

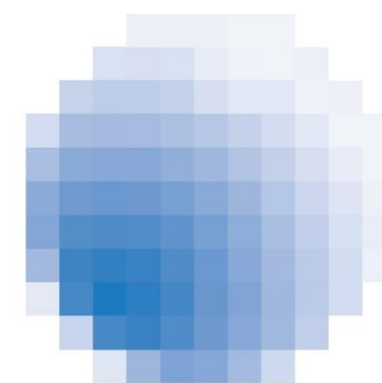
ELDER

GREYFRIARS HOUSE
20 - 30 GREYFRIARS ROAD , READING

NOISE IMPACT STATEMENT

SOL ACOUSTICS





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Co-Living Scheme at 20 – 30 Greyfriars House

Reading

Stage 2 Environmental & Intrusive Noise Assessment Report

P2481-REP01-DJR P04

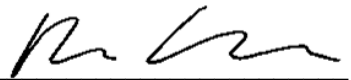
5 November 2024

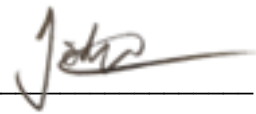


PROJECT: Co-Living Scheme at 20 – 30
Greyfriars House
Stage 2 Environmental & Intrusive
Noise Assessment Report

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DOCUMENT REFERENCE: P2481-REP01-DJR P04

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SUMMARY

Sol Acoustics Ltd has been commissioned by Elder Developments (Greyfriars) Ltd to undertake a RIBA Stage 2 acoustic assessment of the proposed Co-Living Scheme at 20 – 30 Greyfriars Road development in Reading, RG1 1NS.

This report provides details of the acoustic assessment used to assess the suitability of the development site as based on the pre-existing environmental noise climate on-site as measured by Sol during July 2024, together with reference to the guidance presented in '*Professional Planning Guidance: Planning and Noise*' and BS 8233:2014 '*Guidance on sound insulation and noise reduction for buildings*'.

Acoustic guidance is also presented concerning the impact of mitigating residential summertime overheating using a natural ventilation strategy in accordance with the assessment framework provided in '*Acoustics, Ventilation and Overheating, Residential Design Guide 2020*' and the requirements of Building Regulations '*Approved Document O*'.

This report demonstrates that the proposed residential development site can be categorised as a “**Medium risk**” site as defined by '*Professional Planning Guidance: Planning and Noise*' (*ProPG*). The development is likely to be acceptable from a noise perspective assuming a good acoustic design process is demonstrated to mitigate any potential impacts of environmental noise, as outlined in this report.

Appropriate indoor ambient noise levels can be achieved within internal residential habitable rooms across the residential development with an Approved Document F background ventilation strategy and suitable acoustic glazing strategy as outlined in the report.

Predictions show that environmental noise levels within the proposed external amenity spaces for the residents of the development, are in line with standard guidance.

An assessment of noise from surrounding commercial premises has been undertaken and mitigation measures required to meet suitable internal ambient noise level limits are presented.

Appropriate daytime and night time environmental noise limits for M&E plant (and associated louvres, cowls etc.) have also been set herein, all as based on the results obtained from the environmental noise surveys undertaken, and as discussed within this report.



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1 INTRODUCTION

Sol Acoustics Ltd (“Sol”) has been commissioned by Elder Developments (Greyfriars) Ltd (“Elder”) to undertake a RIBA Stage 2 acoustic design assessment of the Co-Living Scheme at 20 – 30 Greyfriars House development (“The Development”) in Reading, RG1 1NS.

The purpose of this acoustic report is as follows:

- To assess the residential scheme in accordance with ‘*ProPG: Planning & Noise 2017*’.
- To determine preliminary acoustic performance specifications for the building envelopes based on the pre-existing environmental noise climate on-site and appropriate internal ambient noise levels stated within the relevant design guidance.
- To carry out an environmental noise assessment of the development due to local commercial sites in accordance with the assessment methodology that is prescribed in relevant Standards (e.g. British Standard 4142:2014+A1:2019) and other acoustic guidance, in order to determine the likely significance of the noise impact generated.
- To provide acoustic guidance concerning the impact of mitigating residential summertime overheating using a natural ventilation strategy in accordance with the assessment framework provided in ‘*Acoustics, Ventilation and Overheating, Residential Design Guide 2020*’ and the statutory requirements of the Building Regulations ‘*Approved Document O*’.
- To specify appropriate daytime and night-time environmental noise limits for M&E plant based on the results obtained from the environmental noise survey undertaken at site.

2 DESCRIPTION OF SITE

2.1 General Overview of the Site and Surroundings

The proposed development is sited in central Reading in an area of mixed commercial and residential buildings, comprising of offices, local amenities, a construction site, and residential blocks.

The site is bound by Garrard Street to the north and Greyfriars Road to the west. Also to the North is a large construction site, and further North is Reading Train Station. To the South, is the rear loading bay of a large Sainsbury’s supermarket, with delivery vans and lorries passing in and out throughout the day.

Past Greyfriars Road to the west of the site is the A329 dual carriageway running North/South through the centre of Reading.

The nearest identified existing residential noise sensitive receptors (“NSRs”) are as follows:

- A. Six and four storey housing on Greyfriars Road, located c.17 metres distance to the north
- B. Three and four storey housing on Vachel Road, located c.30 metres distance to the west

Figure 1 overleaf shows the proposed development site location in relation to the current existing surrounding area.

2.2 Development Proposals

The Development proposals include Demolition of the existing building and the erection of a part-7, part-13 storey building comprising 266 co-living units (Sui Generis) and associated communal amenity facilities, refuse storage, cycle parking and plant equipment.

Figures 2 overleaf shows the proposed ground floor layout of the development.



Figure 1: Proposed development and surroundings (Google Earth, 2024)

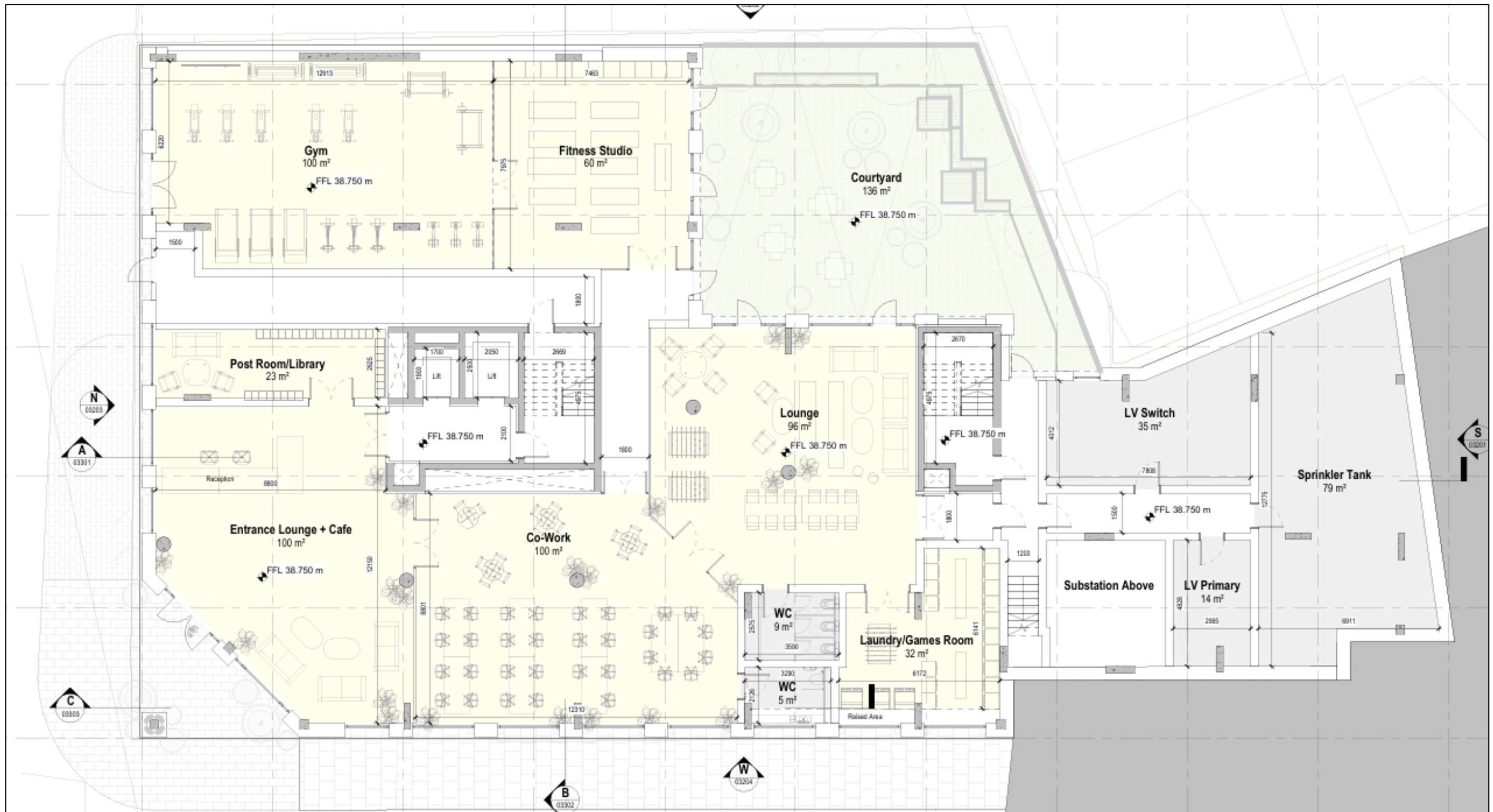


Figure 2: Ground floor GA plan of proposed development

3 DETAILS OF INVESTIGATION

3.1 Basis of Acoustic Assessment

In order to inform the environmental and intrusive noise study, it was necessary to determine the potential noise impact expected from the key identified noise sources, namely road traffic noise from the surrounding road network and noise from existing commercial facilities.

3.2 Environmental Noise Surveys

An environmental noise survey was conducted by Sol between 12th July and 20th July, and on 23rd July 2024. This consisted of three long-term measurement positions, and a single short-term measurement position, as shown in **Figure 3** and described in **Table 1**.

Measurement Position	Description
LP1	A mast-mounted microphone sited in “free field” conditions positioned outside a third storey window along the north façade of the existing building on the proposed development site overlooking Greyfriars Street, at a height of c.10m AGL.
LP2	A mast-mounted microphone sited in “free field” conditions positioned outside a second storey window along the west façade of the existing building on the proposed development site overlooking Greyfriars Road, at a height of c.7m AGL.
LP3	A mast-mounted microphone sited in “free field” conditions positioned outside a second storey window along the east façade of the existing building on the proposed development site overlooking the Sainsburys service yard, at a height of c.7m AGL.
SP1	A tripod-mounted microphone sited in “free field” conditions positions 11.5m from the A329/ Caversham Road carriageway.
LP = Long-term measurement position SP = Short-term measurement position	

Table 1: Noise monitoring measurement positions summary

Type 1 Precision Grade sound measuring instrumentation was exclusively used and microphone windshields were in use at all times. Full details of all the instrumentation used, and corresponding traceable calibration records, are retained on file by Sol and available for inspection if required.

The prevailing weather conditions were suitable for the purposes of environmental noise measurements during the noise survey.

Notwithstanding the weather conditions, the microphone systems were entirely weatherproofed and fitted with all-weather environmental windshields, each with a bird spike.



Figure 3: Aerial image showing environmental noise monitoring locations (Google Earth 2024)

3.3 Comments on Environmental Noise Climate

3.3.1 Noise from Neighbouring Construction Site

It was noted during the installation and collection of the environmental noise survey equipment that noise from the active construction site to the north east of the proposed development site was audible at LP1.

Measurement data impacted by construction noise has been excluded from the measured dataset and subsequent analysis, as shown in Graph A1 of Appendix A.

3.3.2 Sainsburys

An existing Sainsburys service yard is located just south of the proposed development site which is used for goods deliveries and therefore was recognised as having a potential impact on the development. Whilst on site it was noted that the south and east facades of the development will overlook and have line-of-sight to the service yard.

It was noted that multiple items of plant and louvres associated with the Sainsburys were located on the roof and the façade of the service yard entrance.

4 ENVIRONMENTAL NOISE SURVEY RESULTS

Table 2 provides a basic summary of the long-term environmental noise levels measured during the survey:

Measurement Location	Typical Measured Noise Level (dB, Range L_{Aeq} , L_{Amax} and L_{A90})				
	Daytime		Night time		
	$L_{Aeq,16h}$	$L_{A90,15min}$	$L_{Aeq,8h}$	$L_{Amax, 15min}$	$L_{A90,15min}$
LP1	57 - 59	44 - 65	52 - 56	52 - 94	38 - 54
LP2	60 - 63	46 - 58	56 - 59	54 - 97	41 - 55
LP3	57 - 62	47 - 71	55 - 65	52 - 90	43 - 71

Table 2: Summary of long-term typical, measured environmental noise levels, broadband terms

Appendix A provides further information and a full summary of the measurement data.

Considering the above values, the representative and modal Background Sound Level is taken as 52dB $L_{A90, 15min}$ for the daytime assessment period and 45 $L_{A90, 15min}$ for the night time assessment period (as measured at LP3).

Table 3 summarises the corresponding unweighted, time-averaged ($L_{Aeq,T}$) daytime and night time period ambient noise levels used for the assessment, in linear (unweighted) octave band frequency terms as based on the representative survey data:

Measurement Period	A-weighted Broadband Noise Level, dB $L_{Aeq,T}$	Unweighted Sound Pressure Level (dB $L_{eq,T}$) @ Octave Band Centre Frequency (Hz)						
		63	125	250	500	1k	2k	4k
LP1								
Daytime	59	61	56	54	53	54	53	51
Night time	56	60	54	53	54	52	48	41
LP2								
Daytime	63	64	59	58	57	59	56	54
Night time	59	62	54	54	52	55	53	47
LP3								
Daytime	62	62	57	57	54	52	52	58
Night time	65	60	55	55	53	50	56	61

Table 3: Summary of time-averaged environmental noise levels, in octave band terms.

4.1.1 CRTN Survey

In accordance with the shortened measurement procedure presented in CRTN and guidance presented in BS 8233:2014 'Guidance on Sound Insulation and Noise Reduction for Buildings' the full daytime $L_{Aeq, 16hrs}$ value can be derived from the arithmetic mean of three consecutive hourly $L_{10,1h}$ values measured between 10:00 and 17:00 hours.

The $L_{10,1h}$ values measured at Measurement Position SP1 on 23rd July 2024 are shown in **Table 4**:

Time Period	12:10 – 13:10 hrs	13:10 – 14:10 hrs	14:10 – 15:10 hrs
dB $L_{10,1h}$	73	73	73

Table 4: $L_{10,1h}$ noise levels measured at Measurement Position LP3

Based on the results at measurement positions SP4 the predicted sound level from the A239 at the development site vicinity is **72dB $L_{Aeq,16hrs}$ and 61dB $L_{Aeq,8hrs}$ at a distance of 11.5 metres** from the edge of the A329 carriageway.

4.1.2 Noise from Sainsburys

Table 5 below gives a summary of the octave band data measurements of noise from the Sainsburys service yard, as measured at LP3:

Measurement Description	A-weighted Broadband Noise Level, dB L_{Aeq}	Unweighted Sound Pressure Level (dB $L_{eq,T}$) @ Octave Band Centre Frequency (Hz)						
		63	125	250	500	1k	2k	4k
Service Yard Activity	63	62	58	60	56	52	49	60
Fans	71	60	56	56	55	50	61	67

Table 5: Summary of time-averaged environmental noise levels, in octave band terms

4.2 Predicted Development Environmental Noise Levels

In order to predict the likely resultant environmental noise levels across the future façades of the proposed Development, a 3D computer based environmental noise model has been created using the proprietary DataKustik “CadnaA” Noise Mapping software. The following assumptions have been made in the generation of the noise model:

- The noise model was set up to apply the noise prediction methodology set out in ISO 9613-2: ‘Acoustics – Attenuation of Sound propagation outdoors – Part 2: General Method of Calculation’
- The model was set to include up to second-order reflected noise from solid structures;
- Ground absorption was set to G=0 (hard ground), with the exception of significant area of grass/foliage set to G=1 (soft ground);
- Acoustic screening and reflections afforded by nearby buildings and solid structures.

Based upon the above and the measured environmental noise levels the daytime and night time free field noise levels have been predicted across the development.

A 3-dimensional example of the nose map is shown in **Figure 4**, further noise maps are shown in Appendix B.

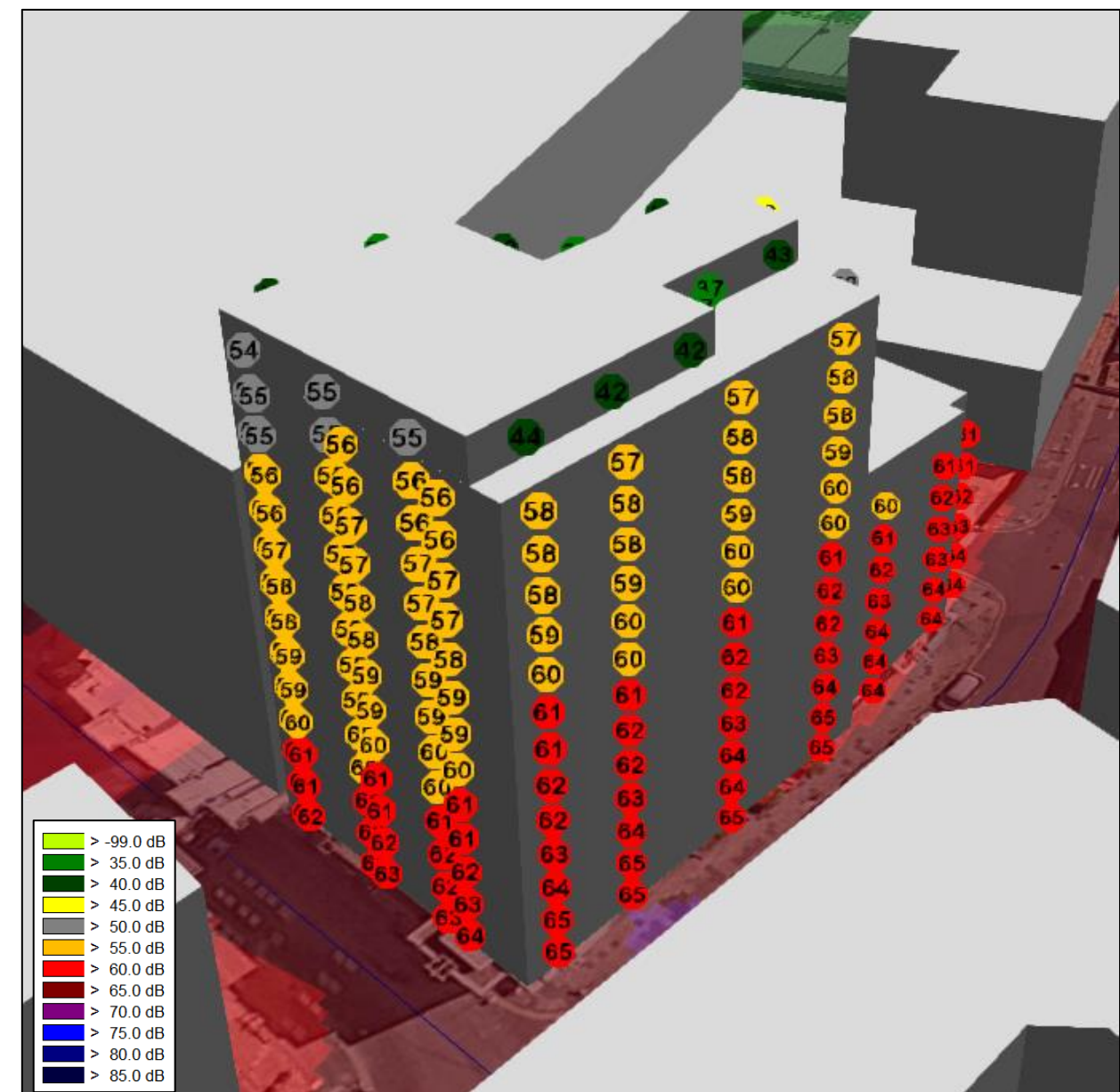


Figure 4: Example of 3D noise map of the proposed development site

5 **PROPG: PLANNING AND NOISE (RESIDENTIAL DEVELOPMENTS) – STAGE 1**

Professional Planning Guidance: Planning and Noise (“ProPG”), provides a risk-based assessment framework to assist with delivering high quality sustainable development by promoting good health and wellbeing by the effective management of noise through good acoustic design.

ProPG provides a 2-stage systematic approach as follows:

- Stage 1 – An initial noise risk assessment of the proposed Development;
- Stage 2 – Systematic consideration of four key elements:-
 - Good Acoustic Design Process
 - Internal Noise Levels
 - External Amenity Noise Levels
 - Consideration of other relevant issues

5.1 **Stage 1 Assessment**

The Stage 1 assessment provides an early indication if noise levels across a proposed development site are likely to provide greater acoustic challenges based on a sliding scale of Risk of Adverse Effect, as shown in **Figure 5**, in accordance with the National Planning Policy Framework and the Noise Policy Statement for England.

Based on the as measured environmental noise levels and the calculated daytime and night time noise levels at the worst-case façades of the proposed development (the latter as shown in Appendix B), the façades of the residential development are designated as **“Medium Risk”**.

Therefore, for a “Medium Risk” site, the Pre-planning application advice states the following:

“As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of the noise will be mitigated and minimised, and which clearly demonstrate that a significant adverse noise impact will be avoided in the finished development.”

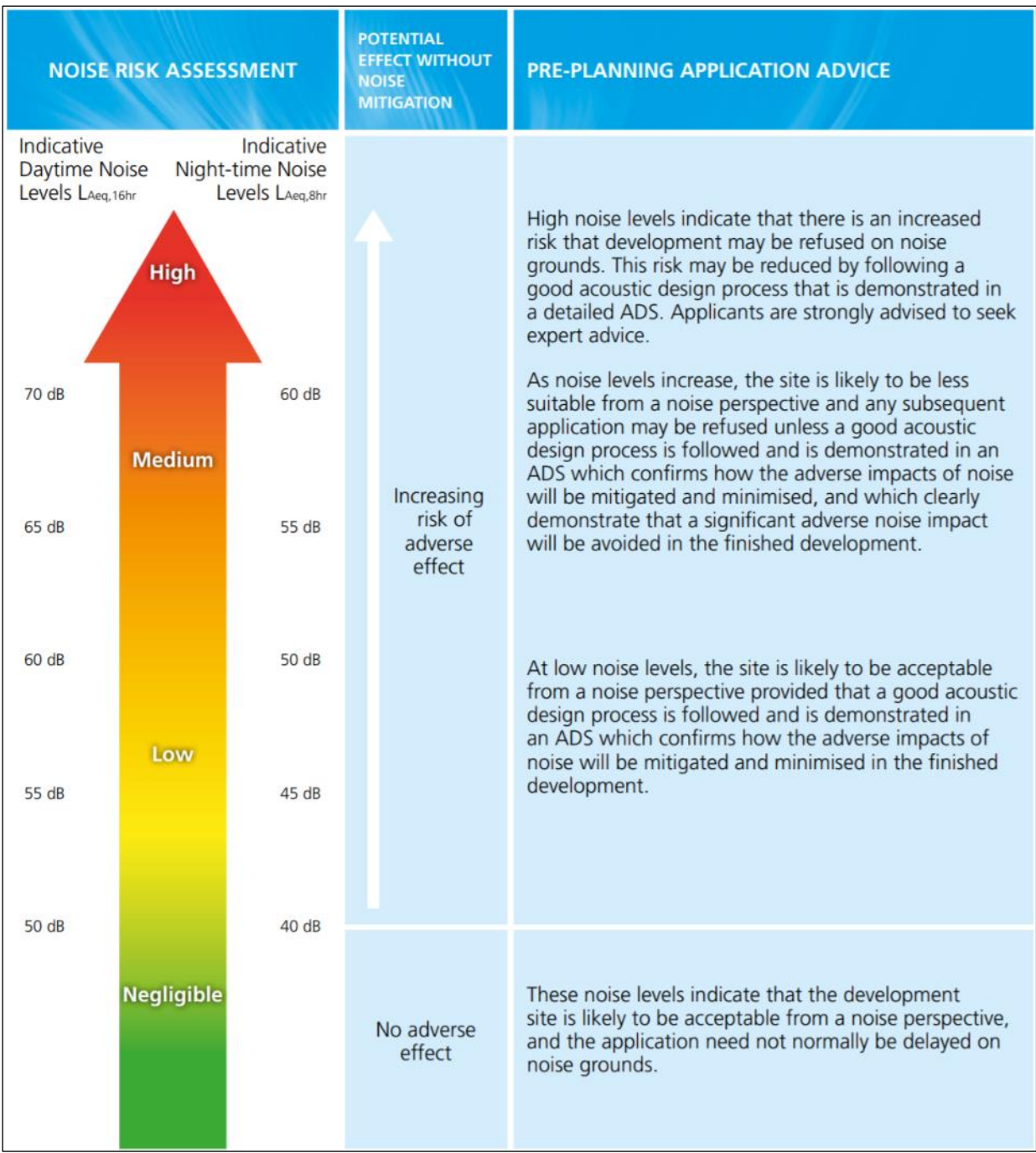


Figure 5: ProPG initial site noise risk assessment

6 PROPG: PLANNING AND NOISE (RESIDENTIAL DEVELOPMENTS) – STAGE 2

6.1 Element 1 – Good Acoustic Design Process

A good acoustic design process is an implicit part of achieving good design as required by Government and Local Planning Policies. Good acoustic design should avoid “unreasonable” acoustic conditions and entirely prevent “unacceptable” acoustic conditions.

Evidence that good acoustic design principles have been followed are presented in the following sections of this report.

6.2 Element 2 – Internal Noise Level Guidelines

BS 8233:2014 ‘Guidance on sound insulation and noise reduction for buildings’ provides appropriate criteria for acceptable levels of noise ingress within various spaces.

6.2.1 Residential Dwellings

Section 7.2.2 of the Standard, entitled ‘Internal ambient noise levels in dwellings’ states that ‘... In general, for steady external noise sources, it is desirable that the internal ambient noise level does not exceed the guideline values in Table 4 [of BS 8233]’ as duplicated below in **Table 6**:

BS 8233:2014 – Indoor ambient noise levels for dwellings			
Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35dB $L_{Aeq,16hr}$	-
Dining	Dining room / area	40dB $L_{Aeq,16hr}$	-
Sleeping (daytime resting)	Bedroom	35dB $L_{Aeq,16hr}$	30dB $L_{Aeq,8hr}$

Table 6: Internal ambient noise level requirements as per BS 8233

Note 7 of BS 8233:2014 states that: ‘... Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed up to 5dB and reasonable internal conditions still achieved.’

No specific performance recommendation is given within BS 8233:2014 regarding maximum (L_{Amax}) intrusive noise levels within bedrooms. ProPG expands on the guidance presented in BS 8233:2014.

Section 2.31 states that ‘... In noise sensitive rooms at night (e.g. bedrooms) individual noise events (from all sources) should not normally exceed 45dB $L_{Amax,F}$ more than 10 times a night as this represents a threshold below which the effects of individual noise events on sleep can be regarded as negligible.’

6.2.1.1. Other Areas

BS 8233:2014 provides guidance on typical internal ambient noise levels within non-domestic buildings due to ‘steady’ external noise sources such as road traffic as is incident on the façade of the development.

It is recommended that the internal ambient noise level due to noise breaking through the external façade do not exceed the following levels:

Space	Internal Ambient Noise Level, dB ($L_{Aeq,7}$)
Amenity	50
Gym / Fitness Studio	45
Entrance Lounge	40
Co-Work Space	35

Table 7: Recommended internal ambient noise level requirements for other areas

6.3 Element 3 – External Amenity Area Noise Levels

Regarding outdoor amenity spaces, BS 8233:2014 states the following (emphases added):

‘... For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50dB $L_{Aeq,T}$, with an upper guideline value of 55dB $L_{Aeq,T}$...

... However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.

Other locations, such as balconies, roof gardens and terraces, are also important in residential buildings where normal external amenity space might be limited or not available, i.e. in flats, apartment blocks etc. In these locations, specification of noise limits is not necessarily appropriate.

Small balconies may be included for uses such as drying washing or growing pot plants, and noise limits should not be necessary for these uses. However, the general guidance on noise in amenity space is still appropriate for larger balconies, roof gardens and terraces, which might be intended to be used for relaxation. In high-noise areas, consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels. Achieving levels of 55dB $L_{Aeq,T}$ or less might not be possible at the outer edge of these areas, but should be achievable in some areas of the space.’

Guidance provided in ProPG states (our emphasis) that:

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

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

- *a relatively quiet facade (containing openable windows to habitable rooms) or a relatively quiet externally ventilated space (i.e. an enclosed balcony) as part of their dwelling; and/or*
- *a relatively quiet alternative or additional external amenity space for sole use by a household, (e.g. a garden, roof garden or large open balcony in a different, protected, location); and/or*
- *a relatively quiet, protected, nearby, external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings; and/or*
- *a relatively quiet, protected, publicly accessible, external amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minute walking distance). The local planning authority could link such provision to the definition and management of Quiet Areas under the Environmental Noise Regulations.’*

Therefore, it is further considered that any potential adverse impact to residential small balconies will be suitably mitigated by access to nearby external amenity areas.

In summary therefore, the “upper guideline” noise level for external amenity spaces, as recommended by the Standard, is 55dB $L_{Aeq(16 \text{ hour})}$, albeit it is duly recognised that this may be exceeded for urban developments and is not applicable to “small balconies” and should ultimately not prohibit development if exceeded in other external amenity areas.

6.4 Element 4 - Other Relevant Issues

6.4.1 Overheating Mitigation Strategy

It is pertinent that the overheating mitigation strategy for the development is developed with consideration of the environmental noise impact from an early stage of the design development. The relevant statutory requirements and current design guidance is introduced below, a full Acoustic Overheating assessment is presented in Section 10.

6.4.1.1. Approved Document O (Residential Development)

The residential development will be required to comply with the requirements of ‘Approved Document O – Overheating 2021’ (“ADO”).

Section 3 of ADO states that it should be ensured that the overheating mitigation strategy is useable and thus if the overheating strategy is to rely on open windows, suitable noise conditions within bedrooms at night should be achieved under such conditions:

‘...the overheating mitigation strategy should take account of the likelihood that windows will be closed during sleeping hours (11pm to 7am).

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

- a. 40dB $L_{Aeq,T}$, averaged over 8 hours (between 11pm and 7am).
- b. 55dB L_{AFmax} , more than 10 times a night (between 11pm and 7am).’

6.4.1.2. Acoustics Ventilation and Overheating Guide (Residential Developments, 2020)

The ‘Acoustics, Ventilation and Overheating Guide’ (“AVO Guide”), as published by the Association of Noise Consultants in 2020 provides a recommended framework for the early design stage assessment of new residential development that takes due regard of the interdependence of provisions for acoustics, ventilation, and overheating.

The AVO Guide provides a two-stage assessment, as shown in **Figure 6**, to highlight at the planning stage those residential façades which may result in an adverse or significant adverse noise impact when using an open window ventilation strategy, and to help the Design Team identify suitable overheating mitigation strategies as a result.

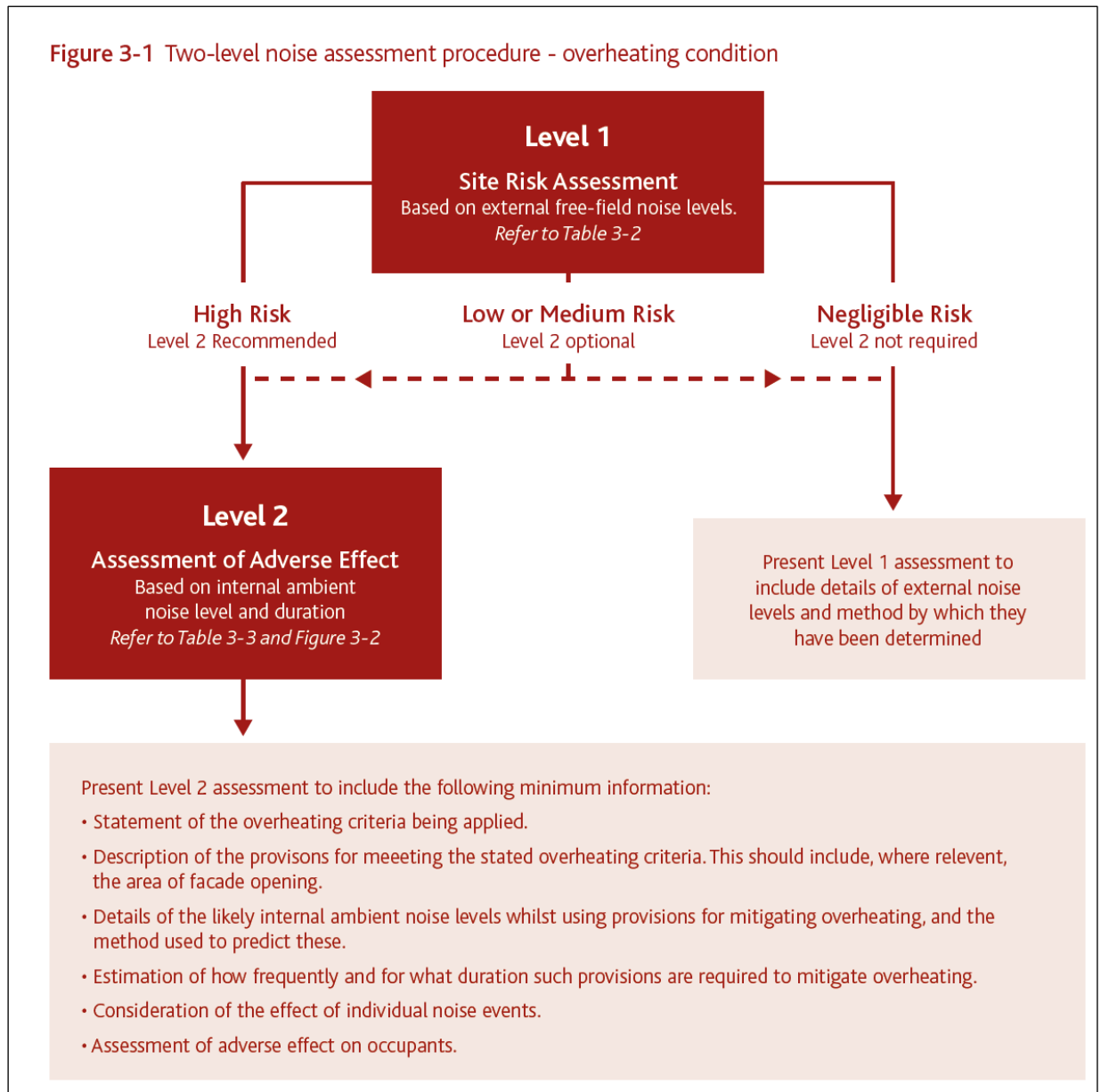


Figure 6: AVO Guide two stage assessment framework

7 INTRUSIVE NOISE ASSESSMENT

By taking account of the levels of ambient and maximum noise levels as measured and predicted at the future façade locations and the likely acoustic characteristics of the noise sensitive receiving space (i.e. living rooms, bedrooms), the required sound reduction performance specifications of glazing has been determined through acoustic calculation.

The following Stage 2 assessment has been undertaken based on drawings by Darling Associates Architects during October 2024.

As window areas and internal layouts are currently unknown, the noise intrusion calculations for the preliminary intrusive noise assessment presented herein, “typical” window areas and room dimensions have been used in the absence of detailed drawings.



Note: Glazing and trickle ventilator specifications are provided to demonstrate site suitability only and final specifications must be reviewed during the detailed design stage.

7.1 Commercial Premises Noise Assessment

The proposed development site is exposed to noise from external existing commercial noise sources, namely the service yard and external plant associated with the neighbouring Sainsburys premises which have the potential to give rise to unacceptable conditions for residential facades facing the south and east of the site.

The operation of the service yard was not witnessed during the installation and collection of the environmental noise survey equipment; however, it was possible to identify noise associated with the Sainsburys through audio recording measured throughout the survey period.

Based on the measurement data and audio recordings it is understood that the facility operates as follows:

- Goods deliveries typically begin during the night time period and end during the daytime period, starting from 04:00 hours.
- Noise from goods deliveries includes mechanical and vehicle plant, as well as noise from moving goods trolleys.
- Fixed supply/ extract plant is located on the roof of the Sainsburys.

Based on the measured octave band source noise levels measured at LP3, the noise impact of the existing Sainsburys facility was predicted across the Proposed Development using a calibrated 3D noise model.

Appendix B provides a CadnaA noise map of the site and the surrounding environment, presenting the Specific Sound Levels predicted across the proposed development during periods of peak activity.

The 3D model predicted that the noise level from the Sainsburys at the worst affected façades of the development would be 73dB $L_{Aeq,T}$ during the daytime (07:00 – 23:00 hours) and 73dB $L_{Aeq,T}$ during the night time (23:00 – 07:00 hours).

7.1.1 BS 4142:2014+A1:2019

BS 4142:2014+A1:2019: *'Method for rating and assessing industrial and commercial sound'* ("BS 4142") is intended to be used to assess noise of a commercial nature such as that arising from commercial premises.

The procedure contained in BS 4142 for assessing environmental noise impact is to compare the measured or predicted noise level from the source in question, the "Specific Sound Level" immediately outside the noise sensitive premises, with the corresponding representative "Background Sound Level". Where the noise contains attention attracting characteristics such as tonal, impulsive and/or intermittent elements, it may be appropriate to apply a correction to the Specific Sound Level to obtain the "Rating Level".

BS 4142 states that the significance of sound arising from an industrial and/or commercial nature depends upon both the margin by which the Rating Level of the specific sound source exceeds the Background Sound Level, and also the context in which the sound occurs:

- a) Typically, the greater this difference, the greater the magnitude of the impact.
- b) A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- c) A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.
- d) The lower the Rating Level is relative to the measured Background Sound Level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the Rating Level does not exceed the Background Sound Level, this is an indication of the specific sound source having a low impact, depending on the context.

For the daytime, the assessment is carried out over a one-hour period, and over a 15-minute period at night. The daytime and night time periods are defined as occurring between 07:00 hours to 23:00 hours, and 23:00 hours to 07:00 hours, respectively.

7.1.2 BS 4142:2014+A1:2019 Assessment

The Sainsburys service yard can be operation during both the daytime and the night-time. Therefore, the reference time interval (Tr) is 1 hour during the day (07:00 hours to 23:00 hours) and 15 minutes during the night (23:00 hours to 07:00 hours).

The acoustic character correction has been determined in full accordance with the BS 4142:2014+A1:2019 "subjective method" for assessing the acoustic character of a noise source. A combined acoustic character correction of +13dB has been applied to the Specific Noise Level to determine the Rating Level (comprising of a +4dB correction for "clearly perceptible" acoustic tonality, a +6dB correction for "clearly perceptible" impulsivity and a +3dB correction associated with the intermittent nature of the operations).

Based on the predicted Rating Levels across the proposed Development and the representative daytime and night time background sound levels presented in **Table 5**, **Figure 7** to **Figure 8** present the BS 4142:2014+A1:2019 assessment of initial estimate of impact.

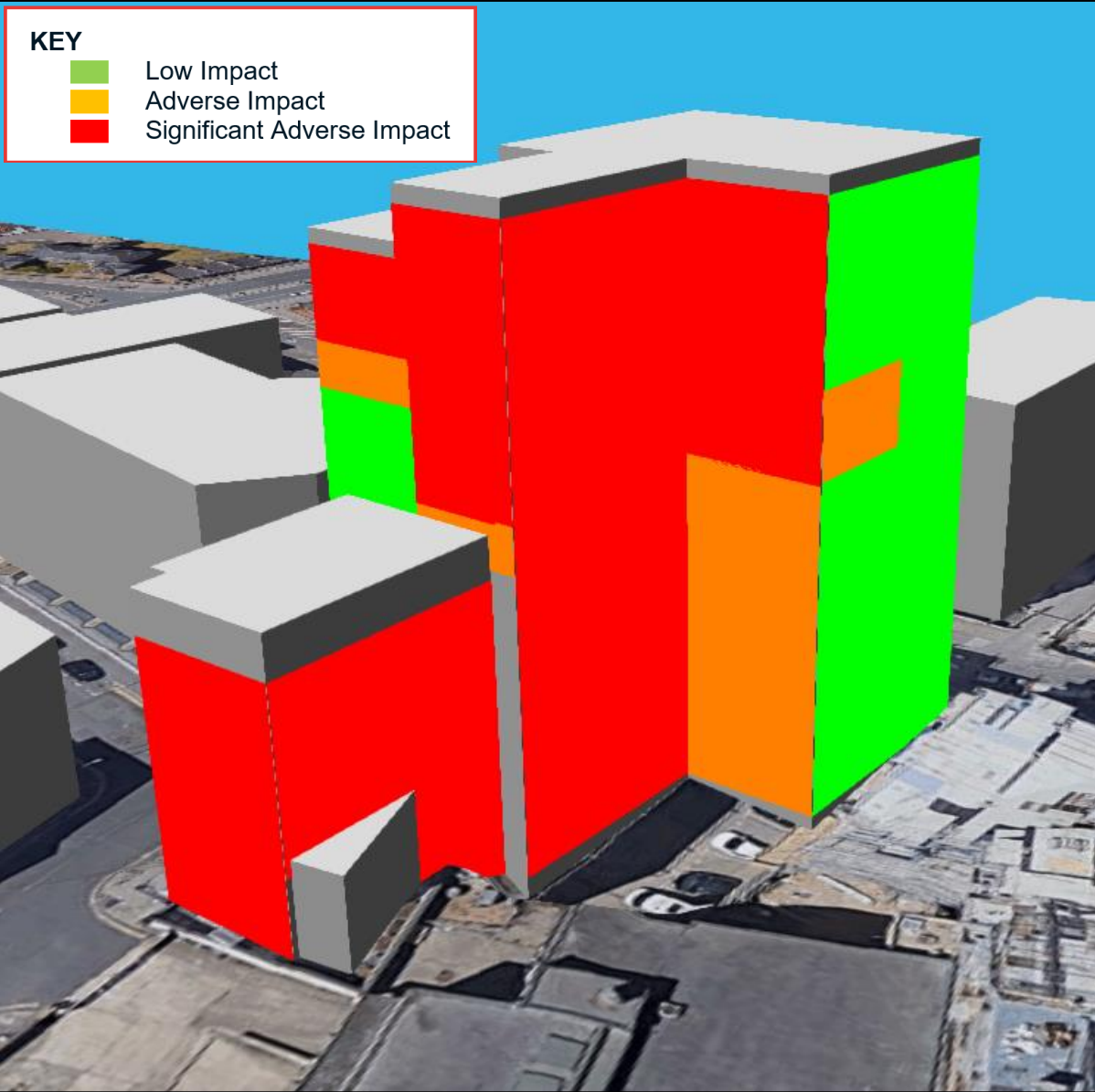


Figure 7: Image showing BS 4142 Assessment of commercial noise sources during the daytime period

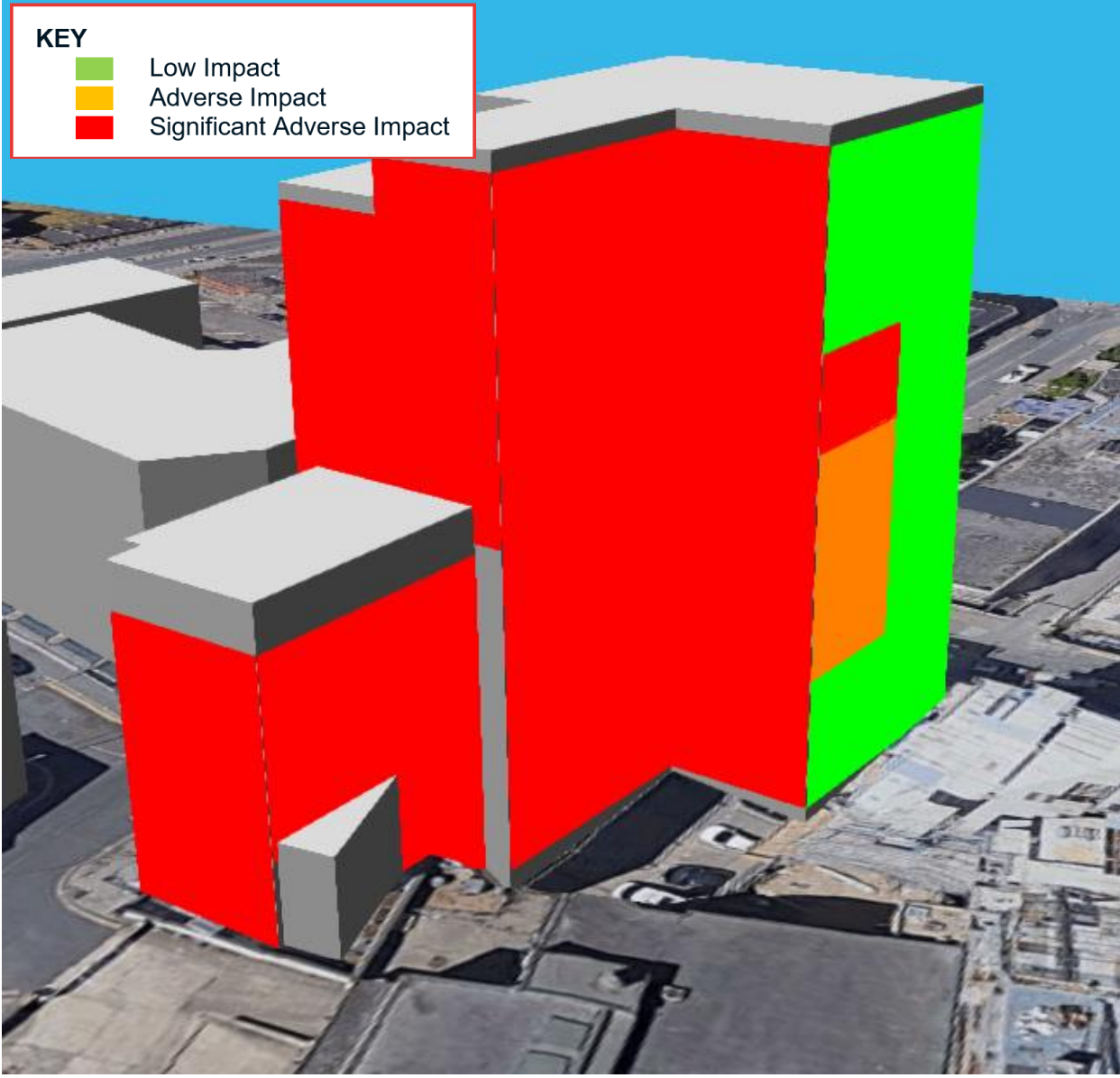


Figure 8: Image showing BS 4142 Assessment of commercial noise sources during the night time period

In accordance with the assessment methodology of BS 4142:2014+A1:2019 the predicted excess of the Rating Level over the Background during both the day and night-time, as presented in **Figure 7** and **Figure 8** above, yields and initial estimate of **significant adverse impact**.

However, as required by BS 4142:2014+A1:2019, the context of the assessment must be considered, and in this case, the proposed development is new residential accommodation in relation to which the Standard states:

‘... The methodology set out in Clauses 7, 8, and 9 of this standard is not intended to be used to assess the extent of the impact at indoor locations. Internal sound levels can be considered as outlined in Clause 11.’

Under the guidance presented in *Clause 11*, modifying the initial estimate of impact should consider all pertinent factors, including but not limited to, the absolute level of sound and the design measures to secure good internal acoustic conditions.

To mitigate the impact on the internal ambient noise levels within apartments, it is recommended that windows remain closed for both standard background ventilation conditions and during periods of overheating.

As such the sound insulation performance of the building façade shall be specified such that internal ambient noise levels both from the commercial noise specifically, and the 16 and 8-hour daily/nightly averages are controlled to a suitable level.

On the basis of a closed window background ventilation strategy it is proposed to adopt the assessment criteria set out in **Table 8** below for facades overlooking the Sainsburys premises, shown in **Figure 7** and **Figure 8**.

Noise Index	Noise Type	Assessment Criterion in Habitable Room	Comment
$L_{Aeq,16hr}$	Sources	NR 20	Approximately 10dB below daytime BS 8233 design target expressed as NR
$L_{Aeq,8hr}$	All Sources	NR 15	Approximately 10dB below night-time BS 8233 design target expressed as NR

Table 8: Summary of recommended assessment criteria.

7.2 Background Ventilation Strategy

7.2.1 Residential Part F Background Ventilation

Guidance within ProPG recommends that as far as reasonably practicable, developments should seek to use natural ventilation i.e., via openable windows or trickle ventilators, to provide the required minimum Building Regulations Part F background ventilation rates.

Through email correspondence between Sol and Meinhardt (UK) Ltd (MEP Consultant) during October 2024, it is understood that natural ventilation will be provided wherever possible, using openable windows to minimise dependence on mechanical ventilation systems. For residential units where natural ventilation is not suitable or where models indicate it may not be sufficient, high-efficiency mechanical ventilation will be installed. Residential units will be equipped with either mechanical ventilation with heat recovery (MVHR) or a centralised mechanical supply and extract ventilation system, both incorporating heat recovery.

Based on the as measured daytime and night time baseline levels and a partially open window attenuation performance of 13dB(A), an open window Part F ventilation strategy is not considered suitable for the development and an alternative Approved Document F background vent strategy (via mechanical ventilation) should be adopted to comply with BS 8233 internal noise level criteria in habitable rooms.

7.3 Residential Building Envelope

7.3.1 External walls

The external façade build-up of the proposed development is unknown; however, considering the measured daytime and night-time noise levels, it is expected that typical residential facade constructions (e.g. SFS, unitized façade) would be suitable to satisfy the acoustic performance requirements.

An example building fabric construction is presented in **Table 9** below:

Wall Construction	Minimum Weighted Sound Reduction Index dB ($R'_w + C_{tr}$)
102mm thick facing brickwork 12mm Board 100mm SFS 2x 15mm Wallboard with mineral	64

Table 9: Predicted building fabric acoustic airborne sound insulation performance requirements

7.3.2 Acoustic Specification for Glazing to Habitable Rooms

Table 10 provides *preliminary* acoustic performance requirements for the glazing (and any glazed doors) for residential dwellings forming part of the development that are needed to meet the requirements for suitable internal ambient noise levels when windows are closed.

As previously stated, these specifications are provided to demonstrate site suitability only and will require further review during detailed design.



Note: The values in **Table 10** are given in terms of the on-site performance requirement $R'_w + C_{tr}$ and a suitable correction should be included from standard laboratory test data; for large glazing units this is typically up to 2dB.

It is likely that sustainability, thermal, and security requirements as advised by others may result in higher specification glazing, however it must be ensured that the stated minimum acoustic performance is achieved in all instances.

Figure 8, Figure 9 and Figure 10 shows where the façade performances presented in **Table 10** apply.

Façade Zone (Figure 9,10,11)	Room Type	Example Glazing Configuration	Minimum Weighted Sound Reduction Index dB ($R'_w + C_{tr}$)
Zone A	Living Rooms / Bedrooms	4 PLANILUX / 20 / 4 PLANILUX	27
Zone B	Living Rooms / Bedrooms	10 PLANILUX / 12 / 44.2 STADIP PROTECT	37*
Zone C	Living Rooms / Bedrooms	10 PLANILUX / 24 / 6 PLANILUX	35*
Zone D	Living Rooms / Bedrooms	6 PLANILUX / 20 / 4 PLANILUX	30*
Note*: Enhanced glazing specification required to mitigate noise from Sainsburys on overlooking facades Sainsburys			

Table 10: Recommended minimum glazing system acoustic specification



Figure 10: Façade zone mark-up Level 7 to Level 11

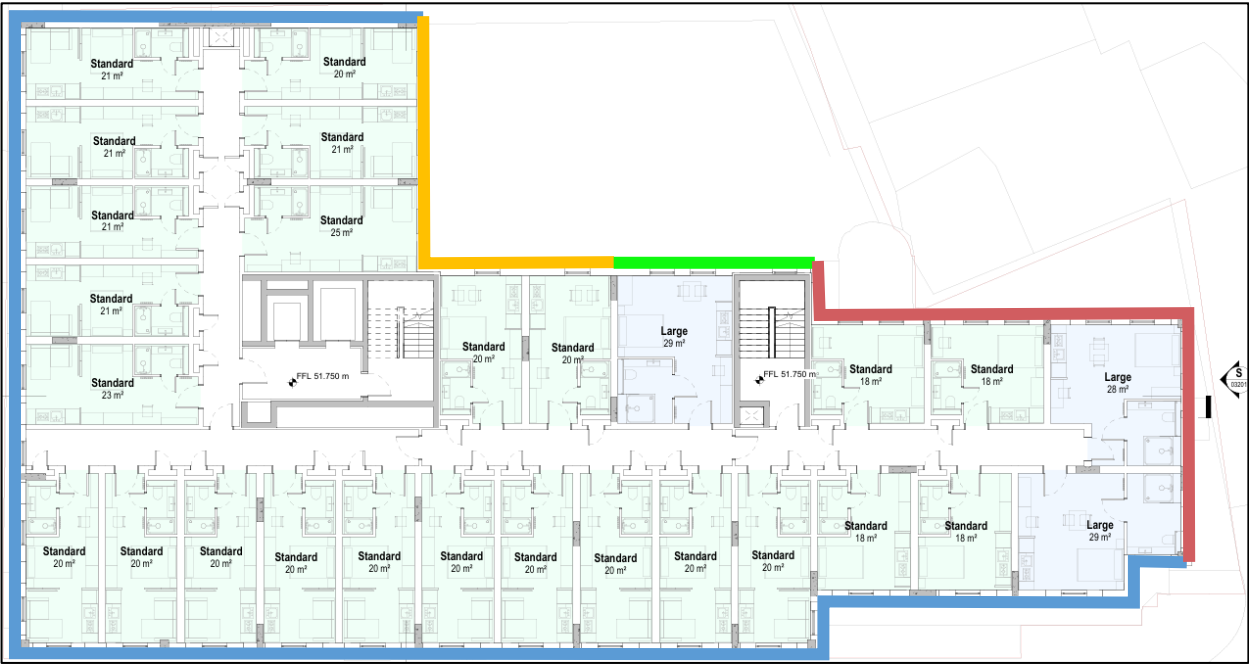


Figure 9: Façade zone mark-up Level 1 to Level 6

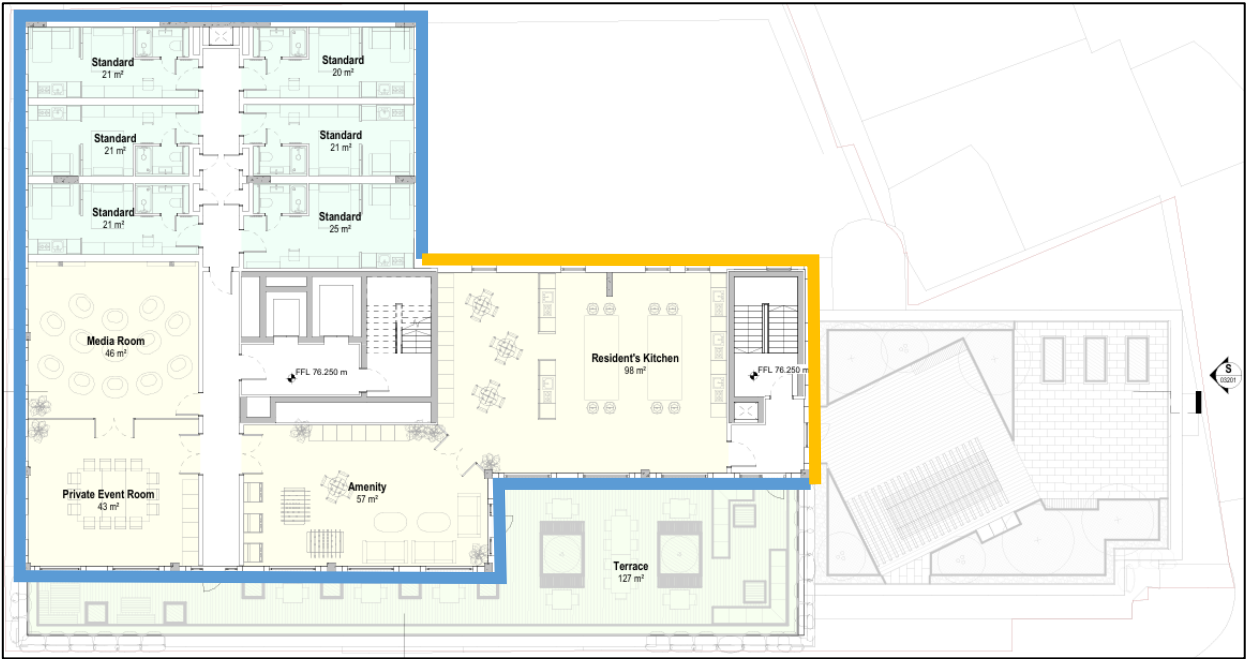


Figure 11: Façade zone mark-up Level 12

7.3.1 Glazing Configurations and Specification Compliance

In all cases, example glazing configurations are provided for guidance only.

All glazing, including any glazed doors, inclusive of framing systems, seals, and hardware must achieve the minimum acoustic performance specifications as indicated.



The sound reduction performance must be confirmed and corroborated by independent acoustic laboratory test data in accordance with BS EN ISO 10140-2:2010 of identical constructions (i.e. including window frames) which must be submitted to Sol for approval.

7.4 Commercial Building Envelope

In order to control environmental noise intrusion to the proposed commercial spaces in line with the proposed criteria in Section 6.2.1.1 preliminary calculations indicate that the external façade should achieve a minimum weighted sound reduction of **27dB $R'_w + C_{tr}$** .

With respect to glazed/curtain walling elements this would typically be achieved by lightweight/standard cladding systems with glazed elements formed of standard thermal double glazing such as a 4mm / 12mm / 4mm configuration. It is likely that sustainability, thermal, and security requirements as advised by others will result in higher specification glazing, however it must be ensured that the stated minimum acoustic performance is achieved in all instances.

Note: Acoustic performance requirements should be fully reviewed as the detailed design develops

8 EXTERNAL AMENITY AREAS NOISE LEVEL ASSESSMENT

8.1 External Amenity Areas

It is understood that external amenity spaces on the ground floor, level 7 and level 12 of the development will be provided for both the residential and commercial schemes in the form of a courtyard and rooftop terraces, as shown highlighted in blue on Figure 12, Figure 13 and Figure 14 respectively:

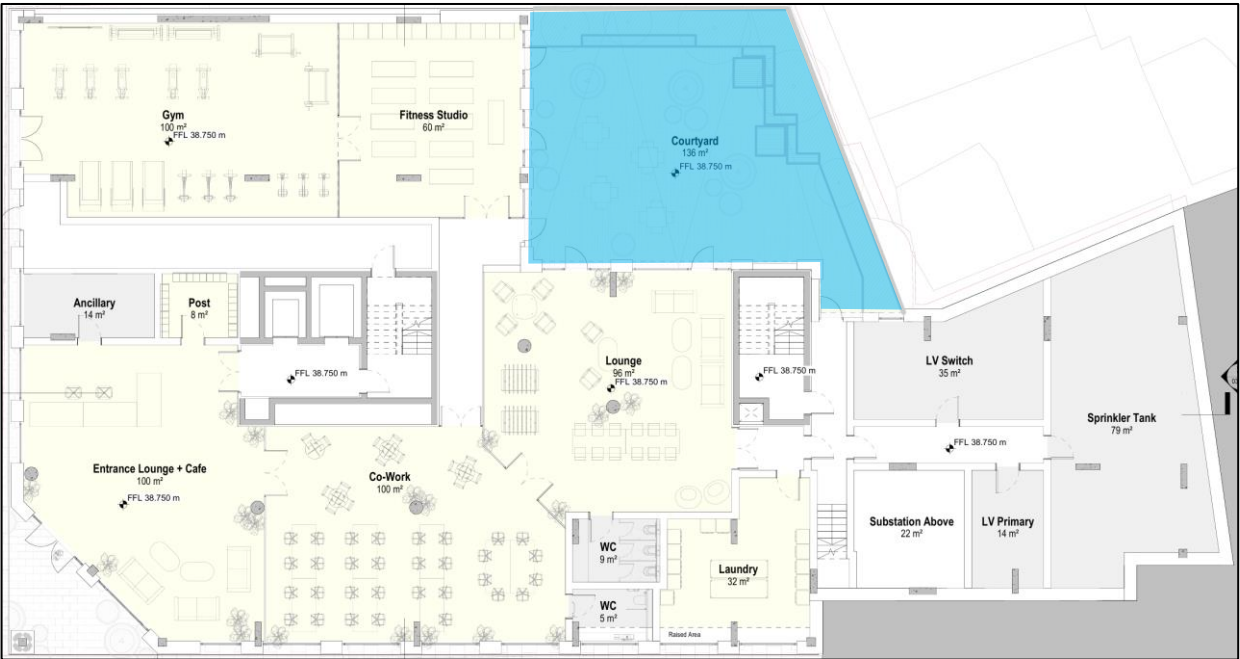


Figure 12: Proposed outdoor amenity spaces on the ground floor of the proposed development



Figure 13: Proposed outdoor amenity spaces on level 7 of the proposed development

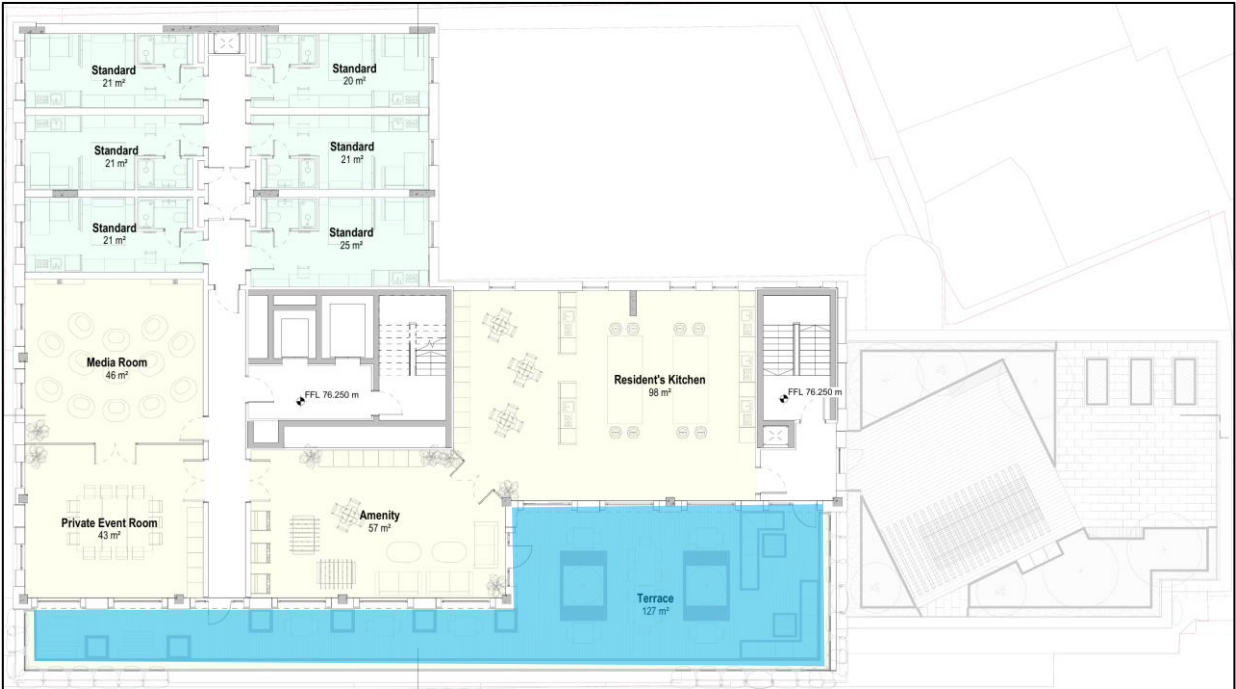


Figure 14: Proposed outdoor amenity spaces on level 12 of the proposed development

Based upon the results of the environmental noise survey and the 3D noise model of the site, the daytime noise levels across the rooftop terraces are presented in Table 11:

Terrace Location	Predicted Noise Level, dB ($L_{Aeq,T}$)
Ground Floor	35 - 47
Level 7	38 - 54
Level 12	33 - 51

Table 11: Predicted noise level in external amenity spaces

Based on the results shown above, the predicted noise levels comply with the BS 8233:2014 upper limit of 55dB $L_{Aeq,16hr}$.

Predictions show that environmental noise levels within the proposed external amenity spaces for the residents of the development, are within the BS 8233 guidance upper noise limits and therefore the proposed development can provide suitable amenity areas for residents and the commercial scheme with no need for mitigation.

9 RESIDENTIAL NATURAL OVERHEATING MITIGATION ASSESSMENT

To assess the suitability of potential overheating mitigation strategies for the development, an assessment has been undertaken based on the following documents:



- Approved Document O (“ADO”) – This document forms part of the building regulations and the night time noise criteria provided is therefore **mandatory**.
- Acoustics, Ventilation and Overheating (“AVO”) guide – This guide provides noise criteria that are not mandatory, however may form a condition of planning approval. On this basis it is recommended that the AVO guidance is considered.

9.1 Approved Document O Assessment

9.1.1 Guidance



The residential development will be required to comply with the requirements of ‘Approved Document O – Overheating 2021’ (“ADO”).

Section 3 of ADO states that it should be ensured that the overheating mitigation strategy is useable and thus if the overheating strategy is to rely on open windows, suitable noise conditions within bedrooms at night should be achieved under such conditions:

‘...the overheating mitigation strategy should take account of the likelihood that windows will be closed during sleeping hours (11pm to 7am).

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).’*

9.1.2 Assessment

An initial assessment has been undertaken based on the predicted façade noise levels and the corresponding predicted night time internal ambient noise levels, as based on a typical window “free open area” required to mitigate overheating in a “moderate overheating risk zone”, providing a minimum of 9dB attenuation, and a “partially open” window (e.g. on 100mm restrictors), providing a minimum of 13dB attenuation.



Results of the assessment show that predicted internal noise levels (particularly $L_{Afm\max}$) are predicted to exceed the ADO noise criteria on ALL facades of the proposed development when assessed against a partially open window. Therefore, open windows will not be permissible for overheating mitigation during the night time period.



9.2 Acoustics, Ventilation and Overheating

9.2.1 AVO Guide Level 1 Site Risk Assessment (Residential)

Based on the environmental noise survey results, the noise level from transportation noise sources at the most exposed residential façades of the development is predicted to be c.63dB $L_{Aeq,16h}$ during daytime periods, and c.59dB $L_{Aeq,8h}$ during night time periods.

In line with the AVO Level 1 Site Risk Assessment framework, as shown in **Figure 16**, the worst-case façades fall into the “**High risk**” category therefore a more detailed Level 2 assessment is recommended.

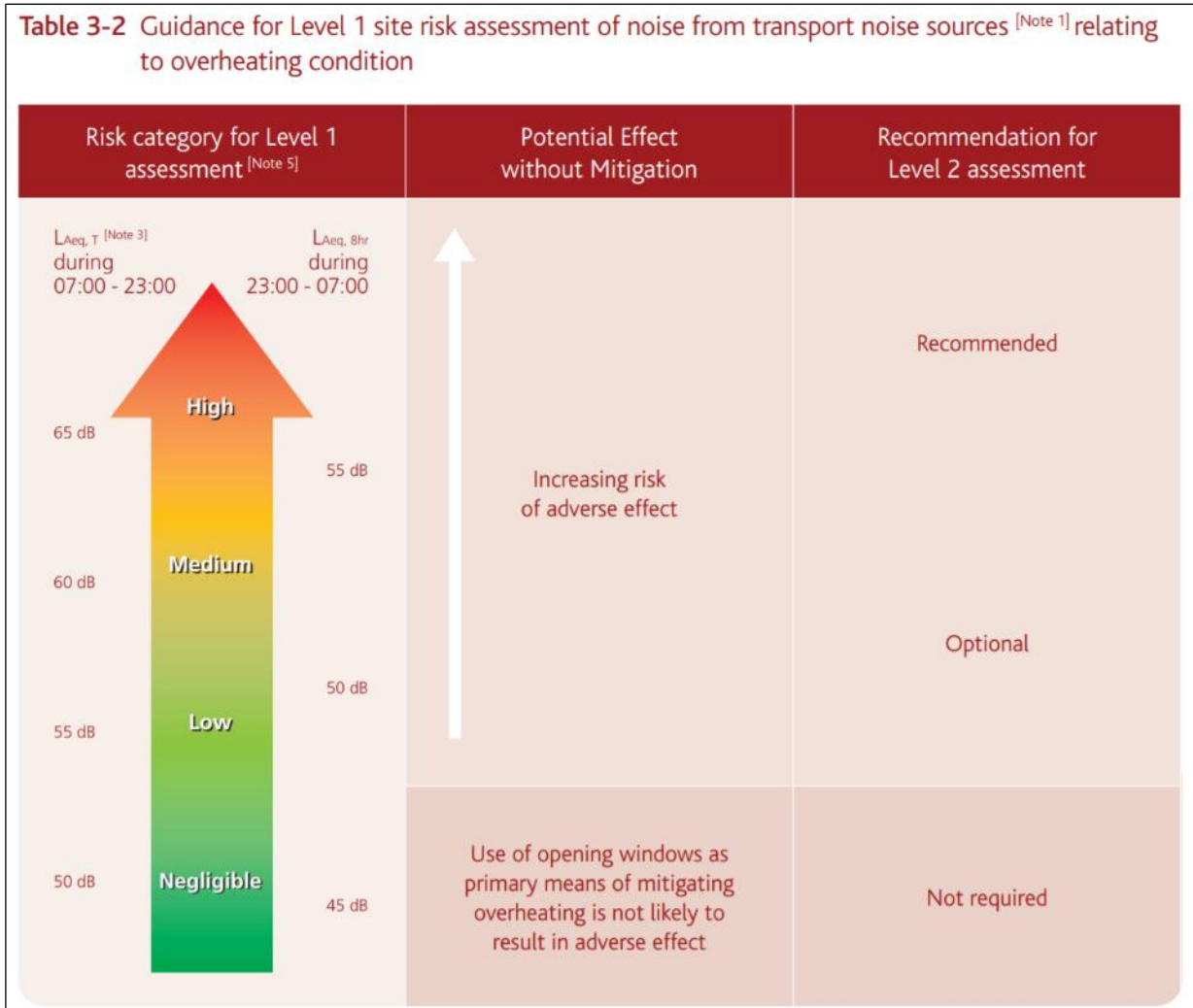


Figure 16: AVO Guide Level 1 Site Risk transportation noise levels thresholds

9.3 AVO Guide Level 2 Assessment of Adverse Effects (Residential)

The Level 2 Assessment provides a detailed assessment of the likely adverse effects on occupants relating to the magnitude of indoor ambient noise levels. Table 3-3 of the AVO Guide, as shown in **Figure 17**, provides a table of typical outcomes for occupants with regards to changes in noise level:

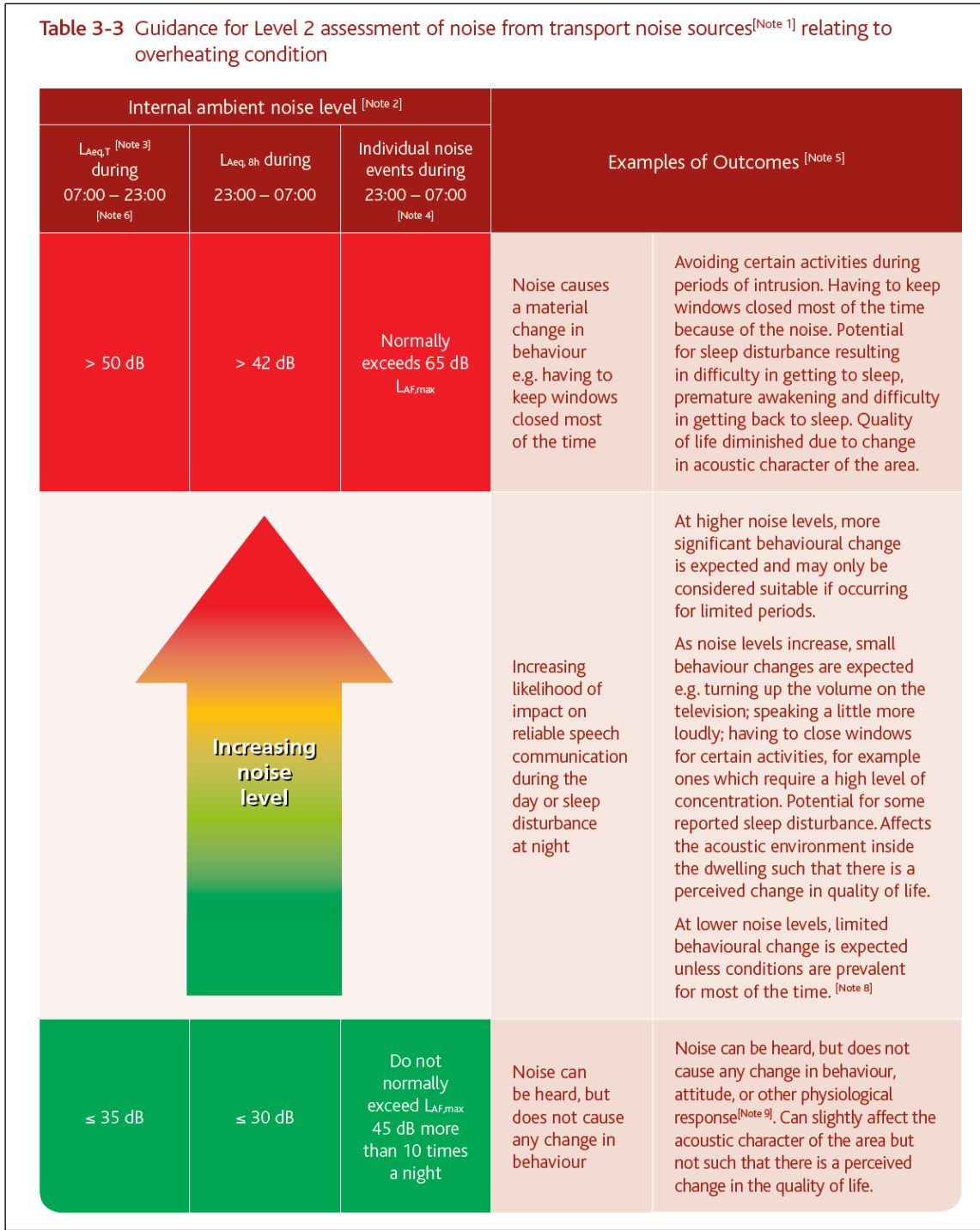


Figure 17: AVO Guide IANL assessment of effect from transport noise sources

9.3.1 Planning Practice Guidance on Noise

Planning Practice Guidance on Noise (“PPGN”) provides a summary of the noise exposure hierarchy, and links the significance of effect based on the likely average response to noise levels to the Noise Policy Statement for England, 2010 defined categories for Observed Adverse Effect Levels:

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

Table 12 provides the significance of effect based on the internal ambient noise level presented in the AVO Level 2 Assessment Guide:

Indoor Ambient Noise Levels			Significance of Effect
Daytime $L_{Aeq,16h}$	Night Time $L_{Aeq, 8h}$	Individual night time noise events	
> 50dB	> 42dB	Normally exceeds 65dB $L_{AF,max}$	SOAEL
Between 36dB and 50dB	Between 31dB and 42dB	Normally in between 45dB and 65dB $L_{AF,max}$	LOAEL
$\leq$ 35dB	$\leq$ 30dB	Do not normally exceed 45dB more than 10 times a night	NOEL

Table 12: Internal ambient noise level significance of effect

9.3.2 Residential Daytime Acoustic Criteria Summary

Based upon the ProPG Stage 2 Elements and the AVO guide Level 2 assessment guidance, the noise criteria listed in **Table 13** have been adopted as the basis of the daytime acoustic assessment.



Note: The night-time criteria have not been assessed as statutory requirements provided by ADO used in the previous assessment are more onerous than those detailed above.

The **non-mandatory** daytime criteria have been selected to prevent a SOAEL in line with Planning Policy Guidance.

Noise Source	Location	07:00 to 23:00 hrs
Transport noise sources	Living rooms (internal)	50dB $L_{Aeq,16h}$
	Bedrooms (internal)	50dB $L_{Aeq,16h}$

Table 13: Summary of recommended noise criteria for daytime overheating mitigation conditions

9.3.3 Assessment

An assessment has been undertaken based on the predicted façade noise levels and the corresponding predicted daytime internal ambient noise levels, as based on a “open” window providing a minimum of 9dB attenuation, and a “partially open” window providing a minimum of 13dB attenuation.



Based on the above, **Figure 18** presents the limitations on a passive overheating mitigation strategy via open windows to avoid a **Significant Observed Adverse Effect Level** for residents during **daytime** hours (07:00 to 23:00 hours). **However, it should be noted that these restrictions are not a statutory requirement for the development but may form a condition of planning approval.**

9.3.4 Commentary



Note: The night time criteria are dictated by ADO which forms a statutory Building Regulations requirement whereas the daytime criteria is based on AVO design guidance which is not mandatory, however may form a condition of planning approval.

A suitable overheating strategy, in line with all planning and building regulation requirements is being developed within the limitations to openable windows as presented in **Figures 18** to mitigate the adverse effect of external noise intrusion.

Note: Through email correspondence between Sol and Meinhardt (UK) Ltd (MEP Consultant) during October 2024, it is understood that residential units that require closed windows to meet the acoustic criteria pass the CIBSE TM59 assessment with a low profile MVHR system.



Note: In accordance with the good acoustic design principles of ProPG it is still recommended that openable are provided for user-controlled comfort and purge ventilation in all cases.

Note: Alternative passive ventilation methods such as large acoustically attenuated through-wall vents may also be suitable from an acoustic perspective however due to the required free area and size for rapid ventilation they are likely to have significant aesthetic implications.



Figure 18: Recommended open window overheating mitigation strategy during the daytime period

10 M&E PLANT NOISE LEVELS

10.1 Environmental Plant Noise Limits

Whilst planning permission for the development is currently being sought, it is likely that Reading Borough Council will require the environmental noise level from fixed plant and equipment to be assessed.

10.1.1 Local Authority Guidance

Reading Borough Council's Local Plan provides policy EN17, relating to plant noise emission:

“Where noise generating equipment is proposed, the noise source specific level (plant noise level) should be at least 10dBA below the existing background level as measured at the nearest noise sensitive receptor.”



Accordingly, it is likely to be necessary to limit the total, aggregate environmental noise from all M&E plant, when operating simultaneously, to an ambient noise level (in $L_{Aeq,T}$ terms) equating to the typical, pre-existing daytime or night time background noise level at any residential property façade, in L_{A90} terms, less a further 10dB when assessed in accordance with BS 4142: 2014+A1:2019.

10.1.2 Environmental Plant Noise Limits

Based on the results of the environmental noise survey undertaken at site, it is recommended that the total, aggregate environmental noise from all M&E plant at any residential window façade should be controlled to not exceed the rating noise levels ($L_{Ar, Tr}$) presented in **Table 14**:

Cumulative Plant Noise Limit 1m from any Façade dB $L_{Ar, Tr}$ (free field)	
Daytime (07:00 – 23:00hrs)	Night Time (07:00 – 23:00hrs)
42	35

Table 14: Maximum permissible noise level limits for all M&E plant

It must also be noted that the M&E plant noise limits identified above are applicable to all plant serving all areas of the development, when operating simultaneously. The allowable individual noise contribution from all plant items and atmospheric terminations such as louvres and cowls must be determined based on these overall noise limits - and consequently will be lower.

10.2 Building Services Noise Limits

10.2.1 MVHR within Residential Apartments – Part F

In terms of internal room noise levels arising due to the operation of MVHR units (and/or other domestic ventilation fans, if used), these room noise levels *must not* exceed the following noise limits under Part F background ventilation rates:

- NR25 in the case of any bedroom;
- NR30 in the case of any living room;
- NR35 in all other areas.

In practical terms, this will mean all MVHR units must be appropriately selected and sized to **operate only at low fan speeds under Part F duty** and furthermore, proprietary in line **duct attenuators must be fitted** as required on the supply and extract to achieve the above noise level criteria.

Under temporary “Boost” and “Purge” ventilation rates it is recommended that the above noise level criteria are not exceeded by more than 5 NR levels.

10.2.2 MVHR within Residential Apartments – Overheating Conditions

During overheating conditions, the recommend desirable upper internal ambient noise limit from mechanical services at high ventilation rates (ventilative/comfort cooling) are:

- 30dB $L_{Aeq,1h}$ (+5dB) in the case of any bedroom;
- 35dB $L_{Aeq,1h}$ (+5dB) in the case of any living room;

CIBSE Guide A 2015 states that a +5dB relaxation to the noise limits may be acceptable depending on the duration, frequency, and degree of occupant control during the overheating conditions. Higher noise levels (+5dB) are likely to be acceptable where rapid changes to the cooling or ventilation rates quickly improve the thermal comfort of the occupant but should not be used where high ventilation rates or peak lopping are required for extended periods of time to control overheating.

Others will need to advise on the duration and frequency of any proposed high ventilation mechanical services and details of the mechanical cooling system will need to be submitted to Sol for acoustic evaluation and approval.

10.2.3 *MVHR within Residential Apartments – Grilles, Diffusers, Ductwork and Volume Control Devices*

It should be noted that all supply and extract air grilles and diffusers must be suitably sized and selected to ensure they are compatible with the required room noise limits for all required modes of MVHR operation in each and every case, as commissioned for both “trickle” and “overheating/boost” unit operational modes. The same applies to the correct sizing of all ductwork and louvres.

The use of opposed blade dampers (“OBDs”) incorporated as part of final grille/diffuser air terminals must be avoided; airflow balancing must be achieved where required via the use of duct-mounted volume control dampers (“VCDs”).

10.2.4 *Noise Limits Within Other Internal Areas*

In terms of internal room noise levels arising due to the operation of M&E plant, these room noise levels *must not* exceed the following noise limits:

- NR40 in the case of any common area corridor and/or public stairwell;
- NR40 in gym spaces;
- NR45 in retail spaces;
- NR70 within any plantroom (with all plant operating at full speed).

10.3 **Vibration Isolation of M&E Plant and Substation Transformers**

It is essential that all M&E plant (e.g. pumps, fans, adiabatic coolers etc.) are wholly and effectively vibration isolated from all building structures in accordance with the guidance in CIBSE Guide B4. This requirement also extends to all substation transformers, much must also be entirely vibration isolated from all building elements and structures.

Proprietary vibration isolators must be used in all cases, and these must be installed strictly in accordance with manufacturer guidelines.

11 CONCLUSION

This report demonstrates that the proposed development site can be categorised as a “Medium risk” site as defined by *‘Professional Planning Guidance: Planning and Noise’*, and therefore the development is considered suitable assuming a good acoustic design process is followed to mitigate any potential impacts of environmental noise.

Appropriate indoor ambient noise levels can be achieved within internal spaces across the development with a suitable background ventilation and glazing strategy as outlined in the report to demonstrate site feasibility.

Predictions show that environmental noise levels within the proposed external amenity spaces for the residents of the development, are in line with standard guidance.

An assessment of noise from the neighbouring Sainsburys has been undertaken and the required mitigation to meet the required internal ambient noise levels are presented.

Acoustic guidance has also been presented concerning the impact of mitigating residential summertime overheating using a natural ventilation strategy in accordance with the assessment framework provided in *‘Acoustics, Ventilation and Overheating, Residential Design Guide 2020’* and Approved Document O.

Appropriate daytime and night time environmental noise limits for M&E plant (and associated louvres, cowls etc.) have also been set herein, all as based on the results obtained from the environmental noise surveys undertaken, and all as discussed within this report.

APPENDIX A NOISE SURVEY DETAILS AND SUMMARY RESULTS

LOCATION

Greyfriars House, Reading

DATES & TIMES

12 July to 20 July 2024

23 July 2024

WEATHER CONDITIONS

Weather conditions were understood to be typically dry with light winds.

PERSONNEL PRESENT DURING MEASUREMENTS

Ross Pritchard – Sol Acoustics Ltd

Tom Hunt – Sol Acoustics Ltd

INSTRUMENTATION

01dB Cube Sound Level Meter (serial no. 11114)

01dB Pre22 Microphone Preamplifier (serial no. 1610399)

Gras 40CD Microphone Capsule (serial no. 260807)

01dB Cube Sound Level Meter (serial no. 11117)

01dB Pre22 Microphone Preamplifier (serial no. 1610404)

Gras 40CD Microphone Capsule (serial no. 260827)

01dB Cube Sound Level Meter (serial no. 12068)

01dB Pre22 Microphone Preamplifier (serial no. 1936010)

Gras 40CD Microphone Capsule (serial no. 292577)

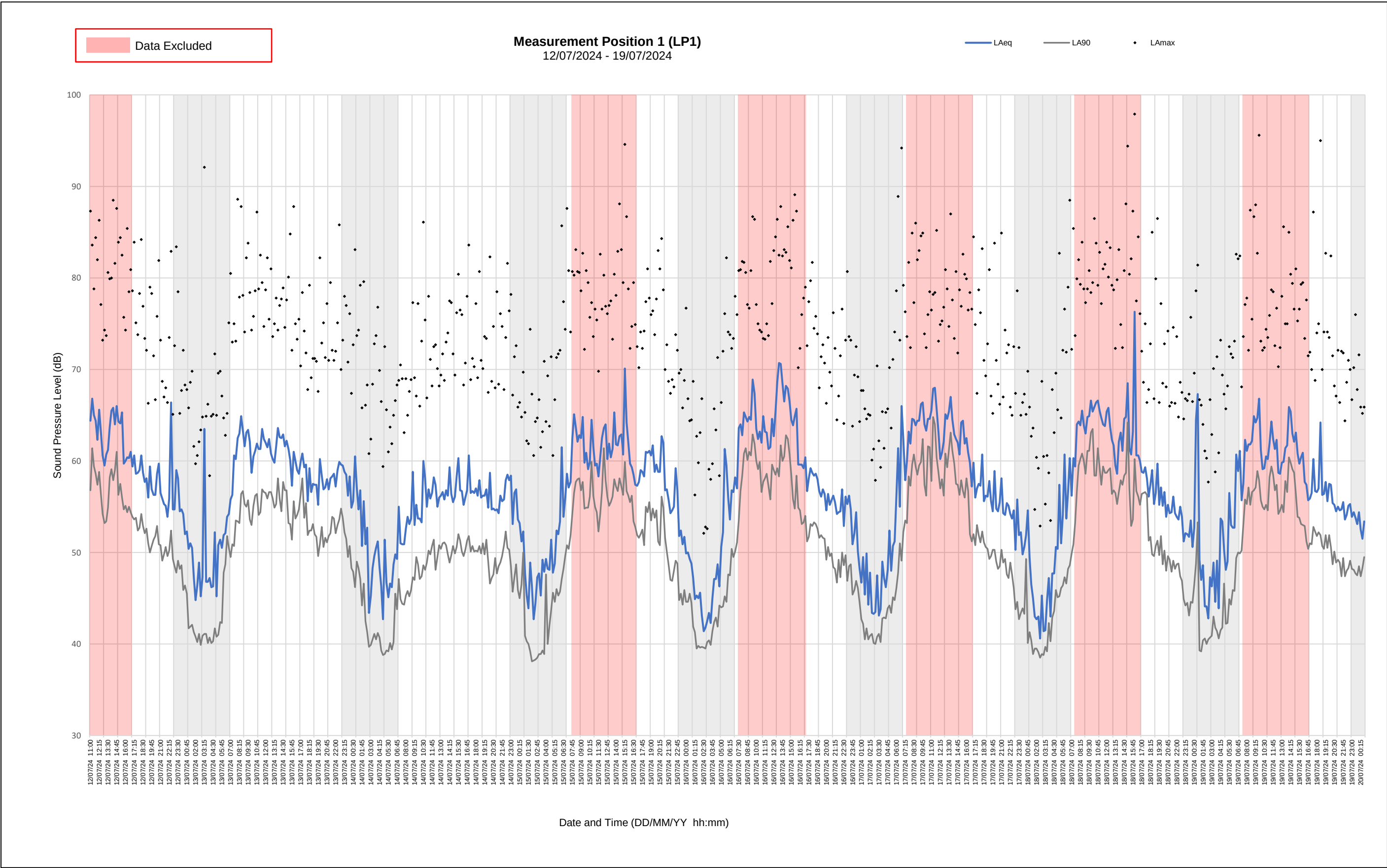
CAL21 Acoustic Calibrator (serial no. 34375244)

METHODOLOGY

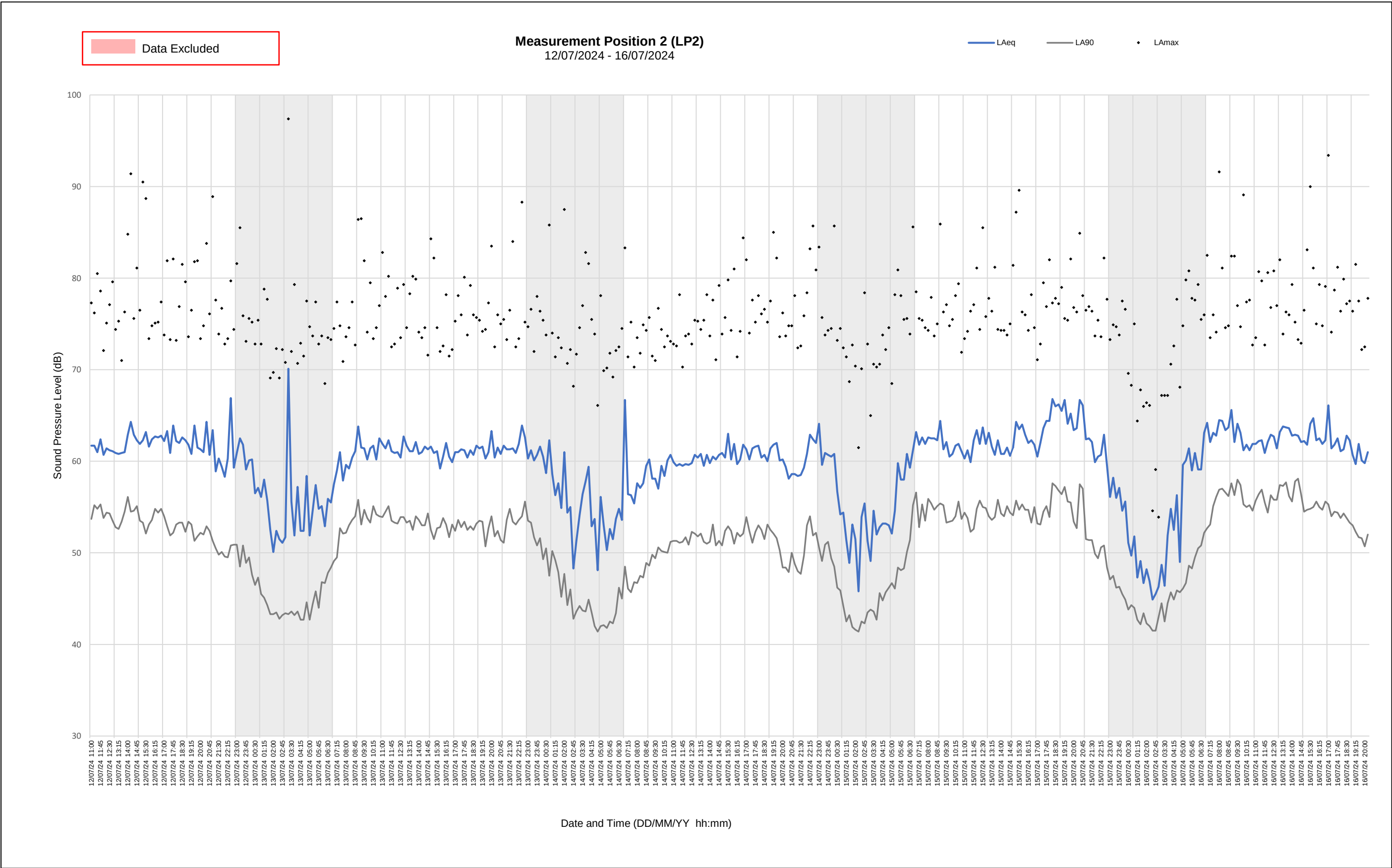
Before and after the measurements the sound level meters were checked and calibrated to an accuracy of ± 0.4 dB using the 01dB CAL 21 Calibrator. The calibrator produces a sound pressure level of 94 dB re 2×10^{-5} Pa @ 1 kHz.

MEASUREMENT RESULTS

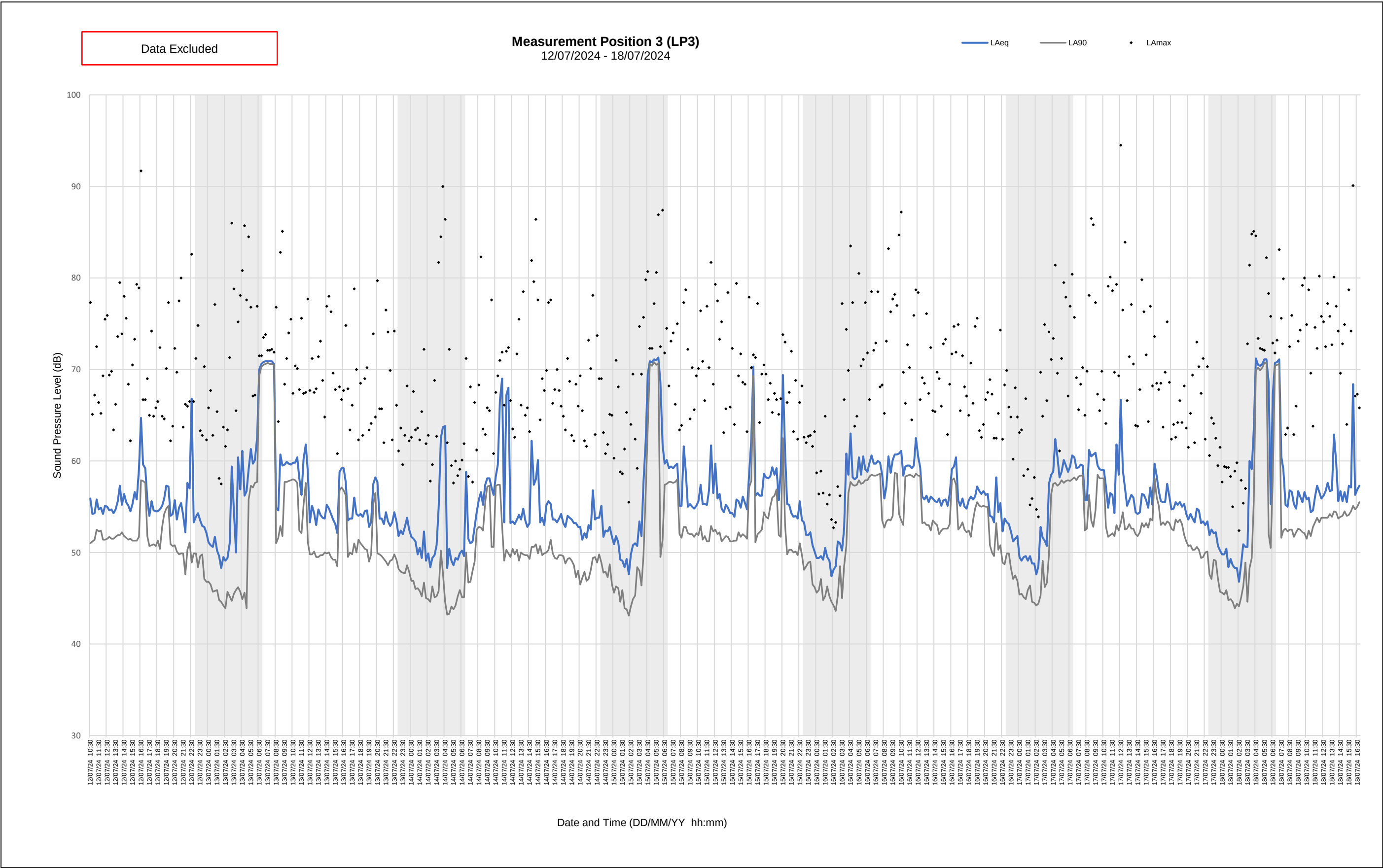
Graphs A1 – A4 summarise the results obtained from the noise survey at Measurement Position LP1, LP2, LP3 and SP1, respectively.



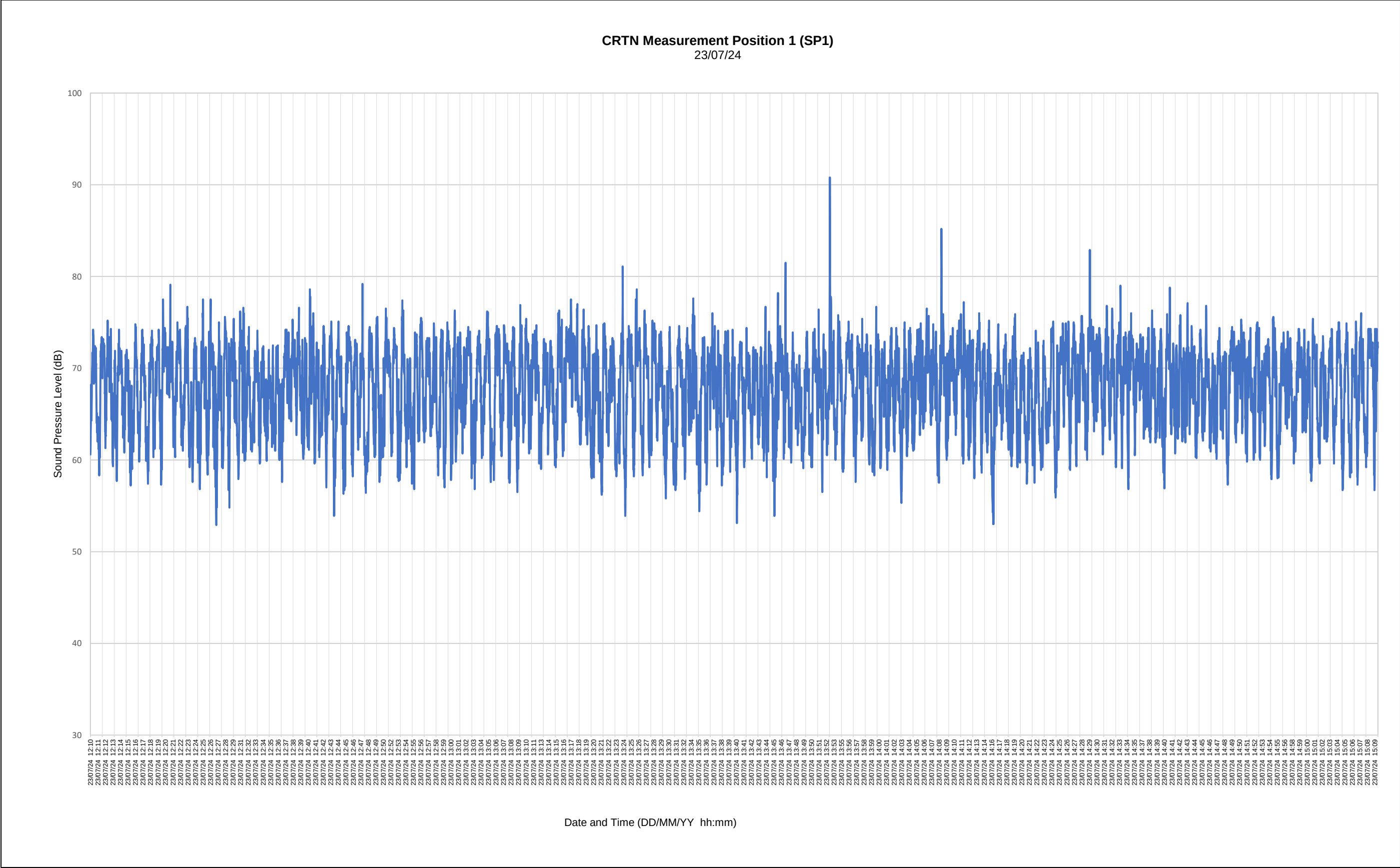
Graph A1: Graph showing measured environmental noise levels as measured at Measurement Position LP1



Graph A2: Graph showing measured environmental noise levels as measured at Measurement Position LP2



Graph A3: Graph showing measured environmental noise levels as measured at Measurement Position LP3



Graph A4: Graph showing measured environmental noise levels as measured at Measurement Position SP1

APPENDIX B CADNAA 3D MODEL NOISE MAPS

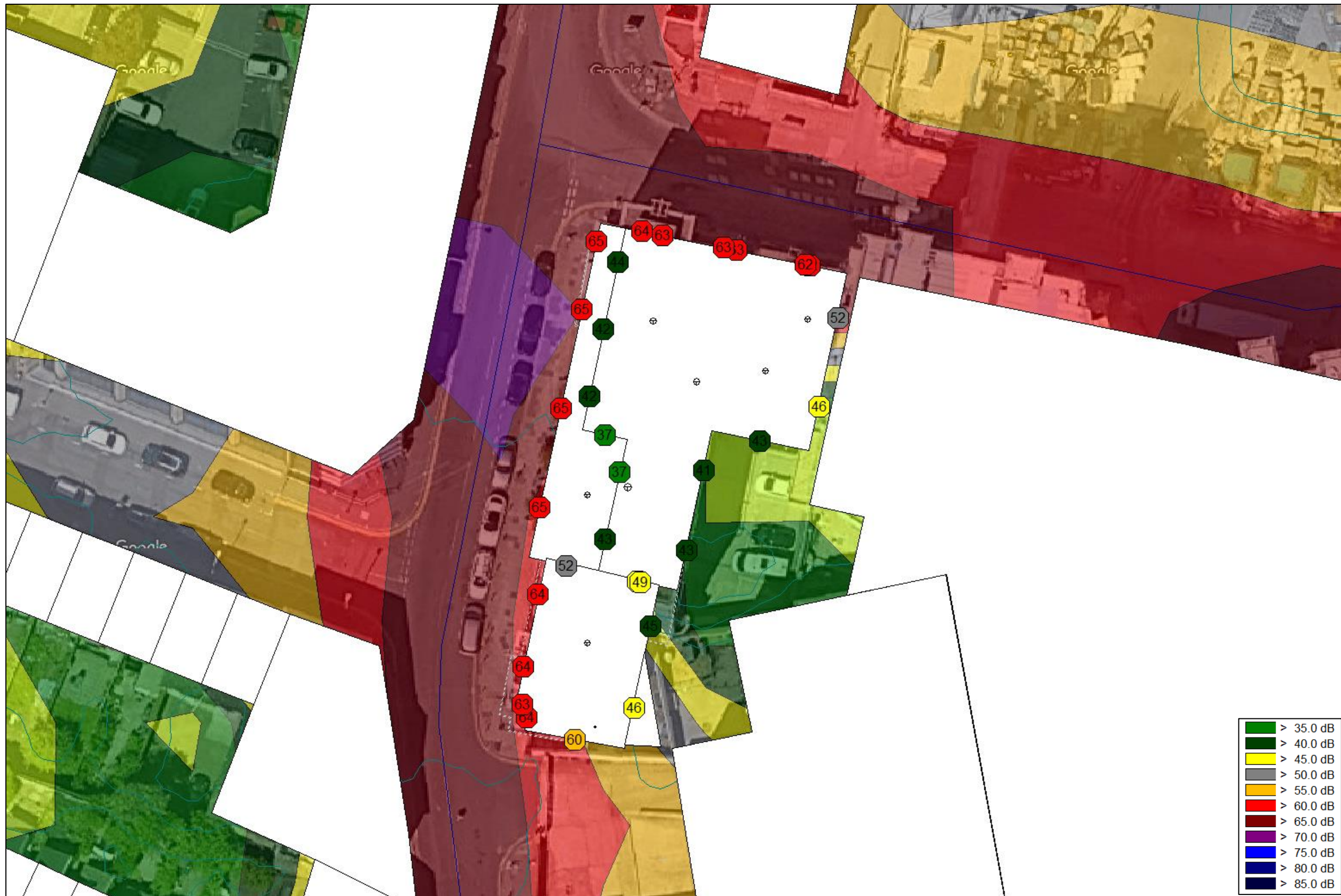


Figure B1: Predicted daytime environmental noise levels ($L_{Aeq,16 \text{ hour}}$)

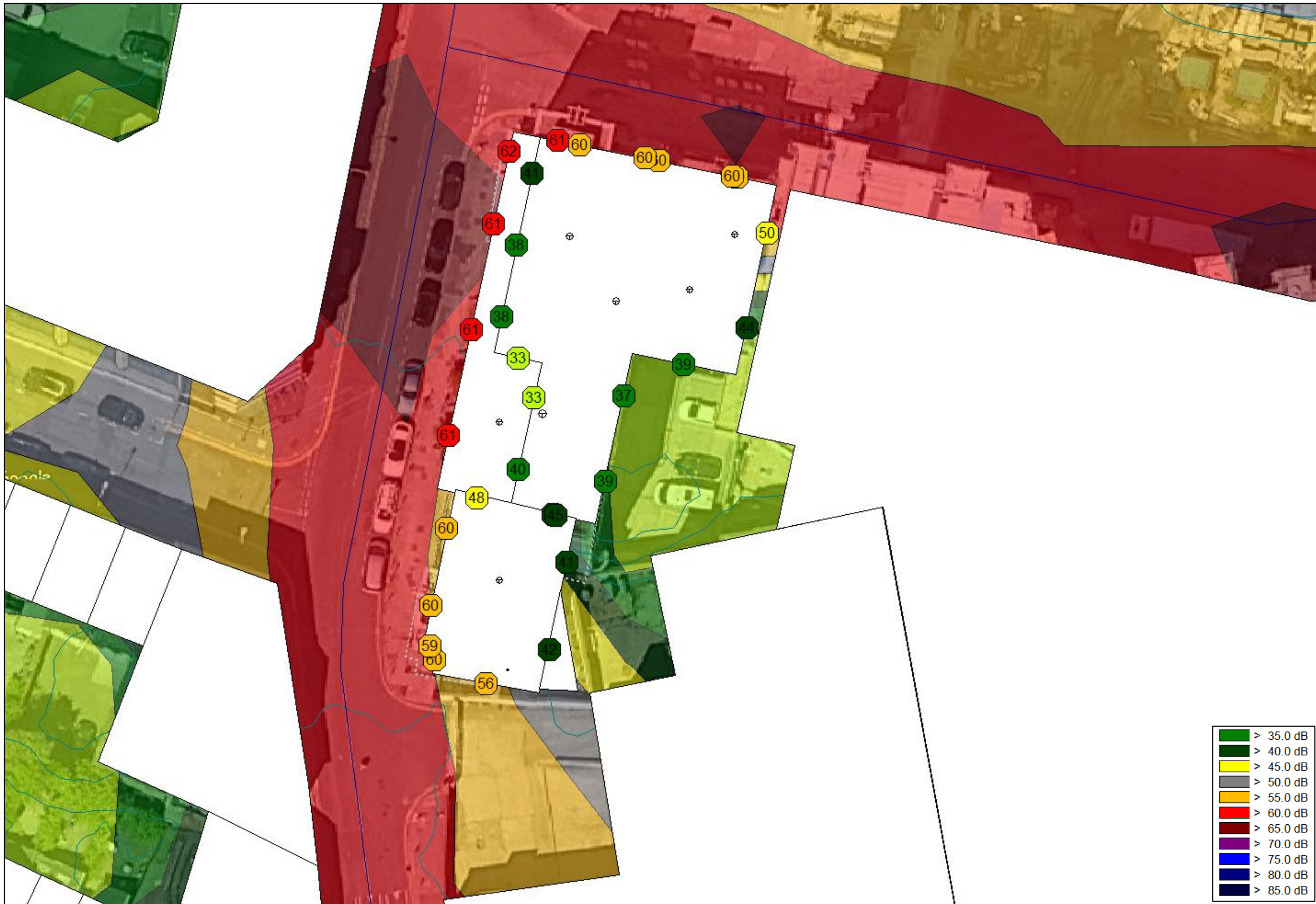


Figure B2: Predicted night time environmental noise levels ($L_{Aeq,8 \text{ hour}}$)

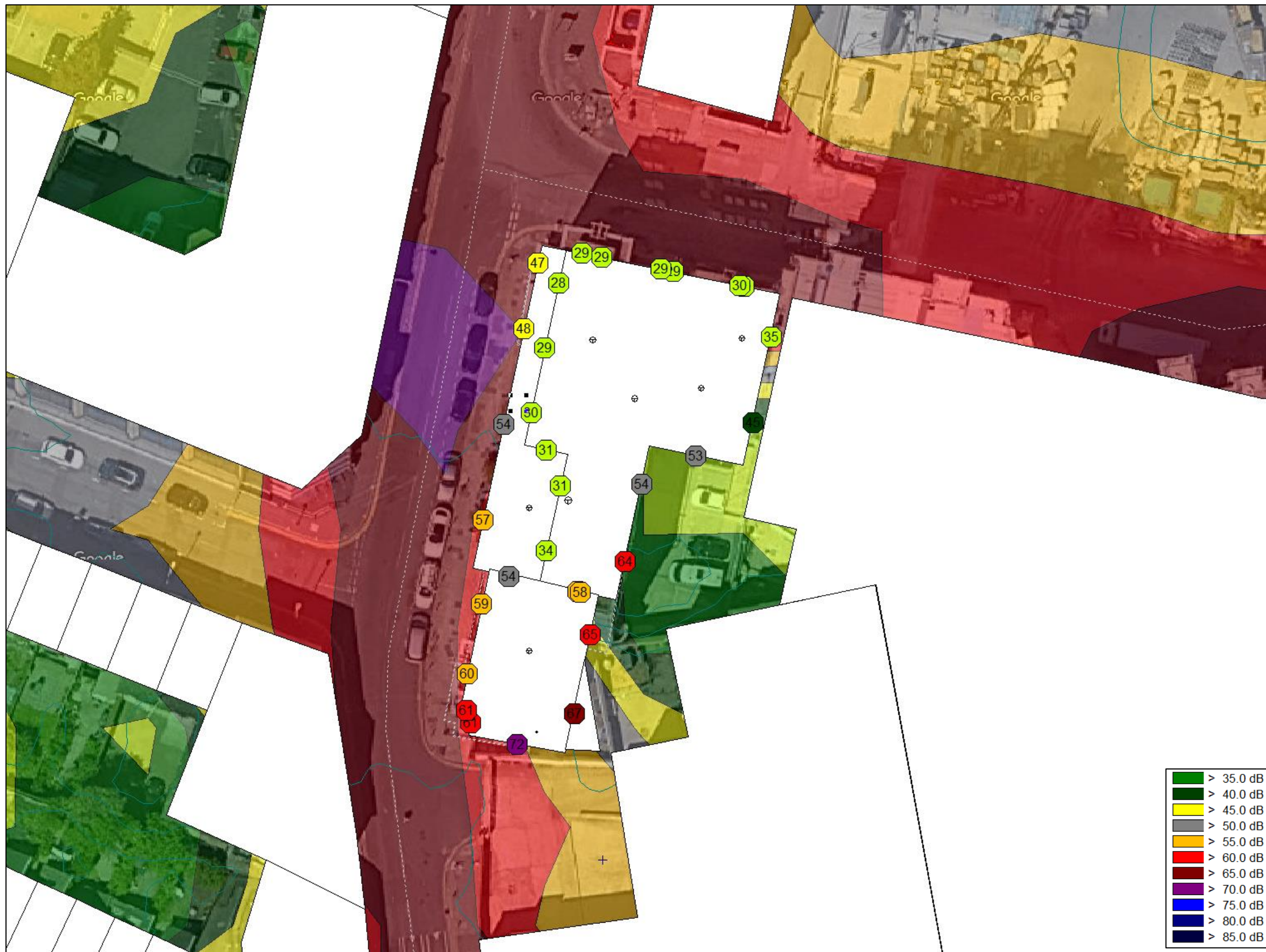


Figure B3: Predicted daytime environmental noise levels ($L_{Aeq,1 \text{ hour}}$)

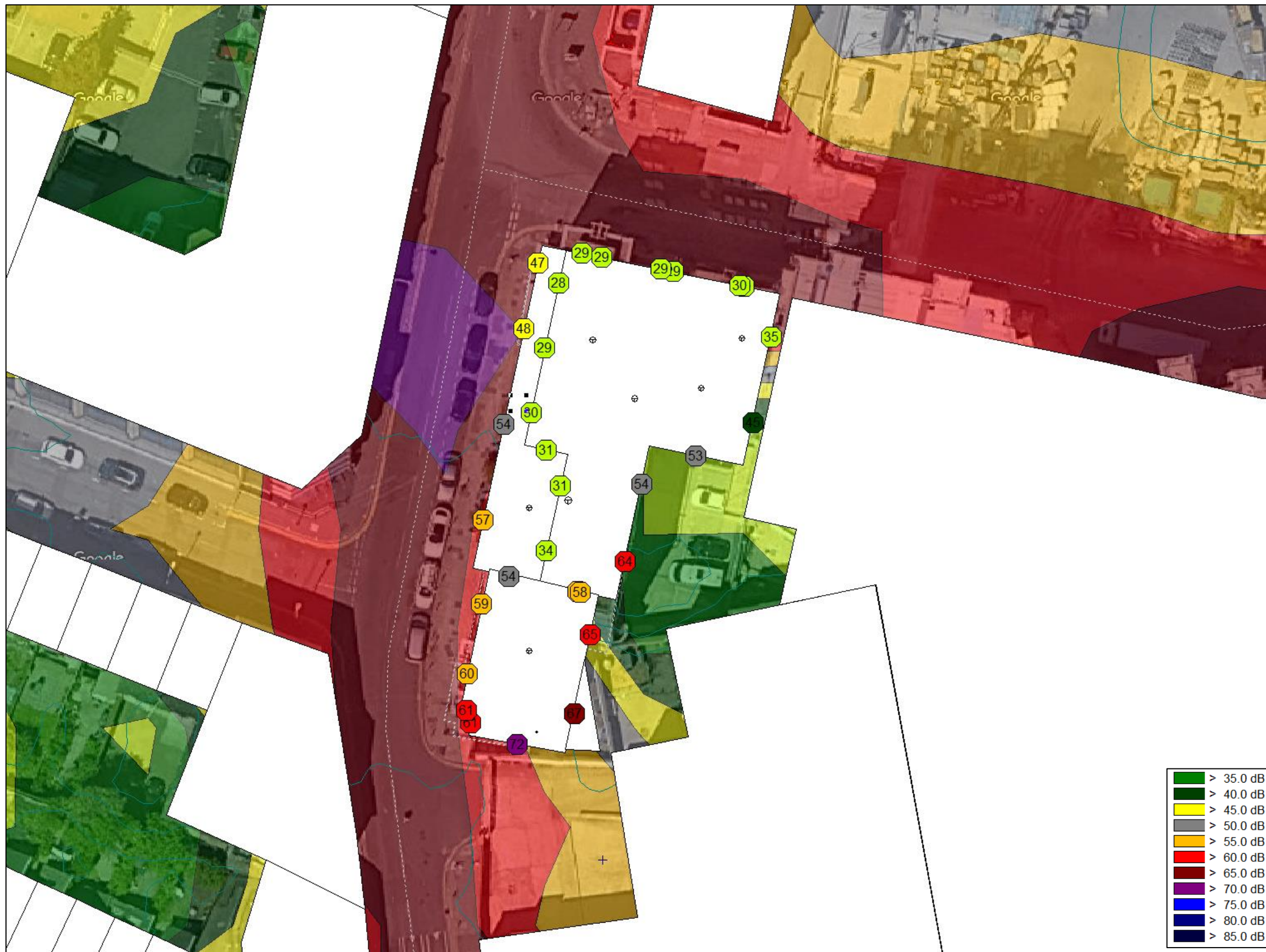


Figure 4: Predicted night time environmental noise levels ($L_{Aeq,15 \text{ min}}$)

ELDER

GREYFRIARS HOUSE
20 - 30 GREYFRIARS ROAD , READING

