Hawkins environmental

Noise Impact Assessment: 112a Great Russell Street, London

GRS Limited

2nd June 2015

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1. INTRODUCTION

Hawkins Environmental Limited has been commissioned by GRS Limited to carry out a noise assessment in respect of the proposed redevelopment of basement levels -4 and -5 of 112a Great Russell Street, situated in the London Borough of Camden. **Appendix 1** shows a location plan of the proposed development site.

The site is currently a 'Quick Parking' car park; however it is proposed to convert the two basement floors into hotel accommodation. During the planning process, concern has been raised as to whether noise from the proposed mechanical plant will have an impact on surrounding residential properties. In addition, concern has been raised by the London Borough of Camden that there could be a *"potential adverse impact on neighbour's in terms of noise and general disturbance as a consequence of the hotel operation. In particular we have concerns about the increased level of activity on this quiet street frontage for example people congregating or smoking".*

Consequently, this report summarises background noise levels in the vicinity of the development site, the likely noise output of the proposed plant and assesses the impact of the plant and noise from the operation of the hotel on surrounding sensitive premises.

2. NOISE CRITERIA

2.1. The Nature, Measurement and Effect of Noise

Noise is often defined as sound that is undesired by the recipient. Whilst it is impossible to measure nuisance caused by noise directly, it is possible to measure the loudness of that noise. 'Loudness' is related to both sound pressure and frequency, both of which can be measured. The human ear is sensitive to a wide range of sound levels. The sound pressure level of the threshold of pain is over a million times that of the quietest audible sound. In order to reduce the relative magnitudes of the numbers involved, a logarithmic scale of decibels (dB) is normally used, based on a reference level of the lowest audible sound.

The response of the human ear is not constant over all frequencies. It is therefore usual to weight the measured frequencies to approximate the human response. The resulting 'A' weighted decibel, dB(A), has been shown to correlate closely to the subjective human response.

When related to changes in noise, a change of ten decibels from say 60 dB(A) to 70 dB(A) would represent a doubling in 'loudness'. Similarly, a decrease in noise from 70 dB(A) to 60 dB(A) would represent a halving in 'loudness'. A change of 3 dB(A) is generally considered to be just perceptible[1]. **Table 2.1** details typical noise levels. A glossary of acoustic terms can be found in **Appendix 3**.

Table 2.1: Typical Noise Levels

Approximate Noise Level (dB(A))	Example
0	Limit of hearing
30	Rural area at night
40	Library
50	Quiet office
60	Normal conversation at 1 m
70	In car noise without radio
80	Household vacuum cleaner at 1 m
100	Pneumatic drill at 1 m
120	Threshold of pain

2.2. The National Planning Policy Framework

In March 2012, the National Planning Policy Framework (NPPF) was published to replace the thousands of pages of national planning policy guidance, including guidance on noise. The intention was to let councils decide

[1] Communities & Local Government (1994). Planning Policy Guidance 24: Planning & Noise.

their own priorities though their Local Plans and reduce the amount of "red tape" to enable growth and development. Amongst many other documents, the NPPF replaces the 1994 document *Planning Policy Guidance Note 24 (PPG 24) 'Planning and Noise'* published by the then Department of Environment, which is now officially withdrawn as official government guidance.

The NPPF includes 12 core planning principles which include:

- Always seek to secure high quality design and a good standard of amenity for all existing and future occupants of buildings;
- Take account of the different roles and character of different areas, promoting the vitality of the main urban areas, protecting the Green Belts around them, recognising the intrinsic beauty of the countryside;
- Contribute to conserving and enhancing the natural environmental and reducing pollution; and
- Take account of and support local strategies to improve health, social and cultural wellbeing for all.

It also states that the planning system "*should contribute to enhance the natural environment, by... preventing both new and existing development from contributing to or being put at risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution…To prevent unacceptable risks from pollution, planning policies and decisions should ensure that new development is appropriate for its location*".

Section 123 of the NPPF talks specifically about noise stating that *"Planning policies and decisions should aim to:*

- *Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;*
- *Mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;*
- *Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established; and*
- *Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason."*

The purpose of the NPPF is for Local Planning Authorities to determine for themselves whether a "*new development is appropriate for its location"* or how to determine what constitutes "*a good standard of amenity for all…future occupants of buildings"*.

2.3. Noise Policy Statement for England

The Noise Policy Statement for England(NPSE)[2] provides further guidance on the interpretation of Section 123 of the NPPF and states that:

"Within the context of sustainable development:

[2] The Noise Policy Statement for England, March 2010, Defra.

- *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."*

NPSE introduces established concepts originally from the field of toxicology that are now being applied to noise impacts. They are:

- **NOEL – No Observed Effect Level** - This is the level of noise below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.
- **LOAEL – Lowest Observed Adverse Effect Level** - This is the level of noise 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.

NPSE goes on to state that *"it is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available."*

2.4. National Planning Practice Guidance on Noise

The NPPG provides more guidance on the assessment of noise for planning purposes and builds on the concepts of NOEL, LOAEL etc introduced in NPSE to establish whether noise is a factor that needs to be taken into account. It states:

"Local planning authorities' plan-making and decision taking should take account of the acoustic environment and in doing so consider:

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

In line with the Explanatory Note of the Noise Policy Statement for England, this would include identifying whether the overall effect of the noise exposure (including the impact during the construction phase wherever applicable) is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation."

However it goes into more detail about the subjective nature of noise and how the results of any assessment must be treated flexible and pragmatically. The guidance states:

"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. These factors include:

- *the source and absolute level of the noise together with the time of day it occurs. Some types and level of noise will cause a greater adverse effect at night than if they occurred during the day – this is because people tend to be more sensitive to noise at night as they are trying to sleep. The adverse effect can also be greater simply because there is less background noise at night;*
- *for non-continuous sources of noise, the number of noise events, and the frequency and pattern of occurrence of the noise;*
- *the spectral content of the noise (ie whether or not the noise contains particular high or low frequency content) and the general character of the noise (ie whether or not the noise contains particular tonal characteristics or other particular features). The local topology and topography should also be taken into account along with the existing and, where appropriate, the planned character of the area.*

More specific factors to consider when relevant:

- *where applicable, the cumulative impacts of more than one source should be taken into account along with the extent to which the source of noise is intermittent and of limited duration;*
- *consideration should also be given to whether 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. 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.*
- *In cases where existing noise sensitive locations already experience high noise levels, a development that is expected to cause even a small increase in the overall noise level may result in a significant adverse effect occurring even though little to no change in behaviour would be likely to occur.*
- *Where relevant, Noise Action Plans, and, in particular the Important Areas identified through the process associated with the Environmental Noise Directive and corresponding regulations should be taken into account. Defra's website has information on Noise Action Plans and Important Areas. Local authority environmental health departments will also be able to provide information about Important Areas.*
- *The effect of noise on wildlife. Noise can adversely affect wildlife and ecosystems. Further information may be found on Defra's website. Particular consideration should be given to noisy development affecting designated sites.*
- *If external amenity spaces are an intrinsic part of the overall design, the acoustic environment of those spaces should be considered so that they can be enjoyed as intended.*
- *The potential effect on an existing business of a new residential development being located close to it should be carefully considered as the existing noise levels from the business may be regarded as unacceptable by the new residents and subject to enforcement action. In the case of an established business, the policy set out in the third bullet of paragraph 123 of the Framework should be followed.*
- *Some commercial developments including fast food restaurants, night clubs and public houses can have particular impacts, not least because activities are often at their peak in the evening and late at night. Local planning authorities will wish to bear in mind not only the noise that is generated within the premises but also the noise that may be made by customers in the vicinity."*

2.5. BS 4242: 2014 *'Methods for rating and assessing industrial and commercial sound'*

British Standard BS 4142: 2014 'Methods for rating and assessing industrial and commercial sound'' provides a method for the measurement and rating of industrial noise or noise of an industrial nature and background noise levels outside dwellings in mixed residential and industrial areas. The rating level (defined in the BS) is used to rate the industrial noise source outside residential dwellings (this is defined as the "specific noise source").

The procedure defined in BS 4142 for predicting the likelihood of complaints is based on establishing the difference between the rating level and the background level outside the residential property of interest. The greater the difference the greater the likelihood of complaints and more specifically:

- *"A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context;*
- *A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context;*
- *The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.*
- *Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact."*

2.6. BS 8233: 2014 *'Guidance on sound insulation and noise reduction for buildings'*

Originally published in 1999, the 2014 edition of BS 8233 significantly updates the guidance in light of the policy changes as a result of the advent of the NPPF and the withdrawal of PPG 24. The 2014 edition of BS 8233 sees a change in the title of the Standard, moving from a *'Code of Practice'* to *'Guidance'*, as the text *'largely comprises guidance that does not support claims of compliance'*.

BS 8233:2014 indicates that to control external noise ingress into a proposed development, a number of planning stages should occur as follows:

"a) Assess the site, identify significant existing and potential noise sources, measure or estimate noise levels, and evaluate layout options.

b) Determine design noise levels for spaces in and around the building(s).

c) Determine sound insulation of the building envelope, including the ventilation strategy".

BS 8233:2014 suggests design noise levels for various types of building. The recommended noise levels for dwelling houses, flats and rooms in residential use (when unoccupied) can be seen in **Table 2.4** below. This is replicated from Table 4 of Section 7.7.2 of BS 8233:2014. The guidance 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 noise levels in **Table 2.4** are marginally different to those published in BS 8233:1999 *'Sound insulation and*

noise reduction for buildings –Code of practice', but are based on the existing guidance from the current World Health Organisation (WHO) *"Guidelines on Community Noise".*

Table 2.2: Summary of Noise Criteria: BS8233:2014

Activity	Location	07:00 to 23:00	23:00 to 0700
Resting	Living room	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 $L_{Aeq.8hour}$

When considering the noise level criteria considered in **Table 2.4**, the following points should be noted:

1. BS 8233: 2014 suggests that the above criteria should be adopted flexibly and that *"where development is considered necessary or desirable... the internal target level may be relaxed by up to 5 dB and reasonable internal conditions still achieved".*
2. The noise levels quoted above are annual averages and *"do not need to be achieved in all circumstances"* e.g. New Years Eve or fireworks night.
3. The noise levels in **Table 2.4** are "*for steady external noise sources"* such as traffic noise or plant noise. This is a departure from the 1999 version of BS 8233, where the recommended internal noise levels were irrespective of the external noise source and therefore included the suggestion that in order to achieve *"reasonable"* noise levels within bedrooms at night, L_{AFmax} noise levels should not exceed 45 dB. Whilst this has been omitted from the 2014 version of BS 8233, it does state that "*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."* Therefore, at sites which may be affected by individual noise events, it is more appropriate to use the guidance contained within the WHO *"Guidelines on Community Noise"* which suggest that good sleep will not generally be affected if internal levels of L_{AFmax} 45 dB are not exceeded more than 10-15 times per night.
4. BS 8233:2014 notes that if the design of the building is *"relying on closed windows to meet the guide values, there needs to be appropriate alternative ventilation that does not compromise the facade insulation or resulting noise level".*
5. BS 8233 provides guidance for noise in gardens and outdoor amenity space. It suggests that *"it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments."* The guidance does go on to say that these guideline values are not achievable in all circumstances and in some 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."

2.7. The London Plan

The London Plan July 2011 with 2013 Alterations[3], provides an overall strategic plan for London, and it sets out a fully integrated economic, environmental, transport and social framework for the development of the capital to 2031. The Plan brings together the Mayor's strategies, including policy on a range on environmental issues, such as climate change, air quality, noise and waste. London boroughs' local plans need to be in general conformity with the London Plan, and its policies guide decisions on planning applications by councils and the Mayor.

Policy 7.15 specifically relates to noise and states:

"Development proposals should seek to reduce noise by:

a) *minimise the existing and potential; adverse impacts of noise on, from, within, or in the vicinity of, development proposals;*

b) *separating new noise sensitive development from major noise sources wherever practicable through the use of distance, screening, or internal layout in preference to sole reliance on sound insulation;*

c) *promoting new technologies and improving practices to reduce noise at source."*

2.8. London Plan – Housing Supplementary Planning Guidance

The Housing SPG, published in November 2012 highlights the elements of the London Plan that are relevant to housing development, and where applicable, provides more detail. The SPG states:

"Noise - Baseline

Standard 5.3.1 (and Policy 7.15) – The layout of adjacent dwellings and the location of lifts and circulation spaces should seek to limit the transmission of noise to sound sensitive rooms within dwellings.

Policy 7.15 Reducing Noise and Enhancing Soundscapes requires development proposals to seek to reduce noise and manage the effects of noise. It is another important aspect of retreat and privacy in a dwelling. Noise from the street and adjoining properties can cause stress, sleep disturbance and friction between neighbours as recognised in the NPPF154.

2.3.35 All dwellings should be built with acoustic insulation and tested to current Building Regulations standards155. However, acoustic insulation should not be relied upon as the only means of limiting noise and the layout and placement of rooms within the building should be considered at an early stage in the design process to limit the impact of external noise on bedrooms and living rooms. The impact of noise should also be considered in the placement of private external spaces."

[3] The London Plan - Spatial Development Strategy for Greater London (July 2011), Mayor of London.

2.9. Local Policy

The London Borough of Camden's Development Policies 2010-2025 document states in Policy DP28 Noise and Vibration that *"The Council will seek to ensure that noise and vibration is controlled and managed and will not grant planning permission for: a) development likely to generate noise pollution;...The Council will only grant permission for plant or machinery if it can be operated without cause harm to amenity and does not exceed our noise thresholds."*

The policy document goes on to describe noise thresholds at which noise levels will be acceptable:

"Table E: Noise levels from plant and machinery at which planning permission will not be granted:

Noise description and location of measurement	***Period***	***Time***	***Noise level***
Noise at 1 metre external to a sensitive façade	*Day, evening and night*	*0000-2400*	*5dB(A) <L_{A90}*
Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1 metre external to a sensitive façade.	*Day, evening and night*	*0000-2400*	*10dB(A) <L_{A90}*
Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive façade.	*Day, evening and night*	*0000-2400*	*10dB(A) <L_{A90}*
Noise at 1 metre external to sensitive façade where L_{A90}>60dB	*Day, evening and night*	*0000-2400*	*55dBL_{Aeq}"*

3. NOISE MEASUREMENT STUDY

In order to determine the extent to which closest noise sensitive premises will be affected by noise from the proposed plant, it is important to determine the existing noise climate of the site. Therefore, a detailed noise measurement study has been carried out.

All noise monitoring was conducted using a Norsonic 140 sound level meter, which conforms to BS EN IEC 61672 as a Class 1 precision measurement system. A Norsonic 1251 field calibrator was used before and after the measurement periods in order to ensure that the equipment had remained within reasonable calibration limits (+/- 0.5 dB). All of the equipment used has current certificates of calibration. **Appendix 3** summarises the equipment used including serial numbers and calibration data.

All noise monitoring has been conducted in accordance with the guidance set out in BS 7445-2: 1991 *'Description and measurement of environmental noise Part 2: Guide to the acquisition of data pertinent to land use*'. This standard details information that should be recorded in addition to the actual measured levels such as meteorological data, and a description of the noise source itself. The following statistical parameters were recorded during the survey: L_{Aeq}, L_{Amax}, L_{A10}, L_{A50}, L_{A90}.

Noise measurements where conducted on a small area of flat roof facing Adeline Place to characterise noise levels in Adeline Place, where the plant is to be located. The Adeline Place noise survey was conducted on Thursday 15th and Friday 16th March 2012. The noise monitoring was conducted by Nick Hawkins of Hawkins Environmental Limited. Nick is a Member of the Institute of Acoustics and holds the Institute of Acoustic's Certificate of Competence in Environmental Noise Measurement.

Weather conditions were conducive to successful monitoring. **Table 3.1** summarises the weather conditions during the measurement period.

Table 3.1: Summary of Weather Conditions during the Noise Measurements

General Description	Warm and sunny on the 15th, cloudy and cool on the 16th.
Windspeed	Light winds were experienced, with average speeds around 0.5 m/s, with gusts of up to 1 m/s.
Temperature	The temperature was around 17°C during the day on the 15th, dropping to around 7°C overnight. On the 16th it was cooler with daytime temperatures of around 12°C.
Precipitation	The measurement period remained dry.

Noise measurements were carried out at the locations identified in **Appendix 1**. The equipment was located in a façade position and was directly above the exit ramp of the current 'Quick Parking' car park. The measurement location is considered to be representative of the ambient and background noise levels experienced by the closest affected properties on Adeline Place.

Noise levels in the vicinity of the site are characterised mainly by road traffic noise from surrounding roads in the vicinity of the site. During the daytime, it was also observed that noise from distant construction work was also occasionally audible.

For the Adeline Place measurement location, the noise measurement data is summarised in **Table 3.2** and **Figure 3.1** below, and detailed in **Appendix 4**.

Table 3.2: Summary of Background Noise Measurements – Adeline Place

Period	Time	L_{Aeq}	L_{Amax}	L_{A10}	L_{A50}	L_{A90}
Day	07:00-19:00	61.6	95.6	63.2	59.0	57.2
Evening	19:00-23:00	59.1	81.1	61.2	57.0	55.6
Night	23:00-07:00	57.3	85.3	58.2	53.8	52.2

The background noise levels have been calculated in accordance with BS 4142:2014, which represents the most up-to-date guidance on the subject. Prior to the publication of the 2014 version of BS 4142, acousticians would use the lowest measured background noise levels; however, BS 4142: 2104 provides substantially more guidance on the determination of background noise levels. Section 8.1 of BS 4142: 2014 states that "*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. Among other considerations, diurnal patterns can have a major influence on background sound levels and, for example, the middle of the night can be distinctly different (and potentially of lesser importance) compared to the start or end of the night-time period for sleep purposes*". The guidance goes on to say that *"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"*.

In order to determine the background noise levels for the day and night time periods, the background noise levels have been analysed over the appropriate time periods, 15 minutes for night time (11pm to 7am) and 1 hour for day time (7am to 7pm) and evening (7pm to 11pm). **Figure 3.2** and **Figure 3.3** detail the distribution of the background noise levels as described in BS 4142: 2014 for the daytime and night time periods.

It can be seen from **Figure 3.2** that all of the daytime $L_{A90.1hour}$ noise levels are in the region of 56 to 58 dB(A), with most at 57 dB(A); therefore it is considered that 57 L_{A90} is the daytime background noise level. **Figure 3.3** shows that during the night, a large proportion of the $L_{A90.15mins}$ noise levels are 51/52 dB(A)); therefore it is considered that 51 L_{A90} is the night time background noise level. Analysis of the evening noise levels indicate that 56 dB(A) is a representative evening background noise level.

Figure 3.1: Summary of Noise Measurements at Adeline Place

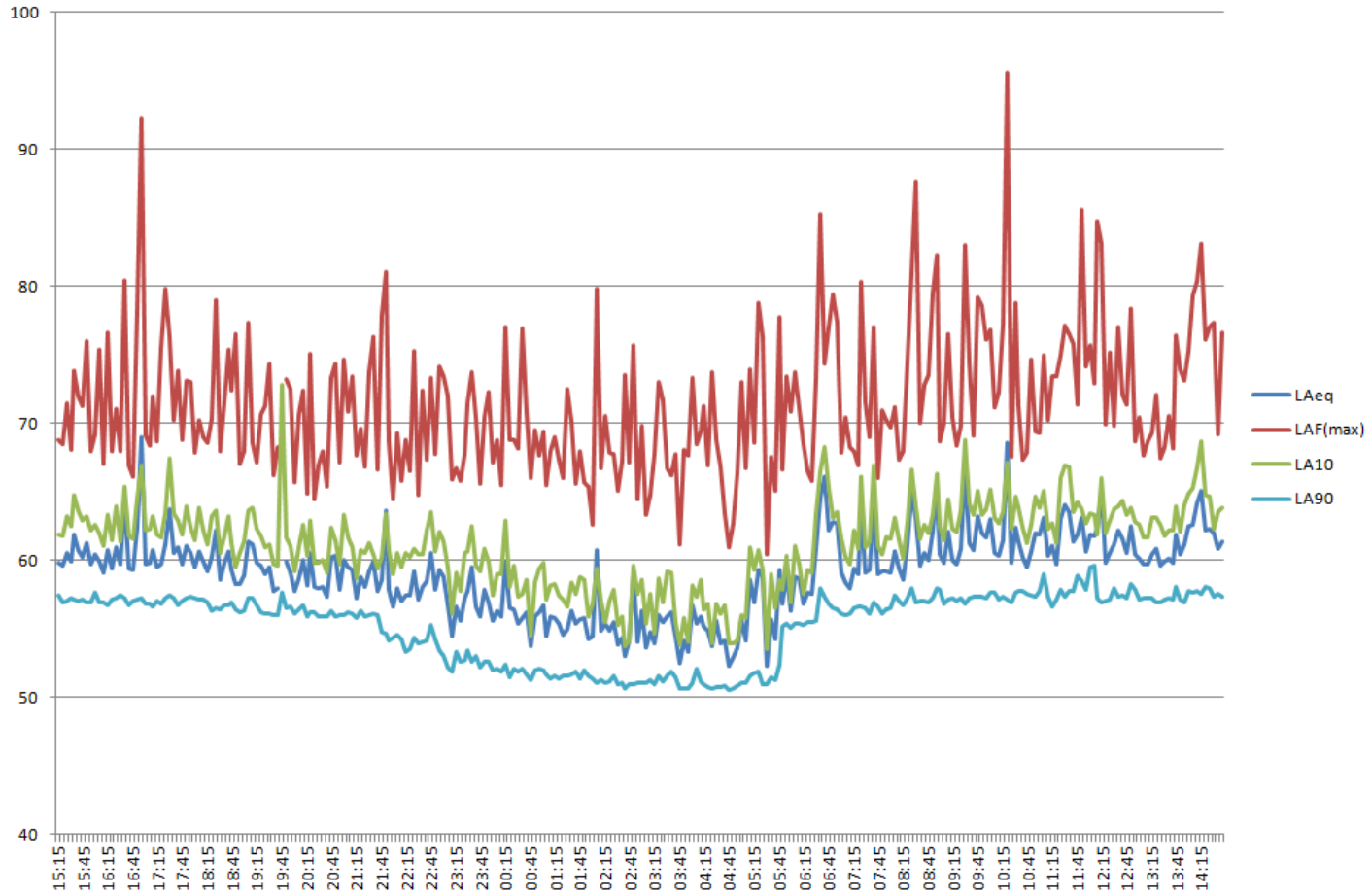


Figure 3.2: Distribution of Daytime $L_{A90.1hour}$ Noise Levels

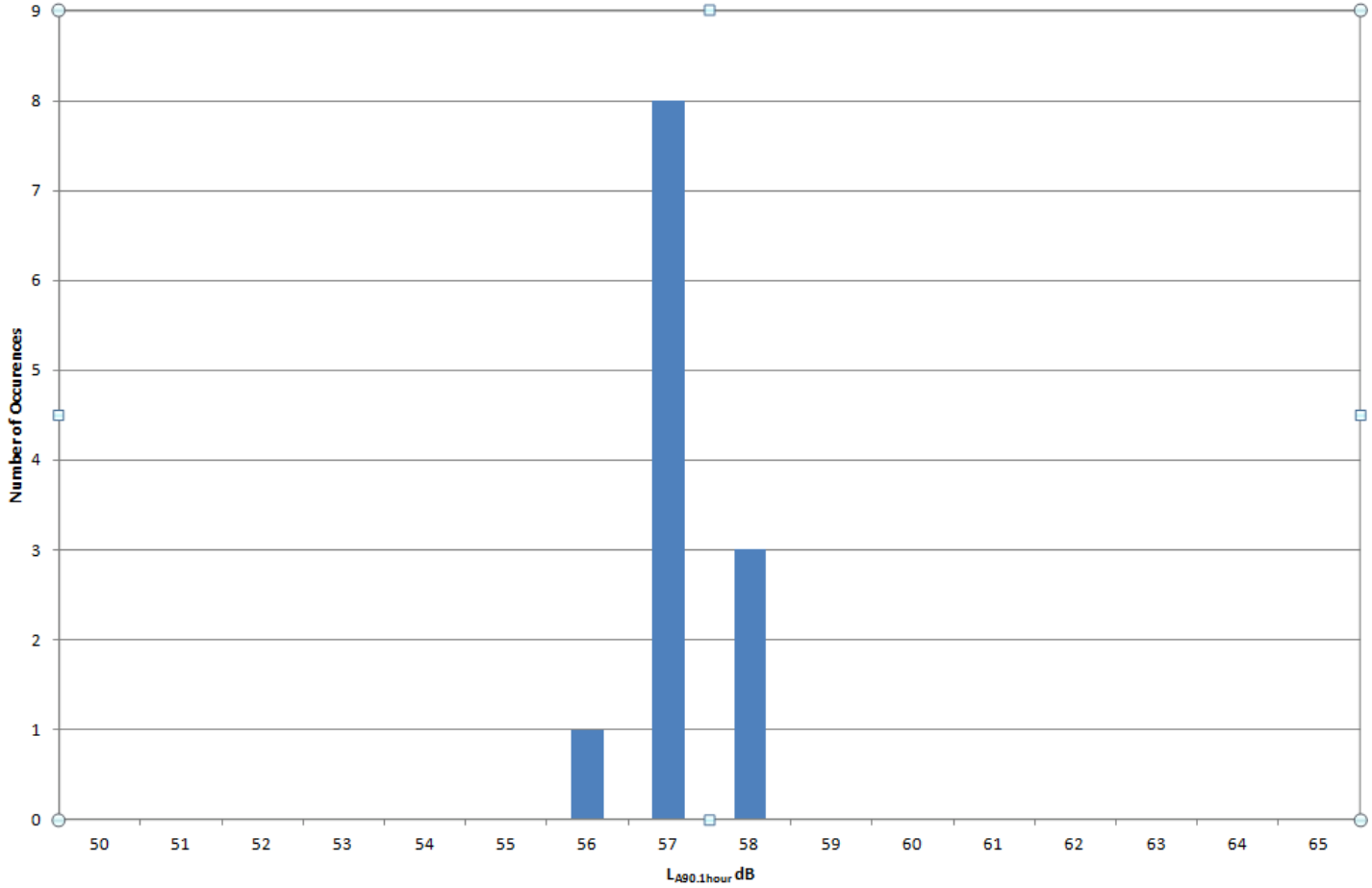
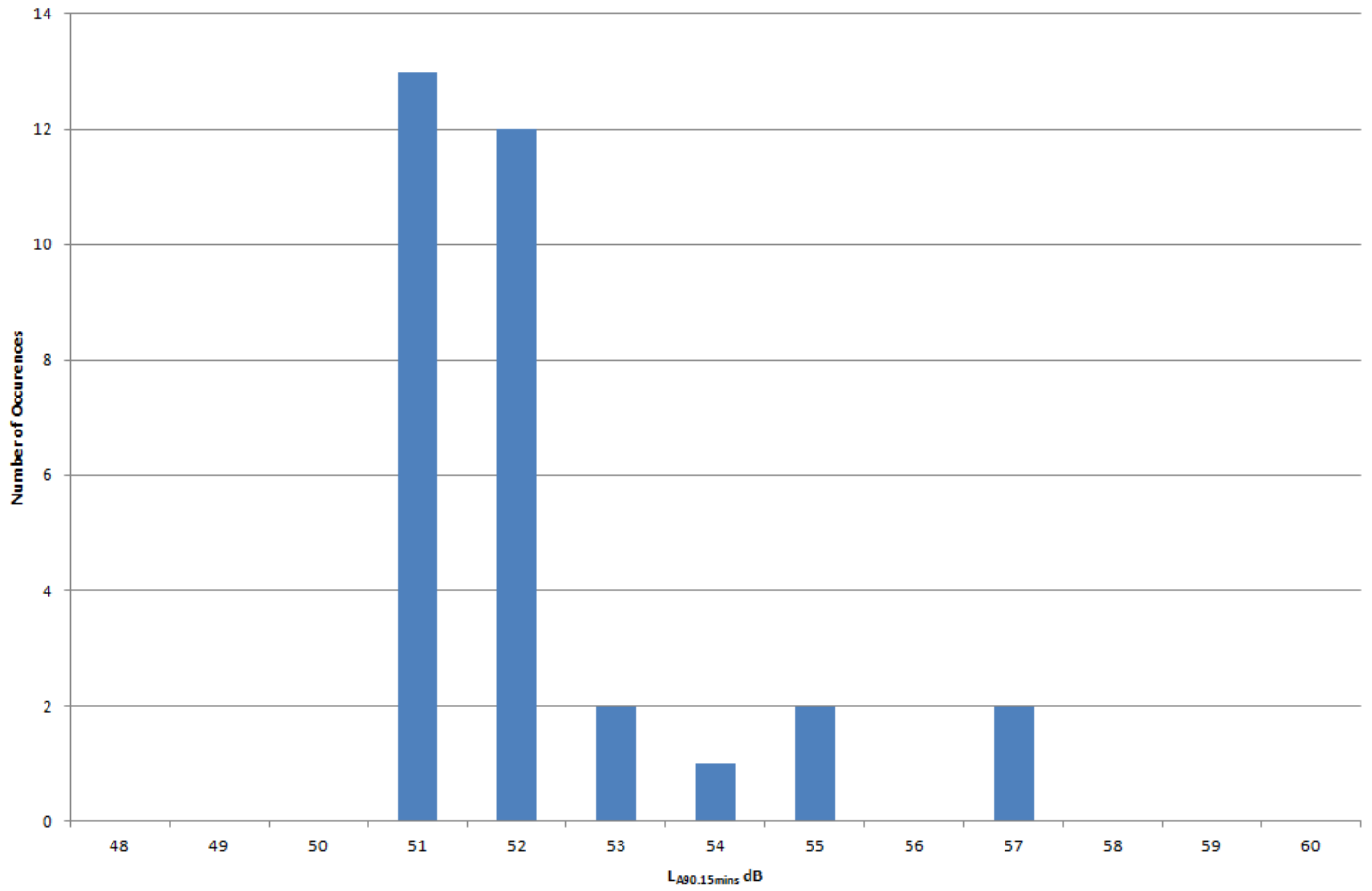


Figure 3.3: Distribution of Night Time $L_{A90.15mins}$ Noise Levels



4. PLANT NOISE IMPACT ASSESSMENT

It is understood from Hoare Lea, the M&E consultants for the project, that the only plant that is to be installed that would be audible outside of the cartilage of the proposed development would be the installation of a number of air source heat pumps which would be situated behind a louvre at ground floor level facing onto Adeline Place, in the location of the existing vehicle access ramp. However, at this stage in the development of the project, Hoare Lea has not specified the exact number or model of the units; therefore it is not possible to conduct a detailed assessment of noise from the units. Since the air source heat pumps will be located behind a louvre, it will be possible to attenuate noise from the pumps in order that noise at the closest sensitive receptors will be below the maximum noise levels specified by the London Borough of Camden.

Under the London Borough of Camden's noise policy, noise levels from the plant should not be louder than 10 dB below background noise levels, if the noise has a distinguishable discrete continuous note (whine, hiss, screech, hum) or if the noise has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive façade, otherwise noise levels from the plant should not be louder than 5 dB below background noise levels. Following discussions with the London Borough of Camden, they have confirmed that for the purposes of the assessment, the plant should not be louder than 5 dB below background noise levels.

The previous section of the report has identified that for the purpose of the assessment, background noise levels should be considered to be 57 dB(A), 56 dB(A) and 51 dB(A) for the day, evening and night time respectively. Based on the assumption that the plant could all operate 24 hours a day, the night time 51 dB(A) background noise level would be considered to be the limiting factor and therefore to achieve no more than 5 dB(A) below background noise levels, the plant must be designed such that noise from the plant should not be greater than 46 dB(A) at the closest sensitive receptor location.

The closest sensitive receptors are located at 12-14 Adeline Place and on the first floor of the St Giles Hotel. 12-14 Adeline Place is situated opposite the plant room at a distance of 17m from the louvres, with St Giles Hotel situated above the louvres at a distance of 11m. Using the methodology contained within ISO 9613: 1996: *Acoustics – Attenuation of sound during propagation outdoors - Part 2: General method of calculation* and taking into account (where appropriate) the affects of building reflections on facade locations, it has been possible to determine the maximum noise levels at a distance of 1m from the louvres, whereby noise will remain within acceptable limits. **Table 4.1** summarises these calculations.

Table 4.1: Noise Levels Calculations

Receptor	St Giles Hotel	12-14 Adeline Place
Background Noise Level	51 dB(A)	51 dB(A)
Target Noise Level (at 1m from the receptor)	46 dB(A)	46 dB(A)
Distance between 1m from louvre and 1m from receptor	11m	15m
Distance Attenuation	21 dB(A)	24 dB(A)
Noise Level at 1m from louvres	67 dB(A)	70 dB(A)
Resultant Receiver Noise Level	46 dB(A)	46 dB(A)

Maximum Noise Level at 1m from louvres	**67 dB(A)**

Table 4.1 therefore shows that in order to achieve noise levels at the closest sensitive receptors in line with the London Borough of Camden's noise policy DP28, noise from the air source heat pumps should not exceed 67 dB(A) at 1m from the louvres. Therefore, the attenuation of the louvres must be designed such that noise breakout should be limited to 67 dB(A). Given that standard acoustic louvres can easily attenuate by 10-15 dB(A) or more, noise levels within the plant room could easily be 80 dB(A) or more and still be within Camden's noise limits at the closest sensitive receptors.

5. HOTEL NOISE IMPACT ASSESSMENT

Concern has been raised by the London Borough of Camden that there could be a *"potential adverse impact on neighbour's in terms of noise and general disturbance as a consequence of the hotel operation. In particular we have concerns about the increased level of activity on this quiet street frontage for example people congregating or smoking".*

The main entrance to the hotel will be situated on Great Russell Street, the street perpendicular to where the plant will be situated. Great Russell Street is itself perpendicular to Tottenham Court Road, which is a very busy thoroughfare, both day and night. The entrance to the hotel will be situated approximately 30m from Tottenham Court Road and it is anticipated that ambient noise levels in the vicinity of the hotel entrance will be significantly higher than those measured on Adeline Street, where L_{Aeq} values of 61.6 dB, 59.1 dB and 57.3 dB were measured for the day, evening and night time periods respectively. Although noise levels are likely to be higher on Great Russell Street than those measured on Adeline Street, if we assume these noise levels are representative of Great Russell Street, this would place the site on the boundary of Noise Exposure Category B and C according to Planning and Policy Guidance Note 24: Planning and Noise (PPG24). Any property that could be considered to be in Noise Exposure Category C would not normally be considered to have a "*quiet street frontage"*.

Whilst it is acknowledged that in some circumstances, particularly associated with licensed premises and inebriated clientele, the necessity to smoke outside as a consequence of the smoking ban in England has resulted in some noise complaints; however, whilst this is a fairly large hotel, there is no restaurant or bar associated with the development and therefore it is likely that smokers loitering around the entrance of the hotel will be individual guests smoking quietly and fairly quickly, rather than large groups of smokers chatting and drinking, which lend to loiter for long periods and are the cause of most smoking related noise complaints.

Given the likely noise levels that would be experienced on Great Russell Street, even at night time, even a dozen people standing outside the hotel entrance smoking is unlikely to generate levels of noise over and above what is normally experienced in the vicinity of the area.

To reduce the likelihood of complaints it may be possible to introduce ways to manage noise from smokers and other clients, specifically through the implementation of the Hotel Management Plan. For example, the hotel managers could put up signs asking clients to be respectful of their neighbours and leave the building quietly. Also, hotel reception staff could play a significant role in reducing noise levels – for example they could be instructed to break up large groups of people congregating outside the hotel (for example when waiting for taxis), or maybe ask them to wait in the reception (as they tend to do in the adjacent St Giles Hotel). Also, reception staff could be instructed to speak to smokers or others making excessive or unreasonable amounts of noise and ask them to be quiet or leave.

It should be noted that the St Giles Hotel, which is situated above the proposed development, has an entrance on Bedford Avenue at a similar distance to Tottenham Court Road to the proposed development, does not appear to have issue with either smokers or other groups congregating outside. Observations in the vicinity of the entrance to St Giles Hotel shows that the numbers of smokers outside are minimal and those waiting for coaches or taxis normally congregate inside the hotel.

6. NOISE FROM YMCA

The London Borough of Camden have expressed concern over the impact of noise from the YMCA sports centre on the floors immediately above the proposed hotel at floors -3 and above. However, regarding the potential impact of noise from floor -3 above the proposed development, a significant proportion of the floor -3 is taken up by uses that are unlikely to generate noise levels in excess of typical domestic noise levels. For example, the majority of the floor area is taken up by changing rooms, offices, tanning rooms, massage rooms and storage areas. Also situated on floor -3 is a squash court, fitness suite, weights room and the main sports hall; however it is acknowledged that these room uses, may generate levels of both airborne and impact noise in excess of typical domestic noise levels; however these rooms occupy the minority of the party floor space.

We know that the party floor will at minimum adhere to Approved Document E of the Building Regulations and therefore offer protection from typical domestic activities to the patrons of the hotel below. Furthermore, it is understood that the party floor is of thick concrete construction and has ensured that noise transmission from the car park of floor -4 to floor -3 was kept to a minimum; therefore it is anticipated that if the floor were to be tested in accordance with ISO 717-1 and ISO 140-4 for airborne sound insulation, it would be expected to pass the minimum requirements of Approved Document E of the Building Regulations, potentially by a large margin. Indeed, it is suggested that the thickness and mass of the floor may also offer significant protection from impact (footfall) noise from the rooms above. Therefore, we can say with reasonable confidence that for large areas of the party floor, noise transmission, particularly airborne noise, should not be an issue. For the remainder, i.e. the floor between the squash court, sports hall etc. and the proposed hotel below, whether or not noise transmission will be a problem will depend upon the level of noise generated in these rooms and the existing performance of the party floor – either way sound insulation could be improved such that noise would not be an issue. In a conversion such as this, it would be common for sound insulation testing of the party floor to be conducted prior to construction to confirm that remedial measures are likely to have the desired effect in order to adhere to the Building Regulations. Therefore it is proposed that at this stage prior to construction, noise transmission from the squash court, sports hall etc. is assessed and remedial measures implemented as appropriate.

7. NOISE IMPACT OF CROSSRAIL

Concerns have been raised by the London Borough of Camden regarding the potential impact of noise from the Crossrail project. In order to assessment the potential impact of Crossrail, we can only review what has been from the *"Assessment of Noise and Vibration Impacts - Technical Report - Volume 4 of 8 Central Section - Final Report"* prepared by RPS on behalf of Crossrail. The report investigates in detail the impacts of Crossrail on the surrounding environment. The report suggests that at the closest point of the proposed development to Crossrail, groundborne noise and vibration from operational impacts would be at *"worst case with standard trackform and piled buildings... 40 dB $L_{Amax,S}$ 0.2 $mms^{-1.75}$ VDV"*. The assessment criteria for the impact of vibration on humans is based upon the Vibration Dose Value (VDV) and is taken from BS 6472-1:2008 *Guide to evaluation of human exposure to vibration in buildings – Part 1: Vibration sources other than blasting.* Based on this criterion, a VDV of 0.2 $mms^{-1.75}$ would suggest "*adverse comment is not expected*". It should be noted that a 40 dB $L_{Amax,S}$ 0.2 $mms^{-1.75}$ VDV is predicted closest to the line of the tunnel, whereas the proposed development site is approximately 160m from the closest tunnel. RPS's report suggests that by 25m from the tunnel, groundborne noise would have already attenuated due to distance to 25 dB $L_{Amax,S}$, suggesting that by the time it reaches the proposed development site, the level would be significantly below 40 dB $L_{Amax,S}$ 0.2 $mms^{-1.75}$ VDV, adding weight to the assertion that *"adverse comment is not expected"*.

8. CONCLUSIONS

It is proposed to redevelop basement levels -4 and -5 of 112a Great Russell Street. As part of the redevelopment it is proposed to convert the two basement floors into hotel accommodation. Since the hotel will be situated below ground, plant will be situated on the ground floor. Consequently, in accordance with the guidance set on in Policy DP28 of the London Borough of Camden's Development Policies 2010-2025, a noise impact assessment has been conducted to ensure that noise levels at the closest sensitive properties are not increased.

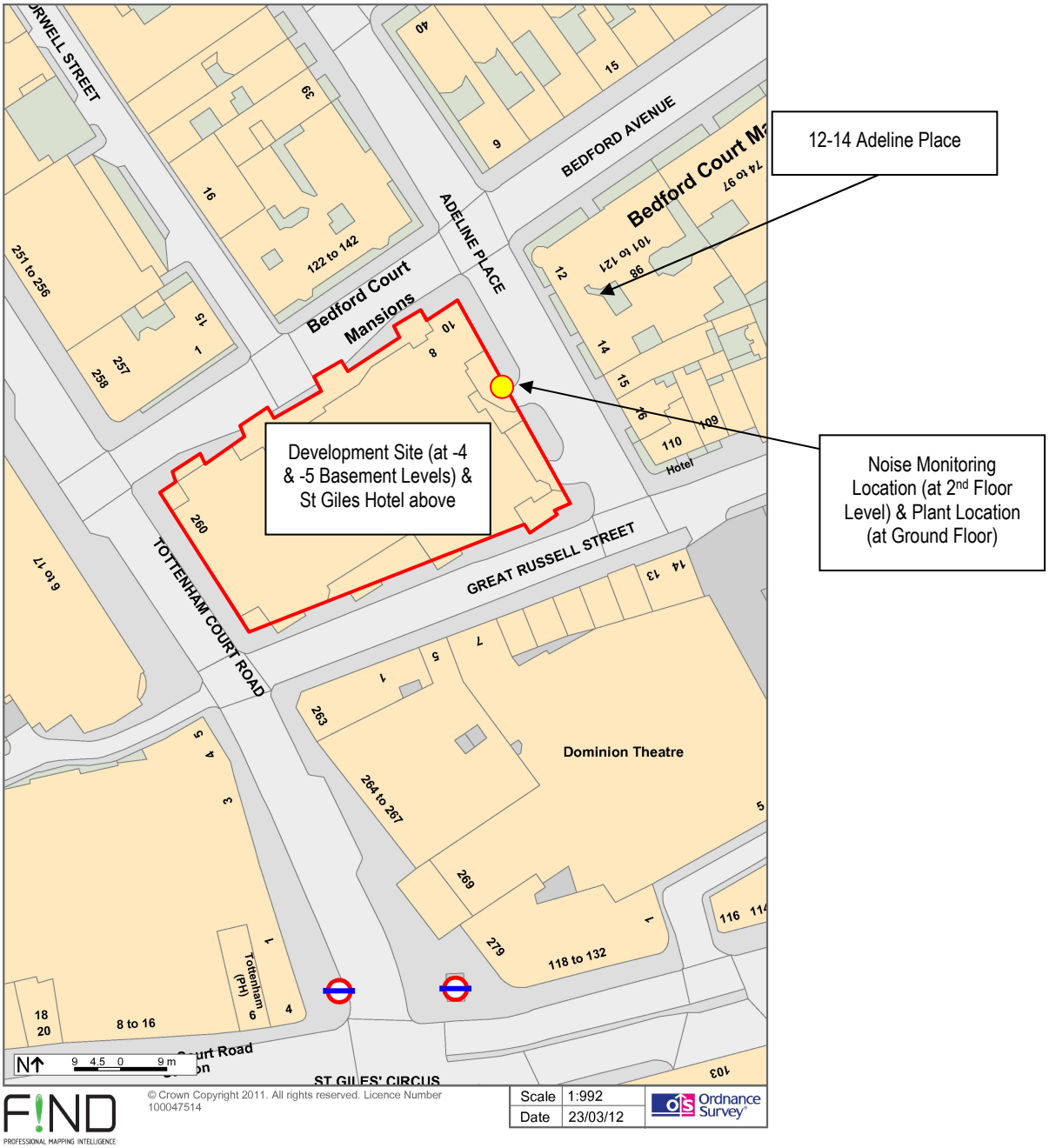
At present, a detailed specification of the proposed air source heat pumps was not available; however calculations have shown that providing the noise level from the plant does not exceed 67 dB(A) at a distance of 1m from the louvres of the plant room, noise from the plant should not exceed 46 dB(A) at the closest sensitive recepotor, i.e. 5 dB(A) below the background noise level in accordance with Policy DP28. Given that standard acoustic louvres can attenuate by 10-15 dB(A) or more, noise levels within the plant room could easily be 80 dB(A) or more and still comply with Policy DP28 of the London Borough of Camden's Development Policies 2010-2025 and therefore noise should not be a constraint upon development.

It is not anticipated that noise from clients entering or leaving the hotel, or congregating outside the hotel will cause complaints from local residents. However, to reduce the likelihood of this occurring, it is recommended that staff and the hotel management actively manage people congregating outside the hotel through the implementation of the Hotel Management Plan.

It is important to note that floors -4 and -5, which are to be converted into a hotel as part of this development, are currently a car park with over 100 car parking spaces. The closure of this car park is likely to result in an improvement in noise levels, with a reduction of several hundred vehicle movements per day on Adeline Place and the surrounding roads. Whilst this has not been quantified, but it is possible that this proposed development will actually have a positive impact on the local noise environment and may lead to a reduction in ambient noise levels for local residents.

Appendix 1
Site Plan

Appendix 1: Site Plan



Appendix 2
Glossary of Acoustic Terms

Appendix 2: Glossary of Acoustic Terms

'A'-Weighting - This is the main way of adjusting measured sound pressure levels to take into account human hearing, and our uneven frequency response.

Decibel (dB) - This is a tenth (deci) of a bel. Decibel can be a measure of the magnitude of sound, changes in sound level and a measure of sound insulation. Decibels are not an absolute unit of measurement but are an expression of ratio between two quantities expressed in logarithmic form.

$L_{Aeq,T}$ - The equivalent steady sound level in dB containing the same acoustic energy as the actual fluctuating sound level over the given period, T. T may be as short as 1 second when used to describe a single event, or as long as 24 hours when used to describe the noise climate at a specified location. $L_{Aeq,T}$ can be measured directly with an integrating sound level meter.

L_{A10} - The 'A'-weighted sound pressure level of the residual noise in decibels exceeded for 10 per cent of a given time and is the L_{A10T}. The L_{A10} is used to describe the levels of road traffic noise at a particular location.

L_{A50} - The 'A'-weighted sound pressure level of the residual noise in decibels exceeded for 50 per cent of a given time and is the L_{A50T}.

L_{A90} - The 'A'-weighted sound pressure level of the residual noise in decibels exceeded for 90 per cent of a given time and is the L_{A90T}. The L_{A90} is used to describe the background noise levels at a particular location.

L_{Amax} - The 'A'-weighted maximum sound pressure level measured over a measurement period.

Appendix 3
Schedule of Equipment

Appendix 3: Schedule of Equipment

Equipment Type	Manufacturer	Serial Number	Calibration Certification Number	Accreditation Body	Date of Last Calibration Check	Date of Next Calibration Check
Nor-140 Type 1 Sound Level Meter	Norsonic	1403056	16831	Campbell Associates	August 2014	August 2016
Nor-1209 Pre-amplifier	Norsonic	12528	16830	Campbell Associates	August 2014	August 2016
Nor-1225 Microphone	Norsonic	14360	16830	Campbell Associates	August 2014	August 2016
Nor-1251 Sound Calibrator	Norsonic	32849	16839	Campbell Associates	August 2014	August 2015
Nor-1284 Dehumidifier	Norsonic	222	Not Applicable			
Nor- 1212 Weather Protection Kit	Norsonic	Not Applicable				
Nor1408A/5 Extension Cable	Norsonic/Lemo	Not Applicable				

Calibration Report

Certificate Number:-16831

Norsonic Type: 140 Serial no: 1403056

Customer:	**Hawkins Environmental Ltd**
Address:	**70 Wentworth Crescent, Basingstoke, Hampshire. RG22 4WX.**
Contact Person:	**Nick Hawkins.**

Instrument software version: V1.4.6238

Microphone :	Norsonic	Type: 1225	Serial no: 14360	Sens:-24.81dB
Preamplifier	Norsonic	Type: 1209	Serial no: 12528	
Calibrator:	Norsonic	Type: 1251	Serial no: 32849	Level:113.98dB
Wind screen	Norsonic	Type: Nor1451		

Mains adapter was included Interface cable was included

This sound level meter has been calibrated as specified in BS 7580. PART 1: 1997. The results are traceable to NPL, UK.
Measurement Results:

Indication at the calibration check frequency - BS7580 Clause 5.4	Passed
Noise test - BS 7580 Clause 5.5.2	Passed
Level Linearity Test - BS 7580, Clause 5.5.3	Passed
Frequency weightings: A Network - BS 7580 Clause 5.5.4	Passed
Frequency weightings: C Network - BS 7580 Clause 5.5.4	Passed
Frequency weightings: Z Network - BS 7580 Clause 5.5.4	Passed
Time weightings F and S - BS7580 Clause 5.5.5	Passed
Peak response - BS7580 Clause 5.5.6	Passed
RMS accuracy - BS7580 Clause 5.5.7	Passed
Time weighting I - BS7580 Clause 5.5.8	Passed
Integrating Test : Time averaging - BS7580 Clause 5.5.9	Passed
Integrating Test : Pulse range - BS7580 Clause 5.5.10	Passed
Integrating Test : Sound exposure level - BS 7580 Clause 5.5.11	Passed
Overload SPL Test - BS 7580 Clause 5.5.12	Passed
Overload Leq Test - BS 7580 Clause 5.5.12	Passed
Acoustic tests - BS 7580 Clause 5.4 and 5.6	Passed
Summation of acoustic tests - BS 7580 Clause 5.5.4	Passed

Comment:
Correct level with associated calibrator is 113.8dB(A).

Environmental conditions:

Pressure:	Temperature:	Relative humidity:
99.810 kPa	22.8 °C	45.5 %RH

Date of calibration: 13/08/2014
Date of issue: 13/08/2014
Supervisor: Darren Batten TechIOA
Engineer

Michael Tickner

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Software version: 6.0d

Calibration Report

Certificate Number:-16830

Manufacturer:	**Norsonic**
Type:	**1225**
Serial no:	**14360**

Customer:	**Hawkins Environmental Ltd**
Address:	**70 Wentworth Crescent, Basingstoke, Hampshire. RG22 4WX.**
Contact Person:	**Nick Hawkins.**

Measurement Results:

	Sensitivity: (dB re 1V/Pa)	Capacitance: (pF)
1:	-24.82	20.9
2:	-24.81	20.9
3:	-24.81	20.9
Result (Average):	**-24.81**	**20.9**
Expanded Uncertainty:	0.10	2.00
Degree of Freedom:	>100	>100
Coverage Factor:	2.00	2.00

The following correction factors have been applied during the measurement:
Pressure:-0.001 dB/kPa Temperature:0.005 dB/°C Relative humidity:0.000 dB/%RH

Reference Calibrator: WSC2 - GRAS42AA-18277 Volume correction: 0.000 dB
Records:K:\C A\Calibration\Nor-1504\Nor-1017 MicCal\2014\NOR1225_14360_M1.nmf
Measurement procedure: TP05
All results quoted are directly traceable to National Physical Laboratory, London

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k = 2, which for a normal distribution corresponds to coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with EA publication EA-4/02.

Comment:

Environmental conditions:

Pressure:	Temperature:	Relative humidity:
99.781 ± 0.040 kPa	23.3 ± 0.2 °C	46.1 ± 1.2 %RH

Date of calibration: 13/08/2014
Date of issue: 13/08/2014

Supervisor : Darren Batten TechIOA
Engineer :

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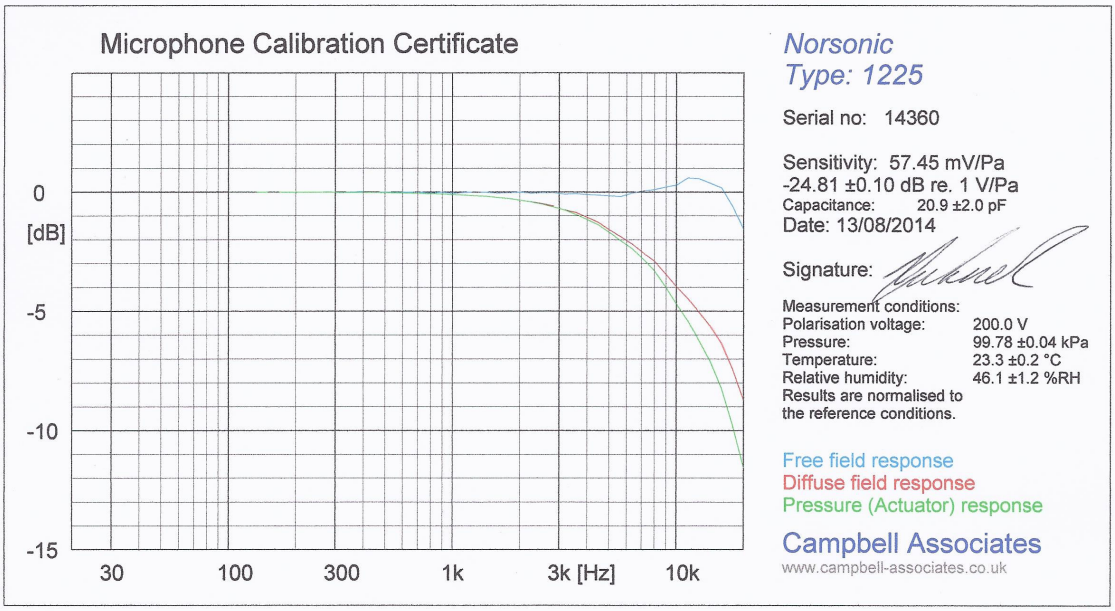
Michael Tickner
Software version: 6.0h


Microphone Calibration Certificate
0
[dB]
-5
-10
-15
30
100
300
1k
3k [Hz]
10k
Norsonic
Type: 1225
Serial no: 14360
Sensitivity: 57.45 mV/Pa
-24.81 ±0.10 dB re. 1 V/Pa
Capacitance: 20.9 ±2.0 pF
Date: 13/08/2014
Signature:
Measurement conditions:
Polarisation voltage: 200.0 V
Pressure: 99.78 ±0.04 kPa
Temperature: 23.3 ±0.2 °C
Relative humidity: 46.1 ±1.2 %RH
Results are normalised to the reference conditions.
Free field response
Diffuse field response
Pressure (Actuator) response
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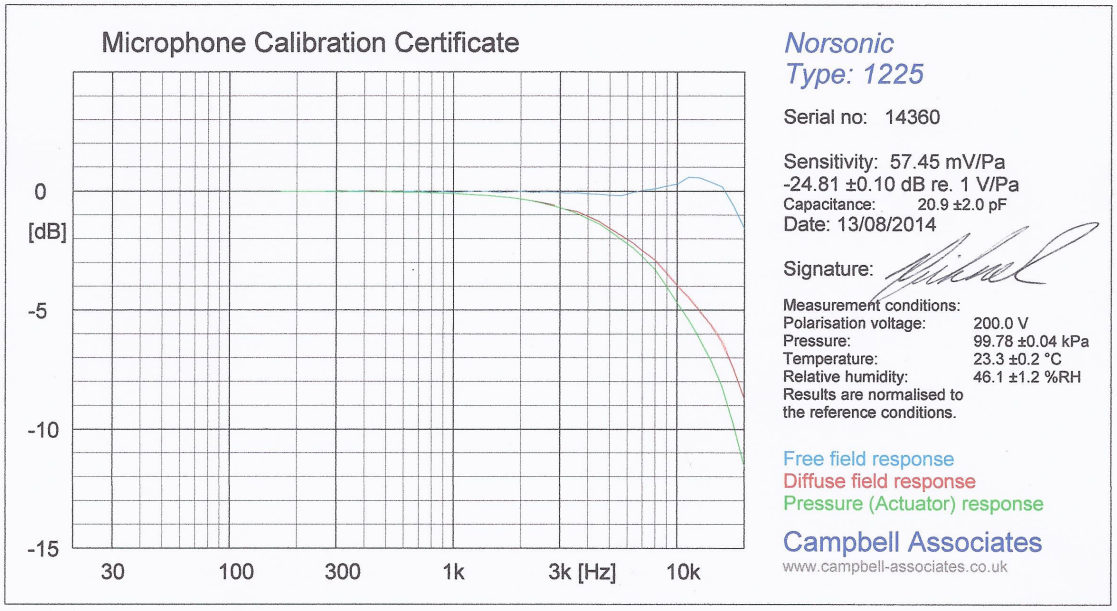
Microphone Calibration Certificate
0
[dB]
-5
-10
-15
30
100
300
1k
3k [Hz]
10k
Norsonic
Type: 1225
Serial no: 14360
Sensitivity: 57.45 mV/Pa
-24.81 ±0.10 dB re. 1 V/Pa
Capacitance: 20.9 ±2.0 pF
Date: 13/08/2014
Signature:
Measurement conditions:
Polarisation voltage: 200.0 V
Pressure: 99.78 ±0.04 kPa
Temperature: 23.3 ±0.2 °C
Relative humidity: 46.1 ±1.2 %RH
Results are normalised to the reference conditions.
Free field response
Diffuse field response
Pressure (Actuator) response
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Comment:

Calibration Report

Certificate Number:-16829

Manufacturer: Norsonic
Type: 1251
Serial no: 32849

Customer: Hawkins Environmental Ltd
Department:
Address: 70 Wentworth Crescent, Basingstoke, Hampshire. RG22 4WX.
Order No:
Contact Person: Nick Hawkins.

Measurement Results:

	Level: (dB)	P. Stab : (dB)	Frequency: (Hz)	F. Stab : (%)	Distortion: (% TD)
1:	113.98	0.01	999.84	0.00	0.19
2:	113.98	0.06	999.83	0.00	0.20
3:	113.98	0.01	999.83	0.00	0.18
Result (Average):	**113.98**	**0.03**	**999.83**	**0.00**	**0.19**
Expanded Uncertainty:	0.10	0.06	1.00	0.01	0.10
Degree of Freedom:	>100	4	>100	>100	>100
Coverage Factor:	2.00	3.31	2.00	2.00	2.00

The stated level is relative to 20µPa.

The following correction factors have been applied during the measurement:
Pressure:0.0005 dB/kPa Temperature:0.003 dB/°C Relative humidity: None
Reference microphone: WSM5 - B&K4192-2496459. Volume correction: -0.018 dB
Records:K:\C A\Calibration\Nor-1504\Nor-1018 CalCal\2014\NOR1251_32849_M1.nmf
Measurement procedure: TP-01
All results quoted are directly traceable to National Physical Laboratory, London

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k = 2, which for a normal distribution corresponds to coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with EA publication EA-4/02.

Environmental conditions:

Pressure:	Temperature:	Relative humidity:
99.774 ± 0.042 kPa	23.0 ± 0.2 °C	46.8 ± 0.8 %RH

Date of calibration: 13/08/2014
Date of issue: 13/08/2014

Supervisor : Darren Batten TechIOA
Engineer :

Michael Tickner
Software version: 6.0b

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Appendix 4
Summary of Noise Measurements

Appendix 4: Summary of Noise Measurements

Adeline Place – 2012:

Time	L_{Aeq}	$L_{AF(max)}$	L_{A10}	L_{A50}	L_{A90}
15:00-16:00	60.5	76.0	62.9	58.7	57.1
16:00-17:00	62.5	92.3	63.0	58.8	57.1
17:00-18:00	60.8	79.8	63.1	58.7	57.0
18:00-19:00	59.9	79.0	61.9	58.0	56.7
19:00-20:00	59.6	77.4	62.5	58.1	56.6
20:00-21:00	58.9	75.1	60.7	57.2	56.1
21:00-22:00	59.5	81.1	61.0	56.9	55.7
22:00-23:00	58.2	75.3	60.8	55.9	54.2
23:00-00:00	57.2	73.7	59.8	54.6	52.7
00:00-01:00	56.4	77.0	58.5	53.7	51.9
01:00-02:00	55.5	72.5	57.8	53.1	51.7
02:00-03:00	56.1	79.8	56.7	52.4	51.1
03:00-04:00	54.9	73.0	56.6	52.7	51.2
04:00-05:00	54.7	73.8	56.1	52.4	51.0
05:00-06:00	57.3	78.8	58.2	53.7	52.1
06:00-07:00	61.6	85.3	62.0	58.0	56.1
07:00-08:00	60.2	80.3	61.9	57.7	56.4
08:00-09:00	61.8	87.7	63.0	58.8	57.2
09:00-10:00	62.0	83.0	63.7	58.9	57.2
10:00-11:00	62.6	95.6	63.6	59.3	57.5
11:00-12:00	62.2	85.6	64.1	60.3	57.8
12:00-13:00	61.9	84.8	63.5	59.7	57.8
13:00-14:00	60.4	76.4	62.6	58.8	57.2
14:00-15:00	62.8	83.1	65.0	60.3	57.7