26 Rosslyn Hill
London
NW3 1PA

Plant Noise Impact Assessment

On behalf of

Simat Properties Limited

Project Reference: 91163 | Revision: 00 | Date: 23rd November 2022

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Document Information

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For and on behalf of Noise Solutions Ltd				

Revision	Date	Description	Prepared	Reviewed/ Approved

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Appendices

Executive Summary

Noise Solutions Ltd (NSL) has been commissioned to provide a noise impact assessment of a new air conditioning (AC) unit and an air source heat pump (ASHP) installed externally at 26 Rosslyn Hill in London.

The assessment shows that noise from the proposed plant, when attenuated as described, will meet the local authority's usual requirements and should therefore be acceptable.

Predicted plant noise levels are inclusive of the following mitigation measures;

- An acoustic screen around proposed AC and ASHP units, blocking line of sight to the windows of Receptors R1 and R2.

1.0 Introduction

1.1. Noise Solutions Ltd (NSL) has been commissioned to provide a noise impact assessment of a new air conditioning (AC) unit and an air source heat pump (ASHP) installed externally at 26 Rosslyn Hill in London.

1.2. An environmental sound survey has been undertaken to establish the prevailing background sound pressure levels at a location representative of the sound levels outside the nearest noise sensitive receptors to the site.

1.3. Noise levels from the proposed plant have been predicted at the nearest noise-sensitive receptors and assessed against the local authority's usual requirements.

1.4. To assist with the understanding of this report a glossary of acoustic terms can be found in **Appendix A**. An in-depth glossary of acoustic terms can be viewed online at www.acoustic-glossary.co.uk.

2.0 Details of development proposals

2.1. The AC and ASHP units are proposed to be installed at the rear along the north boundary of the property. It is assumed that the plant may be operated at any time by the occupants of the house.

2.2. The heating and hot water requirements of the house will be handled by the ASHP unit, and the comfort cooling for the principal rooms will be provided by the AC unit.

2.3. A site plan showing the site and surrounding area and the noise monitoring location used in this assessment is presented in **Appendix B**. Plant noise data is given in **Appendix D**.

3.0 Nearest noise-sensitive receptors

3.1. The surrounding area is predominantly residential in nature.

3.2. The nearest and potentially most affected noise sensitive receptors would be the neighbouring houses to the east (Receptor R1), and west (Receptor R2). The top floor windows of these houses are approximately 17m and 20m away from the plant area respectively.

4.0 Existing noise climate

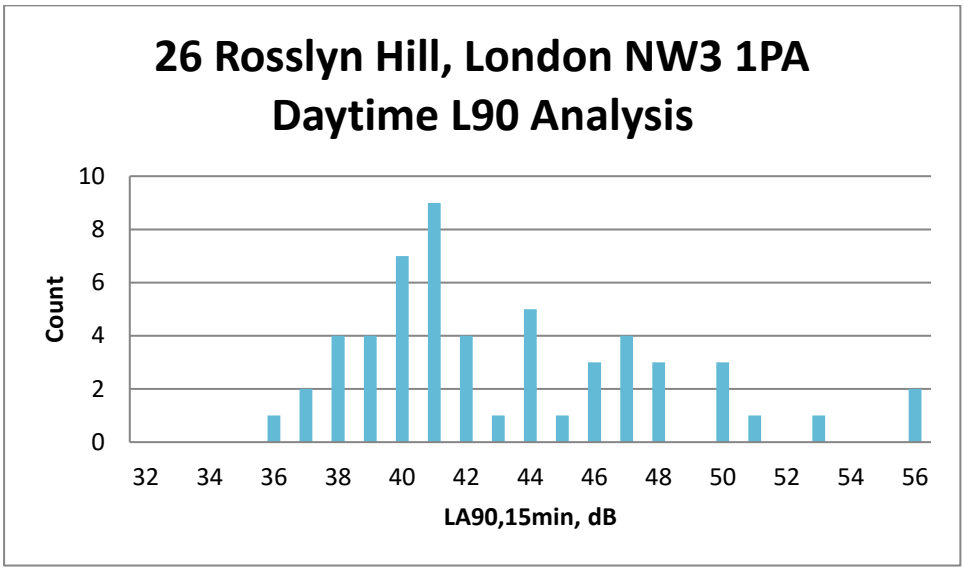
4.1. An environmental noise survey was undertaken to establish the typical background sound levels at a location representative of the noise climate outside the façades of the nearest noise sensitive receptors to the proposed plant area during the quietest times at which the plant will operate.

4.2. The results of the environmental sound survey are summarised in Table 1 below. The full set of measurement results and details of the survey methodology are presented in **Appendix C**.

Table 1 Summary of survey results

Measurement period	Range of recorded sound pressure levels (dB)			
	$L_{Aeq(15mins)}$	$L_{Amax(15mins)}$	$L_{A10(15mins)}$	$L_{A90(15mins)}$
Daytime (07.00 – 23.00 hours)	42-62	53-88	46-64	36-56
Night-time (23.00 – 07.00 hours)	36-50	48-68	38-54	32-39

Figure 1 Histogram of daytime L_{A90} background sound pressure levels



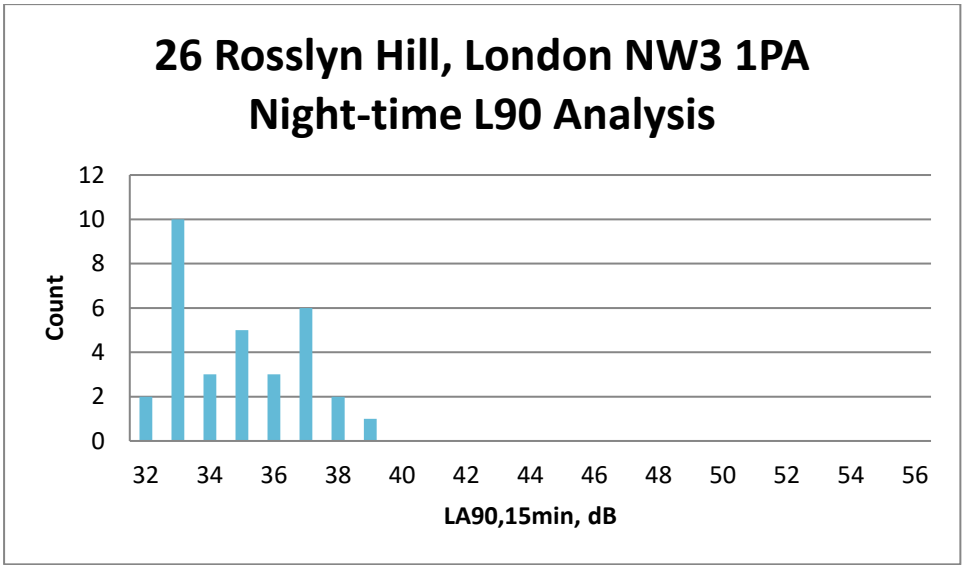
4.3. Further statistical analysis has been carried out on the data, and the mean, mode and median values are shown in Table 2 below.

Table 2 Statistical analysis of $L_{A90,15min}$ levels during the daytime period

dB, L_{A90} daytime period	
mean	43
modal	41
median	42

4.4. From the histogram analysis, 39dB has been selected to be a robust representation of the background noise level during the daytime period.

Figure 2 Histogram of night-time L_{A90} background sound pressure levels



4.5. Further statistical analysis has been carried out on the data and the mean, mode and median values are shown in Table 3 below.

Table 3 Statistical analysis of $L_{A90,15min}$ levels during the night-time period

dB, L_{A90} night-time period	
mean	35
modal	33
median	35

4.6. Again, from the histogram analysis, 33dB has been selected to be a robust representation of the background sound level during the night-time period.

4.7. Therefore, the following values are considered representative of the existing background sound pressure levels at nearby noise sensitive premises:

- 39dB L_{A90} during the daytime period; and
- 33dB L_{A90} during the night-time period.

5.0 Plant noise design criteria

London Borough of Camden

5.1. Section 6 of the Camden Planning Guidance Amenity, published March 2018, gives guidance on noise and vibration.

5.2. Clause 6.8 refers to noise thresholds within Appendix 3 of the Local Plan and to the principles of No observed effect level (NOEL), Lowest observable adverse effect level (LOAEL) and Significant observed adverse effect level (SOAEL) and defines their meanings. Specifically, in the context of this report, LOAEL is defined as:

> *The level above which changes in behaviour (e.g. closing windows for periods of the day) and adverse effects on health (e.g. sleep disturbance) and quality of life can be detected.*

5.3. SOEAL is defined as:

> *The level above which adverse effects on health and quality of life occur. This could include psychological stress, regular sleep deprivation and loss of appetite.*

5.4. Clause 6.27 states that:

> *Developments proposing plant, ventilation, air extraction or conditioning equipment and flues will need to provide the system's technical specifications to the council accompanying any acoustic report. "BS4142 Method for rating Industrial and Commercial Sound' contains guidance and standards which should also be considered within the acoustic report.*

5.5. Appendix 3 within the Camden Local Plan published 2017 states:

> *"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)."*

5.6. Table C of the appendix states the criteria at which development related noise levels will be acceptable:

Table C: Noise levels applicable to proposed industrial and commercial development (including plant and machinery)

Existing Noise sensitive receptor	Assessment Location	Design Period	LOAEL (green)	LOAEL to SOAEL (Amber)	SOAL (Red)
Dwellings**	Garden used for main amenity (free field) and Outside living or dining or bedroom window (façade)	Day	'Rating level' 10dB* below background	'Rating level' between 9dB below and 5dB above background	'Rating level' greater than 5dB above background
Dwellings**	Outside bedroom window (façade)	Night	'Rating level' 10dB* below background and no events exceeding 57dBL_{Amax}	'Rating level' between 9dB below and 5dB above background or noise events between 57dB and 88dBL_{Amax}	'Rating level' greater than 5dB above background and/or events exceeding 88dBL_{Amax}

**10dB should be increased to 15dB if the noise contains audible tonal elements. (day and night). However, if it can be demonstrated that there is no significant difference in the character of the residual background noise and the specific noise from the proposed development then this reduction may not be required. In addition, a frequency analysis (to include, the use of Noise Rating (NR) curves or other criteria curves) for the assessment of tonal or low frequency noise may be required.*

***levels given are for dwellings, however, levels are use specific and different levels will apply dependent on the use of the premises.*

National Planning Policy Framework

5.7. A new edition of NPPF was published in July 2021 and came into effect immediately. The original National Planning Policy Framework (NPPF[1]) was published in March 2012, with revisions in July 2018 and February 2019 - this document replaced the existing Planning Policy Guidance Note 24 (PPG 24) "Planning and Noise." The 2021 revised edition contains no new directions or guidance with respect to noise, and hence, all previous references remain extant. The paragraph references quoted below relate to the July 2021 edition.

5.8. Paragraph 174 of the NPPF states that the planning system should contribute to and enhance the natural and local environment by (amongst others) *"preventing both new and existing*

[1] National Planning Policy Framework, DCLG, March 2012

development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, water or noise pollution or land stability."

5.9. The NPPF goes on to state in Paragraph 185:

" planning policies and decisions should ...

a) Mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development, - and avoid noise giving rise to significant adverse impacts on health and quality of life;
b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason ...

5.10. The NPPF document does not refer to any other documents or British Standards regarding noise other than the Noise Policy Statement for England (NPSE[2]).

5.11. Paragraph 2 of the NPPF states that *"planning law requires that applications for planning permission must be determined in accordance with the development plan unless material considerations indicate otherwise."*

5.12. Paragraph 12 of the NPPF states that *"The presumption in favour of sustainable development does not change the statutory status of the development plan as the starting point for decision making. Where a planning application conflicts with an up-to-date development plan (including any neighbourhood plans that form part of the development plan), permission should not usually be granted. Local planning authorities may take decisions that depart from an up-to-date development plan, but only if material considerations in a particular case indicate that the plan should not be followed".*

5.13. Paragraph 119 states that *"Planning policies and decisions should promote an effective use of land in meeting the need for homes and other uses, while safeguarding and improving the environment and ensuring safe and healthy living conditions. Strategic policies should set out a clear strategy for accommodating objectively assessed needs, in a way that makes as much use as possible of previously-developed or 'brownfield' land".*

BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound

5.14. BS 4142:2014+A1:2019 is intended to be used to assess the likely effects of sound on people residing in nearby dwellings. The scope of BS 4142:2014 includes "sound from fixed plant installations which comprise mechanical and electrical plant and equipment".

[2] Noise Policy Statement for England, DEFRA, March 2010

5.15. The procedure contained in BS 4142:2014 is to quantify the "specific sound level", which is the measured or predicted level of sound from the source in question over a one hour period for the daytime and a 15 minute period for the night-time. Daytime is defined in the standard as 07:00 to 23:00 hours, and night-time as 23:00 to 07:00 hours.

5.16. The specific sound level is converted to a rating level by adding penalties on a sliding scale to account for either potentially tonal or impulsive elements. The standard sets out objective methods for determining the presence of tones or impulsive elements, but notes that it is acceptable to subjectively determine these effects.

5.17. The penalty for tonal elements is between 0dB and 6dB, and the standard notes: "Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible."

5.18. The penalty for impulsive elements is between 0dB and 9dB, and the standard notes: "Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible."

5.19. The assessment outcome results from a comparison of the rating level with the background sound level. The standard states:

- *Typically, the greater this difference, the greater the magnitude of the impact.*
- *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context;*
- *A difference of around +5 dB 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 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.*

5.20. The standard does state that "adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact."

5.21. The standard goes on to note 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."

5.22. In addition to the margin by which the Rating Level of the specific sound source exceeds the Background Sound Level, the 2014 edition places emphasis upon an appreciation of the context, as follows:

> *"An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context."*

5.23. BS 4142:2014 requires uncertainties in the assessment to be considered, and where the uncertainty is likely to affect the outcome of the assessment, steps should be taken to reduce the uncertainty.

Low background noise levels

5.1. Due to the low prevailing environmental noise levels measured during the survey for both daytime and night-time periods, it is suggested that the plant noise design criteria at the nearest residences should be capped at 30dBA. This proposed criterion is based on guidance found in Section 11 of BS 4142:2014 which states:

> *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.*

5.2. A plant noise level of 30dBA at the façade would result in an internal noise level of 15dBA, which is likely to be lower than self-generated noise internally (for example, from domestic refrigerators). This assumption is based on guidance found in BS 8233:2014, which states that approximately 15dB of insulation is provided by a partially open window.

Proposed criteria

5.3. To comply with the London Borough of Camden's requirements, the rating noise level as per the methodology of BS4142:2014 of the new plant, at the nearest noise-sensitive receptor, must not exceed the limits in Table 4 below. A minimum limit of 30 dB(A) has been used as per BS 4142:2014 guidelines.

Table 4 Plant noise emissions limits at sensitive receptors

Period	Cumulative plant noise rating level, dB(A)
Daytime (07.00 – 23.00 hours)	30
Night-time (23.00 – 07.00 hours)	30

6.0 Plant noise assessment

6.1. Plant noise levels have been predicted at the nearest proposed noise-sensitive windows, taking account of the distance between the plant and the receptors.

6.2. It should be noted that the proposed plant is not anticipated to exhibit any tonal or impulsive characteristics provided it is well maintained. All proposed plant will be inverter driven and, therefore, will gently ramp up and down depending on the demands on the various systems. To be robust, however, a +3dB feature correction as advised in BS 4142:2014 has been applied for the possible presence of "*...characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment...".*

6.3. Predictions are inclusive of a minimum 9dB reduction for the condensers being installed behind a suitable acoustic screen, blocking line of sight to the windows of Receptors R1 and R2.

6.4. A summary of the predicted noise levels is given in Table 5. Full calculations are given in **Appendix E**.

Table 5 Assessment of predicted noise levels

Receptor	Period	Plant sound pressure level at receptor, dB L_{Aeq}	Criterion, dB L_{Aeq}	Excess, dBA
R1	Daytime (07.00 – 23.00 hours)	30	30	0
	Night-time (23.00 – 07.00 hours)			
R2	Daytime (07.00 – 23.00 hours)	29	30	-1
	Night-time (23.00 – 07.00 hours)			

6.5. The assessment shows that noise from the proposed plant will be below the recommended criteria and should therefore be acceptable to the local authority.

Context and Uncertainties

6.6. Where possible uncertainty in this assessment has been minimised by taking the following steps:

- The measurement of the background sound levels was undertaken over a period including the quietest times of the day and night.
- The sound level meter and calibrator used have a traceable laboratory calibration and the meter was field calibrated before and after the measurements.

- Uncertainty in the calculated impact has been reduced by the use of a well-established calculation method.

- Care was taken to ensure that the measurement position was representative of the noise climate outside the nearby residential dwellings and not at a position where higher noise levels are present.

7.0 Summary

7.1. Noise Solutions Ltd (NSL) has been commissioned to provide a noise impact assessment of a new air conditioning (AC) unit and an air source heat pump (ASHP) installed externally at 26 Rosslyn Hill in London.

7.2. An environmental noise survey has been undertaken to establish the existing prevailing noise levels at a location representative of the noise climate outside the nearest noise sensitive receptors to the site.

7.3. The assessment shows that, when attenuated as described, noise from the plant will comply with the local authority's usual requirements and should therefore be acceptable to them.

7.4. Predicted plant noise levels are inclusive of the following mitigation measures;

- An acoustic screen around proposed AC and ASHP units, blocking line of sight to the windows of Receptors R1 and R2.

Appendix A Acoustic terminology

Parameter	Description
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near ($L_{Aeq,T}$).
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 $\log_{10}$ (s1/s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa. The threshold of normal hearing is in the region of 0 dB and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions.
dB(A), L_{Ax}	Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).
Fast Time Weighting	Setting on sound level meter, denoted by a subscript F, that determines the speed at which the instrument responds to changes in the amplitude of any measured signal. The fast time weighting can lead to higher values than the slow time weighting when rapidly changing signals are measured. The average time constant for the fast response setting is 0.125 (1/8) seconds.
Free-field	Sound pressure level measured outside, far away from reflecting surfaces (except the ground), usually taken to mean at least 3.5 metres
Façade	Sound pressure level measured at a distance of 1 metre in front of a large sound reflecting object such as a building façade.
$L_{Aeq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level recorded during a noise event with a period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise. $L_{A10,18h}$ is the A –weighted arithmetic average of the 18 hourly $L_{A10,1h}$ values from 06:00-24:00.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. Generally used to describe background noise level.

Appendix B Photograph of site showing areas of interest

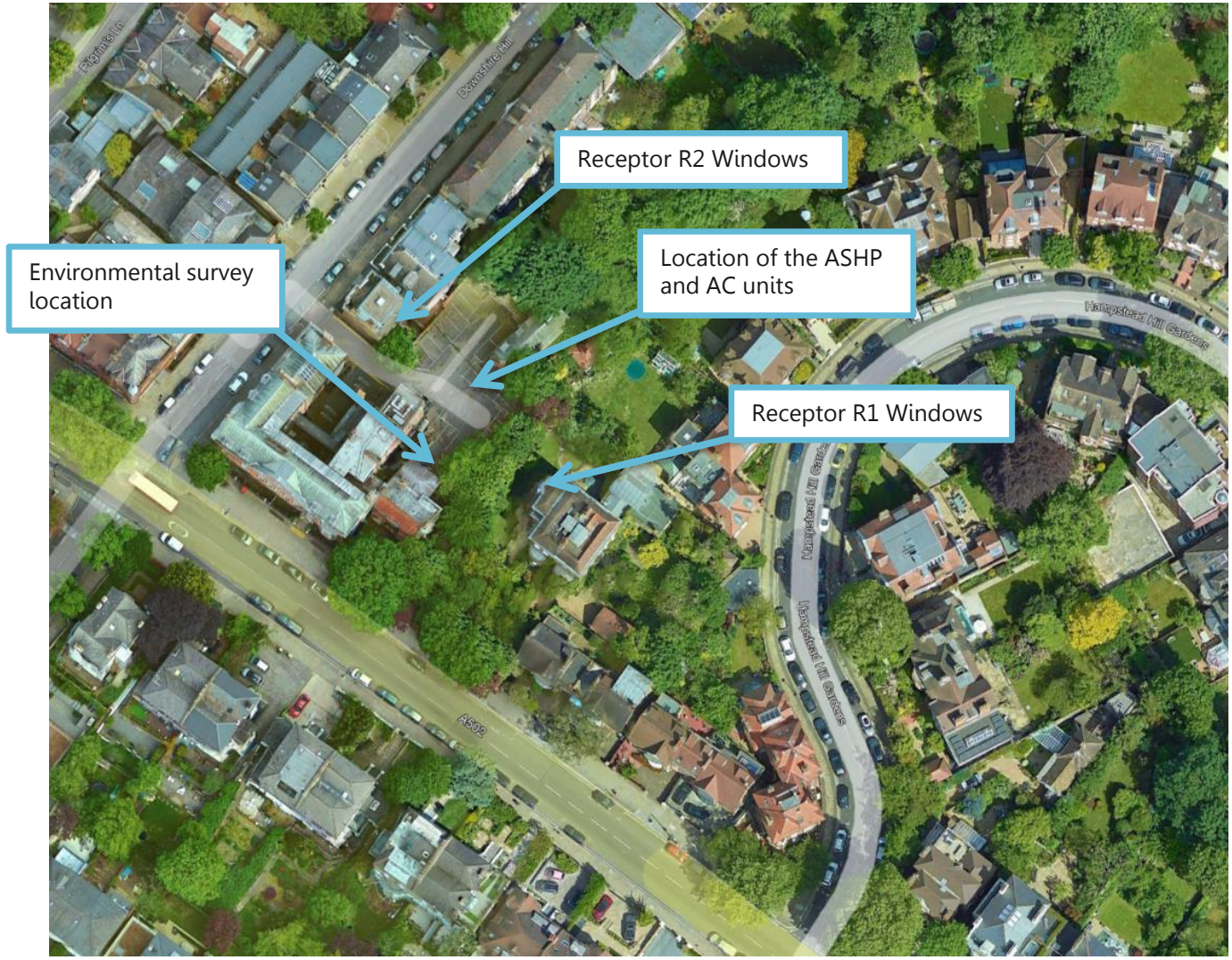


Image © Google 2022

Appendix C Environmental sound survey

Details of environmental sound survey

C.1 Measurements of the existing background sound levels were undertaken between 13.00 hours on Monday 21st November and 10.45 hours on Tuesday 22nd November 2022.

C.2 The sound level meter was programmed to record the A-weighted L_{eq}, L_{90}, L_{10} and L_{max} noise indices for consecutive fifteen-minute sample periods for the duration of the survey.

Measurement position

C.3 The sound level meter was positioned along the rear façade of 26 Rosslyn Hill. The approximate location of the microphone is indicated on the plan in **Appendix B**.

C.4 In accordance with BS 7445-2:1991 *'Description and measurement of environmental noise – Part 2: Guide to the acquisition of data pertinent to land use'*, the measurements were undertaken under free-field conditions.

Equipment

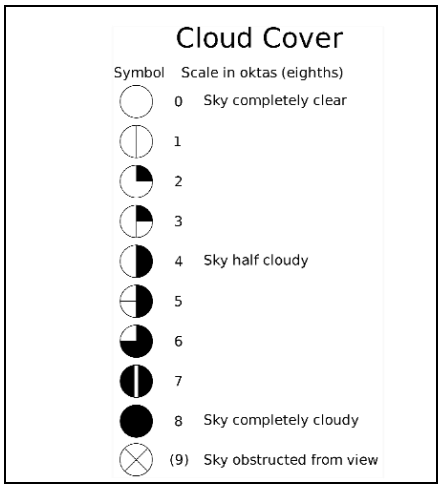
C.5 Details of the equipment used during the survey are provided in the table below. The sound level meter was calibrated before and after the survey; no significant change (+/-0.2 dB) in the calibration level was noted.

Environmental noise survey

Description	Model / serial no.	Calibration date	Calibration certificate no.
Class 1 Sound level meter	Rion NL-52 / 00654035	30/08/2022	TCRT22/1544
Condenser microphone	Rion UC-59 / 14826		
Preamplifier	Rion NH-25 / 87474		
Calibrator	Rion NC-74 /34235932	04/10/2022	1503480-1

Weather conditions

C.6 Weather conditions were determined both at the start and on completion of the survey. It is considered that the meteorological conditions were appropriate for environmental noise measurements. The table below presents the weather conditions recorded on site at the beginning and end of the survey.

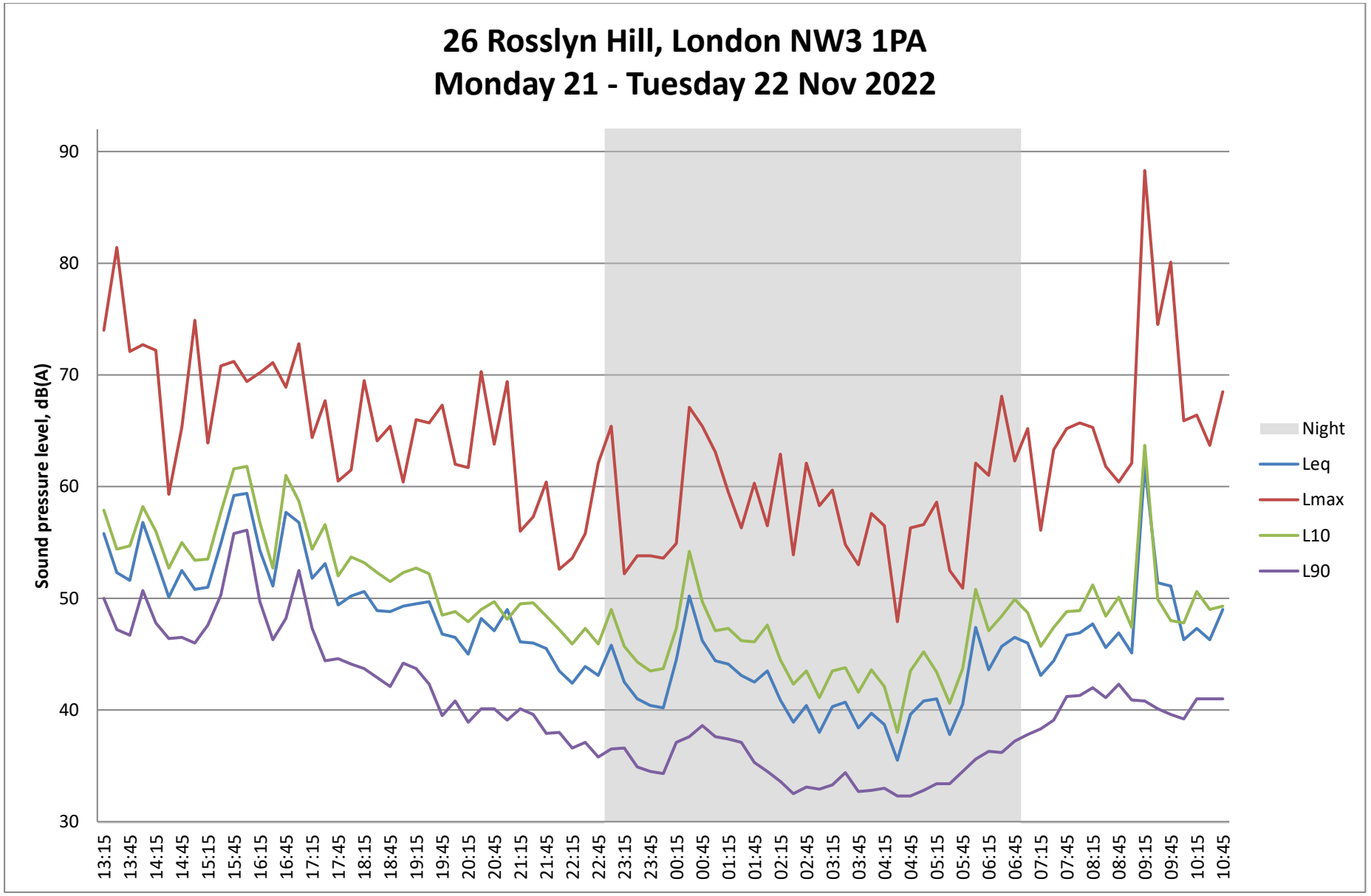
Weather Conditions				
Measurement Location	**Date/Time**	**Description**	**Beginning of Survey**	**End of Survey**
As indicated on Appendix B	13.00 21 Nov - 10.45 22 Nov 2022	Temperature (°C)	8	7
		Precipitation:	Yes	No
		Cloud cover (oktas - see guide)	8	2
		Presence of fog/snow/ice	No	No
		Presence of damp roads/wet ground	Yes	Yes
		Wind Speed (m/s)	2	1
		Wind Direction	NE	E
		Conditions that may cause temperature inversion (i.e. calm nights with no cloud)	No	No

Results

C.7 The results of the environmental survey are considered to be representative of the background sound pressure levels at the façades of the nearest noise sensitive receptors during the quietest times at which the plant will operate.

C.8 The predominant noise source affecting the area at the start of the survey was noise from rainfall, local traffic and construction.

C.9 The predominant noise sources affecting the area at the end of the survey included noise from construction, and local traffic.


26 Rosslyn Hill, London NW3 1PA
Monday 21 - Tuesday 22 Nov 2022
Sound pressure level, dB(A)
90
80
70
60
50
40
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07:15
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08:15
08:45
09:15
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10:15
10:45
Night
Leq
Lmax
L10
L90

Appendix D Plant noise data

Plant Ref	No. of Units	Make/ Model	Operating Hours	Sound pressure level
Air-conditioning unit	1	Mitsubishi / PUMY-P200YKM2	Day or Night	56dBA at 1m (Cooling) 61dBA at 1m (Heating)
Air Source Heat Pump	1	Mitsubishi / PUZ-HWM140VHA	Day or Night	53dBA at 1m

Appendix E Plant noise calculations

Receptor R1 – Houses to the east

Plant item	Source Sound level (dBA)	Distance		Directivity Correction (dB)	Acoustic enclosure (dB)	Acoustic screen (dB)	BS 4142:2014 feature correction	Cumulative plant rating level at receptor L_{Aeq} (dB)
		Distance to Receptor (m)	Correction (dB)					
AC unit (Cooling mode)	56 at 1m	17	-25	3	0	-9	3	28
ASHP unit	53 at 1m	17	-25	3	0	-9	3	25
Cumulative plant rating level (day and night)								**30**

Receptor R2 – Houses to the west

Plant item	Source Sound level (dBA)	Distance		Directivity Correction (dB)	Acoustic enclosure (dB)	Acoustic screen (dB)	BS 4142:2014 feature correction	Cumulative plant rating level at receptor L_{Aeq} (dB)
		Distance to Receptor (m)	Correction (dB)					
AC unit (Cooling mode)	56 at 1m	20	-26	3	0	-9	3	27
ASHP unit	53 at 1m	20	-26	3	0	-9	3	24
Cumulative plant rating level (day and night)								**29**