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Unit 19 The Arches, Red Bank Court, Manchester

22 July 2026

20920-NIA-01-AA-R0

Noise Impact Assessment

Project Number
20920

Issued For
Spotland Bridge



EXECUTIVE SUMMARY

This noise impact assessment has been undertaken in order to assess a proposed plant installation for commercial use at Unit 19 The Arches, Red Bank Court, Manchester.

The proposed plant installation comprises the following plant units:

- 2 No. Toshiba Condenser Units.
- 2 No. Toshiba Heat Recovery Units.

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 Manchester City Council

Calculations were undertaken for the nearest receiver, identified as Masson Place. 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, dependent 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 in-duct acoustic attenuators applied to the proposed HRUs

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.

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REVISION HISTORY

Issue	Date of Issue	Author	Reviewed	Authorised
R0	21/07/2026			
		Jamie Newton Senior Consultant BEng (Hons) MIOA	Andrew Thomas Director BSc (Hons) MIOA	John Smethurst Director BSc (Hons) MIOA

Issue	Comment
R0	First Issue

1.0 INTRODUCTION

Clement Acoustics has been commissioned by Splotland Bridge to measure existing background noise levels at Unit 19 The Arches, Red Bank Court, Manchester. Measured noise levels have been used to determine noise emissions criteria for a proposed plant installation in agreement with the planning requirements of the Manchester City Council.

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

An acoustic terminology glossary is provided in Appendix A.

2.0 SITE DESCRIPTION

The site is located within a railway archway bound by Red Bank to the west, Back Red Bank and RedBank Car Park to the east. The surrounding area is mixed commercial and residential in nature.

Current proposals are to install 2 No. Heat Recovery Units ducted to the front (Red Bank) façade of the site, and 2 No. Condenser Units to be installed on the rear (Back Red Bank) façade of the site.

Residential flats within Masson Place has been identified as the nearest affected receivers. These nearest noise sensitive receivers were identified through observations on-site. If there are any receivers closer than those 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 the plant is installed or any noise mitigation measures are implemented.

Locations are shown in attached site plan 20920-SP1.

3.0 ENVIRONMENTAL NOISE SURVEY

3.1 Unattended Noise Survey Procedure

Measurements were undertaken at one positions as shown on indicative site drawing 20920-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 is described in Table 3.1.

Position No.	Description
UN1	The microphone was mounted to signage at the front of the building. The microphone was positioned 1 m in front of the window / wall / fence. ^[1]

Table 3.1 Description of unattended monitoring locations

Note [1]: The position was not considered to be free-field according to guidance found in BS 4142: 2014 '*Methods for rating and assessing industrial and commercial sound*' (BS 4142: 2014), and a correction for reflections has therefore been applied. Based on the presence of the reflective surface and the nature of surrounding noise sources, a correction for reflections of 3 dB has been applied, in line with the recommendations of the standard.

Continuous automated monitoring was undertaken for the duration of the survey between 16:00 on 23 June 2026 and 08:30 on 25 June 2026.

The measurement procedure generally complied with ISO 1996-2: 2017: '*Description, measurement and assessment of environmental noise*'.

3.2 Weather Conditions

At the time of set-up and collection of the monitoring equipment and during the attended measurements, the weather conditions were hot and dry with light winds. It is understood that the weather conditions during the unattended survey remained warm with no precipitation and low wind speeds.

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.

It is considered that the weather conditions were suitable for the measurement of environmental noise.

3.3 Equipment

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 summarised in Table 3.2.

Position	Instrument	Manufacturer	Type
UN1	Class 1 sound level meter ^[1]	Svantek	977
-	Class 1 sound level meter calibrator ^[1]	Norsonic	1251

Table 3.2 Instrumentation used during the survey

Note [1]: Calibration certificates available upon request

3.4 Unattended Noise Survey Results

The L_{Aeq} : 15min, L_{Amax} : 15min, L_{A10} : 15min and L_{A90} : 15min acoustic parameters were measured at the location shown in site drawing 20920-SP1.

Measured noise levels are shown as time histories in Attachment 20920-TH1, with average ambient and typical background noise levels summarised in Table 3.3.

Position	Time Period	Average ambient noise level L_{Aeq} : T, dB	Typical background noise level L_{A90} : 5min, dB
UN1	Daytime (07:00 - 23:00)	54	45
	Night-time (23:00 - 07:00)	46	43

Table 3.3 Average ambient and typical background noise levels

4.0 NOISE CRITERIA

4.1 Local Authority Criteria

Based on previous projects within the Manchester area, it is understood that the Manchester City Council general plant noise emissions criteria are as follows:

“Any ancillary plant or fan/ducting equipment shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (L_{Aeq}) below the typical background(L_{A90}) level in each octave band at the nearest noise sensitive location”

It is understood that the chiller unit may be operational at all hours and so will be compared against minimum measured background levels during night-time hours in order to present the most robust assessment possible.

Based on the results of the environmental noise survey and requirements of Manchester City Council, Table 4.1 presents the measured typical L_{A90} level in each frequency band and the plant noise emission criteria.

	Sound Pressure Level in each Frequency Band, Hz								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Measured Typical Background Noise Level (L_{A90})	46	45	42	39	39	33	26	16	43
Plant Rating Level Limits	41	40	37	34	34	28	21	11	38

Table 4.1 Plant noise emission limits

5.0 PLANT NOISE IMPACT ASSESSMENT

5.1 Proposed Installation

The proposed plant installation comprises the following:

- 2 No. Toshiba VN-U01001SY-E Heat Recovery Units
- 2 No. Toshiba RAV-GV561ATP-E Condenser Units

Noise emissions for the proposed plant units, are shown in Table 5.1. Loudest modes of operation have been used in order to present a robust worst-case assessment. Noise emission data of the RAV-GV561ATP-E Condenser Unit has been provided by the manufacturer. The manufacturer was not able to provide in-duct sound power levels for the Toshiba VN-U01001SY-E, as such as such these levels have been informed by the stated sound pressure levels, corrected to account for the stated distance, typical casing reductions and data from similar units.

Unit		Frequency Band, Hz								dB(A)
		63	125	250	500	1k	2k	4k	8k	
Sound Power Level										
Toshiba VN-U01001SY-E	Intake	46	46	48	49	55	49	45	37	57
	Exhaust	54	54	58	60	67	61	55	50	69
Sound Pressure Level at 1 m										
Toshiba RAV-GV561ATP-E		50	60	42	42	42	34	29	28	47

Table 5.1 Manufacturer provided noise emissions levels

It is proposed that the Heat Recovery Units will duct to the front (Red Bank) façade of the site, and the condenser units will be located at the back (Back Red Bank) façade; this is shown on indicative site plan 20920-SP1.

5.2 Consideration of Penalties

The typical planning condition shown in Section 4.1 makes reference to a “Rating Level”, which is the level generated by the assessed noise source plus any adjustment for the characteristic of the sound. BS 4142: 2014 provides guideline penalties that can be applied to noise emissions to account for tonality, impulsivity and intermittency, the inclusion of which 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 5.2

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 5.2 Available penalties according to BS 4142

5.2.1 Consideration of Tonality

Air source heat pumps and heat recovery units would not be considered a tonal source of noise, provided the units are maintained in good working order.

5.2.2 Consideration of Impulsivity

The proposed plant would not be considered an impulsive source of noise.

5.2.3 Consideration of Intermittency

In terms of the potential intermittency, the following guidance taken from Section 9.2 of BS 4142: 2014 is noted:

“Intermittency

When the specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time. This can necessitate measuring the specific sound over a number of shorter sampling periods that are in combination less than the reference time interval in total, and then calculating the specific sound level for the reference time interval allowing for time when the specific sound is not present. If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.”

For the assessed worst-case periods, the plant is assumed to be in constant operation, in line with the above guidance. It can therefore be determined that there will be no intermittency within that period.

5.2.4 Consideration of Distinctiveness

It is noted that the design target is to achieve a plant noise level that is 5 dB below the background noise level, as described in Section 4.1. As such, plant noise emissions are not expected to be distinctive against the residual noise environment, and no penalty has therefore been applied.

5.3 Proposed Mitigation Measures

In order to meet the proposed criteria stated in Section 4.1, it is recommended that in-duct acoustic attenuators are installed to the intake and exhaust atmospheric ducts of the heat recovery units.

Based on the information provided, an enclosure meeting the sound reduction indices as stated in Table 5.3 should be suitable to achieve this.

Mitigation	Required Attenuation (dB) in each Frequency Band, Hz							
	63	125	250	500	1k	2k	4k	8k
Intake Attenuator	1	2	7	10	11	9	8	7
Exhaust Attenuator	4	7	13	19	23	23	16	13

Table 5.3 Required attenuation from mitigation

5.4 Noise Impact Assessment

The closest receiver has been identified as the window on the eastern facade of Masson Place, a residential property opposite which is a minimum of 17 m from the front façade of the site.

Screening of the nearest noise sensitive receptor from the proposed condenser location is provided by the railway arches that the site is located within.

Taking into account all necessary acoustic corrections, the resulting noise level at the identified residential windows would be as shown in Table 5.4. Detailed calculations are shown in Appendix B.

Description	Sound pressure Level in each Frequency Band, Hz								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Predicted Rating Level at Receiver, $L_{Aeq:T}$, dB	14	20	21	20	24	16	15	11	26
Plant Rating Level Limit $L_{A90:T}$, dB	41	40	37	34	34	28	21	11	38
Difference between Criteria and Predicted Level, dB	-26	-20	-16	-14	-10	-13	-6	0	-12

Table 5.4 Noise levels and project criterion at noise sensitive residential receivers

As presented in Table 5.4 and Appendix B, the plant installation would be expected to meet the requirements of the proposed criteria.

5.5 British Standard Requirements

Further calculations have been undertaken to assess whether the noise emissions from the proposed 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 26 dB(A), acceptable internal conditions would be met by 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 5.5.

Receiver	Recommended Target – For sleeping conditions in a bedroom, in BS 8233: 2014	Noise Level at Receiver (due to plant installation)
Inside Residential Window	30 dB(A)	11 dB(A)

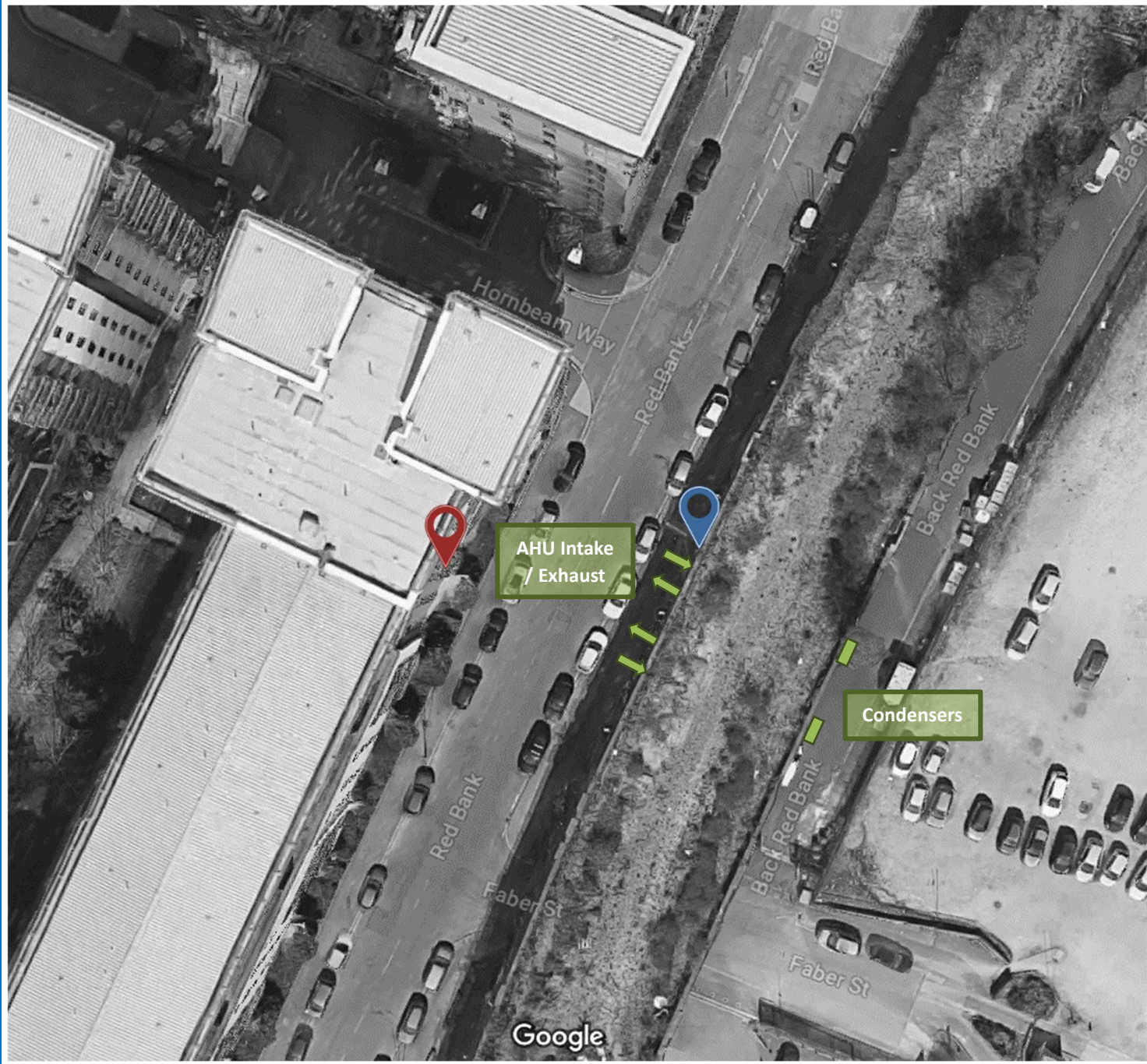
Table 5.5 Noise levels and BS 8233: 2014 criteria inside nearest residential space

6.0 CONCLUSION

An environmental noise survey has been undertaken at Unit 19 The Arches, Red Bank Court, Manchester. The results of the survey have enabled criteria to be set for noise emissions from the proposed plant in accordance with the requirements of the Manchester City 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 nearby noise sensitive receivers.

Calculations show that noise emissions from the proposed units should meet the requirements of the Manchester City Council with the recommended mitigation installed as stated herein.



Not to scale

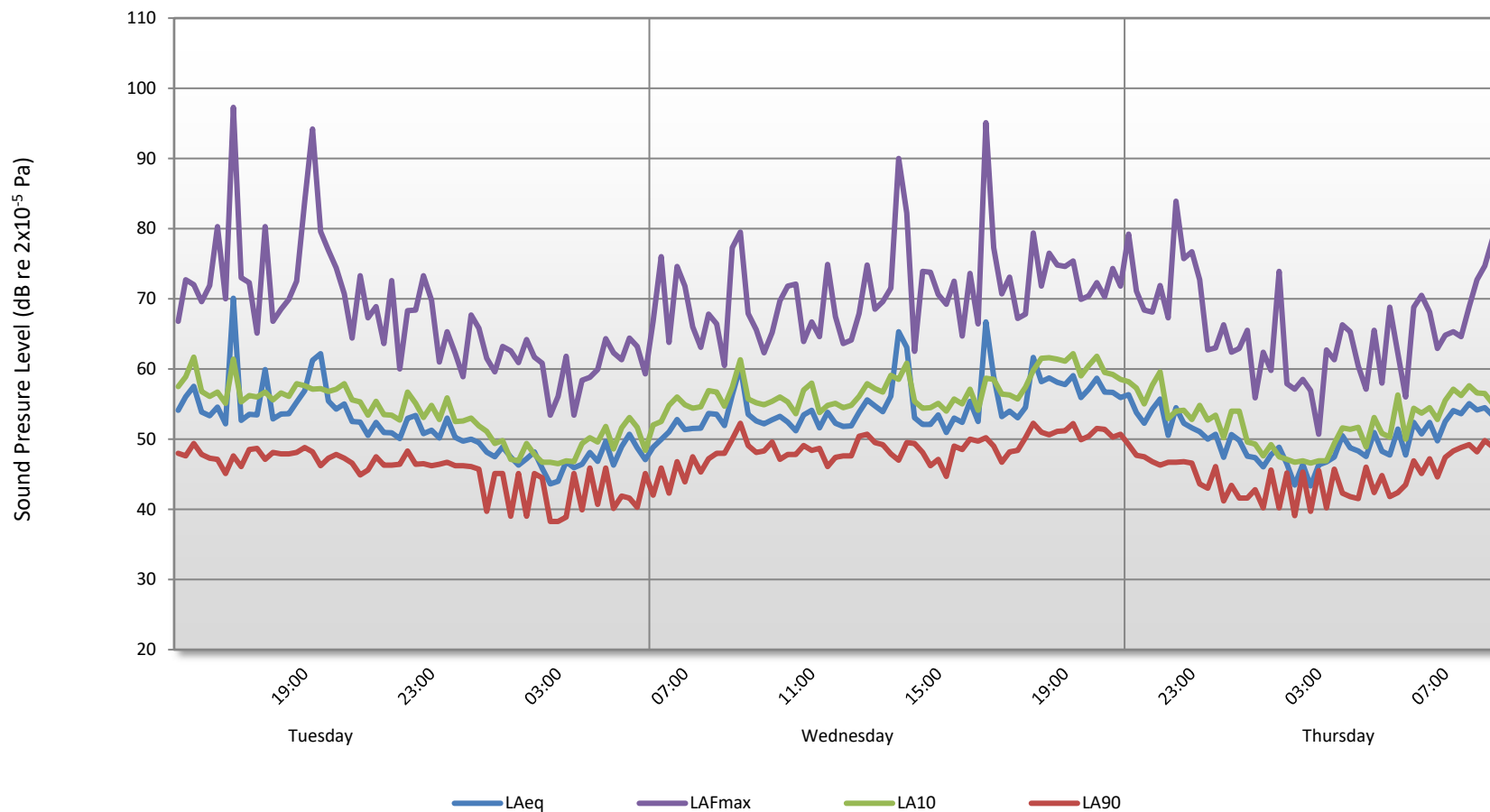
Description:
Indicative site plan showing noise monitoring position, proposed chiller location and nearest sensitive receiver

Date	22 July 2026
Reference	20920-SP1
Project Name	19 Red Bank
Image ©	Google Earth

Key:	
	Unattended Noise Survey Position
	Noise Sensitive Receiver
	Proposed Chiller Location

Unit 19 The Arches, Red Bank Court,
Manchester
Position UN1

Environmental Noise Time History
23 June 2026 to 25 June 2026



GLOSSARY OF ACOUSTIC TERMINOLOGY

Absorption Coefficient α	The absorption coefficient of a material, usually measured for each octave or third-octave band and ranging between zero and one. For example, a value of 0.85 for an octave band means that 85% of the sound energy within that octave band is absorbed on coming into contact with the material. Conversely, a low value below about 0.1 means the material is acoustically reflective.
Acceleration	The rate of change of velocity, often measured in ms^{-2} . Commonly used to assess human response to vibration and for machine condition monitoring.
Accelerometer	A vibration transducer sensor that is used to measure acceleration.
Airborne noise	Noise which is fundamentally transmitted by way of the air and can be attenuated by the use of barriers and walls placed physically between the noise source and receiver.
Ambient Vibration	The all-encompassing vibration occurring at a given location, at a given time, composed of all vibration sources near and far.
Audible Range	The limits of frequency which are audible or heard as sound. The normal hearing in a typical young adult detects ranges from 20 Hz to 20 kHz, although some people can detect sound with frequencies outside these limits. Typically, as a person ages their audible hearing range decreases.
A-Weighting	A filter applied to the sound recording made by a microphone to approximate the response of the human ear.
Axis	A fixed reference line for the measurement of vibration in a particular direction. Vibration is commonly measured in transverse (T), longitudinal (L) and vertical (V) axes (or X, Y and Z).
Background Noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation. The L_{90} parameter, i.e. the level exceeded for not more than 90% of the time is often used as a descriptor of "background noise" for environmental impact studies.
Background Vibration	The underlying level of vibration in the ambient environment, measured in the absence of the vibration sources of interest.
Continuous Vibration	Vibration that continues uninterrupted over a defined period.
dB(A)	The human ear is less sensitive to low (below 125 Hz) and high (above 16 kHz) 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).
Decibel [dB]	The unit that sound is measured in. Decibels are a logarithmic scale hence two equally intense sound sources operating together produce a sound level which is 3 dB higher than one alone and 10 identical, uncorrelated sources produce a 10 dB higher sound level.
Distance Attenuation	Sound which propagates from a point source in free air attenuates by 6 dB for each doubling of distance from the noise source. Sound energy from line sources (e.g. stream of cars) drops off by 3 dB for each doubling of distance.
$D_{nT,w}$	Weighted Standardised Field Level Difference A measure of sound insulation performance of a building element. It is characterised by the difference in noise level on each side of a wall or floor. It is measured in-situ. It is a field measurement that relates to the R_w laboratory measured value but is not equal to it because an in-situ space is not of the same quality as a laboratory space. The value is indicative of the level of speech privacy between spaces. The higher its value the better the insulation performance.
Flanking	Flanking is the transfer of sound through paths around a building element rather than through the building element material directly. For example, sound travelling through a gap underneath a door or a gap at the top of a wall.
Frequency	Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch, and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz. In the case of vibration, frequency is the number of oscillations that occurs per second. Frequency is measured in units of Hertz (Hz).
Ground-Borne Noise	Vibration propagated through the ground and then radiated as noise by vibrating building elements such as wall and floor surfaces. This noise is more noticeable in rooms that are well insulated from other airborne noise. An example would be vibration transmitted from an underground rail line radiating as sound in a bedroom of a building located above.
Impact Noise	Impact noise / structure-borne noise is generated when an object impacts with a separating element, causing that element to vibrate and re-radiate as noise in the receiving room. Common domestic examples of impact noise include footsteps and dropping objects.
Impulsive Noise	Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.

Impulsive Vibration	Vibration that rapidly builds up to a peak followed by a damped decay. May consist of multiple impulsive events, typically less than two seconds in duration.												
Intermittent Noise	The level suddenly drops to that of the background noise several times during the period of observation.												
Intermittent Vibration	Either interrupted periods of continuous vibration or repeated periods of impulsive vibration.												
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_{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_{max}	This is the maximum sound pressure level that has been measured over a period.												
$L_{nT,w}$	Weighted Standardised Field Impact Sound Pressure Level As for $L_{n,w}$ but measured in-situ and therefore subject to the inherent accuracies involved in such a measurement. The equivalent measurement in a laboratory is the $L_{n,w}$. A lower value indicates a better performing floor.												
Noise	Unwanted sound.												
Octave	An octave represents a doubling or halving in frequency. Noise or vibration levels across a frequency spectrum are commonly given in octave or one-third octave frequency bands.												
PPV	Peak Particle Velocity. The absolute maximum value of the vibration velocity signal measured in any axis during a given time interval.												
Reflection	Sound wave reflected from a solid object obscuring its path.												
R_w	Weighted Sound Reduction Index A measure of the sound insulation performance of a building element. It is measured in very controlled conditions in a laboratory. The related field measurement is the $D_{nT,w}$. The higher the value the better the acoustic performance of the building element.												
Sound	A fluctuation of air pressure which is propagated as a wave through air.												
Sound Absorption	The ability of a material to absorb sound energy by conversion to thermal energy.												
Sound Insulation	Sound insulation refers to the ability of a construction or building element to limit noise transmission through the building element. The sound insulation of a material can be described by the R_w and the sound insulation between two rooms can be described by the $D_{nT,w}$.												
Sound Level Meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.												
Sound Power Level	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power of 1 pico watt.												
Sound Pressure Level	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone referenced to 20 micro Pascal.												
Structure-borne Noise	Audible noise generated by vibration induced in the ground and/or a structure. Vibration can be generated by impact or by solid contact with a vibrating machine. Examples of structure-borne noise include the noise of trains in underground tunnels heard to a listener above the ground, the sound of footsteps on the floor above a listener and the sound of a lift car passing in a shaft.												
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.												
	<table border="1"> <thead> <tr> <th>Change in sound level (dB)</th><th>Change in perceived loudness</th></tr> </thead> <tbody> <tr> <td>1</td><td>Imperceptible</td></tr> <tr> <td>3</td><td>Just barely perceptible</td></tr> <tr> <td>6</td><td>Clearly noticeable</td></tr> <tr> <td>10</td><td>About twice as loud</td></tr> <tr> <td>20</td><td>About 4 times as loud</td></tr> </tbody> </table>	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
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												

Tonal Noise	Sound containing a prominent frequency and characterised by a definite pitch.
Transmission Loss	The sound level difference between one room or area and another, usually of sound transmitted through an intervening partition or wall. Also the vibration level difference between one point and another. For example, if the sound level on one side of a wall is 100 dB and 65 dB on the other side, it is said that the transmission loss of the wall is 35 dB. If the transmission loss is normalised or standardised, it then becomes the R_w or R'_w or $D_{nT,w}$.
VDV	Vibration Dose Value. A measure of tactile vibration levels used to assess intermittent vibration.
Velocity	The rate of change of vibration displacement, usually measured in mms^{-1} .
Vibration	A mechanical phenomenon whereby oscillations occur about an equilibrium point; a periodic back-and-forth motion of an elastic body or medium, commonly resulting when almost any physical system is displaced from its equilibrium condition.

Acoustic Calculations

20920

Unit 19 The Arches, Red Bank Court, Manchester

Receiver 1: Masson Place - Plant Noise

External Plant Noise Emissions Calculation

Description	Frequency, Hz								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Manufacturer provided sound power level									
HRU 1 Intake - In duct level	46	46	48	49	55	49	45	37	57
System Corrections	-9	-1	4	5	4	0	-1	-3	
Proposed Attenuator	-1	-2	-7	-10	-11	-9	-8	-7	
Hemi-Spherical Radiating Correction	-8	-8	-8	-8	-8	-8	-8	-8	
Distance correction to receiver, dB (17 m) ^[1]	-25	-25	-25	-25	-25	-25	-25	-25	
Sound pressure level at receiver	3	10	12	11	15	7	3	-6	17
HRU 1 extract - In duct level	54	54	58	60	67	61	55	50	69
System Corrections	-9	-1	4	7	8	6	5	3	
Proposed Attenuator	-4	-7	-13	-19	-23	-23	-16	-13	
Hemi-Spherical Radiating Correction	-8	-8	-8	-8	-8	-8	-8	-8	
Distance correction to receiver, dB (17 m) ^[1]	-25	-25	-25	-25	-25	-25	-25	-25	
Sound pressure level at receiver	8	13	16	15	19	11	11	7	22
HRU 1 Intake - In duct level	46	46	48	49	55	49	45	37	57
System Corrections	-9	-1	4	5	4	0	-1	-3	
Proposed Attenuator	-1	-2	-7	-10	-11	-9	-8	-7	
Hemi-Spherical Radiating Correction	-8	-8	-8	-8	-8	-8	-8	-8	
Distance correction to receiver, dB (17 m) ^[1]	-25	-25	-25	-25	-25	-25	-25	-25	
Sound pressure level at receiver	3	10	12	11	15	7	3	-6	17
HRU 1 extract - In duct level	54	54	58	60	67	61	55	50	69
System Corrections	-9	-1	4	7	8	6	5	3	
Proposed Attenuator	-4	-7	-13	-19	-23	-23	-16	-13	
Hemi-Spherical Radiating Correction	-8	-8	-8	-8	-8	-8	-8	-8	
Distance correction to receiver, dB (17 m) ^[1]	-25	-25	-25	-25	-25	-25	-25	-25	
Sound pressure level at receiver	8	13	16	15	19	11	11	7	22
Manufacturer provided sound pressure level at 1 m									
Toshiba RAV-GV561ATP	50	60	42	42	42	34	29	28	47
Correction for multiple units	3	3	3	3	3	3	3	3	
Barrier Attenuation	-14	-18	-22	-25	-25	-25	-25	-25	
Distance correction to receiver, dB (30 m) ^[1]	-30	-30	-30	-30	-30	-30	-30	-30	
Sound pressure level at receiver	9	15	-7	-10	-10	-18	-23	-24	1
Combined Sound Pressure Level at Receiver (Rating Level)	14	20	21	20	24	16	15	11	26
Design Criterion	41	40	37	34	34	28	21	11	38
Level Difference	-27	-20	-16	-14	-10	-13	-6	0	

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

BS 8233 Assessment Calculation

Description	Frequency, Hz								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Sound pressure level outside window	14	20	21	20	24	16	15	11	26
Minimum attenuation from partially open window, dB	-15	-15	-15	-15	-15	-15	-15	-15	
Sound pressure level inside nearest noise sensitive premises	-1	5	6	5	9	1	0	-4	11
Design Criterion									30