Studios 2-5
1 Stephen Street
London

Environmental Noise Survey
and Plant Noise Assessment Report

31659/PNA2 Rev 1

2 October 2024

For:
Derwent London
c/o Jackson Coles LLP
Morelands
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Hann Tucker Associates

Environmental Noise Survey and Plant Noise Assessment Report 31659/PNA2 Rev 1

Document Control

Rev	Date	Comment	Prepared by	Reviewed by	Approved by
1	02/10/2024	Updated plant noise assessment			
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Hann Tucker Associates

Environmental Noise Survey and Plant Noise Assessment Report 31659/PNA2 Rev 1

Contents

Attachments

1.0 Introduction

Hann Tucker Associates Limited (Hann Tucker) has been commissioned by Derwent London to undertake a noise assessment for a site in Camden, London.

The site, which is located 1 Stephen Street, is proposing to install new external building services plant.

Hann Tucker Associates has therefore been commissioned to undertake a detailed environmental noise survey at the site to establish baseline noise conditions as presented herein.

Suitable plant noise emission criteria based on the requirements of the Local Authority have been established, and a plant noise impact assessment undertaken.

Measures required to mitigate noise impacts for the proposed development (when operational) have been discussed in context with relevant national & local planning policies, design standards and good practice guides.

2.0 Objectives

To undertake an environmental noise survey to establish the existing L_{Amax}, L_{Aeq} and L_{A90} environmental noise levels at selected accessible positions.

To identify noise emission limits from the development with reference to the requirements of the Local Authority and to minimise the possibility of noise nuisance to neighbours.

To assess the noise emissions from the proposed plant, based upon data with which we are provided, and comment upon the acceptability.

To advise on noise control measures if required.

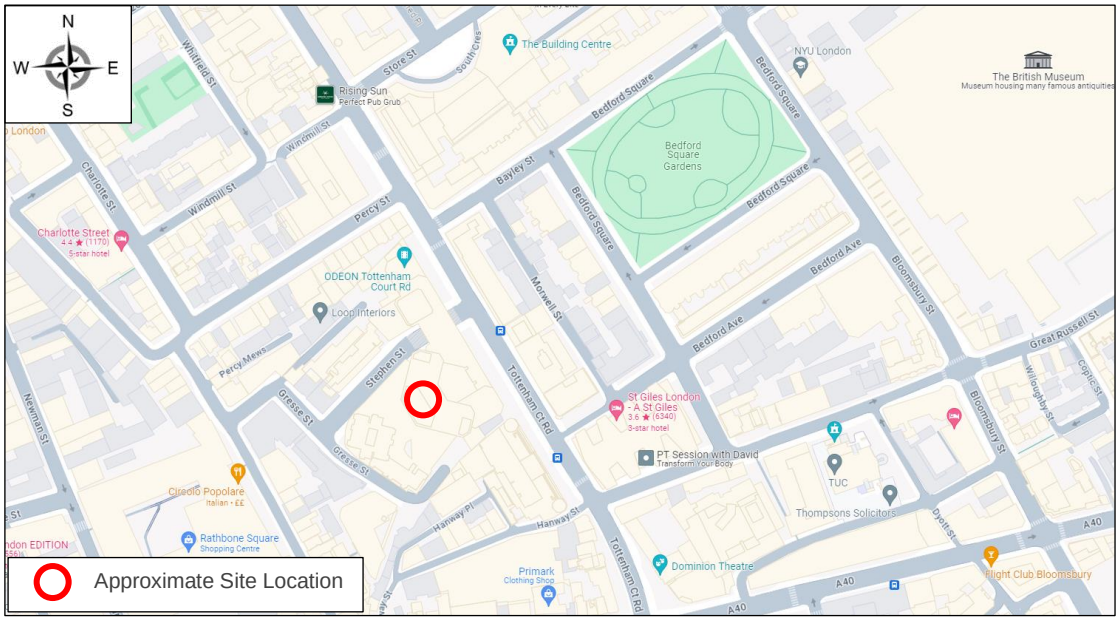
3.0 Acoustic Terminology

For an explanation of the acoustic terminology used in this report please refer to Appendix A enclosed.

4.0 Site Description

4.1 Location

The site is located at 1 Stephen Street, London, W1T 1AL. The location is shown in the Location Map below.



Location Map (Map data © 2024 Google)

The site falls within the jurisdiction of London Borough of Camden.

4.2 Description

The property is located in a mixed-use area (residential, commercial and office premises). The site is bounded to the north by office premises, to the east by mixed-use premises (commercial at ground level with offices above), to the south by commercial and residential premises and to the west by residential premises.

The office building to the north has a height of ground plus 5 storeys. The mixed-use building to the east has a height of ground plus 6 storeys. The commercial building to the south has a height of ground plus 2 storeys. The residential premises to the south and east have a height that range from ground plus 4 storeys to ground plus 9 storeys.

The nearby road network includes Tottenham Court Road to the east of the site, Stephen Street to the north and Gresse Street to the south-west of the site.

The site is shown in the Site Plan below.

Site Plan (Imagery © 2024 Map Data © 2024 Google)

5.0 Planning Policies, Standards & Guidance

5.1 Policies & Guides

In order to provide a suitable assessment a number of national planning policies have been considered.

All guidance used to form a noise impact assessment is taken from various standards, guidance, and Local Authority requirements as summarised below:

- Local Planning Policy
- British Standard 4142:2014 + A1:2019
- Statutory Noise Nuisance

Detailed information for relevant planning policies and guidance can be found within Appendix B.

5.2 Specific Local Authority Criteria

The site lies within the jurisdiction of London Borough of Camden. Their advice regarding criteria for atmospheric noise emissions from building service plant is as follows:

"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).

Table C: Noise levels applicable to proposed industrial and commercial developments (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 88dB L_{Amax}	'Rating level' greater than 5dB above background and/or events exceeding 88dB L_{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.*

The periods in Table C correspond to 0700 hours to 2300 hours for the day and 2300 hours to 0700 hours for the night. The Council will take into account the likely times of occupation for types of development and will be amended according to the times of operation of the establishment under consideration.

There are certain smaller pieces of equipment on commercial premises, such as extract ventilation, air conditioning units and condensers, where achievement of the rating levels (ordinarily determined by a BS:4142 assessment) may not afford the necessary protection. In these cases, the Council will generally also require a NR curve specification of NR35 or below, dependant on the room (based upon measured or predicted Leq,5mins noise levels in octave bands) 1 metre from the façade of affected premises, where the noise sensitive premise is located in a quiet background area."

6.0 Baseline Noise Survey

6.1 Procedure

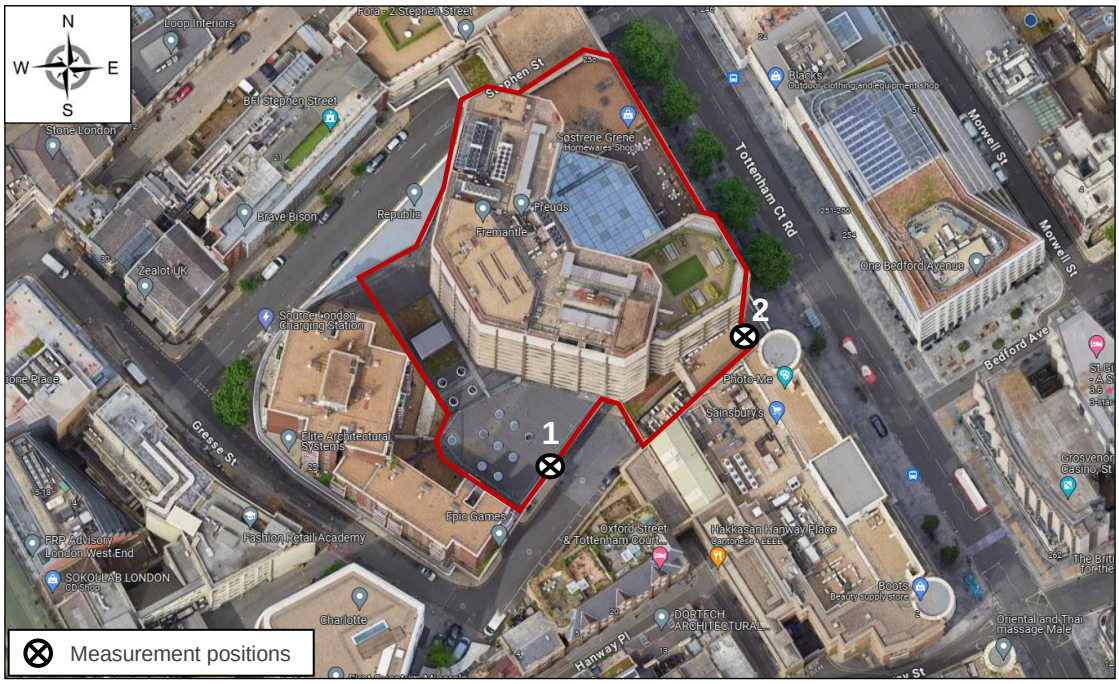
Fully automated environmental noise monitoring was undertaken by Rebeca Sanchez MSc(Hons), LArch, AMIOA from approximately 11:00 hours on Wednesday 26 June 2024 to 11:00 hours on Thursday 27 June 2024, to establish existing baseline noise levels. Measurements were taken continuously of the A-weighted (dBA) L_{90}, L_{eq}, and L_{max} sound pressure levels over discrete 15-minute periods.

6.2 Measurement Positions

The noise level measurements were undertaken at 2No. positions as described in the table below.

Position	Type	Description
1	Unattended	The microphone was positioned at the south boundary of the site, approximately 2m above first floor level. The microphone is considered to be in free-field conditions. Dominant noise was from distance road traffic and plant from the commercial premises at the south of the site.
2	Unattended	The microphone was positioned at the south-east boundary of the site, approximately 2m above third floor level. The microphone is considered to be in free-field conditions. Dominant noise was from road traffic from Tottenham Court Road and plant from the commercial premises at the south of the site.

The positions are shown on the plan below.



Plan Showing Unattended Measurement Positions (Imagery © 2024, Map Data © 2024 Google)

6.3 Weather Conditions

For the unattended survey between Wednesday 26 June 2024 and Thursday 27 June 2024, local weather reports indicated no rainfall, with temperatures ranging from 17°C (night) to 28°C (day) and wind speeds less than 5 m/s. During our time on site, skies were clear, wind conditions were calm from an eastern direction and road surfaces were dry. These conditions are considered suitable for obtaining representative measurement results.

6.4 Instrumentation

The instrumentation used during the survey is presented in the table below:

Position	Description	Manufacturer	Type	Serial Number	Calibration
1	Type 1 ½" Condenser Microphone	PCB	377B02	122885	Calibration on 18/08/2023
	Preamp	Larson Davis	PRM902	3692	Calibration on 18/08/2023
	Type 1 Data Logging Sound Level Meter	Larson Davis	824	3444	Calibration on 18/08/2023

Position	Description	Manufacturer	Type	Serial Number	Calibration
2	Type 1 ½" Condenser Microphone	PCB	377B02	107842	Calibration on 03/01/2024
	Preamp	Larson Davis	PRM902	0880	Calibration on 03/01/2024
	Type 1 Data Logging Sound Level Meter	Larson Davis	824	3541	Calibration on 03/01/2024
-	Type 1 Calibrator	Bruel & Kjaer	4230	1558535	Calibration on 27/07/2023

Each sound level meter, including the extension cable, was calibrated prior to and on completion of the surveys. No significant changes were found to have occurred (no more than 0.1 dB).

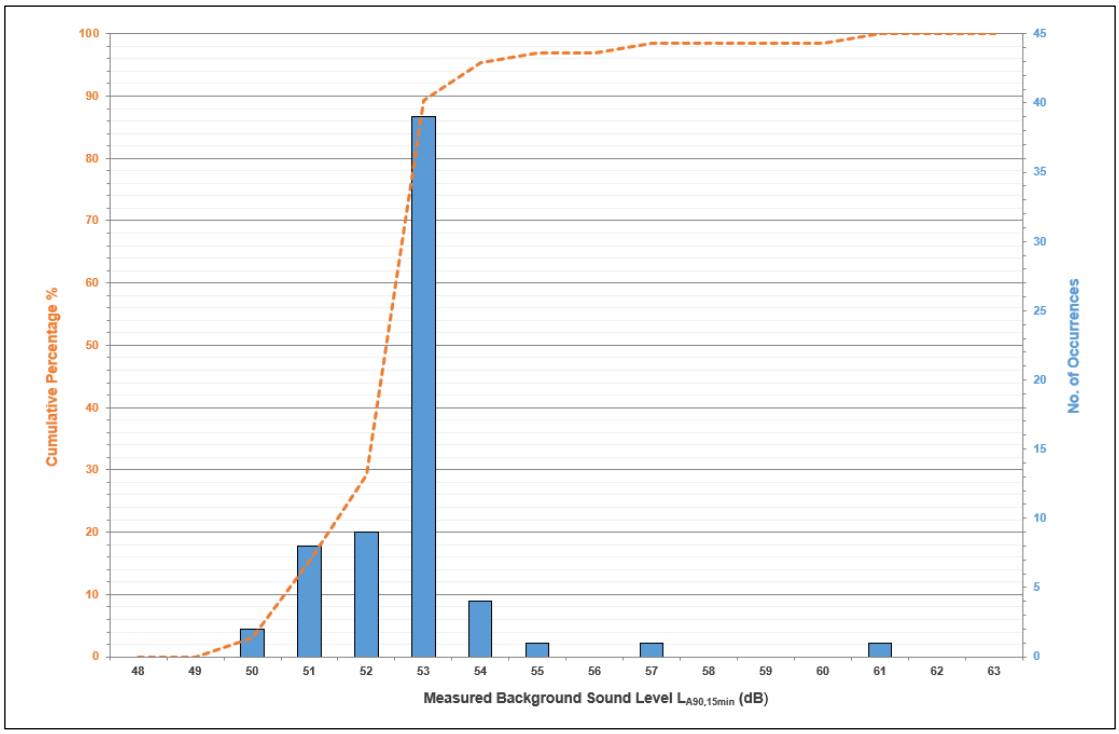
Each sound level meter was located in an environmental case with the microphone connected to the sound level meter via an extension cable. Each microphone was fitted with a windshield.

6.5 Results

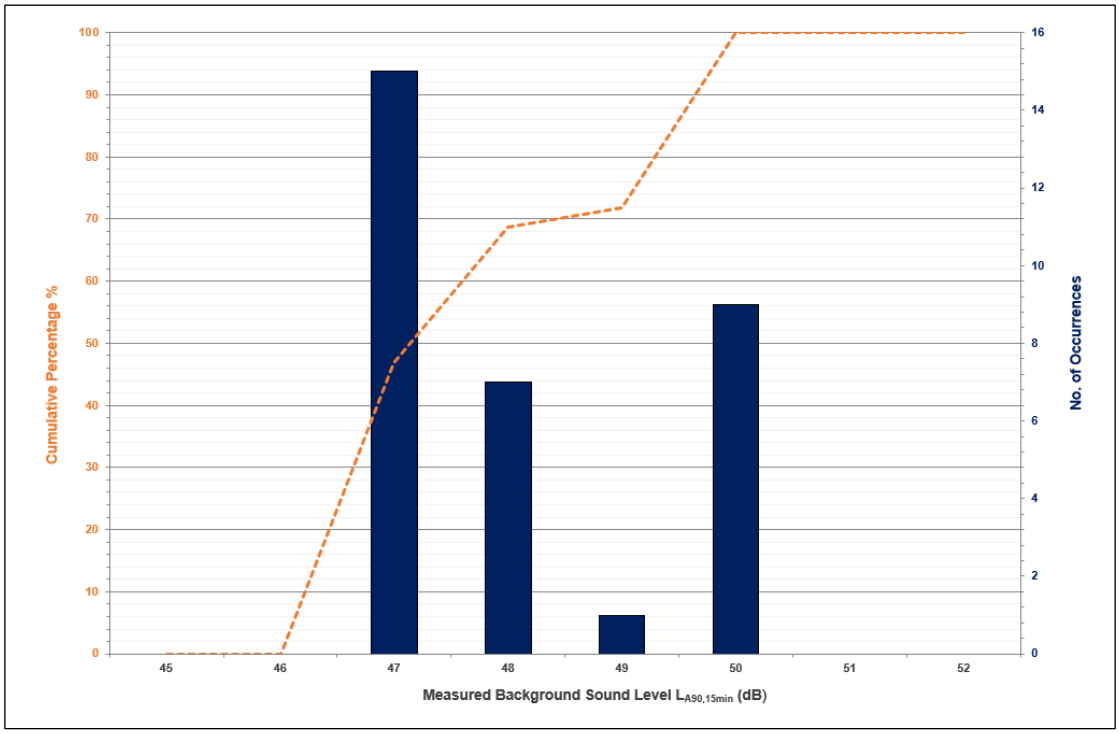
The results have been plotted on Time History Graphs 31659/TH1 and 31659/TH2 enclosed presenting the 15 minute A-weighted (dBA) L_{90}, L_{eq} and L_{max} levels at each measurement position throughout the duration of the survey.

BS 4142 states that *"the background sound level must be reliable and suitably represent the particular circumstances and periods of interest. For this purpose, the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods."* Taking this into account, the following histograms have been created which display the occurrence of each sound level (L_{A90}) for the day and night-time periods.

Position 1

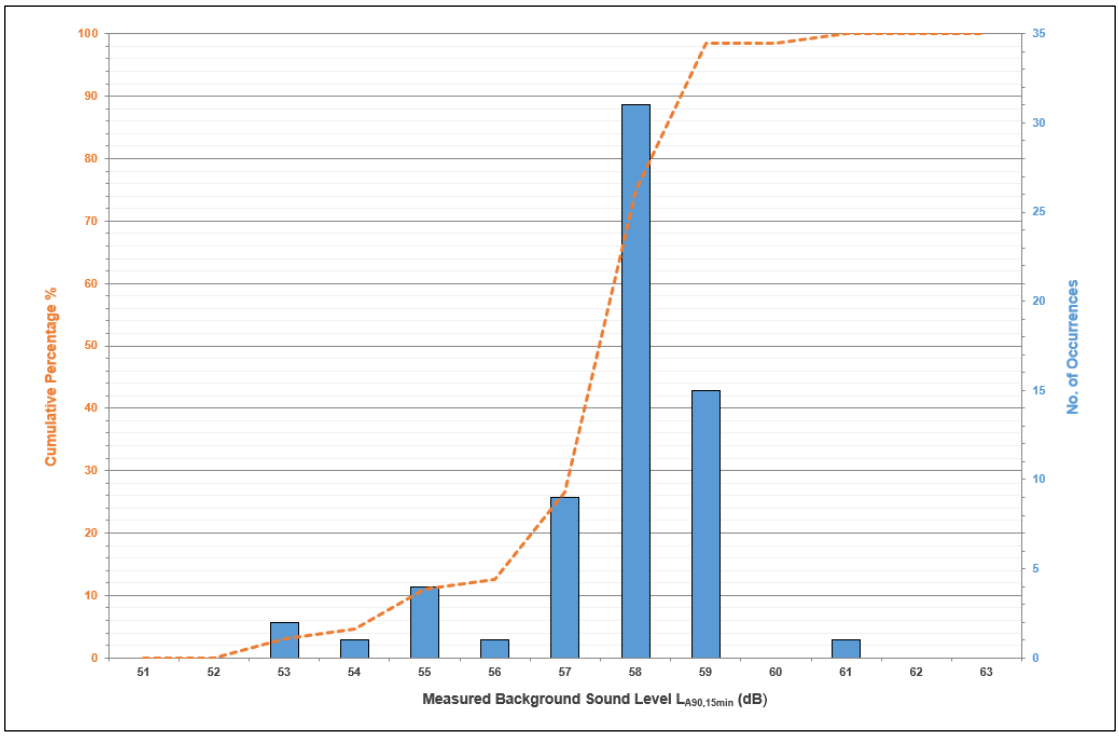


Statistical analysis of daytime background noise levels (7:00-23:00 hrs) at Position 1

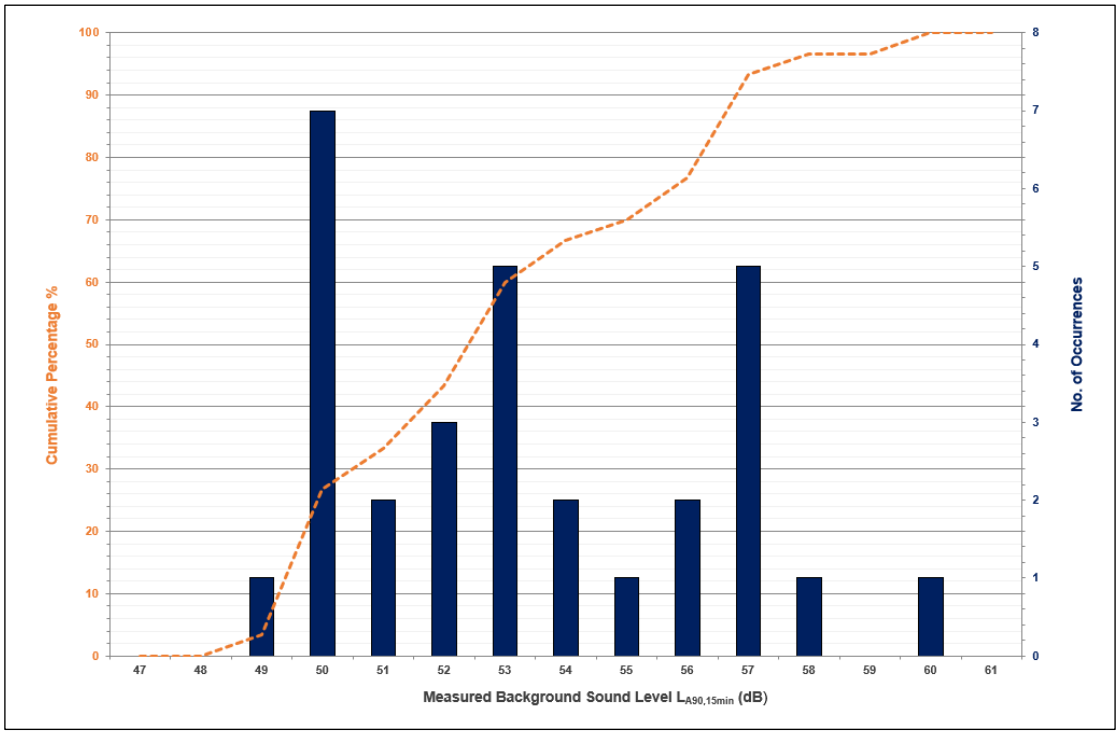


Statistical analysis of night-time background noise levels (23:00-7:00 hrs) at Position 1

Position 2



Statistical analysis of daytime background noise levels (7:00-23:00 hrs) at Position 2



Statistical analysis of night-time background noise levels (23:00-7:00 hrs) at Position 2

Based on the above plots the L_{A90} values presented below are considered to be the 'representative' background sound levels determined through statistical analysis of the 15-minute readings.

Daytime (07:00 – 23:00 hrs)				Night-Time (23:00 – 07:00 hrs)			
Position 1		Position 2		Position 1		Position 2	
$L_{Aeq,16h}$	Typical $L_{A90,15\ min}$	$L_{Aeq,16h}$	Typical $L_{A90,15\ min}$	$L_{Aeq,8h}$	Typical $L_{A90,15\ min}$	$L_{Aeq,8h}$	Typical $L_{A90,15\ min}$
59 dB	52 dB	64 dB	57 dB	51 dB	47 dB	62 dB	50 dB

The above levels are as measured at the measurement positions. The measurements are in free-field conditions.

6.6 Discussion Of Noise Climate

Due to the nature of the survey, i.e. unattended, it is not possible to accurately describe the dominant noise sources, or specific noise events throughout the entire survey period. However, at the beginning and end of the survey period the noise climate was noted to be dominated by road traffic noise from the nearby road network and plant noise from commercial premises at the south of the site.

7.0 Plant Noise Emission Criteria

Building services plant external noise emission levels will need to comply with local authority requirements and statutory noise nuisance legislation.

Based on the results of the noise survey and the requirements of the Local Authority (as outlined in Section 5.2), we propose that the following plant noise emission criteria be achieved incident at the nearest noise sensitive residential windows, with all plant operating simultaneously.

Location	Rating Plant Noise Emission Criteria ($L_{Ar,Tr}$, dB)	
	Daytime (07:00 – 23:00 hours)	Night-time (23:00 – 07:00 hours)
Position 1	42 dBA	37 dBA
Position 2	47 dBA	40 dBA

The above criteria are to be achieved with all of the proposed plant operating simultaneously. It should be noted that the above are subject to the final approval of the Local Authority.

8.0 Plant Noise Impact Assessment

8.1 Proposed Plant

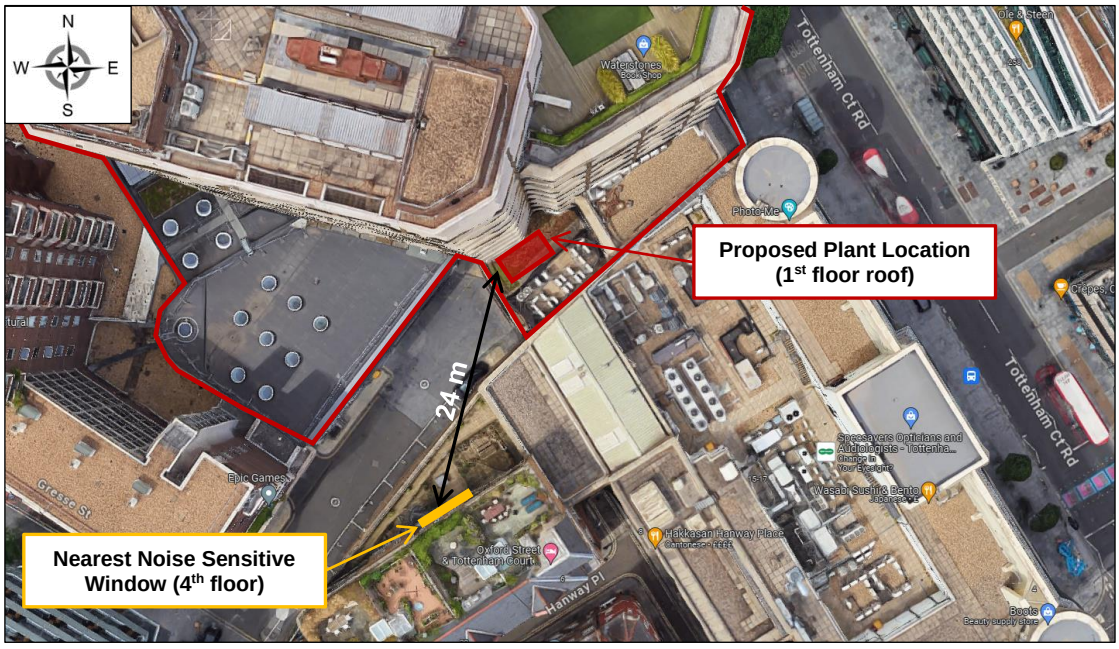
We understand the proposed plant comprises 5No. Daikin REYA 20A external VRF units.

8.1.1 Plant Location

We understand that all the proposed VRF units will be located externally at 1st floor roof level.

We have identified the worst affected noise sensitive property near the site (residential), which is located at the south-east of the site, at first floor level. The distance between the location of the VRF units and the nearest noise sensitive residential window is approximately 24 metres.

The location of the VRF units is shown on the image below along with the location of the nearest noise sensitive residential window.



Plant location (Imagery © 2024, Map Data © 2024 Google)

8.1.2 Plant Operation

We understand that

- during daytime, all 5No. proposed units will be operational at full duty
- during night-time hours, only 2No. of the 5No. units will be operational, and at 50% duty only.

8.1.3 Plant Noise Data

We understand the manufacturer's noise data for the equipment to be 88 dBA (Sound Power Level) at 100% duty and 80 dBA (Sound Power Level) at 50% duty (mode 'Low Noise 3').

8.2 Initial Noise Impact Assessment

Based on the above, calculations suggest that plant noise levels at the nearby noise sensitive receptor are likely to be in excess of the limits set out in Section 7.0, as shown on the tables below.

Daytime

Description	Sound Pressure Level (dBA)
Sound Power Level of proposed VRF unit (SWL) at 100 % duty	88
Correction for 5No. Units	+ 7
Distance Correction (Point Source)	- 36
Cumulative Sound Pressure Level at the nearest noise sensitive receptor	**59**
Acoustic Feature Correction (Intermittency)	+3
Rating Level	62
Rating Plant Noise Emission Criteria (Position 1 - daytime)	42
Excess over Rating Plant Noise Emission Criteria	**+ 20**

Night-time

Description	Sound Pressure Level (dBA)
Sound Power Level of proposed VRF unit (SWL) at 50% duty	80
Correction for 2No. Units	+ 3
Distance Correction (Point Source)	- 36
Cumulative Sound Pressure Level at the nearest noise sensitive receptor	**47**
Acoustic Feature Correction (Intermittency)	+3
Rating Level	50
Rating Plant Noise Emission Criteria (Position 1 - night-time)	37
Excess over Rating Plant Noise Emission Criteria	**+ 13**

As can be seen from the above, a mitigation approach needs to be developed to reduce the levels of plant noise egress in line with the criteria. These mitigation measures are discussed in Section 8.3.

8.3 Recommended Mitigation Measures

In order to control plant noise emissions in line with the proposed criteria, we recommend installing individual or combined acoustic enclosures such that all plant items are attenuated by 20 dBA (minimum).

Please find our acoustic specification for the acoustic enclosure at the end of the report.

8.4 Plant Noise Impact Assessment

The following table summarises our predictions of atmospheric noise emissions from the proposed plant, considering the recommended mitigation measures set out in Section 8.3, to the nearest noise sensitive residential window during daytime.

Daytime

Description	Sound Pressure Level (dBA)
Sound Power Level of proposed VRF unit (SWL) at 100% duty	88
Correction for 5No. Units	+ 7
Proposed enclosure	- 20
Distance Correction	- 36
Cumulative Sound Pressure Level at the nearest noise sensitive receptor	**39**

Based on the above predictions of atmospheric noise emissions the table below provides an initial BS4142:2014 assessment.

Daytime

Results		Relevant Clause	Commentary
Specific Sound Level	L_{Aeq} = 39dB	7.3.8 7.3.9 7.3.10	Cumulative noise level at the nearest receptor for all items of plant with proposed mitigation measures.
Acoustic Feature Correction	+3 dB	9.2	Intermittency correction
Rating level	(39+3) dB = 42dB	9.2	
Background sound level	L_{A90} = 52dB	8.1.1 8.1.3 8.3	Representative background sound level measured near the residential noise sensitive receptor during daytime.
Excess of rating over background sound level	**(52-42) dB = -10 dB**	**11**	**Assessment indicates likelihood of a low impact to residents**
Assessment indicates likelihood of a low impact to residents		11	The rating level is 10dB below to the background level and thus should indicate a low impact on the nearby residents.
Uncertainty of the assessment	Low	10	The background sound level is based on a 24 hours noise survey.

With reference to BS:4142:2014+A1:2019, the assessment indicates that the proposed plant noise emissions, in conjunction with the proposed mitigation measures, should be 10dB below the representative background noise level and thus should indicate a low impact on the nearby residents.

The following table summarises our predictions of atmospheric noise emissions from the proposed plant, considering the recommended mitigation measures set out in Section 8.3, to the nearest noise sensitive residential window during night-time.

Night-time

Description	Sound Pressure Level (dBA)
Sound Power Level of proposed VRF unit (SWL) at 50% duty	80
Correction for 2No. Units	+ 3
Proposed enclosure	- 20
Distance Correction	- 36
Cumulative Sound Pressure Level at the nearest noise sensitive receptor	**27**

Based on the above predictions of atmospheric noise emissions the table below provides an initial BS4142:2014 assessment.

Night-time

Results		Relevant Clause	Commentary
Specific Sound Level	L_{Aeq} = 27dB	7.3.8 7.3.9 7.3.10	Cumulative noise level at the nearest receptor for all items of plant with proposed mitigation measures.
Acoustic Feature Correction	+3 dB	9.2	Intermittency correction
Rating level	(27+3) dB = 30dB	9.2	
Background sound level	L_{A90} = 47dB	8.1.1 8.1.3 8.3	Representative background sound level measured near the residential noise sensitive receptor during daytime.
Excess of rating over background sound level	**(47-30) dB = -17 dB**	**11**	**Assessment indicates likelihood of a low impact to residents**
Assessment indicates likelihood of a low impact to residents		11	The rating level is 17dB below to the background level and thus should indicate a low impact on the nearby residents.
Uncertainty of the assessment	Low	10	The background sound level is based on a 24 hours noise survey.

With reference to BS:4142:2014+A1:2019, the assessment indicates that the proposed plant noise emissions, in conjunction with the proposed mitigation measures, should be 17dB below the representative background noise level and thus should indicate a low impact on the nearby residents.

Our calculations indicate that the proposed plant, in conjunction with the proposed mitigation measures, should be capable of achieving the requirements of the Local Authority outlined in Section 7.0.

9.0 Conclusions

An environmental noise survey has been undertaken in order to establish the currently prevailing noise levels.

Plant noise emission criteria have been recommended based on the results of the noise survey and with reference to the Local Authority's requirements.

An assessment has been carried out to determine the plant noise emissions at the nearest noise sensitive window.

The assessment indicates that the proposed plant, in conjunction with the recommended mitigation measures, should be capable of achieving the proposed environmental noise criteria at the nearest noise sensitive residential window.

Appendix A

The acoustic terms used in this report are defined as follows:

dB — Decibel - Used as a measurement of sound level. Decibels are not an absolute unit of measurement but an expression of ratio between two quantities expressed in logarithmic form. The relationships between Decibel levels do not work in the same way that non-logarithmic (linear) numbers work (e.g. 30dB + 30dB = 33dB, not 60dB).

dBA — The human ear is more susceptible to mid-frequency noise than the high and low frequencies. The 'A'-weighting scale approximates this response and allows sound levels to be expressed as an overall single figure value in dBA. The $_A$ subscript is applied to an acoustical parameter to indicate the stated noise level is A-weighted

It should be noted that levels in dBA do not have a linear relationship to each other; for similar noises, a change in noise level of 10dBA represents a doubling or halving of subjective loudness. A change of 3dBA is just perceptible.

$L_{90,T}$ — L_{90} is the noise level exceeded for 90% of the period *T* (i.e. the quietest 10% of the measurement) and is often used to describe the background noise level.

$L_{eq,T}$ — $L_{eq,T}$ is the equivalent continuous sound pressure level. It is an average of the total sound energy measured over a specified time period, *T*.

L_{max} — L_{max} is the maximum sound pressure level recorded over the period stated. L_{max} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the L_{eq} noise level.

Sound Pressure Level (L_p) is the sound pressure relative to a standard reference pressure of 2×10^{-5} Pa. This level varies for a given source according to a number of factors (including but not limited to: distance from the source; positioning; screening and meteorological effects).

Sound Power Level (SWL or L_w) is the total amount of sound energy inherent in a particular sound source, independent of its environment. It is a logarithmic measure of the sound power in comparison to a specified reference level (usually 10^{-12} W).

Appendix B

Planning Policies, Standards & Guidance

B.1 BS 4142:2014 + A1:2019

When setting plant noise emission criteria reference is commonly made to BS 4142:2014 "*Methods for rating and assessing industrial and commercial sound".*

The procedure contained in BS 4142:2014 provides an assessment of the likely effects of sound on people when comparing the specific noise levels from the source with representative background noise levels. Where the noise contains "a tone, impulse or other characteristic" then various corrections can be added to the specific (source) noise level to obtain the "rating level".

BS 4142 states that: *"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 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."*

The determination of the "rating level" and the "background level" are both open to interpretation, depending on the context.

B.2 Statutory Noise Nuisance

S79(1)(g) of the Environmental Protection Act 1990 defines a statutory nuisance as *"noise emitted from a premises so as to be prejudicial to health or a nuisance".* A duty is placed on the Local Authority to serve an abatement notice under S80 if it becomes satisfied that a statutory nuisance exists.

There is however no quantitative definition/objective method in determining statutory noise nuisance, and as such we are not able to definitively advise or determine on such matters. Noise nuisance is subjective and requires multiple factors to be considered, including but not limited to:

- Straining to hear something is *generally* considered not a nuisance, however,
- Noise level (of source and relative to background), timing, duration, type of noise, frequency, location, continuous or repetitive, all factor into judging nuisance.

To mitigate against, though not remove entirely, the risk of a statutory noise nuisance, a noise assessment should be undertaken by a Suitably Qualified Acoustician. Adoption of appropriate and relevant industry standards/guides can provide a structured framework for such assessments, improving the credibility of mitigation efforts. It is also important to also recognise that ongoing management (both active and passive) may also be necessary depending on the context of the situation.

Appendix C

STUDIOS 2-5, 1 STEPHEN STREET

SPECIFICATION FOR

SMALL ACOUSTIC ENCLOSURES

All plant items shall be supplied complete with acoustic treatment which shall achieve adequate levels of attenuation to ensure that the following limiting sound pressure levels are not exceeded when measured at a distance of 1m (free field over a reflecting plane) in any horizontal or vertical direction under any load conditions.

Plant Description	**A-weighted Limiting Sound Pressure Level @ 1m (dB re 2 x 10^{-5} Pa)**
Each VRF unit	60 dB

Furthermore they shall not exhibit any significant tonal content.

Exceedances in excess of the measurement tolerance for a Type 1 sound level meter shall constitute a failure.

The enclosed outer panels shall be constructed from galvanized sheet steel having a minimum thickness of 1.6mm and fixed at 300mm (max) centres. The enclosure inner panels shall be constructed from punch-perforated (round-hole) galvanised sheet steel facing, having a minimum thickness of 0.7mm fixed at 300mm (max) centres. Flattened-expanded ("Expamet") sheet shall not be used, unless all edges of the sheet are mechanically fixed to the panel casing and galvanised steel cover strips are used to prevent rivet heads pulling through the perforated sheet (trapping the Expamet between two solid steel layers).

The inert, rot and vermin proof, non-hygroscopic and non-combustible mineral wool or glass fibre acoustic medium shall be packed to a density of not less than 48kg/$m^{3.}$ This shall be faced with a glass fibre cloth, or other approved infill protection membrane. Panels shall be constructed and assembled so that no egress of the acoustic medium will occur under the operating conditions.

Doors, access panels, windows and ventilation ducts or electrical cable penetrations hall be treated so as to maintain the specified acoustic insulation of the assembled enclosure.

Demountable sections shall be designed to allow easy disassembly and reassembly by unskilled personnel without affecting the acoustic performance.

The supplier shall ensure that the assembled enclosure is designed and constructed to withstand site operating conditions such as wind and snow loads, roof mounted plant, etc., as appropriate, and if outside, to be suitably weatherproofed.

The acoustic media shall not comprise materials which are generally composed of mineral fibres, either man made or naturally occurring, which have a diameter of 3 microns or less and a length of 200 microns or less or which contain any fibres not sealed or otherwise stabilised to ensure that fibre migration is prevented.

Any deviations from the above specification must be agreed by, and confirmed in writing to, Hann Tucker Associates.

Appendix D

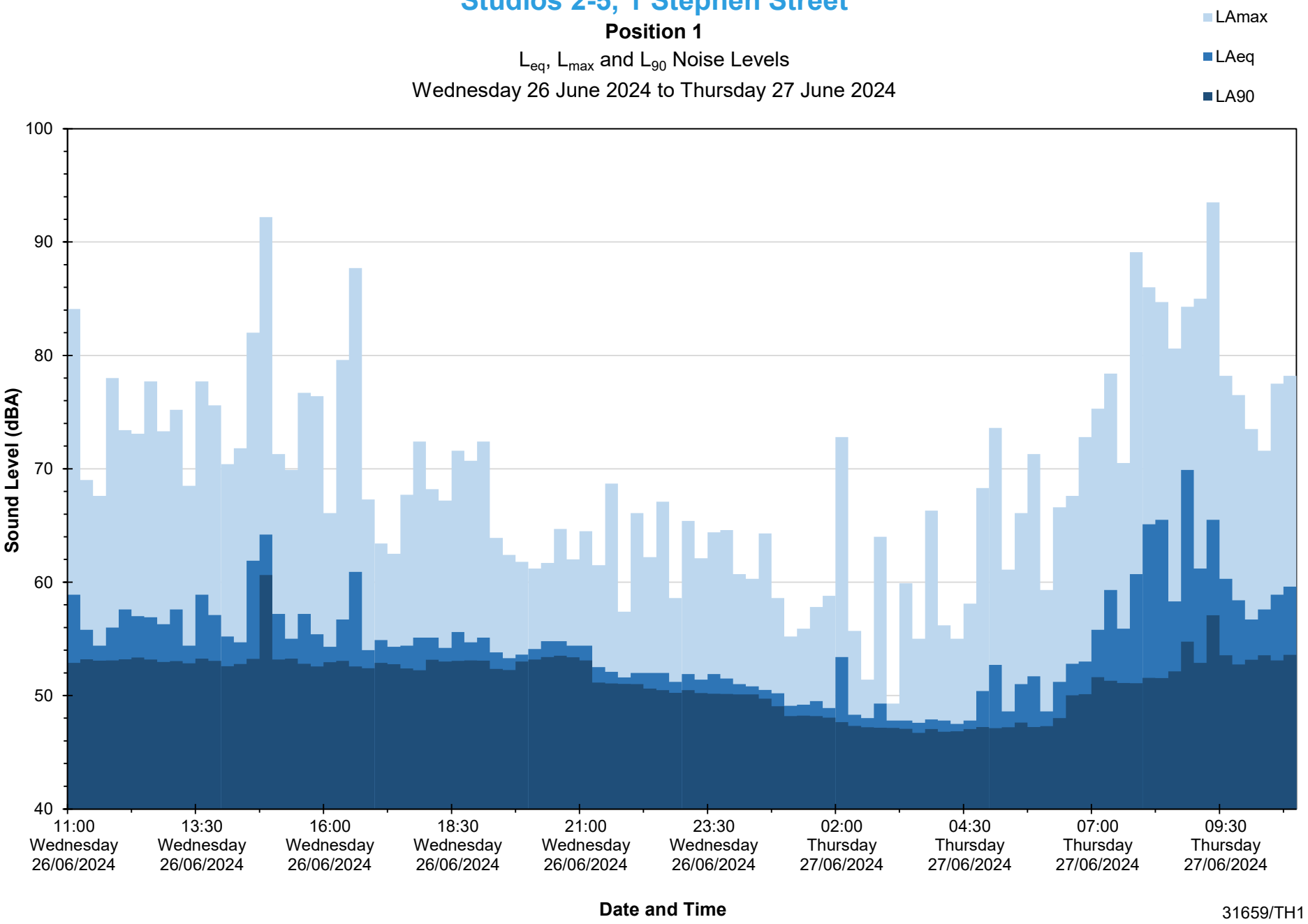
Time History Graphs

Studios 2-5, 1 Stephen Street

Position 1

L_{eq}, L_{max} and L_{90} Noise Levels

Wednesday 26 June 2024 to Thursday 27 June 2024



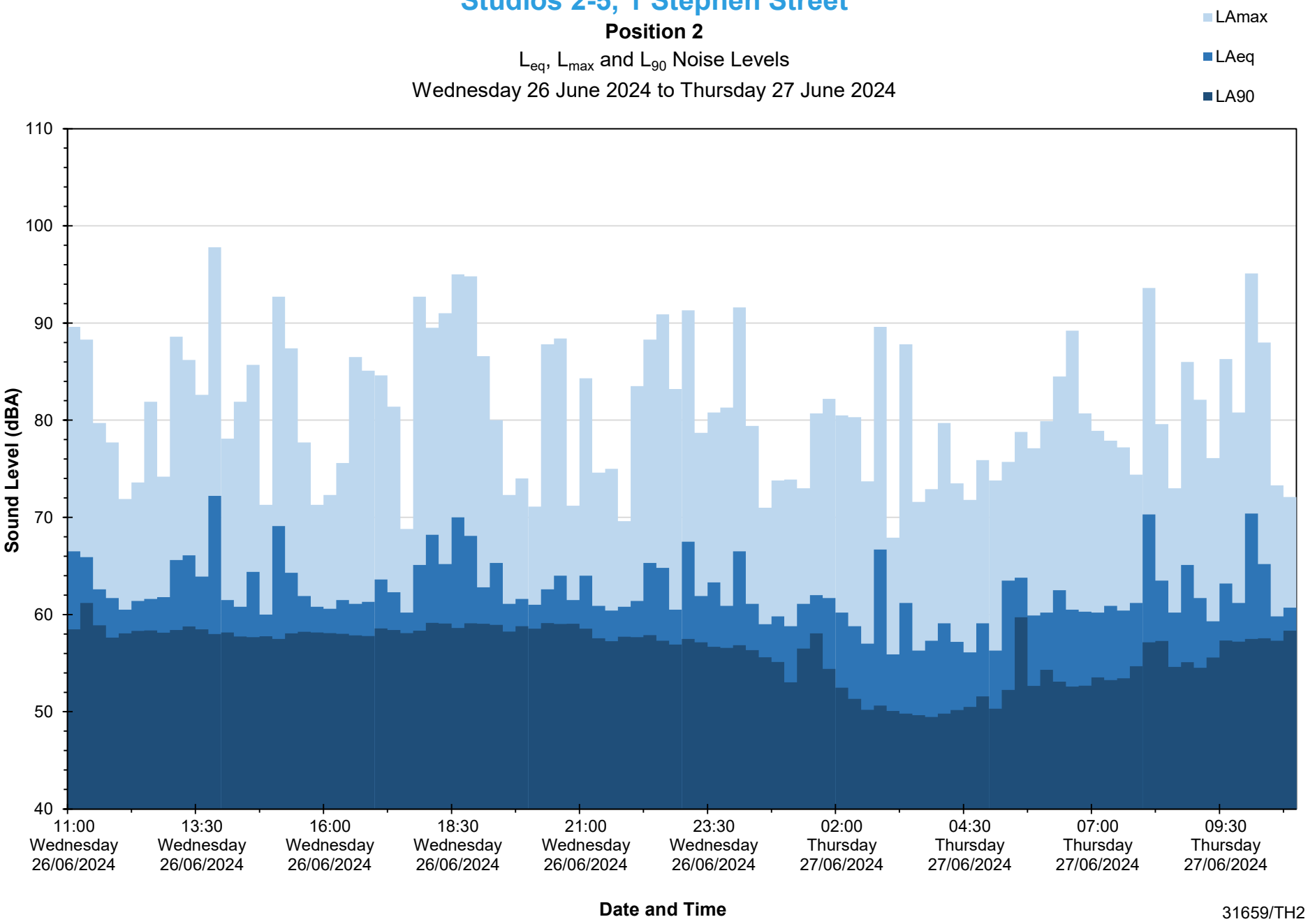
31659/TH1

Studios 2-5, 1 Stephen Street

Position 2

L_{eq}, L_{max} and L_{90} Noise Levels

Wednesday 26 June 2024 to Thursday 27 June 2024



31659/TH2