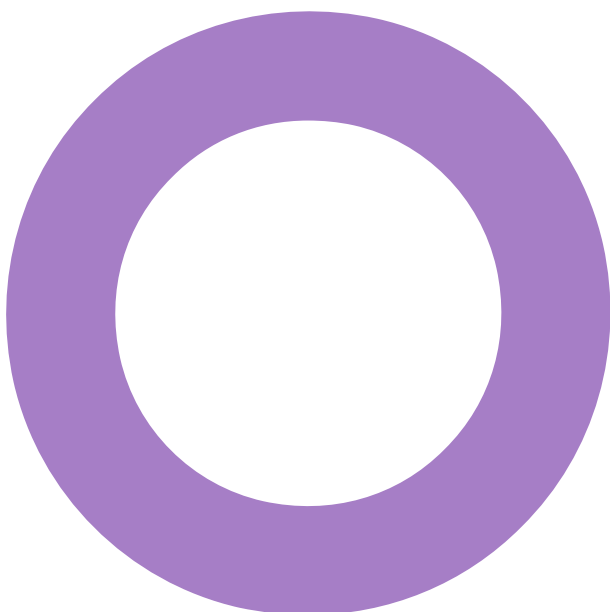


Thamesfield Retirement Village. Remenham. Retirement Villages Group.

ACOUSTICS
ENVIRONMENTAL NOISE SURVEY

REVISION 03 – 13 NOVEMBER 2024



Audit sheet.

Rev.	Date	Description of change / purpose of issue	Prepared	Reviewed	Authorised
01	06/09/2023	For issue.	TH	BRD	BRD
02	12/09/2023	For issue.	TH	BRD	BRD
03	13/11/2024	Final issue.	TH	BRD	BRD

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Project number: 10/14934

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Executive summary.

Hoare Lea has conducted an environmental noise survey for the proposed redevelopment at Thamesfield Retirement Village in Remenham.

The following summarises the assessment procedure and findings contained within this report:

- Environmental noise monitoring was undertaken at the proposed development site across a seven-day period between Wednesday 2nd August 2023 and Wednesday 9th August 2023.
- Background noise levels typical of the daytime and night-time have been measured and used to define building services plant noise emission limits at the nearest noise sensitive receptors.
- The nearest receptors have been identified as the proposed development itself and existing residential dwellings within Thamesfield Retirement Village and those along Wargrave Road to the north including Cognatum Retirement Property to the north.
- During the daytime and night-time, the combined building services plant noise emission contribution limit advised is 35 dB(A) and 33 dB(A) respectively, one metre from the nearest residential façade.
- An assessment of the building envelope acoustic performance is provided and indicates that the ventilation strategy should allow for full mechanical ventilation of bedrooms as the level differences required are above those achievable by simple means of natural ventilation via an open door or window.
- For the mitigation of overheating, several elevations to the rear of the development have been identified as being possible to be naturally ventilated during the daytime and reasonable internal conditions achieved in line with guidance provided within the ANC's Acoustics Ventilation and Overheating Residential Design Guide. This is however subject to further analysis including whether an open window would provide sufficient mitigation of overheating.
- Notional glazing requirements and indicative glazing configurations have been provided for guidance purposes only. Detailed calculations based on façade areas will be required to refine and finalise the performance requirements during the next design stage.
- On the basis of the guidance contained within this report, it is concluded that the Site is suitable for the proposed development.
- The guidance provided within this report is sufficient to satisfy the requirements of Wokingham Borough Council, in our professional opinion.

1. Introduction.

Hoare Lea has been appointed by Retirement Villages Group Limited to conduct an environmental noise survey in order to support the planning application for the proposed redevelopment at Thamesfield Retirement Village in Remenham.

The proposal comprises the part demolition of existing building and replacement with a three-storey extension to provide extra-care units (Use Class C2), with associated soft and hard landscaping works; provision of additional vehicle parking, bin stores and ancillary structures; and alterations to existing basement.

An environmental noise survey is required to quantify the existing ambient and background noise levels at the site in order to establish the design constraints on noise emissions from the operation of plant. The noise survey will also provide information required to establish the acoustic performance of the building façade and ventilation strategy to ensure that the residential accommodation is in accordance with the Local Authority requirements and current guidance.

This report provides a description of the results from the noise survey undertaken, an assessment to determine the external noise limits for building services plant required to meet the Local Authority's general noise emission limits and advice regarding the building envelope and ventilation strategy.

To aid in the understanding of the assessment, definitions of technical terms used have been included in Appendix A.

2. Site description.

2.1 Existing site.

Thamesfield Retirement Village is located within the village of Remenham, directly opposite Henley-on-Thames. The site is bordered by the River Thames to the south west, and Wargrave Road (A321) to the northeast. To the northwest there are retirement properties known as Remenham Row and to the southeast is the Eyot Centre.

Thamesfield is an established and operational Integrated Retirement Community (IRC) providing extra care retirement accommodation and associated communal facilities. The Site currently comprises 37 extra care units. It contains two distinct buildings - the main building which covers the northern part of the site and Thamesfield Lodge which is located in the eastern corner. The main building comprises three elements: the original Stucco Fronted building which fronts on to the Thames and late 20th century extension to the north; the 1993 extension which is adjacent to the northern boundary of the site and the 1995 extension which is broadly centrally located within the site. A mix of hard and soft landscaping cover the remainder of the site including car parking, a croquet lawn and a landscaped lawn down to the banks of the River Thames.

The proposed site (indicative only) is identified in Figure 1 below.

2.2 Local noise environment.

The surrounding noise climate is predominantly formed of road traffic noise from the road network around the site, in particular Wargrave Road (A321) and White Hill (A4130).

Occasional sources of noise including boats on the River Thames, bird noise and wind-induced foliage noise were also audible.



Figure 1: Existing site (red line boundary indicative only).

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3. Basis of assessment.

3.1 National planning policy framework (NPPF): 2023.

The revised National Planning Policy Framework (1) published in December 2023 sets out the Government's current planning policies for England and how these are expected to be applied. The NPPF supersedes the previous NPPF published in July 2021.

With regards to local noise and vibration, paragraph 191 states:

"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;*
- b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and*
- c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation."*

Reference is made to the DEFRA Noise Policy Statement for England 2010 (NPSfE). This latter document is intended to apply to all forms of noise other than that which occurs in the workplace and includes environmental noise and neighbourhood noise in all forms.

The NPSfE advises that the impact of noise should be assessed on the basis of adverse and significant effect but does not provide any specific guidance on assessment methods or limit sound levels. Moreover, the document advises that it is not possible to have *"a single objective noise-based measure...that is applicable to all sources of noise in all situations"*. It further advises that the sound level at which an adverse effect occurs is *"likely to be different for different noise sources, for different receptors and at different times"*.

In the absence of specific guidance for assessment of environmental noise within the NPPF and the NPSfE, it is considered appropriate to base assessment on current British Standards and national guidance. These are considered to be Local Authority guidance, BS 4142 (2), BS 8233 (3) and the World Health Organisations (4) (WHO) guidelines.

3.2 National planning policy framework (NPPF): 2024 – Draft for consultation.

The NPPF 2024 draft was issued for consultation between July and September 2024 and if adopted will supersede the NPPF published in December 2023. With regards to local noise and vibration, paragraph 191 remains as per the December 2023 version and therefore there is no change within this latest revision.

3.3 BS 4142: 2014 + A1: 2019 – Methods for rating & assessing industrial & commercial sound.

Current Government advice to Local Planning Authorities in both England and Wales makes reference to BS 4142 as being the appropriate guidance for assessing commercial operations and fixed building services plant noise. This British Standard provides an objective method for rating the likelihood of complaint from industrial and commercial operations. It also describes means of determining noise levels from fixed plant installations and determining the background noise levels that prevail on a site.

The assessment of impacts is based on the subtraction of the measured background noise level from the rating level determined. The rating level is the source noise level (either measured or predicted) corrected for tone or character (if necessary). The difference is compared to the following criteria to evaluate the impact.

- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact.
- A difference of around +5 dB indicates is likely to be an indication of an adverse impact.

- Where the rating level does not exceed the background noise level, this is an indication of the specific sound source having a low impact.

This method is only applicable for external noise levels.

3.4 BS 8233: 2014 – Guidance on sound insulation and noise reduction for buildings.

BS 8233: 2014 provides guidance for control of noise in and around buildings and suggests appropriate criteria and limits for different situations. The criteria and limits are primarily intended to guide the design of new or refurbished buildings undergoing a change of use.

Table 4 within BS 8233 provides desirable internal ambient noise levels for spaces in residential dwellings when they are unoccupied.

Activity	Location	Daytime (0700 to 2300)	Night-Time (2300 to 0700)
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 $L_{Aeq,8hr}$

Table 1: Indoor ambient noise levels in spaces for dwellings.

Supplementary Note 2 and 4 to Table 4 within BS 8233 are copied below for reference:

'NOTE 2 – the levels shown in Table 4 are based on the existing guidelines issued by the WHO...'

'NOTE 4 – regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$ depending on the character and number of events per night.'

3.5 Approved Document O – Overheating.

Approved Document O (ADO) provides relaxed criteria for internal noise levels in spaces which are subject to overheating:

"Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits.

- 40dB $L_{Aeq,T}$, averaged over 8 hours (between 11pm and 7am).*
- 55dB L_{AFmax} , more than 10 times a night (between 11pm and 7am)."*

3.6 Acoustics Ventilation and Overheating Residential Design Guide.

The Acoustics Ventilation and Overheating (AVO) Residential Design Guide serves to inform acousticians as to a recommended approach for assessing impacts of transport noise on residential development, whilst giving due attention to how any advice serving this goal may impact on ventilation and overheating strategies.

The guidance in the AVO design guide is based on BS 8233 and other relevant standards. The guide states that *"where a development is considered necessary or desirable, the levels in BS 8233: 2014 may be relaxed by up to 5 dB and reasonable internal conditions still achieved."*

The document sets out a two-tiered approach to assess the risk of overheating for a proposed residential development site, based on a number of 'risk categories', ranging from negligible to high. The Level 1 assessment considers the external noise levels experienced by a proposed development, while the Level 2 assessment based on the resultant internal noise level.

3.7 Local planning policy.

3.7.1 Wokingham Borough Local Development Framework, Adopted Core Strategy Development Plan Document, January 2010.

Wokingham Borough's Core Strategy Development Plan Document adopted on 29th January 2010 sets out the vision for how the borough will develop in the period to 2026. It sets out the vision and how that vision will be delivered as well as including policies to be used in the determination of planning applications.

In respect of noise, the Core Strategy contains a single relevant policy.

3.7.1.1 Policy CP1 – Sustainable development.

Policy CP1 states the following:

"Planning permission will be granted for development proposals that:

- 8) Avoid area where pollution (including noise) may impact upon the amenity of future occupiers."*

3.7.2 Wokingham Borough Development Plan, Adopted Management Development Delivery Local Plan, February 2014.

Wokingham Borough's Management Development Delivery Local Plan adopted in February 2014 builds on the Core Strategy and includes more detailed policies for the development of the borough.

In respect of noise, the Management Development Delivery Local Plan contains a single relevant policy.

3.7.2.1 Policy CC06 – Noise.

Policy CC06 states the following:

- 1. "Proposals must demonstrate how they have addressed noise impacts to protect noise sensitive receptors (both existing and proposed) from noise impacts in line with Appendix 1 of the MDD.*
- 2. Noise impact of the development must be assessed. Where there is no adverse impact (No Observed Effect Level) then noise will not be a material consideration.*
- 3. Where there is an adverse effect (Lowest Observed Adverse Effect Level to Significant Observed Adverse Effect Level), then*
 - a. The development layout must be reviewed. Where this results in there no longer being an adverse impact then design and mitigation measures should be incorporated accordingly.*
 - b. Where there is still an adverse impact then internal layout must be reviewed. Where this results in there no longer being an adverse impact then design and measures should be incorporated accordingly.*
 - c. Where there is still an adverse impact then physical mitigation measures such as barrier / mechanical ventilation must be reviewed. Where this results in there no longer being an adverse impact then design and mitigation measures should be incorporated accordingly.*
 - d. Where there is still an adverse impact and the development falls within the significant observed adverse effect level then planning permission will normally be refused."*

3.7.3 Wokingham Borough Local Development Framework, Sustainable Design and Construction SPD, May 2010.

Wokingham Borough's Sustainable Design and Construction Supplementary Planning Document (SPD) adopted on 28th May 2010 forms part of the suite of documents guiding the Core Strategy Strategic Development locations and contains guidance on a number of issues to be considered as part of any planning application.

In respect of noise, the Sustainable Design and Construction SPD contains a single relevant issue.

3.7.3.1 Sustainability Issue 9: Air, Noise and Light Pollution and Land Affected by Contamination.

Sustainability Issue 9 states the following:

“Sustainability Statements submitted with a planning application will be expected to provide evidence of how the proposal has addressed the issues of air, noise and light pollution to minimise their impact. It should also provide evidence of the measures that will enable developers to meet their obligations in respect of land affected by contamination.”

The SPD goes on to refer to PPG 24 as the relevant guidance, however it is noted that PPG 24 was withdrawn on 27th March 2012 and replaced by the NPPF.

3.7.4 Wokingham Borough Local Plan Update 2023-2040: Proposed Submission Plan, 2024.

Wokingham Borough Local Plan Proposed Submission Plan was issued for consultation between 30th September and 13th November 2024 and if adopted will replace the Core Strategy (2010) and the Managing Development Delivery (2014) local plans.

In respect of noise, the Submission Plan contains a single relevant policy.

3.7.4.1 Policy HC8 – Noise pollution.

Policy HC8 states the following:

1. *“Development proposals must demonstrate how noise impacts have been addressed, to protect sensitive receptors, including existing and proposed dwellings.*
2. *The noise impact of the proposed development must be assessed. Where there is no adverse impact (no observed effect level), noise pollution will not be a material consideration.*
3. *Where there is an adverse effect (ranging from the lowest observed adverse effect level to a significant observed adverse effect level), then the following approaches must be taken in the order listed:*
 - a. *The development layout must be reviewed. Where this results in there no longer being an adverse impact then design and mitigation measures should be incorporated accordingly.*
 - b. *Where there is still an adverse impact, the internal layout must be reviewed. Where this results in there no longer being an adverse impact, then design and mitigation measures should be incorporated accordingly.*
 - c. *Where there is still an adverse impact, physical mitigation measures such as barriers / mechanical ventilation must be considered. Where this results in there no longer being an adverse impact, these measures should be incorporated accordingly.*
 - d. *Where there is still an adverse impact and the development falls within the significant observed adverse effect level, then planning permission will normally be refused.*
4. *Adverse impacts on sensitive environmental receptors, such as wildlife corridors, should be avoided or comprehensively mitigated where avoidance is not possible.”*

The subsequent text states the *“Development proposals should aim to meet the internal and external noise standards for residential developments set out in Table 11. These levels are based on Table 4 of BS 8233: 2014.”* This table is replicated below in Table 2.

Room	Time	Noise level dB
Bedrooms	Night (2300 – 0700)	30 dB L _{Aeq} Individual noise events should not exceed 45 dB L _{Amax} during the night-time
Living rooms	Daytime (0700 – 2300)	35 dB L _{Aeq}
Outside amenity space	Daytime (0700 – 2300)	50-55 dB L _{Aeq} Balconies will need to meet the same standard unless it is clear they are not intended to be an outdoor living area

Table 2: Internal and external noise standards.

Paragraph 13.45 goes on to state that “where development sites are affected by a non-steady noise source, commercial or industrial noise, or noise that does not follow a typical diurnal pattern, the acceptability of noise levels will be determined on a case-by-case basis. Where noise is of a continuous and / or tonal nature, this should be 5 dB below background noise levels.”

3.8 Proposed standards.

On the basis of current guidance and that stated within Wokingham Borough Council’s Proposed Submission Plan, the assessment is based on guidance provided within current British Standards. These are BS 4142: 2014 + A1: 2019 and BS 8233: 2014.

3.8.1 Building services – noise.

On the basis of guidance contained within BS 4142: 2014 + A1: 2019 and reference within the Proposed Submission Plan, noise emissions from building services plant shall be designed to achieve the following noise emission limits.

Noise source	Noise emission limit
Building services plant	$L_{Ar,Tr} = L_{A90,T} - 5 \text{ dB}$

Table 3: Noise emission limits for building services.

3.8.2 Environmental noise – internal noise levels.

On the basis of the requirements detailed within BS 8233: 2014, the development shall be designed to enable achievement of the internal noise levels stated within Table 4.

Location	Daytime (0700 to 2300)	Night-Time (2300 to 0700)
Residential dwellings		
Living room	35 dB $L_{Aeq,16hr}$	-
Bedroom	35 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq,8hr}$ & 45 dB $L_{Amax,T}^*$

Table 4: Proposed internal noise levels.

Note *: 45 dB L_{AFmax} to be exceeded no more than 15 times per night-time from sources other than emergency sirens.

In line with guidance provided within the AVO design guide and for the mitigation of overheating via an open window, the internal noise levels (L_{Aeq}) stated within Table 5 may be relaxed by up to 5 dB. Whilst compliance with ADO of the Building Regulations is less stringent, the internal noise levels are not in line with current guidance and are therefore not suitable or appropriate in our professional opinion. It is therefore recommended that internal noise levels do not exceed the target levels stated within the AVO Guide (i.e. a 5 dB relaxation on the L_{Aeq}) for the mitigation of overheating via a simple open window.

3.8.3 Environmental noise – external noise levels.

On the basis of the requirements set out within BS 8233: 2014 and within Wokingham Borough Council’s Proposed Submission Plan, the development shall aim to achieve an external noise level of less than 55 dB(A) in external amenity spaces (i.e., balconies and roof terraces).

4. Environmental noise survey.

An acoustic survey has been carried out at the site to establish the prevailing environmental noise conditions local to the site, so as to determine building services plant noise emission limits and to advise upon the building envelope and ventilation strategy.

4.1 Methodology.

The survey comprised seven-days of unattended automatic noise measurements at a single location and is shown as position L1 in Figure 2 below. This measurement was at a height of approximately 1.5m above local ground floor level.

Measurements recorded consisted of one-minute samples of ambient noise levels ($L_{Aeq,1min}$ in dB), maximum noise levels ($L_{Amax,1min}$ in dB) and background noise levels ($L_{A90,1min}$ in dB) between Wednesday 2nd August 2023 and Wednesday 9th August 2023.

Sample octave band measurements were also conducted at six positions at ground floor level during the daytime. These measurements were synchronised with the unattended measurements at position L1. The position of these measurements is shown in Figure 2 and were hand-held samples at a height of 1.2m above local ground floor level and considered “free-field”.

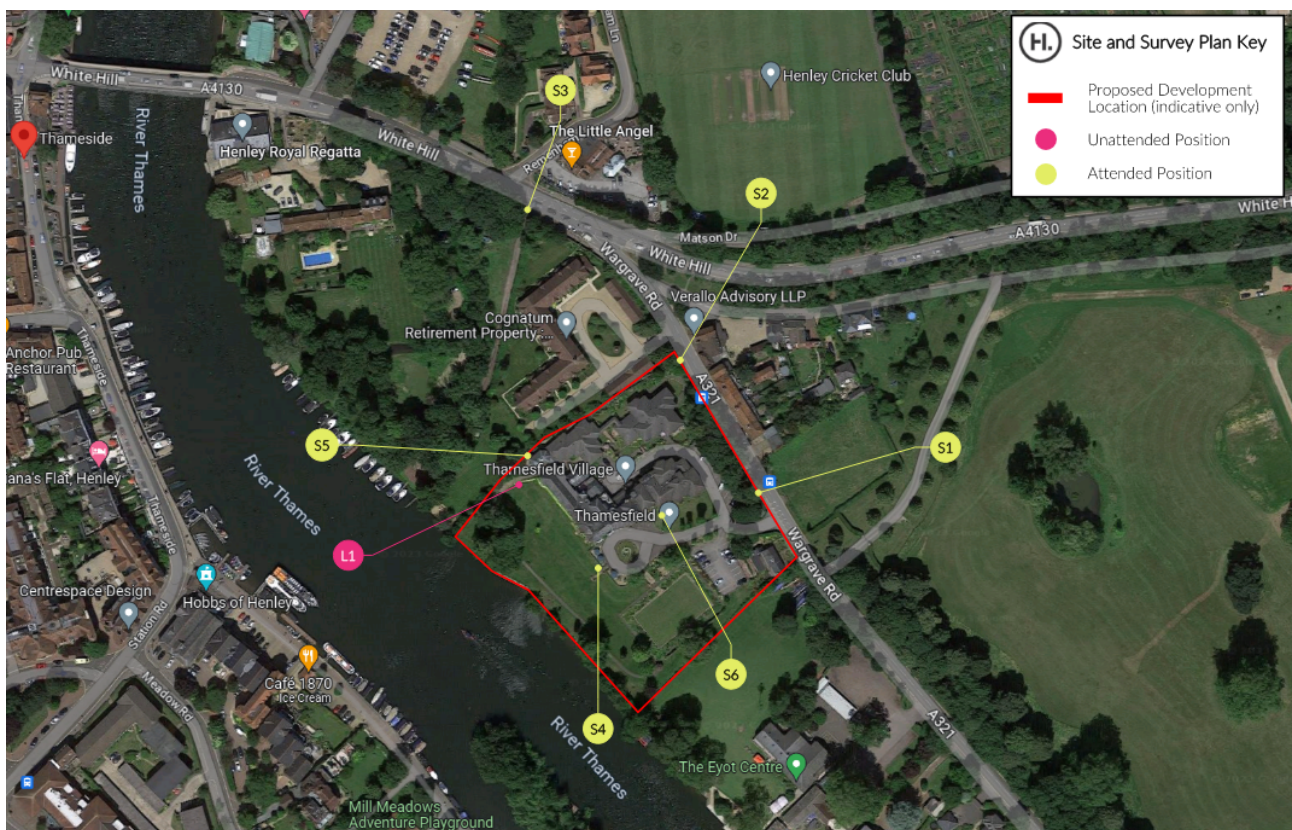


Figure 2: Measurement locations (red line boundary indicative only)

© Google Earth.

The measurement instrumentation used is listed in Appendix B attached and a general acoustic terminology is provided in Appendix A.

4.2 Results summary.

A time history of the L_{Aeq} , L_{A90} and L_{Amax} from the unattended measurements recorded at position L1 is shown in Appendix C attached.

The results of the unattended measurements at position L1 have been calculated into daytime ($L_{Aeq,16hr}$) and night-time ($L_{Aeq,8hr}$) equivalent levels, and are shown with the associated measured minimum background noise level ($L_{A90,T}$) and maximum instantaneous measured noise level ($L_{Amax,T}$) in Table 5 below.

It should be noted that the minimum daytime ($L_{A90,1hr}$) and night-time ($L_{A90,15min}$) background noise level shown below is the lowest arithmetic average of the measured background noise levels ($L_{A90,5min}$) in an hourly and fifteen-minute period respectively.

Measurement date	Time	Position L1					
		Daytime			Night-time		
		$L_{Aeq,16hr}$ dB	Min $L_{A90,1hr}$ dB	Max $L_{Amax,T}$ dB	$L_{Aeq,8hr}$ dB	Min $L_{A90,15min}$ dB	Max $L_{Amax,T}$ dB
Wednesday 2 nd August 2023	1330 – 2300	49	40	94	-	-	-
2 nd / 3 rd August 2023	2300 – 0700	-	-	-	43	38	64
Thursday 3 rd August 2023	0700 – 2300	54	39	87	-	-	-
3 rd / 4 th August 2023	2300 – 0700	-	-	-	41	38	65
Friday 4 th August 2023	0700 – 2300	52	41	85	-	-	-
4 th / 5 th August 2023	2300 – 0700	-	-	-	41	38	67
Saturday 5 th August 2023	0700 – 2300	48	42	68	-	-	-
5 th / 6 th August 2023	2300 – 0700	-	-	-	42	38	68
Sunday 6 th August 2023	0700 – 2300	47	40	74	-	-	-
6 th / 7 th August 2023	2300 – 0700	-	-	-	42	38	66
Monday 7 th August 2023	0700 – 2300	48	39	91	-	-	-
7 th / 8 th August 2023	2300 – 0700	-	-	-	41	38	69
Tuesday 8 th August 2023	0700 – 2300	48	40	74			
8 th / 9 th August 2023	2300 – 0700	-	-	-	41	38	61
Wednesday 9 th August 2023	0700 – 1510	57	44	89	-	-	-

Table 5: Measured noise levels at position L1.

Noise levels measured by the unattended noise logger at position L1 indicate that the typical measured background noise level was $L_{A90,1hr}$ 40 dB during the daytime and $L_{A90,15min}$ 38 dB during the night-time. In addition, the fifteenth highest $L_{Amax,T}$ during the night-time was 58 dB.

A summary of the noise levels at the various attended positions is provided in Table 6 overleaf.

Measurement Position	Typical $L_{Aeq,T}$ dB	Typical $L_{Amax,T}$ dB
Daytime		
S1	70	80
S2	69	80
S3	70	77
S4	63	69
S5	53	55
S6	53	62

Table 6: Measured noise levels at attended positions.

Full details of the hand-held octave band measurements at all positions during the daytime are shown in the tables within Appendix D attached.

5. Noise sensitive areas.

A noise sensitive area is defined as landscapes or buildings where the occupiers are likely to be sensitive to noise created by plant installed in the proposed development, including residential areas.

The nearest noise sensitive area is therefore identified as the proposed development itself and existing residential dwellings within Thamesfield Retirement Village and those along Wargrave Road to the north including Remenham Row to the north. Each of the noise sensitive receptors are identified in Figure 3 below.



Figure 3: Nearest noise sensitive receptors (red line boundary indicative only)

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6. Noise emissions of fixed plant.

Noise levels due to building services serving the proposed development are advised to meet the following noise level criteria shown below in Table 7 one metre from the nearest noise sensitive area as identified in Section 5. These are based on the typical background noise levels measured at position L1 which are deemed representative of the nearest noise sensitive receptors.

Period	Typical background noise level $L_{A90,T}$ dB	Noise emission limit $L_{A,r,Tr}$ dB
Daytime (0700 to 2300)	40	35
Night-Time (2300 to 0700)	38	33

Table 7: Building services noise emission limits.

It should be noted that each of the limits stated above are the combined operational noise levels of plant at the nearest noise sensitive façade. As such, the combined operational noise levels of all plant are required to achieve the noise limits defined above.

For plant noise that is tonal, contains a specific character or is intermittent, the limits of Table 7 above need to include a character correction as defined by the Local Authority and BS 4142: 2014 + A1: 2019.

7. Noise prediction model.

In order to predict the external noise level present at each façade of the proposed development and to determine a suitable ventilation strategy, a noise map has been created using CADNA/A environmental noise prediction and mapping software.

A baseline noise map was generated of the existing site using the results of the environmental noise survey and calibrated for daytime equivalent noise levels ($L_{Aeq,16hr}$), night-time equivalent noise levels ($L_{Aeq,8hr}$) and the fifteenth highest night-time $L_{Amax,T}$. The noise map was calibrated for each of the noise sources discussed in Section 2.2.

Subsequently, a noise map was generated of the site with the proposed development in-situ. Appendix E attached displays a three-dimensional representation of the noise map prediction for each of the proposed development façades. It should be noted that the noise mapping exercise takes into consideration all noise reflections that may occur off the proposed development and adjacent buildings.

8. Building envelope & ventilation strategy.

The sound insulation properties of the building envelope depend upon the external noise levels present at the façade and the proposed design criteria for the internal noise levels of specific rooms, dependant on their use. Table 8 overleaf assumes compliance with BS 8233: 2014 internal noise levels (as stated in Table 4) and shows the level differences for varying spaces within the proposed development.

The examples shown represent the highest level differences required for each façade as identified in Figure 4 below, based on the predicted noise levels.



Figure 4: Façade locations.

It should be noted that the highest-level difference (D) shown for bedrooms within Table 8 takes precedence.

Façade	Room use	Noise levels (dB)		
		Predicted external	Proposed internal (maximum)	Minimum level difference D
Zone 1	Living room ¹	61	35	26
	Bedroom ²	54	30	24
	Bedroom (L_{Amax}) ²	73	45	28
Zone 2	Living room ¹	56	35	21
	Bedroom ²	50	30	20
	Bedroom (L_{Amax}) ²	66	45	21
Zone 3	Living room ¹	55	35	20
	Bedroom ²	48	30	18
	Bedroom (L_{Amax}) ²	65	45	20
Zone 4	Living room ¹	51	35	16
	Bedroom ²	43	30	13
	Bedroom (L_{Amax}) ²	61	45	16

Table 8: Notional sound insulation values of proposed façade construction.

Note 1: Living room (day) $L_{Aeq,16hr}$ (0700 to 2300).

Note 2: Bedroom (night) $L_{Aeq,8hr}$ (2300 to 0700) and $L_{Amax,T}$ (2300 to 0700).

Simple natural ventilation through the use of open windows will provide a level difference (D) in the order of 10 to 15 dB. It can be seen from Table 8 above that all spaces require greater levels of sound insulation based on the external noise levels.

Details of rationalised minimum required $R_w + C_{tr}$ of all glazed window / door elements (glazing, seals, frames etc.) to rooms on each façade based on the above level difference comparison are provided in Table 9.

Façade	Minimum Required $R_w + C_{tr}$ (dB)	
	Living room	Bedroom
Zone 1	26*	28*
Zone 2	21*	21*
Zone 3	20*	20*
Zone 4	16*	16*

Table 9: Minimum required $R_w + C_{tr}$ of glazed elements.

Note *: Achievable with a standard thermal double-glazed unit.

At this stage it is assumed that the non-glazed element on all façades will be capable of achieving a sound reduction of 38 dB $R_w + C_{tr}$.

Examples of primary glazing configurations capable of achieving the minimum required $R_w + C_{tr}$ are provided below:

- $R_w + C_{tr}$ 28 dB – 6mm glass, 16mm air gap, 4mm glass.

At this stage the required glazing sound insulation values have been based on a level difference comparison only. Detailed calculations based on façade areas will be required to refine and finalise the performance

requirements during the next design stage. As such, the sound insulation values stated are indicative and for guidance purposes only.

8.1 Overheating.

8.1.1 Approved Document O.

Part O of the Building Regulations requires that noise in relation to the risk of overheating in homes must be assessed, with criteria given for bedrooms at night as set out in Section 3.5.

Compliance with these bedroom criteria using a partially open window is possible on Zones 2, 3 and 4 providing the window geometric area does not exceed those stated in Table 10. If the opening is required to be larger to mitigate overheating, then these façades may not be suitable using an open window.

Façade	Room use	Maximum window open area* m ²
Zone 2	Bedroom	0.69
Zone 3	Bedroom	0.87
Zone 4	Bedroom	2.19

Table 10: Maximum opening area of window for purposes of mitigating overheating in line with ADO.

Note *: Based on a receiver room volume of 55m³ and a receiver room reverberation time of 0.5 seconds.

It should be noted that this requires further assessment using an overheating model to determine the opening area of the window to mitigate overheating.

8.1.2 Acoustics Ventilation & Overheating Residential Design Guide.

Guidance provided within the ANC's Acoustics Ventilation and Overheating Residential Design Guide states that "the internal target levels (L_{Aeq}) may be relaxed by up to 5 dB and reasonable internal conditions still achieved". On the basis that reasonable internal conditions could still be achieved, natural ventilation via open windows could be provided to the façade zones identified in Figure 5 overleaf during the daytime for the mitigation of overheating. It should be noted that this assumes that an open window provides a reduction of 13 dB(A) and that the maximum window open area does not exceed 0.44m² (based on a receiver room volume of 55m³ and a receiver room reverberation time of 0.5 seconds).

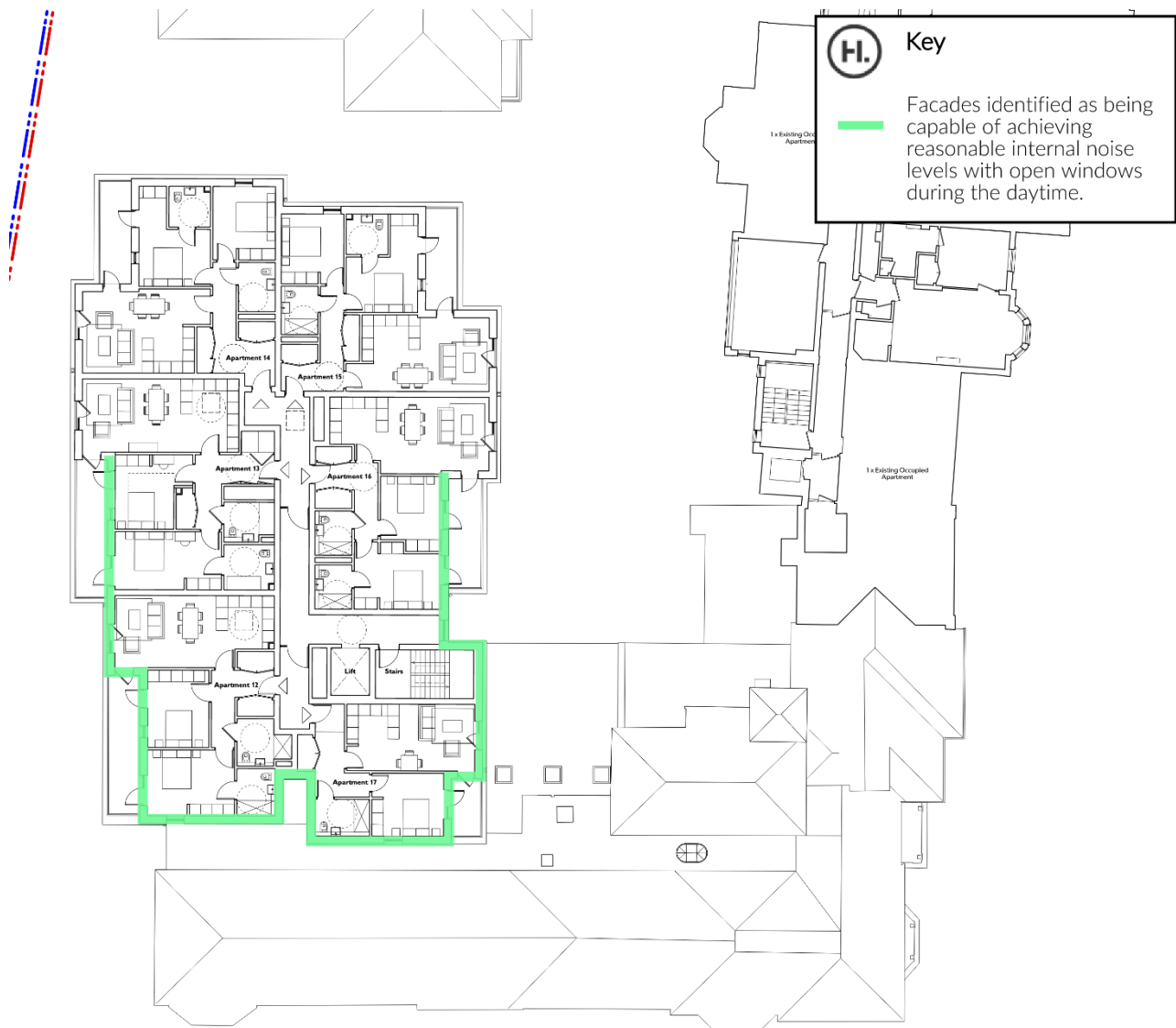


Figure 5: Façades identified as being capable of achieving reasonable internal conditions with open windows – daytime only.

For all other rooms and during the night-time for all façades, provision for alternative forms of ventilation will need to be made such that windows are not required to be opened for ventilation purposes. It should be noted that windows may be openable for purge ventilation within all apartments.

8.1.3 Compliance.

In order to confirm the suitability of the proposed glazed and non-glazed elements, evidence of the laboratory sound insulation performance will be required for the entire unit as it will be installed (including glass, frame, seals, mullions and transoms). All acoustic testing shall be undertaken in controlled laboratory conditions in accordance with ISO 10140-2:2021 *“Acoustics – Laboratory Measurement of Sound Insulation of Building Elements”*(5).

8.2 External amenity.

The proposed development will provide balconies on various elevations of the building. For a seated reisdnet on these balconies, the acoustic screening effect of a solid balustrade is expected to reduce façade levels by approximately 3 dB(A). This would reduce noise levels for a seated receptor on balconies on Zones 2, 3 and 4 to less than 55 dB(A), which would achieve the WHO recommendation for external amenity.

For the remaining balconies on Zone 1, balcony noise levels within the range 54-58 dB(A) are predicted for a seated receptor. Although this marginally exceeds the WHO recommendation for amenity areas, it is considered unlikely that in the context of the site, noise would significantly impact upon their intended amenity use.

9. Summary & conclusions.

Hoare Lea has conducted an environmental noise survey in order to support the planning application for the proposed redevelopment at Thamesfield Retirement Village in Remenham. Unattended noise monitoring throughout a typical seven-day period and sample octave band measurements were conducted.

Background noise levels typical of the daytime and night-time have been measured and used to define building services plant noise emission limits at the nearest noise sensitive receptors. The nearest receptors have been identified as the proposed development itself and existing residential dwellings within Thamesfield Retirement Village and those along Wargrave Road to the north including Cognatum Retirement Property to the north.

During the daytime the combined building services plant noise emission contribution limit advised is 35 dB(A) and during the night-time the combined building services plant noise emission contribution limit advised is 33 dB(A), one metre from the nearest residential façade.

An assessment of the building envelope acoustic performance is provided with the minimum level difference (D) in accordance with the internal ambient noise levels detailed within BS 8233: 2014.

The ventilation strategy should allow for alternative forms ventilation as the level differences required are above those achievable by simple means of natural ventilation.

For the mitigation of overheating, several elevations to the rear of the development have been identified as being possible to be natural ventilated during the daytime and reasonable internal conditions achieved in line with guidance provided within the ANC's Acoustics Ventilation and Overheating Residential Design Guide. This is however subject to further analysis including whether an open window would provide sufficient mitigation of overheating.

Notional glazing requirements for varying internal spaces and indicative glazing configurations have been provided. It should be noted that the defined performances for glazed elements are for guidance purposes only. Detailed calculations based on façade areas will be required to refine and finalise the performance requirements during the next design stage.

On the basis of the guidance contained within this report, it is concluded that the Site is suitable for the proposed development.

The guidance provided within this report is sufficient to satisfy the requirements of Wokingham Borough Council, in our professional opinion.

10. References.

1. *National Planning Policy Framework, Department for Communities and Local Government, December 2023.*
2. *BS 4142: 2014 + A1: 2019: 'Method for rating and assessing industrial and commercial sound'.*
3. *BS 8233: 2014, "Guidance on Sound Insulation and Noise Reduction for Buildings", BSI.*
4. *World Health Organisation (WHO) - Environmental Noise Guidelines for the European Region, 2018.*
5. *ISO 10140-2: 2021, "Acoustics - Laboratory Measurement of Sound Insulation of Building Elements. Part 2: Measurement of Airborne Sound Insulation."*

Appendix A – Acoustic terminology.

Sound

Sound is produced by mechanical vibration of a surface, which sets up rapid pressure fluctuations in the surrounding air.

The Sound Pressure

The Sound Pressure is the force (N) of sound on a surface area (m²) perpendicular to the direction of the sound. The SI-units for the Sound Pressure are Nm⁻² or Pa (Pascal).

Sound is measured with microphones responding proportionally to the sound pressure – p. The power is proportional to the square of the sound pressure.

The Sound Pressure Level

The human ear has an approximately logarithmic response to sound pressure over a very large dynamic range. The lowest audible sound pressure approximately 2×10^{-5} Pa (2 ten billionths of an atmosphere) and the highest is approximately 100 Pa.

It is therefore convenient to express the sound pressure as a logarithmic decibel scale related to this lowest human audible sound, where:

$$L_p = 10 \log \left(\frac{p^2}{p_{ref}^2} \right) = 10 \log \left(\frac{p}{p_{ref}} \right)^2 = 20 \log \left(\frac{p}{p_{ref}} \right)$$

Where:

L_p = sound pressure level (dB)

p = sound pressure (Pa)

p_{ref} = 2×10^{-5} – reference sound pressure (Pa)

In accordance with the logarithmic scale, doubling the sound pressure level gives an increase of 6 dB.

Decibel (dB)

The decibel is the unit used to quantify sound pressure levels as well as sound intensity and power levels.

In accordance with the logarithmic scale, an increase of 10 dB in sound pressure level is equivalent to an increase by a factor of 10 in the sound pressure level (measured in Pa). Subjectively, this increase would correspond to a doubling of the perceived loudness of the sound.

Sound Pressure Level of Some Common Sources

An indication of the range of sound levels commonly found in the environment is given in the following Table.

Source	Sound Pressure Level dB
Threshold of Hearing	0
Rustling Leaves	20
Quiet Whisper	30
Home	40
Quiet Street	50
Conversation	60
Inside a Car	70
Loud Singing	80
Motorcycle (10m)	90
Lawn Mower (1m)	100
Diesel Truck (1m)	110
Amplified Music (1m)	120
Jet Plane (1m)	130

Frequency

The rate at which the pressure fluctuations occur determines the pitch or frequency of the sound. The frequency is expressed in Hertz (Hz) or cycles per second.

Octave and Third Octave Bands

An octave is the interval between two points where the frequency at the second point is twice the frequency of the first.

There are many methods of describing the frequency content of a noise. The most common methods split the frequency range into defined bands, in which the mid-frequency is used as the band descriptor and in the case of octave bands is double that of the band lower. For example, two adjacent octave bands are 250 Hz and 500 Hz.

Third octave bands provided a fine resolution by dividing each octave band into three bands. For examples, third octave bands would be 160 Hz, 250 Hz and 315 Hz for the same 250 Hz octave band.

The human ear is sensitive to sound over a range of frequencies between approximately 20 Hz to 20 kHz and is generally more sensitive to medium and high frequency than to low frequencies within the range. This is the basis of the A-weighting.

A-Weighting

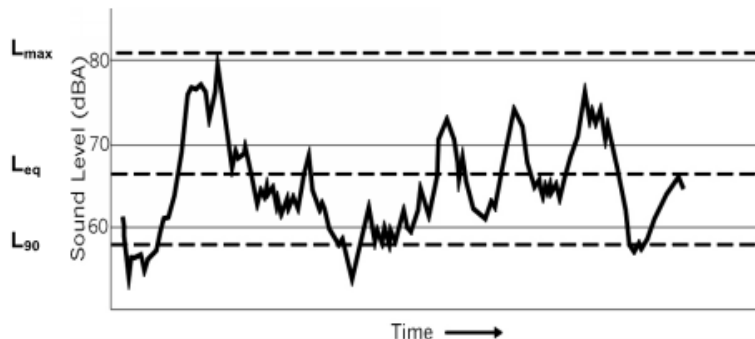
The A-weighting is a correction term applied to the frequency range in order to mimic the sensitivity of the human ear to noise. It is generally used to obtain an overall noise level from octave or third octave band frequencies.

An A weighted value would be written as dB(A) or including A within the parameter term.

Noise Units

In order to assess environmental noise, measurements are carried out by sampling over specific periods of time, such as five minutes, the statistically determined results being used to quantify various aspects of the noise.

The figure below shows an example of sound level varying with time. Because of this time variation the same period of noise can be described by several different levels. The most common of these are described below.



$L_{eq,T}$

The $L_{eq,T}$ is a parameter defined as the equivalent continuous sound pressure level over a defined time period 'T'. It is the sound pressure level equivalent to the acoustic energy of the fluctuating sound signal.

The $L_{eq,T}$ can be thought of as an 'average' sound pressure level over a given time period (although it is not an arithmetic average). Typically, the $L_{eq,T}$ will be an A-weighted noise level in dB(A) and is commonly used to describe all types of environmental noise sources.

$L_{01,T}$

The $L_{01,T}$ is a parameter defined as the sound pressure level exceeded for 1% of the measurement period 'T'.

It is a statistical parameter and cannot be directly combined to other acoustic parameters.

$L_{10,T}$

The $L_{10,T}$ is a parameter defined as the sound pressure level exceeded for 10% of the measurement period 'T'.

It is a statistical parameter and cannot be directly combined to other acoustic parameter and is generally used to describe road traffic noise.

$L_{90,T}$

The $L_{90,T}$ is a parameter defined as the sound pressure level exceeded for 90% of the measurement period 'T'.

It is a statistical parameter and cannot be directly combined to other acoustic parameter and is generally used to describe the prevailing background noise level.

$L_{max,T}$

The $L_{max,T}$ is a parameter defined as the maximum noise level measured during the specified period 'T'.

Specific Noise Level, $L_{Aeq,T,r}$

This is the equivalent continuous A-weighted sound pressure level at the assessment position due to a specific noise source operating over a given time interval.

Free Field

A measurement taken in the free field is at least 3.5m from reflecting vertical surfaces and 1.2m from the ground.

Façade

A measurement is influenced by the reflection of sound from the façade of a building within 3.5m. A façade measurement is made 1m in front of the vertical building surface.

R_w

A single-number quantity which characterizes the airborne sound insulation of a material or building element in the laboratory. See BS EN ISO 717-1: 1997.

Appendix B – List of measurement equipment.

Environmental Noise Survey.

Sound Level Meter (Position L1 – Unattended)

- Rion NL-52 Sound Level Meter (Serial Number 00342839)
- Rion NH-2H Pre-Amplifier (Serial Number 42867)
- Rion UC-59 Microphone (Serial Number 06360)

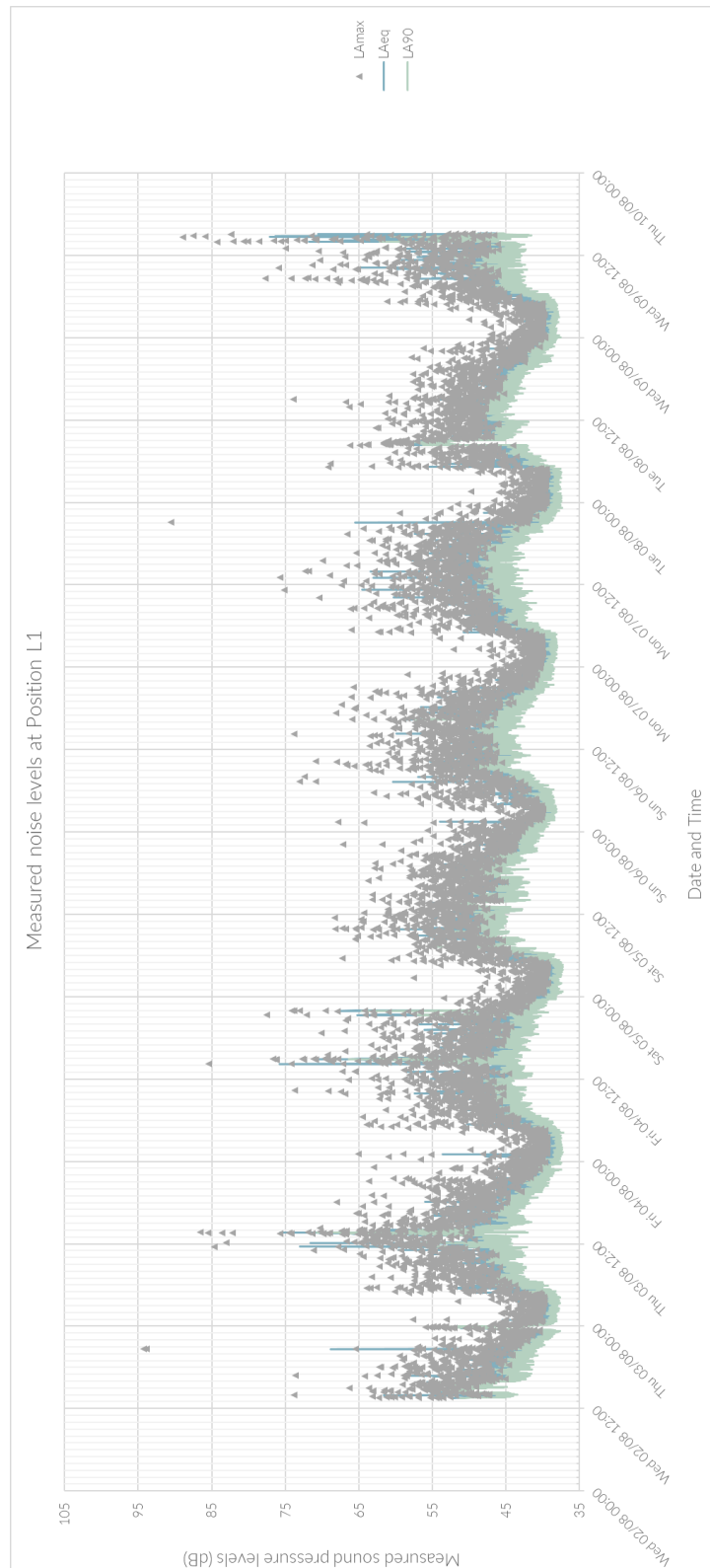
Noise Spectral Analysers (Octave Band Measurements at all Positions)

- Brüel and Kjær 2250 Sound Level Meter (Serial Number 3004050)
- Brüel and Kjær ZC 0032 Pre-Amplifier (Serial Number 19776)
- Brüel and Kjær 4231 Sound Calibrator (Serial Number 2445715)
- Brüel and Kjær 4189 Microphone (Serial Number 3099822)

Sound level meters were field calibrated before and after noise survey and no discernible variations occurred.

Appendix C – Time history of unattended measurements.

Position L1



Appendix D – Octave band levels at measurement positions.

Position	Measurement Period	Duration	Sound Pressure Level per Octave Band Frequency in dB										L _{Aeq,T} dB
			16Hz	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	
S1	09/08/2023 13:52	00:01:00	63.9	69.2	70.7	65.1	66.0	64.2	68.6	61.0	51.5	44.1	70.4
	09/08/2023 13:54	00:01:00	62.0	69.6	74.0	65.9	66.4	64.3	66.8	60.1	51.4	45.2	69.2
S2	09/08/2023 13:56	00:01:00	64.3	72.2	71.8	64.7	64.3	63.2	65.4	58.8	51.4	45.7	67.8
	09/08/2023 13:57	00:01:00	63.0	69.3	71.6	63.6	63.7	61.4	64.2	57.6	48.5	42.4	66.5
	09/08/2023 13:59	00:01:00	63.5	64.2	69.2	63.9	64.2	62.7	65.6	59.3	51.0	45.8	67.9
	09/08/2023 14:00	00:01:00	75.7	75.3	73.9	73.9	72.1	69.8	70.9	63.5	56.9	52.5	73.6
	09/08/2023 14:35	00:01:00	65.3	70.7	73.5	67.3	65.9	63.8	66.4	59.5	51.0	44.9	68.8
	09/08/2023 14:37	00:01:00	71.0	72.2	66.2	59.1	56.3	54.1	55.4	50.7	46.2	43.0	58.9
S3	09/08/2023 14:05	00:01:00	60.8	69.6	79.1	79.0	70.5	65.6	65.9	60.5	54.9	49.7	70.2
	09/08/2023 14:07	00:01:00	61.0	66.0	72.0	65.6	65.0	64.2	67.4	61.2	53.7	47.3	69.6
	09/08/2023 14:08	00:01:00	66.0	72.8	81.1	72.3	66.3	65.8	66.5	61.6	55.9	50.5	69.9
	09/08/2023 14:10	00:01:00	65.6	72.5	72.8	71.6	66.6	66.1	69.6	63.0	54.5	46.9	71.7
	09/08/2023 14:38	00:02:00	67.0	75.9	76.4	70.2	65.6	64.1	66.8	63.1	57.7	49.9	70.1
	09/08/2023 14:43	00:01:00	60.8	72.1	71.8	64.3	61.0	60.1	62.4	56.9	49.1	43.4	65.1
S4	09/08/2023 14:44	00:01:00	62.0	70.1	71.4	65.9	63.6	61.9	63.8	59.6	54.5	48.6	67.1
	09/08/2023 14:15	00:01:00	58.9	64.1	66.4	73.6	63.4	55.4	55.7	56.3	53.4	49.8	63.2
	09/08/2023 14:17	00:01:00	59.7	65.1	67.3	72.7	63.3	55.5	56.4	57.1	53.7	49.1	63.5
	09/08/2023 14:19	00:01:00	57.6	64.1	67.5	72.4	61.3	55.3	55.5	56.2	53.0	49.0	62.7
	09/08/2023 14:20	00:01:00	57.8	64.1	67.0	73.2	63.1	55.1	56.0	56.9	54.3	49.4	63.5
	09/08/2023 14:25	00:01:00	62.0	65.2	64.5	59.9	53.7	49.0	46.5	41.5	33.6	26.7	52.3
S5	09/08/2023 14:26	00:01:00	59.7	65.3	63.1	59.8	54.6	49.1	46.5	41.9	34.6	28.7	52.6
	09/08/2023 14:28	00:01:00	60.4	68.1	65.8	61.1	55.2	49.2	46.5	42.4	35.9	30.4	53.0
	09/08/2023 14:52	00:01:00	59.2	60.8	57.3	53.1	45.9	44.1	46.2	46.1	44.3	39.7	52.0
S6	09/08/2023 14:54	00:02:00	57.9	63.3	55.9	49.7	44.9	43.6	45.5	46.2	44.4	39.6	51.8
	09/08/2023 14:58	00:01:00	58.3	64.4	60.6	62.7	56.9	48.3	47.4	46.7	44.6	39.9	54.6

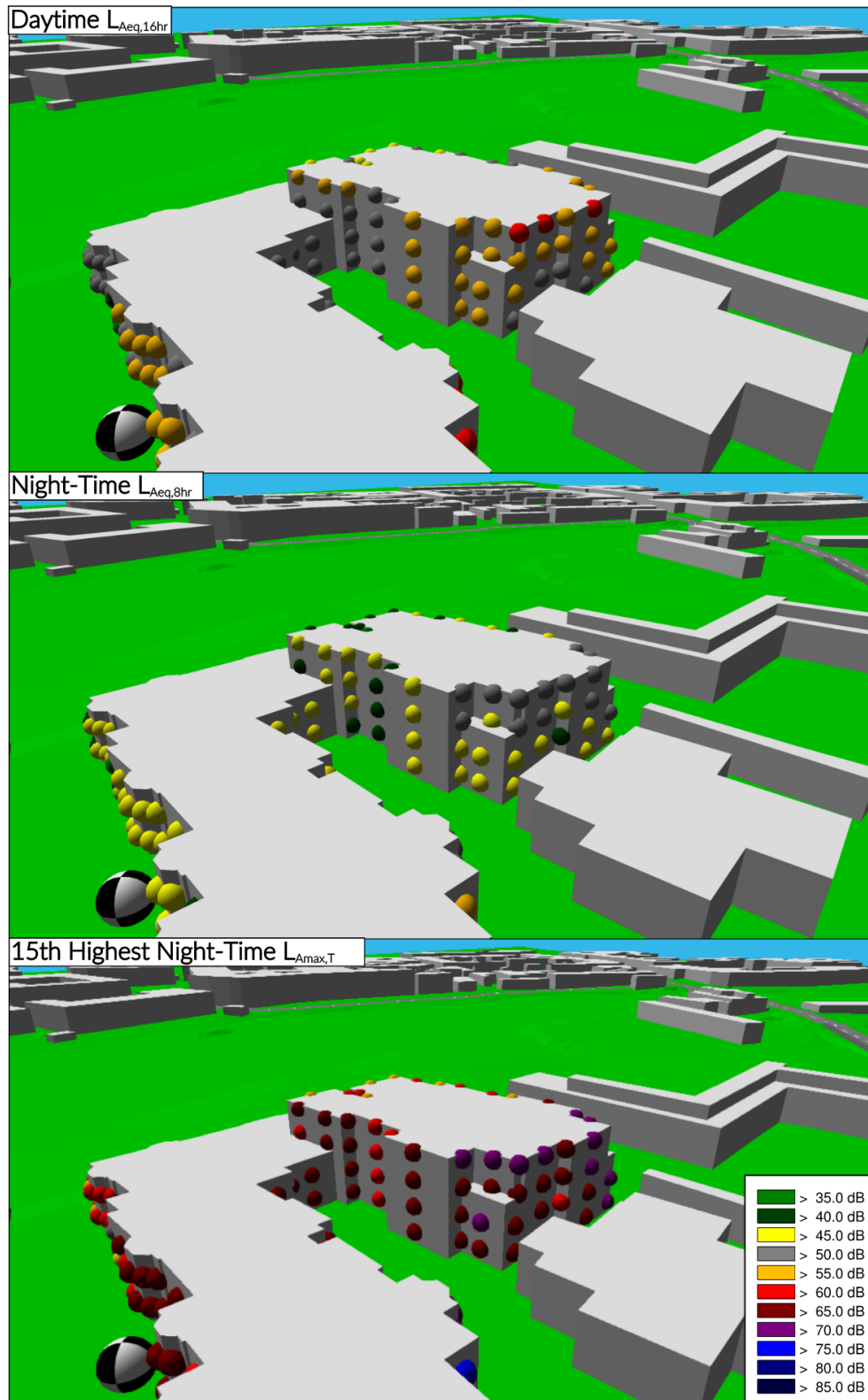
Table 11: Ambient levels measured at attended measurement positions.

Position	Measurement Period	Duration	Sound Pressure Level per Octave Band Frequency in dB										L _{Amax,T} dB
			16Hz	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	
S1	09/08/2023 13:52	00:01:00	77.8	84.4	86.3	79.8	80.5	78.5	83.4	75.7	67.3	60.9	84.3
	09/08/2023 13:54	00:01:00	73.0	81.0	90.2	76.8	77.7	75.5	77.0	69.7	62.4	59.1	77.6
S2	09/08/2023 13:56	00:01:00	75.0	87.3	84.9	76.3	75.9	75.7	77.4	69.7	64.4	59.9	78.6
	09/08/2023 13:57	00:01:00	74.6	82.9	87.1	74.7	77.2	76.2	78.3	70.8	62.1	57.7	79.8
	09/08/2023 13:59	00:01:00	77.8	78.7	84.3	76.7	77.9	76.8	78.7	74.0	67.4	63.8	80.9
	09/08/2023 14:00	00:01:00	91.2	90.9	88.5	85.9	88.7	83.0	80.2	75.8	73.7	70.6	84.4
	09/08/2023 14:35	00:01:00	76.2	84.1	87.5	80.3	75.8	76.1	77.4	70.7	60.0	55.6	79.1
	09/08/2023 14:37	00:01:00	75.8	85.3	73.5	69.4	67.6	65.7	65.5	61.2	61.2	58.7	68.4
S3	09/08/2023 14:05	00:01:00	69.7	80.1	93.5	93.9	84.9	80.4	75.3	69.5	65.3	60.7	78.6
	09/08/2023 14:07	00:01:00	70.4	75.6	86.9	78.1	75.1	75.2	76.4	69.6	64.1	61.1	77.7
	09/08/2023 14:08	00:01:00	76.8	84.8	97.5	88.1	77.2	78.8	74.3	70.6	66.6	64.2	79.6
	09/08/2023 14:10	00:01:00	79.2	84.1	84.7	86.5	75.9	75.8	78.2	70.8	65.6	61.2	79.3
	09/08/2023 14:38	00:02:00	80.0	88.5	91.2	85.0	77.7	76.2	79.4	75.1	70.2	65.1	80.4
	09/08/2023 14:43	00:01:00	69.8	80.4	80.4	72.3	69.3	67.4	69.5	63.7	57.8	55.2	70.6
S4	09/08/2023 14:44	00:01:00	71.0	76.6	81.5	78.7	74.7	70.7	71.6	69.1	67.8	61.4	75.5
	09/08/2023 14:15	00:01:00	63.7	69.6	72.8	82.4	71.3	63.9	64.1	63.4	59.6	57.2	69.5
	09/08/2023 14:17	00:01:00	65.1	70.8	73.0	81.0	69.3	63.2	63.5	63.1	60.1	56.9	68.7
	09/08/2023 14:19	00:01:00	62.5	68.8	72.3	80.5	67.3	62.0	62.1	62.2	62.2	60.7	68.0
	09/08/2023 14:20	00:01:00	62.8	68.7	72.7	81.7	68.9	62.7	62.7	62.7	58.8	55.5	68.2
	09/08/2023 14:25	00:01:00	72.5	69.6	70.0	64.8	57.5	52.7	51.7	44.2	39.7	37.4	54.6
S5	09/08/2023 14:26	00:01:00	64.6	70.0	68.5	64.5	58.8	55.0	52.7	45.2	43.0	40.9	56.2
	09/08/2023 14:28	00:01:00	67.5	72.5	71.2	66.7	59.3	52.5	49.3	46.7	46.9	44.1	54.6
	09/08/2023 14:52	00:01:00	66.8	67.2	64.6	61.0	54.0	55.4	55.5	51.2	48.7	43.6	57.1
S6	09/08/2023 14:54	00:02:00	69.3	72.9	66.3	62.8	57.5	63.6	63.9	61.8	57.2	48.9	68.1
	09/08/2023 14:58	00:01:00	66.9	72.8	68.6	72.6	68.3	57.7	56.2	52.1	48.2	47.3	61.0

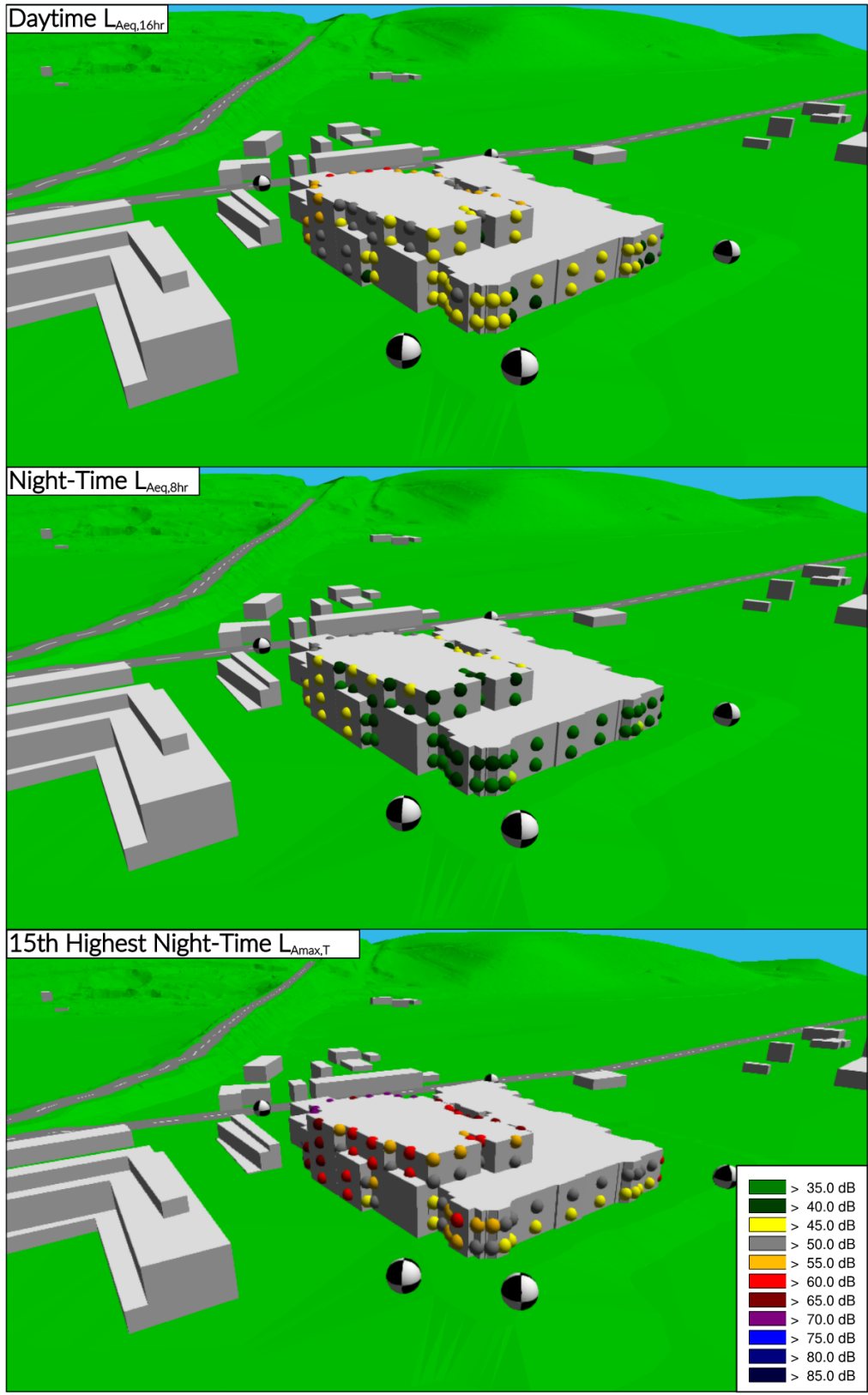
Table 12: Maximum levels measured at attended measurement positions.

Appendix E – 3D noise map of proposed development.

From the east.



From the west.





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