clement acoustics
www.clementacoustics.co.uk

London office
1B(c) Yukon Road
London
SW12 9PZ
Tel: 0203 475 2280

Manchester office
105 Manchester Road
Bury
BL9 0TD
Tel: 0161 850 2280

8 RICHARDSON'S MEWS,
LONDON

NOISE IMPACT ASSESSMENT & COMMISSIONING MEASUREMENTS

Report **16981-NIA-01 RevA**

Prepared on 20 December 2023

Issued For:

Daria Golova

8 Richardson's Mews

London

W1T 6BS

Executive Summary

This noise impact assessment has been undertaken in order to assess a plant installation for residential use at 8 Richardson's Mews, London.

The plant installation comprises 1 No. Toshiba RAV-GM1101ATP-E Condenser Unit.

A background noise survey has been undertaken as detailed in the report, in order to determine an appropriate noise emission criterion, in accordance with the requirements of the London Borough of Camden. Calculations were undertaken for the nearest identified receiver, identified as a window on the front façade of the adjacent property. It should be noted that if there are closer receivers that Clement Acoustics is not aware of, a reassessment will be necessary, and this should therefore be confirmed by the Client.

It has been demonstrated that compliance with the established criterion is feasible, dependant on the following material considerations:

- The plant could be in use at any time over a 24 hour period
- The noise emissions data for the proposed units as obtained from available manufacturer information
- Plant and receiver locations are as established in this report and marked on the attached site plan
- Mitigation is applied as recommended in this report, in the form of a louvred enclosure for the condenser unit

If there is any deviation from the above, Clement Acoustics must be informed, in order to establish whether a reassessment is necessary.

Clement Acoustics has used all reasonable skill and professional judgement when preparing this report. The report relies on the information as provided to us at the time of writing and the assumptions as made in our assessment.

This report is designed to be suitable to discharge typical plant noise planning conditions, as per our original scope of work.

Commissioning measurements have been undertaken following the installation of an acoustic enclosure around the plant installation. The results demonstrate compliance with the Local Authority requirements.

Contents

List of Attachments

Document Revision	Date of Revision	Reasons for Revision	Revision By
0	18/08/2021	First Issue	Kenny Macleod MIOA
A	20/12/2023	Inculsion of commissioning measurements	Daniel Ladega MIOA

1.0 INTRODUCTION

Clement Acoustics has been commissioned by Daria Golova to measure existing background noise levels at 8 Richardson's Mews, London. Measured noise levels have been used to determine noise emissions criteria for a plant installation in agreement with the planning requirements of the London Borough of Camden.

This report presents the results of the environmental survey followed by noise impact calculations and outlines any necessary mitigation measures.

Commissioning measurements have also been undertaken and presented within the report.

An acoustic terminology glossary is provided in Appendix A.

2.0 SITE DESCRIPTION

The site is bound by the Richardson's Mews to the southeast, and residential buildings to all other elevations. The surrounding area is mixed commercial and residential in nature.

The current plant installation comprises 1 No. Toshiba RAV-GM1101ATP-E condenser unit on the second floor roof of the building for residential use.

A window on the front façade of the adjacent property has been identified as the nearest affected receiver, with screening provided by the external building fabric. The closest non-screened receiver has been identified as a window on the rear façade of a residential property opposite. These nearest noise sensitive receivers were identified through observations on-site. If there are any receivers closer to that identified within this report then a further assessment will need to be carried out. Therefore, the closest noise sensitive receiver should be confirmed by the client before any noise mitigation measures are implemented.

There are two windows close to the plant location, but the client has confirmed that these are non-habitable spaces.

Locations are shown in attached site plan 16981-SP1.

3.0 METHODOLOGY

3.1 Unattended Noise Survey Procedure

Measurements were undertaken at one position as shown on indicative site drawing 16981-SP1. The choice of this position was based both on accessibility and on collecting representative noise data in relation to the nearest affected receiver.

The surroundings and position used for the monitoring location are described in Table 3.1.

Position No.	Description
1	The microphone was mounted on a 2nd storey roof terrace at the side of the building. [1]

Table 3.1: Description of unattended monitoring locations

Note [1]: The position was considered to be free-field according to guidance found in BS 4142: 2014, and a correction for reflections has therefore not been applied.

Continuous automated monitoring was undertaken for the duration of the survey between 11:21 on 10 August 2021 and 14:10 on 12 August 2021.

The measurement procedure generally complied with BS 7445: 1991: '*Description and measurement of environmental noise, Part 2- Acquisition of data pertinent to land use*'.

At the time of set-up and collection of the monitoring equipment, the weather conditions were generally dry with light winds. It is understood that the weather conditions during the unattended survey were remained dry with light winds.

It is considered that the weather conditions did not significantly adversely affect the measurements and are therefore considered suitable for the measurement of environmental noise.

The equipment calibration was verified, by means of a field verification check, before and after use and no abnormalities were observed.

The equipment used was as follows.

- 1 No. Svantek Type 957 Class 1 Sound Level Meter
- Rion Type NC-74 Class 1 Calibrator

3.2 Commissioning Measurements

Attended measurements were taken at 1m from the plant in order to determine the noise emissions of the condenser following the installation of an acoustic enclosure. The condenser was running at full capacity during the measurements and background measurements were also taken. The tests were performed at 11:00 on 13 December 2023.

The background noise of the area was high during the measurements and our analysis of the results have taken this into account.

At the time of testing the weather was dry with moderate winds and should not have a significant adverse effect on the results.

The equipment used during the attended measurements were as follows:

- 1 No. Svantek Type 957 Class 1 Sound Level Meter
- Rion Type NC-74 Class 1 Calibrator

4.0 RESULTS

4.1 Unattended Noise Survey Results

The $L_{Aeq:\,5min}$, $L_{Amax:\,5min}$, $L_{A10:\,5min}$ and $L_{A90:\,5min}$ acoustic parameters were measured at the location shown in site drawing 16981-SP1.

Measured noise levels are shown as a time history in Figure 16981-TH1, with average ambient and typical background noise levels summarised in Table 4.1.

It should be noted that the guidance of the latest revision of British Standard 4142: 2014 +A1 2019 *'Methods for rating and assessing industrial and commercial sound'*, as detailed in Section 8.1 of the standard is as follows:

'The objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods.'

Therefore, the typical background noise level will be used for the purpose of this assessment.

Time Period	Average ambient noise level $L_{eq: T}$	Typical background noise level $L_{90: 5min}$
Daytime (07:00 - 23:00)	50 dB(A)	46 dB(A)
Night-time (23:00 - 07:00)	45 dB(A)	39 dB(A)

Table 4.1: Average ambient and typical background noise levels

5.0 NOISE CRITERIA

5.1 Relevant Local Policy

The assessment and recommendations in this report have been undertaken in accordance with Policy D14 of the London Plan 2021, which contains the following relevant sections:

"*D14. In order to reduce, manage and mitigate noise to improve health and quality of life, residential and other non-aviation development proposals should manage noise by:*

> *5) mitigating and minimising the existing and potential adverse impacts of noise on, from, within, as a result of, or in the vicinity of new development without placing unreasonable restrictions on existing noise-generating uses*".

5.2 Local Authority Criteria

The London Borough of Camden general criteria for noise emissions are outlined in the Camden Local Plan (2017) and are 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 (15 dB if tonal components are present) should be considered as the design criterion."*

It is understood that the plant unit is for residential use, and could be operational at any time over a 24 hour period.

Based on the results of the environmental noise survey and requirements of the London Borough of Camden, Table 5.1 presents the proposed plant noise emission criteria to be achieved at 1 m from the nearest noise sensitive receiver:

Period	Plant Noise Emission Limit $L_{eq:T}$
Daytime (07:00 - 23:00)	36 dB(A)
Night-time (23:00 - 07:00)	29 dB(A)

Table 5.1: Plant noise emission limits

6.0 PLANT NOISE IMPACT ASSESSMENT

6.1 Proposed Installation

The proposed plant installation comprises 1 No. Toshiba RAV-GM1101ATP-E condenser unit

Noise emissions for the proposed plant units, as provided by the manufacturer, are shown in Table 6.1. Loudest modes of operation have been used in order to present a robust worst-case assessment. Spectral data is not available, and therefore the overall manufacturer provided noise level has been used with the spectral data from a comparable unit.

Plant Unit	Sound Pressure Levels (at 1 meter, dB) in each Frequency Band								
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	dB(A)
Toshiba RAV-GM1101ATP-E	60	59	60	55	50	47	40	35	57

Table 6.1: Manufacturer provided noise emissions levels

British Standard 4142: 2014 +A1 2019 *'Methods for rating and assessing industrial and commercial sound'* provides guideline penalties that can be applied to noise emissions to account for tonality, impulsivity and intermittency. Where a sound source is neither tonal nor impulsive, but is still distinctive against the residual acoustic environment, a penalty may still be applied.

The available penalties for different characteristics are summarised in Table 6.2.

Characteristic	Comments	Maximum Penalty
Tonality	Can be converted to 2 dB for a tone which is just perceptible, 4 dB where it is clearly perceptible and 6 dB where it is highly perceptible	+6 dB
Impulsivity	Can be converted to 3 dB for impulsivity which is just perceptible, 6 dB where it is clearly perceptible and 9 dB where it is highly perceptible	+9 dB
Intermittency	When the sound has identifiable on/off conditions	+3 dB
Distinctiveness	Intended for sources that are neither tonal nor impulsive, but distinctive against background noise sources	+3 dB

Table 6.2: Available penalties according to BS 4142: 2014

The plant unit is considered to be generally broadband and continuous in nature and therefore no penalty has been applied.

The plant location is on the second floor roof of the building which is shown on indicative site plan 16981-SP1.

6.2 Proposed Mitigation Measures

In order to meet the proposed criteria stated in Section 5.0, it is recommended that an enclosure is installed around the plant. The enclosure should provide sufficient attenuation to achieve a maximum sound pressure level of 51 dB(A) when measured at 1 m in all directions.

Based on the information provided, an enclosure meeting the sound reduction indices as stated in Table 6.2 should be suitable to achieve this.

Mitigation	*Required Attenuation (dB) in each Frequency Band*							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Louvred Enclosure	6	7	10	12	18	18	14	13

Table 6.2: Required attenuation from mitigation

6.3 Noise Impact Assessment

The closest receiver (Receiver 1) has been identified as a window on the front façade of the adjacent property which is approximately 7 m from the plant location.

Screening to this nearest noise sensitive receptor is provided by the building envelope (roof).

The closest non-screened receiver (Receiver 2) has been identified as a window on the rear façade of a residential property opposite which is approximately 15 m from the plant location.

Taking into account all necessary acoustic corrections, the resulting noise level at the identified residential windows would be as shown in Table 6.3. Detailed calculations are shown in Appendix B.

Receiver	Night Time Hours Criterion	Noise Level at Receiver (due to plant)
Nearest Residential Property 1	29 dB(A)	29 dB(A)
Nearest Residential Property 2		27 dB(A)

Table 6.3: Noise levels and project criterion at noise sensitive receivers

As presented in Table 6.3 and Appendix B, the plant installation with acoustic enclosure would be expected to meet the requirements of the proposed criteria.

6.4 British Standard Requirements

Further calculations have been undertaken to assess whether the noise emissions from the plant unit would be expected to meet recognised British Standard recommendations, in order to further ensure the amenity of nearby noise sensitive receivers.

British Standard 8233: 2014 '*Guidance on sound insulation and noise reduction for buildings*' gives recommendations for acceptable internal noise levels in residential properties. Assuming worst case conditions, of the closest window being for a bedroom, BS 8233: 2014 recommends 30 dB(A) as being acceptable internal sleeping conditions during night-time.

With loudest external levels of 29 dB(A), acceptable internal conditions would be met without taking the attenuation of the window itself into consideration. According to BS 8233: 2014, a typical building facade with a partially open window offers 15 dB attenuation.

It can therefore be predicted that, in addition to meeting the requirements of the set criteria, the emissions from the plant would be expected to meet the most stringent recommendations of the relevant British Standard, with neighbouring windows partially open. Predicted levels are shown in Table 6.4.

Receiver	Recommended Target – *For sleeping conditions in a bedroom, in BS 8233: 2014*	Noise Level at Receiver (due to plant installation)
Inside Residential Window 1	30 dB(A)	14 dB(A)
Inside Residential Window 2		12 dB(A)

Table 6.4: Noise levels and BS 8233: 2014 criteria inside nearest residential space

7.0 COMMISSIONING MEASUREMENTS

Commissioning measurements were undertaken of the plant installation with an acoustic enclosure. The exact performance of the acoustic enclosure is unknown; however, the manufacturer is understood to have recommended the acoustic enclosure based values stated in Table 6.2.

The results of the commissioning measurements have been summarised in Table 7.1. In addition, corrections for residual noise levels and directivity have been applied.

Description	Single Octave Frequency Bands (L_{eq}, dB)								A
	63	125	250	500	1000	2000	4000	8000	
Residual Noise Level	57	52	47	45	45	41	32	25	**49**
Plant Noise Level @ 1 m	64	62	55	52	48	43	37	28	**54**
Plant Noise Level Corrected for Background	63	62	55	51	45	39	35	24	**53**
Directivity, dB	-0.5	-1	-3	-7	-8.5	-8.5	-8.5	-8.5	-
Plant Noise Level inc. Directivity	**63**	**61**	**52**	**44**	**36**	**31**	**26**	**16**	**49**

Table 7.1 Commissioning Measurements

As shown in Table 7.1, the measured plant noise emissions when installed within an acoustic enclosure, with a directivity correction due to the effects of the acoustic louvres, complies with the maximum allowable noise level of 51 dB(A) stated in Section 6.2.

8.0 CONCLUSION

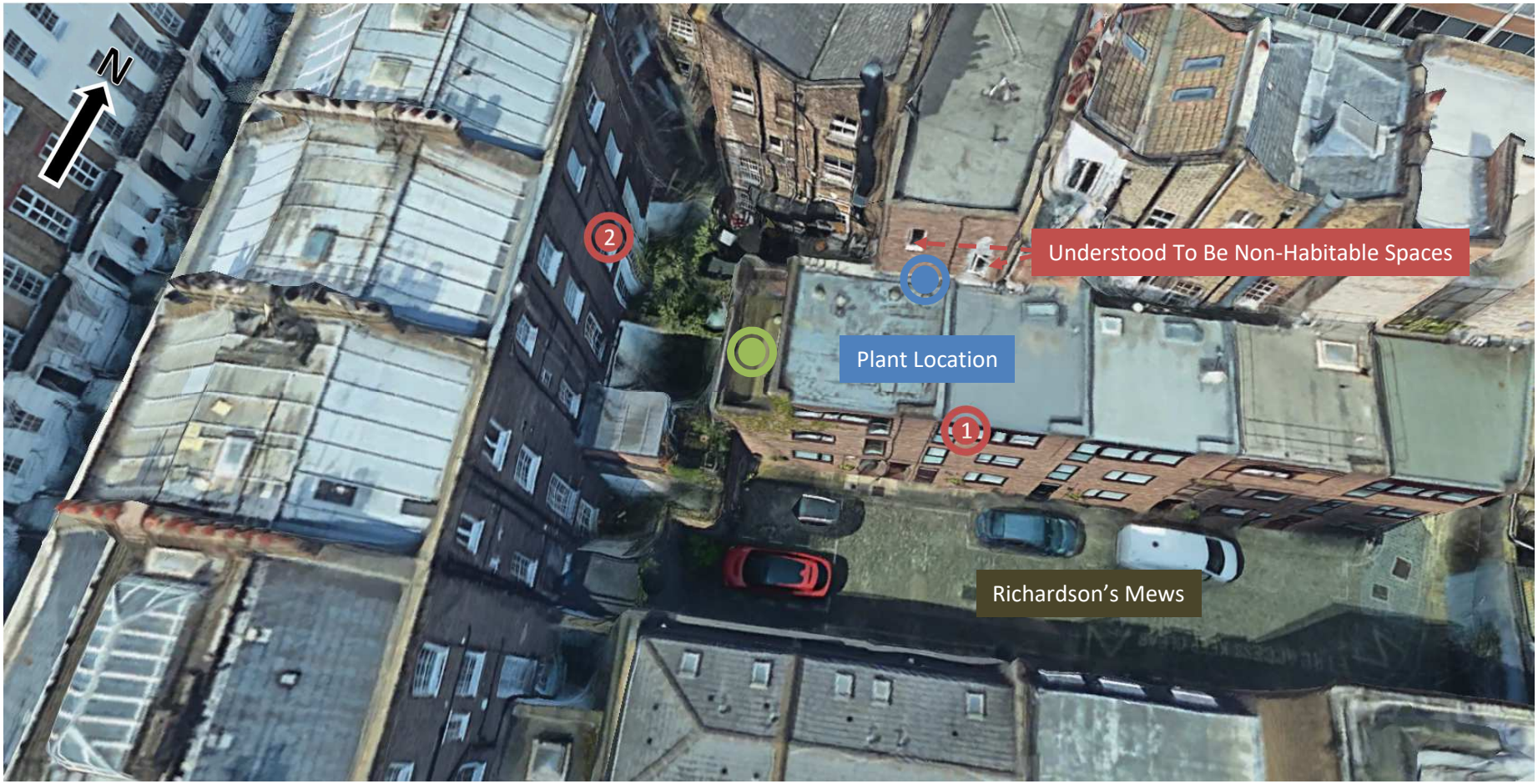
An environmental noise survey has been undertaken at 8 Richardson's Mews, London. The results of the survey have enabled criteria to be set for noise emissions from the plant in accordance with the requirements of the London Borough of Camden.

A noise impact assessment has then been undertaken using manufacturer noise data to predict the noise levels, due to the plant, at the nearby noise sensitive receivers.

Calculations show that noise emissions from the unit should meet the requirements of the London Borough of Camden with the recommended mitigation installed as stated herein.

Commissioning measurements following the installation of the mitigation demonstrate that the acoustic enclosure reduces the noise emissions to below the maximum sound pressure level.

Author	**Daniel Ladega** Technical Assisant BSc (Hons) MIOA		20 December 2023
Reviewed	**Andrew Thomas** Senior Consultant BSc (Hons) MIOA		20 December 2023
Approved	**John Smethurst** Director BSc (Hons) MIOA		20 December 2023

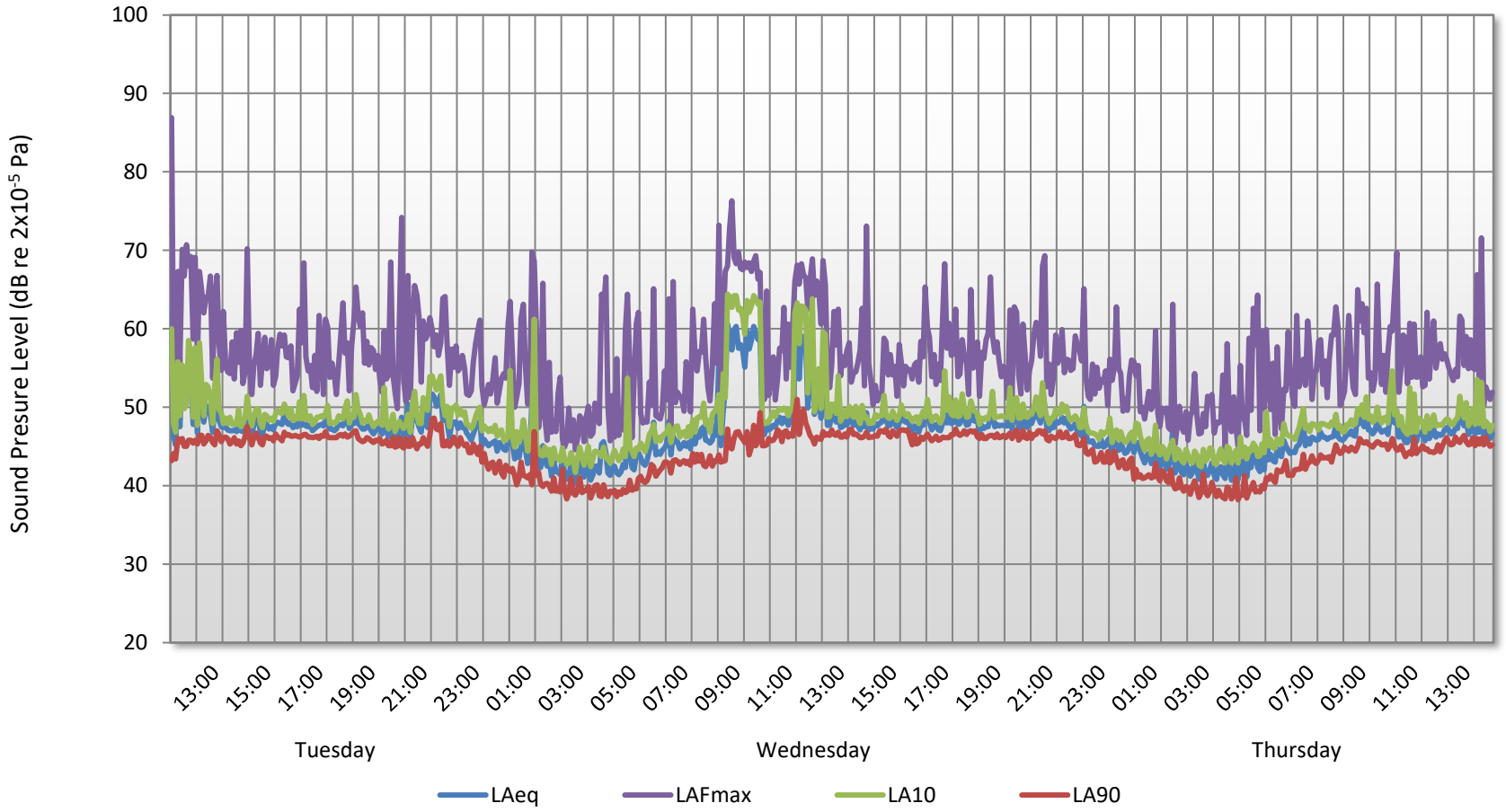


16981-SP1 Indicative site plan indicating noise monitoring position and nearest noise sensitive receivers **Date:** 20 December 2023

8 Richardson's Mews, London

Position 1

Environmental Noise Time History
10 August 2021 to 12 August 2021



16981-TH1

APPENDIX B

16981

8 RICHARDSON'S MEWS, LONDON

EXTERNAL PLANT NOISE EMISSIONS CALCULATION

Receiver: Nearest Residential Receiver 1 (with Screening)
Source: Plant installation

	Frequency, Hz								
	63	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*	*dB(A)*
Manufacturer provided sound pressure level at 1 metre									
Toshiba RAV-GM1101ATP-E	60	59	60	55	50	47	40	35	57
Correction for reflections, dB	6	6	6	6	6	6	6	6	
Required attenuation from mitigation, dB (Louvred Enclosure)	-6	-7	-10	-12	-18	-18	-14	-13	
Attenuation due to screening from external building fabric (roof), dB	-3	-4	-5	-6	-8	-11	-14	-17	
Distance correction to receiver, dB (7 m) [1]	-17	-17	-17	-17	-17	-17	-17	-17	
Sound pressure level at receiver	**41**	**38**	**35**	**26**	**13**	**8**	**2**	**-5**	**29**

[1] Distance loss caluculated assuming Point Source attenuation (*typically used where distance is more than 3x the largest source dimension*)

Design Criterion	**29**

BS 8233 ASSESSMENT CALCULATION

Receiver: Inside Nearest Residential Window 1 (with Screening)
Source: Plant installation

	Frequency, Hz								
	63	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*	*dB(A)*
Sound pressure level outside window	41	38	35	26	13	8	2	-5	29
Minimum attenuation from partially open window, dB	-15	-15	-15	-15	-15	-15	-15	-15	
Sound pressure level inside nearest noise sensitive premises	**26**	**23**	**20**	**11**	**-2**	**-7**	**-13**	**-20**	**14**

Design Criterion	**30**

APPENDIX B

16981

8 RICHARDSON'S MEWS, LONDON

EXTERNAL PLANT NOISE EMISSIONS CALCULATION

Receiver: Nearest Residential Receiver 2 (without Screening)
Source: Plant installation

	Frequency, Hz								
	63	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*	*dB(A)*
Manufacturer provided sound pressure level at 1 metre									
Toshiba RAV-GM1101ATP-E	60	59	60	55	50	47	40	35	57
Correction for reflections, dB	6	6	6	6	6	6	6	6	
Required attenuation from mitigation, dB (Louvred Enclosure)	-6	-7	-10	-12	-18	-18	-14	-13	
Distance correction to receiver, dB (15 m) [1]	-24	-24	-24	-24	-24	-24	-24	-24	
Sound pressure level at receiver	**36**	**34**	**32**	**25**	**14**	**11**	**8**	**4**	**27**

[1] Distance loss caluculated assuming Point Source attenuation (*typically used where distance is more than 3x the largest source dimension*)

Design Criterion	**29**

BS 8233 ASSESSMENT CALCULATION

Receiver: Inside Nearest Residential Window 2 (without Screening)
Source: Plant installation

	Frequency, Hz								
	63	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*	*dB(A)*
Sound pressure level outside window	36	34	32	25	14	11	8	4	27
Minimum attenuation from partially open window, dB	-15	-15	-15	-15	-15	-15	-15	-15	
Sound pressure level inside nearest noise sensitive premises	**21**	**19**	**17**	**10**	**-1**	**-4**	**-7**	**-11**	**12**

Design Criterion	**30**

APPENDIX A

GLOSSARY OF ACOUSTIC TERMINOLOGY

dB(A)

The human ear is less sensitive to low (below 125Hz) and high (above 16kHz) frequency sounds. A sound level meter duplicates the ear's variable sensitivity to sound of different frequencies. This is achieved by building a filter into the instrument with a similar frequency response to that of the ear. This is called an A-weighting filter. Measurements of sound made with this filter are called A-weighted sound level measurements and the unit is dB(A).

L_{eq}

The sound from noise sources often fluctuates widely during a given period of time. An average value can be measured, the equivalent sound pressure level L_{eq}. The L_{eq} is the equivalent sound level which would deliver the same sound energy as the actual fluctuating sound measured in the same time period.

L_{10}

This is the level exceeded for not more than 10% of the time. This parameter is often used as a "not to exceed" criterion for noise

L_{90}

This is the level exceeded for not more than 90% of the time. This parameter is often used as a descriptor of "background noise" for environmental impact studies.

L_{max}

This is the maximum sound pressure level that has been measured over a period.

Octave Bands

In order to completely determine the composition of a sound it is necessary to determine the sound level at each frequency individually. Usually, values are stated in octave bands. The audible frequency region is divided into 10 such octave bands whose centre frequencies are defined in accordance with international standards.

Addition of noise from several sources

Noise from different sound sources combines to produce a sound level higher than that from any individual source. Two equally intense sound sources operating together produce a sound level which is 3dB higher than one alone and 10 sources produce a 10 dB higher sound level.

Attenuation by distance

Sound which propagates from a point source in free air attenuates by 6dB for each doubling of distance from the noise source. Sound energy from line sources (e.g. stream of cars) drops off by 3dB for each doubling of distance.

Subjective impression of noise

Sound intensity is not perceived directly at the ear; rather it is transferred by the complex hearing mechanism to the brain where acoustic sensations can be interpreted as loudness. This makes hearing perception highly individualised. Sensitivity to noise also depends on frequency content, time of occurrence, duration of sound and psychological factors such as emotion and expectations. The following table is a reasonable guide to help explain increases or decreases in sound levels for many acoustic scenarios.

Change in sound level (dB)	Change in perceived loudness
1	Imperceptible
3	Just barely perceptible
6	Clearly noticeable
10	About twice as loud
20	About 4 times as loud

Barriers

Outdoor barriers can be used to reduce environmental noises, such as traffic noise. The effectiveness of barriers is dependent on factors such as its distance from the noise source and the receiver, its height and its construction.

Reverberation control

When sound falls on the surfaces of a room, part of its energy is absorbed and part is reflected back into the room. The amount of reflected sound defines the reverberation of a room, a characteristic that is critical for spaces of different uses as it can affect the quality of audio signals such as speech or music. Excess reverberation in a room can be controlled by the effective use of sound-absorbing treatment on the surfaces, such as fibrous ceiling boards, curtains and carpets.