Roman Bank, Spalding

Noise impact assessment

10241.1

17th October 2022

Revision A

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Contents

1 Summary 3
2 Introduction 4
3 Planning policy and noise criteria 5
4 Noise sources and measurements 7
5 Noise impact on the site 10
6 External amenity area assessment 12
7 Achieving internal noise levels 12
8 Noise limits for fixed mechanical plant 13
9 Conclusion 14
10 References 15
Appendix A Example façade sound insulation calculations 16

1 Summary

1.1 This report has been prepared in support of a planning application for an extra care housing development at Roman Bank, Spalding.

1.2 Noise levels affecting the proposed development from road traffic and other sources have been measured during the day and night, and the façade noise impact calculated.

1.3 Noise propagation across the site is calculated with the environmental noise modelling software, CadnaA.

1.4 The existing noise risk at the site is assessed in accordance with current planning policy, relevant standards and noise practice guidance.

1.5 The façade sound insulation design is considered with windows closed to reduce the calculated noise impact to below the lowest adverse effect level. Alternative provisions should be made for whole dwelling ventilation according to the Building Regulations, Approved Document F (AD-F).

1.6 The acoustic performance requirements for glazing and ventilators are summarised in Table 1. Based on these ventilator acoustic constraints, potential AD-F ventilation strategies are suggested.

1.7 Plant noise limits to safeguard low impacts at the existing and proposed new sensitive receivers have been determined in line with BS4142 and are identified in Table 2.

1.8 Based on the details outlined in this report, the noise risks identified are mitigated and minimised, and the site is considered suitable for the proposed extra care housing.

Location	Rooms affected	Glazing performance	Trickle ventilator performance	Potential AD-F whole dwelling ventilation strategy
All facades	Bedrooms and Living Rooms	≥ 25 dB $R_w + C_{tr}$	≥ 34 dB $D_{ne,w} + C_{tr}$	Natural ventilation (with intermittent extract fans); or Continuous mechanical extract ventilation; or Mechanical ventilation with heat recovery (trickle ventilators not required)
EA = Equivalent Area, as defined by Approved Document F. Trickle ventilation performance is based on 1 vent. If more than 1 vent is used per room, the acoustic performance may increase, and the specifications will need to be reviewed. The glazing and ventilator performance can be achieved with standard products				

Table 1: Summary of minimum façade sound insulation treatment

Period	Plant noise limit, $L_{Ar,Tr}$ dB(A)
Daytime 07:00 – 23:00 hrs	54
Night time 23:00 – 07:00 hrs	42

Table 2: Noise limits for fixed mechanical plant

2 Introduction

2.1 A new development consisting of extra care housing has been proposed at Roman Bank, Spalding.

2.2 Apex Acoustics has been commissioned to undertake a noise survey and assessment of the potential noise impact on the proposed development site in support of a planning application.

2.3 The primary noise sources considered in this assessment are:

- Road traffic noise on Holbeach Road to the south of the development site;
- Road traffic noise on W Marsh Road to the west of the site.

2.4 The site location is shown in Figure 1.

2.5 The purpose of this report is to identify appropriate acoustic design parameters and the manner in which these may be achieved in practice.

2.6 The scope of our appointment includes:

- Measure the existing noise environment;
- Noise modelling based on the proposed layouts to determine noise levels impacting the site;
- Determine potential noise impact under whole dwelling ventilation conditions according to Approved Document F strategies and when utilising open windows for mitigation of overheating risks;
- Provide a detailed scheme for the mitigation of noise to reduce the risk of adverse effects in accordance with local and national policy requirements.

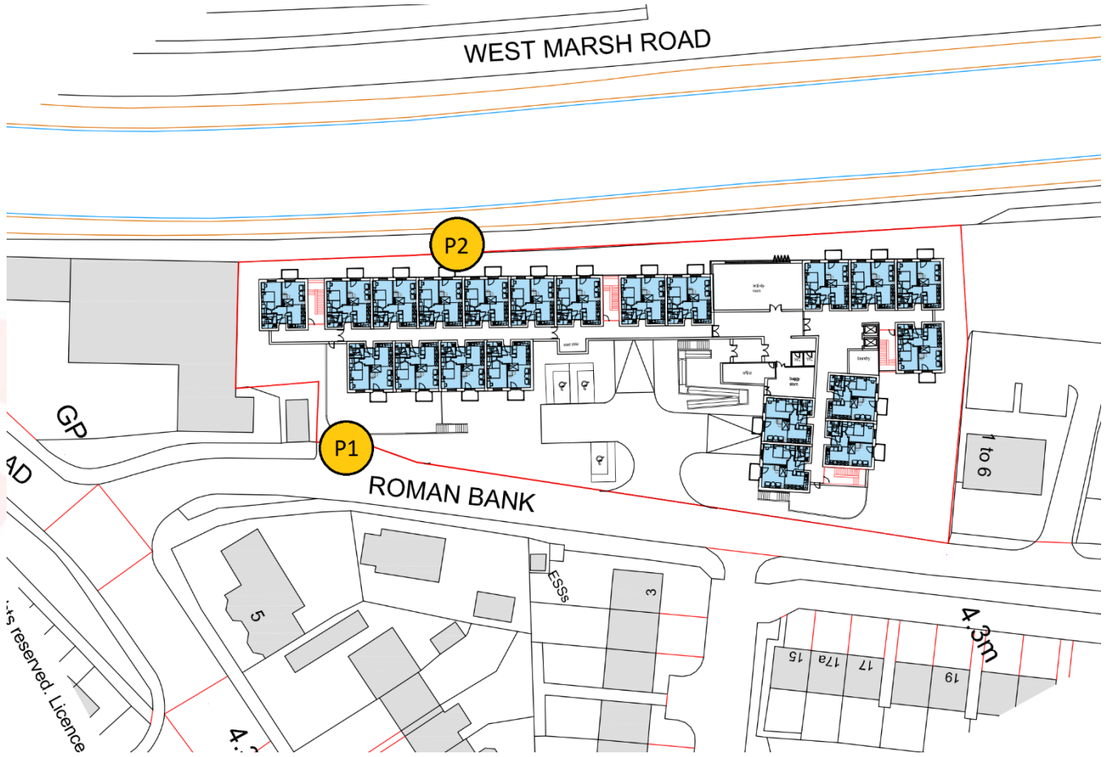


Figure 1: Site location outlined in red and measurement positions indicated by a marker

3 Planning policy and noise criteria

3.1 **National Planning Policy Framework (NPPF)**

3.2 The National Planning Policy Framework (NPPF) Reference 1, sets out the Government's planning policies for England and how these should be applied. It provides a framework within which locally-prepared plans for housing and other development can be produced. In respect of noise, Paragraph 174, 185 and 187 of the NPPF states the following:

3.3 Paragraph 174:

"e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability…"

3.4 Paragraph 185:

"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[65 [See Explanatory Note to the Noise Policy Statement for England];

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;

3.5 Paragraph 187:

"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. "

3.6 **Noise Policy Statement for England (NPSE)**

3.7 The Noise Policy Statement for England, Reference 2, states three policy aims as follows:

"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- avoid significant adverse impacts on health and quality of life;
- mitigate and minimise adverse impacts on health and quality of life; and
- where possible, contribute to the improvement of health and quality of life."

3.8 The NPSE defines adverse noise impact as follows:

- No Observed Effect Level (NOEL)
  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.
- Lowest Observed Adverse Effect Level (LOAEL)
  This is the level above which adverse effects on health and quality of life can be detected.
- Significant Observed Adverse Effect Level (SOAEL)
  This is the level above which significant adverse effects on health and quality of life occur

3.9 The first two aims of the NPSE require that no significant adverse impact should occur and that, where a noise level which falls between a level which represents the lowest observable adverse effect and a level which represents a significant observed adverse effect, then according to the explanatory notes in the statement:

"… all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life whilst also taking into consideration the guiding principles of sustainable development. This does not mean that such effects cannot occur."

3.10 It is considered that meeting the internal ambient noise level limits given in BS 8233, which are in line with those given by the World Health Organisation, Reference, adequately achieve the first and second aims of the NPSE.

3.11 **Local plan / Local Authority guidance**

3.12 The South Holland District Council Planning Department has been consulted regarding the methodology and criteria to adopt to assess noise impacts on the proposed development.

3.13 To the date of this report, Apex Acoustics has not received an answer from the Council.

3.14 **Professional Practice Guidance on Planning & Noise**

3.15 Professional Practice Guidance on Planning & Noise: New Residential Development (ProPG), Reference 4, is a guidance document on the management of noise within the planning system in England for new build housing developments.

3.16 The document draws together guideline limits for internal noise levels from external transport sources from other sources of guidance, including BS 8233, Reference 5, and the World Health Organisation (WHO) Guidelines for Community Noise, Reference 6.

3.17 These criteria are consistent with those usually adopted by the Local Environmental Health Department and are presented in Table 3.

Activity	Location	Guideline upper limit, dB		
		$L_{Aeq,\ daytime}$	$L_{Aeq,\ night\text{-}time}$	L_{AFmax}
Resting	Living room	35	-	-
Dining	Dining room	40	-	-
Sleeping (daytime resting)	Bedroom	35	30	45

Table 3: Internal noise level requirements

3.18 The daytime period is defined as the 16 hours between 07:00 to 23:00 hours and the night-time period is defined as the 8 hours between 23:00 to 07:00 hours.

3.19 With regards to the night-time L_{AFmax} criterion, ProPG states:

"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."

3.20 It is considered that the adopted internal ambient noise level targets align with the LOAEL following the terminology of the NPSE, such that meeting these targets adequately achieves the aims of the NPPF and NPSE.

3.21 ProPG states:

"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."

3.22 Internal ambient noise levels 10 dB above the daytime and night-time values in Table 3 are therefore identified as the SOAEL.

3.23 Appendix A of the ProPG collates the results of various studies on sleep disturbance due to individual noise events, and states the following:

"it can be concluded that at night (2300 - 0700 hrs) a significant effect on sleep disturbance e.g. behavioural awakening, is likely to occur where the maximum sound level at the façade of a building with partially open windows is above:

- 85 dB $L_{Amax,\ F}$ (where the number of events exceeding this value is ≤ 20); or
- 80 dB $L_{Amax,\ F}$ (where the number of events exceeding this value is > 20)."

3.24 These values are identified as a SOAEL in the situation where windows are partially open.

3.25 ProPG guidance on external amenity area assessments "reflects and extends the advice contained in BS 8233:2014 and the current Government guidance in PPG-Noise". Relevant guidance from these sources is summarised in the document as follows:

- "If external 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."
- "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 $L_{Aeq,\ 16\ hr}$."
- "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 levels in these external amenity spaces."

3.26 The BS 8233 'desirable' value of 50 dB $L_{Aeq,\ 16\ hr}$ in external amenity areas is identified as the LOAEL.

3.27 Following DEFRA guidance, Reference 7, on the possible identification of LOAELs and SOAELs, 66 dB $L_{Aeq,\ 16\ hr}$ is identified as the SOAEL.

4 Noise sources and measurements

4.1 **Measurements**

4.2 Measurements of the existing noise environment were carried from the 13th to the 15th of September 2022 at Positions P1 and P2, as shown in Figure 2.

4.3 Measurements at Position P1 were carried out for a 24-hour period. For safety reasons, measurements at Position P2 were attended - the daytime measurements were carried out over three consecutive hours between 12:00 and 15:00 hrs in accordance with the shortened measurement procedure outlined in paragraph 43 of Calculation of Road Traffic Noise (CRTN), Reference 10, and the night-time measurements were carried out from 23:00 to 01:00 hrs to determine the typical relevant night-time noise events to consider.

4.4 For Position P1 the microphone was located at 3.5 m above ground level and for Position P2 the microphone was at 1.8 m above ground level. For both Positions, the microphone was placed at least 3 meters away from other reflecting surfaces, so the measurements are considered free-field.

4.5 The equipment used is listed in Table 4.

Equipment	Model	Serial no.
Sound Level Meter	NTi XL2	A2A-11084-E0
Calibrator	Larson Davis CAL 200	10665
Sound Level Meter	NTi XL2	A2A-11062-E0
Calibrator	Larson Davis CAL 200	13403

Table 4: Equipment used

4.6 All sound level meters and calibrators used meet the technical specifications of BS 7445 and have current calibration certificates traceable to national standards. The equipment was field-calibrated before and after the measurement, with no significant drift in sensitivity noted.

4.7 Weather conditions were dry with wind speeds below 5 m/s.

4.8 **Noise sources**

4.9 The most significant noise source affecting the proposed development during both the daytime and the night-time was traffic noise on Holbeach Road and W Marsh Road.

4.10 Other noise sources included the Bakkavor Spalding factory, which was noticeable but to a lesser extent.

4.11 The measurement positions were therefore selected to enable the characterization of both roads.

4.12 **Results**

4.13 The time histories of the $L_{Aeq,\ 1\ sec}$ recorded are shown in Figure 2Figure 2: Time history of the recorded $L_{Aeq,\ 1\ sec}$ (upper image: Position P1; bottom image: Position P2).

4.14 The measured daytime and night-time noise levels at Position P1 are shown in Table 5.

Position	Parameter	dB(A)	Octave band centre frequency, Hz Measured A-weighted noise levels, dB					
			125	250	500	1k	2k	4k
P1	Daytime, $L_{Aeq,\ 16\ hr}$	**64**	50	54	56	61	57	51
	Night time, $L_{Aeq,\ 8\ hr}$	**58**	40	45	49	55	51	45

Table 5: Measured free-field noise levels

4.15 The measured values of the L_{A10} for three consecutive hours at Position P2 are shown in Table 6.

Time Period	Measured noise level, dB $L_{A10,\ 1\ hr}$
First hour	63
Second hour	63
Third hour	63

Table 6: Measured L_{A10} over three consecutive hours

4.16 $L_{A10,\ 18\ hr}$ noise levels have been calculated from the measured $L_{A10,\ 1\ hr}$ over three consecutive hours in accordance with the shortened measurement procedure detailed in CRTN.

4.17 The methodology of the Transport Research Laboratory, Reference 12, have been used to determine day ($L_{Aeq,\ 12\ hr}$), evening ($L_{Aeq,\ 4\ hr}$) and night-time ($L_{Aeq,\ 8\ hr}$) noise levels. Day and evening levels have been summed with an appropriate time weighting to determine the daytime $L_{Aeq,16\ hr}$.

4.18 The measured noise spectrum has been shifted to meet the calculated single-figure values.

4.19 Night time measurements were made over the first portion of the night time period, immediately after 23:00 hrs, after which noise levels generally fall as the night time period progresses.

4.20 The measured level in the first portion of the night time period is taken to be representative of the whole 8 hour night time period; this is generally considered to be a prudent assumption.

The calculated daytime and night-time noise levels are shown in Table 7.

Position	Parameter	dB(A)	Octave band centre frequency, Hz Measured A-weighted noise levels, dB							
			63	125	250	500	1k	2k	4k	8k
P2	Daytime, $L_{Aeq,\ 16\ hr}$	60	41	41	45	52	58	51	41	32
	Night time, $L_{Aeq,\ 8\ hr}$	52	34	35	40	44	50	45	33	22

Table 7: Calculated A-weighted noise levels

4.21 The highest maximum night-time noise levels from transport sources are shown in Table 8; 76 and 69 dB is not exceeded more than 10 times and therefore are used as the design case to determine compliance against ProPG Note 4 of Figure 2.

Position	Measured 10 highest maximum noise events during the night-time										
P1	L_{AFmax} dB	76	77	77	77	78	78	78	81	82	84	85
	Source	Traffic noise events, i.e. vehicles accelerating or passing by										
P2	L_{AFmax} dB	69	69	69	69	70	70	71	72	73	74	74
	Source	Traffic noise events, i.e. vehicles accelerating or passing by										

Table 8: Measured LAFmax events during the night time period

4.22 **BS 4142 results**

4.23 Regarding commercial and/or industrial noise, ProPG advises:

"In the special case where industrial or commercial noise is present on the site but is "not dominant" (i.e where the impact would be rated as lower than adverse (subject to context) if a BS 4142:2014 assessment was to be carried out), its contribution may be included in the noise level used to establish the degree of risk (and if included, this should be clearly stated)."

"The judgement on whether or not to undertake a BS 4142 assessment to determine dominance should be proportionate to the level of risk. In low risk cases a subjective judgement of dominance, based on audibility, would normally be sufficient."

4.24 Whilst on site, it was noticed that the noise from the Bakkavor Spalding factory was just noticeable and not dominant and as such, its contribution is included in ProPG Stage 1 and Stage 2 assessment, as recommended.



Figure 2: Time history of the recorded $L_{Aeq,\ 1\ sec}$ (upper image: Position P1; bottom image: Position P2)

5 Noise impact on the site

5.1 Noise transmission and propagation is modelled using proprietary software, Cadna/A, Reference 14. This models noise propagation outdoors according to ISO 9613, Reference 15.

5.2 The modelling parameters used, source of data and details are described in Table 9.

Parameter	Source	Details
Model dimensions	Google Earth	British Transverse Mercator coordinates
Site location and layout	Architects drawings	Architects drawings, Reference 16
Topography –within site	Site observations and Google Street view	Modelled with no changes in topography
Topography –Outside of site	Site observations and Google Street view	Modelled with no changes in topography
Building heights – proposed buildings	Drawings	Architects drawings
Building heights – outside of site	Site observations and Google Street view	3 m per storey + 2 m roof (residential properties)
Receptor positions	Site observations and Google Street view	On the façade closest to the source at a height of 4 m
Building and barrier absorption coefficient	ISO 9613-2	0.21 to represent a reflection loss of 1 dB
G, Ground factor	ISO 9613-2	Hard ground, G = 0; Porous ground, G = 1 (locally on model)
Max. order of reflections	Apex Acoustics	Three

Table 9: Modelling parameters and assumptions

5.3 Measured daytime and night-time noise levels have been used to ascribe sound power levels to the surrounding roads, and the noise impact at the proposed building façades has been calculated.

5.4 Measured maximum noise levels due to vehicle passes have been used to attribute sound power levels to a point source. The position of the point source has been shifted along the road to calculate the potential worst-case noise impact at each building façade.

5.5 A plan view and a 3D perspective of the CadnaA model are shown in Figure 3 and Figure 4, respectively.

5.6 The calculated noise contours results for the daytime $L_{Aeq,\ 16\ hr}$ and night-time $L_{Aeq,8\ hr}$ are shown in Figure 5 and Figure 6, respectively.

5.7 According to Pro PG, the initial assessment results indicate a low-medium noise risk for the site and as such, a Stage 2 assessment is required and is detailed in the following Section of this report.



Figure 3: Plan view of the CadnaA model

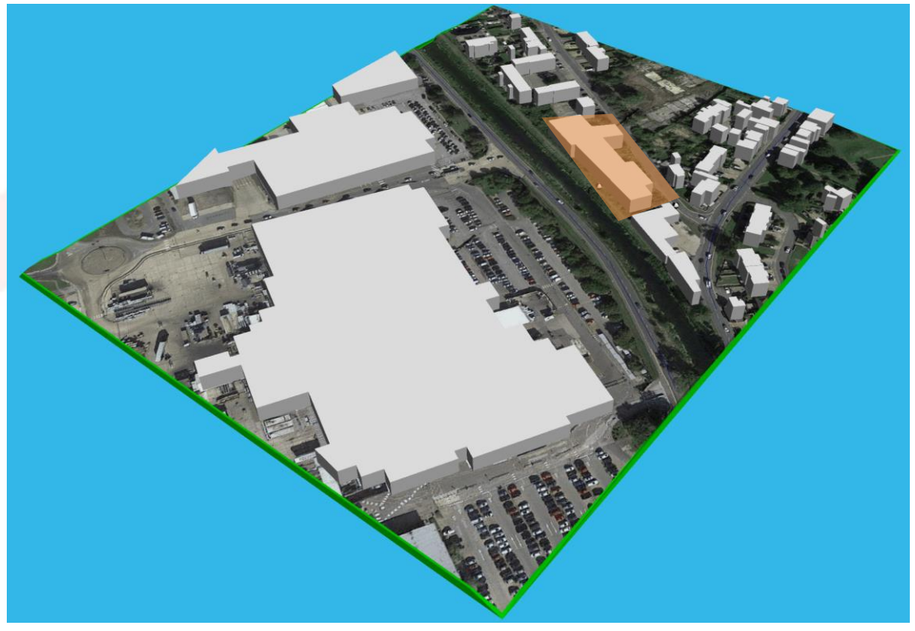


Figure 4: 3D view of the CadnaA model from the southwest



Figure 5: Plan viewing $L_{Aeq,\ 16\ hr}$ sound contours at 2 m above ground



Figure 6: Plan viewing $L_{Aeq,\ 8\ hr}$ sound contours at 2 m above ground

6 External amenity area assessment

6.1 As shown in Figure 5, noise levels within potential amenity areas are within BS 8233 guideline upper limit for a large portion of the site and as such no further noise mitigation is deemed required.

7 Achieving internal noise levels

7.1 **Façade sound insulation calculations**

7.2 Free-field noise levels at the windows of the most exposed rooms which are used in the façade sound insulation calculations are shown in Table 10.

7.3 Octave band $L_{Aeq,T}$ noise levels in the 125 Hz to 2 kHz calculation range indicated in BS 8233 have been adjusted to match the single figure calculated A-weighted noise level.

Façade affected	Parameter	dB(A)	Octave band centre frequency, Hz A-weighted free-field noise level, dB				
			125	250	500	1k	2k
East facing facade	$L_{Aeq,16\ hr}$	**55**	41	45	47	52	48
	$L_{Aeq,8\ hr}$	**49**	31	36	40	46	42
	L_{AFmax}	**67**	-	-	-	-	-
West facing facade	$L_{Aeq,16\ hr}$	**60**	41	45	52	58	51
	$L_{Aeq,8\ hr}$	**52**	35	40	44	50	45
	L_{AFmax}	**69**	-	-	-	-	-

Table 10: A-weighted external free-field noise levels used to calculate façade sound insulation

7.4 The calculation method for façade sound insulation is in accordance with BS 8233 and the principles of BS EN 12354-3, Reference 18.

7.5 From ISO 16283, Reference 20, the reverberation time is typically 0.5 seconds across the relevant frequency range for a furnished living room. This value is used for both living rooms and bedrooms.

7.6 Details of the methodology used to calculate internal noise levels are provided on our website: https://www.apexacoustics.co.uk/calculation-facade-sound-insulation/.

7.7 The minimum glazing and ventilator performances presented in the summary table are calculated to be required to reduce noise levels to below the LOAEL for internal noise levels in those rooms most exposed to external noise ingress.

7.8 Noise levels in less exposed but similarly protected rooms will be lower and therefore also comply with the internal noise level targets.

7.9 The most exposed rooms are those with the largest ratio of window area to the room volume, as well as those closest and most exposed to the noise sources.

7.10 Example glazing units that achieve the performance standards shown in Table 1 are identified in Table 11.

Glazing performance	Example products (others also feasible)
≥ 25 dB $R_w + C_{tr}$	4 /16/ 4 double glazing

Table 11: Example glazing units

7.11 The room and window dimensions used in the calculations are taken from the architects' plans.

7.12 The sound reduction of the masonry portion of the facade is much higher than that of the glazing and ventilation provision. Therefore, noise penetration through the masonry is disregarded as relatively insignificant.

7.13 Calculated internal noise levels on the basis of the identified minimum performance requirements are presented in Table 12.

7.14 An example full calculation for the worst affected location is shown in Appendix A, based on manufacturers test data from the example glazing and ventilator products.

Location	Room affected	Calculated internal level		
		Daytime dB $L_{Aeq,\ 16\ hr}$	Night-time dB $L_{Aeq,\ 8\ hr}$	Night-time dB $L_{Amax,\ F}$
East facing facade	Bedroom	29	21	38
	Living room	28	20	-
West facing facade	Bedroom	32	25	41
	Living room	31	24	-

Table 12: Summary of calculated worst-case internal noise levels

7.15 Based on the proposed façade sound insulation provision and the level and frequency of the measured maximum noise event, 45 dB $L_{Amax,\ F}$ is unlikely to be exceeded more than 10 times per night, and is therefore below the LOAEL described in paragraph 3.19.

7.16 **Noise and Approved Document F ventilation conditions**

7.17 The proposed development will be required to meet Part F of the Building Regulations with regard to the whole dwelling ventilation condition, as described in Approved Document F (AD-F), Reference 17.

7.18 To achieve suitable internal ambient noise levels, windows are required to be closed and alternative means of ventilation need to be provided.

7.19 Based on the trickle ventilators identified in Table 13, any AD-F whole dwelling ventilation strategy as described in Table 1.6 of AD-F is acoustically feasible.

7.20 Where a continuous mechanical extract ventilation system is proposed, trickle ventilators are required to provide a minimum equivalent ventilation area of 4000 mm^2 for each habitable room, and the total number of ventilators in the dwelling should be at least the same as the number of bedrooms plus two ventilators (i.e., a one-bedroom dwelling should have three background ventilators, a two-bedroom dwelling should have four ventilators, etc).

7.21 Should an MVHR system be implemented, trickle ventilators are not required.

Location	Trickle ventilator performance
All facades	≥ 34 dB $D_{ne,w} + C_{tr}$

Table 13: Example trickle ventilators

7.22 On the basis of the AD-F strategies, the façade sound insulation with the provision for whole dwelling ventilation may be assessed with windows closed.

7.23 Purge ventilation conditions as described by AD-F is manually controlled ventilation of rooms or spaces at a relatively high rate to rapidly dilute pollutants and/or disperse water vapour. Purge ventilation may be provided by natural means (e.g. an openable window) or mechanical means (e.g. a fan).

7.24 For AD-F purge ventilation conditions, ProPG states:

"It should also be noted that the internal level guidelines are generally not applicable under "purge ventilation" conditions as defined by Building Regulations Approved Document F, as this should only occur occasionally (e.g. to remove odour from painting and decorating or from burnt food)."

7.25 Considering this guidance, opening windows is considered acceptable for these occasional events without giving risk to potential adverse effect on occupants.

7.26 It should be emphasised that the above is not intended to constitute a ventilation strategy design, which is the responsibility of others. Once the ventilation strategy is established, if the details vary from those described above, the proposed details should be reassessed for acoustic performance.

8 Noise limits for fixed mechanical plant

8.1 It is understood that the proposed development may include air source heat pumps or similar items. As such, the impact from any fixed mechanical plant associated with the proposed development is considered to ensure no adverse effects occur to future and existing residents.

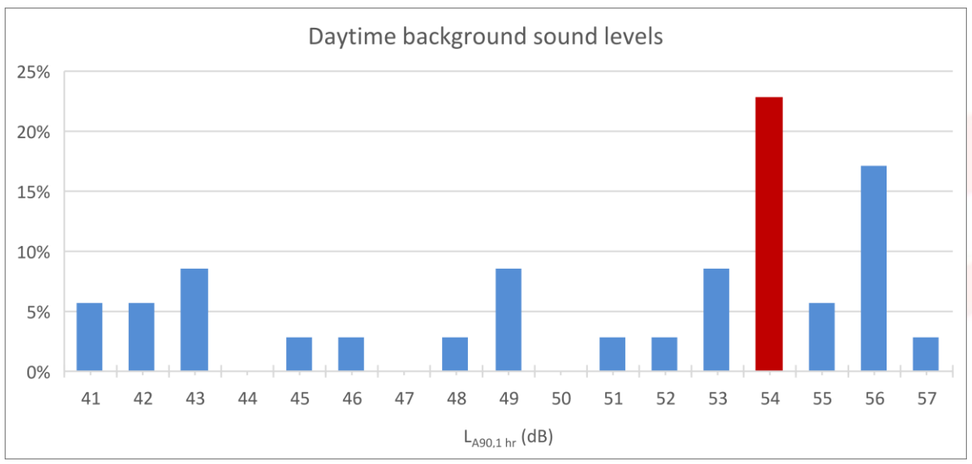
8.2 The background noise levels representative of those at the proposed development and the existing noise-sensitive receivers have been calculated using the data recorded at Position P1, in line with BS 4142 statistical analysis method of the daytime $L_{A90,1hr}$ and night time $L_{A90,15min}$ periods, as shown in Figure 7.

8.3 In line with BS4142 to safeguard a low impact, the noise limits emitted by any fixed plant installations during the day and night at any future and existing noise-sensitive receivers are

shown in Table 14. These limits align with the LOAEL following the terminology of the NPSE, such that meeting these targets adequately achieves the aims of the NPPF and NPSE.

Period	Plant noise limit, $L_{Ar,Tr}$ dB(A)
Daytime 07:00 – 23:00 hrs	54
Night time 23:00 – 07:00 hrs	42

Table 14: Noise limits for fixed mechanical plant



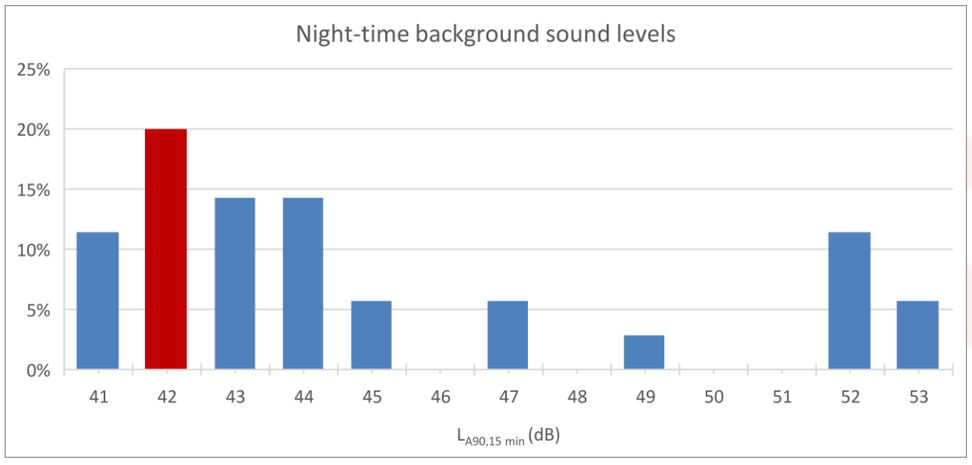


Figure 7: Analysis of daytime and night time background noise levels

9 Conclusion

9.1 The existing noise impact across the proposed development site has been assessed in support of a Planning Application.

9.2 An acoustic design process is undertaken to demonstrate how the identified risks of adverse noise impact can be mitigated and minimised in the finished development.

9.3 The potential implications for the design of the façade sound insulation under whole dwelling conditions as described by AD-F is discussed, and the glazing and ventilator acoustic performance requirements to achieve the indoor noise level targets are identified.

9.4 Plant noise limits to safeguard low impacts have been determined in line with BS4142 and are also identified.

9.5 Based on the existing noise risks and details outlined in this report, the site is considered suitable for the proposed extra care housing.

10 References

1 National Planning Policy Framework, Department for Communities and Local Government, July 2021 .

2 Noise Policy Statement for England, Department for Environment, Food and Rural Affairs, March 2010.

3 Planning Practice Guidance – Noise: http://planningguidance.planningportal.gov.uk/blog/guidance/noise/noise-guidance/

4 Association of Noise Consultants (ANC), Institute of Acoustics (IOA) and Chartered Institute of Environmental Health (CIEH), "ProPG: Planning & Noise - New Residential Development," May 2017.

5 BS 8233: 2014, Guidance on sound insulation and noise reduction for buildings.

6 Guidelines for Community Noise, Edited by Birgitta Bergland, Thomas Lindvall, Dietrich H Schwela, World Health Organisation, 1999.

7 AECOM Environment on behalf of DEFRA, NANR316 Possible options for the identification of SOAEL and LOAEL in support of the NPSE, December 2015.

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11 Real time trains, www.realtimetrains.co.uk.

12 Transport Research Laboratory / Defra, Method for converting the UK road traffic noise index $L_{A10,\,18\,hr}$ to the EU noise indices for noise mapping, 2006.

13 BS 4142: 2014, Method for rating and assessing industrial and commercial sound.

14 Cadna/A environmental noise modelling software, version 2020, Datakustik GmbH.

15 ISO 9613: Acoustics - Attenuation of sound during propagation outdoors.

16 Architects Drawings – Proposed site plan.

17 Approved Document F 2021 Edition, The Building Regulations 2000.

18 BS EN 12354-3:2000, Building Acoustics – Estimation of acoustic performance of buildings from the performance of elements – Part 3: Airborne sound insulation against outdoor sound.

19 Practical Acoustic Design – the Apex Method, Proceedings of the Institute of Acoustics Vol 36 Pt 3 2014. Full paper and Poster presentation at Institute of Acoustics Conference 2014, available to download from www.apexacoustics.co.uk

20 BS EN ISO 16283-1:2014 Acoustics – Field measurement of sound insulation in buildings and of building elements – Part 1: Airborne sound insulation.

Appendix A Example façade sound insulation calculations

ROOM DETAILS	
ID	East fcd bedroom
Type	Bedroom
Volume (m3)	25.0
Wall (m2)	0.0
Window 1 (m2)	1.7
Window 2 (m2)	0.0
Roof (m2)	0.0
Wall vent (m2)	0.0
No. of passive vents	1.0
Element total area (m2)	1.7

TERM	DESCRIPTION	Rw (C;Ctr)	125	250	500	1000	2000	GLOBAL dB(A)
LAeq,16hrs	External ff noise	-	41	45	47	52	48	55
LAeq,8hrs	External ff noise	-	31	36	40	46	42	49
LAFmax	External ff noise		-	-	-	-	-	67
RT (s)	RT (s)	-	0.5	0.5	0.5	0.5	0.5	-
Abs. Area (m2)	Abs. Area (m2)	-	8	8	8	8	8	-
10log A	10log A	-	9	9	9	9	9	-
R (Wall)	n/a	-	100	100	100	100	100	-
R (Window 1)	4 mm / (6-16mm) / 4 mm	29 (-1; -4)	21	17	25	35	37	-
R (Window 2)	n/a	-	100	100	100	100	100	-
R (Roof)	n/a	-	100	100	100	100	100	-
Dne (Ventilator 1)	n/a	-	100	100	100	100	100	-
Dne (Ventilator 2)	dn vent (window mounted)	37 (-1;-3)	39	39	37	36	39	-
R (Vent)	n/a	-	100	100	100	100	100	
R (Facade)	All façade elements	-	21	17	24	27	30	-
LAeq,16hrs	IANLs	-	17	24	20	21	14	28
LAeq,8hrs	IANLs	-	7	15	13	15	8	20
LAFmax	IANLs	-	-	-	-	-	-	38

Table 15: Example calculation for east façade bedrooms

ROOM DETAILS	
ID	West fcd bedroom
Type	Bedroom
Volume (m3)	25.0
Wall (m2)	0.0
Window 1 (m2)	1.7
Window 2 (m2)	0.0
Roof (m2)	0.0
Wall vent (m2)	0.0
No. of passive vents	1.0
Element total area (m2)	1.7

TERM	DESCRIPTION	Rw (C;Ctr)	125	250	500	1000	2000	GLOBAL dB(A)
LAeq,16hrs	External ff noise	-	41	45	52	58	51	60
LAeq,8hrs	External ff noise	-	35	40	44	50	45	52
LAFmax	External ff noise		-	-	-	-	-	69
RT (s)	RT (s)	-	0.5	0.5	0.5	0.5	0.5	-
Abs. Area (m2)	Abs. Area (m2)	-	8	8	8	8	8	-
10log A	10log A	-	9	9	9	9	9	-
R (Wall)	n/a	-	100	100	100	100	100	-
R (Window 1)	4 mm / (6-16mm) / 4 mm	29 (-1; -4)	21	17	25	35	37	-
R (Window 2)	n/a	-	100	100	100	100	100	-
R (Roof)	n/a	-	100	100	100	100	100	-
Dne (Ventilator 1)	n/a	-	100	100	100	100	100	-
Dne (Ventilator 2)	dn vent (window mounted)	37 (-1;-3)	39	39	37	36	39	-
R (Vent)	n/a	-	100	100	100	100	100	
R (Facade)	All façade elements	-	21	17	24	27	30	-
LAeq,16hrs	IANLs	-	17	24	25	27	17	31
LAeq,8hrs	IANLs	-	11	19	17	19	11	24
LAFmax	IANLs	-	-	-	-	-	-	41

Table 16: Example calculation for west façade bedrooms