Camden Mixed Developments Limited

GRAND UNION HOUSE

Acoustic Report

AC-PL-202101
FEBRUARY 2021

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PROJECT NO. 70009120

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CONTENTS

APPENDICES

1 INTRODUCTION

1.1.1. WSP has been appointed by Camden Mixed Developments Limited to undertake an acoustic assessment for the proposed mixed-use development at Grand Union House, Camden ('the Site').

1.1.2. The development consists of partial demolition and redevelopment of the existing building, to provide a new commercial building with associated roof terraces, ground floor flexible town centre uses, and housing units, along with associated landscaping works.

1.1.3. This report presents the results of an acoustic survey undertaken at the existing Site in order to establish the existing noise and vibration conditions.

1.1.4. An outline mitigation and ventilation strategy is presented to demonstrate suitable sound conditions can be achieved with respect to external sources.

1.1.5. The effects of vibration on proposed dwellings is discussed.

1.1.6. This report also presents noise emission limits applicable to external fixed plant items associated with the proposed development (both residential and commercial elements). These have been determined in accordance with relevant policy and guidance, and in conjunction with the results of the acoustic survey.

1.1.7. This report is necessarily technical in nature and a glossary of acoustic terms is presented in Appendix A.

2 SITE DESCRIPTION

2.1 LOCATION

2.1.1. The proposed development is located in the London Borough of Camden, at 22 Kentish Town Road, approximately 120 m north of Camden Town Station.

2.1.2. The northern part of the Site is currently occupied, primarily, by office space atop a double-height car park.

2.1.3. The Site is in an area that is mixed, with commercial use premises at ground floor and residential dwellings at upper floors on Kentish Town Road. The Devonshire Arms public house is located to the north west of the Site, and a Sainsbury's supermarket and St Michael's Church are located to the east. The basement of the northern half of the Site is occupied by Sainsbury's car park.

2.1.4. The London Underground Northern Line runs beneath Kentish Town Road at a depth of approximately 12 - 14 m.

2.1.5. Figure 2-1 presents the Site location, with an approximate red line boundary. Also included are the nearest noise-sensitive receptors (blue), to which building services noise emissions should be assessed.

Figure 2-1 - Proposed commercial site (red – approx.), proposed residential site (green – approx.), nearest noise sensitive receptors (blue)

2.2 THE PROPOSED DEVELOPMENT

2.2.1. The proposed development consists of:

- **Ground Level**: Commercial use with associated cycle parking, with retail and residential cycle parking to the south.
- **Ground Mezzanine**: Office use with associated plant to the northern half of the site, with residential apartments to the south.
- **Level 01**: Open plan office to the northern half of the site with residential units to the south;
- **Level 02**: Open plan office to the northern half of the site with residential units to the south;
- **Level 03**: Open plan office to the northern half of the site with rooftop garden and residential roof level to the south;
- **Level 04**: Open plan office with associated terraces to the northern half of the site.

3 PLANNING POLICY AND GUIDANCE

3.1 INTRODUCTION

3.1.1. This section summarises the planning guidance on which the assessment within this document is made.

3.2 RESIDENTIAL USE

3.2.1. The assessment of residential elements of the development is primarily led by the planning requirements of Camden's Local Policy (2017).

3.2.2. The policies within the local plan, summarised in the following section, generally align with other national planning policy documents and British Standards.

3.2.3. Summaries of other relevant guidance documents are included in Appendix B.

Camden Amenity CPG 2021

3.2.4. In 2021 the Camden Planning Guidance (CPG) – Amenity was also introduced to support the policies in the Local Plan 2017.

3.2.5. The document guides on the planning process and considerations that should be made in undertaking the assessment of noise and vibration affecting a site, and design of developments to mitigate their effects.

3.2.6. No additional quantitative guidance (to that included in the Local Plan 2017) are included.

3.2.7. A pertinent checklist of items that the Amenity CPG recommend are included in an acoustic assessment are reproduced in Section 8 of this report.

CAMDEN LOCAL PLAN (2017)

3.2.8. Camden's Local Plan was released in 2017 and has replaced Camden Development Policies and Core Strategy documents as the basis for planning decisions and future development in the borough.

3.2.9. Policy A4 *Noise and Vibration* of the document describes the LA's approach to controlling the effects noise and vibration throughout the design stage by considering both:

- The effect of proposed developments, that may produce noise, on the existing noise climate; and
- The effect on proposed noise-sensitive developments of existing noise generating uses.

3.2.10. It acknowledges that, due to the high density and mixed-use nature of The Borough, the need for detailed control of noise emissions from development, both in operation and construction, is of high importance to protect local amenity.

3.2.11. Camden sets out its own strategy for judging the suitability of a site for noise-sensitive development, and relates this to the NOEL, LOAEL and SOAEL system of the NPPF, based on a traffic light system as follows:

- ***Green:*** *where noise is considered to be at an acceptable level.*
- ***Amber:*** *where noise is observed to have an adverse effect level, but which may be considered acceptable when assessed in the context of other merits of the development.*
- ***Red:*** *where noise is observed to have a significant adverse effect.*

Proposed Development Likely to be Sensitive to Noise

3.2.12. Relating to noise from general anonymous noise sources (road traffic, rail traffic), the document proposes the following quantitative guidelines for assessing the threshold of acceptability of noise as presented in Table 3-1.

3.2.13. Separate guidance is presented for industrial and commercial noise sources, discussed below, and entertainment noise, which is not discussed as it is not considered applicable to the proposed development.

Table 3-1 – Appendix 3, Table B of Camden's Local Plan: *Noise levels applicable to noise sensitive residential development proposed in areas of existing noise*

Assessment Location	Design Period	LOAEL (Green)	LOAEL to SOAEL (Amber)	SOAEL (Red)
Noise at 1 metre from noise sensitive façade	Day	< 50 dB $L_{Aeq,16hr}$[1]	50 dB to 72 dB $L_{Aeq,16hr}$[1]	> 72 dB $L_{Aeq,16hr}$[1]
	Night	< 45 dB $L_{Aeq,8hr}$[1] < 40 dB L_{night}[2]	45 dB to 62 dB $L_{Aeq,8hr}$[1] > 40 dB L_{night}[2]	> 62 dB $L_{Aeq,8hr}$[1]
Inside a bedroom	Day	< 35 dB $L_{Aeq,16hr}$	35 dB to 45 dB $L_{Aeq,16hr}$	> 45 dB $L_{Aeq,16hr}$
	Night	< 30 dB $L_{Aeq,8hr}$ < 42 dB $L_{Amax,fast}$	30 dB to 40 dB $L_{Aeq,8hr}$ 40 dB to 73 dB $L_{Amax,fast}$	> 40 dB $L_{Aeq,8hr}$ > 73 dB $L_{Amax,fast}$
Outdoor living space (free-field)	Day	< 50 dB $L_{Aeq,16hr}$	50 dB to 55 dB $L_{Aeq,16hr}$	> 55 dB $L_{Aeq,16hr}$

[1] Façade level

[2] Free-field level

3.2.14. It should be noted, and LBC acknowledge this within the Local Plan, that while the external levels may not be met internal levels may still be appropriate with appropriate mitigation strategies (such as glazing and building envelope specification).

Industrial and Commercial Noise Sources

3.2.15. The Camden Local Plan refers to BS 4142:2014 for guidance on the assessment of noise from industrial and commercial sources.

3.2.16. It also presents a similar traffic light strategy for the design of industrial and commercial noise sources as repeated in Table 3-2.

Table 3-2 – Appendix 3, Table C of Camden's Local Plan: *Noise levels applicable to proposed industrial and commercial developments (including plant and machinery)*

Assessment Location	Design Period	LOAEL (Green)	LOAEL to SOAEL (Amber)	SOAEL (Red)
Garden used for main amenity (free-field) and Outside living or dining or bedroom window (façade)	Day	'Rating level' 10 dB[1] below background	'Rating level' between 9 dB below and 5 dB above background	'Rating level' greater than 5 dB above background
Outside bedroom window (façade)	Night	'Rating level' 10 dB[1] below background and no events exceeding 57 dB L_{Amax}	'Rating level' between 9 dB below and 5 dB above background or noise events between 57 dB and 88 dB L_{Amax}	'Rating level' between 9 dB below and 5 dB above background and/or events between exceeding 88 dB L_{Amax}

[1] 10 dB should be increased to 15 dB if the noise contains audible tonal elements (day and night). However, if it can be demonstrated that there is no significant difference in the character to the residual background noise and the specific noise from the proposed development then this reduction may not be required. In addition, a frequency analysis (to include, the use of Noise Rating (NR) curve or other criteria curves) for the assessment of tonal or low frequency noise may be required.

[2] Levels are given for dwellings, however, levels are use specific and difference levels will apply dependent on the use of the premises.

Vibration

The effects of vibration (from the nearby London Underground Northern Line trains) will be assessed in accordance with the limits set in Appendix 3 of Camden's Local Plan (July 2017), as presented in Table 3-3.

Table 3-3 – Appendix 3, Table A of Camden's Local Plan: *Vibration levels from uses such as railways, roads, leisure and entertainment premises and/or plant or machinery at which planning permission will not normally be granted*

Assessment Location	Period	Time	Vibration Levels (Vibration Dose Values)
Vibration inside dwellings	Day and evening	07:00 – 23:00	0.2 to 0.4 $ms^{-1.75}$
	Night	23:00 – 07:00	0.13 $ms^{-1.75}$
Vibration inside offices	Day, evening, night	Any	0.4 $ms^{-1.75}$

3.2.17. In addition, Camden's (now superseded) Development Policies (2010) recommends that ground-borne regenerated noise **within dwellings should not exceed 35 dB(A)max**.

3.3 COMMERCIAL USE

3.3.1. Camden's Local Plan does not include guidance on appropriate conditions in commercial buildings.

3.3.2. Nonetheless, a high-level assessment of the suitability of the site for commercial use is presented, based on the guidance summarised below.

BRITISH STANDARD 8233:2014

3.3.3. BS 8233:2014 Guidance on sound insulation and noise reduction for buildings provides guidance on the control of noise in and around buildings. It suggests guideline indoor noise level criteria for new buildings.

3.3.4. The indoor noise level guideline values for office spaces are presented in Table 3-4.

Table 3-4 – BS8233 indoor ambient noise level criteria in offices

Room	Requirement	Indoor ambient noise level design range
Meeting room, training room	Office environment appropriate for study and work requiring concentration.	35-45 dB $L_{Aeq,T}$
Cellular office		35-40 dB $L_{Aeq,T}$
Open plan office	Office environment where a level of privacy is important.	45-50 dB $L_{Aeq,T}$

3.3.5. The indoor noise level guideline values apply only to steady sources of noise without specific character (i.e. anonymous noise) such road traffic noise and apply during the normal hours of occupation. The guideline values exclude any noise produced by the occupant activities in these spaces.

3.3.6. For offices, BS 8233:2014 also refers to guidance produced by BCO, as described in the following section.

BRITISH COUNCIL FOR OFFICES (2019): GUIDE TO SPECIFICATION (THE BCO GUIDE)

3.3.7. Criteria for indoor noise levels from both external noise and from building services are presented in the BCO specification guidance documents. The relevant indoor noise level criteria to the Proposed Development are reproduced in Table 3-5.

3.3.8. It should be noted that these criteria, conversely to those presented in BS 8233, relate to noise ingress alone and do not include the noise generated by internal building services.

Table 3-5 – BCO guideline indoor noise level criteria for office spaces

Location	Indoor ambient noise level due to external noise ingress	Normal maximum noise level due to noise ingress (db $L_{A01,1hr}$)
Open plan office	NR 40 ($L_{eq,T}$)	55 dB
Speculative office[1]	NR 38 ($L_{eq,T}$)	55 dB
Cellular offices/meeting rooms	NR 35 ($L_{eq,T}$)	50 dB

[1] The speculative office criterion is a compromise between the ideals for open plan and cellular rooms.

3.3.9. On the use of natural ventilation, the BCO guide states that *"in the case of naturally ventilated buildings, it may be appropriate to accept higher external noise intrusion levels in maximum ventilation mode, provided occupants have the choice to open or close windows or ventilation openings. For example, depending on the character of noise, a +5 dB relaxation may be acceptable during occasional periods"/.*

3.4 GUIDANCE DOCUMENTS – CONTROL OF NOISE FROM FIXED PLANT

BRITISH STANDARD 4142:2014

3.4.1. British Standard (BS) 4142:2014 Methods for rating and assessing industrial and commercial sound contains pertinent guidance relating to the assessment of sounds of an industrial and commercial nature, including sound from fixed installations (such as mechanical and electrical plant). It provides a method of determining noise rating levels for sources of industrial or commercial sound for the purposes of investigating complaints, assessing sound from new, modified, or additional sources of sound, and assessing sound at new residential premises.

3.4.2. The assessor is required to estimate the impact by subtracting the measured background sound level from a rating level, considering the following:

- Typically, the greater the difference, the greater the magnitude of the impact, and the lower the rating level is relative to the background sound level, the less likely it is that the specific sound source will have an adverse impact.
- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on context.
- A difference of around +5 dB is likely to be an indication of an adverse impact, depending on context.
- Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

3.4.3. The rating level is determined by 'rating' the source by correcting for any acoustic characteristics that the specific sound may exhibit, such as:

- Tonality; + 2dB just perceptible, +4 dB clearly perceptible, +6 dB highly perceptible.
- Impulsivity; +3 dB just perceptible, +6 dB clearly perceptible, +9 dB highly perceptible.
- Intermittency; +3 dB if readily distinctive.
- Other characteristics; +3 dB if readily distinctive.

3.4.4. On the determination of a background sound level, the Standard states that the goal is to present a background sound level, over a suitable time period, which is representative of the typical noise environment, and considers the context of the noise sources effecting that environment. The statistical analysis provided as an example in BS 4142 presents the lowest most commonly occurring $L_{A90,15m}$ value as the typical background sound level. This approach has been adopted in this assessment.

3.4.5. The importance of 'context' is highlighted in the Standard, as is interpretation by a qualified and experienced assessor. The interpretation of the rating level(s) as quantified above needs to be informed by an understanding of the context within which the noise is experienced.

4 ACOUSTIC SURVEY

4.1 INTRODUCTION

4.1.1. To inform the design, surveys of the existing external noise climate above ground, and vibration from the LU Northern line have been undertaken.

4.1.2. This section discusses the measurement methodology and summarises the results

4.2 NOISE SURVEY METHOD

4.2.1. An unattended environmental noise survey was undertaken between 20 September and 26 September 2017 at the following locations:

- Monitoring Position 1 (MP1): Cantilevered from the roof of the existing building overlooking Kentish Town Road.
- Monitoring Position 2 (MP2): Cantilevered from the roof of the existing building overlooking the rear of Sainsburys and St Michael's Church (to the south east).

4.2.2. The locations were chosen to minimise the influence from building services plant serving the existing development and to best capture the most significant sources of noise likely to effect the proposed development (those being road traffic on Kentish Town Road, noise from Sainsbury's and noise from road traffic on the more distant Camden Street).

4.2.3. Considering its location, and the relative locations of the sources affecting the microphone (primarily road traffic at street level), ambient noise levels and maximum noise levels measured at MP1 are considered to be affected by reflections from the façade and have been corrected as such.

VALIDITY OF 2017 DATA FOR 2021 ASSESSMENT

4.2.4. It is acknowledged that a significant period has passed since the survey was undertaken.

4.2.5. The noise climate, under normal conditions, at the site is not considered to have significantly changed since the 2017 survey – there are no significant changes in surrounding road uses and no new commercial developments that would generate significant commercial/industrial noise affecting the site.

4.2.6. Furthermore, given the current Covid-19 pandemic, noise measurements taken at the time of application would not be considered representative of normal noise conditions.

4.3 NOISE SURVEY RESULTS

4.3.1. The results of the noise survey are presented for periods commensurate with those that apply to the assessments for the differing uses of the development. These being:

Office Use:

- Daytime: 12-hour L_{Aeq} (0900 – 1700, in accordance with the BCO guide), with the arithmetic average of the daily levels presented at each monitoring location.
- Typical daytime maximum levels in terms of the level that is not exceeded by more than 10 events between 0900 and 1700, with the arithmetic average of the daily levels presented at each monitoring location.

Residential Use:

- Daytime: 16-hour L_{Aeq} (0700 – 2300), with the arithmetic average of the daily levels presented at each monitoring location.
- Night-time: 8-hour L_{Aeq} (2300 – 0700), with the arithmetic average of the night-time levels presented at each monitoring location.
- Typical night-time maximum (L_{AFmax}) noise levels in terms of the level that is not exceeded by more than 10 events between 2300 and 0700, with the arithmetic average of the daily levels presented at each monitoring location.

Retail Use:

- Daytime: 10-hour L_{Aeq} (0800 – 1800), with the arithmetic average of the daily levels presented at each monitoring location.

Background Sound Levels

- Periods have been chosen to represent occupied hours (0700 – 1900), evening hours (1900 – 2300) and night-time hours (2300 – 0700), in order for appropriate limits to be set at each time of day.
- The daytime and night-time $L_{AF90,15min}$ background sound levels presented at each location have been determined from analysis of the statistical distribution of the measured 15-minute levels during the respective periods in accordance with the guidance presented in BS 4142:2014.

Table 4-1 presents the results of the unattended noise survey.

Table 4-1 – Results of the unattended environmental noise survey

Monitoring Position	Period	Ambient Noise Level ($L_{Aeq,T}$ free-field)	Typical Maximum Noise Level (free-field)	Typical Background Sound Level ($L_{AF90,\ 15min}$, free-field)
MP1 (West)	0900 - 1700	62[1]	76 dB $L_{A01,1h}$[1]	56
	0700 - 2300	63[1]	-	-
	0800 - 1800	63[1]	-	-
	1900 - 2300	-	-	56
	2300 - 0700	61[1]	81 dB L_{Afmax}[1]	47
MP2 (East)	0900 - 1700	59	70 dB $L_{A01,1h}$	55
	0700 - 2300	59	-	-
	0800 - 1800	59	-	-
	1900 - 2300	-	-	53
	2300 - 0700	56	76 dB L_{Afmax}	49

[1] Measurements have been corrected by -3 dB to account for the effect of reflections from the façade.

4.3.2. Full long-term monitoring data, in graphical format, is included in Appendix C, with a mark-up illustrating the measurement locations in Appendix D.

CALIBRATION

4.3.3. The sound level meters were field calibrated prior to the undertaking of the measurements, and calibration values checked at collection with no significant drift (< 0.5 dB) detected.

4.3.4. The calibrators and sound level meters are calibrated by a UKAS accredited calibration laboratory every year and every two years respectively.

4.4 VIBRATION SURVEY METHOD

4.4.1. Measurements of vibration from the LU Northern line were taken in the basement of the existing building on 4 December 2017 during an evening rush hour.

4.4.2. Since this survey the scheme has changed in that the residential units have been moved to the south of their original location and, therefore, further from the measurement location.

4.4.3. Nevertheless, given the proposed residential building is a similar distance from the tube line to the original scheme, this measurement location is considered representative of what may be experienced at basement level in the location of the proposed residential units.

4.4.4. As such, it is appropriate to use this data for the prediction of noise and vibration arising from the LU line in the proposed dwellings.

4.5 VIBRATION SURVEY RESULTS

4.5.1. Measurements were taken of several train pass-bys during an evening rush hour, with an average of the five events with the highest signal-to-noise ratio averaged to form a representative acceleration spectrum in third-octave bands.

4.5.2. A peak acceleration of approximately 2 mms^{-2} was recorded in the 63 Hz octave band. The average of the measured spectra is presented in Appendix E. Also presented is a maximum “background” vibration curve, which represents the level of continuous vibration from ongoing sources such as road traffic.

5 SITE SUITABILITY ASSESSMENT

5.1 INTRODUCTION

5.1.1. This section assesses the suitability of the Site for the proposed uses with respect to the existing noise and vibration climate.

5.1.2. An appraisal of the performance requirements of the external building envelope has been undertaken. An outline scheme of glazing is presented that would be appropriate to achieve the internal noise level criteria presented in Section 3.

5.1.3. These glazing performances are presented should not form a specification and, rather, should be used to inform a decision on the suitability of the Site for its proposed uses.

5.1.4. Where relevant, the appropriateness of using natural ventilation for provision of fresh air is also discussed.

IMPACT OF SAINSBURY'S COMMERCIAL OPERATION ON RESIDENTIAL ELEMENTS OF THE PROPOSED DEVELOPMENT

5.1.5. The operations of commercial premises' can have adverse impacts on proposed residential developments. Commonly these could be: noise from deliveries; noise emitted from fixed building services plant; or noise from patrons.

5.1.6. Appendix D illustrates the relative location of the current proposed residential units; the commercial deliveries yard; and the measurement location on this side of the development (at roof level).

5.1.7. As the plan shows, the residential units are approximately 85 m from the main deliveries loading yard, and approximately 55 m from the service road. The east facing windows to the residential units are also well screened from these sources of noise by the buildings between.

5.1.8. The noise data from Monitoring Position 2, which overlooked the Sainsbury's service yard has been reviewed to assess the impact of the operations of Sainsburys, and these were not considered to have a significant effect on the overall noise climate at the monitoring location.

5.1.9. On this basis, the activities of Sainsbury's have no significant effect on the noise climate experienced at the residential units, and do not require further assessment.

5.2 RESIDENTIAL USE

BUILDING ENVELOPE SOUND INSULATION

5.2.1. Noise levels vary across the facades of the development, with the most onerous requirements being to dwellings overlooking Kentish Town Road (to the west).

5.2.2. It is acknowledged that the noise levels measured at monitoring position 2 (to the east) are likely to be higher than would actually be experienced at the proposed residential units on this façade, due to them being more screened from Camden Street and traffic associated with Sainsbury's.

5.2.3. A conservative reduction of 5 dB, for screening from the main sources of noise, is applied to the levels at the east residential facades in this assessment.

5.2.4. Table 5-1 presents outline requirements for glazing to the residential elements of the development in order to achieve the internal noise levels targets summarised in Section 3.

5.2.5. Calculations to determine the degree of sound insulation required from a building façade have been undertaken in accordance with the rigorous calculation method in BS 8233. Calculations assume that the non-glazed elements of the façade are of adequate construction such that they are significantly more resistant to the passage of sound than the glazed elements.

Table 5-1 – Glazing sound insulation performance requirements

Façade	Period	External Noise Level (Free-Field, dB)	Internal Acoustic Criteria	Sound Reduction (dB $R_W + C_{tr}$)
West (overlooking Kentish Town Road)	Daytime $L_{Aeq,16h}$	63	35	31[1]
	Night-time $L_{Aeq,8h}$	61	30	
	Night-time L_{AFmax}	81	42	
East (overlooking residential gardens to the east of the Site)	Daytime $L_{Aeq,16h}$	54[2]	35	32
	Night-time $L_{Aeq,8h}$	51[2]	30	
	Night-time L_{AFmax}	71[2]	42	

[1] No bedrooms are located on the west façade and, therefore, the daytime criterion is used for assessment in this location.

[2] Measured noise levels have been reduced by 5 dB to account for the effects of screening from the main sources of noise to the east – which were captured without screening during the survey.

5.2.6. To achieve the above sound reductions, it is likely that glazing would be an acoustically laminated double-glazed system.

5.2.7. The above recommended glazing performances represent an outline scheme that is considered suitable at this stage. Revised calculations should be undertaken at the appropriate time during the detailed design process when internal details (layouts, finishes) and fenestration arrangements are confirmed.

VENTILATION AND COOLING

5.2.8. It is understood that residential units will have mechanical ventilation and cooling systems and, therefore, the provision of ventilation and prevention of overheating is not discussed.

NOISE LEVELS IN EXTERNAL AREAS (BALCONY/TERRACES)

5.2.9. Balconies are located on the east façade, where they are expected to meet the lower guideline values in Camden's Local Plan for external amenity areas.

EFFECTS OF VIBRATION

5.2.10. Vibration Dose Values (VDV) and re-radiated noise from the LU Northern Line have been calculated in the first-floor residential units using empirical transfer functions to predict the attenuation or amplification of vibration as it travels into, and through, the building.

5.2.11. The calculation of vibration dose values (VDV) assumes 30 to 36 trains per hour and that the duration of vibration exposure is 10 seconds per train event. The W_b frequency weighting is used for vibration in the vertical direction (as specified in British Standard 6472-1).

5.2.12. BS 6472-1 advises that vibration exposure to human within buildings should be assessed in terms of the Vibration Dose Value (VDV). The vibration 'dose' is evaluated over a 16-hour daytime period (with the example hours given as 07:00 to 23:00) or 8-hour night-time period (e.g. 23:00 to 07:00).

5.2.13. The predicted VDV (night) range given above considers extra trains ran during the night tube service on Friday and Saturday.

Table 5-2 – Predicted levels of vibration in first-floor dwellings

Location	Predicted Daytime VDV ($ms^{-1.75}$)	Predicted Night-time VDV ($ms^{-1.75}$)	Predicted Re-radiated Noise Level (L_{ASmax})
First Floor Dwelling	0.028 – 0.034 $ms^{-1.75}$	0.016 – 0.024 $ms^{-1.75}$	32 dB(A)

5.2.14. The above fall below the limits stipulated by the London Borough of Camden in their Local Policy.

5.3 OFFICE USE

BUILDING ENVELOPE SOUND INSULATION

5.3.1. Standard thermal double glazing will be appropriate to achieve the target internal noise criteria for open plan offices on all façades of the development, assuming there is not significant contribution through the non-glazed elements of the façade (the construction of which is not confirmed).

5.3.2. These requirements may be higher for cellular offices or meeting rooms located on the west façade (overlooking Kentish Town Road). These spaces require a lower internal noise level.

VENTILATION AND COOLING

5.3.3. It is understood that office units will have mechanical ventilation and cooling systems and, therefore, the provision of ventilation and prevention of overheating is not discussed.

5.4 GROUND FLOOR USES

BUILDING ENVELOPE SOUND INSULATION

5.4.1. The uses and layouts of the ground floor retail units is not known at this stage and will not be known until the units are let in the future.

5.4.2. Acceptable internal noise levels will vary depending on the sensitivity of the space (i.e a noisy kitchen may be more tolerant to the ingress of noise than a quiet café).

5.4.3. BS 8233:2014 suggests a guideline design range of 50 – 55 dB $L_{Aeq,T}$ for a space where speech or telephone communications may be undertaken (such as a café, kitchen or department store).

5.4.4. Standard thermal double glazing is likely to provide adequate levels of sound insulation for use to flexible retail and leisure fronts throughout the development.

VENTILATION AND COOLING

5.4.5. It is understood that ground floor units will have mechanical ventilation and cooling systems and, therefore, the provision of ventilation and prevention of overheating is not discussed.

6 FIXED PLANT NOISE EMISSIONS LIMITS

6.1 INTRODUCTION

6.1.1. The proposed development includes commercial uses on lower floors, and offices on the upper floors. These elements of the development will be served by mechanical building services to provide cooling and ventilation.

6.1.2. At this stage, full details of any such plant are unavailable.

6.1.3. However, to limit disturbance to residents of the proposed development, and also to any nearby existing noise-sensitive receptors, cumulative noise limits have been set for all external sources associated with the proposed development that fall within the scope of BS 4142 (as summarised in Section 3).

6.2 NOISE LIMITS

6.2.1. The nearest existing residential receptors are indicated on the plan in Figure 2-1.

6.2.2. Noise limits, in line with the Local Plan, have been derived and are presented in Table 6-1.

6.2.3. These noise limits apply to the cumulative level of noise from all sources that fall within the scope of BS 4142:2014. As such, individual plant items may need to be designed to achieve lower levels such that the overall noise limit(s) are achieved.

6.2.4. Typical background sound levels have been derived following the methodology in BS 4142 for the following periods:

- Daytime: 0700 – 1900: When the development is likely to be occupied
- Evening: 1900 – 2300: To derive limits for any plant that runs in the evening
- Night-time: 2300 – 0700: To derive limits for any plant that run at night.

Table 6-1 – Noise limits for fixed mechanical services plant

Location	Period	Typical Background Sound Level (dB $L_{AF90,15m}$)	Cumulative Plant Noise Limit at the Receptor Location (dB $L_{Aeq,T}$)		
			Green Non-tonal (Tonal)	**Amber** Non-tonal (Tonal)	**Red** Non-tonal (Tonal)
Residential receptors to the south-east of the development (screened from Kentish Town Road)	Daytime (0900 – 1700)	50[1]	40 (35)	41 - 55 (36 - 50)	> 56 (> 51)
	Evening (1900 – 2300)	48[1]	38 (33)	39 - 53 (34 - 48)	> 61 (> 56)
	Night-time (2300 – 0700)	44[1]	34 (29)	35 - 49 (30 - 44)	> 52 (> 47)

Location	Period	Typical Background Sound Level (dB $L_{AF90,15m}$)	Cumulative Plant Noise Limit at the Receptor Location (dB $L_{Aeq,T}$)		
			Green Non-tonal (Tonal)	**Amber** Non-tonal (Tonal)	**Red** Non-tonal (Tonal)
All other receptors	Daytime (0900 – 1700)	56	46 (41)	47 - 61 (42 - 56)	> 61 (> 56)
	Evening (1900 – 2300)	56	46 (41)	47 - 61 (42 - 56)	> 61 (> 56)
	Night-time (2300 – 0700)	47	37 (32)	38 - 52 (33 - 47)	> 52 (> 47)

[1] Noise levels measured at the east have been reduced by 5 dB to account for a likely reduction in the noise level experienced at the residential façades (which are more screened from most sources of noise) vs the measurement position.

DISCUSSION

6.2.5. The appropriateness of the limit set should consider not only the noise level relative to the existing background, but also the absolute noise level (and its potential effects on a receptor) and the context in which that level is received.

6.2.6. It is acknowledged that there is a desire to reduce noise levels in the urban areas of London in order to provide a more comfortable living environment for residents. That considered, and with a predicted reduction in noise levels from road traffic etc., mechanical plant noise levels should be future-proofed to ensure they do not become a problem in years to come.

6.2.7. On this basis, we would recommend against designing to levels from the Red bracket where noise is observed to have a significant adverse effect. These levels are approaching the ambient noise level at the site and would be clearly audible over the residual sound and would not be conducive to generally bettering the noise environment in the Borough.

6.2.8. Conversely, we would also recommend against designing to the noise limits in the green bracket which are very onerous, and considerably more restrictive than that which would normally be imposed by following the guidance in BS 4142:2014 – which recommends that a rating level (the plant rated for any tonal/other effects) equal to the existing background noise level should result in a low impact.

6.2.9. Initial assessments of the proposed mechanical plant items suggest the need for significant noise control measures to meet the levels within the green bracket. Such noise control measures may have detrimental impact, both to the scheme itself and the nearest receptors, on factors other than acoustics.

6.2.10. It is therefore proposed to design to the noise limits within the amber bracket (LOAEL to SOAEL), where noise may be is observed to have an adverse effect level, but which may be considered acceptable when assessed in the context of other merits of the development.

RECOMMENDATION

6.2.11. It is proposed that the cumulative noise emissions from the development would be designed to be 5 dB below the background noise level when assessed in accordance with BS 4142:2014.

6.2.12. The specific noise level of the plant ($L_{Aeq,T}$) should be rated for feature corrections (such as tonality, intermittency, impulsivity) in accordance with the guidance in BS 4142. These rating corrections would be confirmed at the design stages.

6.2.13. This would result in a noise level ($L_{Aeq,T}$) that is lower than the existing background sound level, and which would be expected to lie within the lower portion of the amber bracket in accordance with the guidance in the Local Plan.

Guidance in BS 4142:2014 – Contextual Considerations and Absolute Noise Levels

6.2.14. BS 4142 recommends that both the absolute level of the sound, and the context in which it is experienced, is considered in determining whether a noise level is appropriate.

6.2.15. Camden is a highly commercial area with the Site, and nearest residential receptors, located in the heart of this busy, urban area.

6.2.16. The nearest receptors are subject to noise from existing fixed plant (from both the existing development on the Site, and surrounding premises') and, therefore, the introduction of the new plant would not be out of context with the existing noise climate.

6.2.17. It should be also noted that the existing noise generating plant on the roof of Grand Union House would be removed as part of the scheme and, therefore, the introduction of the plant associated with the proposed development would not necessarily be a cumulative addition to the noise currently experienced at the receptor locations.

Absolute Noise Levels

6.2.18. The absolute noise levels (in terms of the $L_{Aeq,T}$) also provide an indicator of the likelihood of disturbance from fixed plant and equipment.

6.2.19. Depending on the rating corrections applied, it is likely that designing as recommended above would result in an absolute noise level ($L_{Aeq,T}$) that is around 8 to 10 dB lower than the existing background sound level.

6.2.20. With existing, prevailing, background sound levels of 50 dB and 44 dB during the day and night, respectively, at the nearest residential receptors to the south this would result in external design levels of around 40 to 42 dB $L_{Aeq,T}$ during the daytime, and 34 to 36 dB $L_{Aeq,T}$ during the night-time.

6.2.21. During the daytime, this level is around 10 dB below the recommended guidance for external amenity space (that might be enjoyed during the day) and 20 dB below the existing ambient noise level at the site – implying a low probability of adverse impact during the daytime.

6.2.22. Such night-time noise levels would mean that, were an open window to be used for ventilation (assumed to provide around 15 dB outside to inside level difference, they would be around 10 dB lower than the internal ambient noise level target in a bedroom – thus would be considered very unlikely to cause disturbance to a resident.

7 CONCLUSION

7.1.1. WSP has been appointed to undertake an acoustic impact assessment to support the detailed planning application for the proposed development at Grand Union House, Camden.

7.1.2. An environmental noise survey has been carried out to establish the existing baseline noise and vibration conditions at the Site.

7.1.3. Recommendations have been made for mitigation required, in terms of the external building fabric of the Proposed Development, to provide appropriate internal ambient noise levels. It is demonstrated that the most onerous glazing requirements should be achieved by a glazing unit achieving 32 dB $R_w + C_{tr}$,

7.1.4. Noise emission limits for fixed plant associated with the operation of the Proposed Development have been established with respect to the existing noise climate at the nearest noise-sensitive receptors, and guidance provided by the London Borough of Camden.

7.1.5. It is recommended that a rating level of 5 dB below the prevailing background sound level is targeted, with an assessment method following the methodology in BS 4142: 2014 – which is predicted to result in a level within the Amber bracket of Camden's Local Plan 2017.

7.1.6. The limitations to this report are detailed in Appendix F.

8 CAMDEN AMENITY CPG CHECKLIST

8.1.1. Camden recommends that an acoustic report submitted in support of a planning application should include a number of items, this checklist is repeated below with evidence of items commented.

Table 8-1 – Camden Amenity CPG Checklist

Checklist Item	Evidence
Description of the proposal	Section 2
Description of the site and surroundings, a site map showing noise and vibration sources and measurement locations	Section 2, Appendix D.
Background noise levels measured over a minimum of 24 hours	Section 4.
Details of instruments and methodology used for noise measurements (including reasons for settings and descriptors used, calibration details);	Section 4.
Details of the plant or other source of noise and vibration both on plan and elevations and manufacturers specifications;	Section 5. Plant information not confirmed at this stage.
Noise or vibration output from proposed plant or other source of noise and vibration, including: - noise or vibration levels; - frequency of the output; and - length of time of the output.	Plant information not confirmed at this stage. Recommendations for suitable levels of noise emissions from mechanical plant items presented in Section 6.
Features of the noise or vibration e.g. impulses, distinguishable continuous tone, irregular bursts;	
Specification of the plant, supporting structure, fixtures and finishes;	
Location of noise sensitive uses and neighbouring windows;	
Details of measures to mitigate noise and vibration;	
Details of any associated work including acoustic enclosures and/or screening;	
Cumulative noise levels; and;	
Hours/days of operation	

Appendix A

GLOSSARY OF ACOUSTIC TERMINOLOGY

TECHNICAL GLOSSARY

Terminology	Description
Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of 20μPa (20x10-6 Pascals) on a decibel scale.
Sound Power Level	The sound power level is the sound power relative to a standard reference power of 10^{-12} Watts on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure. The difference in sound pressure level between two sounds s1 and s2 is given by: 20 log10 (s1 / s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{eq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level during the period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. L90 can be considered to be the "average minimum" noise level and is often used to describe the background noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5 m.
Façade	At a distance of 1 m in front of a large sound reflecting object such as a building façade.
Fast Time Weighting	Averaging time used in sound level meters.

Appendix B

GUIDANCE DOCUMENTS - SUMMARY

NATIONAL PLANNING POLICY AND GUIDANCE

NATIONAL PLANNING POLICY FRAMEWORK (NPPF), 2019

First published in 2012 and most recently updated in February 2019, the NPPF sets out the Government's planning policies for England and how these are expected to be applied. It replaces previous noise policy contained in Planning Policy Guidance Note 24. It does not replace the Noise Policy Statement for England 2010 to which it refers.

The NPPF is a concise document that provides its position on noise primarily in paragraph 180 which is reproduced below:

> *'Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:*
>
> *a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life[60];*
>
> *b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and*
>
> *c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.*
>
> *Footnote 60 See Explanatory Note to the Noise Policy Statement for England (Department for Environment, Food & Rural Affairs, 2010)'*

Paragraph 182 of the NPPF provides additional policy information applicable where new development is proposed close to existing commercial noise sources and is reproduced below.

> *'Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.'*

NOISE POLICY STATEMENT FOR ENGLAND (NPSE), 2010

The NPSE provides more detail than the NPPF setting out the long-term vision of the Government noise policy and applying to all forms of noise excluding occupational noise. The NPSE repeatedly refers to the management and control of noise within the context of Government Policy on sustainable development.

The NPSE also stresses that noise impact should not be treated in isolation from other related factors. At paragraph 2.7 for example it states:

'…the application of the NPSE should enable noise to be considered alongside other relevant issues and not to be considered in isolation. In the past, the wider benefits of a particular policy, development or other activity may not have been given adequate weight when assessing the noise implications.'

The NPSE introduces and describes three categories, or levels, describing the presence or absence of noise effects but does not quantify those categories, stating that the corresponding objective levels are likely to be different for different noise sources, receptors and times of the day or night. These categories are:

- **NOEL** – No Observed Effect Level – This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise
- **LOAEL** – Lowest Observed Adverse Effect Level – This is the level above which adverse effects on health and quality of life can be detected
- **SOAEL** – Significant Observed Adverse Effect Level – This is the level above which significant adverse effects on health and quality of life occur.

The NPSE recognised that, at the time of publication, further research was needed into how these categories might be quantified for different scenarios. There is still no robust, universally accepted method of deriving suitable values and a variety of approaches are adopted in different circumstances. The subjective guidance provided in the Planning Practice Guidance (PPG) for noise can be of assistance in deriving suitable values.

The three aims of the NPSE are:

- *Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.*
- *Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.*
- *Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.*

PLANNING PRACTICE GUIDANCE – NOISE (PPG-N), 2019

The Government launched the Planning Practice Guidance (PPG) web-based resource in March 2014 and refreshed it in July 2019. The section on noise provides tabulated descriptions of example outcomes of the categories introduced in the NPSE based on the likely average response. It also adds a fourth category termed Unacceptable Adverse Effect (UAE).

The PPG-N describes sound that is not noticeable to be at levels below the NOEL. It describes exposures that are noticeable but not to the extent there is a perceived change in quality of life as below the LOAEL and need no mitigation. With reference to the definition of noise in the NPSE, such emissions are 'sound; and not 'noise'. On this basis, the audibility of sound from a development is not, in itself, a criterion to judge noise effects that is commensurate with national planning policy.

The PPG-N suggests that noise exposures above the LOAEL cause small changes in behaviour. Examples of noise exposures above the LOAEL provided in the PPG-N is having to turn up the volume on the television; needing to speak more loudly to be heard; where there is no alternative ventilation, closing windows for some time because of the noise; or, a potential for some reported sleep disturbance. In line with the NPPF and NPSE, the PPG-N states that consideration needs to be given to mitigating and minimising effects above the LOAEL but taking account of the economic and social benefits being derived from the activity causing the noise.

The PPG-N suggests that noise exposures above the SOAEL cause material changes in behaviour. Examples of noise exposures above the SOAEL cause material changes in behaviour. Examples of noise exposures above the SOAEL provided in the PPG-N are, where there is no alternative ventilation, keeping windows closed for most of the time or avoiding certain activities during periods when the noise present; and/or there is a potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. In line with the NPPF and NPSE, the PPG-N state that effects above the SOAEL should be avoided and that whilst the economic and social benefits being derived from the activity causing the noise must be taken into account, such exposures are undesirable.

The guidance in the PPG-N, which is basd on that provided in the NPSE, is summarised in

Table B-1 – Outcome descriptors for noise effect levels

Perception	Examples of outcomes	Increasing effect levels	Action
No Observed Effect Level			
Not present	No effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum

Perception	Examples of outcomes	Increasing effect levels	Action
Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

The PPG-N states that there are many factors which should be considered when determining if noise is of concern; one factor is the number of noise events, the frequency and pattern of occurrence of the noise.

The PPG-N provides further information on the adverse effects of noise and how it can be mitigated. For noise sensitive development, mitigation measures can include: avoiding noisy locations; designing the development to reduce the impact of noise from the local environment, including noise barriers; and optimising the sound insulation provided by the building envelope including through noise insulation.

PROFESSIONAL PRACTICE GUIDANCE ON PLANNING AND NOISE (PROPG)

As discussed in Section 2 of this report, the ProPG is designed to provide practitioners with guidance on a recommended assessment approach to the management of noise within the planning system in England for new residential development.

The guidance is non-statutory and is primarily aimed at the assessment of proposed residential development 'exposed predominantly to noise from existing transport sources'. Despite being non-statutory, it is expected to be widely adopted by planning authorities as best practice when considering noise affecting new residential development.

The ProPG aims to complement Government planning and noise policy and guidance, and in particular it strives to:

- *"advocate full consideration of the acoustic environment from the earliest possible stage of the development control process;*
- *encourage the process of good acoustic design in and around new residential developments;*
- *outline what should be taken into account in deciding planning applications for new noise-sensitive developments;*
- *improve understanding of how to determine the extent of potential noise impact and effect; and*
- *assist the delivery of sustainable development."*

The assessment approach, as summarised and implemented in the body of this report, is described as follows.

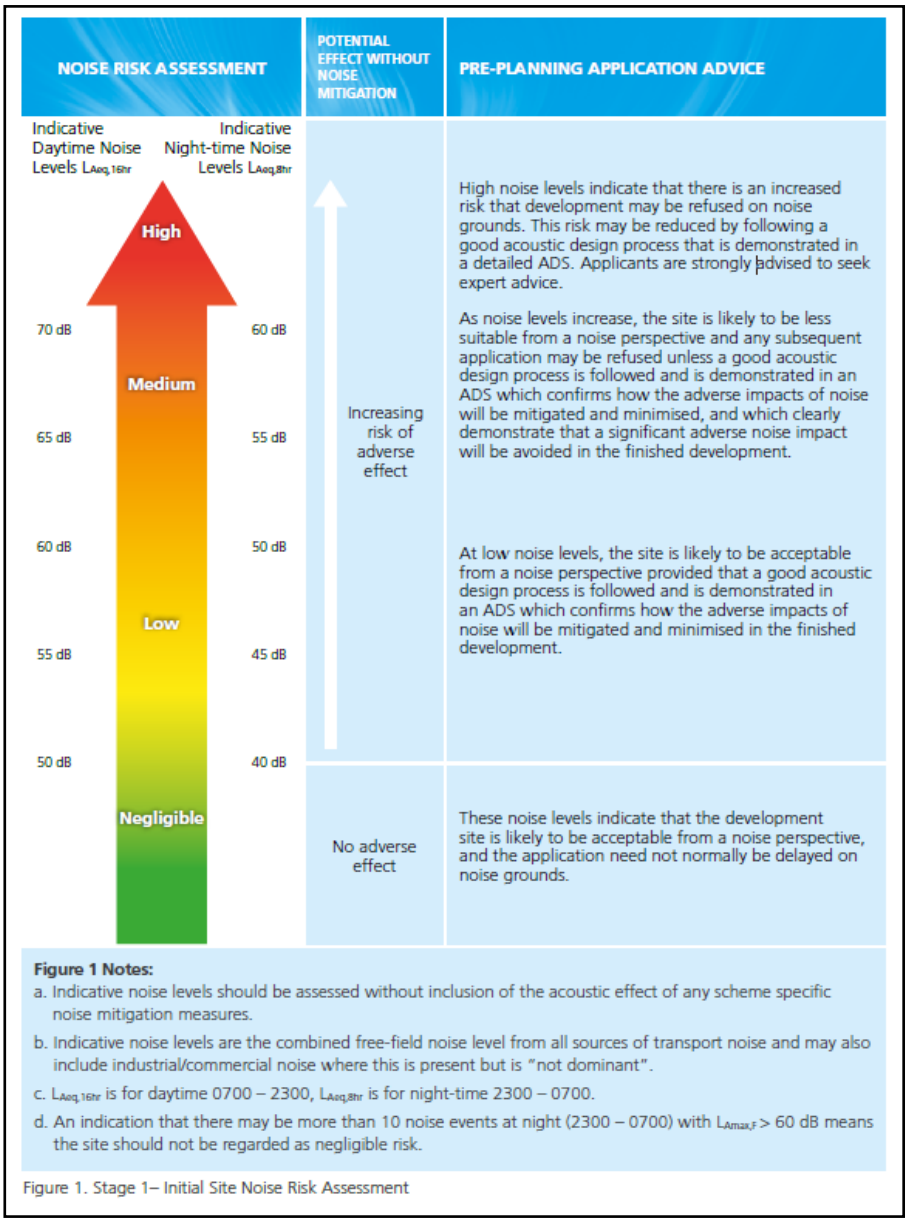
Stage 1 Risk Assessment

The Stage 1 initial noise risk assessment is based on placing the site within ranges of external noise levels, which correspond to varying degrees of risk. The external noise levels refer to the combined free-field noise level from all relevant sources of transport noise that affect the site. The external noise levels may also include industrial/commercial noise where it is present, but where it is "not dominant".

The indicative noise levels are intended to provide a sense of the noise challenge at a potential residential development site and should be interpreted flexibly having regard to the locality, the project and the wider context.

The initial noise risk assessment approach is presented in Figure 1 in the ProPG, which is reproduced in Figure B-1.

Figure B-1 - ProPG Stage 1 risk assessment



Stage 2 Element 1 – Good Acoustic Design Process

ProPG states that planning applications for new residential development should include evidence that the following have been properly considered:

- Check the feasibility of relocating, or reducing noise levels from relevant sources.
- Consider options for planning the site or building layout.
- Consider the orientation of proposed building(s).
- Select construction types and methods for meeting building performance requirements.
- Examine the effects of noise control measures on ventilation, fire regulation, health and safety, cost CDM (construction design and management) etc.
- Assess the viability of alternative solutions.
- Assess external amenity area noise.

Stage 2 Element 2 – Internal Noise Level Guidelines

The internal noise level guidelines provided under Element 2 within Figure 2 of the ProPG are based upon the guidance in BS8233:2014. Accompanying notes 4 – 7 from Figure 2 of the ProPG state the following:

> *"**Note 4** – Regular individual noise events (for example, schedules aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$ depending on the character and number of events per night. Sporadic noise events could require separate values. In most circumstances in noise sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45 dB $L_{Amax,F}$ more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number distribution, predictability and regularity of noise events.*
>
> ***Note 5** – Designing the site layout and the dwellings so that the internal target levels can be achieved with open windows in as many properties as possible demonstrates good acoustic design. Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the "open" position and, in this scenario, the internal L_{Aeq} target levels should not normally be exceeded, subject to the further advice in Note 7.*
>
> ***Note 6** – Attention is drawn to the requirements of the Building Regulations.*
>
> ***Note 7** – Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal L_{Aeq} target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved. The more often internal L_{Aeq} levels start to exceed the internal L_{Aeq} target levels by more than 5 dB, the more that most people are likely to regard them as "unreasonable". Where such exceedances are predicted, applicants should be required to show how the relevant number of rooms affected has been kept to a minimum. Once internal L_{Aeq} levels exceed the target levels by more than 10 dB, they are highly likely to be regarded as "unacceptable" by most people, particularly if such levels occur more than occasionally. Every effort should be made to avoid relevant rooms experiencing "unacceptable" noise levels at all and where such levels are likely to occur frequently, the development should be prevented in its proposed form."*

Stage 2 Element 3 – External Amenity Area Noise Assessment

ProPG refers to the design ranges in BS8233:2014 with respect to the assessment of external amenity, as well as guidance in the PPG-N. Based on these two documents the following guidance is provided with respect to the assessment of noise in external amenity areas:

> *3(i) "If external amenity spaces are an intrinsic part of the overall design, the acoustic environment of those spaces should be considered so that they can be enjoyed as intended"*
>
> *3(ii) "The acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50 – 55 dB $L_{Aeq,16hr}$."*

3(iii) 'These guideline values may not be achievable in all circumstances where development might be desirable. In such a situation, development should be designed to achieve the lowest practicable noise levels in these external amenity spaces."

3(iv) "Whether or not external amenity spaces are an intrinsic part of the overall design, consideration of the need to provide access to a quiet or relatively quiet external amenity space forms part of a good acoustic design process."

3(v) "Where, despite following a good acoustic design process, significant adverse noise impacts remain on any private external amenity space (e.g. garden or balcony) then that impact may be partially off-set if the residents are provided, through the design of the development or the planning process, with access to:

- *a relatively quiet façade (containing openable windows to habitable rooms) or a relatively quiet externally ventilated space (i.e. an enclosed balcony) as part of their dwelling; and/or*
- *a relatively quiet alternative or additional external amenity space for sole use by a household, (e.g. a garden, roof garden or large open balcony in a different protected location); and/or*
- *a relatively quiet, protected, nearby, external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings; and/or*
- *a relatively quiet, protected, publicly accessible, external amenity space (e.g. a public park or local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minutes walking distance)."*

Stage 2 Element 4 – Other Relevant Issues

ProPG states that the following other relevant issues, should be considered, where appropriate:

- *4(i) compliance with relevant national and local policy*
- *4(ii) magnitude and extent of compliance with ProPG*
- *4(iii) likely occupants of the development*
- *4(iv) acoustic design verses unintended adverse consequences*
- *4(v) acoustic design verses wider planning*

Planning Recommendations

Following the ProPG assessment approach, will lead the noise practitioner to choose between four possible recommendations to the decision maker. These are as follows:

- *planning consent may be granted without any need for noise conditions;*
- *planning consent may be granted subject to the inclusion of suitable noise conditions;*
- *planning consent should be refused on noise grounds in order to avoid significant adverse effects ("avoid"); or*
- *planning consent should be refused on noise grounds in order to prevent unacceptable adverse effects ("prevent").*

Full details of where and when the above recommendations apply are provided in Section 3 of ProPG.

BRITISH STANDARDS AND OTHER GUIDANCE

ACOUSTICS VENTILATION AND OVERHEATING RESIDENTIAL DESIGN GUIDE – JANUARY 2020

The Acoustics, Ventilation and Overheating (AVO) Guide recommends an approach to acoustic assessments for new residential development that takes due regard of the interdependence of provisions for acoustics, ventilation and overheating.

The AVO Guide is intended for the consideration of new residential development that will be exposed predominantly to airborne sound from transport sources, and to sound from mechanical services that are serving the dwelling in question.

The AVO Guide provides guidance on all stages of the assessment and design of dwellings. However, of particular use at planning stage, is its guidance on the initial site appraisal.

Figure B-2 presents Table B-2 of The AVO Guide, which presents an initial assessment of appropriate mitigation requirements for dwellings that fall within varying external noise level brackets.

Figure B-2 - The AVO Guide Table B-2: Potential level differences associated with different ventilation systems from ADF

Ventilation System from ADF	Cont. equiv. (L_{Aeq}) or events (L_{AFmax})	Level Difference, external free field level – internal reverberant level, dB	
		Typical windows and vent	Higher acoustic performance windows and vent
1, 2	L_{Aeq}	21	31
	L_{AFmax}	22	35
3 (with trickle vent)	L_{Aeq}	23	33
	L_{AFmax}	24	38
4 (no trickle vent)	L_{Aeq}	27	38
	L_{AFmax}	31	45

BS8233:2014 "GUIDANCE ON SOUND INSULATION AND NOISE REDUCTION FOR BUILDINGS"

BS8233:2014 Guidance on sound insulation and noise reduction for buildings provides guidance for the control of noise in and around buildings. Through providing appropriate criteria and limits for internal and external noise levels it can be used to guide the design of new buildings (or refurbished buildings undergoing a change of use).

Guidance pertaining to indoor noise levels for residential spaces is summarised in Table B-2 below. These levels refer to the overall internal noise resulting from steady external environmental noise, such as road traffic, and are not applicable for sources of noise with specific character.

Table B-2 Indoor ambient noise levels in spaces when unoccupied

Activity	Location	Daytime 07:00 – 23:00 hours	Night-time 23:00 – 07:00 hours
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 $L_{Aeq,8hour}$

In terms of design criteria for "…traditional external areas that are used for amenity space, such as gardens and patios…" BS8233:2014 states that, *"…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. 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."*

In relation to other external amenity areas it states:

> *"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. In high-noise areas, consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels. Achieving levels of 55 dB $L_{Aeq,T}$ or less might not be possible at the outer edge of these areas, but should be achievable in some areas of the space."*

Shorter duration and intermittent noise events can be responsible for sleep disturbance. While BS8233 does not recommend specific maximum noise limits for controlling these events, Note 4 from Figure 2 of the ProPG states that good acoustic design can be used so that individual noise events do not normally exceed 45 dB L_{AFmax} more than 10 times a night.

BS8233:2014 states that, *"Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$ depending on the character and number of events per night."* However, the document does not recommend any specific criterion.

The noise level criteria specified in BS8233:2014 are broadly in line with those specified by the World Health Organization (WHO) in its Guidelines for Community Noise (1999), as described below.

WHO GUIDELINES FOR COMMUNITY NOISE

The WHO *Guidelines* consolidate scientific knowledge on the health effects of community noise and provide guidance to environmental health authorities and professionals trying to protect people from the harmful effects of noise in non-industrial environments. The main sources of community noise are identified as road, rail and air traffic; industries; construction and public work; and neighbours.

The effects of noise in dwellings are, typically, sleep disturbance, speech interference and annoyance. Suggested guideline limitations, and the time periods to which they relate, are presented in **Table B-3** below.

Table B-3 WHO guideline values for community noise in specific environments

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

* These periods are usually taken to be 07:00 – 23:00 (16 hour day) and 23:00 – 07:00 (8 hour night)

** The document states that, *"For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB L_{AFmax} more than 10-15 times per night…"*

In line with the quoted guidance from the WHO Guidelines, it is taken that the L_{AFmax} criterion should not be compared to the highest L_{AFmax} level applicable to the assessment location(s), but rather to that more representative of conditions typically.

It is noted that the WHO guidance relating to night-time maximum noise levels is based on a study of sleep disturbance due to aircraft movements, which are not a prominent feature here. However, in the absence of similar guidance relevant to rail or road traffic, together with aircraft noise typically being considered more annoying than the other two modes of transport, it is considered appropriate to apply the guidance for the purposes of the assessment.

BS4142:2014+A1:2019 "METHODS FOR RATING AND ASSESSING INDUSTRIAL AND COMMERCIAL SOUND"

BS4142:2014+A1:2019 primarily provides a numerical method by which to determine the significance of sound of an industrial nature (i.e. the 'specific sound' from the proposed development and/or existing source) at residential NSRs. The specific sound level may then be corrected for the character of the sound, if appropriate, and this is then termed the 'rating level' (denoted as $L_{Ar,Tr}$), whether or not a rating penalty is applied.

With regard to the rating correction, paragraph 9.2 of BS4142:2014+A1:2019 suggests the following subjective methods for the determination of the rating penalty for tonal, impulsive and/or intermittent specific sounds:

Tonality

- For sound ranging from not tonal to prominently tonal the Joint Nordic Method gives a correction of between 0 dB and +6 dB for tonality. Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible.

Impulsivity

- A correction of up to +9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible.

Intermittency

- When the specific sound has identifiable on/off conditions, the specific sound level should be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time. If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.

Other sound characteristics

- Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied."

BS4142:2014+A1:2019 requires that the background sound levels adopted for the assessment be representative for the period being assessed. The Standard recommends that the background sound level should be derived from continuous measurements of normally not less than 15-minute intervals, which can be contiguous or disaggregated. However, the Standard states that there is no 'single' background sound level that can be derived from such measurements. The accompany not to paragraph 8.1.4 states that:

"A representative level should account for the range of background sound levels and should not automatically be assumed to be either the minimum or modal value."

Estimating Impact

An initial estimate of the impact of the specific sound is obtained by subtracting the measured background sound level from the rating level of the specific sound. In the context of the Standard, adverse impacts include, but are not limited to, annoyance and sleep disturbance.

Typically, the greater this difference, the greater the magnitude of the impact, while the lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact.

BS4142:2014 recommends the following scale to estimate the impact:

- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on context.
- A difference of around +5 dB is likely to be an indication of an adverse impact, depending on context.
- Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

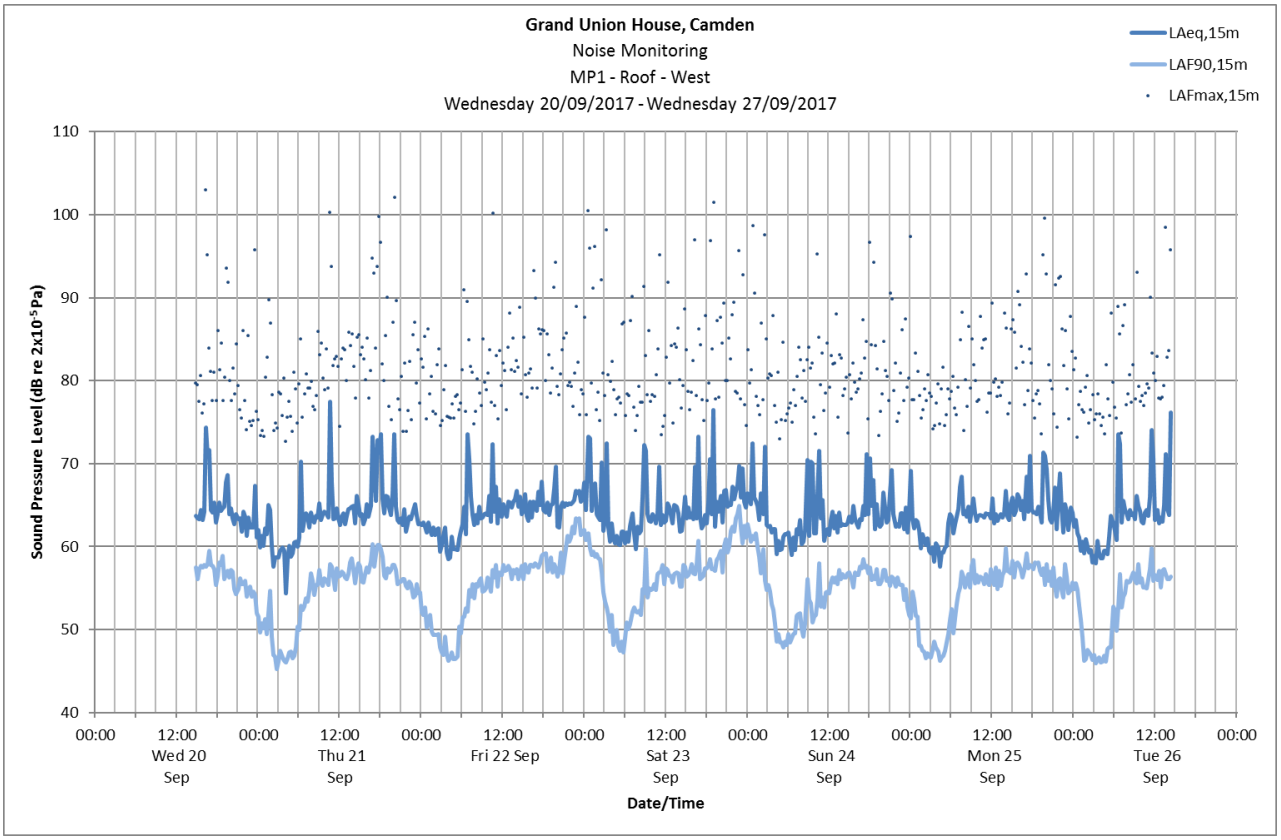
Whilst there is a relationship between the significance of impacts determined by the method contained within BS4142:2014+A1:2019 and the significance of effects described in the PPG-N, there is not a direct link. It is not appropriate to ascribe numerical rating / background level differences to LOAEL and SOAEL because this fails to consider the context of the sound which is a key requirement of the Standard.

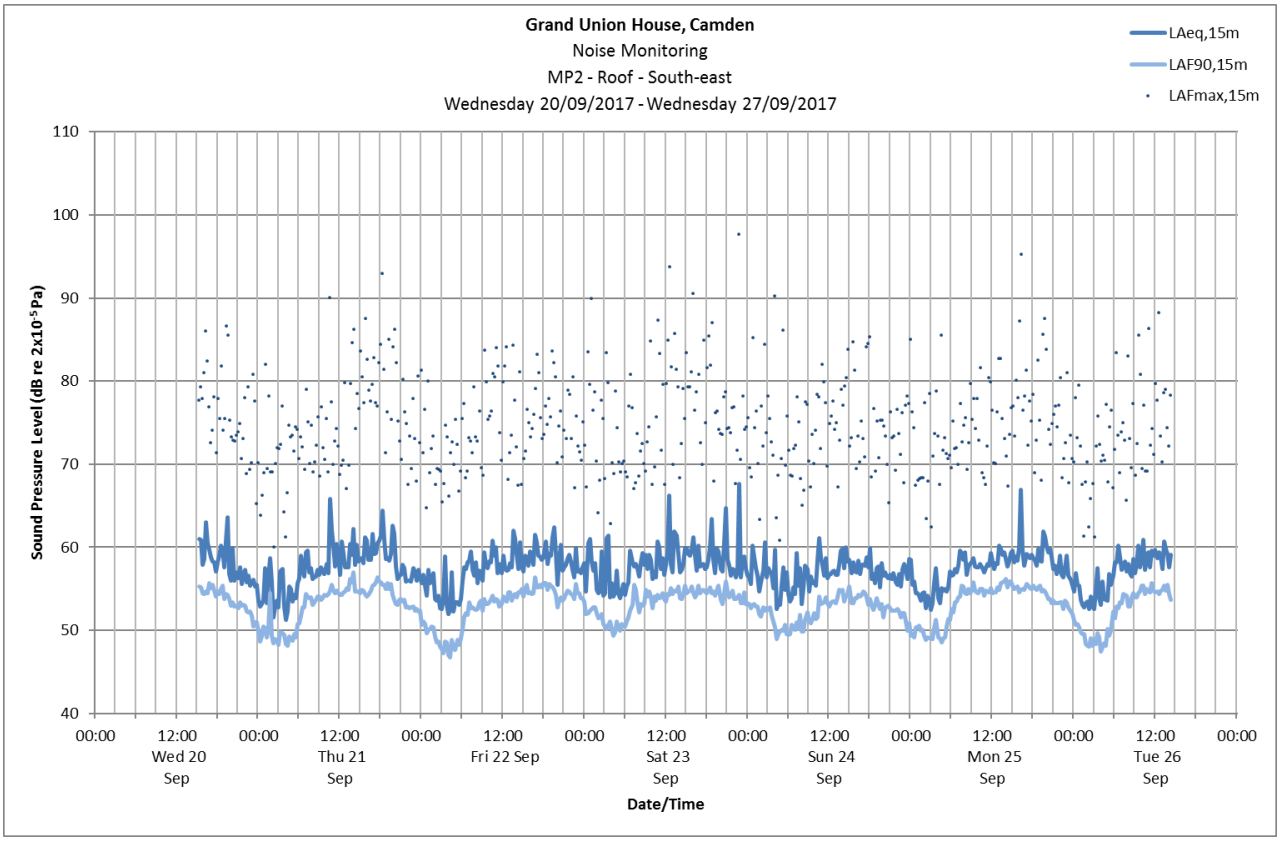
The significance of the effect of the noise in question (i.e. whether above or below SOAEL and LOAEL) should be determined on the basis of the initial estimate of impact significance from the BS4142:2014 assessment with reference to the examples of outcome described within the PPG-N and after having considered the context of the sound. It is necessary to consider all pertinent factors, including:

- the absolute level of the sound;
- the character and level of the residual sound compared to the character and level of the specific sound; and
- the sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions such as:
    - façade insulation treatment;
    - ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and
    - acoustic screening.

Appendix C

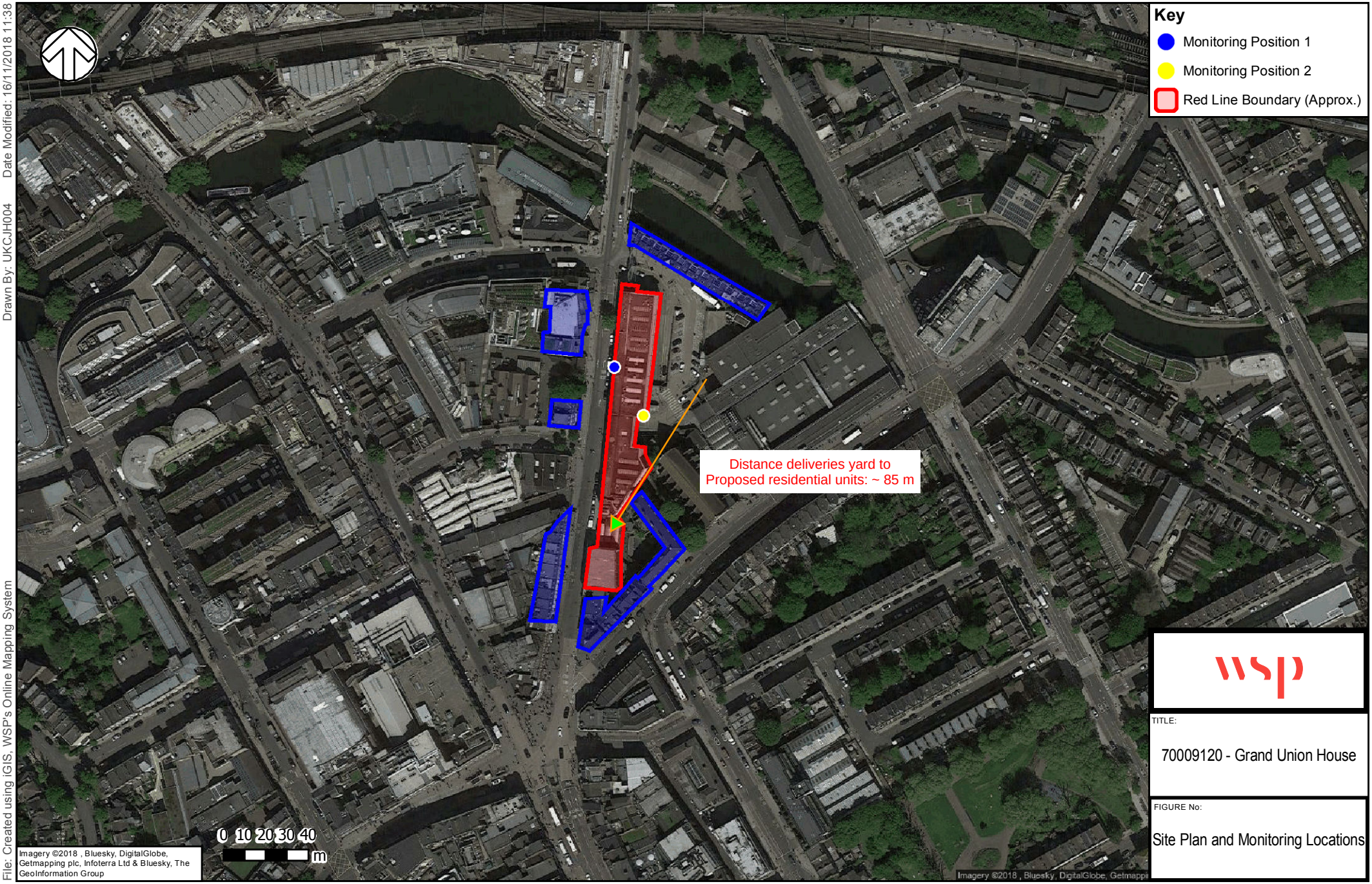
NOISE SURVEY RESULTS


Grand Union House, Camden
Noise Monitoring
MP1 - Roof - West
Wednesday 20/09/2017 - Wednesday 27/09/2017
LAeq,15m
LAF90,15m
LAFmax,15m
Sound Pressure Level (dB re 2x10⁻⁵ Pa)
110
100
90
80
70
60
50
40
00:00
12:00 Wed 20 Sep
00:00
12:00 Thu 21 Sep
00:00
12:00 Fri 22 Sep
00:00
12:00 Sat 23 Sep
00:00
12:00 Sun 24 Sep
00:00
12:00 Mon 25 Sep
00:00
12:00 Tue 26 Sep
00:00
Date/Time


Grand Union House, Camden
Noise Monitoring
MP2 - Roof - South-east
Wednesday 20/09/2017 - Wednesday 27/09/2017
LAeq,15m
LAF90,15m
LAFmax,15m
Sound Pressure Level (dB re 2x10⁻⁵ Pa)
110
100
90
80
70
60
50
40
00:00
12:00 Wed 20 Sep
00:00
12:00 Thu 21 Sep
00:00
12:00 Fri 22 Sep
00:00
12:00 Sat 23 Sep
00:00
12:00 Sun 24 Sep
00:00
12:00 Mon 25 Sep
00:00
12:00 Tue 26 Sep
00:00
Date/Time

Appendix D

NOISE SURVEY LOCATIONS



wsp

TITLE:

70009120 - Grand Union House

FIGURE No:

Site Plan and Monitoring Locations

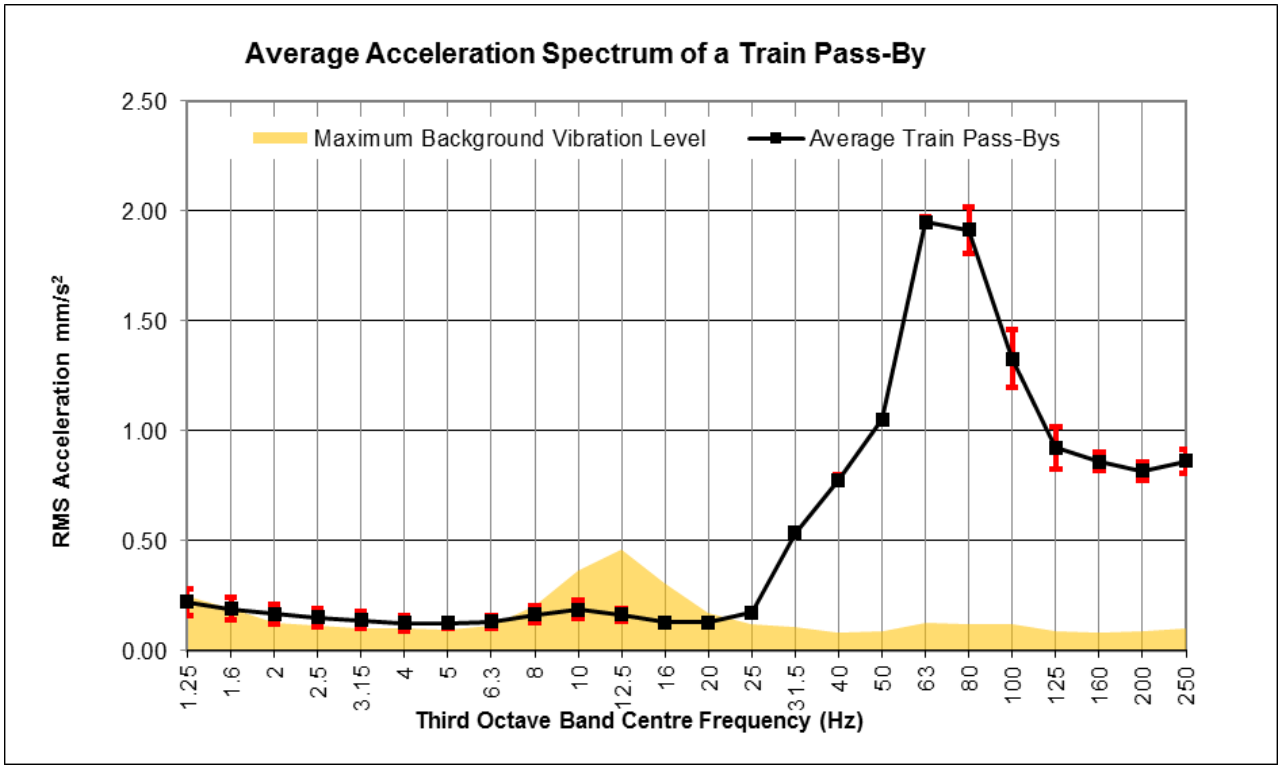
File: Created using iGIS, WSP's Online Mapping System

Drawn By: UKCJH004

Date Modified: 16/11/2018 11:38

Appendix E

VIBRATION SURVEY RESULTS


Average Acceleration Spectrum of a Train Pass-By
Maximum Background Vibration Level
Average Train Pass-Bys
RMS Acceleration mm/s²
2.50
2.00
1.50
1.00
0.50
0.00
1.25
1.6
2
2.5
3.15
4
5
6.3
8
10
12.5
16
20
25
31.5
40
50
63
80
100
125
160
200
250
Third Octave Band Centre Frequency (Hz)

Appendix F

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