Appendix 9.2 Baseline Noise Survey Details

17 November 2022

Introduction

This Appendix provides additional information on the baseline noise surveys completed by WSP.

Equipment and Calibration

1.1. The Class 1 sound pressure level measurement systems and hand held acoustic calibrators as detailed within Table 1 below were used over the course of this survey.

Table 1- Noise Measurement Equipment

WSP equipment reference	Equipment	Make/model	Serial number
SOLO 16	Sound Level Meter	01dB-Metravib Black Solo	65704
	Pre-amplifier	01dB-Metravib PRE 21 S	16925
	Microphone	01dB Metravib MCE 212	153382
	Calibrator	01dB Cal 21	34134167
SOLO 20	Sound Level Meter	01dB-Metravib Black Solo	65811
	Pre-amplifier	01dB-Metravib PRE 21 S	16554
	Microphone	01dB Metravib MCE 212	166394
	Calibrator	01dB-Stell Cal 21	34634224
SOLO 21	Sound Level Meter	01dB-Metravib Blue Solo	61332
	Pre-amplifier	01dB-Metravib PRE 21 S	12495
	Microphone	01dB Metravib MCE 212	67311
	Calibrator	Norsonic type 1251	31462
SOLO 22	Sound Level Meter	01dB-Metravib Blue Solo	61331
	Pre-amplifier	01dB-Metravib PRE 21 S	14575
	Microphone	01dB Metravib MCE 212	92344

	Calibrator	Norsonic type 1251	31460
2250 MAN	Sound Level Meter	Brüel & Kjær Type 2250	3023998
	Pre-amplifier	Brüel & Kjær Preamplifier	26900
	Microphone	Brüel & Kjær Condensing	3130582
	Calibrator	Brüel & Kjær 4231	2524534

1.2. Each of the measurement systems had been calibrated to traceable standards within the previous 24 months, and the handheld calibrators within the previous 12 months. Using the paired handheld calibrator for each system, each measurement chain was subject to calibration at the beginning and end of each measurement. No significant calibration drafts arose.

1.3. At each measurement position , the microphone of the installed measurement system was fitted with a windshield.

1.4. All microphones were mounted in the free-field on a tripod at a height of 1.5m above ground, unless noted otherwise (see Table 2 below).

Purpose and Measurement Positions

1.5. The Site and surrounding area were visited several times from April to October 2022 in order to ascertain the likely dominant noise sources in the area. Based on these observations various noise surveys were carried out.

1.6. The adopted measurement positions (MP) are depicted in Figure 1 and described in Table 2 below.

Figure 1 - Noise measurement positions

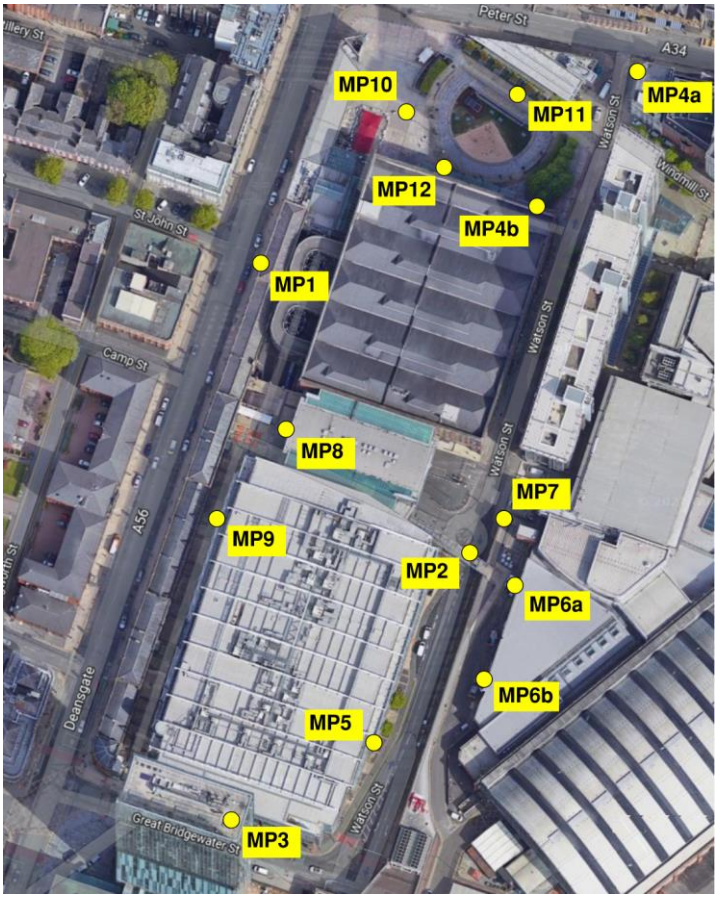


Table 2- Noise Measurement Positions

Meas. Position	Start - End	Duration	Description	Purpose
MP1	04/04/2022 15:00 - 20/04/2022 15:45hrs	~ 16 days	Outside 3rd floor conference room window facing Deansgate, approx. 0.5m from the façade.	Capture prevailing noise levels at the western boundary of the site dominated by road traffic on Deansgate.
MP2	04/04/2022 14:15hrs - 13/04/2022 09:00hrs	~ 8.5 days	Footbridge over Watson Street.	Capture prevailing noise levels at the eastern boundary of the site.
MP3	13/04/2022 10:56 - 13:56hrs	3 hours	Great Bridgewater Street on pavement approx. 4m from road edge.	Capture prevailing daytime and night-time noise levels at the southern boundary of the site dominated by road traffic on Great Bridgewater Street.
	15/04/2022 00:26 - 01:26hrs	1 hour		

MP4a	13/04/2022 14:00 - 17:00hrs	3 hours	Peter Street measurement, on junction by Watson Street approx. 4m from road edge.	Capture prevailing daytime noise levels at the northern boundary of the site dominated by road traffic.
MP4b	14/04/2022 23:09hrs - 15/04/2022 00:09hrs	1 hour	Position on Level 3 at north-eastern corner of the multi-storey car park	Capture prevailing night-time noise levels at the northern boundary of the site dominated by road traffic on Deansgate and noise from bars such as Albert Schloss.
MP5	03/04/2022	Various	Survey during an event in Exchange Hall at Manchester Central	Capture noise levels during a musical bingo event with a full speaker system and DJ. Sound limiter in place in this venue.
MP6	07/07/2022	Various	Survey during an event in Charter Suite at Manchester Central	Capture noise levels during a live music event in the venue space closest to the Proposed Development. This is the only event space with no sound limiting system.
MP7	16/08/2022	Various	Survey during an event in Exchange Hall at Manchester Central	Capture noise levels during a corporate afterparty event with a full speaker system. Sound limiter in place in this venue space.
MP8	29/07/2022	Various	Survey outside the Lion's Den music bar during a music event.	Capture noise levels during a live music event from the music itself and patrons sat outside.
MP9	07/10/2022	31 secs	5m from the Low Four Studio window.	Capture noise levels during a live music event.
MP10	29/07/2022	5 mins	Great Northern Square next to Pong & Puck games bar outdoor area.	Measurement of noise from DJ music and patrons outside.
MP11	29/07/2022	2 mins	Great Northern Square outside Impossible club / bar.	Measurement of noise from music and patrons inside.
MP12	29/07/2022	5 mins	Great Northern Square outside	Venue doors open, measurement of noise from music and people inside

	Lane 7 bowling alley entrance.

Survey Details

General Ambient Noise Climate

1.7. The existing noise climate at the development site and surrounding area is dominated by transport noise, with road traffic on all sides of the site. Additionally, commercial businesses located close to the site contribute to the noise climate.

1.8. An environmental noise survey was undertaken at several unattended and attended locations around the site to determine the prevailing environmental noise climate. The data collected during the surveys has been used to inform assessments of potential noise impacts at both existing and new sensitive receptors which may be caused by the proposed development.

1.9. The measurement positions (MP) were agreed with a representative of Manchester City Council's Environmental Protection team in advance of the survey.

1.10. The tables below provide a summary of the results obtained from the noise measurement positions MP1 to MP4. During all measurements weather conditions were dry and conducive to noise monitoring.

Table 3- Summary of Measured Noise Levels at Unattended Position MP1 - Deansgate

Date	Daytime (07:00 – 23:00 hours)		Night-time (23:00 – 07:00 hours)		
	Average Equivalent Level, dB $L_{Aeq,16hr}$	**Background Level – Range, dB $L_{A90,15min}$**	**Average Equivalent Level, dB $L_{Aeq,8hr}$**	**Background Level – Range, dB $L_{A90,15min}$**	**Typical ** maximum Event Level, dB $L_{AFmax,2min}$**
Mon 04/04/2022	64*	52 - 56*	60	43 - 53	77
Tue 05/04/2022	65	52 - 57	62	44 - 58	83
Wed 06/04/2022	64	52 - 58	62	46 - 55	83
Thu 07/04/2022	65	52 - 62	62	42 - 54	81
Fri 08/04/2022	64	50 - 58	64	45 - 58	83
Sat 09/04/2022	64	48 - 61	64	42 - 61	87
Sun 10/04/2022	63	43 - 55	60	41 - 53	78
Mon 11/04/2022	63	48 - 55	59	39 - 51	77

Tue 12/04/2022	64	49 - 60	60	41 - 52	79
Wed 13/04/2022	64	51 - 61	61	42 - 54	85
Thu 14/04/2022	64	50 - 57	62	42 - 56	82
Fri 15/04/2022	63	45 - 58	62	42 - 59	85
Sat 16/04/2022	64	42 - 58	63	42 - 60	85
Sun 17/04/2022	65	40 - 58	63	45 - 58	85
Mon 18/04/2022	62	45 - 52	59	38 - 49	77
Tue 19/04/2022	63	48 - 55	60	39 - 54	82
Wed 20/04/2022	63*	49 - 57*			
*** Incomplete period** **** 10th highest $L_{AFmax,2min}$ recorded during the night time period**					

Table 4- Summary of Measured Noise Levels at Unattended Position MP2 – Watson Street

Date	Daytime (07:00 – 23:00 hours)		Night-time (23:00 – 07:00 hours)		
	Average Equivalent Level, dB $L_{Aeq,16hr}$	**Background Level – Range, dB $L_{A90,15min}$**	**Average Equivalent Level, dB $L_{Aeq,8hr}$**	**Background Level – Range, dB $L_{A90,15min}$**	**Typical ** maximum Event Level, dB $L_{AFmax,2min}$**
Mon 04/04/2022	65*	53 - 60*	58	51 - 57	77
Tue 05/04/2022	69	53 - 69	59	51 - 63	73
Wed 06/04/2022	67	53 - 70	61	52 - 58	79
Thu 07/04/2022	65	52 - 61	59	50 - 56	78

Fri 08/04/2022	63	53 - 59	58	51 - 54	79
Sat 09/04/2022	61	52 - 59	58	51 - 56	76
Sun 10/04/2022	59	50 - 55	57	50 - 55	76
Mon 11/04/2022	61	51 - 59	55	50 – 55	71
Tue 12/04/2022	65	52 - 70	57	51 - 56	77

Notes:

*** denotes incomplete measurement period**

**** 10th highest $L_{AFmax,2min}$ recorded during the night time period**

Results highlighted in grey were excluded from the assessment due to potential influence from nearby construction works.

Table 5- Summary of Measured Noise Levels at Attended Positions, MP3, MP4a and MP4b, Free-field.

Meas. Position	Start	Period	Duration, *T*	Average Equivalent Level, dB $L_{Aeq,T}$	Background Level – Range, dB $L_{A90,15min}$	Maximum Event Level, dB $L_{AFmax,2min}$
MP3	13/04/2022 10:56 hrs	Day	3 hrs	69	62 - 63	-
MP3	15/04/2022 00:26 hrs	Night	1 hr	62	61 – 61	79
MP4a	13/04/2022 14:00 hrs	Day	3 hrs	66	58 – 59	-
MP4b	14/04/2022 23:09 hrs	Night	1 hr	63	51 – 61	76

1.11. Only short term measurements were possible in locations MP3 and MP4a. Therefore, for the purposes of assessing the $L_{Aeq,T}$ noise levels at night and during the day (and for calibrating the noise model) 16 hour daytime and 8 hour night time L_{Aeq} levels have been derived using methods from CRTN [Ref. 17] and the TRL report [Ref. 21], as follows:

- As per the 'shortened measurement procedure' of CRTN [Ref. 17] the $L_{A10,18hr}$ values are calculated as follows (where $L_{10,3hr}$ is the arithmetic mean of the three consecutive values of hourly L_{10}):

$$L_{A10,18hr} = L_{10,3hr} - 1\ dB$$

- The daytime $L_{Aeq,16hr}$ value is calculated using equation 2.13 of the TRL report [Ref 21]:

$L_{Aeq,16hr} = L_{A10,18hr} - 2.2$ dB

- The night-time $L_{Aeq,8hr}$ value is calculated using equation 4.11 of the TRL report [Ref 21]:

$L_{Aeq,8hr} = 0.90 \times L_{A10,18h} - 3.77$ dB

1.12. The above method produces the following levels, used in the assessment and for calibrating the noise model:

Table 6 - Summary of Ambient Noise Levels Derived From Short Term Measurements Using CRTN/TRL, MP3 and MP4

Meas. Position	Daytime dB $L_{A10,1hr}$	Daytime dB $L_{A10,3hr}$	Daytime dB $L_{Aeq,16hr}$	Night-time dB $L_{Aeq,8hr}$
MP3	71	70	68	60
	72			
	71			
MP4	69	68	66	57
	69			
	69			

Measured Noise Levels Used to Determine Construction Noise Assessment Criteria

1.13. MCC's Planning and Noise Technical Guidance [Ref. 9] requires that all noisy construction works should be restricted to the following hours to minimise disruption:

- Monday - Friday: 7.30am - 6pm
- Saturday: 8.30am - 2pm
- Sunday / Bank holidays: No work

1.14. Therefore, average measured ambient noise levels are presented for the days above. At MP2 the measurement period only covered one Saturday.

1.15. The following levels have been used to determine construction noise assessment criteria.

Table 7- Summary of Ambient Noise Levels Used to Determine Construction Noise Assessment Criteria, MP1 and MP2, Free-field

Meas. Position	Assessment Period	Average daytime dB $L_{Aeq,16hr}$
MP1	Weekday	64
	Saturday	64
MP2	Weekday	63

	Saturday	61

1.16. Ambient noise levels for short-term measurement positions MP3 and MP4 have not been presented as these periods were considered too short to provide reliable data for the purposes of construction noise assessment. Ambient noise levels from long-term measurement positions MP1 and MP2 have been used for this instead and have broadly similar noise climates to the other two positions.

Background Sound Level Measurement Results

1.17. 'Typical' background sound levels have been determined in accordance with the methodology prescribed by MCC in Appendix A of the Noise and Planning Guide [Ref. 9]. These noise levels have been used to set plant and entertainment noise limits and have been calculated as follows:

- Measured $L_{A90,15min}$ values tabulated for each 15 min period of each day in the survey.
- The average value is calculated for each time period across the full survey duration.
- The minimum value of the averages is taken as the 'typical' value.
- The above is completed separately for the daytime and night-time periods to help determine limits for plant noise.
- In addition, we have completed the above in individual octave bands from 31.5 Hz to 4 kHz, in order to determine limits for entertainment noise.

1.18. Background sound levels for short-term measurement positions MP3 and MP4 have not been presented as these periods were considered too short to provide reliable data for the purposes of setting plant noise limits. Background sound levels from long-term measurement positions MP1 and MP2 have been used for this instead and have broadly similar noise climates to the other two positions.

Table 8- Summary of Typical Background Sound Levels, MP1 and MP2 Free-field

Meas. Position	Period	Typical Broadband $L_{A90,15min}$ (dB)	Typical Octave-Band $L_{90,15min}$ (dB)						
			63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
MP1	Day	49	57	52	48	44	45	40	31
	Night	44	52	48	43	40	40	35	26
MP2	Day	53	58	55	51	50	48	44	35
	Night	51	54	52	50	49	46	43	35

Manchester Central

1.19. Manchester City Council requested that event noise from Manchester Central be considered in the assessment:

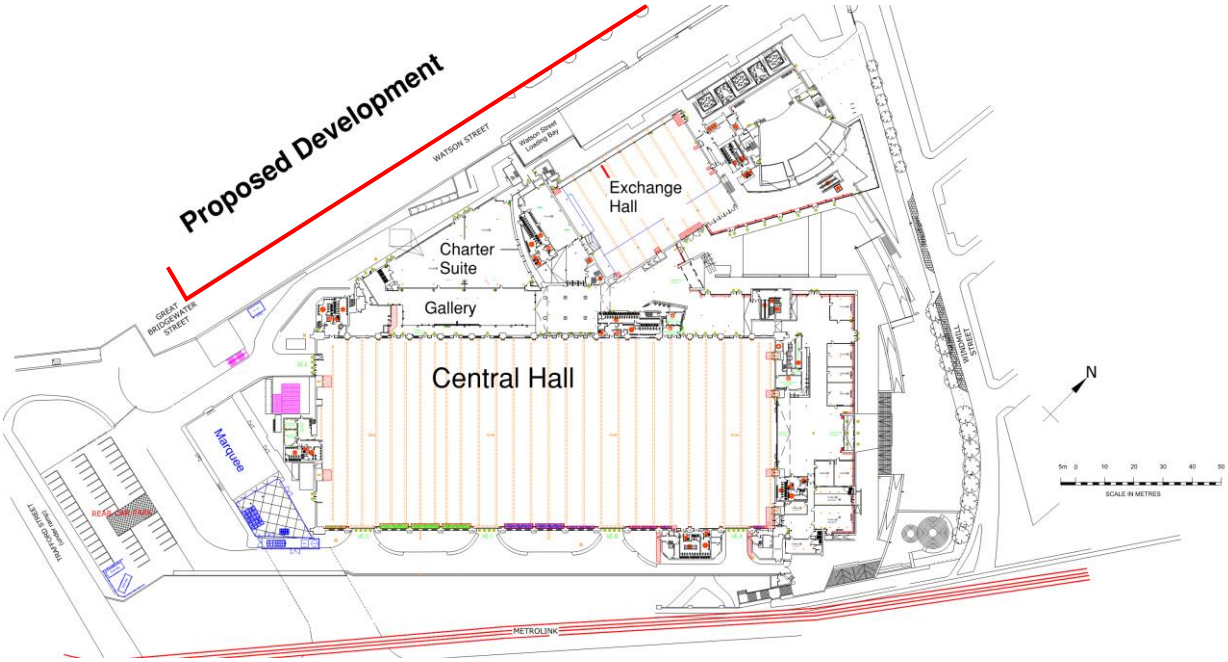
1.20. "Events are held at the Manchester Central (formerly GMEX) that contain high volume amplified sound/music content, namely Exchange Hall & Central Hall. More frequent events occur at the former but the latter is able to host large concert style events. These could adversely impact on the proposed residential units. Suggest that this assessed using a targeted monitoring strategy inc. more representative locations."

1.21. Based on discussions with the Manchester Central Facilities Management and their chosen sound system supplier (Sterling Event Group Ltd), the venue is understood to contain several event spaces which could

potentially impact the Proposed Development. These have been labelled on the plan below and are described as follows:

- Central Hall, large space hosting a variety of events which may have live or recorded music. Subject to a noise limiting system set to a maximum of 96 dB at the 63 Hz octave band centre frequency.
- Exchange Hall, large event space hosting a variety of events which may have recorded music but no live music due to complaints in the past from residents of the Great Northern Tower which is located within 10m of the space. Subject to a noise limiting system set to a maximum of 88 dB at the 63 Hz octave band centre frequency.
- Charter Suite, used for a variety of corporate events and parties including live music. Not subject to any sound limiting system and is the closest venue to the Proposed Development, with rear fire exit doors approximately 30m from the nearest façade of the Proposed Development.
- Gallery, central space used for a variety of corporate events and parties including live music.

Figure 2 - Manchester Central Plan (Event Spaces Labelled)



1.22. WSP attended site on several occasions to gather noise data from events at Manchester Central and carried out the following surveys:

- MP5 - WSP attended the Site on the evening of Saturday 30 April 2022 to measure external noise levels during a large music event in Exchange Hall (Bongo's Bingo - a combination of music, bingo, and audience participation etc.). However, noise levels were inaudible at the Site over the ambient noise climate.
- MP6a & MP6b - WSP attended Manchester Central on the evening of Thursday 07 July 2022 to measure noise from a corporate afterparty in the Charter Suite which had a live band and DJ playing through a sound system. No noise limiting system was in place and noise was clearly audible breaking out of several closed double-door fire exits.
- MP7 - WSP attended Manchester Central on the evening of Thursday 07 July 2022 to measure noise from a corporate afterparty in Exchange Hall which had recorded music playing through a sound system comprising full 12 speaker flying arrays with subwoofers. Noise levels were virtually inaudible over the ambient noise climate, even in a position close to the venue.

1.23. Observations from the two attendances at Site were that noise levels from Exchange Hall were virtually inaudible, even within the Manchester Central site. This space is also mostly screened from the Proposed

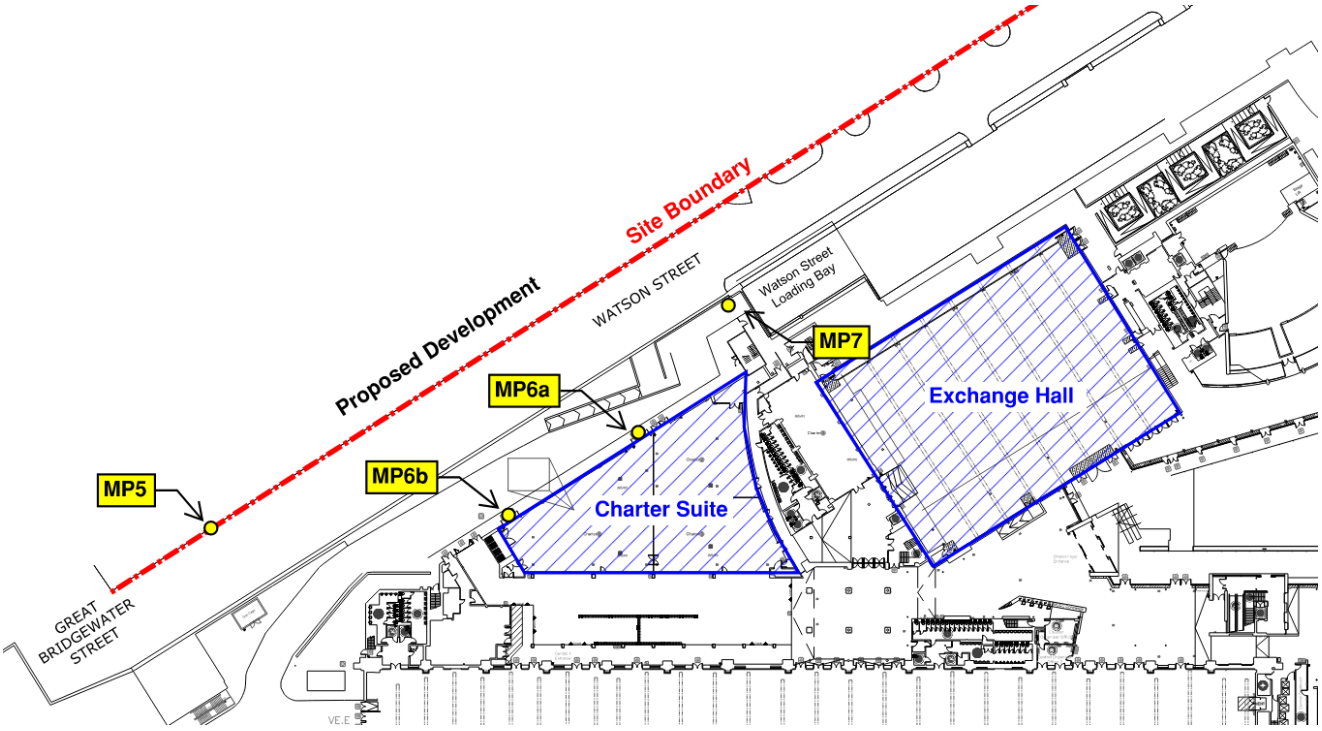
Development and therefore has not been assessed further. However, the locations attended on site have been included in Figure 3 below for reference.

1.24. Unfortunately, no suitable events took place at Central Hall which could be monitored in time for submission of the ES and Manchester Central declined to share pre-existing data with WSP for confidentiality reasons.

1.25. However, it was observed that the Charter Suite had two sets of poorly insulated external fire doors which leaked sound in the direction of the Proposed Development. Therefore, combined with the fact that no noise limiting system is in place here and it is the closest event space to the Proposed Development, it is expected that the Charter Suite has the greatest potential to generate significant effects at the Proposed Development.

1.26. The measurement positions are shown in yellow in Figure 3 below.

Figure 3 - Manchester Central Noise Survey Measurement Positions



1.27. As mentioned previously, at positions MP5 and MP7 noise from Exchange Hall was inaudible and could not be measured.

1.28.

1.29. Table 9 below provides a summary of the results obtained from the noise measurement positions MP6a and MP6b, measurements were taken at 1m from the respective fire exit doors. During all measurements weather conditions were dry and conducive to noise monitoring.

Table 9- Manchester Central Noise Survey Measurement Results, MP6a and MP6b

Meas. Position	Start time	Duration *T*	Measured sound pressure level at 1m from doors, $L_{eq,T}$ Octave-band level (dB)

			Broadband level (dBA)	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
MP6a	22:01 hrs	5 min	71	94	82	69	65	64	61	57
	22:06 hrs	5 min	71	94	82	69	64	63	60	57
	22:11 hrs	5 min	71	93	81	71	66	64	61	57
MP6b	22:39 hrs	5 min	66	88	77	69	59	55	55	51
	22:44 hrs	5 min	66	89	79	68	59	54	54	49

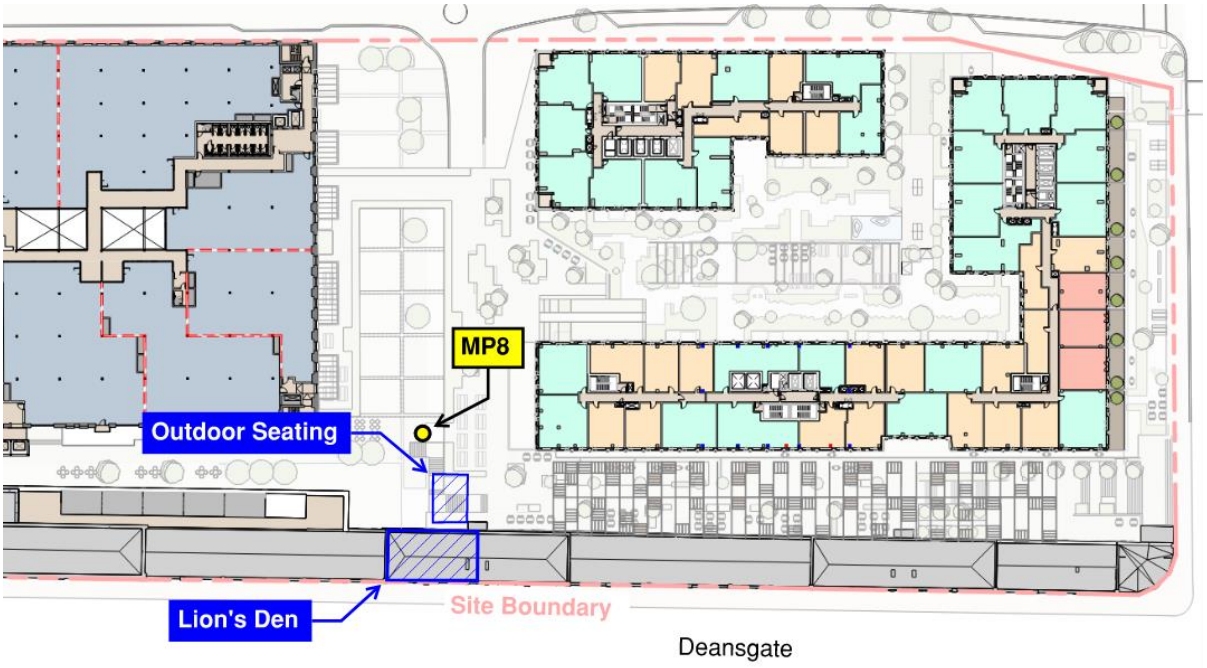
Lion's Den Music Bar

1.30. The Lion's Den is a music bar which hosts live music events in an upstairs room and has an outdoor seating area for customers. Noise from this source is likely to affect eastern and northern façades of the Proposed Development.

1.31. Noise surveys were carried out on Friday the 29th July 2022 to capture noise levels during a live music event from the music venue itself and patrons sat outside. It was a warm and clear night at the time of the survey and so the outdoor seating area was busy.

1.32. The location of the Lion's Den bar and outdoor seating area is shown in Figure 4, the attended measurement position MP8 is marked in yellow.

Figure 4 – Lion's Den Noise Survey Measurement Position



1.33. The conditions during the measurements at position MP8 are described as follows:

- 21:06 hrs - live music upstairs with sash window open
- 22:24 hrs – no live music, noise from patrons in outside seating area

- 23:36 hrs - live music upstairs, windows closed but front door still open

1.34. Table 10 below provides a summary of the results obtained at MP8. During all measurements weather conditions were dry and conducive to noise monitoring.

Table 10- Lion's Den Noise Survey Measurement Results, MP8, Free-field

Meas. Position	Start time	Duration *T*	Measured sound pressure level, $L_{eq,T}$							
			Broad-band level (dBA)	Octave-band level (dB)						
				63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
MP8	21:06	3 mins	76	76	76	76	74	69	66	67
	22:24	5 mins	69	72	68	63	66	66	60	54
	23:36	5 mins	67	74	74	69	64	60	56	52

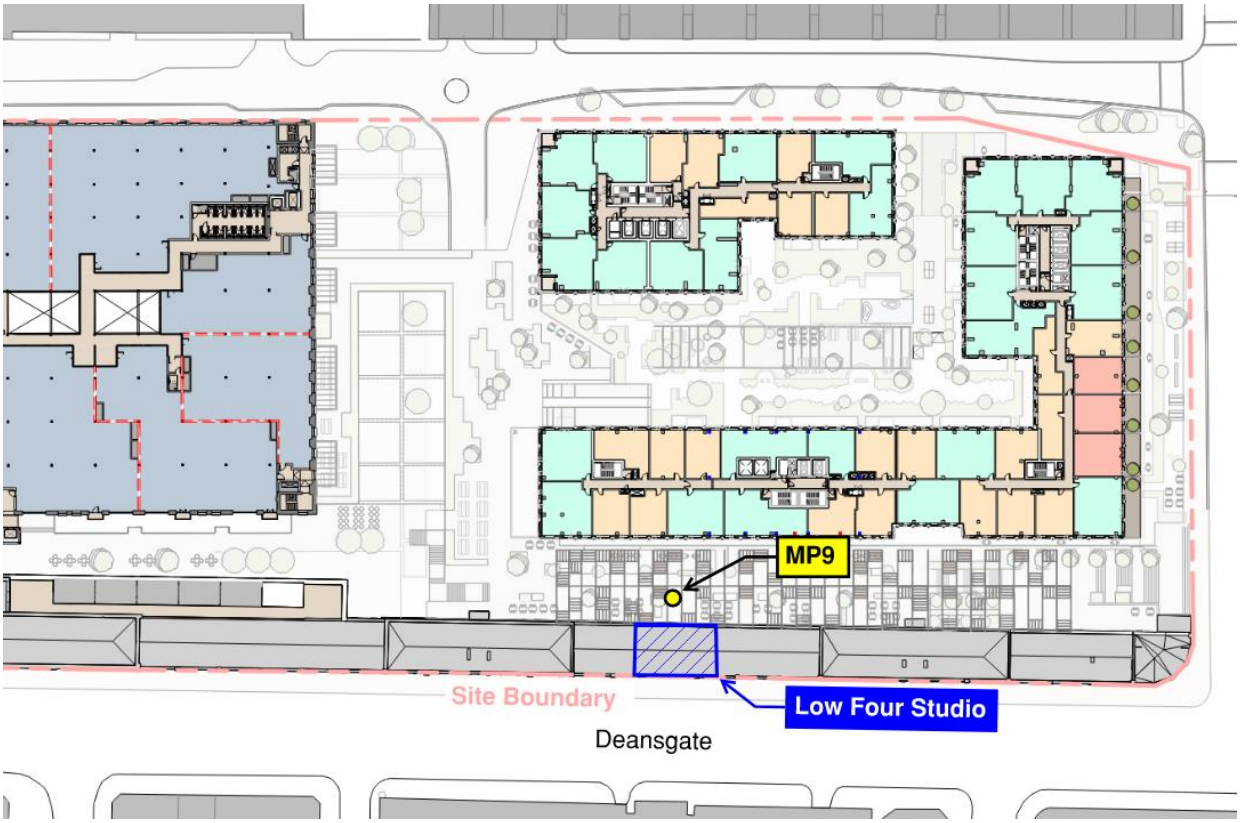
Low Four Studio

1.35. Low Four Studio is a music venue and bar which hosts live music events in a downstairs studio. Noise from this source is likely to primarily affect eastern and northern façades of the Proposed Development.

1.36. A noise survey was carried out on Friday the 7th October 2022 to capture noise levels during a live music event from the music venue itself.

1.37. The location of Low Four Studio is shown in Figure 5 and the attended measurement position MP9 is marked in yellow.

Figure 5 – Low Four Studio Noise Survey Measurement Position



1.38. Measurement position MP9 was 5m from the studio window.

1.39. Table 11 below provides a summary of the results obtained at MP9. During the measurement weather conditions were dry and conducive to noise monitoring.

Table 11 - Low Four Studio Noise Survey Measurement Results, MP9, Free-field

Meas. Position	Start time	Duration *T*	Measured sound pressure level, $L_{eq,T}$							
			Broad-band level (dBA)	Octave-band level (dB)						
				63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
MP9	23:02	31 secs	64	77	76	65	60	56	51	46

Great Northern Square

1.40. Several potentially noisy entertainment premises are located around the Great Northern Square toward the northern end of the Site.

1.41. Noise surveys were carried out on Friday the 29th of July 2022 to capture noise from the various premises. It was a warm and clear night at the time of the survey. The area was busy.

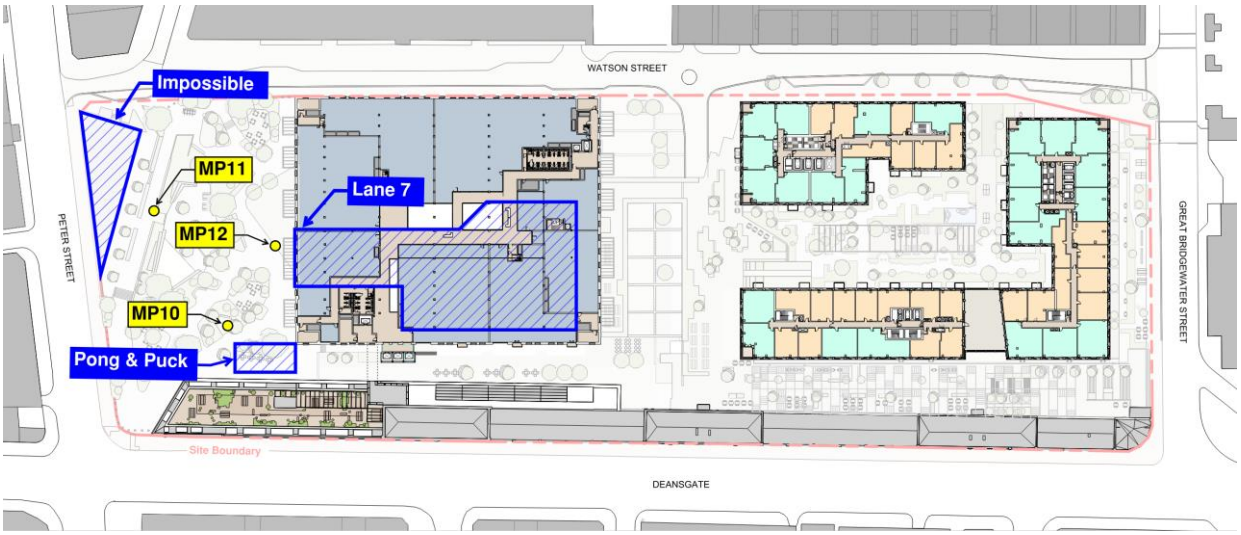
1.42. The measurement positions adopted at the Great Northern Square are summarised as follows:

- MP10 - Pong & Puck games bar – measurement of noise from DJ music and patrons outside

- **MP11** – Impossible Club / bar / restaurant - measurement of noise from music and patrons inside
- **MP12** - Lane 7 bowling alley - doors open, measurement of noise from music and people inside

1.43. The location of the three entertainment premises and attended measurement positions MP10 – MP12 are marked in yellow in Figure 6below.

Figure 6 – Great Northern Square Noise Survey Measurement Positions



1.44. Table 12 table below provides a summary of the results obtained at MP10 - MP12. During all measurements weather conditions were dry and conducive to noise monitoring.

Table 12 - Great Northern Square Noise Survey Measurement Results, MP10 to MP12, Free-field

Meas. Position	Start time	Duration *T*	Measured sound pressure level, $L_{eq,T}$							
			Broad-band level (dBA)	Octave-band level (dB)						
				63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
MP10	21:16	5 mins	67	71	71	63	65	63	57	51
MP11	22:47	2 mins	73	81	71	63	71	69	65	58
MP12	22:40	5 mins	69	76	70	66	67	65	61	56