

fisher acoustics

Symphony Park, Manchester

Environmental Noise Study

March 2021

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Flint Glass Works, 64 Jersey Street, Manchester, M4 6JW

0161 605 0905 

info@fisheracoustics.co.uk 

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CLIENT BRUNTWOOD LIMITED
YORK HOUSE
YORK STREET
MANCHESTER
M2 3BB

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AUTHOR MATT FISHER, BENG (HONS) CENG MIOA

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1.0 SUMMARY

Fisher Acoustics Ltd has been commissioned by Bruntwood LG Limited to carry out an environmental noise assessment relating to the holding of external entertainment events at Symphony Park, Circle Square, Manchester.

Music noise limits have been established at nearby residential and commercial receptors in line with Manchester City Council's published guidance.

Computer modelling studies have been undertaken to calculate the potential music noise levels at nearby noise sensitive receptors due to external music events at Symphony Park.

The calculated noise levels at residential properties within the Circle Square estate exceed the published guidelines of Manchester City Council. However, it is understood that the holding of external music and entertainment events at Circle Square is part of the offer to potential residents of Circle Square, such that residents are fully aware of the potential for disruption during these events. As such, if complaints do occur, these would be managed by the operators of the Circle Square residential buildings.

Similarly, the calculated noise levels at the office buildings within the Circle Square estate exceed the published guidelines of Manchester City Council. However, it is understood that the potential for disruption during external music and entertainment events at Circle Square is communicated to office tenants. As such, if complaints do occur these would be managed by the Landlord of the Circle Square office buildings.

The calculated noise levels at the great majority of residential properties beyond the Circle Square estate comply with the published guidelines of Manchester City Council. However, there are a number of individual apartments and hotel rooms on Charles Street at which compliance is not expected.

In particular, an excess of 11dB(A) has been calculated at eight apartments within Bracken House. In addition, there are fifty three apartments within Bracken House that may experience noise levels that are between 5 dB(A) and 8dB(A) in excess of Manchester City Council's guideline noise limits for venues that hold twelve to thirty events per year.

Whilst there is therefore expected to be a short-term dis-benefit to a relatively small number of residents, it may be considered that the economic and social benefits that the proposed events bring about could offset the predicted dis-benefit.

2.0 INTRODUCTION

Planning permission was granted in June 2016 at Circle Square for two buildings of eighteen and fourteen storeys (Blocks 2 and 4) that comprise offices with ground and mezzanine floor commercial uses and a rooftop restaurant, a basement pavilion building for events and music use (Block 3) and the creation of a public green space (application reference 111025/FO/2016/C1).

The planning approval includes the following noise-related conditions with regard to use of the external space:

17) Before any use hereby approved commences, within (a) each of the ground floor units; (b) the Pavilion and (c) external Events Space details of the proposed operating hours shall be submitted to and approved in writing by the City Council as local planning authority. The units shall not be operated outside the hours approved in discharge of this condition.

Reason - In interests of residential amenity in order to reduce noise and general disturbance in accordance with saved policy DC26 of the Unitary Development Plan for the City of Manchester and policies SP1 and DM1 of the Core Strategy.

30) No amplified sound or any music shall be produced or played in any part of the site outside of the building other than in accordance with a scheme detailing the levels at which any music shall be played and the hours during which it shall be played which has been submitted to and approved in writing by the City Council as local planning authority.

Reason - In interests of residential amenity in order to reduce noise and general disturbance in accordance with saved policy DC26 of the Unitary Development Plan for the City of Manchester and policies SP1 and DM1 of the Core Strategy.

Annex 2 of the Premises Licence for the public realm at Circle Square (premises licence number 216698, dated 30 August 2018) includes the following conditions related to noise

17 Noise from amplified music or voices shall not be such as to cause a noise nuisance to occupants of nearby premises.

18 No noise shall emanate from the premises nor vibration be transmitted through the structure of the premises which gives rise to a nuisance.

Fisher Acoustics Ltd has been commissioned by Bruntwood LG Limited to carry out an environmental noise assessment for the public realm which responds to condition 30 of the planning approval and the noise-related conditions within the public realm premise licence.

This report includes the results of environmental noise surveys at receptors close to and around the site and the determination of music noise limits in line with published guidance. The results and implications of acoustic modelling studies to assess the propagation of music noise from the events space is presented.

The steps undertaken in compiling this study are as follows:

- Reference to previous daytime and night time environmental noise surveys at receptors at and around the site in order to determine the existing levels of noise at sensitive receptors around the site
- Determination of maximum allowable external music noise levels at noise sensitive receptors to comply with Manchester City Council's published guidance
- Modelling of music noise propagation from the proposed location of loudspeakers
- Comparison of calculated music noise levels at noise sensitive receptors with published guidance
- Determination of potential for disturbance due to external music noise levels from events

3.0 DESCRIPTION OF SITE

Symphony Park is located on the southern edge of Manchester City Centre within the Circle Square development on Oxford Road. The Circle Square site is bounded by Oxford Road to the west, Charles street to the north, the River Medlock to the east and the A57(M) Mancunian Way to the south.

Symphony Park lies within the interior of Circle Square and is bounded by Blocks 2 and 4 (office buildings), Blocks 6, 7 and 8 (residential buildings) and by Brancaster Road.

Oxford Road is a busy road into the centre of Manchester. Between 6am and 9pm, the section of Oxford Road adjacent to Circle Square is closed to all traffic with the exception of buses, taxis and permit holders.

The A57(M) Mancunian Way is a heavily trafficked road that forms part of the Manchester Inner Ring Road.

Charles Street is a reasonably busy road that normally experiences heavy pedestrian footfall during the evening and night, particularly at the weekend, due to local bars, clubs and music venues. Brancaster Road is lightly trafficked.

The buildings in the vicinity of the site include multi-storey residential buildings, nightclubs, bars, hotels, banks and shops.

Figure 1 shows the location of Symphony Park in the context of the surrounding roads and buildings.

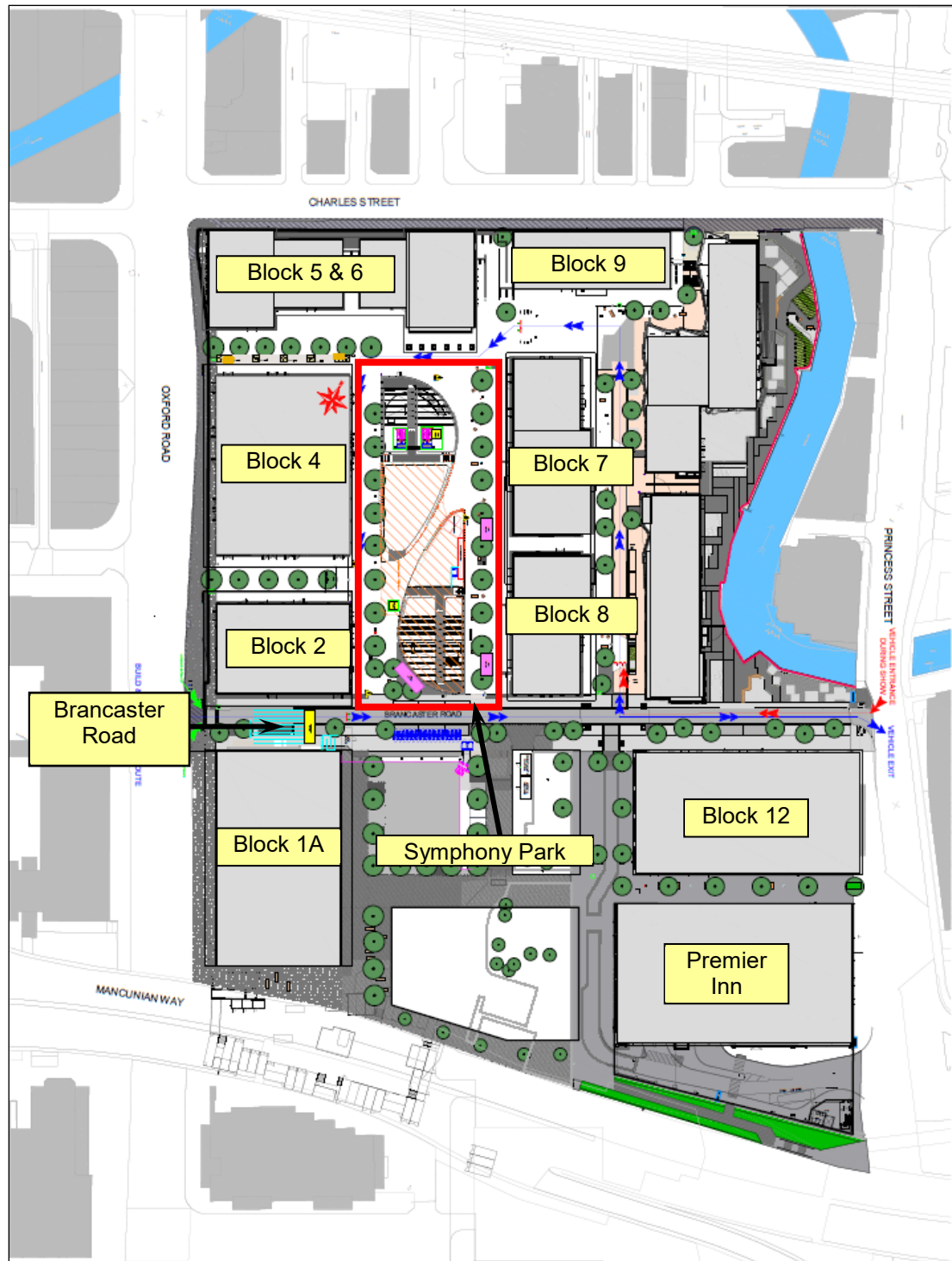


Figure 1: Development site plan (edged red) in context of surroundings roads and buildings

4.0 PROPOSED EVENT LAYOUTS

On non-event days, Symphony Park will be open to the public. For events, the site will be fenced off and only ticket and permit holders would be allowed to access the Park. Additional infrastructure would be brought in to support the staging of events.

Service vehicle access would be via Brancaster Road off Oxford Road and Princess Street. Service vehicle egress is via Brancaster Road onto Princess Street.

The stage would be constructed at the north pavilion end of Symphony Park. Customers would enter the site at the Brancaster Road entrance off Oxford Road, entering Symphony Park at the southwest corner. All other entrances and exits to Symphony Park would be used only as emergency exits until the end of a show.

At the end of a show, exits on the north and west of the park will be opened to allow supervised egress onto Charles Street and Oxford Road.

The proposed stage curfew time is 11pm. The proposed audience capacity for a 'Headline' stage event is 1800.

Figure 2 shows the proposed site layout during events that employ a large main stage. Figures 3 and 4 show the stage and audience areas for main stage events and screening events.

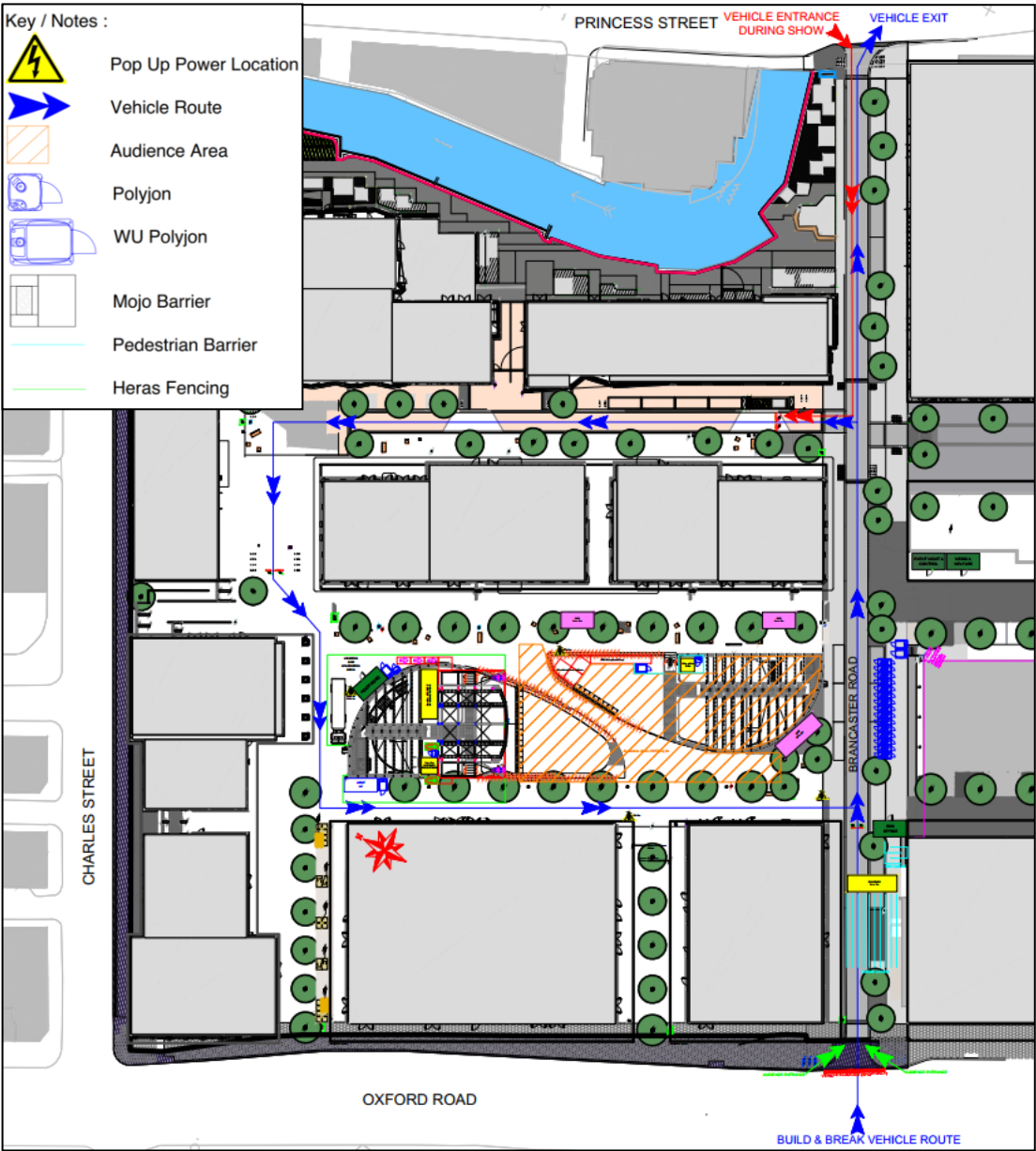


Figure 2: Proposed site layout for large main stage events

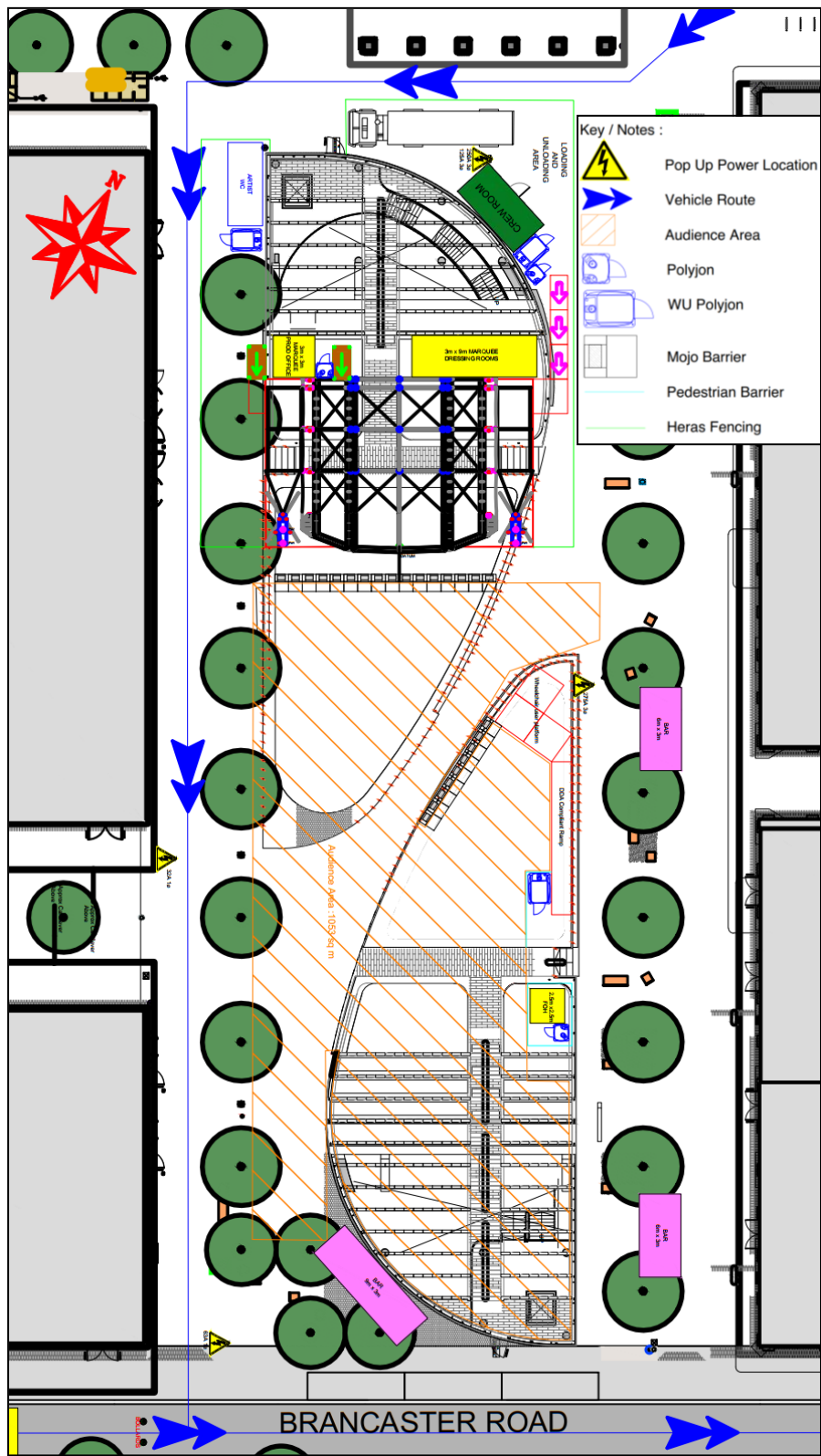


Figure 3: Proposed layout for large main stage events

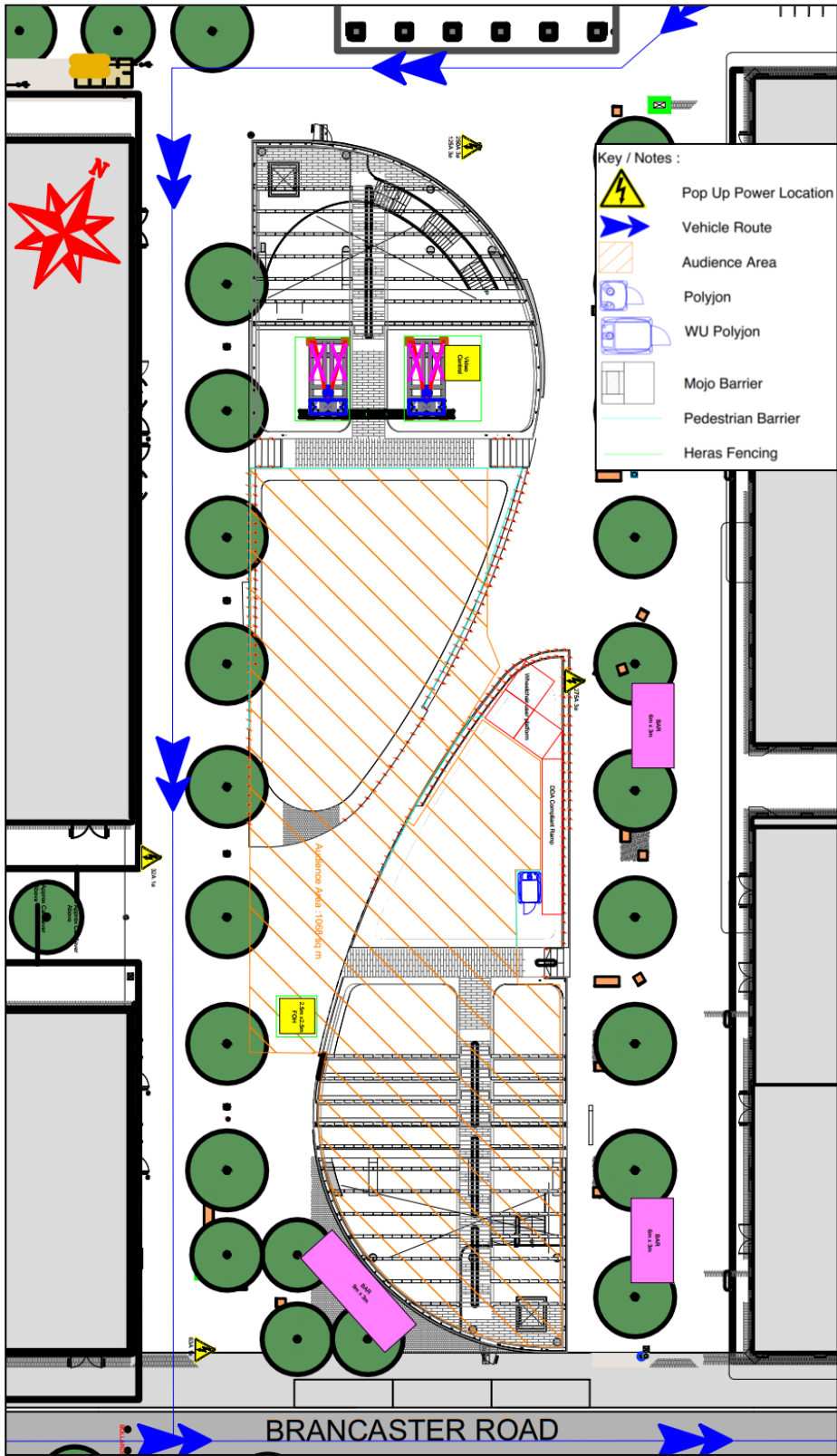


Figure 4: Proposed layout for screening events

There is the potential for noise generation during events from the following aspects:

1. PA loudspeakers
2. Audience/patron noise

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

5.0 RELEVANT GUIDANCE DOCUMENTS

National Planning Policy

The National Planning Policy Framework (NPPF), published in February 2019 by the Ministry of Housing, Communities and Local Government 'sets out the Government's planning policies for England and how these are expected to be applied'.

Clause 170 of the National Planning Policy Framework states that 'Planning policies and decisions should contribute to enhance the natural and local environment by ...preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability'.

Clause 180 of the National Planning Policy Framework states that '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 value for this reason; and
- c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.'

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, Food 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.

Planning Practice Guidance – Noise, is a web-based resource provided by the Department for Communities and Local Government (last revision date July 2019) which gives guidance on Planning considerations in relation to noise.

The document identifies the subjective grading of noise without reference to objective measurement parameters. The document states that noise that causes an adverse effect should be mitigated but advises that for certain adverse effect levels, account should be taken of 'the economic and social benefits being derived from the activity causing the noise'.

Local Planning Policy

The local planning context is provided by Manchester's Local Development Framework, Core Strategy, Development Plan Document 2012-2027. The Document was adopted on 11th July 2012.

With regard to noise, Policy DM1, Development Management, states that 'all development should have regard to the following specific issues for which more detailed guidance may be given within a supplementary planning document: 'effects on amenity, including privacy, light, noise, vibration, air quality, odours, litter, vermin, birds, road safety and traffic generation. This could also include proposals which would be sensitive to existing environmental conditions, such as noise.

6.0 PUBLISHED GUIDANCE ON ENVIRONMENTAL NOISE

Music noise from open air concerts

Manchester City Council published 'Guidance on noise control for open air concerts and events' in October 2018. This document gives external noise limits at noise sensitive buildings during concerts. The noise criteria within the document are derived from the Code of Practice on Environmental Noise Control at Concerts, published by the Noise Council in 1995.

Table 1 identifies the applicable guideline noise limits for the 'Music Noise Level' (MNL) at a position 1 metre from the external façade of any noise sensitive premises. The noise limits are applicable for events held between the hours of 0900 and 2300.

Concert days per calendar year, per venue	Venue Category	Guideline
1 to 3	Urban Stadia or Arenas	The MNL should not exceed 75 dB LAeq over a 15 minute period
1 to 3	Other Urban and Rural Venues	The MNL should not exceed 65 dB LAeq over a 15 minute period
4 to 12	All Venues	The MNL should not exceed the background noise level by more than 15 dB LAeq over a 15 minute period

Table 1: MCC guideline music noise limits for concerts

MCC's guidance document does not define 'urban stadia' or 'other urban venues'. However, the Code of Practice from which the MCC criteria have been taken defines the venues as follows:

- Urban Stadia or Arenas: A regular venue for major sporting or similar events in an urban area
- Other Urban Venue: An urban park or similar area which is not normally used for major organised events

Noise sensitive premises are defined in the guidance 'includes premises used for residential purposes, hospitals or similar institutions, education establishments (when in use), or places of worship (during recognised times and days of worship) or any premises used for any other purpose likely to be affected by the music noise'.

For the purposes of this assessment, we have assumed that office buildings are 'noise sensitive premises', although consideration should be given to the levels of occupation of the offices at the time of events

Patron Noise

Manchester City Council's 'Guidance on noise control for open air concerts and events' does not provide criteria in relation to audience noise.

The only reference to audience noise in the document is in relation to the measuring of noise levels during an event, as follows: 'When monitoring noise levels, the sound of the audience applause can be a significant contributor, especially at the mixing desk. It is not possible to address this issue precisely; instead it is recommended that any such effect be noted [during the measurement]'. The document therefore appears to accept that audience noise as an inevitable consequence of open air concerts.

7.0 ENVIRONMENTAL NOISE SURVEYS

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

The long-term noise environment at noise sensitive properties around the site is principally determined by road traffic on Oxford Road and the Mancunian Way.

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

The measured noise levels have been used to establish the allowable music noise level at receptors based on the pre-existing background noise level at the receptors

8.0 NOISE PROPAGATION FROM PROPOSED DEVELOPMENT

The propagation of music noise from Symphony Park has been predicted using CadnaA 3D noise modelling software, which implements the methodologies of ISO 9613-2: 1996 'Acoustics- attenuation of sound during propagation outdoors – Part 2: General method of calculation'.

The model is based on the main stage layout identified in Figure 3. The model is based on the generation of a music noise level of 95dB LAeq in the central audience area.

Figure 5 shows the layout of the model (viewpoint is positioned to the south east of Circle Square, looking approximately north west).

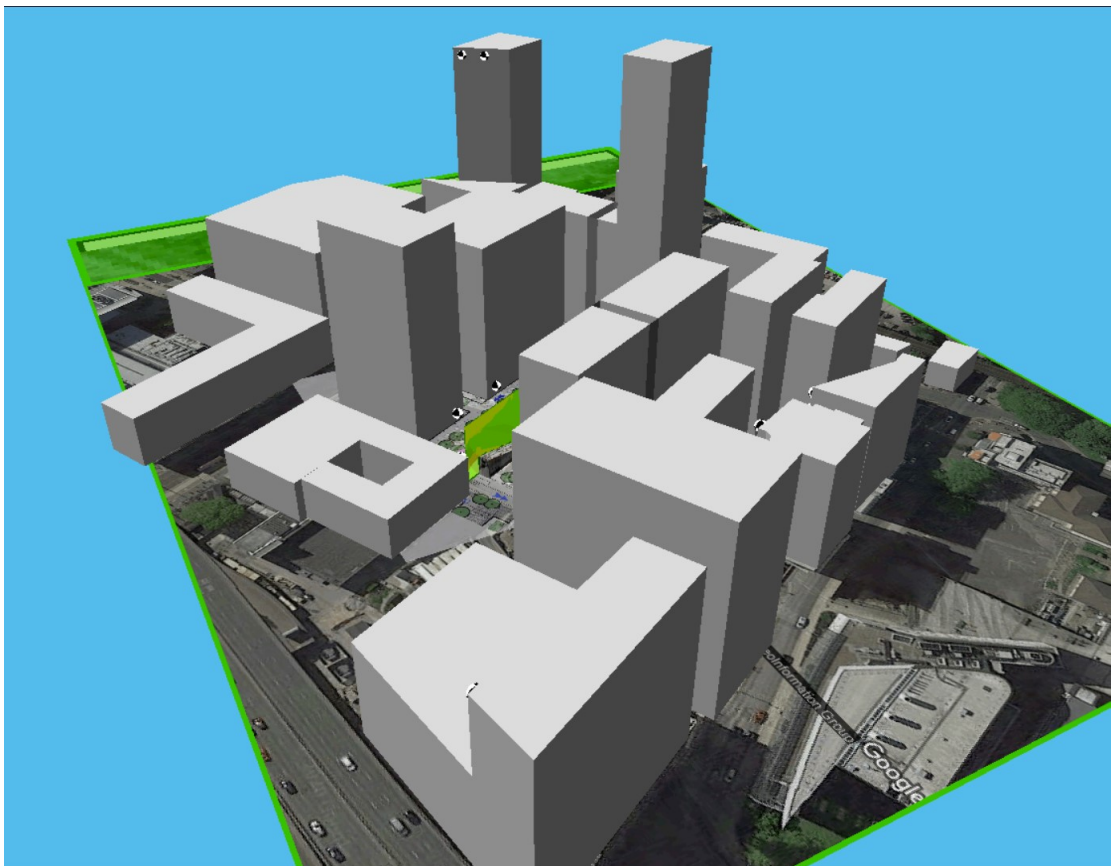


Figure 5: 3D acoustic model

Music noise levels have been calculated at these receptors both within and beyond Circle Square. Figure 6 shows the noise sensitive receptors beyond the Circle Square site.

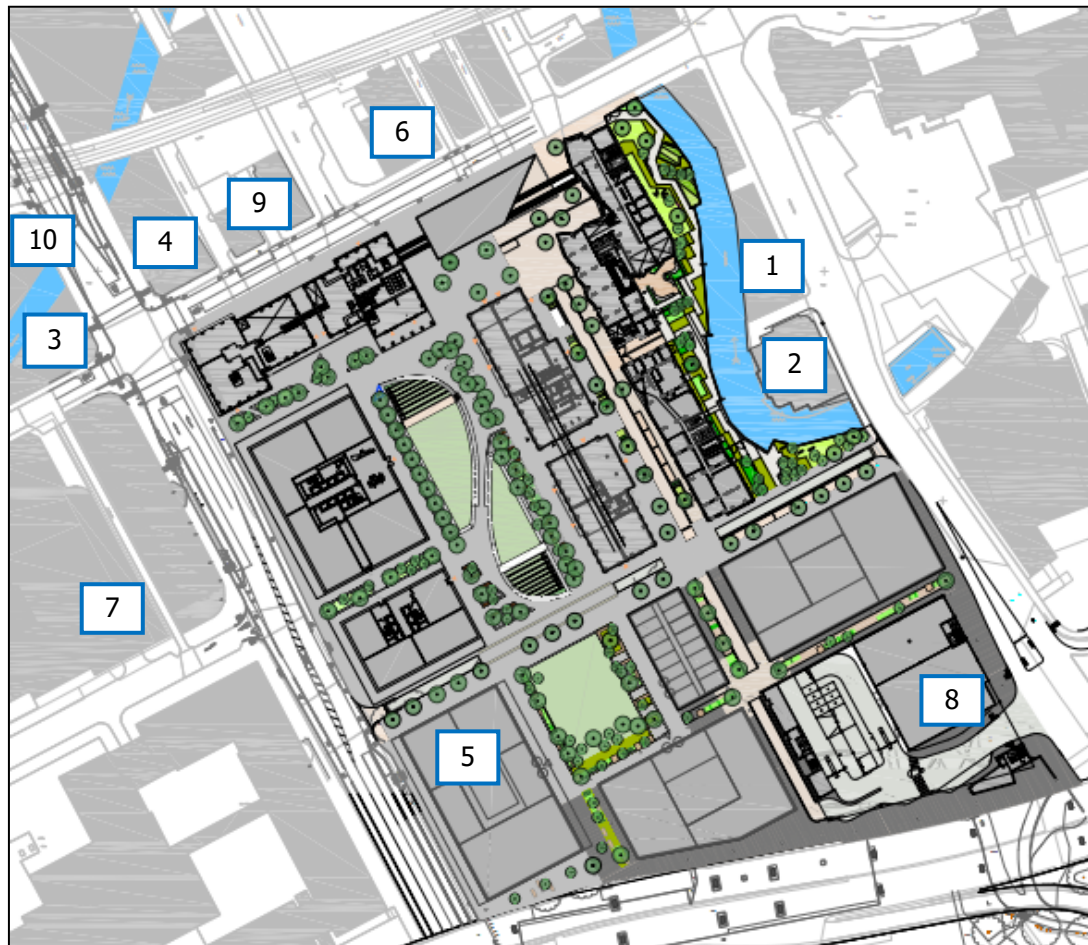


Figure 6: Noise sensitive receptors beyond Circle Square site

KEY

- 1 Montana House (residential apartments)
- 2 Princess House (residential apartments)
- 3 Holiday Inn Express (hotel)
- 4 Oxford Place (residential apartments)
- 5 Manchester Technology Centre (offices)
- 6 Bracken House (residential apartments)
- 7 The Quadrangle (residential apartments)
- 8 Premier Inn (hotel)
- 9 Maldron Hotel
- 10 1-5 New Wakefield Street (Student residential)

The noise model has determined the music noise propagation paths from Symphony Park, as shown in Figure 7. It can be seen that the Circle Square buildings provide a beneficial degree of screening to receptors.

Relatively narrow noise propagation paths at gaps between the Circle Square buildings can be seen to the north, west and south of Circle Square.

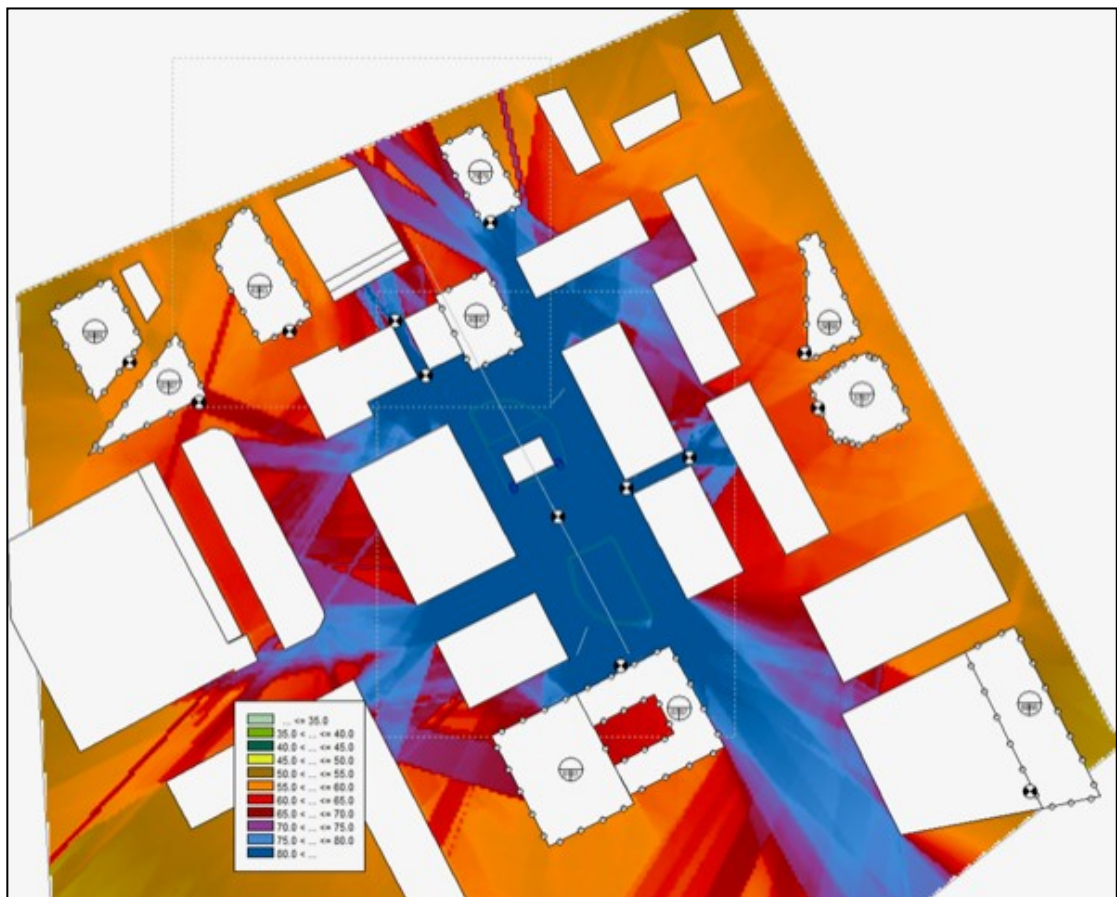


Figure 7: 2D contour plan

Figure 8 shows the results of the noise modelling including the variation of music noise with height.

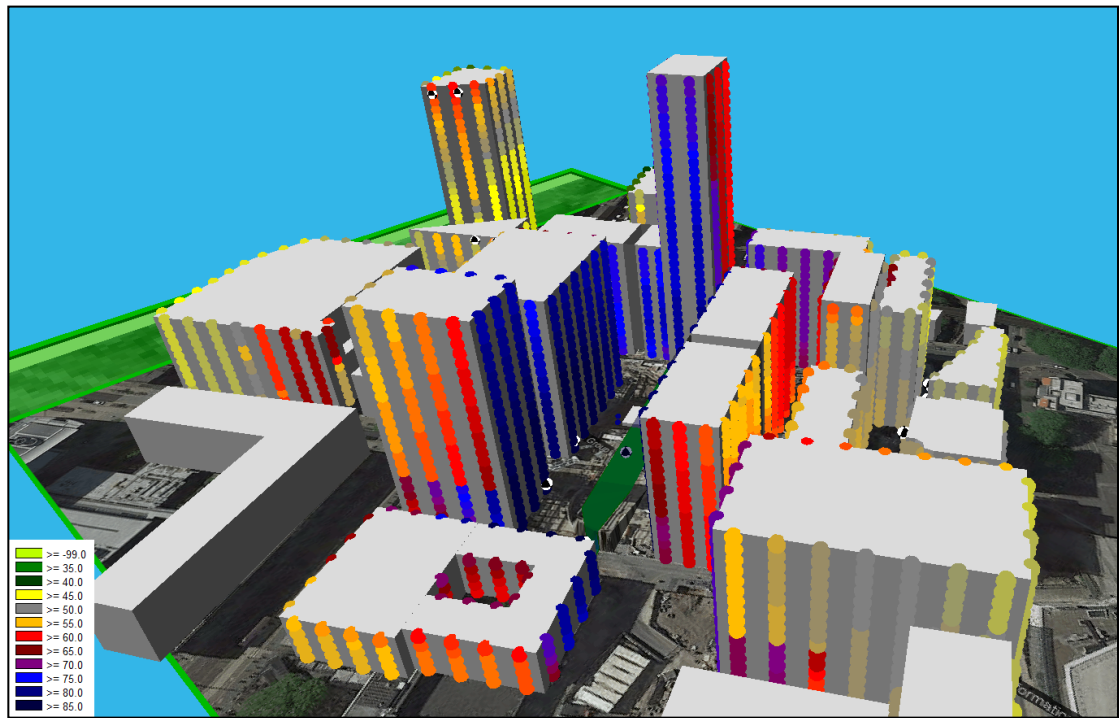


Figure 8: 3D contour plan

Calculated Noise Levels & Assessment

If it is assumed that there are between four and twelve major events per year at Symphony Park, then then with reference to Table 1 above, the calculated noise levels would be assessed as follows (non-compliance with the applicable noise limit is highlighted by red text):

Location	A-weighted sound pressure level (dB LAeq)		
	Predicted	Music Noise Limit	Excess
Mcr Technology Centre (office)	87	70	17
Holiday Inn Express (Hotel)	59	75	-16
Oxford House (Residential)	55	70	-15
Bracken House (Residential)	71	70	1
Montana House (Residential)	51	67	-16
Princess House (Residential)	51	67	-16
1-5 New Wakefield St (Residential)	59	70	-11
The Quadrangle (Residential)	65	76	-11
Premier Inn	66	80	-14
Charles St Hotel – ground floor opposite Building 5&6 walk-through	72	70	2
Charles St Hotel - Top Right	54	70	-13
Circle Square Building 2 (office)	91	67	24
Circle Square Building 4 (office)	90	67	23
Circle Square Buildings 5 & 6 (Residential)	81	67	14
Circle Square Buildings 7 & 8 (Residential)	89	67	22
Circle Square Building 9 (Residential)	75	67	8
Circle Square Building 10 (Residential)	67	67	0
Circle Square Building 11 (Residential)	66	67	-1
Circle Square Building 12 (office)	69	67	2

Table 2: Excess over music noise limit, four to twelve events per year

MCC's guidelines do not identify noise limits for venues that hold more than 12 events a year. However, the Code of Practice from which MCC's guidance is drawn states 'For indoor venues used for up to about 30 events per calendar year, a music noise level not exceeding the background noise by more than 5dB(A) over a fifteen minute period is recommended for events finishing no later than 2300 hours.

If it is assumed that there are between twelve and thirty major events per year, then the calculated noise levels would be assessed as follows:

Location	A-weighted sound pressure level (dB LAeq)		
	Predicted	Music Noise Limit (MCC)	Excess
Mcr Technology Centre (office)	87	60	27
Holiday Inn Express (Hotel)	59	65	-6
Oxford House (Residential)	55	60	-5
Bracken House (Residential)	71	60	11
Montana House (Residential)	51	57	-6
Princess House (Residential)	51	57	-6
1-5 New Wakefield St (Residential)	59	60	-1
The Quadrangle (Residential)	65	66	-1
Premier Inn	66	70	-4
Charles St Hotel – ground floor opposite Building 5&6 walk-through	72	60	12
Charles St Hotel - Top Right	54	60	-6
Circle Square Building 2 (office)	91	57	34
Circle Square Building 4 (office)	90	57	33
Circle Square Buildings 5 & 6 (Residential)	81	57	24
Circle Square Buildings 7 & 8 (Residential)	89	57	32
Circle Square Building 9 (Residential)	75	57	18
Circle Square Building 10 (Residential)	67	57	10
Circle Square Building 11 (Residential)	66	57	9
Circle Square Building 12 (office)	69	57	12

Table 3: Excess over music noise limit, 12-30 events per year

Conclusions - Receptors beyond Circle Square

It can be seen that if there are major events on between four days and twelve days of the year, the predicted music noise levels at receptors beyond the Circle Square estate only just exceed the applicable criterion at two residential receptors. The calculated noise excesses are only 1dB and 2dB. These excesses are not considered to be significant.

It is therefore suggested that the predicted noise levels at the residential receptors beyond Circle Square are acceptable if there are major events held for up to twelve days of the year.

Whilst there is a predicted substantial excess over the noise limit at the Manchester Technology Centre, it may be the case that this office building is not occupied at the time of the events, such that there would no resulting loss of amenity.

If there are major events on between twelve days and thirty days of the year, the predicted music noise levels at receptors beyond the Circle Square estate exceeds the applicable criterion at two locations by a significant margin. The calculated noise excesses are 11 dB and 12 dB. However, one of these receptors is a hotel (Maldron Hotel on Charles Street, currently under construction and due to complete mid-2021). The excess is calculated at a reduced number of hotel bedrooms in proximity to the passageway that exists only at ground floor between Buildings 5 and 6 of Circle Square.

The calculated noise level of 71dB(A) at Bracken House only applies to the Bracken House apartments at the south west corner of the building (eight apartments in total). There are approximately fifty other apartments within Bracken House that are predicted to experience music noise levels between 5 dB(A) and 8dB(A) in excess of the applicable noise limits.

Whilst there is therefore expected to be a short-term dis-benefit to a relatively small number of residents, it may be considered that the economic and social benefits that the proposed events bring about could offset the predicted dis-benefit.

Conclusions- receptors within Circle Square

It can be seen that for all eventualities, except for Buildings 10 and 11 in one circumstance, the predicted music noise levels at the Circle Square buildings exceed the applicable noise limits, some by a significant margin.

However, it is understood that the holding of external music and entertainment events at Circle Square is part of the offer to potential residents of Circle Square, such that residents are fully aware of the potential for disruption during these events. As such, if complaints do occur, these would be managed by the operators of the Circle Square residential buildings.

Similarly, the calculated noise levels at the office buildings within the Circle Square estate exceed the published guidelines of Manchester City Council. However, it is understood that the potential for disruption during external music and entertainment events at Circle Square is communicated to office tenants. As such, if complaints do occur these would be managed by the Landlord of the Circle Square office buildings.

APPENDIX A**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 °C
Saturday 15 August 2015	3/8 cloud cover, 2 m/s light breeze, no rain, 13 °C
Thursday 3 September 2015	6/8 cloud cover, 2 m/s light breeze, no rain, 12 °C
Thursday 10 December 2015	7/8 cloud cover, 4 m/s light breeze, no rain, 8 °C
Friday 11 December 2015	2/8 cloud cover, 3 m/s light breeze, no rain, 6 °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 checked calibrated to an accuracy of ± 0.3 dB 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 9 to 19 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.

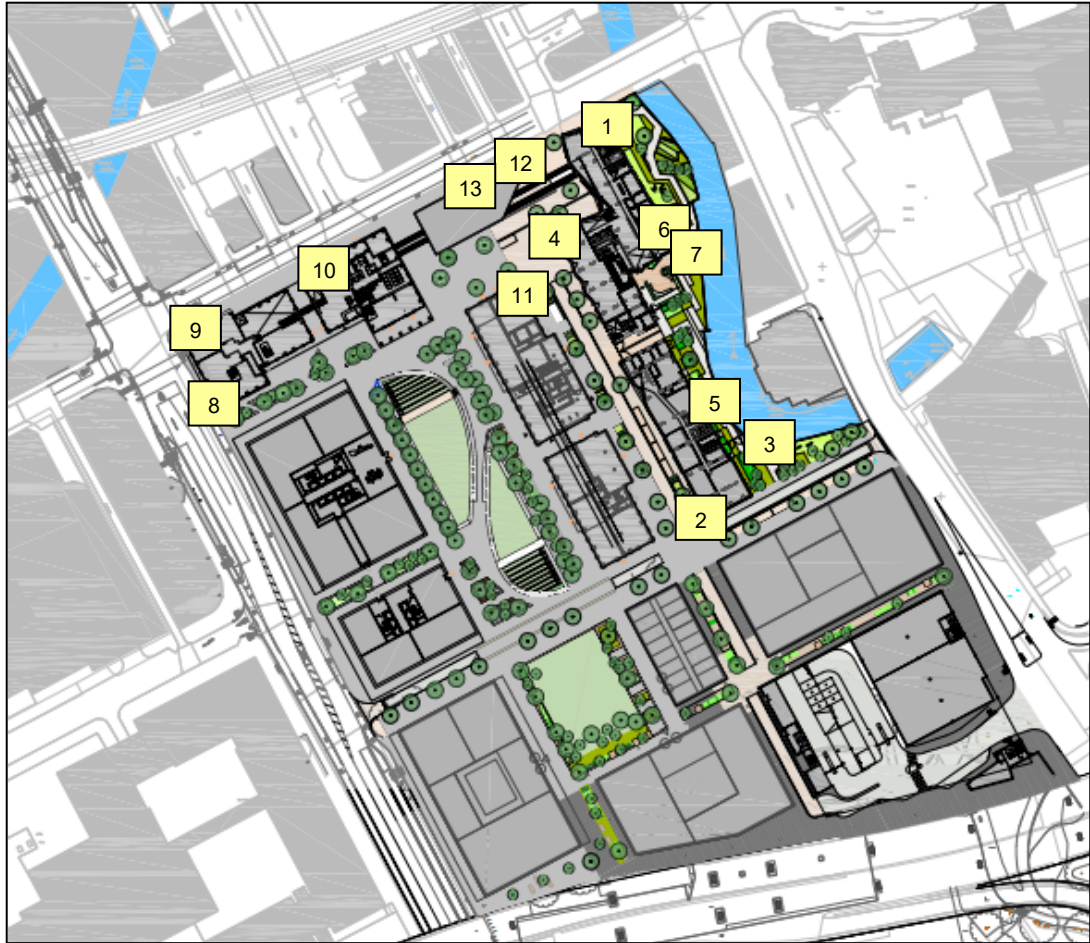


Figure 9: Noise survey measurement locations, Circle Square Plot 5 to 11

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 L _{Aeq}	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 L _{Aeq}	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	"
13	00:54	73.0	84.3	83.0	67.2	"
13	00:55	70.5	77.9	76.3	66.0	"

Measurement Position	Start Time	Measured Noise Levels, dB				Noise sources
		L _{Aeq}	L _{Amax}	L _{A1}	L _{A90}	
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
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

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	00:55	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

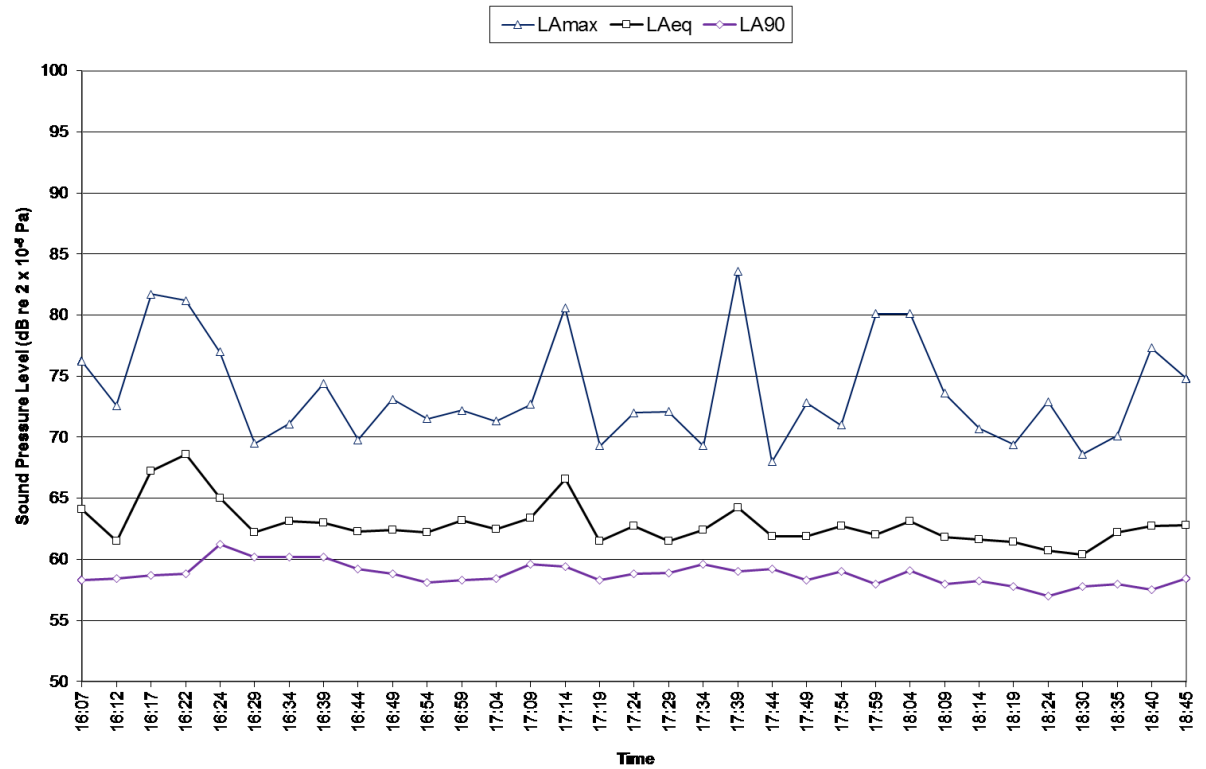


Figure 10: Noise survey measurement results, Position 1, daytime 6 August 2015

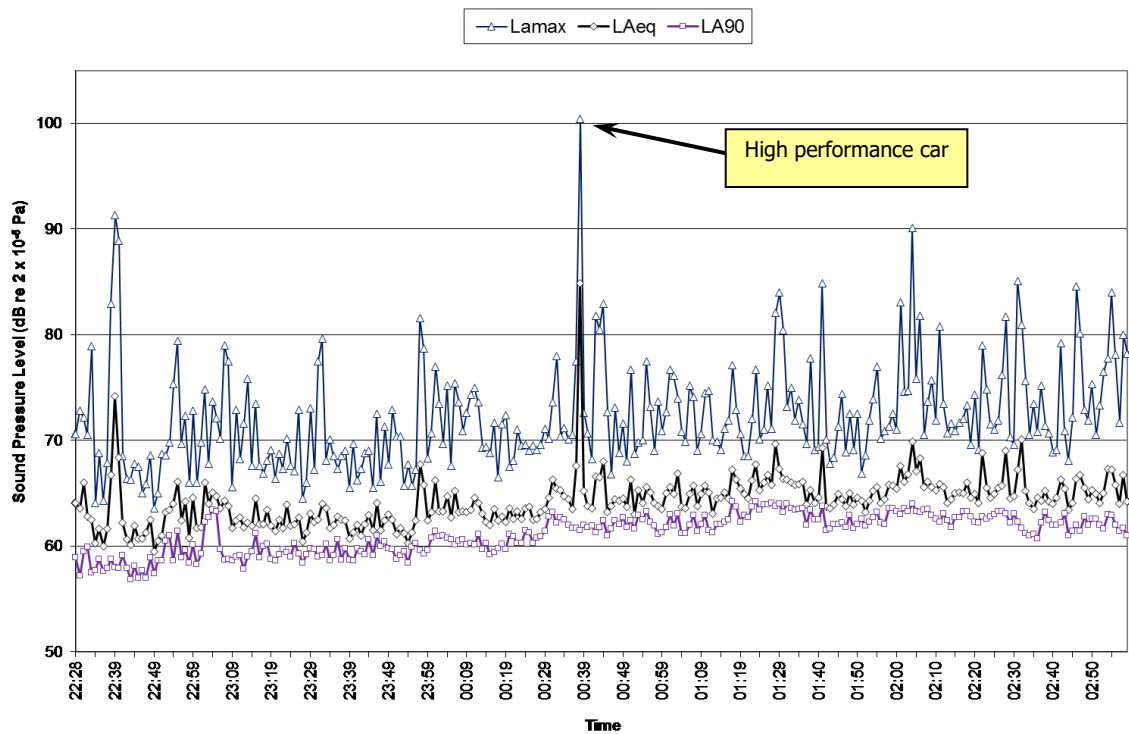


Figure 11: Noise survey measurement results, Position 1, night time Saturday 15 August 2015

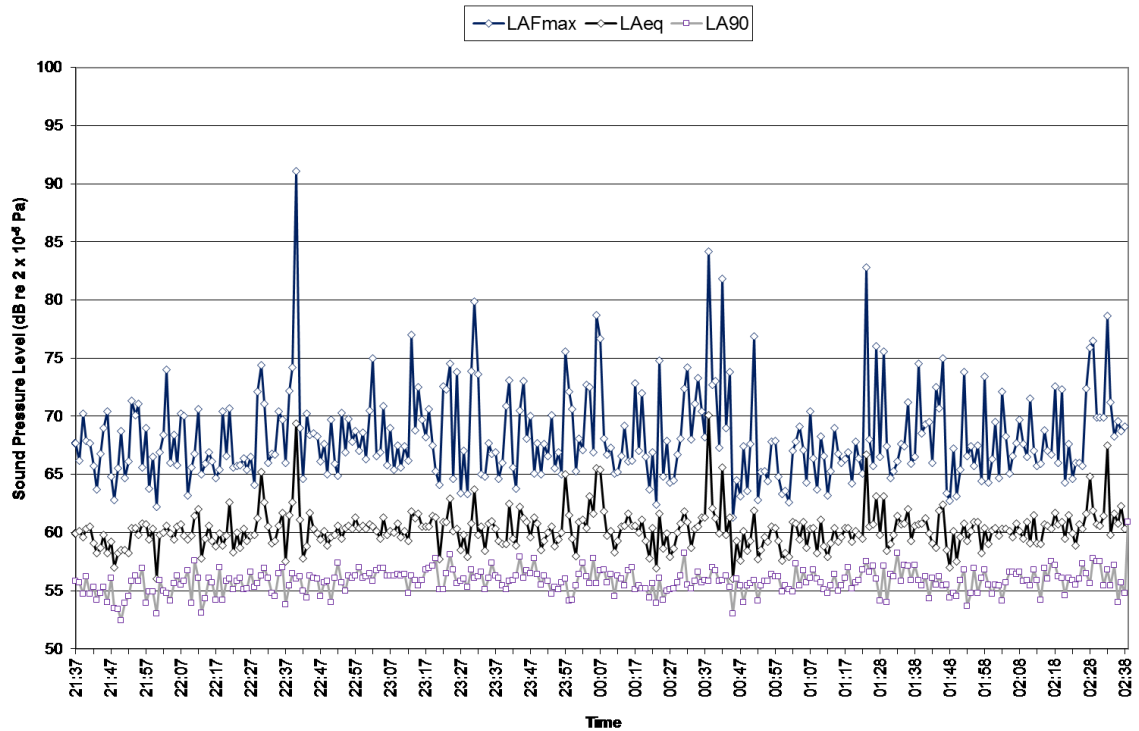


Figure 12: Noise survey measurement results, Position 3, night time Saturday 15 August 2015

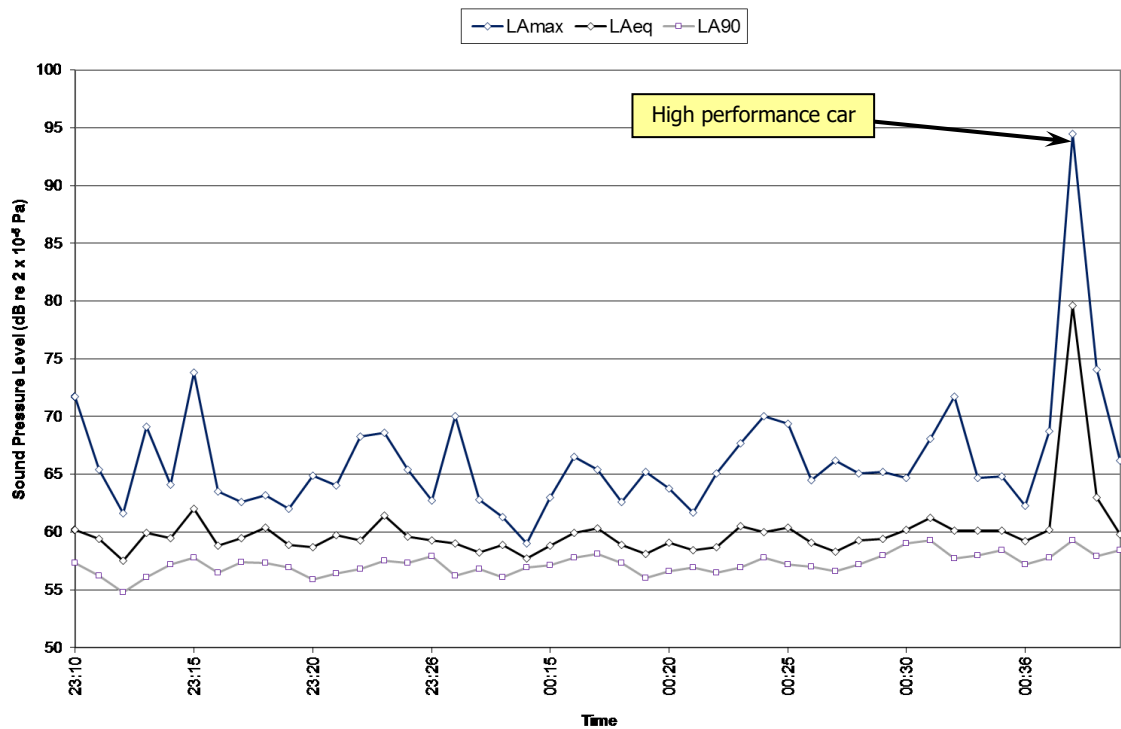


Figure 13: Noise survey measurement results, Position 4, night time Saturday 15 August 2015

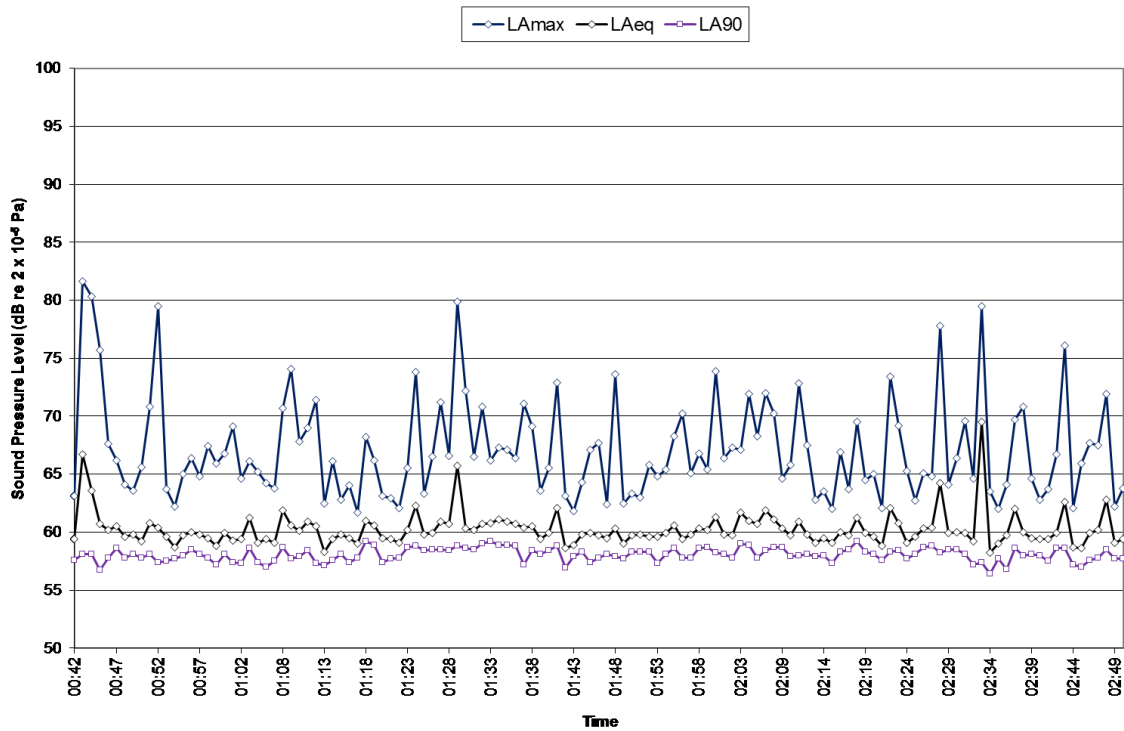


Figure 14: Noise survey measurement results, Position 6, night time Saturday 15 August 2015

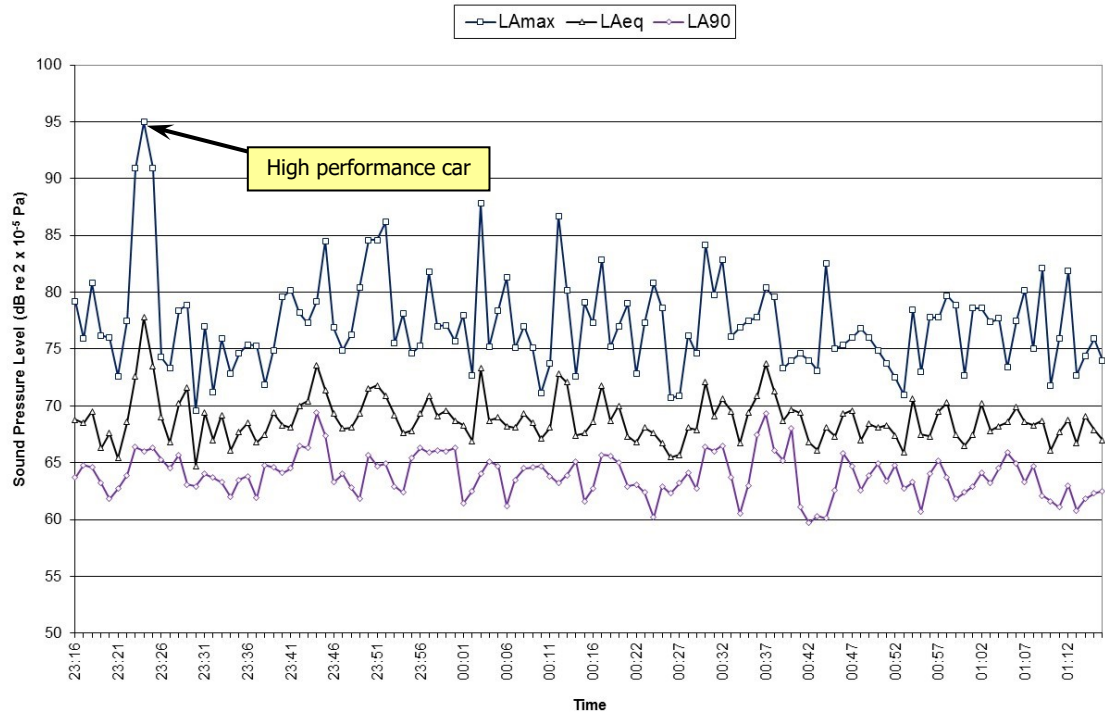


Figure 15: Noise survey measurement results, Position 8, night time Friday 11 December 2015

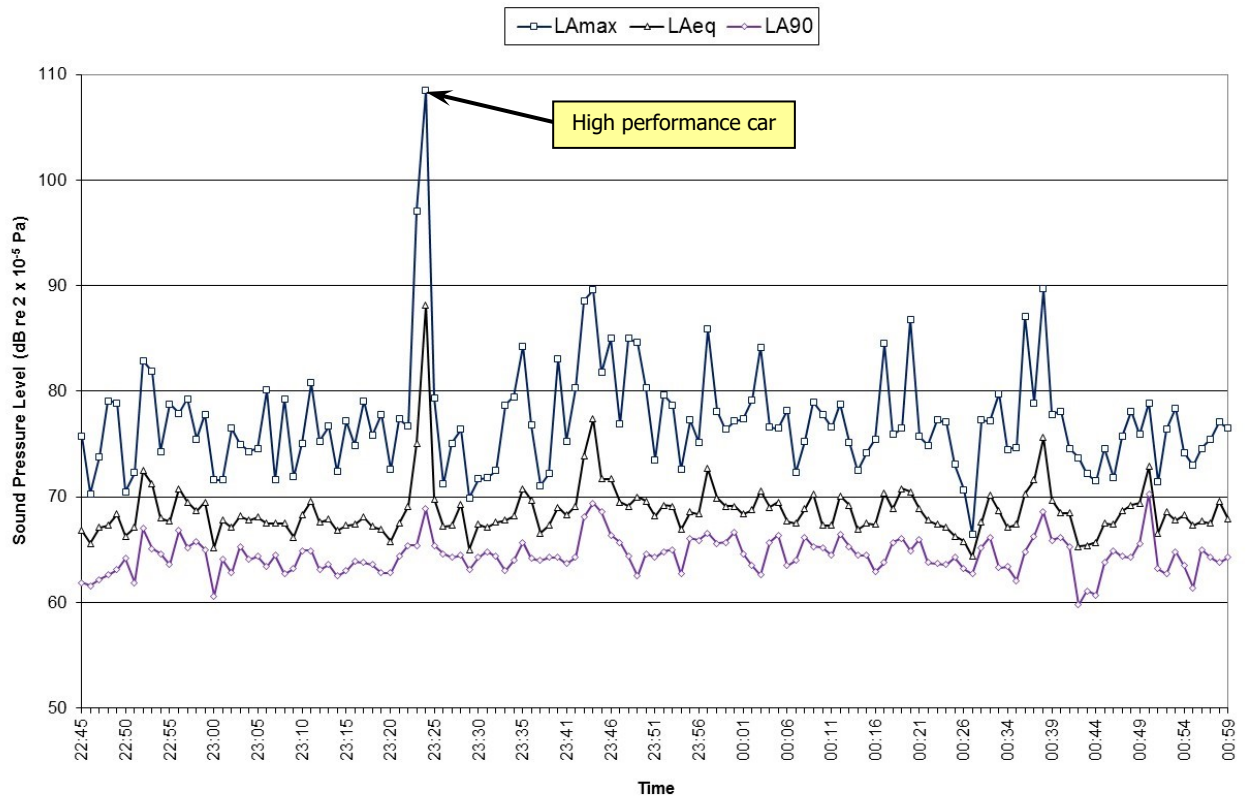


Figure 16: Noise survey measurement results, Position 9, night time Friday 11 December 2015

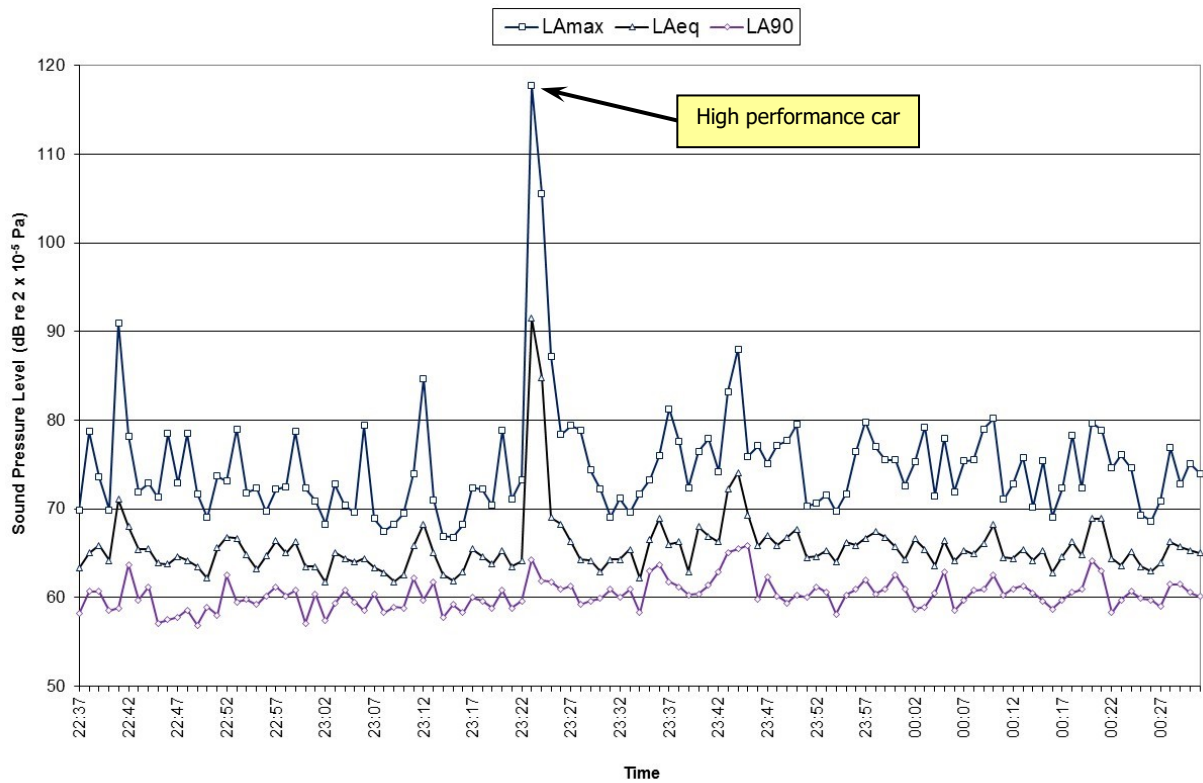


Figure 17: Noise survey measurement results, Position 10, night time Friday 11 December 2015

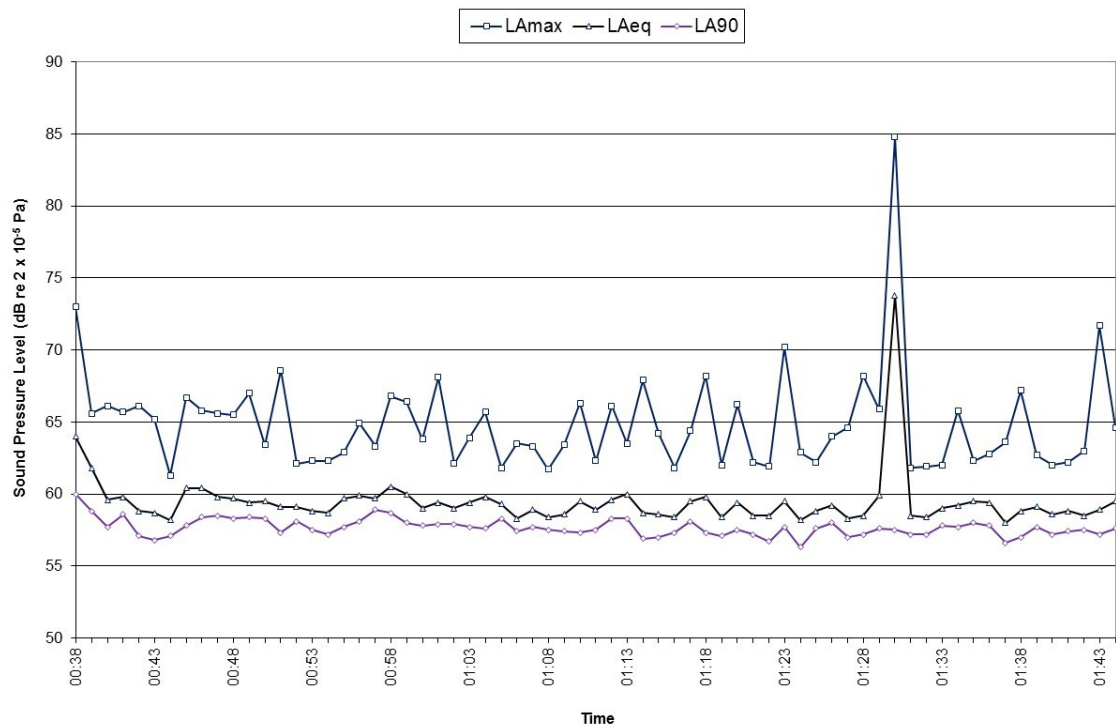


Figure 18: Noise survey measurement results, Position 11, night time Friday 11 December 2015

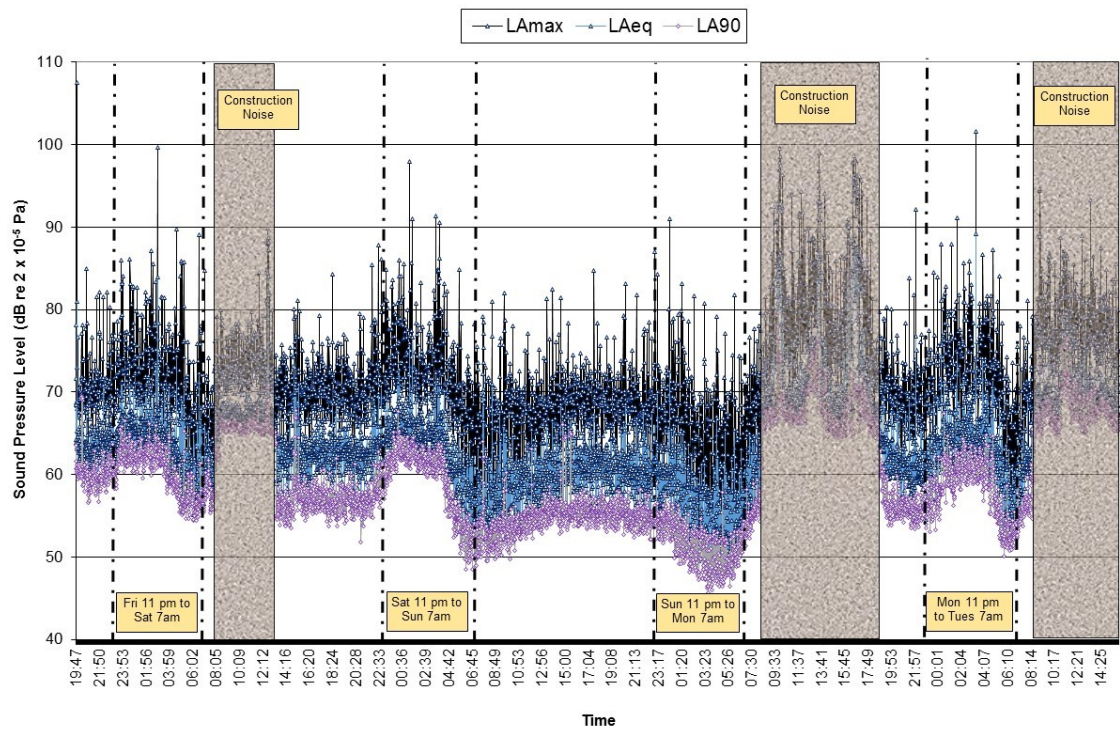


Figure 19: Noise survey measurement results, Position 12, 28 October 2016 to 1 November 2016

APPENDIX B

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 °C
Thursday 10 August 2017 (Night time)	1/8 cloud cover, 2 m/s light breeze, no rain, 11 °C
Friday 11 August 2017 (Day time)	7/8 cloud cover, 5 m/s light breeze, light rain, 17 °C
Friday 11 April 2017 (Night time)	6/8 cloud cover, 4 m/s light breeze, no rain, 15 °C
Saturday 12 August 2017 (Day time)	6/8 cloud cover, 5 m/s light breeze, light rain, 17 °C
Saturday 12 August 2017 (Night time)	2/8 cloud cover, 3 m/s light breeze, no rain, 11 °C
Sunday 13 August 2017 (Day time)	2/8 cloud cover, 3 m/s light breeze, no rain, 19 °C
Sunday 13 April 2017 (Night time)	4/8 cloud cover, 3 m/s light breeze, no rain, 14 °C
Monday 14 April 2017 (Night time)	7/8 cloud cover, 3 m/s light breeze, no rain, 14 °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 $\pm 0.3\text{dB}$ 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

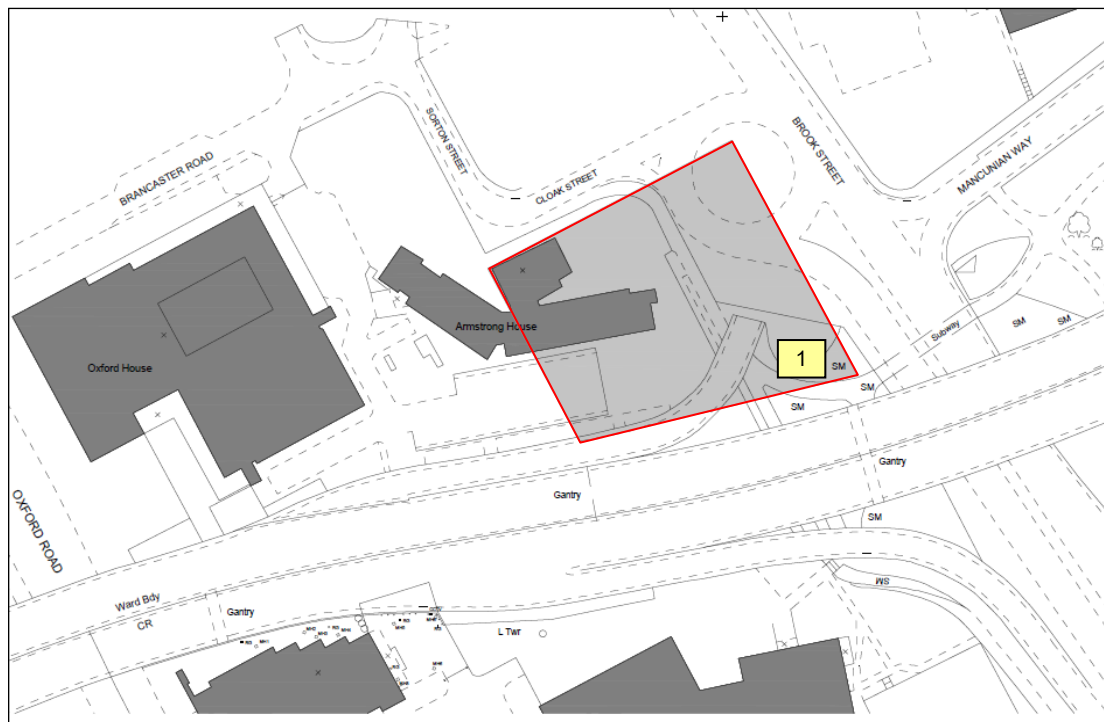


Figure 20: Noise survey measurement location, Plot 14, Circle Square

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

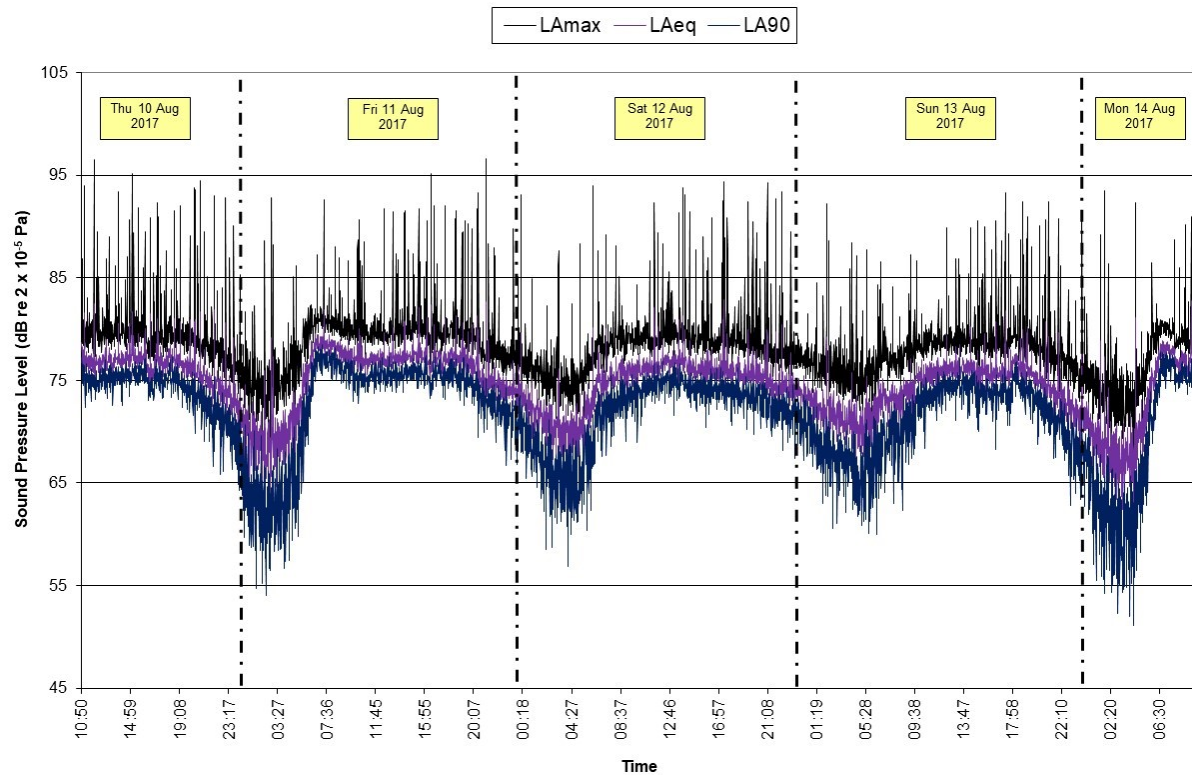


Figure 21: Position 1 noise measurements, Thursday 10 August 2017 to Monday 14 August 2017, maximum (LAmax), average (LAeq) and background (LA90) noise levels