levels are very low, and for this reason BS 4142 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."*

7. Noise Impact Assessment

7.1. Assessment Criteria

This assessment is carried out to confirm that the proposed development aligns with both National and Local Policy regarding noise impacts from new sources of external plant.

The guiding principle that should inform local policy from national planning policies, specifically the NPPF paragraph 191, is to minimise adverse noise impacts and avoid significant adverse impacts on health and quality of life. The Noise Policy Statement for England (NPSE) further elaborates on this by setting out aims to avoid significant adverse noise impacts, and mitigate/minimise adverse noise impacts within the framework of sustainable development.

The commercial/industrial sound from new plant installations is assessed in accordance with BS 4142:2014, which determines the noise impact based on the margin by which the specific sound source's rating level exceeds the background sound level, considering the sound's context:

- A margin of about +10 dB or more may indicate a significant adverse impact.
- A margin of around +5 dB may signify an adverse impact.
- A rating level at or below the background sound level suggests a low impact.

Consequently, the typical target for the rating level of new external plant to achieve a level equal to or below the existing typical background sound level. However, in accordance with the Camden Local Plan, in this instance a Rating Level of 10 dB below background (15 dB if tonal components are present) should be considered as the design criterion.

Based on a combination of the measured background sound levels and the stated requirements of Camden Council, the limiting criteria in Table 4 have been derived for this plant noise impact assessment.

Table 4: Plant Noise Criteria at the Nearest Noise Sensitive Receptors

Receptor	Period (T)	Typical background sound level $L_{A90,T}$ (dB)	Limiting Rating Level Criteria for Normally Operating Plant $L_{Ar,Tr}$ (dB)
R1 & R2	Daytime (07:00 – 23:00)	42	32
	Night-time (23:00 – 07:00)	34	24

Achieving the rating level thresholds in Table 4 is expected to ensure that the noise results in no impact at the receptor, in accordance with BS 4142, and is not expected to contribute to an increase in background noise levels.

7.2. Proposed Plant and Noise Control Strategies

We understand that the current selection for the proposed ASHP unit is an EcoForest ecoAIR 1-7 Pro. The manufacturer's sound data for this unit is presented in Table 5. Please note that the manufacturer data is limited to a global sound power level. Accordingly, the spectrum detailed below is taken from our library of similar sources, and has been scaled to meet the stated broadband sound level.

Table 5: ASHP Unit Sound Level Data

Unit Type	Parameter	Octave Band Centre Frequency, Hz							dBA
		63	125	250	500	1000	2000	4000	
		Sound level (dB)							
ASHP	Sound Power	66.5	63.5	57.5	55.5	53.5	47.5	40.5	58

To achieve the limiting noise criteria at the nearest noise sensitive receptors in the currently proposed location, the condenser would need to be fully enclosed in a noise reducing enclosure which achieves the minimum insertion losses detailed in Table 6.

Table 6: Condenser Unit Attenuation Pack Insertion Loss Requirements

Unit Type	Attenuation Type	Octave Band Centre Frequency, Hz dBA							
		63	125	250	500	1000	2000	4000	8000
		Minimum Insertion Loss Requirement (dB)							
ASHP	Attenuation Pack	3	3	7	11	16	18	18	16

The insertion loss performance stated in Table 6 is based on manufacturer test data for the Environ SC100 Low Spec acoustic enclosure and should therefore be readily achievable.

The resulting limiting sound power levels for the ASHP unit, including the acoustic enclosure are presented in Table 7 for information purposes.

Table 7: Limiting Noise Levels for the Proposed Condenser Unit with Attenuation

Plant Type	Maximum Sound Power Level dB L_{wA}
ASHP	48.4

7.3. Determining the Specific Sound Level

The specific sound levels have been determined for receptor R1. The predictions have been carried out to a number of locations within the grounds and at the building facades of the neighbouring properties to determine absolute worst-case in terms of potential operational sound levels.

The plant noise data has been taken from the manufacturer data sheet, and then a noise model has been created to predict the noise emissions in accordance with the ISO 9613-2 calculation methodology. The source of the sound is treated as a point source. The ASHP unit could operate continuously and therefore no correction for the operational time has been applied.

7.4. Noise Impact Assessment

7.4.1. Specific Sound Level Results

The assessment of the proposed layout and the manufacturer sound data has been undertaken to determine the specific noise levels at the nearest noise sensitive receptor. The results of the modelling are presented in Table 8.

Table 8: Predicted Specific Noise Levels at the Nearest Noise Sensitive Receptors

Receptor	Predicted Specific Plant Noise Level dB	
	Daytime (07:00 to 23:00) $L_{Aeq,1hour}$	Night-time (23:00 to 07:00) $L_{Aeq,15mins}$
R1	23	23

7.4.2. Feature Correction Applicability

Following BS 4142's subjective methodology, the identified specific sound levels have been adjusted for characteristic features:

- **Tonality:** The manufacturer data for the proposed ASHP condenser does not show a tonality, and typically ASHP units should not operate with a tonal noise output unless they require maintenance. Therefore, no tonality correction has been applied. The data provided by the manufacturer is limited to broadband data and, therefore, the manufacturer should confirm that the unit does not produce distinguishable tones prior to installation.
- **Impulsivity:** The condenser unit is not expected to produce impulsive sound emissions and therefore not correction is applied.
- **Intermittency:** The unit may switch on and slowly run up and down depending on the external/internal temperatures. However it is unlikely that there will be distinguishable and regular on/off conditions and so no intermittency correction is has been applied.

7.4.3. BS 4142 Noise Impact Assessment

The noise impact analysis, combining specific sound levels with feature corrections, generates the rating levels for comparison against background sound levels. This comparative analysis aims to ascertain the potential noise impact on adjacent receptors.

The analysis has been carried out for the night-time period only as this represents the worst-case scenario.

This assessment assumes that the ASHP unit is housed in an acoustic enclosure that achieves the insertion loss performance requirements stated earlier in this report.

Table 9: Predicted Specific and Rating Levels for Typical Operations

Location	Typical Background Sound Level, LA90,T, dB	LPA Limiting Rating Level Criteria for Plant $L_{Ar,Tr}$ (dB)	Predicted Specific Sound Level dB $L_{Aeq,1hour}$	Applicable Feature Correction dB (Type)	Predicted Rating Level dB $L_{Ar,1hour}$	Rating against Limiting Criteria (dB)	Rating against Typical Background Sound Level (dB)
R1	34	23	23	0	23	-1 (Low Impact)	-11 (low impact)

The assessment reveals that the predicted rating level is 11 dB below the existing background sound level at receptor R1 and therefore satisfies the requirements of Camden Council. Given the context, a low impact is considered to appropriately characterise the noise experienced as a result of the operation of the proposed plant.

7.4.4. Uncertainty

This assessment, adhering to industry best practices, is based on environmental sound data captured using Class 1 monitoring equipment. The sound emission propagation has been calculated in accordance general best practice, BS 4142 and ISO 9613 standards, leveraging open-source mapping data, site observations, and measured site sound levels. The analysis considers the loudest items of equipment at each receptor location and is therefore considered an accurate representation of the actual noise impact.

Wind was blowing both towards, and away from the nearest major road traffic noise sources at different times during the survey, and therefore measured levels should represent the lowest that are typically experienced in the location.

Thus, the uncertainty associated with this assessment is considered low, reflecting a robust and reliable predictive model.

8. Conclusion

Heyda Ltd has been commissioned by Kaye Stout Tate to perform a detailed noise impact assessment for the proposed new external plant noise sources at Stout House, adjacent to 1 Regency Lawn, Croftdown Road, London NW5. This assessment critically examines the potential noise impact of the proposed external plant on the nearest noise-sensitive receptors, in the context of both national and local planning policies.

Adhering to the methodology prescribed by British Standard 4142:2014 for Rating and Assessing Industrial and Commercial Sound, this report undertakes an exhaustive evaluation incorporating environmental sound measurements and predictive noise modelling. This approach facilitates a comprehensive assessment of the noise emissions from the proposed plant, factoring in corrections for any distinctive acoustic features such as tonality, impulsivity, and intermittency as specified by BS 4142, thus offering a refined analysis of the acoustic environment.

Our findings indicate that, with the implementation of the recommended noise control strategies, including the application of an appropriate attenuation pack, the proposed development is anticipated to achieve compliance with the established noise criteria derived from the London Borough of Camden's policies and BS 4142 standards. Specifically, the predicted noise levels at the closest residential receptors are expected to exhibit no more than a low impact, aligning with the local authority's criteria and ensuring that the development does not contribute to an increase in the ambient noise levels within this suburban setting.

In conclusion, the noise impact assessment for the proposed external plant at Stout House demonstrates that the project, with the proposed mitigation measures in place, is capable of complying with the relevant noise impact criteria, thereby avoiding an unacceptable noise impact on the nearby noise-sensitive receptors. This compliance underpins our professional opinion that the installation and operation of the external plant, contingent upon the adherence to the assessed noise control measures, should not be restricted based on noise impact considerations.

Appendix A - Glossary of Acoustic Terminology

Sound is the vibration of particles in a medium, such as air, which may be detected by the human ear. This sound is defined as noise when it is audible and unwanted or undesirable to a listener.

The vibration, or oscillation, of particles about an equilibrium position results in local pressure fluctuations from the normal pressure. These local pressure fluctuations are described as sound pressure, and the number of oscillations per second is described as the frequency.

The human ear responds to an incredibly large range of sound pressure, from 0.00002 Pa to 200 Pa, and the perceived loudness is proportional to the logarithm of the sound pressure squared. For this reason, sound is measured in terms of a logarithmic parameter, the sound pressure level, to approximate the response of the ear. Sound pressure levels are quantified in decibels (dB) relative to the threshold of hearing.

The human ear responds to a wide range of sound frequencies, from the lowest perceptible bass note, around 20 Hz, to the highest perceptible treble note, around 20,000 Hz. The ear does not respond equally to each frequency and is most sensitive to sound within the mid-frequency range of around 600 to 8000 Hz.

The response of the ear to each frequency also varies with the sound pressure level. For very loud sounds the difference in perceived loudness between each frequency is less pronounced than for low level sound.

Acousticians measure sound pressure levels using sound level meters, which incorporate a microphone.

A sound level meter approximates the response of the human ear to sound by using frequency filters. For typical environment sounds, the A-weighting filter is used to approximate the response of the ear at typical sound pressure levels. The sound pressure level, adjusted to approximate the response of the ear, is quantified in A-weighted decibels, dB(A) or dB LpA.

In a typical environment, the A-weighted sound pressure level will vary with time. For this reason, acousticians use statistical measurement parameters to describe the sound environment. The most common measurement parameters are as follows:

- dB $L_{Aeq,T}$: Equivalent continuous A-weighted sound pressure level. This is the energy-average sound pressure level during a measurement period, T.
- dB $L_{AFmax,T}$: Maximum A-weighted sound pressure level. This is the maximum sound pressure level during a measurement period, T, and measured in a way that approximates the time-response of the ear.
- dB $L_{A90,T}$: 90th percentile A-weighted sound pressure level. This is the sound pressure level exceeded for 90% of the measurement period, T, commonly referred to as the background sound level.

Sound pressure levels in typical environments are presented in Table A1. Further definitions of acoustic parameters are presented in Table A2.

Table A1: Sound pressure levels within typical environments

Sound Pressure Level, dB	Typical Environment or Description
0	Threshold of hearing
15 to 25	A recording studio
25 to 35	A hotel bedroom at night
35 to 45	An unoccupied office
45 to 55	Quiet residential street
55 to 65	Normal conversation, 1 m away TV programme, listener position
65 to 75	Raised voices, 1 m away Urban high street traffic
75 to 85	Busy motorway traffic, on hard shoulder Typical small plant room
85 to 95	High-speed hand-dryer, operator position Inside London underground (average)
95 to 105	Pneumatic hammer, operator position Concert orchestra
105 to 115	Typical nightclub Untreated generator plantroom
115 to 140	Aircraft take-off, close proximity Threshold of pain

Table A2: Definitions of Acoustic Terminology and Parameters

Wording	Description
Ambient sound level	The total sound pressure level in a given position from all surrounding sources of noise, both near and far. Normally expressed as an equivalent continuous A-weighted sound pressure level, dB $L_{Aeq,T}$.
A-weighting	The process of weighting the observed sound pressure level at each frequency band, to approximate the sensitivity of the human ear to sounds of different frequencies. A-weighted sound pressure levels are expressed as dB(A) or dB L_{Ap}.
Decibel	A logarithmic value quantifying the sound pressure at a specified position or sound power. relative to a reference sound pressure or sound power (20 µPa for sound pressure, 10-12 W for sound power).
D	Sound level difference. The difference in energy-average sound pressure levels between a "source" room containing a loudspeaker and an adjacent "receiving" room. D = L(source) – L(receiving).
$D_{ne,w}$	Weighted element normalised sound level difference. The single-figure rating of the difference in sound level between rooms when sound is transmitted only through a small technical element only, such as a vent or grille, and normalised to a reference absorption area A0 of 10 m^2. Measured in a laboratory in accordance with BS EN ISO 10140, with single figure rating determined in accordance with BS EN ISO 717-1.
$D_{nF,w}$	Weighted normalised flanking sound level difference. A single-figure rating of the difference in sound level between rooms when sound is transmitted only via a specified flanking path, such a via a flanking curtain wall system. Measured in a laboratory in accordance with BS EN ISO 10848, with single figure rating determined in accordance with BS EN ISO 717-1.
$D_{nT,w}$	Weighted standardised sound level difference. A single-figure rating of the sound insulation between adjacent rooms or spaces in real-world conditions in completed buildings. The rating is determined over a range of frequencies and normalised to a reference reverberation time of 0.5 seconds for dwellings. Measured in-situ in accordance with BS EN ISO 140-4, with single figure rating determined in accordance with BS EN ISO 717-1. The measurement includes the

	effects of sound transmission via flanking routes and weak points at junctions, interfaces, and penetrations.
Façade	A sound monitoring position is a "façade" position when it includes a strong reflection from an adjacent building or structure. This corresponds with a position that is between 1 and 2 metres away from a reflecting building or structure.
Free-field	A sound monitoring position is a "free-field" position when it is not affected by sound reflections from surrounding buildings and structures. This corresponds with a position at least 3.5 metres away from reflecting buildings or structures.
Frequency	The number of oscillations per second of a vibrating particle in a medium, measured in Hertz (Hz) or cycles per second.
$L_{A90,T}$	The A-weighted sound pressure level exceeded during 90% of the time interval, T. Typically used to quantify the background sound level at a specified position.
$L_{Aeq,T}$	The equivalent continuous A-weighted sound pressure level over a time interval, T. This is an energy-average sound pressure level over the specified time period.
Noise	Unwanted or undesirable sounds observed by a listener.
Octave band	A frequency band used in acoustical measurements. An octave is a frequency interval between two sounds where the frequency of the lower sound is half the frequency of the upper sound. The human hearing range is divided into ten logarithmically equal frequency divisions called octave bands, with centre-band frequencies as follows: (16 Hz, 32 Hz,) 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1000 Hz, 2000 Hz, 4000 Hz, 16000 Hz.
Rating level, $L_{Ar,Tr}$	The specific sound level plus a correction accounting for acoustic features such as impulses, tones, intermittent features, or any other characteristics that draw more attention to the sound source.
Residual sound level	The equivalent continuous A-weighted sound pressure level of the ambient sound remaining at a specified position when the specific sound source (the sound source being assessed) does not contribute to the ambient sound.
R_w	The weighted sound reduction index of an architectural element. A single-figure rating of the sound insulation provided by the architectural element in idealised conditions over a range of frequencies. Measured in a laboratory in accordance with BS EN ISO 140-3 (or BS EN ISO 10140-2), with single figure rating determined in accordance with BS EN ISO 717-1.
Sound	The vibration, or oscillation, of particles in a medium, such as air, which may be detected by the human ear.
Sound absorption	The reduction of sound energy by transmission through an absorbing medium such an "acoustically soft" material or surface which results in a reduced reflection of incident sound.
Sound absorption class.	A classification system describing the ability of a specified material or surface to absorb sound. Typically measured in a laboratory in accordance with BS EN ISO 354, with class determined in accordance with BS EN ISO 11654.
Sound absorption coefficient, α	A fractional measure of the ability of a material or surface to absorb incident sound. Expressed as a value between 1.0 (total absorption of incident sound, no reflection) and 0.0 (no absorption, 100% reflection).
Sound insulation	The ability of architectural elements or structures to reduce the transmission of sound, predominantly due to the reflection of sound incident on the element or structure. Typically measured as the difference in sound pressure levels between a "source" room containing a loudspeaker and an adjacent "receiving" room.
Sound power level	A logarithmic measurement that quantifies the total sound power of a source emitted in all directions relative to a reference sound power (W_{ref} = 1 pW or 10-12 W). Equal to 10 log10 (W / W_{ref}) and expressed in decibels.
Sound pressure level (SPL)	A logarithmic measurement that quantifies the sound pressure at a specified position relative to a reference sound pressure (pref = 20 μPa). Equal to 20 log10 (p / p_{ref}) and expressed in decibels.
Specific sound level	The equivalent continuous A-weighted sound pressure level at a specified position due to the specific sound source (the sound source being assessed).
Third-octave band	A higher-resolution frequency band used in acoustical measurements. A third-octave band is equal to one of three logarithmically equal parts of the corresponding octave frequency band. The upper band edge frequency is equal to the lower band-edge frequency multiplied by 1/3.

Appendix B - Policy, Standards and Guidelines

Legislation

Control of Pollution Act, 1974

Section 60 of the Control of Pollution Act, 1974 (the 'Act'), Part III - Noise enables a local authority to serve a notice on anyone (including a company) who is carrying out, or intending to carry out, works in relation to construction, demolition, road-works, railway maintenance etc. in order to control the noise from those operations. Section 61 of the Act also enables such a person to apply to the local authority for consent in respect of such works.

The Act introduces the concept of using 'Best Practicable Means' (BPM) to control the impact of noise where significant impacts are likely to occur. BPM essentially means selection of the quietest techniques and equipment, in addition to considering factors such as timing, duration, location and opportunities for acoustic screening or separation, to ensure that impacts are controlled in so far as is reasonably practicable. The demonstrable use of BPM can also be used as a defence to enforcement action under nuisance legislation.

National Policy

National Planning Policy Framework, 2023

The latest revision to the National Planning Policy Framework (NPPF) was published in 2023. The NPPF sets out the Government's planning policies for England and how these should be applied. It provides a framework within which local plans for housing and other development can be produced.

This document makes reference to voiding significant adverse impacts, and mitigating and reducing potential adverse impacts resulting from noise to a minimum but it does not set absolute criteria.

Noise Policy Statement for England, 2010

The underlying principles and aims of existing noise policy documents, legislation and guidance are clarified in the Noise Policy Statement for England (NPSE). The NPSE sets out the 'Long Term Vision' of Government noise policy as follows: "Promote good health and good quality of life through the effective management of noise within the context of Government policy on sustainable development".

The NPSE outlines the following three aims for the effective management and control of environmental, neighbour and neighbourhood noise:

- "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".

The guidance defines three established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation (WHO):

- "NOEL (No observed Effect Level) – 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"
- "LOAEL (Lowest Observed Adverse Effect Level) – This is the level above which adverse effects on health and quality of life can be detected"; and
- "SOAEL (Significant Observed Adverse Effect Level) – This is the level above which significant adverse effects on health and quality of life occur".

The guidance also states that it is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations and that not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available.

National Planning Practice Guidance, England, 2023

Further guidance in relation to the National Planning Policy Framework and the Noise Policy Statement for England has been published in the National Planning Practice Guidance in England: Noise (NPPG-Noise), which summarises the noise exposure hierarchy, based on the likely average response.

The National Planning Practice Guidance (NPPG) has been revised and updated to be easily accessible and available online.

The Noise Guidance advises on how planning can manage potential noise impacts in new development. It sets out when noise is relevant to planning and outlines the following Observed Effect Levels to determine the noise impact:

- Significant observed adverse effect level: This is the level of noise exposure above which significant adverse effects on health and quality of life occur
- Lowest observed adverse effect level: this is the level of noise exposure above which adverse effects on health and quality of life can be detected
- No observed effect level: this is the level of noise exposure below which no effect at all on health or quality of life can be detected.

The document recognises the subjective relationship between noise levels and the impact on those affected and advises on factors which may influence on whether noise could be a concern.

The significance criteria from NPPG-Noise are reproduced in Table B1 below.

Table B1: Significance Criteria from NPPG In England: Noise

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level (LOAEL)			
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, 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 perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level (SOAEL)			
Noticeable and disruptive	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. 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
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

Local Policy

Camden Council

In accordance with the Camden Planning Guidance, Amenity (2021), Camden Council places significant emphasis on the management of noise quality within the borough.

The guidance outlines requirements and design principles for managing noise within new developments, focusing on the following key aspects:

- **Protection of Amenity:** Proposals must ensure that new developments do not have an unacceptable impact on the indoor and outdoor acoustic environment. This includes safeguarding the amenities of both existing and future occupants against noise pollution.
- **Mitigation Measures for New Plant Noise:** Particular attention is given to new sources of plant noise. The document stipulates that developments involving new plant installations are required to conduct thorough acoustic assessments and implement effective noise mitigation strategies to minimise impact on the surrounding environment.
- **Compliance with Standards:** The guidance mandates compliance with relevant national standards and guidance on noise pollution. Developments must demonstrate adherence to these standards through detailed acoustic assessments included in planning applications.

Camden provide a comprehensive framework for addressing noise pollution within the borough. By emphasising the need for noise mitigation, particularly in relation to new sources of plant noise, the document ensures that developments contribute to a healthy and harmonious living environment.

Standards and Guidelines

BS 4142:2014+A1 'Methods for Rating and Assessing Industrial and Commercial Sound'

BS 4142:2014+A1 describes the method for assessing the likely impact of noise sources of an industrial, commercial or fixed nature on people residing in the area.

New commercial development can often incorporate plant and processes that have the potential to generate noise, especially if operated at night-time when background noise levels are at their lowest.

Good practice dictates that new developments should be designed to give a cumulative noise rating level ($L_{Ar,Tr}$) of no more than the current prevailing background noise level (L_{A90}) at a distance of 1m from the nearest residential facades, when assessed in accordance with BS 4142:2014+A1 as this is defined as a low impact.

BS 4142:2014+A1 sets out a method to assess the likely impact of noise from factories, industrial premises or fixed installations and sources of an industrial nature in commercial premises on noise-sensitive receptors in the vicinity.

The procedure contained in BS 4142:2014+A1 for assessing the likely impact is to compare the measured or predicted noise level from the source in question, the $L_{Aeq,T}$ 'specific noise level', immediately outside the dwelling with the $L_{A90,T}$ background noise level.

Where the noise contains a tonality, impulsivity, intermittency and other sound characteristics, then a correction depending on the grade of the aforementioned characteristics of the sound is added to the specific noise level to obtain the $L_{Ar,Tr}$ 'rating noise level'. A correction to include the consideration of a level of uncertainty in noise measurements, data and calculations can also be applied, when considered necessary.

BS 4142:2014+A1 states: "The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs". An estimation of the impact of the specific noise can be obtained by the difference of the rating noise level and the background noise level and considering the following:

Typically, the greater this difference, the greater the magnitude of the impact.

- A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.
- The lower the rating level is relative to the measured background level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background level, this is an indication of the specific sound source having a low impact, depending on the context."

The periods associated with day or night, for the purposes of the standard, are considered to be 07.00 to 23.00 and 23.00 to 07.00, respectively.

Appendix C - Time History

1 Regency Lawn, London
Measurement Position 1
Measured L_{Aeq}, L_{AFmax}, & L_{A90} Time Histories
20/08/2024 - 21/08/2024