



Mayfield Depot Cinema, Manchester

Noise Survey and Noise Impact Assessment

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Mayfield Depot Cinema R01C

Client: Broadwick Live

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Revision History

Revision	Date	Revision Details	Author	Checked
R01	15/07/2022	Original Issue	Luke Hine BSc AMIOA	Ben Tomlin BSc MIOA
R01A	19/07/2022	Updated based on client comments	Luke Hine BSc AMIOA	Ben Tomlin BSc MIOA
R01B	27/09/2022	Updated based on further client comments	Ben Tomlin BSc MIOA	Susan Witterick BSc MIOA
R01C	5/12/2022	Updated to address EHO comments	Ben Tomlin Ben Tomlin BSc MIOA	Susan Witterick Susan Witterick BSc MIOA

1 INTRODUCTION

- 1.1 dBx Acoustics has been appointed by Broadwick Live to undertake a noise survey and noise impact assessment for the proposed rooftop cinema at Mayfield Depot, Baring Street, Manchester City Centre.
- 1.2 This report presents results of the noise survey undertaken at the noise sensitive receptors to determine the existing noise climate, and thereby assess the potential noise impact from the development, in accordance with the requirements of Manchester City Council (MCC).
- 1.3 Noise limits for the venue, as set out in this Noise Report, are based on a range of background noise levels that have been recorded at the nearest sensitive receptors and those that are considered to be sensitive from the site boundary. The acoustic surveys that have been undertaken at time period representative of the likely lowest background noise levels, as well as when events are taking place on evenings or weekends.
- 1.4 It is considered that, based on the acoustic surveys undertaken and the proposed construct of the venue, along with event management protocols for the external areas and hours of operation, that the venue is capable of meeting Manchester City Council's Planning and Noise guidance criteria set out above.
- 1.5 This report updates dBx Acoustics' previous report ref 22073-R01B-BT to consider the cumulative effect of all areas.
- 1.6 Once the venue has been constructed, further acoustic testing will be undertaken on site both internally and externally to confirm that the necessary acoustic attenuation has been achieved and will be submitted to the Local Planning Authority for approval by way of planning condition.
- 1.7 A glossary of acoustic terminology is presented in Appendix A.

2 SITE DESCRIPTION

Site Description

- 2.1 Mayfield Depot is located on Baring Street, Manchester, M1. It is bounded by Baring Street to the west, Temperance Street to the east, and Fairfield Street to the north. The specific location of the proposals is on the rooftop area of the Mayfield Depot, which is the former Mayfield Depot Railway station platform.
- 2.2 Underneath the rooftop area, the venue has been converted into a mixed-use leisure and entertainment venue, known as “Depot Mayfield”. This venue has events taking place in the evening and on weekends and has been successfully operated as an entertainment venue since 2019. It is operated by Broadwick Live, who have extensive experience in managing events of this scale.
- 2.3 The area surrounding the site is both industrial and commercial in nature with various industrial buildings to the east of the site and some bars and restaurants nearby.
- 2.4 Unite Students are located to the west on the opposite side of Baring Street, with further student residential accommodation located further to the south and represent the nearest sensitive receptors to the Site.
- 2.5 With regard to the wider area, Manchester Piccadilly Station is located to the north beyond Fairfield Street, with other projects such as London Road Fire Station and the wider City Centre beyond.
- 2.6 Figure 1 illustrates the location of the proposals, which are located on the roof of Depot Mayfield, and identifies the nearest noise sensitive receptor (NSRs), including those located in Ardwick. The nearest noise sensitive receptor is the Unite Students – Piccadilly Point student accommodation building located approximately 100m to the south-west of the Site.

Figure 1: Site Boundary and Nearby Noise Sensitive Properties



Nearby Noise Sensitive Receptors (NSR)

- 2.7 The nearest noise sensitive receptor is the Unite Students – Piccadilly Point student accommodation building located approximately 100m to the south-west from the screen/speakers of the cinema.

Proposed Development

- 2.8 The proposal seeks to construct a temporary cinema space on top of the existing Mayfield Depot Venue, which is initially proposed to operate for a 3-year period. It will be operated by Backyard Cinema and will be carefully managed by Broadwick Live as overall operators of Depot Mayfield.
- 2.9 The Proposed Development on the Mayfield Depot rooftop will comprise a temporary flexible leisure space, primarily for cinema uses, with ancillary food and beverage offering and outdoor and indoor seating. The space will be separated into two areas: Area A will be operated as an indoor rooftop cinema space, supporting theatre, art, and other performance-related events, with a supporting food and beverage offering. Area B will be utilized as an events space, allowing for seasonal specific events or temporary exhibitions.
- 2.10 Where possible, covered areas will be housed on the former Mayfield Depot structures that exist on site on the rooftop. A proposed additional free-standing temporary structure will house the event and cinema space to be introduced. Details of the construction are provided in the Design and Access Statement prepared by Broadwick and, in summary, will adopt a Trimapanel external wall panel system. A brochure is provided with the planning application, but the acoustic details of the system are highlighted below.
- 2.11 The cinema will have variable operating hours. It will generally operate until 00:00h but would not operate any later than 02:00h. It is also proposed that there will be bar and food areas.
- 2.12 Figure 2, below, presents the preliminary site plan for the cinema and other rooftop areas. Figure 3 shows the site elevations as a 3D model.

Figure 2: Proposed Rooftop Cinema and Terrace Area

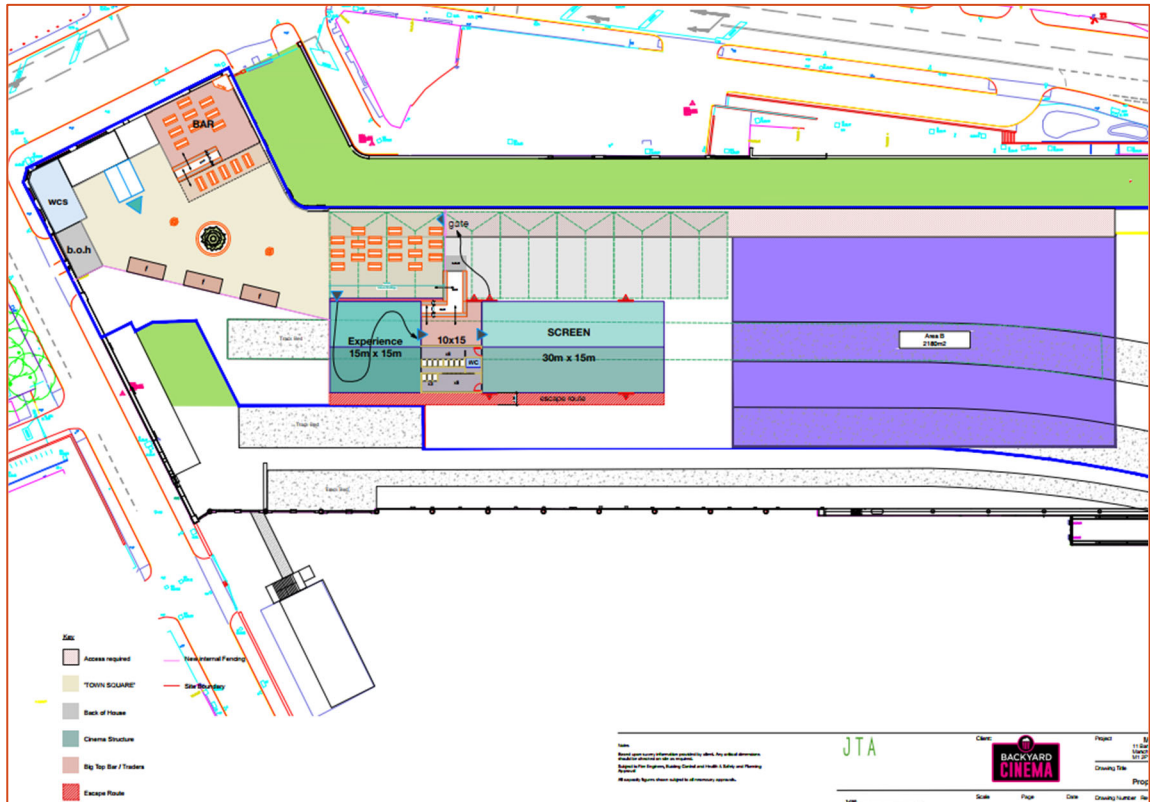
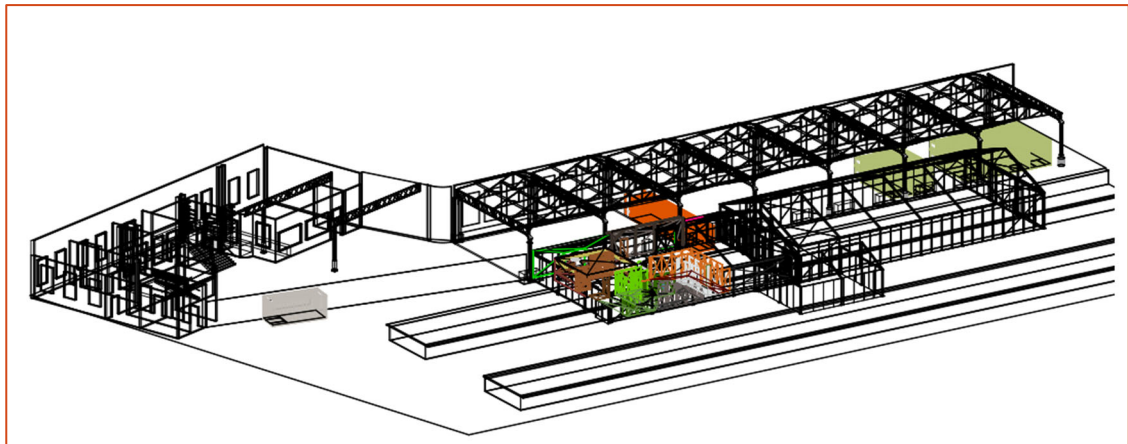
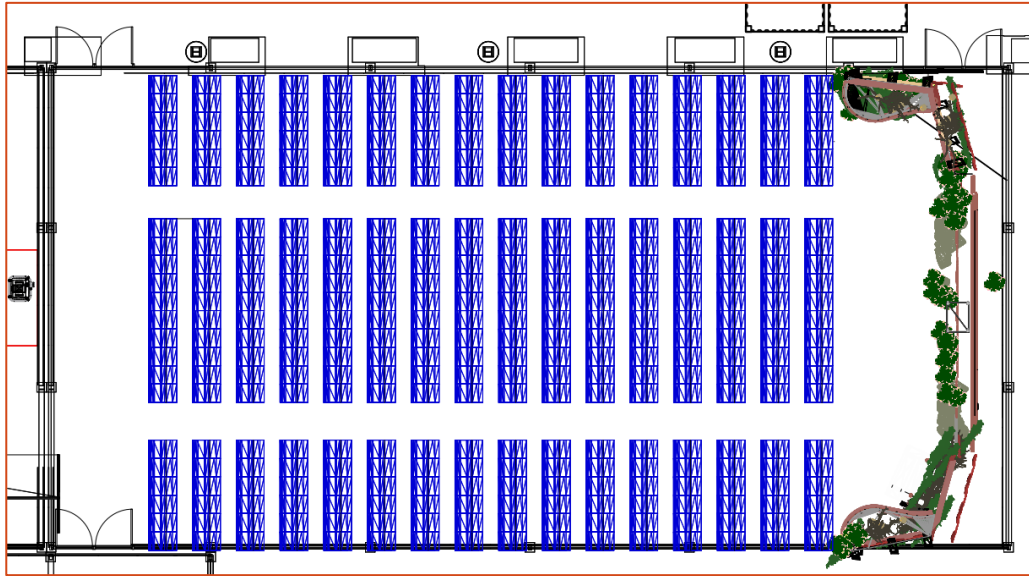


Figure 3: Cinema Elevations



- 2.13 The new structures are to be formed from Tata Trimapanel steel panel system. This panel has a sound insulation performance of 29dBR_w.
- 2.14 The screen and loudspeaker are to be located at the far eastern point of the cinema, around 100m from the student accommodation, as indicated in Figure 4, below.

Figure 4: Cinema Detailed Plan



- 2.15 There is also a proposed 'Area B', indicated in purple in Figure 2, above, where occasional ad hoc events are to take place, such as ice skating and exhibitions. These are not expected to be late night, and details of the events proposed in this location are set out in the Design and Access Statement and Planning Statement submitted with the application.

3 BASIS OF NOISE ASSESSMENT

Local Authority

- 3.1 The site falls under the jurisdiction of Manchester City Council (MCC). Their acoustic criteria are detailed below.

Manchester City Council – Planning & Noise Technical Guidance (June 2022)

- 3.2 This document sets out Manchester City Council's requirements with regard to current guidance and policy, with the aspiration that new developments achieve the highest standards without compromising the health and wellbeing of residents.
- 3.3 The following requirements are considered relevant to this project.
- “Entertainment noise ($L_{Aeq,5min}$) should be controlled to 5dB below the typical background noise level (L_{A90}) in each octave band at the nearest noise sensitive location”.*
- 3.4 Therefore, as the noise limits are based on the existing background noise levels, a noise survey was undertaken at locations representative of nearby noise sensitive receptors, at a time period representative of the likely lowest background noise levels.
- 3.5 Once the venue has been constructed, further acoustic testing will be undertaken on site both internally and externally to confirm that the necessary acoustic attenuation has been achieved, and will be submitted to the Local Planning Authority for approval by way of planning condition.

4 NOISE SURVEY

Methodology

- 4.1 Background noise levels were measured between 00:00h and 02:00h on Wednesday 13th July at Locations A and B, as indicated in Figure 5, below.
- 4.2 The acoustic survey was undertaken at time period representative of the likely lowest background noise levels at NSRs while the cinema would be operational.

Figure 5: Noise Monitoring Locations



- 4.3 All measurements were undertaken in accordance with BS 7445-1:2003 "Description and Measurement of Environmental Noise", with microphones located at approximately 1.5 metres above the local ground level and at least 3.5 metres away from reflective surfaces other than the ground which can be considered as in free field conditions.

Equipment

- 4.4 The equipment used during the environmental noise survey is detailed in Table 1.

Table 1: Equipment Used in the Environmental Noise Survey

Equipment	Manufacturer & Part No	Serial Number
Sound Level Meter	Norsonic Nor140	1405619
Calibrator	Norsonic Nor1251	33827
Microphone	Norsonic Nor1225	168247

- 4.5 The sound level meter was calibrated before and after measurements, with no significant drift recorded. An accredited laboratory calibrated the equipment not more than two years prior to the measurements being made, except for the calibrator, which had been calibrated not more than one year prior to the survey.

Weather Conditions

- 4.6 Weather conditions throughout the survey period were suitable for environmental measurements with wind speeds of less than 5 m/s. No precipitation was recorded during the noise survey. Temperatures varied between 15°C and 19°C.

5 ENVIRONMENTAL NOISE SURVEY RESULTS

- 5.1 A summary of the noise levels measured is presented in Table 2, below. All measurements were 15 minutes in duration.

Table 2: Summary of Measured Night-time Attended Noise Levels

Location - Receptor (Figure 3)	Time(hh:mm)	Ambient Noise Level (dB L _{Aeq,15mins})	Maximum Noise Level (dB L _{AFmax})	Background Noise Level (dB L _{A90, 15mins})
A – Unite Student NSR	00:11	53	70	48
	00:59	52	66	47
	01:40	51	69	46
B – Ardwick Green	00:35	54	70	46
	01:18	53	73	43
	01:58	51	66	41

- 5.2 At location A the dominant source of noise was road traffic noise emanating from the A635, with occasional contributions rail movements associated with Piccadilly Station.
- 5.3 The dominant noise source at measurement location B was road traffic on the A6.
- 5.4 The typical octave band background sound levels (dBL₉₀) measured at both locations from this survey are used to set the entertainment noise limits, both confirmed in Table 3, below. Corrections are required for distance as indicated in Table 5.

Table 3: Summary of Measured External Background Noise Levels and Subsequent Limits at NSRs

Location	Description	Noise Metric	Octave Band Centre Frequency (Hz), dB						
			63	125	250	500	1k	2k	4k
A	Measured Background Noise	L ₉₀	50	45	44	43	43	36	27
	Derived Limit	L _{eq}	45	40	39	38	38	31	22
B	Measured Background Noise	L ₉₀	49	44	38	37	37	31	22
	Derived Limit	L _{eq}	44	39	33	32	32	26	17

6 NOISE IMPACT ASSESSMENT- ROOF TOP CINEMA

6.1 MCC requirements are that “where entertainment noise is proposed the L_{Aeq} (entertainment noise) shall be controlled to 5 dB below the L_{A90} (without entertainment noise) in each octave band at the façade of the nearest noise sensitive location.”

6.2 Table 3, above, confirms MCC’s noise limits.

Typical Cinema Noise Levels

6.3 A paper published by the Acoustical Society of New Zealand¹ details measured noise levels within a commercial cinema for a variety of films. It was found that, dependent on the type of film, the typical noise level for the duration of the film varied between 61 and 84dB $L_{Aeq, T}$. See Figure 5, below.

Figure 5 – Film Noise Levels

Name of movie	Duration (min)	L_{Aeq} (dB)	L_{Amax} (dB)	L_{Peak} (dB)	Predicted $L_{ep,D}$ $L_{Aeq}(8\text{ hr})$	Cinema Size / % full ²	Number of minutes $L_{Aeq} > 90\text{dB}$
James Bond 007 – World is not enough	120	75	88	107	69	M / 100	NIL
Star Wars Episode 1: The Phantom Menace	125	77	92	115	71	M / 100	NIL
Star Wars Episode 1: The Phantom Menace (2)	125	84	97	119	78	L / 5	1
The Mummy	116	78	98	>140	72	M / 100	NIL
The Matrix	114	78	101	131	72	M / 100	0.5
Southpark	72	79	95	118	71	M / 10	NIL
The Blair Witch Project	75	69	91	132	61	M / 100	NIL
Cruel Intentions	90	61	84	107	54	S / 100	NIL
Austin Powers - The Spy Who Shagged Me	84	72	87	107	64	M / 100	NIL
Deep Blue Sea	93	82	107	117	75	M / 25	NIL
Gladiator	143	84	99	103 ¹	79	L / 10	12
Gladiator (2)	143	77	92	109	72	M / 100	NIL
Final Destination	88	81	100	103 ¹	74	M / 100	1
Final Destination (2)	88	72	90	114	65	M / 75	NIL
Scream 3	108	79	99	103 ¹	73	M / 100	NIL
Fantasia 2000	66	73	86	120	64	M / 50	NIL
U-571	105	78	96	122	71	M / 100	NIL

6.4 Maximum noise levels varied between 84 and 107dB $L_{Amax, F}$ with several films exceeding 95dB $L_{Amax, F}$.

6.5 Based on typical octave band noise spectra within cinemas, Table 4 below, confirms typical cinema noise levels.

Table 4: Typical Octave Band Data for a Cinema

	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	dBA
Typical noise level, dB $L_{eq,T}$	70	71	74	77	80	80	73	87
Maximum noise level, dB $L_{max,F}$	100	95	95	95	90	90	90	98

¹ https://www.acoustics.org.nz/sites/www.acoustics.org.nz/files/journal/pdfs/Ellerton, D_NZA2002.pdf

6.6 On this basis, the anticipated worst case cinema noise levels at NSR A have been calculated, and are compared to the determined MCC noise limits, as shown in Calculation 1 and Table 5, below.

Calculation 1 – Prediction of Cinema Noise at NSR A

NOISE BREAK OUT TO OUTSIDE									
Contract No:	22073						Date:	27/09/2022	
Client:									
Project:	Mayfield Cinema						Consultant:	BT	
Source	Cinema								
Building & Element									
Area (S)	450	m ²	Width(a)=	30	m	Height(b)=	15	m	
Position Directivity (Q)	Roof		Q=	2					
Receiver	Student flats								
Distance (R) from element	100	m							
			63	125	250	500	1k	2k	4k
Source directivity			9.0	9.0	9.0	9.0	9.0	9.0	9.0
Barrier,	dB		0	0	0	0	0	0	0
Façade,	dB		0	0	0	0	0	0	0
Calculation									
Frequency, Hz			63	125	250	500	1k	2k	4k
Internal Level,	dB		70	71	74	77	80	80	73
Internal Corrections ,	dB		0	0	0	0	0	0	0
Corrected Internal Level,Lin,	dB		70	71	74	77	80	80	73
									Rw
SRI of Element,	dB		13	14	19	26	29	35	34
Additional Directivity,	dB		9.0	9.0	9.0	9.0	9.0	9.0	9.0
Propagation Corrections									
Barrier,	dB		0.0	0.0	0.0	0.0	0.0	0.0	0.0
Façade,	dB		0.0	0.0	0.0	0.0	0.0	0.0	0.0
Level (1) at Receiver	dB		39	39	36	33	32	27	20
Local Authority			45	40	39	38	38	31	22
(enter at 1kHz)									
Shortfall (1)	dB		-6	-1	-3	-5	-6	-4	-2
Calculation Method									
	(1)	Lp = Lin - R - 6 + 10Log(S) - 20Log(R) - 11 + 10Log(Q)							
	(2)	Lp = Lin - R - 6 + 10Log(ab/(pi ² *R ²)) + 10Log(Q/2)							
	(3)	Lp = Lin - R - 6 (near field)							

Table 5: Comparison of Predicted Worst Case Cinema Noise to MCC Limit (NSR A)

	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Noise Level at NNSR, $dBL_{Aeq,T}$	39	39	36	33	32	27	20
MCC Noise Limit, $dBL_{Aeq,T}$	45	40	39	38	38	31	22
Difference	-6	-1	-3	-5	-6	-4	-2

- 6.7 As can be seen from Table 5, above, the typical cinema ambient noise levels meet MCC's criteria at NSR A at all frequency values.
- 6.8 It should be noted that the assessment is based on the lowest measured background noise levels on a weekday night, rather than the 'typical' background noise levels specified in the MCC guidance document.
- 6.9 Additionally, the highest L_{Aeq} values of the films measured has been used. The quietest film was some 23dB lower than this.
- 6.10 The above assessment therefore represents an absolute worst-case assessment.
- 6.11 The predicted noise levels at NSR B are shown as Calculation 2, below, again showing that the criteria are met.

Calculation 2 - Prediction of Cinema Noise at NSR A

NOISE BREAK OUT TO OUTSIDE									
Contract No:	22073					Date:	27/09/2022		
Client:									
Project:	Mayfield Cinema					Consultant:	BT		
Source	Cinema								
Building & Element									
Area (S)	450	m ²	Width(a)=	30	m	Height(b)=	15	m	
Position Directivity (Q)	Roof		Q=	2					
Receiver	Student flats								
Distance (R) from element	360	m							
			63	125	250	500	1k	2k	4k
Source directivity			9.0	9.0	9.0	9.0	9.0	9.0	9.0
Barrier,	dB		0	0	0	0	0	0	0
Façade,	dB		0	0	0	0	0	0	0
Calculation									
Frequency, Hz			63	125	250	500	1k	2k	4k
Internal Level,	dB		70	71	74	77	80	80	73
Internal Corrections ,	dB		0	0	0	0	0	0	0
Corrected Internal Level, Lin,	dB		70	71	74	77	80	80	73
									Rw
SRI of Element,	dB		13	14	19	26	29	35	34
Additional Directivity,	dB		9.0	9.0	9.0	9.0	9.0	9.0	9.0
Propagation Corrections									
Barrier,	dB		0.0	0.0	0.0	0.0	0.0	0.0	0.0
Façade,	dB		0.0	0.0	0.0	0.0	0.0	0.0	0.0
Level (1) at Receiver	dB		27	28	25	22	21	16	9
Local Authority			44	39	33	32	32	26	17
(enter at 1kHz)									
Shortfall (1)	dB		-17	-11	-8	-10	-11	-10	-8
Calculation Method	(1)	Lp = Lin - R - 6 + 10Log(S) - 20Log(R) - 11 + 10Log(Q)							
	(2)	Lp = Lin - R - 6 + 10Log(ab/(pi ² *R ²)) + 10Log(Q/2)							
	(3)	Lp = Lin - R - 6 (near field)							

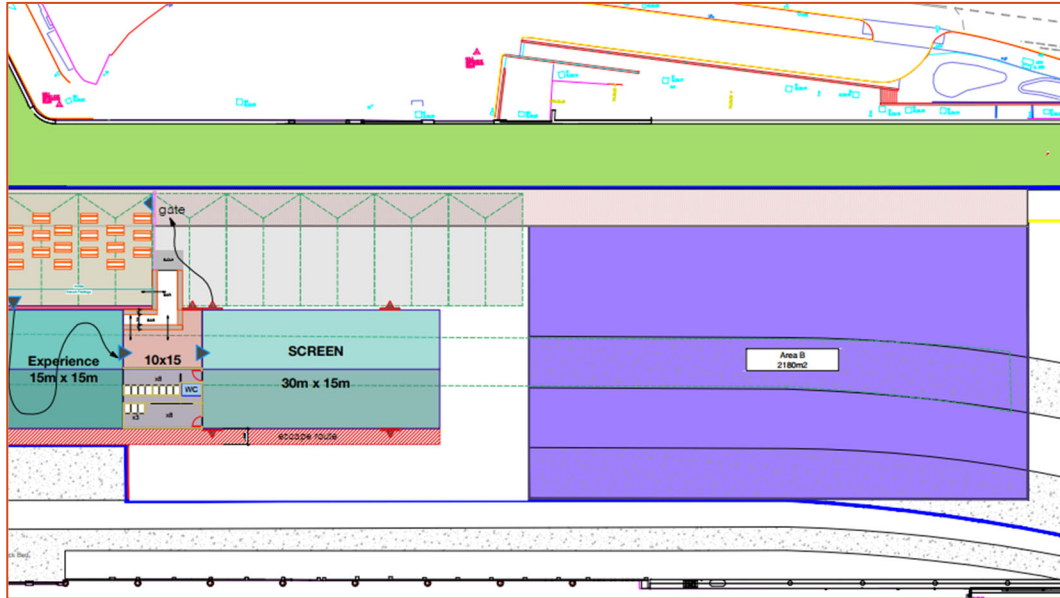
Maximum Noise Levels

- 6.12 In addition to the entertainment noise limits, MCC require that maximum noise levels in the night-time period do not exceed $45\text{dB}_{\text{LAmax, F}}$ more than 15 times.
- 6.13 This will however be affected by other sources such as vehicle pass-bys, pedestrian noise etc.
- 6.14 However, in terms of the cinema, ideally, maximum noise levels beyond 23:00h would ideally be controlled to around $60\text{dB}_{\text{LAmax, F}}$ assuming partially opened windows at the NSR which can typically be assumed to provide a 15dB external to internal level difference.
- 6.15 Based on a typical worst case cinema maximum noise level of $98\text{dB}_{\text{LAmax, F}}$, calculations indicate that the likely maximum noise levels outside the NSR would be $55\text{dB}_{\text{LAmax, F}}$.
- 6.16 This is 5dB below the proposed limit external to the NSR, and hence should therefore be acceptable, with some tolerance.
- 6.17 It is also significantly lower than existing maximum noise levels due to vehicle movements etc. experienced at the NSR, of up to $70\text{dB}_{\text{LAmax, F}}$, as indicated in Table 2, above.
- 6.18 Maximum noise levels from the cinema are therefore likely to be acceptable at all times.

7 NOISE IMPACT ASSESSMENT- AREA B

7.1 Figure 6, below, identifies the area currently identified on the site plan as 'Area B'.

Figure 6 –Location of Area B in Relation to The Cinema



- 7.2 It is understood that the bar would feature music played at a low / background level to allow for conversation whilst drinking and dining. On occasion the system in the bar may also be used for small acoustic events / cabaret.
- 7.3 Based on noise levels measured in a similar venue, of around 75dBL_{Aeq,T}, the predicted noise level at the NNSR is shown in Table 6, below.

Table 6: Noise Egress Area B

	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Noise Level, dBL _{Aeq,T}	75	72	71	74	70	66	55
Distance	-44	-44	-44	-44	-44	-44	-44
SPL at NNSR, dBL _{Aeq,T}	31	28	27	30	26	22	11

8 NOISE IMPACT ASSESSMENT- BAR

- 8.1 There is also a bar area included on the northwest side of the development which may play quiet background music.
- 8.2 Based on music noise levels of around 75dBL_{Aeq,T}, the predicted noise level at the NNSR is shown in Table 7, below.

Table 7: Predicted Noise Egress, Bar

	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Noise Level, dBL _{Aeq,T}	75	72	71	74	70	66	55
Distance	-38	-38	-38	-38	-38	-38	-38
SPL at NNSR, dBL_{Aeq,T}	37	34	33	36	32	28	17

9 CUMULATIVE NOISE IMPACT

- 9.1 An assessment of the overall noise impact when all three areas operate simultaneously is presented in Table 8, below.

Table 8 – Cumulative Noise Impact

	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Cinema	39	39	36	33	32	27	20
Area B	31	28	27	30	26	22	11
Bar	37	34	33	36	32	28	17
Sum	42	40	38	38	36	31	22
MCC Limit	45	40	39	38	38	31	22
Difference	-4	0	-1	0	-3	0	0

- 9.2 It can be seen that even with all three areas operating simultaneously, MCCs noise limits would be met. It should be noted that this is based on the absolute worst case cinema noise levels, and background noise levels at 2am on a weeknight. The bar and Area B would not usually operate at this time, and hence this represents an absolute worst case assessment.

10 SUMMARY AND CONCLUSION

- 10.1 dBx Acoustics has been appointed by Broadwick Live to undertake a noise survey and noise assessment for the proposed rooftop cinema on Mayfield Depot, Fairfield Street, Manchester.
- 10.2 A noise survey was undertaken around the site to determine existing background noise levels in order to determine whether the cinema can meet Manchester City Council's entertainment noise criteria.
- 10.3 Noise predictions have been undertaken which confirm that the venue is a viable location for the proposed events. Further sound tests will be undertaken to validate the noise predictions and a compliance report submitted to the Local Authority.
- 10.4 A comprehensive noise management system, including sound system design, monitoring and community engagement will be in place to promote the local authority requirements and the licence holder and promoters are committed to a continual improvement strategy.
- 10.5 It is therefore considered that this report adequately demonstrates that the proposed temporary rooftop cinema use and additional supporting facilities will comply with planning requirements and promote the Licensing Act 2003 objective of the prevention of public nuisance and Manchester City Council's Planning and Noise Guidance.

APPENDIX A

Glossary of Acoustic Terminology

Decibel, dB	A unit of level derived from the logarithm of the ratio between the value of a quantity and a reference value. For sound pressure level (L_p) the reference quantity is 2×10^{-5} N/m ² . The sound pressure level existing when microphone measured pressure is 2×10^{-5} N/m ² is 0 dB, the threshold of hearing.
L	Instantaneous value of Sound Pressure Level (L_p) or Sound Power Level (L_w).
Frequency	Number of cycles per second, measured in hertz (Hz), related to sound pitch.
A-weighting	Arithmetic corrections applied to values of L_p according to frequency. When logarithmically summed for all frequencies, the resulting single "A weighted value" becomes comparable with other such values from which a comparative loudness judgement can be made, then, without knowledge of frequency content of the source.
$L_{eq, T}$	Equivalent continuous level of sound pressure which, if it actually existed for the integration time period T of the measurement, would possess the same energy as the constantly varying values of L_p actually measured.
$L_{Aeq, T}$	Equivalent continuous level of A weighted sound pressure which, if it actually existed for the integration time period, T, of the measurement would possess the same energy as the constantly varying values of L_p actually measured.
$L_{n, T}$	L_p which was exceeded for n% of time, T.
$L_{An, T}$	Level in dBA which was exceeded for n% of time, T.
L_{Fmax}	The instantaneous maximum sound pressure level which occurred during the measurement. F indicates that the fast time-weighting is used.
L_{AFmax}	The instantaneous maximum A weighted sound pressure level which occurred during the measurement. F indicates that the fast time-weighting is used.
$L_{Ar, Tr}$	The rating level: the equivalent continuous A-weighted sound pressure level of the noise, plus any adjustment for the characteristic features of the noise.

22073 - Mayfield Depot Cinema Manchester R01C

Final Audit Report

2022-12-05

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