



**PROPOSED RESIDENTIAL DEVELOPMENT AT
LAND WEST OF WESTBURY ROAD, WARMINSTER, WILTSHIRE**

NOISE AND VIBRATION ASSESSMENT

On behalf of:
BDW Trading Ltd



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1. INTRODUCTION

- 1.1 Hepworth Acoustics was commissioned by BDW Trading Ltd to carry out a noise assessment in connection with a proposed outline planning application for residential development at a site known as Land West of Westbury Road, Warminster, Wiltshire.
- 1.2 The application is for: Erection of up to 205 no. dwellings, community hub, public open space, access, infrastructure and associated works, with all other matters reserved.
- 1.3 The site is currently farmland, bounded to the southwest / west by the Wessex Mainline railway, to the south by an existing residential area, to the east by Westbury Road and to the north by further open farmland/fields.
- 1.4 The railway line is generally at or slightly above the ground level of the site across the southwest / west site boundary. Westbury Road is generally at grade with the site, albeit within a slope downwards in the land moving away from the road, towards the south.
- 1.5 Beyond the railway to the southwest is a mixed commercial / industrial area and business park at Markay Estate and Crusader Park. Towards the southernmost area, there are existing residences on the opposite side of the railway track from the proposed development site, intervening between the development site and the employment area.
- 1.6 The site location is shown in Figure 1. The illustrative masterplan for the proposed development is shown in Figure 2.
- 1.7 This assessment is based on baseline noise and vibration survey work undertaken by Hepworth Acoustics in 2020 and 2021. Noise survey work was firstly carried out over the course of 28-31 January and 3-4 February 2020, hence prior to any restrictions relating to Covid-19. Subsequently, an additional noise survey, plus a ground vibration survey, were undertaken over the course of 4-5 February 2021, hence more recently but during a period of restrictions relating to Covid-19. Nonetheless, potential small impacts associated with those restrictions have been taken into account in the assessment. Further, we are aware of no changes to local circumstances in the intervening period (i.e. up to issue of this report) that would lead to any appreciable change in baseline conditions.
- 1.8 The various acoustics indices referred to in this report are described in Appendix A. All noise levels in the text have been rounded to the nearest decibel as fractions of a decibel are imperceptible.

2. NOISE AND VIBRATION CRITERIA

NPPF / NPSE

- 2.1 The *National Planning Policy Framework* (NPPF), December 2024, states at paragraph 187 that *“Planning policies and decisions should contribute to and enhance the natural and local environment by: ... e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of ... noise pollution ...”*.
- 2.2 Paragraph 198 states that *“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 ...”*.
- 2.3 Paragraph 200 states that: *“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.”*
- 2.4 The Noise Policy Statement for England (NPSE) 2010, as referred to in the NPPF, includes three aims:
- 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.
- 2.5 However, there is as yet no specific guidance on numerical acoustic assessment/design criteria for proposed new housing developments provided in the NPPF, accompanying Technical Guidance document, National Planning Practice Guidance ‘Noise’, nor the NPSE.

ProPG: Planning & Noise

- 2.6 ProPG: Planning & Noise ‘Professional Practice Guidance on Planning & Noise’ 2017 provides “*guidance on a recommended approach to the management of noise within the planning system in England*”, predominantly for proposed new residential developments on land that is exposed to transportation noise.
- 2.7 The ProPG recommends a staged approach to assessment. Stage 1 is an initial site noise risk assessment, indicating whether the proposed site is considered to pose a negligible, low, medium or high risk from a noise perspective.
- 2.8 At low noise levels, the more likely the site is to be acceptable from a noise perspective provided that a good acoustic design process is followed and an ADS (Acoustic Design Statement) confirms how the adverse impacts of noise will be mitigated and minimised in the finished development.
- 2.9 As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and an ADS confirms how the adverse impacts of noise will be mitigated and minimised, and which clearly demonstrate that a significant adverse noise impact will be avoided in the finished development.
- 2.10 Higher noise levels indicate that there is an increased risk that development may be refused on noise grounds. This risk may be reduced by following a good acoustic design process that is demonstrated in a detailed ADS.
- 2.11 Stage 2 of the recommended approach in ProPG is a full assessment to consider good acoustic design. The guidelines of ProPG in terms of suitable acoustic design criteria are broadly consistent with the guidance of BS 8233, and the sound insulation recommendations made later in this report have been designed to achieve the BS 8233 guidelines, as described below.
- 2.12 The scope of the ProPG is restricted to sites that are exposed predominantly to noise from transportation sources. However, the recommended approach is also stated as being suitable where some industrial or commercial noise contributes to the acoustic environment provided that it is “*not dominant*”.

BS 8233

- 2.13 British Standard 8233: 2014 Guidance on sound insulation and noise reduction for buildings, which carries the full weight of an adopted British Standard recommends guidance on design criteria for acceptable noise levels within residential accommodation. BS 8233 guidelines for the daytime (0700-2300hrs) and night-time (2300-0700hrs) periods are summarised in Table 1.

Table 1: BS 8233 Recommended Acoustic Design Criteria

Activity	Location	Internal Noise Levels	
		Daytime 0700-2300hrs	Night-time 2300-0700hrs
Resting	Living room	35 dB $L_{Aeq,16hr}$	-
Dining	Dining room / area	40 dB $L_{Aeq,16hr}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq,8hr}$

- 2.14 BS 8233 also states that, “where development is considered necessary or desirable ... the internal target levels [i.e. those in Table 1] may be relaxed by up to 5dB and reasonable internal conditions still achieved”.
- 2.15 BS 8233 clarifies that the above guidance relates only to noise without specific character (e.g. such as that which has a distinguishable, discrete and continuous tone, is irregular enough to attract attention, or has strong low-frequency content) and that where such characteristics are present, lower noise limits might be appropriate.
- 2.16 Further, BS 8233 states that if there is a reliance on closed windows to meet the guide values, “there needs to be an appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level”. Further, it is stated that assessments should be based on a room with “adequate ventilation provided (e.g. trickle ventilators should be open)”.
- 2.17 BS 8233 also recognises that regular individual noise events at night can cause sleep disturbance. Peaks of noise from individual events are usually described in terms of L_{Amax} values and these can be highly variable and unpredictable. In this regard, ProPG: Planning & Noise ‘Professional Practice Guidance on Planning & Noise’ 2017 states that “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 45dB $L_{Amax,F}$ 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”.
- 2.18 Regarding outdoor living areas, Clause 7.7.3.2 of BS 8233 states that “it is desirable that the external noise level does not exceed 50dB $L_{Aeq,T}$, with an upper guideline value of 55dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is 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, 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, developments should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited”.

BS 4142

- 2.19 British Standard 4142: 2014 +A1:2019, *Methods for rating and assessing industrial and commercial sound* provides methods for rating and assessing sound of an industrial nature from industrial or commercial premises.
- 2.20 This requires the sound from a specific source (in L_{Aeq}) to be compared with the existing background sound level (L_{A90}) outside residential locations. The standard also puts weight on the importance on the context in which the sound will occur.
- 2.21 The noise ‘rating’ level ($L_{Ar,T}$) is derived based on the ‘specific’ L_{Aeq} sound level attributable to the operation with an ‘acoustic feature’ penalty added for any sound sources which give rise to tonal, impulsive, intermittent, or other characteristics readily distinctive against the residual acoustic environment.
- 2.22 BS 4142 stipulates that impacts should be assessed over a reference time interval ‘T’ of 1-hour during the daytime (0700-2300hrs) and 15-minutes during the night-time (2300-0700hrs).
- 2.23 An initial estimate of the impact of the operation is determined by subtracting the background level from the ‘rating’ level. BS 4142 states that:
- A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context
 - A difference of around +5dB is likely to be an indication of an adverse impact, depending on the 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
- 2.24 Where the initial estimate of the impact needs to be modified due to the context, BS 4142 states that all pertinent factors should be taken into account in determining whether the initial estimate of the impact needs to be modified, including:
- The absolute level of noise, including “where background noise levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds background. This is especially true at night”
 - The character and level of the residual noise
 - The sensitivity of the receptor

BS 6472

- 2.25 British Standard 6472: 2008 *Guide to evaluation of human exposure to vibration in buildings. Part 1: Vibration sources other than blasting* provides guidance on predicting the human response to vibration in buildings. The standard describes how to determine the vibration dose value (VDV) from frequency-weighted vibration measurements.

- 2.26 BS 6472 further explains how the VDV is used to estimate the probability of adverse comment which might be expected from human beings experiencing vibration in buildings.
- 2.27 The threshold levels stated in BS 6472 for the probability of adverse comment from vibration are shown in Table 2.

Table 2: BS 6472 Vibration Threshold Levels

Place and time	Low probability of adverse comment $\text{ms}^{-1.75}$ (1)	Adverse comment possible $\text{ms}^{-1.75}$	Adverse comment probable $\text{ms}^{-1.75}$ (2)
Residential buildings 16 h day	0.2 – 0.4	0.4 – 0.8	0.8 – 1.6
Residential buildings 8 h day	0.1 – 0.2	0.2 – 0.4	0.4 – 0.8

Note: (1) Below these ranges adverse comment is not expected; (2) Above these ranges adverse comment is very likely.

3. NOISE AND VIBRATION SURVEY

Railway Noise Survey

- 3.1 Railway noise monitoring was undertaken at the site over a continuous 72-hour period commencing at 1500hrs on Tuesday 28 January 2020. Noise levels were measured in sequential 5-minute samples at a single location towards the southwest site boundary, close to the railway line, identified as Location 1 in Figure 1.
- 3.2 An extended survey duration was adopted to account for any fluctuation in daytime and night-time noise levels resulting from varying levels of freight activity.
- 3.3 The actual daytime $L_{Aeq,16hr}$ and night-time $L_{Aeq,8hr}$ noise exposure levels at Location 1 have been obtained from the logarithmic average of all measured $L_{Aeq,5min}$ noise measurement samples over each of those periods. To provide a robust interpretation of ProPG guidelines relating to L_{Amax} , the overall night-time L_{Amax} noise level has been determined for assessment purposes as the measured $L_{Amax,5min}$ exceeded no more than 3 times over any full night-time period. This accounts for the relatively high magnitude of L_{Amax} levels from trains, set against comparatively low frequency of occurrence of night-time events.
- 3.4 Overall railway noise levels for Location 1 are presented in Table 3.

Table 3: Overall Railway Noise Levels at Location 1 – 2020

Period	Daytime (0700-2300hrs)	Night-time (2300-0700hrs)	
	dB $L_{Aeq,16hr}$	$L_{Aeq,8hr}$	L_{Amax}
Daytime (partial) – 28 Jan	(59)		
Night-time – 28/29 Jan		51	81
Daytime – 29 Jan	56		
Night-time – 29/30 Jan		50	77
Daytime – 30 Jan	57		
Night-time – 30/31 Jan		50	79
Daytime (partial) – 31 Jan	(56)		
Overall	57	51	81

- 3.5 Further railway noise monitoring was undertaken at the site over a continuous 24-hour period commencing at 1500hrs on Thursday 4 February 2021. Noise levels were measured in sequential 15-minute samples at a location close to Location 1, but set further back from the nearest railway line, representative of the nearest proposed residences. This is identified as Location 2 in Figure 1.
- 3.6 The daytime $L_{Aeq,16hr}$ and night-time $L_{Aeq,8hr}$ noise exposure levels and the overall night-time L_{Amax} noise level at Location 2 have been obtained on the same basis as for Location 1 and are summarised in Table 4.

Table 4: Overall Railway Noise Levels at Location 2 – 2021

Period	Daytime (0700-2300hrs)	Night-time (2300-0700hrs)	
	dB $L_{Aeq,16hr}$	$L_{Aeq,8hr}$	L_{Amax}
Daytime (partial) – 4 Feb	55		
Night-time – 4/5 Feb		51	81
Daytime (partial) – 5 Feb	55		
Overall	55	51	80

- 3.7 The noise levels measured at Locations 1 and 2 are due to railway noise. Residual ambient noise was at a low level.
- 3.8 During the daytimes, it was noted that some noise was just audible at times from the employment area to the southwest of the site, beyond the railway line. During the 2020 survey, this in fact appeared to be attributable largely to some construction-type activity. During the 2021 survey, this element was less conspicuous, and the noise attributable to the employment area was less noticeable, albeit present at a low level on occasions.
- 3.9 The site noise survey was attended during the late evening of Thursday 4 February 2021 at about 2130-2200hrs, and again on the morning of Thursday 4 February 2021 at about 0630-0700hrs. At these times it was noted that there was no noticeable noise from the employment area. Both in the evening and early morning, a sortie to the employment area identified that most businesses were indeed fully shut during those hours and that generally there was no noise generation.
- 3.10 A notable exception was some steady machinery noise and also some minor forklift truck activity, prior to 0700hrs, to the west side of an industrial building that is further south than the proposed development site. However, this was not discernible either at the application site, or at the existing residential area to the west of the railway line, due to the acoustic screening provided by the industrial building itself.
- 3.11 During the daytime, noise levels from the employment area are low, and are not readily measurable even over the more distant road traffic noise, which itself is well below the dominant railway noise.
- 3.12 It is therefore appropriate in line with ProPG guidelines to assess the noise environment straightforwardly based on the measured railway noise levels, as the mitigation required to adequately control railway noise will be at least sufficient to control noise from any other sources to the southwest.

Railway Vibration Survey

- 3.13 Over the same continuous 24-hour period commencing at 1500hrs on Thursday 4 February 2021, continuous ground vibration monitoring was undertaken at Location 2, in sequential 30-second samples.

- 3.14 Overall vibration levels at Location 2 are presented in Table 5. However, due at least in part to the separation distance to the railway line, the measured vibration levels do not in fact result in any measured impact upon the measurement 'floor' of the recorder i.e. the ground vibration levels were so low as to be unmeasurable.

Table 5: Overall Vibration Levels at Location 2

Period	Vibration Dose Values in $\text{ms}^{-1.75}$		
	x-axis	y-axis	z-axis
Daytime (partial) – 4 Feb	0.028	0.022	0.025
Night-time – 4/5 Feb	0.028	0.023	0.028
Daytime (partial) – 5 Feb	0.027	0.022	0.026

Road Traffic Noise Measurements

- 3.15 Road traffic noise monitoring was undertaken at the site over a continuous 17-hour period commencing at 1400hrs on Tuesday 4 February 2020 at a single location close to Westbury Road, identified as Location 3 in Figure 1.
- 3.16 Overall daytime $L_{\text{Aeq},16\text{hr}}$ road traffic noise levels at Location 3 have been determined in accordance with the 'Shortened Measurement Procedure' described in the Department of Transport document 'Calculation of Road Traffic Noise' (CRTN), 1988. This procedure involves taking noise measurements in terms of $L_{\text{A10,T}}$ over representative time periods within any three consecutive hours between 1000hrs and 1700hrs. By taking the $L_{\text{A10},3\text{hr}}$ as the arithmetic mean of the measured L_{A10} values, the $L_{\text{A10},18\text{hr}}$ value can then be calculated. The correction to obtain the $L_{\text{A10},18\text{hr}}$ value from the $L_{\text{A10},3\text{hr}}$ level is -1dB. The $L_{\text{A10},18\text{hr}}$ values have then been converted into the equivalent $L_{\text{Aeq},16\text{hr}}$ values by applying a correction of -2dB, as set out in paragraph 6.2.2 of BS 8233.
- 3.17 The actual overall night-time $L_{\text{Aeq},8\text{hr}}$ noise exposure level at Location 3 has been obtained from the logarithmic average of all measured $L_{\text{Aeq},5\text{min}}$ noise measurement samples over the period 2300-0700hrs. To provide a robust interpretation of ProPG guidelines relating to L_{Amax} , the overall night-time L_{Amax} noise level has been determined for assessment purposes as the measured $L_{\text{Amax},5\text{min}}$ noise level exceeded no more than 5 times over the full night-time period.
- 3.18 Overall road traffic noise levels for Location 3 are presented in Table 6.

Table 6: Overall Road Traffic Noise Levels at Location 3 – 2020

Location	Daytime (0700-2300hrs)	Night-time (2300-0700hrs)	
	dB $L_{\text{Aeq},16\text{hr}}$	$L_{\text{Aeq},8\text{hr}}$	L_{Amax}
3	65	55	75

- 3.20 Further road traffic noise monitoring was undertaken at the site over a continuous 3-hour period commencing at 1200hrs on Thursday 4 February 2021, again at Location 3. During the same period, some additional short-term attended noise measurements were undertaken at further locations representative of the nearest proposed residential facades, identified as Locations 4, 5 and 6, in Figure 1.
- 3.21 All supplementary noise measurements at Locations 4 - 6 were undertaken in 5-minute samples. In broad accordance with the 'Comparative Measurements' technique set out in the Department of Transport document 'Calculation of Road Traffic Noise' (CRTN), 1988, the average differences in measured 5-minute sample noise levels at Locations 4, 5 and 6 with the concurrent measurements at Location 3 have been determined.
- 3.22 Noting that the 2021 road traffic noise measurements were undertaken during a national Covid-19 lockdown period, potentially resulting in reduced traffic flows, these differences have been subsequently applied to the overall noise levels measured in more 'normal' circumstances in February 2020. The derived overall road traffic noise levels for Location 4, 5 and 6 are presented in Table 7.

Table 7: Overall Road Traffic Noise Levels at Locations 4, 5 and 6

Location	Daytime (0700-2300hrs)	Night-time (2300-0700hrs)	
	dB $L_{Aeq,16hr}$	$L_{Aeq,8hr}$	L_{Amax}
4	63	53	73
5	61	51	71
6	60	50	70

Survey Details

- 3.23 Noise monitoring at Locations 1 and 2 was undertaken using a Norsonic 140 Class 1 Integrating Sound Level Meter (serial no. 1406529). Noise monitoring at Location 3 was undertaken using a Norsonic 118 Class 1 Integrating Sound Level Meter (serial no. 31617). This applies equally to the 2020 and 2021 surveys.
- 3.24 Noise measurements at Locations 4, 5 and 6 were undertaken using a Bruel & Kjaer 2260 Type 1 Integrating Sound Level Meter (serial no. 2467014). Calibration checks were carried out on all Sound Level Meters before and after use using a Bruel & Kjaer Acoustic Calibrator, Type 4231 (serial no. 2389221), and no variation in the calibration levels was observed.
- 3.25 The measurement microphones were fitted with windshields and mounted in 'free-field' conditions at about 1.5m above local ground at all locations.
- 3.26 The vibration measurements were undertaken using a Vibrock V901-02 triaxial vibration recorder (serial no. 1024) fitted with a Vibrock V901-VDV transducer. The vibration transducer was mounted on a paving slab on well compacted earth with a sandbag laid over.

- 3.27 The weather throughout the survey periods, both in 2020 and 2021, was dry with light winds of speeds typically less than 5m/s.
- 3.28 All noise measurements are presented in Appendix II. The full set of ground vibration data is not included in the appendices because, as set out above, the train vibration was so low that it did not result in any measurable impact upon the measurement 'floor' of the vibration recorder.

4. NOISE AND VIBRATION ASSESSMENT AND RECOMMENDATIONS

- 4.1 Notwithstanding that train vibration does not result in any measurable impact upon the measurement 'floor' of the recorder, the vibration dose values levels measured at Location 2 have been compared against the threshold levels shown in BS 6472 for adverse comment from vibration shown in Table 2. Both during the daytime and night-time, it can be seen that the measured VDV's are well below the threshold level at which there is a low probability of adverse comment.
- 4.2 It is considered that any amplification of vibration from transfer functions within the future houses will not be significant, ensuring that vibration levels received by future occupants will be below the range of 'low probability of adverse comment'. It is therefore concluded that there is no requirement for specific vibration control measures for the proposed development.
- 4.3 Based on the overall noise levels at Locations 1 and 2, railway noise levels fall within the 'low' risk category as set out in the Stage 1 guidance of ProPG, for both the daytime and night-time periods, albeit towards the higher end of this category at night.
- 4.4 Based on the overall noise levels at Locations 4 - 6, road traffic noise levels fall within the 'low' risk category as set out in the Stage 1 guidance of ProPG, for both the daytime and night-time periods, albeit towards the higher end of this category for both periods.
- 4.5 In both cases, therefore, noise mitigation measures will be necessary to ensure good acoustic design and a suitable acoustic environment for future occupants. However, there are no overarching constraints to residential development by reason of noise.
- 4.6 For internal noise levels in areas close to the railway line, based on the measured railway noise levels and the illustrative masterplan shown in Figure 1, no specific noise mitigation measures are required to adequately control daytime noise levels; this will be achieved using standard thermal double glazing and standard non-acoustic trickle vents.
- 4.7 For the night-time, the 'average' $L_{Aeq,8hr}$ railway noise levels are also at a modest level, however the L_{Amax} noise levels for individual train events are such that upgraded acoustically rated glazing and acoustically attenuated ventilation is necessary for bedrooms overlooking the railway line.
- 4.8 For the 'front-line' of houses backing on to the railway line, for bedrooms with windows on rear or side elevations within about 30-45m of the railway, it is recommended that an acoustic glazing system is employed, providing the minimum Sound Reduction Indices (SRIs) set out in Table 8.

Table 8: Glazing SRIs - Bedrooms with Windows Overlooking Railway within about 30-45m

	Octave Band Centre Frequency, Hz					
	125	250	500	1k	2k	4k
SRI, dB	26	36	46	50	52	63

- 4.9 The SRIs set out in Table 8 are typically achievable using a system comprising one 12.8mm thick laminated pane and one 8.8mm thick laminated pane on a 16mm air cavity (i.e. 12.8_{lam}-16-8.8_{lam}). In these cases, any trickle ventilation is to be acoustically attenuated, rated at not less than 44dB $D_{n,e,w}$. This may necessitate through wall acoustic vents instead of window frame type vents.
- 4.10 For houses set slightly further back from the railway, for bedrooms with windows with a view towards the railway line within about 45-80m from the tracks, it is recommended that a more modest acoustic glazing system is employed, providing the minimum Sound Reduction Indices (SRIs) set out in Table 9.

Table 9: Glazing SRIs - Bedrooms with Windows Overlooking Railway within about 45-80m

	Octave Band Centre Frequency, Hz					
	125	250	500	1k	2k	4k
SRI, dB	26	27	34	40	38	46

- 4.11 The SRIs set out in Table 9 are typically achievable using a system comprising one 10mm thick standard pane and one 6mm thick standard pane on a 12mm air cavity (i.e. 10-12-6). In these cases, any trickle ventilation is to be acoustically attenuated, rated at not less than 38dB $D_{n,e,w}$.
- 4.12 For internal noise levels in areas close to Westbury Road, based on the measured road traffic noise levels and the illustrative masterplan shown in Figure 1, it is recommended that an acoustic glazing system is employed, providing the minimum Sound Reduction Indices (SRIs) set out in Table 9, i.e. as per the 10-12-6 system described above. In these cases, again, any trickle ventilation is to be acoustically attenuated, rated at not less than 38dB $D_{n,e,w}$.
- 4.13 For outdoor noise levels in gardens, in areas close to the railway line, gardens are proposed to back on to the railway line. This represents a continuation of the general layout arrangement of existing residences adjacent to the railway, immediately to the southeast of site. The noise survey results demonstrate that noise levels will be at or within the BS 8233 'upper guideline value' of 55dB $L_{Aeq,T}$ in areas closest to the rear of the proposed houses, where quiet amenity would be most required.
- 4.14 Noise levels in areas towards the far ends of the gardens, i.e. further from the houses, and closer to the railway line, may be up to 1-2dB above the 'upper guideline limit', without any additional mitigation in place. This would not be a perceptible exceedance over and above the guidelines limit, and hence is not significant. Nonetheless, it would be beneficial, where possible, to incorporate acoustic screening to the proposed garden areas, potentially taking the visual form of a relatively standard garden wall or fence.
- 4.15 Ideally, any acoustic screen will need to be of adequate height to just interrupt a direct line-of-sight from a point 1.5m above the centre of private rear gardens to the railway tracks. It is recognised that this may not be feasible in all areas, due to the site topography relative to the railway line.

- 4.16 However, due to the very low exceedance of the '*upper guideline limit*', it is likely that even where a direct line-of-sight remains to the railway line at the nearest point, where this line of sight is interrupted to either side, there will be sufficiently reduced angle-of-view of the railway so as to still achieve an appropriate reduction of railway noise.
- 4.17 Taking account of this and the provisions of Clause 7.7.3.2 of BS 8233 (as per paragraph 2.17 of this report), and also noting that noise levels at or within the '*upper guideline limit*' will be achieved in areas closer to houses, it is recommended that acoustic screening in this area of the site should be limited to a height of 2.5m above local ground, at the garden boundaries.
- 4.18 In areas close to Westbury Road, houses are in general proposed to face towards the road, with gardens located to the opposite side. In such cases, the houses themselves will act as substantial acoustic screens, ensuring that traffic noise levels in gardens will be well within BS 8233 guidelines. In any cases where houses and gardens are oriented side-on to the road, or where gardens are otherwise not protected, then it is recommended that acoustic screening is provided at the relevant boundaries of the garden areas, again, potentially taking the visual form of a relatively standard garden wall or fence. These acoustic screens should be at a height of 1.8m above local ground.
- 4.19 Any acoustic screening should be of overall mass not less than 10kg/m² and nominal thickness not less than 20mm. It should be imperforate with no holes or gaps and should be sealed at the base.
- 4.20 To summarise, suitable mitigation measures can be readily incorporated within development proposals as set out herein. This may be readily enshrined for planning purposes by way of a suitable planning condition.

5. SUMMARY

- 5.1 Hepworth Acoustics was commissioned by BDW Trading Ltd to carry out a noise and vibration assessment in connection with a proposed outline planning application for residential development at a site known as Land West of Westbury Road, Warminster, Wiltshire.
- 5.2 Railway noise and road traffic noise surveys have been undertaken at the site and daytime and night-time noise exposure levels have been determined.
- 5.3 Based on the results of the noise surveys, railway noise levels fall within the 'low' risk category as set out in the Stage 1 guidance of ProPG, for both the daytime and night-time periods, albeit towards the higher end of this category in the night-time. Road traffic noise levels fall within the 'low' risk category for both the daytime and night-time periods
- 5.4 There are therefore no overarching constraints to residential development by reason of noise, although some noise mitigation measures will be required to ensure good acoustic design and a suitable acoustic environment for future occupants.
- 5.5 Recommendations of appropriate noise mitigation measures have been set out in order to achieve appropriate acoustic criteria in line with relevant British Standard guidelines. This may be readily enshrined for planning purposes by way of a suitable planning condition.





Key:	Do not scale from this figure	Project: P25-262 Ref: Figure 2 Title: Illustrative Masterplan hepworthacoustics
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APPENDIX A: ACOUSTICS UNITS & INDICES

Sound and the decibel

A sound wave is a small fluctuation of atmospheric pressure. The human ear responds to these variations in pressure, producing the sensation of hearing. The ear can detect a very wide range of pressure variations. In order to cope with this wide range of pressure variations, a logarithmic scale is used to convert the values into manageable numbers. Although it might seem unusual to use a logarithmic scale to measure a physical phenomenon, it has been found that human hearing also responds to sound in an approximately logarithmic fashion. The dB (decibel) is the logarithmic unit used to describe sound (or noise) levels. The usual range of sound pressure levels is from 0 dB (threshold of hearing) to 120dB (threshold of pain).

Due to the logarithmic nature of decibels, when two noises of the same level are combined together, the total noise level is (under normal circumstances) 3 dB(A) higher than each of the individual noise levels e.g. 60 dB(A) plus 60 dB(A) = 63 dB(A). In terms of perceived 'loudness', a 3 dB(A) variation in noise level is a relatively small (but nevertheless just noticeable) change. An increase in noise level of 10 dB(A) generally corresponds to a doubling of perceived loudness. Likewise, a reduction in noise level of 10 dB(A) generally corresponds to a halving of perceived loudness.

The ear is not equally sensitive to sound at all frequencies. It is less sensitive to sound at low and very high frequencies, compared with the frequencies in between. Therefore, when measuring a sound made up of different frequencies, it is often useful to 'weight' each frequency appropriately, so that the measurement correlates better with what a person would actually hear. This is usually achieved by using an electronic filter called the 'A' weighting, which is built into sound level meters. Noise levels measured using the 'A' weighting are denoted dB(A) or dBA.

Frequency and Hertz (Hz)

As well as the loudness of a sound, the frequency content of a sound is also very important. Frequency is a measure of the rate of fluctuation of a sound wave. The unit used is cycles per second, or hertz (Hz). Sometimes large frequency values are written as kiloHertz (kHz), where 1 kHz = 1000 Hz.

Young people with normal hearing can hear frequencies in the range 20 Hz to 20 kHz. However, the upper frequency limit gradually reduces as a person gets older.

Glossary of Terms

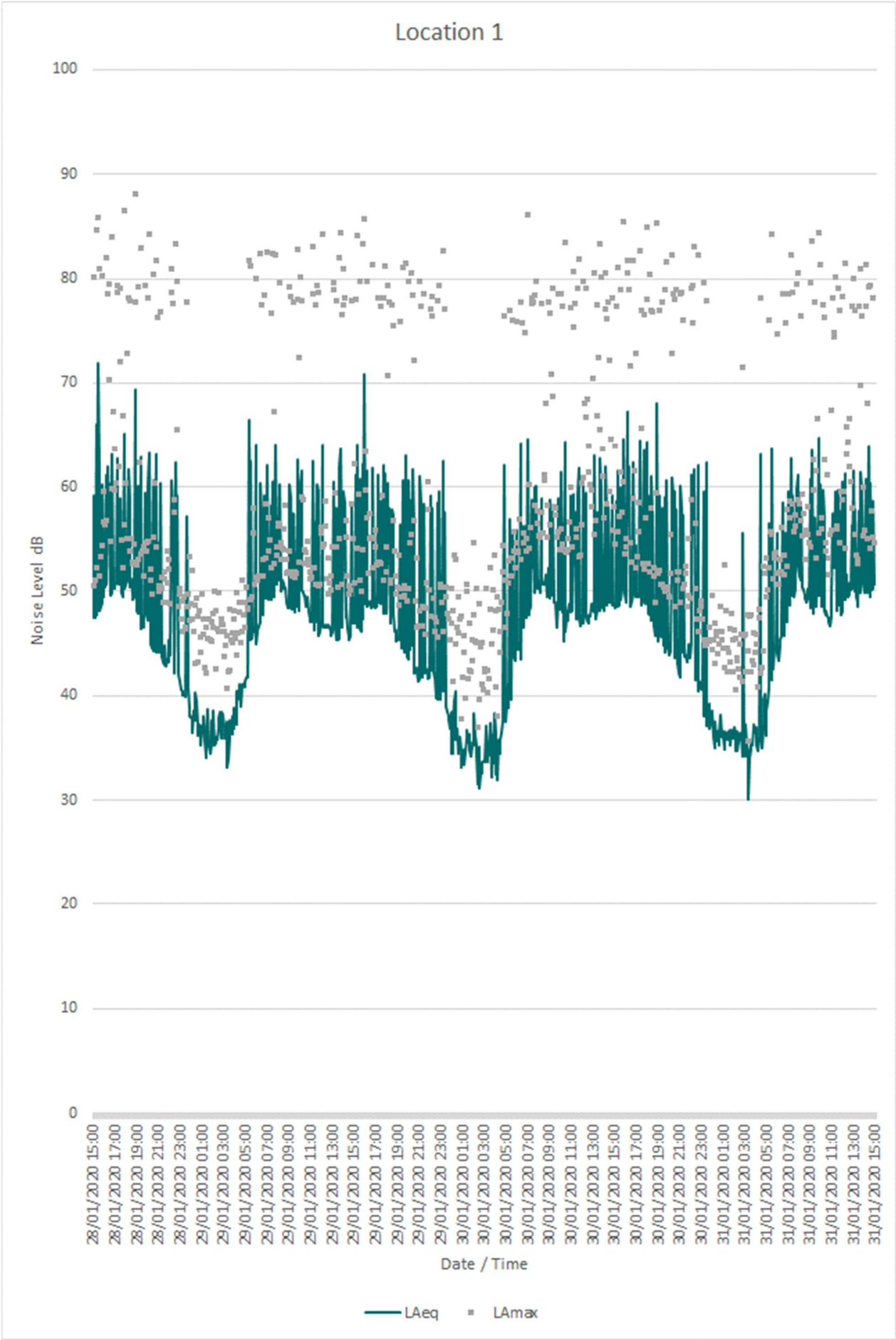
When a noise level is constant and does not fluctuate, it can be described adequately by measuring the dB(A) level. However, when the noise level varies with time, the measured dB(A) level will vary as well. In this case it is therefore not possible to represent the noise climate with a simple dB(A) value. In order to describe noise where the level is continuously varying, a number of other indices can be used. There are also a number of ways to describe sound insulation performance.

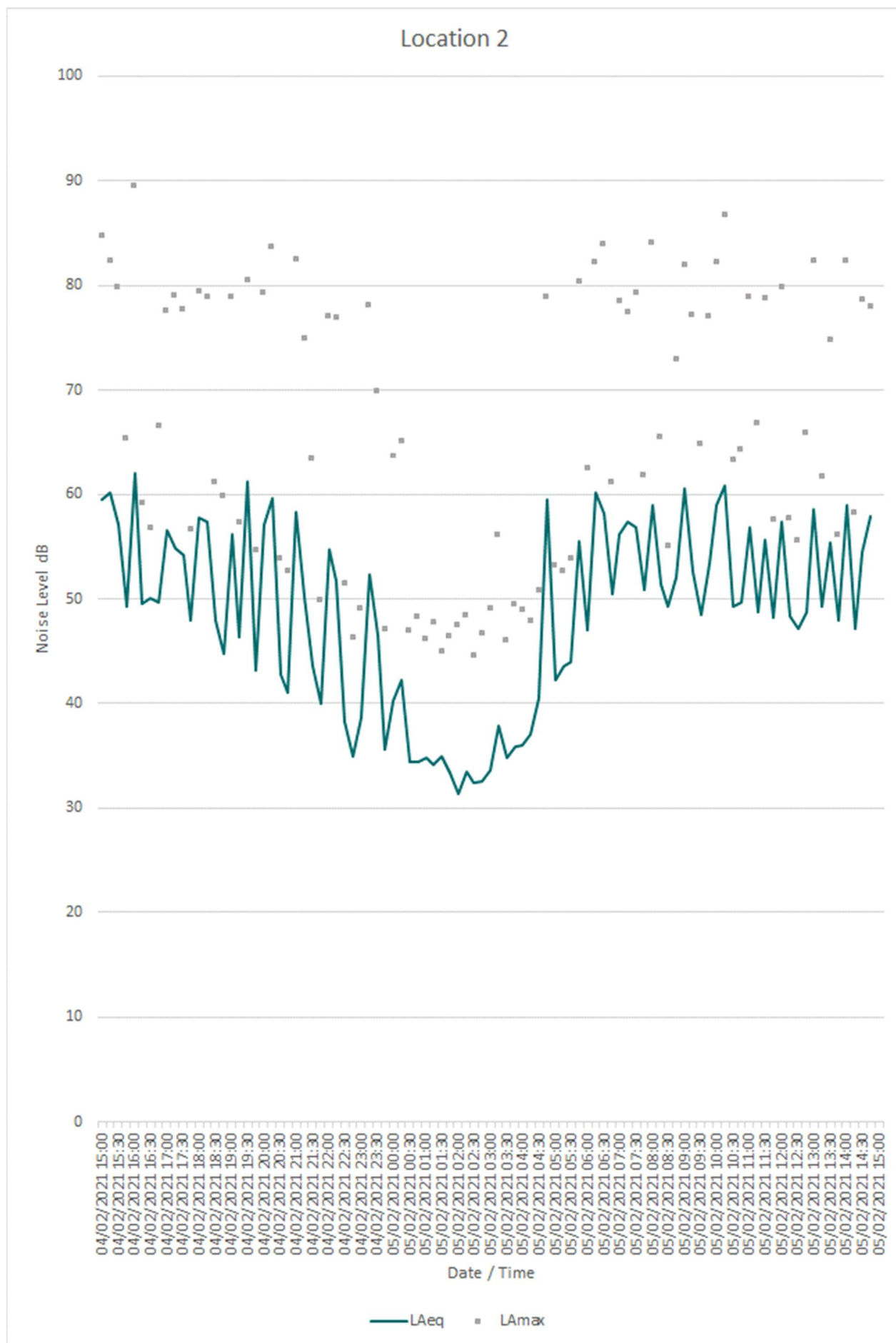
The indices used in this report are described below:

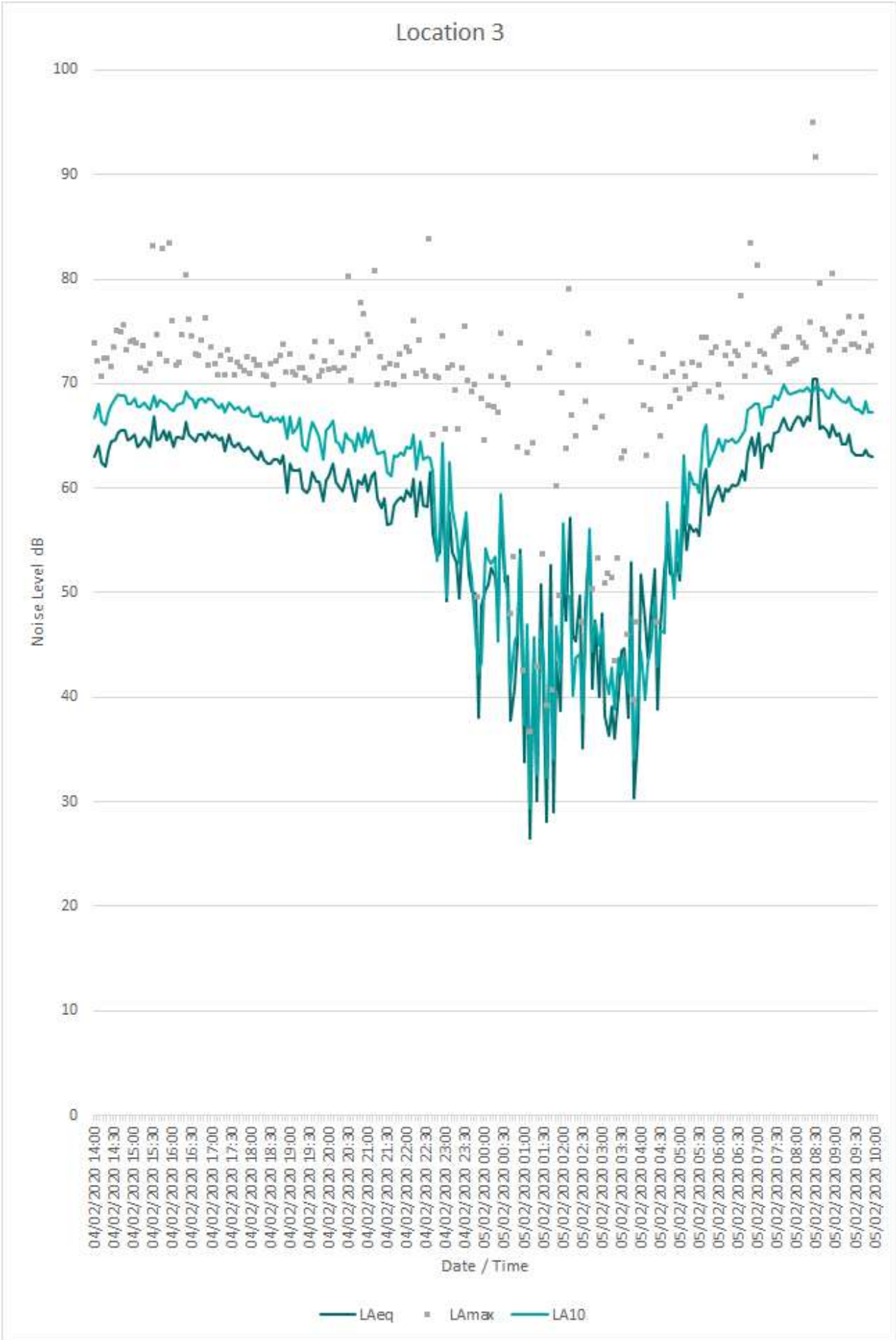
- $L_{Aeq,T}$** **A-weighted Equivalent Continuous Sound Level:** An average of the total sound pressure measured over a specified time period (T). In other words, $L_{Aeq,T}$ is the level of a steady sound which has the same total A-weighted sound pressure as the real fluctuating noise, measured over the same time period. It is increasingly being used as the preferred parameter for most forms of environmental noise.
- L_{Amax}** **Maximum A-weighted Sound Level with Fast Time-weighting:** The maximum A-weighted sound pressure level during the measurement period, using the Fast time-weighting of 125ms. L_{Amax} used in this report refers throughout to L_{AFmax} with the Fast time-weighting, denoted L_{AFmax} or $L_{Amax,f}$ in other documents but L_{Amax} in BS 8233:2014 standard notation.
- $L_{A10,T}$** **A-weighted 10 Percentile Level:** The A-weighted sound level exceeded for 10% of a measurement time period (T). $L_{A10,T}$ is often used for calculations of road traffic noise, such as in ‘*Calculation of Road Traffic Noise*’ (CRTN) 1988.
- $L_{A90,T}$** **A-weighted 90 Percentile Level:** The A-weighted sound level exceeded for 90% of a measurement time period (T). $L_{A90,T}$ is generally used as a measure of Background Sound Level.
- $D_{n,e,w}$** **Weighted Element Normalised Level Difference:** A frequency weighted single figure laboratory value quantifying the sound insulation performance of a building element, such as an air vent.
- R_w** **Weighted Sound Reduction Index:** A single figure frequency weighted laboratory sound insulation performance metric of a building element or construction arrangement (e.g. a wall).
- C_{tr}** **Transport Noise Spectral Adaptation Term:** A term used with single figure broadband sound insulation metrics (e.g. R_w , $D_{n,e,w}$ or $D_{nT,w}$) to account for the spectral composition of typical transport noise sources.
- VDV** **Vibration Dose Value:** A quantity developed to allow for the evaluation of human response to cumulative exposure to vibration over a reference time period (16-hour day or 8-hour night). VDV is the fourth root of the time integral (over the reference period T) of the fourth power of the frequency-weighted acceleration, with W_b or W_d frequency weightings as appropriate to the orientation of the axes:

$$VDV = \left[\int_0^T a^4(t) dt \right]^{\frac{1}{4}}$$

APPENDIX B: NOISE SURVEY RESULTS







Date	Time		Noise Level dB											
	Start	Stop	Location 3			Location 4			Location 5			Location 6		
			L _{Aeq}	L _{Amax}	L _{A10}	L _{Aeq}	L _{Amax}	L _{A10}	L _{Aeq}	L _{Amax}	L _{A10}	L _{Aeq}	L _{Amax}	L _{A10}
05/02/21	12:00	12:05	63	72	67	62	77	66						
05/02/21	12:05	12:10	64	73	68	63	72	67						
05/02/21	12:10	12:15	64	74	68	64	73	68						
05/02/21	12:15	12:20	64	77	68									
05/02/21	12:20	12:25	64	72	68				61	73	64			
05/02/21	12:25	12:30	63	71	67				59	68	63			
05/02/21	12:30	12:35	62	73	66				58	67	62			
05/02/21	12:35	12:40	63	73	67									
05/02/21	12:40	12:45	64	76	67							60	72	63
05/02/21	12:45	12:50	63	73	67							58	64	61
05/02/21	12:50	12:55	63	71	67							58	65	62
05/02/21	12:55	13:00	63	70	66									
05/02/21	13:00	13:05	64	71	67									
05/02/21	13:05	13:10	63	70	67									
05/02/21	13:10	13:15	62	70	66									
05/02/21	13:15	13:20	63	72	66									
05/02/21	13:20	13:25	63	72	67									
05/02/21	13:25	13:30	63	72	67									
05/02/21	13:30	13:35	63	73	67									
05/02/21	13:35	13:40	63	72	66									
05/02/21	13:40	13:45	63	73	66									
05/02/21	13:45	13:50	63	71	67									
05/02/21	13:50	13:55	63	77	67									
05/02/21	13:55	14:00	63	72	67									
05/02/21	14:00	14:05	64	74	67	64	74	67						
05/02/21	14:05	14:10	63	71	67	63	71	67						
05/02/21	14:10	14:15	62	73	66	62	73	66						
05/02/21	14:15	14:20	62	72	67									
05/02/21	14:20	14:25	62	73	66				59	68	62			
05/02/21	14:25	14:30	63	72	67				59	68	62			
05/02/21	14:30	14:35	62	72	65				59	68	63			
05/02/21	14:35	14:40	63	72	66									
05/02/21	14:40	14:45	63	76	66							59	76	62
05/02/21	14:45	14:50	64	73	67							59	66	62
05/02/21	14:50	14:55	64	77	67							61	70	63
05/02/21	14:55	15:00	62	77	66									