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79 SILVER STREET, READING

NOISE IMPACT ASSESSMENT

Report **13188-NIA-01-RevB**

Prepared on 16 July 2020

Issued For:

Morlet Property

38 Newdigate Road

Coventry

CV6 5ES



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13188-NIA-01-SP1	Indicative Site Plan
13188-NIA-01-TH1	Environmental Noise Time History
Appendix A	Glossary of Acoustic Terminology
Appendix B1-2	Acoustic Calculations

Document Revision	Date of Revision	Reasons for Revision	Revision By
0	24/06/2020	First Issue	Matt Markwick MIOA
RevA	08/07/20	Nearest receiver identified as non-residential. Report revised to reflect this and additional assessment to secondary, residential receiver added.	Matt Markwick MIOA
RevB	15/07/20	Correction of mis-print. Clarification on requirement for mitigation.	Matt Markwick MIOA

1.0 INTRODUCTION

Clement Acoustics has been commissioned by Morlet Property to measure existing background noise levels at 79 Silver Street, Reading, RG1 2TN. Measured noise levels have been used to determine noise emissions criteria for a proposed plant installation in agreement with the planning requirements of Reading Borough Council.

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

2.0 SITE DESCRIPTION

Current proposals are to install 4 No. outdoor air conditioning condenser units as part of a new build residential development.

The proposed units will be for residential use, meaning they could be in use at any time.

It is understood the south facing façade of the adjacent building, overlooking this development, includes existing external condenser units, close to the proposed plant location.

The units are to be installed at ground level on the north wall of the new development, overlooked by windows to the office building adjacent which have been identified as the nearest affected receiver (Receiver 1). The nearest residential receiver has been identified as the window to the building on the opposite side of Silver Street, Mount Pleasant (Receiver 2). The nearest noise sensitive receivers have been confirmed by the client.

Locations are shown in attached site plan 13188-NIA-01-SP1.

3.0 ENVIRONMENTAL NOISE SURVEY

3.1 Procedure

An automated noise survey was undertaken at the position shown on indicative site drawing 13188-NIA-01-SP1. The choice of this position was based both on accessibility and on collecting representative noise data in relation to the site.

The microphone was mounted on a of the flat roof of the original building. 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. Noise levels at the monitoring position were dominated by traffic from Silver Street during collection and installation of equipment.

Continuous automated monitoring was undertaken for the duration of the survey between 08 February at 13:45 and 11 February 2018 at 22:05.

Weather conditions were generally dry with light winds, therefore suitable for the measurement of environmental noise.

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

3.2 Equipment

The equipment calibration was verified before and after use and no abnormalities were observed.

The equipment used was as follows.

- 1 No. Svantek Type 977 Class 1 Sound Level Meter
- Norsonic Type 1251 Class 1 Calibrator

4.0 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 13188-SP1.

Measured noise levels are shown as a time history in Figure 13188-NIA-01-TH1, with average ambient and minimum background noise levels summarised in Table 4.1.

	Average ambient noise level	Minimum background noise level
	$L_{eq:T}$	$L_{90:5min}$
Daytime (07:00 - 23:00)	57 dB(A)	44 dB(A)
Night-time (23:00 - 07:00)	52 dB(A)	38 dB(A)

Table 4.1: Average ambient and minimum background noise levels

5.0 NOISE CRITERIA

5.1 Office Windows

BS 8233:2014 “Guidance on sound insulation and noise reduction for buildings” describes recommended acceptable internal noise levels for commercial spaces during daytime hours. Relevant levels are summarised in Table 5.1.

Objective	Location	Design range $L_{Aeq,T}$ dB
Typical noise level for acoustic privacy in shared spaces	Open plan office	45-50 dB(A)
Typical noise level for work requiring concentration	Meeting Room	35-45 dB(A)

Table 5.1: BS8233 recommended internal background noise levels

In order to ensure a robust assessment, the more onerous design range of 35-45 dB(A) for a meeting room will be used for the closest office windows.

5.2 Residential Receivers

The Reading Borough Council criteria for noise emissions as stated in condition 11 of the associated planning decision notice are understood to be as follows:

“No mechanical plant shall be installed until a noise assessment of the proposed mechanical plant has been submitted and approved by the Local Planning Authority. The assessment shall be carried out for in accordance with BS4141:2014 methodology. The predicted specific sound level ($L_{Aeq,TR}$) as measured at a point 1 metre external to sensitive facades shall be at least 10dB below the existing background sound level, $LA_{90,T}$ when all plant/equipment (or any part of it) is in operation. The predicted rating level, $L_{Ar,Tr}$ (specific sound level plus any adjustment for the characteristic features of the sound) as measured at a point 1 metre external to sensitive facades shall not exceed the existing background sound level, $LA_{90,T}$ when all plant/equipment (or any part of it) is in operation. The plant shall thereafter only be installed in accordance with the assessment.”

It is understood that the proposed plant units are for residential use so may be operational at any time. Therefore, the criteria will be derived from the minimum measured $L_{A90,T}$ during the noise survey. Resulting in the following criteria:

- Specific sound level ($L_{Aeq,TR}$) emissions criterion of 28 dB(A)
- Rating level ($L_{Ar,Tr}$) emissions criterion of 38 dB(A)

6.0 PLANT NOISE IMPACT ASSESSMENT

6.1 Proposed Installation

The proposed plant installation comprises the following:

- 2 No. Daikin RXS 35L3 Outdoor Units
- 1 No. Daikin RXS 50L Outdoor Unit
- 1 No. Daikin RXA 35A Outdoor 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.

Unit	Sound Pressure Levels (at 1 meter, dB) in each Frequency Band								dB(A)
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	
Daikin RXS 35L3	40	45	43	41	37	33	27	19	48
Daikin RXS 50L	45	47	45	39	38	34	25	15	48
Daikin RXA 35A	47	52	50	47	44	39	35	27	49

Table 6.1: Manufacturer provided noise emissions levels

The proposed plant location is on the wall on the north west façade of the building at ground floor level at the rear of the building which is shown on indicative site plan 13188-SP1.

6.2 Proposed Mitigation Measures

In order to meet the proposed criteria stated in Section 5.0 (specifically the criteria for the nearest residential receiver stated in Section 5.2), 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 53 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	-1	-2	-3	-4	-5	-6	-6	-6

Table 6.2: Required attenuation from mitigation

The required attenuation shown in Table 6.2 is particularly low and could typically be achieved through screening. However, due to the relative position of the proposed plant location and surrounding windows, it is not clear if it would be possible to completely block line of sight to the closest residential receivers.

As an alternative to the installation of an enclosure or screening, the plant may be repositioned a minimum 27 m from the nearest residential receiver, or an alternative location screened from line of sight to this receiver.

6.3 Noise Impact Assessment – Office Windows

The closest office windows overlook the plant location, at a distance of approximately 8m.

As criteria for offices are given in terms of internal levels, the sound reduction provided by the window itself must also be taken into consideration. In order to present a robust assessment it will be assumed that the office window may be partially open for ventilation. According to BS 8233: 2014, a typical building facade with a partially open window offers 15 dB attenuation.

Taking into account all necessary acoustic corrections, including the typical sound reduction performance of a typical single glazed window, the resulting noise level at the identified residential windows would be as shown in Table 6.3.

Detailed calculations are shown in Appendix B1.

Receiver	Design Range	Noise Level at Receiver (due to proposed plant)
Nearest Office Window	35-45 dB(A)	23 dB(A)

Table 6.3: Noise levels and criteria at noise sensitive receivers

As presented in Table 6.3 and Appendix B1, the proposed plant installation would be expected to comply with the design range suggested in section 5.1 with or without the recommended mitigation measures, however it should be noted that the requirement to meet the criteria at the residential receiver currently supersedes this. With mitigation installed as required for the residential receiver, noise levels within the office due to the plant would be further reduced.

6.4 Rating Level

According to BS 4142:2014 the rating level is determined by an acoustic features correction added to the specific sound level. The acoustic features considered are tonality, impulsivity, intermittency, and distinctiveness against the residual acoustic environment.

The plant is not currently installed and therefore an objective assessment cannot be carried out, although the manufacturer's spectral data does not indicate any tonal content. Based on the existing acoustic environment, which already includes nearby condensers, any acoustic features from the proposed plant is likely to be masked. However, to present a robust assessment a 3 dB penalty will be applied.

6.5 Noise Impact Assessment – Residential Receiver

The closest residential receiver has been identified as the window of the property (Mount Pleasant) on the opposite side of the road which is a minimum of 17 m from the proposed plant location.

Taking into account all necessary acoustic corrections, the resulting noise level at the identified residential windows would be as shown in Table 6.4. Detailed calculations are shown in Appendix B2.

	Criterion	Predicted Level at Receiver (due to proposed plant)	Compliant / Non-Compliant
Specific Sound Level	28 dB(A)	28 dB(A)	Compliant
Rating Level	38 dB(A)	31 dB(A)	Compliant

Table 6.4: Specific sound levels, rating level and criteria at sensitive receivers

As presented in Table 6.4 and Appendix B2, the proposed plant installation with acoustic enclosure would be expected to meet the requirements of the proposed criteria.

6.6 British Standard 8233: 2014 Requirements

Further calculations have been undertaken to assess whether the noise emissions from the proposed plant unit would be expected to meet other 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 resting/sleeping conditions during night-time.

With loudest external specific sound levels of 28 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 proposed 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 6.5.

Receiver	Recommended Target – For resting/sleeping conditions in a bedroom, in BS 8233: 2014	Noise Level at Receiver (due to plant installation)
Inside Residential Window	30 dB(A)	13 dB(A)

Table 6.5: Noise levels and criteria inside nearest residential space

7.0 CONCLUSION

An environmental noise survey has been undertaken at 79 Silver Street, Reading, RG1 2TN. The results of the survey have enabled criteria to be set for noise emissions from the proposed plant units in accordance with the requirements of Reading Borough Council.

A noise impact assessment has then been undertaken using manufacturer noise data to predict the noise levels, due to the proposed plant, at the closest noise sensitive commercial and residential receivers. It is calculated that mitigation will be required to meet the required noise criteria at the nearest identified residential receiver.

Calculations show that noise emissions from the proposed plant units should meet the requirements of the Local Authority with the recommended mitigation installed as stated herein.

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16 July 2020

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16 July 2020

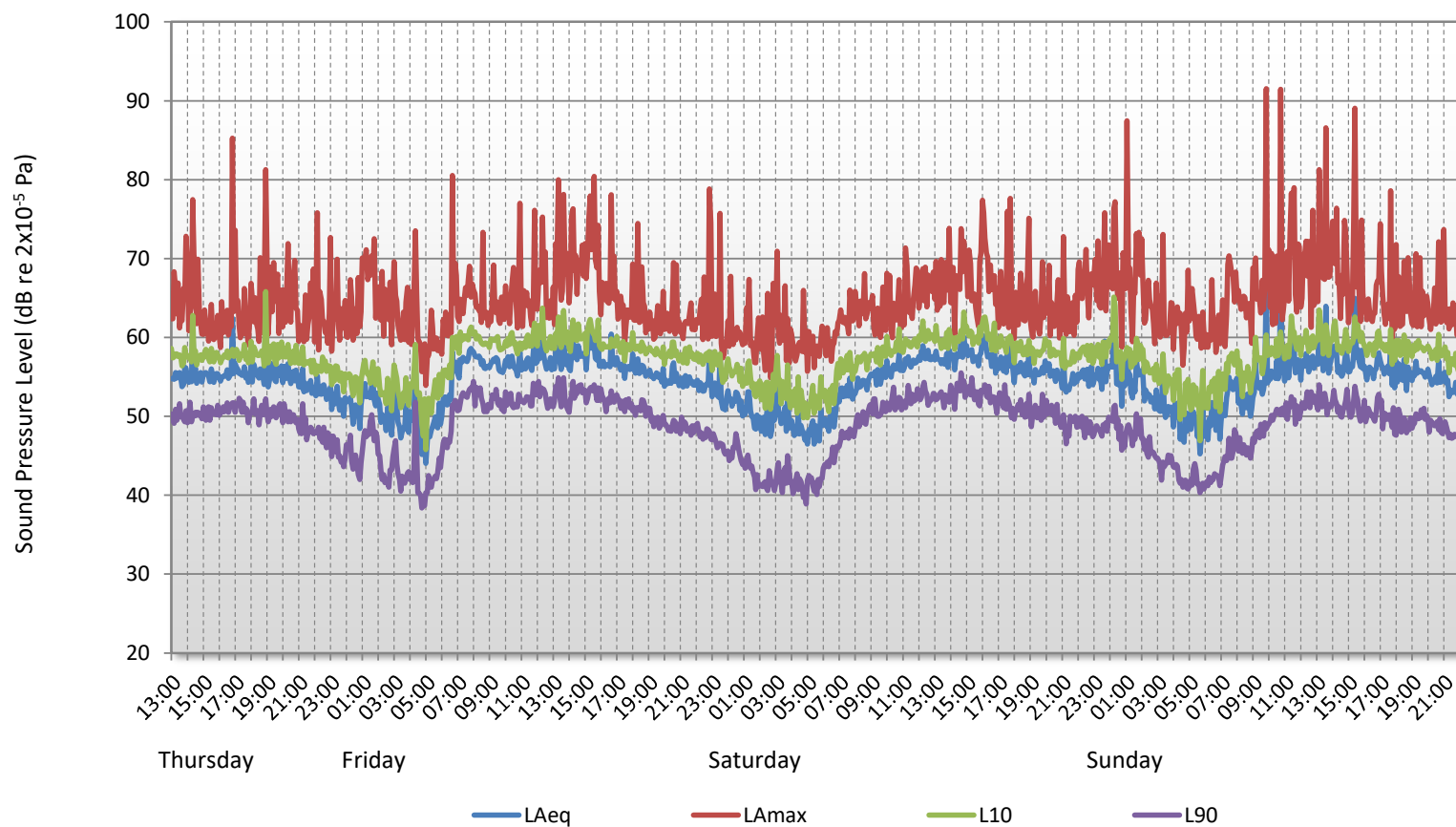
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16 July 2020



79 Silver Street, Reading
Environmental Noise Time History
8 February to 11 February 2018



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.

APPENDIX B

13188
79 Silver Street, Reading

EXTERNAL PLANT NOISE EMISSIONS CALCULATION

Receiver: Nearest Office Window
Source: Proposed plant installation

	Frequency, Hz								
	63	125	250	500	1k	2k	4k	8k	dB(A)
Manufacturer provided sound pressure level at 1 metre									
Daikin RXS 35L3	40	45	43	41	37	33	27	19	48
Daikin RXS 35L3	40	45	43	41	37	33	27	19	48
Daikin RXS 50L	42	46	43	39	37	34	25	17	48
Daikin RXA 35A	47	52	50	47	44	39	35	27	49
Cumulative Sound Pressure Level, dB	49	54	52	49	46	42	37	29	51
Correction for reflections, dB	6	6	6	6	6	6	6	6	
Attenuation from partially open window	-15	-15	-15	-15	-15	-15	-15	-15	
Distance correction to receiver, dB (8 m)	-18	-18	-18	-18	-18	-18	-18	-18	
Sound pressure level at receiver	22	27	25	22	19	0	0	0	23

Design Criterion	35-45
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APPENDIX B

13188
79 Silver Street, Reading

EXTERNAL PLANT NOISE EMISSIONS CALCULATION

Receiver: Nearest Residential Receiver

Source: Proposed plant installation

	Frequency, Hz								
	63	125	250	500	1k	2k	4k	8k	dB(A)
Manufacturer provided sound pressure level at 1 metre									
Daikin RXS 35L3	40	45	43	41	37	33	27	19	48
Daikin RXS 35L3	40	45	43	41	37	33	27	19	48
Daikin RXS 50L	42	46	43	39	37	34	25	17	48
Daikin RXA 35A	47	52	50	47	44	39	35	27	49
Cumulative Sound Pressure Level, dB	49	54	52	49	46	42	37	29	51
Correction for reflections, dB	6	6	6	6	6	6	6	6	
Reduction required from mitigation, dB	-1	-2	-3	-4	-5	-6	-6	-6	
Distance correction to receiver, dB (17 m)	-25	-25	-25	-25	-25	-25	-25	-25	
Sound pressure level at receiver	29	33	30	26	22	17	12	4	28

Design Criterion	28
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BS 8233 ASSESSMENT CALCULATION

Receiver: Inside Nearest Residential Window

Source: Proposed plant installation

	Frequency, Hz								
	63	125	250	500	1k	2k	4k	8k	dB(A)
Sound pressure level outside window	29	33	30	26	22	17	12	4	28
Minimum attenuation from partially open window, dB	-15	-15	-15	-15	-15	-15	-15	-15	
Sound pressure level inside nearest noise sensitive premises	14	18	15	11	7	2	-4	-12	13

Design Criterion	30
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