Bickerdike Allen Partners

25 CHURCH ROAD, SE19

Music Test - Noise Survey following installation of Fire Exit Acoustic Doors on Tuesday 18 December 2012

Report to

Kayode Falebita

Kingsway International Christian Centre
3 Hancock Road
Bromley-By-Bow
London E3 3DA

By email: Kayode_Falebita@KICC.ORG.UK

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1.0 INTRODUCTION

Bickerdike Allen Partners (BAP) are retained by Kayode Falebita on behalf of the Kingsway International Christian Centre (KICC) to carry out a sound test during music playback in the Hall following installation of acoustic doors as recommended by BAP at 25 Church Road, London. We understand that KICC's intention is the Hall is to be used for conferences, concerts and community-based activities with potential future use as a place of worship. BAP previously carried out noise-breakout assessments of the premises (BAP Reports A9540 of 26 July 2012, and also 31 August 2012) and made recommendations for mitigation works to reduce noise levels at nearest dwellings. Most of the recommended works were previously carried out, and acoustic fire doors to replace the SE fire door, is the remaining item of work to be assessed.

The present noise level survey was carried out by Howard Latham, Fellow of the Institute of Acoustics, Chartered Architect and Practicing Member of the Academy of Experts, with 25 years experience as acoustic consultant at BAP.

This report sets out the results of the most recent survey, and BAP's recommendations to meet typical environmental noise level requirements. The measurement locations are shown in Figure 1, and the measured survey results are in Schedules 1 to 6. A glossary of acoustical terminology can be found in Appendix A.

2.0 SITE DETAILS AND BAP'S MEASUREMENT POSITIONS

The building is a converted cinema situated in a mixed residential and commercial area in Crystal Palace, Bromley, see site plan Figure 1, site measurement location plan.

The layout of the building consists of a foyer area and main Hall split into two levels with balcony and tiered seating at first floor level. BAP's Meter 1 was positioned at the sound mixer desk throughout the measurements, to provide fixed reference noise levels. This was situated in the middle of the ground floor of the main Hall.

During these test measurements a sample of music with bass beat was replayed by the sound engineer through the PA system at an overall level (as measured by an A-weighting circuit) and frequencies (in 63 Hz octave band) considered to be higher than normally representative.

BAP's Meter 2 was used at various locations outside the Hall, to measure any noise breakout. The north-west façade of the building faces the relatively busy Church Road with commercial properties, and no break-out noise was observed at the north-west elevation, where road traffic noise and other local sources were dominant.

The south-east façade is more sheltered and faces a number of residential properties, which are generally well sheltered from traffic noise on Church Road. BAP's measurements outside the Hall concentrated in this area in the Lane at the rear of the building.

The main positions at the rear were BAP's Position 2 (at 11 metres from the SE fire door), and BAP's Position 6 (at 22 metres from the NE corner of the building), see Figure 1. These locations were used in the survey as representative positions to assess noise levels at the nearest dwellings, see Schedule 1, sound level survey results.

During the survey it was found that much of the music test noise was not audible at the two reference positions, 2 and 6, and measurements were made closer to the SE fire exist door, and along the rear wall, where noise-break out was audible or in some cases just audible.

These were BAP Position 1 (2 metres from the SE fire exit doors, in the alley) and Position 3 (2 metres from rear wall and 14 metres from Position 1) and Position 4 (2 metres from the wall and 11 metres from Position 3), and Position 5 (11 metres from Position 4). All these external measurement locations were in the Lane at the rear of the building.

The weather was fine with no rain throughout the measurement period.

Care was taken to record BAP's observations on audibility of local noise sources to ensure that the noise level readings were representative.

3.0 BAP'S RECOMMENDED NOISE CRITERIA

BAP's report of 26 July 2012 in absence of noise criteria from London Borough of Bromley recommended using appropriate noise criteria from another London local authority,

"*The conditions suggested in this section apply to any premises who wish to provide recorded music, live music dance performance, or provision of facilities for music and dancing as part of their licensable activities.*"

"*Before 2300 hours, the noise climate of the surrounding area shall be protected such that the A-weighted equivalent continuous noise level (L_{Aeq}) emanating from the application site, as measured one metre from any façade of any noise sensitive premises over any five minute period with entertainment taking place, shall not increase by more than 5dB as compared to the same measure, from the same position, and over a comparable period, with no entertainment taking place; and the unweighted equivalent noise level (L_{eq}) in the 63Hz Octave band, measured using the "fast" time constant, inside any living room of any noise*

sensitive premises, with the windows open or closed, over any five minute period with entertainment taking place, should show no increase as compared to the same measure, from the same location(s), and over a comparable period, with no entertainment taking place."

"After 2300 hours, the noise climate of the surrounding area shall be protected such that the A-weighted equivalent continuous noise level (L_{Aeq}) emanating from the application site, as measured one metre from any façade of any noise sensitive premises over any five minute period with entertainment taking place shall not increase by more than 3 dB as compared to the same measure, from the same position, and over a comparable period, with no entertainment taking place and the unweighted equivalent noise level (L_{eq}) in the 63Hz Octave band, measured using the "fast" time constant, inside any living room of any noise sensitive premises, with the windows open or closed, over any five minute period with entertainment taking place, should show no increase as compared to the same measure, from the same location(s), and over a comparable period, with no entertainment taking place."

"No sound emanating from regulated entertainment shall be audible from a metre from the façade of the nearest noise sensitive premises".

For assessing noise in the present survey, daytime criteria are relevant, and the two levels that are appropriate are the short-term Leq dB(A) level (representing all the break-out sound) and the Leq 63 Hz octave band level (representing bass or low frequency amplified music).

In the previous survey relevant background levels for assessment at the rear of the building were measured throughout the day-time period at 50 dB(A) and 57 dB 63 Hz. These levels included all sources in the area, passing aircraft and helicopters, road traffic, local neighbour noise and other residual sources, all in the absence of any activity noise from the Hall itself. The present survey has noted such separate sources for each sample measurement, and where appropriate they are not included in the present assessments, such that the short-term ambient noise levels in this report are lower than the previously-reported long-term levels.

As access was not possible to the relevant residential locations, BAP's measurements were made at representative positions on the Lane at the rear of the building, at similar distances from the dwellings relative to the rear wall of the building.

4.0 NOISE SURVEY RESULTS

4.1 Unattended survey – internal ambient conditions – Meter 1

In order to assess the internal noise conditions in the Hall during the event, an unattended sound level meter was placed at the sound mixer desk in the Hall. This position is in the centre of the Hall and considered to be representative of internal levels during the survey. The meter was set up to record levels 0.5 minute duration continuously throughout the survey. The equipment used was a Norsonic type 118 sound level meter, calibrated prior to and after the survey and no significant drift was observed.

4.2 Attended survey – external ambient conditions – Meter 2

In order to establish current performance of the building envelope, a number of synchronous measurements were undertaken outside simultaneously at various positions around the south-eastern façade. Measurements were taken 1.2m above ground. External measurement positions were chosen to be representative of similar distances to the nearest dwellings, or at nearer locations to the building when break-out sound occurring at the time was audible or only just audible. These locations are shown in Figure 1 and labelled for the eastern façade, Position nos. 1, 2, 3, 4, 5 and 6. The equipment used for the present attended measurements was a second Norsonic type 118 sound level meter, this was calibrated prior to and after the survey, and no significant drift was observed.

4.3 Unattended noise survey results – Meter 1 Inside

The average $L_{Aeq,T}$ spectrum recorded inside the Hall during the survey is shown in Table 1. The average dB(A) level is also presented for the entire event period.

Position	Average ambient noise level, dB $L_{Aeq,T}$						
	63Hz	**125 Hz**	**250Hz**	**500Hz**	**1 kHz**	**2 kHz**	**A**
Event daytime (9:30 to 16:15)	96	88	88	87	93	90	**96**

Table 1 – Noise Survey Results – Inside Hall

The actual noise spectrum inside the Hall varied throughout the survey depending on gaps in the sound material, and only the highest sample values have been used in our assessment. The tests were made at a high level with music playing. Levels in the range 85-99 dB $L_{Aeq,T}$ were generated for the tests. The music had to be replayed at high level because even with these high levels, audibility and measurement was difficult at the assessment locations.

4.4 Attended noise survey results – Meter 2 Outside

Figure 1 shows BAP's measurement locations, 1-6. The results of the survey are given in Schedules 1-6 for each of these external measurement positions.

Schedule 1 displays relevant (dB(A) and 63 Hz) sample levels measured inside and outside the Hall, highlighted in colour for emphasis. The results of these two parameters are important as they are relevant for the criteria. The full spectrum values are shown from 63 Hz to 2 kHz. Half-minute recordings were made to allow control over the readings, and observations, and the results can then be computed and displayed as longer sample periods.

Each row shows the octave band results and the A-weighted level for a half-minute sample. The first block shows results for Meter 1, with music on, inside the Hall, and average values. The second block shows results for Meter 2, outside the Hall, with music on., and averages, and averages corrected for background noise in absence of the music. Average background values are given in the third block, Meter 2 outside with music off. The fourth block gives the calculated level differences, and background-corrected average sound level difference values.

It can be seen in Schedule 1, close to the improved acoustic door that the sound level difference is 28 dB at 63 Hz, and 48 dB(A) overall. These are the dB(A) and 63 Hz values relevant to the criteria for entertainment noise. During the survey, background noise consisted generally of road traffic and aircraft noise, and generally increased with reducing screening from Position numbers 1 to 6. At position 1, traffic was screened at the rear of the building, 43 dB(A). Positions 3 and 4 were well screened, 44-45 dB(A). Positions 5 and 6 were 50 dB(A) and 60-63 dB (63 Hz) in lulls between traffic. For BAP's assessment, we have allowed 5 dB to account for screening due to orientation, as shown in Table 2 below,

Type of Sound	Representative Position		Assessment
	63Hz	dB(A)	dB
Representative "Background" Noise therefore criterion = ( )	60-63 (50-53)	50 (40)	—
Measured amplified Music	54	39	Meets dB(A) criterion and nearly meets 63 Hz criterion
Amplified Music with 5 dB correction for orientation	49	34	Meets dB(A) criterion And 63 Hz criterion

Table 2 – Summary of Assessment at Nearest Dwellings

BAP's assessment indicates that for most of the survey results, break-out noise levels were sufficiently low as to satisfy the daytime noise criteria specified in Section 3.0. At Positions 5 and 6, which are considered representative, the test amplified music was inaudible, and when the system was switched off for measurement of background noise, listening checks had to be made at the other locations to check that the system had been in fact switched off. Following installation of the acoustic doors, the limiting factors are now the sound insulation properties of the existing 9-inch brick walls, and the existing roof construction.

5.0 RECOMMENDATIONS FOR NOISE LIMITER INSTALLATION

The results of these tests support the noise limits suggested in BAP's first report of 25 July 2012. To protect the community against noise breakout, it is recommended that a noise limiter system is installed and set to meet the limits inside the Hall as set out below:

Octave band	**63Hz**	**125 Hz**	**250Hz**	**500Hz**	**1k Hz**	**2k Hz**	**dB(A)**
Day Limited level (dB L_{eq})	92	102	97	97	91	85	97
Night Limited level (dB L_{eq})	86	94	91	92	90	85	94

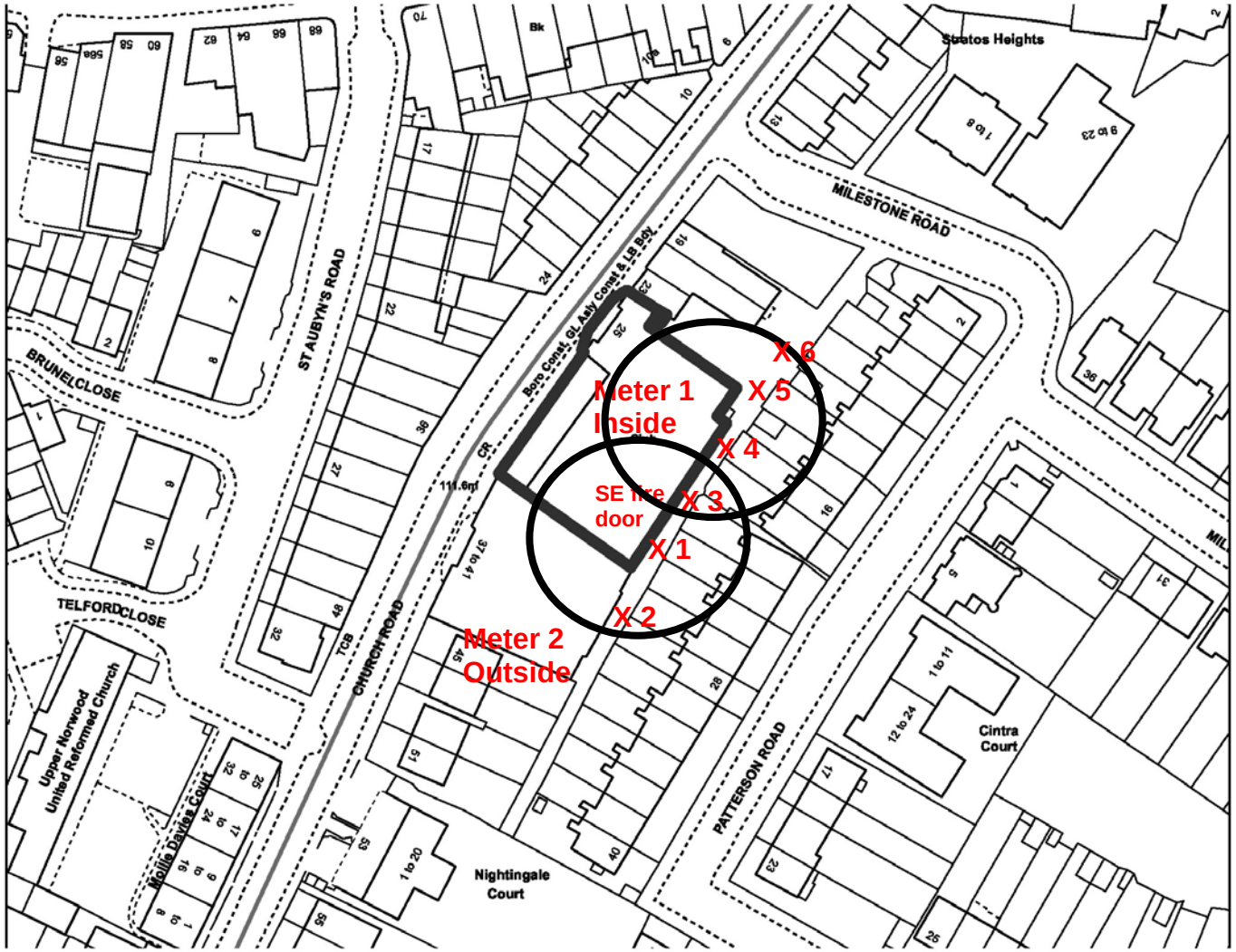
Table 3 – Recommended Settings for Noise Limiter Installation

6.0 SUMMARY

Bickerdike Allen Partners have carried out a measurement check following completion of the recommended building works, and find breakout sound to be significantly reduced. The limiting factor is now the existing brickwork and roof or the original cinema building. Noise limits have been recommended to safeguard community environmental noise levels.

Howard Latham
for Bickerdike Allen Partners

Peter Henson
Partner



Meter 1
Inside Hall (at sound mixer desk)

Meter 2
Outside Hall, locations:

1. 2 m from SE fire door
2. 15 m from fire door (gate No. 28)
3. 11 m from fire door (third pilaster)
4. 11 m from pos. 3
5. 11 m from pos. 4
6. 11 m from pos. 5

Illustrative circles showing BAP Positions 2 and 6, at similar distance to nearest dwellings from rear wall

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Figure 1. Site Measurement Location Plan – Positions 1-6 at Rear of Building

Meter 1 Inside - Music On		63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2 kHz	LAeq
025	11:52:00	96	88	87	87	93	92	97
027	11:53:00	94	86	87	86	90	89	94
028	11:53:30	97	89	87	86	92	92	96
029	11:54:00	94	87	86	85	92	90	95
031	11:55:00	86	81	78	81	86	83	89
032	11:55:31	95	87	85	86	91	86	93
033	11:56:01	95	87	86	87	89	86	93
034	11:56:30	96	88	85	89	91	88	94
035	11:57:00	96	88	83	91	92	90	96
036	11:57:30	93	86	88	88	91	90	95
037	11:58:00	94	87	88	89	91	91	96
038	11:58:31	92	85	85	87	88	88	93
039	11:59:00	97	89	87	86	91	91	96
042	12:00:30	97	89	87	86	86	85	91
043	12:01:00	96	88	88	88	91	91	96
044	12:01:30	96	88	89	89	90	89	95
045	12:02:01	96	88	87	88	91	89	95
Average Sound Level, dB		95	87	87	87	91	89	95

Meter 2 Outside - Music On		63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2 kHz	LAeq
002	11:52:01	69	52	48	43	40	39	48
004	11:53:00	66	51	47	41	38	37	46
005	11:53:30	70	53	48	51	44	36	52
006	11:54:01	68	53	47	49	40	36	49
008	11:55:01	57	47	40	42	35	30	42
009	11:55:31	67	51	45	41	38	33	45
010	11:56:01	67	52	47	48	44	33	49
011	11:56:31	68	52	47	50	40	33	49
012	11:57:01	69	52	43	44	37	33	46
013	11:57:31	66	50	46	41	38	35	45
014	11:58:01	67	50	48	44	38	38	47
015	11:58:31	65	50	46	49	39	35	48
016	11:59:00	68	52	48	51	40	36	50
019	12:00:30	69	52	47	40	34	32	45
020	12:01:00	70	53	49	42	38	36	47
021	12:01:30	70	52	50	42	40	40	49
022	12:02:00	67	51	48	41	38	35	46
Average Sound Level, dB		68	51	47	47	40	36	48
Average background corrected		68	49	44	46	37	-	46

Meter 2 Outside - Music Off		63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2 kHz	LAeq
129	12:55:31	54	44	39	37	38	37	46
130	12:56:01	53	47	45	40	39	37	46
131	12:56:31	55	53	49	44	39	37	47
132	12:57:01	56	50	47	42	37	33	44
133	12:57:31	51	44	41	36	36	31	40
134	12:58:01	52	46	42	37	35	32	41
135	12:58:31	52	44	40	35	34	30	39
136	12:59:01	50	42	38	34	35	31	39
137	12:59:31	51	43	37	35	34	30	38
Average Sound Level, dB		53	47	44	39	37	34	43

Estimated Level Difference	63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2 kHz	LAeq
002	27	38	42	46	56	-	52
004	29	38	43	50	59	-	52
005	27	38	42	35	49	-	46
006	27	36	41	36	54	-	48
008	31	81	78	43	86	-	89
009	28	38	46	49	58	-	54
010	28	37	41	39	46	-	45
011	28	38	41	39	54	-	46
012	27	38	83	49	65	-	54
013	28	40	46	51	61	-	55
014	28	39	43	46	57	-	51
015	28	39	43	38	52	-	46
016	29	40	41	35	55	-	47
019	28	39	44	53	86	-	52
020	26	37	41	50	58	-	51
021	26	38	40	49	52	-	48
022	29	40	42	51	58	-	53
Average (background corrected)	28	38	43	41	54	-	48

Noise level sample readings at reference position P1 in rear alley, 1 metre to fire exit door
Estimated level differences: 28 dB (63 Hz), 38 dB (125 Hz), 43 dB (250 Hz) and 48 dB(A).

Schedule 1. Summary of Music Noise Breakout Survey - Position 1, 18 Dec. 2012

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Meter 1 Inside - Music On		63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2 kHz	LAeq
048	12:03:31	94	86	87	87	93	90	96
049	12:04:01	94	86	87	86	90	89	94
050	12:04:31	97	89	87	86	92	92	97
055	12:07:00	98	89	90	90	96	92	99
057	12:08:01	93	85	87	87	94	88	96
058	12:08:30	96	88	88	87	91	90	95
059	12:09:00	97	89	87	86	92	92	97
062	12:10:31	96	88	86	86	89	88	93
Average Sound Level, dB		96	88	88	87	93	90	96

Meter 2 Outside - Music On		63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2 kHz	LAeq
025	12:03:31	59	46	39	33	30	27	38
026	12:04:00	58	46	39	34	31	27	38
027	12:04:30	62	49	40	34	31	28	40
032	12:07:01	61	48	40	35	33	29	40
034	12:08:01	59	47	43	36	33	29	40
035	12:08:30	61	48	42	35	33	33	41
036	12:09:01	62	48	42	35	33	31	41
039	12:10:30	58	45	38	36	31	27	38
Average Sound Level, dB		60	47	41	35	32	29	40
Average background corrected		59	45	-	-	-	-	34

Meter 2 Outside - Music Off		63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2 kHz	LAeq
139	13:00:31	55	44	40	37	37	34	41
140	13:01:01	56	46	39	35	35	32	40
141	13:01:31	55	46	40	37	34	31	40
142	13:02:01	54	45	39	34	33	30	38
143	13:02:31	52	42	39	34	35	31	39
144	13:03:01	52	42	38	35	35	31	39
145	13:03:31	51	42	37	34	33	29	38
146	13:04:01	52	40	35	32	33	29	38
147	13:04:31	55	42	38	34	35	30	39
Average Sound Level, dB		54	44	39	35	35	31	39

Estimated Level Difference	63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2 kHz	LAeq
025	36	45	-	-	-	-	-
026	38	44	-	-	-	-	-
027	35	42	-	-	-	-	-
032	37	44	-	-	-	-	-
034	37	41	-	-	-	-	-
035	36	41	-	-	-	-	-
036	36	42	-	-	-	-	-
039	41	50	-	-	-	-	-
Average (background corrected)	37	43	-	-	-	-	62

Noise level sample readings at representative position P2 in rear alley, opp. gate no. 28.
Estimated level differences: 37 dB (63 Hz band), 43 dB (125 Hz band) and 62 dB(A).

Schedule 2. Summary of Music Noise Breakout Survey - Position 2, 18 Dec. 2012

Bickerdike Allen Partners

Meter 1 Inside - Music On		63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2 kHz	LAeq
064	12:11:31	96	88	88	89	96	92	99
065	12:12:01	94	86	89	88	95	90	97
066	12:12:30	94	86	89	89	94	90	97
067	12:13:00	97	89	89	89	95	92	98
068	12:13:30	95	87	86	84	91	90	95
069	12:14:00	80	76	78	82	83	82	87
070	12:14:31	86	80	75	78	83	82	87
071	12:15:00	93	86	83	82	87	85	91
072	12:15:30	96	89	86	86	90	90	95
073	12:16:00	97	89	87	87	93	91	97
074	12:16:30	96	88	89	89	96	92	99
Average Sound Level, dB		95	87	87	87	93	90	96

Meter 2 Outside - Music On		63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2 kHz	LAeq
041	12:11:31	64	51	46	41	38	38	45
042	12:12:01	63	49	44	41	40	34	45
043	12:12:30	61	49	44	39	36	31	42
044	12:13:00	65	51	45	41	39	36	45
045	12:13:30	63	50	42	38	37	34	43
046	12:14:01	56	47	40	36	35	35	42
047	12:14:31	55	46	39	36	36	32	41
048	12:15:01	61	48	40	36	34	30	40
049	12:15:31	63	49	42	38	34	32	42
050	12:16:01	65	51	42	38	36	33	43
051	12:16:31	65	54	48	43	38	34	46
Average Sound Level, dB		63	50	44	39	37	34	43
Average background corrected		62	49	40	-	-	-	39

Meter 2 Outside - Music Off		63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2 kHz	LAeq
119	12:50:31	54	46	40	38	37	35	42
120	12:51:01	49	42	38	35	35	32	39
121	12:51:31	51	44	40	36	35	32	40
122	12:52:01	50	43	38	33	33	30	38
125	12:53:31	54	47	45	51	41	33	49
126	12:54:01	53	46	42	46	41	36	46
127	12:54:31	53	44	40	38	39	34	42
Average Sound Level, dB		52	45	41	44	38	33	44

Estimated Level Difference	63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2 kHz	LAeq
041	32	39	45	-	-	-	59
042	32	39	47	-	-	-	62
043	33	39	49	-	-	-	-
044	33	40	47	-	-	-	59
045	32	38	49	-	-	-	-
046	27	33	-	-	-	-	-
047	34	38	-	-	-	-	-
048	33	41	-	-	-	-	-
049	34	42	-	-	-	-	-
050	32	40	-	-	-	-	-
051	32	34	42	-	-	-	57
Average (background corrected)	32	38	46	-	-	-	57

Noise level sample readings at reference position P3 in rear alley, half way along building
Estimated level differences: 32 dB (63 Hz), 38 dB (125 Hz), 46 dB (250 Hz) and 57 dB(A).

Schedule 3. Summary of Music Noise Breakout Survey - Position 3, 18 Dec. 2012

Bickerdike Allen Partners

Meter 1 Inside - Music On		63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2 kHz	LAeq
077	12:18:00	97	89	87	86	93	92	97
078	12:18:30	93	86	85	83	89	88	93
081	12:20:00	95	87	82	83	87	86	91
083	12:21:00	96	88	83	87	91	88	94
084	12:21:30	95	87	81	89	89	89	94
085	12:22:00	94	86	88	87	91	90	95
086	12:22:31	94	87	87	88	90	91	95
087	12:23:01	93	86	87	87	91	89	95
Average Sound Level, dB		95	87	86	87	90	90	95

Meter 2 Outside - Music On		63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2 kHz	LAeq
054	12:18:01	65	54	46	40	37	34	45
055	12:18:31	61	51	43	37	36	33	43
058	12:20:01	61	51	41	39	38	35	43
060	12:21:01	61	49	41	39	37	34	43
061	12:21:31	61	49	39	38	33	29	40
062	12:22:01	59	49	44	39	38	34	43
063	12:22:31	60	50	45	40	37	36	44
064	12:23:01	58	49	43	39	38	36	43
Average Sound Level, dB		61	51	43	39	37	34	43
Average background corrected		60	47	-	-	-	-	36

Meter 2 Outside - Music Off		63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2 kHz	LAeq
109	12:45:31	51	48	41	37	38	37	44
110	12:46:01	53	48	40	36	38	34	42
111	12:46:31	55	50	44	39	42	42	47
112	12:47:01	53	48	41	37	37	36	43
113	12:47:31	56	51	48	42	39	36	45
114	12:48:01	56	49	44	40	42	36	45
117	12:49:31	53	47	41	39	39	35	43
Average Sound Level, dB		54	49	44	39	40	37	45

Estimated Level Difference	63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2 kHz	LAeq
054	32	36	-	-	-	-	-
055	34	39	-	-	-	-	-
058	35	40	-	-	-	-	-
060	37	47	-	-	-	-	-
061	35	47	-	-	-	-	-
062	37	47	-	-	-	-	-
063	35	47	-	-	-	-	-
064	37	45	-	-	-	-	-
Average (background corrected)	35	41	-	-	-	-	59

Noise level sample readings at reference position P4 in rear alley, at east end of building
Estimated level differences: 35 dB (63 Hz), 41 dB (125 Hz) and 59 dB(A).

Schedule 4. Summary of Music Noise Breakout Survey - Position 4, 18 Dec. 2012

Bickerdike Allen Partners

Meter 1 Inside - Music On		63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2 kHz	LAeq
093	12:26:00	97	89	86	86	90	90	95
094	12:26:30	97	89	87	87	93	91	97
095	12:27:00	96	88	87	87	93	91	97
097	12:28:00	95	87	88	86	90	90	95
098	12:28:30	97	89	87	86	92	92	97
Average Sound Level, dB		96	88	87	86	92	91	96

Meter 2 Outside - Music On		63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2 kHz	LAeq
070	12:26:01	62	52	51	54	47	39	53
071	12:26:30	62	51	46	49	42	38	49
072	12:27:01	60	51	44	43	43	40	48
074	12:28:01	62	51	44	46	44	40	49
075	12:28:31	60	50	46	43	42	38	47
Average Sound Level, dB		61	51	47	49	44	39	50
Average background corrected		57	-	-	-	-	-	31

Meter 2 Outside - Music Off		63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2 kHz	LAeq
098	12:40:01	57	51	48	48	44	40	49
099	12:40:31	61	53	50	48	45	42	51
100	12:41:01	64	51	45	42	42	38	46
101	12:41:30	59	52	50	46	46	41	50
102	12:42:01	58	55	51	49	45	40	51
105	12:43:30	60	54	52	50	46	40	51
106	12:44:01	57	52	48	46	45	40	49
107	12:44:31	57	52	48	45	44	39	48
Average Sound Level, dB		60	53	50	47	45	40	50

Estimated Level Difference	63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2 kHz	LAeq
070	38	-	-	-	-	-	-
071	40	-	-	-	-	-	-
072	44	-	-	-	-	-	-
074	36	-	-	-	-	-	-
075	46	-	-	-	-	-	-
Average (background corrected)	39	-	-	-	-	-	66

Noise level sample readings at reference position P5 in rear alley, 11m from P4 east building
Many sample levels were less than background due to traffic at this location.
Estimated level differences: 39 dB (63 Hz) and 66 dB(A).

Schedule 5. Summary of Music Noise Breakout Survey - Position 5, 18 Dec. 2012

Bickerdike Allen Partners

Meter 1 Inside - Music On		63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2 kHz	LAeq
105	12:32:00	95	87	82	90	90	89	94
107	12:33:00	94	87	88	89	91	91	95
108	12:33:30	94	86	87	87	91	89	95
109	12:34:00	96	89	88	89	95	91	97
Average Sound Level, dB		95	87	87	89	92	90	96

Meter 2 Outside - Music On		63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2 kHz	LAeq
082	12:32:01	63	52	46	47	41	38	48
084	12:33:01	62	53	48	52	45	40	52
085	12:33:31	61	52	49	51	46	41	51
086	12:34:01	64	54	50	48	46	43	51
Average Sound Level, dB		63	53	48	50	45	41	51
Average background corrected		-	-	-	-	-	-	-

Meter 2 Outside - Music Off		63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2 kHz	LAeq
088	12:35:01	63	54	48	46	45	41	50
089	12:35:31	63	53	45	47	44	38	48
092	12:37:01	64	56	53	48	42	36	50
093	12:37:31	64	57	52	53	45	39	52
094	12:38:01	61	55	51	49	47	42	51
095	12:38:30	60	55	55	45	44	39	50
Average Sound Level, dB		63	55	52	49	45	40	50

Estimated Level Difference	63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2 kHz	LAeq
082	-	-	-	-	-	-	-
084	-	-	-	-	-	-	-
085	-	-	-	-	-	-	-
086	-	-	-	-	-	-	-
Average (background corrected)	-	-	-	-	-	-	-

Noise level sample readings at reference position P6 in rear alley, 22 m from P4 east building
Most sample noise levels were less than background due to traffic at this location.
Test music breakout noise was not audible or measurable at this location.

Schedule 6. Summary of Music Noise Breakout Survey - Position 6, 18 Dec. 2012

APPENDIX A
GLOSSARY OF ACOUSTIC TERMINOLOGY

The Decibel, dB

The unit used to describe the magnitude of sound is the decibel (dB) and the quantity measured is the sound pressure level. The decibel scale is logarithmic and it ascribes equal values to proportional changes in sound pressure, which is a characteristic of the ear. Use of a logarithmic scale has the added advantage that it compresses the very wide range of sound pressures to which the ear may typically be exposed to a more manageable range of numbers. The threshold of hearing occurs at approximately 0 dB (which corresponds to a reference sound pressure of 2×10^{-5} pascals) and the threshold of pain is around 120 dB.

The sound energy radiated by a source can also be expressed in decibels. The sound power is a measure of the total sound energy radiated by a source per second, in watts. The sound power level, L_w is expressed in decibels, referenced to 10^{-12} watts.

Frequency, Hz

Frequency is analogous to musical pitch. It depends upon the rate of vibration of the air molecules that transmit the sound and is measure as the number of cycles per second or Hertz (Hz). The human ear is sensitive to sound in the range 20 Hz to 20,000 Hz (20 kHz). For acoustic engineering purposes, the frequency range is normally divided up into discrete bands. The most commonly used bands are octave bands, in which the upper limiting frequency for any band is twice the lower limiting frequency, and one-third octave bands, in which each octave band is divided into three. The bands are described by their centre frequency value and the ranges which are typically used for building acoustics purposes are 63 Hz to 4 kHz (octave bands) and 100 Hz to 3150 Hz (one-third octave bands).

A-weighting

The sensitivity of the ear is frequency dependent. Sound level meters are fitted with a weighting network which approximates to this response and allows sound levels to be expressed as an overall single figure value, in dB(A).

Environmental Noise Descriptors

Where noise levels vary with time, it is necessary to express the results of a measurement over a period of time in statistical terms. Some commonly used descriptors follow.

$L_{Aeq, T}$ The most widely applicable unit is the equivalent continuous A-weighted sound pressure level ($L_{Aeq, T}$). It is an energy average and is defined as the level of a notional sound which (over a defined period of time, T) would deliver the same A-weighted sound energy as the actual fluctuating sound.

L_{A90} The level exceeded 90% of the time is normally used to describe background noise.

Sound Transmission in the Open Air

Most sources of sound can be characterised as a single point in space. The sound energy radiated is proportional to the surface area of a sphere centred on the point. The area of a sphere is proportional to the square of the radius, so the sound energy is inversely proportional to the square of the radius. This is the inverse square law. In decibel terms, every time the distance from a point source is doubled, the sound pressure level is reduced by 6 dB.

Road traffic noise is a notable exception to this rule, as it approximates to a line source, which is represented by the line of the road. The sound energy radiated is inversely proportional to the area of a cylinder centred on the line. In decibel terms, every time the distance from a line source is doubled, the sound pressure level is reduced by 3 dB.

Factors Affecting Sound Transmission in the Open Air

Reflection

When sound waves encounter a hard surface, such as concrete, brickwork, glass, timber or plasterboard, it is reflected from it. As a result, the sound pressure level measured immediately in front of a building façade is approximately 3 dB higher than it would be in the absence of the façade.

Meteorological Effects

Temperature and wind gradients affect noise transmission, especially over large distances. The wind effects range from increasing the level by typically 2 dB downwind, to reducing it by typically 10 dB upwind – or even more in extreme conditions. Temperature and wind gradients are variable and difficult to predict.