Acoustic Consultancy Report

34161/3/1/2

External Plant Assessment

Report Prepared For

Trivent Ltd
Head Of Steam
30 June 2025

Report Author

Bradley Fox

Checked By

M Balsom MSc MIOA (D) (E)

Telephone
0118 918 6460
Facsimile
0118 918 6480

enquiries@lcpacoustics.co.uk
www.lcpacoustics.co.uk

LCP
Riverside House
3 Winnersh Fields
Gazelle Close
Winnersh
Wokingham
RG41 5QS

A division of Caice
Acoustic Air Movement Ltd.

Company Registration Number
2790667
VAT Registration Number
GB614683632

Contents

i) Executive Summary 4

ii) Document History 4

1. Introduction 5

2. Survey 5

2.1. Site Description 5

2.2. Receiver Location 5

2.3. Local Noise Climate 5

2.4. Measurements 5

2.5. Measurement Results 6

3. Evaluation of Design Criteria 6

3.1. Residential Design Criterion 6

3.1.1. BS4142:2014 6

3.1.2. World Health Organisation (WHO) Guidelines for Community Noise (1999) 7

3.1.3. BS8233:2014 8

3.1.4. Local Authority Requirements 8

3.1.5. Recommended Residential Design Rating Level 8

3.2. Design Rating Levels 8

4. Review of Current Design 9

4.1. Current Design 9

4.2. Calculated Results 9

5. Noise Mitigation Option 9

5.1. Noise Mitigation Scheme 9

5.2. Mitigated Results 10

6. Conclusion 10

Appendix A: Site Plan 11

Appendix B: Plant location 12

Appendix C: Measurement Data 13

Appendix D: Plant Data 14

Appendix E: Calculations 15
Appendix F: Glossary 17

i) Executive Summary

New mechanical plant is to be installed at Head of Steam, in Manchester.

LCP has been commissioned by Trivent Ltd to carry out an acoustic environment survey and to use the obtained data to assess the potential noise impact of the plant installation on surrounding noise sensitive receptors.

The design criterion is as follows:

Day:	45 dB $L_{Aeq,T}$ at 4m, Finlay's Yard.

The design as proposed and assessed will achieve the required criteria provided the mitigation detailed in section 5 of this report is implemented; the calculated rating levels are as follows:

Day:	44 dB $L_{Aeq,T}$ at 4m, Finlay's Yard.

This report concludes that the design criteria can be achieved.

ii) Document History

Issue	Date	Issue Details	Issued By	Checked By
1	30/06/2025	Initial Issue	BF	VB

1. Introduction

New mechanical plant is to be installed at Head of Steam, in Manchester.

LCP has been commissioned by Trivent Ltd to carry out an acoustic environment survey and to use the obtained data to assess the potential noise impact of the plant installation on surrounding noise sensitive receptors.

The report details recommendations for necessary noise mitigation where necessary.

The guidance contained in this report is given on the basis that the operational period of the plant may potentially be continuous between 11:00 and 21:30.

2. Survey

2.1. Site Description

The site layout together with the measurement position is shown in the drawing contained within Appendix A.

2.2. Receiver Location

The site was surveyed to determine the location of the most affected receiver.

The nearest receiver with direct line of sight to the plant area is 4m to the southeast of the site. This is shown in the site plan in Appendix A. The receiver is part of a residential block consisting of 4 storeys

2.3. Local Noise Climate

The predominant local noise sources were existing plant, which was not dominant and not included in the proposed site. Road traffic noise was occasional along with people regularly talking near the microphone.

2.4. Measurements

The noise monitoring took place on the 20th until the 24th of June 2025. The measurement period was considered sufficient to establish the representative background sound levels corresponding to the operational period of the plant.

The weather conditions monitored during the survey are shown in the following table.

Table 1: Weather Conditions at Measurement Location

Weather	Value				
	20/06/25	**21/06/25**	**22/06/25**	**23/06/25**	**24/06/25**
Average Wind Speed	2.5m/s	3m/s	5m/s	5m/s	5m/s
Wind Direction	North	Northwest	Northeast	East	Northeast
Cloud Cover	10%	50%	60%	40%	70%
Max. Temperature	29°C	28°C	20°C	17°C	21°C

Weather	Value				
	20/06/25	21/06/25	22/06/25	23/06/25	24/06/25
Min. Temperature	25°C	24°C	15°C	15°C	18°C
Precipitation	None	13:20-15:50 light rain	16:20-21:00 rain showers	None	12:20-12:50 light rain

2.5. Measurement Results

The measured statistical broad-band sound pressure levels are shown within Appendix B. The representative background sound level(s) obtained being as follows:

Table 2: Representative background sound levels, dB re $2x10^{-5}$ Pa

Measurement Position	$L_{A90,\ 15\ mins}$ Day*
MP1	55

* Day periods are defined as between 07:00 - 23.00.

3. Evaluation of Design Criteria

3.1. Residential Design Criterion

3.1.1. BS4142:2014

BS4142:2014 states that 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.

Table 3: BS4142 assessment based upon rating level

Difference between background noise and rating levels	Assessment
+ 10 dB	Indication of a significant adverse impact
+ 5 dB	Indication of an adverse impact
0 dB	Indication of low impact

Certain acoustic features can increase the significance of impact. The specific sound level should be corrected if a tone, impulse or other acoustic feature is expected to be present.

Table 4: Corrections for acoustic features, subjective method

Acoustic Feature	Correction, dB		
	Just Perceptible	Clearly Perceptible	Highly Perceptible
Tonality	2	4	6
Impulsivity	3	6	9
Other Characteristics	3		
Intermittency	3		

Typically the acoustic feature correction would not be expected to exceed 10dB.

Where the level of uncertainty could affect the conclusion, take reasonably practicable steps to reduce the level of uncertainty.

3.1.2. World Health Organisation (WHO) Guidelines for Community Noise (1999)

The WHO's 'Guidelines for Community Noise' gives the following relevant noise criteria:

Table 5: Guideline values for community noise, from Guidelines for Community Noise (WHO, 1999)

Specific Environment	$L_{Aeq,T}$ dB	Time Base (hours)	L_{Amax}, fast dB
Outdoor living area (serious annoyance, daytime and evening)	55	16	-
Outdoor living area (moderate annoyance, daytime and evening)	50	16	-
Dwelling, indoors	35	16	-
Inside bedrooms	30	8	45
Outside bedrooms	45	8	60
Outdoors in parkland and conservation areas*	-	-	-

* Existing quiet outdoor areas should be preserved and the ratio of intruding noise to natural background sound should be kept low

The WHO's 'Guidelines for Community Noise' also gives the following general guidance on the expected sound insulation performance of a façade with a partly open window, it states that:

"At night, sound pressure levels at the outside facades of the living spaces should not exceed 45 dB L_{Aeq} and 60 dB L_{Amax}, so that people may sleep with bedroom windows open. These values have been obtained by assuming that the noise reduction from outside to inside with the window partly open is 15 dB."

3.1.3. BS8233:2014

The criteria offered in BS8233 for residential buildings are largely based on the recommendations made in the Guidelines for Community Noise.

Using the general guidance from above, on the expected sound insulation performance of a façade with a partly open window, the criteria shown in the table below have been adapted from the criteria offered in table 4 of BS8233 in order to obtain acceptable external noise levels.

The noise levels shown should be treated as overall noise levels, i.e., the combination of all existing noise levels at the site, and noise levels from any proposed plant or activity.

Table 6: External ambient noise levels for dwellings, based on BS8233, dB re $2x10^{-5}$ Pa

Activity	Location	Time period	
		07:00 to 23:00	23:00 to 07:00
Resting	Living Room	50 $L_{Aeq,16\ hour}$	-
Dining	Dining Room/area	55 $L_{Aeq,\ 16\ hour}$	-
Sleeping (daytime resting)	Bedroom	50 $L_{Aeq,\ 16\ hour}$	45 $L_{Aeq,\ 8\ hour}$

In addition to the above criteria, BS8233 goes on to say:

"*For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 $L_{Aeq,\ T}$, with an upper guideline value of 55 dB $L_{Aeq,\ T}$ which would be acceptable in nosier environments.*"

The above criteria are in line with the recommendations made in WHO's 'Guidelines for Community Noise'.

3.1.4. Local Authority Requirements

Manchester City Council Local Authority Conditions state that:

'Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (LAeq) below the typical background (LA90) level at the nearest noise sensitive location'. Statement obtained from Manchester City Council Planning & Noise Technical Guidance document.

3.1.5. Recommended Residential Design Rating Level

On the basis of the above the recommended residential design rating level should therefore be:

Residential Design Rating Level
Representative $L_{A90,\ 15\ mins}$ - 10 dB

3.2. Design Rating Levels

The design levels to be adopted for this project are set out in the table below.

Table 7: Design rating levels, dB re $2x10^{-5}$ Pa

Receiver Premises	Approximate Distance (m)	Design Level (Day) $L_{Aeq,\ 12\ hr}$
Finlay's Yard	4	45

4. Review of Current Design

4.1. Current Design

The proposed plant shall comprise of an internal located extract fan which will discharge at the façade of the site. The discharge terminal will be located on the southern façade above an access door. The discharge terminal area is 702mm² with a weather louvre.

The extract fan will operate between the hours of 11:00-21:30 only.

4.2. Calculated Results

Calculations of the predicted noise levels have been carried out with the appropriate corrections for geometric attenuation, barrier effect, reflective surfaces and multiple source addition.

The design rating levels to be adopted for this project, together with the predicted noise levels, are set out in the table below.

Table 8: Design and predicted rating levels, dB re $2x10^{-5}$ Pa

Receiver Premises	Approximate Distance (m)	Design Level (Day) $L_{Aeq,\ 12\ hr}$	Predicted Level $L_{Aeq,T}$
Finlay's Yard	4	45	67

Plant noise level data used in this assessment are contained within Appendix D.

Calculations are shown within Appendix E.

5. Noise Mitigation Option

As the plant installation has been assessed to be over the required criteria at the surrounding noise sensitive receptors, the following option shall be applied in order that noise emissions are reduced to acceptable levels.

Should the plant installation be redesigned after consideration of the mitigation options, the installation shall be re-assessed to ensure compliance to the specification has been achieved.

5.1. Noise Mitigation Scheme

The suggested mitigation measure is the introduction of a suitable noise mitigation scheme by means of an 1500mm attenuator on the exhaust, typical performance of an 1500mm exhaust attenuator is shown in the table below.

Table 9: Typical exhaust attenuator insertion loss, dB

	Octave Band Centre Frequency (Hz)							
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
1500mm exhaust attenuator	3	6	11	20	18	11	7	4

The problems of air flow, pressure drop etc, applicable to this equipment will all need to be taken into account.

It is recommended that all attenuator performances are verified by test data in accordance with ISO 7235.

It is important to note that as the criteria is a single figure dB(A) value, the performance of any enclosure, screen or attenuator at each individual frequency can vary from those shown above and still meet the single figure dB(A) value.

5.2. Mitigated Results

The design rating levels to be adopted for this project, together with the predicted noise levels inclusive of the mitigation detailed in Section 5, are set out in the table below.

Table 10: Design and predicted mitigated rating levels, dB re $2x10^{-5}$ Pa

Receiver Premises	Approximate Distance (m)	Design Level (Day) $L_{Aeq,\ 12\ hr}$	Predicted Level $L_{Aeq,T}$
Finlay's Yard	4	45	44

Plant noise level data used in this assessment are contained within Appendix C.

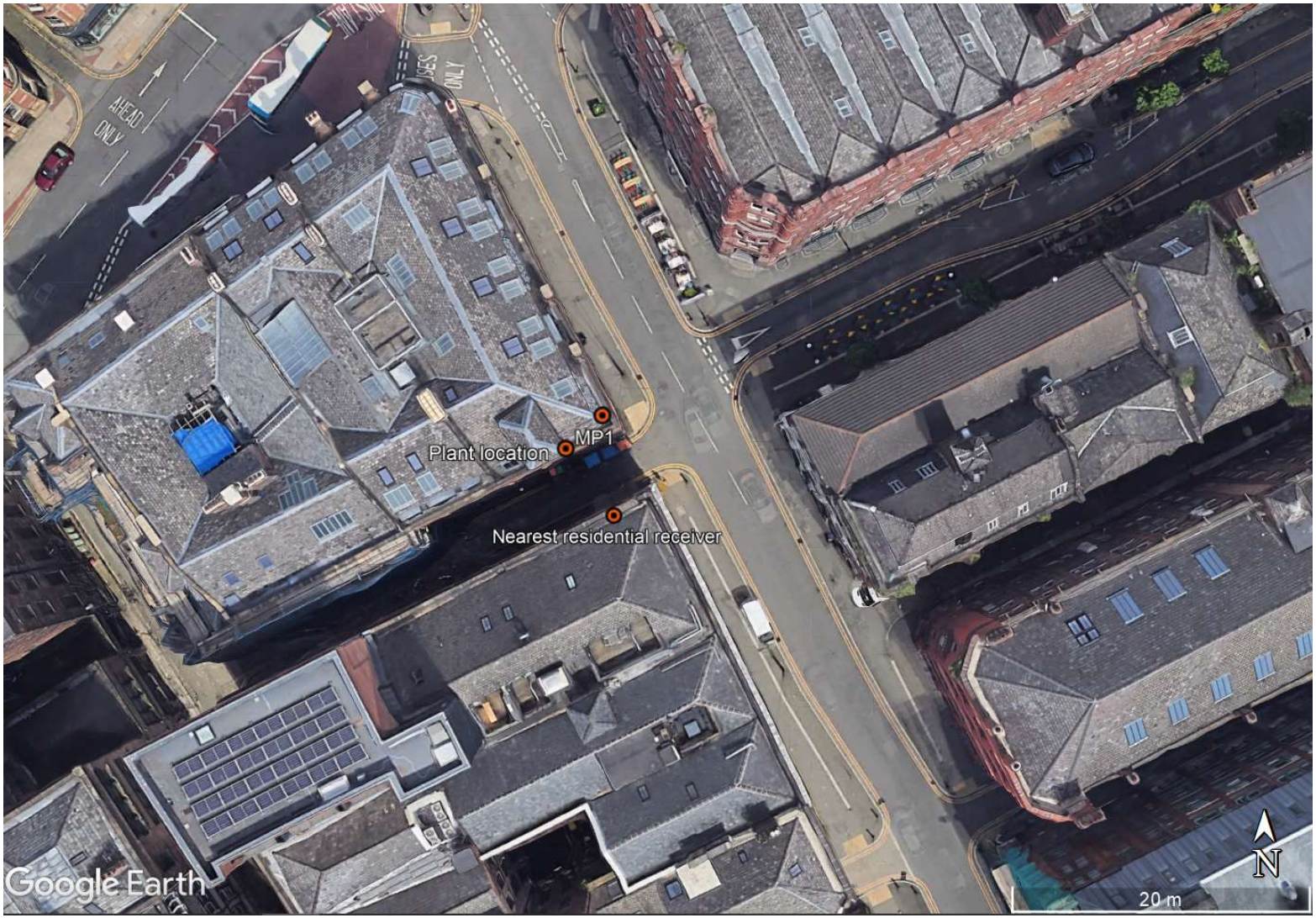
Calculations are shown within Appendix D.

6. Conclusion

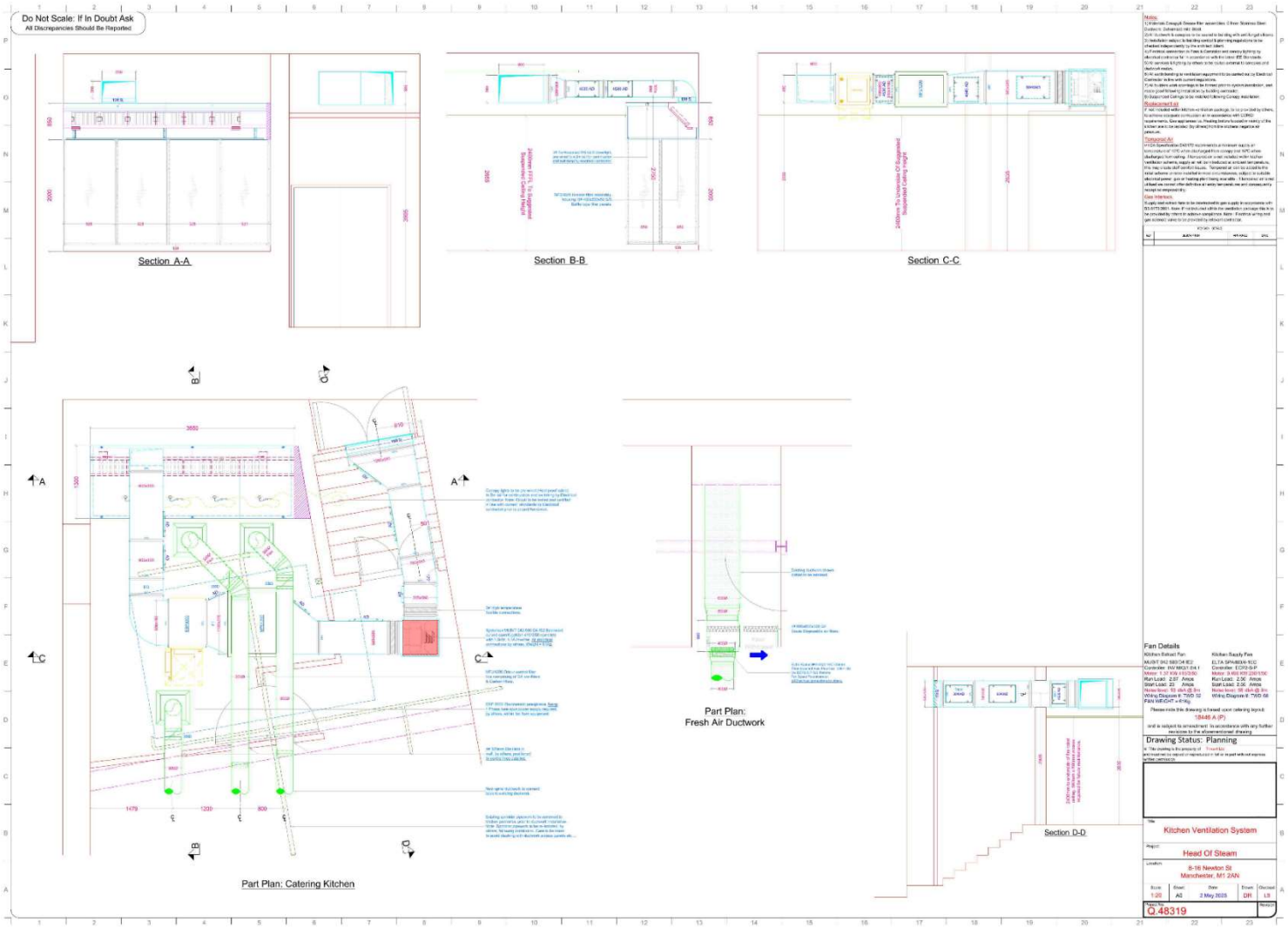
An environmental noise survey has been undertaken in order to establish the representative background sound levels local to the site generally in accordance with the method contained within BS4142: 2014.

Calculations have been carried out to determine the noise levels at the nearest receiver premises. The calculations show that with the implementation the noise mitigation measures detailed in section 5 of this report the design criteria will be met.

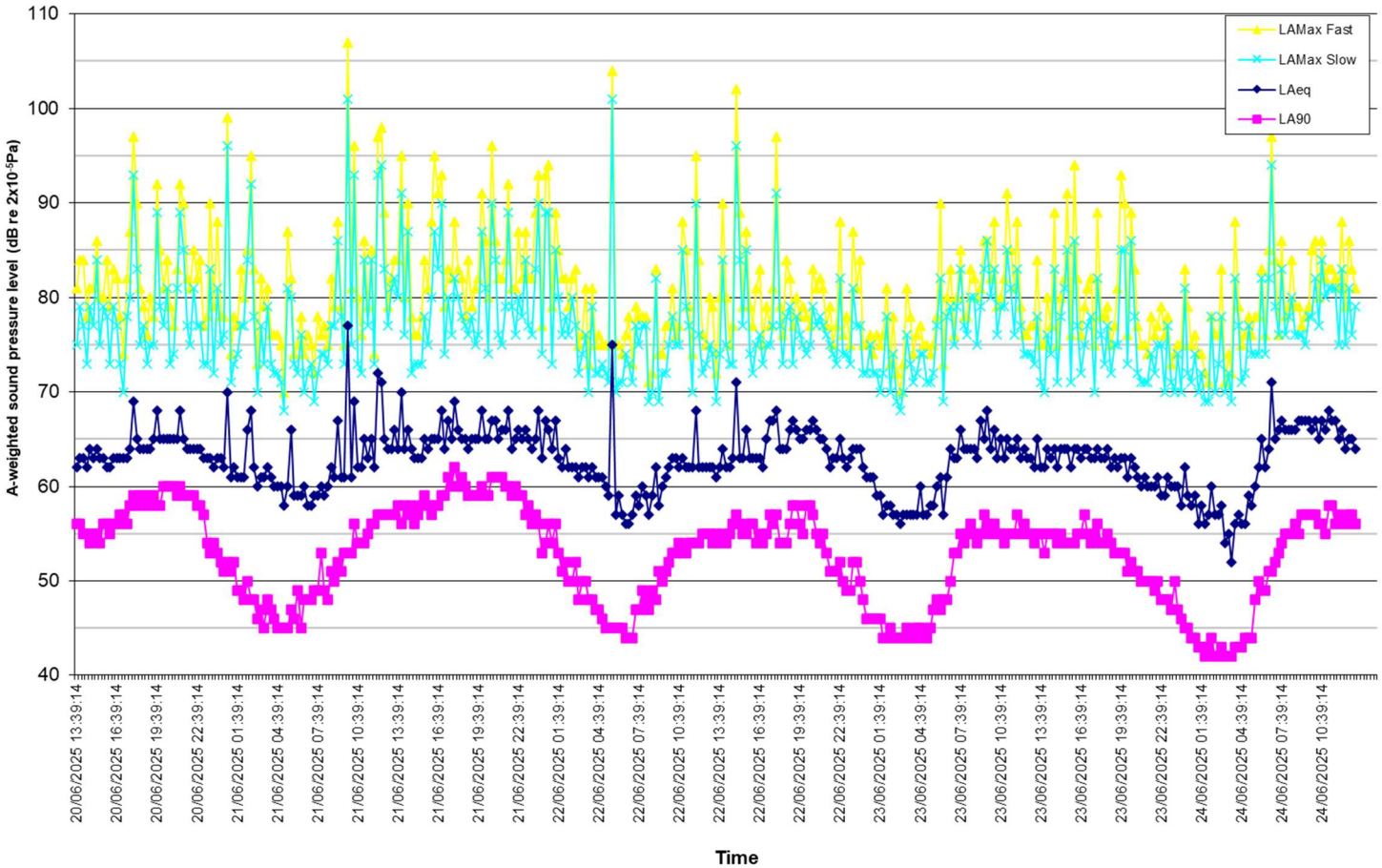
Appendix A: Site Plan



Appendix B: Plant location



Appendix C: Measurement Data



Sound pressure level measurements were obtained using the following instrumentation complying with the Class 1 specification of BS EN 61672:2003

- Svantek 959 Sound Level Meter S/N: 11205 (next cal due 08/04/27) Start gain -0.09 End gain -0.25
- Svantek pre-amplifier SV12L S/N: 13245 with GRAS microphone capsule 40AE S/N: 75181

Calibration checks were made prior to and after completion of measurements using a Svantek SV30A calibrator, S/N: 10893 (next cal due 18/08/25) complying with Class 1 specification of BS EN 60942:2003, calibration level 114.0 dB @ 1.0 kHz. All acoustic instrumentation carried current manufacturer's certificates of conformance.

Appendix D: Plant Data

Plant noise data used in the preceding assessment follow.

Table 11: Manufacturer's plant sound power data, dB re 10^{-12} W

Plant	Octave Band Centre Frequency (Hz)								L_{WA}
	63	125	250	500	1k	2k	4k	8k	
Systemair MUB/T 042-500	48	73	72	77	78	75	72	63	82

Appendix E: Calculations

Before mitigation:

Ref.	plant	Ref.dist.	Sound Level (Lp/Lw) (If Lp, assumes hemi-sherical radiation to convert to Lw +20*LOG(distance)+8)									Lw	Reciever Distance (m)	Source height	Receiver height	Ground factor (source) 0-1	Ground factor (middle) 0-1	Ground factor (receiver) 0-1	dB(A)	Lp	No. off	dB	Angular Directionality	63	125	250	500	1k	2k	4k	8k	Reflections (additional to ground, 1=3dB)	dB	Façade correction 3dB	dB	Losses (Duct, end reflection, weather louvre) Negative values								Additional Attenuation (Attenuator loss)							
			63	125	250	500	1k	2k	4k	8k	dB(A)	dB(A)																									63	125	250	500	1k	2k	4k	8k	63	125	250	500	1k	2k	4k	8k
1	Systemair MUB/T	0.00	48	73	72	77	78	75	72	63	82	82	4.0	4.0	4.0	0.0	0.0	0.0	-23	59	1	0	None	0	0	0	0	0	0	0	0	0	0	Yes	3																		

Ref.	plant	Receiver Lp (excluding barrier)								
		63	125	250	500	1k	2k	4k	8k	dB(A)
1	Systemair MUB/T 042-500	30	55	54	59	60	57	54	45	64
Safety/Feature Correction		3	3	3	3	3	3	3	3	
Total		33	58	57	62	63	60	57	48	67

Criteria									
NR	63	125	250	500	1k	2k	4k	8k	dB(A)
42	69	59	51	46	42	39	37	35	50

Ref.	Plant	Excess								
		63	125	250	500	1k	2k	4k	8k	dB(A)
1	Systemair MUB/T 042-500	-39	-4	3	13	18	18	17	10	13
Total		-36	-1	6	16	21	21	20	13	16

Ref.	Plant	Mitigated Receiver Lp (including barrier, if present)								
		63	125	250	500	1k	2k	4k	8k	dB(A)
1	Systemair MUB/T 042-500	30	55	54	59	60	57	54	45	64
Safety/Feature Correction		3	3	3	3	3	3	3	3	
Total		33	58	57	62	63	60	57	48	67

	63	125	250	500	1k	2k	4k	8k	dB(A)
Criteria	69	59	51	46	42	39	37	35	50
Excess	-36	-1	6	16	21	21	20	13	16

Ground factor.

Hard ground = 0

Porous ground = 1

Edge diffraction

Top edge = 1

Vertical edge = 2

Edge diffraction	Barrier height	Source to barrier distance	Barrier to receiver distance	Barrier Path Difference Loss: Calculated path difference	63	125	250	500	1000	2000	4000	8000
			4.0	-5.66	0	0	0	0	0	0	0	0

Barrier SRI	63	125	250	500	1k	2k	4k	8k	Rw
Manual									0
Unknown	100	100	100	100	100	100	100	100	101

Barrier Deration									
Systemair MUB/T (	0	0	0	0	0	0	0	0	

Net barrier loss (including ground effect correction)									
Systemair MUB/T (	0	0	0	0	0	0	0	0	

Atmospheric conditions		Ground effect																			
T °C	RH %	63	125	250	500	1k	2k	4k	8k	63	125	250	500	1k	2k	4k	8k
15	80	0	0	0	0	0	0	0	0	3	3	3	3	3	3	3	3

After mitigation:

Ref.	plant	Ref.dist.	Sound Level (Lp/Lw) (If Lp, assumes hemi-sherical radiation to convert to Lw +20*LOG(distance)+8)									Lw	Reciever Distance (m)	Source height	Receiver height	Ground factor (source) 0-1	Ground factor (middle) 0-1	Ground factor (receiver) 0-1	dB(A)	Lp	No. off	dB	Angular Directionality	63	125	250	500	1k	2k	4k	8k	Reflections (additional to ground, 1=3dB)	dB	Façade correction 3dB	dB	Losses (Duct, end reflection, weather louvre) Negative values								Additional Attenuation (Attenuator loss)							
			63	125	250	500	1k	2k	4k	8k	dB(A)	dB(A)																									63	125	250	500	1k	2k	4k	8k	63	125	250	500	1k	2k	4k	8k
1	Systemair MUB/T 042-500		48	73	72	77	78	75	72	63	82	82	4.0	4.0	4.0	0.0	0.0	0.0	-23	59	1	0	None	0	0	0	0	0	0	0	0		0	No	0	-14	-10	-6	-3	-3	-3	-4	-7	-3	-9	-15	-27	-24	-14	-8	-4

Ref.	plant	Receiver Lp (excluding barrier)								
		63	125	250	500	1k	2k	4k	8k	dB(A)
1	Systemair MUB/T 042-500	11	34	31	27	31	38	40	32	44
Total		**11**	**34**	**31**	**27**	**31**	**38**	**40**	**32**	**44**

Ground factor.

Hard ground = 0

Porous ground = 1

Edge diffraction

Top edge = 1

Vertical edge = 2

Edge diffraction	Barrier height	Source to barrier distance	Barrier to receiver distance	Barrier Path Difference Loss: Calculated path difference	63	125	250	500	1000	2000	4000	8000
			4.0	-5.66	0	0	0	0	0	0	0	0

Atmospheric conditions												Ground effect							
T °C	RH %	63	125	250	500	1k	2k	4k	8k	63	125	250	500	1k	2k	4k	8k	63	125	250	500	1k	2k	4k	8k
15	80	0	0	0	0	0	0	0	0	3	3	3	3	3	3	3	3								

Criteria									
NR	63	125	250	500	1k	2k	4k	8k	dB(A)
36	64	53	45	40	36	33	31	29	45

Ref.	Plant	Excess								
		63	125	250	500	1k	2k	4k	8k	dB(A)
1	Systemair MUB/T 042-500	-53	-19	-14	-13	-5	5	9	3	-1
Total		-53	-19	-14	-13	-5	5	9	3	-1

Ref.	Plant	Mitigated Receiver Lp (including barrier, if present)								
		63	125	250	500	1k	2k	4k	8k	dB(A)
1	Systemair MUB/T 042-500	11	34	31	27	31	38	40	32	44
Total		**11**	**34**	**31**	**27**	**31**	**38**	**40**	**32**	**44**

	63	125	250	500	1k	2k	4k	8k	dB(A)
Criteria	64	53	45	40	36	33	31	29	45
Excess	-53	-19	-14	-13	-5	5	9	3	-1

		63	125	250	500	1k	2k	4k	8k	Rw
Barrier SRI										
	Manual									0
	Unknown	100	100	100	100	100	100	100	100	101
Barrier Deration	Systemair MUB/T (	0	0	0	0	0	0	0	0	
Net barrier loss (including ground effect correction)	Systemair MUB/T (	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	

Appendix F: Glossary

The list below details the major acoustical terms and descriptors, with brief definitions:

'A' Weighting	
Weighting applied to the level in each stated octave band by a specified amount, in order to better represent the response of the human ear. The letter 'A' will follow a descriptor, indicating the value has been 'A' weighted. An 'A' weighted noise level may also be written as dB(A).	
Airborne Noise	
Noise transmitted through air.	
Ambient Noise	
The total noise level including all 'normally experienced' noise sources.	
dB or Decibel	
Literally meaning 'a tenth of a bel', the bel being a unit devised by the Bell Laboratory and named after Alexander Graham Bell. A logarithmically based descriptor to compare a level to a reference level. Decibel arithmetic is not linear, due to the logarithmic base. For example:	
30 dB + 30 dB ≠ 60 dB	30 dB + 30 dB = 33 dB
D_{nTw}+C_{tr}	
The weighted, normalised difference in airborne noise levels measured in a source room (L1) and a receive room (L2) due to a separating partition.	
D	Is simply L1 – L2.
D_{nT}	Is the normalisation of the measured level difference to the expected (in comparison to the measured) reverberation time in the receiving room.
D_{nTw}	Is the weighted and normalised level difference. This value is the result of applying a known octave band weighting curve to the measured result.
C_{tr}	Is a correction factor applied to the D_{nTw} to account for the known effects of particular types of noise, such as loud stereo music or traffic noise.
Frequency (Hz)	
Measured in Hertz (after Heinrich Hertz), and represents the number of cycles per second of a sound or tone.	
Insertion Loss, dB	
The amount of sound reduction offered by an attenuator or louvre once placed in the path of a noise level.	
$L_{A90, T}$	
The 'A' weighted noise level exceeded for 90% of the time period T, described or measured. The '90' can be substituted for any value between 1 and 99 to indicate the noise level exceeded for the corresponding percentage of time described or measured.	
$L_{Aeq, T}$	
The 'A' weighted 'equivalent' noise level, or the average noise level over the time period T, described or measured.	
L_{Amax}	
The 'A' weighted maximum measured noise level. Can be measured with a 'slow' (1 sec) or 'fast' (0.125 sec) time weighting.	
L_{Amin}	

The 'A' weighted minimum measured noise level.

NR

Noise Rating (NR) level. A frequency dependent system of noise level curves developed by the International Organisation for Standardisation (ISO). NR is used to categorise and determine the acceptable indoor environment in terms of hearing preservation, speech communication and annoyance in any given application as a single figure level. The US predominantly uses the Noise Criterion (NC) system.

Octave

The interval between a frequency in Hz (f) and either half or double that frequency (0.5f or 2f).

Pa

Pascals, the SI unit to describe pressure, after physicist Blaise Pascal.

Reverberation Time, T_{mf}, RT60, RT30 or RT20

The time taken in seconds for a sound to diminish within a room by 1,000 times its original level, corresponding to a drop in sound pressure of 60 dB. When taking field measurements and where background noise levels are high, the units RT20 or RT30 are used (measuring drops of 20 or 30 dB respectively). Sometimes given as a mid-frequency reverberation time, T_{mf} which is the average of reverberation time values at 500Hz, 1kHz and 2kHz.

R_w

The sound reduction value(s) of a constructional element such as a door, as measured in a laboratory, with a known octave band weighting curve applied to the result.

Sound Power Level

A noise level obtained by calculation from measurement data, given at the face of an item of plant or machinery. Referenced to 10^{-12} W or 1pW.

Sound Pressure Level

A noise level measured or given at a distance from a source or a number of sources. Referenced to $2x10^{-5}$ Pa.

Subjective Effect of Changes in Sound Pressure Level

The table below details the subjective effects of variations in sound pressures (adapted from Bies and Hansen).

Difference between background noise and rating levels	Increase in ambient noise level in 'real terms'	Change in apparent loudness
+ 10 dB	+ 10 dB	Twice as loud
+ 5 dB	+ 6 dB	Clearly noticeable
0 dB	+ 3 dB	Just perceptible
-10 dB	0 dB	No change

W

Watts, the SI unit to describe power, after engineer James Watt.