clarke saunders acoustics

clarkesaunders.com

PREPARED: 16 April 2025

146-168 HEXHAM ROAD

PLANT NOISE IMPACT ASSESSMENT

CONTENTS

1.0	EXECUTIVE SUMMARY	1
2.0	INTRODUCTION	1
3.0	SITE DESCRIPTION	1
4.0	LOCAL AUTHORITY REQUIREMENTS	1
5.0	ENVIRONMENTAL NOISE SURVEY	2
6.0	PLANT NOISE CRITERIA	2
7.0	PREDICTED NOISE IMPACT	3
8.0	CONCLUSIONS	4

LIST OF ATTACHMENTS

AS13936/SP1	Indicative Site Plan
APPENDIX A	Acoustic Terminology
APPENDIX B	Acoustic Calculations

Project Ref:	AS13936	**Project Name:**	146-168 Hexham Road
Report Ref:	AS13936.250414.R1	**Report Title:**	Plant Noise Impact Assessment
Client Name:	Michael Aubrey Barrow		
Project Manager:	Andrew Nesbitt		
Report Author:	Michael Symmonds		

Clarke Saunders Acoustics
Winchester SO22 5BE

This report has been prepared in response to the instructions of our client. It is not intended for and should not be relied upon by any other party or for any other purpose.

1.0 EXECUTIVE SUMMARY

1.1 Clarke Saunders Acoustics has conducted a noise impact assessment of the proposed air source heat pumps to be installed at ground floor level to rear of the of the block of flats at 146-168 Hexham Road, as part of its refurbishment.

1.2 Results of environmental noise surveys have been used to establish the current background noise climate at the nearest noise sensitive receptors, which has enabled the acoustic suitability of the ASHP proposals to be assessed in accordance with the planning requirements of Reading Borough Council.

1.3 Manufacturer data for the new ASHPs have been used to predict the noise impact of the proposed plant at neighbouring receptors. Compliance with the noise emissions design criterion has been demonstrated with the inclusion of an acoustic screen/canopy and an absorptive wall lining behind the ASHPs.

2.0 INTRODUCTION

2.1 New air source heat pumps (ASHPs) will be installed at ground floor level to the rear of the refurbished flats at 146-168 Hexham Road, Reading, RG2 7UB.

2.2 Clarke Saunders Acoustics (CSA) has been appointed to conduct a noise impact assessment, in accordance with the planning requirements of Reading Borough Council, for the installation of the mechanical plant.

2.3 This report describes the survey, noise impact assessment, and the findings.

2.4 A glossary relevant to the terminology used in this report is presented in Appendix A.

3.0 SITE DESCRIPTION

3.1 The flats at 146-168 Hexham Road are to be refurbished, to provide 12 no. residential dwellings over 3 floors (four flats per floor). The proposals involve installing 12 no. heat pumps to the rear of the property, each serving a single refurbished flat.

3.2 The site is located in a suburban area, to the south-east of Reading town centre, surrounded by existing residential dwellings.

3.3 The nearest off-site noise-sensitive receptor are the row of terraced houses at 85-101 Hexham Road to the north of the site. There are also on-site receptors, those being the residents within the refurbished flats.

3.4 The site and surroundings are shown in the appended site plan AS13936/SP1.

4.0 LOCAL AUTHORITY REQUIREMENTS

4.1 Plant noise emissions requirements have been agreed with the Environmental Protection & Nuisance Team at Reading Borough Council (RBC), as defined below:

- Noise level for the **on-site** receptors within the block of flats should not exceed the typical background noise level;
- Noise level for the **off-site** receptors should achieve 10dB below the typical background noise level.

5.0 ENVIRONMENTAL NOISE SURVEY

5.1 PROCEDURES & EQUIPMENT

5.1.1 A survey of existing noise levels was undertaken at 56-90 Bamburgh Close, circa 200m to the south-west of the site. Owing to the proximity to site and suburban nature of the surrounding area, this position is deemed representative of the noise levels experienced in and around 146-168 Hexham Road.

5.1.2 This survey was undertaken between 23:45 hours on Tuesday 24th September 2024 and 00:45 hours on Wednesday 25th September 2024. The survey was conducted to determine typical night-time background sound levels experienced in the vicinity, which is the period with the most onerous criterion.

5.1.3 The following equipment was used during the course of the survey.

- 1 no. Rion data logging sound level meter type NL52;
- 1 no. Rion sound level field calibrator type 1251.

5.1.4 The calibration of the sound level meters was verified before and after use. No significant calibration drift was detected (≤0.5dB).

5.1.5 The weather during the measurements was dry with light winds, which made the conditions suitable for the measurement of environmental noise.

5.1.6 Measurements were made following procedures in BS 7445:1991 (ISO1996-2:1987) *Description and measurement of environmental noise Part 2-Acquisition of data pertinent to land use*.

5.2 SURVEY RESULTS

5.2.1 The measured average ambient and typical background sound levels are summarised in Table 5.1 below.

AVERAGE AMBIENT $L_{Aeq,T}$	BACKGROUND L_{A90}
49 dB	32 dB

Table 5.1: Summary of results from attended night-time survey [dB ref 20µPa]

5.2.2 Minimal activity occurred across the course of the survey, where the background soundscape was determined by distant road traffic.

6.0 PLANT NOISE CRITERIA

6.1 The plant noise criteria have been based on the data provided in Table 5.1, alongside the stated plant noise emissions criteria provided at Section 4.0.

6.2 The noise emissions criteria that should not be exceeded for each noise sensitive receptor is provided in Table 6.1.

PERIOD	ON-SITE RECEPTORS	OFF-SITE RECEPTOR AT 85-101 HEXHAM ROAD
Night-time (23:00 – 07:00)	32 dB	22 dB

Table 6.1 – Plant noise emissions design criteria [dB ref. 20μPa]

7.0 PREDICTED NOISE IMPACT

7.1 PROPOSED PLANT

7.1.1 The selected heat pumps have been confirmed as follows:

- 12 no. Aerona 290 4kW Air Source Heat Pumps

7.1.2 Overall sound pressure and sound power levels have been confirmed by the manufacturer and are presented in Table 7.1.

SPL @ 1m (dBA)	SWL (dBA)
40	48

Table 7.1 – Source noise data [dB ref. 20μPa]

7.2 PREDICTED NOISE IMPACT

7.2.1 The noise levels of the proposed ASHPs have been assessed to the nearest off-site noise-sensitive receptors at 85-101 Hexham Road and the nearest on-site noise-sensitive receptors.

7.2.2 The on-site assessment scenarios are as follows:

- 8 ASHPs operating (serving ground and first floor flats) – calculated to second floor middle window.
- 4 ASHPs operating (serving second floor flats) – calculated to ground floor middle window.

7.2.3 In order to control noise breakout to the on-site receptors within the ground floor flats, the effect of a canopy over the top of each ASHP has been incorporated into the calculations. On the basis that these canopies would obscure line of sight between each on-site residential window and ASHP, this would afford a minimum 5dB reduction.

7.2.4 If the ASHPs are installed within 1.5m of the façade, an absorptive lining will also need to be installed on the wall behind the unit, to mitigate against a façade reflection effect.

7.2.5 Calculations include the implementation of the canopy over the units, an absorptive wall lining on the rear of the building, and assumes the heat pumps are neither tonal nor intermittent.

7.2.6 The overall predictions are presented in Table 7.2.

RECEPTOR	PREDICTED NOISE LEVEL	DESIGN CRITERIA
On-Site Ground Floor Flats	30 dB	≤32 dB
On-Site 2nd Floor Flats	25 dB	≤32 dB
Off-Site Terraced Houses on Hexham Road	22 dB	≤22 dB

Table 7.2 – Summary of predicted plant noise levels [dB ref. 20μPa]

7.2.7 Compliance with the relevant design criteria has been shown.

7.2.8 Full calculations are attached in Appendix B.

8.0 CONCLUSIONS

8.1 Clarke Saunders Acoustics has conducted a noise impact assessment of the proposed air source heat pumps to be installed at ground level to rear of the of the block of flats at 146-168 Hexham Road, as part of its refurbishment.

8.2 Results of environmental noise surveys have been used to establish the current background noise climate at the nearest noise sensitive receptors, which has enabled the acoustic suitability of the ASHP proposals to be assessed in accordance with the planning requirements of Reading Borough Council.

8.3 Manufacturer data for the new ASHPs has been used to predict the noise impact of the proposed plant at neighbouring receptors. Compliance with the noise emissions design criterion has been demonstrated with the inclusion of an acoustic screen/canopy and an absorptive lining on the wall behind the ASHPs.

M Symmonds

Michael Symmonds MIOA
CLARKE SAUNDERS ACOUSTICS

Indicative Site Plan

Figure AS13936.SP1

APPENDIX A

Acoustic Terminology

The human impact of sounds is dependent upon many complex interrelated factors such as 'loudness', its frequency (or pitch) and variation in level. In order to have some objective measure of the annoyance, scales have been derived to allow for these subjective factors.

Sound Vibrations propagating through a medium (air, water, etc.) that are detectable by the auditory system.

Noise Sound that is unwanted by or disturbing to the perceiver.

Frequency The rate per second of vibration constituting a wave, measured in Hertz (Hz), where 1Hz = 1 vibration cycle per second. The human hearing can generally detect sound having frequencies in the range 20Hz to 20kHz. Frequency corresponds to the perception of 'pitch', with low frequencies producing low 'notes' and higher frequencies producing high 'notes'.

dB(A): Human hearing is more susceptible to mid-frequency sounds than those at high and low frequencies. To take account of this in measurements and predictions, the 'A' weighting scale is used so that the level of sound corresponds roughly to the level as it is typically discerned by humans. The measured or calculated 'A' weighted sound level is designated as dB(A) or L_A.

L_{eq}: A notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the actual, fluctuating sound measured over that period (e.g. 8 hour, 1 hour, etc).

The concept of L_{eq} (equivalent continuous sound level) has primarily been used in assessing noise from industry, although its use is becoming more widespread in defining many other types of sounds, such as from amplified music and environmental sources such as aircraft and construction.

Because L_{eq} is effectively a summation of a number of events, it does not in itself limit the magnitude of any individual event, and this is frequently used in conjunction with an absolute sound limit.

L_{10} & L_{90}: Statistical L_n indices are used to describe the level and the degree of fluctuation of non-steady sound. The term refers to the level exceeded for n% of the time. Hence, L_{10} is the level exceeded for 10% of the time and as such can be regarded as a typical maximum level. Similarly, L_{90} is the typical minimum level and is often used to describe background noise.

It is common practice to use the L_{10} index to describe noise from traffic as, being a high average, it takes into account the increased annoyance that results from the non-steady nature of traffic flow.

L_{max}: The maximum sound pressure level recorded over a given period. L_{max} is sometimes used in assessing environmental noise, where occasional loud events occur which might not be adequately represented by a time-averaged L_{eq} value.

Octave Band Frequencies

In order to determine the way in which the energy of sound is distributed across the frequency range, the International Standards Organisation has agreed on "preferred" bands of frequency for sound measurement and analysis. The widest and most commonly used band for frequency measurement and analysis is the Octave Band.

In these bands, the upper frequency limit is twice the lower frequency limit, with the band being described by its "centre frequency" which is the average (geometric mean) of the upper and lower limits, e.g. 250 Hz octave band extends from 176 Hz to 353 Hz. The most commonly used octave bands are:

Octave Band Centre Frequency Hz	63	125	250	500	1000	2000	4000	8000

Human Perception of Broadband Noise

Because of the logarithmic nature of the decibel scale, it should be borne in mind that sound levels in dB(A) do not have a simple linear relationship. For example, 100dB(A) sound level is not twice as loud as 50dB(A). It has been found experimentally that changes in the average level of fluctuating sound, such as from traffic, need to be of the order of 3dB before becoming definitely perceptible to the human ear. Data from other experiments have indicated that a change in sound level of 10dB is perceived by the average listener as a doubling or halving of loudness. Using this information, a guide to the subjective interpretation of changes in environmental sound level can be given.

INTERPRETATION

Change in Sound Level dB	Subjective Impression	Human Response
0 to 2	Imperceptible change in loudness	Marginal
3 to 5	Perceptible change in loudness	Noticeable
6 to 10	Up to a doubling or halving of loudness	Significant
11 to 15	More than a doubling or halving of loudness	Substantial
16 to 20	Up to a quadrupling or quartering of loudness	Substantial
21 or more	More than a quadrupling or quartering of loudness	Very Substantial

Earth Bunds and Barriers - Effective Screen Height

When considering the reduction in sound level of a source provided by a barrier, it is necessary to establish the "effective screen height". For example if a tall barrier exists between a sound source and a listener, with the barrier close to the listener, the listener will perceive the sound as being louder if he climbs up a ladder (and is closer to the top of the barrier) than if he were standing at ground level. Equally if he sat on the ground the sound would seem quieter than if he were standing. This is explained by the fact that the "effective screen height" is changing with the three cases above. In general, the greater the effective screen height, the greater the perceived reduction in sound level.

Similarly, the attenuation provided by a barrier will be greater where it is aligned close to either the source or the listener than where the barrier is midway between the two.

PLANT SOUND TO OFF-SITE RECEPTOR		63Hz 125Hz 250Hz 500Hz 1kHz 2kHz 4kHz 8kHz	dB(A)
Aerona 290 4kW Lp @ 1m	Lp @ 1m	No spectral data available	40
Number of	3no		5
Screening Loss	No Screening		
Distance Loss	19m		-26
	Subtotal		**19**
Aerona 290 4kW Lp @ 1m	Lp @ 1m	No spectral data available	40
Number of	6no		8
Screening Loss	No Screening		
Distance Loss	32m		-30
	Subtotal		**18**
Aerona 290 4kW Lp @ 1m	Lp @ 1m	No spectral data available	40
Number of	3no		5
Screening Loss	No Screening		
Distance Loss	43m		-33
	Subtotal		**12**
Specific sound level at receptor	**$L_{eq\ 1hr}$**		**22**

PLANT SOUND TO ON-SITE 2ND FLOOR RECEPTOR		63Hz 125Hz 250Hz 500Hz 1kHz 2kHz 4kHz 8kHz	dB(A)
Aerona 290 4kW Lp @ 1m	Lp @ 1m	No spectral data available	40
Number of	3no		5
Screening Loss	Line of Sight (5 dB)		-5
Distance Loss	11m		-21
	Subtotal		**19**
Aerona 290 4kW Lp @ 1m	Lp @ 1m	No spectral data available	40
Number of	2no		3
Screening Loss	Line of Sight (5 dB)		-5
Distance Loss	6m		-16
	Subtotal		**22**
Aerona 290 4kW Lp @ 1m	Lp @ 1m	No spectral data available	40
Number of	3no		5
Screening Loss	Line of Sight (5 dB)		-5
Distance Loss	15m		-24
	Subtotal		**16**
Specific sound level at receptor	**$L_{eq\ 1hr}$**		**25**

PLANT SOUND TO ON-SITE GROUND FLOOR RECEPTOR		63Hz 125Hz 250Hz 500Hz 1kHz 2kHz 4kHz 8kHz	dB(A)
Aerona 290 4kW Lp @ 1m	Lp @ 1m	No spectral data available	40
Number of	1no		0
Screening Loss	Line of Sight (5 dB)		
Distance Loss	11m		-21
	Subtotal		**19**
Aerona 290 4kW Lp @ 1m	Lp @ 1m	No spectral data available	40
Number of	1no		0
Screening Loss	Line of Sight (5 dB)		-5
Distance Loss	2m		-6
	Subtotal		**29**
Aerona 290 4kW Lp @ 1m	Lp @ 1m	No spectral data available	40
Number of	1no		0
Screening Loss	Line of Sight (5 dB)		-5
Distance Loss	5m		-14
	Subtotal		**21**
Aerona 290 4kW Lp @ 1m	Lp @ 1m	No spectral data available	40
Number of	1no		0
Screening Loss	Line of Sight (5 dB)		-5
Distance Loss	14m		-23
	Subtotal		**12**
Specific sound level at receptor	**$L_{eq\ 1hr}$**		**30**