THE EQUUS PARTNERSHIP

Member of the Association of Noise Consultants

CONSULTANTS IN ACOUSTICS

WHITTINGTON HOUSE

ALFRED PLACE, LONDON WC1

Noise Impact Statement

August 2015

Ref: EPL:4271/PBG/R2

The EQUUS Partnership Ltd
The Garden Office
5 Linkfield Corner
Redhill
RH1 1BD

Registered in England No: 3611876

Tel: 01737 778355
Email: acoustix@equuspartnership.co.uk

CONTENTS

APPENDICES

1 INTRODUCTION

This **Noise Impact Statement** accompanies a planning application submitted by Platine Holdings. The application seeks the development at Whittington House, Alfred Place, London, including the proposed installation of new building services plant.

This **Noise Impact Statement** presents:

- The results of environmental noise surveys undertaken at the site, to establish existing ambient noise levels;
- Discusses environmental acoustic design targets for the proposed plant in the context of national and local planning policy and other relevant industry standard guidance;
- Assesses noise emissions from proposed plant and, where necessary, the engineering controls that will be implemented to control noise emissions to satisfactorily mitigate any adverse noise impacts, in accordance with relevant national and local planning policy.

2 THE SITE AND ITS SURROUNDINGS

The subject premises are located at the corner of Alfred Place and Chenies Street. The existing 9 storey building is an "L" shape and comprises a basement car park, ground floor reception/showroom, with office accommodation on Levels 1 to 6. The existing 7th floor houses building services plant.

Opposing the site on Alfred Place is a terrace of 4 to 5 storey properties which generally appear to have commercial use.

To the north, the site overlooks Chenies Street. Land usage on the northern side of this road appears to be mixed, including residential use. The closest residential properties are those within 9 Chenies Street.

The eastern boundary of the site is principally formed with existing buildings in educational use (RADA) and residential properties in Rossetti Close, Ridgmount Place. Further residential accommodation is to be found in Ridgmount Street slightly further east of the site.

To the south, the site adjoins 31-32 Alfred Place, a seven storey property in commercial (office) use.

The location of the site and its general environs are shown on **Figure 1** attached at **Appendix A**.

3 PLANNING POLICY GUIDANCE

3.1 National Planning Policy

Current governmental guidance relating to the determination of planning applications is given in the recently published National Planning Policy Framework (NPPF).

Paragraph 109 of the NPPF advises:

> *"The planning system should contribute to and enhance the natural and local environment by:*
>
> *protecting and enhancing valued landscapes, geological conservation interests and soils;*
>
> *recognising the wider benefits of ecosystem services;*
>
> *minimising impacts on biodiversity and providing net gains in biodiversity where possible, contributing to the Government's commitment to halt the overall decline in biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures;*
>
> *preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability; and*
>
> *remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.*

With specific regard to noise, paragraph 123 of the NPPF states:

> *"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."

With regard to the "adverse impacts" referred to in the first two of the above bullet points, the NPPF directs the reader to the advice contained in DEFRA's Noise Policy Statement for England (NPSE). This Policy Statement introduces the concept of a "Significant Observed Adverse Effect Level" (SOAEL), "Lowest Observed Adverse Effect Level" (LOAEL) and "No Observed Adverse Effect Level" (NOAEL). However, whilst the intent of the NPSE in relation to the NPPF is clear, the Noise Policy Statement for England does not, at this time, provide any quantitative threshold values for each identified level of "effect". Indeed, the NPSE carefully highlights 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."

The Government has now issued *"National Planning Practice Guidance"* to assist in understanding the perception of noise effects, outcomes and actions that should be taken to align decision making with the NPPF. The table below sets out this guidance:

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not noticeable	No Effect	No Observed Effect	**No specific measures required**
No Observed Adverse Effect Level (NOAEL)			
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	**No specific measures required**
Lowest Observed Adverse Effect Level (LOAEL)			
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; closing windows for some of the time because of the noise. Potential for non-awakening sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	**Mitigate and reduce to a minimum**
Significant Observed Adverse Effect Level (SOAEL)			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. having to keep windows closed most of the time, avoiding certain activities during periods of intrusion. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	**Avoid**
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	**Prevent**

In light of the above, it can be seen that whilst the NPPF and associated planning practice guidance sets out stringent imperatives to ensure the satisfactory development of land in relation to possible noise impacts, the NPPF does not generally provide any detailed technical guidance defining what may be considered to constitute a *"significant" or "other"*

adverse impact. In the absence of such technical guidance, reference needs to be been made to sustainable development standards set out in local policy and/or relevant *'industry standard'* guidance, as set out later in this report.

3.2 Local Planning Policy

The London Borough of Camden's adopted *"Core Strategy 2010-2025"* includes the following policy which seeks to protect the amenity of existing neighbours from new development:

CS5 – Managing the impact of growth and development

The Council will manage the impact of growth and development in Camden. We will ensure that development meets the full range of objectives of the Core Strategy and other Local Development Framework documents, with particular consideration given to:

a) providing uses that meet the needs of Camden's population and contribute to the borough's London-wide role;

b) providing the infrastructure and facilities needed to support Camden's population and those who work in and visit the borough;

c) providing sustainable buildings and spaces of the highest quality; and

d) protecting and enhancing our environment and heritage and the amenity and quality of life of local communities.

The Council will protect the amenity of Camden's residents and those working in and visiting the borough by:

e) making sure that the impact of developments on their occupiers and neighbours is fully considered;

f) seeking to ensure development contributes towards strong and successful communities by balancing the needs of development with the needs and characteristics of local areas and communities; and

f) requiring mitigation measures where necessary.

The London Borough of Camden's Local Development Framework *("Camden Development Policies 2010-2025")* includes the following policies:

DP26 – Managing the impact of development on occupiers and neighbours

The Council will protect the quality of life of occupiers and neighbours by only ranting permission for development that does not cause harm to amenity. The factors we will consider include:

a) visual privacy and overlooking;

b) overshadowing and outlook;

c) sunlight, daylight and artificial light levels;

d) noise and vibration levels;

e) odour, fumes and dust;

f) microclimate;

g) the inclusion of appropriate attenuation measures.

DP28 – Noise and vibration

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; or

b) development sensitive to noise in locations with noise pollution, unless appropriate attenuation measures are provided.

c) Development that exceeds Camden's Noise and Vibration Thresholds will not be permitted.

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 Council will seek to minimise the impact on local amenity from the demolition and construction phases of development. Where these phases are likely to cause harm, conditions and planning obligations may be used to minimise the impact

The *"Noise and Vibration Thresholds"* referenced in DP28 for new plant installations are set out in Table E of the Development Policies document, as follows:

Noise Description and Location of Measurement	Period	Time	Noise Level
Noise at 1m 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 1m external to a sensitive façade	Day, evening and night	0000-2400	10dB(A) < L_{A90}
Noise that has distinct bangs and impulses (bangs, clicks, clatters, thumps) at 1m external to a sensitive façade	Day, evening and night	0000-2400	10dB(A) < L_{A90}
Noise at 1 metre external a noise sensitive façade where L_{A90}>60dB	Day, evening and night	0000-2400	55dB L_{Aeq}

Camden's DP document indicates that "noise sensitive" development includes housing, schools and hospitals as well as offices, workshops and open spaces. As such the criteria above will need to be achieved at 1m from the façade of adjoining dwellings, offices, workshops and/or buildings in educational use.

4 ENVIRONMENTAL NOISE SURVEY

Environmental noise surveys of the site have been undertaken to determine typical prevailing background noise levels in the vicinity of the site.

It is understood that the Whittington House will principally operate between 07.00 to 19.00 hours, with some limited overnight occupation. The noise surveys therefore comprised a series of three fully attended noise monitoring periods (06.00 to 08.00 hours, 18.00 to 20.00 hours and 01.00 to 04.00 hours) to cover operational times when background noise levels were likely to be lowest.

4.1 Noise Measurement Location

Noise measurements were monitored at the following measurement locations:

Position A: At 1m from the façade of no. 13 Alfred Place. The sound level meter was positioned approximately 1.5m above ground level.

Position B: On the pavement outside 17 Alfred Place. The sound level meter was positioned approximately 3m from the building façade and 1.5m above ground level.

Position B: On the pavement outside 9 Chenies Street (Flats 1-36). The sound level meter was positioned approximately 2m from the building façade and 1.5m above ground level.

Position D: On the pavement in Ridgmount Street. The sound level meter was positioned approximately 1m from the building façade and 1.5m above ground level.

The approximate locations of the measurement positions are shown on **Figure 2** attached at **Appendix B**.

4.2 Instrumentation

The following instrumentation was used for the noise survey:

Brüel and Kjær Precision Grade Sound Level Analyser	Type 2236
Brüel and Kjær ½" Condenser Microphone	Type 4188
Brüel and Kjær Sound Level Calibrator	Type 4231
Microphone Windshield	

The calibration of the sound level analyser was checked prior to each survey period and the calibration was checked upon completion. No drift was found to have occurred.

4.3 Noise Survey Procedure

Noise measurements of the L_{A90}, L_{Aeq} and $L_{Amax,fast}$ sound levels were measured over a notional sequential 5 minute sample period.

Please refer to **Appendix C** for an explanation of the acoustic terminology used above.

4.4 Noise Survey Results

Noise levels are presented in **Tables 1** to **4** attached at **Appendix D**.

4.5 Weather Conditions

Weather conditions during the survey were fine and with light variable winds.

4.6 Discussion of Results

Noise levels at all measurement locations were influenced by distant and local road traffic and plant noise emissions from plant.

The highest noise levels were measured in the vicinity of Alfred Place (Position A and B), which appeared to be most particularly influenced by plant noise emission emanating from the direction of Store Street.

Lower noise levels were generally measured at Position C.

The lowest background noise levels were measured at Position D, given this location greater screening to adjoining major thoroughfares.

5 ACOUSTIC DESIGN TARGETS

5.1 Local Authority Requirements

As noted above, the London Borough of Camden require that noise emissions from proposed plant to adjoining noise sensitive properties will need to be controlled to a level 5dB(A) below the minimum measured background noise level during the proposed operational hours of the plant, as measured at 1m from the nearest window of adjoining properties.

5.2 "Minimum" Background Noise Levels

The minimum background noise levels measured during "normal" office hours (07.00 and 19.00) and "extended" office hours (19.00 to 07.00 hours) measured during the environmental noise survey at each location are summarised in the **Table 5** below:

Table 5: Minimum Measured Background Noise Levels

Measurement Location	Minimum Measured Background Noise Level, $L_{A90,15mins}$ dB	
	"Normal" Office Hours (07.00 – 19.00 hours)	**"Extended" Office Hours** (19.00 to 07.00 hours)
Position A	55	52
Position B	53	49
Position C	52	45
Position D	48	43

5.3 Environmental Acoustic Design Targets

Based on the above minimum measured background noise levels, the Local Authority's requirements will require that mechanical services installations are designed in accordance with the following acoustic design targets:

Table 6: Proposed Environmental Acoustic Design Targets

Location of Noise Sensitive Receptors	Minimum Measured Background Noise Level, $L_{A90,15mins}$ dB	
	"Normal" Office Hours (07.00 – 19.00 hours)	**"Extended" Office Hours** (19.00 to 07.00 hours)
Alfred Place (Southern End)	50	47
Alfred Place (Northern End)	48	44
Chenies Street	47	40
Ridgmount Street/ Ridgmount Mews/Rossetti Court	43	38

The above targets are to be achieved at a distance of 1m from the nearest window of any adjoining noise sensitive property with all plant operating normally.

6 PROPOSED PLANT

The proposed plant is to include:

- 7 no. condenser units, to be installed at first floor roof level;
- 1 no. new air handling unit to be mounted externally at 7th floor level;
- 3 no. condenser units to be mounted at 7th floor level.

The proposed disposition of plant is shown on the drawings prepared by Tate Hindle Architects which accompany the application.

Manufacturer's noise data for all plant is summarised on **Plant Noise Schedule 4271/PN1** attached at **Appendix E**.

The VRF units serving the residential areas are able to operate in a "Night Quiet Mode" and it is assumed that this will be configured for the out of hours operation of the units to achieve at least an 8dB(A) reduction in unit noise level. Manufacturer's data setting out the noise reduction achievable through the use of the night quiet mode is attached at **Appendix F**.

It is proposed that a 2.25m high acoustic screen is erected to the south of each bank of condenser units on the first floor, as shown on Tate Hindle Architects drawings accompanying the application. The proposed screen is to be a sandwich panel construction comprising a solid steel outer skin to one side, perforated steel panel to the other and acoustic insulation, orientated with the acoustically absorptive face of the screen facing onto the plant to minimise reflected noise.

The air handling unit will have attenuators installed on the atmospheric side of the unit, with insertion loss performances as summarised below:

	Static Insertion Loss, dB							
System	63	125	250	500	1k	2k	4k	8k
Fresh Air Intake	8	13	22	31	43	36	27	18
Exhaust	9	15	21	29	37	32	25	16

6 PLANT NOISE ASSESSMENT

The nearest windows to the proposed plant are windows in the northern elevation of Rossetti Court, as shown on **Photograph 1** below, which are estimated to be approximately 10-11m from the closest plant (condenser units AC/6/1 to AC/6/5):

Photograph 1: 1st Floor Roof Area Looking Towards Rossetti Court

Calculations have been undertaken to assess environmental noise emissions from the proposed plant in general accordance with the procedures of ISO 9613-3: 1996, with appropriate allowances made for plant directivity and propagation attenuation, etc. Calculated noise levels incident on the nearest windows of Rossetti Court are summarised below:

Plant	Predicted Noise Level, dB(A)
Condenser Unit AC/B/1	25
Condenser Unit AC/B/2	25
Condenser Unit AC/6/1	37
Condenser Unit AC/6/2	34
Condenser Units AC/6/3	30
Condenser Unit AC/6/4	37

Condenser Unit AC/6/5	37
7th Floor Condenser Units	34
AHU Fresh Air Intake	7
AHU Exhaust	20
TOTAL SOUND LEVEL	**43**

These calculations confirm that the proposed plant and noise control provisions should control noise emissions in line with the Council's standard noise control policy requirements.

7 CONCLUSIONS

An environmental noise survey has been undertaken in order to establish the prevailing background noise levels at the subject premises.

Based on these data, environmental noise emission design targets have been determined in accordance with the London Borough of Camden's noise control policy requirements.

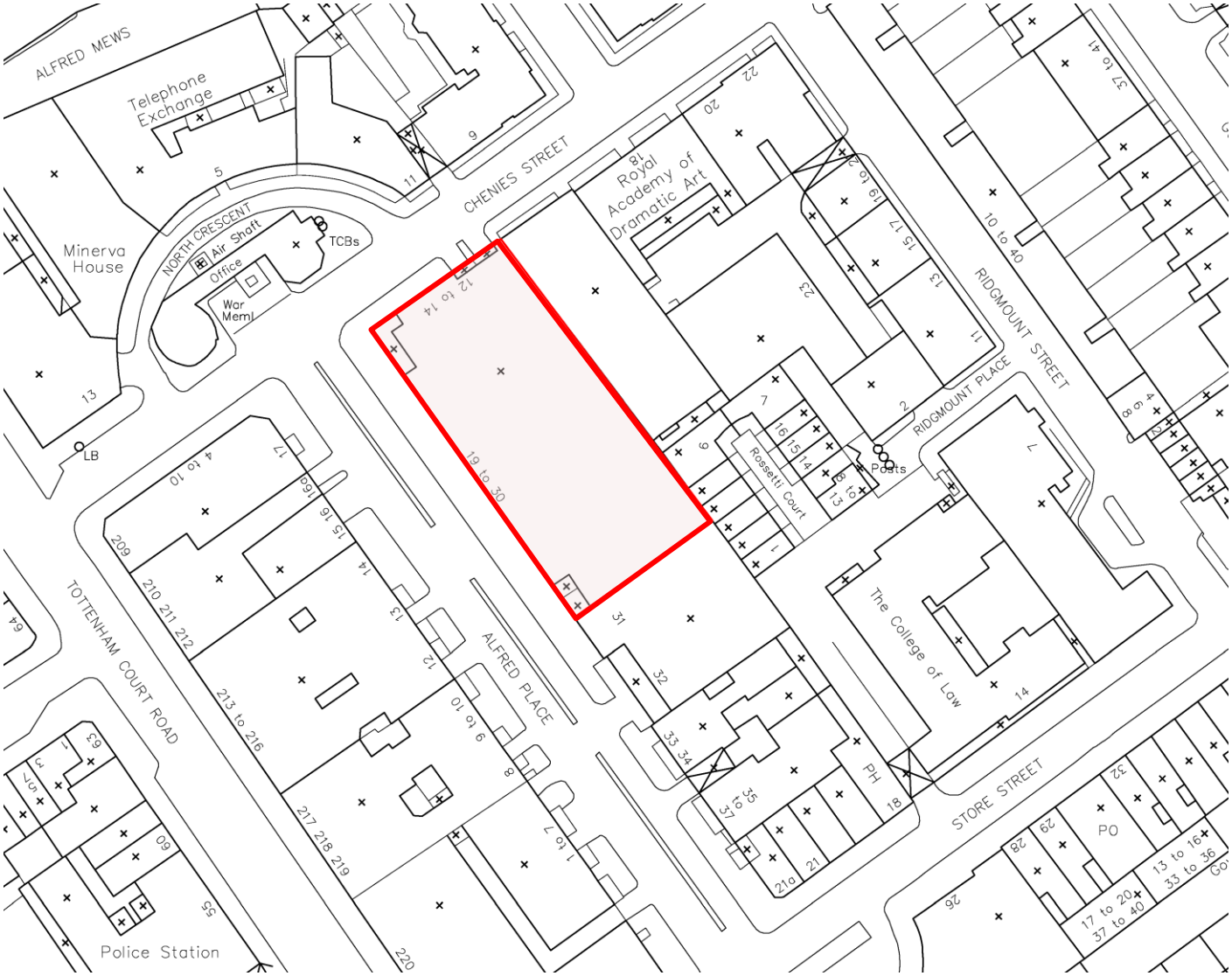
Noise emissions from the proposed plant have been assessed based on manufacturer's noise data and proposed noise hardware (e.g. acoustic screens and attenuators).

It is concluded that noise emissions from the proposed condenser units will be adequately controlled in accordance with the Council's standard noise control policy requirements. The proposed plant installation does not, therefore, raise any significant or other adverse noise impact concerns.

It is therefore concluded that the proposed plant installation complies fully with relevant national and local planning policy (in particular Policy CS5 of the Borough's adopted *"Core Strategy"* and Policies DP26 and DP28 of the *"Camden Development Policies 2010-2025"*).

PAUL GRAY BSc(Hons), MIOA
THE EQUUS PARTNERSHIP LTD

APPENDIX A



THE EQUUS PARTNERSHIP
Member of the Association of Noise Consultants
CONSULTANTS IN ACOUSTICS

WHITTINGTON HOUSE
ALFRED PLACE, LONDON WC1

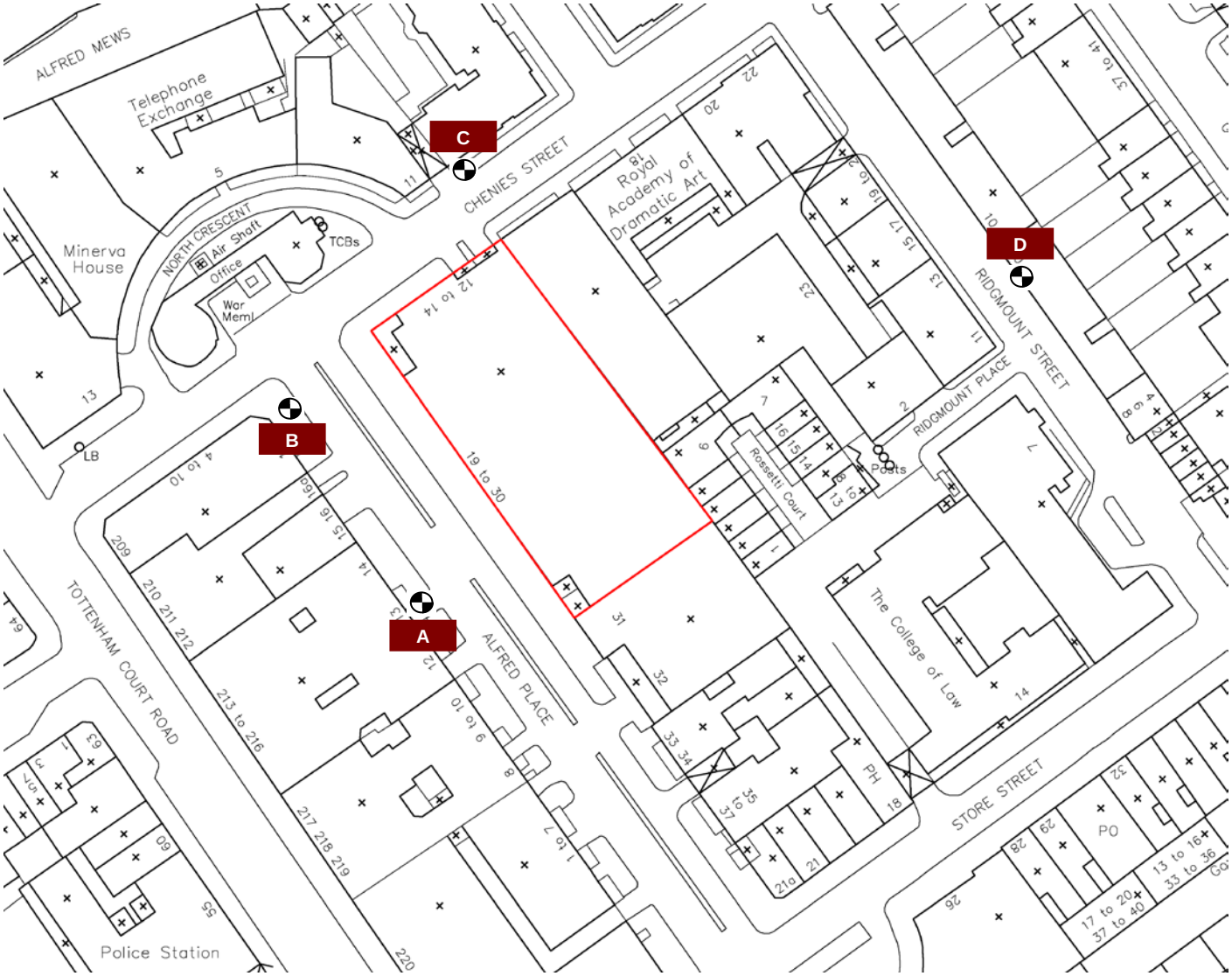
Site Location Plan

Date: July 2015

Scale: NTS

Drawing Ref: Figure 1

APPENDIX B



THE EQUUS PARTNERSHIP
Member of the Association of Noise Consultants
CONSULTANTS IN ACOUSTICS

-- Noise Monitoring Location

WHITTINGTON HOUSE
ALFRED PLACE, LONDON WC1

Site Plan Showing Approximate Locations of Noise Monitoring Positions

Date: July 2015

Scale: NTS

Drawing Ref: Figure 2

APPENDIX C

GLOSSARY OF ACOUSTIC TERMINOLOGY

THE EQUUS PARTNERSHIP
Member of the Association of Noise Consultants
CONSULTANTS IN ACOUSTICS

General

A vibrating surface or turbulent fluid flow will cause pressure fluctuations in the surrounding air. These pressure fluctuations are perceived by the human ear as "sound".

Measurement Units

The human ear can detect sound pressures as low as about 20 µPa, and can tolerate (for short periods) sound pressures as high as 200 Pa, an amplitude range of 10 million times. To take account of this huge amplitude range, sound pressure levels (often written in "acoustic shorthand" as SPL or Lp) are quantified using a logarithmic scale, the decibel (dB) scale. This is based on a reference pressure of 20µPa, thus a sound pressure of 20µPa would equate to 0dB and a pressure of 200Pa would equate to 140dB.

Frequency (Pitch) Characteristics

The sound received at any particular location is not solely influenced by the sound pressure level, the frequency characteristics (pitch) of the noise is also an important factor. Noise audible to a human (with "normal" hearing), typically covers the frequency range 20 Hertz to 20,000 Hertz. Hertz (Hz) are defined as the number of times the sound pressure fluctuates in one second. "Low" pitched sounds fluctuate less times per second than "high" pitched sounds. Whilst humans are capable of detecting a wide range of frequencies, the ear is not equally sensitive to all frequencies – the ear is most sensitive at frequencies towards the middle of the audible range and less sensitive to the lower and higher frequencies.

To take account of this frequency response, sound pressure fluctuations are normally quantified by applying a frequency-weighting network or filter which simulates the frequency response of the ear. In essence, this means that more significance is given to the frequencies at which the ear is most sensitive and less significance to those at which the ear is less sensitive. Noise measurements relating to human reaction are generally made using an "A-weighting" network. These measurements are reported as A-weighted decibels or dB(A). The A-weighted sound pressure level is written in "acoustic shorthand" as L_A.

Variation of Sound with Time

It will be appreciated that the sound pressure level of most noise sources will fluctuate with time. In order to take account of the way in which the human ear perceives noise, it is normal for the sound pressure level to be quantified using a time weighting network, to mimic the speed of response of the human ear. The standardised setting for most types of noise is a "Fast" time weighting.

The manner in which sound fluctuates with time can also influence the subjective manner in which noise is perceived. Noise can be continuous (showing no significant variation with time as in the case of a fan), intermittent (i.e. the noise is transient in it's nature, such as a train pass-by) or impulsive (i.e. there is a sudden build up of noise - this can range from "clanking" types sounds as might be experienced next to railway goods yard or a high energy discharge such as an explosion)

Measurement of Sound

Sound pressure levels are measured using equipment comprising a pressure-sensitive microphone, associated amplifier, frequency weighting network, time weighted network and output indicator. In its simplest form this is a small hand-held instrument called a sound level meter. More sophisticated instrumentation (a sound level analyser) is also available which allows the real-time output of the frequency characteristics of the sound to be quantified.

Comparison of Sound Levels

To put the significance of noise measurement into context, the following Table presents the A-weighted sound pressure level of some typical sources:

Sound Pressure Level, dB(A)	Typical Noise Source . Activity
160	Saturn Rocket Taking Off
140	Military Jet Taking Off at 30m
100	Nightclub
90	Heavy goods vehicle driving past at 7m
80	Busy urban road
70	Domestic vacuum cleaner at 3m
60	Busy office environment
55	Normal speech at 1m
40	Whispered conversation at 2m
30	Bedroom at night (BS 8233: 1999)
20	Remote country location
0	Threshold of hearing – a very eery silence

Addition of Sound Levels

It is important to note that the use of a logarithmic scale to describe noise does not allow normal arithmetic addition. This means that two noise sources each generating a level of, say, 60dB(A) will not generate a combined sourd level of 120dB(A). The values must be added logarithmically, which would actually yield a combined sound level of 63dB(A) in this example.

Subjective Perception of Sound Levels Changes

With regard to the human perception of sound level changes, the human ear:

- Cannot generally perceive a sound level difference of less than 3dB(A)
- Will perceive a sound level difference of 4-5dB(A) as "noticeable"
- Will perceive a sound level difference of 10dB(A) as a doubling (or halving) of loudness.

GLOSSARY OF ACOUSTIC TERMINOLOGY

THE EQUUS PARTNERSHIP
Member of the Association of Noise Consultants
CONSULTANTS IN ACOUSTICS

Acoustic Terminology

As stated previously, most sources of noise will fluctuate with time. In order to characterize such noise, it is therefore normal to represent the noise climate using a variety of noise parameters and statistical indices. The most commonly adopted noise parameters are described below:

$L_{Aeq,T}$ This is the equivalent continuous A-weighted sound level measured over a specified time period "T". This is the notional continuous sound level which, over the time T, contains the same amount of energy as the actual fluctuating sound being measured. This parameter is widely accepted as being the most appropriate noise descriptor for most environmental noise and the effects of noise on humans.

$L_{Amax,fast}$ This is maximum A-weighted sound pressure measured with a fast frequency response recorded during the stated measurement period. It is typically used to characterise the highest sound level caused during a noise event.

$L_{A90,T}$ This is the A-weighted sound pressure level exceeded for 90% of the specified time period "T". It is normally used to describe the underlying background noise level of an environment since it inherently excludes the effects of transient noise sources.

Noise Rating (NR) Level

When describing noise from building services installations, it is common to express noise levels in terms of a Noise Rating (NR) Level. The NR level is determined by plotting the measured frequency spectrum of a noise against a series of reference curves, which roughly approximate to equal loudness values. This method permits higher sound levels at low frequencies corresponding to the sensitivity of the human ear. The NR level is defined as the value of the highest curve "touched" by the plotted frequency spectrum. For typical sources of building services noise, the overall A-weighted sound level is numerically around 5-6dB higher than the NR level of the noise.

α_w The "**Weighted Absorption Coefficient**" (α_w) is a single figure measure of the overall sound absorption capabilities of a building element determined in accordance with BS EN ISO 11654: 1997.

APPENDIX D

TABLE 1:
Results of Attended Noise Measurements – Position A (Alfred Street)

Time	Measured Sound Level, dB		
	$L_{A90,5mins}$	$L_{Aeq,5mins}$	$L_{Amax,fast}$
06.00 – 07.00	52	57	71
07.00 – 08.00	55	59	73
18.00 – 19.00	55	61	75
19.00 – 20.00	55	60	78
01.00 – 02.00	52	55	71
02.00 – 03.00	52	54	68
03.00 – 04.00	52	55	68

TABLE 2:
Results of Attended Noise Measurements – Position B (Corner Alfred Street/Chenies Street)

Time	Measured Sound Level, dB		
	$L_{A90,5mins}$	$L_{Aeq,5mins}$	$L_{Amax,fast}$
06.00 – 07.00	51	56	73
07.00 – 08.00	53	58	71
18.00 – 19.00	53	59	73
19.00 – 20.00	53	58	75
01.00 – 02.00	51	55	72
02.00 – 03.00	50	53	58
03.00 – 04.00	49	57	76

TABLE 3:
Results of Attended Noise Measurements – Position C (Chenies Street)

Time	Measured Sound Level, dB		
	$L_{A90,5mins}$	$L_{Aeq,5mins}$	$L_{Amax,fast}$
06.00 – 07.00	51	66	79
07.00 – 08.00	52	65	74
18.00 – 19.00	53	66	81
19.00 – 20.00	52	66	79
01.00 – 02.00	47	64	74
02.00 – 03.00	46	63	77
03.00 – 04.00	45	54	73

TABLE 4:
Results of Attended Noise Measurements – Position D (Ridgmount Street)

Time	Measured Sound Level, dB		
	$L_{A90,5mins}$	$L_{Aeq,5mins}$	$L_{Amax,fast}$
06.00 – 07.00	47	57	75
07.00 – 08.00	48	58	77
18.00 – 19.00	48	64	78
19.00 – 20.00	48	62	85
01.00 – 02.00	44	63	85
02.00 – 03.00	43	60	81
03.00 – 04.00	44	64	88

APPENDIX E

SCHEDULE: 4271/PN1

SHEET NO. 1 OF 1

DATE: July 2015

WHITTINGTON HOUSE, 19-30 ALFRED PLACE, LONDON WC1

PLANT NOISE SCHEDULE

THE EQUUS PARTNERSHIP
Member of the Association of Noise Consultants
CONSULTANTS IN ACOUSTICS

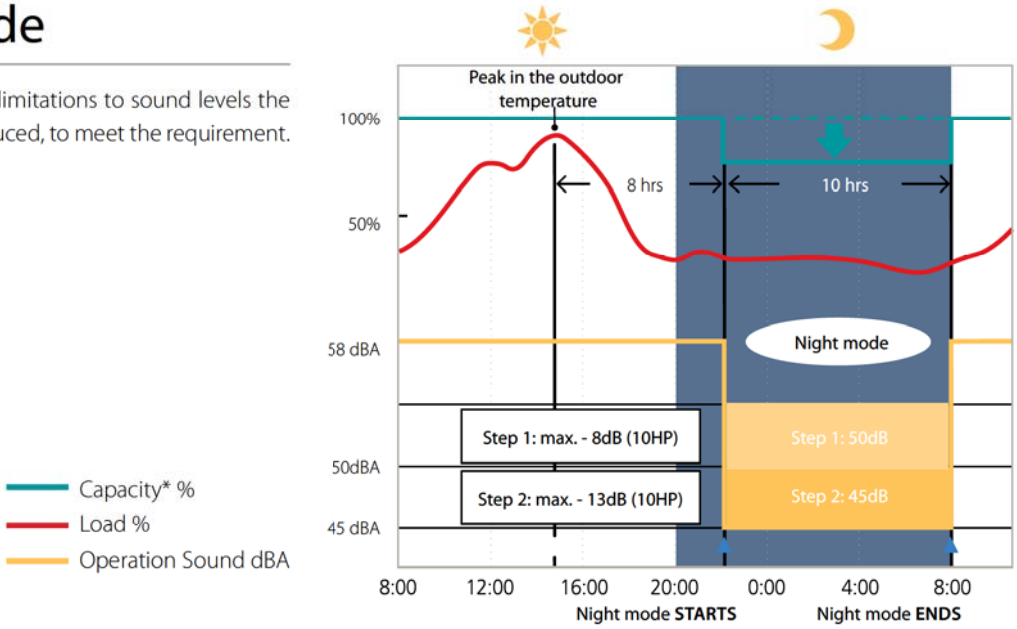
Plant Ref.	Manufacturer/Model	Location	m3/s	Pa.	Lw / Lp	Octave Band Centre Frequency, Hz							
						63	125	250	500	1k	2k	4k	8k
AHU	Flakt-Woods 23(08-05)	7th Floor Roof	3.550	300	(M) Intake Lw	63	70	76	68	65	59	53	50
			2.350	240	(M) Discharge Lw	64	80	77	78	75	71	67	64
Condenser AC/B/1	Daikin REYQ18T	1st Floor Roof	--	--	(M) Lp @ 1m	66	65	66	64	59	55	50	44
Condenser AC/B/2	Daiking REYQ18T	1st Floor Roof	--	--	(M) Lp @ 1m	66	65	66	64	59	55	50	44
Condenser AC/6/1	Daikin REYQ18T	1st Floor Roof	--	--	(M) Lp @ 1m	66	65	66	64	59	55	50	44
Condenser AC/6/2	Daikin REYQ12T	1st Floor Roof	--	--	(M) Lp @ 1m	54	65	60	62	54	49	44	35
Condenser AC/6/3	Daikin REYQ10T	1st Floor Roof	--	--	(M) Lp @ 1m	62	65	56	57	51	48	40	35
Condenser AC/6/4	Daikin REYQ18T	1st Floor Roof	--	--	(M) Lp @ 1m	66	65	66	64	59	55	50	44
Condenser AC/6/5	Daikin REYQ18T	1st Floor Roof	--	--	(M) Lp @ 1m	66	65	66	64	59	55	50	44
7th Floor Condensers (3 no.)	Airedale CR30	7th Floor Roof	--	--	(M) Lp @ 10m	50	61	44	42	43	40	35	30

Lw = Sound Power Level (dB. re. 1 pico Watt).
Lp = Sound Pressure Level (dB. re. 20 micro Pascals).
(M) = Manufacturers Noise Data (E) = Empirical Noise Data

APPENDIX F

Night quiet mode

For areas where there are stringent limitations to sound levels the outdoor unit sound level can be reduced, to meet the requirement.



Example for VRV IV heat pump, factory setting.

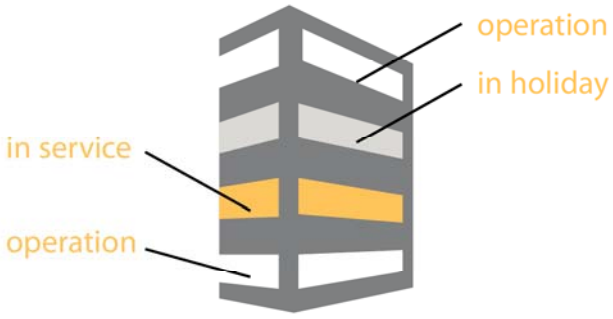
Indoor installation

The VRV optimised fan blade shape increases output and reduces pressure loss. Together with the high ESP setting (up to 78pa), it makes VRV outdoor units ideal for indoor installation using ducts.

Indoor installation leads to less piping length, lower installation costs, increased efficiency and better visual aesthetics.

Multiple tenants, one outdoor unit

The multi tenant function ensures that the entire VRV system does not shut down when the main power supply of an indoor is switched off. This means that the indoor unit's main fuse can be turned off when a part of the building is closed, is being serviced, …



No structural reinforcement necessary

Thanks to the vibration-free and sufficient light construction of the outdoor units, floors do not need to be reinforced, reducing the overall cost of the building when compared to a chiller.

max. 398kg for a 20HP unit