Noise Impact Assessment of the Proposed Installation of an Air Conditioning System

Client:	Whitepaperco Limited
Address:	8 Alfred Mews, Tottenham Court Road, Fitzrovia, London, W1T 7AA
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Executive summary

An environmental noise survey and noise impact assessment have been undertaken to assess the potential increase in noise levels from the installation of an air conditioning system with 2 outdoor units, on the surrounding noise-sensitive receptors. The measured noise background sound levels have allowed a BS4142:2014 noise assessment to be carried out.

The BS4142 assessment at the closest residential property shows 'Negligible Impact, depending on context'. The lowest measured $L_{A90,15min}$ has been used to represent the background noise level to ensure a robust and conservative assessment. This is a positive indication that the noise emissions from the Proposed Development will not adversely impact the amenity of residential occupants in the area.

An assessment of the noise levels at the nearest commercial office shows that with mitigation the BS8233:2014 office ambient noise level criteria can be achieved.

An overview of the recommendations can be seen below:

Recommendations and Mitigation Overview
- An enclosure capable of reducing the cumulative noise emissions of the plant by at least 20 dB should be installed. - All plant units should be appropriately isolated on anti-vibrational mounts in order to minimise structure-borne noise transference.

Further recommendations and mitigation measures can be found in the body of the report. Written approval of the findings of this report is required from the Local Authority prior to works commencing.

1. Introduction

1.1 Overview

NOVA Acoustics Ltd has been commissioned to prepare a noise assessment for the installation of 2 no. air conditioning condensers ('the Proposed Development') at 8 Alfred Mews, Tottenham Court Road, Fitzrovia, London, W1T 7AA ('the Site').

The Applicant is preparing a planning application to be submitted ('the Application') to the London Borough of Camden Council.

Accordingly, the following technical noise assessment has been produced to accompany the Application to the local authority.

This report details the existing background sound climate at the nearest receptors, as well as the sound emissions associated with the Proposed Development.

This noise assessment is necessarily technical in nature; therefore, a glossary of terms is included in Appendix A to assist the reader.

1.2 Scope & Objectives

The scope of the noise assessment can be summarized as follows:

- Baseline sound monitoring survey to evaluate the prevailing sound levels at the nearest sensitive receptor ('NSR') to Site;
- Detailed sound modelling, acoustic calculation and analysis in accordance with ISO9613 – 1 prediction methodology to predict sound levels at the NSR.;
- A detailed assessment of the suitability of the Site, in accordance with relevant standards in respect of sound from the proposed sources; and
- Recommendation of mitigation measures, where necessary, to comply with the requirements of the National Planning Practice Guidance in England and Wales, BS4142:2014 and other relevant Standards.

1.3 Legislation, Policy and Guidance

This report is to be primarily based on the following legislation, policy and guidance.

- National Planning Policy Framework (2019)
- Noise Policy Statement for England
- IEMA Guidelines on Noise Impact Assessments
- BS 4142:2014
- ISO 9613-2 Attenuation of sound during propagation outdoors
- BS EN 12354-4 Building Acoustics

2. Site Description & Background Information

2.1 Site & Surroundings

The site is located in central London to the south of Torrington Place. To the west is the A400 (Tottenham Court Road) and to the south is Alfred Mews. The closest residential NSR to site (NSR1) is located approximately 15m to the east on Huntley Street. The closest office window to the site is located directly adjacent, approximately 2m to the south the Proposed plant units. The dominant sources of noise at the site are traffic noise from the local roads, and plant noise from units installed on nearby buildings.

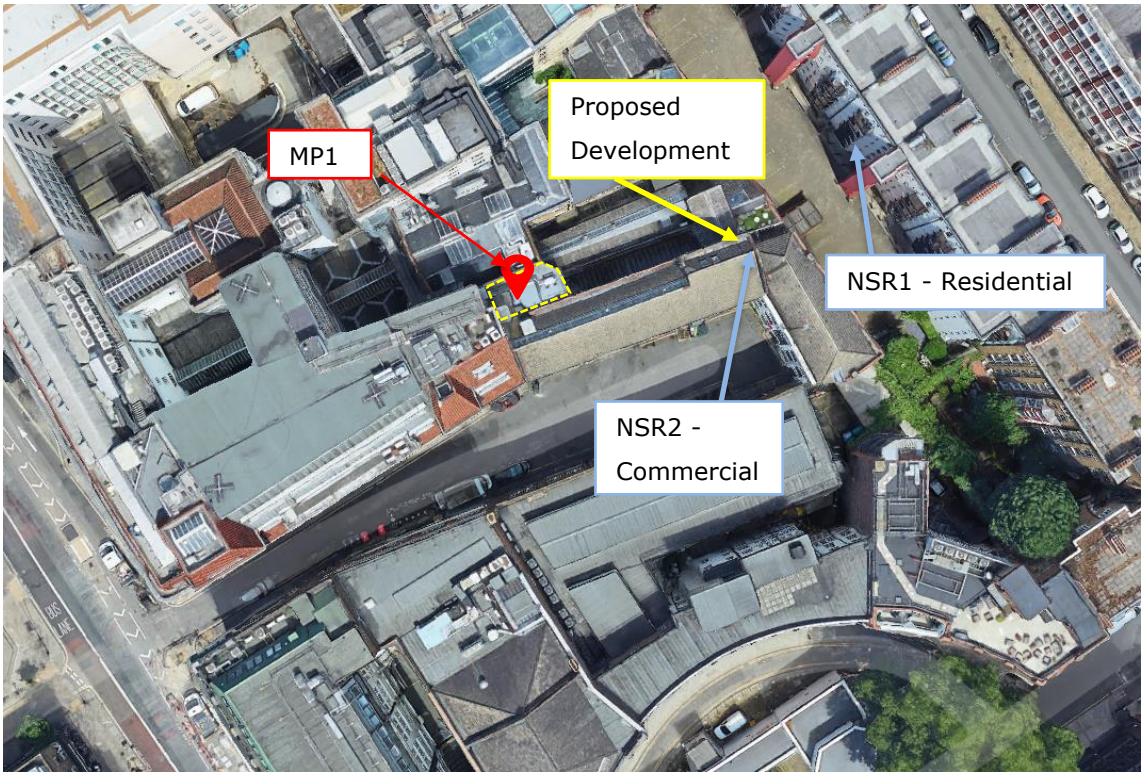


Figure 1.0 – Site and Surroundings

2.2 Background

It is proposed that 2 no. plant units are installed on the roof terrace at 8 Alfred Mews. It is assumed that the units can run during any time of the day and night.

In previous Noise Impact Assessments for this area, it has been expected that the specific noise emissions should be at least 10 dB below the lowest measured $L_{A90,15min}$ at residential NSRs.

Location and site plans are included in Appendices C and D respectively.

3. Environmental Noise Survey

In order to characterise the sound profile of the area of the proposed development, a long term 42-hour environmental sound survey was carried out from the 21st November 2018 to 23rd November 2018 as part of a previous survey on Alfred Mews.

3.1 Measurement Methodology

For the long-term sound monitoring, the sound level meter was placed on a flat roof at 3rd floor level of the proposed site. The microphone was positioned approximately 1m away from the building's façade and approximately 1.5m above the flat roof. The monitoring position was chosen in order to collect representative sound levels of the area during the week and weekend day time and night time periods. This position was also representative of the sound levels at the NSRs. The measurement position can be found in Figure 1.0.

3.2 Measurement Equipment

Piece of Equipment	Serial No	Calibration Deviation
CESVA SC420 Class 1 Sound level meter	T238593	≤0.5
CESVA CB006 Class 1 Calibrator	901013	

Table 1.0 – Measurement Equipment

All equipment used during the survey was field calibrated at the start and end of the measurement period with a negligible deviation of ≤0.5 dB. All sound level meters are calibrated every 24 months and all calibrators are calibrated every 12 months, by a third-party calibration laboratory. All microphones were fitted with a protective windshield for the entire measurements period. Calibration certificates can be provided upon request.

3.3 Weather Summary

As the environmental noise survey was carried out over a long un-manned 42-hour period no records of weather conditions were taken. However, during the setup and collection of the monitoring equipment, the weather was calm with wind speeds of less than 5m/s and no precipitation. All measurements have been compared with met office weather data of the area and periods of elevated weather conditions have been excluded from the subsequent calculations. The weather conditions were suitable for the measurement of environmental noise in accordance with BS7445 Description and Measurement of Environmental Noise.

3.4 Results

3.4.1 Summary Results

The following table shows a summary of the sound survey results; L_{Aeq}, L_{Amax}, L_{A90} and the L_{A10} for the measurement period.

Measurement Position MP1				
Measurement Time Period ('t')	**$L_{Aeq,t}$**	**$L_{Amax,t}$**	**$L_{A90,t}$**	**$L_{A10,t}$**
Day 1 – 21/11/18 – 16:00 - 23:00	51.7	75.0	50.3	52.7
Night 1 – 21/11/18 – 23:00 – 07:00	52.5	69.8	52.1	52.8
Day 2 – 22/11/18 – 07:00 - 23:00	52.0	76.4	50.9	52.9
Night 2 – 22/11/18 – 23:00 – 07:00	51.8	65.8	51.6	52.0
Day 3 – 23/11/18 – 07:00 – 09:45	52.2	68.1	51.3	52.7

Table 2.0 – Sound Survey Summary Results

The following table shows a summary of the minimum and maximum measured L_{A90} results for the measurement period.

Measurement Position MP1		
Measurement Time Period ('t')	**Lowest $L_{A90,t}$**	**Highest $L_{A90,t}$**
Day 1 – 21/11/18 – 16:00 - 23:00	49.7	52.4
Night 1 – 21/11/18 – 23:00 – 07:00	51.8	52.5
Day 2 – 22/11/18 – 07:00 - 23:00	49.8	52.9
Night 2 – 22/11/18 – 23:00 – 07:00	51.3	51.9
Day 3 – 23/11/18 – 07:00 – 09:45	50.2	52.4

Table 3.0 – Highest and Lowest $L_{A90,15minute}$ Results

3.5 Subjective impression & Context

Whilst on site it was found that the acoustic environment of the area was moderate to high in level. This is typical of a built-up area such as this. The dominant source of noise at NSR1 was traffic noise from the local road system and existing plant noise from surrounding commercial premises.

3.6 Assumptions

It is assumed that the noise levels recorded on the site are indicative of the noise levels at NSR1.

3.7 Uncertainty

BS4142:2014 section 10.0 states that uncertainty in the calculation of sound levels during the assessment process can arise from both the measured values and calculation methods.

To ensure the accuracy of the assessment consideration has been taken for the level of uncertainty in the measured data and associated calculations in the proposed methodology used to undertake the assessment. Where the level of uncertainty could affect the conclusion, reasonably practicable steps have been taken to minimise the level of uncertainty. Where the level of uncertainty is

excessive, additional measurements and site visits have been conducted to increase the confidence in the results. In all instances the following steps have been taken to address the uncertainty;

1) Measured Values; A detailed understanding of the source of noise under investigation has been conducted including consideration for the complexity, variability over time and location, the character and effect of the residual sound level in comparison with the source, the measurement location, quantity of measurements and distance/intervening ground conditions, measurement time interval and the range of times measurement were taken, the suitability of weather conditions, the level of rounding and the classification of the instrumentation used to conduct the assessment.
2) Calculation Methods; Consideration has been taken for the accuracy of the measured sound levels, the character of the sound emissions in question, the calculation method and the simplification of the real situation to "fit" the modelled situation. Recognised standards and validated methods and processes have been used to establish accurate values during the calculation process.

For the avoidance of doubt, the level of uncertainty will not be quantified. If appropriate consideration is taken for points 1 and 2 during the collection of data and analysis thereof, then the influence of uncertainty in the final result is at its lowest practical value.

4. Noise Assessment

4.1 BS4142:2014 Noise Assessment

The noise sources that are to be assessed in this section are as follows:

- 1 x Digital Inverter Outdoor Unit (SM404ATP-E)
- 1 x Toshiba Air Conditioning Unit (MMY-MAP1806HT8P-E)

4.1.1 Specific Sound Level

The sound power levels associated with the proposed development, based on manufacturers and vendor data, can be seen in the following table.

Make	Model	Sound Power (dBA)	No. of Units	Total Sound Power Level (dBA)
TOSHIBA	SM404ATP-E	65.0	1	83.0
TOSHIBA	MMY-MAP1806HT8P-E	83.0	1	

Table 4.0 – Specific Sound Level Summary

The closest residential NSR to the site is approximately 15m to the east on Huntley Street, and the closest office window is approximately 2m from the plant units. A Q factor of 8 has been assumed to allow for the reflective surfaces in close proximity to the units. The sound levels with the distance corrections included can be seen in the tables below.

NSR	Cumulative Sound Power Level at Source	Distance to NSR	Distance Correction (dB)	Sound Pressure Level at NSR (dBA)
NSR1	83.0	15m	25.5	57.5
NSR2	83.0	2m	8.0	75.0

Table 5.0 – Specific Sound Level Summary

In order to reduce the noise level at the NSRs to an appropriate level, an acoustic enclosure will be needed that will fully enclose the plant units. The proposed location of the enclosure can be seen in Appendix D.

The acoustic enclosure needs to be capable of attenuating the noise emissions of the cumulative plant by at least 20 dB.

A summary of the specific sound levels at the NSRs incorporating the attenuation provided by the enclosure is shown in the following table.

NSR	Specific Sound Level (dBA)
1	37.5
2	55.0

Table 6.0 - Specific Sound Level at NSR Summary

4.1.2 Rating Level

Rating Penalty

Section 9 of BS4142:2014 describes how the rating sound level should be derived from the specific sound level, by deriving a rating penalty.

BS4142:2014 states:

"Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features are present at the assessment location, add a character correction to the specific sound level to obtain the rating level. This can be approached in three ways:

a) subjective method;
b) objective method for tonality;
c) reference method."

Due to the nature of the development the subjective method has been adopted to derive the rating sound level from the specific sound level. This is discussed in Section 9.2 of BS4142:2014, which states:

"Where appropriate, establish a rating penalty for sound based on a subjective assessment of its characteristics. This would also be appropriate where a new source cannot be measured because it is only proposed at that time, but the characteristics of similar sources can subjectively be assessed. Correct the specific sound level if a tone, impulse or other characteristics occurs, or is expected to be present, for new or modified sound sources."

BS4142:2014 defines four characteristics that should be considered when deriving a rating penalty, namely; tonality; impulsivity; intermittency; and other sound characteristics, which are defined as:

a) Tonality

A rating penalty of +2 dB is applicable for a tone which is "just perceptible", +4 dB where a tone is "clearly perceptible", and +6 dB where a tone is "highly perceptible".

b) Impulsivity

A rating penalty of +3 dB is applicable for impulsivity which is "just perceptible", +6 dB where it is "clearly perceptible", and +9 dB where it is "highly perceptible".

c) Other Sound Characteristics

BS4142:2014 states that where "the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distance against the residual acoustic environment, a penalty of +3 dB can be applied."

d) Intermittency

BS4142:2014 states that when the "specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time … if the intermittency is readily distinctive against the residual acoustic environment, a penalty of +3 dB can be applied."

Rating Penalty Assessment

Considering the requirements of the rating penalty, an assessment of the various sound sources associated with the Proposed Development, in terms of whether any rating penalties are applicable, and has been detailed in the following table.

Source	Tonality	Impulsivity	Intermittency	Other Sound Characteristics	Discussion
All Plant	+2	--	--	--	Likely audible tonality and intermittency at both NSRs

Table 7.0 – Rating Penalty Assessment

Rating Level

Incorporating the rating penalties with the specific sound levels, the rating sound levels have been derived and have been detailed in the following table.

NSR	Rating Sound Level (dB)
1	39.5
2	57.0

Table 8.0 – Summary of Rating Sound Levels

4.1.3 Background Sound Level

The background sound level is the underlying level of sound over a period, T, and is indicative of the relative quietness at a given location. It does not reflect the occurrence of transient and/or higher sound level events and is generally governed by continuous or semi-continuous sounds.

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.

On this occasion, the noise level recorded contains noise emissions of plant equipment. This can be seen by the clearly definable on/off periods present in the environmental noise survey graph in Appendix E. For this reason, and to ensure a robust and conservative assessment, the lowest measured $L_{A90,15min}$ will be used for the background noise level. This is shown in the table below.

Measurement Position MP1	
Measurement Time Period ('t')	**Lowest Measured $L_{Aeq,15min}$**
Day 1 – 21/11/18 – 16:00 - 23:00	**49.7**
Night 1 – 21/11/18 – 23:00 – 07:00	51.8
Day 2 – 22/11/18 – 07:00 - 23:00	49.8
Night 2 – 22/11/18 – 23:00 – 07:00	51.3
Day 3 – 23/11/18 – 07:00 – 09:45	50.2

Table 9.0 – Lowest $L_{A90,15min}$ Results

Discussion

The lowest measured $L_{A90,15min}$ for the measurement period is 49.7 dB. This will be used for the following assessment.

4.1.4 BS4142 Assessment

The rating sound level has been assessed in accordance with BS4142:2014 at NSR1. The BS4142:2014 assessment at the NSR can be seen in the table below.

Results	Sound Level at NSR1 (dB)	Notes
Rating Sound Level	39.5	As shown in Table 8.0
Operational Period Background Sound Level	49.7	As shown in Table 9.0
Excess of Rating over Background Sound Level	-10.2	Assessment Indicates 'Negligible Impact, Depending on Context'.

Table 10.0 – BS4142:2014 Assessment

Discussion

As can be seen in the table above, the BS4142 assessment indicates 'Negligible Impact' at NSR1 provided an enclosure with a minimum attenuation of 20 dB is installed around the units. This equates to 'No Observed Effect Level' when assessed in accordance with the NPSE.

4.1.5 Consideration for Noise Levels at the Nearest Commercial Office

As can be seen in Figure 1.0 the closest commercial office is directly adjacent to the Proposed Development, approximately 2m from the plant units. It is thought that if the noise level is satisfactory at this location, then it will meet the criteria in all other office locations.

It is assumed that due to the relatively high noise levels in the area, the offices will not be reliant on opening windows for ventilation. It is instead expected that the offices will employ a secondary source of ventilation, and for this reason, the sound reduction provided by the glazing can be applied to the following assessment.

The rating sound level incident on this commercial premises considering the attenuation provided by the acoustic enclosure is 57.0 dB. It is assumed that standard double glazing or 4mm float glass is installed in all office areas either of these configurations should provide a minimum sound reduction of 29 dB R_w. The table below shows the expected internal noise levels at the closest office due to noise emissions plant units.

Description	Sound Level (dB)
Specific noise level at the nearest office	57.0
Double glazing R_w 4/12/4	29.0
Expected internal level $_{L1-R+6}$	34.0
BS8233 ambient noise levels in offices	45.0

Level below criteria	-11.0

Table 11.0 – Commercial Unit Assessment - Cumulative Impact

Discussion

As can be seen in the table above the expected internal noise levels at the closest commercial office fall 11.0 dB below the internal noise levels for open-plan offices specified in BS8233:2014. Therefore, this assessment indicates no impact.

4.2 Increase in Ambient Noise Level Assessment

The following section analyses the expected increase in ambient noise levels at NSR1 and NSR2 due to the Proposed Development. The specific sound levels associated with the proposed development are logarithmically added to the lowest measured residual sound level. The higher the increase in noise levels the higher the impact.

Increase in Ambient Noise Level Assessment		
Description	**NSR1 Value (dB)**	**NSR2 Value (dB)**
Lowest Measured Ambient Noise Level	51.7	51.7
Specific Noise Level	37.5	55.0
Resulting Noise Level	52.0	57.0
Increase in Noise Level	+0.3	+5.0
Expected impact	None/Not Significant	Substantial

Table 12.0 –Increase in Ambient Noise Level Assessment

Discussion

The above assessment shows that the emissions from the Proposed Development are predicted to be 'None/Not Significant' at NSR1 and at NSR2 it's showing there will be a substantial change in ambient noise levels, however it must be noted that NSR2 is the offices directly adjacent to the proposed AC units, which are being installed for use by this office.

4.3 Recommendations and Mitigation

The following section outlines the mitigation measures that are necessary to reduce the impact of the Proposed Development.

- An enclosure capable of reducing the cumulative noise emissions of the plant by at least 20 dB should be installed.
- All plant units should be appropriately isolated on anti-vibrational mounts in order to minimise any structure-borne noise transference.

Appendix A – Acoustic Terminology

Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of 20μPa (20x10-6 Pascals) on a decibel scale.
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.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{eq,T}$	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 during the period T. Lmax is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall Leq noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. L90 can be considered to be the "average minimum" noise level and is often used to describe the background noise.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L10 can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m
Facade	At a distance of 1m in front of a large sound reflecting object such as a building façade.
Fast Time Weighting	An averaging time used in sound level meters. Defined in BS 5969.

In order to assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided. The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0 dB (the threshold of hearing) to over 120 dB. An indication of the range of sound levels commonly found in the environment is given in the following table.

Sound Level	Location
0dB(A)	Threshold of hearing
20 to 30dB(A)	Quiet bedroom at night
30 to 40dB(A)	Living room during the day
40 to 50dB(A)	Typical office
50 to 60dB(A)	Inside a car
60 to 70dB(A)	Typical high street
70 to 90dB(A)	Inside factory
100 to 110dB(A)	Burglar alarm at 1m away
110 to 130dB(A)	Jet aircraft on take off
140dB(A)	Threshold of Pain

The ear is less sensitive to some frequencies than to others. The A-weighting scale is used to approximate the frequency response of the ear. Levels weighted using this scale are commonly identified by the notation dB(A).

In accordance with logarithmic addition, combining two sources with equal noise levels would result in an increase of 3 dB(A) in the noise level from a single source. A change of 3 dB(A) is generally regarded as the smallest change in broadband continuous noise which the human ear can detect (although in certain controlled circumstances a change of 1 dB(A) is just perceptible). Therefore, a 2 dB(A) increase would not be normally be perceptible. A 10 dB(A) increase in noise represents a subjective doubling of loudness.

A noise impact on a community is deemed to occur when a new noise is introduced that is out of character with the area, or when a significant increase above the pre-existing ambient noise level occurs.

For levels of noise that vary with time, it is necessary to employ a statistical index that allows for this variation. These statistical indices are expressed as the sound level that is exceeded for a percentage of the time period of interest. In the UK, traffic noise is measured as the L_{A10}, the noise level exceeded for 10% of the measurement period. The L_{A90} is the level exceeded for 90% of the

time and has been adopted to represent the background noise level in the absence of discrete events. An alternative way of assessing the time varying noise levels is to use the equivalent continuous sound level, L_{Aeq}.

This is a notional steady level that would, over a given period of time, deliver the same sound energy as the actual fluctuating sound. To put these quantities into context, where a receiver is predominantly affected by continuous flows of road traffic, a doubling or halving of the flows would result in a just perceptible change of 3 dB, while an increase of more than 25%, or a decrease of more than 20%, in traffic flows represent changes of 1 dB in traffic noise levels (assuming no alteration in the mix of traffic or flow speeds).

Note that the time constant and the period of the noise measurement should be specified. For example, BS4142:2014 specifies background noise measurement periods of 1 hour during the day and 15 minutes during the night. The noise levels are commonly symbolised as $L_{A90,1hour}$ dB and $L_{A90,15mins}$ dB. The noise measurement should be recorded using a 'FAST' time response equivalent to 0.125ms.

Appendix B – Legislation, Policy and Guidance

This report is to be primarily based on the following legislation, policy and guidance.

National Planning Policy Framework (2019)

Government policy on noise is set out in the National Planning Policy Framework (NPPF), published in 2019. This replaced all earlier guidance on noise and places an emphasis on sustainability. In section 15, Conserving and enhancing the natural and local environment, paragraph 170e, it states:

Preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans;

Paragraph 180 states:

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

a) *Mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*
b) *Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and*
c) *Limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.*

Noise Policy Statement for England

Paragraph 180 of the NPPF also refers to advice on adverse effects of noise given in the Noise Policy Statement for England (NPSE). This document sets out a policy vision to:

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

To achieve this vision the Statement identifies the following three aims:

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

- *Avoid significant adverse impacts on health and quality of life;*
- *Mitigate and minimise adverse impacts on health and quality of life;*
- *Where possible, contribute to the improvement of health and quality of life.*

In achieving these aims the document introduces significance criteria as follows:

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur. It is stated that "significant adverse effects on health and quality of life should be avoided while also considering the guiding principles of sustainable development".

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected. It is stated that the second aim above lies somewhere between LOAEL and SOAEL and requires that: "all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also considering the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur."

NOEL – No Observed Effect Level

This is the level 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. This can be related to the third aim above, which seeks: "where possible, positively to improve health and quality of life through the pro-active management of noise while also considering the guiding principles of sustainable development, recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim."

The NPSE recognises that it is not possible to have a single objective noise-based measure that is mandatory and applicable to all sources of noise in all situations and provides no guidance as to how these criteria should be interpreted. It is clear, however, that there is no requirement to achieve noise levels where there are no observable adverse impacts but that reasonable and practicable steps to reduce adverse noise impacts should be taken in the context of sustainable development and ensure a balance between noise sensitive and the need for noise generating developments.

Any scheme of noise mitigation outlined in this report will, therefore, aim to abide by the above principles of the NPPF and NPSE whilst recognizing the constraints of the site.

IEMA Guidelines on Noise Impact Assessments

The IEMA Guidelines for Environmental Noise Assessment address the key principles of noise impact assessment and are applicable to all development proposals where noise effects may occur. The guidelines set out key principles for noise impact assessment relevant to all types of project regardless of size. The guidance provides advice with regards to the collection of baseline noise data, prediction of noise levels and how noise should be assessed. The guidance recognizes that the effect associated with a noise impact will be dependent on a number of factors including but not limited to the sensitivity of the receptor, frequency and duration of the noise source and time of day. The Guidelines accept that a simple change in noise levels using a single noise indicator may fail to adequately reveal the actual noise impact of the proposal. The character of the noise must be considered and the Guidelines suggest comparing several noise indicators such as the LAeq, LAmax and LA90 as a more rigorous approach.

Absolute levels such as those set out in WHO Guidelines are also considered and the Guidelines suggest that a change in noise levels in an area where the existing levels are above WHO Guidelines

should be considered as having more of an adverse effect than a change in noise levels in an area where existing levels are well below.

The Guidelines stop short of providing specific assessment criteria which developments should achieve but instead suggests that the methodology adopted should be selected on a site by site basis regarding relevant national and local standards.

The Guidelines contain effect descriptors for changes in noise levels and for noise effect levels. These are summarized below:

Effect Descriptors	
Very substantial	Greater than 10 dB L_{Aeq} change in sound level perceived at a receptor of great sensitivity to noise
Substantial	Greater than 5 dB L_{Aeq} change in sound level at a noise sensitive receptor, or a 5 to 9.9 dB LAeq change in sound level at a receptor of great sensitivity to noise
Moderate	A 3 to 4.9 dB L_{Aeq} change in sound level at a sensitive or highly sensitive noise receptor, or a greater than 5dB LAeq change in sound level at a receptor of some sensitivity
Slight	A 3 to 4.9 dB L_{Aeq} change in sound level at a receptor of some sensitivity
None/Not Significant	Less than 2.9 dB L_{Aeq} change in sound level and/or all receptors are of negligible sensitivity to noise or marginal to the zone of influence of the proposals

Table 13.0 – IEMA Guidelines effect descriptors

Noise Effect Level		
Time	**Lowest Observed Adverse Effect Level**	**Significant Observed Adverse Effect Level**
07:00 - 23:00	50 dB $L_{Aeq,16\ hour}$	60 dB $L_{Aeq,16\ hour}$
23:00 - 07:00	40 dB $L_{Aeq,8\ hour}$	55 dB $L_{Aeq,8\ hour}$
	60 dB L_{AFMax} (at the facade)	80 dB L_{AFMax} (at the facade)

Table 14.0 – IEMA Guidelines noise effect level

The Guidelines are not prescriptive as to how a noise impact assessment should be carried out, and allow assessors to consider factors such as frequency spectra, days and times of operation, frequency of operation and any other factor which allows the noise to be assessed in context.

BS 4142:2014

BS4142:2014 sets out a method to assess the likely effect of sound from factories, industrial premises or fixed installations and sources of an industrial nature in commercial premises, on people who might be inside or outside a dwelling or premises used for residential purposes in the vicinity.

The procedure contained in BS4142:2014 for assessing the effect of sound on residential receptors is to compare the measured or predicted sound level from the source in question, the $L_{Aeq,T}$ 'specific sound level', immediately outside the dwelling with the $L_{A90,T}$ background sound level.

Where the sound contains a tonality, impulsivity, intermittency and other sound characteristics, then a correction depending on the grade of the aforementioned characteristics of the sound is added to the specific sound level to obtain the $L_{Ar,Tr}$ 'rating sound level'. A correction to include the consideration of a level of uncertainty in sound measurements, data and calculations can also be applied when necessary.

BS4142:2014 states: "The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs". An estimation of the impact of the specific sound can be obtained by the difference of the rating sound level and the background sound level and considering the following:

- "Typically, the greater this difference, the greater the magnitude of the impact."
- "A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context."
- "A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context."
- "The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a negligible impact, depending on the context."

Interpreting the guidance given in BS4142:2014, with consideration of the guidance given in the NPSE and NPPG Noise, an estimation of the impact of the rating sound is summarised in the following text:

- A rating sound level that is +10 dB above the background sound level is likely to be an indication of a Significant Observed Adverse Effect Level;
- A rating sound level that is +5 dB above the background sound level is likely to be an indication of a Lowest Observed Adverse Effect Level;
- The lower the rating sound 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 sound level does not exceed the background sound level, this is an indication of the specific sound source having a negligible impact, and would therefore classified as a No Observed Adverse Effect Level.

During the daytime, the assessment is carried out over a reference time period of 1-hour. The periods associated with day or night, for the purposes of the Standard, are 07.00 to 23.00 and 23.00 to 07.00, respectively.

ISO 9613-2 Attenuation of sound during propagation outdoors

The ISO 1996 series of standards specifies methods for the description of noise outdoors in community environments. Part 2 of ISO 9613 is intended to enable noise levels in the community to be predicted from sources of known sound emission. The method is general in the sense that it may be applied to a wide variety of noise sources, and cover most of the major mechanisms of attenuation.

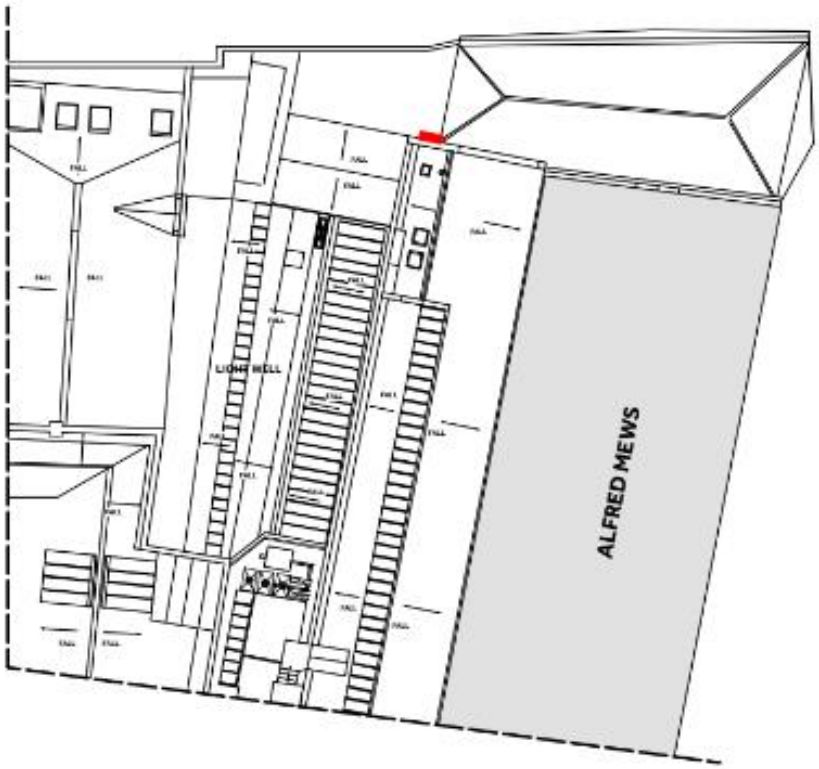
This standard provides guidance on the outdoor propagation of sound. It is widely used to establish the different attenuations that occur during the transmission of the sound from the sources to the receivers. The total attenuation is the sum of the following: geometrical divergence, atmospheric absorption, ground effect, barriers, and miscellaneous other effects.

BS EN 12354-4 Building Acoustics

Estimation of acoustic performance of buildings from the performance of elements – Transmission of indoor sound to the outside

This European Standard describes a calculation model for the sound power level radiated by the envelope of a building due to airborne sound inside that building, primarily by means of measured sound pressure levels inside the building and measured data which characterize the sound transmission by the relevant elements and openings in the building envelope. These sound power levels, together with those of other sound sources in or in front of the building envelope, form the basis for the calculation of the sound pressure level at a chosen distance from a building as a measure for the acoustic performance of buildings.

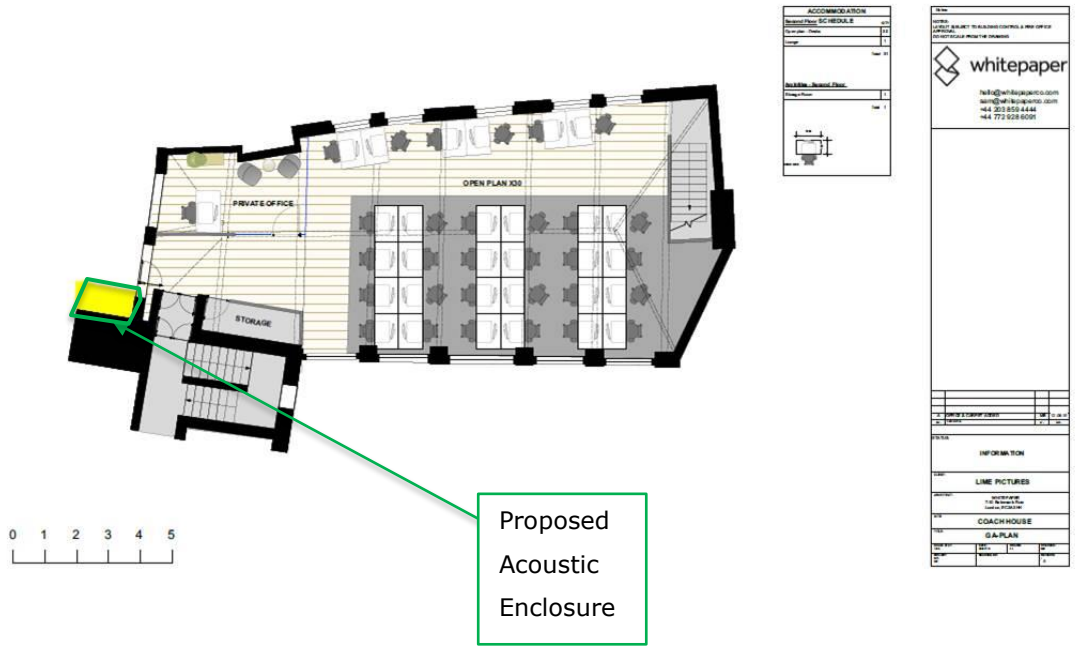
Appendix C - Location Plan



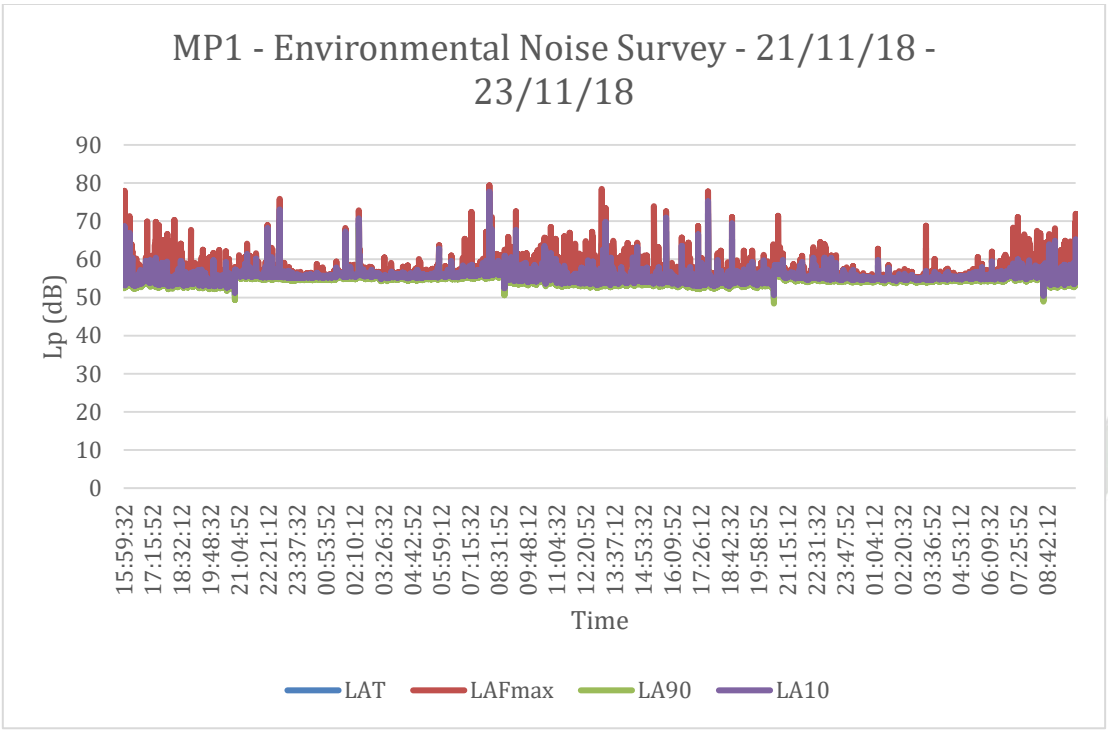
Site Plan -Scale 1:500

Appendix D – Site Plans (Proposed Enclosure)

COACH HOUSE - 8 ALFRED MEWS GA PLAN- SECOND FLOOR



Appendix E – Environmental Sound Survey



Appendix F – Manufacturers Data Sheets & Other Relevant Information

Digital Inverter Outdoor

CODE			25	35	50	71
Outdoor Unit		RAV-	SM304ATP-E	SM404ATP-E	SM564ATP-E	SM804ATP-E
Cooling Range (Min. - Max.)		kW	0.9 - 3.0	0.9 - 4.0	1.5 - 5.6	1.5 - 8.0
Heating Range (Min. - Max.)		kW	0.8 - 4.5	0.8 - 5.0	1.5 - 6.3	1.5 - 9.0
Ambient Operating Range Cooling/Heating		°C	46 to -15/24 to -15	46 to -15/24 to -15	46 to -15/15 to -15	46 to -15/15 to -15
Fan(s)	Motor Power	W	43	43	43	43
	Standard Air Flow	l/s	500	617	667	750
	Standard Air Flow	m³/min	30	37	40	45
	Standard Air Flow	m³/h	1800	2220	2400	2700
Sound	Pressure Level C/H	dB(A)	46/47	49/50	46/48	48/52
	Power Level C/H	dB(A)	61/62	64/65	63/65	65/69
Unit	Appearance		Silky Shade (Muncel 1Y 8,5/0,5)	Silky Shade (Muncel 1Y 8,5/0,5)	Silky Shade (Muncel 1Y 8,5/0,5)	Silky Shade (Muncel 1Y 8,5/0,5)
	Heat Exchanger		Finned tube	Finned tube	Finned tube	Finned tube
	Compressor Type		Hermetic Twin Rotary	Hermetic Twin Rotary	Hermetic Twin Rotary	Hermetic Twin Rotary
	Compressor Power	kW	0.75	1.1	1.1	1.6
	Height x Width x Depth	mm	550 x 780 x 290	550 x 780 x 290	550 x 780 x 290	550 x 780 x 290
	Total Weight	kg	33	39	40	44
Refrigerant	Control		Pulse motor valve	Pulse motor valve	Pulse motor valve	Pulse motor valve
	Gas Type		R410A	R410A	R410A	R410A
	Base Charge/Chargeless To	kg/m	0,8/15	1,4/15	1,1/20	1,7/20
	Additional Charge Main Liquid Side	g/m	20	20	20	40
	Replacement Technology	Yes	R22, R407C, R417A, R134a, R12	R22, R407C, R417A, R134a, R12	R22, R407C, R417A, R134a, R12	R22, R407C, R417A, R134a, R12
Pipe Connections	Min.-Max. Length	m	2-20	2-20	5-30	5-30
	Height Difference Outdoor To AHU	m	±10	±10	±30	±30
	Gas Side	inch	3/8	1/2	1/2	5/8
	Liquid Side	inch	1/4	1/4	1/4	3/8
	Drain Port Connector Hose Inner Diameter	mm	16	16	16	16
Electrical	Power Supply	V/ph/Hz	220-240/1/50	220-240/1/50	220-240/1/50	220-240/1/50
	Maximum Run Current	A	3,86	5,14	8,95	11,43
	Suggested Fused Supply	A	10	10	16	16

CODE			100	100	125	125
Outdoor Unit		RAV-	SM1104ATP-E	SM1104AT8P-E	SM1404ATP-E	SM1404AT8P-E

TOSHIBA Leading Innovation

Toshiba Air Conditioning - VRF Data Sheet

MMY-MAP1806HT8P-E
Two-pipe SMMSe - Heat Pump Condensing Unit

Features

- New DC twin rotary compressor with DLC coated vane
- Wave interface communication tool for Smartphone (Android) commissioning and data transfer
- Longer pipe lengths up to 1000 m
- Increased connectable capacity up to 64 indoor units
- New sub-cooling heat exchanger for improved energy efficiency
- High efficiency combinations 20 hp to 54 hp

Technical Data

Model reference		MMY-MAP1806HT8P-E
Nominal cooling	kW	50.4
Nominal heating	kW	56.0
Capacity code		18
Min./max. capacities connectable	hp	9/24.3
Power input (cool/heat)	kW	14.6/14.1
SEER/ESEER Value (Office Profile)		6.83/7.53
SCOP/ESCOP Value (Office Profile)		4.99/5.30
Starting current	A	1
Running current (cool/heat)	A	22.9/22.1
Suggested fuse size	A	32
Power supply	V-ph-Hz	400-3-50
Interconnecting cable		2-core screened 1.5 mm
Sound power (cool/heat)	dB(A)	81/83
Sound pressure (cool/heat)	dB(A)	60/61
Standard air flow	m^3/h	17300
Standard air flow	l/s	4806
Maximum indoor units connectable		40
Dimensions (H x W x D)	mm	1830 x 1600 x 780
Unit weight	kg	371
R410A refrigerant base charge	kg	11.5