

**UCL – HILLEL
HOUSE
LONDON**

**M&E NOISE
IMPACT
ASSESSMENT
REPORT**

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M&E NOISE IMPACT ASSESSMENT REPORT

AUDIT SHEET

REVISION	DESCRIPTION	DATE	ISSUED BY	REVIEWED BY
1	M&E Noise Impact Assessment Report	02/06/2010	CC	MC

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M&E NOISE IMPACT ASSESSMENT REPORT

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1. INTRODUCTION

An acoustic assessment has been undertaken for the proposed installation of new building services plant, which would serve a University College London (UCL) building, Hillel House, at Endsleigh Street in the London Borough of Camden.

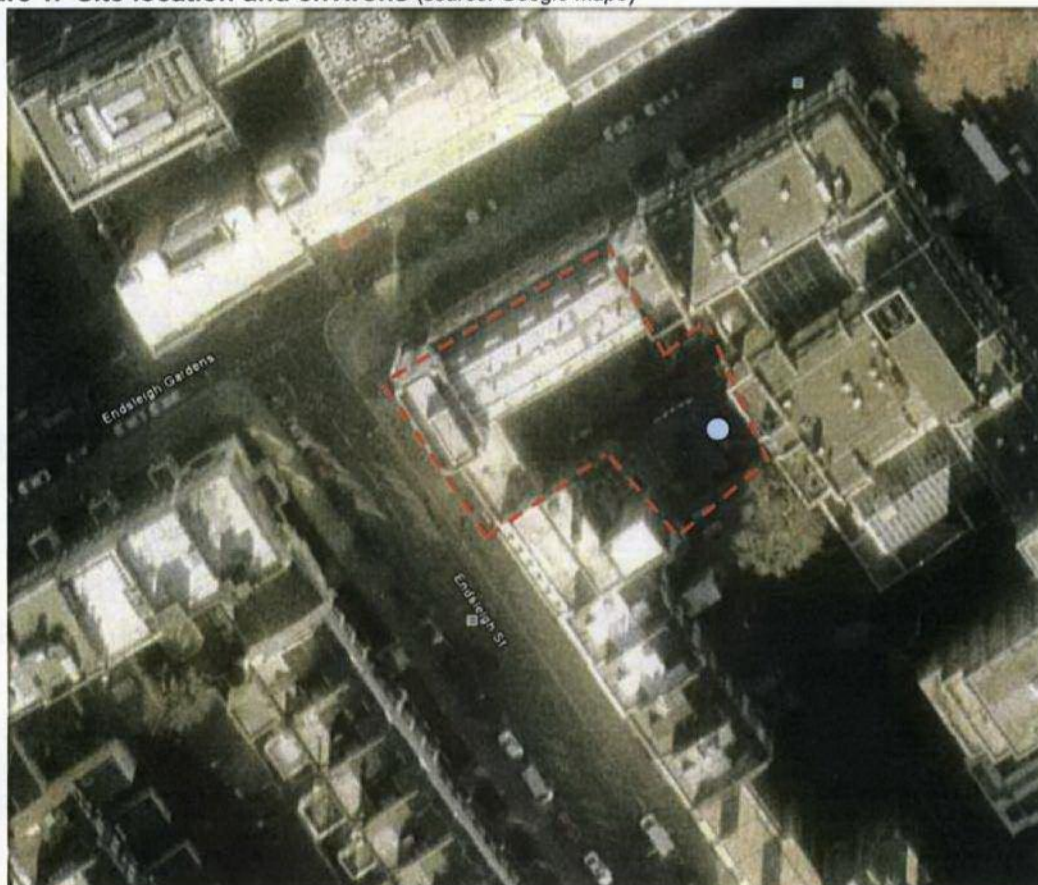
The noise survey forms the basis on which external noise limits for the proposed equipment are defined. Proposed new mechanical plant items are then analysed with regards to likely compliance with these limits. This report contains details of this assessment.

This report is suitable for informing the client, the design team and Local Authority (Planners, Environmental Health) on acoustic strategies regarding the support of the application for planning permission, taking into consideration the London Borough of Camden and UCL requirements.

M&E NOISE IMPACT ASSESSMENT REPORT**2. DESCRIPTION OF SITE AND SURROUNDINGS****2.1 Existing situation**

Figure 1 shows the site location and local environs.

Figure 1. Site location and environs (source: Google Maps)



Notes:

- (blue circles) M&E plant proposed location

The site is bounded by Endsleigh Gardens and Endsleigh Street to north and west, respectively. To the south of the site there are residences and hotel are located to the east and north-east. The areas surrounding the development comprise mainly residential and educational premises. The closest noise-sensitive receptors to the proposed M&E plant location, shown with a blue circle in Figure 1, are the Scandic Crown and Euston Plaza hotels.

2.2 Local noise conditions

Environmental noise levels at the site are dominated mainly by road traffic noise, although the buildings offered some shelter in the light-well area. M&E noise from existing plant was also observed.

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3. BASIS OF ASSESSMENT

3.1 London Borough of Camden Unitary Development Plan

It is understood from the London Borough of Camden Unitary Development Plan (UDP) that it requires under Policy SD8 that planning permission for plant or machinery, including ventilation or air handling equipment, will only be granted if it can be operated without causing a loss to local amenity and complies with the thresholds set out in Table 1.

Table 1. London Borough of Camden standard noise criteria

Noise description and location of measurement	Period	Time
The proposed plant noise ($L_{Aeq,1h}$) when measured at 1 metre external to a sensitive façade should be at least 5dB(A) below the existing background noise in the area (L_{A90})	Day, evening and night	0000 - 2400
If the proposed plant noise has a distinguishable discrete continuous note (whine, hiss, screech, hum), then the proposed plant noise ($L_{Aeq,1h}$) should be at least 10dB(A) below the existing background noise in the area (L_{A90}) when measured at 1 metre external to a sensitive façade.	Day, evening and night	0000 - 2400
If the proposed plant noise has distinct impulses (bangs, clicks, clatters, thumps), then the proposed plant noise ($L_{Aeq,1h}$) should be at least 10dB(A) below the existing background noise in the area (L_{A90}) when measured at 1 metre external to a sensitive façade.	Day, evening and night	0000 - 2400
The proposed plant noise ($L_{Aeq,1h}$) should be lower than 55dB L_{Aeq} when measured at 1 metre external to sensitive façade when the existing background noise in the area (L_{A90}) is higher than 60dB	Day, evening and night	0000 - 2400

As with most Local Authority policies on noise and planning, the London Borough of Camden observes the advice contained on Planning Policy Guidance Note 24 (PPG24). This recommends that where a potential 'new' noise source, which is industrial or commercial in nature, is introduced to a mixed commercial and residential area, the likelihood of noise complaints should be assessed using BS 4142: 1997 "Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas".

The above London Borough of Camden noise emission standards derive from the BS 4142 method in terms of limiting the likelihood of complaints from neighbours. It effectively requires that the rated level of the plant noise (including a tonal/character penalty of 5dB if necessary) is 5 dB below the existing background levels (see Appendix A).

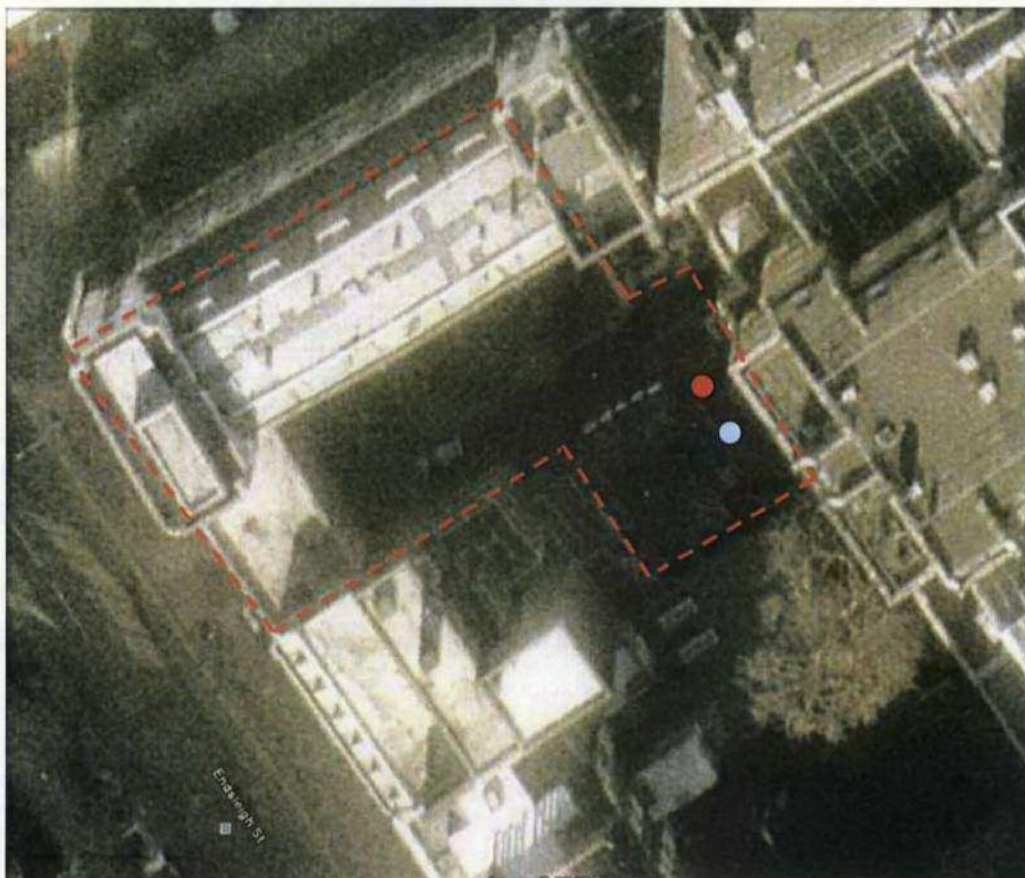
M&E NOISE IMPACT ASSESSMENT REPORT**3.2 UCL Internal Noise Level Criteria**



The UCL Noise Level Criteria recommends a noise rating level of NR25 in seminar rooms and NR35 in offices in order to minimise disturbance to concentration and speech intelligibility. It should be noted that a noise level of NR25 can be assumed to be approximately equivalent to a noise level of 30dB $L_{Aeq,1hour}$.

4. BASELINE NOISE SURVEY**4.1 Survey description**

A survey of the existing ambient noise environment at the proposed development site was carried out from 11:40 on Wednesday 12th May 2010 to 14:40 on Monday 17th May 2010. The survey was undertaken to enable the prevailing noise environment at the site to be determined, and thus enable an assessment of the plant noise design according to the requirements described in section 3.

Figure 2. Survey locations

Notes:

-  (red circle) unattended fixed continuous position
-  (blue circles) M&E plant proposed location

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4.2 Survey results

A noise monitoring system was installed on site at lower ground level as shown in Figure 2. This position was considered the most suitable accessible location to obtain data which would be representative of the typical background noise conditions at the nearest noise sensitive building, the hotel. Practical access constraints were considered, as well as limiting the influence of traffic noise from Endsleigh Street. Measurements were made for 5-minute contiguous intervals over the entire duration with observations made at the start and end of the measurement survey.

Equipment details and full results of the noise monitoring survey are presented in Appendix B. The graph of figure B1 shows the evolution of the measured LA90 levels during the survey. The observed discontinuity in the noise levels is thought to be caused by the operation of existing M&E plant operating during the day-time, from 5:30am approximately. As this plant may be removed as part of refurbishment works, and these levels not be representative of those experienced at the nearby noise-sensitive locations, the periods influenced by plant operation were excluded from the analysis. In particular, the levels measured during early morning hours were used as a *conservative* representation of day-time background noise levels in the area: see Table 2.

Table 2. Measurement Results

Location of measurement	Period	Background noise levels (Typical Lowest L _{A90})
Unattended measurements	Day-time	48 dB (excluding influence of plant)
	Night-time	45 dB

The background noise levels during the measurement period are consistent with expectations of a location in a central London sheltered from road traffic by the surrounding buildings.

The periods when meteorological conditions were wet with cloud cover and occasional showers are not suitable for environmental noise measurements. In accordance with guidance given in BS 4142 these periods have been excluded.

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5. CONTROL OF NOISE EMISSION

Noise emission from the external mechanical plant will need to be controlled to achieve acceptable levels of environmental noise both within the development itself and in the surrounding areas.

5.1 Proposed plant noise rating limits

As described in section 3, the London Borough of Camden noise policy requires that the plant noise rating level emanating from any fixed building services plant should be 5dB below the measured background noise level (L_{A90}) at the nearest noise sensitive residential property.

The L_{A90} levels at the nearest noise-sensitive location are derived following the analysis of section 4.2. Table 3 sets out the derived plant noise emission limits that will need to be referenced in the design and selection of the external equipment, when measured at 1m from the facade of any surrounding residential properties.

In addition, UCL internal noise level criteria requires that noise intrusion in seminar rooms does not exceed 30dB $L_{Aeq,1hour}$. We understand that the postgraduate general study area that overlooks the proposed plant location is air conditioned and therefore that windows are to remain closed. Assuming a 25 dB reduction in noise level by a double-glazed window, it is desirable that plant noise levels outside these seminar/teaching rooms do not exceed 55dB $L_{Aeq,1hour}$.

Table 3. Plant noise limits at 1m from the facade of any surrounding residential properties

Period	Measured background noise levels at noise-sensitive properties	Plant noise rating limit at 1m from residential façade	Plant noise rating limit outside UCL seminar rooms
Day (0700-2300)	48 dB L_{A90}	43 dB $L_{Aeq,1hour}$	55 dB $L_{Aeq,1h}$
Night (2300-0700)	45 dB L_{A90}	40 dB $L_{Aeq,5min}$	n/a

If the noise emitted by the plant has any distinguishing features, such as impulses or a tonal character, a 5dB penalty should be applied by reducing the limits of Table 3 by the same amount.

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5.2 Proposed mechanical services plant

An assessment of the proposed external plant selection has been made, based on a preliminary plant selection, in order to demonstrate the feasibility of compliance with the limits above.

An Air Handling Unit (AHU) with an incorporated DX unit is currently proposed for installation at the approximate location shown in Figure 2, replacing existing units there. Table 4 lists the manufacturer-specified acoustic emission characteristics for the proposed plant unit. Detailed information can also be found in Appendix C.

Table 4. M&E plant noise data

Description	Noise emission characteristics (sound power level)	Distance from nearest hotel façade	Distance from nearest seminar room
Swegon Gold RX AHU	Supply = 77dB(A) Supply Breakout = 62dB(A)	~15m	~3m
	Extract = 87dB(A) Extract Breakout = 63dB(A)		
	Integrated DX unit = 73dB(A)		

The Scandic Crown hotel did not appear to have residential windows directly overlooking the proposed plant location. The closest residential noise-sensitive façade directly facing the plant was that of the Euston Plaza hotel, which is approximately 15m away from the AHU exhaust and fresh air inlet connections.

The preliminary plant selection included noise mitigation measures in the form of integral attenuators for the AHU exhaust and inlet atmosphere connections, providing the following insertion loss:

Frequency (Hz)	63	125	250	500	1k	2k	4k	8k
Insertion loss (dB)	4	6	12	13	13	13	11	9

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5.3 Assessment of the proposed mechanical services plant

We are not aware of the equipment considered producing any tones or operating intermittently so as to attract attention and no penalty was applied in the calculations; the final chosen equipment should be checked so that these acoustic characteristics are not present.

The plant items corresponding predicted sound pressure levels at 1m from the buildings façade based on standard distance calculations are shown in Table 5.

Table 5. Predicted M&E plant noise levels based on preliminary plant selection

Description	Manufacturer & model	Sound Pressure Level at 1m from closest residential property	Sound Pressure Level outside seminar room
Air Handling Unit	Swegon Gold RX AHU	38 dB L_{Aeq}	52 dB L_{Aeq}

The noise level calculations are outlined in more detail in Appendix C. The predicted noise levels of Table 5 comply with the limits set out in Table 3, both for day-time and night-time.

Please note that no allowance for screening attenuation or for directivity effects was taken into account although the AHU exhaust and inlet face away from the hotel façade. Furthermore, although the assessment was made for both day and night-time periods, we understand that the proposed plant is likely to only operate during daytime hours.

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6. SUMMARY

- New plant equipment is proposed to be installed at UCL Hillel House building at Endsleigh Street, London. A noise survey has been undertaken to determine the prevailing noise climate at and around the site and an outline assessment has been carried out of the potential impact with reference to the London Borough of Camden noise policy and UCL internal noise criteria.
- Suitable environmental noise level limits for M&E plant associated with the new equipment have been proposed based upon the measured existing background noise levels. If the noise emitted by the plant has any distinguishing features, such as impulses, a hiss or hum, the criteria should be reduced by 5dB.
- An assessment was made to evaluate the feasibility of compliance with the derived limits, using supplied preliminary plant schedule and manufacturer information. This showed that compliance with the noise limits could be achieved in practice using noise mitigation measures.
- Therefore it is not expected that noise should be a limiting factor for the planning application.

APPENDIX A - GLOSSARY OF ACOUSTICAL TERMS USED

Decibel (dB)

The decibel is the unit used to quantify sound pressure levels. The human ear has an approximately logarithmic response to acoustic pressure over a very large dynamic range (typically 20 micro-Pascal to 100 Pascal). Therefore, a logarithmic scale is used to describe sound pressure levels and also sound intensity and power levels. The logarithms are taken to base 10. Hence an increase of 10 dB in sound pressure level is equivalent to an increase by a factor of 10 in the sound pressure level (measured in Pascal). Subjectively, this increase would correspond to a doubling of the perceived loudness of sound.

Octave and Third Octave Bands

The human ear is sensitive to sound over a range of frequencies between approximately 20 Hz to 20 kHz and is generally more sensitive to medium and high frequencies than to low frequencies within the range. There are many methods of describing the frequency content of a noise. The most common methods split the frequency range into defined bands, in which the mid-frequency is used as the band descriptor and in the case of octave bands is double that of the band lower. For example two adjacent octave bands are 250 Hz and 500 Hz. Third octave bands provide a fine resolution by dividing each octave band into three bands. For example third octave bands would be 160 Hz, 250 Hz, 315 Hz for the same 250 Hz octave band.

A-Weighting

The 'A' weighting is a correction term applied to the frequency range in order to mimic the sensitivity of the human ear to noise. It is generally used to obtain an overall noise level from octave or third octave band frequencies. An 'A' weighted value would be written as dB(A).

Equivalent Continuous Sound Level L_{eq}

The L_{eq} is a parameter defined as the equivalent continuous sound pressure level. Over a defined time period 'T', it is the sound pressure level equivalent to the acoustic energy of the fluctuating sound signal. The $L_{eq,T}$ can be seen to be an "average" sound pressure level over a given time period (although it is not an arithmetic average). Typically the $L_{eq,T}$ will be an 'A' weighted noise level in dB(A). It is commonly used to describe all types of environmental noise sources.

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Background Noise Level L_{90}

The $L_{90,T}$ is a parameter defined as the sound pressure level exceeded for 90% of the measurement period 'T'. It is a statistical parameter and can not be directly combined to other acoustic parameters. It is generally used to describe the prevailing background noise level or underlying noise level.

Rating Level

The specific noise level of the source plus any adjustment for characteristic features of the noise.

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APPENDIX B – DETAILS OF ENVIRONMENTAL NOISE SURVEY

Noise survey undertaken in May 2010:

Details of measurement instrumentation

Background noise survey measurements

Rion - Sound Level Meter: NL-31 sn: 00841830

Rion - Microphone: UC-53A sn: 307209

Rion - Pre-amplifier: NH-21 sn: 12962

The instrument was checked for sensitivity both before and after the survey and found to be within the acceptable tolerance.

Additional Equipment

Brüel and Kjær - Sound Calibrator: 4231 sn: 2445715

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Figure B1. Unattended Noise Measurement Survey Data

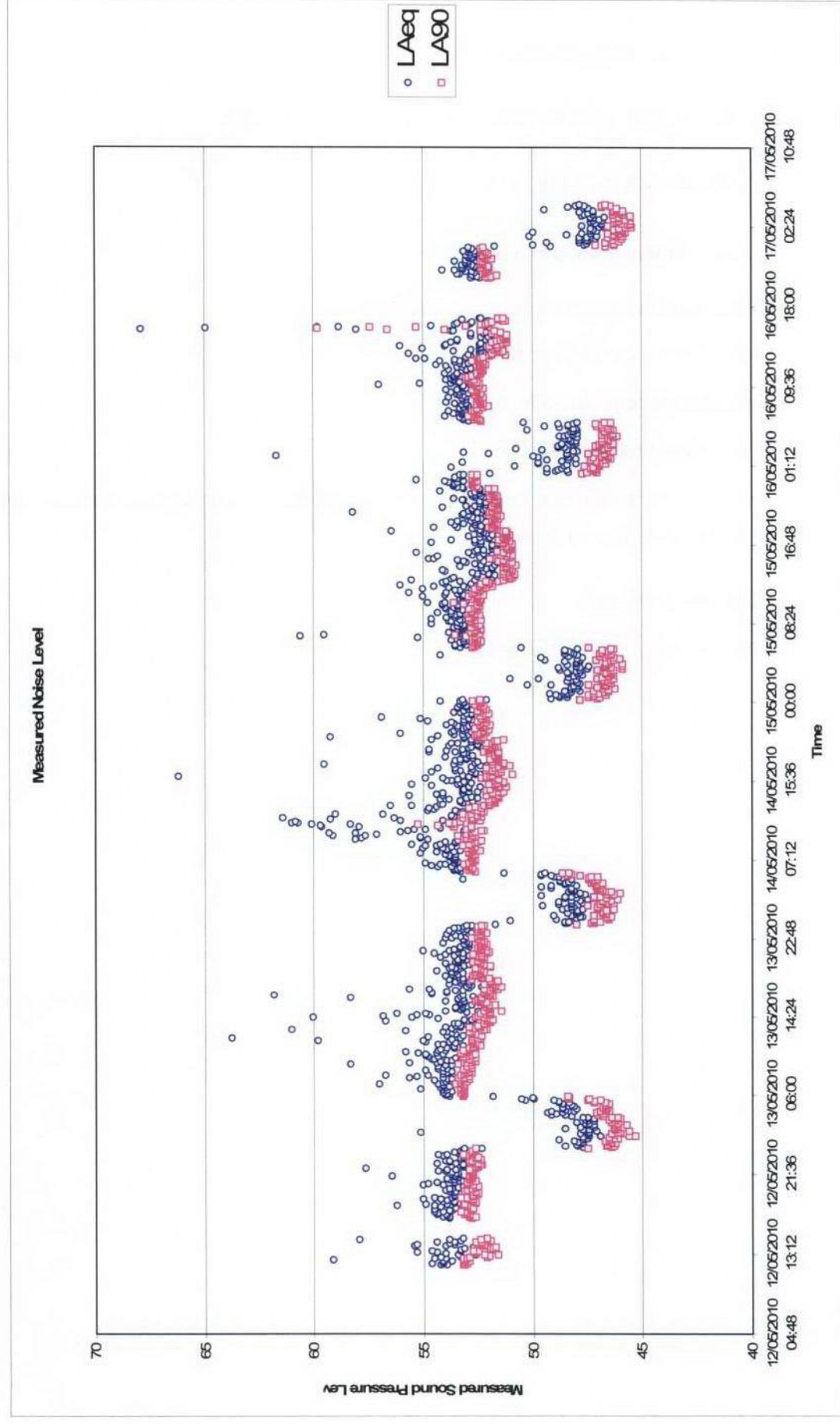
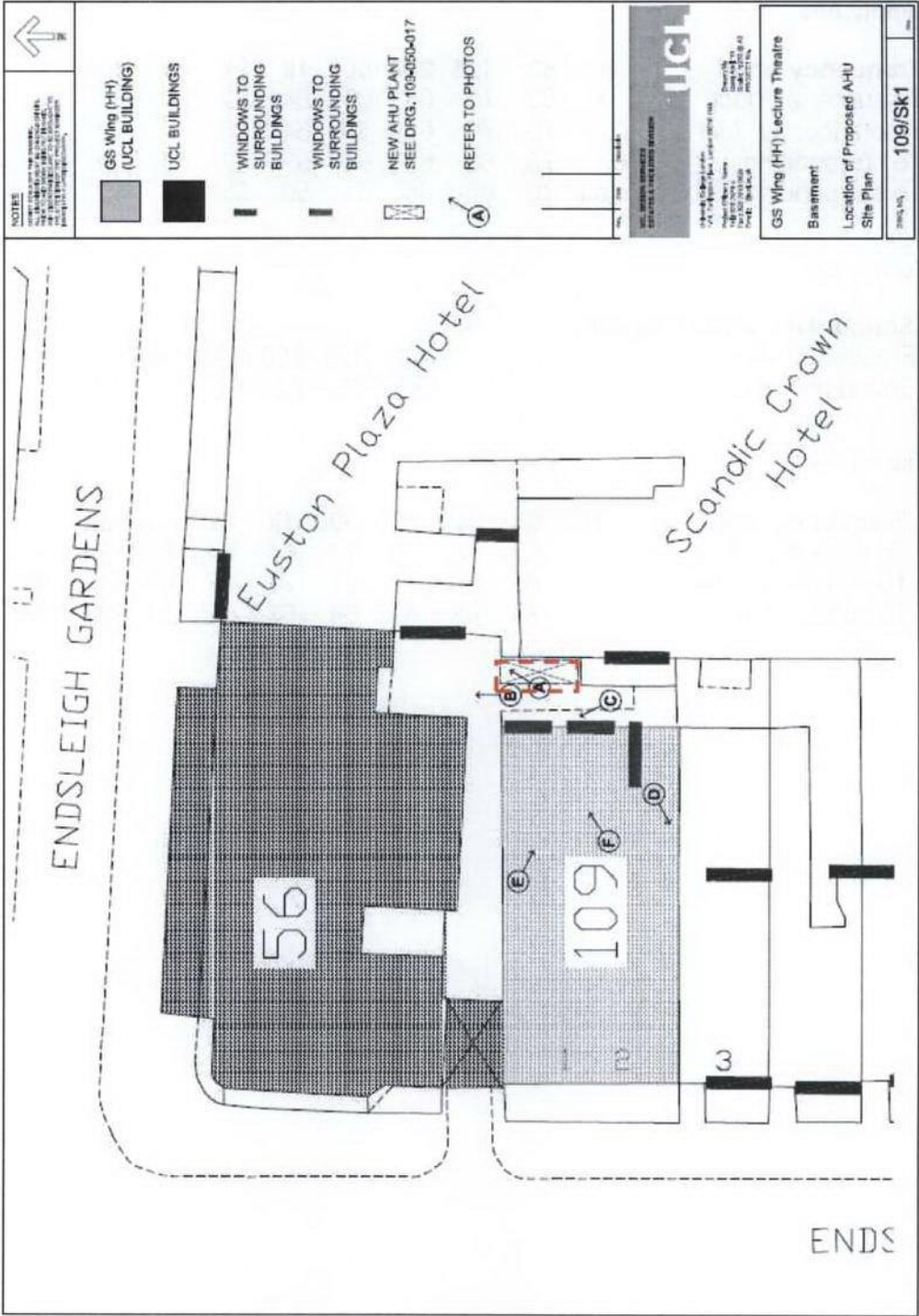


Figure C1. Plant item location



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Swegon Air Handling Unit – Manufacturer-specified acoustic emission data extracted from the Swegon product data sheet.

Supply Air:

Frequency band	Hz	63	125	250	500	1k	2k	4k	8k		All	
To supply air duct		83	76	83	83	84	82	82	67	dB	89	dB(A)
To outdoor air duct		76	71	65	60	54	58	60	62	dB	67	dB(A)
To surroundings		73	63	62	64	53	52	51	39	dB	63	dB(A)
To surroundings incl. exh. air		76	66	65	67	56	55	54	42	dB	66	dB(A)

Cooling Coil:

Sound data, GOLD CoolDX

Frequency band	63	125	250	500	1k	2k	4k	8k	Hz
Sound power level	93	65	72	65	69	57	56	44	dB

Extract Air:

Frequency band	Hz	63	125	250	500	1k	2k	4k	8k		All	
To extract air duct		82	78	78	73	64	64	59	59	dB	74	dB(A)
To exhaust air duct		85	70	72	67	71	67	69	58	dB	75	dB(A)
To surroundings		73	63	62	64	53	52	51	39	dB	63	dB(A)

M&E NOISE IMPACT ASSESSMENT REPORT**Calculation details****At nearest residential façade (hotel):****Supply**

Frequency (Hz)	63	125	250	500	1000	2000	4000	8000	dB(A)
Fan Sound Power Level	76	71	65	60	54	58	60	62	67
DX cooling coil (supply)	93	65	72	65	69	57	56	44	73
Attenuator	4	6	12	13	13	13	11	9	
Screening	0	0	0	0	0	0	0	0	
Distance	15	15	15	15	15	15	15	15	
Sound Pressure Level	58	34	29	22	25	16	19	22	33

Breakout

Frequency (Hz)	63	125	250	500	1000	2000	4000	8000	dB(A)
Sound Power Level	73	63	62	64	53	52	51	39	63
Screening	0	0	0	0	0	0	0	0	
Attenuator	0	0	0	0	0	0	0	0	
Distance	15	15	15	15	15	15	15	15	
Sound Pressure Level	41	31	30	32	21	20	19	7	32

Exhaust

Frequency (Hz)	63	125	250	500	1000	2000	4000	8000	dB(A)
Fan Sound Power Level	85	70	72	67	71	67	69	58	75
screening	0	0	0	0	0	0	0	0	
Attenuator	4	6	12	13	13	13	11	9	
Distance	15	15	15	15	15	15	15	15	
Sound Pressure Level	49	32	28	22	26	22	26	17	32

Exhaust

Frequency (Hz)	63	125	250	500	1000	2000	4000	8000	dB(A)
Sound Power Level	73	63	62	64	53	52	51	39	63
screening	0	0	0	0	0	0	0	0	
Attenuator	0	0	0	0	0	0	0	0	
Distance	15	15	15	15	15	15	15	15	
Sound Pressure Level	41	31	30	32	21	20	19	7	32

AHU – Total A-weighted Lp at nearest residence = 38 dB

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Calculation outside seminar room:

Supply

Frequency (Hz)	63	125	250	500	1000	2000	4000	8000	dB(A)
Fan Sound Power Level	76	71	65	60	54	58	60	62	67
DX cooling coil (supply)	93	65	72	65	69	57	56	44	73
Attenuator	4	6	12	13	13	13	11	9	
screening	0	0	0	0	0	0	0	0	
Distance	3	3	3	3	3	3	3	3	
Sound Pressure Level	72	48	43	36	39	30	33	36	47

Breakout

Frequency (Hz)	63	125	250	500	1000	2000	4000	8000	dB(A)
Sound Power Level	73	63	62	64	53	52	51	39	63
screening	0	0	0	0	0	0	0	0	
Distance	3	3	3	3	3	3	3	3	
Sound Pressure Level	55	45	44	46	35	34	33	21	46

Exhaust

Frequency (Hz)	63	125	250	500	1000	2000	4000	8000	dB(A)
Fan Sound Power Level	85	70	72	67	71	67	69	58	75
screening	0	0	0	0	0	0	0	0	
Attenuator	4	6	12	13	13	13	11	9	
Distance	3	3	3	3	3	3	3	3	
Sound Pressure Level	63	46	42	36	40	36	40	31	46

Break-out

Frequency (Hz)	63	125	250	500	1000	2000	4000	8000	dB(A)
Sound Power Level	73	63	62	64	53	52	51	39	63
screening	0	0	0	0	0	0	0	0	
Attenuator	0	0	0	0	0	0	0	0	
Distance	3	3	3	3	3	3	3	3	
Sound Pressure Level	55	45	44	46	35	34	33	21	46

AHU – Total A-weighted Lp = 52 dB