

Growing Baldock

Environmental Statement Volume 2: Figures & Appendices

Chapter 5: Noise

Appendix 5.4 Noise Impact Assessment

APPENDIX 5.4 – NOISE IMPACT ASSESSMENT

Introduction

- 5.4.1 This appendix has been produced to demonstrate the propagation of noise from existing noise sources and proposed transportation sources across the development site, and at proposed dwellings. In addition, it presents a description of the process which has been undertaken to determine the embedded mitigation at the Proposed Development site. Full details of the development site are described in the main noise and vibration chapter
- 5.4.2 The process which is set out herein is part of the site suitability assessment and is not part of the standard EIA process.
- 5.4.3 The technical content of this assessment has been provided by RPS personnel, all of whom are corporate members (MIOA) of the IOA (the UK's professional body for those working in acoustics, noise and vibration). This report has been peer reviewed within the RPS team to ensure that it is technically robust and meets the requirements of our Integrated Management System.
- 5.4.4 RPS is a member of the Association of Noise Consultants (ANC), the representative body for acoustics consultancies, having demonstrated the necessary professional and technical competence. The assessment has been undertaken with integrity, objectivity, and honesty in accordance with the Code of Conduct of the Institute of Acoustics (IOA) and ethically, professionally, and lawfully in accordance with the Code of Ethics of the ANC.

Assessment Methodology

Introduction

- 5.4.5 This section of the assessment details the assessment methodology utilised to consider the potential impact of noise on the Proposed Development, and the mitigation measures that are required to protect the amenity of the proposed residents.

Consultation

- 5.4.6 The following consultation has been carried out to inform the assessment methodology within this appendix. The consultation which has been undertaken is set-out in Table 5.4.1 below.

Table 5.4.1: Consultation Summary

Date	Consultee	Consultation	Consultee Comments
12 th February 2025	North Hertfordshire Council Environmental Health Department	Consultation on Baldock Urban Extension Noise Survey Methodology	Methodology confirmed in Scoping Response

Technical Guidance

- 5.4.7 This assessment has been undertaken in accordance with current planning and technical guidance, and best practice methods.
- Professional Practice Guidance on Planning & Noise. New Residential Development. May 2017 (ProPG).
 - British Standard 8233:2014 Guidance on sound insulation and noise reduction for buildings (BS:8233:2014).

- AVO - Acoustics Ventilation and Overheating - Residential Design Guide, 2020 (AVO).
- Building Bulletin 93: Acoustic Design of Schools (BB93).

Baseline Noise Levels – Site Wide

- 5.4.8 A noise measurement survey has been undertaken across the Site to inform the noise impact assessment. Noise monitoring has been undertaken in five locations between 25th March and 3rd April 2024 at the Proposed Development. The monitoring locations are considered to capture noise emissions from the existing sources. Full details of this survey are described in Appendix 5.2, and this survey forms the main basis for the assessment.
- 5.4.9 In addition, a detailed noise measurement survey matrix has been undertaken across the BA3 land parcel on the 4th June 2025. Further details on this survey are provided here-in.
- 5.4.10 The captured noise data has been used to assess the impact of existing sources of noise on the Proposed Development, and to determine the mitigation measures which are required to meet internal and external noise guideline levels at the proposed development site.

Noise Modelling

- 5.4.11 SoundPLAN v9.1 noise modelling software has been used to calculate the propagation of noise from the A505, site roads and other surrounding roads at proposed dwellings and the school, and to determine the need for any mitigation measures.
- 5.4.12 The modelling has been carried out in accordance with ISO 9613-2:2024 Acoustics - Attenuation of sound during propagation outdoors - Part 2: Engineering method for the prediction of sound pressure levels outdoors (ISO9613). The software uses geographical information to create a model of the study area on which to generate noise contours and includes objects that affect the propagation of sound, such as buildings and topography.

Ventilation and Overheating in Proposed Dwellings

- 5.4.13 This assessment includes a consideration of the potential risk of overheating in the proposed dwellings.

Baseline Conditions

Introduction

- 5.4.14 This section of the assessment sets out the details of the baseline measurement surveys.
- 5.4.15 Prior to undertaking the noise measurements, a review of the site was carried out using online free to view mapping and aerial and street photography.
- 5.4.16 Additionally, a site walk-over was conducted to ensure that there were no further noise sources which were not identified during the initial desk-based review of the site.
- 5.4.17 Two baseline surveys have been undertaken, these are;
- A long term fixed position site wide noise survey.
 - A detailed noise matrix on BA3 land parcel.

Long Term Fixed Position Site Wide Noise Survey

- 5.4.18 A noise measurement survey has been undertaken across the land parcels to inform the noise impact assessment. Noise monitoring has been undertaken in five locations between Wednesday 27th March and concluded at 12:30 hours on Tuesday 2nd April 2024. The monitoring locations are considered to be representative of the existing noise sensitive receptors, and have been selected to capture noise emissions from the existing sources.

5.4.19 The noise measurements locations are shown in Figure 5.2 in Appendix 5.5.

5.4.20 Site observations identified a number of noise sources which were audible at the Proposed Development, including:

- Continuous road traffic on the A505;
- Frequent road traffic on other local roads;
- Other, less dominant noise sources included:
- Birdsong;
- People talking;
- Noise from passing trains on the line which bisects the BA1 land parcels; and
- Overflying aircraft.

5.4.21 All sound level measurements were made using 'Class 1' Rion NL-52 sound level meters (SLMs) in accordance with BS 7445-2:1991. Calibration of the equipment was carried out before and after measurements using a Rion NC-74 calibrator. No significant drift ($< \pm 0.5$ dB) was observed.

5.4.22 Noise data was logged in 100 m/s samples, with the required assessment parameters and measurement periods extracted in post-processing. The sound pressure levels used in this assessment are the logarithmic average of the various measured daytime $L_{Aeq,16hr}$ and night-time $L_{Aeq,8hr}$ levels, which are themselves the logarithmic averages of all the 15-minute sound pressure data for each day and night-time period, respectively.

5.4.23 The maximum ($L_{AFmax,T}$) sound levels have been post-processed for the night-time period. The $L_{AFmax,T}$ level used in this assessment is the 10th highest $L_{AFmax,1min}$ level from a representative night-time period.

5.4.24 A summary of data collected during the noise survey is shown in Table 5.4.2 below, the locations are shown on Figure 5.2 in Appendix 5.5.

Table 5.4.2: Summary of Noise Monitoring Results

Measurement Location	Daytime		Night-time		
	Ambient Noise Level $L_{Aeq, 16hrs}$ (dB)	Background Sound Level $L_{A90, 1hr}$ (dB)	Ambient Noise Level $L_{Aeq, 8hrs}$ (dB)	Background Sound Level $L_{A90, 15min}$ (dB)	Night-time 10 th Highest Individual Event Levels $L_{AFmax,T}$ (dB)
LT1	63	53	57	84	39
LT2	65	49	59	81	38
LT3	62	50	55	75	39
LT4	72	50	65	89	38
LT5	76	67	70	87	37

5.4.25 These measured sound levels have been used to calibrate the acoustic noise model, and have been used in this assessment.

Baseline Noise Levels – BA3 Land Parcel

- 5.4.26 A detailed noise measurement survey matrix has been undertaken across the BA3 land parcel. This approach was prompted following comments from the design team, that the propagation of noise across the BA3 land parcel, shown in preliminary noise model results, did not appear to reflect the true sound levels on the site.
- 5.4.27 An attended baseline sound survey was undertaken at the BA3 land parcel to quantify the existing local sound climate across the site. The survey commenced at 10:00 hours and concluded at 16:00 hours on Wednesday 4th June 2025.
- 5.4.28 In addition, a second sound level meter was installed at LT5 to capture the reference noise from the A505 during the measurements matrix, and to ensure that the source of the dominant noise at BA3 remained constant throughout.
- 5.4.29 Noise measurements were undertaken in 16 positions across the BA3 land parcel in a matrix so to cover the whole site area. Measurements were taken in fixed locations and at set distances from the A505. A monitoring location plan is shown in Annex A. To cover as many points as possible, noise measurements during the detailed survey were limited to 15 minutes. This time period was considered to be suitably representative, as the results of the noise measurements at LT5 identified that road traffic noise from the A505 remained consistent throughout the survey period.
- 5.4.30 All sound level measurements were made using 'Class 1' Rion NL-52 sound level meters (SLM). The SLMs were set up to log the A-weighted broadband sound pressure level (SPL) in 100 ms periods. Measurements of the L_{Aeq} , L_{Amax} , and L_{A90} were undertaken at 100 ms intervals and averaged over 15-minute periods for the duration of the survey.
- 5.4.31 The weather conditions were noted to be fine and dry throughout the measurement survey. Cloud cover was low, temperature was around 18 degrees Celsius. Wind speeds varied up to around 6m/s. It is generally regarded that noise measurements should be undertaken in wind speeds up to 5 m/s. However, the slightly higher than ideal wind speeds were not considered likely to cause a significant impact to the measured levels. This opinion was verified through the observations undertaken throughout the measurements.
- 5.4.32 The results of the detailed noise measurement survey on BA3 are presented in Table 5.4.3 the locations are shown in Annex A of this appendices.

Table 5.4.3: Summary of Baseline Sound Level Data

Distance from the Top of the Embankment Alongside the A505 (m)	Measured Noise Levels		
	$L_{Aeq,15min}$		
	Northern Row	Mid Row	Southern Row
7.5	62	61	59
15	56	55	57
30	55	54	55
60	53	53	53
120	--	50	52
180	--	49	51

- 5.4.33 As is shown in the results in Table 5.4.3, at 30m from the top of the embankment alongside the A505, the measured sound level is 55dB(A) $L_{eq,15min}$ during the daytime. 55dB(A) is the upper guideline noise level for gardens of proposed dwellings, and the noise level limit for unoccupied playgrounds.

Details of the Noise Model

- 5.4.34 To calculate sound levels associated with road traffic movements on the A505, site roads and other surrounding roads, and the London to Cambridge railway line, a 3D noise model has been built using SoundPLAN v9.1 acoustic modelling software. The input data for the model has been based upon information from the baseline survey, and RPS's experience of other, similar projects.
- 5.4.35 The model predicts sound levels under light down-wind conditions based on hemispherical sound propagation with corrections for atmospheric absorption, ground effects, screening, and directivity based on the procedure detailed in ISO 9613-2:2024 '*Acoustics – Attenuation of sound during propagation outdoors - Part 2: Engineering method for the prediction of sound pressure levels outdoors*'.
- 5.4.36 The placement of road sources is based on the imported Ordnance Survey data and maps of the surrounding area, and they have been created in the model as line sources. Night-time $L_{AFmax,T}$ events have been modelled as moving point sources.
- 5.4.37 Typical sound power levels were allocated to the model sources and then calibrated such that the modelled noise levels matched up with the levels measured on site. This procedure was undertaken for daytime, night-time and night-time $L_{AFmax,T}$ noise levels.
- 5.4.38 The placement of the on-site buildings has been based on an indicative housing layout which represents one way in which dwellings could be set-out on the site.
- 5.4.39 The following assumptions have been incorporated into the noise model:
- The topography of the site and the surrounding area has been obtained from the Department for Environment, Food and Rural Affairs (Defra) as 1 m LiDAR data;
 - The effect of screening from solid structures (buildings) has been incorporated into the modelling process by importing OS Vector Map data into the model;
 - The garden fences have been modelled as 1.8 m fences; and
 - The ground type in the model has been set to mixed ground ($G=0.5$).
- 5.4.40 The noise model has been calibrated so that it is representative of the true acoustic conditions at the development site. This has been done by co-locating the noise monitoring locations from the baseline survey into the computer noise model. The noise emissions from the roads surrounding the site are subsequently adjusted in the computer noise model until a point is reached that the noise model is suitably representative of the existing acoustic environment. This is typically achieved once the measured levels are within 1dB of the noise model results.
- 5.4.41 Following this calibration process, predictions have been undertaken of noise levels across the development, and those which are incident on the façades of the proposed development due to road traffic sources and include the development traffic flows and the development itself.
- 5.4.42 Noise levels incident on the façades of the proposed development have been predicted based on the modelling assumptions and methodology detailed above. The model predicts daytime $L_{Aeq,16hr}$, night-time $L_{Aeq,8hr}$, and the 10th highest night-time $L_{AFmax,5min}$ levels. This is based upon an indicative development layout which shows one way in which the dwellings could be set-out on the site.
- 5.4.43 Details on the results obtained from the noise modelling can be found in Appendix 5.5. The following figures have been prepared;
- Figure 5-1 - Receptor Location Plan.
 - Figure 5-2 - Noise Monitoring Location Plan.
 - Figure 5-3 - 2033 Road Traffic Noise Change.

- Figure 5-4 - 2040 Road Traffic Noise Change.
- Figure 5-5 - Cumulative Traffic Noise Change.
- Figure 5-6 - BA1 - Noise on Undeveloped Site.
- Figure 5-7 - BA2 - Noise on Undeveloped Site.
- Figure 5-8 - BA3 - Noise on Undeveloped Site.
- Figure 5-9 - BA1 - Noise on Developed Site.
- Figure 5-10 - BA2 - Noise on Developed Site.
- Figure 5-11 - BA3 - Option 1 - Noise on Developed Site.
- Figure 5-12 - BA3 - Option 2 - Noise on Developed Site.
- Figure 5-13 - BA3 - Option 3 - Noise on Developed Site.
- Figure 5-14 - BA1 - Daytime Noise at Façades.
- Figure 5-15 - BA2 - Daytime Noise at Façades.
- Figure 5-16 - BA3 - Option 1 - Daytime Noise at Façades.
- Figure 5-17 - BA3 - Option 2 - Daytime Noise at Façades.
- Figure 5-18 - BA3 - Option 3 - Daytime Noise at Façades.
- Figure 5-19 - BA1 - Night-time, L_{Aeq} at Façades.
- Figure 5-20 - BA2 - Night-time, L_{Aeq} at Façades.
- Figure 5-21 - BA3 - Option 1 - Night-time, L_{Aeq} at Façades.
- Figure 5-22 - BA3 - Option 2 - Night-time, L_{Aeq} at Façades.
- Figure 5-23 - BA3 - Option 3 - Night-time, L_{Aeq} at Façades.
- Figure 5-24 - BA1 - Night-time, $L_{Af,Max}$ at Façades.
- Figure 5-25 - BA2 - Night-time, $L_{Af,Max}$ at Façades.
- Figure 5-26 - BA3 - Option 1 - Night-time, $L_{Af,Max}$ at Façades.
- Figure 5-27 - BA3 - Option 2 - Night-time, $L_{Af,Max}$ at Façades.
- Figure 5-28 - BA3 - Option 3 - Night-time, $L_{Af,Max}$ at Façades.
- Figure 5-29 - BA1 - Daytime / Livingroom Mitigation.
- Figure 5-30 - BA2 - Daytime / Livingroom Mitigation.
- Figure 5-31 - BA3 - Option 1 - Daytime / Livingroom Mitigation.
- Figure 5-32 - BA3 - Option 2 - Daytime / Livingroom Mitigation.
- Figure 5-33 - BA3 - Option 3 - Daytime / Livingroom Mitigation.
- Figure 5-34 - BA1 – Night-time / Bedroom Mitigation.

- Figure 5-35 - BA2 - Night-time / Bedroom Mitigation.
- Figure 5-36 - BA3 - Option 1 - Night-time / Bedroom Mitigation.
- Figure 5-37 - BA3 - Option 2 - Night-time / Bedroom Mitigation.
- Figure 5-38 - BA3 - Option 3 - Night-time / Bedroom Mitigation.

5.4.44 For the BA3 land parcel the noise model was found to overpredict the propagation of sound from the A505. This is likely to occur due to the complex topography of the BA3 land parcel and the surrounding areas, including the ground elevation of the A505. Other areas of the site have less complex topography, and so the noise modelling results for other land parcels can be more readily relied upon. In any case, for BA3, the noise model was found to slight over predict the propagation of sound across the site which would provide a more robust assessment.

5.4.45 As a result, the propagation of noise across parcel BA3 has been undertaken using the results of the detailed noise measurement survey on this area of the site, with the result of the noise model having been adjusted to meet with the true site conditions.

Embedded Mitigation

Introduction

5.4.46 This section of the assessment sets out the process which has been undertaken to determine the embedded site mitigation at the Proposed Development.

5.4.47 The embedded site mitigation has been determined with a view towards achieving internal and external noise guideline levels at proposed dwellings.

Existing Sound Levels on the Site

5.4.48 Our initial assessment of the Proposed Development site identified that road traffic noise from the A505 and rail noise from the London to Cambridge railway line are the dominant sources of noise at the development site. The propagation of noise across an unmitigated site is shown as a noise contour plot in Figures 5.6, 5.7 & 5.8 in Appendix 5.5.

5.4.49 As shown in Figures 5.6 to 5.13 in Appendix 5.5, the noise across the unmitigated site is between 55dB(A) and 75dB(A) during the daytime.

5.4.50 Guideline noise levels for the proposed dwellings are;

- 55dB(A) L_{eq} in gardens during the daytime.
- 35dB(A) L_{eq} in living rooms and bedrooms during the daytime.
- 30dB(A) L_{eq} in bedrooms during the night-time.
- 45dB(A) L_{fMax} exceed up to 10 times per night in bedrooms.

Determination of Embedded Mitigation

5.4.51 In order to achieve external noise guideline levels at the Proposed Development site some noise mitigation measures are required, determination of which has been undertaken in accordance with ProPG's good acoustic design process, as follows:

- Maximising the spatial separation of noise source(s) and receptor(s).
- Investigating the necessity and feasibility of reducing existing noise levels and relocating existing noise sources.

- Using existing topography and existing structures (that are likely to last the expected life of the noise-sensitive scheme) to screen the proposed development site from significant sources of noise.
- Incorporating localised noise barriers as part of the scheme to screen the proposed development site from significant sources of noise.
- Using the layout of the scheme to reduce noise propagation across the site.
- Using the orientation of buildings to reduce the noise exposure of noise sensitive rooms.
- Using the building envelope to mitigate noise to acceptable levels.

5.4.52 As is noted on the Parameter Plan, the first row of dwellings are likely to be located away from the A505, and so achieve a good spatial separating from the main noise source. This is the 1st stage of the acoustic design process.

5.4.53 It would not be possible to reduce the noise from the different sources, as defined in the 2nd stage.

5.4.54 The layout of the scheme and housing orientation will be designed to achieve appropriate noise levels in gardens of proposed dwellings. This is shown in principal using an indicative housing layout, which is shown on the following Figures in Appendix 5.5:

- Figure 5-9 - BA1 / BA10 - Noise on Developed Site.
- Figure 5-10 - BA2 - Noise on Developed Site.
- Figure 5-11 - BA3 - Option 1 - Noise on Developed Site.
- Figure 5-12 - BA3 - Option 2 - Noise on Developed Site.
- Figure 5-13 - BA3 - Option 3 - Noise on Developed Site.

5.4.55 Details of the building envelope have been considered and are detailed below.

Noise Impact Assessment

Introduction

5.4.56 This section of the assessment considers the potential impact of existing sources of sound on the Proposed Development in terms of guidance presented in AVO and BS8233. With respect to BS8233, this assessment considers external noise levels in gardens during the daytime, and internal noise levels in living rooms and bedrooms during the daytime and night-time, as appropriate.

5.4.57 The assessment relies upon the measured levels, as well as the results of the computer noise model.

5.4.58 This assessment report has been prepared to accompany an outline planning application, and so the layout which has been utilised in this assessment shows one way in which the houses could be laid out on site, informed by the Illustrative Masterplan. The final design of the development may vary from that show within.

5.4.59 There are three development options for the BA3 land parcel, as follows:

- Option 1 – Education (secondary and SEND) uses on BA3.
- Option 2 – Mix of Education (SEND) and Residential uses on BA3.
- Option 3 – Mix of Education (secondary and SEND) and Residential uses on BA3.

5.4.60 Each option has been considered herein.

Stage 1 Overheating Assessment

- 5.4.61 The guidance document AVO allows for a risk assessment to be undertaken to establish the likelihood of an adverse effect from overheating in the proposed dwellings, with respect to noise.
- 5.4.62 This risk assessment methodology is shown in Figure 1 of AVO. In terms of this methodology, those dwellings located closest to the A505 and railway line would be at a high risk of an adverse noise effect relating to overheating during the daytime and night-time as windows would need to be kept closed due to noise.
- 5.4.63 Noise levels further into the site and at a greater distance from the A505 and railway line are at a medium to low risk of overheating.
- 5.4.64 This assessment, in terms of AVO, identifies that mitigation measures would be recommended to reduce the likelihood of an adverse noise effect relating to overheating.
- 5.4.65 Overheating is covered by the Building Regulations Approved Document O (ADO). This includes a requirement for suitable residential amenity to be maintained whilst excess heat is removed and includes noise thresholds for bedrooms at night where open windows cannot be used to avoid overheating. It is considered unlikely that occupants will be subject to significant adverse noise impacts if the requirements of ADO are achieved.

External Noise Level in Gardens

- 5.4.66 BS8233 states that external noise levels should be limited to avoid annoyance in gardens of proposed dwellings. A noise level in gardens of 50 dB $L_{Aeq,16hour}$ or less is seen as desirable, and 55 dB $L_{Aeq,16hour}$ should not normally be exceeded.
- 5.4.67 The results of the noise modelling, shown in Figures 5.9, 5.10, 5.11, 5.12 and 5.13, identify that with the indicative housing layout in place, the majority of dwellings have a noise level in the garden area which achieves the guideline level of 55dB(A). There are a small number <10% of dwellings where the noise in gardens exceeds 55dB(A) during the daytime. However, as stated in paragraph 7.7.3.2 of BS8233 this is considered to be acceptable as the residents will benefit from living close to the transport network.
- 5.4.68 The exact housing layout has not yet been decided, and so an alternative layout could be used to better screen noise in gardens of proposed dwellings. In addition, the results of the modelling for BA1 and BA3 do not include localised garden fencing. The location and height of fencing will be determined during later stages of the design

Internal Noise Levels in Living Rooms and Bedrooms

- 5.4.69 As part of the guidance contained in BS8233 it is recommended that internal noise levels do not exceed 35 dB $L_{Aeq,16hour}$ during the day and 30 dB $L_{Aeq,8hour}$ at night. It also makes reference to the World Health Organization 'Guidelines on Community Noise' which recommend that there are no more than ten $L_{AFmax,T}$ events exceeding 45 dB(A) per night.
- 5.4.70 Estimating associated external levels by allowing 13 dB typical reduction for a partially-open window, the results of the modelling in Figures 5.14 to 5.28 in Appendix 5.5 show that some facades have a noise level which exceeds 48 dB(A) during the daytime, and 43 dB(A) L_{Aeq} and 58 dB $L_{AF,Max}$ during the night-time. Therefore, some façade mitigation (e.g. glazing and ventilation), or alternative noise mitigation measures (e.g. a bund) will be required to reduce internal ambient noise levels to meet guideline levels at some locations as a standard façade design with open windows will not be sufficient to control internal ambient noise levels.

Noise at the Proposed Schools

- 5.4.71 The Proposed Development includes up to 2 primary schools on the BA1 land parcel, and the option of educational use (SEND and secondary schools) on BA3. As a result of this, it is necessary to control noise at the schools to ensure a suitable teaching environment. The noise level incident on the proposed schools is set-out on Figure 5.9 to 5.17 of Appendix 5.5.

- 5.4.72 As is shown on Figures 5.9 and 5.11 to 5.13 noise levels at the areas proposed for outdoor school sites is less than 60dB(A). Therefore, as is stated in Section 2 in BB93, the sites are suitable for school use.
- 5.4.73 It will be necessary to achieve the following external sound levels at the proposed schools:
- Noise levels in unoccupied playgrounds, playing fields and other outdoor areas should not exceed 55 dB $L_{Aeq,30min}$.
 - there should be at least one area suitable for outdoor teaching activities where noise levels are below 50 dB $L_{Aeq,30min}$.
- 5.4.74 Furthermore, noise within proposed teaching spaces of the school should achieve the internal noise limits which are set-out in BB93. These internal noise level vary between 30dB(A) and 50dB(A) depending on the proposed use of the space.
- 5.4.75 Therefore some noise mitigation measures will be required to meet with the requirements of BB93. These measures will be detailed during later stages of the design process.

Summary

- 5.4.76 This assessment has considered the potential impact of noise on the proposed dwellings in terms of ProPG, AVO and BS8233.
- 5.4.77 The assessment has identified that the majority of dwellings have a sound level of 55dB(A) or less in gardens. In addition, some dwellings will require some form of façade mitigation to achieve internal noise guideline levels.
- 5.4.78 Furthermore, some noise mitigation measures will be required to meet with the requirements of BB93 in the proposed schools. These measures will be detailed during later stages of the design process.
- 5.4.79 These mitigation measures will include standard measures, such as appropriate glazing and ventilation where rooms with a higher sensitivity to noise are located on the noisier facades.

Additional Mitigation

Introduction

- 5.4.80 This section identifies the noise mitigation measures required to achieve internal and external noise guideline levels during the daytime and night-time.

Noise Level in Gardens

- 5.4.81 The assessment has shown that, beyond 1.8m high fences around gardens, additional mitigation measures are not required with an appropriate housing layout (e.g. gardens located on the screened side of dwellings, and away from the major sources of noise surrounding the site). The assessment shows that external noise guideline levels would be met in the majority of gardens of proposed dwellings.

Internal Sound Level

- 5.4.82 This assessment has identified varying needs for façade mitigation for the proposed dwellings.
- 5.4.83 To predict internal noise levels, an inductive noise break-in calculation has been undertaken following the guidance contained in BS8233. This allows the internal ambient noise levels to be predicted based on the noise levels incident on the façade, the façade dimensions, and the construction materials.
- 5.4.84 It has been assumed that non-bedroom living areas will be 4 x 5 m and bedrooms will be 3 x 4 m. All rooms have been assumed to be 2.5 m high. It has been assumed that non-bedroom living areas will have a reverberation time of 0.8 s and for bedrooms it will be 0.5 s.

- 5.4.85 Due to the range of noise levels predicted at the façades of the Proposed Development, two different façade specifications are proposed: an 'enhanced spec' to control noise levels at the most affected façades; and a 'standard spec' which will be sufficient to control noise levels at the less affected façades. The 'standard spec' is split further into two categories, one where open windows can be used to control overheating, and one where they cannot. As such, for this latter category (and the 'enhanced spec'), some form of passive ventilation is required. These specifications are detailed in Table 5.4.3 below.

Table 5.4.3: Façade Mitigation Strategy

Façade Mitigation Strategy	External Wall R_w (dB)	Windows R_w (dB)	Ventilation $D_{n,e,w}$ (dB)	Composite Sound Reduction RW (dB)
Façade Treatment 1 (Standard Spec, Open windows)	51 ¹	30 ²	N/A	13 (With windows open)
Façade Treatment 2 (Standard Spec)	51 ¹	30 ²	49 ⁴	42
Façade Treatment 3 (Enhanced Spec)	51 ¹	37 ³	49 ⁴	46
¹ Standard brick / block external façade construction (as specified in BS 8233:2014). ² Pilkington 4 / 12 / 4 (4 mm float glass, 12 mm air gap, 4 mm float glass) ³ Pilkington 10 / 12 / 6 (10 mm float glass, 12 mm air gap, 6 mm float glass) ⁴ Acoustic trickle ventilators (based on manufacturers data for Glidevale Acoustic Fresh 80 dB vent) in open condition. It should be noted that this performance assumes two ventilation openings. Should additional ventilation openings be needed to meet the requirements of Approved Document F, the required acoustic performance in terms of $D_{n,e,w}$ will need to be increased by $10\log(N)$, where N is the number of vents required. For example, if two additional vents are required to provide sufficient equivalent area the performance of each vent will need to be increased by 3 dB.				

- 5.4.86 Figures 5.29 to 5.38 show the requisite façade treatment needed for each façade to reduce internal ambient noise levels to within acceptable levels, for living rooms and bedrooms, respectively. If these façade treatments, or equivalent ones, are used on the required façades, then internal noise levels in all premises will be below the internal guideline levels detailed in BS 8233:2014 and any adverse impact due to road traffic noise will be very unlikely.

Ventilation and Overheating

- 5.4.87 It is a requirement of Building Regulations Part F that the following types of ventilation are provided, where windows should not be opened for ventilation:

- Whole dwelling ventilation (previously referred to as 'background' ventilation);
- Extract ventilation (in kitchens and bathrooms)'

- 5.4.88 The likely acoustic impact of each type of ventilation is discussed in the following sections.

Whole Dwelling Ventilation

- 5.4.89 Passive through-wall ventilators are specified in the façade treatments for some of the façades of the proposed development. These will provide the whole dwelling ventilation required. Those façades without passive through-wall ventilators will get whole dwelling ventilation from open windows.

Extract Ventilation

- 5.4.90 Extract ventilation is required in rooms where most pollutants or water vapour are generally found, i.e., kitchens (cooker hoods, etc.) and bathrooms (bathroom fans). These spaces are not considered

habitable rooms and the method used to provide ventilation is unlikely to reduce the sound insulation of the façade. Therefore, it is unlikely that providing extract ventilation in these spaces will result in adverse noise impacts.

Purge Ventilation

- 5.4.91 Purge ventilation is required to allow rapid removal of pollutants released from occasional activities (e.g., burning toast or when painting) and is normally provided by open windows. It is generally accepted that, as purge ventilation is only required occasionally and for short periods, increases in noise level during the purge ventilation condition (e.g., when windows are opened) will not result in adverse impacts.

Overheating

- 5.4.92 The normal method of providing relief from overheating is to open windows. When windows are open to provide thermal comfort, it is likely that internal noise levels will increase. The impact that any increased internal noise levels will have depends on two factors:

- The level of noise inside the dwelling / habitable rooms; and
- How often windows need to be opened (i.e., how often or long occupants are exposed to increased noise levels).

- 5.4.93 To reduce any adverse noise impacts, the development where possible should be designed to reduce the duration and frequency of occurrence of overheating when windows are shut. This will in turn reduce adverse noise effects as occupants will be exposed to increased noise levels for a shorter period of time.

- 5.4.94 This has been considered as part of an assessment in line with the Acoustics, Ventilation & Overheating (AVO) guide.

Summary

- 5.4.95 With the implementation of the mitigation measures defined above, the appropriate internal and external noise guideline levels will be achieved in all dwellings.
- 5.4.96 As has been defined above, the site allocated for secondary / SEND school use has a noise level which is less than the upper level limit stated in BB93. However, some standard noise mitigation measures will be required to meet with the requirements of BB93 in the proposed schools. These measures will may include appropriate glazing and ventilation on some façade of the school, and can be determined during the detailed design phase.

ANNEX A

BA3 Detailed Noise Monitoring Plan

