

Technical Note

Project: 50 Red Bank, Manchester
Subject: Noise Impact Assessment Suitability Statement
Prepared: Francis Goodall
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The meanwhile-use development at 50 Red Bank, Manchester is currently in operation under a change of use consent which expires in July 2023.

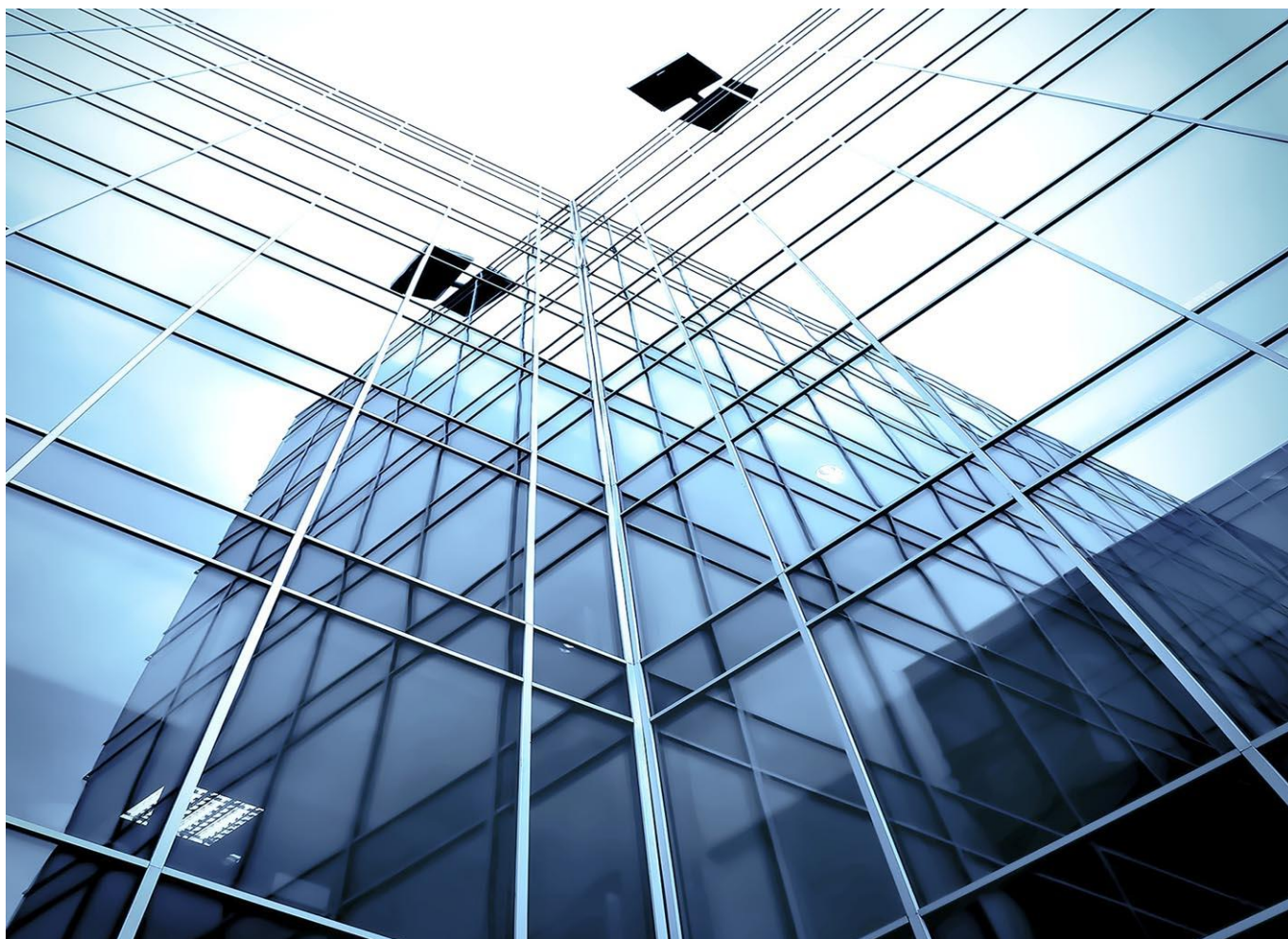
The development is therefore being re-submitted for a temporary change of use consent in order to ensure the continuous operation of the businesses currently on the site.

The original acoustic report carried out by RSK Acoustics (ref 297772-RSK-RP-01-(00) - appended to this note for reference) is still considered representative of the scheme in its current form, based on the following principles,:

- There are no proposed changes to building massing of the development;
- There are no proposed changes to occupancy numbers within the development;
- There are no proposed changes to operational hours of the businesses within the development, and;
- There are no consented developments in the vicinity of the site which would require further assessment.

It is noted that the overarching planning application (ref 133143/VO/2022) for the Red Bank area includes areas to the north of the 50 Red Bank site was approved July 2022. However as yet, and as confirmed within the Environmental Statement for the aforementioned application area, there are no specific planning applications or consented noise-sensitive premises for the wider Red Bank area. Should planning applications be submitted for noise-sensitive developments within these areas, particularly residential developments, it would be expected that the developments would be introduced with sufficient mitigation with respect to the 50 Red Bank site, noting the agent of change principal and the existing nature of the meanwhile use at the 50 Red Bank site.

Encl. 297772-RSK-RP-01-(00) 50 Red Bank – Noise Impact Assessment



Lambert Smith Hampton

50 Red Bank, Manchester

Noise Impact Assessment

297772-RSK-RP-01-(00)

DECEMBER 2019



RSK GENERAL NOTES

Project No.: 297772

Title: 50 Red Bank, Manchester
Noise Impact Assessment

Client: Lambert Smith Hampton

Date: 03 December 2019

Office: Helsby

Status: Issue

Author:	<u>Matthew Thomson MIOA</u>	Technical reviewer:	<u>Mark Underhill MIOA</u>
Date:	<u>03 December 2019</u>	Date:	<u>03 December 2019</u>

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Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the work.

This work has been undertaken in accordance with the quality management system of RSK Environment Ltd.

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1 INTRODUCTION

1.1 General

This report details the noise assessment work carried out by RSK in support of the planning application for the retrospective change of use of 50 Red Bank, Manchester, on behalf of LWP Eastbrook Property Ltd.

The report is informed by a noise survey and calculations carried out by RSK between 14 November and 30 November 2019.

1.2 Proposed development

The proposed development site comprises a two-storey former industrial building and a service yard area with access to Red Bank. The yard will primarily be used for mobile vans or gazebos to serve food. The ground floor of the building includes a bar area and children's play room. The first floor contains a bar area with tables, intended to be the main area for food consumption. A smaller room on the first floor will be used for infrequent workshops, private events and public performances (typically spoken word, theatre, comedy). While some bookings in the events space are anticipated for live music, this will likely be solo artists with minimal amplification.

It is proposed that the development will operate between 12:00 and 23:00, with the site cleared by 23:30. On rare occasions, such as New Year's Eve, the venue may open until midnight.

It is anticipated that the site will attract up to 600 people on weekend days (in the summer), although there is potential for this to increase on exceptional days (such as heatwaves). During the week, daily patronage is expected to typically reach 50.

Vehicle deliveries will access the site via the existing gate from Red Bank. Deliveries will be restricted to 07:30 – 20:00 Monday to Saturday and 10:00 – 18:00 on Sundays and Bank Holidays, however it is anticipated that deliveries will typically be made during office hours (weekdays 10:00 – 16:00). There will be a maximum of six deliveries in any week, with deliveries made by LGVs parked within the site.

1.3 Objectives

The aims of the noise assessment are to:

- Establish the pre-development noise environment;
- Quantify patron noise;
- Quantify entertainment noise from sound systems;
- Quantify noise from fixed and temporary plant installations; and
- Suggest any appropriate mitigation measures to reduce the potential for disturbance at the nearest noise sensitive receptors.

2 SITE AND SURROUNDINGS

The application site is located at 50 Red Bank, Manchester, M4 4EP. It was previously used as a textile warehouse and associated offices, with site topography rising from south to north.

The adjacent land uses to the application site are as follows:

- **Northern boundary** – Disused industrial premises (54 Red Bank) also under ownership of the applicant.
- **Eastern/southern boundary** – Disused elevated railway sidings (Red Bank Viaduct), beyond which is an area of industrial premises and car parking.
- **Western boundary** - Red Bank road, commercial buildings and up to ten storey residential apartments.

The closest noise sensitive receptors are considered to be the residential apartments to the west, at the corner of Red Bank and Lord Street, which overlook both the property and courtyard at the upper floors.

The site location plan is presented in Figure 2.1.

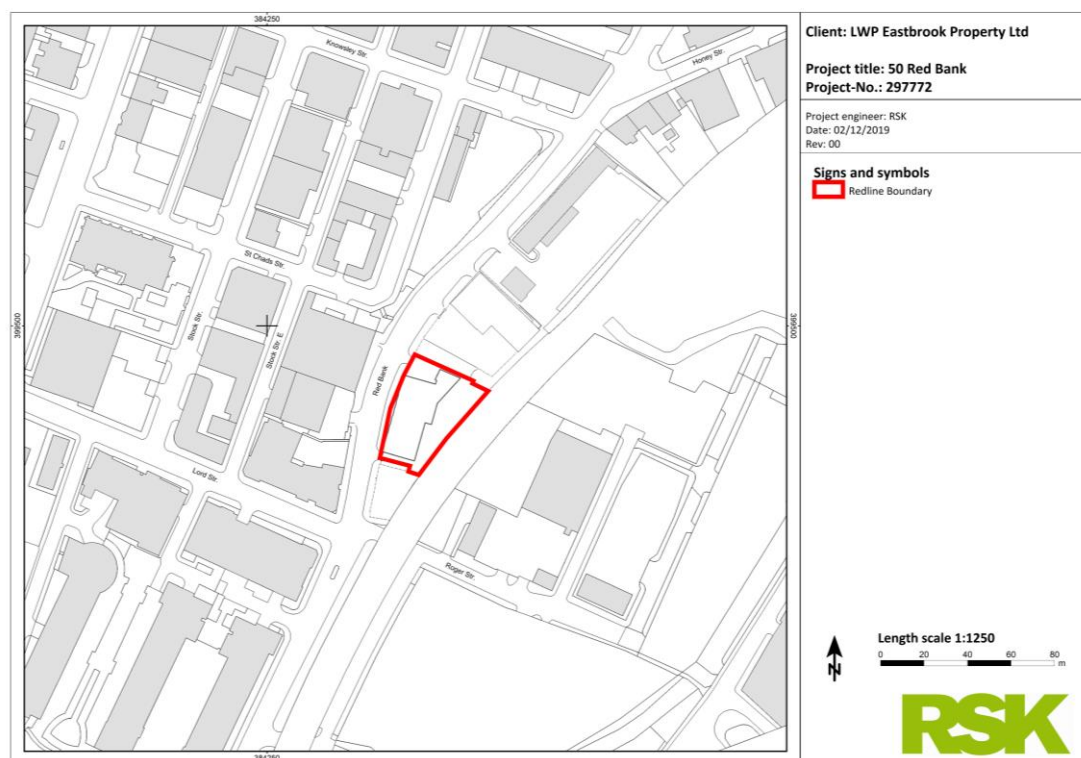


Figure 2.1: Site location plan

3 LEGISLATION, POLICY AND GUIDANCE

A summary of the relevant legislative framework, planning policies and guidance documents is provided in Table 3.1.

Table 3.1: Legislation, policy and guidance

Document	Summary
Legislation	
Control of Pollution Act 1974	An Act to make further provision with respect to waste disposal, water pollution, noise, atmospheric pollution and public health; and for purposes connected with the matters aforesaid.
Environmental Protection Act 1990	An Act to make provision for the improved control of pollution arising from certain industrial and other processes; to re-enact the provisions of the Control of Pollution Act 1974
Planning Policy	
National Planning Policy Framework (NPPF) 2019	The NPPF was introduced by the Department of Communities and Local Government (DCLG) in February 2012 and subsequently updated in July 2018 and in March 2019. The document sets out the Government's planning policies for England and how these are expected to be applied. The NPPF includes statements relating to noise and the requirement to take it into account during the planning process.
Noise Policy Statement for England (NPSE) 2010	The NPSE sets out the long-term vision of Government noise policy: to promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.
Manchester City Council, Manchester Core Strategy 2012 to 2027	Policy C 10 of the Core Strategy 'Leisure and the Evening Economy' states that new development and redevelopment that supports the evening economy, contributes to the vitality of district centres and supports a balanced and socially inclusive evening/night-time economy will be permitted, subject to the following considerations: 2. Residential amenity – the proposed use should not create an unacceptable impact on neighbouring uses in terms of noise, traffic and disturbance. Policy DM 1 'Development Management' states that all development should have regard to the following specific issues:- Effects on amenity, including privacy, light, noise, vibration, air quality, odours, litter, vermin, birds, road safety and traffic generation.

Document	Summary
Standards and Guidance	
Manchester City Council Planning & Noise – Technical Guidance	The Manchester City Council guidance document aims to provide help and advice in relation to noise in a planning context to encourage good acoustic design. It outlines what is expected in relation to current guidance and policy with the aspiration that new developments achieve the highest possible standards without compromising the health and well being of people that live and work within the City of Manchester.
BS 4142:2014 +A1:2019 <i>'Methods for rating and assessing industrial and commercial sound'</i>	BS 4142 provides a method for rating industrial and commercial sound and a method for assessing resulting impacts upon people. The method is applicable to fixed plant installations, sound from industrial and manufacturing process and other associated activities. The rating method takes into account specific source characteristics, such as tonality, impulsivity and intermittency. The impact assessment procedure described in BS 4142 is generally based on the comparison of the rating sound level with the background sound level prevailing at the assessment locations.
BS 7445-1:2003 <i>'Description and measurement of environmental noise'</i>	BS 7445 defines the basic quantities to be used for the description of noise in community environments and describes basic procedures for the determination of these quantities.
Guidelines for Community Noise, 1999	The Guidelines for Community noise was published as a response to a need for action together with a generic need for improvements in legislation at a national level. Although not legislation, this document provides general guidance and guidelines which have been set for different health effects, using the lowest noise level that produces an adverse health effect in specific human environments.
ISO 9921:2003 <i>'Ergonomics – Assessment of speech communication'</i>	ISO 9921 specifies the requirements for the performance of speech communication. Methods to predict and to assess the subjective and objective performance in practical applications are described.

4 BASELINE NOISE CLIMATE

4.1 Survey methodology

A baseline noise survey has been undertaken by RSK to establish the pre-development noise levels at the application site and surrounding area. The resulting measurement data has been used to inform the assessment of noise levels that will be experienced by the surrounding noise sensitive receptors.

An overview of the methodology used to carry out the survey is presented below.

4.1.1 Monitoring locations

Unattended noise measurements were taken at one location within the application site between Wednesday 13 November and Wednesday 27 November 2019 (ref. MP1).

The monitoring equipment was secured within the application site, with the microphone elevated approximately 0.5m above the perimeter fence. The location is considered to be suitable for recording existing noise levels representative of the nearest noise sensitive receptors to the application site, taken to be residential apartments approximately 15 m to the west.

To inform the noise assessment, attended measurements were carried out on 29 and 30 November 2019 by an RSK surveyor. This captured a number of noise sources that will operate as part of the development proposals, discussed further in Section 5.

The unattended measurement location is presented below in Figure 4.1, with photographs in Appendix 2.

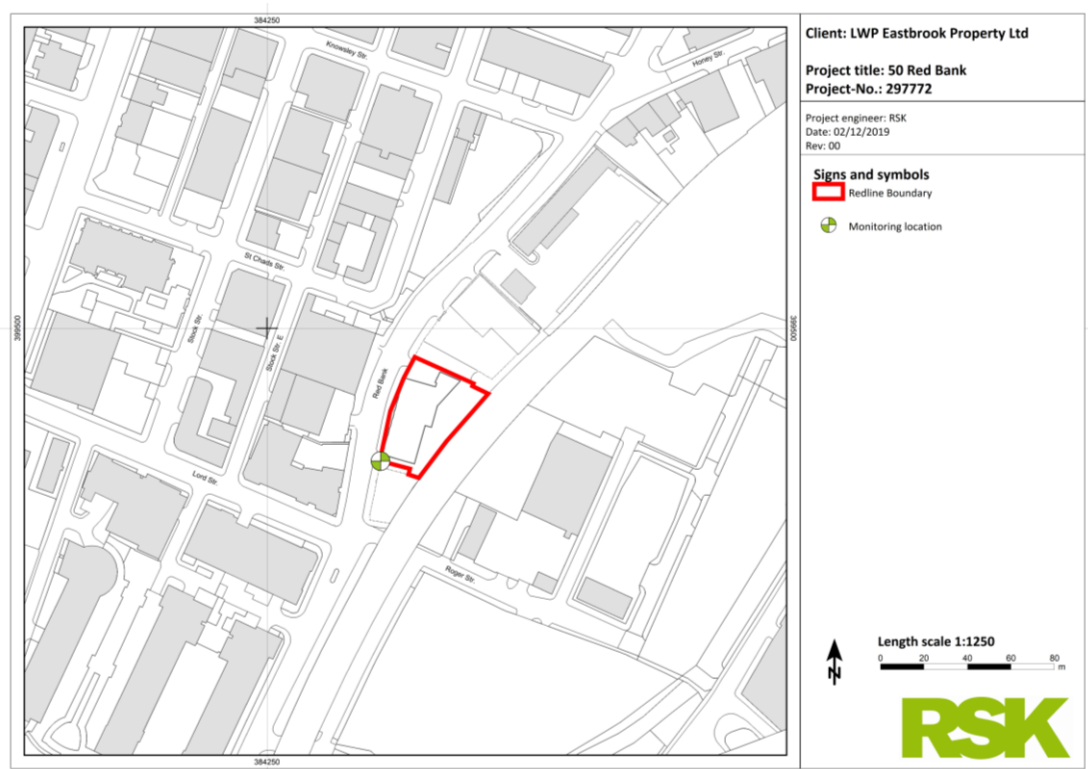


Figure 4.1: Baseline survey location plan

4.1.2 Survey equipment

The equipment used during the baseline noise survey is provided below in Table 4.1.

Table 4.1: Survey equipment

Equipment	Type	Serial no.	Calibration date
Class 1 sound level meter	Rion NL-52	00197783	11/06/2019
Acoustic calibrator	Svantek SV-33	39614	05/08/2019

The noise monitoring equipment used had a calibration history that is traceable to a certified calibration institution. Certificates of conformance can be provided on request. The calibration of the sound level meter was field checked prior to commencing measurements and prior to removing the equipment from site upon completion; no significant calibration drift was observed.

The sound level meter conformed to the requirements of BS EN 61672-1:2013 '*Electroacoustics. Sound level meter, Specifications*'. The acoustic calibrator used conforms to the requirements of BS EN IEC 60942:2018 '*Electroacoustics. Sound calibrators*'.

4.1.3 Meteorological conditions

Meteorological conditions were recorded by a locally installed third-party weather station through Wunderground¹.

Table 4.2: Meteorological conditions

Date	Average temp (°C)	Average wind speed (m/s)	Total precipitation (mm)
13/11/2019	4.9	1.3	2.0
14/11/2019	5.6	4.3	4.8
15/11/2019	7.1	2.4	0.0
16/11/2019	7.9	0.9	2.5
17/11/2019	6.8	0.8	2.0
18/11/2019	2.5	0.4	0.3
19/11/2019	3.0	1.3	0.0
20/11/2019	6.3	3.7	0.0
21/11/2019	5.0	3.5	0.0
22/11/2019	7.4	2.5	1.0
23/11/2019	9.3	2.2	3.8
24/11/2019	8.3	0.8	0.5

¹ Weather data can be found at:
<https://www.wunderground.com/weather/gb/cheadle-hulme/ISTOCKPO4>

Date	Average temp (°C)	Average wind speed (m/s)	Total precipitation (mm)
25/11/2019	10.4	2.3	1.8
26/11/2019	10.1	2.5	3.3
27/11/2019	8.7	1.6	4.8

The average wind speeds throughout the baseline survey were noted to be below 5 m/s, however, precipitation events occurred on certain days. Commentary on the rainfall events and the influence on the noise measurements are provided below.

4.2 Measurement Results

The noise environment at MP1 was dominated by road traffic on Red Bank, with infrequent noise from pedestrians passing the measurement location. While periods of rainfall were noted during the survey, these did not appear to cause significant fluctuation in measured noise levels hence has not been excluded from the dataset.

A summary of the measured noise levels at location MP1 are presented in Table 4.3. Based on the guidance contained within Manchester City Council's Planning and Noise – Appendix A, statistical analysis has been carried out to determine the typical background and ambient noise levels, with the averaged 1-hour periods presented below. A complete dataset is provided for reference in Appendix 3.

Table 4.3: MP1 typical noise levels

Time	Average ambient	Average background
12:00 – 13:00	67 dB LAeq,1hour	57 dB LA90,1hour
13:00 – 14:00	67 dB LAeq,1hour	57 dB LA90,1hour
14:00 – 15:00	67 dB LAeq,1hour	58 dB LA90,1hour
15:00 – 16:00	68 dB LAeq,1hour	58 dB LA90,1hour
16:00 – 17:00	68 dB LAeq,1hour	60 dB LA90,1hour
17:00 – 18:00	68 dB LAeq,1hour	60 dB LA90,1hour
18:00 – 19:00	67 dB LAeq,1hour	57 dB LA90,1hour
19:00 – 20:00	65 dB LAeq,1hour	55 dB LA90,1hour
20:00 – 21:00	63 dB LAeq,1hour	53 dB LA90,1hour
21:00 – 22:00	63 dB LAeq,1hour	53 dB LA90,1hour
22:00 – 23:00	62 dB LAeq,1hour	51 dB LA90,1hour

5 ASSESSMENT METHODOLOGY

5.1 Proposed operations

It is proposed that the development will consist of the following:

- **External area** – Up to eight food trucks or stalls serving food. These will typically be mains powered and not reliant on generators. Two fans are mounted on the east building elevation serving the internal spaces. No loudspeakers are located externally.
- **Ground floor** – Bar area, children's play room and office space. Amplified music at ambient level will be played in the bar.
- **First floor** – Bar area with tables, intended as the main area for food consumption, with amplified music played at ambient levels. Small workshop and event space for public performance, which will typically be spoken word, comedy, or solo musicians with minimal amplification.

The proposed typical opening hours will be between 12:00 and 23:00, Monday to Sunday, with the site cleared by 23:30. While the venue may open until midnight, this is expected to occur only on rare occasions, e.g. New Year's Eve. It is anticipated that between 250-600 patrons will visit the site on a typical weekend, with a potential doubling during the summer months. Midweek, the anticipated visitor numbers drop to approximately 50.

Vehicle deliveries will access the site via the existing gate to Red Bank. It is anticipated that deliveries will typically be made during office hours (weekdays 10:00 – 16:00). There will be a maximum of six deliveries in any week, with deliveries made by LGVs parked within the yard. Due to the limited number of deliveries, a quantitative assessment has not been undertaken as it is considered unlikely that noise impacts would be significant.

5.2 Model parameters

A 3D noise model has been prepared to predict the level of noise likely to arise from typical operations at the application site. This has been developed based on existing area masterplans and survey data obtained by RSK.

A number of proprietary and well proven software packages are available that can be programmed to conform to recognised prediction standards and methodologies; unless otherwise indicated all noise predictions have been carried out using SoundPLAN 8.1, incorporating the prediction method contained within International Standard: ISO 9613-2: 1996(E): '*Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation*'. The noise prediction method described in this part of the standard is suitable for a wide range of engineering applications where the noise level outdoors is of interest. The noise source(s) may be moving or stationary and the method considers the following major mechanisms of noise attenuation:

- Geometrical divergence (also known as distance loss or geometric damping);
- Atmospheric absorption;
- Ground effect; Reflection from surfaces; and

- Screening by obstacles.

The method predicts noise levels under meteorological conditions favourable to noise propagation from the sound source to the receiver, such as downwind propagation, or equivalently, propagation under a moderate ground-based temperature inversion.

An overview of the modelling assumptions and parameters are presented in Table 6.1.

Table 5.1: Model parameters

Parameter	Setting
Calculation algorithm	International Standard ISO 9613-2:1996
Ground absorption	Acoustically reflective (hard) ground assumed throughout
Meteorological conditions	10 degrees Celsius; 70% humidity; and Wind from source to receiver
Receptor height	Ground floor calculated at 1.5m above external ground level. Floor to ceiling height assumed as 2.5m
Source modelling	See Section 5.5
Site layout	As per Bennetts Associates drawings: 1816-BA-ZZ-00-DR-A-20-0102 Rev. A 1816-BA-ZZ-00-DR-A-20-0103 Rev. A
Terrain	Derived from Environment Agency LIDAR Composite Digital Surface Model – 1m (11 October 2019).

5.3 Prediction scenarios

To assess the noise levels during varying periods of operation, four prediction scenarios have been prepared. This is based on the existing site arrangement, available area and predicted number of visitors. As noise from patrons can be variable, an assumption has been made that one in four people within the premises may be speaking at any given time, with differing volumes of speech.

- **Scenario 1** – Up to 50 patrons in ground floor bar, with limited external activities. 25% of visitors speaking at normal conversational volume with background music.
- **Scenario 2** – All available internal seating at ground and first floor occupied. One person per square metre standing in external area. 25% of patrons speaking at normal conversational volume at any given time. Background music playing within bar areas.
- **Scenario 3** – All available internal seating at ground and first floor occupied. One person per square metre standing in external area. 20% of patrons speaking at normal conversational volume and 5% speaking with raised voices at any given time. Background music playing within bar areas.
- **Scenario 4** – All available internal seating at ground and first floor occupied. One person per square metre standing in external area. 25% of patrons speaking with raised voices at any given time. Background music playing within bar areas.

In all scenarios it is assumed that the external fans on the east elevation of the building will be in operation. As the food trucks will be connected to mains power, it is assumed that noise from equipment operation will not be significant and generally masked by conversation.

5.4 Building envelope

For the purpose of assessment, the building external walls are assumed to be of a masonry construction with a weighted sound reduction (R_w) of at least 50 dB R_w , with windows to the ground and first floor bar areas assumed to provide a minimum 30 dB R_w . The roof structure is not known, therefore a conservative reduction of 27 dB R_w is assumed.

Table 5.2: Assumed sound reduction of building envelope

Element	Frequency (Hz)						
	63	125	250	500	1000	2000	4000
Walls	35	37	39	43	52	58	61
Windows	17	17	19	24	31	34	35
Roof	16	16	25	26	24	30	36

Where windows are openable to the bar/seating areas, it is assumed that these are partially open, providing 15 dB attenuation of sound from inside to out.

5.5 Noise emissions

The following noise emission levels have been adopted within the model. Noise from loudspeakers were measured at the development on 29 November 2019 and are understood to be representative of the levels and type of music typically played during a busy weekend. The external fans were understood to be operating at full capacity. No noise from food trucks has been included – this is based on survey observations which concluded that the trucks were mains powered and noise emissions were negligible in comparison to other sources.

Table 5.3: Summary of noise sources

Element	Height above ground/floor level)	SWL dB(A)	Source
Normal voice	1.5m	68 (per person)	ISO 9921:2003
Raised voice	1.5m	74 (per person)	ISO 9921:2003
2no. wall-mounted fans	2.0m	77 (per unit)	Site measurement
2no. bar music loudspeakers	1.5m	78 (per loudspeaker)	Site measurement

Table 5.4: Noise sources – assumed sound power spectra

Element	Frequency (Hz)						
	63	125	250	500	1000	2000	4000
Normal voice	19	39	57	66	63	57	51
Raised voice	47	58	69	74	71	63	46
Fans	48	59	69	74	74	74	71
Music	60	69	72	74	71	64	63

6 ASSESSMENT RESULTS

The noise emissions from the various operating scenarios have been predicted, with the results summarised below. While noise contour plots are presented for each scenario at a height of 1.5m above ground level to provide context, the apartment floor with the highest predicted noise level from proposed operations is discussed for comparison against pre-development criteria. All noise levels are presented as free-field for ease of comparison with the baseline survey dataset.

6.1 Scenario 1

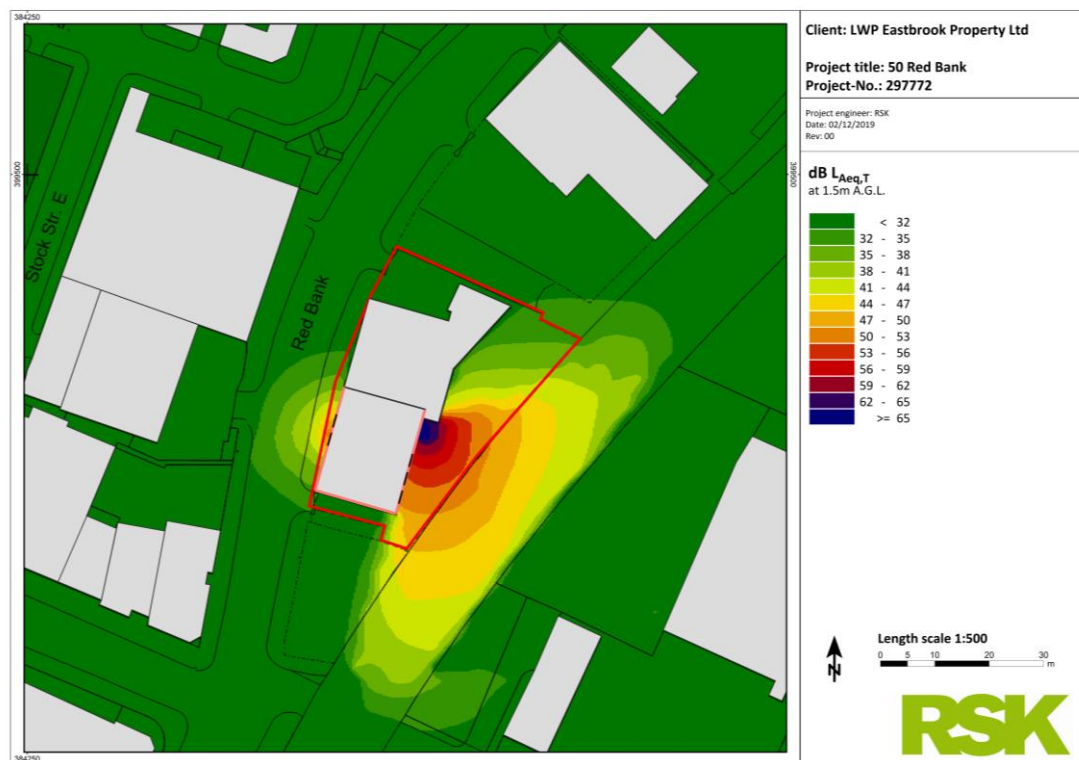


Figure 6.1: Scenario 1 noise contour plot

The highest predicted noise level for operations during Scenario 1 is 27 dB LAeq,T. This is predicted on the fourth floor of the Red Bank apartment block and the second floor of the office space (CPS) on Red Bank.

Scenario 1 is taken to reflect operations where only the ground floor bar area is in use, which may occur during the week. Predicted noise levels are likely to be significantly below the minimum averaged 1-hour background noise levels during opening hours. On this basis, no adverse impact is considered likely.

6.2 Scenario 2

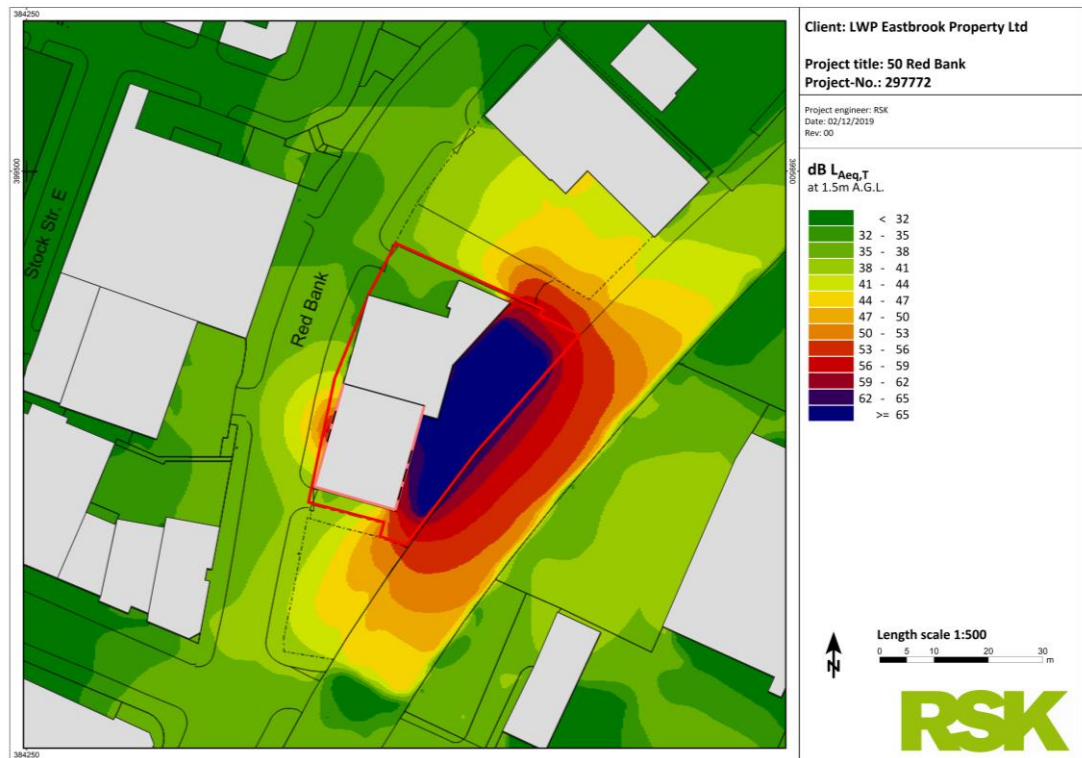


Figure 6.2: Scenario 2 noise contour plot

The highest predicted noise level for operations during Scenario 2 is 41 dB LAeq,T, predicted at the sixth floor of the apartment block to the west. The most prominent noise source is predicted to be that from patrons conversing in the yard area.

The highest predicted noise levels are 10dB below the minimum averaged background noise level derived at the nearest noise sensitive receptor between 22:00 and 23:00. Existing ambient noise levels will also serve to significantly mask noise from patrons and therefore no adverse impact is considered likely.

6.3 Scenario 3

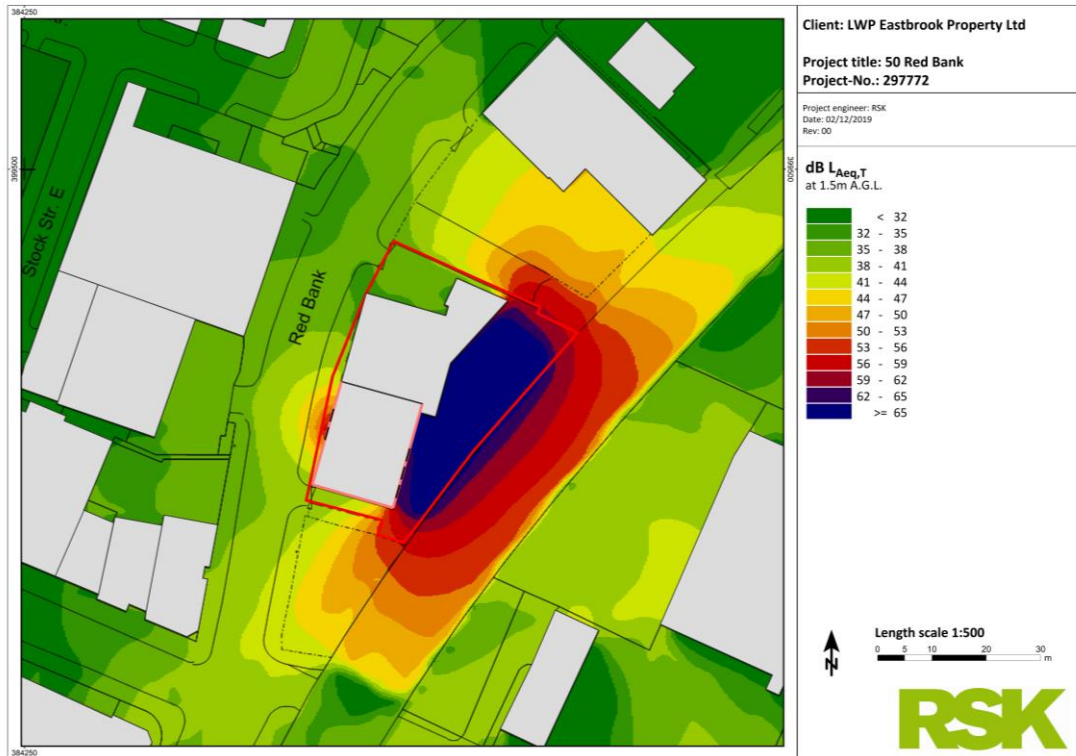


Figure 6.3: Scenario 3 noise contour plot

The highest predicted noise level for operations as per Scenario 3 is 43 dB LAeq,T, predicted at the sixth floor of the apartment block to the west. The most prominent noise source is predicted to be that from patrons in the yard area.

The highest predicted noise levels are 8dB below the averaged background noise level derived at the nearest noise sensitive receptor between 22:00 and 23:00. Existing ambient noise levels during this time period will also serve to significantly mask noise from patrons and will therefore minimise disruption at the residential receptors. As the predicted noise levels are 15dB to 21dB below existing ambient noise levels during the worst-case hour (22:00 to 23:00), the likelihood of adverse impact is considered low.

6.4 Scenario 4

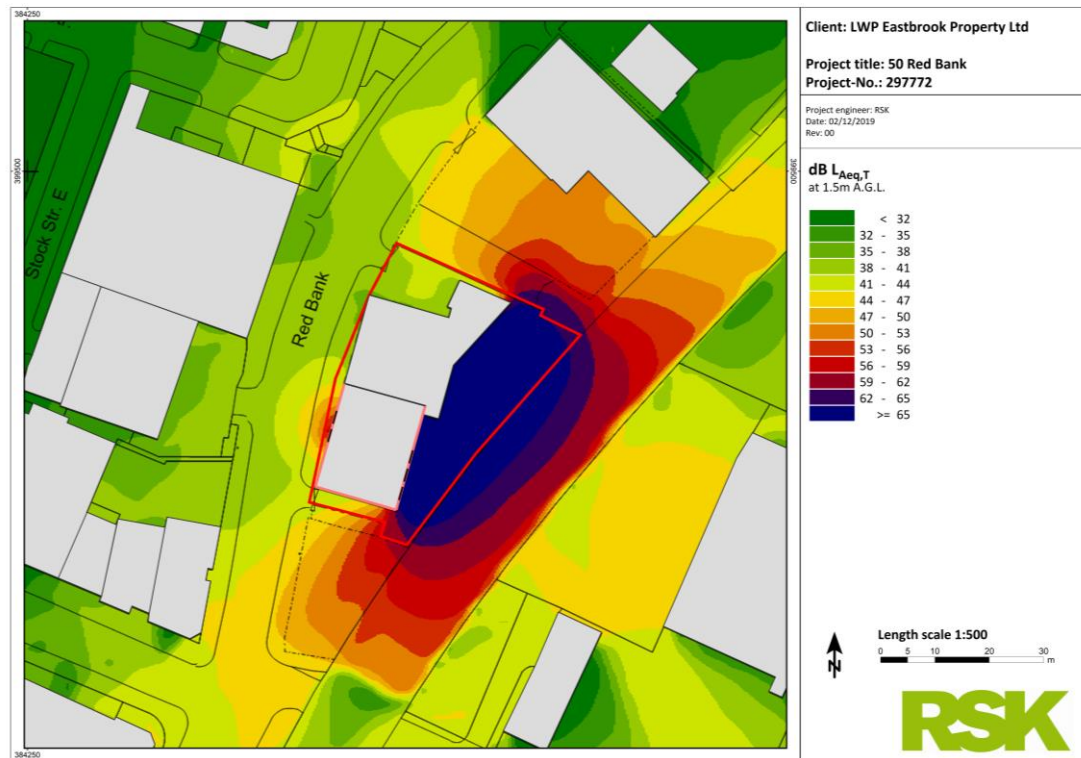


Figure 6.4: Scenario 4 noise contour plot

The highest predicted noise level for operations during Scenario 4 is 46 dB L_{Aeq,T}, predicted at the sixth floor of the apartment block to the west. The most prominent noise source is predicted to be that from patrons in the yard area.

The highest predicted noise levels are 5dB below the minimum averaged background noise level derived at the nearest noise sensitive receptor between 22:00 and 23:00. Existing ambient noise levels during this time period also serve to significantly mask noise from patrons and will therefore minimise disruption at the residential receptors.

As the predicted noise levels are 12dB to 18dB below existing ambient noise levels during the worst-case hour (22:00 to 23:00), while noise from the premises may be audible during lulls in traffic, it is unlikely to be prominent throughout the hours of operation and will be generally masked by existing noise sources. Furthermore, in the unlikely event that the venue was well occupied and noise from patrons was sustained throughout the opening hours, noise levels from the venue which would be incident upon the façade of the nearest noise sensitive receptors are unlikely to exceed the recommended indoor ambient noise level target of 35 dB L_{Aeq,16hour} as adopted by Manchester City Council and the World Health Organisation as a design target for dwellings. On this basis, the likelihood of adverse impact is considered low.

7 MITIGATION

7.1 Building envelope

No additional envelope treatment required on the basis that the dominant noise emissions from the venue can be attributed to external activities.

7.2 Fixed source attenuation

No additional treatment of specific noise sources required on the basis that the dominant noise emissions from the venue can be attributed to external activities.

7.3 Management measures

To help mitigate potential noise issues associated with venue opening the following management measures are suggested:

- Control of anti-social behaviour and shouting from patrons, particularly in external areas and at closing.
- Any events where amplified music in the yard is desired should be undertaken through Temporary Events Notices (TENS) as applied through the Licencing Regime. A noise limiter should be considered to control emissions to an acceptable level.
- Deliveries should make use of the yard area which will benefit from the acoustic screening from the intervening building.

8 CONCLUSION

RSK Environment Ltd was instructed by LWP Eastbrook Property Ltd to carry out a noise impact assessment in support of the planning application for the retrospective change of use for the commercial development of 50 Red Bank, Manchester.

A baseline noise survey has been undertaken to establish the pre-development noise levels at a location that is representative of the nearest noise sensitive receptor surrounding the application site. The resulting dataset has been used to inform the assessment.

In addition to the baseline noise survey, source measurements were taken whilst an event was taking place at the 50 Red Bank venue. This included measurements of noise generated by fixed plant installations and loudspeakers.

An assessment has been undertaken to establish the potential noise impacts associated with entertainment activities taking place at the venue, considering both internal and external areas. The methodology has considered several scenarios based on different levels of occupancy and source emissions. The assessment has focused on the potential impact of typical operations at the venue rather than licensable events.

During typical venue operations, there is predicted to be minimal impact at neighbouring properties. This is primarily due to the acoustic screening provided by the development building, lack of prominent amplified music within external areas and the relatively high levels of pre-development noise. On this basis, it is suggested that the proposed use of the site is suitable for planning approval with respect to noise.

APPENDIX 1

GLOSSARY

Frequency Weighting Networks

Frequency weighting networks, which are generally built into sound level meters, attenuate the signal at some frequencies and amplify it at others. The A-weighting network approximately corresponds to human frequency response to sound. Sound levels measured with the A-weighting network are expressed in dB(A). Other weighting networks also exist, such as C-weighting which is nearly linear (i.e. unweighted) and other more specialised weighting networks. Variables such as L_p and L_{eq} that can be measured using such weightings are expressed as L_{pA} / L_{pC} , L_{Aeq} / L_{Ceq} etc.

L_p - Sound Pressure Level

The basic unit of sound measurement is the sound pressure level, which is measured on a logarithmic scale and expressed in decibels (dB). The logarithmic scale makes it easier to manage the large range of audible sound pressures, and also more closely represents the way the human ear responds to differences in sound pressure:

$$L_p = 20 \log_{10} (p/p_0)$$

where p = RMS (root mean square) sound pressure; and
 p_0 = reference sound pressure 2×10^{-5} Pa.

L_{Aeq} – Equivalent Continuous Sound Pressure Level

Sound levels tend to fluctuate, and as such an ‘instantaneous’ measurement like sound pressure level cannot fully describe many real-world situations. A summation can be made of the measured sound energy over a certain period, and a notional steady level can be calculated which would contain the same total energy as the fluctuating sound. This notional level is termed the equivalent continuous sound level L_{eq} . L_{eq} can be determined over any time period, which is indicated as $L_{eq,T}$ where T is the time period (e.g. $L_{eq,24h}$).

In mathematical terms, for n discrete sound level measurements, L_{eq} is given by:

$$L_{eq,T} = 10 \log_{10} (t_1 \times 10^{L_1/10} + t_2 \times 10^{L_2/10} + \dots t_n \times 10^{L_n/10})/T$$

where t_1 = time at level L_1 dB;
 t_2 = time at level L_2 dB;
and T = total time.

L_{max} - Maximum Sound Pressure Level or Maximum Noise Level

This is the maximum RMS sound pressure level occurring within a specified period. The time weighting is usually specified, such as in L_{Fmax} .

L_N - Percentile or Statistical Levels

Sometimes it is useful to calculate the level which is exceeded for a certain percent of a total period. Background noise is often defined as the A-weighted sound pressure level exceeded for 90% of the specified period T , expressed $L_{A90,T}$.

Time Weighting

Sound level meters use various averaging times for the measurement of RMS sound pressure level. The most commonly used are fast (0.125s averaging time), slow (1s averaging time) and impulse (0.035s averaging time). Variables that are measures with time weightings are expressed as L_{AFmax} etc.

Rating Level ($L_{Ar,T}$)

Specific sound level plus any adjustment for the characteristic features of the sound.

APPENDIX 2

NOISE MONITORING LOCATION





APPENDIX 3

BASELINE SURVEY DATA

dB L _{Aeq,1hour}	13/11	14/11	15/11	16/11	17/11	18/11	19/11	20/11	21/11	22/11	23/11	24/11	25/11	26/11
12:00 - 13:00	-	67	68	65	65	67	67	67	68	70	67	65	68	67
13:00 - 14:00	-	68	68	65	66	67	67	68	69	69	66	65	69	68
14:00 - 15:00	-	68	69	65	65	68	68	68	69	70	67	65	69	68
15:00 - 16:00	69	69	68	65	65	69	69	69	69	69	65	65	69	69
16:00 - 17:00	70	69	69	64	65	70	70	70	70	69	66	64	70	70
17:00 - 18:00	70	70	69	64	65	70	70	69	70	68	65	63	69	70
18:00 - 19:00	69	68	67	64	66	68	69	68	68	68	63	63	68	69
19:00 - 20:00	66	67	64	63	62	66	66	66	66	67	64	62	65	68
20:00 - 21:00	65	65	63	62	61	65	64	63	64	65	64	62	64	64
21:00 - 22:00	64	64	62	64	60	64	64	63	64	64	63	60	62	63
22:00 - 23:00	60	64	64	63	59	59	62	61	61	63	63	58	62	64

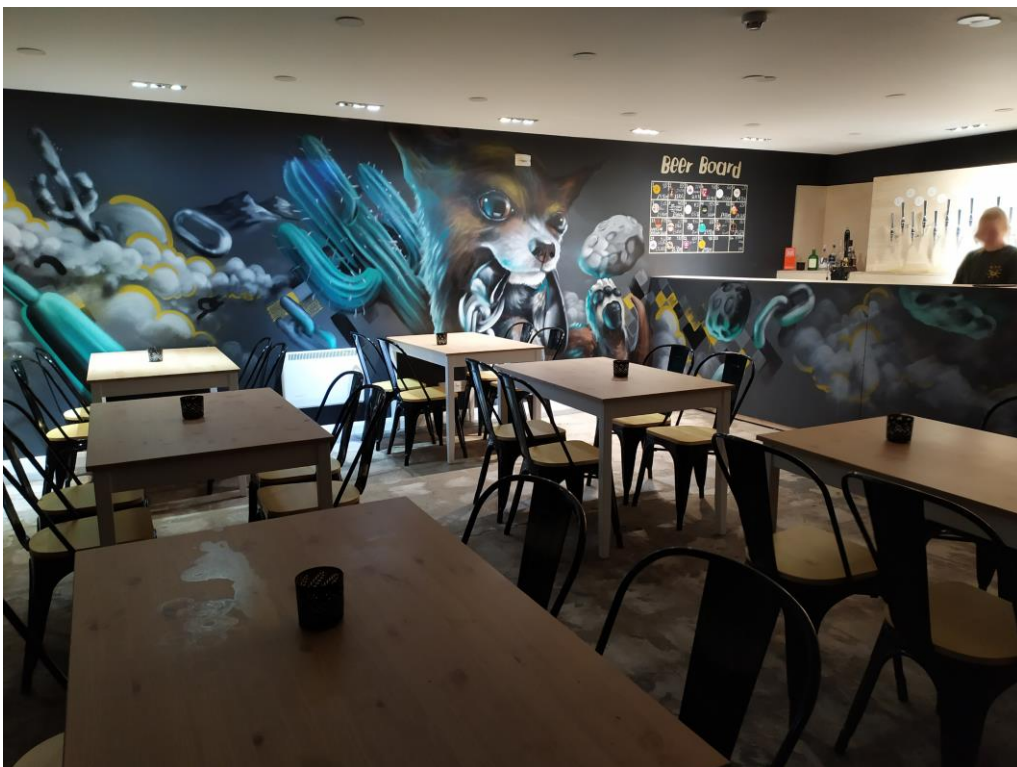
dB L _{A90,1hour}	13/11	14/11	15/11	16/11	17/11	18/11	19/11	20/11	21/11	22/11	23/11	24/11	25/11	26/11
12:00 - 13:00	-	56	58	54	54	55	57	58	60	61	56	53	58	57
13:00 - 14:00	-	57	57	55	54	55	58	58	60	61	56	54	58	58
14:00 - 15:00	-	58	58	55	55	56	59	59	60	61	56	55	58	58
15:00 - 16:00	61	59	58	56	55	58	61	61	60	61	56	55	59	60
16:00 - 17:00	63	61	61	55	54	61	62	62	62	61	58	53	61	61
17:00 - 18:00	63	61	61	55	54	63	62	61	62	61	56	53	61	62
18:00 - 19:00	60	58	57	54	51	59	61	58	59	60	54	51	58	61
19:00 - 20:00	56	55	54	54	49	56	58	56	57	59	55	48	54	57
20:00 - 21:00	56	54	51	52	48	56	55	55	55	57	55	48	51	53
21:00 - 22:00	56	54	51	52	45	53	57	55	56	57	53	48	50	51
22:00 - 23:00	51	52	51	51	44	48	54	51	53	53	54	47	48	53

APPENDIX 4 DEVELOPMENT ARRANGEMENT

External area



Ground floor



First floor

