

Francis Gardner House West Hampstead

Environmental Noise Survey and Acoustic Design Statement Report

27465/ADS1/Rev1

20 May 2022

For:

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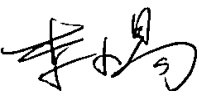

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Time History Noise Graphs 27465/TH1 – 27465/TH2



1.0 Introduction

Refurbishment is proposed for a student accommodation building located in West Hampstead, London. The proposed redevelopment includes adding a one-storey extension on the existing roof.

Hann Tucker Associates have therefore been commissioned to undertake an environmental noise survey and noise impact assessment in order to assess the suitability of the site for residential use, and to assess the potential building services plant noise impacts on neighbouring noise sensitive premises.

This report presents the methodology and findings of our noise survey and assessment in the context of national planning policies and the policy of the Local Authority.

2.0 Objectives

To inspect the site to familiarise ourselves with its layout and surroundings in order to identify suitable accessible locations for environmental noise measurements.

To establish by means of a detailed 24 hour survey the existing L_{Amax} , L_{Aeq} and L_{A90} environmental road, rail and air traffic noise levels at up to two (2No.) secure and accessible on-site positions, using fully computerised unmanned monitoring equipment.

To establish the number of L_{Amax} noise events which exceed 82dBA at the measurement positions.

Based on the results of the survey, to undertake a noise assessment to assess the suitability of the proposed development for residential use in accordance with the NPPF/PPG24 and Local Authority guidance/requirements.

Based upon the Environmental Noise Survey data and suitable recommended internal noise criteria, potential glazing configurations and internal acoustic treatment capable of meeting the criteria will be presented.

To propose plant noise emission criteria to be achieved at noise sensitive locations based on the requirements of the Local Authority.

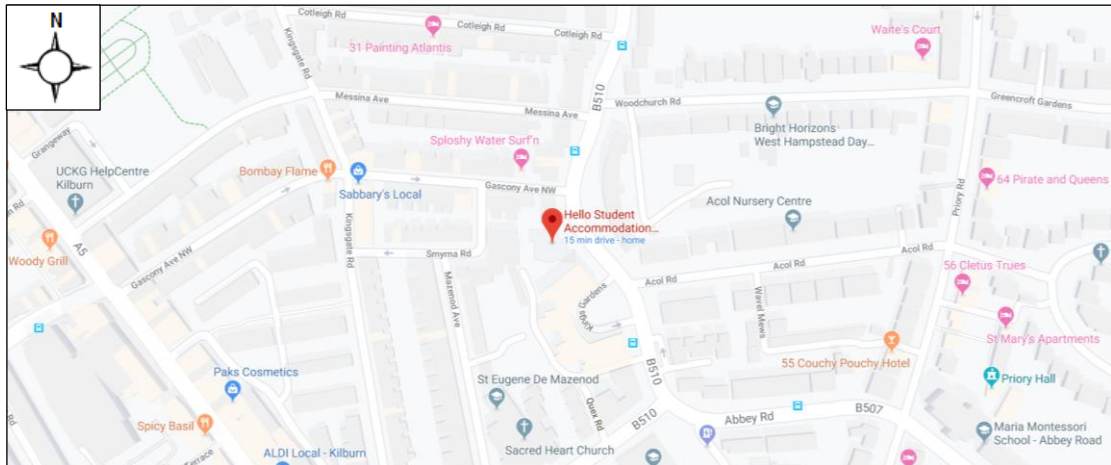
To prepare a report presenting our survey findings and interpretation of the results, to support the planning application as far as reasonably possible.



3.0 Site Description

3.1 Location

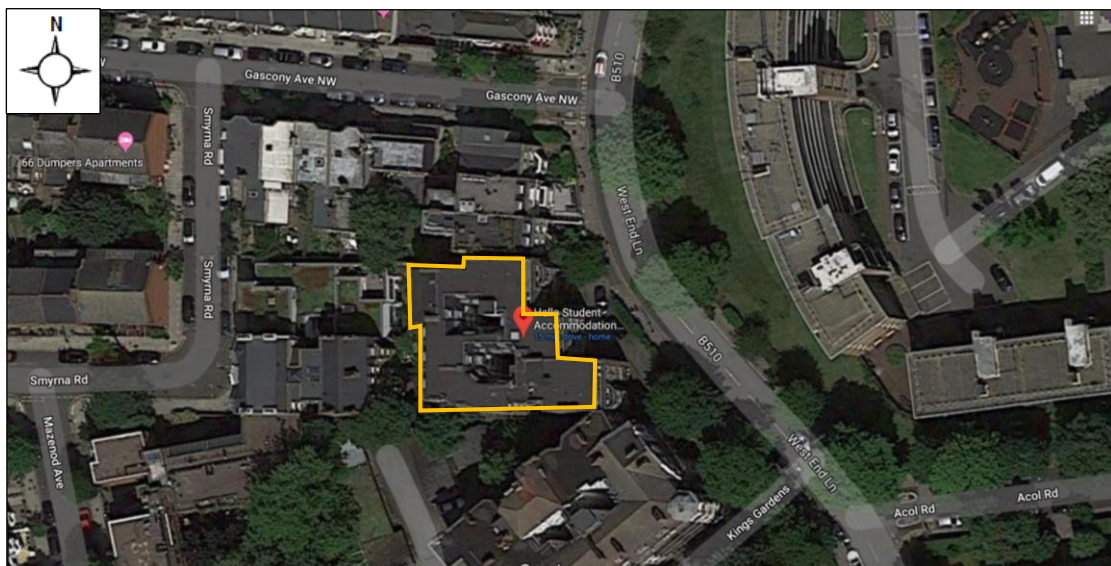
The site is located at 89-91 West End Lane, London, and falls within the jurisdiction of London Borough of Camden. The location is shown in the Location Map below.



Location Map (Map Data © 2022 Google)

3.2 Description

The site is located in a predominantly residential area. The site is bound by West End Lane to the east, a large mansion building to the south, several domestic terrace buildings to the north and west. Subjectively, the dominant noise source on site was noticed to be road traffic on West End Lane. The site is shown in the Site Plan below.



Site Plan (Map Data © 2022 Google)



4.0 Acoustic Terminology

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

5.0 Methodology

The survey was undertaken by Xiaoyi Li, MSc, BA(Hons), AMIOA.

5.1 Procedure

Fully automated environmental noise monitoring was undertaken from approximately 13:00 hours on Wednesday 27th November 2019 to 13:30 hours on Thursday 28th November 2019.

During the periods we were on site the wind conditions were light. The sky was generally overcast. We understand that generally throughout the survey period the weather conditions were similar. These conditions are considered suitable for obtaining representative measurement results.

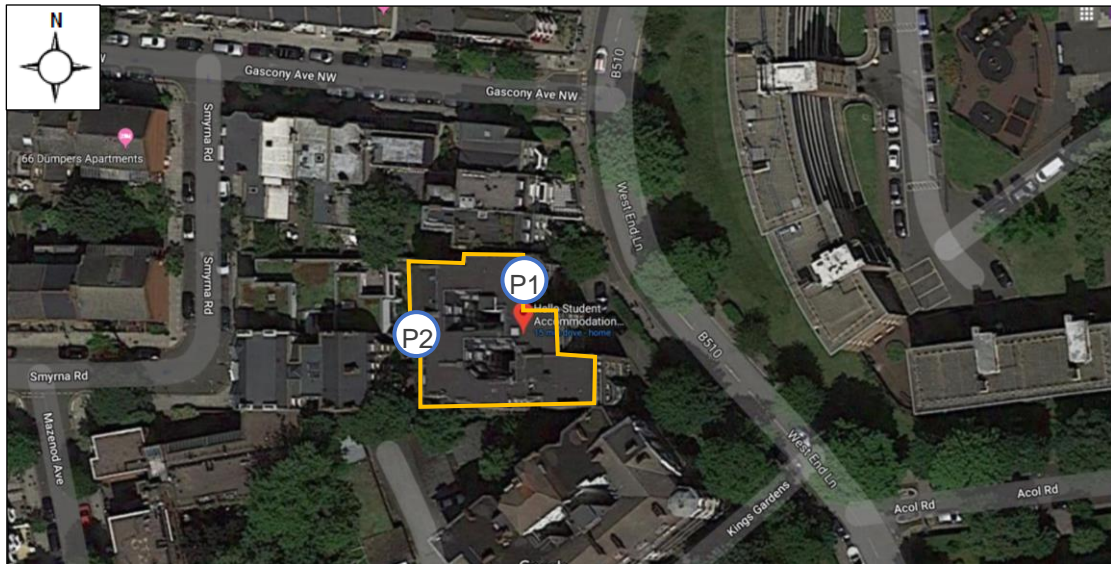
Measurements were taken continuously of the A-weighted (dBA) L_{90} , L_{eq} and L_{max} sound pressure levels over 15 minute periods.

5.2 Measurement Positions

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

Position No	Description
1	The sound level meter was placed on the 4 th floor flat balcony. The microphone was attached to a pole fixed to the balcony hand railing, approximately 15 metres above ground level and 8 metres from West End Lane, overlooking West End Lane. The microphone was in free field conditions.
2	The sound level meter was placed on the 3 rd floor fire escape balcony. The microphone was attached to a pole fixed to the balcony hand railing, approximately 12 metres above ground level, overlooking neighbouring residential buildings to the south. The microphone was in free field conditions.

The positions are shown on the plan overleaf.



Plan Showing Unmanned Measurement Positions (Map Data © 2019 Google)

5.3 Instrumentation

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

Description	Manufacturer	Type	Serial Number	Calibration
Position 1 Type 1 ½" Condenser Microphone	ACO Pacific	7052E	71786	Calibration on 13/09/2019
Position 1 Preamp	Svantek	SV18	75754	Calibration on 13/09/2019
Position 1 Type 1 Data Logging Sound Level Meter	Svantek	971	74415	Calibration on 13/09/2019
Position 2 Type 1 ½" Condenser Microphone	ACO Pacific	7052E	71839	Calibration on 09/08/2019
Position 2 Preamp	Svantek	SV18	75733	Calibration on 09/08/2019
Position 2 Type 1 Data Logging Sound Level Meter	Svantek	971	74368	Calibration on 09/08/2019
Type 1 Calibrator	Brüel & Kjær	4230	1558535	Calibration on 17/10/2019

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.

6.0 Results

The results have been plotted on Time History Graphs 27465/TH1 to 27465/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.

6.1 L_{90} Noise Levels

The following table presents the lowest measured $L_{A90,15\text{minutes}}$ background noise levels during the survey:

Position	Lowest Measured $L_{A90,15\text{minutes}}$ Background Noise Level (dB re 2×10^{-5} Pa)		
	Daytime (07:00 – 23:00) Hours	Night-Time (23:00 – 07:00) Hours	24 Hours
1	53	38	38
2	43	42	42

The following table presents the modal average of the measured $L_{A90,15\text{minutes}}$ background noise levels during the survey:

Position	Modal Average Measured $L_{A90,15\text{minutes}}$ Background Noise Level (dB re 2×10^{-5} Pa)		
	Daytime (07:00 – 23:00) Hours	Night-Time (23:00 – 07:00) Hours	24 Hours
1	59	39	39
2	47	43	43

6.2 L_{eq} Noise Levels

In order to compare the results of our survey with the relevant guidelines it is necessary to convert the measured $L_{Aeq(15\text{ minute})}$ noise levels into single figure daytime $L_{Aeq(16\text{-hour})}$ (07:00-23:00 hours) and night-time $L_{Aeq(8\text{-hour})}$ (23:00-07:00 hours) levels.

The daytime $L_{Aeq(16\text{-hour})}$ and night-time $L_{Aeq(8\text{-hour})}$ noise levels for each position are presented in the tables below.

Position	Daytime $L_{Aeq(16\text{-hour})}$	Night-Time $L_{Aeq(8\text{-hour})}$
1	66dB	60dB
2	54dB	47dB



6.3 Night-Time L_{\max} Results

During the night-time period 23:00 hours – 07:00 hours the recorded L_{\max} events at Position 1 range from 66dB to 91dB. The 10th highest L_{\max} event recorded was 73dB.

During the night-time period 23:00 hours – 07:00 hours the recorded L_{\max} events at Position 2 range from 50dB to 67dB. The 10th highest L_{\max} event recorded was 59dB.

7.0 Discussion of Noise Climate

During the periods we were on site the dominant noise source was noted to be road traffic on West End Lane at Position 1, and nearby road traffic at Position 2.

8.0 Relevant Planning Policies and Guidance

8.1 Noise Policy Statement for England

The Noise Policy Statement for England (NPSE) was published in March 2010 (i.e. before the NPPF). The NPSE is the overarching statement of noise policy for England and applies to all forms of noise other than occupational noise, setting out the long term vision of Government noise policy which is to:

“Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.”

That vision is supported by the following NPSE noise policy aims which are reflected in paragraph 180 of the NPPF (see paragraph 8.2 (b) below):

“Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- *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 Explanatory Note to the NPSE has three concepts for the assessment of noise in this country:

NOEL – No Observed Effect Level

This is the level below which no effect can be detected and below which there is no detectable effect on health and quality of life due to noise.

LOAEL – Lowest Observable Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected.

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur.

None of these three levels are defined numerically and for the SOAEL the NPSE makes it clear that the noise level is likely to vary depending upon the noise source, the receptor and the time of day/day of the week, etc. The need for more research to investigate what may represent an SOAEL for noise is acknowledged in the NPSE and the NPSE asserts that not stating specific SOAEL levels provides policy flexibility in the period until there is further evidence and guidance.

The NPSE concludes by explaining in a little more detail how the LOAEL and SOAEL relate to the three NPSE noise policy aims listed above. It starts with the aim of avoiding significant adverse effects on health and quality of life, then addresses the situation where the noise impact falls between the LOAEL and the SOAEL when *“all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development.”* The final aim envisages pro-active management of noise to improve health and quality of life, again taking into account the guiding principles of sustainable development which include the need to minimise travel distance between housing and employment uses in an area.

8.2 National Planning Policy Framework (NPPF)

The following paragraphs are from the NPPF (published July 2021):

185. Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they 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 the 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.

187. Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or ‘agent of change’) should be required to provide suitable mitigation before the development has been completed.”

Paragraph 185 also references the Noise Policy Statement for England (NPSE). This document does not refer to specific noise levels but instead sets out three aims:

- “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.
- 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.
- 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.”

8.3 Planning Practice Guidance on Noise

Planning Practice Guidance (PPG) under the NPPF has been published by the Government as a web based resource at <http://planningguidance.planningportal.gov.uk/blog/guidance/>. This includes specific guidance on Noise although, like the NPPF and NPSE the PPG does not provide any quantitative advice. It seeks to illustrate a range of effect levels in terms of examples of outcomes as set out in the following table:



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	
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.	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 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 hard, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

8.4 The London Plan (2021)

The London Plan was published March 2021.

Policy D14 Noise states:

A. *"In order to reduce, manage and mitigate noise to improve health and quality of life, residential and other non-aviation development proposals should manage noise by:*

- 1) *avoiding significant adverse noise impacts on health and quality of life*
- 2) *reflecting the Agent of Change principle as set out in Policy D13*



- 3) *mitigating and minimising the existing and potential adverse impacts of noise on, from, within, as a result of, or in the vicinity of new development without placing unreasonable restrictions on existing noise-generating uses*
- 4) *improving and enhancing the acoustic environment and promoting appropriate soundscapes (including Quiet Areas and spaces of relative tranquillity)*
- 5) *separating new noise-sensitive development from major noise sources (such as road, rail, air transport and some types of industrial use) through the use of distance, screening, layout, orientation, uses and materials – in preference to sole reliance on sound insulation*
- 6) *where it is not possible to achieve separation of noise-sensitive development and noise sources without undue impact on other sustainable development objectives, then any potential adverse effects should be controlled and mitigated through applying good acoustic design principles*
- 7) *promoting new technologies and improved practices to reduce noise at source, and on the transmission path from source to receiver.*

B. *Boroughs, and others with relevant responsibilities, should identify and nominate new Quiet Areas and protect existing Quiet Areas in line with the procedure in Defra's Noise Action Plan for Agglomerations.*

3.14.1 The **management of noise** is about encouraging the right acoustic environment, both internal and external, in the right place at the right time. This is important to promote good health and a good quality of life within the wider context of achieving sustainable development. The management of noise should be an integral part of development proposals and considered as early as possible. Managing noise includes improving and enhancing the acoustic environment and promoting appropriate soundscapes. This can mean allowing some places or certain times to become noisier within reason, whilst others become quieter. Consideration of existing noise sensitivity within an area is important to minimise potential conflicts of uses or activities, for example in relation to internationally important nature conservation sites which contain noise sensitive wildlife species, or parks and green spaces affected by traffic noise and pollution. Boroughs, developers, businesses and other stakeholders should work collaboratively to identify the existing noise climate and other noise issues to ensure effective management and mitigation measures are achieved in new development proposals.



- 3.14.2 The **Agent of Change Principle** places the responsibility for mitigating impacts from existing noise-generating activities or uses on the new development. Through the application of this principle existing land uses should not be unduly affected by the introduction of new noise sensitive uses. Regard should be given to noise-generating uses to avoid prejudicing their potential for intensification or expansion.
- 3.14.3 The management of noise also includes promoting **good acoustic design of the inside of buildings**. Section 5 of BS 8223:2014 provides guidance on how best to achieve this. The Institute of Acoustics has produced advice *Pro:PG Planning and Noise* (May 2017) that may assist with the implementation of residential developments. BS4214 provides guidance on monitoring noise issues in mixed residential/industrial areas.
- 3.14.4 Deliberately **introducing sounds** can help mitigate the adverse impact of existing sources of noise, enhance the enjoyment of the public realm, and help protect the relative tranquillity and quietness of places where such features are valued. For example, playing low-level music outside the entrance to nightclubs has been found to reduce noise from queueing patrons, leading to an overall reduction in noise levels. Water features can be used to reduce the traffic noise, replacing it with the sound of falling water, generally found to be more pleasant by most people.
- 3.14.5 Heathrow and London City Airport Operators have responsibility for noise action plans for airports. Policy T8 Aviation sets out the Mayor's approach to **aviation-related development**.
- 3.14.6 The definition of **Tranquil Areas, Quiet Areas and spaces of relative tranquillity** are matters for London boroughs. These are likely to reflect the specific context of individual boroughs, such that Quiet Areas in central London boroughs may reasonably be expected not to be as quiet as Quiet Areas in more residential boroughs. Defra has identified parts of Metropolitan Open Land and local green spaces as potential Quiet Areas that boroughs may wish to designate."

8.5 London Plan Sustainable Design and Construction SPG

The London Plan Sustainable Design and Construction SPG provides additional information in the following key areas:

- The sources of noise;
- Ways to mitigate noise emitted by developments;



- Ways to mitigate the impact of noise on developments; and
- Some detailed design considerations.

This document has now been revoked.

8.6 Local Planning Policy

The site falls in the jurisdiction of London Borough of Camden. Their policy regarding internal design noise levels are detailed in Appendix 3 of *Camden Local Plan* adopted in 2017 and presented as follows:

“Special consideration will need to be given to noise sensitive developments that are proposed in areas which are, or expected to become, subject to levels of noise likely to have an adverse effect. The threshold of acceptability of the noise will primarily depend on two factors: the intended use of the noise sensitive development and the source of the noise experienced, or likely to be experienced.”

Table B: Noise levels applicable to noise sensitive residential development proposed in areas of existing noise

Dominant Noise Source	Assessment Location	Design Period	LOAEL (Green)	LOAEL to SOAEL (Amber)	SOAEL (Red)
Anonymous noise such as general environmental noise, road traffic and rail traffic ~	Noise at 1 metre from noise sensitive façade/free field	Day	<50dBL _{Aeq,16hr} *	50dB to 72dBL _{Aeq,6hr} *	>72dBL _{Aeq,16hr} *
		Night	<45dBL _{Aeq,8hr} <40 dBL _{Aeq,8hr} **	45dB to 62dBL _{Aeq,8hr} * >40dBL _{night} **	>62dBL _{Aeq,8hrs} *
	Inside a bedroom	Day	<35dBL _{Aeq,16hr}	35dB to 45dBL _{Aeq,16hr}	>45dBL _{Aeq,16hr}
		Night	<30dBL _{Aeq,8hr} 42dBL _{Amax,fast}	30dB to 40dBL _{Aeq,16hr} 40dB to 73dBL _{Amax,fast}	>40dBL _{Aeq,8hr} >73dBL _{Amax,fast}
	Outdoor living space (free field)	Day	<50dBL _{Aeq,16hr}	50dB to 55dBL _{Aeq,6hr}	>55dBL _{Aeq,16hr}
Non-anonymous noise	See guidance note on non-anonymous noise				

*L_{Aeq,T} values specified for outside a bedroom window are façade levels

**L_{night} values specified for outside a bedroom window are free field levels



“The levels given above are for dwellings, however, levels are use specific and different levels will apply dependent on the use of the premises. The Council will also 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.”

Camden’s policy regarding plant and machinery noise emission criteria are detailed in Appendix 3 of *Camden Local Plan* adopted in 2017 and presented 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 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.



“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 $L_{eq,5mins}$ 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.”

Camden also stated the following in relation to noise from emergency plant in Section 6.100 of Camden Local Plan adopted in 2017:

“Emergency equipment such as generators which are only to be used for short periods of time will be required to meet the noise criteria of no more than 10dB above the background level (L_{90} 15 minutes). During standby periods, emergency equipment will be required to meet the usual criteria for plant and machinery. Conditions to this effect may be imposed in instances where emergency equipment forms part of the application.”

8.7 World Health Organisation

The current Environmental Noise Guidelines 2018 for the European Region (ENG) supersede the Guidelines for Community Noise from 1999 (CNG). Nevertheless, the ENG recommends that all CNG indoor guideline values and any values not covered by the current guidelines (such as industrial noise and shopping areas) remain valid.

A summary of the guidance from the ENG and CNG is shown in the table below.

Source	CNG guideline indoors all sources	ENG guideline outdoors noise from specific source only
Road traffic noise	35 L_{Aeq} , 16h	53 dB L_{den}
	30 L_{Aeq} , 8h	45 dB L_{night}
Railway noise	35 L_{Aeq} , 16h	54 dB L_{den}
	30 L_{Aeq} , 8h	44 dB L_{night}
Aircraft noise	35 L_{Aeq} , 16h	45 dB L_{den}
	30 L_{Aeq} , 8h	40 dB L_{night}



With regard to single-event noise indicators, Section 2.2.2 of the WHO Environmental Noise Guidelines 2018 state:

“In many situations, average noise levels like the L_{den} or L_{night} indicators may not be the best to explain a particular noise effect. Single-event noise indicators – such as the maximum sound pressure level ($L_{A,max}$) and its frequency distribution – are warranted in specific situations, such as in the context of night-time railway or aircraft noise events that can clearly elicit awakenings and other physiological reactions that are mostly determined by $L_{A,max}$. Nevertheless, the assessment of the relationship between different types of single-event noise indicators and long-term health outcomes at the population level remains tentative. The guidelines therefore make no recommendations for single-event noise indicators.”

8.8 British Standard BS8233: 2014

British Standard 8233: 2014 “Guidance on sound insulation and noise reduction for buildings” provides guidance for the control of noise in and around buildings.

8.8.1 Internal Areas

BS8233:2014 Section 7.7.2 titled “Internal ambient noise levels for dwellings” states:

“In general for steady external noise sources, it is desirable that internal ambient noise levels do not exceed the following guideline values:

Activity	Location	Desirable Internal Ambient Criteria	
		07:00 – 23:00	23:00 to 07:00
Resting	Living Rooms	35 dB $L_{Aeq,16hour}$	-
Dining	Dining Room/Area	40 dB $L_{Aeq,16hour}$	-
Sleeping (Daytime Resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

Note 1 The above table provides recommended levels for overall noise in the design of a building. These are the sum total of structure-borne and airborne noise sources. Groundborne noise is assessed separately and is not included as part of these targets, as human response to groundborne noise varies with many factors such as level, character, timing, occupant expectation and sensitivity.

Note 2 The levels shown in the above table are based on the existing guidelines issued by the WHO and assume normal diurnal fluctuations in external noise. In cases where local conditions do not follow a typical diurnal pattern, for example on a road serving a port with high levels of traffic at certain times of the night, an appropriate alternative period, e.g. 1 hour, may be used, but the level should be selected to ensure consistency with the levels recommended in the above table.



Note 3 These levels are based on annual average data and do not have to be achieved in all circumstances. For example, it is normal to exclude occasional events, such as fireworks night or New Year's Eve.

Note 4 Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$ depending on the character and number of events per night. Sporadic noise events could require separate values.

Note 5 If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level.

If applicable, any room should have adequate ventilation (e.g. trickle ventilators should be open) during assessment.

Note 6 Attention is drawn to the Building Regulations.

Note 7 Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved."

8.8.2 External Amenity Areas

BS823:2014 Section 7.7.3.2 titled "Design criteria for external noise" states:

"For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}^1$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.

Other locations, such as balconies, roof gardens and terraces, are also important in residential buildings where normal external amenity space might be limited or not available, i.e. in flats, apartment blocks, etc. In these locations, specification of noise limits is not necessarily appropriate. Small balconies may be included for uses such as drying washing or growing pot plants, and noise limits should not be necessary for these uses. However, the general guidance on noise in amenity space is still appropriate for larger balconies, roof gardens, and terraces, which might be intended to be used for relaxation. In high-noise areas consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels. Achieving levels of 55dB $L_{Aeq,T}$ or less might not be possible at the outer edge of these areas, but should be achievable in some areas of the space."



8.9 ProPG : Planning & Noise : 2017

8.9.1 The primary goal of the ProPG is to assist the delivery of sustainable development by promoting good health and well-being through the effective management of noise. It seeks to do that through encouraging a good acoustic design process in and around proposed new residential development having regard to national policy on planning and noise. It is applicable to noise from existing transport sources (noting that good professional practice should have regard to any reasonably foreseeable changes in existing and/or new sources of noise). The recommended approach is also considered suitable where some industrial or commercial noise contributes to the acoustic environment provided that is “not dominant”.

8.9.2 This ProPG advocates a systematic, proportionate, risk based, 2-stage, approach. The approach encourages early consideration of noise issues, facilitates straightforward accelerated decision making for lower risk sites, and assists proper consideration of noise issues where the acoustic environment is challenging.

8.9.3 The two sequential stages of the overall approach are:

- Stage 1 – an initial noise risk assessment of the proposed development site; and
- Stage 2 – a systematic consideration of four key elements.

8.9.4 The four key elements to be undertaken in parallel during Stage 2 of the recommended approach are:

- Element 1 – demonstrating a “Good Acoustic Design Process”;
- Element 2 – observing internal “Noise Level Guidelines”;
- Element 3 – undertaking an “External Amenity Area Noise Assessment”; and
- Element 4 – consideration of “Other Relevant Issues”.

8.9.5 The ProPG considers suitable guidance on internal noise levels found in “BS8233:2014: Guidance on sound insulation and noise reduction for buildings”. Table 4 in Section 7.7.2 of the standard suggests that “in general, for steady external noise sources, it is desirable that the internal ambient noise level does not exceed the guideline values”. The standard states (Section 7.7.1) that “occupants are usually more tolerant of noise without a specific character” and only noise without such character is considered in Table 4 of the standard.

Activity	Location	07:00 – 23:00 Hours	23:00 – 07:00 Hours
Resting	Living Room	35dB LAeq,16hr	-
Dining	Dining Room / Area	40dB LAeq,16hr	-
Sleeping (daytime resting)	Bedroom	35dB LAeq,16hr	30dB LAeq,16hr 45dB LAmax,F



NOTE 1 the Table provides recommended internal L_{Aeq} target levels for overall noise in the design of a building. These are the sum total of structure-borne and airborne noise sources. Ground-borne noise is assessed separately and is not included as part of these targets, as human response to ground-borne noise varies with many factors such as level, character, timing, occupant expectation and sensitivity.

NOTE 2 The internal L_{Aeq} target levels shown in the Table are based on the existing guidelines issued by the WHO and assume normal diurnal fluctuations in external noise. In cases where local conditions do not follow a typical diurnal pattern, for example on a road serving a port with high levels of traffic at certain times of the night, an appropriate alternative period, e.g. 1 hour, may be used, but the level should be selected to ensure consistency with the L_{Aeq} target levels recommended in the Table.

NOTE 3 These internal L_{Aeq} target levels are based on annual average data and do not have to be achieved in all circumstances. For example, it is normal to exclude occasional events, such as fireworks night or New Year's Eve.

NOTE 4 Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$, depending on the character and number of events per night. Sporadic noise events could require separate values. In most circumstances in noise-sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45dB $L_{Amax,F}$ more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability and regularity of noise events (see Appendix A).

NOTE 5 Designing the site layout and the dwellings so that the internal target levels can be achieved with open windows in as many properties as possible demonstrates good acoustic design. Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the "open" position and, in this scenario, the internal L_{Aeq} target levels should not normally be exceeded, subject to the further advice in Note 7.

NOTE 6 Attention is drawn to the requirements of the Building Regulations.



NOTE 7 Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal L_{Aeq} target levels may be relaxed by up to 5dB and reasonable internal conditions still achieved. The more often internal L_{Aeq} levels start to exceed the internal L_{Aeq} target levels by more than 5dB, the more that most people are likely to regard them as “unreasonable”. Where such exceedances are predicted, applicants should be required to show how the relevant number of rooms affected has been kept to a minimum. Once internal L_{Aeq} levels exceed the target levels by more than 10dB, they are likely to be regarded as “unacceptable” by most people, particularly if such levels occur more than occasionally. Every effort should be made to avoid relevant rooms experiencing “unacceptable” noise levels at all and where such levels are likely to occur frequently, the development should be prevented in its proposed form (See Section 3.D).

Figure 2. ProPG Internal Noise Level Guidelines (additions to BS8233:2014 shown in blue).

8.10 Statutory Noise Nuisance

There is no quantitative definition of statutory noise nuisance. It is generally accepted however, that if the plant noise level is at least 5dB (or 10dB if tonal) below the minimum background $L_{90(15minutes)}$ at 1m from the nearest noise sensitive residential window, then the risk of a statutory noise nuisance is avoided. By adopting this as a design criterion the guidance contained in BS 4142:2014 should also be complied with.

9.0 Plant Noise Emission Criteria

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

On the basis of the aforementioned acoustic guidance, Local Authority’s planning policy and the results of the environmental noise survey, we propose that the following plant noise emission criteria be achieved at 1 metre from the nearest noise sensitive residential window.

Position	‘Rating Level’ Noise Emission Limit (dBA)		
	Daytime (07:00 – 23:00 hours)	Night-time (23:00 – 07:00 hours)	24 hours
1	49	29	29
2	37	33	33

The above criteria are to be achieved with all of the proposed plant operating simultaneously.

If plant contains tonal or impulsive characteristics the external design criteria should be reduced



by 5dBA.

It should be noted that the above are subject to the final approval of the Local Authority.

For life safety standby plant, only used in emergencies and occasional testing - e.g. smoke extract fans and life safety generators - relaxations of the internal and external criteria are normally acceptable but should comply with local authority and occupational requirements and must not interfere with internal audible emergency alarms.

10.0 Plant Noise Impact Assessment

We understand the proposed plant comprises the following:

Plant Description	Location	Qty	Plant Make	Model Number
Air Source Heat Pumps	Fifth Floor Roof	2	Mitsubishi	QAHV-N560YA-HPB
Packaged Standby Generator	Fifth Floor Roof	1	Kohler SDMO	4045HFS87
Smoke Ventilation Fans	Fifth Floor Roof	2	NSP	CVS-Ø800-4/4P F300

10.1 Plant Noise Data

We understand the manufacturer's noise data for the equipment to be as follows:

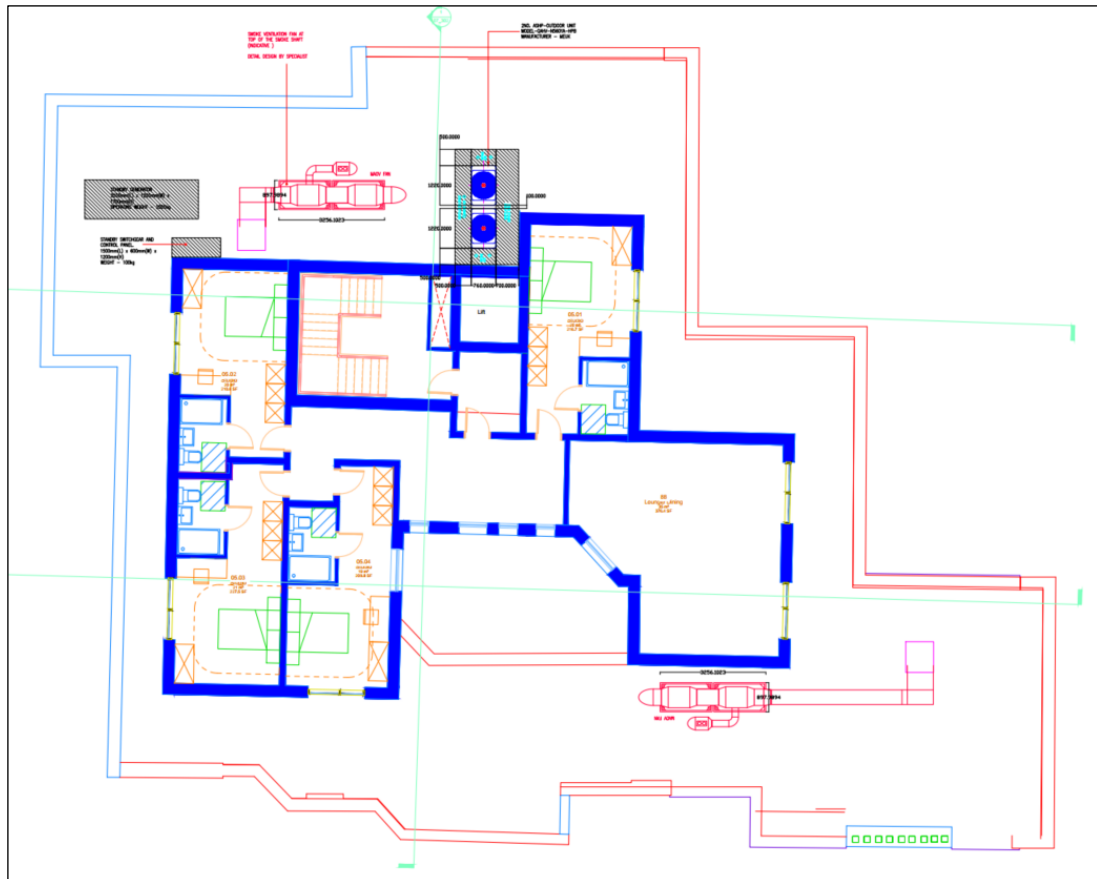
Plant Description	Sound Pressure Level (dB re 2×10^{-5} Pa) at 1 metre at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
Air Source Heat Pump	72	58	59	56	52	48	44	39	58
Packaged Standby Generator	76dBA at 1m								

Plant Description	Sound Power Level (dB re 10^{-12} W) at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
Smoke Extract Fan	87	94	90	89	87	84	81	78	92



10.2 Location of Plant

All plant items are proposed to be located on the fifth-floor roof, as illustrated in the layout below.



Fifth Floor Roof Plant Layout (Ref. 2592-MWL-XX-05-SK-CS-59101 ©2022 Mendick Waring Limited)

The nearest and potentially worst affected noise sensitive residential window is identified to be located on third floor at 93 W End Ln, approximately 9 metres from the proposed air source heat pumps on the roof.

10.3 Mitigation Measures

In order to control plant noise emissions in line with the proposed criteria, we recommend each proposed ASHP be contained within individual small acoustic enclosures complying with the enclosed Acoustic Specification for Small Acoustic Enclosures.



10.4 Plant Noise Impact Assessment

10.4.1 Air Source Heat Pumps

We understand that the proposed air source heat pumps will be operational 24 hours.

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 external plant will be inverter driven and, therefore, will gently ramp up and down depending on the demands on the various systems. In order to be robust, however, a +3dB feature correction as advised in BS 4142:2014 has been applied for the possible present of “... *characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment*”.

The following table summarises our predictions of atmospheric noise emissions from the air source heat pumps on the roof to the nearest noise sensitive residential window.

Description	Sound Pressure Level (dBA)
Plant Noise Emission Limit for Each ASHP Acoustic Enclosure	53 @ 1m
Correction for 2No.	+3
Radiation Mode Correction	+3
Distance Correction (approx. 10m)	-16
Barrier Correction	-17
Feature Correction	+3
Calculated Noise Level at Receptor	29

Our calculations indicate that the proposed air source heat pumps, in conjunction with the proposed mitigation measures, should be capable of achieving the proposed plant noise emission criteria in Section 9.0 and therefore should be complying with the requirements of the Local Authority outlined in Section 8.6.



10.4.2 Smoke Ventilation Fans

We understand the proposed smoke ventilation fans are for emergency use and occasional testing only.

The following table summarises our predictions of atmospheric noise emissions from each smoke ventilation fan on the roof to the nearest noise sensitive residential window.

Description	Sound Pressure Level (dB re 2×10^{-5} Pa) at Octave Band Centre Frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
Sound Power Level for Smoke Extract Fan	87	94	90	89	87	84	81	78	92
Distance Correction (approx. 9m)	-27	-27	-27	-27	-27	-27	-27	-27	
Barrier Correction	-9	-11	-14	-17	-20	-20	-20	-20	
Calculated Noise Level at Receptor	51	56	49	45	40	37	34	31	48

Our calculations indicate that resultant noise levels arising from the proposed smoke ventilation fans at the nearest noise sensitive residential receptors are predicted to be approximately 48dBA. This is approximately 1dB above the existing L_{90} background noise level measured night-time hours (47dBA), and 9dB above the existing L_{90} background noise level measured during daytime hours (39dBA). This should be capable of achieving the requirements of the Local Authority outlined in Section 8.6. However, this is subject to final approval by the Local Authority.

10.4.3 Standby Generator

We understand the proposed standby generator is for emergency use and occasional testing only.

The following table summarises our predictions of atmospheric noise emissions from each standby generator on the roof to the nearest noise sensitive residential window.

Description	Sound Pressure Level (dBA)
Sound Pressure Level at 1m from Standby Generator	76 @ 1m
Distance Correction (approx. 9m)	-13
Barrier Correction	-17
Calculated Noise Level at Receptor	46



Our calculations indicate that resultant noise levels arising from the proposed standby generator at the nearest noise sensitive residential receptors are predicted to be approximately 46dBA. This is approximately 1dB below the existing L_{90} background noise level measured during night-time hours (47dBA), and 7dB above the existing L_{90} background noise level measured during daytime hours (39dBA). This should be capable of achieving the requirements of the Local Authority outlined in Section 8.6. However, this is subject to final approval by the Local Authority.

11.0 Proposed Design Target Internal Noise Levels

On the basis of BS8233:2014 we propose the following internal noise levels be adopted as design targets in the proposed habitable rooms:

Activity	Location	Desirable Internal Ambient Criteria	
		07:00 – 23:00	23:00 to 07:00
Resting	Living Rooms	35 dB $L_{Aeq,16hour}$	-
Dining	Dining Room/Area	40 dB $L_{Aeq,16hour}$	-
Sleeping (Daytime Resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

Note: For this site the $L_{Aeq,T}$ noise parameter alone is considered to be sufficient given the character of the noise climate we have measured. This is consistent with Section 2.2.2 of The World Health Organisation Environmental Noise Guidelines for the European Region and Note 4 of Section 7.7.2 of BS8233:2014.

Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target noise levels may be relaxed (subject to the requirements of any planning conditions) by up to 5 dB and reasonable internal conditions still achieved.

12.0 Achievable Internal Noise Levels

We have predicted the levels that would be achievable in the worst-case dwellings with windows partially opened and also with windows closed.

12.1 Windows Partially Open

It is generally accepted that the typical noise reduction achieved with partially opened windows is around 15dBA (ref. BS 8233:2014 Annex G.1). This value is the difference between dBA levels measured outside and inside typical dwellings, therefore 3dBA should be added to free field noise levels to determine outside levels.



A simple assessment thus indicates the following noise levels may be expected within the proposed worst case habitable rooms with partially opened windows.

Description	Predicted Worst Case Internal Noise Levels with Windows Partially Opened			
	Position 1		Position 2	
	Daytime L _{Aeq} (16-hour)	Night-time L _{Aeq} (8-hour)	Daytime L _{Aeq} (16-hour)	Night-time L _{Aeq} (8-hour)
External free field level measured at 4 th floor level	66dBA	60dBA	54dBA	47dBA
External free field level estimated at ground floor level	70dBA	64dBA	58dBA	51dBA
Façade correction	+3dBA	+3dBA	+3dBA	+3dBA
Façade noise level	73dBA	67dBA	61dBA	54dBA
Noise reduction for conventional thermal double glazing	-15dBA	-15dBA	-15dBA	-15dBA
Predicted internal noise levels	58dBA	52dBA	46dBA	39dBA

12.2 Windows Closed

Provision exists to provide appropriate sound insulation solutions as required including, where necessary, suitably specified glazing and attenuated ventilators. We have carried out preliminary calculations to determine the likely façade sound insulation performance requirements for the worst affected (east) facade. Our calculation methods follow those outlined in BS 8233:2014. Our calculations are based on the following assumptions:

- Conventional brick/block cavity external wall or equivalent
- 14m³ approximate room volume
- 2.9m² approximate window area
- Typical furnishings including beds, sofas, chairs etc.
- Double glazing comprising 10/12/6.4 or equivalent having an R_w + C_{tr} of 35dB
- Acoustic trickle ventilator having an D_{n,e,w} + C_{tr} of 35dB



The following table summarises our assessment of achievable noise levels within the proposed worst case habitable rooms with closed windows.

Description	Predicted Worst Case Internal Noise Levels with Windows Closed	
	Daytime $L_{Aeq}(16\text{-hour})$	Night-time $L_{Aeq}(8\text{-hour})$
External free field level measured at 4 th floor level	66dBA	60dBA
External free field level estimated at 1 st floor level	69dBA	63dBA
Noise reduction for closed windows ¹	-34dBA	-34dBA
Predicted internal noise levels	35dBA	29dBA

¹ Calculated in accordance with BS8233:2014 assuming mitigation measures outlined in Section 12.0.

Note: At detailed design stage octave band acoustic specifications will need to be developed, and it will be essential that the prospective glazing/cladding system suppliers can demonstrate compliance with these specifications, rather than simply offering generic glazing configurations as described above.

13.0 External Amenity Area

Noise levels in external amenity areas should ideally not be above the range of 50-55dB $L_{Aeq,16hr}$, as stated in BS8233:2014. The design has achieved the lowest practicable noise levels. It is acknowledged that noise levels on the front roof terrace may be above this noise level. However in addition to the smaller roof terrace all dwellings will have access to the rear roof terrace, where noise levels will be below/within the range of 50-55dB $L_{Aeq,16hr}$ as stated in BS8233:2014.

It should be noted that BS8233:2014 states: *"In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited."*



14.0 Mitigation Measures

The predicted worst case internal noise levels with windows closed meet the proposed criteria. It is thus demonstrated that acceptable internal noise levels are achievable with suitably specified double glazing and acoustically attenuated ventilation.

The predicted worst case internal noise levels with windows partially opened exceed the proposed target levels (as is often the case). The minimum mitigation available to future occupants would be to close their window. Ventilation (incorporating suitable acoustic attenuation) will be provided to comply with the requirements of the Building Regulations Approved Document F whole dwelling ventilation. The occupants will thus have the option of keeping windows closed for most of the time and only opening windows for purge ventilation.

This form of mitigation is supported within the Pro:PG which advises the following:

- 2.34 Where the LPA accepts that there is a justification that the internal target noise levels can only be practically achieved with windows closed, which may be the case in urban areas and at sites adjacent to transportation noise sources, special care must be taken to design the accommodation so that it provides good standards of acoustics, ventilation and thermal comfort without unduly compromising other aspects of the living environment. In such circumstances, internal noise levels can be assessed with windows closed but with façade openings used to provide “*whole dwelling ventilation*” in accordance with Building Regulations Approved Document F (e.g. trickle ventilators) in the open position (see Supplementary Document 2). Furthermore, in this scenario the internal L_{Aeq} target noise levels should not generally be exceeded.
- 2.35 It should also be noted that the internal noise level guidelines are generally not applicable under “*purge ventilation*” conditions as defined by Building Regulations Approved Document F, as this should only occur occasionally (e.g. to remove odour from painting and decorating or from burnt food).

At this stage of the design scheme the precise details of window to be used are not known, nor are the precise details of the ventilation.

The external envelope of the proposed residences will incorporate suitably specified glazing so as to achieve the proposed design target internal noise levels presented above.

Where ventilation is provided through the façade it shall be suitably acoustically attenuated to ensure the achievement of the proposed target internal noise levels is not compromised.



The Local Planning Authority may expect to be provided with details of the sound insulation treatments when available. Therefore in granting consent it would be appropriate for a planning condition to be imposed along the following lines, (based on the example condition 1 drawn from PPG24):

“Construction work shall not begin until a scheme for protecting the proposed noise-sensitive development from noise from nearby dominant noise sources has been submitted to and approved by the local planning authority; all works which form part of the scheme shall be completed before any part of the noise-sensitive development is occupied.”

15.0 Conclusions

A detailed environmental noise survey has been undertaken in order to establish the currently prevailing environmental noise climate around the site.

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

Potential plant noise impacts on the neighbouring noise sensitive premises have been assessed, and mitigation measures have been recommended in line with the proposed plant noise criteria.

The environmental noise impact upon the proposed dwellings has been assessed in the context of national and local planning policies.

Appropriate target internal noise levels have been proposed. These are achievable using conventional mitigation measures. Mitigation advice, including the use of suitably specified glazing and acoustically attenuated ventilation, have been recommended to reduce to a minimum the adverse impact on health and quality life arising from environmental noise.

The assessment shows the site, subject to appropriate mitigation measures, is suitable for residential development in terms of noise.

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	<p>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</p> <p>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.</p>
L _{90,T}	L ₉₀ is the noise level exceeded for 90% of the period <i>T</i> (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, <i>T</i> .
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.
L _p	Sound Pressure Level (SPL) is the sound pressure relative to a standard reference pressure of 2 x 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).
L _w	Sound Power Level (SWL) 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).

FRANCIS GARDNER HOUSE

SPECIFICATION FOR

SMALL ACOUSTIC ENCLOSURES

The air source heat pumps 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) or in any horizontal direction under any load conditions.

Plant Description	A-weighted Limiting Sound Pressure Level @ 1m (dB re 2×10^{-5} Pa)
Each Proposed Air Source Heat Pump	53dBA

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 shall 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.

Francis Gardner House, West Hampstead

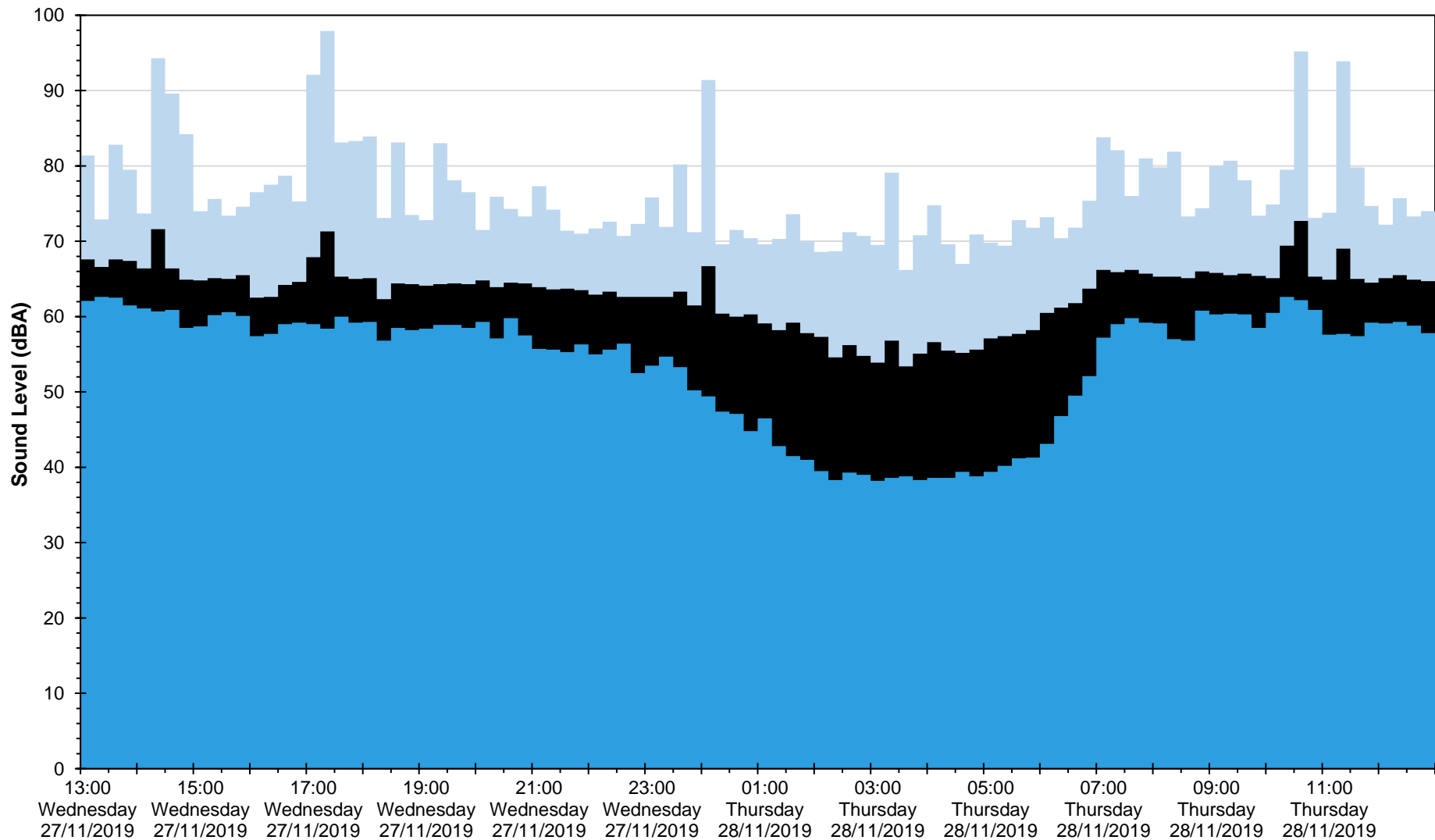
Position 1

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

Wednesday 27 November 2019 to Thursday 28 November 2019

■ L_{max} ■ L_{eq}

■ L_{90}



Date and Time

27465/TH1

Francis Gardner House, West Hampstead

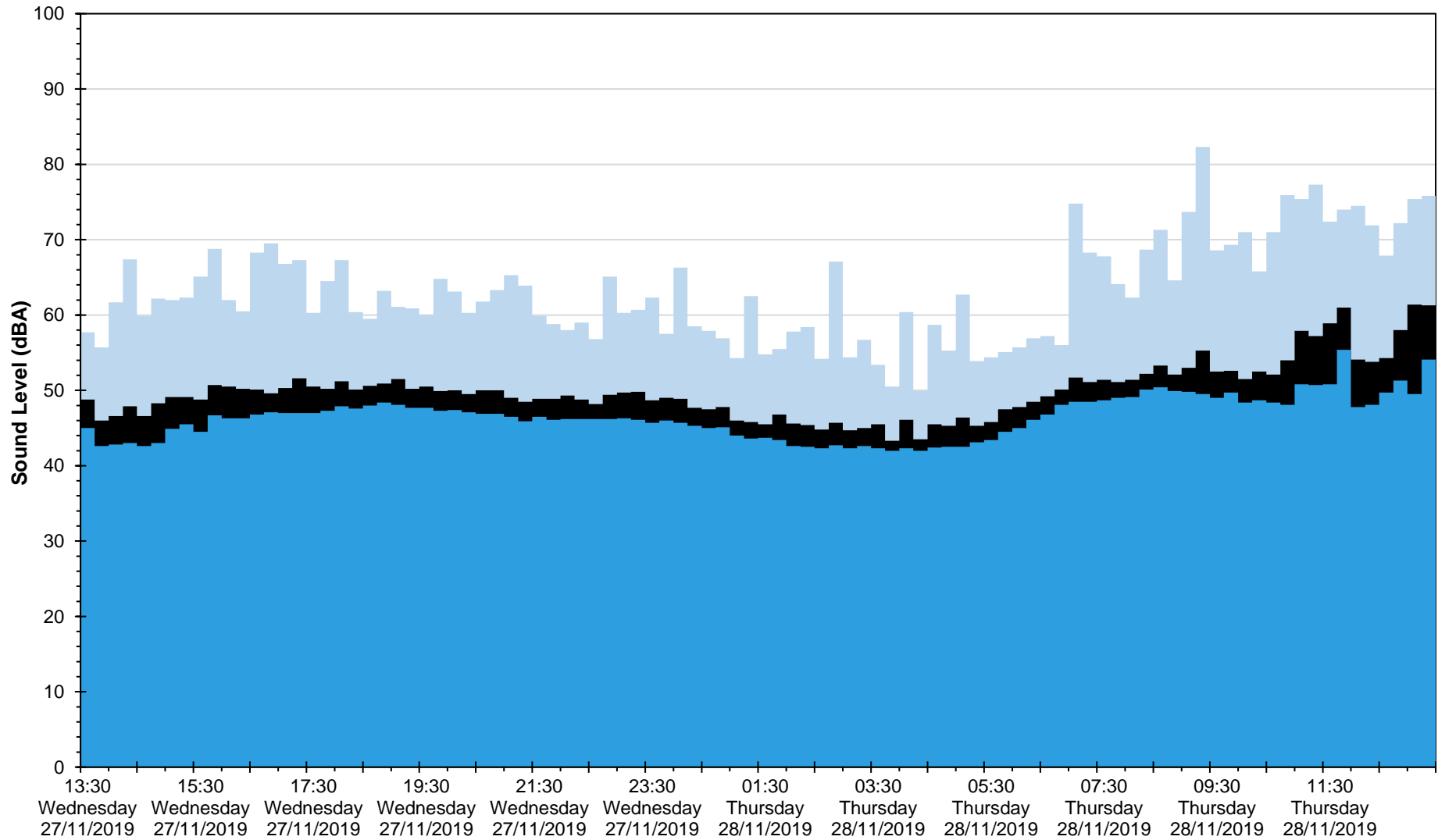
Position 2

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

Wednesday 27 November 2019 to Thursday 28 November 2019

L_{max} L_{eq}

L_{90}



Date and Time

27465/TH2