NOISE IMPACT ASSESSMENT

551-557 Finchley Road

Produced by XCO2 for Hampstead Properties Ltd c/o Delta Properties

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EXECUTIVE SUMMARY

The proposal is for change of use from Use Classes B1a/B1c/A1/D1 and remodelling of the existing building to provide apart-hotel (C1) and co-working/café (B1/A3) and a flexible retail / non-residential institution / assembly and leisure unit (A1-A5 / D1/D2), alterations including partial demolition and extensions at the rear at lower ground, ground and first floor levels, extension to provide an additional storey at roof level, levelling of the lower ground floor level, remodelling and restoration of front façade, cycle parking and all associated works.

An environmental sound survey has been undertaken to inform plant selections and attenuation designs.

Additional comments and advice have been provided relating to the transfer of noise from plant rooms and commercial spaces to adjacent bedrooms.

PLANT NOISE LIMITS

Plant noise limits have been given in Table 9 to enable initial design work to commence. The limits are based on meeting London Borough of Camden's usual requirements for noise from new services plant.

SOUND INSULATION BETWEEN PLANTROOMS AND BEDROOMS

Recommendations are given for the minimum sound insulation that should be provided between the plantrooms and adjacent bedrooms to meet the requirements of Building Regulations Approved Document E and the recommendations in BS 8233:2014. Initial guidance has been provided for the control of plant vibration into the building structure.

SOUND INSULATION BETWEEN COMMERCIAL SPACES AND BEDROOMS

Recommendations are given for the minimum sound insulation that should be provided between the commercial units and adjacent bedrooms above to meet the requirements of Building Regulations Approved Document E and the recommendations in BS 8233:2014. Recommended limits have been given for noise within the commercial units that would provide reasonable noise levels in the bedrooms. Initial design guidance has been given with regard to the control of noise and vibration from the gym.

INTRODUCTION

It is proposed to redevelop the site at 551-557 Finchley Road to provide a 33-key Apart-Hotel with reception, café and co-working facilities and an associated sub-let retail unit.

The local authority has requested that an assessment to demonstrate that noise from plant and operations of the non-residential parts of the development will not adversely affect the bedrooms or adjacent flats.

SITE LOCATION

The site is located on the west side of Finchley Road within the London Borough of Camden (See Figure 1 below).

Figure 1: Site location map

PLANNING POLICIES

A great deal of change has occurred in recent years in the assessment of noise impacts and their relationship with planning decisions. The following sections introduce the applicable policies, either national or local, which ought to be considered to support the planning application. It should be highlighted that the assessment is mainly addressed to the local planning authority.

NOISE POLICY STATEMENT FOR ENGLAND

The Noise Policy Statement for England (NPSE[1]), published in March 2010, sets out the long-term vision of Government noise policy. The Noise Policy aims, as presented in this document, are: "*Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:*

- *avoid significant adverse effects on health and quality of life;*
- *mitigate and minimise adverse effects on health and quality of life; and*
- *where possible, contribute to the improvement of health and quality of life."*

The NPSE makes reference to the concepts of NOEL (No Observed Effect Level) and LOAEL (Lowest Observed Adverse Effect Level) as used in toxicology but applied to noise impacts. It also introduces the concept of SOAEL (Significant Observed Adverse Effect Level) which is described as the level above which significant adverse effects on health and quality of life occur.

The first aim of the NPSE is to avoid significant adverse effects, taking into account the guiding principles of sustainable development (as referenced in Section 1.8 of the NPSE). The second aim seeks to provide guidance on the situation that exists when the potential noise impact falls between the LOAEL and the SOAEL, in which case: *"...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."*

Importantly, the NPSE goes on to state that: "*This does not mean that such adverse effects cannot occur."*

The NPSE does not provide a noise-based measure to define SOAEL, acknowledging that the SOAEL is likely to vary depending on the noise source, the receptor and the time in question. NPSE advises that: *"Not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available."*

It is therefore likely that other guidance will need to be referenced when applying objective standards for the assessment of noise, particularly in reference to the SOAEL, whilst also taking into account the specific circumstances of a proposed development.

[1] Noise Policy Statement for England, Defra, March 2010

NATIONAL PLANNING POLICY FRAMEWORK

A new edition of NPPF was published in February 2019 and came into effect immediately. The original National Planning Policy Framework (NPPF[2]) was published in March 2012, with a revision in July 2018 - this document replaced the existing Planning Policy Guidance Note 24 (PPG 24) "Planning and Noise." The 2019 revised edition contains no new directions or guidance with respect to noise, and hence, all previous references remain extant. The paragraph references quoted below relate to the February 2019 edition.

Paragraph 170 of the NPPF states that the planning system should contribute to and enhance the natural and local environment by, (amongst others) *"preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, water or noise pollution or land stability."*

The NPPF goes on to state in Paragraph 180 "*planning policies and decisions should … :*

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

The NPPF document does not refer to any other documents or British Standards regarding noise other than the NPSE.

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

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

Paragraph 117 states that *"Planning policies and decisions should promote an effective use of land in meeting the need for homes and other uses, while safeguarding and improving the environment and ensuring safe and healthy living conditions. Strategic policies should set out a clear strategy for accommodating objectively assessed needs, in a way that makes as much use as possible of previously-developed or 'brownfield' land.*

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

PLANNING PRACTICE GUIDANCE – NOISE

An updated Planning Practice Guidance (PPG) for noise was published on 22 July 2019 and provides additional guidance and elaboration on the NPPF. It advises that when plan-making and decision-taking, the Local Planning Authority should consider the acoustic environment in relation to:

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

This guidance introduced the concepts of NOAEL (No Observed Adverse Effect Level), and UAEL (Unacceptable Adverse Effect Level). NOAEL differs from NOEL in that it represents a situation where the acoustic character of an area can be slightly affected (but not such that there is a perceived change in the quality of life). UAEL represents a situation where noise is 'very disruptive' and should be 'prevented' (as opposed to SOAEL, which represents a situation where noise is 'disruptive', and should be 'avoided').

As exposure increases above the LOAEL, the noise begins to have an adverse effect and consideration needs to be given to mitigating and minimising those effects, taking account of the economic and social benefits being derived from the activity causing the noise. As the noise exposure increases, it will then at some point cross the SOAEL boundary.

The LOAEL is described in PPG as the level above which "noise starts to cause small changes in behaviour and attitude, for example, having to turn up the volume on the television or needing to speak more loudly to be heard".

PPG identifies the SOAEL as the level above which "noise causes a material change in behaviour such as keeping windows closed for most of the time or avoiding certain activities during periods when the noise is present."

In line with the Explanatory Note of the NPSE, the PPG goes on to reference the LOAEL and SOAEL in relation to noise impact. It also provides examples of outcomes that could be expected for a given perception level of noise, plus actions that may be required to bring about a desired outcome. However, in line with the NPSE, no objective noise levels are provided for LOAEL or SOAEL although the PPG acknowledges that "...the subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation."

The relevant guidance in the PPG in relation to the adverse effect levels is summarized in Table 1.

Table 1. PPG guidance on adverse effect levels

Response	Examples of Outcomes	Increasing Effect Level	Action
No Observed Effect Level			
Not Present	No Effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
Present and not Intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. 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			
Present and Intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and Disruptive	The noise causes a material change in behaviour, attitude or other physiological response, 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
Present and very Disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

The Planning Practice Guidance states the following in relation to mitigation measures:

"For noise sensitive developments, mitigation measures can include avoiding noisy locations in the first place; designing the development to reduce the impact of noise from adjoining activities or the local environment; incorporating noise barriers; and optimising the sound insulation provided by the building envelope."

In addition, the Guide notes that it may also be relevant to consider:

"... whether any adverse internal effects can be completely removed by closing windows and, in the case of new residential development, if the proposed mitigation relies on windows being kept closed most of the time (and the effect this may have on living conditions). In both cases a suitable alternative means of ventilation is likely to be necessary. Further information on ventilation can be found in the Building Regulations".

THE LONDON PLAN 2016

The London Plan 2016 is the overall strategic plan for London, setting out an integrated economic, environmental, transport and social framework for the development of London over the next 20–25 years. London Plan's Policy 7.15 states the following:

STRATEGIC

The transport, spatial and design policies of this plan will be implemented in order to reduce and manage noise to improve health and quality of life and support the objectives of the Mayor's Ambient Noise Strategy.

PLANNING DECISIONS

Development proposals should seek to manage noise by:

a. *avoiding significant adverse noise impacts on health and quality of life as a result of new development;*
b. *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 development or adding unduly to the costs and administrative burdens on existing businesses;*
c. *improving and enhancing the acoustic environment and promoting appropriate soundscapes (including Quiet Areas and spaces of relative tranquillity);*
d. *separating new noise sensitive development from major noise sources (such as road, rail, air transport and some types of industrial development) through the use of distance, screening or internal layout – in preference to sole reliance on sound insulation;*
e. *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 the application of good acoustic design principles;*
f. *having particular regard to the impact of aviation noise on noise sensitive development;*
g. *promoting new technologies and improved practices to reduce noise at source, and on the transmission path from source to receiver.*

LOCAL DEVELOPMENT FRAMEWORK PREPARATION

Boroughs and others with relevant responsibilities should have policies to:

a. *manage the impact of noise through the spatial distribution of noise making and noise sensitive uses;*
b. *identify and nominate new Quiet Areas and protect existing Quiet Areas in line with the procedure in Defra's Noise Action Plan for Agglomerations*[1].

NEW DRAFT LONDON PLAN

On 13 August 2018 the Mayor published a version of the draft New London Plan.

The intent of the plan is unchanged from the previous plan, as it "sets out an integrated economic, environmental, transport and social framework for the development of London over the next 20-25 years".

Policy D1 requires that:

> *Development Plans, area-based strategies and development proposals should ensure the design of places addresses the following requirements:*
> *...*
> *Help prevent or mitigate the impacts of noise ...*
> *Achieve indoor and outdoor environments that are comfortable and inviting for people to use*

Paragraph 3.1.3 in the narrative to Policy D1 states that:

> *Measures to design out exposure to poor air quality and noise from both external and internal sources, should be integral to development proposals and considered early in the design process.*

Policy D13 requires that:

> *In order to reduce, manage and mitigate noise to improved 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 D12*
> *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*

The narrative to the policy includes the advice that:

> *The management of noise also includes promoting good acoustic design of the inside of buildings. Section 5 of BS 8233:2014 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.*
> *BS 4142 provides guidance on monitoring noise issues in mixed residential/industrial areas.*

LONDON BOROUGH OF CAMDEN

London Borough of Camden has provided pre-application advice, including the required scope for a noise assessment.

Section 12 *Amenity* of the advice given[3] includes:

> *Noise for prospective occupiers*
> *Depending on the proposed use at ground floor level, a Noise Impact Assessment may need to be submitted to demonstrate that the proposed retail units would not cause disturbance to the residential flats above, particularly if air conditioning units or plant is proposed. This would need to be in accordance with Policy A4 (noise and vibration).*

London Borough of Camden's usual requirements for noise are given later in this report.

BRITISH STANDARD 8233: 2014

BS 8233: 2014 "British Standard Code of practice for Sound insulation and noise reduction for buildings" provides guidance on internal noise levels and sound insulation between rooms in various types of buildings.

BRITISH STANDARD 4142:2014

The method employed for assessing the likelihood of noise impact from plant noise to a noise-sensitive façade is a standard method laid out in BS 4142:2014: "Methods for rating and assessing industrial and commercial sound".

This British Standard describes a methodology to be exercised on the outside of a building for determining:

> *(a) Sound levels from factories, industrial premises or fixed installations and sources of an industrial nature in commercial premises; and*
> *(b) Background sound level.*

This standard also describes a method for assessing the impact of the sound referred to within (a) on the nearby residents. The likelihood of sound provoking complaints depends on its level relative to the background sound level and whether or not it has certain tonal or impulsive audible characteristics, such as a distinctive whine, bangs, thumps or clatters. Such sounds are assumed to increase the sound depending how perceptible these sounds are. BS 4142 states that Reference to paragraph 11 "Assessment of the impacts" gives the following conclusion:

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

[3] Ref. 2019/2750/PRE dated 2 July 2019

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

The standard states that a sound 10 dB or greater than background sound would be likely to be an indication of a significant adverse impact. Around 5 dB would be an adverse impact, whereas a sound equal to background would be a low impact.

Section 8 of BS 4142:2014 states,

8.1 In using the background sound level in the method for rating and assessing industrial and commercial sound it is important to ensure that values are reliable and suitably represent both 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 ...

Since the intention is to determine a background sound level in the absence of the specific sound that is under consideration, it is necessary to understand that the background sound level can in some circumstances legitimately include industrial and/or commercial sounds that are present as separate to the specific sound...

8.1.4 The monitoring duration should reflect the range of background sound levels for the period being assessed. In practice, there is no "single" background sound level as this is a fluctuating parameter. However, the background sound level used for the assessment should be representative of the period being assessed.

... A representative level ought to account for the range of background sound levels and ought not automatically to be assumed to be either the minimum or modal value."

DESIGN NOISE LEVELS

Noise control in and around buildings is discussed in the British Standard guides on an objective and quantifiable basis. The guides suggest criteria, such as suitable sleeping/resting conditions, and propose noise levels that normally satisfy these criteria for most people.

BS 8233:2014 GUIDANCE ON SOUND INSULATION AND NOISE REDUCTION FOR BUILDINGS.

This Standard provides recommended guideline values for internal noise levels within dwellings which are similar in scope to guideline values contained within the World Health Organisation (WHO) document, Guidelines for Community Noise (1999[4]). These guideline noise levels are shown in Table 2, below:

Table 2: BS 8233 Desirable Internal Ambient Noise Levels for Dwellings

Activity	Location	07:00 to 23:00 hours	23:00 to 07:00 hours
Resting	Living room	35 dB $L_{Aeq,16h}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16h}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16h}$	30 dB $L_{Aeq,8h}$

SOUND INSULATION BETWEEN PLANTROOMS AND COMMERCIAL SPACES AND BEDROOMS

Airborne noise from the commercial demises to the bedrooms must be controlled in order to meet the statutory requirements in the current Building Regulations. In addition, it is recommended that guidance values in BS 8233:2014 are also met or exceeded.

BUILDING REGULATIONS APPROVED DOCUMENT E

The building regulations Approved Document E *Resistance to the passage of sound* gives minimum acoustic performance requirements for separating walls and floors between bedrooms and other spaces within the same building. Hotel bedrooms are categorised in the Approved Document as “Rooms for Residential Purposes”.

For a new-build development, the airborne sound insulation provided by any separating floor must be at least 45 dB $D_{nT,w} + C_{tr}$. For any separating wall, the requirement is a sound insulation of at least 43 dB $D_{nT,w} + C_{tr}$.

[4] World Health Organisation Guidelines for Community Noise, 1999

BS 8233:2014

The requirements of Approved Document E are intended for use in residential and mixed-use buildings where noise levels are not expected to be high. Where such a situation occurs, additional guidance is taken from section 7.5 in BS 8233:2014.

This states:

... sound from adjacent spaces can affect the intended use, depending on the noise activity, noise sensitivity and privacy requirement. A matrix may be used to determine the sound insulation requirement of separating partitions once the noise activity, noise sensitivity and privacy requirements for each room and space. An example matrix, which can be adapted according to the specific building use, is given in [BS 8223] Table 3. Each room may be both a source and a receiving room. Where adjacent rooms have different uses, the worst-case sound insulation should be specified.

Table 3 **Example on-site sound insulation matrix (dB $D_{nT,w}$)**

Privacy requirement	Activity noise of source room	Noise sensitivity of receiving rooms		
		Low sensitivity	Medium sensitivity	Sensitive
Confidential	Very high	47	52	57 [A)]
	High	47	47	52
	Typical	47	47	47
	Low	42	42	47
Moderate	Very high	47	52	57 [A)]
	High	37	42	47
	Typical	37	37	42
	Low	No rating	No rating	37
Not private	Very high	47	52	57 [A)]
	High	37	42	47
	Typical	No rating	37	42
	Low	No rating	No rating	37

*NOTE Background noise can also influence privacy. See also **7.7.6.3**.*

[A)] $D_{nT,w}$ 55 dB or greater is difficult to obtain on site and room adjacencies requiring these levels should be avoided wherever practical.

The commercial demises within the development comprise the café and co-working space on the ground and lower ground floors, the gym on the lower ground floor and the sub-let retail space on the ground floor. In addition, there are plantrooms on the lower ground floor, and on the fourth floor.

There is an element of professional judgment to be made when categorising the room activity noise level, required privacy and noise-sensitivity. This is described in more detail in the sections on *Sound Insulation Between plantrooms and bedrooms* and *Sound Insulation Between Commercial spaces and bedrooms* below

MEASUREMENT OF NOISE LEVELS

The following section describes the methodology undertaken in order to establish the environmental noise levels around the site.

DETAILS OF ENVIRONMENTAL SOUND SURVEY

Continuous measurements of the incident sound pressure levels at the site were undertaken from 14.40 hours on Monday 11th November to 09.45 hours on Tuesday 12th November 2019. The sound level meter was programmed to record the A-weighted L_{eq}, L_{90}, L_{10} and L_{max} noise indices and corresponding octave band frequency information (for L_{eq}) for consecutive sample periods for the duration of the survey. A measurement interval of 5 minutes was used to discriminate for the effect of existing plant in the area.

MEASUREMENT POSITION

The measurement of incident sound levels was undertaken at the approximate location in the aerial photograph below and Table 3 describes the measurement position. In accordance with BS 7445-2:1991 'Description and measurement of environmental noise – Part 2: Guide to the acquisition of data pertinent to land use', the measurements were undertaken under free-field conditions.

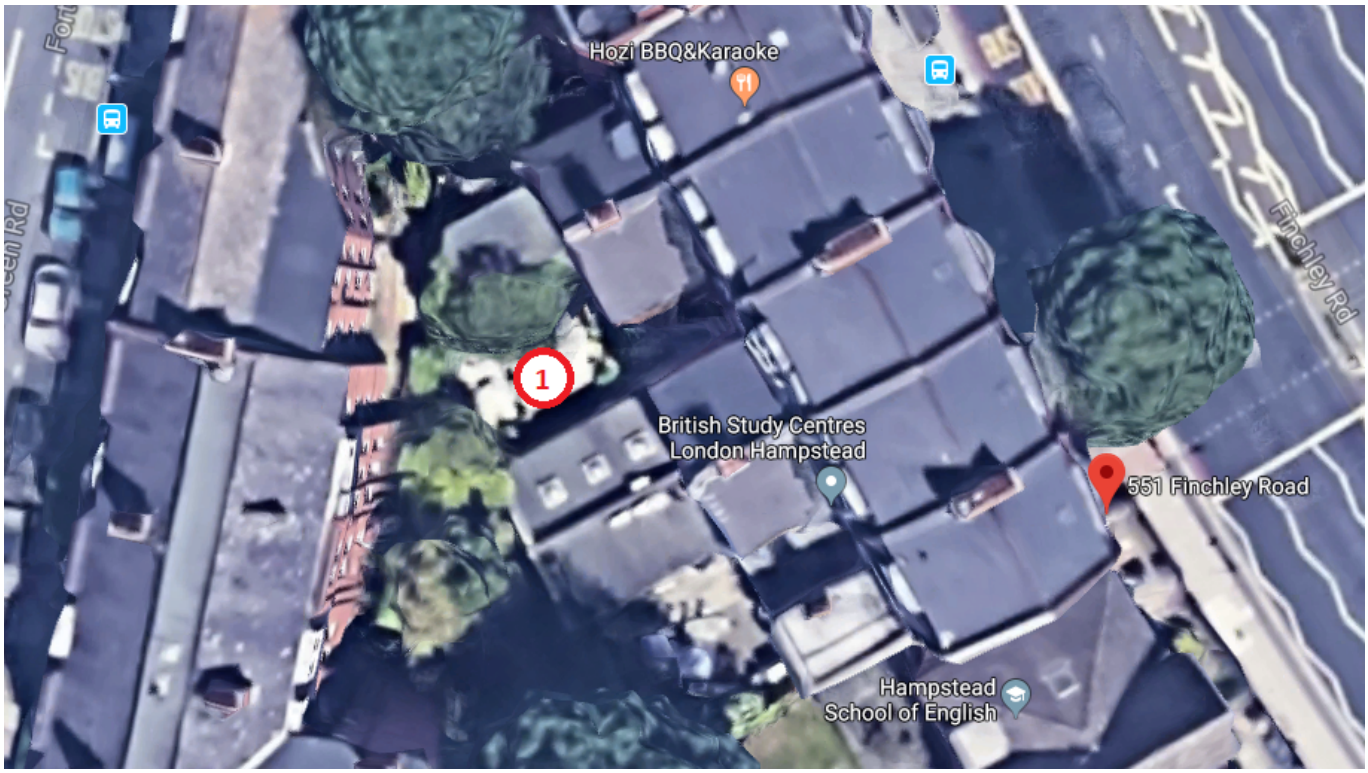


Figure 2: On site sound pressure level measurement positions

Table 3. Description of measurement position

Position	Description
1	Within courtyard at rear of premises

EQUIPMENT

Details of the equipment used during the survey are provided in Table 4 below. The sound level meters were calibrated before and after the survey; no significant change (+/-0.2 dB) in the calibration level was noted.

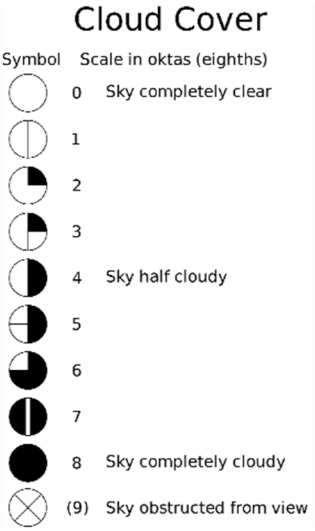
Table 4. On site instrumentation

Position	Description	Model / serial no.	Calibration date	Calibration certificate no.
1	Class 1 Sound level meter	Rion NL-52 / 00654035	29/05/2019	UCRT19/1634
	Condenser microphone	Rion UC-59 /08290		
	Preamplifier	Rion NH-25 / 54080		
	Calibrator	Rion NC-74 /34535932	24/05/2019	TCRT19/1409

WEATHER CONDITIONS

Weather conditions were determined both at the start and on completion of the survey. It is considered that the meteorological conditions were appropriate for environmental noise measurements. Table 5 presents the weather conditions recorded on site at the beginning and end of the survey.

Table 5. Weather Conditions

Date/Time	Description	Beginning of Survey	End of Survey
14.40 11 Nov – 09.45 12 Nov 2019	Temperature (°C)	10	7
	Precipitation:	No	No
	Cloud cover (oktas - see guide)	7	2
	Presence of fog/snow/ice	No	No
	Presence of damp roads/wet ground	No	No
	Wind Speed (m/s)	2	3
	Wind Direction	E	E
	Conditions that may cause temperature inversion (i.e. calm nights with no cloud)	No	No

RESULTS

Noise levels were observed to be predominantly due to road traffic and intermittent services plant, with voices and aircraft also audible.

MEASURED NOISE LEVELS

The time history of the main sound pressure level indices recorded are presented in Appendix B. The relevant results of the survey have been summarised in Table 6.

Table 6. Summary of survey results (free field levels)

Position	Measurement period	Range of recorded sound pressure levels (dB)			
		$L_{Amax,5min}$	$L_{Aeq,\ 5\ min}$	$L_{A10,\ 5\ min}$	$L_{A90,\ 5\ min}$
1, Wallis Road	Daytime (07.00 – 23.00 hours)	66 - 98	54 - 69	55 - 71	49 - 58
	Night-time (23.00 – 07.00 hours)	53 - 88	47 - 59	48 - 61	44 - 53

BACKGROUND SOUND LEVELS

The noise survey data has been analysed to determine representative background sound levels at the nearest noise-sensitive receptor. The statistical distributions of daytime and night-time background sound levels are shown in Figure 3 and Figure 4 and Table 7.

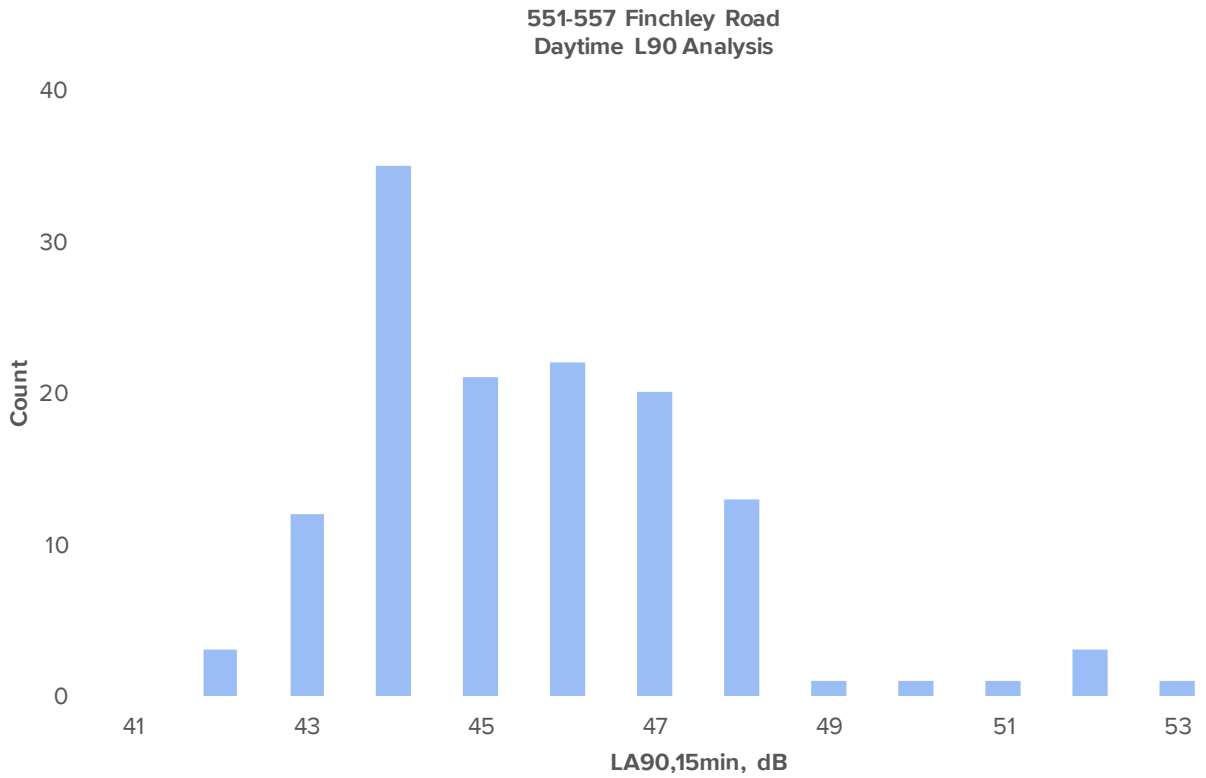


Figure 3. Histogram of daytime L_{A90} background sound pressure levels

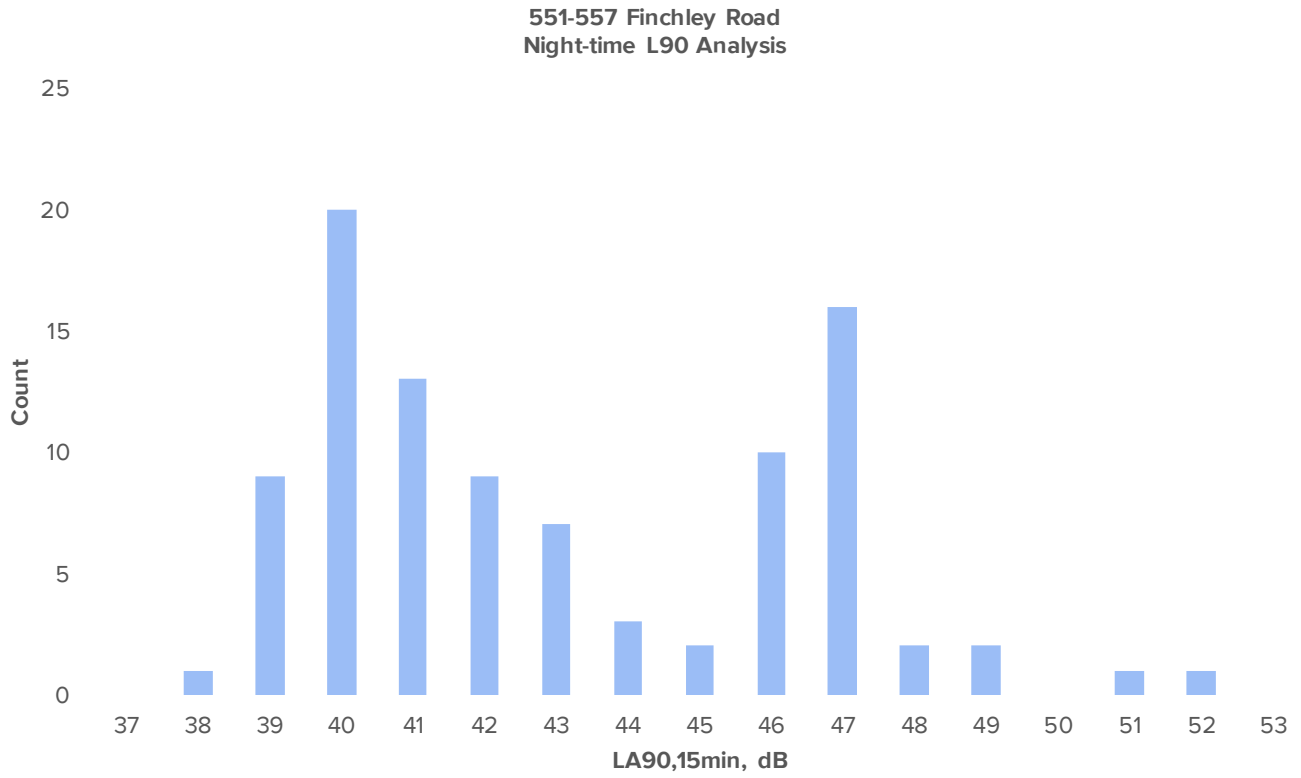


Figure 4. Histogram of night-time L_{A90} background sound pressure levels

Table 7. Statistical analysis of background sound levels

Parameter	dB $L_{A90, 5min}$	
	Daytime (07.00 – 23.00 hours)	Night-time (23.00 – 07.00 hours
mean	46	43
modal	44	40
median	45	42

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

- 44dB L_{A90} during the daytime period; and
- 40dB L_{A90} during the night-time period

PLANT NOISE GUIDANCE

It is understood that selection of services plant will be made during detailed design. The following outline guidance is made in order to permit initial plant selections and identify at an early stage the likely need for attenuation.

PLANT LOCATIONS AND NEAREST NOISE-SENSITIVE RECEPTORS

Plantrooms having external louvres are:

- Combined central heating boilers and hot water calorifiers plantroom on lower ground floor. This has a mechanical ventilation system with intake and discharge louvres on the ground floor adjacent to the main entrance. The boiler flue rises through the building and discharges above the roof.
- Condenser plantroom on the 4th floor. This has ventilation intake and discharge louvres in the rear wall. Forced ventilation may be required, depending on the plant selected.

In addition, an MVHR system is proposed for the gym, with louvres at low level on the ground floor. The sub-let retail unit is also likely to require a ventilation / air conditioning system.

The nearest noise-sensitive receptors to the louvres and flue termination are:

- Windows of Unit 1.7, approximately 5m above the boiler room intake and discharge louvres
- Windows at front elevation of adjacent first floor residential property above 551 Finchley Road, approximately 3m above the louvres serving the gym and sub-let retail unit
- Window at rear elevation of Unit 4.3, approximately 2m from the condenser plantroom louvres
- Front window of Unit 4.3, approximately 4m from the flue termination and screened from it by the building geometry.

CRITERIA

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

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

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

SOEAL is defined as:

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

Clause 6.27 states that:

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

Appendix 3 within the Camden Local Plan published 2017 states:

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

Table C of the appendix (Table 8 below) states the criteria at which development related noise levels will be acceptable:

Table 8: Camden Council criteria table

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 57dBLAmax	'Rating level' between 9dB below and 5dB above background or noise events between 57dB and 88dBLAmax	'Rating level' greater than 5dB above background and/or events exceeding 88dBLAmax

SURVEY

As described previously, representative background sound levels are considered to be 44dB $L_{A90,5min}$ during the day (07.00 – 23.00) and 40 dB $LA_{90,5min}$ at night.

PLANT NOISE GUIDANCE

In order to comply with the London Borough of Camden criteria above, the BS4142:2014 rating level due to new plant, at the nearest noise-sensitive façades should not exceed 34dB during the day and 30dB at night. These limits assume the plant installed does not exhibit any tonality. These values are significantly below the level at which BS 4142:2014 predicts there is likely to be a "low impact".

Typically, plant used for this type of development is not anticipated to exhibit any tonal or impulsive characteristics provided it is well maintained. A penalty of 3dB as described in BS 4142:2014 would typically be applied for the possible presence of "…characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment…".

The first-floor dwelling above 551 Finchley Road may be subject to noise from the gym MVHR louvres and the plant serving the sub-let retail unit. Because of the layout of the building and proposed locations of the other plantroom louvres and boiler flue termination, no receptor window is subject to noise from more than one source. In those cases, each source can therefore be considered in isolation.

Taking account of the distance and potential screening between the plant and the nearest receptors as described above, noise from the plant serving the development should not exceed the following limits in order to demonstrate compliance with the criteria described above:

Table 9: Guidance on maximum plant and louvre noise emission limits

Plant	Period	Maximum cumulative plant emission level dB(A)
Boiler plantroom ventilation louvres (total)	Day (07.00 – 23.00 hours)	34 dB at 10m
	Night (23.00 – 07.00 hours)	30 dB at 10m
Condenser plantroom ventilation louvres (total)	Day (07.00 – 23.00 hours)	26 dB at 10m
	Night (23.00 – 07.00 hours)	22 dB at 10m
Boiler flue termination	Day (07.00 – 23.00 hours)	42 dB at 10m
	Night (23.00 – 07.00 hours)	38 dB at 10m
Gym ventilation louvres (total)	Day (07.00 – 23.00 hours)	30 dB at 10m
	Night (23.00 – 07.00 hours)	26 dB at 10m
Ventilation louvres serving sub-let retail unit (total)	Day (07.00 – 23.00 hours)	30 dB at 10m
	Night (23.00 – 07.00 hours)	26 dB at 10m

SOUND INSULATION BETWEEN PLANTROOMS AND BEDROOMS

Airborne noise from the plantrooms to the bedrooms above must be controlled in order to meet the statutory requirements in the current Building Regulations. In addition, it is recommended that guidance values in BS 8233:2014 are also met or exceeded.

DESCRIPTION OF PLANTROOMS

Plantrooms proposed for the development comprise:

- Cold water booster set plantroom on lower ground floor. This has separating walls to Units LG3 and LG4 and a separating floor to Units G3 and G4 on the ground floor. Access doors open onto the lower ground floor corridor, which also serves the bedrooms on this level
- Combined central heating boilers and hot water calorifiers plantroom on lower ground floor. This has a separating floor to the reception area above but no separating wall or floor to any bedroom. Access doors open onto the lower ground floor corridor, which also serves the bedrooms on this level
- Electrical plantroom on lower ground floor. This has a separating floor to the reception area above but no separating wall or floor to any bedroom. Access is through the heating plantroom
- Condenser plantroom on the 4th floor. This has a separating wall to the Unit 4.3 and a separating floor to Unit 3.4 below

BUILDING REGULATIONS APPROVED DOCUMENT E

As noted previously, the airborne sound insulation of separating walls between bedrooms and other spaces within the same building must be at least 43 dB $D_{nT,w} + C_{tr}$, with the airborne sound insulation provided by the corresponding separating floors being at least 45 dB $D_{nT,w} + C_{tr}$.

BS 8233:2014

The cold water booster plantroom, boiler plantroom and condenser plantroom may be considered to be “not private” spaces with a “high” activity noise level. The electrical plantroom may be considered a “not private” space with a “typical” activity noise level. Bedrooms would be considered as “sensitive” spaces with “typical” noise levels requiring a confidential level of privacy.

Using the matrix table in BS 8233:2014, the separating walls and floors between the cold water booster plantroom and the condenser plantroom and the adjacent bedrooms must have an airborne sound insulation of at least 47 dB $D_{nT,w}$. In practice, meeting the requirements of Approved Document E will mean the recommendations based on BS 8233:2014 will also be met.

This assessment is based on reverberant noise levels within the plantrooms not exceeding 70 dB(A), with no individual octave band sound pressure level exceeding 75 dB. In the event that reverberant sound pressure levels within a plantroom are higher, additional acoustic treatment of the separating walls/floors may be required (depending on the actual sound insulation of the proposed wall / floor).

DOORS TO PLANTROOMS

To control plantroom noise transmission into corridors also serving bedrooms it is recommended that purpose-made and type-tested acoustic doorsets are provided to the lower ground floor plantrooms and to the 4th floor condenser plantroom. The sound insulation should be at least R_w 40 dB.

VIBRATION ISOLATION

All plant and rigidly connected pipes or ducts must be fitted with suitable vibration isolators, to prevent vibration from entering the structure and re-radiating in the bedrooms. Mounts should be specified and designed to provide at least 95% isolation efficiency.

SOUND INSULATION BETWEEN COMMERCIAL SPACES AND BEDROOMS

Airborne noise from the commercial demises to the bedrooms must be controlled in order to meet the statutory requirements in the current Building Regulations. In addition, it is recommended that guidance values in BS 8233:2014 are also met or exceeded.

The potentially-noisy non-residential spaces within the development comprise:

- Café seating and co-working spaces on the lower ground floor. This area has no separating walls or floors to bedrooms.
- Gym on lower ground floor. This has a separating floor to the bathroom of Unit G1 above
- Reception area on ground floor. This has a separating floor to Unit 1.7 above
- Café on ground floor. This has a separating floor to Units 1.3 and 1.4 above
- Sub-let retail unit on ground floor. This has a separating floor to Unit 1.3 above.

BUILDING REGULATIONS APPROVED DOCUMENT E

As noted previously, the airborne sound insulation of separating walls between bedrooms and other spaces within the same building must be at least 43 dB $D_{nT,w} + C_{tr}$, with the airborne sound insulation provided by the corresponding separating floors being at least 45 dB $D_{nT,w} + C_{tr}$.

BS 8233:2014

Assuming that high music noise levels are not proposed within the sub-let flexible A1-A5/D1/D2 space, reception area, café and co-working spaces, these may be considered to be “not private” spaces with a “high” activity noise level. The gym may be considered a “not private” space with a “very high” activity noise level. Bedrooms would be considered as “sensitive” spaces with “typical” noise levels requiring a confidential level of privacy.

Using the matrix table in BS 8233:2014, the separating first floor between the café and reception area and bedrooms above must have an airborne sound insulation of at least 47 dB $D_{nT,w}$. In practice, meeting the requirements of Approved Document E will mean the recommendations based on BS 8233:2014 will also be met.

The recommended minimum airborne sound insulation performance noted above will typically result in acceptable internal levels in the bedrooms above, where the reverberant sound level in the non-residential space is no higher than the levels given in Table 10.

Table 10. Permissible reverberant sound pressure levels in commercial units (without additional acoustic treatment to ceiling)

	Reverberant sound pressure level (dB) at octave band centre frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
$L_{eq,15min\ (07:00 – 23:00)}$	75	75	75	75	75	70	70	70	75
$L_{Max,f\ (07:00 – 23:00)}$	85	85	85	85	85	80	80	80	85
$L_{eq,15min\ (23:00 – 07:00)}$	70	70	70	70	70	65	65	65	70
$L_{Max,f\ (23:00 – 07:00)}$	80	80	80	80	80	75	75	75	80

The above limits will typically permit the majority of commercial uses, including a restaurant or bar, but preclude playing loud/amplified music.

In the event that higher noise levels are likely, for example if the tenant of the sub-let retail space wishes to be able to play music at noise levels higher than the above, additional sound insulation would be required.

ACOUSTIC TREATMENT TO GYM

The separating floor between the gym and the room above should have a sound insulation of at least 57dB $D_{nT,w}$. Depending on the proposed floor construction, this is likely to mean a significant enhancement to the separating floor and to the flanking walls. Typically, this would comprise a solid mass-layer plasterboard ceiling suspended on isolated drop-rods, while the flanking walls should be lined with one layer of 15mm thick dense gypsum-based board (BG SoundBloc or similar) spaced 25mm from the structure and with 25mm mm thick mineral/glass wool quilt in the cavity.

In addition, to control impacts and subsequent noise and vibration re-radiation into bedrooms, it is recommended that all gym equipment, most especially free weights, treadmills and resistance equipment are wholly vibration isolated from all supporting structures i.e. floors and walls.

It is recommended that a localised, high performance floating floor system, complete with full perimeter vibration isolation, is proposed to the area around all free weight areas and treadmill machines etc. Advice must be sought from specialist gym equipment suppliers/installers in terms of correct and appropriate means of supporting specialist gym/resistance machines to the proposed floating floor system, prior to any finalisation and procurement.

SUMMARY OF RECOMMENDED SOUND INSULATION PERFORMANCE

A summary of the recommended airborne sound insulation noted above is given in Table 11. In each case both the criteria must be met.

Table 11. Summary of recommended sound insulation between non-residential spaces and bedrooms

Source Room	Receiving Room	Separating Construction	Minimum Airborne Sound Insulation (Approved Document E)	Recommended minimum sound insulation (BS 8233:2014)
Reception Area	Unit 1.7	Floor	45 $D_{nT,w} + C_{tr}$	47 $D_{nT,w}$
Café (ground floor)	Units 1.3, 1.4	Floor	45 $D_{nT,w} + C_{tr}$	47 $D_{nT,w}$
Gym	Unit G1	Floor	45 $D_{nT,w} + C_{tr}$	57* $D_{nT,w}$
Sub-let retail unit	Unit 1.3	Floor	45 $D_{nT,w} + C_{tr}$	47* $D_{nT,w}$

**Subject to limiting internal sound levels and design comments above*

CONCLUSION

An environmental sound survey has been undertaken to inform plant selections and attenuation designs.

Additional comments and advice have been provided relating to the transfer of noise from plant rooms and commercial spaces to adjacent bedrooms.

PLANT NOISE LIMITS

Plant noise limits have been given in Table 9 to enable initial design work to commence. The limits are based on meeting London Borough of Camden's usual requirements for noise from new services plant.

SOUND INSULATION BETWEEN PLANTROOMS AND BEDROOMS

Recommendations are given for the minimum sound insulation that should be provided between the plantrooms and adjacent bedrooms to meet the requirements of Building Regulations Approved Document E and the recommendations in BS 8233:2014. Initial guidance has been provided for the control of plant vibration into the building structure.

SOUND INSULATION BETWEEN COMMERCIAL SPACES AND BEDROOMS

Recommendations are given for the minimum sound insulation that should be provided between the commercial units and adjacent bedrooms above to meet the requirements of Building Regulations Approved Document E and the recommendations in BS 8233:2014. Recommended limits have been given for noise within the commercial units that would provide reasonable noise levels in the bedrooms. Initial design guidance has been given with regard to the control of noise and vibration from the gym.

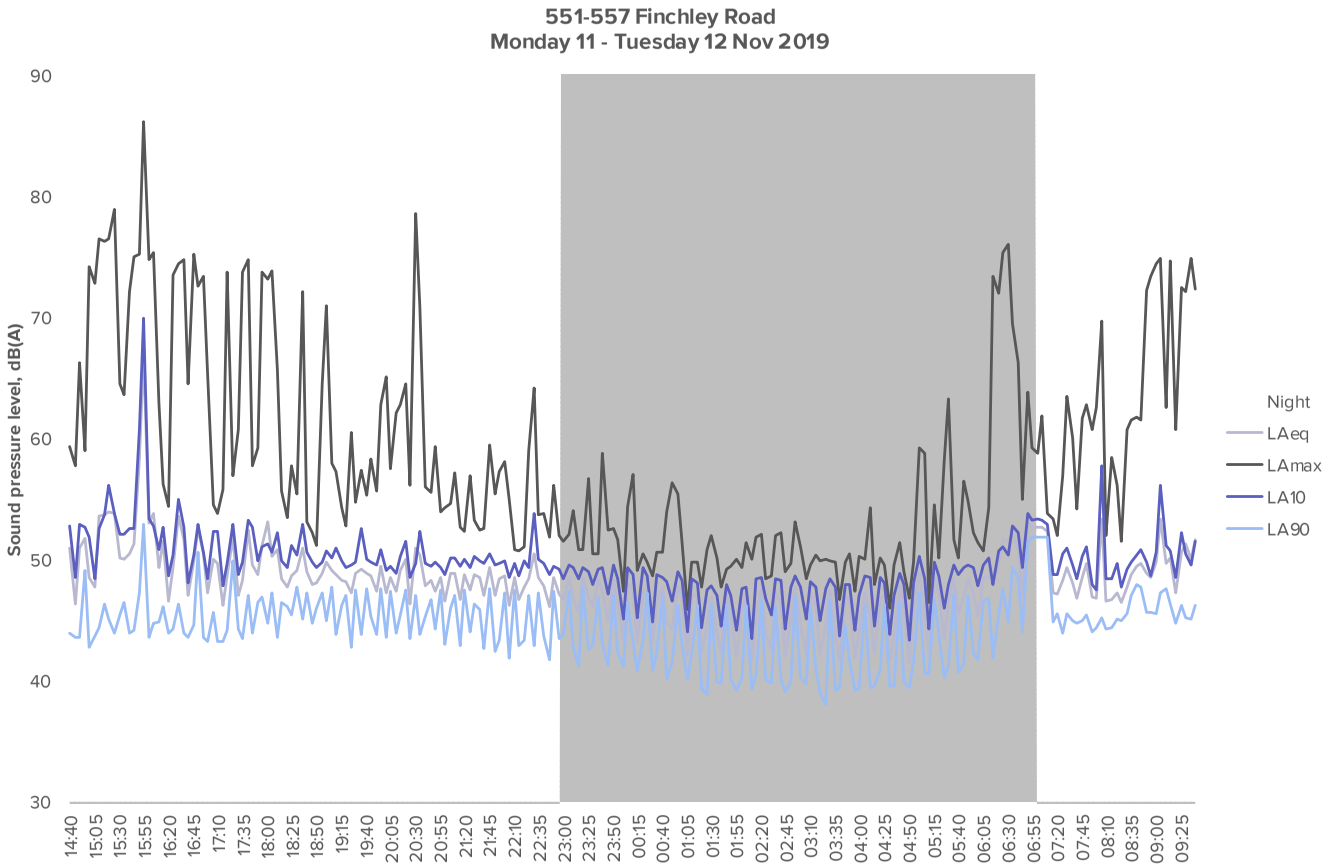
APPENDIX A

Table 12. Acoustic Terminology

Parameter	Description
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near ($L_{Aeq,T}$).
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log10 (s1/s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20µPa. The threshold of normal hearing is in the region of 0 dB and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions.
dB(A), LAx	Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).
Fast Time Weighting	Setting on sound level meter, denoted by a subscript F, that determines the speed at which the instrument responds to changes in the amplitude of any measured signal. The fast time weighting can lead to higher values than the slow time weighting when rapidly changing signals are measured. The average time constant for the fast response setting is 0.125 (1/8) seconds.
Free-field	Sound pressure level measured outside, far away from reflecting surfaces (except the ground), usually taken to mean at least 3.5 metres
Façade	Sound pressure level measured at a distance of 1 metre in front of a large sound reflecting object such as a building façade.
$L_{Aeq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level recorded during a noise event with a period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise. $L_{A10,18h}$ is the A –weighted arithmetic average of the 18 hourly $L_{A10,1h}$ values from 06:00-24:00.
$L_{90,T}$	A noise level index. The noise level that is exceeded for 90% of the measurement time interval, T. It gives an indication of the lower levels of fluctuating noise. It is often used to describe the background noise level and can be considered to be the "average minimum" noise level and is a term used to describe the level to which non-specific noise falls during quiet spells, when there is lull in passing traffic for example.

APPENDIX B

Results of environmental noise measurements at Position 1.



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