

SANDY BROWN

Consultants in Acoustics, Noise & Vibration

16044-R01-B

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Mindel House & 11 Bloom Street, Manchester

Residential planning noise report

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Version	Date	Comments	Author	Reviewer
A	16 Feb 16		Alastair Plail	Mark Howarth
B	18 Jan 18	Updated in line with revised scheme	Alastair Plail	Matthew Robinson

Summary

Sandy Brown has been commissioned by Beech Construction Partnership Limited to provide acoustic advice in relation to the proposed development at Mindel House and 11 Bloom Street, Manchester.

Unattended noise monitoring has previously been undertaken at the site over 12 weeks to monitor noise levels from now defunct Madison Lounge which used to be located in the basement of Mindel House. The survey was performed between 23 April and 16 July 2015.

In addition, attended noise measurements were carried out during the daytime and on a weekend night. These were carried out on 6 June 2014 and 5 February 2016 respectively.

The representative background sound levels were as follows:

- During the day (07:00 – 23:00) - $L_{A90,5min}$ 51 dB
- During the night (23:00 – 07:00):
 - $L_{A90,5min}$ 47 dB at the nearby sensitive premises on Bloom Street and Minshull Street
 - $L_{A90,5min}$ 51 dB at the nearby sensitive premises on Richmond Street

On the basis of the requirements of the Manchester City Council, the relevant plant noise limits at the worst affected existing noise sensitive premises must not exceed 5 dB below these representative background sound levels. These limits are cumulative, and apply with all plant operating under normal conditions. If plant items contain tonal or attention catching features, a penalty is to be applied.

An initial facade sound insulation assessment has been carried out to determine the required acoustic performance of the facade, and provide guidance on the ventilation strategy. Based on this, mechanical ventilation is recommended and example glazing configurations are set out.

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1 Introduction

Sandy Brown has been commissioned by Beech Construction Partnership Limited to provide acoustic advice in relation to the proposed development at Mindel House and 11 Bloom Street, Manchester.

An environmental noise survey has been carried out, the background sound levels from which are used as the basis for setting limits for noise emission from proposed building services plant. These limits are set in accordance with the requirements of the Manchester City Council.

The facade sound insulation will be assessed in order to determine the necessary performance required to achieve appropriate internal noise levels for residences set in accordance with Manchester City Council requirements.

This report presents the noise survey methods, the results of the survey, a discussion of acceptable limits for noise emission from building services plant and minimum sound insulation requirements for the building envelope.

2 Site description

2.1 The site and its surroundings

The scheme comprises two adjacent existing grade II listed buildings, Mindel House and 11 Bloom Street, both of which are five storeys tall. The former night club located in the basement, Madison Lounge, is now vacated and is proposed to be converted into dwellings as part of the scheme.

The site is bounded by Minshull Street to the north east, Richmond Street to the south east, Bloom Street to the north west and a car park to the south west.

The site is located in the Village area, with a high concentration of restaurants, bars and night clubs in its proximity.

The site location in relation to its surroundings is shown in Figure 1.

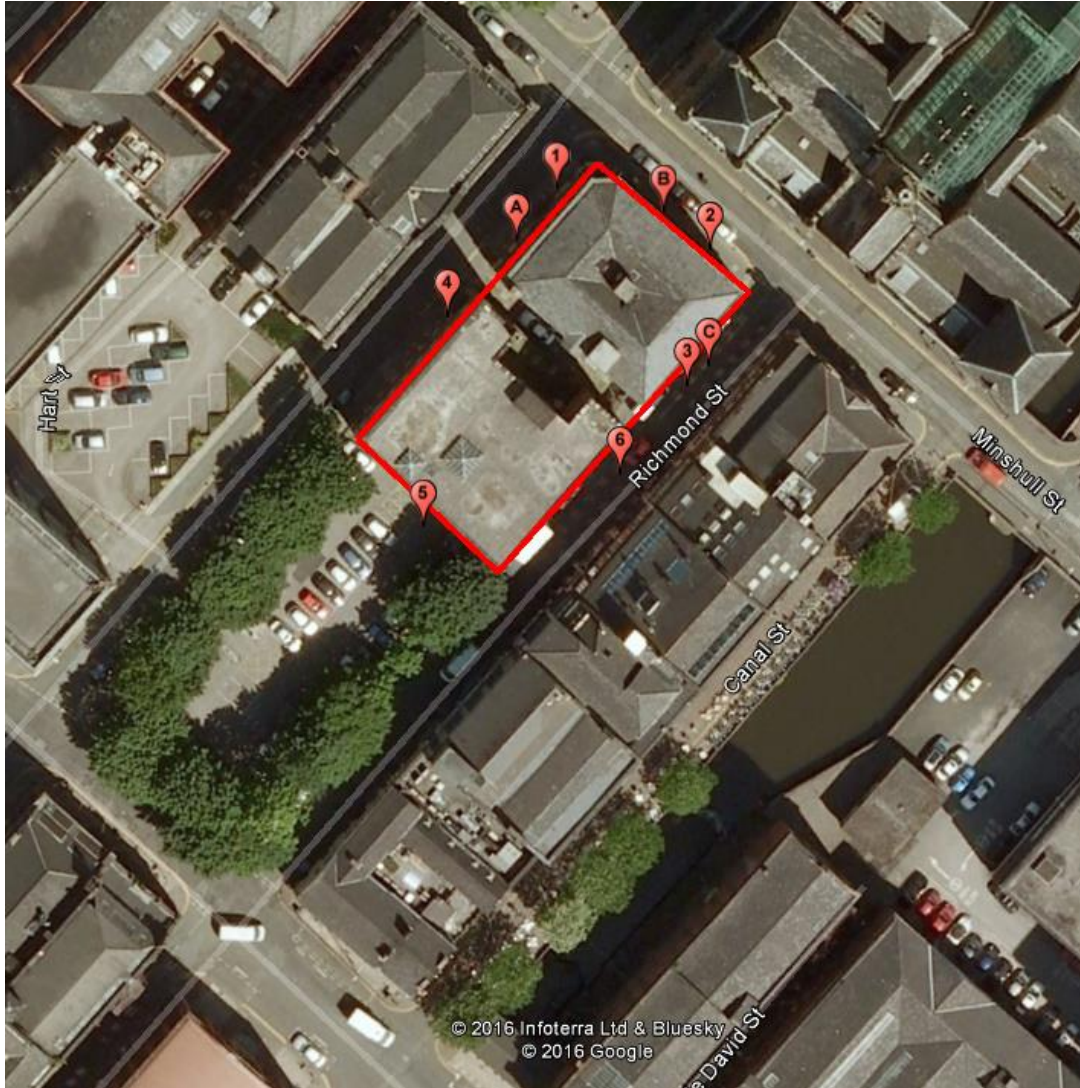


Figure 1 Site map (courtesy of Google Earth Pro)

2.2 Adjacent premises

The surrounding area consists of retail premises, bars, night clubs and offices.

The former Essential night club lies opposite the site on Minshull Street which has not been operational since October 2014.

A number of restaurants, bars and clubs lie across from the site on Richmond Street. These include Void night club, Kiki night club, Velvet restaurant and Churchills bar.

The nearest noise sensitive premises are considered to be Velvet Hotel approximately 10 m to south east of the site on Canal Street and SACO Apartments approximately 30 m to the north west of the site on Minshull Street.

3 Method

Details of the equipment used, the noise indices and the weather conditions during the survey are provided in Appendix A. Further information on the specific survey method is provided in this section.

3.1 Unattended measurements

Unattended noise monitoring has previously been undertaken at the site over 12 weeks to monitor noise levels from Madison Lounge in the basement of Mindel House.

The unattended measurements were performed over 5 minute periods between 10:27 on 23 April 2015 and 09:47 on 16 July 2015. The equipment was installed, maintained and collected by Alastair Plail and Chris Perry.

The measurement positions used during the survey are indicated in Figure 1, denoted by the letters 'A' to 'C'. These locations are considered to be reasonably representative of the background noise levels experienced by the nearest noise sensitive premises, and also of night time maximum noise levels experienced by the site.

In all instances, the microphone was positioned out of a first storey window approximately 1 m from the facade.

3.2 Attended measurements

Attended sample measurements were previously performed at the site at the locations indicated in Figure 1 as positions 1 to 3. The attended measurements were carried out on 6 June 2014, over 5 minute periods, with the purpose of determining the existing noise levels from road traffic, pedestrians and other significant noise sources in the area during the daytime.

In each case the microphone was mounted on a tripod approximately 1.5 m above ground level and measurements were taken at the facade (ie no more than 1 m away from the facade).

Further night time noise measurements were carried out on Friday 5 February 2016. These were carried out at the locations 2, 4, 5 and 6 in Figure 1. Each measurement was carried out over 1 minute periods with the purpose of determining noise sources incident on the site during a typical weekend night.

In each case the microphone was mounted on a tripod approximately 1.5 m above ground level and measurements were taken at the facade (ie no more than 1 m away from the facade).

4 Measurement results

4.1 Observations

4.1.1 Daytime attended survey (6 June 2014)

During the daytime survey carried out on 6 June 2014, the dominant noise sources were:

- Occasional road traffic along on Minshull Street and Bloom Street
- Distant road traffic along Portland Street, Aytoun Street and Chorlton Street
- Pedestrians passing
- Plant noise from the rear of a restaurant on Richmond Street
- Trams passing on Aytoun Street.

Less significant noise sources included occasional distant construction works.

4.1.2 Night time attended survey (5 February 2016)

During the night time survey carried out on 5 February 2016, the dominant noise sources were:

- Road traffic along Bloom Street and Minshull Street
- Amplified music egress from Void
- Pedestrians passing
- Plant noise from the rear of a restaurant on Richmond Street.

Amplified music egress from Madison Lounge was also audible at times at positions 2, 4 and 6. Amplified music egress was more significant via the door to the club on Bloom Street and vents in the facade on Richmond Street, however efforts were made to minimise the impact from these sources on the measurements.

4.2 Unattended measurement results

Full measurement results of the unattended noise surveys conducted at positions A to C between April and July 2015 are provided in the reports *15139-R01 – R06*. A summary is provided in the subsequent sections.

4.2.1 Position A

A summary of the average ambient noise level per week at position A is provided in Table 1.

Table 1 Average ambient noise levels measured at position A

Week	Average ambient noise level per week at position A		
	Daytime (07:00 – 23:00)	Weeknight (23:00 – 07:00)	Weekend night (23:00 – 07:00)
	$L_{Aeq,16h}$ (dB)	$L_{Aeq,8h}$ (dB)	$L_{Aeq,8h}$ (dB)
23 April – 30 April 2015	61	59	68
30 April – 7 May 2015	61	60	70
7 May – 14 May 2015	63	59	70
14 May – 21 May 2015	62	59	71
Average	62	59	70

In line with BS 4142:2014, for the purpose of analysis and establishing representative background sound levels, day and night time typical levels have been quantified using statistical analysis from the continuous logging measurements.

Daytime and night time statistical analysis of representative values from the unattended measurements at position A is presented in Figure 2 and Figure 3.

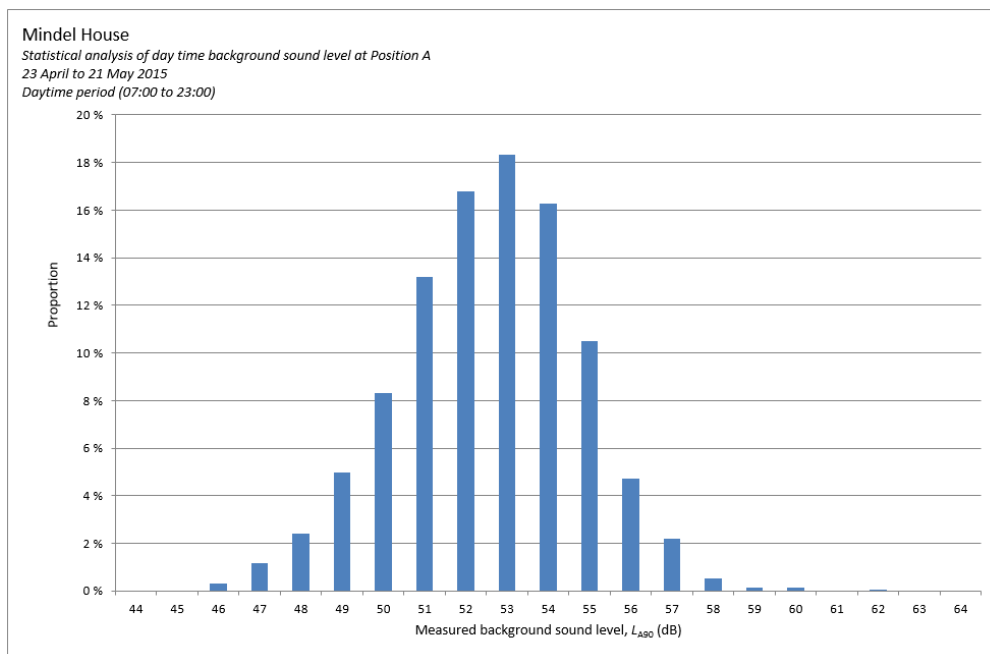


Figure 2 Statistical analysis of daytime (07:00 to 23:00) background sound levels at position A

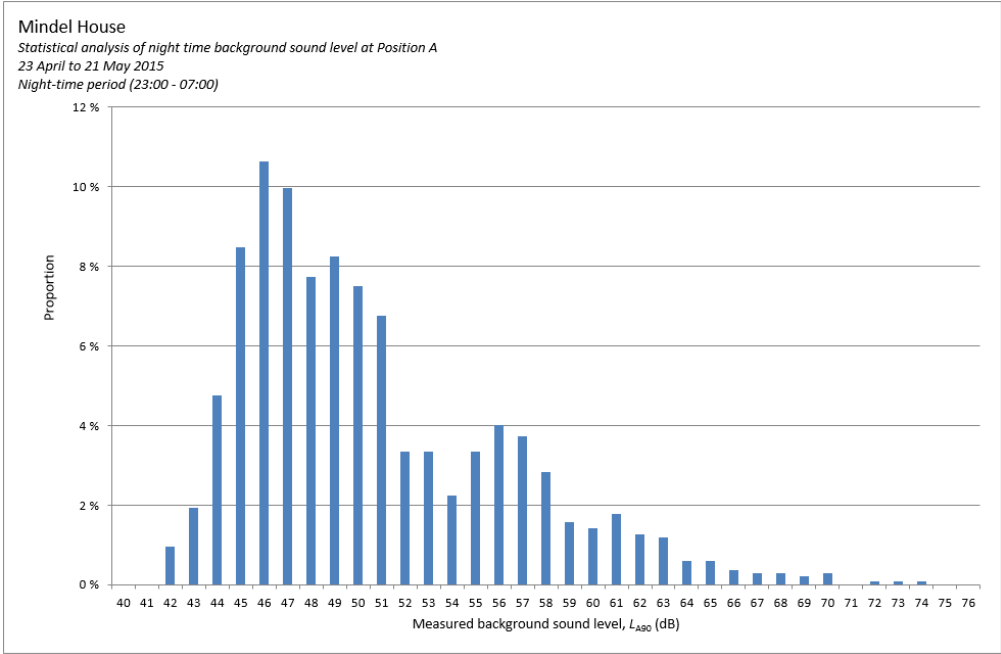


Figure 3 Statistical analysis of night-time (23:00 to 07:00) background sound levels at position A

From this analysis, the representative background sound levels measured at Position B were $L_{A90,5min}$ 53 dB during the daytime and $L_{Aeq,5min}$ 46 dB during the night.

Appendix A of *Planning and Noise Technical Guidance* document dated December 2015 sets out a calculation method for determining the ‘typical’ background noise level. Using this method the typical background noise levels during the day and night at Position A are set out in Table 2.

Table 2 Calculated typical background (MCC method)

Time of day	Calculated typical background, $L_{90,5min}$ (dB)
Daytime (07:00-23:00)	51
Night-time (23:00-07:00)	47

4.2.2 Position B

A summary of the average ambient noise level per week at position B is provided in Table 3.

Table 3 Average ambient noise levels measured at position B

Week	Average ambient noise level per week at position B		
	Daytime (07:00 – 23:00)	Weeknight (23:00 – 07:00)	Weekend night (23:00 – 07:00)
	$L_{Aeq,16h}$ (dB)	$L_{Aeq,8h}$ (dB)	$L_{Aeq,8h}$ (dB)
21 May – 28 May 2015	64	61	68
28 May – 4 June 2015	65	61	67
4 June – 11 June 2015	63	60	63
11 June – 18 June 2015	64	60	67
Average	64	61	66

Daytime and night time statistical analysis of representative values from the unattended measurements at position A is presented in Figure 4 and Figure 5.

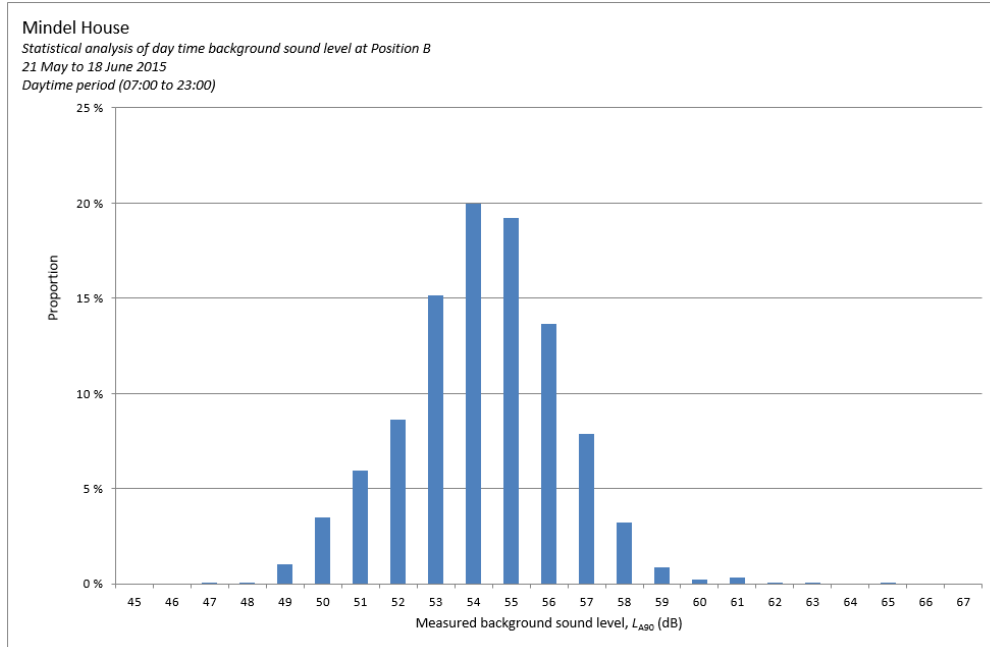


Figure 4 Statistical analysis of daytime (07:00 to 23:00) background sound levels at position B

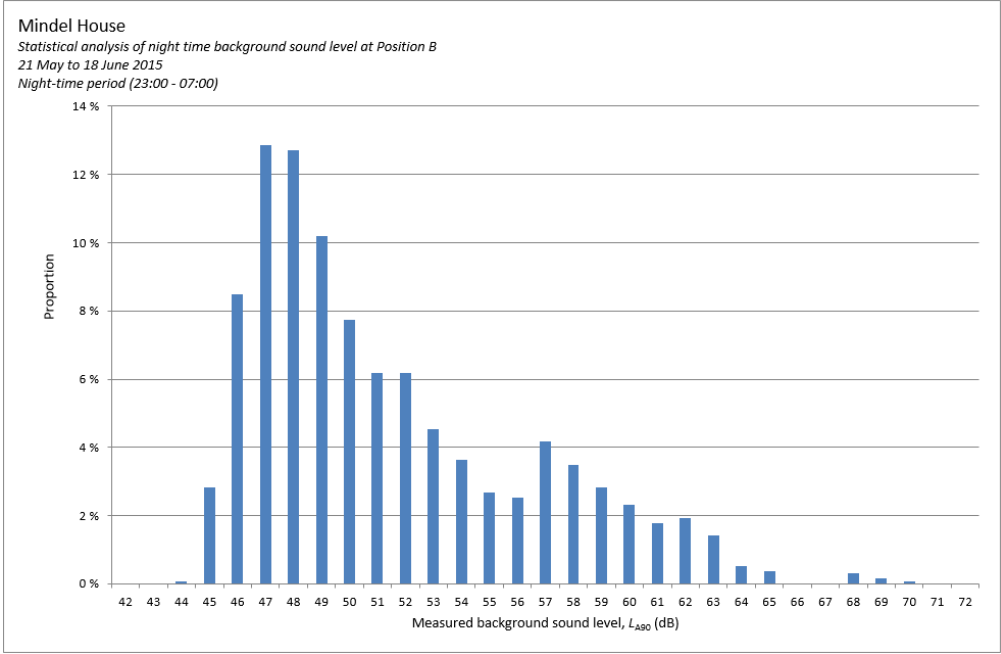


Figure 5 Statistical analysis of night-time (23:00 to 07:00) background sound levels at position B

From this analysis, the representative background sound levels measured at Position B were $L_{A90,5min}$ 54 dB during the daytime and $L_{Aeq,5min}$ 47 dB during the night.

Using the MCC method for determining the ‘typical’ background noise level, the resultant levels during the day and night are set out in Table 4.

Table 4 Calculated typical background (MCC method)

Time of day	Calculated typical background, $L_{90,5min}$ (dB)
Daytime (07:00-23:00)	53
Night-time (23:00-07:00)	48

4.2.3 Position C

A summary of the average ambient noise level per week at position C is provided in Table 5.

Table 5 Average ambient noise levels measured at position C

Week	Average ambient noise level per week at position C		
	Daytime (07:00 – 23:00)	Night (23:00 – 07:00)	Weekend night (23:00 – 07:00)
	$L_{Aeq,16h}$ (dB)	$L_{Aeq,8h}$ (dB)	$L_{Aeq,8h}$ (dB)
18 June – 25 June 2015	64	60	63
25 June – 2 July 2015	63	59	64
2 July – 9 July 2015	63	61	64
9 July – 16 July 2015	63	62	64
Average	63	61	64

Daytime and night time statistical analysis of representative values from the unattended measurements at position C is presented in Figure 6 and Figure 7.

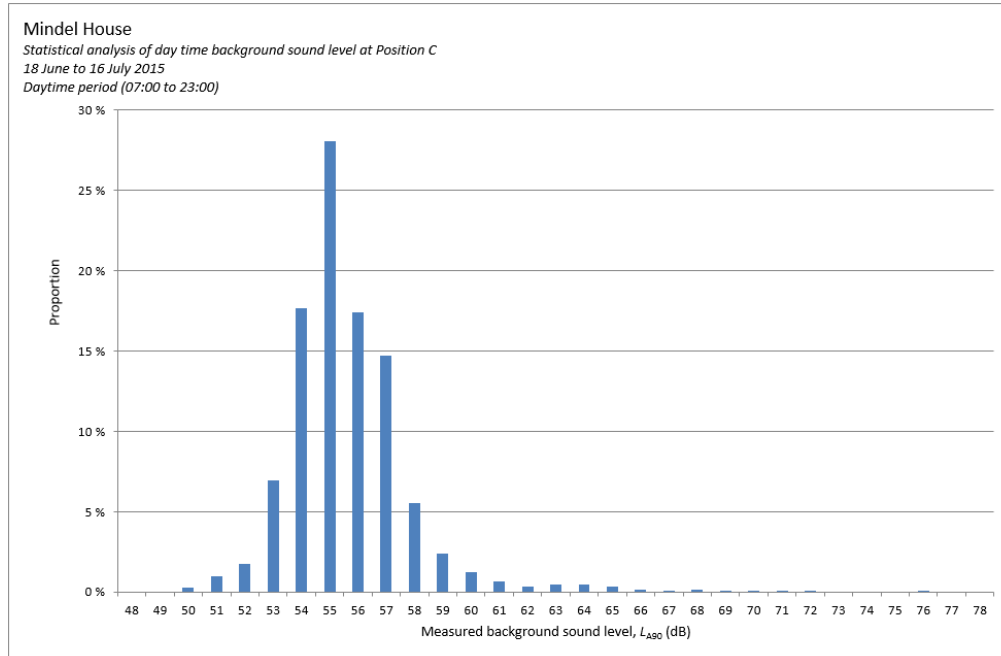


Figure 6 Statistical analysis of daytime (07:00 to 23:00) background sound levels at position C

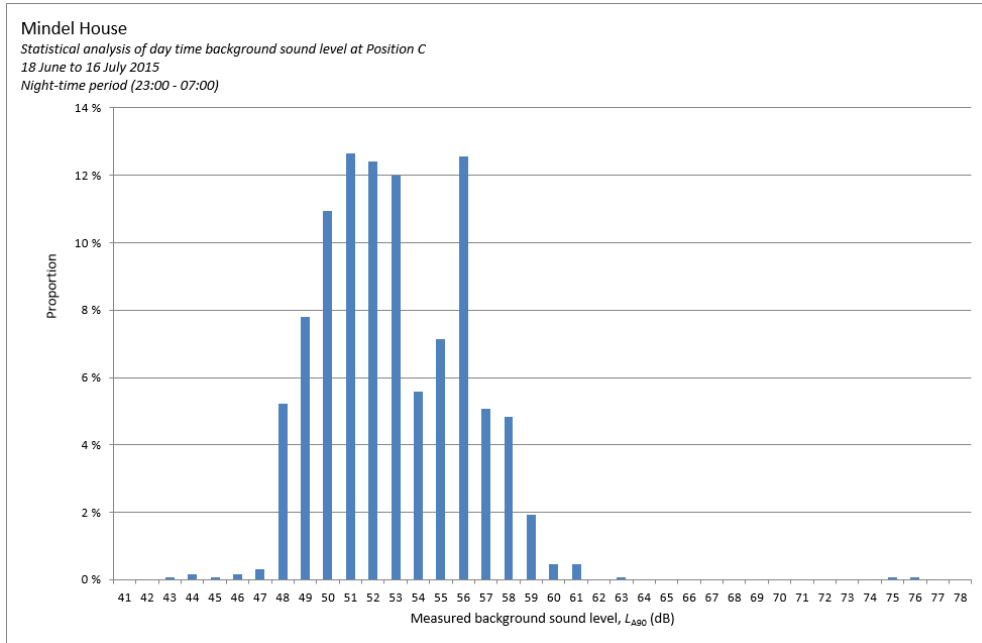


Figure 7 Statistical analysis of night-time (23:00 to 07:00) background sound levels at position C

From this analysis, the representative background sound levels measured at Position C were $L_{A90,5min}$ 55 dB during the daytime and $L_{Aeq,5min}$ 51 dB during the night.

Using the MCC method for determining the 'typical' background noise level, the resultant levels during the day and night are set out in Table 6.

Table 6 Calculated typical background (MCC method)

Time of day	Calculated typical background, $L_{90,5min}$ (dB)
Daytime (07:00-23:00)	53
Night-time (23:00-07:00)	52

4.3 Attended measurement results

4.3.1 Daytime measurements

Attended measurements were performed at 3 locations around the site on 6 June 2014. The sound pressure levels recorded during these measurements are summarised in Table 7. The dominant noise sources noted during the measurements are also described.

Table 7 Sound pressure levels from attended measurements (6 June 2014)

Position	Start time	Sound pressure levels (dB)		Noise sources
		$L_{Aeq,5min}$	$L_{Amax,5min}$	
1	16:10	61	78	Cars passing on Bloom Street, trams passing on Aytoun Street, pedestrians passing, faint plant noise
	16:15	63	78	
	16:20	61	76	
2	16:30	64	78	Cars passing on Minshull Street, pedestrians passing, road traffic noise from Aytoun Street, *motorbike passing
	16:35	63	78	
	16:40	64	85*	
3	16:45	63	75	Plant noise from back of restaurant on Canal Street, occasional cars passing on Richmond Street
	16:50	61	72	
	16:55	61	75	

4.3.2 Night time measurements

The sound pressure levels recorded during the attended measurements carried out during the night of 5 February 2016 are summarised in Table 8. The dominant noise sources noted during the measurements are also described.

Table 8 Sound pressure levels from attended measurements

Position	Start time	Sound pressure levels (dB)		Noise sources
		$L_{Aeq,1min}$	$L_{AFmax,1min}$	
2	23:29	65	79	Road traffic along Minshull Street, pedestrians, low frequency amplified music egress from Madison Lounge audible at times.
	23:30	67	75	
	23:31	75	89	
	23:33	68	75	
	23:34	69	80	
	23:35	67	77	
	23:36	66	74	
	23:37	68	83	
	23:38	66	76	
	23:40	64	76	
	23:41	66	77	

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Position	Start time	Sound pressure levels (dB)		Noise sources
		$L_{Aeq,1min}$	$L_{AFmax,1min}$	
4	23:42	64	72	Road traffic along Bloom Street, pedestrians, low frequency amplified music egress from Madison Lounge audible at times.
	23:43	64	73	
	23:09	62	74	
	23:10	64	75	
	23:11	65	74	
	23:12	57	64	
	23:13	57	67	
	23:14	61	73	
	23:15	62	72	
	23:16	64	72	
	23:17	63	71	
	23:19	61	69	
	23:21	62	75	
	23:22	61	71	
	23:23	66	82	
	23:48	63	75	
	23:49	58	67	
	23:55	62	74	
	23:56	60	77	
	23:57	62	76	
	23:58	59	68	
	23:59	62	72	
	00:00	64	84	
	00:01	64	75	
	00:02	56	66	
	00:03	69	82	
	00:04	61	77	
5	23:10	56	66	Low frequency amplified music egress from Void night club, road
	23:11	58	71	

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Position	Start time	Sound pressure levels (dB)		Noise sources
		$L_{Aeq,1min}$	$L_{AFmax,1min}$	
	23:12	59	65	traffic noise along Bloom Street, occasional car park activity.
	23:13	57	64	
	23:14	58	65	
	23:15	57	71	
	23:16	59	67	
	23:22	61	68	
	23:23	57	68	
	23:24	58	63	
	23:25	58	63	
	23:47	59	70	
	23:48	58	67	
	23:49	60	70	
	23:50	59	66	
	23:51	58	67	
	23:52	59	65	
	23:53	67	74	
	23:54	60	64	
	23:55	58	65	
	23:56	57	63	
	23:57	58	64	
	23:58	58	63	
	23:59	57	71	
	00:00	57	64	
	00:01	58	65	
6	23:28	59	68	Plant noise from rear of restaurant on Richmond Street, some low frequency amplified music egress from Madison Lounge audible at times, road traffic along Minshull St and
	23:29	60	66	
	23:30	65	75	
	23:31	66	82	
	23:32	65	76	

Position	Start time	Sound pressure levels (dB)		Noise sources
		$L_{Aeq,1min}$	$L_{AFmax,1min}$	
	23:33	64	74	occasionally along Richmond St.
	23:34	64	75	
	23:35	60	65	
	23:36	61	67	
	23:37	62	75	
	23:38	65	76	
	23:39	63	71	
	23:40	58	64	
	23:41	59	65	
	23:42	59	65	

5 Assessment criteria

5.1 NPPF and NPSE

The National Planning Policy Framework (NPPF) sets out the government planning requirements, and supersedes previous guidance notes such as PPG24. No specific noise criteria are set out in the NPPF, or in the Noise Policy Statement for England (NPSE) to which it refers.

The NPPF states:

‘Planning policies and decisions should aim to:

- Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;*
- Mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;*
- Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established; and*
- Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.’*

The NPSE states that its aims are as follows:

‘Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- Avoid significant adverse impacts on health and quality of life;
- Mitigate and minimise adverse impacts on health and quality of life; and
- Where possible, contribute to the improvement of health and quality of life.'

As such, although neither of these documents sets out specific acoustic criteria for new residential development, the requirement to control both the effect of existing noise on the new development and the effect of noise from the development on the surroundings needs to be considered.

5.2 External noise levels – noise egress

5.2.1 Local Authority criteria

Manchester City Council (MCC) provides guidance in relation to plant noise emissions in *Planning and Noise Technical Guidance* (December 2015), which states the following in relation to plant noise egress:

'The development should be designed so as to achieve a rating level of 5 dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location.'

Corrections for tonal or attention catching characteristics would need to be applied to the rating level in accordance with BS4142:2014.

5.3 Internal noise level – noise ingress

It is understood from Richard Knightley at Manchester City Council (MCC) that the planning guidance is currently being updated, however, it is understood that the criteria provided in Table 9 will apply to internal noise in residential developments.

Table 9 Manchester City Council internal noise criteria for residential developments

Internal space	Internal noise limit, L_{Aeq} (dB)	
	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)
Living rooms	35	-
Bedrooms	-	30*

* Individual noise events in bedrooms should not exceed L_{Amax} 45 dB by more than 15 times.

Where noise from entertainment venues is the dominant noise source the facade sound insulation should be sufficient such that internal noise levels in bedrooms at night do not exceed 42 dB and 36 dB at 63 Hz and 125 Hz respectively.

The levels in Table 9 are the cumulative noise levels to be achieved by external noise ingress in combination with any noise from mechanical ventilation systems.

6 Plant noise egress

6.1 Limits

Based on the representative background sound levels and MCC 'typical' background levels set out in Section 4.2, the existing background noise levels which are considered to apply in the vicinity of the site are set out in Table 10. These are either in line with, or more onerous than the 'typical' level based on Appendix A of the *Planning and Noise Technical Guidance* document.

Table 10 Existing background noise levels outside nearby sensitive premises

Time of day	Maximum sound pressure level at 1 m from noise sensitive premises
Daytime (07:00-23:00)	L_{Aeq} 51 dB
Night-time (23:00-07:00)	L_{Aeq} 47 dB outside the nearby sensitive premises on Bloom Street and Minshull Street L_{Aeq} 51 dB outside the nearby sensitive premises on Richmond Street

Based on the above criteria, the cumulative noise level resulting from the operation of all new plant at 1 m from the worst affected windows of the nearest noise sensitive premises should not exceed the limits set out in Table 11.

Table 11 Plant noise limits at 1 m from the nearest noise sensitive premises

Time of day	Maximum sound pressure level at 1 m from noise sensitive premises
Daytime (07:00-23:00)	L_{Aeq} 46 dB
Night-time (23:00-07:00)	L_{Aeq} 42 dB outside the nearby sensitive premises on Bloom Street and Minshull Street L_{Aeq} 46 dB outside the nearby sensitive premises on Richmond Street

The limits set out in Table 11 do not include any attention catching features. The penalties for attention catching features may be significant, and will need to be considered as the building services design progresses. This is discussed further in Section 6.1.1.

6.1.1 Attention catching features

If the proposed plant noise contains attention catching features (such as tonal elements, whines, whistles, bangs etc), the plant should be designed to achieve a limit below those set out above, based on the type and impact of the features.

If appropriate, a subjective assessment of the plant features can be adopted. Where the plant noise contains tonal elements, the following corrections can be made depending on how perceptible the tone is at the noise receptor:

- 0 dB where the tone is not perceptible
- 2 dB where the tone is just perceptible
- 4 dB where the tone is clearly perceptible
- 6 dB where the tone is highly perceptible

Where the plant noise is impulsive, the following corrections can be made depending on how perceptible the impulsivity is at the noise receptor:

- 0 dB where the impulse is not perceptible
- 3 dB where the impulse is just perceptible
- 6 dB where the impulse is clearly perceptible
- 9 dB where the impulse is highly perceptible

For noise which is equally both impulsive and tonal, then both features can be taken into account by linearly summing the corrections for both characteristics.

If the plant has other distinctive characteristics, such as intermittency, then a 3 dB correction can be made.

If a subjective assessment is not appropriate then an objective assessment can be made. A noise source is deemed to be tonal if the time averaged sound pressure level in a one-third octave band exceeds the level in adjacent one-third octave bands by the level differences given below:

- 15 dB in the low frequency one-third octave bands (25 Hz to 125 Hz)
- 8 dB in the mid frequency one-third octave bands (160 Hz to 400 Hz)
- 5 dB in the high frequency one-third octave bands (500 Hz to 10000 Hz)

If an objective assessment identifies the plant noise to be tonal then a 6 dB correction must be made.

6.2 Assessment

At this stage, no information is available in relation to the proposed installation of building services plant, and this will need to be assessed in detail as the design progresses. However, all plant items will be designed to achieve the plant noise limits set out above, including any corrections for attention catching features.

7 Facade sound insulation – noise ingress

This section discusses internal noise level criteria and assesses the required facade sound insulation performance. In principle, the required facade specification depends on two factors – the external noise levels at the site, and the internal noise criteria.

The following assessment is based on achieving the internal noise stipulated by the MCC, which are set out in Section 5.2.1.

It is assumed that noise emission limits would be set by MCC for any future licenced premises in the vicinity, to ensure that the internal noise levels within the dwellings do not exceed the MCC criteria.

7.1 External noise levels

As the Madison Lounge night club in the basement of Mindel House was operational at the time of the noise survey, consideration must be given to the relative contributions to the external facade levels.

As noted in Section 4.1.2, significant levels of amplified music egress from Madison Lounge was noted via the door on Bloom Street and facade ventilators on Richmond Street. As the unattended measurement positions A and C are expected to be affected by this, the night time ambient noise levels, $L_{Aeq,8hr}$, measured during weekends are no longer considered to be representative following the club's closure. The attended measurements carried out on 5 February at positions 4 and 6 have therefore formed the basis of the ambient noise level predictions at these facades as amplified music egress was dominated by other noise sources at these positions.

The maximum noise levels, L_{AFmax} , measured at positions A and C are considered representative of the current noise climate as recorded audio of the maxima suggest that they are primarily caused by passing pedestrians talking/shouting and passing vehicles rather than noise associated with the former Madison Lounge.

Based on the results from the noise survey, the maximum noise levels not exceeded more than 15 times at the various facades are as follows:

- Minshull Street - L_{AFmax} 86 dB
- Bloom Street - L_{AFmax} 92 dB
- Richmond Street - L_{AFmax} 86 dB
- Car park (south west) - L_{AFmax} 89 dB.

The above levels are based on the worst case night time period during the unattended noise monitoring for each position. In each instance, this occurred on a Friday or Saturday night where the measured maxima are consistently higher than those measured during the week.

The predicted external noise levels at the various facades of the proposed development are shown in Figure 8 and Figure 9.

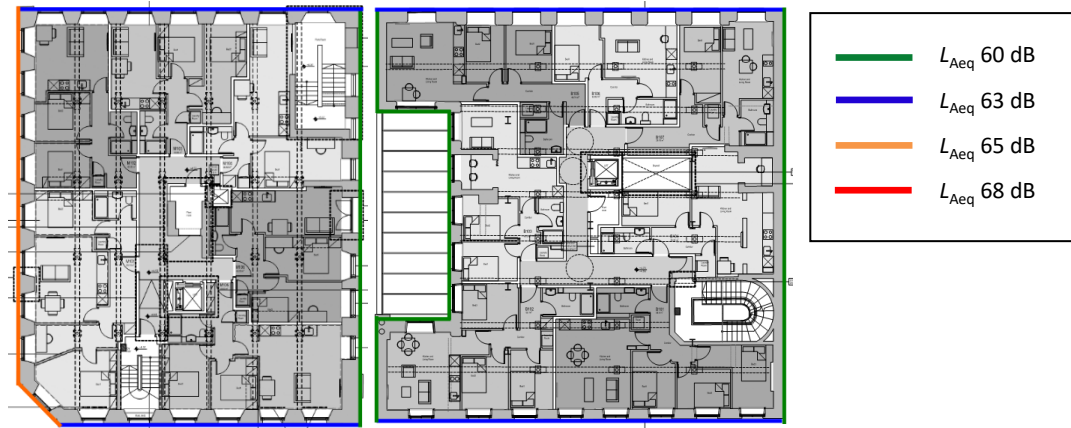


Figure 8 Predicted external noise levels during the daytime (07:00 - 23:00)

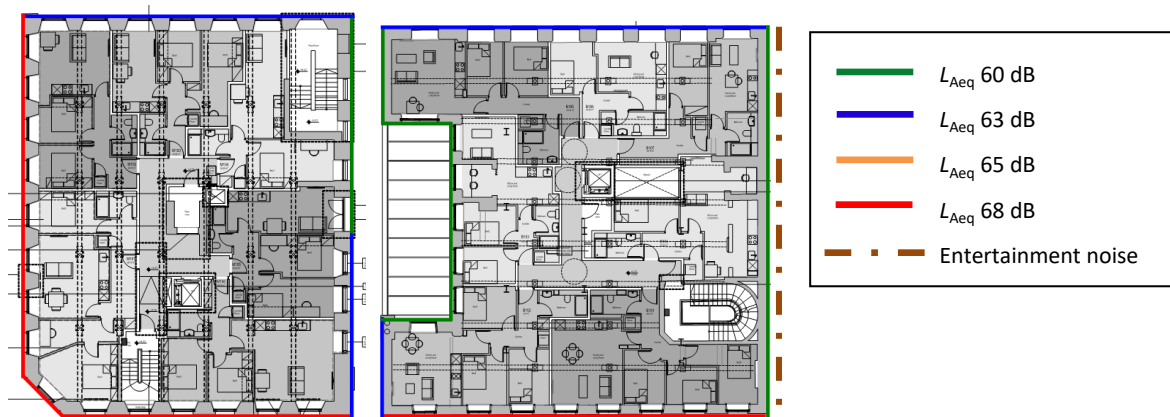


Figure 9 Predicted external noise levels during the night (23:00 - 07:00)

7.2 Facade sound insulation

To achieve the internal noise criteria given in section 5.2.1 for bedrooms and other living areas, minimum facade sound insulation requirements have been determined based on the external noise levels at each facade stated above.

The minimum sound insulation performance requirements for the different building facades are given in Table 12.

As amplified music egress from the night club Kiki was a dominant noise source at the facade adjacent to the car park, as indicated in Figure 9, the internal noise limits stipulated in Section 5.2.1 at 63 Hz and 125 Hz must be met in any bedrooms on this facade.

It should be noted that the sound insulation performances given are based on providing equal contributions from external noise ingress and building services noise.

Table 12 Overall facade sound insulation performance requirements

Facade zone	Minimum sound insulation performance			
	Living areas		Bedrooms	
	Overall, R'_w+C_{tr} (dB) ¹	Overall, R'_w+C_{tr} (dB)	Low frequency, R'_{63Hz} (dB)	Low frequency, R'_{125Hz} (dB)
Minshull Street	33	36	-	-
Bloom Street	31	41 ²	-	-
Richmond Street	31	36	-	-
Alley (central)	28	33	-	-
Car park (south west)	28	38 ¹	30	29

¹ Where living rooms are located on corners of the building (ie, dual aspect), the overall facade sound insulation is required to be 3 dB greater than the value given on both facades.

² Performance driven by maximum not exceeded more than 15 times.

7.3 Guidance on facade construction, glazing, and ventilation strategy

7.3.1 Non-glazed construction

The existing non-glazed facade is understood to be masonry with a depth of at least 400 mm.

Generally, this is expected to be capable of controlling external noise ingress throughout the scheme. Where there is a low frequency sound insulation performance requirement specified to bedrooms located on the car park facade, the exact construction will need to be reviewed to confirm that it is capable of meeting these requirements.

7.3.2 Glazed construction

An initial assessment of the glazing sound insulation performance is presented below based on the following assumptions:

- The non-glazed facade element provides a sound insulation performance at least 10 dB greater than the glazing
- No more than 50% of the facade is glazed (as per the drawings received on 11 January 2018).

On the basis of the above, the sound insulation performance provided by the window units alone is required to achieve 3 dB less than the values given in Section 7.2. Example glazing constructions capable of achieving this are provided below.

Table 13 Example glazing configurations

Facade	Example glazing configuration	
	Living rooms	Bedrooms
Minshull Street	Single aspect – 6 mm glass/12 mm airspace/6.4 mm laminated glass Dual aspect – 10 mm glass/12 mm airspace/6.4 mm laminated glass	10 mm glass/12 mm airspace/6.4 mm laminated glass
Bloom Street	Single aspect – 6 mm glass/12 mm airspace/6 mm glass Dual aspect – 6 mm glass/12 mm airspace/6.4 mm laminated glass	10 mm glass/12 mm airspace/ 12.8 mm laminated glass
Richmond Street	Single aspect – 6 mm glass/12 mm airspace/ 6 mm glass Dual aspect – 6 mm glass/12 mm airspace/6.4 mm laminated glass	10 mm glass/12 mm airspace/6.4 mm laminated glass
Alley (central)	6 mm glass/12 mm airspace/6 mm glass	6 mm glass/12 mm airspace/6.4 mm laminated glass
Car park (south west)	¹	¹

¹ There are no windows located on this facade. As such, none of the glazing is required to control low frequency noise ingress in line with the criteria set out in Section 7.2.

7.3.3 Ventilation strategy

The ventilation strategy cannot depend on opening windows or simple facade ventilators. Mechanical ventilation is understood to be proposed throughout which is in line with this.

Existing ventilation opening which within the facade to the proposed dwellings will need to connect to sound attenuated ducted ventilation systems or be removed and filled to the full depth with a material that is at least the same density as the wall.

8 Conclusion

The existing background sound levels in the vicinity of the site as follows:

- During the day (07:00 – 23:00) - $L_{A90,5min}$ 51 dB
- During the night (23:00 – 07:00):
 - $L_{A90,5min}$ 47 dB at the nearby sensitive premises on Bloom Street and Minshull Street
 - $L_{A90,5min}$ 51 dB at the nearby sensitive premises on Richmond Street

On the basis of the requirements of the Manchester City Council, the relevant plant noise limits at the worst affected existing noise sensitive premises must not exceed 5 dB below these representative background sound levels. These limits are cumulative, and apply with all plant operating under normal conditions. If plant items contain tonal or attention catching features, a penalty is to be applied.

An initial facade sound insulation assessment has been carried out to determine the required acoustic performance of the facade, and provide guidance on the ventilation strategy. Based on this, mechanical ventilation is recommended and example glazing configurations are set out.

Appendix A

Survey details

Equipment

A Rion NL-52 sound level meter was used to undertake the unattended measurements. The attended measurements were carried out using a Norsonic 118 sound level meter. The calibration details for the equipment used during the survey are provided in Table A1.

Table A1 Equipment calibration data

Equipment description	Type/serial number	Manufacturer	Calibration expiry	Calibration certification number
Sound level meter	Nor118/31754	Norsonic	2 Mar 17	08241
Microphone	40AF/62396	Gras	2 Mar 17	08241
Pre-amp	1206/30873	Norsonic	2 Mar 17	08241
Calibrator	1251/31322	Norsonic	20 Feb 17	08208
Sound level meter	NL-52/00932326	Rion	24 Feb 17	1502114
Microphone	UC-59/035549	Rion	24 Feb 17	1502114
Pre-amp	NH-25/32354	Rion	24 Feb 17	1502114
Calibrator	NC-74/34125432	Rion	24 Feb 17	1502110

Calibration of the sound level meters used for the tests is traceable to national standards. The calibration certificates for the sound level meters used in this survey are available upon request.

The sound level meters and microphones were calibrated at the beginning and end of the measurements using their respective sound level calibrators. No significant deviation in calibration occurred.

Noise indices

The equipment was set to record a continuous series of broadband sound pressure levels. Noise indices recorded included the following:

- $L_{Aeq,T}$ The A-weighted equivalent continuous sound pressure level over a period of time, T.
- $L_{AFmax,T}$ The A-weighted maximum sound pressure level that occurred during a given period with a fast time weighting.
- $L_{A90,T}$ The A-weighted sound pressure level exceeded for 90% of the measurement period. Indicative of the background sound level.

The L_{A90} is considered most representative of the background sound level for the purposes of complying with any local authority requirements.

Sound pressure level measurements are normally taken with an A-weighting (denoted by a subscript 'A', eg L_{A90}) to approximate the frequency response of the human ear.

A more detailed explanation of these quantities can be found in BS7445: Part 1: 2003 *Description and measurement of environmental noise, Part 1. Guide to quantities and procedures*.

Weather conditions

During the attended measurements carried out on 6 June 2014 and 5 February 2016, the weather was generally clear and dry and no rain occurred. Wind speeds were low.

During the unattended noise measurements between 23 April and 16 July 2015, weather reports for the area indicated that wind speeds were low for sufficient periods.

These weather conditions are considered suitable for obtaining representative measurements.