4-6 BEDFORD PLACE HOTEL

Plant Noise Assessment

Reference: 13417.RP01.PNA.0
Prepared: 14 June 2024
Revision Number: 1

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Revision	Comment	Date	Prepared By	Approved By
0	First issue of report	10 June 2024	Patrick Spiers	Russell Richardson
1	Update of included figures at client request	14 June 2024	Patrick Spiers	Russell Richardson

Terms of contract:

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The recommendations within this report relate to acoustics performance only and will need to be integrated within the overall design by the lead designer to incorporate all other design disciplines such as fire, structural integrity, setting-out, etc. Similarly, any sketches appended to this report illustrate acoustic principles only and will need to be developed into full working drawings by the lead designer to incorporate all other design disciplines.

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1. INTRODUCTION

It is proposed to locate new items of plant at 4-6 Bedford Place, WC1B 5AH. As part of the planning application, London Borough of Camden requires consideration be given to atmospheric noise emissions from the proposed equipment to the nearest noise-sensitive receptors.

RBA Acoustics has been commissioned to undertake measurements of the prevailing noise conditions at the site and to determine the atmospheric noise emission limits in accordance with London Borough of Camden's requirements. This report presents the results of the noise measurements, associated criteria and provides the required assessment.

2. SITE DESCRIPTION

The site is shown in relation to its surroundings in the site plan in Figure 1 (Appendix E).

Bedford Place is a long row of terraced properties, to the south of Russell Square. The site is located at the southern end of the road, near to Bloomsbury Square Gardens. Directly to the north is the Pickwick Hall hotel, and to the south are residential properties. Further to the west is the British Museum and to the east is Southampton Row, along which is a mix of commercial and residential premises. The acoustic environment consists mainly of a general urban ambience, with vehicle traffic from the surrounding streets (especially Southampton Row) clearly audible. Vehicle and pedestrian traffic are also fairly consistent along Bloomsbury Place / Great Russell Street.

3. ENVIRONMENTAL NOISE SURVEY

An environmental noise survey of the site has been previously undertaken by RBA Acoustics (detailed in full in RBA Acoustics report 12365.RP01.PNA.2 dated 10 March 2023). A summary of the lowest L_{A90} and the period averaged L_{Aeq} noise levels measured are summarised in Table 1.

Table 1 – Measured Levels

Measurement Period	Position 1 – Rear 2nd Floor Window	
	Lowest $L_{A90,15min}$ (dB)	L_{Aeq} (dB)
Daytime (07:00 – 23:00)	49	55
Night-time (23:00 – 07:00)	41	51

4. PLANT NOISE CRITERIA

The requirements of London Borough of Camden's Environmental Health Department regarding new building services plant are understood to be as follows.

> *"Where appropriate and within the scope of the document it is expected that British Standard 4142:2014 'Methods for rating and assessing industrial and commercial sound' (BS 4142) will be used. For such cases a 'Rating Level' of 10 dB below background (15dB if tonal components are present) should be considered as the design criterion)."*

In line with the above requirements, we propose items of mechanical services be designed so that noise emissions from the plant do not exceed the following levels when assessed at the nearest noise sensitive location:

Table 2 – Plant Noise Limits at NSRs

Assessment Period	Plant Noise Criteria to be achieved at 1m outside the window of the nearest Noise-Sensitive Receptors (NSR)	
	NSR1 (7 Bedford Place Rear Window)	NSR2 (Grange Clarendon Hotel Front Window)
Daytime (07:00 – 23:00)	39	39
Night-time (23:00 – 07:00)	31	31

It should be noted that the above requirements are applied at the nearest residential adjacencies and alternative criteria should be incorporated if there are also commercial properties affected by the proposed plant installations.

5. PLANT NOISE ASSESSMENT

This assessment has been based on the information provided to RBA Acoustics by Energylab_ and is described in the following sections.

5.1 Proposed Plant Items

The following plant is proposed for the scheme:

Table 3 – Proposed Plant Items

Ref.	Manufacturer/Model/Duty	Plant Type
MVHR 1-4	Systemair Topvex SR25-L-EL5,2	MVHR

5.2 Plant Locations

The proposed units are to be located at roof level, with 3No. units situated within lightwells, and 1No. unit within the northernmost roof space. Fresh Air and Exhaust ductwork terminate upwards for plant located within lightwells, and the at the rear façade for the unit located within the northernmost roof space. The equipment positions are indicated in Figure 2 in Appendix E.

5.3 Plant Noise Levels

Information regarding the noise levels of the proposed plant has been provided by the manufacturer of the unit. The associated plant noise levels are detailed as follows:

Table 4 – Plant Noise Levels

Unit	Parameter	Sound Level (dB) at Octave Band Centre Frequency (Hz)								dBA
		63	125	250	500	1k	2k	4k	8k	
MVHR1-4 (Fresh Air)	In-Duct L_w	71	64	64	51	50	39	30	21	58
MVHR1-4 (Exhaust)	In-Duct L_w	82	74	73	66	64	60	54	47	70
MVHR1-4 (Case Breakout)	In-Duct L_w	60	55	60	48	46	44	34	27	54

Review of the octave band data provides no indication of any tonal characteristics associated with the proposed plant.

5.4 Noise-Sensitive Receptors (NSRs)

Based on observations made on site and discussions with the design team we understand the nearest noise-sensitive receptors to the proposed plant to be as follows:

- *NSR1 – 7 Bedford Place Rear Window*
  This receptor lies adjacent to the site to the north. The rear upper floor window lies approximately 4.5 metres away from the ductwork termination of plant located in the roof space.

- *NSR2 – Grange Clarendon Hotel Front Window*
  This receptor lies across Bedford Place to the west of the site, approximately 19 metres from the proposed plant location.

The receptors are shown in the site plan in Figure 1 in Appendix E.

5.5 Predicted Noise Levels at NSRs

Our calculation method for predicting noise levels from the proposed external plant at the nearest noise-sensitive receptors, based on the information above, is summarised below.

- Source Term SWL
- Distance Attenuation
- Directivity
- Reflections
- Screening

Our calculation method for predicting noise levels from ducted mechanical services to the nearest noise sensitive windows is summarised below.

- Source Term SWL
- In-Duct Losses (Duct Runs, Bends etc.)
- Mitigation – In-Duct Attenuators
- Grille End Reflections
- Distance Attenuation
- Directivity
- Reflections
- Screening

Calculation sheets are attached for further information in Appendix C.

The results of the calculations indicate the following noise levels at the nearest affected residential windows:

Table 5 – Predicted Plant Noise Levels

Operating Period	Noise Level (dB) at NSR1 – 7 Bedford Place Rear Window		Noise Level (dB) at NSR2 – Grange Clarendon Hotel Front Window	
	Prediction	Criterion	Prediction	Criterion
Daytime (07:00 – 23:00)	40	39	30	39
Night-time (23:00 – 07:00)	40	31	30	31

Noise from the proposed plant installations is in exceedance of the Local Authority Criteria.

We therefore recommend the following mitigation measures be included in the design and installation.

6. ACOUSTIC MITIGATION

6.1 In-duct Attenuators

The following atmosphere-side attenuators are required, capable of achieving the following minimum static insertion loss specification:

Table 6 – Minimum Specification for Atmospheric-side Attenuator

Attenuator	Static Insertion Loss (dB) at Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
MVHR4 (Fresh Air)*	2	4	9	15	17	14	10	8
MVHR4 (Exhaust)*	2	4	9	15	17	14	10	8

For costing purposes, we would typically expect a 900mm long, 50% free air in-duct attenuator to provide the required minimum insertion losses. However, suppliers should be required to provide evidence of the insertion loss performance detailed in Table 6.

It is recommended that the ducting to these units is acoustically lagged in order to prevent duct casing breakout noise.

6.2 Predicted Noise Levels at NSRs with Mitigation

With the above mitigation measures included, the resultant predicted noise levels are as follows:

Table 7 – Predicted Plant Noise Levels with Mitigation

Operating Period	Noise Level (dB) at NSR1 – 7 Bedford Place Rear Window		Noise Level (dB) at NSR2 – Grange Clarendon Hotel Front Window	
	Prediction	Criterion	Prediction	Criterion
Daytime (07:00 – 23:00)	31	39	30	39
Night-time (23:00 – 07:00)	31	31	30	31

Noise from the proposed plant with the mitigation measures incorporated is within the Local Authority criteria.

7. VIBRATION CONTROL

In addition to the control of airborne noise transfer, it is also important to consider the transfer of noise as vibration to adjacent properties (as well as to any sensitive areas of the same building).

We would typically advise that MVHR units be isolated from the supporting structure by means of either steel spring isolators or rubber footings. For particularly sensitive locations, or when on lightweight structures the mounts should ideally be caged and be of the restrained type.

It is important the isolation is not "short-circuited" by associated pipework or conduits. To this end, any conduits should be looped, and flexible connectors should be introduced between the condenser and any associated pipework. Pipework should be supported by brackets containing neoprene inserts.

8. CONCLUSION

RBA Acoustics have undertaken noise monitoring at London Borough of Camden. The measured noise levels are presented within this report. The resultant noise levels have been used to determine the required criteria for atmospheric noise emissions from the proposed plant installations.

The following mitigation measures are proposed within this report:

- Atmosphere-side attenuators capable of achieving the minimum static insertion losses described in Table 6 should be fitted to MVHR4.

Provided the above mitigation measures are included in the design and installation, the results of the assessment indicate atmospheric noise emissions from the proposed plant are within the criteria required by London Borough of Camden and, as such, can be considered acceptable in terms of noise.

Appendix A - Acoustic Terminology

A-weighting (e.g. dB(A))	A correction applied across the frequency bands to take into account the response of the human ear, and therefore considered to be more representative of the sound levels people hear.
DeciBel (dB)	Unit used for many different acoustic parameters. It is the logarithmic ratio of the level being assessed to a standard reference level.
L_{eq}	The level of a notional steady sound which, over a stated period of time, *T*, would have the same acoustic energy as the fluctuating noise measured over that period. Typically used to represent the average or ambient noise level.
$L_{Aeq,T}$	The A-weighted level of a notional steady sound which, over a stated period of time, *T*, would have the same acoustic energy as the fluctuating noise measured over that period. Typically used to represent the average or ambient noise level.
L_{An} (e.g. L_{A10}, L_{A90})	The sound level exceeded for n% of the time. E.g. L_{A10} is the A-weighted level exceeded for 10% of the time and as such can be used to represent a typical maximum level. Similarly, L_{A90} is the level exceeded for 90% of the measurement period, and is often used to describe the underlying background noise.
NR	Noise Rating – A single figure term to describe a measured noise level which considers the frequency content of the noise, generally used for internal noise level measurements (particularly mechanical services plant).

Appendix B - Instrumentation

The following equipment was used for the measurements.

Table B1– Equipment Calibration Details*

Manufacturer	Model Type	Serial No.	Calibration	
			Certificate No.	Expiry Date
Norsonic Type 1 Sound Level Meter	Nor140	1407794	4712332270	9 December 2023*
Norsonic Pre Amplifier	1209	23229		
Norsonic ½" Microphone	1225	468970		3 December 2023*
Norsonic Sound Calibrator	1255	125525795	Cal 022-2021-14778	8 December 2023*

** Table presents calibration details of the equipment for the time of environmental noise survey. Equipment has since been calibrated in accordance with its schedule, and the new certification can be provided if necessary.*

Appendix C - Plant Calculations

Table C1 - Example Calculation – MVHR1 (Fresh Air) to NSR1

Parameter	Octave-band Noise Levels (dB) at Octave-band Centre Frequency (Hz)								dBA
	63	125	250	500	1000	2000	4000	8000	
L_w	**71**	**64**	**64**	**51**	**50**	**39**	**30**	**21**	**58**
Duct Losses	-1	-1	-1	-2	-2	-3	-3	-3	-
Grille End Reflections	-13	-8	-4	-1	0	0	0	0	-
Directivity losses	0	0	0	0	0	-4	-7	-7	-
Spherical Radiation	-11	-11	-11	-11	-11	-11	-11	-11	-
Reflections	+5	+5	+5	+5	+5	+5	+5	+5	
Distance losses at 27m	-29	-29	-29	-29	-29	-29	-29	-29	-
Screening losses	0	-8	-9	-12	-15	-18	-20	-20	-
Noise level at receiver	**23**	**13**	**15**	**2**	**0**	**0**	**0**	**0**	**10**

Table C2 - Summary Noise Levels

Unit	Received noise level (dB) at 1m from NSR1	Received noise level (dB) at 1m from NSR2
MVHR1 (Fresh Air)	25	28
MVHR1 (Exhaust)	10	12
MVHR1 (Case Breakout)	8	8
MVHR2 (Fresh Air)	19	17
MVHR2 (Exhaust)	14	12
MVHR2 (Case Breakout)	14	13
MVHR3 (Fresh Air)	24	24
MVHR3 (Exhaust)	18	15
MVHR3 (Case Breakout)	11	12
MVHR4 (Fresh Air)	28	7
MVHR4 (Exhaust)	18	7
MVHR4 (Case Breakout)	8	7
Total Received Level	**31**	**30**

Appendix D - CDM Considerations

The Likelihood (**L**) the harm will occur can be assessed by applying an indicative score (from 1 to 5) as follows:

1 – Remote (almost never)
2 – Unlikely (occurs rarely)
3 – Possible (could occur, but uncommon)
4 – Likely (recurrent but not frequent)
5 – Very likely (occurs frequently)

The Severity of harm (**S**) can be assessed by applying an indicative score (from 1 to 5) as follows:

1 – Trivial (e.g. discomfort, slight bruising, self-help recovery)
2 – Minor (e.g. small cut, abrasion, basic first aid need)
3 – Moderate (e.g. strain, sprain, incapacitation for more than 3 days)
4 – Serious (e.g. fracture, hospitalisation for more than 24 hours, incapacitation for more than 4 weeks)
5 – Fatal (single or multiple)

The rating value is obtained by multiplying the two scores and is then used to determine the course of action.

Table D1- Risk Ratings

Rating Bands (Likelihood x Severity)		
Low Risk (1 – 8)	Medium Risk (9 -12)	High Risk (15 – 25)
May be ignored but ensure controls remain effective	Continue, but implement additional reasonable practicable controls where possible	Avoidance action is required; therefore alternative design solutions must be examined. Activity must not proceed until risks are reduced to a low or medium level

The following hazards pertinent to our design input have been identified and control measures suggested:

Table D2 – Risk Assessment

Hazard	Risk Of	At Risk	Rating			Control Measures	Controlled		
			L	S	R		L	S	R
Vibration Isolators	Injury to hands	Contractors	3	3	9	Care needs to be taken during adjustment. Follow manufacturers guidance	1	3	3
Attenuators/ Acoustic Lagging	Strain of neck, limbs or back.	Contractors	3	4	12	Provide sufficient manpower/ lifting gear	1	4	4
Attenuators/ Acoustic Lagging	Skin & respiratory irritation	Contractors	4	3	12	Wear gloves and mask	1	3	3

L: Likelihood S: Severity R: Rating

Appendix E - Site Plans

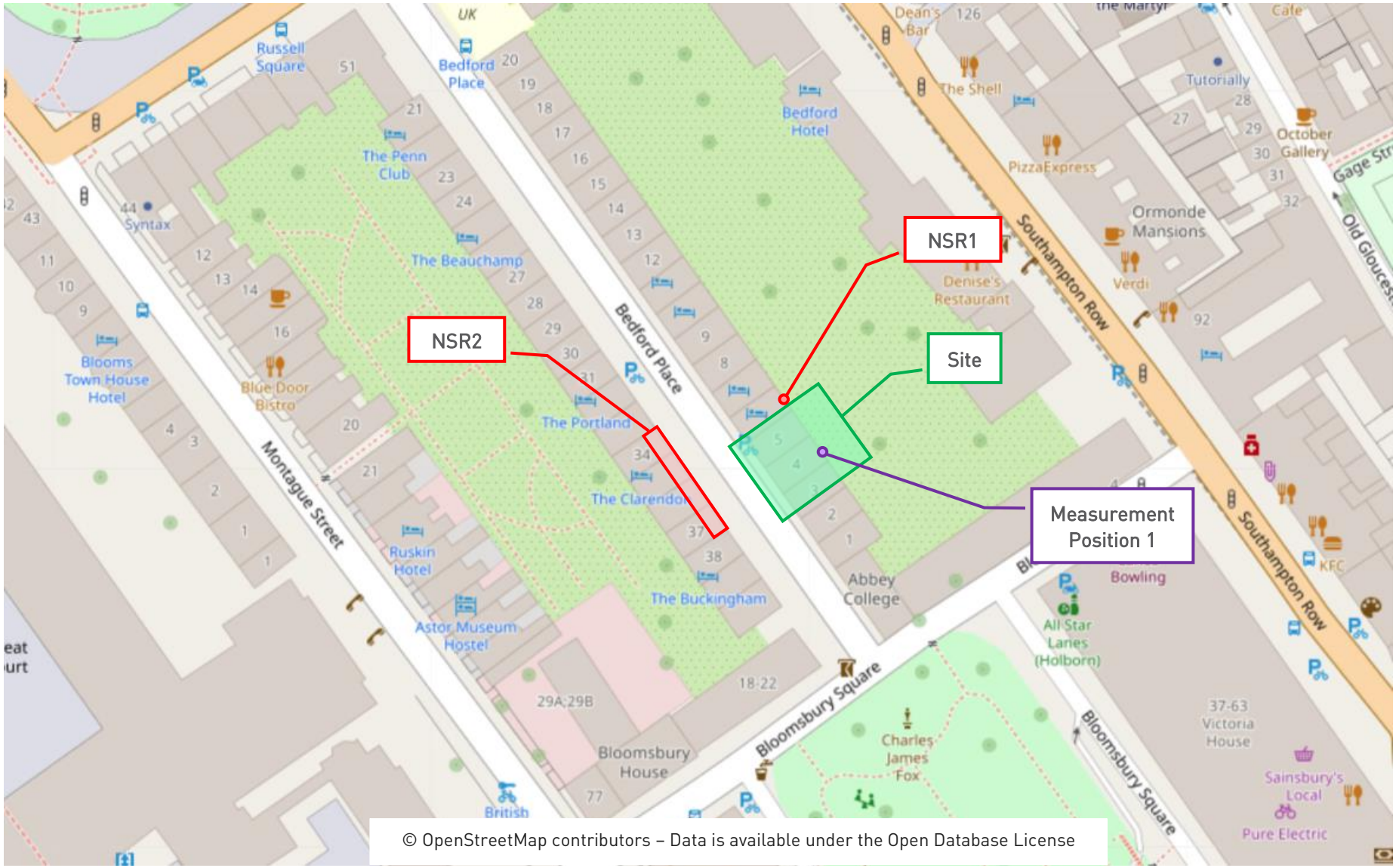

Figure 1 – Location of Site, Measurement Positions, & Nearest Noise-Sensitive Receptors

4-6 Bedford Place Hotel

Project 13417

14 June 2024

Not to Scale

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Figure 2 – Proposed Plant Locations (Section Detail)

4-6 Bedford Place Hotel

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Not to Scale

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