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DANIELI GROUP

STACK MANCHESTER

ACOUSTIC ASSESSMENT REPORT

APRIL 2023

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DATE ISSUED:	**APRIL 2023**
JOB NUMBER:	**NT16247**
REPORT NUMBER:	**001**
VERSION:	**V0.1**
STATUS:	**DRAFT**

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ACOUSTIC ASSESSMENT REPORT

APRIL 2023

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EXECUTIVE SUMMARY

Wardell Armstrong LLP has carried out a noise assessment for a proposed entertainment venue under the Mancunian Way (A57(M)), Oxford Road, Manchester. This assessment has been prepared for submission with planning and licensing applications.

An application for flexible commercial uses, consisting of Use Classes A1 (shop), A3 (restaurant/café), A4 (drinking establishment), A5 (hot food takeaway) or B1 (office), received approval in August 2019, at the Oxford Road site. The site currently operates as Phase 2 of Hatch, a food, drink and retail venue. It is proposed that the operator of the site would change to Danieli Group (the client) who plans to promoted the site as part of the 'STACK' collection of venues.

STACK venues are of the similar to the existing Hatch, a selection of food and drink outlets, focused on a central seating and entertainment area. Due to the change in ownership, a noise assessment is required to assess the operational and layout changes, to ensure local sensitive receptors are protected.

Conditions were attached to a previous planning approval for Hatch at the site on Oxford Road, Manchester (Ref: 124502/FO/2019). A noise assessment was prepared for Hatch Phase 2 in June 2019 (Ref: PR0601-REP02A-MPF) and the noise limits stated within have been conditioned in the Decision Notice. This noise assessment has therefore been prepared considering these existing noise limits.

The site is situated under the Mancunian Way flyover on Oxford Road, and local receptors are already subject to high baseline sound levels. The nearest receptors are located approximately 95m away, at Circle Square.

The Client has already sought to embed noise control measures into the development proposals, to ensure it is demonstrated that the venue does not cause any disturbance to sensitive receptors. A noise management plan would be prepared for the venue. The entrance into the venue would be lobbied, and a 1.8m high glass screen will be included on the façade fronting Oxford Road. Where practical, the venue layout has been used to provide noise screening and to limited noise emissions from the venue. This includes using the proposed containers as noise screens and reducing and gaps between the containers and underside of the A57 carriageway.

With these measures in place, the development will meet the respective noise limits implemented at receptors, with the exception of the upper floors of one receptor building. However, for these receptors and for those receptors without limits (not previously

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considered), a cumulative impact assessment has been undertaken using NR level analysis. This assessment takes into consideration the character of the sound, the location of the receptors (within buildings), and the façade mitigation that has been provided to properties via previous planning approvals.

The predicted NR levels at each receptor demonstrated that good internal sound levels would be achieved, and that receptors would be protected from operations at the venue.

Given that no significant noise impacts are expected from the proposed venue, and noise from the venue has been mitigated and reduced to a minimum, the proposed development complies with paragraphs 185 and 187 of the National Planning Policy Framework (NPPF), and noise should not be a material consideration during the planning process.

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1 INTRODUCTION

1.1.1 Wardell Armstrong LLP (WA) has been commissioned by Danieli Group to carried out a noise assessment for a proposed entertainment venue under the Mancunian Way (A57(M)), Oxford Road, Manchester. This assessment has been prepared for submission with planning and licensing applications.

1.1.2 An application for flexible commercial uses, consisting of Use Classes A1 (shop), A3 (restaurant/café), A4 (drinking establishment), A5 (hot food takeaway) or B1 (office), received approval in August 2019, at the Oxford Road site. It currently operates as Phase 2 of Hatch, an existing food, drink and retail venue. It is proposed that the operator of the site would change to Danieli Group (the client) who plans to promote the site as part of the 'STACK' collection of venues.

1.1.3 STACK venues are of the same nature as the existing Hatch, a selection of food and drink outlets, focused on a central seating and entertainment area. Due to the change in ownership, a noise assessment is required to assess the operational and layout changes, to ensure local sensitive receptors are protected. The proposed venue layout is shown in **Appendix A**.

1.1.4 This noise assessment has been prepared to consider the existing noise limits set within the previous Decision Notice, and where required expand the assessment to consider Noise Rating Curves and the any new local receptors in the area.

1.1.5 The report assesses the results noise modelling carried out in accordance with current guidance and includes recommendations for noise mitigation where appropriate.

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2 ASSESSMENT METHODOLOGY

2.1 Previous Assessment

2.1.1 A noise assessment was prepared for Hatch Phase 2 in July 2019 (Ref: PR0601-REP02A-MPF) which was approved in August 2019. The noise assessment can be found in **Appendix B**.

2.1.2 The following methodology was proposed for Hatch Phase 2:

- Determination of existing levels of noise at sensitive receptors around the site
- Determination of maximum allowable external music noise level to allow amenity to be maintained
- Calculation of noise propagation from stage loudspeakers and distributed loudspeakers around the development
- Determination of environmental noise limits for building services plant to safeguard residential amenity
- Assessment of expected environmental noise levels due to operation of the proposed extract fans at the units
- Assessment of patron noise propagation to residential properties around the site

2.1.3 Within the Hatch Phase 2 assessment, noise limits at sensitive receptors have been determined, which have been considered in this assessment, as required by the Decision Notice.

2.1.4 The noise assessment will consider current guidance including:

- National Planning Policy Framework, 2021 (NPPF)
- Planning Practice Guidance, 2019 (PPG)
- Noise Policy Statement for England, 2010 (NPSE)
- British Standard 8233:2014 Guidance on Sound Insulation and noise reduction for buildings (BS 8233) – For comparison to Noise Rating Curves
- British Standard 4142: 2014+A1:2019 Methods for rating and assessing industrial and commercial sound (BS 4142)

2.1.5 Further details of these documents are included in **Appendix C.**

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2.2 Noise Sensitive Receptors

2.2.1 The following sensitive receptors (ESRs) have been considered in this assessment, as identified in the Hatch Phase 2 noise assessment. Through a desktop study, several other sensitive receptors have been identified in the vicinity of the development which also need to be considered. These are also identified in Table 1 below.

Table 1: ESRs considered in the Noise Assessment

Receptor	Address	Co-ordinates		Approximate Distance to Site
		X	Y	
ESR 1	Circle Square, Plots 5 and 6	384188.4	397414.3	181
ESR 2	Circle Square, Plot 9	384268.4	397450.9	202
ESR 3	Circle Square, Plot 4	384215.4	397365.8	115
ESR 4	Circle Square, Plot 10	384318.4	397423	175
ESR 5	Circle Square, Plot 2	384246.5	397312.4	77
ESR 6	Circle Square, Plots 7 and 8*	384313.6	397356.8	109
ESR 7	Circle Square, Plot 11	384347.5	397370.2	135
ESR 8	Princess House*	384375	397402	176
ESR 9	Oxford House*	384320.9	397271.9	16
ESR 10	Circle Square, Premier Inn Hotel, Plot 14*	384377.3	397293.7	98

*Identified in Hatch Phase 2 noise assessment

2.3 Noise Modelling

2.3.1 SoundPLAN noise modelling software has been used to calculate the propagation of noise from the proposed development to ESRs and to determine the need for any mitigation measures.

2.3.2 The modelling has been carried out in accordance with ISO 9613-2:1996 Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation (ISO9613). The software uses geographical information to create a model of the study area on which to generate noise contours and includes objects that affect the propagation of sound such as buildings and topography. Further details on the noise modelling undertaken can be found in Section 4.4 of this report, modelling assumptions and parameters are provided in **Appendix D**.

3 DETERMINED NOISE LIMITS

3.1.1 The noise assessment for Hatch Phase 2 determined noise limits at each ESRs 6 to 10. The noise limits were presented as broadband and octave bands levels. The noise limits are dependent on the source of the noise from the development, that being either building service noise, music noise or patron noise, established from Planning Guidance or British Standards.

3.1.2 The defined noise limits have been replicated in Tables 2 to 4 below. These limits have been utilised in this assessment, as required by the Decision Notice, to design the scheme to ensure noise nuisance is unlikely.

Table 2: Maximum allowable cumulative daytime and night-time free-field external noise levels at the closest residential façades due to music noise

Receptor/Period	Sound Pressure Level (dB(A) L_{eq}) at Octave Frequency (Hz)							
	63	125	250	500	1000	2000	4000	Total
ESR 6 (0700 to 2300)	53	48	45	41	41	34	23	55
ESR 6 (2300 to 0100)	51	46	42	41	41	33	24	53
ESR 7 (0700 to 2300)	53	48	45	41	41	34	23	55
ESR 7 (2300 to 0700)	51	46	42	41	41	33	24	53
ESR 8 (0700 to 2300)	50	45	44	43	44	37	25	53
ESR 8 (2300 to 0700)	50	45	42	41	42	34	24	53
ESR 9 (0700 to 0000)	58	53	48	48	47	41	32	60
ESR 9 (0000 to 0700)	55	51	46	45	45	41	32	57
ESR 10 (0700 to 2300)	53	48	50	51	56	49	35	60
ESR 10 (2300 to 0700)	51	48	50	51	55	46	33	59

Table 3: Maximum allowable daytime and night-time free-field external noise levels at the closest residential façade due to patron noise

Receptor	Daytime (0700 to 2300 hours) $L_{Aeq,t}$	Night-time (2300 to 0700 hours) $L_{Aeq,t}$
ESR 6	52	50

Table 4: Maximum allowable daytime and night-time free-field external noise levels at the closest residential façade due to building service noise		
Receptor	**Daytime (0700 to 2300 hours) $L_{Aeq,t}$**	**Night-time (2300 to 0700 hours) $L_{Aeq,t}$**
ESR 6	44	35
ESR 9	55	55
ESR 10	64	55

3.1.3 For those receptors where limits have not been set, a Noise Rating (NR) assessment has been undertaken. The assessment considers the cumulative noise impact from music, patron and plant noise.

3.1.4 The NR value is a graphical method to assign a single number to a noise spectrum of interest. NR levels are considered internally, therefore take into consideration the attenuation provided by the building façade of any receptor. Further details of this are provided in Section 5 of this report.

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4 OPERATIONAL NOISE ASSESSMENT

4.1 Introduction

4.1.1 This section of the report sets out the assessment of noise from the proposed development, at the ESRs.

4.1.2 A computer noise model has been used to determine the noise impact at the ESRs during the typical operations of the development.

4.2 Identification of Proposed Sources of Noise

4.2.1 To understand the likely noise sources associated with the proposed venue, an operational acoustic survey was undertaken at STACK Seaburn, Sunderland. Further details on the monitoring undertaken can be found in **Appendix E**.

4.3 Embedded Mitigation

4.3.1 As best practice, the venue will implement measures to reduce the noise impact to existing receptors.

4.3.2 The entrance into the venue would be lobbied, and a 1.8m high glass screen will be placed along the façade fronting Oxford Road. This screen would attenuate noise from the terraced area overlooking Oxford Road. Where practical the venue design has been used to provide noise screening and to limited noise emissions from the venue. This includes using the proposed containers as noise screens and reducing and gaps between the containers and underside of the A57 carriageway. Emergency doors would only be opened in case of an emergency.

4.3.3 A noise management plan will be prepared. The plan will detail specific events which include amplified music and background music and operational control measures to ensure all members of staff are aware of the management procedures. Training would be provided to staff ensuring these controls are implemented correctly.

4.3.4 The noise management plan will set out a clear noise management strategy, detailing how the venue will be managed and monitored (employee attendance and CCTV), and how patrons who are causing excessive noise would be addressed.

4.3.5 Signage would also be place around the venue requesting that patrons respect the local area and avoid creating excessive noise when using the venue and leaving the premises.

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4.3.6 The noise management plan would also include a complaints procedure detailing how complaints relating to noise would be addressed by the venues management team.

4.3.7 It is proposed that the venue would operate during the following time periods:

Sunday to Thursday:

- Venue opening: Morning* to 0100 hours
- Live music: Finish 2200 hours
- DJ set/amplified music: Finish 0100 hours
- Background music: Opening to finish 0100 hours

**Some vendors would be open for breakfasts and coffee, opening times to be confirmed.*

Friday & Saturday:

- Venue opening: Morning* to 0200 hours
- Live music: Finish 2200 hours
- DJ set/amplified music: Finish 0200 hours
- Background music: Opening to finish 0200 hours

**Some vendors would be open for breakfasts and coffee, opening times to be confirmed.*

Sunday / Bank Holidays:

- Venue opening: Morning* to 0200 hours
- Live music: Finish 2200 hours
- DJ set/amplified music: Finish 0200 hours
- Background music: Opening to finish 0200 hours

**Some vendors would be open for breakfasts and coffee, opening times to be confirmed.*

4.4 Noise Model

4.4.1 To assess the impact of the proposed venue, a noise model has been created to allow prediction of noise at sensitive receptors.

4.4.2 The following modelling scenarios have been considered:

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- Entertainment Noise
- Patron Noise
- External Plant Noise
- Cumulative Assessment – entertainment, patron and plant noise

4.4.3 The noise modelling assumptions, uncertainties and parameters are provided in **Appendix D.**

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5 ASSESSMENT RESULTS

5.1 Comparison with Noise Limits

Music Noise

5.1.1 The specific sound level from music noise from the venue has been predicted at each of the ESRs, as shown in Table 5. The noise contours for music noise break out have been provided in Figure 2. The sound levels have been compared to the noise limits stated in Table 2.

Table 5: Comparison of specific noise levels to noise limits

Receptor/Period	(dB(A) L_{eq}) at Octave Frequency (Hz)							
	63	125	250	500	1k	2k	4k	Total
Predicted External Sound Pressure Level								
ESR 6 – Ground Floor to Floor 9 (0700 to 2300)	21	22	35	37	30	24	14	40
ESR 6 – Floor 10+ (0700 to 2300)	47	47	47	47	43	36	23	50
ESR 6 – Ground Floor to Floor 9 (2300 to 0700)	21	22	35	37	30	24	14	40
ESR 6 – Floor 10+ (2300 to 0700)	47	47	47	47	43	36	23	50
ESR 7 (0700 to 0000)	31	33	38	40	35	27	14	43
ESR 7 (0000 to 0700)	31	33	38	40	35	27	14	43
ESR 8 (0700 to 2300)	20	27	37	39	32	25	8	42
ESR 8 (2300 to 0700)	20	27	37	39	32	25	8	42
ESR 9 (0700 to 2300)	38	42	44	48	41	34	22	51
ESR 9 (2300 to 0100)	38	42	44	48	41	34	22	51
ESR 10 (0700 to 2300)	45	48	49	50	45	38	25	55
ESR 10 (2300 to 0700)	45	48	49	50	45	38	25	55
Comparison with noise limits								
ESR 6 – Ground Floor to Floor 9 (0700 to 2300)	**-33**	**-26**	**-10**	**-4**	**-11**	**-10**	**-9**	**-15**
ESR 6 – Floor 10+ (0700 to 2300)	**-6**	**-1**	**+2**	**+6**	**+2**	**+2**	**±0**	**-5**
ESR 6 – Ground Floor to Floor 9 (2300 to 0700)	**-31**	**-35**	**-33**	**-29**	**-36**	**-43**	**-56**	**-13**
ESR 6 – Floor 10+ (2300 to 0700)	**-4**	**+1**	**+5**	**+6**	**+2**	**+3**	**-1**	**-3**
ESR 7 (0700 to 0000)	**-22**	**-15**	**-7**	**-1**	**-6**	**-7**	**-9**	**-12**
ESR 7 (0000 to 0700)	**-20**	**-13**	**-4**	**-1**	**-6**	**-6**	**-10**	**-10**
ESR 8 (0700 to 2300)	**-30**	**-18**	**-7**	**-4**	**-12**	**-12**	**-17**	**-11**
ESR 8 (2300 to 0700)	**-30**	**-18**	**-5**	**-2**	**-10**	**-9**	**-16**	**-11**
ESR 9 (0700 to 2300)	**-20**	**-12**	**-4**	**±0**	**-6**	**-7**	**-10**	**-9**
ESR 9 (2300 to 0100)	**-17**	**-10**	**-2**	**+3**	**-4**	**-7**	**-10**	**-6**
ESR 10 (0700 to 2300)	**-8**	**±0**	**-1**	**-1**	**-12**	**-11**	**-10**	**-5**
ESR 10 (2300 to 0700)	**-6**	**±0**	**-1**	**-1**	**-11**	**-8**	**-8**	**-4**

5.1.2 Table 5 shows that music noise will meet the required noise limits at all ESRs except ESR 6, above floor 10, during both the daytime and night time period, and ESR 9,

during the night time period. ESR 9 is representative of Oxford House, which consists of office premises. Therefore, during the night time period the offices would not be occupied. The predicted impact at this location is not significant and can be dismissed. It should be noted that at all ESRs the total sound level is less than the noise limits. For ESR 6 however, an NR curve assessment has been undertaken. ERS 6 is a relatively new development that benefits from façade noise mitigation, sue to the baseline sound levels in the area.

5.1.3 NR levels are considered internally, therefore take into consideration the attenuation provided by the building façade of any receptor. Research into the glazing specification for ESR 6 has found the minimum octave band sound reduction (worst-case), the specification is shown in Table 6.

Table 6: Octave Band Glazing Sound Reduction Index for ESR 6 (dB(Z))

Receptor/Period	63	125	250	500	1k	2k	4k
ESR 6 – Floor 10+ (0700 to 2300), Living Rooms	16	19	19	29	35	35	35
ESR 6 – Floor 10+ (2300 to 0700), Bedrooms	21	26	27	34	35	35	35

5.1.4 A continuous running supply and extract ventilation has been provided to properties at ESR 6, therefore no trickle ventilation openings are installed on the façade.

5.1.5 The NR value can be used to assess acceptability of a noise spectrum for a particular application, in this case, the noise from the proposed STACK venue at ESR 6.

5.1.6 During the daytime (0700 to 2300 hours) and night-time (2300 to 0700 hours) periods, NR 30 and NR 25 respectively, are generally accepted as good internal acoustic conditions for rest and relaxation.

5.1.7 An assessment of the predicted NR level at ESR 6 as a result of the development has been undertaken. An NR level of 17 has been predicted at ESR 6 during the daytime and NR 21 during the night-time as a result of the operational noise from the proposed STACK venue, these are significantly below NR 30 and NR 25.

5.1.8 Therefore, it is considered that resident's amenity would be protected as good internal acoustic conditions would remain. Detailed NR curve analysis can be found in **Appendix F**.

5.1.9 It is therefore concluded that, in regard to music noise, resident's amenity would be protected and proposed venue would be compliant with the existing noise limits.

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Patron Noise

5.1.10 The specific sound level from patron noise from the venue has been predicted at ESR 6. ESR 6 is the only receptor with limits conditioned for patron noise in planning approval (Ref: 124502/FO/2019), and documented in noise assessment (Ref: PR0601-REP02A-MPF). The limits are presented in Table 7. The noise contours from patron noise break out has been provided in Figure 3. The sound levels have been compared to the noise limits stated in Table 2.

Table 7: Comparison of specific noise levels to noise limits

Receptor	Daytime (0700 to 2300 hours) $L_{Aeq,t}$	Night-time (2300 to 0700 hours) $L_{Aeq,t}$
Predicted Specific Sound Level		
ESR 6 – Floor 10+	46	46
Comparison with noise limits		
ESR 6 – Floor 10+	**-6**	**-4**

5.1.11 Table 7 shows that patron noise will meet the required noise limit identified. The development therefore complies with patron noise.

5.1.12 It should be noted that patron noise has also been included in the cumulative noise impact assessment, section 5.2, to consider the potential noise impact at all ESRs.

Building Service Noise

5.1.13 The specific sound level from building service noise from the venue has been predicted at ESR 6, ESR 9 and ESR 10. These are the only receptors with limits to be considered for building service noise in planning approval (Ref: 124502/FO/2019) and documented in noise assessment (Ref: PR0601-REP02A-MPF). The limits are provided in Table 8. The noise contours for building service noise has been provided in Figure 4. The sound levels have been compared to the noise limits stated in Table 2.

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Table 8: Comparison of specific sound levels to noise limits		
Receptor	**Daytime (0700 to 2300 hours) $L_{Aeq,t}$**	**Night-time (2300 to 0700 hours) $L_{Aeq,t}$**
Predicted Specific Sound Level		
ESR 6 – Floor 10+	4	4
ESR 9	39	39
ESR 10	21	21
Comparison with noise limits		
ESR 6 – Floor 10+	**-40**	**-31**
ESR 9	**-16**	**-16**
ESR 10	**-43**	**-34**

5.1.14 Table 8 shows that building service noise will meet the required noise limits identified. he development therefore complies with plant noise.

5.1.15 It should be noted that building service noise has also been included in the cumulative noise impact assessment, section 5.2, to consider the potential noise impact at all ESRs.

5.2 Cumulative Impact

5.2.1 To assess the level and potential character of the sound from the proposed development at those identified receptors without limits, and the upper floors of ESR 6, a Noise Rating (NR) assessment has been undertaken.

5.2.2 The NR value is a graphical method to assign a single number to a noise spectrum of interest. NR levels are considered internally, therefore take into consideration the attenuation provided by the building façade of any receptor. As a worst case, only the attenuation of the glazing has been considered. As each receptor has different glazing specified on each façade, the glazing with the lowest attenuation (worst-case) has been considered. Research of the glazing attenuation for the ESRs has found the following minimum octave band sound reduction, as shown in Table 9.

Table 9: Octave Band Glazing Sound Reduction Index for each ESR (dB(Z))							
Receptor/Period	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**
ESR 1 – Living Rooms	19	23	23	30	38	40	39
ESR 1 - Bedrooms	21	26	27	34	35	35	35
ESR 2 – Living Rooms and Bedrooms	23	26	28	35	41	44	45
ESR 3 – open plan office areas	19	23	23	30	36	36	36
ESR 4 – Living Rooms and Bedrooms	25	27	30	37	41	44	45
ESR 5 – open plan office areas	19	23	23	30	36	36	36
ESR 6 – Living Rooms	16	19	19	29	35	35	35

ESR 6 - Bedrooms	21	26	27	34	35	35	35
ESR 7 – Living Rooms and Bedrooms	23	26	28	35	41	44	45
ESR 8	16	19	19	29	35	35	35
ESR 9	16	19	19	29	35	35	35
ESR 10	21	26	27	34	35	35	35

5.2.3 A continuous running supply and extract ventilation has been provided at all ESRs within Circle Square (ESRs 1 to 7, and ESR 10), therefore no trickle ventilation openings are installed on the façade. The specification for ESR 10 was unavailable, however due to the receptor being a Premier Inn hotel adjacent to the A57, it is assumed the acoustic specification for the façade would be high given the location and sensitivity. Therefore, to be robust a specification similar to that of ESR 6 bedrooms has been assumed.

5.2.4 For ESR 8 and 9, due to their older construction, there is no data on the façade attenuation installed. Due to the location of the ESRs, it is assumed the glazing would be enhanced to attenuate road traffic noise. The specification for ESR 6 living rooms has been implemented at ESR 8 and 9.

5.2.5 The NR value can be used to assess acceptability of a noise spectrum for a particular application, in this case, the noise predicted from the proposed terrace at existing sensitive receptors.

5.2.6 During the daytime (0700 to 2300 hours) and night-time (2300 to 0700 hours) periods, NR 30 and NR 25 respectively, are generally accepted as good internal acoustic conditions for rest and relaxation.

5.2.7 An assessment of the predicted NR levels at sensitive receptors as a result of the cumulative impact of the venue operations. A summary of the results is shown in Table 10 below. Detailed NR level/curve analysis can be found in **Appendix F**.

Table 10: NR Levels at ESRs due to Development Noise

Receptor	NR Level	
	Living Rooms (daytime)	Bedrooms (night-time)
ESR 1	NR 5	NR 2
ESR 2	NR 1	NR 1
ESR 3	NR 13	N/A
ESR 4	NR 1	NR 1
ESR 5	NR 21	N/A

ESR 6	NR 28	NR 22
ESR 7	NR 8	NR 8
ESR 8	NR 16	NR 16
ESR 9	NR 25	NR 25
ESR 10	NR 21	NR 21

5.2.8 The NR levels presented in Table 10 are below NR 30 and NR 25, which are deemed acceptable for good internal acoustic conditions.

5.2.9 It is therefore concluded the development would not cause an adverse impact at receptors.

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6 CONCLUSIONS

6.1.1 Wardell Armstrong LLP has carried out a noise assessment for a proposed entertainment venue under the Mancunian Way (A57(M)), Oxford Road, Manchester. This assessment has been prepared for submission with planning and licensing applications.

6.1.2 An application for flexible commercial uses, consisting of Use Classes A1 (shop), A3 (restaurant/café), A4 (drinking establishment), A5 (hot food takeaway) or B1 (office), received approval in August 2019, at the Oxford Road site. The site currently operates as Phase 2 of Hatch, a food, drink and retail venue. It is proposed that the operator of the site would change to Danieli Group (the client) who plans to promoted the site as part of the 'STACK' collection of venues.

6.1.3 STACK venues are of the similar to the existing Hatch, a selection of food and drink outlets, focused on a central seating and entertainment area.

6.1.4 Conditions were attached to a previous planning approval for Hatch at the site on Oxford Road, Manchester (Ref: 124502/FO/2019). This noise assessment has therefore been prepared considering these existing noise limits, and where required expand the assessment to consider Noise Rating Curves and the any new local receptors in the area.

6.1.5 The Client has already sought to embed noise control measures into the development proposals, to ensure it is demonstrated that the venue does not cause any disturbance to sensitive receptors. The entrance into the venue would be lobbied, and a 1.8m high glass screen will be included on the façade fronting Oxford Road. Where practical, the venue layout has been used to provide noise screening and to limited noise emissions from the venue. A noise management plan would also be prepared for the venue.

6.1.6 With these measures in place, the development will meet the respective noise limits implemented at receptors, with the exception of the upper floors of one receptor building. However, for these receptors and for those receptors without limits (not previously considered), a cumulative impact assessment has been undertaken using NR level analysis. This assessment takes into consideration the character of the sound, the location of the receptors (within buildings), and the façade mitigation that has been provided to properties via previous planning approvals.

6.1.7 The predicted NR levels at each receptor demonstrated that good internal sound levels would be achieved, and that receptors would be protected from operations at

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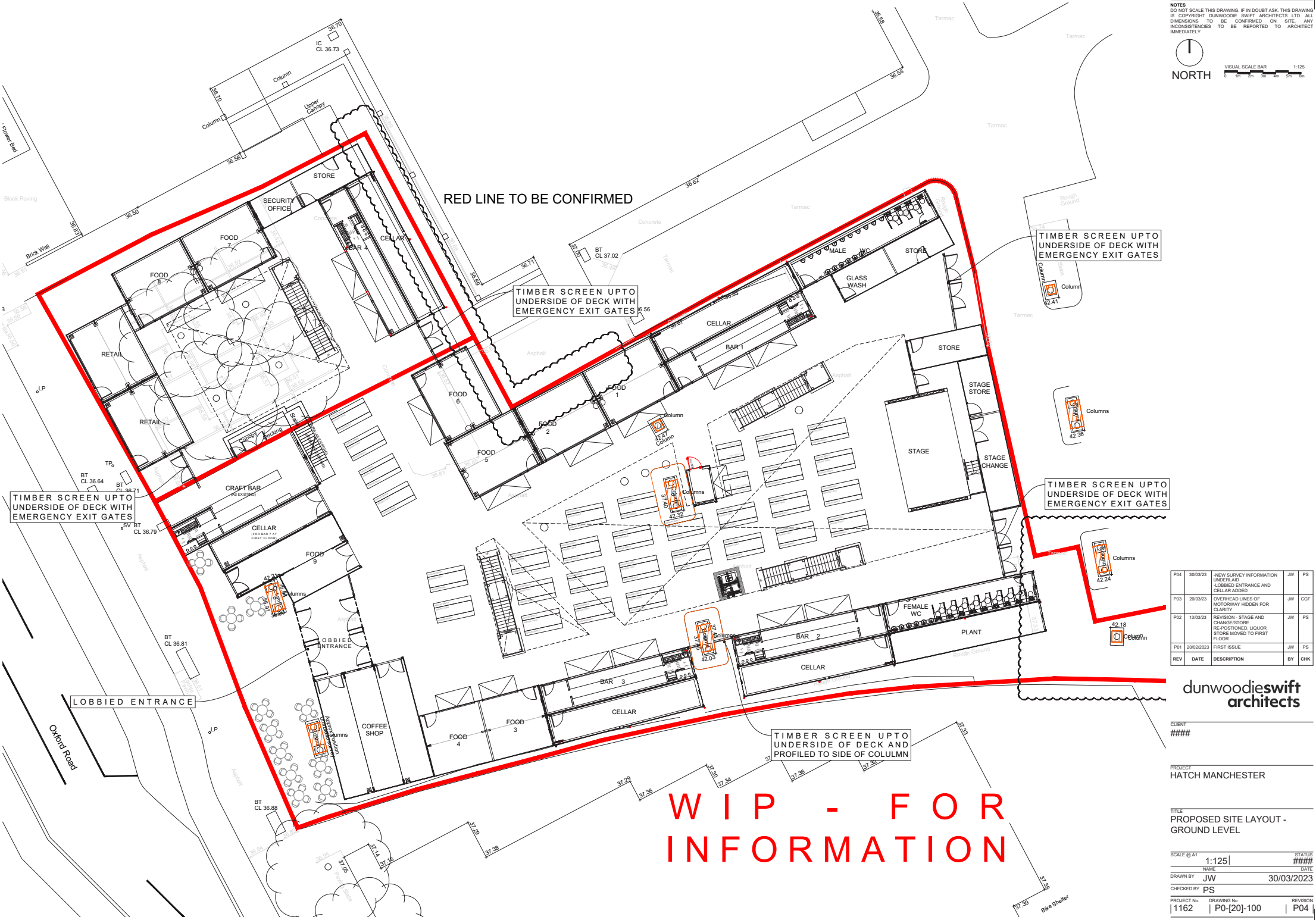
the venue.

6.1.8 Given that no significant noise impacts are expected from the proposed venue, and noise from the venue has been mitigated and reduced to a minimum, the proposed development complies with paragraphs 185 and 187 of the National Planning Policy Framework (NPPF), and noise should not be a material consideration during the planning process.

DRAFT

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APPENDIX A
Site Layout



NOTES
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REV	DATE	DESCRIPTION	BY	CHK
P04	30/03/23	-NEW SURVEY INFORMATION UNDERLAID -LOBBIED ENTRANCE AND CELLAR ADDED	JW	PS
P03	20/03/23	OVERHEAD LINES OF MOTORWAY HIDDEN FOR CLARITY	JW	CGF
P02	13/03/23	REVISION - STAGE AND CHANGE/STORE RE-POSITIONED, LIQUOR STORE MOVED TO FIRST FLOOR	JW	PS
P01	20/02/2023	FIRST ISSUE	JW	PS

dunwoodieswift architects

CLIENT
####

PROJECT
HATCH MANCHESTER

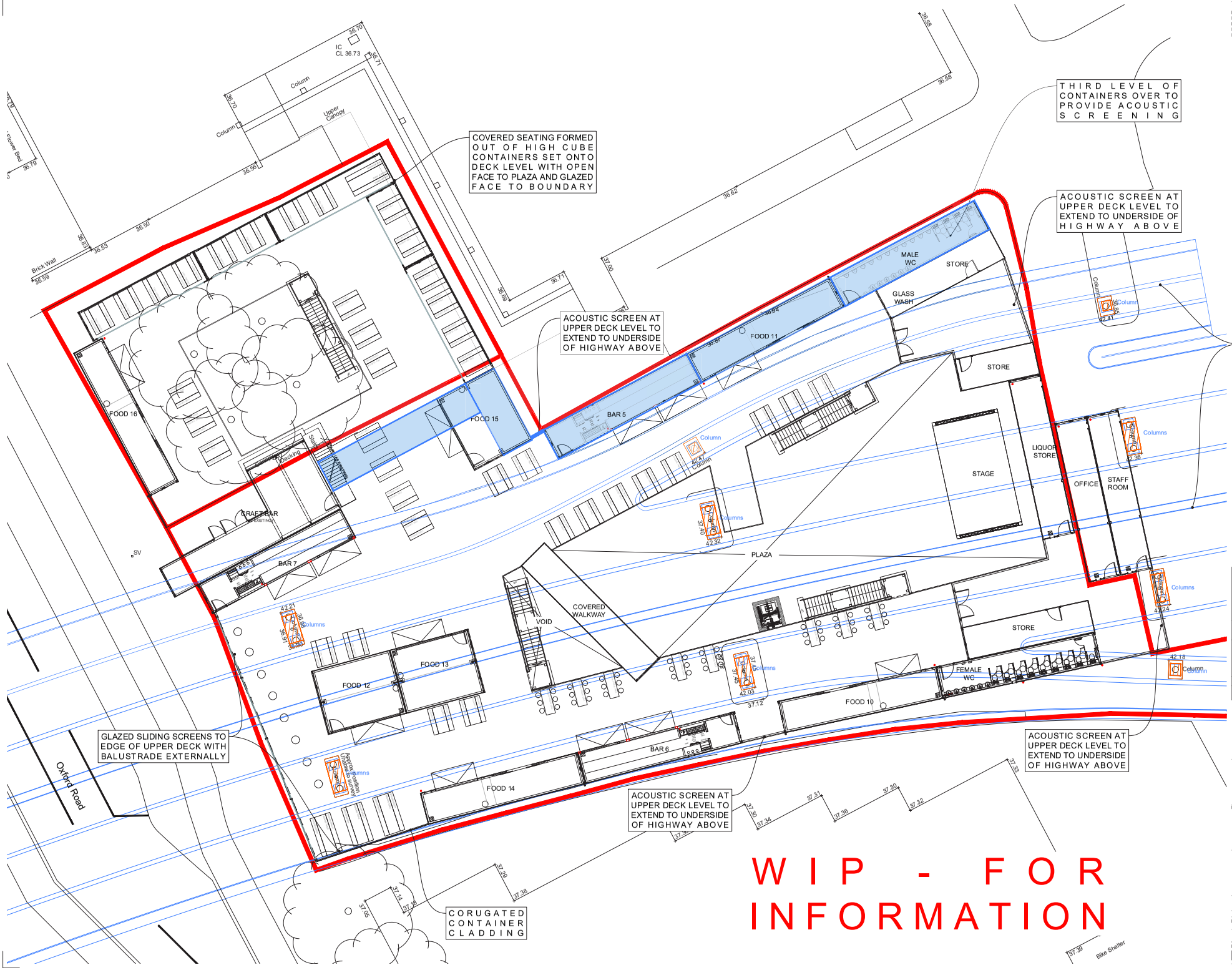
TITLE
PROPOSED SITE LAYOUT - GROUND LEVEL

SCALE @ A1 1:125 | STATUS ####

NAME	DATE
DRAWN BY JW	30/03/2023
CHECKED BY PS	

PROJECT No. 1162 | DRAWING No. P0-[20]-100 | REVISION P04

WIP - FOR INFORMATION



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NORTH

VISUAL SCALE BAR 1:125
0 1m 2m 3m 4m 5m 6m

REV	DATE	DESCRIPTION	BY	CHK
P04	30/03/23	-NEW SURVEY INFORMATION UNDERLAID -SEATING CONTAINERS ADDED -LINES OF MOTORWAY OVER UNHIDDEN -INDICATIVE LINE OF ACOUSTIC SCREENING SHOWN	JW	PS
P03	20/03/23	OVERHEAD LINES OF MOTORWAY HIDDEN FOR CLARITY	JW	OGF
P02	13/03/23	REVISION - OFFICE/STAFF ROOM RE-ARRANGED, LIQUOR STORE MOVED FROM GROUND FLOOR, STAGE REPOSITIONED TO REFLECT CHANGES TO GROUND FLOOR	JW	PS
P01	20/02/2023	FIRST ISSUE	JW	PS

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####

PROJECT
HATCH MANCHESTER

TITLE
PROPOSED FLOOR PLAN - UPPER LEVEL

SCALE @ A1 1:125
STATUS ####
NAME
DATE
DRAWN BY JW 31/03/2023
CHECKED BY PS

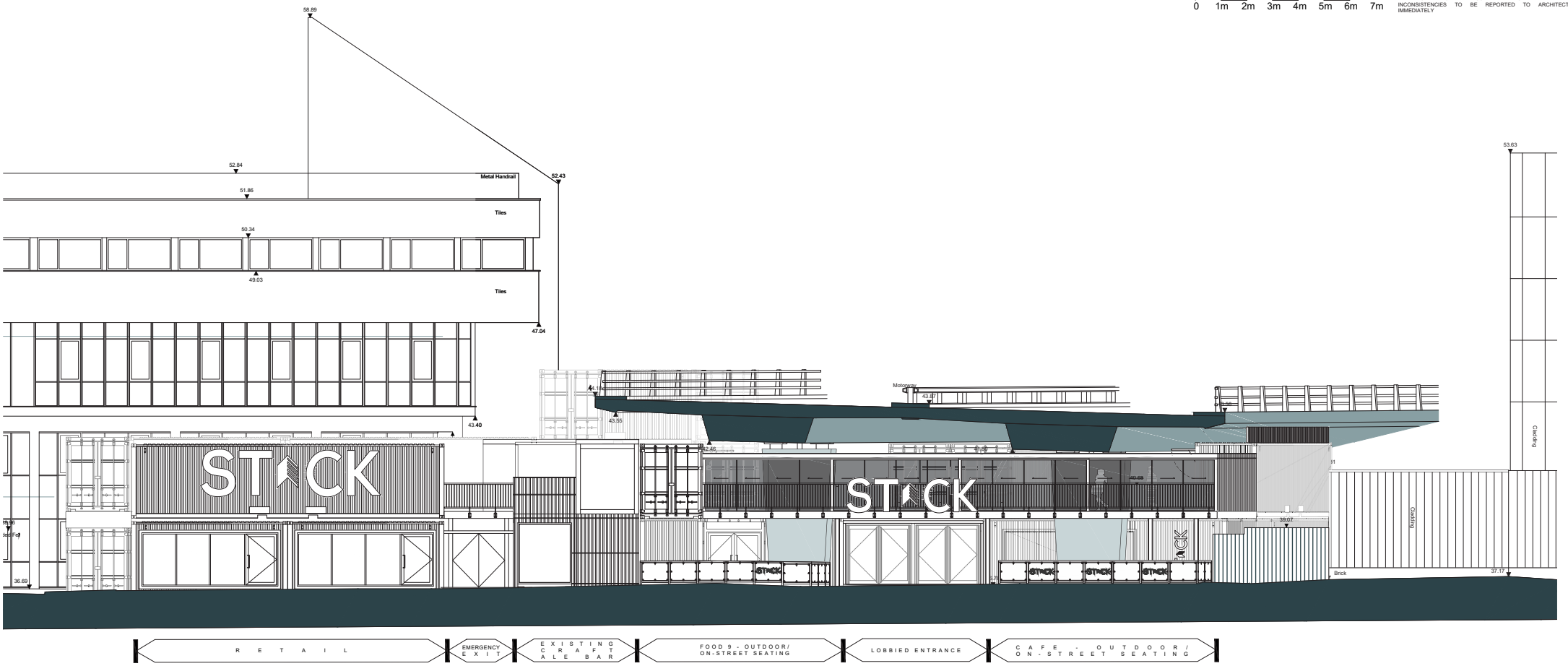
PROJECT No. 1162
DRAWING No. P1-[20]-101
REVISION P04

VISUAL SCALE BAR 1:150

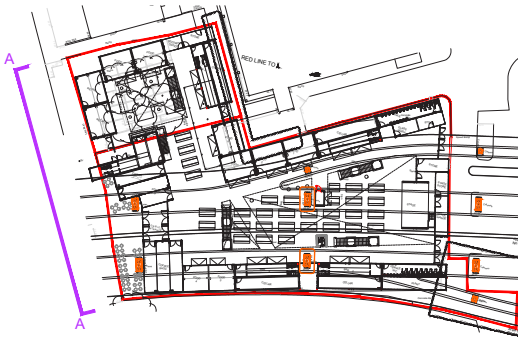
0 1m 2m 3m 4m 5m 6m 7m

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PROPOSED WEST ELEVATION A-A
OXFORD ROAD
SCALE 1:150



REV	DATE	DESCRIPTION	BY	CHK
P01	20/03/23	FIRST ISSUE	JW	PS

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CLIENT
####

PROJECT
STACK - MANCHESTER

TITLE
PROPOSED ELEVATION A-A
WESTERN ELEVATION -
OXFORD ROAD

SCALE @ A3 1:150 | STATUS ####

	NAME	DATE
DRAWN BY	JW	30/03/2023
CHECKED BY	PS	

PROJECT No.	DRAWING No	REVISION
1162	EL-[00]-210	P01

DRAFT

APPENDIX B
Hatch Phase 2 Noise Assessment

fisher acoustics

Hatch Phase 2, Manchester

Environmental Noise Study

June 2019

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fisher acoustics

PROJECT TITLE	HATCH, PHASE 2, OXFORD ROAD, MANCHESTER
REPORT TITLE	ENVIRONMENTAL NOISE STUDY
CLIENT	BRUNTWOOD LIMITED YORK HOUSE YORK STREET MANCHESTER M2 3BB
REPORT REFERENCE	PR0601-REP02A-MPF
DATE	JUNE 2019
AUTHOR	MATT FISHER, BENG (HONS) CENG MIOA
DOCUMENT HISTORY	
FIRST ISSUE	20 JUNE 2019
REVISION A	21 JUNE 2019

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1.0 SUMMARY

Planning permission was granted in September 2018 at the Hatch Phase 2 site for the erection of one and two storey buildings with flexible commercial uses (Use Classes A1 (shop), A3 (restaurant/cafe), A4 (drinking establishment) or A5 (hot food takeaway)) at ground and first floor together with related access, landscaping and other associated works including external seating areas and courtyard space for a temporary period (application reference 120050/FO/2018).

Subsequent to the planning approval, revisions to the proposed layout of the temporary buildings on the site have been made. The layout revisions are sufficient to require a new planning application.

Fisher Acoustics Ltd has been commissioned by Bruntwood LG Limited to carry out an environmental noise assessment of the revised proposals.

Environmental noise limits have been recommended for building services plant serving the proposed units. An assessment of the proposed extract fans serving the units has shown that the noise limits are not expected to be breached.

Music noise limits are given for the proposed loudspeaker systems in order to avoid potential noise nuisance at noise sensitive properties around the site.

This report also responds to the noise-related planning conditions of the extant approval.

2.0 INTRODUCTION

Planning permission was granted in September 2018 at the Hatch Phase 2 site for the erection of one and two storey buildings with flexible commercial uses (Use Classes A1 (shop), A3 (restaurant/cafe), A4 (drinking establishment) or A5 (hot food takeaway)) at ground and first floor together with related access, landscaping and other associated works including external seating areas and courtyard space for a temporary period (application reference 120050/FO/2018).

Subsequent to the planning approval, revisions to the proposed layout of the temporary buildings on the site have been made. The layout revisions are sufficient to require a new planning application.

Fisher Acoustics Ltd has been commissioned by Bruntwood LG Limited to carry out an environmental noise assessment of the revised proposals.

This report identifies the results of environmental noise surveys at receptors close to and around the site and the determination of acceptable building services noise levels at the development site to maintain residential amenity. An assessment of the proposed extract fans serving the units has also been carried out. Music noise limits are given for the proposed loudspeaker systems.

The steps undertaken in compiling this study are as follows:

- Reference to previous daytime and night time environmental noise survey at a residential properties close to the proposed development site in order to determine the existing levels of noise at sensitive receptors around the site
- Determination of maximum allowable external music noise level to allow amenity to be maintained
- Calculation of noise propagation from stage loudspeakers and distributed loudspeakers around the development.
- Determination of environmental noise limits for building services plant to safeguard residential amenity
- Assessment of expected environmental noise levels due to operation of the proposed extract fans at the units.
- Assessment of patron noise propagation to residential properties around the site

3.0 DESCRIPTION OF SITE

The site is located on the southern edge of Manchester City Centre at the intersection of Mancunian Way and Oxford Road and proposes to utilise the undercroft space created by the Mancunian Way flyover.

The site is bounded to the west by Oxford Road and to the east the site is bordered by the existing surface level car park which runs under the Mancunian Way. Timber hoarding separates the site from the delivery yard of the Tesco Express, the operator of one of the ground floor retail units in Oxford House on Oxford Road.

Oxford Road and the Mancunian Way (A57) are busy major roads that are trafficked by passenger vehicles, goods vehicles, motorbikes and buses.

The existing buildings around the proposed development are principally commercial in nature, including office buildings and shops. The closest residential buildings to the site are within the emerging Circle Square masterplan at a distance of approximately 95 metres from the proposed development.

Figure 1 shows the development site in the context of the surrounding roads and buildings.

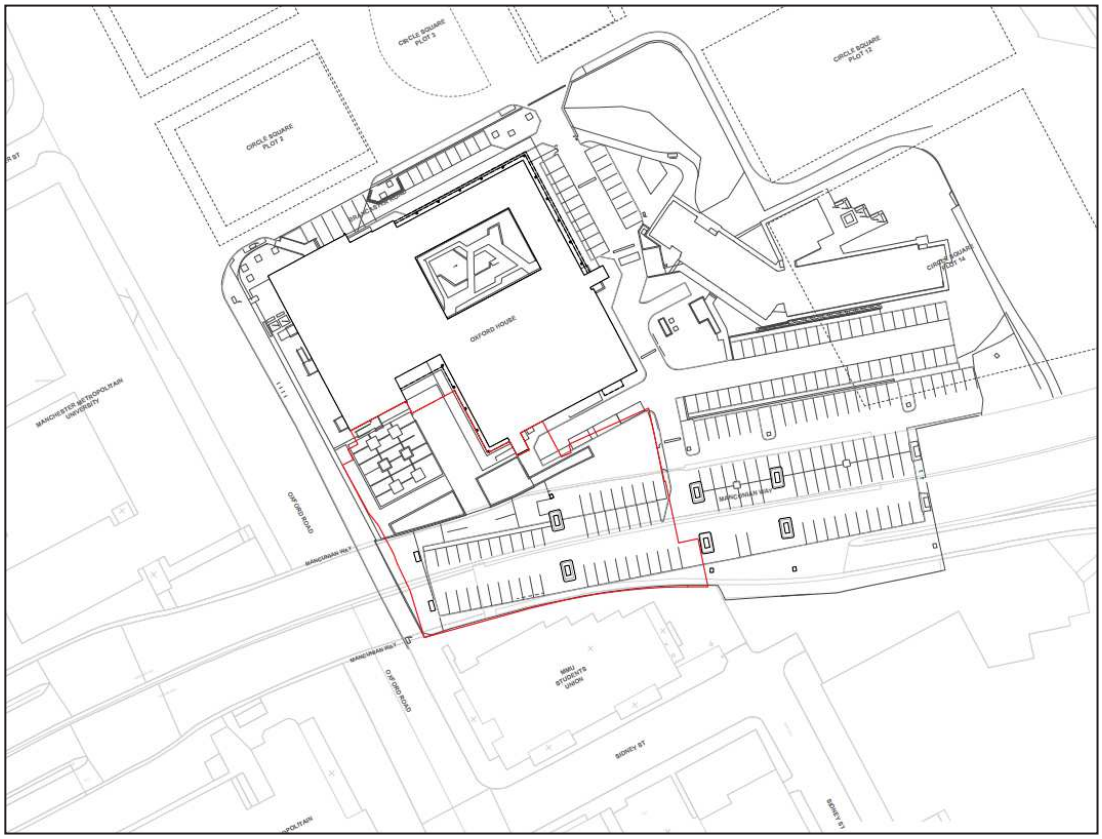


Figure 1: Development site plan (edged red) in context of surroundings roads and buildings

4.0 DESCRIPTION OF PROPOSED DEVELOPMENT

The proposed development involves the creation of a mix of retail and food/drink outlets. The scheme will offer a range of pop-up and semi-permanent retail, workspace and food/drink outlets within former shipping containers and will occupy the vacant courtyard area adjacent to Manchester Technology Centre at Oxford House and underneath the Mancunian Way flyover.

The proposed development forms Phase 2 of the overall proposals for the site. Planning permission for Phase 1 has been granted previously.

The unit layout compliments the Phase 1 scheme by drawing visitors through from the existing courtyard space. A central pedestrian route tracing the line of the Mancunian Way above draws people through the retail offer and into the food and beverage/events area to the rear of the scheme.

The layout also allows for the area to be secured during non-operational hours. The units will front both Oxford Road and the courtyard area. Public access to the development will be from Oxford Road, with access to the courtyard being between two containers on the Oxford Road frontage, and access to the main retail and food and beverage area underneath a signage unit on Oxford Road. There will be no public access to the units from the rear, other than for emergency access.

Servicing access will take place from the rear via Brook Street, utilising the existing servicing access for the Manchester Technology Centre.

It is understood that the proposed operational hours of the development extend to midnight.

Figures 2 and 3 show the proposed ground floor and first floor of the development.



Figure 2: Proposed ground floor layout



Figure 3: Proposed first floor layout

There is the potential for noise generation from the following aspects of the development:

1. Public seating areas
2. PA loudspeakers on the ground floor stage and distributed loudspeaker system around the development
3. Extract fans serving the kitchens of the units

The above noise generating aspects must be assessed to ensure that residential amenity is maintained at locations around the site.

PROPOSED PUBLIC ADDRESS AND MUSIC PLAYBACK LOUDSPEAKERS

The proposed external Public Address and music playback loudspeaker items are as follows:

- 10 no. Column Loudspeakers
- 4 no. Sub-woofers
- 2 no Stage PA Loudspeakers
- 2 no. Stage PA Sub-woofers

Figure 4 identifies the locations of the proposed Stage PA and music playback loudspeaker positions within the Hatch Phase 2 development.



Figure 4: Proposed Stage PA and music playback loudspeaker positions

Key

- Column Loudspeaker
- Sub-woofer
- Stage PA Loudspeaker
- Stage PA Sub-woofer

PROPOSED BUILDING SERVICES PLANT

The proposed external building services plant items to be installed are as follows:

- 11 no. Sabre Plate Mounted Sickle Fans (VSP) (extract fans for street food units)

Table 1 identifies the reported sound power levels of the extract fans. The full specification data for the fans are included in Appendix A.

Building services plant item	Sound Power Level (dB re 1 x 10-12 W)							
	dB(A)	Octave Band Centre Frequency (Hz)						
		63	125	250	500	1k	2k	4k
Sabre Plate Mounted Sickle Fan (VSP) - VSP35514P	66	67	70	67	64	58	60	53

Table 1: Sound power levels of proposed extract fans, Hatch Phase 2

Figure 5 identifies the location of the extract fans within the Hatch Phase 2 development.

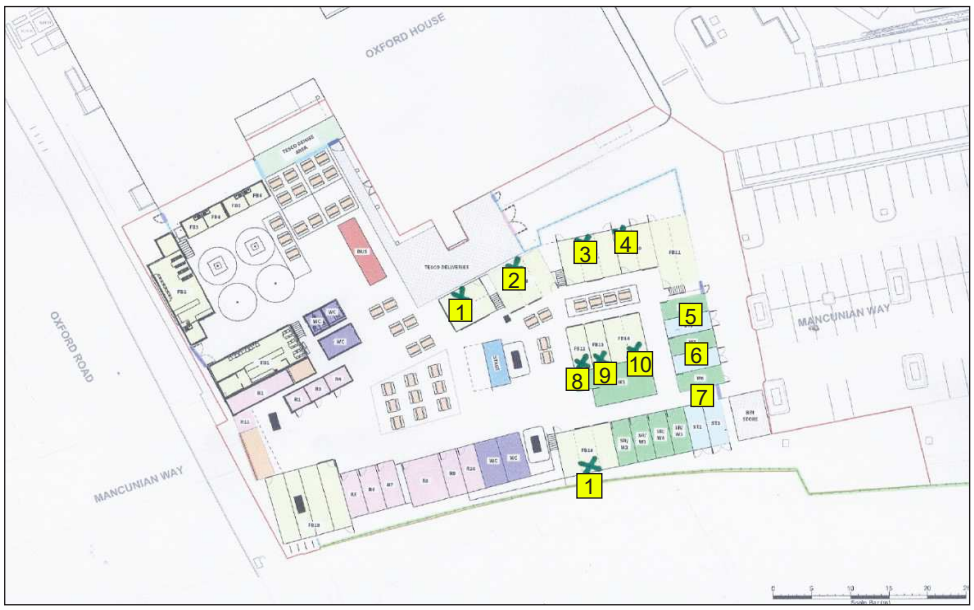


Figure 5: Hatch Phase 2 development - location of kitchen extract fans

The fans are to be positioned on the rear façade of each unit, with the exception of items 5, 6 and 7, which are to be roof-mounted.

5.0 RELEVANT GUIDANCE DOCUMENTS

The National Planning Policy Framework (NPPF), published in March 2012 by the Department for Communities and Local Government supersedes previous Planning guidance documents, such as PPG 24 'Planning and Noise'. The NPPF 'sets out the Government's planning policies for England and how these are expected to be applied'.

Clause 109 of the National Planning Policy Framework states that 'The planning system should contribute to and enhance the natural and local environment by…preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by …unacceptable levels of …noise pollution.

Clause 123 of the National Planning Policy Framework states that 'Planning policies and decisions should aim to:

- avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;
- mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;
- recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established and
- identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason'.

The National Planning Policy Framework document cross references the 'Explanatory Note to the Noise Policy Statement for England'. The 'Noise Policy Statement for England' (NPSE) was published by the Department for Environment Roof and Rural Affairs in March 2010.

The NPSE does not give suggested external noise criteria for commercial developments. In the absence of specific criteria, reference shall be made in this document to established guidance and principles, as established in British Standards and the local Planning policy.

6.0 PUBLISHED GUIDANCE ON ENVIRONMENTAL NOISE

Building Services Noise

BS4142: 2014

For noise of an industrial nature such as fixed building services plant, an assessment of the likely effects on people inside or outside residential buildings due to noise can be carried out using BS4142: 2014 'Methods for rating and assessing industrial and commercial sound'.

The following acoustic parameters are described within BS4142: 2014:

- Specific Noise Level – the equivalent continuous A-weighted sound pressure level measured over a specified time period, Tr, at the assessment position with the specific noise source contribution, $L_{Aeq, Tr}$ (i.e. the noise level due to the new noise source).
- Rating Level – the Specific Noise Level plus an adjustment for any characteristic noise features, $L_{Ar, Tr}$
- Residual Noise Level – the equivalent continuous A-weighted sound pressure level measured when the specific noise does not contribute to the ambient noise
- Background Noise level – measured for a specific duration, T, in the absence of the specific noise source, $L_{A90,T}$

To complete a BS4142 assessment of potential noise effects upon residential properties, it is necessary to obtain the Rating Level due to the sound source in question. The Rating Level is derived by adding corrections to the measured Specific Noise Level, if the noise source:

- is tonal (correction of 0dB to +6dB, depending on severity)
- contains distinct impulses (correction of 0dB to +9dB, depending on severity)
- is intermittent (correction of +3dB if applicable)
- is otherwise distinctive against the residual acoustic environment (correction of +3dB)

For instance, where the noise from a particular sound source is strongly tonal and impulsive at any noise sensitive receptor over the duration of the appropriate assessment period, a maximum correction of +15 dB may apply.

The Rating Level can then be used in order to ascertain the *likelihood of complaints* due to industrial noise disturbance by subtracting the measured background noise level. The greater the positive difference, the greater the likelihood of complaints.

Table 2 summarises the assessment method.

Difference between Rating Level and Measured Background Level	Assessment
+10 dB or greater	Significant adverse impact
+5 dB	Indication of adverse impact, depending on context
0 dB or less	Indication of low impact, depending on context

Table 2: BS4142: 2014 Assessment Method

Where a new noise source has not yet been introduced, a recommended specific noise level can be determined based on a knowledge of the existing background noise level.

BS 4142: 2014 recognises that where background and rating levels are low, the potential absolute noise levels at the sensitive receptor might be more relevant in assessing potential impact than a simple comparison of the rating level and background noise level.

In such instances, reference can be made to BS 8233: 2014 in order to determine appropriate external noise levels due to buildings services plant, such that acceptable noise levels are achieved inside buildings.

Planning & Noise, Technical Guidance - Manchester City Council

'Planning & Noise, Technical Guidance' issued by Manchester City Council in December 2015 gives guidance on the preferred approach to environmental noise assessments. With regard to external noise due to building services plant, Section 3.6.1.5.1 of the document states:

- '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'.

Noise from commercial operations

Music noise

Music noise egress from the proposed development must be controlled to appropriate levels.

'Planning & Noise, Technical Guidance' issued by Manchester City Council gives guidance on the preferred approach to environmental noise assessments. With regard to entertainment venues, Section 3.6.1.2 of the document states:

- 'When considering the potential impact of a proposal for an entertainment venue consultants should consider the overall noise level (LAeq) and the 63 Hz and 125 Hz octave band noise levels (Leq). Music noise in the 63 Hz and 125 Hz octave bands, which is often described as "bass noise", is particularly difficult to contain and the impulsive character of this low frequency music noise is particularly disturbing for local residents exposed to it.

- A planning application for a new entertainment venue that is structurally detached from other building uses should demonstrate that music noise from the proposal will not be 'audible' in nearby residential properties, assuming that the residential properties in question have their windows open. The criterion here is:

  'Entertainment noise (LAeq) should be controlled to 10dB below the background noise level (LA90) without the entertainment noise present, in each octave band at the nearest noise sensitive location'.

It will be noted that the above guidance published refers to the achievement of inaudibility of music noise in residential properties. However, in order to target inaudibility of music noise, Condition 13 of the extant planning approval states that 'LAeq (entertainment noise) shall be controlled to 10dB below the LA90 (without entertainment noise) in each octave band at the facade of the nearest noise sensitive location.'

With reference to BS8233: 2014 'Guidance on sound insulation and noise reduction for buildings', it could be argued that an office building is a noise-sensitive location, although it is not known if this is the intention of Manchester City Council. For instance, BS4142: 2014 'Methods for rating and assessing industrial and commercial sound' is the primary reference document in relation to the assessment of noise of an industrial or commercial nature, and

only provides an assessment method for the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes. In addition, BREEAM guidance does not list office buildings as noise sensitive.

It is therefore suggested that an inaudibility criterion is unnecessarily onerous for an office building, as opposed to a residential building. The noise limits proposed in this report are considered to be appropriate considering the use of the surrounding buildings.

Patron Noise

No formal published guidance is available that gives recommended assessment criteria for noise due to restaurant patrons in an external area. However, reference can be made to the 'Draft Code of Practice on the Control of Noise from Pubs and Clubs' published by the Institute of Acoustics in 1999. This suggested that for entertainment noise during the night (2300 to 1000) and for entertainment noise during the day that occurs more than twice a week, the $L_{Aeq,5\ min}$ noise level external to a dwelling, including the noise contribution from the venue, should be no greater than the typical pre-existing $L_{Aeq,5\ min}$ noise level (i.e. without the contribution from the venue).

To achieve the above criterion would require that the noise level at the nearest dwelling due to patron noise from the roof extension is 10dB(A) below the pre-existing ambient noise level.

Whilst no criteria were given in the final version of the Code of Practice on the Control of Noise from Pubs and Clubs, this criterion has been applied successfully by some Local Authorities.

It should be noted that the proposed development is approximately 95 metres away from the nearest residential buildings and is physically screened from these building by intervening structures.

7.0 ENVIRONMENTAL NOISE SURVEYS

As part of the Planning application and acoustic design process for the nearby Circle Square development, noise surveys have been conducted at locations representative of noise sensitive properties around the site.

Appendices B and C detail the results of the noise surveys.

The measured noise levels can be used to establish appropriate environmental noise criteria for the sensitive properties around the site.

The long-term noise environment at noise sensitive properties around the site is determined by road traffic on Oxford Road and the Mancunian Way. Building services noise at various buildings in the area contribute to background noise levels.

8.0 NOISE PROPAGATION FROM PROPOSED DEVELOPMENT

In order to avoid potential noise nuisance to existing noise sensitive receptors, activity noise egress from the proposed development must be controlled.

Music noise

As detailed in Section 6 above and as required by Condition 13 of the previous planning permission, it is recommended that music noise levels (measured as an L_{eq} noise level) external to a residential property due to an entertainment venue should be 10dB lower than the prevailing background noise level in each octave band with a lower bound governed by the threshold of human hearing.

With reference to the measured background noise levels, Table 3 identifies the maximum allowable cumulative daytime and night time free-field external noise levels at the closest residential façades due to music noise from the proposed roof extension.

Receptor/period	Sound Pressure Level (dB Leq) @ Octave Band Centre Frequency (Hz)						
	63	125	250	500	1k	2k	4k
Princess House (0700 to 2300)	50	45	44	43	44	37	25
Princess House (2300 to 0700)	50	45	42	41	42	34	24
Oxford House (0700 to 0000)	58	53	48	48	47	41	32
Oxford House (0000 to 0700)	55	51	46	45	45	41	32
Circle Square, Plot 11 (0700 to 2300)	53	48	45	41	41	34	23
Circle Square, Plot 11 (2300 to 0100)	51	46	42	41	41	33	24
Circle Square, Plots 7 & 8 (Planning permission reference 110026/FO/2016/C1 and 110027/FO/2016/C1) (0700 to 2300)	53	48	45	41	41	34	23
Circle Square, Plots 7 & 8 (Planning permission reference 110026/FO/2016/C1 and 110027/FO/2016/C1) (2300 to 0100)	51	46	42	41	41	33	24

Receptor/period	Sound Pressure Level (dB Leq) @ Octave Band Centre Frequency (Hz)						
	63	125	250	500	1k	2k	4k
Premier Inn Hotel, Circle Square, Plot 14 (0700 to 2300)	53	48	50	51	56	49	35
Premier Inn Hotel, Circle Square, Plot 14 (2300 to 0700)	51	48	50	51	55	46	33

Table 3: Maximum allowable external music noise levels due to the proposed development

Based on the reported source positions for the PA system & column loudspeakers and the maximum allowable external music noise levels due to the proposed development given in Table 3, the maximum allowable sound power levels of the PA system and column loudspeakers/ subwoofers have been calculated.

Table 4 identifies the calculated maximum allowable sound power level of the PA system and music playback loudspeakers within the proposed Hatch Phase 2 development such that the noise limits in Table 3 are not exceeded.

System	Sound Power Level (dB re 1 x 10^{-12} W)							
	dB(A)	Octave Band Centre Frequency (Hz)						
		63	125	250	500	1k	2k	4k
Stage PA loudspeaker	86	86	86	83	84	82	77	69
Stage PA Subwoofer	86	93	88	83	84	82	77	69
Column Loudspeaker and Subwoofers	75	83	75	72	72	72	67	56

Table 4: Calculated maximum allowable sound power levels of individual loudspeakers

The allowable sound power levels of the Stage loudspeaker systems would permit reasonably loud amplified music to be accommodated. However, amplified music noise levels that would be typical of live music venues that host touring bands could not be accommodated.

The allowable sound power levels for the column loudspeakers and subwoofers would permit background music replay.

Given compliance with the above noise limits, it is expected that the proposed stage area will be able to operate without causing disturbance to existing and proposed noise sensitive receptors around the site.

Compliance with Manchester City Council's published guidance on environmental noise limits at the sensitive receptors is expected in relation to operation of the proposed development.

Patron Noise

As discussed in Section 6 above, in order to avoid potential noise nuisance due to patron noise, it is recommended that the noise level at the nearest dwelling due to patron noise from the development is 10dB(A) below the pre-existing ambient noise level. Compliance with this criterion would ensure that the pre-existing ambient noise level at noise sensitive receptors was not increased.

The measured daytime and night time external noise levels at a position representative of the nearest residential receptors to the proposed development (Circle Square, Plot 7&8) is 62dB LAeq and 60 dB LAeq respectively.

It is therefore recommended that at the facades of the residential buildings that are closest to the proposed development, noise levels due to patrons do not exceed 52dB LAeq during the day and 50dB LAeq to approximately midnight.

Table 5 identifies the sound power level of the human voice at difference voice efforts (ref: ANSI 3.5:1997 'Methods for calculation of the speech intelligibility index'). As a guide, 'normal' voice effort would be that used in normal conversation. 'Raised' voice effort would be similar to that used by a teacher when addressing a full classroom.

Voice effort	**Sound Power Level (dB Leq) @ Octave Band Centre Frequency (Hz)**						
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**
Normal	45	55	65	69	63	56	50
Raised	48	59	70	75	72	64	57
Loud	52	63	73	84	89	82	75

Table 5: Sound power of human voice at different effort levels

It has been calculated that compliance with the night time noise level limit of 50dB LAeq could be achieved with, for instance, one hundred people talking in a loud voice in the vicinity of the stage area and on the 1st floor terraces.

In order to estimate the number of people that may be talking at any one time in a social situation, reference can be made to research which indicates that at any one time, just less than one-third of patrons of a restaurant would be expected to be talking simultaneously (ref J.H. Rindel 'Acoustical capacity as a means of noise control in eating establishments', *Proc of Joint Baltic-Nordic Acoustics Meeting*, 2012).

This implies that approximately 300 patrons could be accommodated within the proposed development, 100 of whom could be talking in a loud voice, without exceeding the maximum allowable patron noise levels at the nearest residential receptors.

Therefore, given the potential number of patrons on the 1st floor terraces and in the ground floor areas close to the stage and on the potential number of patrons that would be taking at any one time, it has been determined that compliance with the recommended night time noise limits could be achieved.

9.0 EXTERNAL NOISE LEVELS DUE TO BUILDING SERVICES AND CONSTRUCTION

BUILDING SERVICES

The measured background noise levels around the site can be used to establish the acceptable level of noise from any new plant serving the proposed extension.

With reference to the discussion in Section 6, it is recommended that the Rating Noise level due to any proposed new plant is at least 5dB lower than the pre-existing background noise levels at the nearest residential receptors to the site.

Table 6 identifies the allowable cumulative noise level at the nearest residential and other receptors to the proposed development due to new building services plant.

Location	Rating level (dB LAeq)	
	Daytime (07:00 hrs to 23:00 hrs)	Night time (07:00 hrs to 23:00 hrs)
Oxford House	55	55
Plot 7 & 8, Circle Square	44	35
Premier Inn	64	55

Table 6: Environmental noise limits for new building services plant

Based on the reported source sound level data for the kitchen extract fans, the expected noise levels at the nearest existing noise sensitive properties have been calculated. Table 7 identifies the calculated noise levels.

Noise Sensitive Property	Rating level (dB LAeq)	
	Daytime (07:00 hrs to 23:00 hrs) (dB L_{Aeq})	Night time (07:00 hrs to 23:00 hrs)
Oxford House	46	46
Plot 7 & 8, Circle Square	29	29
Premier Inn	26	26

Table 7: Calculated building services noise levels at the nearest existing noise sensitive properties

With reference to Table 7, it can be seen that the calculated cumulative plant noise levels at the closest noise sensitive properties at and around the site comply with the recommended noise limits given in Table 6 above.

Therefore, compliance with Manchester City Council's published guidance on environmental noise limits at the sensitive receptors is expected in relation to operation of the proposed building services plant.

CONSTRUCTION NOISE

Condition 9 of the previous planning permission requires that a Construction Management Plan be submitted, which contains a Noise and Vibration section. This condition was discharged on 27 March 2019.

Due to the short duration of the works (20 weeks from breaking ground to completion) and the modular nature of the buildings (the proposed buildings on the site are all shipping containers) the potential for disturbance due to construction noise is considered to be minimal. For instance, the construction task with the longest duration is the internal fit-out of the containers, which is due to last six weeks.

It is therefore not considered that a formal noise and vibration assessment would be required.

APPENDIX A

DATA SHEETS FOR PROPOSED EXTRACT FANS TO STREET FOOD UNITS

Sabre Plate Mounted Sickle Fans (VSP)

- Swept impeller with Aerofoil blades, winglets and serrated trailing edge for optimum performance
- One shot die cast impeller, dynamically balanced for smoother operation
- Operating temperature up to 70°C
- External Rotor Motors on all models for compact efficient design
- All models speed controllable
- Guards fitted as standard on all models
- Thermal Overload Protection for motor protection
- Maintenance free sealed for life bearings
- 2 Year Guarantee



The latest generation of the Vent-Axia Sabre® Plate Mounted Sickle fans incorporate the very latest FE2 Owlett impeller offering improved performance over the previous ranges with up to 7dB(A) reduction in sound and up to 15% improvement in efficiency ensuring the best available fan performance in its class. The advanced blade design, matched to a purpose designed external rotor motor ensures unrivalled reliability and controllability.

Design and Development

Using a combination of NASA research into wing performance and winglets, coupled with a study of bird flight, has enabled the development of the best available Sickle blade profile. By matching this to a purpose designed close fitting mounting plate ensures best use of this blade technology thereby reducing noise and improving the performance in plate axial fans.

Construction

Vent-Axia Sabre® Plate Mounted Sickle fans are based on an integrated impeller and external rotor motor design, which produces a very compact unit. Together with a specially designed bell mouth inlet and mounting plate, the complete fan is lightweight and ensures an excellent performance to sound level ratio.

The mounting plate is formed from a single sheet, protected with a tough epoxy paint finish. Inlet finger guards and motor supports are manufactured from steel rod and electro welded for extra strength. Finger guards give protection to BS 848 Part 5. Manufacture is controlled to BS EN ISO 9001 Standards.

Impellers

The impellers incorporate the latest in sickle blade aerofoil technology to ensure minimum sound and maximum performance. Impellers up to 400mm diameter are moulded from a composite polymer, impellers above this size are Aluminium. The motors and impellers are factory matched, statically and dynamically balanced to ISO 1940 part 1, Quality Class G.6.3.

Motors

The external rotor motors are specifically designed and styled for this range of fan. Ball bearings are greased for life. Sizes 315 - 710 motors are protected to IP54 against dust and moisture, complying with BS EN 60529.

They have ribbed aluminium body castings for efficient cooling with Motor insulation to Class 'F' (from -40°C to + 70°C). Speed controlled sizes 450 to 710, 6 & 8 pole motors are only suitable for operating temperatures of up to 40°C.

Electrical

The Sabre® Plate Mounted Sickle fan range is available for either single phase 220-240V 50 Hz capacitor start and run or three phase 380-415V 50Hz. Motors are fitted with Thermal Overload Protection which should be wired into all controller circuits and into starter contactors to prevent motor damage due to overloading / overheating.

Speed Control

Units are suitable for speed control by either electronic, voltage reduction or frequency inverters where permissible. For optimum efficiency and controllability Vent-Axia recommend the use of the eDemand Inverter controller to give close control via sensors or manual control.

Form of Running

Plate mounted fans (ex-stock) are supplied for extract use (Form 'A' running).

Performance

The fan performance is in accordance with tests to ISO 5801.

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Sound Levels

Fan sound levels are measured in a reverberant chamber in accordance with ISO 3744 Part 1. Published dB(A) figures are free field sound pressure levels at 3m with spherical propagation at a reference level of 2×10^{-5}Pa (20 micro-Pascal). The sound power level spectra figures are dB with a reference level of 10^{-12} Watts (1 pico-watt).

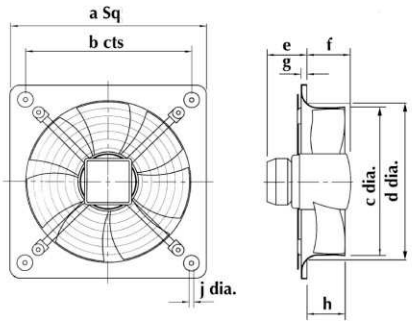
To ensure minimum noise levels during speed control, either an auto transformer or eDemand inverter speed control is recommended.

Accessories

A full range of accessories is available with the Sabre® Plate Mounted Sickle fans:

- Electronic speed controllers
- Auto transformer speed controllers
- eDemand inverter speed control
- D.O.L. starters
- Louvre shutter
- Discharge guard

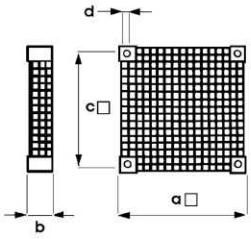
Fan Dimensions (mm)



Stock Ref	kg	A	B	C	D	E	F	G	H	J
VSP25012/14	3.3	370	320	260	264.5	78	73.4	6	50	7
VSP31514/34	6.7	430	380	349	349	78	83.9	11	63	9
VSP35514/34	7.5	485	435	390	390	78	82.9	12	68	9
VSP40014/34	7.8	549	490	412	419.8	90	91.5	12	88	9
VSP45014/34/16/36	16.2	575	535	463	480	110	143.5	14	96	11
VSP50014/34/16/36	20.1	655	615	517	528	84.5	141.5	16	104	11
VSP56014	31.8	725	675	568	589	98.3	167.5	16	119	11
VSP56034/16/36	24.2	725	675	568	589	82.5	162.5	16	119	11
VSP63034/36	41.6	805	750	643	664	111	159.5	20	130	11
VSP63016	33.7	805	750	643	664	70.5	174.5	20	130	11
VSP71016/36/38	38.6	850	810	720	763	44	201.5	20	150	14.5

Accessories Dimensions (mm)

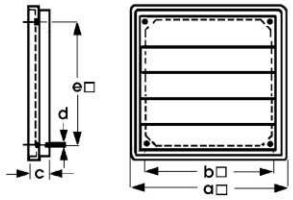
Discharge Guard 'K' factor loss 0.25



Stock Ref	a	b	c	Ød
10502325	397	64	351	8
10502375	449	64	403	8
10502450	501	64	455	8
10502525	553	64	507	8
10502630	808	150	735	8
10502800	1010	140	-	8

If a discharge guard is required with a louvre shutter the next size up discharge guard should be selected.

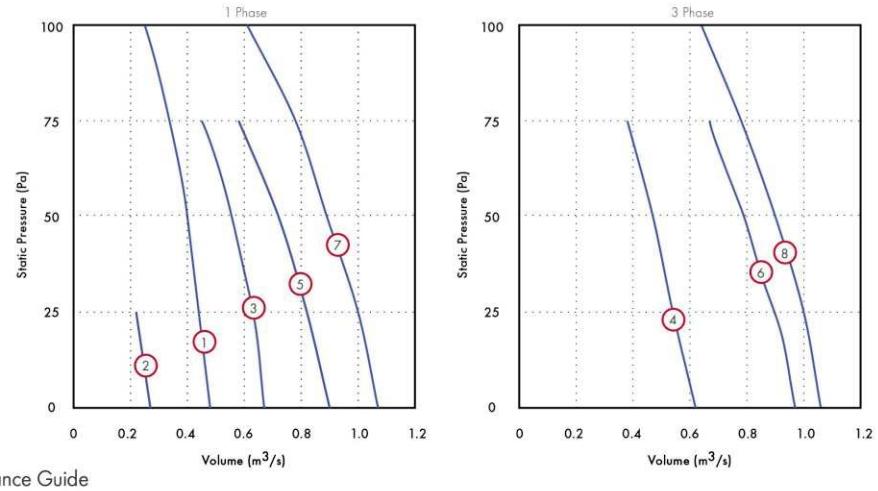
Louvre Shutter



Stock Ref	a	b	c	Ød	e□
LS250	294	265	25	6	230
LS315	344	276	26	6	295
LS355	398	312	26	6	329
LS400	458	365	26	6	382
LS450	499	395	31	6	432
LS500	544	444	31	6	477
LS560	605	533	31	6	533
LS630	694	627	31	6	626
LS710	790	722	43	6	722

Performance Curves

250 to 400 dia. - Pole 2 & 4



Performance Guide

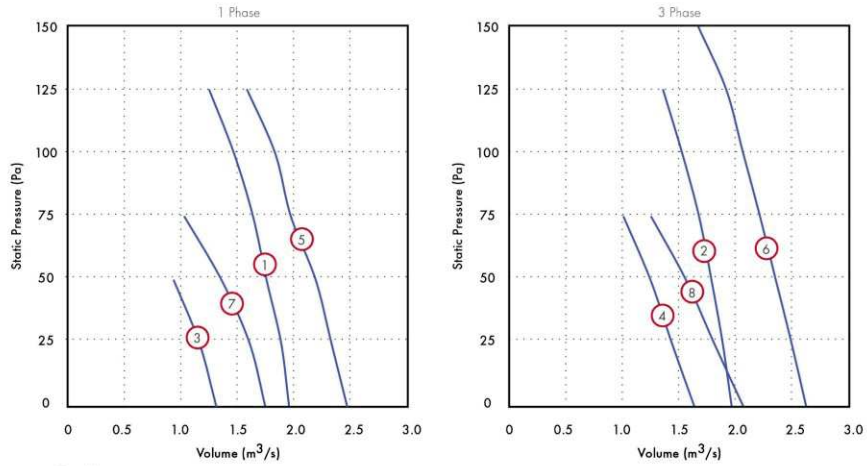
Stock Ref	Supply	IP Rating	Motor kW	F.L.C Amps	S.C. Amps	Poles	rpm	Curve		Volume m³/s @ Pa 0	25	50	75	100	dB(A) @ 3m
VSP25012	230/1/50	IP54	0.12	0.54	2.16	2	2160	1	Volume m³/s	0.48	0.44	0.40	0.36	0.25	50
									Power Watts	110	115	118	121	125	
VSP25014	230/1/50	IP54	0.05	0.24	0.96	4	1370	2	Volume m³/s	0.27	0.22				37
									Power Watts	46	48				
VSP31514	230/1/50	IP54	0.12	0.54	2.16	4	1360	3	Volume m³/s	0.67	0.63	0.51	0.45		45
									Power Watts	111	118	124	130		
VSP31534	400/3/50	IP54	0.12	0.39	1.7	4	1450	4	Volume m³/s	0.62	0.54	0.47	0.38		47
									Power Watts	105	115	117	120		
VSP35514	230/1/50	IP54	0.13	0.56	2.24	4	1260	5	Volume m³/s	0.90	0.82	0.72	0.58		46
									Power Watts	132	141	151	162		
VSP35534	400/3/50	IP54	0.19	0.4	1.6	4	1390	6	Volume m³/s	0.97	0.90	0.65	0.67		48
									Power Watts	152	168	176	178		
VSP40014	230/1/50	IP54	0.24	1.05	4.2	4	1340	7	Volume m³/s	1.07	1.00	0.89	0.78	0.61	46
									Power Watts	166	195	200	210	240	
VSP40034	400/3/50	IP54	0.23	0.46	1.6	4	1360	8	Volume m³/s	1.06	1.00	0.90	0.78	0.64	47
									Power Watts	160	170	190	205	220	

Sound Power Level Spectra dB (ref 10^{-12} Watts)

Stock Ref	63Hz	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz	8KHz	dB(A) @ 3m
VSP25012	65	70	68	66	64	66	62	55	50
VSP25014	56	63	56	54	53	53	49	41	37
VSP31514	71	70	65	60	58	59	55	47	45
VSP31534	75	71	62	60	61	62	59	51	47
VSP35514	67	70	67	64	58	60	53	45	46
VSP35534	74	66	61	63	64	63	59	53	48
VSP40014	72	73	66	62	60	59	54	48	46
VSP40034	67	67	61	60	60	59	54	48	47

Performance Curves

450 to 500 dia. - Pole 4 & 6



Performance Guide

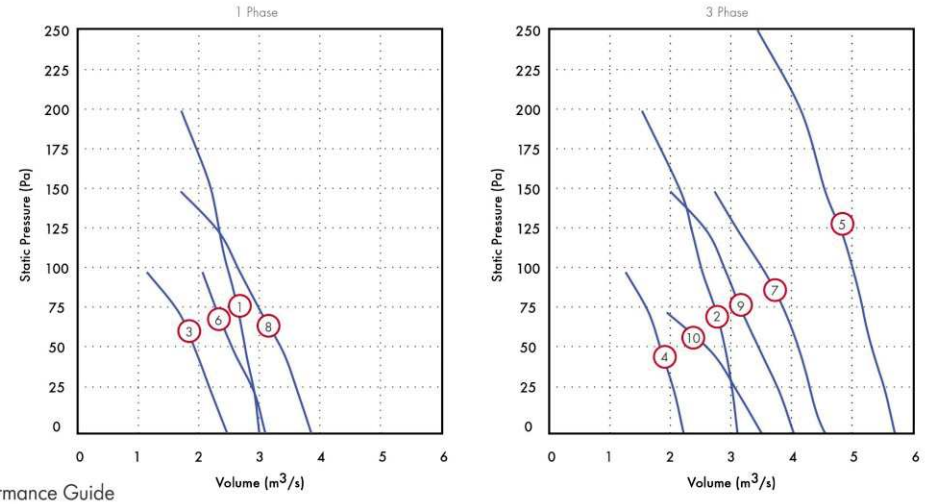
Stock Ref	Supply	IP Rating	Motor kW	F.L.C Amps	S.C. Amps	Poles	rpm	Curve		Volume m³/s @ Pa 0	25	50	75	100	125	150	dB(A) @ 3m
VSP45014	230/1/50	IP54	0.6	2.9	10	4	1320	1	Volume m³/s	1.96	1.89	1.76	1.64	1.47	1.25		49
									Power Watts	480	500	520	530	540	550		
VSP45034	400/3/50	IP54	0.54	1.1	4.4	4	1350	2	Volume m³/s	1.97	1.89	1.79	1.68	1.53	1.36		49
									Power Watts	440	460	480	505	520	530		
VSP45016	230/1/50	IP54	0.19	0.9	3.6	6	910	3	Volume m³/s	1.32	1.17	0.94					41
									Power Watts	165	175	180					
VSP45036	400/3/50	IP54	0.36	0.66	2.64	6	1020	4	Volume m³/s	1.64	1.44	1.25	1.01				44
									Power Watts	325	350	360	380				
VSP50014	230/1/50	IP54	0.7	3.2	12.8	4	1230	5	Volume m³/s	2.47	2.33	2.19	1.97	1.83	1.58		51
									Power Watts	630	660	670	690	720	740		
VSP50034	400/3/50	IP54	0.84	1.45	5.8	4	1340	6	Volume m³/s	2.63	2.50	2.36	2.22	2.07	1.92	1.67	52
									Power Watts	620	650	680	720	740	750	800	
VSP50016	230/1/50	IP54	0.27	1.25	5.0	6	910	7	Volume m³/s	1.75	1.61	1.36	1.03				44
									Power Watts	250	265	280	295				
VSP50036	400/3/50	IP54	0.54	0.96	3.84	6	940	8	Volume m³/s	2.07	1.81	1.56	1.25				47
									Power Watts	470	500	520	540				

Sound Power Level Spectra dB (ref 10^{-12} Watts)

Stock Ref	63Hz	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz	8KHz	dB(A) @ 3m
VSP45014	67	69	71	63	63	63	59	53	49
VSP45034	72	70	65	65	64	64	59	53	49
VSP45016	57	62	59	56	56	56	50	41	41
VSP45036	71	66	60	60	60	58	51	43	44
VSP50014	71	75	67	63	67	68	60	52	51
VSP50034	74	72	66	66	68	68	62	56	52
VSP50016	66	72	70	55	59	58	51	43	44
VSP50036	77	77	72	66	64	61	54	47	47

Performance Curves

560 to 710 dia. - Pole 4 & 6 & 8



Performance Guide

Stock Ref	Supply	IP Rating	Motor kW	F.L.C Amps	S.C. Amps	Poles	rpm	Curve		Volume m³/s @ Pa 0	25	50	75	100	125	150	200	250	dB(A) @ 3m
VSP56014	230/1/50	IP54	1.15	5	20	4	1330	1	Volume m³/s	3.00	2.92	2.78	2.69	2.51	2.31	2.22	1.71		62
									Power Watts	810	830	870	890	900	980	1000	1100		
VSP56034	400/3/50	IP54	1.05	2.2	8.8	4	1280	2	Volume m³/s	3.11	3.03	2.92	2.76	2.53	2.36	2.17	1.53		57
									Power Watts	742	800	840	860	910	920	940	1044		
VSP56016	230/1/50	IP54	0.39	1.8	7.2	6	930	3	Volume m³/s	2.22	2.07	1.86	1.64	1.26					50
									Power Watts	369	394	415	438	458					
VSP56036	400/3/50	IP54	0.58	1.1	4.4	6	910	4	Volume m³/s	2.47	2.21	1.96	1.67	1.14					51
									Power Watts	489	518	542	556	576					
VSP63034	400/3/50	IP54	2.4	4.6	18.4	4	1320	5	Volume m³/s	5.71	5.56	5.35	5.19	5.03	4.83	4.56	4.16	3.44	62
									Power Watts	2305	2350	2400	2450	2500	2540	2587	2628	2639	
VSP63016	230/1/50	IP54	0.6	2.8	11.2	6	910	6	Volume m³/s	3.10	2.92	2.59	2.31	2.06					52
									Power Watts	568	603	650	679	710					
VSP63036	400/3/50	IP54	1.5	2.6	10.4	6	1040	7	Volume m³/s	4.56	4.32	4.07	3.81	3.56	3.13	2.73			57
									Power Watts	1538	1550	1593	1610	1645	1661	1666			
VSP71016	230/1/50	IP54	0.95	4.4	17.6	6	850	8	Volume m³/s	3.86	3.64	3.40	3.03	2.68	2.33	1.70			52
									Power Watts	607	666	700	760	808	850	950			
VSP71036	400/3/50	IP54	0.94	1.7	6.8	6	900	9	Volume m³/s	4.04	3.81	3.50	3.19	2.92	2.61	2.00			49
									Power Watts	560	620	700	768	813	861	920			
VSP71038	400/3/50	IP54	0.62	1.05	4.2	8	690	10	Volume m³/s	3.51	3.12	2.69	1.94						45
									Power Watts	451	510	540	616						

Sound Power Level Spectra dB (ref 10^{-12} Watts)

Stock Ref	63Hz	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz	8KHz	dB(A) @ 3m
VSP56014	79	78	74	74	77	77	73	66	62
VSP56034	84	78	76	74	75	74	70	63	57
VSP56016	75	73	66	65	67	66	60	54	50
VSP56036	77	77	67	66	67	66	60	54	51
VSP63034	85	80	77	75	78	77	71	66	62
VSP63016	74	71	73	68	68	66	60	54	52
VSP63036	84	75	71	71	74	71	65	59	57
VSP71016	81	81	72	69	70	67	61	57	52
VSP71036	69	69	68	67	68	65	59	52	49
VSP71038	66	63	63	65	62	59	50	44	45

Accessories






Stock Ref	Supply	Electronic Controller*	5 Step Auto Transformer	eDemand Voltage*	eDemand 3ph Inverter	eDemand 1ph in 3ph out Inverter	eDemand 1Ph Inverter	D.O.L Starter	Overload
VSP25012	230/1/50	W10303102M	10314102	444164	-	-	444169	444744	444698
VSP25014	230/1/50	W10303102M	10314102	444164	-	-	444169	444744	444697
VSP31514	230/1/50	W10303102M	10314102	444164	-	-	444169	444744	444699
VSP31534	400/3/50	-	10314301	444166	444172	444177	-	444747	444699
VSP35514	230/1/50	W10303102M	10314102	444164	-	-	444169	444744	444699
VSP35534	400/3/50	-	10314301	444166	444172	444177	-	444747	444698
VSP40014	230/1/50	W10303102M	10314102	444164	-	-	444169	444744	444700
VSP40034	400/3/50	-	10314301	444166	444172	444177	-	444747	444698
VSP45014	230/1/50	10303103	10314103	444164	-	-	444169	444744	444702
VSP45034*	400/3/50	-	10314302	444166	444172	444177	-	444747	444700
VSP45016	230/1/50	W10303102M	10314102	444164	-	-	444169	444744	444699
VSP45036*	400/3/50	-	10314301	444166	444172	444177	-	444747	444699
VSP50014	230/1/50	10303106	10314105	444164	-	-	444169	444744	444702
VSP50034*	400/3/50	-	10314302	444166	444172	444177	-	444747	444700
VSP50016	230/1/50	W10303102M	10314102	444164	-	-	444169	444744	444700
VSP50036*	400/3/50	-	10314302	444166	444172	444177	-	444747	444700
VSP56014	230/1/50	10303106	10314105	444164	-	-	444170	444744	444703
VSP56034*	400/3/50	-	10314304	444166	444172	444177	-	444747	444702
VSP56016	230/1/50	10314103	10314103	444164	-	-	444169	444744	444702
VSP56036*	400/3/50	-	10314302	444166	444172	444177	-	444747	444700
VSP63034*	400/3/50	-	10314307	444166	444173	444177	-	444747	444703
VSP63016	230/1/50	10303106	10314105	444164	-	-	444169	444744	444702
VSP63036*	400/3/50	-	10314304	444166	444173	444177	-	444747	444702
VSP71016	230/1/50	10303106	10314105	444164	-	-	444170	444744	444703
VSP71036*	400/3/50	-	10314302	444166	444172	444177	-	444747	444701
VSP71038*	400/3/50	-	10314302	444166	444172	444177	-	444747	444700

* Electronic Voltage controllers may cause motor noise and vibration at lower speeds, transformer or Inverter recommended for noise sensitive applications

* All models are supplied with 2 speed delta/star connection motors as standard (Sizes 450 to 630 are 4/6 Pole, size 710 is 6/8 pole)

Guards: Some installations may occur where additional safety parts are needed, to ensure safety in operation. For example, the unit may be fitted at the inlet or outlet end of a ducted ventilation system, thereby exposing the impeller/motor to unguarded access. In this event, the installer must fit a safety guard complying to current regulations. These guards are available as an optional extra

Where inverters are utilised these must be include Sine filters, as included within our eDemand range of inverters

Louvre shutter	
Fan Dia.	Stock Ref
250	LS250
315	LS315
355	LS355
400	LS400
450	LS450
500	LS500
560	LS560
630	LS630
710	LS710

Discharge guard	
Fan Dia.	Stock Ref
250	10502325
315	10502325
355	10502375
400	10502450
450	10502525
500	10502525
560	10502630
630	10502630
710	10502800

NOTE: If a discharge guard is required with a louvre shutter the next size up discharge guard should be selected

APPENDIX B

NOISE SURVEY DETAILS AND SUMMARY RESULTS, CIRCLE SQUARE PLOTS 5 TO 11

LOCATION

Circle Square, Oxford Road/Charles Street, Manchester

DATES AND TIMES

Thursday 6 August 2015	15:05 to 18:50
Saturday 15 August 2015	21:35 to 03:00
Thursday 3 September 2015	00:30 to 02:30
Thursday 10 December 2015	18:05 to 20:15
Friday 11 December 2015	22:45 to 01:45

Weather during surveys

Thursday 6 August 2015	4/8 cloud cover, 4 m/s light breeze, no rain, 17 ^{o}C
Saturday 15 August 2015	3/8 cloud cover, 2 m/s light breeze, no rain, 13 ^{o}C
Thursday 3 September 2015	6/8 cloud cover, 2 m/s light breeze, no rain, 12 ^{o}C
Thursday 10 December 2015	7/8 cloud cover, 4 m/s light breeze, no rain, 8 ^{o}C
Friday 11 December 2015	2/8 cloud cover, 3 m/s light breeze, no rain, 6 ^{o}C

Personnel present during survey

Matt Fisher – Fisher Acoustics

Instrumentation

Norsonic Type 118 IEC 60651 Type 1 Integrating-Averaging Sound Level Meter (serial no. 31498)
Norsonic Type 118 IEC 60651 Type 1 Integrating-Averaging Sound Level Meter (serial no. 30560)
Norsonic Type 140 IEC 60651 Type 1 Integrating-Averaging Sound Level Meters (serial no. 1403193)
Norsonic Type 1251 IEC 60942-1997 Class 1 Sound Calibrators (x2) (serial nos. 31971, 27878)

Measurement methodology

Before and after the noise survey the sound level meters were check calibrated to an accuracy of ±0.3dB using the Norsonic Type 1251 Calibrators - no drift in sensitivity was detected. The measurement microphones were installed at the locations identified in this report. All survey measurements were in 'free field' conditions.

Figures A1 to 15.12 and Tables A15.1 to A15.16 identify the free-field noise levels measured around the site. Measurement locations are shown on Figure 15.2 and described below.

The measurement locations were as follows (microphone height 1.5 metres unless noted):

- Location 1: At location of closest façade of Building 10 of Phase 1A (Planning permission reference 110055/FO/2015/C1) to Charles Street, at a microphone height of 15 metres above street level
- Location 2: At location of closest façade of Building 11 of Phase 1A (Planning permission reference 110055/FO/2015/C1) to Brancaster Road
- Location 3: Representative of Princess House and to assess traffic noise from Princess Street, at a microphone height of 12 metres above street level
- Location 4: At location of closest façade of proposed western wing of Building 10 to Charles Street and Oxford Road, at a microphone height of 7 metres above street level
- Location 5: Representative of rear of Princess House
- Location 6: At location of south east corner of Building 10, at a microphone height of 7 metres above street level
- Location 7: Representative of rear of Montana House
- Location 8: At location of closest façade of Building 5/6 of proposed development to Oxford Road, at a microphone height of 6 metres above street level
- Location 9: At location of closest façade of Building 5/6 of proposed development to Charles Street, 10 metres from Oxford Road, at a microphone height of 6 metres above street level
- Location 10: At location of closest façade of Building 5/6 of proposed development to Charles Street, 55 metres from Oxford Road, at a microphone height of 6 metres above street level
- Location 11: At location of closest façade of Building 7/8 of proposed development to Factory 251 night club, 10 metres from Oxford Road, at a microphone height of 6 metres above street level
- Location 12: At location of the north east corner of Plot 9, adjacent to Charles Street
- Location 13: At location of North elevation of proposed Phase 1C (Plot 9) development, directly opposite R Base venue at ground floor of building at 42 Charles Street.

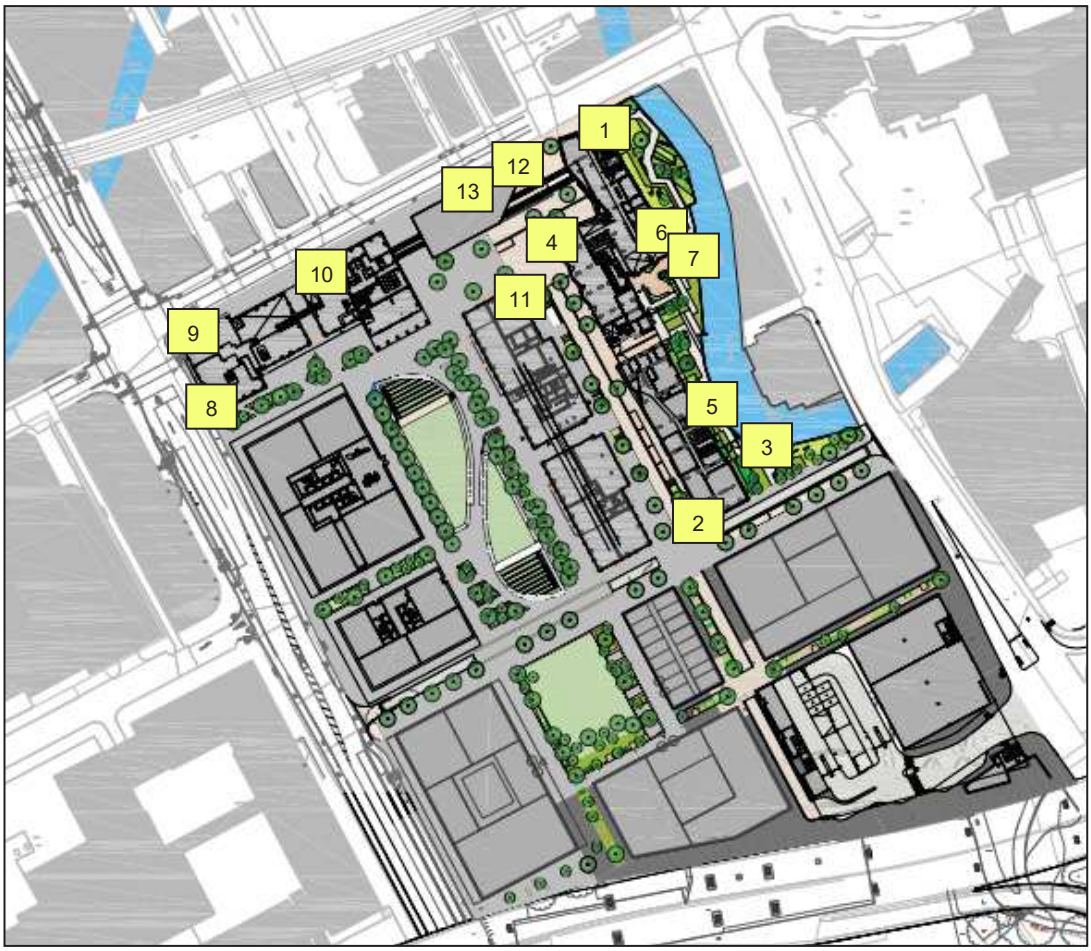


Figure 6: Noise survey measurement locations, Circle Square Plot 5 to 11

Measurement Position	Start Time	Measured Noise Levels, dB				Noise sources
		L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}	
2	15:20	58.8	74.0	60.2	56.2	Distant road traffic
2	15:25	57.7	66.7	59.5	55.5	"
2	15:30	58.7	70.6	60.1	56.5	"
2	15:35	59.1	66.7	61.4	56.0	"
2	15:40	58.5	65.8	60.8	55.8	"
2	15:45	59.3	68.5	61.9	56.7	"
2	15:50	60.6	67.6	62.3	57.5	"
2	15:55	58.8	67.1	61.2	55.6	"
2	16:00	58.5	66.9	61.0	55.3	"
2	16:05	64.6	78.0	69.4	55.5	Angle grinding on site
2	16:10	57.5	66.1	59.4	55.4	Distant road traffic
2	16:15	62.9	75.6	62.3	55.4	Angle grinding on site
2	16:20	66.9	78.7	72.4	55.9	"
2	16:25	65.8	87.9	64.4	56.3	"

Table A1: Summary Statistical Noise Levels – Daytime, 6 August 2015, Position 2

Measurement Position	Start Time	Noise Level, dB LAeq	Sound Pressure Level (dB) @ Octave Band Centre Frequency (Hz)						
			63	125	250	500	1k	2k	4k
2	15:20	58.8	66.3	60.1	56.3	54.6	55.8	50.1	40.7
2	15:25	57.7	67.1	59.4	56.0	53.5	54.9	48.4	39.3
2	15:30	58.7	67.7	61.9	57.7	54.5	55.5	49.6	41.4
2	15:35	59.1	68.8	63.1	58.2	54.3	55.2	50.6	47.4
2	15:40	58.5	67.1	62.8	58.8	54.1	55.1	49.0	40.6
2	15:45	59.3	67.3	61.2	57.6	53.9	55.4	51.2	48.7
2	15:50	60.6	66.7	60.9	56.6	53.9	55.3	52.6	53.9
2	15:55	58.8	71.3	63.3	57.1	53.7	54.8	49.2	48.8
2	16:00	58.5	67.0	60.3	56.5	53.6	54.7	49.3	48.7
2	16:05	64.6	68.7	64.2	60.1	55.3	56.6	58.8	58.6
2	16:10	57.5	66.7	59.1	55.3	52.8	54.8	48.1	38.5
2	16:15	62.9	66.7	62.4	56.8	55.4	57.2	55.5	56.9
2	16:20	66.9	65.0	61.4	59.6	60.5	60.5	60.0	60.6
2	16:25	65.8	68.0	65.2	62.2	66.2	60.8	54.5	50.5

Table A2: Measured Octave Band L_{eq} Noise Levels – Daytime, 6 August 2015, Position 2

Measurement Position	Start Time	Measured Noise Levels, dB				Noise sources
		L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}	
3	16:40	61.0	69.6	63.5	57.5	Road traffic, Princess Street
3	16:45	60.9	70.5	63.5	57.5	"
3	16:50	61.4	70.0	64.0	57.6	"
3	16:55	60.5	69.0	62.3	57.9	"
3	17:00	60.9	71.1	63.4	57.8	"
3	17:05	61.8	72.6	64.5	57.4	"
3	17:10	62.9	76.5	65.5	58.6	"
3	17:15	65.0	79.0	68.4	57.4	"
3	17:20	62.0	72.7	64.7	57.1	"
3	17:25	61.8	72.9	64.5	57.3	"
3	17:30	61.9	70.9	64.7	58.0	"
3	17:35	62.1	71.6	64.6	58.5	"
3	17:40	61.3	71.7	63.8	57.2	"
3	17:45	61.8	72.8	64.3	58.2	"
3	17:50	61.9	78.5	64.0	56.8	"
3	17:56	61.5	70.8	64.3	57.0	"
3	18:01	61.8	74.9	64.9	56.6	"
3	18:06	61.8	73.0	64.7	57.2	"
3	18:11	61.8	73.1	64.9	56.7	"
3	18:16	62.6	76.8	65.2	56.7	"
3	18:21	61.0	71.6	63.8	56.8	"
3	18:26	61.4	71.4	64.1	56.6	"
3	18:31	60.8	69.7	63.5	57.2	"
3	18:36	60.9	66.8	63.7	57.3	"

Table A3: Summary Statistical Noise Levels – Daytime, 6 August 2015, Position 3

Measurement Position	Start Time	Noise Level, dB LAeq	Sound Pressure Level (dB) @ Octave Band Centre Frequency (Hz)						
			63	125	250	500	1k	2k	4k
3	16:40	61.0	66.1	59.6	57.5	56.7	58.2	52.5	43.1
3	16:45	60.9	67.2	60.3	57.9	56.6	58.1	52.4	43.2
3	16:50	61.4	69.7	61.7	59.4	57.1	58.5	52.8	43.3
3	16:55	60.5	65.9	58.9	57.7	56.8	57.6	51.3	45.5
3	17:00	60.9	66.0	60.4	58.3	56.3	58.0	51.8	47.7
3	17:05	61.8	66.8	61.1	58.0	56.6	59.4	53.2	44.2
3	17:10	62.9	69.2	63.1	59.4	60.1	59.9	53.3	44.8
3	17:15	65.0	66.8	61.5	57.5	56.6	62.0	59.1	49.7
3	17:20	62.0	66.0	60.0	57.6	56.9	59.7	53.1	44.5
3	17:25	61.8	68.6	60.4	57.7	56.7	59.3	53.3	44.5
3	17:30	61.9	67.0	59.6	58.4	57.0	59.5	53.1	43.6
3	17:35	62.1	69.7	63.3	58.3	57.3	59.5	53.2	43.6
3	17:40	61.3	68.0	61.7	58.4	56.4	58.5	52.9	43.3
3	17:45	61.8	69.7	63.1	59.4	57.2	59.0	53.2	44.0
3	17:50	61.9	66.6	59.7	58.6	56.9	58.6	54.8	45.2
3	17:56	61.5	66.5	61.2	58.0	56.7	58.9	53.1	43.6
3	18:01	61.8	68.9	61.3	58.5	57.0	59.1	53.4	44.0
3	18:06	61.8	67.1	61.7	59.8	57.1	59.0	53.4	44.3
3	18:11	61.8	67.4	60.5	58.5	56.9	59.0	53.6	44.9
3	18:16	62.6	77.0	65.3	58.3	56.9	59.4	54.7	46.3
3	18:21	61.0	71.8	62.4	57.6	56.2	58.0	52.9	43.8
3	18:26	61.4	66.4	60.2	58.7	57.3	58.6	52.6	42.9
3	18:31	60.8	68.8	60.0	57.7	56.2	58.2	52.1	42.7
3	18:36	60.9	65.6	58.9	57.1	56.2	58.3	52.5	41.2

Table A4: Measured Octave Band L_{eq} Noise Levels – Daytime, 6 August 2015, Position 3

Measurement Position	Start Time	Measured Noise Levels, dB				Noise sources
		L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}	
4	17:07	58.8	68.0	61.2	55.8	Road traffic, trains
4	17:12	58.7	66.7	60.3	56.3	"
4	17:21	57.9	69.0	59.8	55.3	"
4	17:26	57.7	65.2	59.7	55.1	"
4	17:31	58.2	70.7	60.0	55.5	"
4	17:36	58.6	75.0	60.0	56.2	"
4	17:41	58.5	67.2	60.8	55.6	"
4	17:46	58.6	66.8	60.5	56.3	"
4	17:51	57.9	64.1	60.1	54.8	"
4	17:56	57.8	62.7	59.4	56.0	"
4	18:01	57.8	70.1	59.6	55.1	"
4	18:06	58.6	70.4	60.1	55.3	"
4	18:12	57.1	68.7	58.5	54.7	"
4	18:17	57.2	69.2	58.4	54.7	"
4	18:22	57.4	62.2	59.6	54.5	"
4	18:27	57.5	65.0	59.5	54.6	"
4	18:32	57.0	64.6	59.0	54.9	"

Table A5: Summary Statistical Noise Levels – Daytime, 6 August 2015, Position 4

Measurement Position	Start Time	Noise Level, dB LAeq	Sound Pressure Level (dB) @ Octave Band Centre Frequency (Hz)						
			63	125	250	500	1k	2k	4k
4	17:07	58.8	72.0	64.1	60.3	55.9	54.1	48.0	41.0
4	17:12	58.7	70.2	64.3	59.8	55.3	54.2	48.7	41.3
4	17:21	57.9	67.9	63.5	58.3	54.6	53.9	47.5	42.2
4	17:26	57.7	67.5	62.0	58.9	54.6	53.7	47.5	39.7
4	17:31	58.2	68.3	62.5	59.8	54.5	54.2	47.6	40.2
4	17:36	58.6	68.7	63.4	59.4	55.0	54.6	48.6	40.2
4	17:41	58.5	68.8	64.2	59.5	55.1	54.2	48.3	40.4
4	17:46	58.6	70.3	64.2	60.2	55.5	54.2	47.9	39.5
4	17:51	57.9	68.0	62.7	59.0	54.5	53.6	48.2	39.9
4	17:56	57.8	68.0	62.7	58.9	54.4	53.7	47.7	39.0
4	18:01	57.8	67.1	62.1	59.1	54.7	53.7	47.0	38.4
4	18:06	58.6	68.4	64.8	60.0	55.2	54.2	48.4	41.6
4	18:12	57.1	67.4	63.7	58.8	53.5	52.8	46.4	38.2
4	18:17	57.2	67.4	61.5	58.2	54.1	53.0	47.5	39.1
4	18:22	57.4	68.2	62.0	58.3	54.3	53.3	47.4	39.5
4	18:27	57.5	66.6	61.8	59.0	54.8	53.1	47.0	38.2
4	18:32	57.0	65.9	60.4	57.7	54	53.2	46.8	37.7

Table A6: Measured Octave Band L_{eq} Noise Levels – Daytime, 6 August 2015, Position 4

Measurement Position	Start Time	Measured Noise Levels, dB				Noise sources
		L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}	
5	00:32	52.3	64.1	54.4	49.7	Distant road traffic, trains
5	00:37	52.8	64.2	55.0	48.4	“
5	00:42	51.4	62.4	52.8	49.5	“
5	00:47	50.5	60.4	52.1	47.9	“
5	00:52	56.0	79.3	55.5	49.0	“
5	00:57	51.9	63.2	54.5	48.0	“
5	01:02	51.1	61.2	53.5	47.2	“
5	01:07	50.7	58.0	52.6	47.9	“
5	01:12	53.0	64.8	54.1	50.6	“
5	01:17	52.3	61.1	54.4	50.0	“
5	01:22	58.9	78.6	59.3	50.2	“
5	01:27	51.8	63.4	53.5	48.6	“
5	01:32	57.1	76.3	54.1	49.0	“
5	01:37	50.1	56.9	52.2	47.4	“
5	01:42	49.6	59.9	51.1	47.0	“
5	01:47	50.2	63.9	53.3	46.6	“
5	01:52	49.9	58.3	52.0	47.1	“
5	01:57	49.8	59.1	51.9	46.8	“
5	02:02	50.3	59.4	52.9	47.2	“
5	02:07	51.0	66.4	53.5	46.7	“
5	02:12	52.4	60.4	56.4	46.9	“
5	02:17	49.8	56.6	52.0	47.5	“
5	02:22	49.3	57.8	51.6	47.2	“

Table A7: Summary Statistical Noise Levels – Night time, 3 September 2015, Position 5

Measurement Position	Start Time	Noise Level, dB LAeq	Sound Pressure Level (dB) @ Octave Band Centre Frequency (Hz)						
			63	125	250	500	1k	2k	4k
5	00:32	52.3	65.3	55.1	50.7	48.8	49.0	43.1	33.7
5	00:37	52.8	62.4	58.5	52.4	49.4	48.7	43.8	38.2
5	00:42	51.4	61.7	54.6	51.3	48.3	47.4	42.4	33.6
5	00:47	50.5	59.3	53.2	49.5	47.2	47.2	41.0	30.4
5	00:52	56.0	63.5	58.9	58.9	53.9	50.4	45.5	37.4
5	00:57	51.9	62.5	55.6	51.5	48.5	48.3	42.5	34.0
5	01:02	51.1	60.7	54.4	49.9	47.6	47.7	41.7	32.2
5	01:07	50.7	59.6	53.9	50.4	47.2	47.3	41.5	31.6
5	01:12	53.0	69.0	58.6	54.1	48.4	48.4	43.7	36.5
5	01:17	52.3	68.2	57.4	53.3	48.3	47.9	42.9	35.5
5	01:22	58.9	66.3	64.6	60.8	55	54.3	49.2	41.6
5	01:27	51.8	64.5	55.3	51.6	48.2	47.7	43.3	35.6
5	01:32	57.1	65.5	56.1	51.3	51.6	54.8	48.8	34.4
5	01:37	50.1	61.7	53.2	49.5	46.9	46.7	40.4	31.0
5	01:42	49.6	59.1	52.6	48.0	46.4	46.4	39.8	29.5
5	01:47	50.2	58.0	52.6	48.2	46.5	47.1	41.2	30.7
5	01:52	49.9	61.1	54.2	49.8	46.8	46.2	39.4	29.1
5	01:57	49.8	59.9	53.0	48.5	46.7	46.5	39.7	29.5
5	02:02	50.3	58.5	52.9	48.7	46.8	47.2	41.0	30.9
5	02:07	51.0	58.9	52.9	48.9	48.0	47.7	41.7	31.8
5	02:12	52.4	63.0	57.3	53.5	49.7	47.7	42.4	35.9
5	02:17	49.8	59.2	53.7	49.4	46.6	46.5	39.7	30.0
5	02:22	49.3	58.7	52.9	48.2	46.3	45.6	39.7	32.4

Table A8: Measured Octave Band L_{eq} Noise Levels – Night time, 3 September 2015, Position 5

Measurement Position	Start Time	Measured Noise Levels, dB				Noise sources
		L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}	
7	00:32	51.3	56.8	53.4	48.8	Distant road traffic, trains
7	00:37	52.9	63.5	54.3	47.6	“
7	00:42	50.7	55.5	51.8	49.1	“
7	00:47	50.1	56.7	52.3	47.3	“
7	00:52	55.5	77.4	54.3	48.3	“
7	00:57	51.2	60.1	53.9	47.7	“
7	01:02	50.0	55.0	52.2	46.4	“
7	01:07	49.7	56.3	51.4	47.5	“
7	01:12	51.7	60.3	53.6	49.3	“
7	01:17	50.5	56.6	52.1	48.9	“
7	01:22	58.6	76.8	60.5	49.1	“
7	01:27	50.7	61.0	52.9	47.4	“
7	01:32	56.6	75.3	52.7	47.9	“
7	01:37	49.1	54.1	50.9	46.9	“
7	01:42	48.4	54.9	50.4	46.1	“
7	01:47	49.2	56.6	51.8	46.1	“
7	01:52	49.4	59.1	51.7	46.6	“
7	01:57	49.2	60.0	51.7	46.2	“
7	02:02	49.0	54.0	51.0	46.6	“
7	02:07	49.2	57.5	51.6	46.0	“
7	02:12	52.7	60.7	57.5	46.5	“
7	02:17	49.5	57.9	51.8	46.5	“

Table A9: Summary Statistical Noise Levels – Night time, 3 September 2015, Position 7

Measurement Position	Start Time	Noise Level, dB LAeq	Sound Pressure Level (dB) @ Octave Band Centre Frequency (Hz)						
			63	125	250	500	1k	2k	4k
7	00:32	51.3	63.7	56.4	50.1	47.5	47.8	41.6	33.2
7	00:37	52.9	61.4	58.3	52.3	49.4	48.8	44.2	37.5
7	00:42	50.7	61.4	55.6	50.6	47.3	46.6	41.3	32.6
7	00:47	50.1	60.0	53.9	49.1	46.2	46.9	40.3	29.8
7	00:52	55.5	63.1	59.5	57.4	53.4	49.9	45.4	38.2
7	00:57	51.2	62.8	56.5	50.7	47.9	47.4	41.4	32.3
7	01:02	50.0	60.7	55.3	49.3	46.3	46.3	40.3	30.8
7	01:07	49.7	59.7	54.5	48.6	46.0	46.3	40.2	30.5
7	01:12	51.7	64.9	58.2	50.9	47.6	47.4	42.7	35.3
7	01:17	50.5	65.7	56.5	50.3	46.6	46.3	40.8	32.5
7	01:22	58.6	66.3	65.6	59.7	54.5	54.1	48.7	42.7
7	01:27	50.7	62.0	55.6	50.1	46.6	46.4	42.6	34.7
7	01:32	56.6	63.3	55.6	49.9	50.7	54.4	48.3	33.7
7	01:37	49.1	61.1	54.1	48.8	45.7	45.2	39.1	30.1
7	01:42	48.4	59.1	53.5	47.3	45.2	44.8	38.2	28.4
7	01:47	49.2	58.9	53.8	48.2	45.7	45.7	39.4	29.5
7	01:52	49.4	61.3	54.9	49.4	46.1	45.6	39.2	29.7
7	01:57	49.2	60.2	53.8	48.5	46.0	45.8	38.9	29.0
7	02:02	49.0	58.8	53.8	47.9	45.7	45.5	39.2	29.6
7	02:07	49.2	58.8	53.4	47.8	46.0	45.8	39.5	28.7
7	02:12	52.7	63.7	58.1	54.1	50.0	47.8	42.4	35.9
7	02:17	49.5	59.8	54.6	49.0	46.0	46.1	39.3	30.0

Table A10: Measured Octave Band L_{eq} Noise Levels – Night time, 3 September 2015, Position 7

Measurement Position	Start Time	Measured Noise Levels, dB				Noise sources
		L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}	
8	18:07	69.0	79.5	72.0	64.0	Road traffic
8	18:12	69.3	80.9	72.1	65.2	"
8	18:17	69.5	79.7	72.5	63.6	"
8	18:22	69.8	88.1	71.6	63.3	"
8	18:27	70.0	80.7	73.2	62.7	"
8	18:32	69.1	77.2	72.3	63.7	"
8	18:37	68.7	77.8	71.3	63.3	"
8	18:42	67.8	76.7	70.5	63.6	"
8	18:47	69.6	83.5	72.0	64.2	"
8	18:53	69.9	82.1	72.8	65.9	"
8	18:58	69.1	80.3	72.3	64.0	"
8	19:03	68.8	77.3	72.4	63.7	"
8	19:08	69.8	80.4	72.8	64.7	"
8	19:13	70.1	80.5	73.2	63.3	"
8	19:18	69.3	83.1	72.5	63.3	"
8	19:23	69.7	83.4	72.2	63.3	"
8	19:28	68.7	82.4	71.3	63.3	"
8	19:33	67.8	78.6	70.4	62.3	"
8	19:38	70.5	84.3	72.9	64.9	"

Table A11: Summary Statistical Noise Levels – Daytime, 10 December 2015, Position 8

Measurement Position	Start Time	Noise Level, dB LAeq	Sound Pressure Level (dB) @ Octave Band Centre Frequency (Hz)						
			63	125	250	500	1k	2k	4k
8	18:07	69.0	75.0	69.3	67.9	65.5	64.5	61.0	56.8
8	18:12	69.3	75.7	68.5	66.3	64.1	65.0	61.7	59.0
8	18:17	69.5	76.1	68.6	66.6	64.5	65.3	62.6	57.6
8	18:22	69.8	74.8	68.3	66.5	67.0	65.9	61.8	56.7
8	18:27	70.0	75.5	68.7	67.1	65.9	66.0	62.6	57.2
8	18:32	69.1	75.3	68.2	66.7	65.0	65.4	61.4	55.1
8	18:37	68.7	74.4	69.4	66.2	64.6	64.9	60.8	56.0
8	18:42	67.8	74.9	68.1	65.0	63.6	64.2	59.9	54.5
8	18:47	69.6	75.6	69.8	67.8	65.2	65.4	61.7	59.0
8	18:53	69.9	76.0	69.8	67.8	65.8	65.6	62.1	58.6
8	18:58	69.1	73.5	68.4	66.9	65.2	65.3	61.3	55.7
8	19:03	68.8	74.4	68.6	67.1	65.1	65.1	60.7	54.7
8	19:08	69.8	77.0	71.3	68.7	65.7	65.5	62.1	56.7
8	19:13	70.1	76.1	69.2	68.4	66.6	65.9	62.3	56.8
8	19:18	69.3	73.9	68.4	66.1	66.6	65.3	61.4	56.3
8	19:23	69.7	75.2	68.9	68.2	65.7	65.7	62.1	56.4
8	19:28	68.7	74.1	71.8	65.8	65.8	64.7	60.4	54.2
8	19:33	67.8	73.6	67.5	64.0	63.2	64.3	60.2	54.9
8	19:38	70.5	76.1	71.2	67.9	67.3	66.4	62.6	57.1

Table A12: Measured Octave Band L_{eq} Noise Levels – Daytime, 10 December 2015, Position 8

Measurement Position	Start Time	Measured Noise Levels, dB				Noise sources
		L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}	
9	18:10	68.3	80.1	70.9	63.4	Road traffic
9	18:15	69.0	80.3	71.3	63.2	“
9	18:20	67.4	73.0	70.0	61.5	“
9	18:25	67.2	81.4	69.2	63.2	“
9	18:30	71.5	89.6	71.7	62.8	“
9	18:35	72.0	90.0	71.8	65.3	“
9	18:40	68.6	78.8	71.0	63.9	“
9	18:45	68.9	81.1	71.7	63.3	“
9	18:50	67.7	79.0	70.4	63.7	“
9	18:55	70.0	84.7	72.1	63.1	“
9	19:00	68.5	76.0	70.8	64.9	“
9	19:05	68.5	79.8	71.0	63.6	“
9	19:10	68.8	77.9	72.0	63.8	“
9	19:15	67.0	77.6	69.5	62.6	“
9	19:20	69.3	87.8	69.6	62.8	“
9	19:25	67.4	78.6	69.6	62.3	“
9	19:30	69.7	86.6	71.6	65.3	“
9	19:35	68.8	80.7	71.5	63.9	“
9	19:40	70.5	84.7	72.4	64.0	“
9	19:45	69.8	83.0	71.9	64.0	“
9	19:50	68.1	78.2	70.6	63.0	“
9	19:55	67.7	76.0	70.8	62.8	“

Table A13: Summary Statistical Noise Levels – Daytime, 10 December 2015, Position 9

Measurement Position	Start Time	Noise Level, dB LAeq	Sound Pressure Level (dB) @ Octave Band Centre Frequency (Hz)						
			63	125	250	500	1k	2k	4k
9	18:10	68.3	74.5	67.2	66.2	64.3	64.7	60.2	53.8
9	18:15	69.0	73.7	67.7	67.0	65.4	65.5	60.6	54.3
9	18:20	67.4	74.0	66.2	64.3	62.8	64.2	59.6	52.6
9	18:25	67.2	75.2	69.2	64.7	62.8	63.3	59.6	53.5
9	18:30	71.5	74.4	72.2	70.0	69.3	67.7	61.9	56.8
9	18:35	72.0	75.4	73.3	69.6	69.5	68.2	62.9	58.0
9	18:40	68.6	74.0	68.6	66.6	64.7	64.8	60.8	55.4
9	18:45	68.9	73.4	71.5	68.5	65.6	64.8	60.2	54.5
9	18:50	67.7	73.8	67.1	65.6	63.6	64.0	59.8	53.8
9	18:55	70.0	75.9	71.7	69.7	67.1	65.8	61.4	55.3
9	19:00	68.5	75.4	67.6	66.3	64.8	64.4	60.8	55.1
9	19:05	68.5	73.4	67.9	65.4	64.4	64.8	60.9	54.9
9	19:10	68.8	75.1	68.5	67.6	65.0	64.9	60.8	54.8
9	19:15	67.0	72.2	66.0	64.3	63.1	63.3	59.1	53.8
9	19:20	69.3	74.4	74.5	67.6	67.9	63.9	60.0	54.3
9	19:25	67.4	74.1	67.3	64.5	63.1	63.8	60.0	53.4
9	19:30	69.7	74.2	70.2	67.1	65.6	66.2	61.9	55.8
9	19:35	68.8	74.5	71.1	67.3	64.7	64.9	60.9	55.3
9	19:40	70.5	74.9	73.4	71.2	67.9	65.1	62.1	57.0
9	19:45	69.8	74.1	73.8	70.3	68.0	64.5	60.2	54.9
9	19:50	68.1	74.3	71.0	66.9	63.9	64.2	59.9	54.5
9	19:55	67.7	74.0	67.8	65.1	63.4	63.8	60.3	55.0

Table A14: Measured Octave Band L_{eq} Noise Levels – Daytime, 10 December 2015, Position 9

Measurement Position	Start Time	Measured Noise Levels, dB				Noise sources
		L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}	
10	18:42	66.7	86.2	69.9	59.1	Road traffic
10	18:47	64.5	76.1	67.6	59.2	"
10	18:52	68.5	84.1	70.5	60.1	"
10	18:57	64.7	74.4	67.5	60.5	"
10	19:02	65.7	78.5	68.6	61.3	"
10	19:07	65.9	78.1	69.4	58.5	"
10	19:12	65.1	77.8	67.3	60.0	"
10	19:17	64.1	76.5	67.8	59.2	"
10	19:22	64.8	73.1	67.8	60.5	"
10	19:27	66.5	77.7	69.2	61.5	"
10	19:32	66.9	81.0	69.2	59.8	"
10	19:37	65.6	76.4	68.8	58.3	"
10	19:42	66.9	82.8	68.0	60.4	"
10	19:47	64.4	74.9	66.4	61.1	"
10	19:52	64.0	75.3	67.8	58.0	"
10	19:57	64.8	76.0	67.9	58.3	"
10	20:02	64.4	73.2	67.9	58.2	"
10	20:07	64.0	77.8	68.0	58.7	"
10	20:12	64.5	72.0	68.5	58.6	"

Table A15: Summary Statistical Noise Levels – Daytime, 10 December 2015, Position 10

Measurement Position	Start Time	Noise Level, dB LAeq	Sound Pressure Level (dB) @ Octave Band Centre Frequency (Hz)						
			63	125	250	500	1k	2k	4k
10	18:42	66.7	69.9	70.4	65.7	63.6	63.1	57.4	49.5
10	18:47	64.5	70.7	63.9	61.4	60.2	61.2	56.6	49.6
10	18:52	68.5	72.7	72.0	69.4	65.4	64.4	59.0	53.4
10	18:57	64.7	71.4	63.6	61.6	60.5	61.3	56.7	50.2
10	19:02	65.7	70.4	64.7	62.6	61.3	62.4	58.2	50.9
10	19:07	65.9	70.7	65.4	63.3	61.1	62.8	58.1	50.1
10	19:12	65.1	71.1	66.0	62.5	61.1	61.5	57.3	50.3
10	19:17	64.1	68.4	64.4	60.4	59.7	61.1	56.1	47.4
10	19:22	64.8	71.4	64.8	61.9	60.6	61.3	57.0	50.9
10	19:27	66.5	70.0	65.0	63.1	62.7	63.3	58.2	50.4
10	19:32	66.9	70.8	68.7	67.0	63.1	62.5	58.9	53.4
10	19:37	65.6	69.6	63.2	61.7	61.5	62.6	57.5	49.2
10	19:42	66.9	71.7	70.4	68.7	64.1	62.0	57.4	51.9
10	19:47	64.4	73.4	71.5	63.0	59.9	60.4	55.7	49.7
10	19:52	64.0	70.3	66.7	62.3	59.8	60.4	56.0	48.5
10	19:57	64.8	71.8	63.5	61.2	60.0	61.8	57.0	48.4
10	20:02	64.4	69.8	62.4	60.8	59.6	61.4	56.6	48.9
10	20:07	64.0	68.6	62.2	60.9	59.6	60.7	56.5	48.7
10	20:12	64.5	69.2	62.9	60.5	60.0	61.2	57.2	49.9

Table A16: Measured Octave Band L_{eq} Noise Levels – Daytime, 10 December 2015, Position 10

Measurement Position	Start Time	Measured Noise Levels, dB				Noise sources
		L_{Aeq}	L_{Amax}	L_{A1}	L_{A90}	
13	23:58	66.5	83.6	74.0	62.0	R-Base night club, occasion road traffic
13	23:59	64.6	70.4	69.3	61.8	“
13	00:00	64.3	70.5	68.0	62.2	“
13	00:01	63.1	72.5	69.6	60.1	“
13	00:02	63.7	69.1	67.3	61.4	“
13	00:03	64.1	68.8	67.4	61.6	“
13	00:04	64.9	75.6	72.6	59.8	“
13	00:05	64.2	68.1	67.3	62.4	“
13	00:06	68.5	81.5	75.4	64.8	“
13	00:07	70.9	80.1	78.0	66.5	“
13	00:08	68.6	73.9	72.0	66.3	“
13	00:16	66.7	70.7	69.9	64.6	“
13	00:21	66.8	72.3	71.2	64.8	“
13	00:22	65.7	70.6	68.7	63.7	“
13	00:23	68.4	78.4	75.9	64.7	“
13	00:24	66.5	73.4	71.8	64.0	“
13	00:25	67.5	72.2	71.0	65.6	“
13	00:26	67.8	72.8	71.9	66.0	“
13	00:27	69.6	76.1	74.8	65.6	“
13	00:28	68.1	74.8	72.5	65.1	“
13	00:29	67.2	73.8	72.0	64.7	“
13	00:30	70.0	78.3	76.5	65.4	“
13	00:31	69.9	75.8	74.1	64.5	“
13	00:32	69.6	76.2	73.2	64.8	“
13	00:33	69.7	75.7	73.2	66.9	“
13	00:34	68.6	73.2	72.8	66.1	“
13	00:35	69.1	73.7	72.5	67.0	“
13	00:36	67.9	71.7	70.6	66.4	“
13	00:37	68.0	76.8	73.2	66.1	“
13	00:38	68.4	76.4	72.6	65.9	“
13	00:39	68.1	71.5	70.8	65.7	“
13	00:40	69.1	76.1	73.6	66.7	“
13	00:41	68.5	77.1	74.2	66.3	“
13	00:42	69.3	80.8	73.9	66.4	“
13	00:43	67.8	73.0	71.5	65.7	“
13	00:44	68.9	75.4	71.8	66.5	“
13	00:45	68.5	76.4	75.5	65.0	“
13	00:46	68.3	73.9	72.8	66.0	“
13	00:47	68.0	77.3	73.0	65.3	“
13	00:48	68.9	75.8	73.6	66.3	“
13	00:49	67.6	72.7	71.1	64.6	“
13	00:50	68.5	75.6	74.0	64.4	“
13	00:51	73.3	91.4	82.8	67.2	“
13	00:52	69.5	77.7	74.6	66.8	“
13	00:53	69.6	74.4	73.0	67.2	“

Measurement Position	Start Time	Measured Noise Levels, dB				Noise sources
		L_{Aeq}	L_{Amax}	L_{A1}	L_{A90}	
13	00:54	73.0	84.3	83.0	67.2	"
13	00:55	70.5	77.9	76.3	66.0	"
13	00:56	68.1	75.1	72.0	64.7	"
13	00:57	68.9	78.4	74.8	65.1	"
13	00:58	70.4	75.6	73.7	68.7	"
13	00:59	70.0	75.2	73.0	68.5	"

Table A17: Summary Statistical Noise Levels – Night time, 19 November 2016, Position 13

Measurement Position	Start Time	Noise Level, dB LAeq	Sound Pressure Level (dB) @ Octave Band Centre Frequency (Hz)						
			63	125	250	500	1k	2k	4k
13	23:58	66.5	81.7	69.5	60.5	60.9	61.5	58.6	57.8
13	23:59	64.6	84.9	67.9	60.4	61.6	60.0	55.8	47.3
13	00:00	64.3	86.3	66.5	59.7	60.5	59.8	55.5	46.9
13	00:01	63.1	85.2	65.9	57.9	59.2	58.7	53.7	45.2
13	00:02	63.7	86.8	66.1	58.9	60.4	58.9	54.2	45.2
13	00:03	64.1	87.1	65.0	59.9	60.5	58.9	55.4	47.9
13	00:04	64.9	85.1	64.6	60.1	61.4	60.0	55.6	53.4
13	00:05	64.2	86.9	65.7	60.1	60.9	59.2	55.2	47.4
13	00:06	68.5	86.9	68.3	65.6	66.1	63.7	59.2	54.4
13	00:07	70.9	90.0	69.1	65.9	67.4	66.3	62.8	54.5
13	00:08	68.6	89.9	68.5	65.8	64.1	63.5	59.7	51.6
13	00:16	66.7	79.4	66.4	64.8	63.7	63.0	57.8	49.7
13	00:21	66.8	82.7	66.8	65.8	64.0	62.6	57.4	50.5
13	00:22	65.7	83.9	66.2	65.2	62.6	61.1	56.1	48.3
13	00:23	68.4	88.6	67.1	66.4	65.4	64.1	57.9	49.8
13	00:24	66.5	85.8	66.6	65.4	62.8	62.1	56.4	48.5
13	00:25	67.5	89.5	67.8	65.0	63.9	62.7	58.4	49.9
13	00:26	67.8	89.8	66.3	64.7	63.9	63.4	59.0	50.6
13	00:27	69.6	89.8	67.8	65.6	65.3	66.0	61.0	53.0
13	00:28	68.1	90.7	66.6	65.6	64.2	63.5	59.1	50.5
13	00:29	67.2	87.4	63.3	64.4	63.4	63.4	58.1	49.8
13	00:30	70.0	89.0	66.1	65.4	65.3	66.8	61.1	53.8
13	00:31	69.9	93.8	67.0	66.3	65.1	65.0	60.8	52.4
13	00:32	69.6	92.6	67.2	65.9	65.3	64.9	60.7	52.2
13	00:33	69.7	93.0	66.1	65.5	65.7	65.0	60.3	52.2
13	00:34	68.6	88.9	65.6	65.1	65.1	64.2	58.9	51.2
13	00:35	69.1	89.0	65.6	64.6	66.0	64.7	59.4	50.9
13	00:36	67.9	87.7	66.3	65.2	64.3	63.6	58.4	50.1
13	00:37	68.0	86.0	65.0	65.1	65.1	64.1	58.2	50.4
13	00:38	68.4	86.4	64.7	65.1	65.2	64.5	59.3	51.1
13	00:39	68.1	86.2	66.2	66.0	65.3	63.7	58.3	50.7
13	00:40	69.1	86.4	65.2	65.4	66.8	64.9	59.7	50.6
13	00:41	68.5	86.5	66.5	64.8	66.3	64.4	58.5	50.0

Measurement Position	Start Time	Noise Level, dB LAeq	Sound Pressure Level (dB) @ Octave Band Centre Frequency (Hz)						
			63	125	250	500	1k	2k	4k
13	00:42	69.3	86.1	65.6	64.1	66.2	66.0	59.7	50.9
13	00:43	67.8	85.8	64.8	64.0	65.2	63.8	58.2	50.3
13	00:44	68.9	87.9	66.1	65.0	66.4	64.6	59.6	51.8
13	00:45	68.5	86.7	64.0	64.6	65.4	64.7	59.7	50.9
13	00:46	68.3	88.4	65.3	64.1	65.0	64.1	59.0	52.4
13	00:47	68.0	87.8	64.8	63.9	64.5	64.2	59.3	49.4
13	00:48	68.9	89.1	64.3	63.6	65.0	65.3	59.8	50.7
13	00:49	67.6	87.1	66.2	63.7	63.9	63.4	58.8	49.8
13	00:50	68.5	88.3	65.4	64.5	64.6	64.6	59.5	51.0
13	00:51	73.3	88.0	69.2	71.7	69.9	70.2	63.5	56.2
13	00:52	69.5	83.7	66.1	64.3	66.2	66.2	61.1	51.9
13	00:53	69.6	82.9	65.5	64.2	66.7	66.2	61.2	52.1
13	00:54	73.0	84.2	66.8	65.0	70.0	69.4	65.3	55.2
13	00:55	70.5	85.9	65.1	64.0	67.8	66.9	61.4	53.3
13	00:56	68.1	85.6	67.0	63.0	64.7	64.5	58.7	50.0
13	00:57	68.9	78.8	63.4	63.7	65.8	65.9	60.1	50.9
13	00:58	70.4	93.3	65.0	65.2	66.9	65.8	61.3	52.8
13	00:59	70.0	93.6	66.9	64.9	65.8	65.6	60.7	52.6

Table A18: Measured Octave Band L_{eq} Noise Levels – Night time, 19 November 2016, Position 13

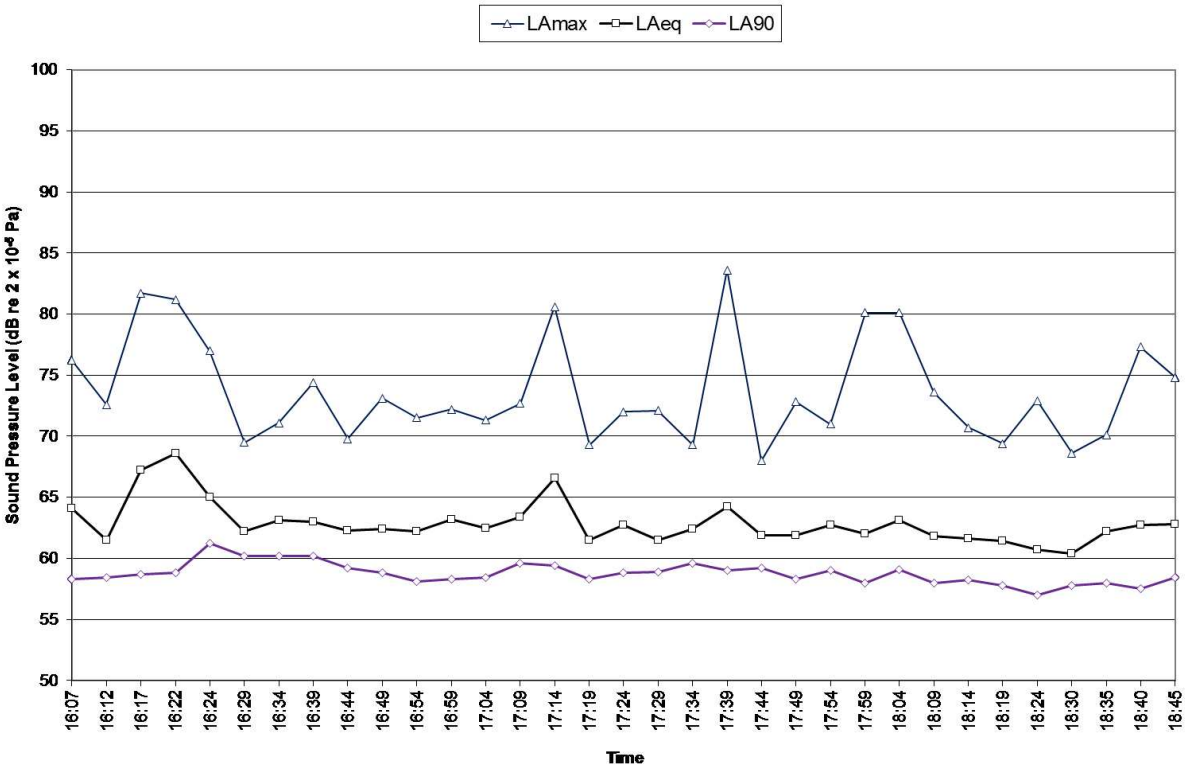


Figure 7: Noise survey measurement results, Position 1, daytime 6 August 2015

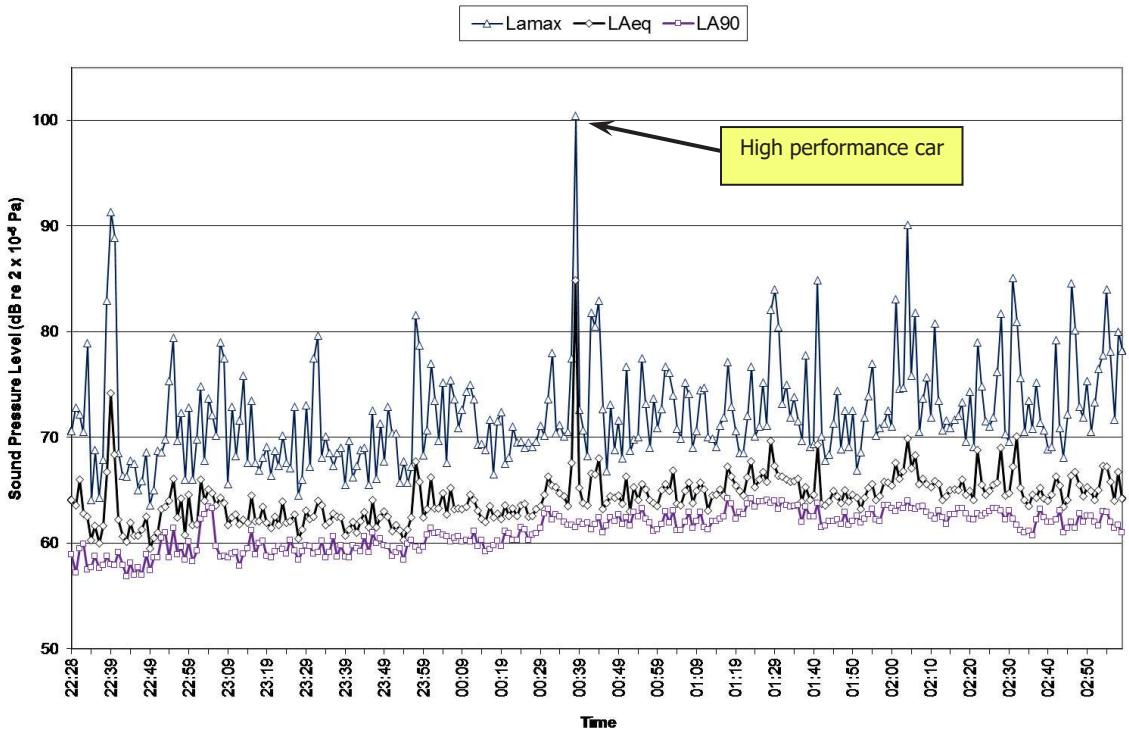


Figure 8: Noise survey measurement results, Position 1, night time Saturday 15 August 2015

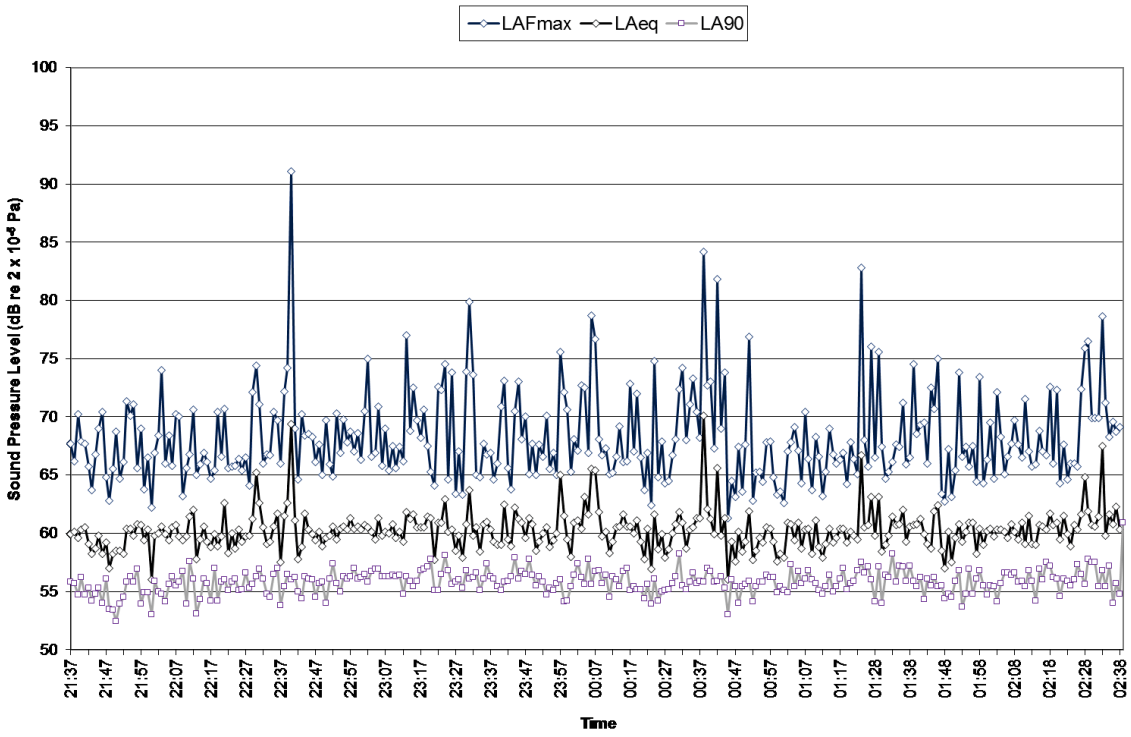


Figure 9: Noise survey measurement results, Position 3, night time Saturday 15 August 2015

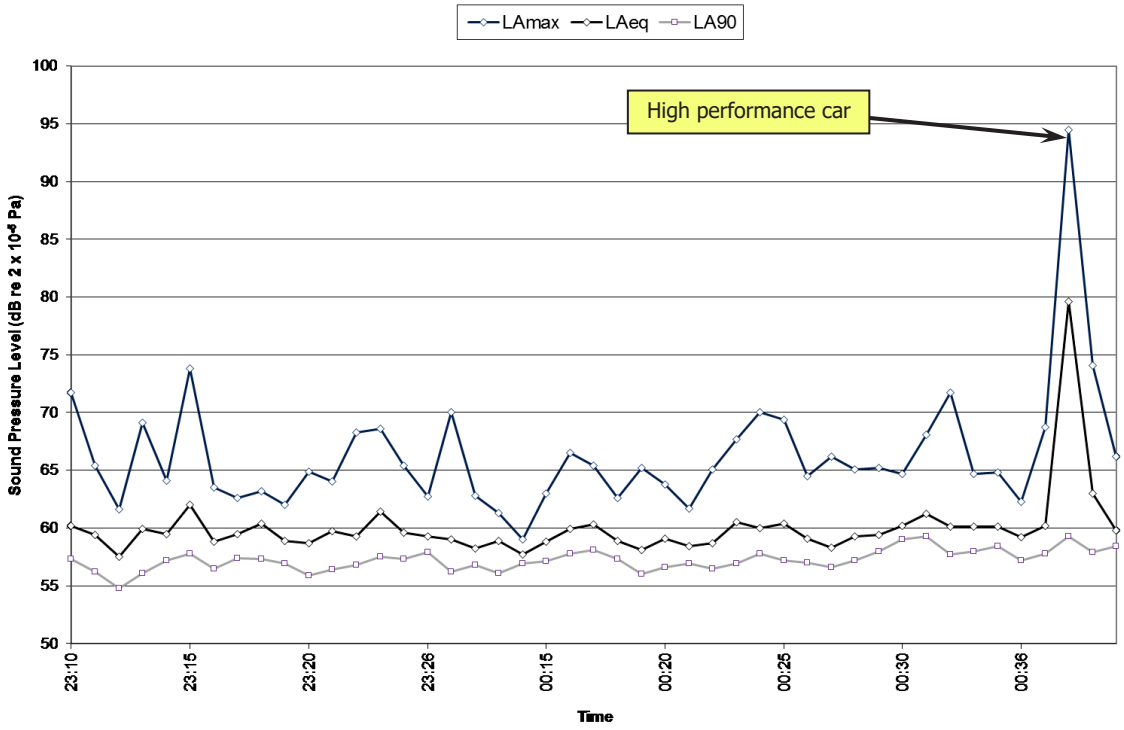


Figure 10: Noise survey measurement results, Position 4, night time Saturday 15 August 2015

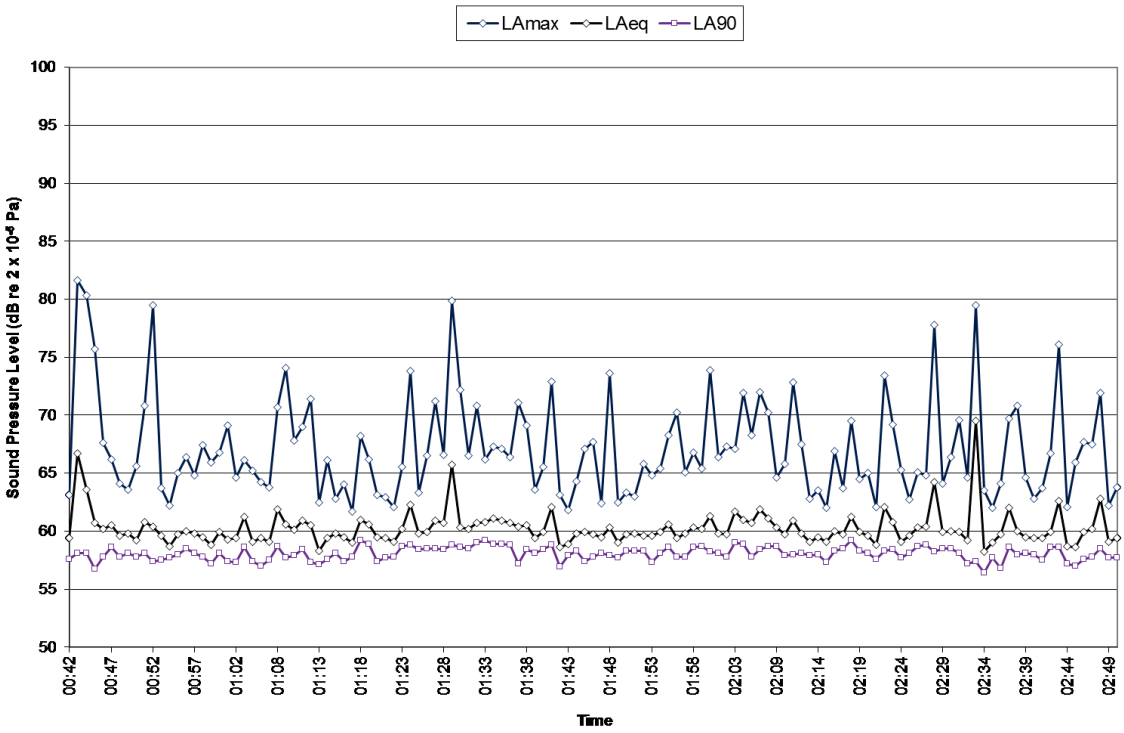


Figure 11: Noise survey measurement results, Position 6, night time Saturday 15 August 2015

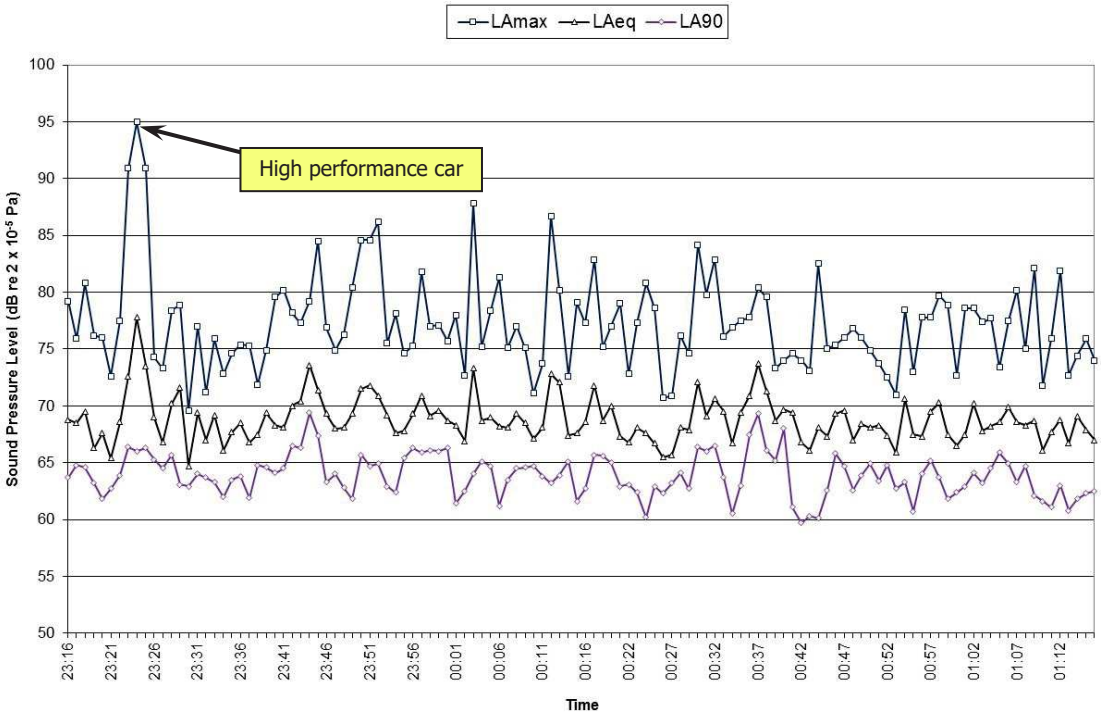


Figure 12: Noise survey measurement results, Position 8, night time Friday 11 December 2015

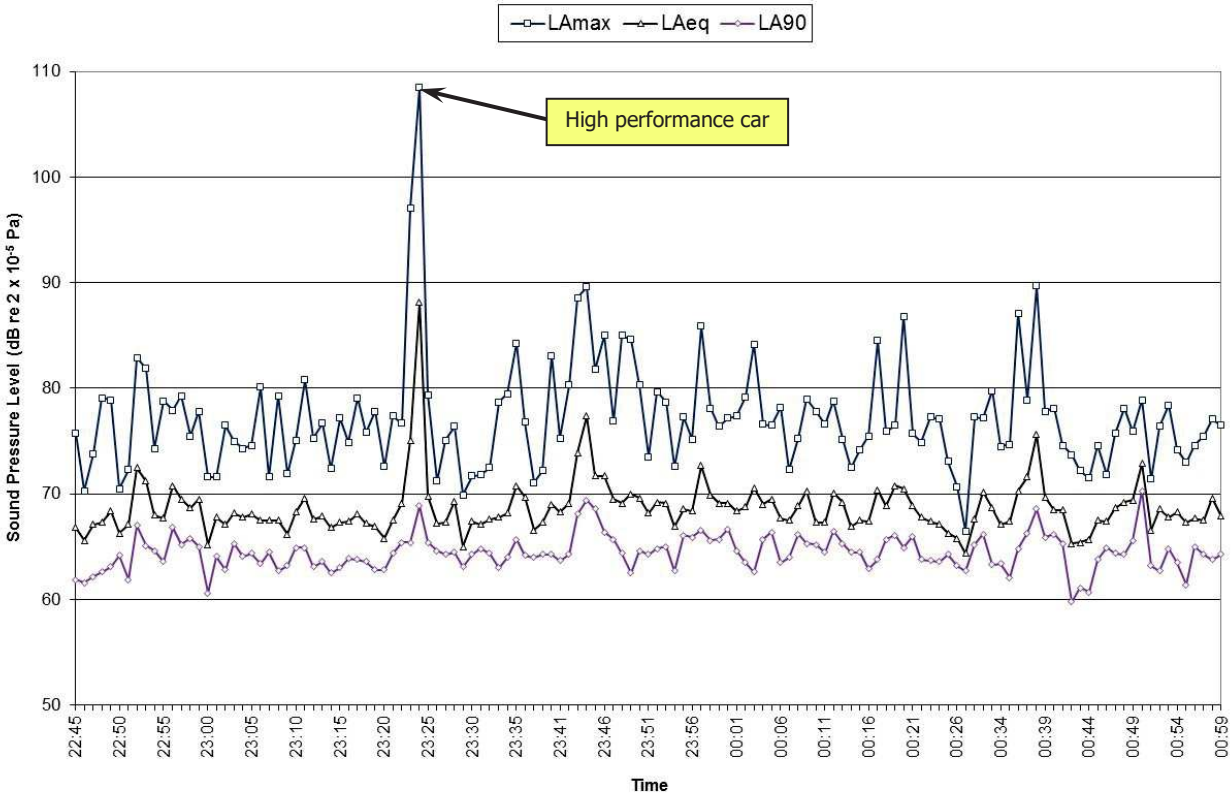


Figure 13: Noise survey measurement results, Position 9, night time Friday 11 December 2015

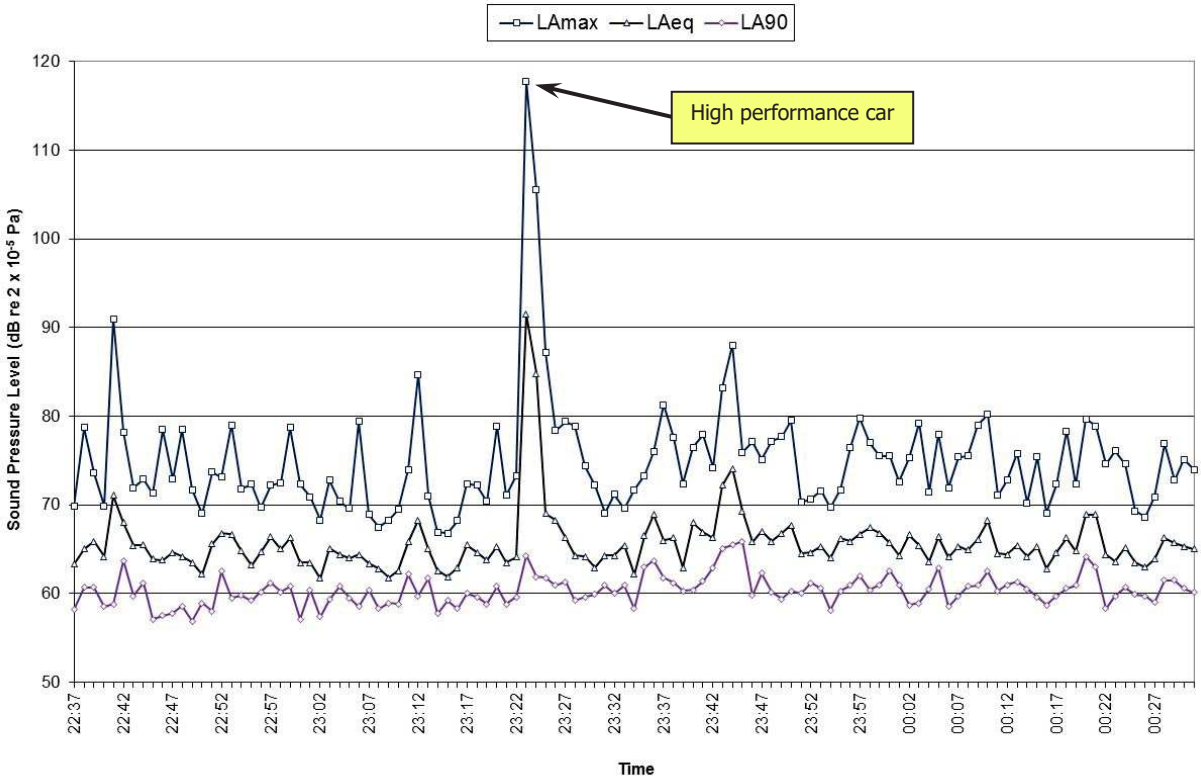


Figure 14: Noise survey measurement results, Position 10, night time Friday 11 December 2015

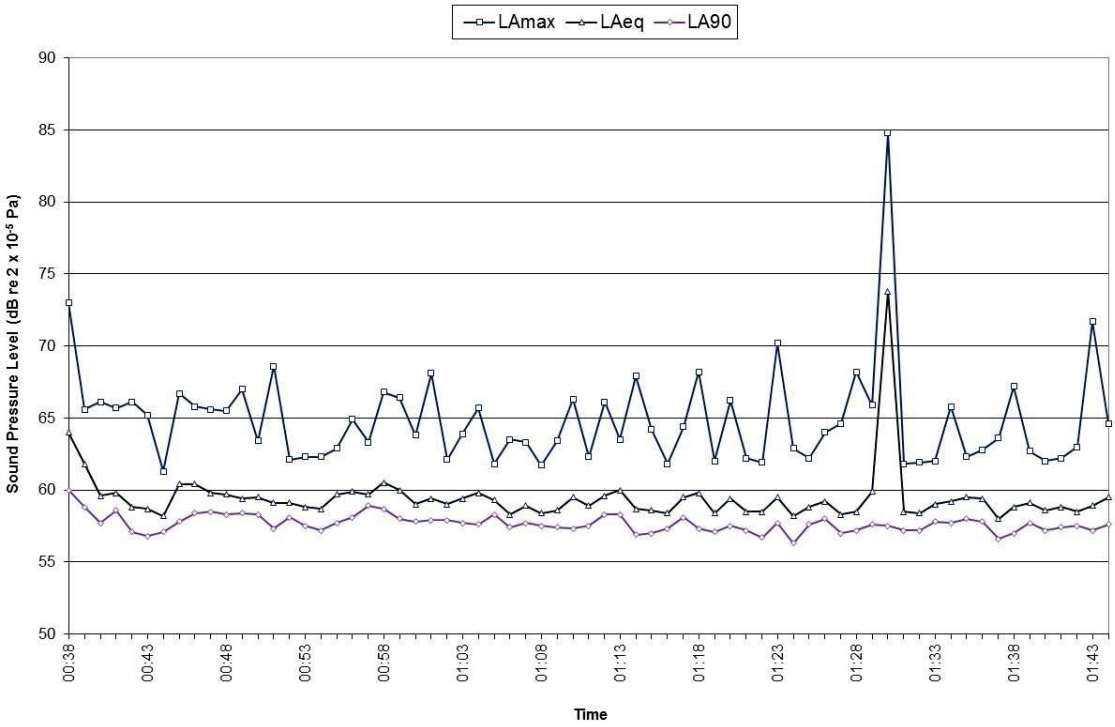


Figure 15: Noise survey measurement results, Position 11, night time Friday 11 December 2015

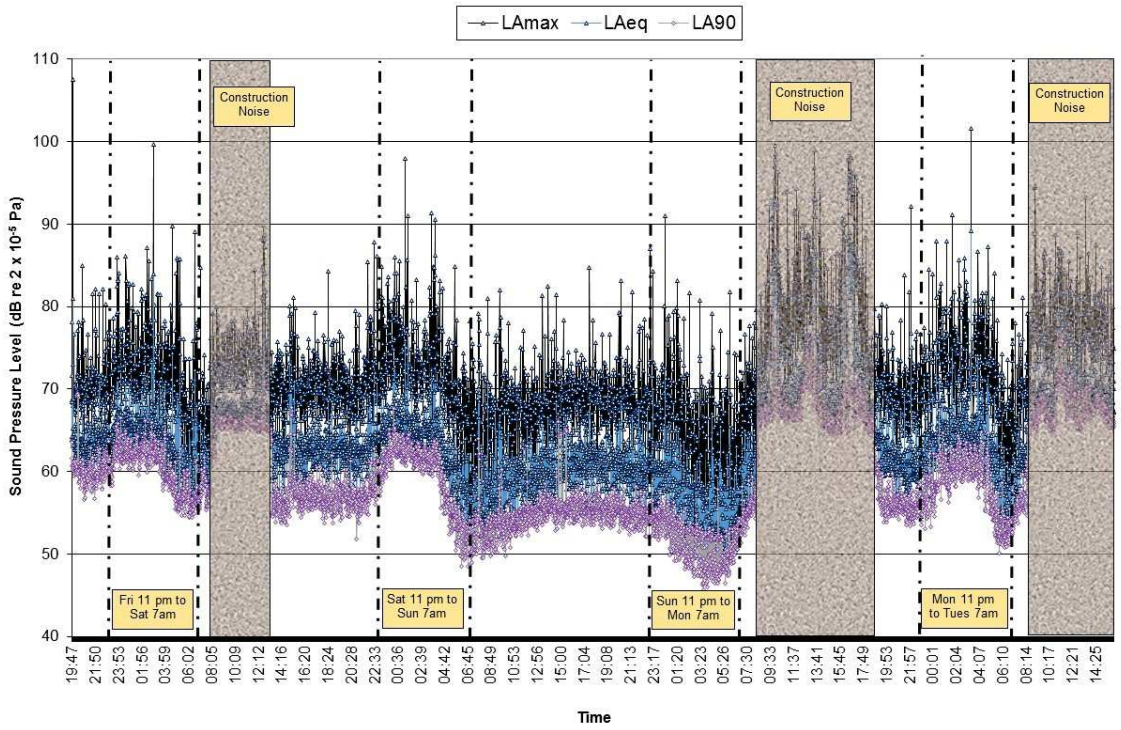


Figure 16: Noise survey measurement results, Position 12, 28 October 2016 to 1 November 2016

APPENDIX C

NOISE SURVEY DETAILS AND SUMMARY RESULTS, CIRCLE SQUARE PLOT 14

LOCATION

Circle Square, Plot 14, Manchester

DATES AND TIMES

Thursday 10 August 2017 to Monday 14 August 2017 10:50 to 09:30

WEATHER DURING SURVEYS

Thursday 10 August 2017 (Day time)	1/8 cloud cover, 2 m/s light breeze, no rain, 19 ^{o}C
Thursday 10 August 2017 (Night time)	1/8 cloud cover, 2 m/s light breeze, no rain, 11 ^{o}C
Friday 11 August 2017 (Day time)	7/8 cloud cover, 5 m/s light breeze, light rain, 17 ^{o}C
Friday 11 April 2017 (Night time)	6/8 cloud cover, 4 m/s light breeze, no rain, 15 ^{o}C
Saturday 12 August 2017 (Day time)	6/8 cloud cover, 5 m/s light breeze, light rain, 17 ^{o}C
Saturday 12 August 2017 (Night time)	2/8 cloud cover, 3 m/s light breeze, no rain, 11 ^{o}C
Sunday 13 August 2017 (Day time)	2/8 cloud cover, 3 m/s light breeze, no rain, 19 ^{o}C
Sunday 13 April 2017 (Night time)	4/8 cloud cover, 3 m/s light breeze, no rain, 14 ^{o}C
Monday 14 April 2017 (Night time)	7/8 cloud cover, 3 m/s light breeze, no rain, 14 ^{o}C

PERSONNEL PRESENT DURING SURVEY

Matt Fisher– Fisher Acoustics (commencement of survey)

Lee Copley – Fisher Acoustics (end of survey)

INSTRUMENTATION

Norsonic Type 118 IEC 60651 Type 1 Integrating-Averaging Sound Level Meter (serial no. 31498)

Norsonic Type 140 IEC 60651 Type 1 Integrating-Averaging Sound Level Meters (serial no. 1406387)

Norsonic Type 140 IEC 60651 Type 1 Integrating-Averaging Sound Level Meters (serial no. 1403193)

Norsonic Type 1251 IEC 60942-1997 Class 1 Sound Calibrators (x2) (serial nos. 31971, 27878)

MEASUREMENT METHODOLOGY

Before and after the noise survey the sound level meter was check calibrated to an accuracy of ±0.3dB using the Norsonic Type 1251 Calibrator - no drift in sensitivity was detected. The measurement microphone was installed at the location identified in this report. All survey measurements were in 'free field' conditions.

The measurement location is shown on Figure 17 and described below.

The measurement location was as follows:

- Location 1: At location of closest bedroom window of proposed hotel to A57(M) floor level at a microphone height of 38 metres above site ground level



Figure 17: Noise survey measurement location, Plot 14, Circle Square

Figure 18 identifies the free-field noise levels measured at the site.

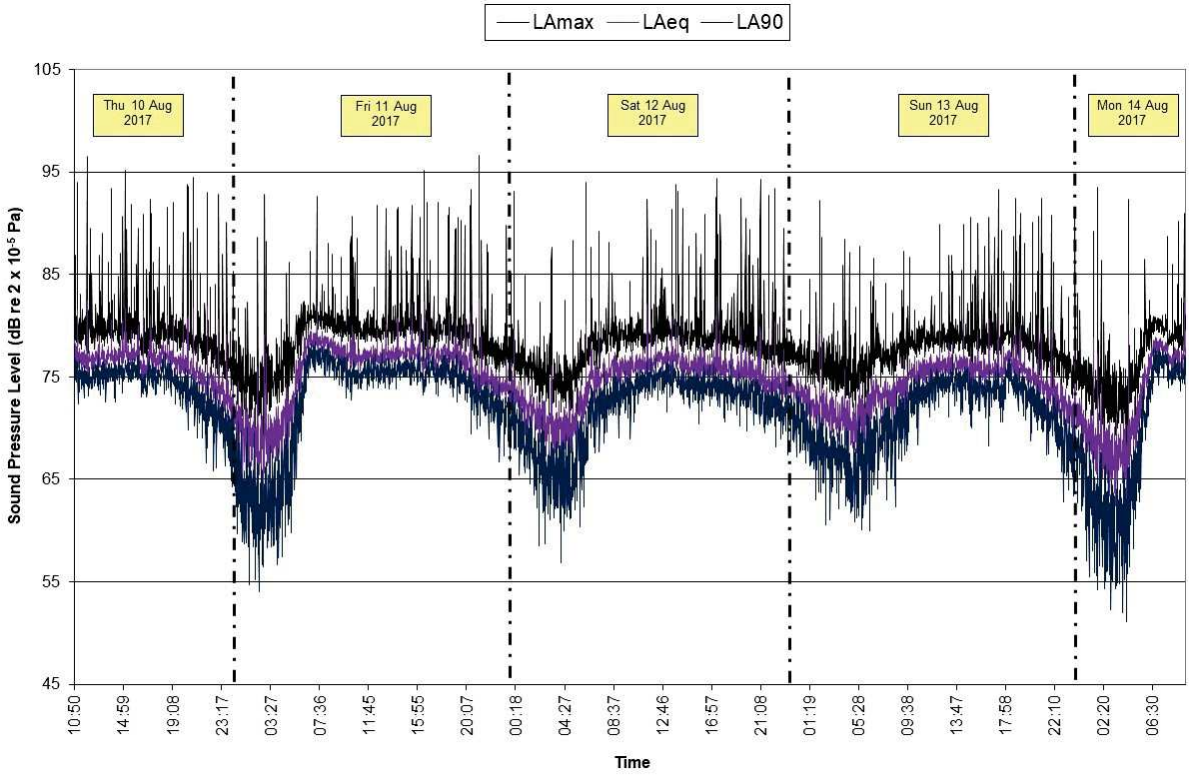


Figure 18: Position 1 noise measurements, Thursday 10 August 2017 to Monday 14 August 2017, maximum (LAmax), average (LAeq) and background (LA90) noise levels

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APPENDIX C
Noise Legislation and Guidance

Appendix C: Noise Legislation and Guidance

National Planning Policy Framework

C.1 The 'National Planning Policy Framework' (NPPF), revised in July 2021, was introduced as the current planning policy guidance within England. Paragraph 185 of the NPPF states:

'Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) Mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;

b) Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity values for this reason;"

Noise Policy Statement for England

C.2 With regard to 'adverse impacts' the NPPF refers to the 'Noise Policy Statement for England' (NPSE), which defines three categories, as follows:

- NOEL – No Observed Effect Level. This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.
- LOAEL – Lowest Observed Adverse Effect Level. This is the level above which adverse effects on health and quality of life can be detected.
- SOAEL – Significant Observed Adverse Effect Level. This is the level above which significant adverse effects on health and quality of life occur.'

C.3 The first aim of the NPSE states that significant adverse effects on health and quality of life should be avoided. The second aim refers to the situation where the impact lies somewhere between LOAEL and SOAEL, and it requires that all reasonable steps are taken to mitigate and minimise the adverse effects of noise. However, this does not mean that such adverse effects cannot occur.

Planning Practice Guidance

C.4 The Planning Practice Guidance (PPG) provides further detail about how the effect levels can be recognised. Above the NOEL noise becomes noticeable; however, it has no adverse effect as it does not cause any change in behaviour or attitude.

C.5 Once noise crosses the LOAEL threshold it begins to have an adverse effect and consideration needs to be given to mitigating and minimising those effects, taking account of the economic and social benefits being derived from the activity causing the noise.

C.6 Increasing noise exposure further might cause the SOAEL threshold to be crossed. If the exposure is above this level the planning process should be used to avoid the effect occurring by use of appropriate mitigation such as by altering the design and layout. Such decisions must be made taking account of the economic and social benefit of the activity causing the noise, but it is undesirable for such exposure to be caused.

C.7 At the highest extreme the situation should be prevented from occurring regardless of the benefits which might arise. The following Table summarises the noise exposure hierarchy.

National Planning Practice Guidance Noise Exposure Hierarchy			
Perception	**Examples of Outcomes**	**Increasing Effect Level**	**Action**
Not Present	No Effect	No Observed Effect	No specific measures required
		No Observed Effect Level	
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed adverse Effect	No specific measures required
		Lowest Observed Adverse Effect Level	
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
		Significant Observed Adverse Effect Level	
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

C.8 The PPG summarises the approach to be taken when assessing noise. It accepts that noise can override other planning concerns, but states:

"Neither the Noise Policy Statement for England nor the National Planning Policy Framework (which reflects the Noise Policy Statement) expects noise to be considered

in isolation, separate from the economic, social and other environmental dimensions of proposed development."

BS8233 Guidance on sound insulation and noise reduction for buildings

C.9 British Standard 8233 "Guidance on sound insulation and noise reduction for buildings" 2014 bases its advice on the WHO Guidelines. In addition, for internal noise levels it states:

C.10 "Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved."

C.11 Furthermore, with regard to external noise, the Standard states:

"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 dB $L_{Aeq,T}$ with ***an*** *upper guidance value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognised that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited."*

Institute of Acoustics (IOA) Good Practice Guide on the Control of Noise from Pubs and Clubs

C.12 The IOA Good Practice Guide on the Control of Noise from Pubs and Clubs *"provides guidance for the assessment and control of noise affecting noise-sensitive properties from the public and private use of public houses, hotels, discotheques, restaurants, cafes, community or village halls and other similar premises."*

C.13 The main noise sources of consideration in the document are music, signing, public address systems, childrens play areas, beer gardens, people in general, car parks and access roads, deliveries, collections, materials handling, plant and machinery and skittle alleys.

C.14 The guide does not provide criteria for when 'disturbance' is likely, however instead its intention is to assist local authorities and venue management and their staff in the prevention of noise disturbance and in investigation and resolution of noise

complaints. Its purpose is also to assist with the planning and licensing of proposed or existing premises.

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APPENDIX D
Noise Monitoring Details and Results

CLIENT:	DANIELI GROUP
PROJECT:	Stack Manchester
SUBJECT:	Appendix D: Noise Modelling
JOB NO.:	NT16247
DATE:	18th April 2023
PREPARED BY:	Lee Whitehall
REVIEWED BY	Simon Urquhart
APPROVED BY:	Simon Urquhart

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E.1 BUILDING OF THE NOISE MODELLING

E.1.1 The SoundPLAN software uses geographical information to create a model of the study area on which to generate noise contours and includes objects that affect the propagation of noise such as buildings and topography.

E.1.2 The model uses the methodology set out in ISO 9613-2:1996 'Attenuation of sound during propagation outdoors' and produced sound levels at selected receptor points and/or noise contour plots demonstrating the levels sound over a given area and at ESRs.

E.1.3 The following modelling parameters have been implemented.

Table E.1: Noise Modelling Parameters		
Parameter	**Source**	**Details**
Base Mapping Data	OS Open Map Local	SJ89NW
Building Dimensions and Elevations	Architects Plans	Architects Plans
Topography	Defra Survey Data Download	LIDAR – DTM - 1m – 2022 – SJ89NW
Source heights	Architects plans and site observations	Appendix F – Previous experience on Stack Sites
Building and Barrier absorption coefficient	ISO9613-2	0.21 to represent typical reflection loss
Propagation of Noise	ISO9613-2	$L_{ft}(DW) = L_w + D_c - A$
Ground Absorption Coefficient	ISO 9613 - 2	Hard Ground, G = 0
Maximum Order of Reflections	Wardell Armstrong – Best Practice Measures	Three

E.1.4 In order to calculate the noise levels generated by the proposed terrace, the likely noise levels generated by activities have been input into the model.

E.1.5 The operations, and noise levels used in the noise model, are described in Table E.2 below.

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Table E.2: Noise Levels Used in Modelling Scenarios				
Noise Source	**Quantity**	**Source Type**	**Sound Power Level (dB(A))**	**Source Reference**
Patrons Standing - Talking	Equivalent of 75 people (45% of total use)	Area Source	75dB Lw m /m^2	Measured Sound Level – Stack Seaburn (Appendix F)
Patrons Seated - Talking	Equivalent of 75 people (45%of total use)	Area Source	75dB Lw m /m^2	Measured Sound Level – Stack Seaburn (Appendix F)
Patrons Raised Voices and Burst of Laugher	Loud Laughing and raised voices (10% of total use)	Area Source	78.4 dB LW m / m^2	Measured Sound Level – Stack Seaburn (Appendix F)
Loud Laughing LAmax	Single loudest event during the measurement period for LAmax assessment	Point Source	99.6 dB LW	Measured Sound Level – Stack Seaburn (Appendix F)
Front of House Speakers	2 Speakers	Point Source	117dB LW	Level increased from measured level at Stack Seaburn to achieve requested level at the crowd
Stage Monitors	2 Speakers	Point Source	90dB LW	Measured Sound Level – Stack Seaburn (Appendix F)
Ground floor Music Speakers	4 Speakers	Directional Point Source	100 dB Lw	Level increased from measured level at Stack Seaburn to achieve requested level at the crowd
First floor Music Speakers	9 speakers	Directional Point Source	90 dB LW	Measured Sound Level – Stack Seaburn (Appendix F)

E.1.6 The noise emissions and specifications in Table E.2 describe the noise sources which have been included in the computer noise model at the approximate locations in which they are expected to operate, as shown on Image 1.

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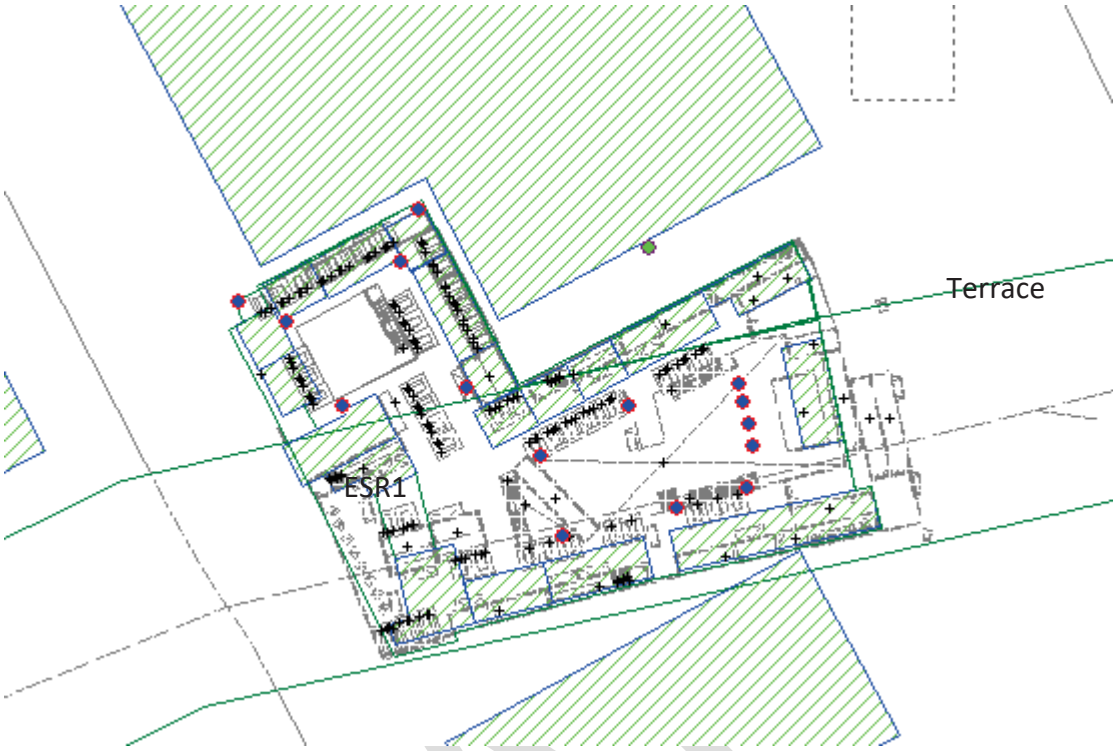


Image 1: 2D top town location of Noise Sources. Area of seating on terrace (patron noise) in Yellow and point sources indicated as blue dots showing the direction of the speakers.

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E.1.7 Speaker System

E.1.8 Due to the sensitivity of the existing sensitive receptors, the directionality of the loud speak system has been considered. Based on the observations at the Seaburn location, a typical loud speaker design has been chosen.

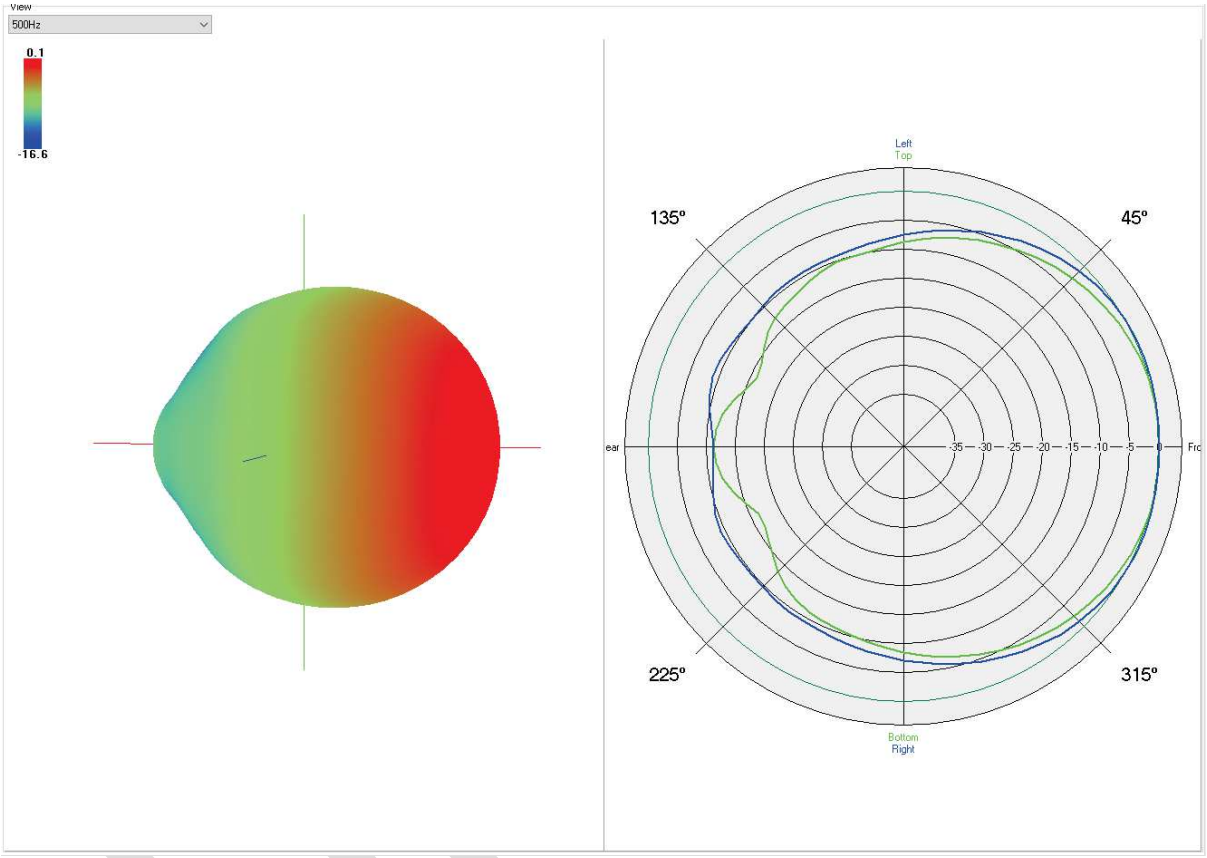


Image 2 above shows the directionality of the proposed speak system at 500Hz.

Patron Noise

E.1.9 Measurements of patron noise (conversations) were captured during monitoring at Stack Seaburn. The measurements were in the centre of the open-air venue, in-between groups of tables. The measurements were taken 1m from the nearest patrons. During the measurements the Site was operating under typical conditions with a combination of live music, and pre-recorded background music. All food vendors were open as usual. Full details of the noise survey can be found in Appendix F.

E.1.10 Therefore, this measurement is considered representative of the sound power generated from 1m^2 of the terrace. To ensure the assessment considers the terrace at

maximum capacity, the sound level has been used to cover each square meter of the seating area proposed for the terrace.

E.1.11 In addition, to be robust, it has been assumed that 45% of the patrons would be seated and 45% would be standing, giving source heights of 1.7m and 1.2m respectively. For the remaining 10% of the time, the model considers a higher sound level of group laughter and raised voices, which was also captured in proximity during our noise monitoring at Stack Seaburn. Group laughter has been modelled at a height of 1.7m to represent a worst case.

E.1.12 The noise from the proposed operation have been assessed at the ESRs. The daytime (0700-2300 hours) and the night-time (2300-0700 hours) at each floor façade.

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APPENDIX E
Stack Seaburn Acoustic Survey

Operational Acoustic Survey

CLIENT:	DANIELI GROUP
PROJECT:	Stack Seaburn
SUBJECT:	Operational Acoustic Survey
JOB NO.:	NT16247
DATE:	18th April 2023
PREPARED BY:	Lee Whitehall
APPROVED BY:	Simon Urquhart

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E.1 INTRODUCTION

E.1.1 Wardell Armstrong was commissioned by Danieli Group to undertake an operational acoustic survey of Stack Seaburn to establish operational sound levels and to create and archive of sound data. This data can be used to predict the noise emissions from future developments when assessing the potential noise impact. It can also be used to aid in the design and management of current and future Stack Sites.

E.1.2 The noise survey was undertaken on the between 15:30 on Saturday 18th February and 00:24 Sunday 19th February 2023. This day was chosen due to the site being fully operational, having capacity for 2000 people, with a combination live music, Bingo, pre-recorded music, and a DJ set. The operational schedule of events during the noise survey were as follows:

- 15:30 – 16:15 - Acoustic Band with PA system
- 16:15 – 16:45 - Break with Background music
- 16:45 – 17:30 - Acoustic Band with PA system
- 17:30 – 19:00 - Bingo
- 19:00 – 19:45 - Rock off Jukebox – Live Band
- 19:45 – 20:15 - Break with background music
- 20:15 –21:00 - Rock off Jukebox – Live Band
- 21:00 – 24:00 - DJ Set

E.2 NOISE SURVEY

E.2.1 Two noise monitors were utilised on site. One stationary monitor installed at the sound technician booth at height of 3m which will remain throughout the duration of monitoring period. The second monitor used was a handheld monitor used to take specific noise measurements and create a noise map detailing the noise levels across the site during each of the operations. Details of the noise monitors are as follows:

Table E.1: Noise Monitor Details

Name and Location	Serial Number	Before survey calibration	Post survey calibration	Drift
Svan – Stationary	60696	0.83	0.79	0.04
Fuision – Roaming	11072	0.09	0.05	-0.04

E.2.2 The roaming monitoring Locations are shown in Figures E.1 and E.2 with the results detailed below and full details have been provided in Annex A. The noise measurements were undertaken across the ground and first floors of the venue. The ground floor consists of the main stage, plaza including seating areas, and food and beverage vendors. The first floor consists of covered seating areas and food and beverage vendors. The main speaker system is located on the stage however smaller individual speakers are strategically located throughout the venue to provide an even coverage of music, without excessive sound levels for one group of speakers.

E.2.3 When monitoring the noise from the patrons, the measurements were taken in the centre of the groups of tables, approximately 1m from the closest patrons. Approximately 100 people occupied the seating area at the time of the survey. Due to the arrangement of tables each measurement was dominated by noise from several tables at once. This value therefore should not be considered to be an individual voice, rather the noise emission per m^2.

Table E.2: Noise Measurement Results

Measurement Ref	Time	Duration	Floor	Ref	LAeq,t	LAmax
M1	15:38	30 Seconds	Ground Floor	Acoustic Set	84.4	89.9
M2	15:40	30 Seconds	Ground Floor	Acoustic Set	87.8	91.5
M3	15:41	30 Seconds	Ground Floor	Acoustic Set	86.1	90.4
M4	15:42	30 Seconds	Ground Floor	Acoustic Set	80.3	83

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M5	15:42	30 Seconds	Ground Floor	Acoustic Set	85.6	91.2
M6	15:44	30 Seconds	Ground Floor	Acoustic Set	83.1	88.6
M7	15:45	30 Seconds	Ground Floor	Acoustic Set	87.5	91.2
M8	15:46	30 Seconds	Ground Floor	Acoustic Set	87.4	91.3
M9	15:49	30 Seconds	Ground Floor	Acoustic Set	88.4	92.1
M10	15:50	30 Seconds	Ground Floor	Acoustic Set	89.2	94.6
M11	15:51	30 Seconds	Ground Floor	Acoustic Set	89.1	92.1
M12	15:52	30 Seconds	Ground Floor	Acoustic Set	90.8	93.7
M13	15:55	30 Seconds	First Floor	Acoustic Set	88.6	91.1
M14	15:56	30 Seconds	First Floor	Acoustic Set	87.3	90.7
M15	15:58	30 Seconds	First Floor	Acoustic Set	86.4	89.2
M16	16:00	30 Seconds	First Floor	Acoustic Set	86.4	90.4
M17	16:01	30 Seconds	First Floor	Acoustic Set	89.2	93.8
M18	16:02	30 Seconds	First Floor	Acoustic Set	88.7	91.8
M19	16:15	30 Seconds	Ground Floor	No Music – Patron Noise	78.4	84.6
M20	16:16	30 Seconds	Ground Floor	No Music – Patron Noise	75	77.6
M21	16:17	30 Seconds	Ground Floor	No Music – Patron Noise	76.3	81
M22	16:18	30 Seconds	Ground Floor	No Music – Patron Noise	72.7	76.3
M23	16:19	30 Seconds	First Floor	No Music – Patron Noise	76.8	82.1
M24	16:20	30 Seconds	First Floor	No Music – Patron Noise	72.4	75.2
M25	16:21	30 Seconds	First Floor	No Music – Patron Noise	77.3	81.1
M26	16:22	30 Seconds	Ground Floor	No Music – Patron Noise	74.8	81.1

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M27	16:27	30 Seconds	Ground Floor	Background Music	81.9	88.1
M28	16:28	30 Seconds	Ground Floor	Background Music	82.8	91.3
M29	16:29	30 Seconds	Ground Floor	Background Music	84.5	90
M30	16:30	30 Seconds	Ground Floor	Background Music	82.8	88.4
M31	16:31	30 Seconds	Ground Floor	Background Music	80	85.7
M32	16:33	30 Seconds	Ground Floor	Background Music	86.9	91.3
M33	16:34	30 Seconds	Ground Floor	Background Music	86.2	90.1
M34	16:35	30 Seconds	Ground Floor	Background Music	81.4	86.3
M35	16:36	30 Seconds	Ground Floor	Background Music	84.9	89.4

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STACK Seaburn
Annex A

Ref	
AS	Acoustic Set
NM	No Music
BM	Background Music

Spot Measurements

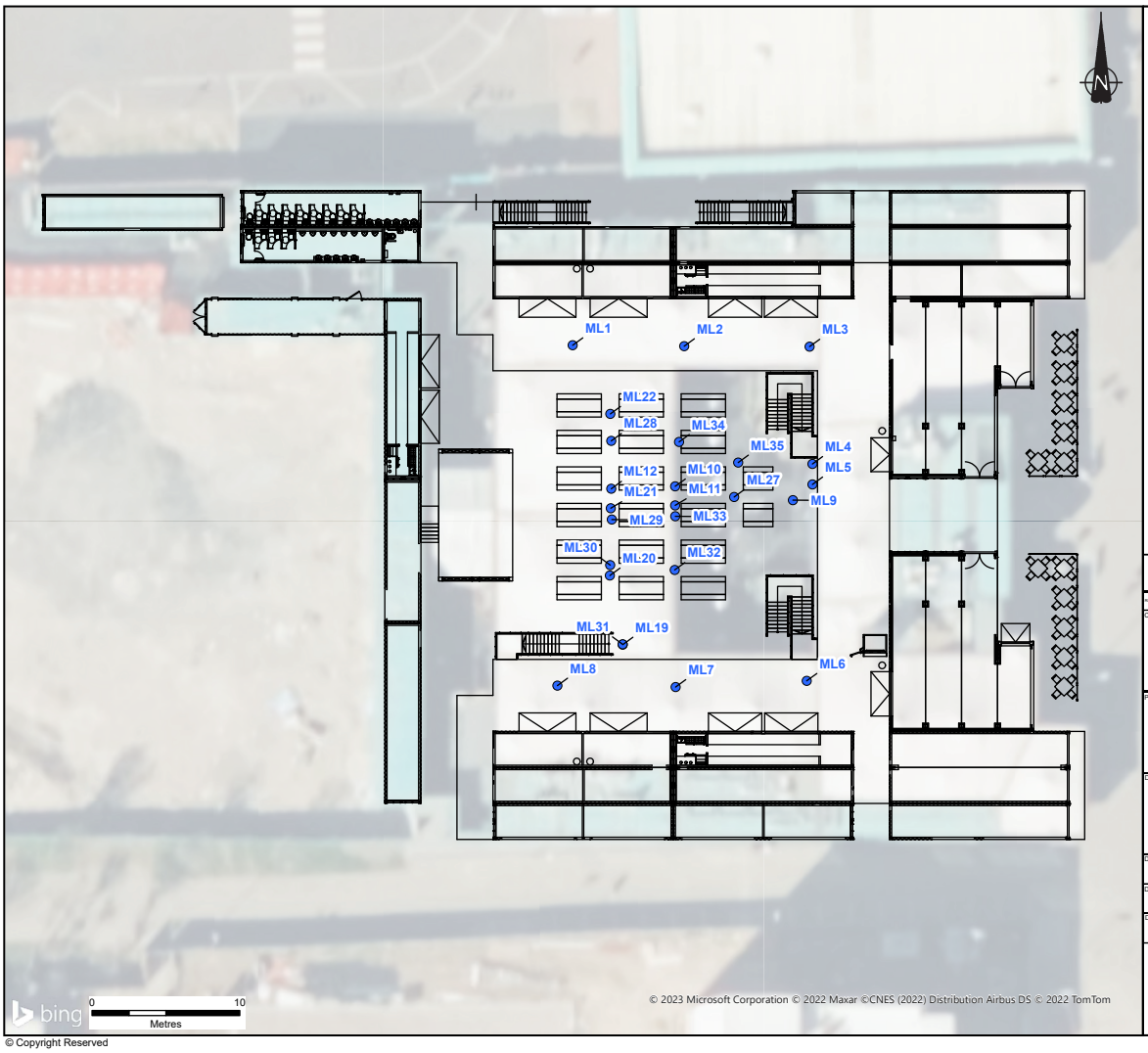
Measure Ref	Time	Duration	Floor	Ref	Comment	LAeq,t	LAmax
M1	15:38	30 Seconds	GF	AS		84.4	89.9
M2	15:40	30 Seconds	GF	AS		87.8	91.5
M3	15:41	30 Seconds	GF	AS		86.1	90.4
M4	15:42	30 Seconds	GF	AS	Taken at same location	80.3	83
M5	15:42	30 Seconds	GF	AS		85.6	91.2
M6	15:44	30 Seconds	GF	AS		83.1	88.6
M7	15:45	30 Seconds	GF	AS		87.5	91.2
M8	15:46	30 Seconds	GF	AS		87.4	91.3
M9	15:49	30 Seconds	GF	AS		88.4	92.1
M10	15:50	30 Seconds	GF	AS	Same location as M11 (Guy taking to surveyour during this measurement)	89.2	94.6
M11	15:51	30 Seconds	GF	AS	Same location as M10, little further back than M12, but ideal location for calibrating sound from gig in the centre of the space.	89.1	92.1
M12	15:52	30 Seconds	GF	AS	Middle of stage and tables, ideal location for calibrating sound from gig in the centre of the space.	90.8	93.7
M13	15:55	30 Seconds	F 1	AS		88.6	91.1
M14	15:56	30 Seconds	F 1	AS		87.3	90.7
M15	15:58	30 Seconds	F 1	AS		86.4	89.2
M16	16:00	30 Seconds	F 1	AS		86.4	90.4
M17	16:01	30 Seconds	F 1	AS		89.2	93.8
M18	16:02	30 Seconds	F 1	AS		88.7	91.8
M19	16:15	30 Seconds	GF	NM	Ladies laughing at table next to	78.4	84.6
M20	16:16	30 Seconds	GF	NM		75	77.6
M21	16:17	30 Seconds	GF	NM		76.3	81
M22	16:18	30 Seconds	GF	NM		72.7	76.3
M23	16:19	30 Seconds	F 1	NM	Same location, M23 includes guy shouting towards Lee, and girls asking him	76.8	82.1
M24	16:20	30 Seconds	F 1	NM		72.4	75.2
M25	16:21	30 Seconds	F 1	NM		77.3	81.1
M26	16:22	30 Seconds	GF	NM		74.8	81.1
M27	16:27	30 Seconds	GF	BM		81.9	88.1
M28	16:28	30 Seconds	GF	BM		82.8	91.3
M29	16:29	30 Seconds	GF	BM		84.5	90
M30	16:30	30 Seconds	GF	BM		82.8	88.4
M31	16:31	30 Seconds	GF	BM		80	85.7
M32	16:33	30 Seconds	GF	BM		86.9	91.3
M33	16:34	30 Seconds	GF	BM		86.2	90.1
M34	16:35	30 Seconds	GF	BM		81.4	86.3
M35	16:36	30 Seconds	GF	BM	Approx 1.9m from speaker (s)	84.9	89.4

Measure Ref	20 Hz	25 Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz
M1	9	17	17	23	43	58	60	61	64	65	65	71	73	73	79
M2	8	16	17	21	44	56	60	63	70	67	67	73	76	78	80
M3	18	21	20	25	38	48	58	61	64	61	65	71	72	75	77
M4	6	15	18	27	42	55	56	58	66	60	60	72	69	68	73
M5	7	15	18	26	45	53	58	68	65	67	67	70	72	75	80
M6	18	25	22	27	43	54	63	68	64	62	67	69	70	75	72
M7	9	17	18	24	46	52	59	64	67	64	67	71	73	78	79
M8	11	19	21	26	43	51	54	62	61	65	66	70	76	76	74
M9	8	16	18	24	37	49	62	65	64	62	67	69	71	79	76
M10	4	12	13	22	43	55	66	69	67	70	72	73	78	75	80
M11	4	11	13	21	44	54	65	70	66	71	72	73	79	75	80
M12	3	10	15	32	55	58	69	76	70	78	78	74	79	79	81
M13	1	7	10	23	43	53	58	65	65	71	70	74	74	81	80
M14	4	11	16	25	40	51	60	64	61	65	68	73	72	77	80
M15	10	14	19	23	37	50	55	66	62	58	68	70	72	76	75
M16	13	19	17	25	47	52	58	61	59	65	73	71	73	76	76
M17	3	8	15	22	47	56	55	59	62	66	66	70	76	80	79
M18	5	12	13	19	40	49	51	57	65	68	72	72	72	77	79
M19	8	16	21	25	30	31	35	37	42	47	49	53	56	60	66
M20	7	14	16	22	26	28	32	35	39	47	48	53	57	60	64
M21	8	13	16	22	27	34	31	36	40	47	50	54	58	61	65
M22	6	12	15	22	26	27	31	35	39	46	48	53	55	59	62
M23	6	15	16	20	26	27	31	38	41	47	50	53	56	61	66
M24	10	17	15	21	27	28	31	38	41	45	48	52	55	58	63
M25	8	14	16	20	27	29	31	37	43	49	49	52	56	61	68
M26	4	11	13	20	26	26	31	37	42	47	47	52	55	60	63
M27	5	13	15	39	53	57	61	60	66	66	62	62	67	70	69
M28	7	11	17	37	56	61	69	67	65	66	70	67	69	71	76
M29	2	9	15	35	49	58	69	66	68	66	67	69	71	73	79
M30	2	12	15	32	51	54	60	59	59	63	67	66	66	72	76
M31	5	16	17	28	41	51	56	53	58	56	61	62	62	67	70
M32	8	17	18	30	44	58	61	63	71	65	69	71	74	77	75
M33	6	14	16	30	46	60	58	62	60	57	64	68	68	75	74
M34	8	14	15	23	40	52	56	61	63	66	70	68	65	70	70
M35	12	17	19	26	37	51	58	67	66	64	69	67	66	71	72

Measure Ref	630 Hz	800 Hz	1 kHz	1.25 kHz	1.6 kHz	2 kHz	2.5 kHz	3.15 kHz	4 kHz	5 kHz	6.3 kHz	8 kHz	10 kHz	12.5 kHz	16 kHz	20 kHz
M1	75	76	74	74	69	67	66	65	63	58	57	56	51	41	30	17
M2	79	79	79	78	75	72	69	68	71	66	64	62	56	44	31	16
M3	76	77	79	77	75	70	68	70	71	64	62	58	53	43	31	16
M4	70	72	68	71	67	64	62	61	59	57	55	53	49	42	31	17
M5	74	75	75	75	74	70	70	71	65	60	59	58	53	44	32	17
M6	72	74	74	74	72	67	65	66	62	59	57	55	51	43	31	16
M7	78	78	77	79	76	71	70	71	69	63	61	59	54	45	33	17
M8	80	78	78	79	77	74	71	70	72	65	63	62	56	48	36	21
M9	81	77	80	79	79	73	71	75	77	68	66	64	61	49	38	21
M10	81	78	80	81	78	73	71	71	73	68	65	63	57	49	38	22
M11	81	78	80	80	77	73	72	72	73	67	66	62	57	48	38	21
M12	83	81	80	80	80	76	75	73	73	68	68	67	63	53	42	27
M13	76	79	79	80	77	73	73	70	67	62	59	58	54	45	36	22
M14	76	79	78	78	77	71	70	69	66	61	59	59	54	45	37	23
M15	78	77	79	76	76	72	71	71	69	62	60	58	54	44	34	20
M16	77	79	77	78	75	69	68	67	65	61	58	57	52	43	33	18
M17	78	79	82	80	80	76	74	72	71	65	63	61	58	49	38	25
M18	79	80	81	80	77	75	72	73	72	64	63	63	59	50	42	27
M19	68	71	73	70	69	66	64	62	60	55	51	47	43	35	26	15
M20	66	67	67	67	66	63	61	60	58	53	49	46	42	36	23	13
M21	67	68	68	68	68	65	62	60	57	52	48	46	41	37	23	13
M22	64	65	64	64	63	60	59	57	54	49	46	44	40	32	20	10
M23	68	67	69	69	68	65	65	65	61	52	48	46	42	33	23	13
M24	64	64	63	63	62	61	61	59	56	50	46	45	40	30	19	9
M25	69	70	69	68	67	64	65	62	57	52	48	45	40	32	22	19
M26	68	67	68	65	64	61	62	59	55	50	46	43	38	29	19	8
M27	72	74	74	72	71	69	67	66	64	61	57	57	52	43	29	14
M28	73	73	72	71	70	67	65	64	62	60	58	57	52	46	38	20
M29	75	73	73	71	72	72	69	66	65	61	58	58	54	49	42	24
M30	75	73	73	70	71	70	69	66	66	62	58	57	52	47	41	22
M31	72	72	71	70	70	68	66	64	61	56	52	50	46	39	30	13
M32	77	80	78	77	75	73	72	70	66	63	62	58	52	41	28	15
M33	77	78	77	77	77	74	74	71	66	64	62	57	52	43	29	15
M34	73	73	71	71	69	68	66	63	60	57	57	52	46	36	21	9
M35	74	77	77	75	74	73	70	71	69	71	68	65	59	53	40	18

Running Order	
Acoustic Set	**15:30**
Break	**16:15**
Acoustic Set	**16:45**
Bingo (approx)	**17:30**
Rock oF 1 Jukebox (Band)	**19:00**
Break (Approx)	**19:45**
Rock oF 1 Jukebox (Band) (Approx)	**20:15**
DJ set (Approx)	**21:00**

Summary of Events			
Name	**Duration hh:mm**	**Laeq**	**LAmax**
Acoustic Band	00:45	86.7	98.3
Talking	00:09	74.3	90
Background Music	00:19	88.6	104.9
Bingo	01:30	87.9	104
Rock off Jukebox	00:45	91.3	105
DJ	02:59	87.3	106.4



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Stack Seaburn Ground Floor

Noise Monitoring Locations

Notes:

Boundaries are indicative. Aerial imagery shown for context purposes only.

REVISION	DETAILS	DATE	DRAWN	CHKD	APP'D

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STACK WHITLEY BAY

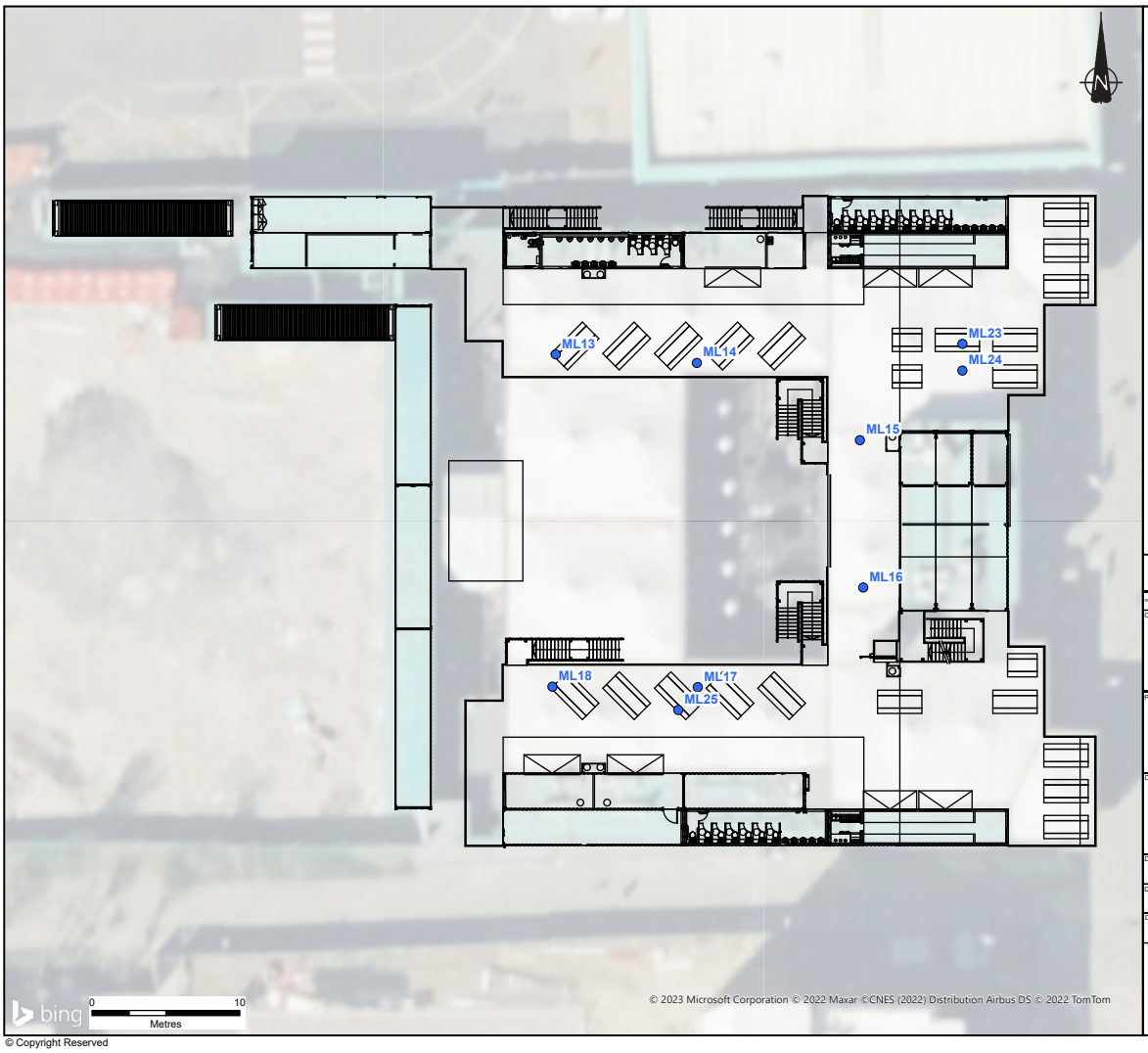
DRAWING TITLE

ANNEX A-1
SEABURN STACK GROUND FLOOR
NOISE MONITORING LOCATIONS

DRG No.		REV
NT16226-Annex A-1		A
DRG SIZE	SCALE	DATE
A3	1:250	08/03/2023
DRAWN BY	CHECKED BY	APPROVED BY
EF	LW	SU

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KEY

Stack Seaburn First Floor

Noise Monitoring Locations

Notes:

Boundaries are indicative. Aerial imagery shown for context purposes only.

REVISION	DETAILS	DATE	DRAWN	CHKD	APP'D

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DRAWING TITLE

ANNEX A-2
SEABURN STACK FIRST FLOOR
NOISE MONITORING LOCATIONS

DRG No.		REV
NT16226-Annex A-2		A
DRG SIZE	SCALE	DATE
A3	1:250	08/03/2023
DRAWN BY	CHECKED BY	APPROVED BY
EF	LW	SU

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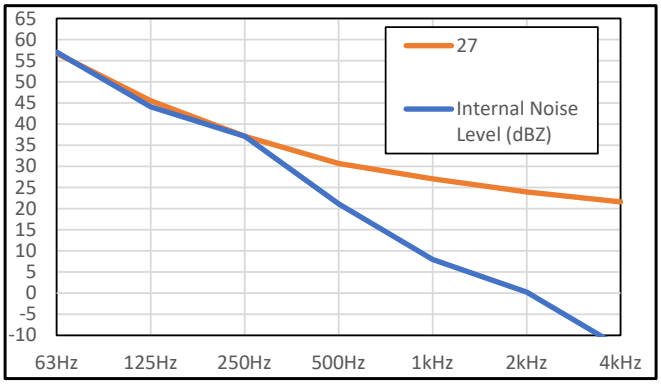
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APPENDIX F
NR Curves

Entertainment - Amplified Music

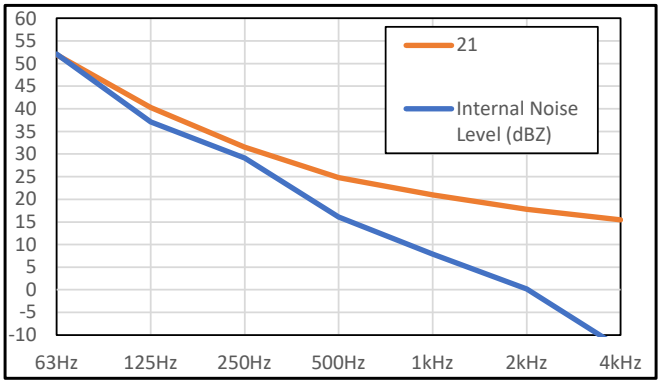
NR Curve Assessment - ESR 6 Floors 10+ Daytime

Frequency (Hz)	External Noise Level (dBZ)	Reduction from façade	Internal Noise Level (dBZ)	27
63Hz	73	16	57	57
125Hz	63	19	44	45
250Hz	56	19	37	37
500Hz	50	29	21	31
1kHz	43	35	8	27
2kHz	35	35	0	24
4kHz	22	35	-13	22
Overall	**73.6**			



NR Curve Assessment - ESR 6 Floors 10+ Night Time

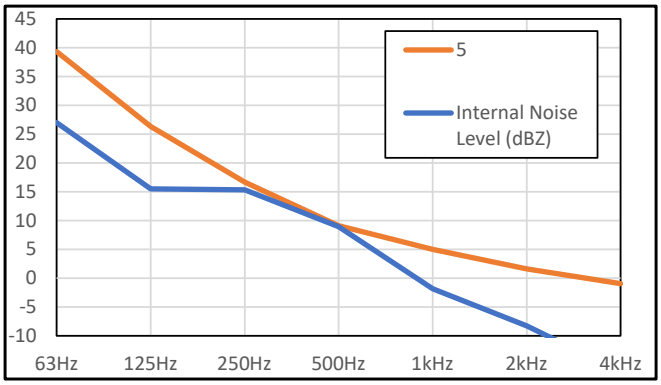
Frequency (Hz)	External Noise Level (dBZ)	Reduction from façade	Internal Noise Level (dBZ)	21
63Hz	73	21	52	52
125Hz	63	26	37	40
250Hz	56	27	29	32
500Hz	50	34	16	25
1kHz	43	35	8	21
2kHz	35	35	0	18
4kHz	22	35	-13	15
Overall	**73.6**			



Cumulative - All Operational Sources

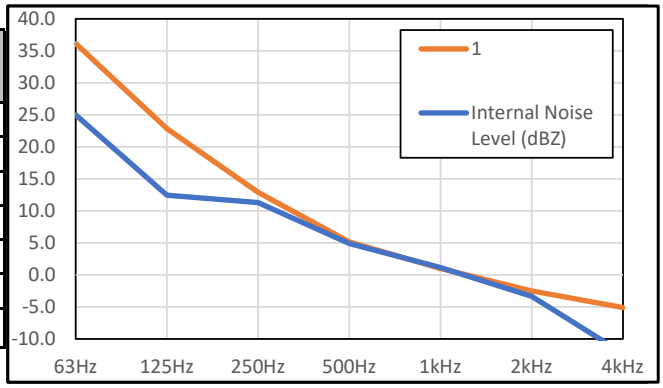
NR Curve Assessment - ESR 1 Living Rooms

Frequency (Hz)	External Noise Level (dBZ)	Reduction from façade	Internal Noise Level (dBZ)	5
63Hz	46	19	27	39
125Hz	38	23	15	26
250Hz	38	23	15	17
500Hz	39	30	9	9
1kHz	36	38	-2	5
2kHz	32	40	-8	2
4kHz	23	39	-16	-1
Overall	**48.3**			



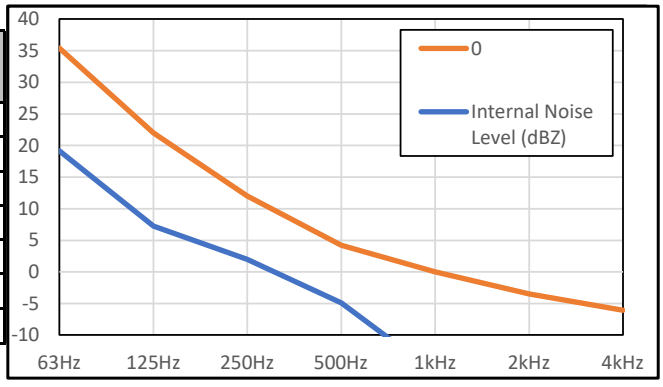
NR Curve Assessment - ESR 1 Bedrooms

Frequency (Hz)	External Noise Level (dBZ)	Reduction from façade	Internal Noise Level (dBZ)	1
63Hz	46	21	25.0	36.2
125Hz	38	26	12.5	22.9
250Hz	38	27	11.3	12.9
500Hz	39	34	4.9	5.2
1kHz	36	35	1.1	1.0
2kHz	32	35	-3.3	-2.5
4kHz	23	35	-12.2	-5.1
Overall	**48.3**			



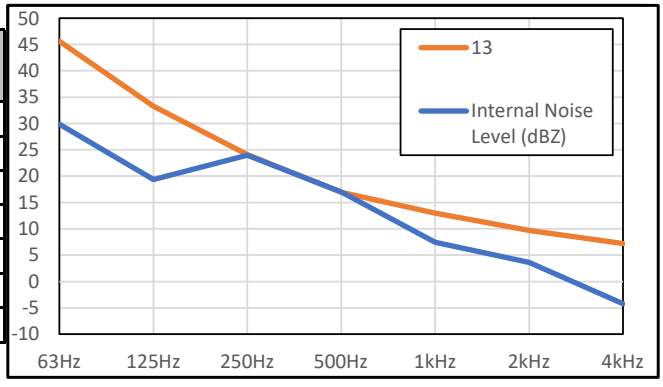
NR Curve Assessment - ESR 2 Living Rooms and Bedrooms

Frequency (Hz)	External Noise Level (dBZ)	Reduction from façade	Internal Noise Level (dBZ)	0
63Hz	42	23	19	35
125Hz	33	26	7	22
250Hz	30	28	2	12
500Hz	30	35	-5	4
1kHz	25	41	-16	0
2kHz	20	44	-24	-4
4kHz	11	45	-34	-6
Overall	**43.2**			



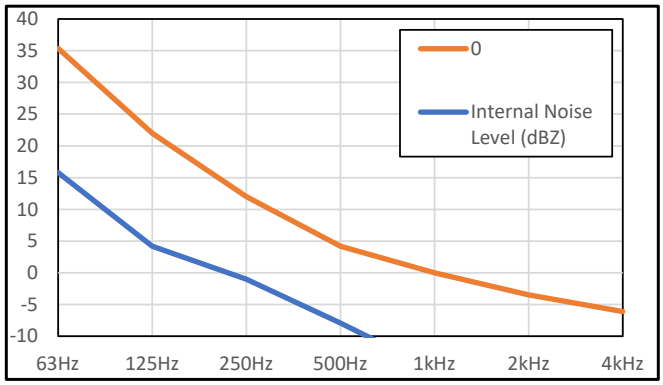
NR Curve Assessment - ESR 3

Frequency (Hz)	External Noise Level (dBZ)	Reduction from façade	Internal Noise Level (dBZ)	13
63Hz	49	19	30	46
125Hz	42	23	19	33
250Hz	47	23	24	24
500Hz	47	30	17	17
1kHz	43	36	7	13
2kHz	40	36	4	10
4kHz	32	36	-4	7
Overall	**53.6**			



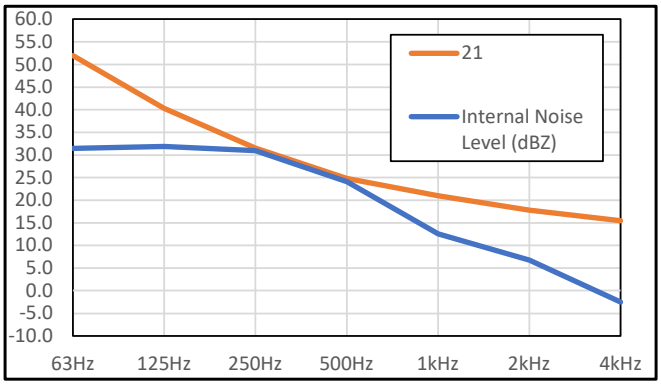
NR Curve Assessment - ESR 4

Frequency (Hz)	External Noise Level (dBA)	Reduction from façade	Internal Noise Level (dBZ)	0
63Hz	41	25	16	35
125Hz	31	27	4	22
250Hz	29	30	-1	12
500Hz	29	37	-8	4
1kHz	26	41	-15	0
2kHz	20	44	-24	-4
4kHz	11	45	-34	-6
Overall	**41.9**			



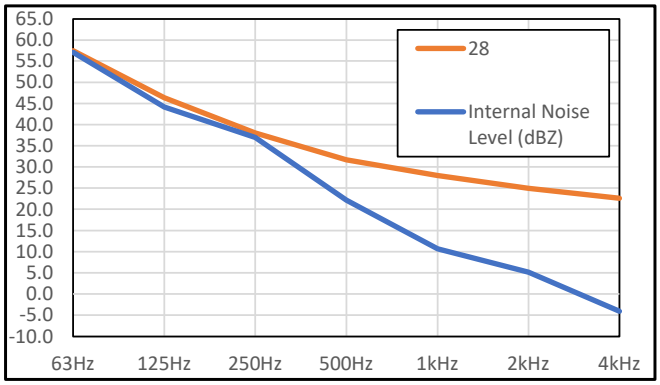
NR Curve Assessment - ESR 5

Frequency (Hz)	External Noise Level (dBZ)	Reduction from façade	Internal Noise Level (dBZ)	21
63Hz	50.5	19	31.5	52.0
125Hz	54.9	23	31.9	40.3
250Hz	54.0	23	31.0	31.5
500Hz	54.1	30	24.1	24.8
1kHz	48.6	36	12.6	21.0
2kHz	42.8	36	6.8	17.8
4kHz	33.5	36	-2.5	15.4
Overall	**60.1**			



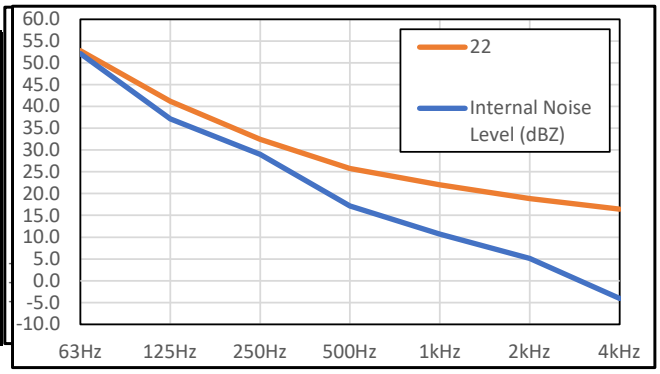
NR Curve Assessment - ESR 6 Living Room

Frequency (Hz)	External Noise Level (dBZ)	Reduction from façade	Internal Noise Level (dBZ)	28
63Hz	73.1	16	57.1	57.5
125Hz	63.1	19	44.1	46.4
250Hz	56.0	19	37.0	38.0
500Hz	51.2	29	22.2	31.6
1kHz	45.7	35	10.7	28.0
2kHz	40.1	35	5.1	24.9
4kHz	30.9	35	-4.1	22.6
Overall	**73.6**			



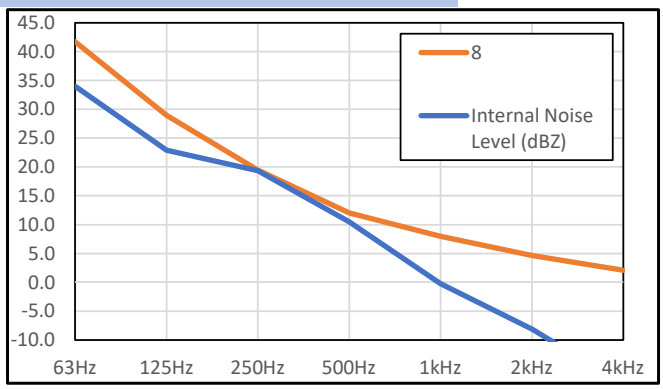
NR Curve Assessment - ESR 6 Bedroom

Frequency (Hz)	External Noise Level (dBZ)	Reduction from façade	Internal Noise Level (dBZ)	22
63Hz	73.1	21	52.1	52.8
125Hz	63.1	26	37.1	41.1
250Hz	56.0	27	29.0	32.5
500Hz	51.2	34	17.2	25.8
1kHz	45.7	35	10.7	22.0
2kHz	40.1	35	5.1	18.8
4kHz	30.9	35	-4.1	16.5
Overall	**73.6**			



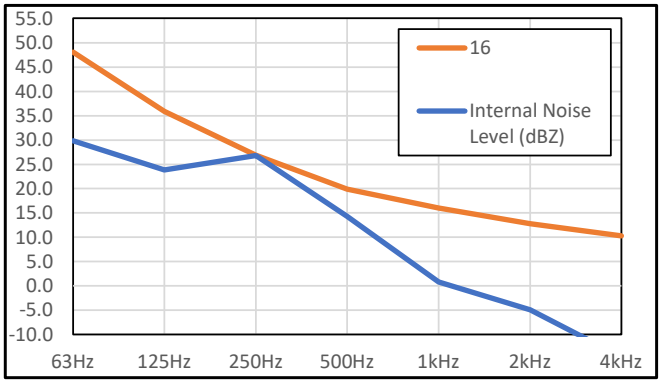
NR Curve Assessment - ESR 7

Frequency (Hz)	External Noise Level (dBZ)	Reduction from façade	Internal Noise Level (dBZ)	8
63Hz	57.0	23	34.0	41.7
125Hz	48.9	26	22.9	29.0
250Hz	47.4	28	19.4	19.4
500Hz	45.4	35	10.4	12.0
1kHz	40.7	41	-0.3	8.0
2kHz	35.9	44	-8.1	4.6
4kHz	27.3	45	-17.7	2.1
Overall	**58.4**			



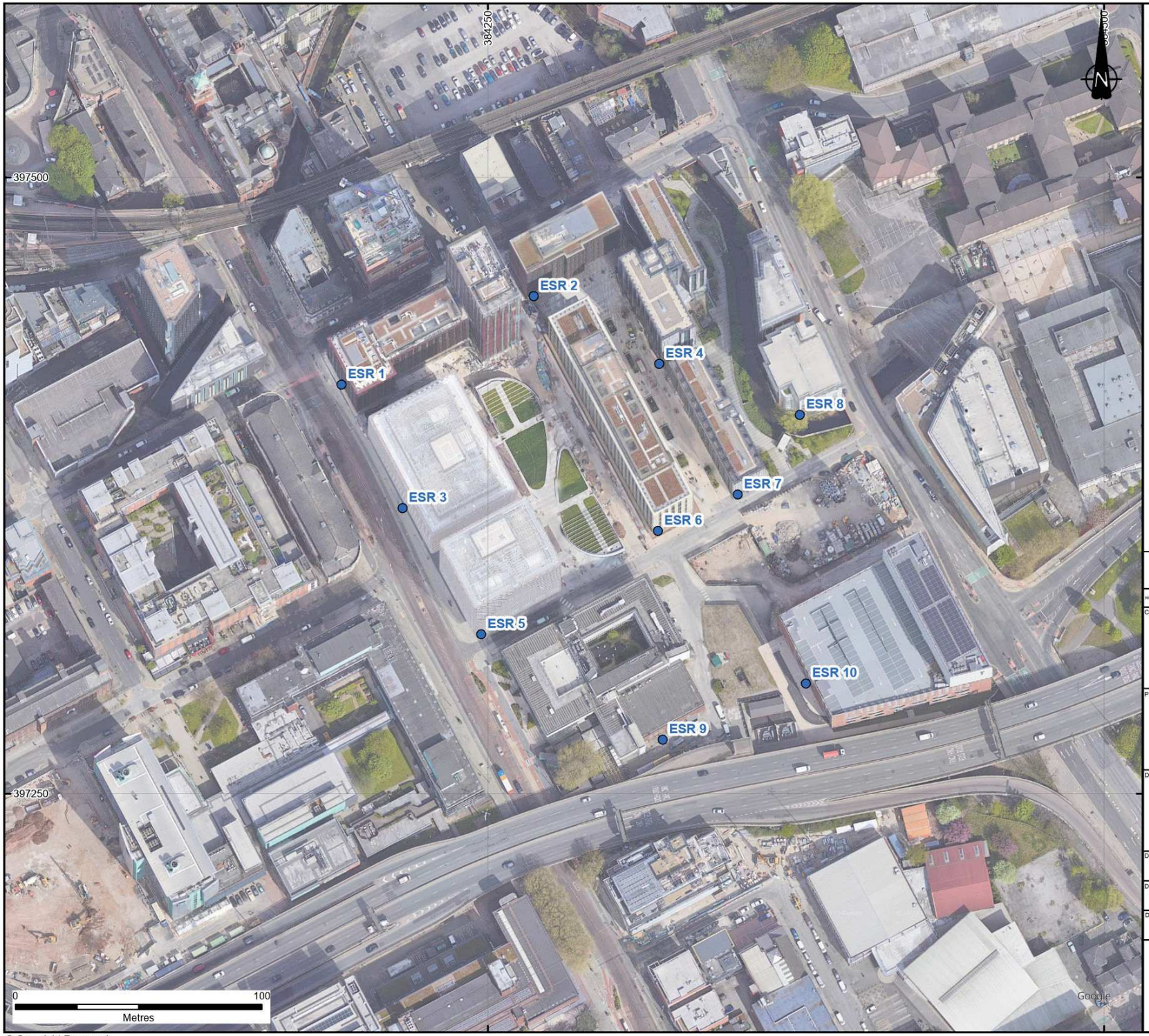
NR Curve Assessment - ESR 8

Frequency (Hz)	External Noise Level (dBA)	Reduction from façade	Internal Noise Level (dBZ)	16
63Hz	45.8	16	29.8	48.0
125Hz	42.8	19	23.8	35.9
250Hz	45.8	19	26.8	26.9
500Hz	43.3	29	14.3	19.9
1kHz	35.8	35	0.8	16.0
2kHz	30.0	35	-5.0	12.7
4kHz	20.4	35	-14.6	10.3
Overall	**50.9**			



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FIGURES



KEY

- Noise Sensitive Receptors

Notes:

Boundaries are indicative. Aerial imagery shown for context purposes only.

REVISION	DETAILS	DATE	DRAWN	CHK'D	APP'D

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STACK MANCHESTER

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FIGURE 1 - NOISE SENSITIVE RECEPTORS LOCATION PLAN

DRG No.		REV
NT16247-001		A
DRG SIZE	SCALE	DATE
A3	1:1,500	18/04/2023
DRAWN BY	CHECKED BY	APPROVED BY
EF	LW	SU

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Key

- Area
- Existing Buildings
- Road
- Point source
- Wall
- Wall
- Receiver

Daytime L_{Aeq} dB

<=	45.0
45.0 -	47.0
47.0 -	49.0
49.0 -	51.0
51.0 -	53.0
53.0 -	55.0
55.0 -	57.0
57.0 -	59.0
59.0 -	61.0
>	61.0

CLIENT:	Danieli Group
PROJECT:	Stack Manchester
TITLE:	Figure 2 - Entertainment Noise
DRG NO:	NT16247/002
REV:	A
DRG SIZE:	A3
SCALE:	1:1000
DATE:	12/04/2023
DRAWN BY	LW
CHECKED BY	SU
APPROVED BY	SU

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Key

- Area
- Existing Buildings
- Road
- Point source
- Wall
- Receiver
- First Floor

Daytime L_{Aeq} dB

<=	45.0
45.0 -	47.0
47.0 -	49.0
49.0 -	51.0
51.0 -	53.0
53.0 -	55.0
55.0 -	57.0
57.0 -	59.0
59.0 -	61.0
>	61.0

CLIENT: Danieli Group		
PROJECT: Stack Manchester		
TITLE: Figure 3 - Parton Noise		
DRG NO: NT16247/003		REV: A
DRG SIZE: A3	SCALE: 1:1000	DATE: 12/04/2023
DRAWN BY: LW	CHECKED BY: SU	APPROVED BY: SU

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Key

- Area
- Existing Buildings
- Road
- Point source
- Wall
- Receiver
- First Floor

Daytime L_{Aeq} dB

<=	20.0
20.0 -	22.0
22.0 -	24.0
24.0 -	26.0
26.0 -	28.0
28.0 -	30.0
30.0 -	32.0
32.0 -	34.0
34.0 -	36.0
>	36.0

CLIENT: Danieli Group		
PROJECT: Stack Manchester		
TITLE: Figure 4 - Plant Noise		
DRG NO: NT16247/004		REV: A
DRG SIZE: A3	SCALE: 1:1000	DATE: 12/04/2023
DRAWN BY: LW	CHECKED BY: SU	APPROVED BY: SU

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Key

- Existing Buildings
- Area source
- Point source
- Road
- Wall
- Receiver
- First Floor

Daytime L_{Aeq} dB

<=	45.0
45.0 -	47.0
47.0 -	49.0
49.0 -	51.0
51.0 -	53.0
53.0 -	55.0
55.0 -	57.0
57.0 -	59.0
59.0 -	61.0
>	61.0

CLIENT: Danieli Group		
PROJECT: Stack Manchester		
TITLE: Figure 5 - Cumulative Noise		
DRG NO: NT16247/005		REV: A
DRG SIZE: A3	SCALE: 1:1000	DATE: 12/04/2023
DRAWN BY: LW	CHECKED BY: SU	APPROVED BY: SU

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