SANDY BROWN

Consultants in Acoustics, Noise & Vibration

18431-R02-C

15 May 2020

Stables, Bonded Warehouse

Acoustic planning report

London, Manchester, Edinburgh, Birmingham, Belfast, Stevenage

post@sandybrown.com
www.sandybrown.com

Sandy Brown Associates LLP
Registered in England & Wales No. OC 307504

Registered Office: 55 Charterhouse Street, London EC1M 6HA

Version	Date	Comments	Author	Reviewer
A	22 April 20		Kane Mitchell	Jake Mroz
B	13 May 20	Minor amendments in Section 7.3	Jake Mroz	Matthew Robinson
C	15 May 20	Minor amendments	Kane Mitchell	Matthew Robinson

Summary

Sandy Brown has been commissioned by OBI Property LTD to provide an acoustic planning report in relation to the proposed redevelopment of the Stables, Bonded Warehouse, Manchester.

The existing buildings at the Stables will be redeveloped to provide a bar / reception known as *the hub* and gymnasium (class D2 use) at ground floor, and a bar and external terrace (class A4 use) at first floor level.

Due to noise from existing construction activity at the site, an environmental noise survey previously carried out at the site has been used as the basis for the assessment. The noise survey was carried out between 7 March 2014 and 18 March 2014 and is presented in *'15058-R02-D Acoustic planning report'* dated 14 September 2018. When considering the minimal variation in noise levels expected due to the surrounding noise sources, this survey is considered representative of the future noise climate.

Representative background sound levels measured during the survey were:

- $L_{A90,5min}$ 55 dB during the daytime and $L_{A90,5min}$ 47 dB at night at the commercial premises within Bonded Warehouse
- $L_{A90,5min}$ 51 dB during the daytime and $L_{A90,5min}$ 45 dB at night at the residential buildings along Lower Byrom Street and Atherton Street

Based on the requirements of the Manchester City Council and on the results of the noise survey, all plant must be designed such that the cumulative noise level at 1 m from the worst affected windows of the nearby noise sensitive premises does not exceed:

- $L_{A90,5min}$ 50 dB during the daytime and $L_{A90,5min}$ 42 dB at night at the commercial premises within Bonded Warehouse
- $L_{A90,5min}$ 46 dB during the daytime and $L_{A90,5min}$40 dB at night at the residential buildings along Lower Byrom Street and Atherton Street

An initial assessment of the proposed plant items associated with the development has been carried out. The results of which indicate that without any attenuation, the noise egress limits are expected to be marginally exceed at the adjacent Bonded Warehouse due to noise emissions from the AHU exhaust. In-duct attenuation shall therefore be provided to the AHU exhaust such that the noise egress criteria are complied with.

Internal amplified sound limits have been set for both the GF Studio and L1 Bar in order to ensure the Manchester City Council external amplified sound limits at the nearest receptors are not exceeded. These limits are based on secondary glazing being provided to the GF studio to achieve a minimum sound insulation performance of R_W+C_{tr} 38 dB and standard thermal double glazing being provided to the L1 bar to achieve a minimum sound insulation performance of R_w+C_{tr} 28 dB.

With the above measures, the planning requirements of Manchester City Council will be met.

Contents

1 Introduction 5
2 Site description 5
3 Assessment criteria 6
4 Survey method 7
5 Measurement results 8
6 Control of plant noise egress 12
7 Operational noise assessment 15
8 Conclusion 16
Appendix A 18
Survey details 18
Appendix B 21
Results of unattended measurements at Location ‘P1’ 21
Results of unattended measurements at Location ‘P2’ 23
Appendix C 25
BS 4142 corrections for attention catching features 25

1 Introduction

Sandy Brown has been commissioned by OBI Property LTD to provide an acoustic planning report in relation to the proposed redevelopment of the Stables, Bonded Warehouse, Manchester.

The existing buildings at the Stables will be redeveloped to provide a bar / reception known as *the hub* and gymnasium (class D2 use) at ground floor, and a bar and external terrace (class A4 use) at first floor level.

An environmental noise survey has previously been carried out at the site and has been used as the basis for establishing background sound levels around the site and at the nearby noise sensitive premises.

The background sound levels measured during the survey are used as the basis for setting limits for noise emission from proposed building services plant, and for setting external operational noise limits. These limits are set in accordance with the requirements of the Manchester City Council (MCC).

This report provides details of the noise survey, including measurement results, and an assessment of operational noise from the gym and bar together with external building services plant.

2 Site description

2.1 The site and its surroundings

The site location in relation to its surroundings is shown in Figure 1 highlighted in red.

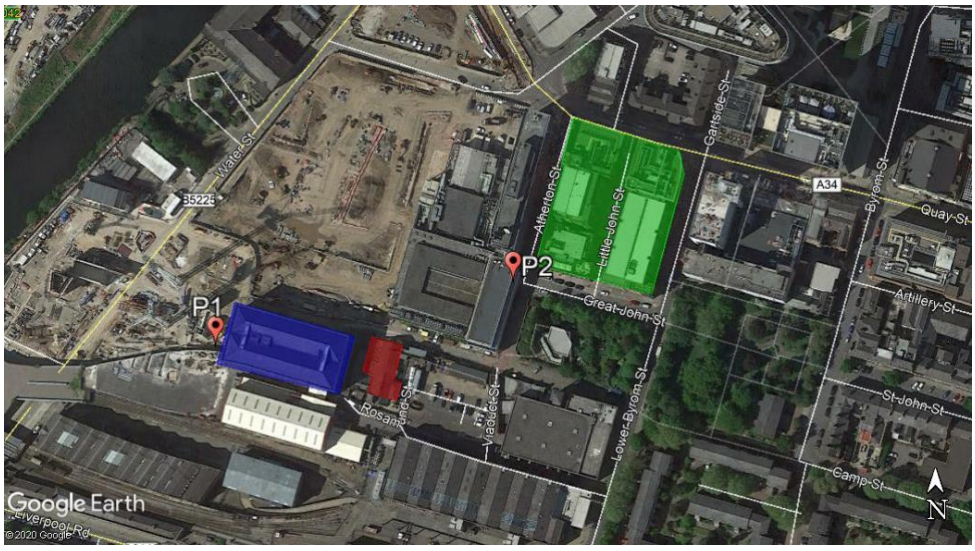


Figure 1 Aerial view of site (courtesy of Google Earth Pro)

2.2 Adjacent premises

The site is largely surrounded by commercial premises, with a significant amount of the surrounding area currently under development as part of the St Johns Masterplan.

The nearest existing commercial premises are the adjacent units located within the Bonded Warehouse highlighted in blue within Figure 1. Although structurally connected, there is considerable acoustic buffer space provided by corridors and BoH uses between the Stables and noise sensitive office class B1(a) uses at the Bonded Warehouse.

The nearest existing residential premises are the residential buildings along Lower Byrom Street and Atherton Street highlighted in green within Figure 1.

3 Assessment criteria

3.1 Standard guidance

BS 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound* (BS 4142) provides a method for assessing noise from items such as building services plant against the existing background sound levels at the nearest noise sensitive premises.

BS 4142 suggests that if the noise level is 10 dB or more higher than the existing background sound level, it is likely to be an indication of a significant adverse impact. If the level is 5 dB above the existing background sound level, it is likely to be an indication of an adverse impact. If the level does not exceed the background level, it is an indication of having a low impact.

If the noise contains 'attention catching features' such as tones, bangs etc, a penalty, based on the type and impact of those features, is applied.

3.2 Local Authority criteria

3.2.1 Noise egress

Manchester City Council (MCC) provides guidance in relation to plant noise emissions in *Planning and Noise Technical Guidance* document dated December 2015 and states the following in relation to plant noise egress:

'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 5 dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location.'

3.2.2 Amplified sound egress criteria

MCC *Planning and Noise Technical Guidance* document dated December 2015 stipulates the following in relation to amplified music associated with a new development:

'*Entertainment noise (L_{Aeq}) should be controlled to 10 dB below the background noise level (L_{A90}) without the entertainment noise present, in each octave band at the nearest noise sensitive location.'*

This criterion is applicable to nearby residential receptors only. To safeguard against any future residential developments proposed as part of the St Johns Masterplan, the assessment has been carried out to the adjacent Bonded Warehouse as this is the worst affected existing receptor in terms of location. If noise levels are suitably controlled here, they will also be suitably controlled at any future residential C3(a) use in the area.

4 Survey method

4.1 Noise survey method

Due to noise from existing construction activity at the site, an environmental noise survey previously carried out at the site has been used as the basis for the assessment. The noise survey was carried out between 7 March 2014 and 18 March 2014. When considering the minimal variation in noise levels expected due to the surrounding noise sources, this survey is considered representative of the future noise climate.

4.1.1 Unattended measurements

An unattended noise survey was previously undertaken at two locations around the site.

The unattended measurement locations are indicated in Figure 1, denoted by the 'P1' and 'P2'.

- Location 'P1' is considered representative of the commercial premises within Bonded Warehouse.
- Location 'P2' is considered representative of the residential buildings along Lower Byrom Street and Atherton Street

Full details of the survey can be found in Sandy Brown report *'15058-R02-D Acoustic planning report'* dated 14 September 2018.

Details of the equipment used and the noise indices measured are provided in Appendix A.

The unattended measurements were taken over 5 minute periods.

4.2 Weather conditions

Weather conditions during the survey are described in Appendix A.

5 Measurement results

5.1 Observations

5.1.1 Noise

The dominant noise sources observed at the site during the survey consisted of the following:

- Constant road traffic noise from Trinity Way
- Road traffic noise from Water Street (apart from in August 2017 when the road was closed)
- Train passes on the Ordsall Junction railway lines.

Less significant noise sources included pedestrians passing by, distant demolition works, and local pedestrians.

5.2 Unattended noise measurement results

The results of the unattended noise measurements are summarised in the following tables. Graphs showing the results of the unattended measurements are provided in Appendix B.

In line with BS 4142:2014 and MCC noise egress criteria, for the purpose of analysis and establishing representative background sound levels, day and night-time typical levels have been quantified using statistical analysis from the continuous logging measurements.

Daytime and night-time statistical analysis of representative values for each of the unattended noise monitoring locations around the site are given in Appendix B, the results of which are summarised in the following sections.

5.2.1 Location 'P1'

The day and night-time ambient noise levels measured at location P1 are presented in Table 1.

Table 1 Ambient noise levels measured during the survey at location 'P1'

Date	Daytime (07:00 – 23:00) $L_{Aeq,16h}$ (dB)	Night (23:00 – 07:00) $L_{Aeq,8h}$ (dB)
Friday 14 March 2014	58 *	54
Saturday 15 March 2014	58	53
Sunday 16 March 2014	57	53
Monday 17 March 2014	58	54
Tuesday 18 March 2014	60 *	-

* Measurement not made over full period due to monitoring start and end time

Daytime and night time statistical analysis of representative values for location ‘P1’ are given in Figure 2 and Figure 3.

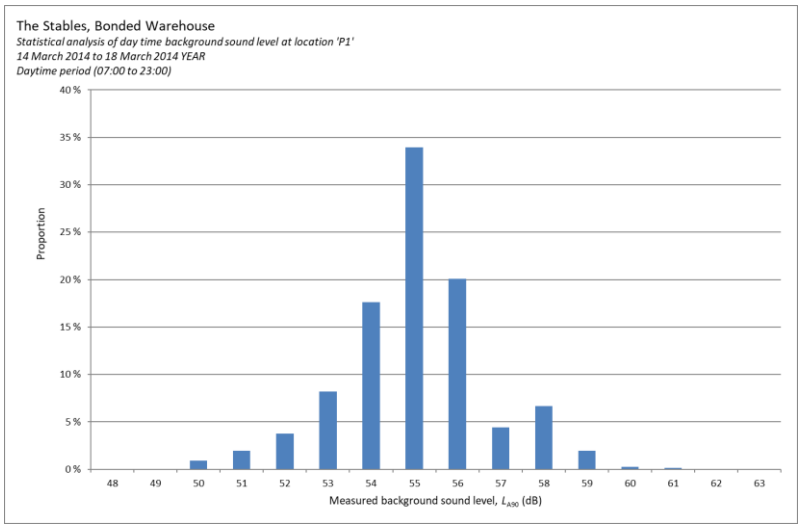


Figure 2 Location ‘P1’ – Statistical analysis of daytime (07:00 – 23:00) background sound levels

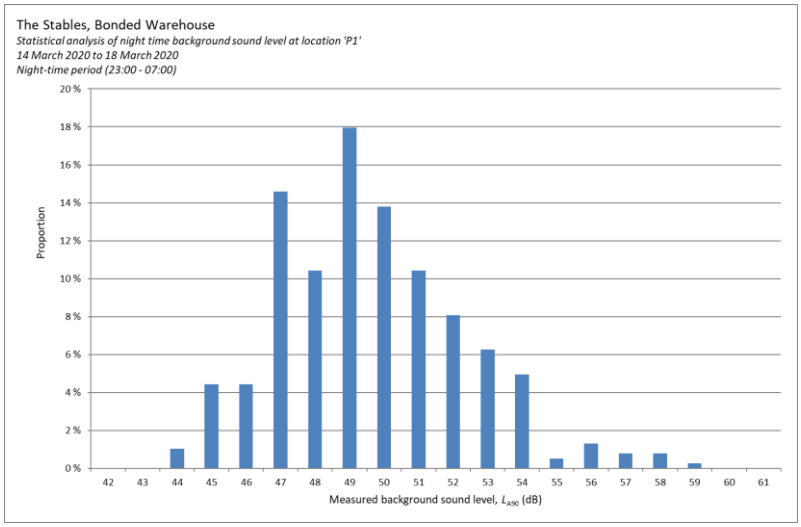


Figure 3 Location ‘P1’ – Statistical analysis of night-time (23:00 – 07:00) background sound levels

Based on the results of the statistical analysis, the typical background sound level at location ‘P1’ are L_{A90} 55 dB during the daytime and L_{A90} 47 dB at night.

The typical average octave band sound pressure levels corresponding to the representative background sound level, L_{A90} (dB), are provided in Table 2.

Table 2 Indicative octave band background sound levels measured at location 'P1'

Time of day	Indicative background noise level, $L_{90,5min}$ (dB) Octave band centre frequency (Hz)						
	63	125	250	500	1k	2k	4k
Daytime (07:00-23:00)	58	54	53	49	53	47	32
Night (23:00-07:00)	52	49	47	42	44	38	23

5.2.2 Location 'P2'

The day and night-time ambient noise levels measured at location 'P2', near Lower Byrom Street, are presented in Table 3.

Table 3 Ambient noise levels measured during the survey at location 'P2'

Date	Daytime (07:00 – 23:00) $L_{Aeq,16h}$ (dB)	Night (23:00 – 07:00) $L_{Aeq,8h}$ (dB)
Friday 14 March 2014	57 *	53
Saturday 15 March 2014	57	55
Sunday 16 March 2014	58	51
Monday 17 March 2014	59 *	-

* Measurement not made over full period due to monitoring start and end time

Daytime and night time statistical analysis of representative values for location 'P2' are given in Figure 4 and Figure 5.

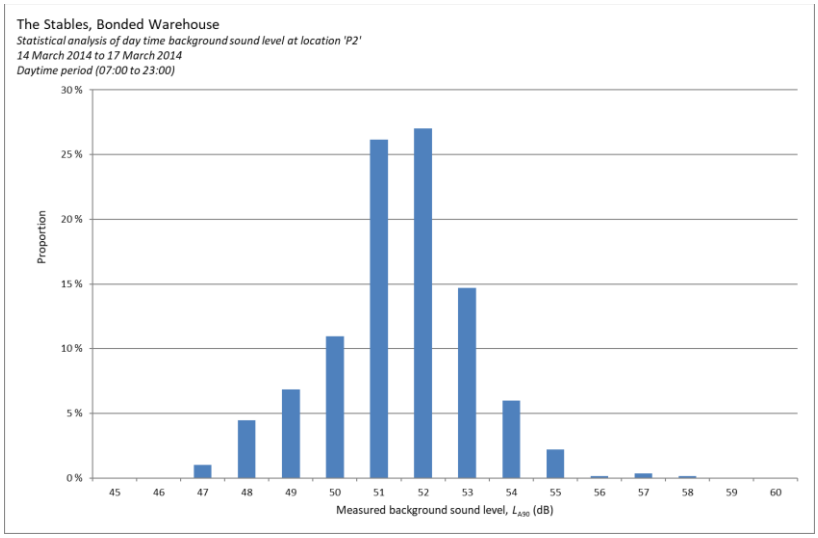


Figure 4 Location 'P2' – Statistical analysis of daytime (07:00 – 23:00) background sound levels

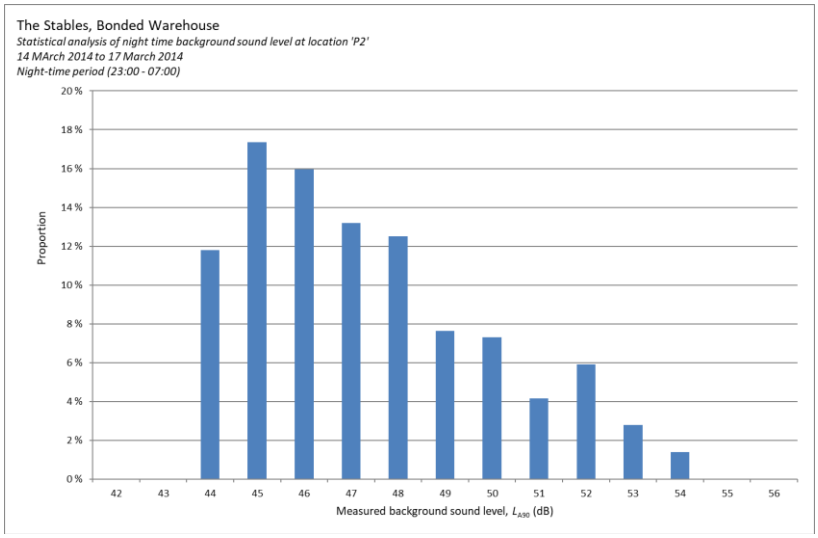


Figure 5 Location 'P2' – Statistical analysis of night-time (23:00 – 07:00) background sound levels

Based on the results of the statistical analysis, the typical background sound level at location 'P2' are L_{A90} 51 dB during the daytime and L_{A90} 45 dB at night.

The typical average octave band sound pressure levels corresponding to the representative background sound level, L_{A90} (dB), are provided in Table 4.

Table 4 Indicative octave band background sound levels measured at location 'P2'

Time of day	Indicative background noise level, $L_{90,5min}$ (dB)						
	Octave band centre frequency (Hz)						
	63	125	250	500	1k	2k	4k
Daytime (07:00-23:00)	60	54	48	46	48	42	35
Night (23:00-07:00)	60	55	43	40	40	34	27

6 Control of plant noise egress

6.1 MCC limits

Based on the survey data, together with the requirements of MCC, the cumulative noise level resulting from the operation of all new plant should not exceed the limits set out in Table 5.

Table 5 Plant noise limits at 1 m from the nearest noise sensitive premises

Time of day	Maximum sound pressure level at 1 m from noise sensitive premises, L_{Aeq} (dB)
Location 'P1' – Commercial premises within Bonded Warehouse	
Daytime (07:00-23:00)	50
Night-time (23:00-07:00)	42
Location 'P2' – Residential premises along Lower Byrom Street and Atherton Street	
Daytime (07:00-23:00)	46
Night-time (23:00-07:00)	40

The limits set out in Table 5 do not include any attention catching features. The penalties for attention catching features may be significant and will need to be considered as the building services design progresses. This is discussed further in Appendix C.

6.2 Proposed plant locations

Figure 6 shows the proposed location of the existing condenser compound located to the rear of the Stables along the south elevation. This is a distance of approximately 22 m from the rear elevation of the Bonded Warehouse.

The nearest residential uses to the compound will be approximately 120 m to the north and will benefit from considerable acoustic screening by the Stables building envelope.

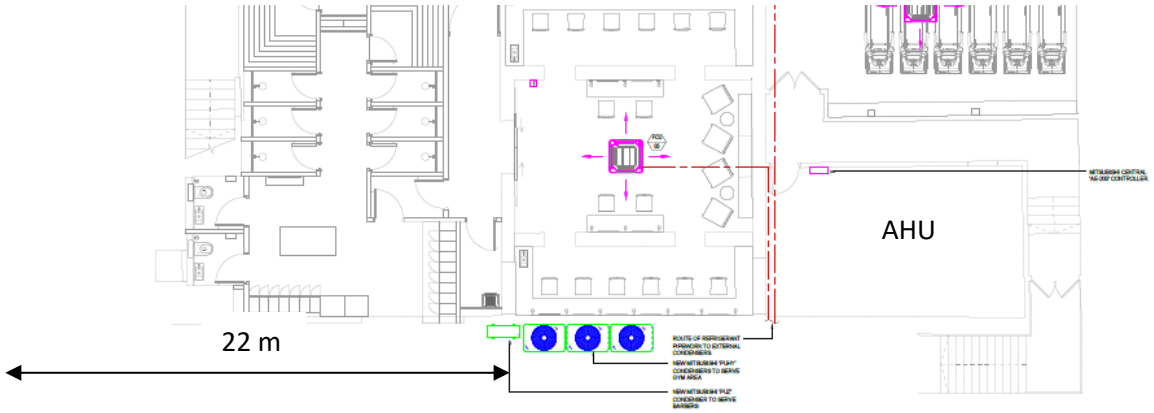


Figure 6 Proposed plant locations

6.3 Proposed plant items

In addition to the 2 x Mitsubishi PUHY condensers already installed in the ground floor level condenser compound along the Stables south elevation, the following items of plant are also to be installed in the compound as part of the redevelopment:

- 1 x Mitsubishi PUHY P1200-YSNW-A condensers
- 1 x Mitsubishi PUZ-ZM35-VKA condenser

An air source Air Handling Unit (AHU) will be located as part of the fit-out works in a ground floor level plant room with the AHU intake and exhaust terminating via grilles to the rear of the Stables.

The acoustic data for the proposed condensers is summarised in Table 6.

Table 6 Condenser sound pressure acoustic data

	Sound pressure level L_{Aeq} (dB) at 1 m Octave-band centre frequency (Hz)							
	63	125	250	500	1000	2000	4000	8000
Mitsubishi PUHY	78	70	71	70	64	60	54	51
Mitsubishi PUZ	50	45	43	42	39	36	28	23

The acoustic data for the proposed AHU is summarised in Table 7.

Table 7 AHU sound power acoustic data

	Sound power data L_W (dB) Octave-band centre frequency (Hz)							
	63	125	250	500	1000	2000	4000	8000
AHU noise source								
Intake	72	72	78	77	71	67	63	63
Exhaust	74	77	83	81	81	77	73	70

6.4 Noise egress assessment

Calculations to assess noise egress from the proposed plant items against the noise egress limits as per Table 5 have been undertaken to each of the noise sensitive receptors in Figure 1.

The calculations indicate that when taking into consideration attenuation with distance, directivity effects and screening by the building envelope, noise levels will marginally exceed the MCC noise limits by approximately 5 dB at the nearest receptor (Bonded Warehouse). This is driven by the AHUs, where mitigation will be needed.

6.4.1 Mitigation measures

In order to ensure compliance with the requirements of MCC, an in-duct attenuator with the insertion losses provided in Table 8 will be required at the AHU exhaust.

Table 8 Attenuator insertion loss requirements (dB)

	Attenuator Insertion Loss (dB) Octave-band centre frequency (Hz)							
	63	125	250	500	1000	2000	4000	8000
AHU exhaust	5	5	10	15	15	15	10	10

These insertion losses can be achieved within a zonal allowance of 600 mm.

When considering the above measures, calculations indicate that the proposals are expected to comply with the requirements of the MCC.

7 Operational noise assessment

7.1 External limits

Based on the survey data and the requirements of the MCC, the cumulative noise levels resulting from amplified sound egress at 1 m from the worst effected windows of the nearest noise sensitive premises should not exceed the limits in Table 9.

Table 9 Amplified noise limits at 1 m from nearest noise sensitive premises

	Maximum sound pressure level at 1 m from noise sensitive premises (dB) Octave-band centre frequency (Hz)						
	63	125	250	500	1000	2000	4000
Location 'P1' – Commercial premises within Bonded Warehouse							
Daytime (07:00-23:00)	48	44	43	39	43	37	22
Night-time (23:00-07:00)	42	39	37	32	34	28	13
Location 'P2' – Residential premises along Lower Byrom Street and Atherton Street							
Daytime (07:00-23:00)	50	44	38	36	38	32	25
Night-time (23:00-07:00)	50	45	33	30	30	24	17

7.2 Glazing specification

The Stables is acoustically buffered from the adjacent Bonded Warehouse. As such, noise breakout via the windows is considered to be the main transmission path. The existing windows within the GF Studio area are single glazed assumed to be at least 10 mm thick.

Gym studio's generally have aspirations for high noise levels (e.g. spin classes) when compared to other spaces (e.g. cardio zones).

In order to control noise breakout from amplified sound, secondary glazing shall be provided to the Studio and should be specified to achieve a minimum sound insulation performance of R_w+C_{tr} 38 dB.

To achieve this level of performance would require a secondary 10 mm pane of glass installed behind the existing glazing separated by a cavity of at least 70 mm. Sound absorbing material (e.g. 25 mm cloth faced mineral fibre) should be installed within the frame reveals.

For the remaining areas including the L1 bar, there will likely be aspirations for quieter noise levels. Glazing specified to achieve a minimum sound insulation performance of R_w+C_{tr} 28 dB is expected to be suitable. This performance can be achieved with any practical thermal double glazing (e.g. 6 mm glass / 12 mm air / 6 mm glass).

7.3 Operational internal limits

When considering the recommended glazing specifications and the external amplified sound limits as per Table 9, internal amplified sound shall not exceed the limits in Table 10.

The above measures will be suitable in ensuring compliance with the Manchester City Council requirements for entertainment noise egress.

Table 10 Internal amplified noise limits

	Maximum sound pressure level $L_{Aeq,5min}$ (dB) Octave-band centre frequency (Hz)						
	63	125	250	500	1000	2000	4000
GF Studio							
Daytime (07:00-23:00)	95	95	90	90	90	85	80
Night-time (23:00-07:00)	90	90	85	85	85	80	75
L1 bar							
Daytime (07:00-23:00)	85	85	90	90	90	90	80
Night-time (23:00-07:00)	80	80	80	80	90	80	70

It is recommended that an electronic noise limiting devices are installed within the gym and L1 bar. This system should be calibrated to ensure that music noise levels at different locations within each space do not exceed the levels in Table 10 over 5-minute periods.

8 Conclusion

The representative background sound levels measured during the survey were:

- $L_{A90,5min}$ 55 dB during the daytime and $L_{A90,5min}$ 47 dB at night at the commercial premises within Bonded Warehouse
- $L_{A90,5min}$ 51 dB during the daytime and $L_{A90,5min}$ 45 dB at night at the residential buildings along Lower Byrom Street and Atherton Street

Based on the requirements of the Manchester City Council, the relevant plant noise limits at the worst affected existing noise sensitive premises are:

- $L_{A90,5min}$ 50 dB during the daytime and $L_{A90,5min}$ 42 dB at night at the commercial premises within Bonded Warehouse
- $L_{A90,5min}$ 46 dB during the daytime and $L_{A90,5min}$ 40 dB at night at the residential buildings along Lower Byrom Street and Atherton Street

These limits are cumulative and apply with all plant operating under normal conditions. If plant items contain tonal or attention catching features, the limits will be more stringent.

An initial assessment of the proposed plant items associated with the development has been carried out. The results indicate that without any attenuation, the noise egress limits are expected to be marginally exceed at the adjacent Bonded Warehouse due to noise emissions from the AHU exhaust. In-duct attenuation shall therefore be provided to the AHU exhaust such that the noise egress criteria are complied with.

Internal amplified sound limits have been set for both the GF Studio and L1 Bar in order to ensure the Manchester City Council external amplified sound limits at the nearest receptors are not exceeded. These limits are based on secondary glazing being provided to the GF studio to achieve a minimum sound insulation performance of R_W+C_{tr} 38 dB and standard thermal double glazing being provided to the L1 bar to achieve a minimum sound insulation performance of R_w+C_{tr} 28 dB.

Appendix A

Survey details

Equipment

Calibration details for the equipment used during the survey are provided in Table A1.

Table A1 Equipment calibration data

Equipment description	Type/serial number	Manufacturer	Calibration expiry	Calibration certification number
Unattended measurement at location 'P2' – Measurements conducted in March 2014				
Sound level meter	NL-52/00932326	Rion	25 Nov 15	1311554
Microphone	UC-59/035549	Rion	25 Nov 15	1311554
Pre-amp	NH-25/32354	Rion	25 Nov 15	TCRT17/1087
Calibrator	NC-74/34125432	Rion	19 Feb 15	1204153
Unattended measurement at location 'P1' – Measurements conducted in March 2014				
Sound level meter	SVAN948/9365	Svantek	2 Apr 15	1304131
Microphone	SV22/4013841	Svantek	2 Apr 15	1304131
Pre-amp	SV12L/10614	Svantek	2 Apr 15	1304131
Calibrator	SV30/10569	Svantek	2 Apr 15	1304129

Calibration certificates for the sound level meters used in this survey are available upon request.

Calibration checks were carried out on the meters and their measurement chains at the beginning and end of the survey. No significant calibration deviation occurred.

Noise indices

Noise indices recorded included the following:

- $L_{Aeq,T}$ The A-weighted equivalent continuous sound pressure level over a period of time, T.
- $L_{AFmax,T}$ The A-weighted maximum sound pressure level that occurred during a given period, T, with a fast time weighting.
- $L_{ASmax,T}$ The A-weighted maximum sound pressure level that occurred during a given period, T, with a slow time weighting.
- $L_{A90,T}$ The A-weighted sound pressure level exceeded for 90% of the measurement period. Indicative of the background sound level.

Sound pressure level measurements are normally taken with an A-weighting (denoted by a subscript 'A', eg L_{A90}) to approximate the frequency response of the human ear.

A more detailed explanation of these quantities can be found in BS7445: Part 1: 2003 *Description and measurement of environmental noise, Part 1. Guide to quantities and procedures.*

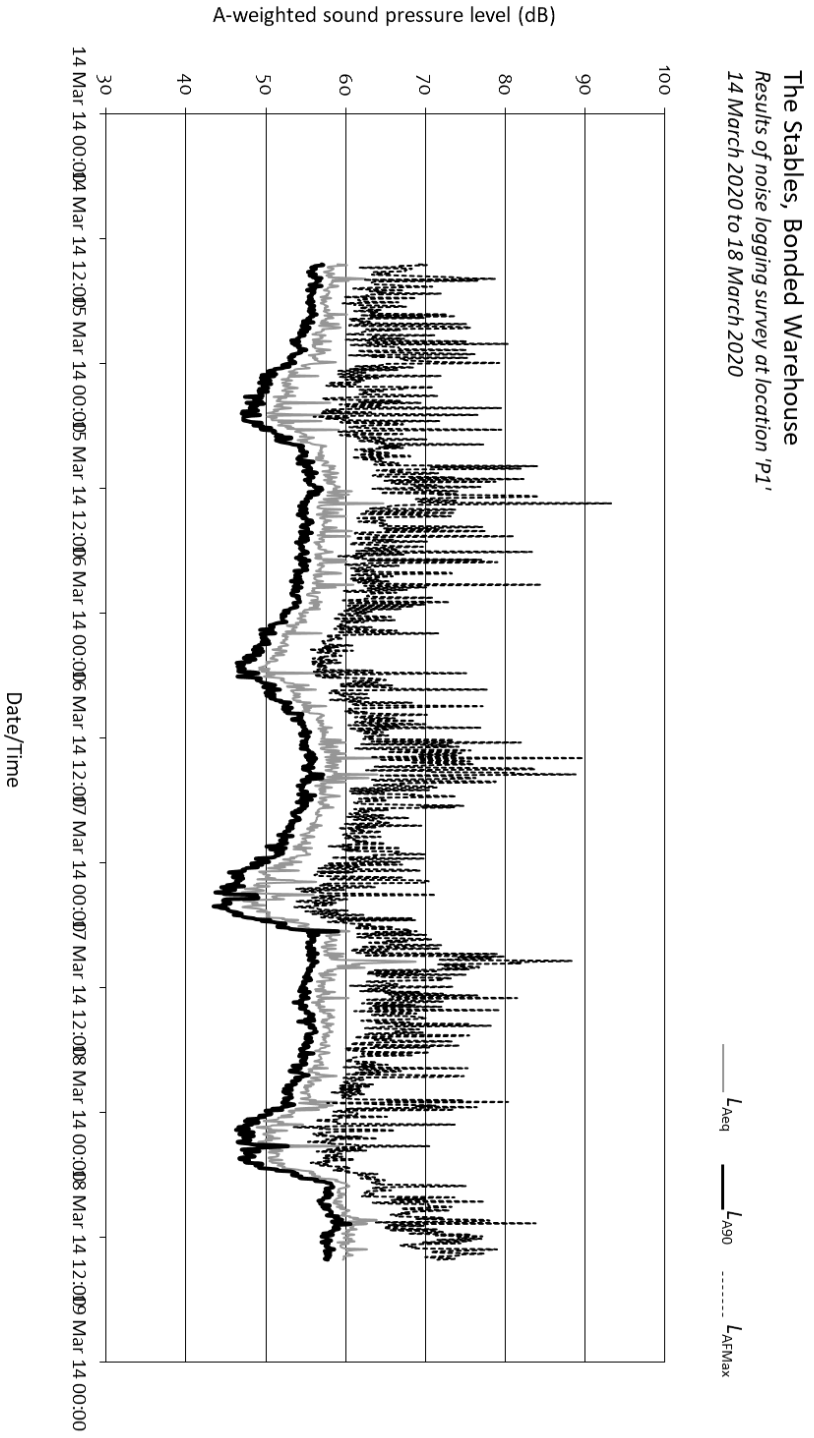
Weather conditions

During the measurements obtained between 14 March 2013 and 18 March 2014, weather reports for the area indicated that temperatures varied between 11°C at night and 1°C during the day, and the wind speed was less than 10 m/s.

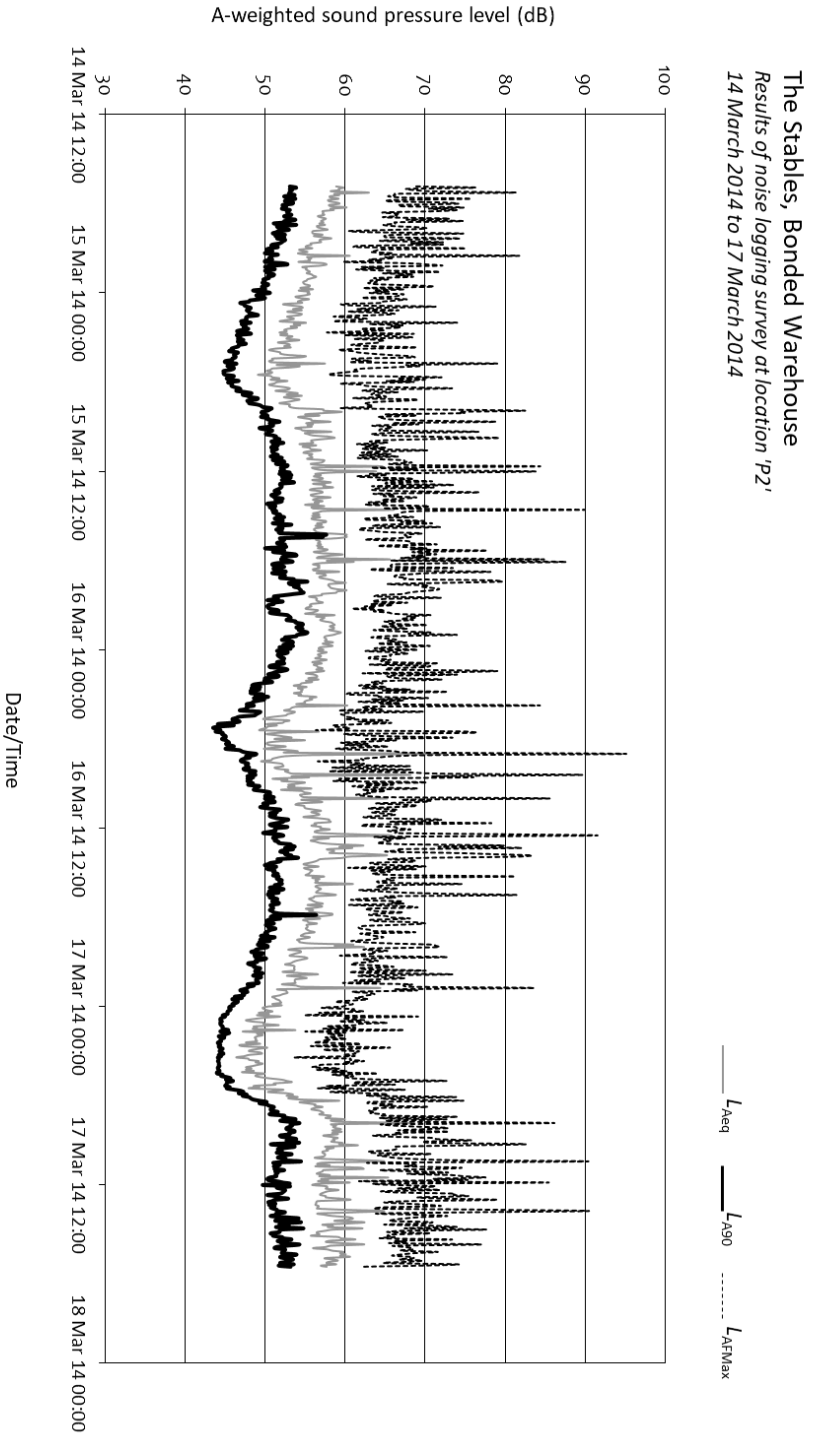
These weather conditions are considered suitable for obtaining representative measurements.

Appendix B

Results of unattended measurements at Location ‘P1’


The Stables, Bonded Warehouse
Results of noise logging survey at location 'P1'
14 March 2020 to 18 March 2020
A-weighted sound pressure level (dB)
30
40
50
60
70
80
90
100
14 Mar 14 00:00
14 Mar 14 12:00
15 Mar 14 00:00
15 Mar 14 12:00
16 Mar 14 00:00
16 Mar 14 12:00
17 Mar 14 00:00
17 Mar 14 12:00
18 Mar 14 00:00
18 Mar 14 12:00
19 Mar 14 00:00
Date/Time
L_{Aeq}
L_{A90}
L_{AFMax}

Results of unattended measurements at Location ‘P2’


The Stables, Bonded Warehouse
Results of noise logging survey at location 'P2'
14 March 2014 to 17 March 2014
A-weighted sound pressure level (dB)
30
40
50
60
70
80
90
100
14 Mar 14 12:00
15 Mar 14 00:00
15 Mar 14 12:00
16 Mar 14 00:00
16 Mar 14 12:00
17 Mar 14 00:00
17 Mar 14 12:00
18 Mar 14 00:00
Date/Time
L_{Aeq}
L_{A90}
L_{AFMax}

Appendix C

BS 4142 corrections for attention catching features

The following applies where plant noise is assessed in accordance with BS 4142:2014+A1:2019.

If the proposed plant noise contains attention catching features (such as tonal elements, whines, whistles, bangs etc), penalty corrections should be applied based on the type and impact of the features.

If appropriate, a subjective assessment of the plant features can be adopted. Where the plant noise contains tonal elements, the following corrections can be made depending on how perceptible the tone is at the noise receptor:

- 0 dB where the tone is not perceptible
- 2 dB where the tone is just perceptible
- 4 dB where the tone is clearly perceptible
- 6 dB where the tone is highly perceptible.

Where the plant noise is impulsive, the following corrections can be made depending on how perceptible the impulsivity is at the noise receptor:

- 0 dB where the impulse is not perceptible
- 3 dB where the impulse is just perceptible
- 6 dB where the impulse is clearly perceptible
- 9 dB where the impulse is highly perceptible.

For noise which is equally both impulsive and tonal, then both features can be accounted for by linearly summing the corrections for both characteristics.

If the plant has other distinctive characteristics, such as intermittency, then a 3 dB correction can be made.

If a subjective assessment of tonality is not appropriate, an objective assessment can be made by analysis of time-averaged, third-octave band sound pressure levels. A noise source is deemed to be tonal if the level in a third-octave band exceeds the level in adjacent third-octave bands by the level differences given below:

- 15 dB in the low frequency third-octave bands (25 Hz to 125 Hz)
- 8 dB in the mid frequency third-octave bands (160 Hz to 400 Hz)
- 5 dB in the high frequency third-octave bands (500 Hz to 10000 Hz).

If an objective assessment identifies the plant noise to be tonal then a 6 dB correction must be made.