SANDY BROWN

Consultants in Acoustics, Noise & Vibration

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59 Maresfield Gardens

Environmental noise survey and facade assessment report

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Version	Date	Comments	Author	Reviewer
A	15 Feb 16		Jake Mroz	Richard Muir

Summary

Sandy Brown Associates LLP (SBA) has been commissioned by Jackson Coles LLP to provide acoustic advice in relation to the proposed development at 59 Maresfield Gardens.

An environmental noise survey has been carried out to determine the existing background sound levels in the area and setting appropriate plant noise limits in line with the requirements of the Local Authority.

The noise survey was performed between 10:20 on 28 January 2015 and 10:40 on 01 February 2016.

The survey was conducted at two positions to collect representative background sound levels measured at both the front and rear of 59 Maresfield Gardens. The typical background sound levels measured during the survey were $L_{A90,15min}$ 44 dB during the daytime and $L_{A90,15min}$ 38 dB at night towards the front of the property overlooking Maresfield Road. Typical background sound levels of $L_{A90,15min}$ 43 dB during the daytime and $L_{A90,15min}$ 37 dB at night were measured at the rear.

Based on the requirements of the London Borough of Camden and on the results of the noise survey, all plant must be designed such that the cumulative noise level at 1 m from the worst affected windows of the nearby noise sensitive premises does not exceed $L_{Aeq,15min}$ 38 dB during the daytime, and $L_{Aeq,15min}$ 32 dB during night-time periods. These limits apply at all surrounding noise sensitive receptors due to the minimal variation in background sound levels around the site.

These limits are cumulative, and apply with all plant operation under normal conditions. If plant items contain tonal or attention catching features, a penalty based on the type and impact of those features will be applied, and the limits will be more stringent than those set.

Contents

1 Introduction

An environmental noise survey has been carried out, the purpose of which was to establish the existing ambient and background sound levels in the vicinity of the site and nearby noise sensitive premises.

The background sound levels measured during the survey 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 London Borough of Camden (LBC).

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 BS 8233:2014 *Sound insulation and noise reduction for buildings*, World Health Organisation and London Borough of Camden's guidelines.

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 surrounding

The site location in relation to its surroundings is shown in Figure 1. Position L_1 indicates the location of the unattended noise monitor installed at the front of the development site. Position L_2 indicates the location of the unattended logger installed at the rear.

59 Maresfield Gardens is located in a residential area of within the London Borough of Camden and fronts the relatively quiet Maresfield Gardens Road. The heavily trafficked, yet more distant Finchley Road (A41) runs to the west of the site at a distance of approximately 200 m.

Finchley Road and Frognal station lies to the west of the site and is served by the London Overground railway. The westbound and eastbound lines run a distance of approximately 60 m to the north of the site.

The more distant Finchley Road station lies a distance of approximately 350 m to the west, and is served by the Jubilee and Metropolitan lines. These lines run approximately 190 m to the south of the site.

Figure 1 Site map (courtesy of LoM Architecture). Approximate footprint of 59 Maresfield Gardens highlighted in red

2.2 Adjacent premises

The most affected noise sensitive receptors are considered to be the residential properties to the south of the site indicated on Figure 1 at 57 Maresfield Gardens. These are approximately 7 m from the development location. There are also residential properties to the north of the site, approximately 16 m from the new buildings at No. 40 Maresfield Gardens.

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.

Weather conditions throughout the survey period were generally dry with light winds (less than 5 ms^{-1}).

3.1 Unattended measurements

Unattended noise monitoring was undertaken at the site over 5 days to determine the existing background sound levels in the vicinity of nearby noise sensitive premises.

The unattended measurements were performed over 15 minute periods between 10:20 on 28 January 2016 and 10:40 on 01 February 2016. The equipment was installed by and collected by Jake Mroz.

The measurement positions used during the survey are indicated in Figure 1, denoted by the letter 'L_1' and 'L_2'. Photographs showing the measurement locations are provided Figure 2. These locations were chosen to be reasonably representative of the noise levels experienced by the nearest noise sensitive premises.

Location 'L_1' was located a distance of approximately 1.2 m above the vestibule flat roof directly overlooking 59 Maresfield Road, and were taken as facade measurements. This position is representative of upper floor bedroom windows of the development.

Location 'L_2' was located a distance of approximately 1.2 m above ground height within the garden to the rear of 59 Maresfield Garden, and were taken as facade measurements. Although taken at ground floor level, due to the distant nature of environmental noise sources, the measurement location is representative of first floor bedroom windows at the first floor of the proposed scheme.

Photographs of each of these measurement positions have been presented in Figure 2.

(a) (b)

Figure 2 Photograph (a) shows the measurement position at the rear, position (b) shows the measurement position at the front

4 Measurement results

4.1 Observations

The dominant noise sources observed at both positions on the site during the survey consisted of the distant rumble of road traffic along Finchley Road (A41), relatively frequent aircraft flyovers, and occasional train movements at the nearby Finchley Road and Frognal stations.

Less significant noise sources included distant children playing at the heavily screened St Marys School. The rustling of foliage was also audible and likely influenced the ambient sound levels during wind gusts.

4.2 Unattended measurement results

The results of the unattended noise measurements are summarised in the following tables. A graph showing the results of the unattended measurements is provided in Appendix B.

The day and night time ambient noise levels measured towards the rear of the site during the unattended survey are presented as facade measurements in Table 1.

Table 1 Ambient noise levels measured during the survey (rear)

Date	Daytime (07:00 – 23:00) $L_{Aeq,16h}$ (dB)	Night (23:00 – 07:00) $L_{Aeq,8h}$ (dB)
28 Jan 2016	50	50
29 Jan 2016	54	52
30 Jan 2016	47	43
31 Jan 2016	50	47
1 Feb 2016	53*	N/A
Average	50	48

* Measurement not made over full period due to monitoring start and end time. The measurement on 1 Feb 16 was over 3 hours and catches morning peak hours only (07:00 – 10:00); not included in the average

The day and night time ambient noise levels measured at the front of the site during the unattended survey are presented as facade measurements in Table 2

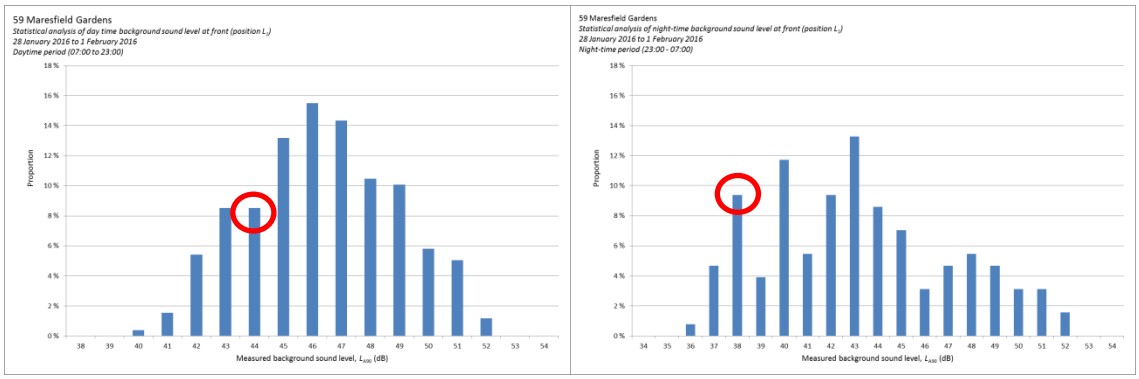
Table 2 Ambient noise levels measured during the survey (front)

Date	Daytime (07:00 – 23:00) $L_{Aeq,16h}$ (dB)	Night (23:00 – 07:00) $L_{Aeq,8h}$ (dB)
28 Jan 2016	54	51
29 Jan 2016	58	52
30 Jan 2016	50	42
31 Jan 2016	51	49
1 Feb 2016	57*	N/A
Average	53	49

* Measurement not made over full period due to monitoring start and end time. The measurement on 1 Feb 16 was over 3 hours and catches morning peak hours only (07:00 – 10:00); not included in the average

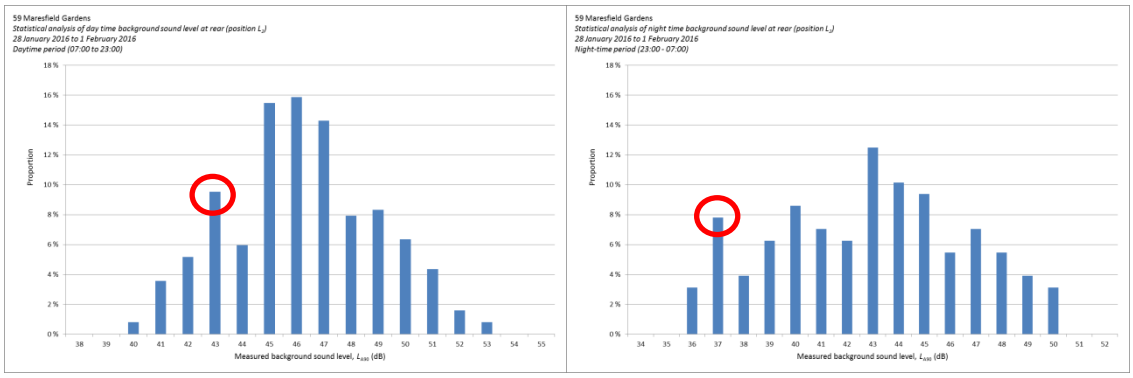
For the purpose of analysis and establishing representative background sound levels, day and night time typical levels have been quantified using statistical analysis from the continuous

logging measurements. Daytime and night time statistical analysis of representative values are given in Figure 3 and Figure 4 for the front and rear of the site respectively.



(a) (b)

Figure 3 Statistical analysis of daytime (a) and night-time (b) background sound level at position 'L1' (front)



(a) (b)

Figure 4 Statistical analysis of daytime (a) and night-time (b) background sound level at position 'L2' (rear)

From this analysis, the typical background sound levels measured during the survey were $L_{A90,15min}$ 44 dB during the daytime and $L_{A90,15min}$ 38 dB at night towards the front of the property overlooking Maresfield Road. Typical background sound levels of $L_{A90,15min}$ 43 dB during the daytime and $L_{A90,15min}$ 37 dB at night were measured at the rear.

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 Standard guidance

Guidance for noise emission from proposed new items of building services plant is given in BS 4142: 2014 '*Methods for rating and assessing industrial and commercial sound*'.

BS 4142 provides a method for assessing noise from items such as building services plant against the existing background sound levels at the nearest noise sensitive.

BS 4142 suggests that if the noise level is 10 dB or more higher than the existing background sound level, it is likely to be an indication of a significant adverse impact. If the level is 5 dB above the existing background sound level, it is likely to be an indication of an adverse impact. If the level does not exceed the background level, it is an indication of having a low impact.

If the noise contains 'attention catching features' such as tones, bangs etc, a penalty, based on the type and impact of those features, is applied.

5.2.2 Local Authority criteria

Policy DP28 of Camden Councils Local Development Framework (LDF) adopted in 2010, states the following in relation to noise and vibration:

Policy DP28 - Noise and vibration

The Council will seek to ensure that noise and vibration is controlled and managed and will not grant planning permission for:

a) development likely to generate noise pollution; or
b) development sensitive to noise in locations with noise pollution, unless appropriate attenuation measures are provided.

Development that exceeds Camden's Noise and Vibration Thresholds will not be permitted.

The Council will only grant permission for plant or machinery if it can be operated without cause harm to amenity and does not exceed our noise thresholds.

The Council will seek to minimise the impact on local amenity from the demolition and construction phases of development. Where these phases are likely to cause harm, conditions and planning obligations may be used to minimise the impact.

Camden Councils LDF sets the external noise levels criteria for mechanical plant and machinery to determine applications for planning permission within the borough, as outlined in Figure 5.

Table E: Noise levels from plant and machinery at which planning permission will not be granted

Noise description and location of measurement	Period	Time	Noise level
Noise at 1 metre external to a sensitive façade	Day, evening and night	0000-2400	5dB(A) <LA90
Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1 metre external to a sensitive façade.	Day, evening and night	0000-2400	10dB(A) <LA90
Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive façade.	Day, evening and night	0000-2400	10dB(A) <LA90
Noise at 1 metre external to sensitive façade where LA90>60dB	Day, evening and night	0000-2400	55dB$_{LAeq}$

Figure 5 Excerpt from Camden Councils LDF relating to planning criteria for noise and vibration

In summary Camden Councils requirements are:

- Plant and machinery noise should not exceed 5 dB below the background noise L_{A90}. Corrections should be applied if the sources exhibit any signs of tonality or impulsivity, as set out in Table E.

5.3 Internal noise level – noise ingress

5.3.1 Standard guidance

Guidance on acceptable internal noise levels in residential dwellings is given in BS 8233:2014 *Sound insulation and noise reduction for buildings*, and is also provided by the World Health Organisation. The guidance given by BS 8233 and WHO is shown in Table 3.

Table 3 Internal noise criteria for sleeping/resting

Internal space	Indoor ambient noise level L_{Aeq} (dB)		
	BS 8233 (07:00 to 23:00)	BS 8233 (23:00 to 07:00)	WHO
Living rooms	35	-	30/35[1]
Dining room	40	-	-
Bedrooms	35	30[2]	30[2]

[1] WHO does not differentiate between different types of living spaces, but recommends L_{Aeq} 30 dB in relation to sleep disturbance and L_{Aeq} 35 dB in relation to speech intelligibility. WHO provides a 16 hour time base when referring to speech intelligibility and an 8 hour time base when referring to sleep disturbance.

[2] BS 8233 notes that individual noise events can cause sleep disturbance, and that a guideline value may be set depending on the character and number of events per night, although no specific limit is provided. Section 3.4 of the WHO guidelines for community noise suggests that good sleep will not generally be affected if internal levels of L_{Amax} 45 dB are not exceeded more than 10-15 times per night.

5.3.2 Local authority criteria

Camden Councils LDF sets the external noise levels criteria to determine applications for planning permission within the borough, as outlined in Figure 6.

In summary:

- Should noise levels in the vicinity of the site exceed those given in Table A, planning permission would not be granted
- Should noise levels due to the adjoining roads reach those given in Table B, attenuation measures would be required.

Table A: Noise levels on residential sites adjoining railways and roads at which planning permission will not be granted

Noise description and location of measurement	Period	Time	Sites adjoining railways	Sites adjoining roads
Noise at 1 metre external to a sensitive façade	Day	0700-1900	74 dB L_{Aeq} 12h	72 dB L_{Aeq} 12h
Noise at 1 metre external to a sensitive façade	Evening	1900-2300	74 dB L_{Aeq} 4h	72 dB L_{Aeq} 4h
Noise at 1 metre external to a sensitive façade	Night	2300-0700	66 dB L_{Aeq} 8h	66 dB L_{Aeq} 8h

Table B: Noise levels on residential streets adjoining railways and roads at and above which attenuation measures will be required

Noise description and location of measurement	Period	Time	Sites adjoining railways	Sites adjoining roads
Noise at 1 metre external to a sensitive façade	Day	0700-1900	65 dB L_{Aeq} 12h	62 dB L_{Aeq} 12h
Noise at 1 metre external to a sensitive façade	Evening	1900-2300	60 dB L_{Aeq} 4h	57 dB L_{Aeq} 4h
Noise at 1 metre external to a sensitive façade	Night	2300-0700	55 dB L_{Aeq} 1h	52 dB L_{Aeq} 1h
Individual noise events several times an hour	Night	2300-0700	>82dB L_{Amax} (S time weighting)	>82dB L_{Amax} (S time weighting)

Figure 6 Excerpt from Camden Councils LDF relating to planning criteria for noise and vibration

5.4 External amenity spaces

BS8233:2014 provides guidance on acceptable noise levels in outdoor amenity spaces. Here it is stated that:

"*For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable.*"

It goes on to state that:

"*Other locations, such as balconies, roof gardens and terraces, are also important in residential buildings where normal external amenity space might be limited or not available, i.e. in flats, apartment blocks, etc. In these locations, specification of noise limits is not necessarily appropriate. Small balconies may be included for uses such as drying washing or growing pot plants, and noise limits should not be necessary for these uses. However, the general guidance on noise in amenity space is still appropriate for larger balconies, roof gardens and terraces, which might be intended to be used for relaxation.*"

Guidance in BS8233 for noise limits in external amenity spaces is roughly in line with guidance given by the WHO: 1999 Guidelines on Community Noise.

6 Plant noise limits – noise egress

6.1 Basic limits

Based on the above criteria and the measurement results, 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 4.

Due to the minimal variation in background (L_{A90}) sound pressure levels between the front and rear of the property (<1 dB), the worst case levels have been assumed across the site as a conservative assumption.

Table 4 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 ($L_{Aeq,15min}$ dB)
Daytime (07:00-23:00)	38
Night-time (23:00-07:00)	32

The limits set out in Table 4 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.

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 levels recommended in BS 8233 and by Camden Councils LDF, which are set out in Section 5.3.

7.1 External noise levels

In order to allow an assessment of the worst case scenario, the highest noise levels provided in Table 1 and Table 2 have been used to assess noise ingress.

These are:

Daytime periods (07:00 – 23:00)

- L_{Aeq} 58 dB towards the front of the property, and L_{Aeq} 54 dB at the rear.

Night-time periods (23:00 – 07:00)

- L_{Aeq} 52 dB at both the front and rear of the property.

7.2 Facade sound insulation

To achieve the internal noise criteria given in section 5.3.1 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.

Current proposals for the primary facade at both the eastern and western elevations comprise full-height glazing to ground and first floor living spaces. Openings are to be incorporated to allow for natural ventilation.

Based on the layouts currently proposed and the calculated external levels at the facade, standard thermal double glazing with a minimum performance of R_w+C_{tr} 24 dB (e.g. 6 mm glass /12 mm air gap/ 6 mm glass) is expected to be capable of controlling external noise break in for bedrooms and living rooms at first and upper ground floor levels.

At lower ground floor level is a proposed dining room. Due to the relaxed criteria given in BS8233 (see Table 3), and the screening provided by landscaping from Maresfield Gardens Road, a relaxed facade specification of R_w+C_{tr} 15 dB at both the front and rear of 59 Maresfield Gardens would be acceptable.

Consequently to prevent summer time over heating, open windows with limited openings could be used to naturally ventilate the space, and still be capable in achieving suitable internal noise levels for dining rooms.

Table 5 provides guidance on facade construction, glazing and ventilation strategies that could be employed to achieve the required sound insulation performance for the various elevations.

Table 5 Example glazing configurations and ventilation strategies

Sound insulation R_w+C_{tr} (dB)	Example glazing configuration	Ventilation Strategy
≤10	6 mm/12 mm/6 mm	Open windows
10-15	6 mm/12 mm/6 mm	Limited open area opening windows
15-29	6 mm/12 mm/6 mm	Attenuated passive ventilation (eg, trickle vents)
30-32	6.4 mm/12 mm/6 mm	Attenuated passive ventilation
33-35	6.4 mm/12 mm/10 mm	High performance acoustically attenuated passive ventilation

The attenuation of sound provided by an open window is typically in the region of 10 to 15 dB when located in a solid facade, depending on the open area. As such, where the required facade sound insulation performance is less than R_w+C_{tr} 10 dB, it is likely that opening windows can be used whilst achieving the necessary internal noise levels.

In areas where the necessary facade sound insulation is between R_w+C_{tr} 10 and 15 dB, partially open windows may be used for ventilation purposes depending on the open area.

The performance required by each element will depend on the construction of the solid elements, the glazing specification, the relative areas of the solid and glazed elements, and the ventilation strategy (including the acoustic performance of the trickle ventilators and the number of ventilators required to serve individual rooms, if applicable).

As the design progresses, a more detailed facade sound insulation assessment will need to be performed, taking into account the factors listed above, to ensure that the overall performance requirements will be met.

7.3 External amenity spaces

A balcony area is proposed at upper ground floor level overlooking the garden to the rear of the property. As the noise levels presented in Table 1 fall below the criteria presented in section 5.4 for external amenity spaces, noise is not considered to be an issue for balcony and garden spaces.

8 Conclusion

The survey was conducted at two positions to collect representative background sound levels measured at both the front and rear of 59 Maresfield Gardens. The typical background sound levels measured during the survey were $L_{A90,15min}$ 44 dB during the daytime and $L_{A90,15min}$ 38 dB at night towards the front of the property overlooking Maresfield Road. Typical background sound levels of $L_{A90,15min}$ 43 dB during the daytime and $L_{A90,15min}$ 37 dB at night were measured at the rear.

Based on the requirements of the London Borough of Camden's (LBC) and on the results of the noise survey, all plant must be designed such that the cumulative noise level at 1 m from the worst affected windows of the nearby noise sensitive premises does not exceed $L_{Aeq,15min}$ 38 dB during the daytime, and $L_{Aeq,15min}$ 32 dB during the night at noise sensitive receptors facing the front of 59 Maresfield Gardens. If plant items contain tonal or attention catching features, a penalty based on the type and impact of those features will be applied, and the limits will be more stringent than those set.

The facade sound insulation has been assessed in order to determine the necessary performance required to achieve appropriate internal noise levels for residences set in accordance with BS 8233:2014 *Sound insulation and noise reduction for buildings*, World Health Organisation and London Borough of Camden's guidelines.

In order to achieve the relevant internal noise limits, standard thermal glazing (e.g. 6 mm glass /12 mm air gap/ 6 mm glass), in combination with attenuated trickle ventilators are expected to be capable of controlling external noise break in for bedrooms and living rooms proposed at first and upper ground floor levels.

For the dining room at ground floor level, natural ventilation via partially openable windows are expected to control external noise break in.

Appendix A

Survey details

Equipment

Two Rion NL-32 sound level meters were used to undertake the unattended measurements. 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
NL-32C				
Sound level meter	NL-32/00623762	Rion	13 Oct 17	1510549
Microphone	UC-53A/319234	Rion	13 Oct 17	1510549
Pre-amp	NH-21/76670	Rion	13 Oct 17	1510549
Calibrator	NC-74/34536130	Rion	02 Oct 17	1510534
NL-32D				
Sound level meter	NL-32/00423756	Rion	11 Nov 16	1411546
Microphone	UC-53A/319228	Rion	11 Nov 16	1411546
Pre-amp	NH-21/36631	Rion	11 Nov 16	1411546
Calibrator	NC-74/34625670	Rion	11 Nov 16	1411530

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

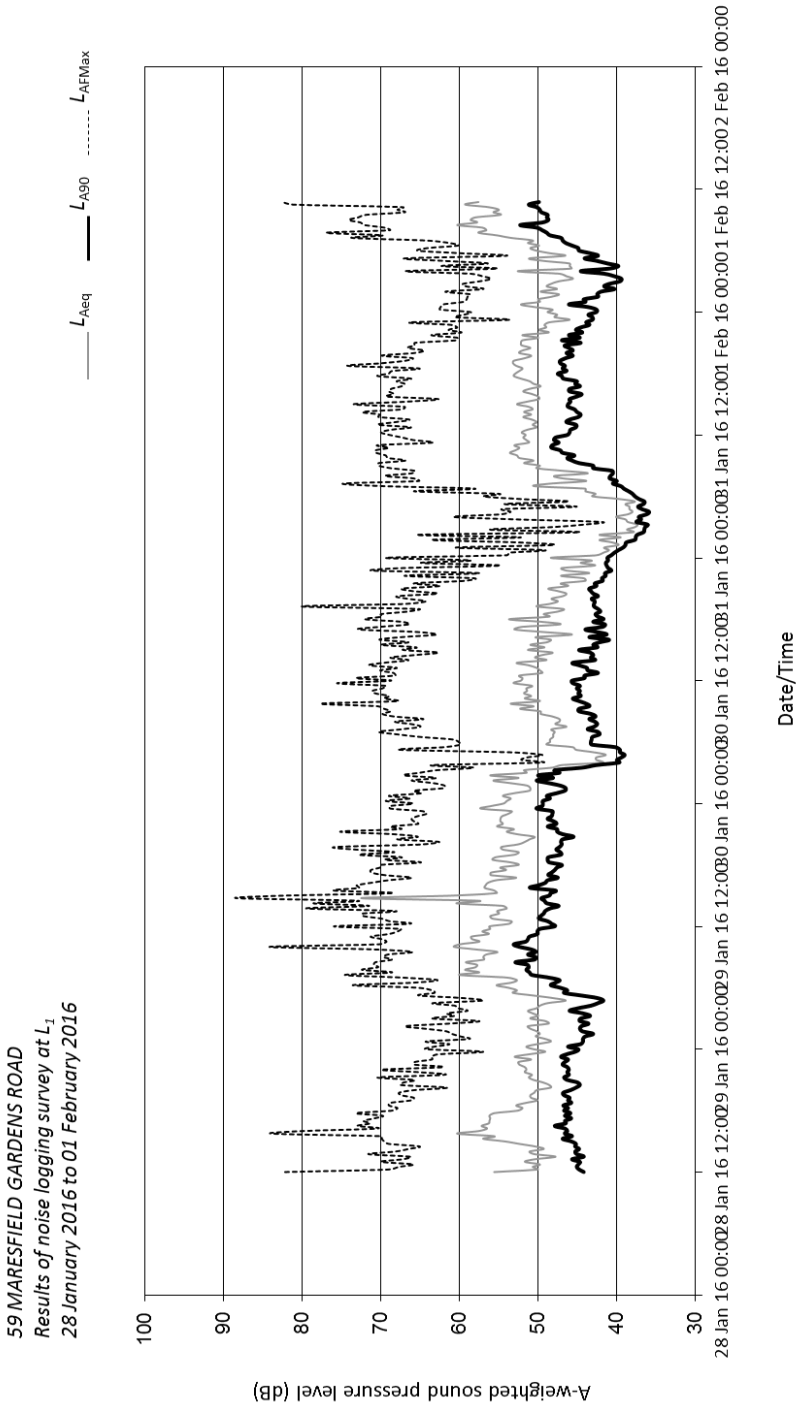
During the unattended noise measurements between 28 January 2016 and 01 February 2016, weather reports for the area indicated that temperatures varied between 2°C at night and 13°C during the day, and the wind speed were generally less than 5 m/s.

These weather conditions are considered suitable for obtaining representative measurements.

Appendix B

Results of unattended measurements

Position L_1 facing Maresfield Gardens Road



Position L_2 towards the rear of the property