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Noise Impact Assessment

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This document must only be treated as a draft unless it has been signed by the originators and approved by a director.

<i>Revision</i>	-	<i>Rev. A</i>
Date	27/02/2018	12/11/2019
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1 EXECUTIVE SUMMARY

An assessment has been carried out of the present noise climate at **138-140 Highgate Road, London**. The approved scheme involves the construction of 6 No. 4-bed terraced houses at the site of a former garage. Revision A of the report reflects an updated noise measurement survey carried out in November 2019 to satisfy planning conditions set for the approved development.

The approved development is set over three floors and makes use of the topography of the site. The main entrance is on the top floor of the property, level with College Lane at the rear of the site. The middle floor is at the same level as Highgate Road and the lowest floor is set under the existing ground level, with the main amenity areas for each house also being located at the lowest level. The houses will be located in the rear half of the site, next to College Lane rather than Highgate Road and the remainder of the site will be grassland.

The assessment is based on the results a noise measurement survey that has been carried out at the approved development site and has considered the requirements of the set planning conditions and best practice guidance.

Planning Conditions 17 and 18 have been set in respect of noise. **Planning Condition 17 refers to sound insulation between buildings where different rooms/uses are proposed in adjacent rooms, as this situation does not occur within the approved development the condition can therefore be discharged.**

In respect of internal noise levels, it has been identified that the requirements of Planning Condition 18 can be achieved through careful consideration of the building envelope. The construction assumptions that have led to this conclusion are:

- **The façade build-up will be a standard brick and block construction (or equivalent) to achieve an R_w of approximately 55 dB.**
- **A typical double-glazing system in a 4/12/6 configuration (or equivalent) will be installed to give a Sound Reduction Index (SRI) of 32 dB $R_{w,1}$.**
- **Appropriately specified acoustic trickle vents or an alternative means of ventilation will be installed to allow adequate ventilation without the requirement to open windows.**

It has also been shown that the noise levels within external amenity areas should readily achieve the upper guideline criterion set out in BS 8233 and the WHO Guidelines (55 dB $L_{Aeq,16hr}$) and should achieve the lower guideline criterion (50 dB $L_{Aeq,16hr}$). **Accordingly, the requirements of Planning Condition 18 should be achieved.**

Overall, it has been shown that, through careful consideration of the building envelope construction, the requirements of the set planning conditions should be achieved, and the approved development should avoid future residents being exposed to harmful levels of noise. Accordingly, Planning Conditions 17 and 18 can be discharged.

2 INTRODUCTION

This report has been prepared to support the planning application for the approved development at **138-140 Highgate Road, London**. The approved scheme involves the construction of 6No. 4-bed terraced houses at the site of a former garage. Revision A of the report reflects an updated noise measurement survey carried out in November 2019 to discharge planning conditions for the scheme.

The report assesses, through on-site noise measurements, the impact of the existing noise climate on the approved development.

The approved development site is located in a mixed commercial and residential area and is bound by Highgate Road to the west and College Lane to the east. The Gospel Oak to Barking railway line is located approximately 40m to the south of the proposed development site. The railway is raised approximately 3m to 4m above the road level and crosses Highgate Road on a bridge. The location of the proposed development site is provided in **Figure 2.1**.



Figure 2.1: Site Location

The approved development is set over three floors and makes use of the topography of the site. The main entrance is on the top floor of the property, level with College Lane. The middle floor is at the same level as Highgate Road and the lowest floor is set under the existing ground level, with the main amenity areas for each house also being located at the lowest level. The houses will be located in the rear half of the site, next to College Lane rather than Highgate Road and the remainder of the site will be grassland. The upper ground floor site layout plan is provided in **Figure 2.2** as an example of the proposed layout.

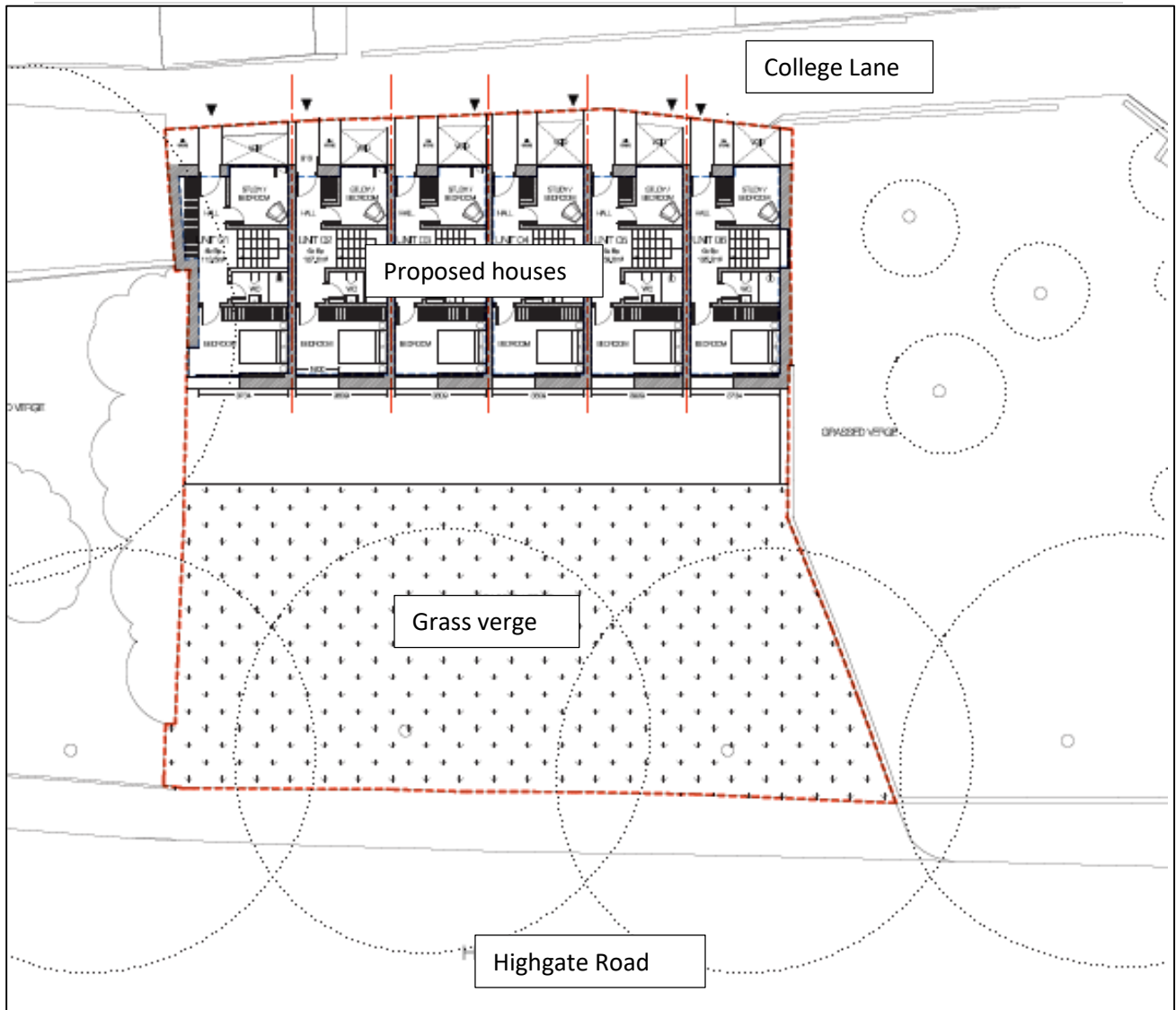


Figure 2.2: Proposed Upper Ground Floor Layout

3 PLANNING CONDITIONS AND GUIDANCE DOCUMENTS

3.1 Planning Conditions

The site is located within the administrative boundary of Camden Council (CC).

Planning permission for the development was granted on 9th July 2019 (application ref 2018/1528/P) and Planning Conditions 17 and 18 state:

“Planning Condition 17

Prior to commencement of the development of this plot, details shall be submitted to and approved in writing by the Council, of an enhanced sound insulation value of $D_{nT,w}$ and $L'_{nT,w}$ of at least 5dB above Building Regulations value, for the floor/ceiling/wall structures separating different types of rooms/uses in adjoining dwellings, namely e.g. living room and kitchen above bedroom of separate dwelling. Approved details shall be implemented prior to occupation of the development and thereafter be permanently retained.

Reason: To ensure that the amenity of occupiers of the development site is not adversely affected by noise in accordance with policies A1 and A4 of the London Borough of Camden Local Plan 2017.

Planning Condition 18

The noise level in rooms at the development hereby approved shall meet the noise standard specified in BS8233:2014 for internal rooms and external amenity areas.

Reason: To ensure that the amenity of occupiers of the development site is not adversely affected by noise in accordance with policies A1 and A4 of the London Borough of Camden Local Plan 2017.”

Nick Priddle, Technical Officer Contaminated Land & Noise at CC, has requested a further environmental noise measurement survey due to the age of previous noise survey and uncertainty regarding noise sources. Mr. Priddle has stated that the additional survey would be required before the discharge of Planning Conditions related to noise.

In respect of Planning Condition 17, it is noted that the layout of the approved houses does not provide any examples of different rooms/uses in adjoining dwellings and therefore Planning Condition 17 can be automatically discharged.

3.2 British Standard BS 8233:2014

BS 8233: *Sound Insulation and Noise Reduction for Buildings – Code of Practice* has a number of design criteria and limits for intrusive external noise. The guidelines are designed to achieve reasonable resting/sleeping conditions in bedrooms and good listening conditions in other rooms and the most appropriate to the residential environment are reproduced in **Table 3.1**.

Activity	Location	07:00 – 23:00	23:00 – 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

Table 3.1: Indoor Ambient Noise Levels for Dwellings

With respect to external noise levels, BS 8233 states:

‘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 recognised that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces but should not be prohibited.’

Additionally, in order to protect against L_{Amax} noise levels at night, it is normal good practice to consider the guidance provided in the WHO Guidelines for Community Noise in addition to BS 8233.

3.3 World Health Organization Guidelines for Community Noise

The World Health Organization (WHO) has developed guidelines designed to minimise the adverse effects of noise. The guidelines relevant to residential noise exposure are detailed in **Table 3.2**. For each specific environment the stated noise levels are the maximum noise levels to avoid the health effect noted.

Specific Environment	Critical health effect(s)	L_{Aeq} dB	Time Base (hours)	L_{Amax} (fast) dB
Outdoor living area	Serious annoyance, daytime and evening	55	16	-
	Moderate annoyance, daytime and evening	50	16	-
Dwelling, indoors Inside bedrooms	Speech intelligibility and moderate annoyance, daytime and evening	35	16	-
	Sleep disturbance, night-time	30	8	45
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45	8	60

Table 3.2: WHO Community Noise Guideline Values

The WHO guidelines state, with respect to the L_{Amax} threshold, that *‘for a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45dB L_{Amax} more than 10 – 15 times per night (Vallet and Vernet 1991)’.*

4 BASELINE NOISE LEVELS

In order to determine the extent to which the site is currently affected by noise, a detailed measurement study has been carried out at the site. Measurements have been carried out in order to characterise the existing noise climate over a 3 day period. Due to ongoing construction works on the approved development site, it was suggested by Nick Priddle, Technical Officer Contaminated Land & Noise at CC, in an email dated 1st November 2019, to measure over a weekend period to avoid significant disturbance from construction noise sources. The noise levels on site were dominated by road traffic noise on Highgate Road. Whilst on site, occasional pedestrian noise was audible as well as occasional aircraft and trains.

During a previous daytime measurement survey at the site it had been noted that freight trains were clearly audible at the measurement position, but not dominant above the road traffic noise. Passenger trains were more frequent but only just audible at the measurement position.

The noise measurements utilised a Norsonic 140 Type 1 Precision Sound Level Meter with a current certificate of calibration, the full list of equipment is detailed in **Appendix 3**. Before and after the measurement period the equipment was calibrated in order to ensure that the equipment had remained within reasonable calibration limits (+/- 0.5 dB). Noise Measurements were carried out in consecutive 5 minutes periods with a 1 second resolution.

Measurements were carried out between 1100 hrs on Friday 8th November 2019 and 1000 hrs on Monday 11th November 2019.

During the noise measurement survey, the temperature was up to 10°C during the daytime, dropping to a low of -1°C overnight. The wind speed was generally very low (< 1 m/s), with occasional periods of stronger winds (up to 2-3 m/s) on Saturday night into Sunday morning and also on Monday morning just before collection. The wind direction was variable; north-westerly on Friday 8th November, which changed to south-easterly for most of Saturday 9th November and north-easterly for most of Sunday 10th November. During the evening of Sunday 10th November into the morning of Monday 11th November, the wind was from a southerly direction and this changed again to a westerly direction on the late morning on Monday 11th November, just before collection. The cloud cover was noted to be 10% at the start of the survey and 50% at the end, however it is noted that there was a period of sustained light precipitation throughout Saturday 9th November. A close analysis of the noise measurement data has shown that this may have had a minor impact on the measured L_{Aeq} noise levels on that day, however the data has been utilised in the analysis in order to provide a worst-case assessment of existing noise levels.

Noise measurements were carried out at Measurement Position 1 (MP1) in a free-field location at a height of approximately 4.5m (approximately 1.5m – 2m above the existing site hoardings) on the western (Highgate Road) boundary of the site, approximately 3.5m back from Highgate Road. The position was chosen in order to measure noise levels from a relatively secure location with a line of sight to both Highgate Road and the railway line. The approximate measurement position is shown in **Figure 4.1**.



Figure 4.1: Noise Monitoring Location

Table 4.1 below displays a summary of the measured noise levels and detailed measurement results are presented in **Appendix 4**.

Date	Period (hours)	$L_{Aeq,T}$ (dB)	L_{Amax} (dB)
Friday 8 th November 2019	Daytime (1100 – 2300)	73	93
	Night-time (2300 – 0000)	70	-
Saturday 9 th November 2019	Daytime (0700 – 2300)	69	93
	Night-time (2300 – 0700)	62	79
Sunday 10 th November 2019	Daytime (0700 – 2300)	68	90
	Night-time (2300 – 0700)	64	79
Monday 11 th November 2019	Daytime (0700 – 1000)	69	91
	Night-time (0000 – 0700)	64	80

Table 4.1: Summary of Free Field Semi-Permanent Noise Levels

Note: The average noise levels stated are logarithmic for L_{Aeq} . The $L_{Amax,F}$ noise levels stated are the arithmetic average of the hourly noise levels during the daytime (0700 hrs – 2300 hrs) and the 10th highest $L_{Amax,F,5min}$ noise level at night (2300 hrs – 0700 hrs), as noted in Section 3.3.

Audio recordings of the highest maximum noise levels at night have been analysed and are from motor vehicles, motorcycles and emergency vehicles passing the site, with one train triggering an audio measurement per night.

5 NOISE IMPACT ASSESSMENT

5.1 Development Noise Levels

The measured noise levels have been corrected to the façade position using standard distance attenuation formulae. The measurement position was located at approximately 3.5m from Highgate Road and the proposed development will be located at a distance of approximately 18m from Highgate Road. This equates to a correction of -7 dB for the L_{Aeq} noise levels (assuming line source attenuation) and -14 dB for the L_{Amax} noise levels (assuming point source attenuation).

The corrected noise development noise levels are presented in **Table 5.1**. The worst-case full period noise levels measured at MP1 (as presented in **Table 4.1**) have been utilised as a worst-case (i.e. 69 dB $L_{Aeq,16hr}$ daytime, 64 dB $L_{Aeq,8hr}$ night-time and 80 dB L_{Amax} at night)

Assessment Location	Period (hours)	$L_{Aeq,T}$ (dB)	L_{Amax} (dB)
Highgate Road Façade	Daytime (0700 – 2300)	62	-
	Night-time (2300 – 0700)	57	66

Table 5.1: Derived Noise Levels at the Façade Position

5.2 Internal Noise Level Assessment

It is common practice that internal noise levels should ideally be achieved in as many properties as possible with windows open. Due to the relatively high noise levels present at site, those habitable rooms facing Highgate Road will not be able to achieve the requirements with windows open, and therefore the sound insulation of the building façade will be required to mitigate noise levels. The aim will be to achieve internal noise levels specified in Planning Condition 18 (as detailed in **Section 3**). In carrying out our assessment, we have therefore made the following assumptions:

- The façade build-up will be a standard brick and block construction (or equivalent) to achieve an R_w of approximately 55 dB.
- A typical double-glazing system in a 4/12/6 configuration (or equivalent) will be installed to give a Sound Reduction Index (SRI) of 32 dB R_w .
- Appropriately specified acoustic trickle vents or an alternative means of ventilation will be installed to allow adequate ventilation without the requirement to open windows.

Table 5.2 identifies the likely L_{Aeq} and L_{Amax} internal noise levels, assuming windows closed, utilising the *Simple Calculation Method* described in BS 8233:2014 for the worst affected façade. As it can be seen that habitable rooms at the worst affected façade will achieve the requirements, it can be safely assumed that all other habitable rooms will also achieve the requirements.

Assessment Location	Period (hrs)	External Noise Levels (dB) (ref. Table 5.1)	Sound Insulation of Glazing (dBA)	Internal Noise Levels (dB)	Compliance with BS8233/ WHO Guidelines Criteria
Ambient Noise Level L_{Aeq} (dB)					
Highgate Road Façade	Daytime (0700 – 2300)	62	32	30	✓
Highgate Road Façade	Night-time (2300 – 0700)	57	32	25	✓
Maximum Noise Level L_{AFmax} (dB)					
Highgate Road Façade	Night-time (2300 – 0700)	66	32	34	✓

Table 5.2: Internal Noise Levels

5.3 External Noise Level Assessment

The external amenity spaces for the development are located at the lowest level of the development, which is below the level of Highgate Road, as shown in the site section plans in **Figure 5.1**.

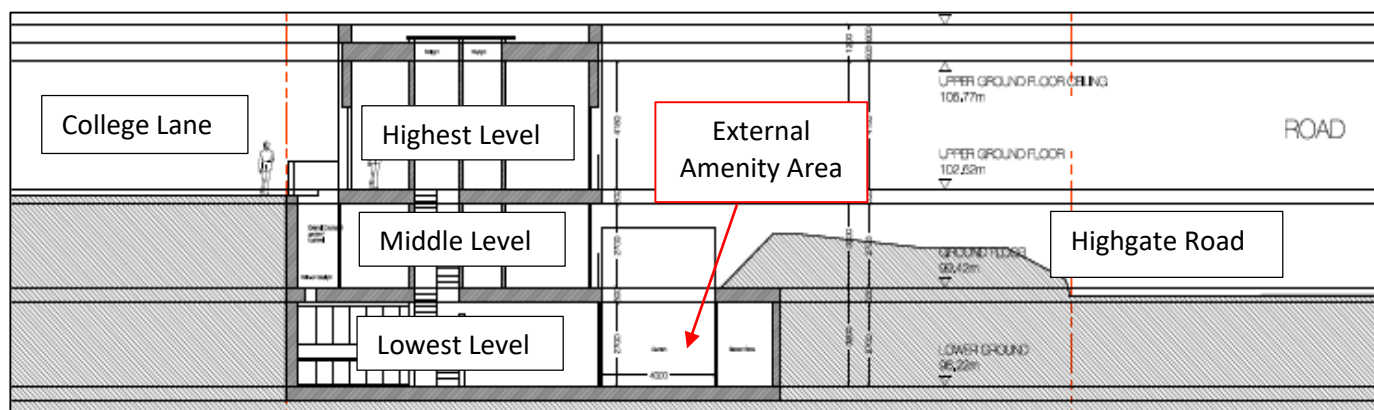


Figure 5.1: External Amenity Area Location

As there is no line of site between the external amenity area and Highgate Road, noise levels are likely to be at least 10 dB – 15 dB lower than at the façade location (62 dB $L_{Aeq,16hr}$). Accordingly, daytime noise levels within the external amenity area are likely to be between 47 dB $L_{Aeq,16hr}$ and 52 dB $L_{Aeq,16hr}$ (or lower).

Accordingly, the predicted noise levels should readily achieve the upper guideline criterion set out in BS 8233 and the WHO Guidelines (55 dB $L_{Aeq,16hr}$) and should achieve the lower guideline criterion (50 dB $L_{Aeq,16hr}$). Accordingly, the requirements of Planning Condition 18 should be achieved.

6 CONCLUSION

An assessment has been carried out of the present noise climate at **138-140 Highgate Road, London** and the impact of that noise on the approved development.

The assessment is based on the results a noise measurement survey that has been carried out at the approved development site and has considered the requirements of the set planning conditions and best practice guidance.

Planning Conditions 17 and 18 have been set in respect of noise. **Planning Condition 17 refers to sound insulation between buildings where different rooms/uses are proposed in adjacent rooms, as this situation does not occur within the approved development the condition can therefore be discharged.**

In respect of internal noise levels, it has been identified that the requirements of Planning Condition 18 can be achieved through careful consideration of the building envelope. The construction assumptions that have led to this conclusion are:

- **The façade build-up will be a standard brick and block construction (or equivalent) to achieve an R_w of approximately 55 dB.**
- **A typical double-glazing system in a 4/12/6 configuration (or equivalent) will be installed to give a Sound Reduction Index (SRI) of 32 dB R_w .**
- **Appropriately specified acoustic trickle vents or an alternative means of ventilation will be installed to allow adequate ventilation without the requirement to open windows.**

It has also been shown that the noise levels within external amenity areas should readily achieve the upper guideline criterion set out in BS 8233 and the WHO Guidelines (55 dB $L_{Aeq,16hr}$) and should achieve the lower guideline criterion (50 dB $L_{Aeq,16hr}$). **Accordingly, the requirements of Planning Condition 18 should be achieved.**

Overall, it has been shown that, through careful consideration of the building envelope construction, the requirements of the set planning conditions should be achieved, and the approved development should avoid future residents being exposed to harmful levels of noise. Accordingly, Planning Conditions 17 and 18 can be discharged.

7 APPENDIX 1: GLOSSARY OF ACOUSTIC TERMINOLOGY

Term	Description
'A'-Weighting	<i>This is the main way of adjusting measured sound pressure levels to take into account human hearing, and our uneven frequency response.</i>
Decibel (dB)	<i>This is a tenth (deci) of a bel. The decibel can be a measure of the magnitude of sound, changes in sound level and a measure of sound insulation. Decibels are not an absolute unit of measurement but are an expression of ratio between two quantities expressed in logarithmic form.</i>
$L_{Aeq,T}$	<i>The equivalent steady sound level in dB containing the same acoustic energy as the actual fluctuating sound level over the given period, T. T may be as short as 1 second when used to describe a single event, or as long as 24 hours when used to describe the noise climate at a specified location. $L_{Aeq,T}$ can be measured directly with an integrating sound level meter.</i>
L_{A10}	<i>The 'A'-weighted sound pressure level of the residual noise in decibels exceeded for 10 per cent of a given time and is the L_{A10T}. The L_{A10} is used to describe the levels of road traffic noise at a particular location.</i>
L_{A50}	<i>The 'A'-weighted sound pressure level of the residual noise in decibels exceeded for 50 per cent of a given time and is the L_{A50T}.</i>
L_{A90}	<i>The 'A'-weighted sound pressure level of the residual noise in decibels exceeded for 90 per cent of a given time and is the L_{A90T}. The L_{A90} is used to describe the background noise levels at a particular location.</i>
L_{Amax}	<i>The 'A'-weighted maximum sound pressure level measured over a measurement period.</i>

8 APPENDIX 2: PROFESSIONAL STATEMENT

David Yates

David Yates is a full member of the Institute of Acoustics (MIOA) and has approximately ten years' experience in acoustic consultancy. David has particular expertise in environmental noise providing acoustic consultancy for residential and mixed use planning applications, plant noise and vibration, construction noise and the design of acoustic, noise and vibration control. David is also experienced in providing sound insulation testing and design advice. David is familiar with the application of all relevant standards associated with his work, including but not limited to, BS 4142, BS 8233, BS 7445, BS 6472, BS 5228, BS 140 series, BS 16283 series and BS 717 series.

9 APPENDIX 3: LIST OF EQUIPMENT

Equipment Type	Manufacturer	Serial Number	Calibration Certification Number	Date of Last Calibration Check
Nor-140 Type 1 Sound Level Meter	Norsonic	1406389	27193	December 2017
Nor-1225 Microphone	Norsonic	225519	27192	December 2017
Nor-1209 Preamplifier	Norsonic	20598	27193	December 2017
SV36 Sound Calibrator	SvanteK	73463	33239	November 2019

10 APPENDIX 4: DETAILED NOISE MEASUREMENT RESULTS

Measured Noise levels – 08.11.2019

Time (hrs)	L _{Aeq,T} (dB)	L _{AF(max)} (dB)	L _{A10} (dB)	L _{A90} (dB)
1100-1200	69	100	70	58
1200-1300	81	107	82	69
1300-1400	77	91	79	65
1400-1500	73	91	74	63
1500-1600	73	102	74	61
1600-1700	65	84	69	57
1700-1800	67	95	69	58
1800-1900	66	87	69	57
1900-2000	66	93	69	58
2000-2100	69	96	72	59
2100-2200	66	86	70	57
2200-2300	66	86	70	55
2300-0000	70	103	69	54
1100-2300	73	93	72	60
2300-0000	70	103	69	54

Note: The periods marked in red have been significantly affected by construction noise.

Measured Noise levels – 09.11.2019

Time (hrs)	L _{Aeq,T} (dB)	L _{AF(max)} (dB)	L _{A10} (dB)	L _{A90} (dB)
0000-0100	64	77	68	50
0100-0200	62	83	65	46
0200-0300	60	78	64	44
0300-0400	60	81	63	43
0400-0500	62	95	61	43
0500-0600	62	95	63	42
0600-0700	62	78	67	46
0700-0800	66	86	70	51
0800-0900	66	83	70	53
0900-1000	66	87	70	56
1000-1100	73	107	69	57
1100-1200	68	101	69	56
1200-1300	70	99	70	57
1300-1400	69	100	70	57
1400-1500	69	96	72	58
1500-1600	70	93	73	59
1600-1700	69	92	73	59
1700-1800	69	87	73	60
1800-1900	70	94	73	60
1900-2000	69	84	73	59
2000-2100	69	94	72	57
2100-2200	66	84	70	56
2200-2300	67	96	70	55
2300-0000	65	88	69	54
0700-2300	69	93	71	57
2300-0700	62	84	65	46

Measured Noise levels – 10.11.2019

Time (hrs)	L _{Aeq,T} (dB)	L _{AF(max)} (dB)	L _{A10} (dB)	L _{A90} (dB)
0000-0100	64	79	68	53
0100-0200	64	85	67	49
0200-0300	62	82	66	47
0300-0400	62	79	66	46
0400-0500	63	79	67	45
0500-0600	62	85	65	45
0600-0700	63	80	67	46
0700-0800	66	88	69	48
0800-0900	64	79	68	50
0900-1000	65	84	70	54
1000-1100	65	77	69	55
1100-1200	65	84	69	55
1200-1300	65	85	69	55
1300-1400	68	99	69	56
1400-1500	72	103	71	59
1500-1600	68	88	71	61
1600-1700	72	102	71	61
1700-1800	67	89	69	57
1800-1900	67	96	69	56
1900-2000	65	83	68	55
2000-2100	64	86	68	54
2100-2200	68	99	67	53
2200-2300	65	96	66	50
2300-0000	66	98	65	47
0700-2300	68	90	69	55
2300-0700	64	83	67	47

Measured Noise levels – 11.11.2019

Time (hrs)	L _{Aeq,T} (dB)	L _{AF(max)} (dB)	L _{A10} (dB)	L _{A90} (dB)
0000-0100	62	93	64	46
0100-0200	59	82	60	42
0200-0300	59	79	62	43
0300-0400	61	81	63	48
0400-0500	62	78	65	52
0500-0600	65	81	68	49
0600-0700	69	89	73	56
0700-0800	71	96	74	60
0800-0900	68	88	71	58
0900-1000	68	89	71	59
0700-1000	69	91	72	59
0000-0700	64	83	65	48

Measured Noise Levels from 1100 hrs on 08.11.2019 to 1000 hrs on 11.11.2019

