RBA ACOUSTICS

9 BRIARY CLOSE, LONDON, NW3 3JZ

Plant Noise Assessment

Reference: 13663.RP01.PNA.2
Prepared: 19 August 2024
Revision Number: 2

Ashley Donoff
9 Briary Close
London
NW3 3JZ

Plant Noise Assessment

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Revision	Comment	Date	Prepared By	Approved By
0	First issue of report	16 July 2024	Patrick Spiers	Martin Raisborough
1	Minor amendments based on client feedback	30 July 2024	Patrick Spiers	Martin Raisborough
2	Inclusion of updated drawing in Appendix B	19 August 2024	Patrick Spiers	Martin Raisborough

Terms of contract:

RBA Acoustics Ltd has prepared this report in accordance with our Scope of Work 13663.ACB01.0 dated 24 April 2023. RBA Acoustics Ltd shall not be responsible for any use of the report or its contents for any purpose other than that for which it was provided. Should the Client require the distribution of the report to other parties for information, the full report should be copied. No professional liability or warranty shall be extended to other parties by RBA Acoustics Ltd without written agreement from RBA Acoustics Ltd.

The recommendations within this report relate to acoustics performance only and will need to be integrated within the overall design by the lead designer to incorporate all other design disciplines such as fire, structural integrity, setting-out, etc. Similarly, any sketches appended to this report illustrate acoustic principles only and again will need to be developed in to full working drawings by the lead designer to incorporate all other design disciplines.

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Contents

1.0 INTRODUCTION

RBA Acoustics has been appointed by Ashley Donoff to undertake a noise impact assessment in relation to the installation of 3No. new condenser units on the roof of 9 Briary Close, in Swiss Cottage. The assessment is required to support a retrospective planning application for the installation of these units. London Borough of Camden requires consideration be given to atmospheric noise emissions from the proposed equipment at the nearest noise-sensitive property.

RBA Acoustics has undertaken measurements of the prevailing noise conditions at the site and to determine the atmospheric noise emissions in accordance with London Borough of Camden's requirements. This report presents the results of the noise measurements, associated criteria and provides the required assessment.

This report occasionally employs technical acoustic terminology. A glossary of acoustic terminology is presented in Appendix A.

2.0 SITE DESCRIPTION

The property at 9 Briary Close, Swiss Cottage comprises a four-storey terraced residential premises located approximately 430-metres to the east of Swiss Cottage Underground Station. The surrounding area consists of further residential properties.

The adjacencies immediately to the east and west are the adjoining terraced residential properties. To the north is a small common green space, across which are the rear gardens of properties located along Fellows Road. The south is bounded by Adelaide Road, with further residential properties located on the southern side.

The condenser units have been installed in the centre of the roof of the property. The nearest noise sensitive properties to the site are those adjacent to the property on either side.

A plan of the site showing the location, the local environment and the nearby noise sensitive properties is illustrated in Figure 1 in Appendix B, while photographs of the measurement position are shown in Figure 2 in Appendix B.

A layout of the location of the condensing units on the roof of the property is shown in Figure 3 of Appendix B.

3.0 ENVIRONMENTAL NOISE MONITORING

Monitoring of the prevailing noise levels was undertaken between Wednesday, 3rd July and Friday 5th July 2024. Measurements commenced at approximately 11:30 on Wednesday 3rd and concluded at around 14:00 on Friday 5th. The equipment was installed and collected by Patrick Spiers of RBA Acoustics.

3.1 Measurement Location

In order to determine the background noise climate at the nearest affected residential receptors to the site, the equipment was installed on the northern facade of the site, at top floor level.

The sound level meter was secured within the property, with the connecting microphone mounted on an A-frame such that it was 1.5-metres from the façade and approximately 8-metres above the ground. As such, the measurements recorded are to be considered façade reflected. The prevailing noise climate at this location was considered representative of the background noise climate at the adjacent noise sensitive receptors on Briary Close.

Continuous measurements of the L_{A90}, L_{Amax} and L_{Aeq} noise levels were made over sample periods of 15 minutes duration throughout the survey period.

The measurement location is illustrated on the site plan in site plan in Figure 1 and in the photograph in Figure 2 in Appendix B.

3.2 Noise Climate

The noise climate at the measurement position consisted predominantly of noise from the surrounding road network and other general urban noise sources (human activity, etc.).

It was noted that cladding works were ongoing at the Burnham tower block, approximately 55-metres northwest of the site. As the survey was unattended, the exact timing of these works is unknown, and thus recorded levels during standard construction hours (08:00 – 18:00) have been excluded, and daytime noise levels taken from the period between 18:00 – 23:00.

It is understood that the installed units were switched off for the duration of the survey period, and thus the measured noise levels are representation of the current noise climate without any contributions from the new units.

3.3 Instrumentation

For information regarding the equipment used for the measurements please refer to Appendix C.

The sound level meter was calibrated both prior to and on completion of the survey with no calibration drifts observed. The sound level meter and field calibrator have been laboratory calibrated within the last 2 years, while the field calibrator has undergone and additional in-house calibration check within the past year.

3.4 Weather Conditions

Weather conditions throughout the survey were considered to be conducive to the measurement of environmental sound. Wind speeds measured during the beginning of the survey were measured to be an average of 4m/s with a temperature of 16 degrees. At the end of the survey, the wind speed was measured to be an average of 5m/s with a temperature of 18 degrees.

As the survey was unattended, detailed records of weather conditions throughout the survey were not able to be recorded, however, it is understood from weather reports from nearby stations that weather conditions remained mostly dry and still throughout the survey.

3.5 Location of the Nearest Noise-Sensitive Receptors

We understand the nearest noise-sensitive receptors (NSR) to the proposed plant to be as follows:

NSR 1 – 8 Briary Close (Top Floor Windows)

This receptor is adjacent to the site, with the windows located approximately 7m east of the proposed plant location.

NSR 2 – 10 Briary Close (Top Floor Windows)

This receptor is also adjacent to the site, with the windows located approximately 7m west of the proposed plant location.

As the NSR are equidistant from the proposed plant, satisfying the criteria at NSR 1 will automatically satisfy the criteria at NSR 2.

3.6 Results

The full results of the measured sound levels are shown as time-histories on the Graphs presented in Appendix D.

The lowest measured $L_{A90,\,15min}$ periods over the entire survey period are summarised in Table 1 below.

Table 1 – Measured Sound Levels

Measurement Period	Position 1 – Site Rooftop	
	Typical Lowest Background Noise $L_{A90,15min}$ (dB)	Period Averaged Noise Levels L_{Aeq} (dB)
Daytime (07:00 – 23:00)	44	56
Daytime with Construction Excluded (18:00 – 23:00)	41	46
Night-time (23:00 – 07:00)	35	50

The results of the above measurements will be used in the subsequent analysis of plant noise.

4.0 ASSESSMENT CRITERIA

4.1 Local Authority Criteria

The requirements of London Borough of Camden's Environmental Health Department regarding new building services plant are understood to be as follows.

> *Industrial and Commercial Noise Sources*
>
> *A relevant standard or guidance document should be referenced when determining values for LOAEL and SOAEL for non-anonymous noise. Where appropriate and within the scope of the document it is expected that British Standard 4142:2014 'Methods for rating and assessing industrial and commercial sound' (BS 4142) will be used. For such cases a 'Rating Level' of 10 dB below background (15dB if tonal components are present) should be considered as the design criterion).*

4.2 National Planning Policy Framework (NPPF)

The National Planning Policy Framework (NPPF) states that, with respect to noise, planning policies and decisions should aim to:

- Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;
- Mitigate and reduce to a minimum, other adverse impacts on health and quality of life arising from noise from a 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 upon them because of changes in nearby land uses since they were established; 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.

The guidance contained within the NPPF further determines that consideration should be given to the Noise Policy Statement for England (DEFRA, March 2010).

4.3 Noise Policy Statement for England (NPSE, March 2010)

The NPSE attends to three types of noise;

- "Environmental noise" which includes noise from transportation sources;
- "Neighbour noise" which includes noise from inside and outside people's homes; and
- "Neighbourhood noise", which includes noise arising from within the community such as industrial and entertainment premises, trade and business premises, construction sites and noise in the street.

In line with the aims determined in the NPPF, the NPSE determines three aims;

1. Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development;
2. Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development; and,
3. Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

The guidance detailed within the NPSE relates a number of key phrases with regards to adverse effects which can be applied to noise impacts as used by the World Health Organisation.

- **NOEL – No Observed Effect Level** - The level below which no health effect or detrimental impact on the quality of life is observed.
- **LOAEL – Lowest Observed Adverse Effect Level** - The level at which adverse effects on health and quality of life can be detected
- **SOAEL – Significant Observed Adverse Effect Level** - The level above which significant adverse effects on health and quality of life occur.

The guidance indicates that it is not possible to have a single objective noise-based measure that defines SOAEL, and as such the SOAEL is likely to be different for different noise sources and receptors. The document indicates that further research is required to establish what may constitute a significant adverse impact on health and quality of life from noise.

While the NPSE determines the NOEL, LOAEL and SOAEL descriptions, the document indicates that, unlike other environmental disciplines, there are currently no European or national noise limits which have to be met, although the NPSE states that "there can be specific local limits for specific developments" allowing for negotiation.

4.4 Planning Practice Guidance - Noise

The Planning Practice Guidance for noise 2014 (updated July 2019) broadly considers the same issues as demonstrated within both the NPPF and the NPSE with regards to noise within the planning realm. The information detailed within the PPG indicates that noise should be considered when:

- New developments may create additional noise; and/ or,
- New developments would be sensitive to the prevailing acoustic environment.

The guidance indicates that Local Planning Authorities should take account of the acoustic environment and in doing so consider:

- Whether or not a significant adverse effect is occurring or likely to occur;
- Whether or not an adverse effect is occurring or likely to occur; and,
- Whether or not a good standard of amenity can be achieved.

The impact of noise is rated within the policy document in terms of the relative 'Observed Effect Level', defined in line with the guidance within the NPSE. Based upon this, the Planning Practice Guidance provides the following matrix of likely average response.

Table 2 - PPG Observed Effect Levels

Perception	Example 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			
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			
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 character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/ or an ability 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

4.5 BS 4142:2014 'Method for Rating and Assessing Industrial & Commercial Sound'

BS4142:2014 *Methods for rating and assessing industrial and commercial sound* describes methods for rating and assessing sound of an industrial and/or commercial nature, which includes:

- sound from industrial and manufacturing processes
- sound from fixed installations which comprise mechanical and electrical plant and equipment
- sound from the loading and unloading of goods and materials at industrial and/or commercial premises
- sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site.

The methods described within BS4142:2014 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.

The standard is also applicable to determine rating levels for sound of an industrial or commercial nature at proposed new dwellings or premises used for residential premises. The standard is only appropriate for the assessment of external sound levels.

The assessment method described in BS4142:2014 is based on the continuous sound pressure level produced by a specific source ($L_{Aeq,Tr}$) at the assessment location. Appropriate corrections allowing for any tonality, impulsivity, other characteristics or intermittency of the specific sound source are then applied to derive the rating level ($L_{Ar,Tr}$). The rating level is then compared to the background sound level ($L_{A90,T}$) to produce the relative difference, or excess of rating level over background sound level. BS4142:2014 quantifies the estimated impact from the excess as:

a) *Typically the greater this difference, the greater the magnitude of impact.*
b) *A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
c) *A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.*
d) *The lower the rating level is relative to the measured background sound 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 sound level, this is an indication of the specific sound source having a low impact, depending on the context.*

For the purposes of this assessment, it is considered that these response levels may be correlated to the effect levels within NPSE and PPG, as presented in Table 3.

Table 3 – BS 4142 Correlated Effect Levels with NPSE and PPG

BS4142 Rating Level	NPSE	PPG
> +8dB	SOAEL	Unacceptable Adverse Effect / Significant Observed Adverse Effect
> 0dB < +8dB	LOAEL / SOAEL	Observed Adverse Effect
>-5dB < 0dB	LOAEL	No Observed Adverse Effect
< -5dB	NOEL	No Observed Adverse Effect

4.6 Plant Noise Emission Limits

Based on the above guidance, the requirements of the London Borough of Camden, and the typically lowest noise levels representative of those at the nearest affected noise sensitive properties in Table 1, the following plant noise emission limits are recommended.

Table 4 – Recommended Plant Noise Emission Limits

Period	Typical lowest $L_{A90,15min}$ (dB)
Daytime (07:00 – 23:00)	34dB $L_{Ar,T}$
Night-time (23:00 – 07:00)	30dB $L_{Ar,T}$

These limits are to be achieved at 1 metre from the façade of the nearest noise sensitive due to operation of the extract fan at representative worst-case duty. The limits are based on meeting the requirements of the London Borough of Camden, which in turn will achieve a rating noise level 10dB below the current background sound level, and will be in line with "NOEL", with reference to NPSE guidance and "No Observed Adverse Effect", with reference to PPG.

5.0 PLANT NOISE IMPACT ASSESSMENT

This assessment has been based on the information provided to RBA by the Client, and is described in the following sections.

5.1 Plant Noise Emission Limits

Based on the guidance and adopted assessment criteria in Section 4.0, and the typically lowest noise levels representative of those at the nearest affected noise sensitive properties in Table 1, the following plant noise emission limits are recommended.

Table 5 – Recommended Plant Noise Emission Limits

Period	Typical lowest $L_{A90,15min}$ (dB)
Daytime (07:00 – 23:00)	34dB $L_{Ar,T}$
Night-time (23:00 – 07:00)	30dB $L_{Ar,T}$

These limits are to be achieved at 1 metre from the façade of the nearest noise sensitive due to operation of the extract fan at representative worst-case duty. The limits are based on achieving a rating noise level 10dB below the current background sound level, which will be in line with "NOEL", with reference to NPSE guidance and "No Observed Adverse Effect", with reference to PPG.

5.2 Proposed Plant Items

The following items of plant have been installed in the centre of the roof of the demise:

Table 6 – Proposed Extract Fan

Ref.	Manufacturer/Model/Duty	Plant Type
CON 1 – 2	Daikin 5MXS90E	Condenser
CON 3	Daikin RXM60R	Condenser

5.3 Noise Levels

Information regarding the noise levels of the installed plant has been provided by the Client. The associated plant noise levels are detailed as follows:

Table 7 – Plant Noise Levels

Unit	Parameter	Sound Level (dB) at Octave Band Centre Frequency (Hz)							dBA
		125	250	500	1k	2k	4k	8k	
CON 1 – 2	L_p	57	53	52	50	48	42	38	32
CON 3	L_p	52	53	51	47	46	40	34	26

Review of the octave band data provides no indication of any tonal characteristics associated with the proposed plant.

5.4 Calculation of Noise Levels at Nearest Residential Window

Our calculation method for predicting noise levels from the installed plant at the nearest residential windows, based on the information stated above, is summarised below.

- Source Term SPL
- 20LogR Distance Attenuation
- Directivity
- Reflections
- Screening

The results of the calculations indicate the following noise levels at the nearest affected residential windows:

Table 8 – Predicted Noise Levels

Plant Details	Predicted Noise Level @ Nearest Noise-Sensitive Receptor		
	Specific Noise Level	Rating Corrections	BS 4142 Rating Noise Level
CON 1	20dBA	0	20dB $L_{Ar,T}$
CON 2	20dBA	0	20dB $L_{Ar,T}$
CON 3	20dBA	0	20dB $L_{Ar,T}$
Total Noise Level @ Receptor Location 1			**25dB $L_{Ar,T}$**

Noise levels from the installed plant is within the assessment and Local Authority criteria.

5.5 Control of Vibration

In addition to the control of airborne noise transfer, it is also important to consider the transfer of noise as vibration to adjacent properties (as well as to any sensitive areas of the same building).

We would typically advise that fans be isolated from the supporting structure by means of either steel spring isolators or rubber footings. For particularly sensitive locations, or when on lightweight structures the mounts should ideally be caged and be of the restrained type.

It is important the isolation is not "short-circuited" by associated pipework, ductwork or conduits. To this end, any conduits should be looped and flexible connectors should be introduced between the condenser and any associated pipework. Pipework should be supported by brackets containing neoprene inserts.

5.6 Uncertainty

Uncertainty is an unavoidable feature of measurements in the field, which can be subject to many factors; the weather typically being the most significant of which with respect to the measurement of sound. Uncertainty is also unavoidable in the prediction of sound levels, where naturally, before the scenario being considered becomes a reality, a number of assumptions need to be relied upon. There is also the uncertainty of people's reactions, which can be influenced by a number of factors, not just the magnitude or character of the sound in question.

In keeping with the scale of each project, therefore, it is the aim of RBA Acoustics to minimise uncertainty at each stage as far as reasonably practicable. With this in mind, RBA Acoustics follow the best practise methodologies based on the guidance within BS 4142:2014 and our experience in undertaking assessments of these nature.

Crucially, it has been determined that environmental noise measurements have been undertaken by suitably qualified staff, using in calibration equipment and avoiding adverse weather conditions.

The predictions have also been undertaken by suitably qualified staff, whilst using the best available information, an industry standard calculation method, and the most applicable calculation procedures.

Notwithstanding this, naturally some uncertainty remains. Given the sheer number of factors involved, however, it is not feasible to place a value on the level of uncertainty, without resulting in an unhelpful range of possible outcomes. It is the professional position of RBA Acoustics that uncertainty has been kept to a realistic minimum and that the outcome of this assessment is sufficiently representative.

6.0 CONCLUSIONS

RBA Acoustics has been appointed by Ashley Donoff to undertake a noise impact assessment in relation to the installation of 3No. new condenser units on the roof of 9 Briary Close, in Swiss Cottage. London Borough of Camden requires consideration be given to atmospheric noise emissions from the proposed equipment at the nearest noise-sensitive property.

Baseline environmental sound monitoring was undertaken at the site between Wednesday, 3rd July and Friday, 5th July 2024 to ascertain current prevailing sound levels close to the nearest existing noise sensitive receptors to the installed new external noise generating plant items. The closest residential receptors have been identified to be the top floor window of the adjacent 8 Briary Close and 10 Briary Close – located equidistant from the plant location.

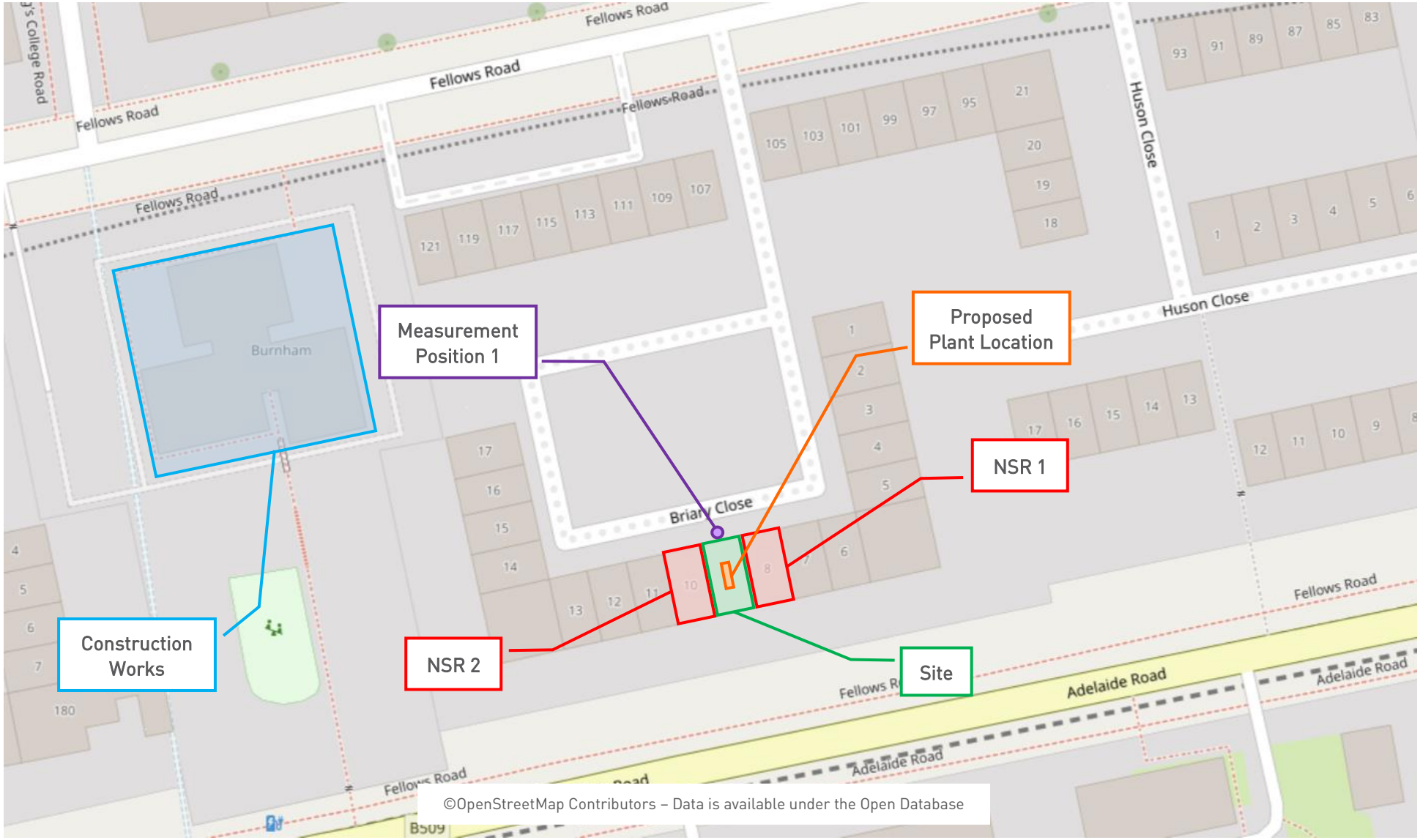
The baseline environmental noise levels have been used to set noise emission limits for the new plant items based on Local Authority criteria, national noise policy guidelines, and British Standard 4142 in order that there may be no significant impact on the nearby noise sensitive properties.

Based on the details of the plant installed at the property and noise impact assessment has been undertaken, the results of our assessment suggest that noise from the operation of the installed plant is expected to be at least 10dB below the otherwise prevailing background sound level, meeting the requirements of London Borough of Camden, and in line with “NOEL”, with reference to NPSE guidance and “No Observed Adverse Effect”, with reference to PPG.

Appendix A - Acoustic Terminology

dB	Decibel - Used as a measurement of sound pressure level. It is the logarithmic ratio of the noise being assessed to a standard reference level.
dB(A)	The human ear is more susceptible to mid-frequency noise than the high and low frequencies. To take account of this when measuring noise, the 'A' weighting scale is used so that the measured noise corresponds roughly to the overall level of noise that is discerned by the average human. It is also possible to calculate the 'A' weighted noise level by applying certain corrections to an un-weighted spectrum. The measured or calculated 'A' weighted noise level is known as the dB(A) level. Because of being a logarithmic scale noise levels in dB(A) do not have a linear relationship to each other. For similar noises, a change in noise level of 10dB(A) represents a doubling or halving of subjective loudness. A change of 3dB(A) is just perceptible.
L_{eq}	L_{eq} is defined as a notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the actual, fluctuating sound measured over that period (1 hour).
L_{Aeq}	The level of notional steady sound which, over a stated period of time, would have the same A-weighted acoustic energy as the A-weighted fluctuating noise measured over that period.
L_{An} (e.g L_{A10}, L_{A90})	If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time, hence L_{10} is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L_{90} is the average minimum level and is often used to describe the background noise.
$L_{max,T}$	The instantaneous maximum sound pressure level which occurred during the measurement period, T. It is commonly used to measure the effect of very short duration bursts of noise, such as for example sudden bangs, shouts, car horns, emergency sirens etc. which audibly stand out from the general level of, say, traffic noise, but because of their very short duration, maybe only a very small fraction of a second, may not have any effect on the L_{eq} value.

Appendix B – Site Plans



9 Briary Close, London, NW3 3JZ

Location of Site, Proposed Plant, Nearest Noise-Sensitive Receptors, & Construction Noise

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Figure 1

19 August 2024

Not to Scale

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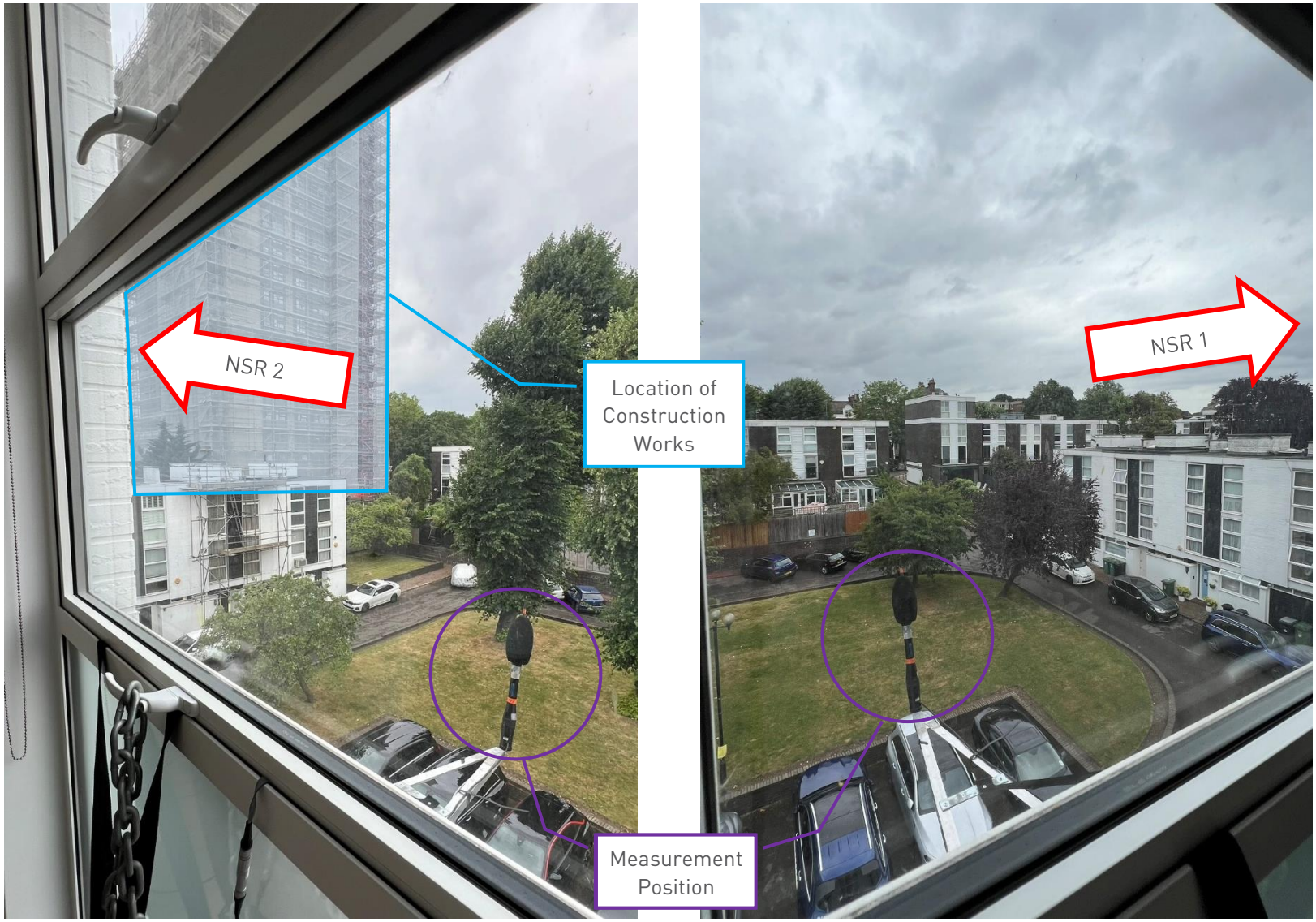

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Monitoring Location

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Figure 2

19 August 2024

Not to Scale

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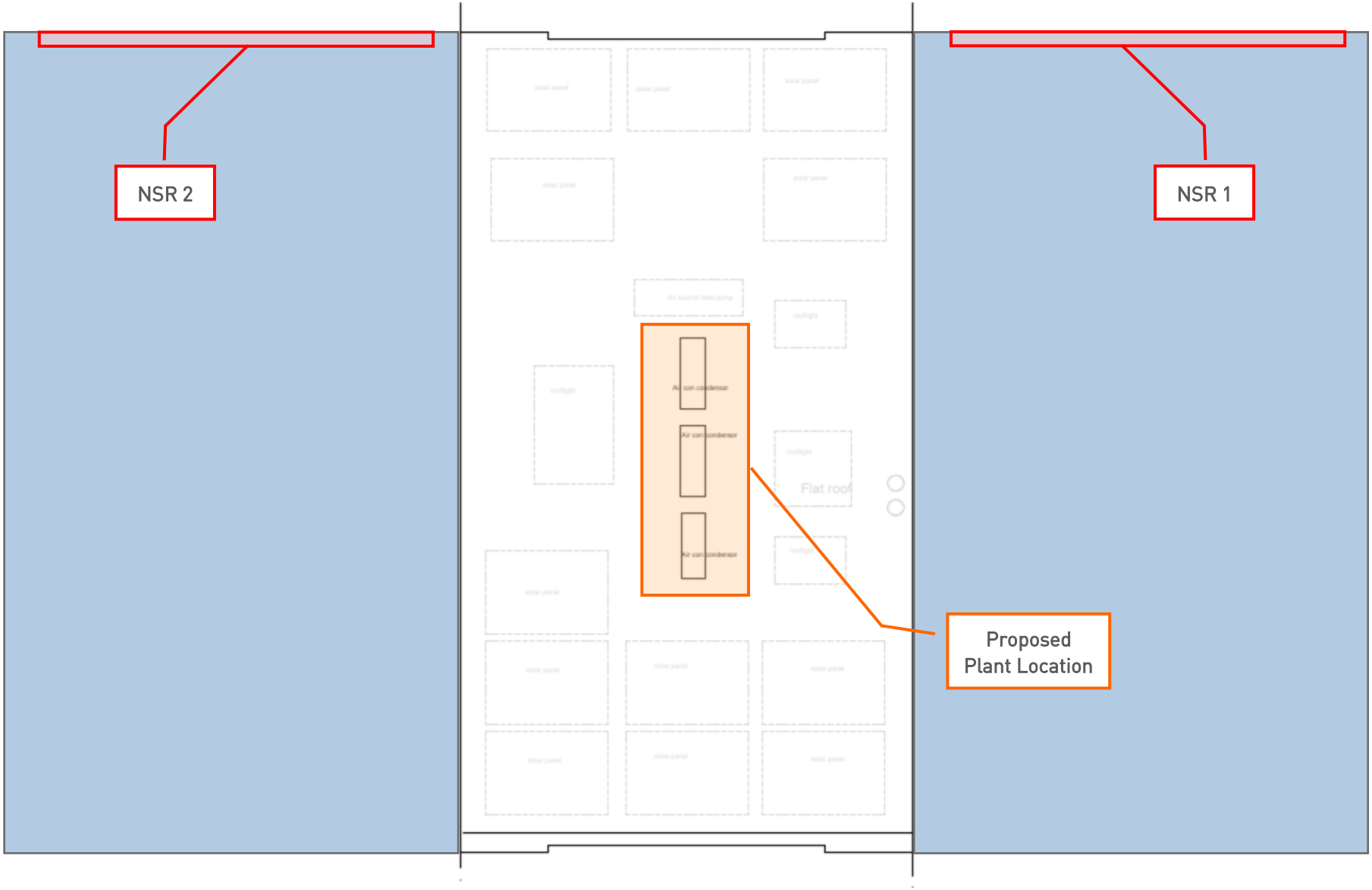

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Proposed Plant Layout (based on drawing "Proposed Roof Layout", Drawing No 134, Rev 10, 23/02/2022)

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Figure C

19 August 2024

Not to Scale

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Appendix C –Instrumentation

The following equipment was used for the measurements

Table C1 – Equipment Calibration Details

Manufacturer	Model Type	Serial No.	Calibration	
			Certificate No.	Valid Until
Norsonic Type 1 Sound Level Meter	Nor140	1403226	U42991	18 January 2025
Norsonic Pre Amplifier	1209A	12066		
Norsonic ½“ Microphone	1225	168180	42990	18 January 2025
Norsonic Sound Calibrator	1251	31988	U42989	18 January 2025

Appendix D – Results of Noise Monitoring Survey

9 Briary Close, London NW3

Measured Levels (15min Sample Periods)

Measurement Position 1, Third Floor Window - Wednesday 3 July to Friday 5 July, 2024

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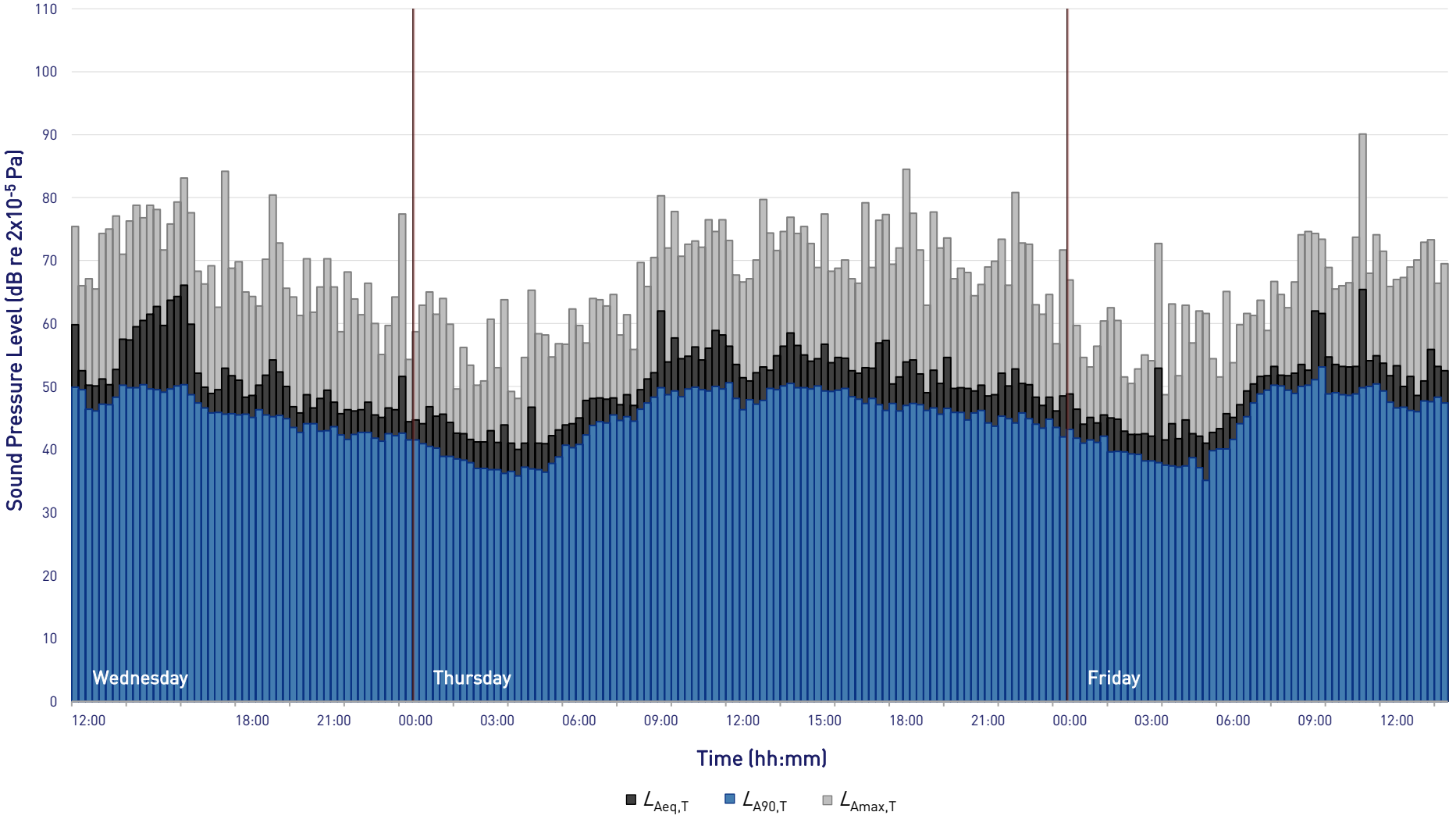
Graph 1



9 Briary Close, London NW3

$L_{A90,\,15\,min}$ Histogram

Measurement Position 1, Third Floor Window - Wednesday 3 July to Friday 5 July, 2024

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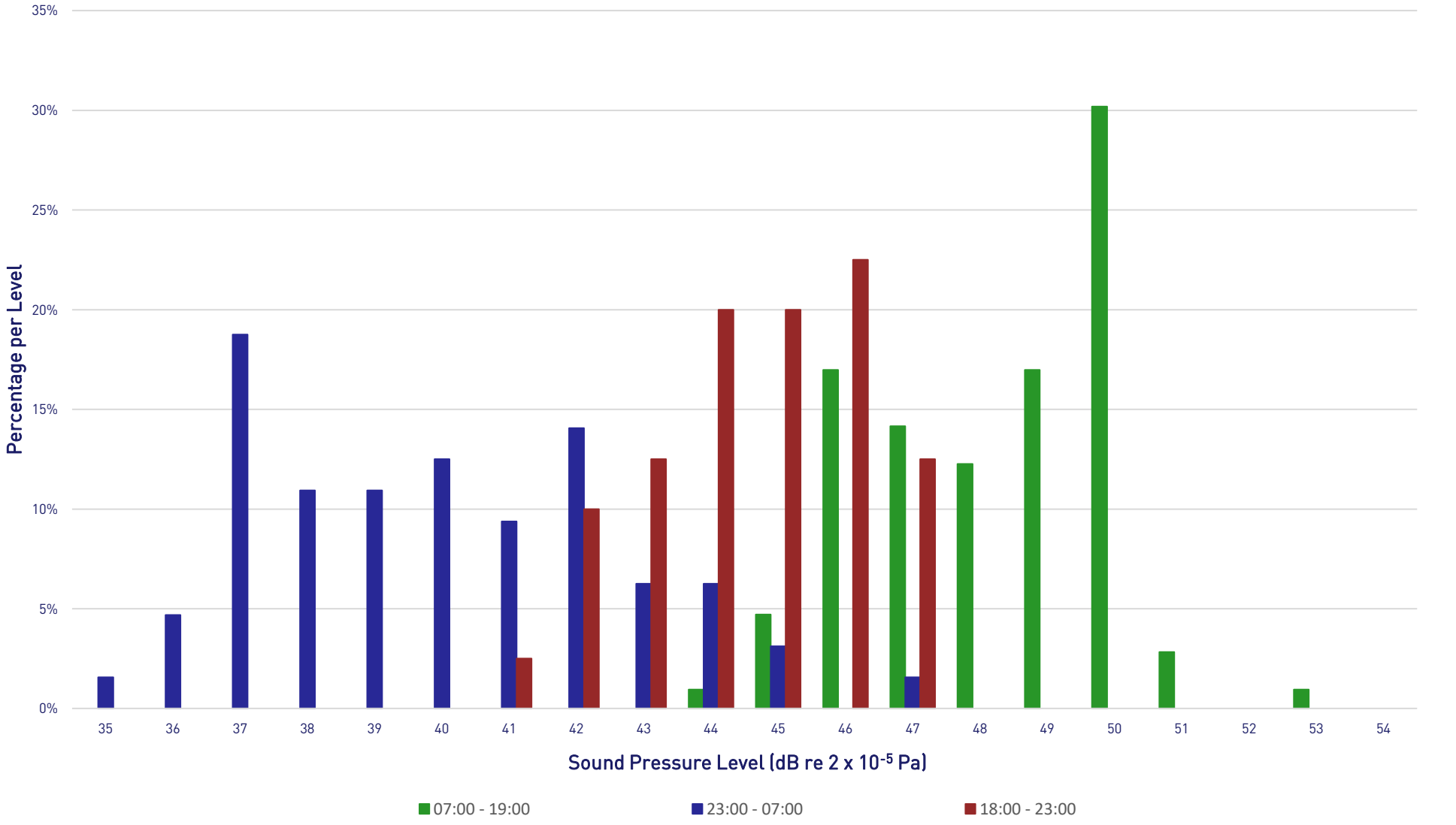
Graph 2



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