ENVIRONOISE
CONSULTANTS IN ACOUSTICS

Acoustics Report

Reference:	5371R01SWMW
Your reference:	-
Client:	Ty Avow, 21 Egerton Street Wrexham LL11 1ND
Project:	Plant noise impact assessment, Ty Avow, Wrexham LL11 1ND
Revision:	-
Author/ Approver:	Sam Williams MIOA / Miles Woolley MIOA
Date:	Thursday, 18 December 2025

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Executive Summary

Environoise Consulting Limited has been commissioned by Lawray Architects to provide a noise impact assessment of the proposed external heat pump serving the refurbishment and extension to Ty Avow, 21 Egerton St, Wrexham LL11 1ND. The assessment is required to inform a planning application.

Noise Survey

An unattended noise survey was done between Wednesday 10th and Thursday 11th December 2025 to determine existing background noise levels at a position representative of the nearest noise-sensitive receptors which are the residential properties in Trinity House, situated on Trinity Street, adjacent to the rear of the site.

Plant Noise Impact

The level of plant noise impact has been assessed considering the proposed heat pump specification and measured background noise levels, in accordance with BS 4142:2014+A1:2019. The noise impact is calculated to be of 'low impact' with an accounting of the context of the proposed heat pump in relation to the existing noise environment.

The level of plant noise breakthrough into the Flexible Community Space directly below has been assessed and is calculated to meet a recommended NR25 $L_{eq,T}$ target.

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1 Criteria

1.1 Wrexham County Borough Council

1.1.1 it is understood that Wrexham County Borough Council do not specify any objective criteria for the assessment of fixed external plant. Therefore, the assessment of noise impact from external plant has been done to achieve a 'low impact', in accordance with BS 4142:2014+A1:2019 'Methods for rating and assessing industrial or commercial sound'[i] (BS 4142).

1.2 BS 4142:2014+A1:2019

1.2.1 BS 4142 provides a method of determining the '*impact of specific sound'* on dwellings due to industrial and commercial noise sources through comparison between the measured background noise level (L_{A90}) and the noise source rating level ($L_{Ar,Tr}$) under consideration. The rating level is the specific noise level plus penalties of up to 18dB added for features to account for the character of the noise as follows:

- **Tonality:** +2dB penalty: Just perceptible; +4dB penalty: Clearly perceptible and +6dB penalty: Highly perceptible.
- **Impulsivity:** +3dB penalty: Just perceptible; +6dB penalty: Clearly perceptible and +9dB penalty: Highly perceptible.
- **Intermittency:** +3dB penalty: identifiable on / off conditions.
- **Other:** +3dB penalty: where the specific sound features characteristics that are neither tonal nor impulsive, nor intermittent though otherwise, are readily distinctive against the residual acoustic environment.

1.2.2 When comparing the rating plant noise level against the background noise level, BS 4142:2014+A1:2019 provides the following noise impact descriptors:

- +10dB(A) is likely to be an indicator of 'a significant impact, depending on the context'.
- +5dB(A) is likely to be an indicator of 'an adverse impact, depending on the context'.
- No excess of the background noise level is an indicator of 'a low impact, depending on the context'.

2 Noise Survey

2.1 Site Description

2.1.1 The site is bound to the north by Ijazz Indian Cuisine, to the east by Egerton Street with Armed Forces Careers office beyond, commercial outlets to the south (including Co-op Food and Wrexham World Food Centre), Wrexham Library to the northeast, and Trinity Street to the west with Wrexham Bus Station beyond.

2.1.2 To the west is Trinity House on Trinity Street, which contains residential apartments. It is unclear whether these apartments are currently occupied; however, an internet search[1] indicates that some units were sold as residential properties in 2024. Therefore, these properties are assumed to remain in residential use.

2.2 Survey Methodology

2.2.1 An unattended noise survey was done at two positions; however, only one position (Position 1) is pertinent to this report and so Position 2 has not been referenced further. Measurements were taken at Position 1 between 14.30hrs, Wednesday 10th December and 09.15hrs, Thursday 11th December 2025, the position is representative of the nearest residential noise sensitive receptors (NSRs) in Trinity House.

2.2.2 The SLM was set to measure A-weighted overall contiguous 15-minute interval ambient, maximum, and background noise levels ($L_{Aeq,15\ minute}$, $L_{Amax,fast}$, $L_{A90\ (15\ minute)}$) and associated Z-weighted octave band noise levels. The measurement position is shown in Figures 2.1 and 2.2.

[1] https://www.192.com/places/ll/ll11-1/ll11-1nl/

Figure 2.1: Noise measurement position – plan view.



Figure 2.2: Noise measurement position – street view.



Equipment and Calibration

2.2.3 Details of instrumentation used are given in Table 2.1.

Table 2.1: Instrumentation details for noise survey.

Manufacturer	Equipment type	Serial number	Laboratory calibration date
Rion	NL-53 sound level meter	941366	7th January 2025
	NH-25 preamplifier	44321	
	UC-59 microphone	25919	
	NC-75 calibrator	35146216	

2.2.4 The sound level meter was calibrated before and after the surveys, with no recorded drift greater than 0.2dB; therefore, the measurements are acceptable.

Weather

2.2.5 During the survey, measured windspeeds were above 5m/s between approximately 07.00 and 09.00hrs, Thursday 11th December 2025. However, a review of the background noise level data obtained indicates that this had a negligible impact on the sound levels. Therefore, all measurements have been included in the analysis.

2.3 Background Noise Levels

2.3.1 BS 4142 requires the use of a 'representative' background noise level to assess the impact of plant noise. Table 2.2 presents the background noise level obtained at Position 2 which was deemed to be 'representative', which was the second most commonly occuring noise level. The building is understood to operate between 09.00 and 18.00hrs; however, measurements taken between 07.00 and 19.00hrs have been used in the assessment to account for any occasional extension of work hours.

2.3.2 Measurements can be considered as 'façade' noise levels due to the proximity to the external wall; therefore, the values given in Table 2.2 have been corrected by -3dB to convert to 'free-field' equivalent.

Table 2.2: Measured background noise levels and plant noise limits.

Period	Measured background noise level [$L_{A90\ (15mins)}$ (dB)]	
	Range	Representative background noise level and plant noise limit
Daytime (14.30 – 19.00 and 07.00 - 09.15hrs)	44 - 52	45

3 Noise Impact

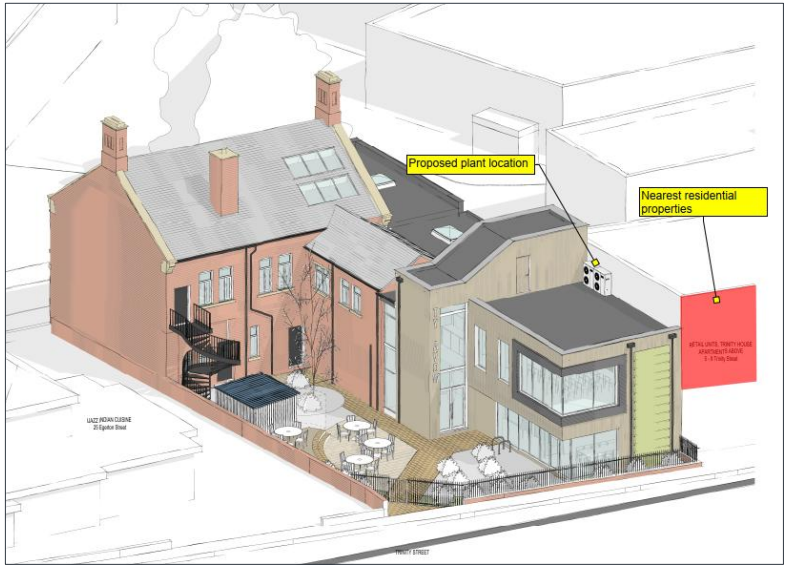
3.1 Proposed Plant

3.1.1 One air source heat pump is proposed on the flat roof, see Figure 3.1, with the specification and corresponding sound data given in Table 3.1. The highest noise generating mode (capacity priority mode) has been used for a robust assessment.

Table 3.1: Considered plant and associated sound pressure level data.

Specification	Octave band (Hz) sound pressure level at 1m [L_p (dB)]							L_{pA} at 1m (dB)
	63	125	250	500	1k	2k	4k	
Mitsubishi CAHV-R450YA-HPB (capacity priority mode)	66	73	70	68	62	60	62	72

Figure 3.1: Proposed plant location and nearest residential properties.



3.2 Noise Impact Assessment

3.2.1 Proposed plant noise levels have been calculated at the façade of the nearest NSRs for the operational period considered (07.00 – 19.00hrs) using the sound pressure levels of the proposed plant in general accordance with BS 4142 and ISO 9613-2, see Table 3.2.

$L_{p\,(NSR)} = L_p - 20 \times \log (R/r) - A$

Where:
$L_{p\,(NSR)}$ = sound pressure level at NSR (dBA)
L_p = sound pressure level of plant at reference distance (dBA)
R = plant noise level measurement reference distance (m)
r = distance in metres of plant to NSR
A = building attenuation (complete obscuring of line of sight = ≥10dB)

Therefore:

$72 - 20 \times \log (9/1) - 10 = 43$

Acoustic Feature Correction

3.2.2 The guidance in BS 4142 requires that decibel corrections be added to the *specific sound level* if the noise contains unusual acoustic characteristics. The corrected sound level is known as the *rating level*. The following characteristics have been considered:

- **Tonality** – Noise from the new heat pump is expected to be broadband in nature and so no correction has been applied.
- **Impulsivity** – When properly maintained, noise from the proposed new equipment is not expected to exhibit impulsive characteristics, therefore no correction has been applied.
- **Intermittency** – New equipment is expected to operate with gradual stops/starts and so no correction has been applied.
- **Other** – The units are not expected to emit any other characteristics that would be readily distinctive against the existing acoustic environment; therefore, no correction has been applied.

Table 3.2: Plant noise impact assessment at NSRs.

	Noise impact Daytime (07.00 – 23.00hrs)
Specific noise level at NSR (dBA)	43
Acoustic feature correction (dB)	0
Rating plant noise level ($L_{Ar,Tr}$)	43
Plant noise limit (dBA)	45
Excess (dBA)	0 (-2)
BS 4142:2014 initial estimate descriptor	'low impact, depending on the context'

Context

3.2.3 The initial estimate is an indication of a 'low impact, depending on the context' in BS 4142. However, this numerical assessment is only an 'initial estimate' of a BS 4142 assessment and consideration of context is necessary to determine the extent of noise impact in accordance with the Section 11 of the standard as follows:

> *'The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs. An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context'.*

3.2.4 The site is situated in an area already containing external plant serving the Ijazz Indian Restaurant and Co-op (see Figures B1 and B2, Appendix B). Therefore, the current sound environment and operations are similar character to that proposed and with consideration of the context, the impact is still deemed to be 'low'. Moreover, the existing bus station is situated directly opposite the windows of the NSRs with the nearest buses parking approximately 9 metres away which will be a significant commercial noise source operating beyond the hours of the heat pump.

Discussion

3.2.5 A 'low' impact is achieved at the nearest NSRs; therefore, no further plant noise mitigation measures are necessary.

4 Plant Noise Breakthrough

4.1 Roof Construction Assessment

4.1.1 The level of roof-top plant noise break-through has been calculated using the roof sound insulation performances in Table 4.1 and the sound pressure level of the heat pump. The roof construction has been based on the proposed sectional drawing ref: AES-LAW-X-X-DR-A-063002 and first floor ceiling plan ref: AES-LAW-X-U01-DR-A-065003 and has been modelled in INSUL sound insulation prediction software.

Table 4.1: Calculated SRI of indicative roof / ceiling construction to the two-storey extension.

Indicative roof construction	Sound reduction indices [SRI (dB)] at octave centre frequency (Hz)							R_w (dB)	$R_w + C_{tr}$ (dB)
	63	125	250	500	1k	2k	4k		
• 3mm waterproof membrane • 250mm PIR insulation • 150mm composite concrete and metal deck system • MF ceiling system forming a ~400mm void • Mineral fibre ceiling tiles (≥2.4kg/m^2)	36	45	59	69	87	87	87	70	60

4.1.2 Tables 4.2 summarises the plant noise break-through calculation compared to a recommended target of NR25 for the Flexible Community Space which is situated directly below the proposed rooftop plant.

Table 4.2: Calculated plant noise breakthrough level in Flexible Community Space, 1st floor.

	$L_{eq,T}$ at octave band centre frequency (Hz)						
	63	125	250	500	1k	2k	4k
Plant noise ingress level (dB)	35	33	16	4	0	0	0
NR25 target [$L_{eq,T}$ (dB)]	55	44	35	29	25	22	20
Level of excess (dB)	0	0	0	0	0	0	0

Discussion

4.1.3 The level of plant noise breakthrough into the Flexible Community Space meets the recommended NR25 target. Therefore, no mitigation measures are necessary assuming that the heat pump is suitably isolated from the roof structure with a vibration isolation target provided in section 4.2.

4.2 General Plant Recommendations

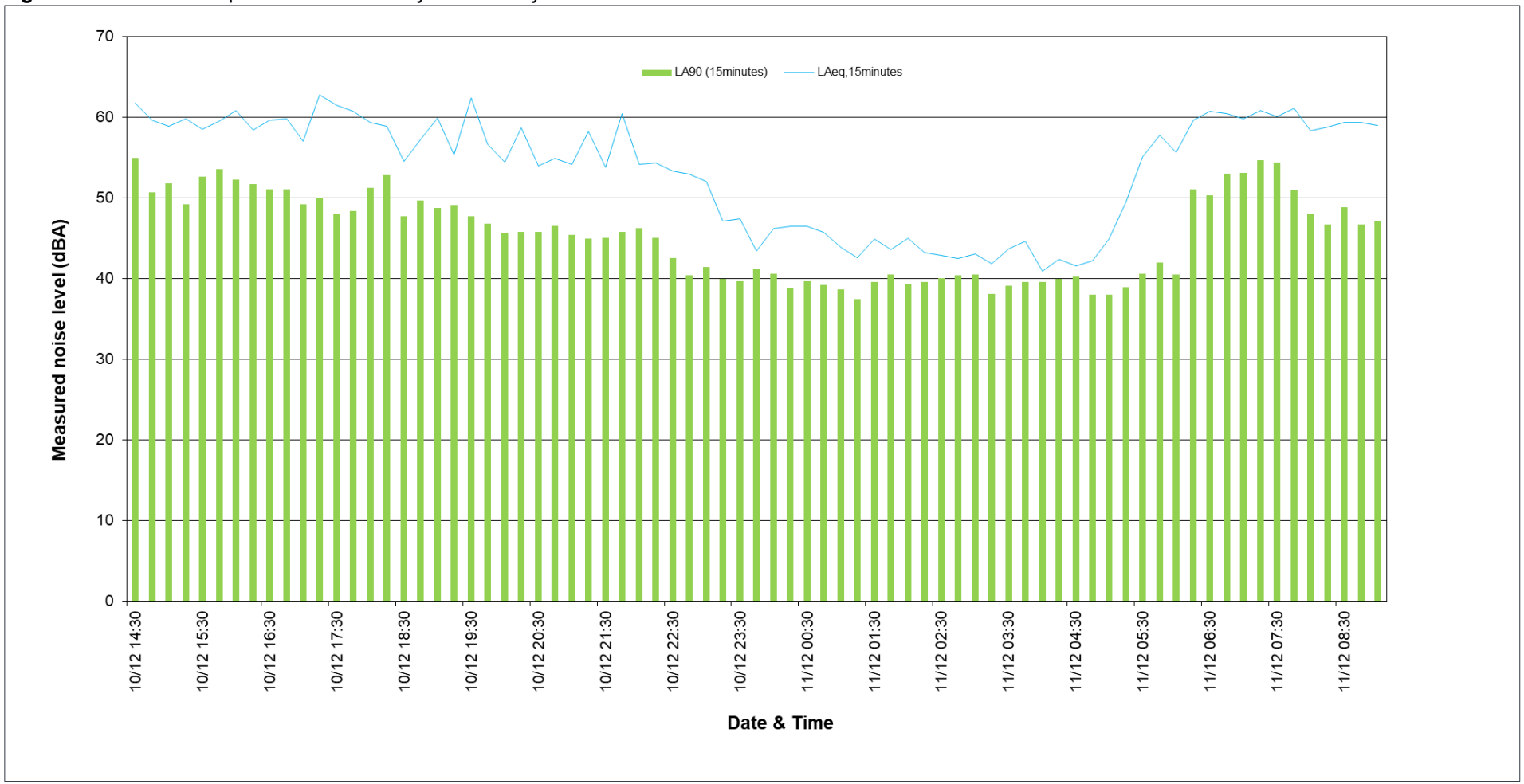
4.2.1 Plant should have suitable isolation to achieve 95% isolation of frequencies of concern. Plant vibration isolators should be chosen such that the natural frequency of the item when mounted on the isolators is substantially below the forcing frequency of the item of plant and the natural frequency of the supported plant.

4.2.2 Please note, we cannot advise on the specification of vibration isolators. Manufactures of vibration isolation mounts have a technical service to advise on the correct mounts to use. They will need to know the weights and weight distribution of the plant over the slab, and the lowest forcing frequency likely to be encountered. An example company is Total Vibration Solutions.

4.2.3 An inertia pouring base or paving slabs may be worth considering. If the requirement is to mount the plant directly onto the roof then a rubber/spring anti-vibration mount should be employed between the plant and inertia base.

Appendix A: Noise Survey Data

Figure A1: Unattended position noise survey time history.



Appendix B: Existing Plant in Vicinity

Figure B1: Plant serving Ijazz Indian Cuisine.



Figure B2: Plant location serving Co-op.



References

[i] BS 4142:2014+A1:2019 ‘Methods for rating and assessing industrial or commercial sound.’