Noise Impact Assessment

Rhoose, VoG, Masterplan Site Allocation

PMG Ltd

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Basis of Report

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1.0 Introduction

PMG Ltd has appointed SLR Consulting Limited to undertake a noise assessment to inform decision making and support the allocation of the site on the Land south of Cardiff Airport, within Rhoose, Vale of Glamorgan, henceforth known as “Rhoose” for this assessment document.

This report has been prepared to assess the existing noise climate at the Proposed Development Site to determine the suitability of the Site regarding the proposed uses.

Suitability of the Site will be determined using Local and National Policy and Guidance relevant to the development proposals.

Whilst reasonable effort has been made to ensure that this report is easy to understand, it is technical in nature. To assist the reader, a glossary of terminology has been included in **Appendix A**.

2.0 Site Description

The Site is located south and west of Cardiff Airport, and Port Road to the north. The site is broadly north of the built up residential area comprising Rhoose with Fontygary Road to the south.

Figure A below details the Proposed Development Site location and surrounding area context.

2.1 Proposed Development

The Proposed development parameters are not presently known in any detail, however at present it is understood the below land portion is proposed for residential or potentially mixed-use commercial industrial and residential development.

Figure A below details the indicative red line boundary location plan in context.

Figure A: Location Plan and Site Context

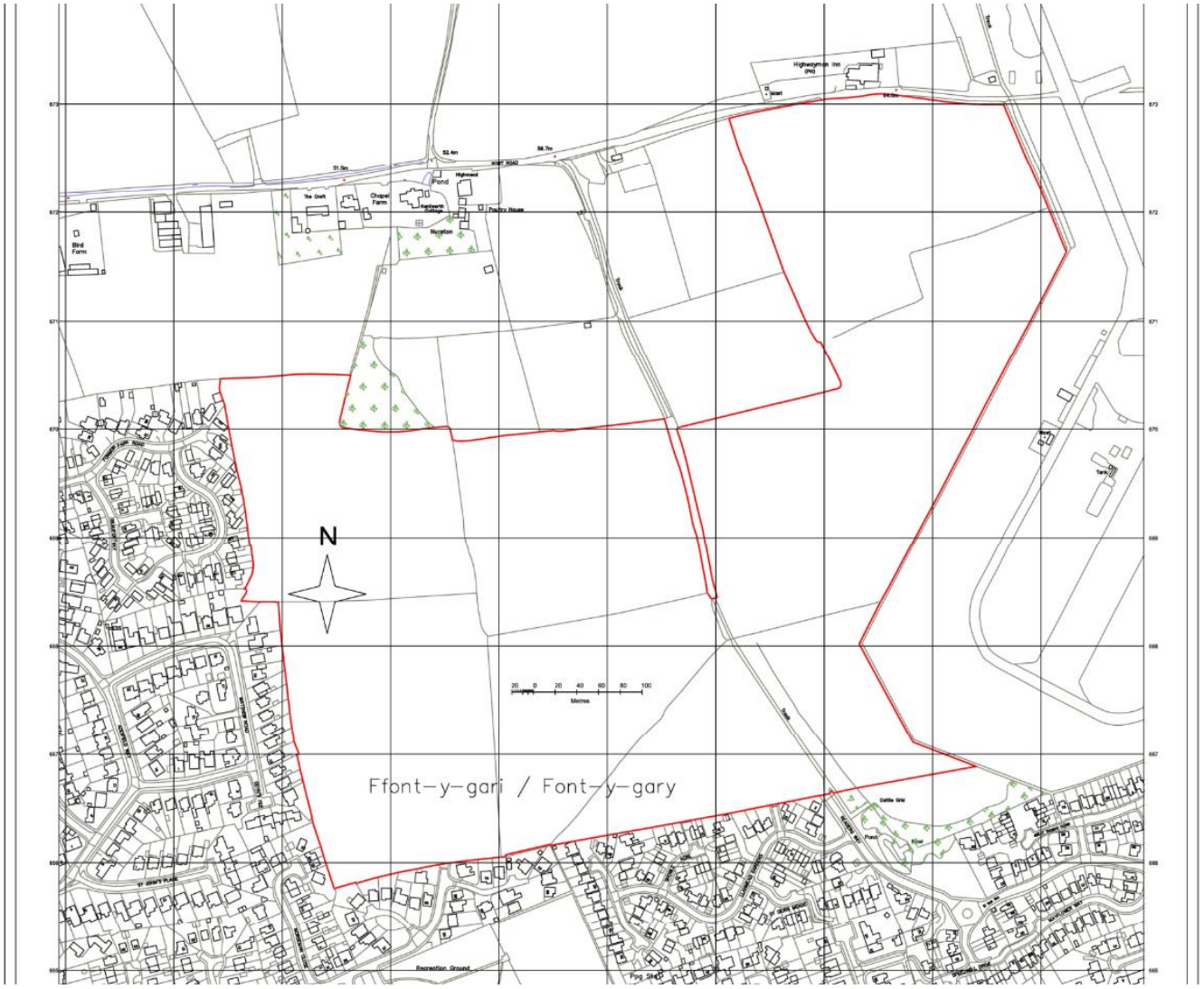


Figure B below outlines the present status masterplan proposal for the site.

Figure B: Indicative Masterplan Exercise

3.0 Standards and Guidance

3.1 Overview

A summary of the standards and guidance relevant to noise and the proposed development is provided below:

- Welsh Government (2021) Planning Policy Wales (PPW)
- Welsh Office (1997) Technical advice note (TAN) 11: Noise (TAN11)
- ANC, IOA & CIEH (2017) Professional Planning Guidance (ProPG): Planning & Noise, New Residential Development, Supplementary Document 2, Good Acoustic Design
- The British Standards Institution (2014) BS 8233:2014 Guidance on sound insulation and noise reduction for buildings
- World Health Organisation (1999) Guidelines for Community Noise
- The British Standards Institution (2014) BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites
- Department of Transport Welsh Office (1988) Calculation of Road Traffic Noise (CRTN)
- Highways Agency (2008) Design Manual for Roads and Bridges. London, DFT

3.2 Planning Policy Context

3.2.1 Planning Policy Wales (PPW) (Welsh Government, 2021)

> *"Where sensitive developments need to be located close to existing transportation infrastructure for sustainable movement and access they should be designed, as far as practicable, to limit harmful substances and noise levels within and around those developments both now and in the future. This may include employing the principles of good acoustic design and the inclusion of active travel or travel management measures as part of development proposals. Such development, however, should preferably be located away from existing sources of significant noise, which may include aircraft noise or roads, particularly new roads or those with programmed route improvements."*

PPW is supplemented by a number of technical advice notes, including Technical advice note (TAN) 11: Noise (TAN11) (Welsh Office, 1997)

PPW also states,

> *"For more information on the principles of good acoustic design, readers are referred to Professional Planning Guidance (ProPG) Supplementary Document 2, produced by the Association of Noise Consultants, the Institute of Acoustics and the Chartered Institute of Environmental Health (http://www.association-of-noise-consultants.co.uk/propg/). ProPG has been written principally to assist with the planning process in England, but the design principles put forward in Supplementary Document 2 may also be adopted in Wales."*

3.2.2 Noise and Soundscape Plan for Wales 2023-2028

In 2018, Welsh Government published the Noise and Soundscape Action Plan 2018-2023 (NSAP), which reframed noise policy in Wales in terms of the Well-being of Future Generations (Wales) Act 2015 ("the WFG Act"). It resulted in Wales being recognised as the first nation to include soundscapes in national policy, and it was referenced in the United Nations Environment Programme's Frontiers 2022 report.

Earlier this year, Wales introduced the Environment (Air Quality and Soundscapes) (Wales) Bill, which will require to production of a national strategy on soundscapes.

In 2018, Wales did this voluntarily in the form of the NSAP, giving the new Noise and Soundscape Plan 2023-2028 a more solid legal foundation raising its profile and increase its effectiveness in guiding informed decision-making.

The draft Noise and Soundscape Plan 2023-2028 retains and refines the core messages of the NSAP, which include:

- appropriate soundscapes;
- commitment to embed the five ways of working in the WFG Act; and
- commitment to join up action on noise and air quality wherever it makes sense to do so.

The 2018-2023 Noise and Soundscape plan provides key commentary in relation to Cardiff Airport as summarised below:

> *"Aircraft noise in the Vale of Glamorgan:*
>
> *Within the Vale of Glamorgan are two airports: a civilian airport, Cardiff Airport, near Rhoose, purchased by the Welsh Government in March 2013, and a Ministry of Defence site at St Athan. Together they form the Welsh Government's Cardiff Airport Enterprise Zone.*
>
> *Constructed in the 1940s, Cardiff Airport was originally a military airport established to house a wartime satellite aerodrome and training base for RAF Spitfire pilots. It now handles over a million passengers per year, with a runway that is over two kilometres long and one of the largest maintenance hangars in the world. However, with take-off and landing over either the sea or agricultural land, the airport endeavours to have a low noise impact on the neighbouring community*
>
> *The noise contour maps available support this opinion.*
>
> *https://www.cardiff-airport.com/media 77 10.4.8 Use of the improved navigational capabilities of modern aircraft should, over time, result in less lateral dispersal of flights either side of the inbound routes, meaning that fewer people will experience overflying aircraft. However, those who are directly beneath the flight path are likely to experience a greater number of aircraft over-flights83. Noise complaints in relation to both airports are few, and, if received, both facilities have a positive and co-operative stance."*

3.2.3 Vale of Glamorgan Policy

3.2.3.1 Noise and planning – Local Development Plan Policy

On 28 June 2017 the Council adopted its LDP for the period 2011-2026.

The LDP became operative on its adoption and supersedes the previously adopted Unitary Development Plan.

The LDP is the basis for decisions on land use planning in the Vale of Glamorgan and will be used by the Council to guide and manage new development proposals.

The LDP's emphasis is on re-using previously developed land and minimising the need to develop on green fields. This is evident in Barry where the emphasis is very much on the continued regeneration of the Waterfront.

Nevertheless, the LDP does recognise, as detailed in policy item MD2 (Design of New Development),

That:

"…in order to create high quality, healthy, sustainable and locally distinct places, development proposals should, amongst other matters, safeguard existing public and residential amenity, particularly with regard to privacy, overlooking, security, noise and disturbance. However, it is also recognised that problems such as noise can be overcome by good design."

Policy MD5 advocates that:

"…development within settlement boundaries shall have no unacceptable impact on the amenity and character of the locality by way of noise, traffic congestion and parking, thereby addressing the residential amenity of existing and future residents."

Regard is given in policy MD7 to environmental protection. The policy states that:

"…development proposals will be required to demonstrate that they will not result in an unacceptable impact on people, residential amenity, property and/or the natural environment from either, amongst other matters, noise, vibration, odour nuisance or light pollution."

The local planning authority utilises TAN 11 in relation to proposed residential development near noise sources, as major transport routes (road, rail and air) and some industrial and commercial activities can generate particularly high noise levels.

The LDP, for example states*:*

"recognises that certain sites should be given specific consideration with regard to noise. Such a site is Higher End in St Athan.

Due to the site's proximity to MOD St Athan and the Aerospace Business Park / Enterprise Zone, it is specified within the LDP that a noise assessment will also be required for any future development proposals.

Regardless of site-specific allocations, officers also recognise that where necessary new developments would give rise to high noise levels, including from proposed transport schemes, they should be located and designed to minimise their noise impact.

Therefore, where necessary, developers will be required to provide an assessment of noise impact, together with proposals for mitigation.

Such assessments are routinely requested and scrutinised by officers within SRS.

Planning officers work closely with SRS officers and recognise that decisions can be informed by evidence in relation to noise complaints, as well as the acoustic knowledge of SRS officers, thereby reducing the likelihood of noise nuisance and in turn protecting residential amenity.

In responding to planning applications, SRS officers take account of the Welsh Government's statutory duties under the Environmental Noise Directive and the designated noise action planning priority areas within the Vale of Glamorgan. Officers also give specific regard to noise-sensitive receptors such as housing, schools and hospitals, noting that noise can have a harmful impact on people's health and quality of life as well as on the landscape and nature.

Officers in both SRS and the planning department acknowledge that proactive noise mitigation is the most beneficial and cost-effective method of dealing with noise. Officers advocate that proactive interventions can bring multiple benefits, such as reducing people's exposure to noise and air pollutants.

Noise from existing industrial sources affecting new noise-sensitive developments is best addressed proactively via the LDP, good design and, where appropriate, conditions at the planning stage rather than after construction has commenced or been completed. As necessary, both SRS and planning officers consult regulators and site operators. Smaller and more localised industrial noise sources are also considered."

3.2.3.2 Vale of Glamorgan Local Development Plan 2011-2026: Public Consultation on Draft Supplementary Planning Guidance on Cardiff Airport and Gateway Development Zone _ July 2019 Cabinet Meeting

Cardiff Airport undertook a Noise and Environmental Monitoring Report in 2010 which identified the number of complaints received concerning noise and environmental issues in relation to aircraft movements and route deviations over each quarterly period between January and December 2010.

The Monitoring Report offers an insight to where the potential noise issues are located within the Vale of Glamorgan.

However, due to the age of the report and the limited data recorded any future noise assessment would be required to undertake a more detailed and up to date study of the impacts any future expansion of the airport would have on the amenity of the surrounding area.

Future noise assessments should be carried out in accordance with Welsh Government Guidance contained within TAN 11: Noise (1997). An update to TAN11 was released in the form of a Ministerial Letter which updates references throughout TAN115 .

Due to the existing uses on the site, future developers must take account of the agent of change principle set out in PPW which states:

> *"…that a business or person responsible for introducing a change is responsible for managing that change. In practice, for example, this means a developer would have to ensure that solutions to address air quality or noise from nearby pre- existing infrastructure, businesses or venues can be found and implemented as part of ensuring development is acceptable."*

To ensure future occupiers are not adversely impacted by the noise created by aircraft, design features should be included within the proposed development to mitigate against noise.

These could include:

- Sound insulation
- Screening development from noise sources using both artificial and natural barriers
- Positioning noise sensitive buildings an adequate distance away from noise sources.

In addition, new development on the site must have regard to existing residential properties in the area and the likely impact proposals would have on residential amenity. Noise creating development should be positioned away from other sensitive uses to ensure residential and public amenity is protected.

3.3 Guidance and Standards Content

3.3.1 Technical Advice Note 11 (TAN11)

Noise bands defining categories A-D of TAN11 (Welsh Office, 1997) are set in terms of $L_{Aeq,16hr}$ daytime and $L_{Aeq,8hr}$ night time levels for noise from Road and Air Traffic, free field 1.2-1.5m above ground level as follows in Table A.

Table A: Recommended Noise Exposure Categories (NEC)

Recommended noise exposure categories for new dwellings near existing noise sources (ref Table 2 of TAN 11 (Wales) October 1997)					
Noise Source	**Time**	**Noise Exposure Categories**			
		A	**B**	**C**	**D**
Road Traffic	07:00-23:00	<55	55-63	63-72	>72
	23:00-07:00	<45	45-57	57-66	>66
Air Traffic	07:00-23:00	<57	57-66	66-72	>72
	23:00-07:00	<48	48-57	57-66	>66

3.3.1.1 Assessment Practice Notes-Noise levels:

The noise level(s) ($L_{Aeq,T}$) used when deciding the NEC of a site should be representatives of typical conditions.

Night-time noise levels (2300-0700): sites where individual noise events regularly exceed 82dBL_{Amax} (S time weighting) several times in any hour should be treated as being in NEC C, regardless of the $L_{Aeq,8H}$ (except where the $L_{Aeq,8H}$ already puts the site in NEC D).

Aircraft noise: daytime values accord with the contour values adopted by the Department of Transport which relate to levels measured 1.2m above open ground.

For the same amount of noise energy, contour values can be up to 2 dB(A) higher than those of other sources because of ground reflection effects.

Mixed sources: this refers to any combination of road, rail, air and industrial noise sources.

The "mixed source" values are based on the lowest numerical values of the single source limits in the table. The "mixed source" NECs should only be used where no individual noise source is dominant.

To check if any individual noise source is dominant (for the purposes of this assessment) the noise level from the individual sources should be determined and then combined by decibel addition (remembering first to subtract 2 dB(A) from any aircraft noise contour values).

If the level of any one source, then lies within 2 dB(A) of the calculated combined value, that source should be taken as the dominant one and the site assessed against the appropriate NEC for that source, rather than using the "mixed source".

NECs: If the dominant source is industrial noise see paragraph B17 of Annex B.

If the contribution of the individual noise sources to the overall noise level cannot be determined by measurement and/or calculation, then the overall measured level should be used, and the site assessed against the NECs for "mixed sources".

Local planning authorities should then have regard to the advice in the appropriate NEC, as below:

Table B: TAN11 Noise Exposure Category Advice Summary

NEC	Summary
A	Noise need not be considered as a determining factor in granting planning permission, although the noise level at the high end of the category should not be regarded as desirable.
B	Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection.
C	Planning permission should not normally be granted. Where it is considered that permission should be granted, for example because there are no alternative quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise.
D	Planning permission should normally be refused.

3.3.2 Professional Planning Guidance (ProPg)

ProPG Supplement 2 (ANC, IOA & CIEH, 2017) as referenced above in TAN11 discusses the general principles of Good Acoustic Design, including the following hierarchy of noise management measures in descending order of preference;

- Maximising the spatial separation of noise source(s) and receptor(s).
- Investigating the necessity and feasibility of reducing existing noise levels and relocating existing noise sources.
- Using existing topography and existing structures (that are likely to last the expected life of the noise-sensitive scheme) to screen the proposed development site from significant sources of noise.
- Incorporating noise barriers as part of the scheme to screen the proposed development site from significant sources of noise.
- Using the layout of the scheme to reduce noise propagation across the site.
- Using the orientation of the buildings to reduce the noise exposure of noise-sensitive rooms.
- Using the building envelope to mitigate noise to acceptable levels.

For the purposes of this assessment the noise categorisation thresholds from TAN11 will be used in tandem with the above guidelines in relation to design optimisation for the site.

3.3.3 British Standard 8233:2014

BS 8233:2014 (The British Standards Institute, 2014) includes internal noise criteria of habitable rooms in residential dwellings, as shown below in Table C;

Table C: BS 8233:2014 Internal Ambient Noise Criteria for Habitable Rooms

Space	07:00 to 23:00	23:00 to 07:00
Living room	35 dB $L_{Aeq,16hr}$	-
Dining room/area	40 dB $L_{Aeq,16hr}$	-
Bedroom	35 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq,8hr}$

3.3.3.1 Notes to Table C

> *"Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5dB and reasonable internal conditions still achieved."*

In addition, it states*:*

> *"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. Sporadic noise events could require separate values."*

Reference is therefore made to World Health Organisation (WHO) 'Guidelines for Community Noise' (WHO, 1999) which states *"For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45dB L_{Amax} more than 10-15 times per night (Vallet & Vernet 1991)".*

Section 7.7.3.2 of BS 8233:2014 entitled 'Design criteria for external noise' states;

> *"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 50 dB $L_{Aeq,T}$ with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognised that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, 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 to 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.".*

3.3.4 BS 4142:2014 +A1:2019

The British Standard BS 4142:2014 +A1:2019 *Methods for Rating and Assessing Industrial and Commercial Sound* (BS 4142) notably describes methods for rating and assessing sound of an industrial or commercial nature. It has been referenced where required in policy and guidance documents to assess the potential impact of sound of an industrial and/or commercial nature, at existing and proposed noise-sensitive receptor locations within the context of the existing sound environment.

Certain acoustic features can increase the significance of impact from a comparison of the specific sound level to the background sound level where these features are likely to affect perception and response. Where such features are present at the assessment location, a character correction (or penalty) to the specific sound level is made to obtain the rating level. This can be approached from subjective, objective and reference methods.

- Tonality: A correction of 0 dB to + 6 dB for sound ranging from not tonal to prominently tonal.
- Impulsivity: A correction of up to + 9 dB can be applied for sound that is impulsive.
- Intermittency: A penalty of + 3 dB can be applied if on/off conditions are readily distinctive within the reference time interval over the period of the greatest amount of on-time.
- Other characteristics: A penalty of + 3 dB can be applied in the absence of all other defined characteristics, where the specific sound contains a distinctive feature in the residual acoustic environment.
- The rating sound level is equal to the specific sound level if there are no acoustic features present or expected to be present.

The significance of sound depends upon both the margin by which the rating level exceeds the background sound level and the context in which the sound occurs. An initial estimate of the impact of the specific sound is made by subtracting the measured background sound level from the rating level.

- Typically, the greater the difference, the greater the magnitude of the impact;
- A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context;
- A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context; and
- 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 level, this is an indication that the specific sound source will have a low impact, depending on the context.

BS 4142 has stipulated that context is important when assessing the impact of sound of a commercial and/or industrial nature. Amongst a range of advocated considerations, this can include mitigation, residual sound levels, location and absolute sound levels in the consideration of context.

The scope of BS 4142 recognises that human response to sound can be subjective as affected by many factors, both acoustic and non-acoustic. The significance of its impact can depend on various factors such as the exceedance to the background level, its absolute level, time of day and change in environment, as well as local attitudes to the source of sound and character of the neighbourhood.

4.0 Environmental Sound Survey

To establish the prevailing sound climate at the Site, a baseline environmental sound survey was undertaken from approximately 14:00 on 10 August 2023 and 13:00 on 16 August 2023.

In some instances, the meter ceased operation late on Monday 14 August 2023, however the data set is considered sufficient given that both day and night noise levels across key weekdays (Friday and Monday), and the full weekend (Saturday and Sunday) are captured which from the survey data are indicated to be peak flight movement days.

The survey was undertaken over a substantial period to obtain the typical daytime and night-time sound levels experienced at the Site including weekend fluctuation.

Environmental sound level measurements were undertaken at four key locations across the Site.

These locations were chosen as representative of the development boundaries for amenity use, as well as residential areas, as their further extent and closest extent in relation to Cardiff Airport.

The locations of the environmental sound survey are presented in **Figure C** and **Table D** below.

Figure C: Environmental Sound Survey Location

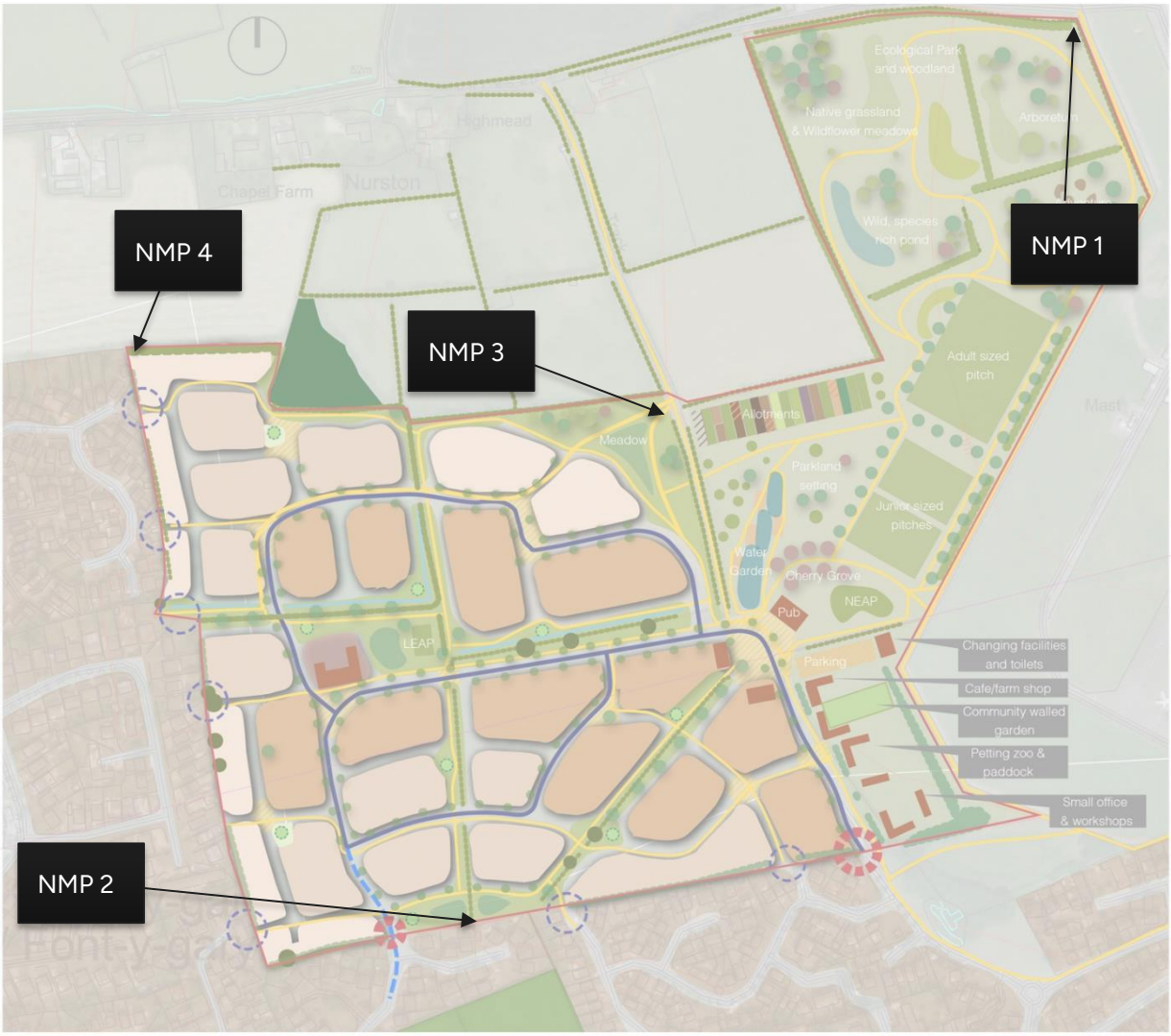


Table D: Environmental Sound Survey Locations and Sound Climate Classification

Location	Description	Dominant Noise Source
NMP 1	Representative of incident sound levels from the airfield on the most north eastern extent of the site, location is reflective of north eastern boundary of proposed ecological leisure garden area.	Airport noise dominant. Planes taking off and taxiing. Vegetation rustling. Birdsong. People talking nearby
NMP 2	Representative of background sound levels at the southern boundary of the proposed residential areas. Also used an aircraft noise propagation calibration position for noise modelling purposes with reference to Cardiff Airport.	Noise from existing residential uses to the south. Lawnmowers, people talking, cars driving by. Vegetation rustling and birdsong.
NMP 3	Representative of North Eastern extent of Residential massing within the proposed Masterplan, and worst-case residential allocation areas impacted by Cardiff Airport.	Airport audible. Vegetation rustling and birdsong. High altitude aircraft.
NMP4	Representative of background sound levels Also used an aircraft noise propagation calibration position for noise modelling purposes with reference to Cardiff Airport.	Airport audible. Vegetation rustling and birdsong. People talking in garden nearby. Motorbike in distance.

4.1 Meteorological Conditions

The period of surveying incorporated weather conditions that were conducive for sound surveying works. During the survey period temperatures ranged from 10 to 23 °C, with the lower temperatures being perceived during night-time periods.

Average wind speeds remained below 5 m/s.

Generally, conditions were considered suitable for surveying, and unlikely to materially affect the findings of the overall assessment.

4.2 Equipment and Measurements

4.2.1 Equipment

Sound pressure level measurements were carried out using the equipment listed in Table E below. Sound Level Meters (SLM) and their associated calibrators are Class 1 for acoustic accuracy.

The SLM were calibrated before the measurements using the handheld acoustic calibrator and the calibration was checked upon completion of the survey. No significant drift was observed. The calibration chain of equipment has been maintained traceably to national standards, no greater than one year for sound calibrators and two years for SLMs.

Table E: Sound Monitoring Equipment

Location	Description	Serial No.
NMP1	RION Class 1 Sound Level Meter	00976174
NMP2	Cirrus Class 1 Sound Level Meter	G400059
NMP3	Cirrus Class 1 Sound Level Meter	G068726
NMP4	RION NL-52 Class 1 Sound Level Meter	00331823
Calibrator	RION Acoustic Calibrator	34336013

4.2.2 Measurement Parameters

Measurements were recorded in free field conditions, as measured in-situ 1.5 m above ground.

The monitoring protocol consisted of substantially unattended readings over the survey period with nominal 1-hour attendances at the start and end of the monitoring periods, covering nominally 5-days.

The following sound level indices have been reported at 15-minute intervals in decibels (dB):

- $L_{Aeq,T}$ – The A-weighted equivalent continuous noise level over the measurement period.
- $L_{A90,T}$ – The A-weighted noise level exceeded for 90% of the measurement period.
- $L_{A10,T}$ – The A-weighted noise level exceeded for 10% of the measurement period.
- $L_{Amax(F)}$ – The maximum A-weighted noise level during the measurement period.

Where relevant for residential massing areas and in accordance with the TAN11 assessment methodology the L_{ASMax} (Slow Max) parameter has also been analysed.

The single figure free field noise indices recorded are presented in graphical format within **Appendix B**.

The dataset is large and therefore has not been reproduced in full.

The numeric summary is presented below in Table F to Table M below.

Table F:Noise Survey Summary-Daytime NMP1

Time Period	Log Average dB L_{Aeq}	Tenth Highest L_{AFmax}, n=10	Median dB L_{A90}	Median dB L_{A10}
Daytime (07:00 – 23:00) **T = 16-hours**				
Thursday 10th August; 15:05 – 23:00	49	72	34	44
Friday 11th August; 07:00 - 23:00	52	83	33	40
Saturday 12th August; 07:00 – 23:00	53	82	37	46
Sunday 13th August; 07:00 – 23:00	49	75	34	42
Monday 14th August; 07:00 – 23:00	51	75	37	46
Tuesday 15th August; 07:00 – 12:55	52	76	35	42

Table G:Noise Survey Summary-Night-Time NMP1

Time Period	Log Average dB L_{Aeq}	Tenth Highest L_{AFmax}, n=10	Median dB L_{A90}	Median dB L_{A10}
Night-time (23:00 – 07:00) **T = 8-hours**				
Thursday 10th August / Friday 11th August; 23:00 - 07:00	49	60	29	35
Friday 11th August / Saturday 12th August; 23:00 -07:00	46	56	33	41
Saturday 12th August / Sunday 13th August; 23:00 – 07:00	46	57	32	38
Sunday 13th August / Monday 14th August; 23:00 – 07:00	50	67	34	41
Monday 14th August / Tuesday 15th August; 23:00 – 07:00	48	57	29	35

Table H:Noise Survey Summary-Daytime NMP2

Time Period	Log Average dB L_{Aeq}	Tenth Highest L_{AFmax}, n=10	Median dB L_{A90}	Median dB L_{A10}
Daytime (07:00 – 23:00) **T = 16-hours**				
Thursday 10th August; 14:35 – 23:00	39	59	30	36
Friday 11th August; 07:00 - 23:00	44	69	33	42
Saturday 12th August; 07:00 – 23:00	46	69	38	47
Sunday 13th August; 07:00 – 23:00	44	67	35	43
Monday 14th August; 07:00 – 23:00	48	68	38	46
Tuesday 15th August; 07:00 – 11:30	45	68	38	47

Table I:Noise Survey Summary-Night-Time NMP2

Time Period	Log Average dB L_{Aeq}	Tenth Highest L_{AFmax}, (2 min) n=10*	Median dB L_{A90}	Median dB L_{A10}
Night-time (23:00 – 07:00) **T = 8-hours**				
Thursday 10th August / Friday 11th August; 23:00 - 07:00	40	59	28	35
Friday 11th August / Saturday 12th August; 23:00 -07:00	39	56	31	39
Saturday 12th August / Sunday 13th August; 23:00 – 07:00	40	59	32	40
Sunday 13th August / Monday 14th August; 23:00 – 07:00	44	61	31	39
Monday 14th August / Tuesday 15th August; 23:00 – 07:00	39	54	29	35
Thursday 10th August / Friday 11th August; 23:00 - 07:00	44	58	29	33

Table J:Noise Survey Summary-Daytime NMP3

Time Period	Log Average dB L_{Aeq}	Tenth Highest L_{AFmax}, n=10	Median dB L_{A90}	Median dB L_{A10}
Daytime (07:00 – 23:00) **T = 16-hours**				
Thursday 10th August; 12:30 - 23:00	42	63	34	40
Friday 11st August; 07:00 - 23:00	48	73	33	42
Saturday 12nd August; 07:00 - 23:00	49	74	39	49
Sunday 13rd August; 07:00 - 23:00	45	71	35	46

Table K:Noise Survey Summary-Night-Time NMP3

Time Period	Log Average dB L_{Aeq}	Tenth Highest L_{AFmax}, (2 min) n=10*	Median dB L_{A90}	Median dB L_{A10}
Night-time (23:00 – 07:00) **T = 8-hours**				
Thursday 10th August / Friday 11th August; 23:00 - 07:00	42	59	29	36
Friday 11th August / Saturday 12th August; 23:00 -07:00	44	58	36	47
Saturday 12th August / Sunday 13th August; 23:00 – 07:00	43	59	33	45
Sunday 13th August / Monday 14th August; 23:00 – 07:00	47	70	33	43

Table L:Noise Survey Summary-Daytime NMP4

Time Period	Log Average dB L_{Aeq}	Tenth Highest L_{AFmax}, n=10	Median dB L_{A90}	Median dB L_{A10}
Daytime (07:00 – 23:00) **T = 16-hours**				
Thursday 10th August; 13:45 – 23:00	41	64	33	41
Friday 11th August; 07:00 - 23:00	46	72	31	46
Saturday 12th August; 07:00 – 23:00	48	73	35	48
Sunday 13th August; 07:00 – 23:00	45	69	33	45
Monday 14th August; 07:00 – 23:00	48	69	39	48
Tuesday 15th August; 07:00 – 13:55	46	71	35	46

Table M:Noise Survey Summary-Night-Time NMP4

Time Period	Log Average dB L_{Aeq}	Tenth Highest L_{AFmax}, (2 min) n=10*	Median dB L_{A90}	Median dB L_{A10}
Night-time (23:00 – 07:00) **T = 8-hours**				
Thursday 10th August / Friday 11th August; 23:00 - 07:00	43	61	29	43
Friday 11th August / Saturday 12th August; 23:00 -07:00	41	55	32	41
Saturday 12th August / Sunday 13th August; 23:00 – 07:00	42	56	30	42
Sunday 13th August / Monday 14th August; 23:00 – 07:00	48	63	36	48
Monday 14th August / Tuesday 15th August; 23:00 – 07:00	42	61	27	42
Thursday 10th August / Friday 11th August; 23:00 - 07:00	44	61	28	44

4.2.3 L_{AFMax} Analysis (BS8233)

Night-time maximum event noise levels have been established from the period 23:00 – 07:00, as per a published, statistical approach[1] accordingly an additional analysis of the 2 minute interval night time maximum level noise events in terms of dB L_{AFMax} gives rise to a level of 71dB for the 10th highest fast time weighted maximum event at night at NMP3 which is the closest noise measurement position to Cardiff Airport where residential massing is proposed within the masterplan. Maximum noise levels are objectively lower at other measurement positions being further from Cardiff Airport where residential massing is proposed (NMP2 and NMP4), and therefore no further analysis is warranted.

4.2.4 L_{ASMax} Analysis (TAN11)

As stated in section 3.3 above, Night-time noise levels (2300-0700): sites where individual noise events regularly exceed 82dBL_{Amax} (S time weighting) several times in any hour should be treated as being in NEC C, regardless of the $L_{Aeq,8H}$ (except where the $L_{Aeq,8H}$ already puts the site in NEC D).

SLR have analysed the survey data at Position NMP3 considered the closest monitoring position where residential massing would be proposed in relation to Cardiff Airport. Data has been analysed at a 2-minute internals[1] with the view this is reflective of regularly occurring events having been sampled 30 times in any one night time hour.

No slow time weighted night time maxes are found above 73dB(A), with the 10th highest L_{ASMax} for all four nights cumulatively being 60dB(A). Maximum noise levels are objectively lower at other measurement positions being further from Cardiff Airport where residential massing is proposed (NMP2 and NMP4), and therefore no further analysis is warranted.

4.2.5 Soundscape Survey Assessment

As part of the site acoustic survey exercise, SLR have undertaken soundscape mapping at key sound survey locations across the site where various use types are proposed within the present site massing.

SLR have undertaken an objectively presented, subjective soundscape assessment of the existing sound climate accordance with ISO BS:12913 Parts 1-3 published in 2014, 2018 and 2019 respectively.

It should be noted that the sample size is small based on the installation engineers' observations.

However, the assessment methodology presents a useful tool for considering the subjective qualities of an existing sites particularly soundscape, particularly when being considered for residential use allocation in the context of Welsh National Policy.

The site is rated on key subjective acoustic characteristics, such as:

Pleasantness, "Chaotic", Vibrancy, Uneventfulness, Calmness, Annoyance, Eventfulness, and Monotony.

Each characteristic is scored between 1 and 5 based upon the following key indicators:

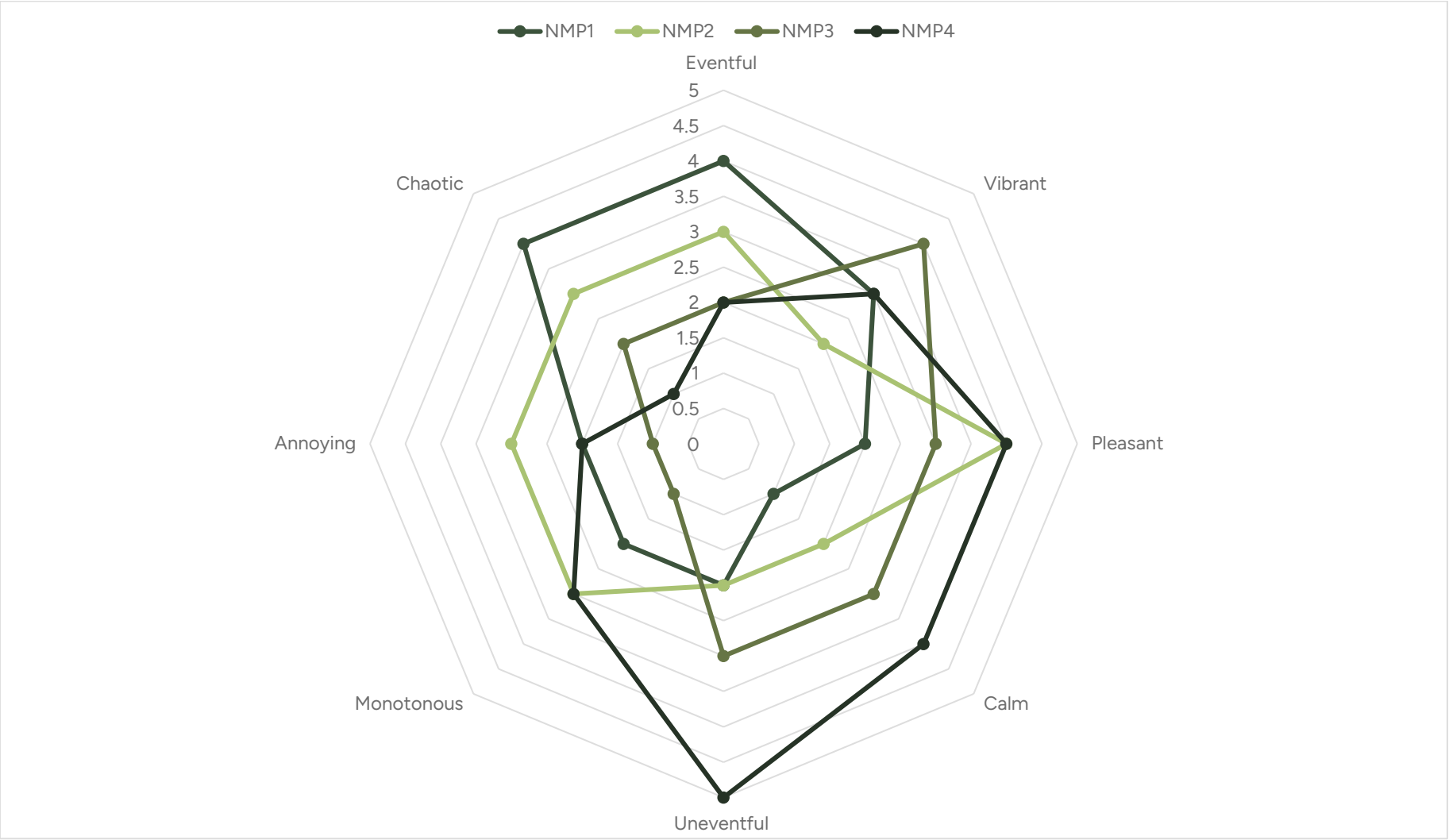
Strongly Agree (1), Agree (2), Neither Agree or Disagree (3), Disagree (4) and Strongly Disagree (5) this rating is known as the "Likert Scale".

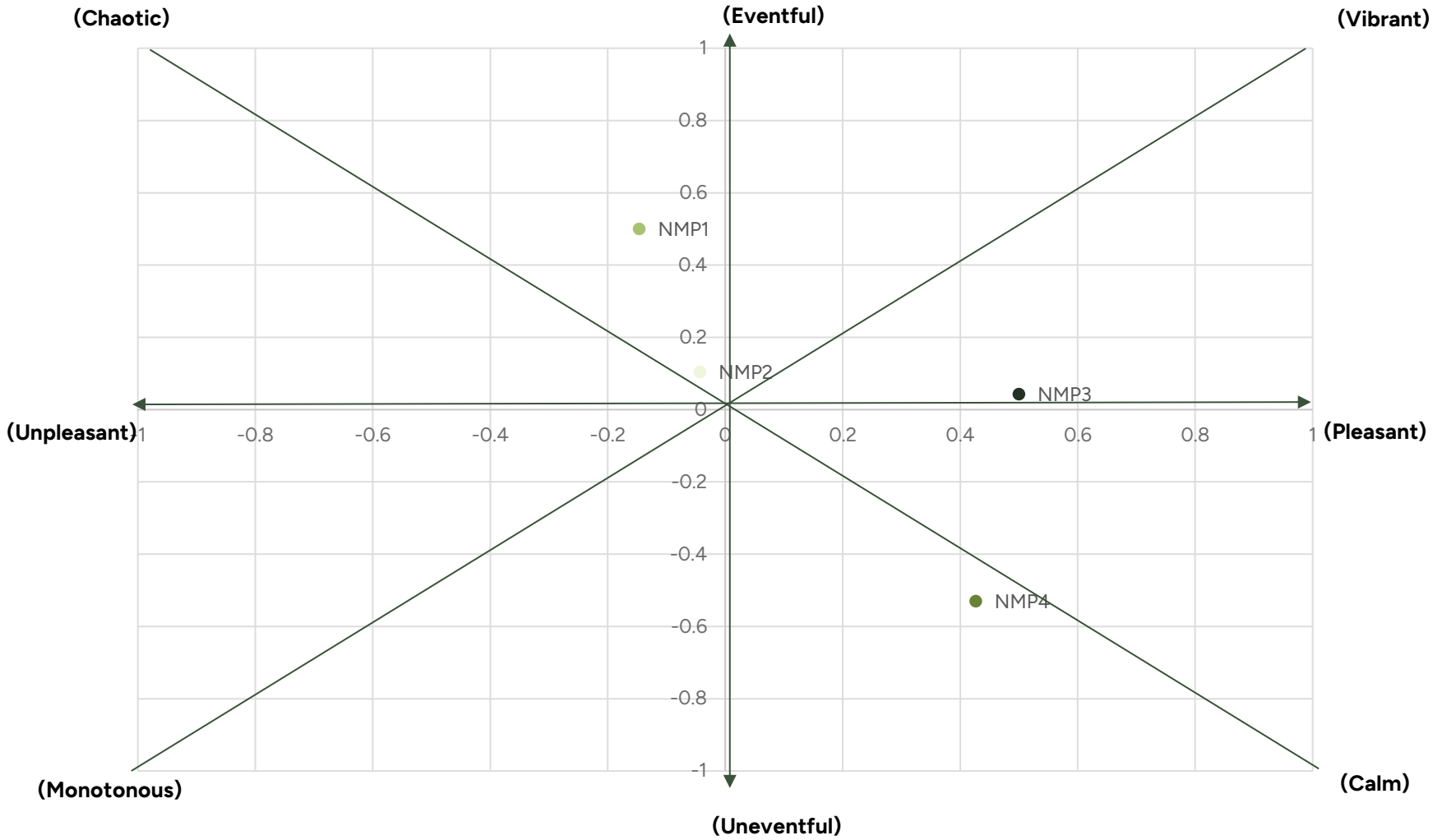
The plots below present this graphically via a Likert Scale Response Plot, and Coordinate Transformation plot.

[1] Paxton, B. Conlan, N et al. Assessing Lmax for residential developments: the AVO guide approach. Proceedings of the Institute of Acoustics. Volume 41, Part 1, 2019.

Each measurement position from the baseline sound survey is colour coordinated accordingly. These soundscape observations are discussed in the context of the below assessments where relevant in Section 8.0 of this report.

Figure D: Soundscape Plots




(Chaotic)
(Eventful)
(Vibrant)
(Unpleasant)
(Pleasant)
(Monotonous)
(Calm)
(Uneventful)
NMP1
NMP2
NMP3
NMP4
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-0.8
-0.6
-0.4
-0.2
0.2
0.4
0.6
0.8
1

4.3 Soundscape Observations

From the above subjective observation and assessment, it can be inferred in **Table N** as follows:

Table N:Soundscape Analysis Summary

Location	Soundscape Description	Dominant Noise Source
NMP 1	Eventful with some “chaotic “characteristics, was deemed neutral in regard to pleasantness.	Airport noise dominant. Planes taking off and taxiing. Vegetation rustling. Birdsong. People talking nearby
NMP 2	Neutral Soundscape no specific tendencies.	Noise from existing residential uses to the south. Lawnmowers, people talking, cars driving by. Vegetation rustling and birdsong.
NMP 3	Moderately pleasant with neutral eventfulness, neither particularly vibrant, calm, chaotic or monotonous.	Airport audible. Vegetation rustling and birdsong. High altitude aircraft.
NMP4	Moderately pleasant calm and uneventful.	Airport audible. Vegetation rustling and birdsong. People talking in garden nearby. Motorbike in distance.

The above infers that subjectively the soundscape particular at those measurement positions proposed for residential massing NMP2-4 is not considered problematic.

The soundscape at NMP1 being closer the airport is understandably “busier” however it was not deemed specifically annoying or unpleasant. The introduction of an ecological garden into this area could introduce new sound related to flora and fauna known as “biophonic” sound which it is anticipated would have a positive impact on this region of the site.

5.0 Agent of Change and Commercial, Industrial and Leisure Activity Noise Considerations

The site lies in a predominantly greenfield area without significant noise generating commercial and/or industrial activity in the immediate surround. Historically and presently the key noise source is aircraft movement and taxiing at Cardiff Airport.

Aircraft noise is dealt with in Welsh National Policy via TAN11, in addition BS4142 2014+A1: 2019 is not considered suitable for assessment and rating of such noise sources.

5.1 The Agent of Change Principle

The 'agent of change principle' encapsulates the position that a person or business (i.e. the agent) introducing a new land use is responsible for managing the impact of that change.

The practical issue that has arisen on occasion is that in circumstances where residents move into an area where noise is emanating from a long-standing commercial operation, this may have resulted in the Local Planning Authority (LPA) imposing additional licensing restrictions on the established licensed and/or permitted business.

In England the NPPF provides guidance on the implementation of an 'agent of change' principle’ to place the responsibility for noise management measures on the incoming 'agent of change' in this instance the developer for which this application is being made.

Similar sentiments are beginning to influence Welsh planning applications and policy decisions also.

SLR anticipate as provided future dwellings can be designed such that significant adverse impacts (*SOAEL) are avoided; the likelihood of valid complaint would be minimised and therefore the ethos of the “Agent of Change” principle be met.

The assessment below provides the relevant design guidance at the present project stage with this intent.

6.0 Air Traffic Characteristics at Cardiff Airport

6.1 Overview

SLR have reviewed public information regarding typical flight schedules experienced at Cardiff Airport presented, in addition SLR note discussion on potential future expansion of the airports flight capacity.

The purpose is to investigate the expected noise exposure presently, and the potential impacts of expansion to inform the later assessments undertaken.

6.2 Present Flight Activity

There are not Cardiff specific contours currently available due to the relatively low movement traffic at Cardiff Airport in national UK Airport terms.

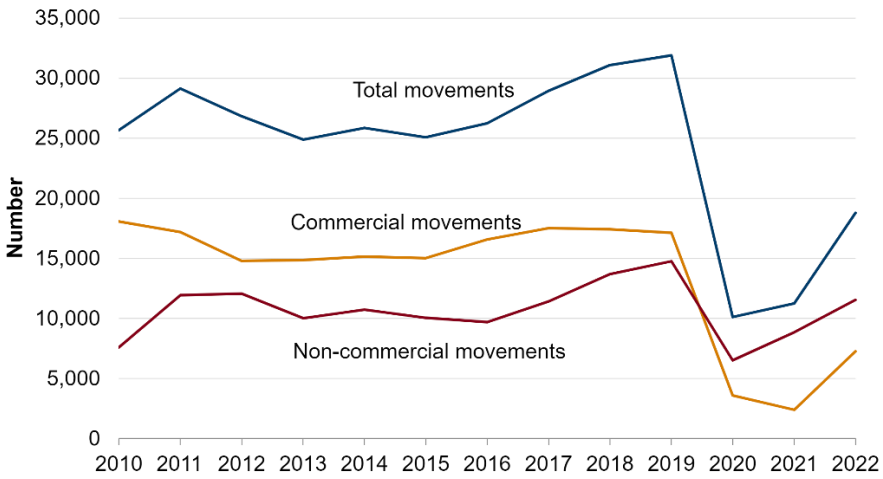
6.2.1 Aircraft movements (flights)

An aircraft movement is considered an aircraft taking off or landing at an airport.

- Commercial flights involve aircraft engaged in the transport of passengers or cargo on commercial terms, as well as positioning flights and local movements.
- Non-commercial flights cover all other types of flight, including private and Aero Club flights (flying clubs).

The number of aircraft movements shown in **Figure E** decreased sharply at the start of the COVID-19 pandemic in 2020, before increasing slightly in 2021. There were 19,000 aircraft movements at Cardiff International airport in 2022, an increase of 67% compared with 2021 (11,000) but a decrease of 41% compared to 2019 (13,000).

Figure E: Number of aircraft movements at Cardiff Airport from 2011 to 2022



Description of **Figure E**: A line chart showing the trend in aircraft movement at Cardiff airport. All types of aircraft movements show an increase in the number of movements in 2022 compared to previous year.2

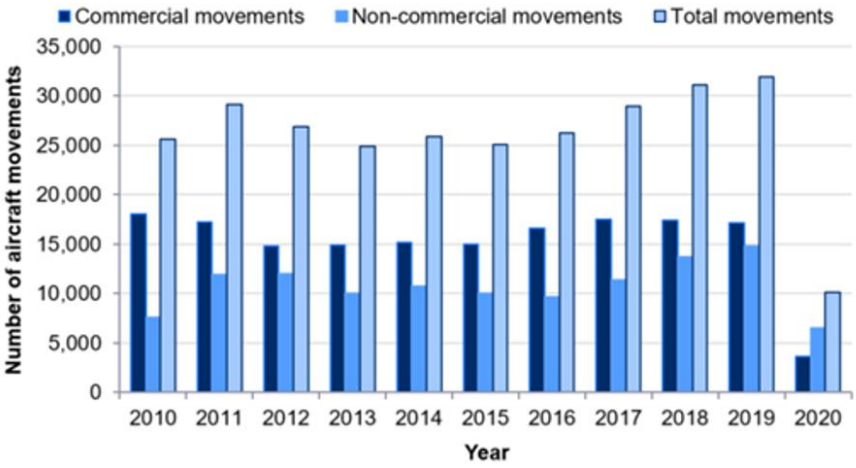
2: Source: Welsh Government analysis of Civil Aviation Authority data

Therefore, it is considered that to assess the site in terms of a likely return to pre covid-19 levels of aircraft movement would be appropriate, presently SLR have considered 2019 as the recent “peak” of air traffic accordingly.

Welsh Government reported movements at Cardiff Airport pre-pandemic within the Air Transport 2020 summary published to Gov.Wales[3].

This is referenced below in **Figure F** for the years 2010 to 2020.

Figure F: Number of aircraft movements at Cardiff Airport from 2010 to 2022 - Histogram



Presently the following typical annual and daily movements are reported at Cardiff Airport on an annual basis as presented below in **Table O** with reference to Statwales.Gov. [4].

Table O: Aircraft Movements at Cardiff Airport by Movement Type and Year

Year			2022	2021	2020	2019	2018	2017
Total			18,793	11,236	10,111	31,881	31,085	28,934
Total	Commercial Movements		7,246	2,376	3,599	17,121	17,402	17,515
	Commercial Movements	Air Transport	6,747	2,059	3,229	16,549	16,749	16,761
		Positioning Flights	499	317	370	572	653	754
		Local Movements	0	0	0	0	0	0
	Non-Commercial Movements		11,547	8,860	6,512	14,760	13,683	11,419
	Non-Commercial Movements	Test and Training	323	312	144	625	640	247
		Other Flights	.	0	3	0	0	0
		Aero Club	5,112	4,518	3,428	7,634	7,057	5,758
		Private Flights	5,871	3,692	2,724	6,155	5,804	5,184
		Official	0	0	0	0	0	0
		Military	241	338	213	346	182	230
		Business Aviation	0	0	0	0	0	0

4. www.statwales.gov

Table P: Movements Numeric Assessment

Year		Commercial Flights	Non-Commercial Flights	Dail Average Equivalent Total
2022		18,793	11,547	83*
2019		21,881	14,760	100*
	*based on 365 day a year operation daily flight average.			

Presently (as of 2022) the airport is reporting a daily number of flights in the region of 83% of the 2019 pre covid-19 peak. On this basis SLR have added a margin of +1dB to add a margin for "return" to these levels post covid in future (noting that decibels are a logarithmic metric).

Where:

10 x Log10(83/100) = +0.8dB.

This has been applied to the noise maps presented for the initial site noise risk assessment.

The implications for maximum event noise levels at night are discussed separately.

6.3 Night time maximum noise level events

Flights mainly operate between (07:00-23:00) during the daytime, and occasionally during the night with a frequency of 1-2 movement per hour during the core night period (23:00-06:00).

As mentioned in Section 3.3.3.1 of this document the principal concern with maximum noise level events is night time awakening, and therefore data has been analysis on this basis and considered accordingly.

Considerations for future growth and expansion of services at Cardiff airport "beyond" pre pandemic levels is discussed further in the relevant section of this document and is not considered relevant to the initial site noise risk assessment.

There are typically 4 movements per hour in the worst effected key night time hour (06:00-07:00) outside this period, movements are generally singular in any one hour if they occur at all.

BS8233:2014 states (as above)*: "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. Sporadic noise events could require separate values."*

Reference is therefore made to World Health Organisation (WHO) 'Guidelines for Community Noise' (WHO, 1999) which states "For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45dB L_{Amax} more than 10-15 times per night (Vallet & Vernet 1991)".

It is considered that maximum noise level events would not be dissimilar to present regarding frequency of movement or magnitude at pre pandemic movement levels.

However future significant movement expansion at Cardiff airport is described separately in the relevant section of this report.

7.0 Noise Modelling Exercise

7.1 Overview

The assessment method SLR have been applied to the development is intended to understand the risks and design requirements to mitigate the proposal from environmental transportation noise sources.

The noise levels recorded at the measurement positions have been considered as representative of the predominant source of noise (being aircraft) across the site, thus for the purposes of this assessment these sources have been modelled accordingly and the site measurement locations calibrated to the survey data captured. With the key dominant noise source being Airplanes taxiing. Landing and taking off from Cardiff Airport.

Planes utilising the runway have been modelled as a line source at 15m height to simulate jet engines (being the dominant noise source), similarly take off and landing has also been modelled as a line source, rising at a steep incline of 600m above it. The noise model was hen calibrated in alignment with the highest average measured dB $L_{Aeq,\,T}$ day and night time noise levels as measured at NMP-4 as well as allowing for the correction described in Section 6.0 above (+1dB).

SLR note that being in relatively close proximity to Cardiff airport, the site does not directly fall under the flightpath (or anticipated approach turning routes due to the radius required) but will experience movements from the north and east approaches as well as taxiing around the airfield. Some occasional fly overs were noted from aircraft circling awaiting landing instructions “ at height”.

7.2 Initial Site Noise Risk Assessment

The environmental survey provided in Section 4.0 of this report has been utilised to inform a baseline noise modelling exercise for the site.

7.3 Noise Model

The sound predictions for the assessment have been undertaken using a proprietary software-based noise model, CadnaA®, which implements the full range of UK calculation methods. The calculation algorithms set out in ISO 9613-2:2009 have been used and the model assumes:

- A ground absorption factor of 0.5 representative of mixed ground conditions, after model calibration utilising soft ground conditions G=1.0 to reflect current ground type.
- Relative humidity of 70%.
- Air temperature of 10°C.
- Contour Data to include OS terrain data.
- A reflection factor of 2.

The effects of the existing noise climate impacting the proposed new scheme have been considered for this assessment.

With reference to the criteria set out in this document and the noise modelling inputs and impacts summarised, building evaluation maps have been produced for the daytime and night-time periods.

The scale has been set to inform typical implications for acoustics, in relation to glazing and ventilation specification for residential uses.

The noise maps are presented in **Figure G** and **Figure H** for the daytime and night-time, respectively. It is noted that the noise maps have been modelled at 1.5 m height above ground during the daytime to represent the height of a ground floor living room window or garden, and 4 m above the ground during the night to represent the height of a first-floor bedroom window.

Figure G: Prediction of NEC Category as a result of Air Traffic Noise Levels – Day $L_{Aeq,16h}$

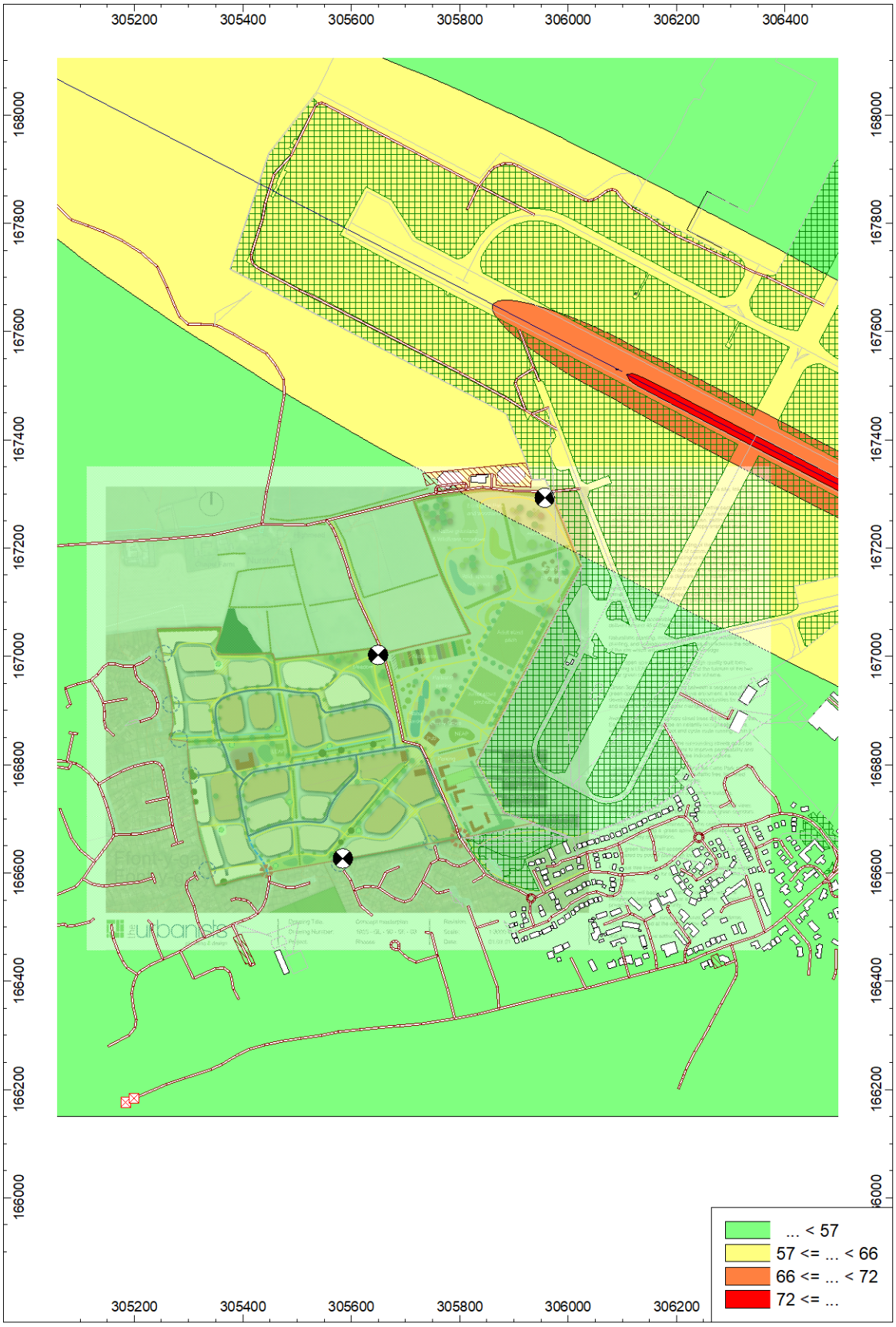
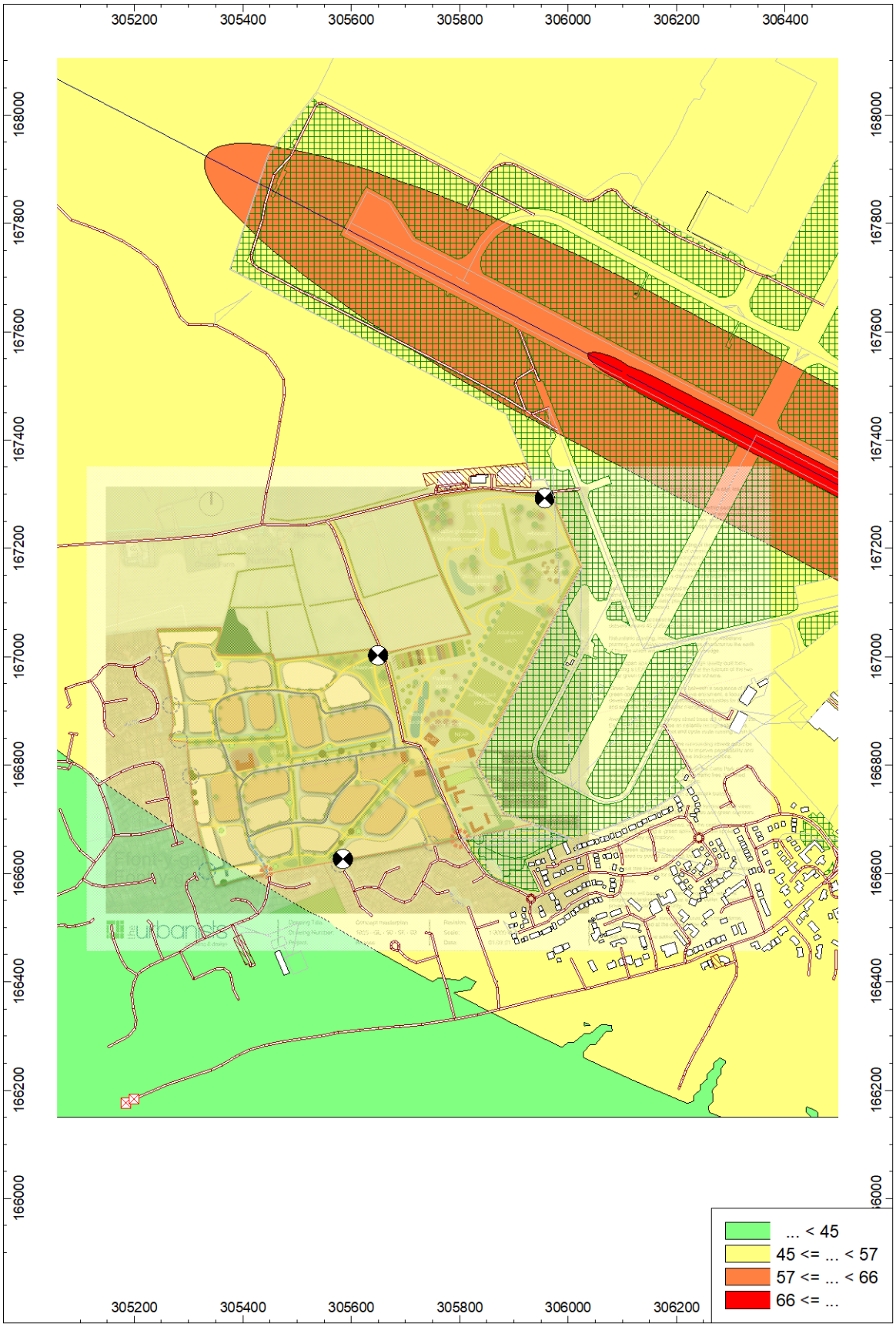


Figure H: Prediction of NEC Category as a result of Air Traffic Noise Levels – Night $L_{Aeq,8h}$



The initial site noise risk assessment has been categorised is below:

The most prevalent environment noise source across the site was noted from transportation sources, being air traffic during the day and night.

No significant commercial activities have been observed impacting on the site.

The initial Site noise risk assessment has been categorised in the worst-case for areas of the site proposed for residential dwellings within the site (to the south west) during the day could be considered NEC Category A.

At night the site can generally be considered to fall more into NEC Category B.

For sites falling into NEC Category A (Nosie Exposure Category A TAN11 States

> *"Noise need not be considered as a determining factor in granting planning permission, although the noise level at the high end of the category should not be regarded as desirable."*

For sites falling into NEC (Noise Exposure Category B TAN11 States

> *"Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection."*

As per the analysis in Section 4.0 maximum slow weighted maximum noise levels (L_{ASMax}) do not alter this initial site assessment.

7.4 Stage 2 – Full Assessment

7.4.1 Good Acoustic Design Process

ProPG is referenced within Welsh Guidance and as stated above it is imperative for acoustic design to be considered at an early stage of the development control process, as to avoid unreasonable acoustic conditions and prevent those which are unacceptable.

The main requirements for Good Acoustic Design have been explained relative to transport sources incident on the site.

7.4.1.1 Barriers Bunds, Terrace Barrier Blocks.

Presently no site layout is available for the proposals beyond general massing and area allocations.

SLR have considered the application of barrier blocks towards the north east of the residential massing area of the site to generally reduce noise risk, however given that aircraft noise to the north by its nature will be a combination of taxiing and airborne (at height) landing/take off activity benefits of screens or barriers will be limited in value, and therefore have been excluded as recommendations at this time for the purposes of controlling this noise source. Such measures may be beneficial however to control noise from new spine roads interlinking areas of the site internally which would require noise modelling at the appropriate design stage.

7.4.2 Future Considerations for Site Layout and Soundscape

7.4.2.1 Standoff distances

It is clear from the indicative masterplan that generally massing proposed for noise sensitive residential use has been oriented to the south and west of the site (NEC Category A during the day, and NEC Category B during the night), as such this represents a standoff from the key noise source being air traffic. This is considered optimal.

Generally, the ecological garden to the north and east will build positively upon the existing soundscape through the attraction of species affording positive masking sounds to what is presently agricultural land

with a soundscape relating to intermitted periods of calm intersected with noise from aircraft in the surround. Although even here noise levels do not exceed NEC CAT B during the daytime.

The sports pitch areas are located towards the east in closer proximity to the airfield, generally these sources are noise generating rather than noise sensitive and therefore this is considered the optimal location, furthermore aircraft noise is not such that instructional sports teaching activity would be significantly impacted (Where Acoustics of Schools: A Design Guide[5]) states:

> *"For new schools, 60 dB $L_{Aeq,30min}$ should be regarded as an upper limit for external noise at the boundary of external areas used for formal and informal outdoor teaching and recreation."*

These levels are not contraindicated or exceeded by the existing noise climate presently.

The city farm area is indicated to the south east of the site, thus the site layout by design offers some standoff distance to Cardiff Airport giving some consideration to the potential sensitivity of livestock to noise by design. Although there is minimal guidance in suitable noise levels in this regard, the siting is considered appropriate in context.

Overall, it is considered that the site masterplan for allocation makes best use of available land in its massing proposal, considering the noise sensitive and noise generating characterises of proposed uses in respect to an optimised soundscape.

7.4.2.2 Topography

The present site topography is of little consequence to the overarching acoustic design requirements and optimisation of site massing.

7.4.2.3 Plot Orientation:

Orientation should be viewed as primarily useful to afford screened garden areas behind intervening dwellings, presently ambient noise levels in the region of residential massing are not such that the requirements of BS8233:2014 for outdoor amenity areas are exceeded (See Section 9.0 below), although localised garden fencing is often beneficial acoustically as well as offering privacy to individual dwellings.

7.4.2.4 Internal Layouts:

It has been acknowledged that 'good acoustic design' generally requires facing less-sensitive rooms (i.e. kitchens and bathrooms) towards the dominant incident noise sources to the north east.

More sensitive rooms wherever possible could be oriented towards the south east potentially offering benefits to occupants, and a higher likelihood of mitigation of incident noise levels to those spaces, which could facilitate opening windows to key internal spaces without sacrificing acoustic comfort.

It has been presently assumed that all proposed dwellings would typically be formed by traditional brick construction along with an insulated roof.

The sound insulation of these components has been deemed less consequential to resulting internal ambient noise levels, where the acoustic performance of glazing and ventilation elements will typically remain as dictating the performance requirements.

It is considered that once all optimisations of the site layout as above have been incorporated, and designers have been advised on acoustic limitations of the site from the enclosed guidance, then preliminary site plans as they develop should be reviewed, such that the site can be optimized for acoustic design purposes in accordance with the GAD process from ProPG with consideration to TAN11.

Consideration should then as the last item, be given to acoustic design of building fabric, glazing and ventilation associated with dwellings, and the private amenity spaces associated with the development.

8.0 Building Fabric, Glazing and Ventilation-Acoustic Design

8.1 Preliminary Glazing and Ventilation Specification

Whilst layouts are not presently known, the current baseline noise maps and the categories devised can inform potential ventilation and glazing strategies that would be acoustically suitable in an indicative fashion at the present stage.

Calculations have been undertaken on the basis of the following typical external wall construction:

- Brickwork exterior finish
- Mineral wool insulation (50mm 10kg/m^3)
- Lightweight independent internal plasterboard linings (1x12.5mm wallboard or equivalent).

The above is calculated to provide the minimum nominal sound insulation rating of 54 dB R_w.

A standard brick and block cavity construction would also achieve an equivalent performance if suitably specified.

Alternative lightweight or composite façade constructions may be suitable including constructions providing a lower sound insulation rating, provided the sound insulation performance of the façade system (or roof system for room in roof constructions) exceeds the glazing and ventilator performance specified by at least 10dB.

Suitability of detailed proposals would be subject to detailed assessment and further calculations to confirm suitability. Particularly where apartments may feature a lightweight (non-masonry) façade construction.

The noise ingress calculations are based on the predicted ambient (L_{Aeq}) levels from the noise model provided in **Figure G** and **Figure H** for daytime and night-time respectively. (i.e Living Rooms, and Bedrooms).

Table Q below summarises ventilation and glazing strategies in a hierarchical fashion based upon the predicted noise levels at the site presently.

Table Q: Required Glazing and Ventilation Acoustic Performance Values

NEC Category Noise Exposure Level	Daytime External Noise Level, dB $L_{Aeq,\ 16\ hour}$ (07:00-23:00) Living Rooms	Night-time External Noise Level, dB $L_{Aeq\ 8\ hour}$ (23:00 - 07:00 hours) Bedrooms	Night-time External Noise Level, dB L_{AFMax} (23:00 - 07:00 hours) Bedrooms	Glazing Performance Requirement dB $R_w + C_{tr}$	Suitable Background Ventilation Modes and Performance Requirements Preliminary Overheating Control Design Guidance	
					Suitable Modes and Description	Ventilator $D_{ne,w} + C_{tr}$
NEC B	Not Applicable.	48	71	Standard Thermal Double Glazing (Nominal 27dB)	Reasonable (BS8233:2014 +5dB) internal acoustic conditions will be achieved with windows partially open for background ventilation. Good (BS8233:2014) internal acoustic conditions will be achieved with windows closed and the provision of acoustic trickle vents, positive input ventilation or whole house ventilation, for background ventilation provision. Opening of windows should be avoided a to cool an overheating room for acoustic reasons. At the lower end of this range, passively attenuated solutions such as acoustic louvres and passively attenuated air input pathways may be acoustically feasible as a method to control overheating. However, opening of windows should be avoided for noise levels in this range during the night. At the upper end of this range, alternative overheating control strategies should be devised that are not dependant on opening windows, such as adiabatic cooling, boosted mechanical purge extraction. Note: the above does no preclude occupants having access to opening windows, only that the occupant should not have to chose between acoustic comfort and other factors, and thus alternative provision should be “designed” into the scheme to offer choice.	33
NEC A	50	Not Applicable.			Good internal acoustic conditions will be achieved with windows closed or open. When windows are open to background ventilation or to cool an overheating room, acoustic conditions will be in line with BS8233:2014.	

8.2 Considerations for "Room in Roof"

Given that the key noise source is aircraft, the provision of "room in roof" structures should carefully be considered for acoustic reasons.

Lightweight and mansard roof structures commonly offer lower levels of sound insulation verses typical cavity external wall constructions.

On this basis where and if proposed some enhancement to glazing, internal linings and acoustic trickle ventilation would likely be warranted in this scenario and should be considered at the appropriate design stage.

8.3 Residential Ventilation Additional Considerations (Overheating & Purge)

The outline proposals above are suitable to achieve internal noise levels from BS8233:2014, ProPG and WHO Guidance.

However, it will occasionally be necessary to open windows to provide additional ventilation for purge (e.g. short term extraction of fumes or odours) or to cool an overheating room. There is no need to apply limits to noise ingress during purge ventilation as this is usually done for a short duration and can often be planned not to coincide with times when the occupants may wish to maintain low internal noise levels.

It may also be desirable to open windows to provide cooling during the hotter months of the year. Occupants should not have to choose between unacceptably high internal noise levels or uncomfortable internal temperatures.

8.4 Overheating Guidance - Wales

The Welsh Government Edition of Approved Document O (overheating) takes effect on 23 November 2022 for use in Wales. It does not apply to work subject to a building notice, full plans application or initial notice submitted before that date, provided the work for each building is started before 23 November 2023. Full detail of the transitional arrangements can be found in Circular Letter 003/2022.

There are no fixed noise limits for the overheating condition provided within the Welsh edition. However, the standard states:

> *"In the Welsh Ministers' view, requirement O1(2)(a) is met in a new residential building if the building's overheating mitigation strategy for use by occupants takes account of all of the following. a. Noise at night – paragraphs 2.2 to 2.4."*
>
> *"Noise at night*
>
> ***2.2** High levels of external noise could limit the use of cross-ventilation to mitigate the risk of summer overheating.*
>
> *External noise is a material consideration considered when applying for Planning permission and mitigating measures may be required in the design in order to obtain Planning permission and controlled through a condition imposed on the consent.*
>
> *In exceptional cases, this could include non openable windows.*
>
> *More commonly, windows will be openable in order to enable natural ventilation to occur at less sensitive times of day, when there is lower noise, when people are not present in the room, or when they are present but not engaged in noise-sensitive activities.*

But those windows may need to be kept closed at times to maintain acceptable indoor acoustic conditions, for example when people are using the rooms for sleep or office work. A noise issue may be identified at the Planning stage but rely on occupants to close windows at noise sensitive times rather than prevent them from ever opening them, and in those cases overheating strategies should assume windows will be closed during noise-sensitive periods even if they are not fixed closed.

***2.3** When the removing excess heat as part of the overheating strategy, noise levels in bedrooms should be kept to a minimum during the sleeping hours of 23:00 –07:00.*

Building control bodies may accept as evidence that this requirement is satisfied: a. documentation to demonstrate that the local planning authority did not consider external noise to be an issue at the site at the planning stage or;

b. if the local planning authority did consider external noise to be an issue that should be controlled through a condition at planning stage, then documentation to demonstrate that the proposals for heat removal (during the sleeping hours of 23.00 – 07.00) are accommodated within or do not conflict with documentation provided to the local planning authority to satisfy any related planning permission condition(s).

(For example any expectation that windows on one or more façade, or in certain rooms, will need to be kept closed during noise-sensitive periods.)

***2.4** Where active measures (e.g. mechanical system) are used for removing excess heat within the overheating strategy, the noise generated by these measures, particularly within bedrooms and living rooms should be considered. Noise generated by ventilation/cooling systems (which may travel through ducts) and noise from the fan unit may disturb the occupants of the building and so discourage their use. Therefore, the designer should consider minimising noise by careful design and the specification of quieter products. Further guidance on mechanical ventilation systems can be found in Approved Document F."*

8.5 Overheating Discussion

For moderate/ overheating risk sites (i.e. the UK except for London and Manchester), It is considered as highlighted above that night time would be most sensitive, during the daytime overarching noise levels would not prevent the opening of windows in regard to indoor average ambient noise level guidance for overheating as published in the UK.

The insertion loss for an open window in the overheating condition would be 9dB based on the guidance in the English version of Approved Document O.

On this basis night-time external ambient noise levels do not exceed 49 $L_{Aeq,\ 8\ hour}$ at night, and the 10th highest night time maximum noise levels do not exceed 64dB $L_{AF\ Max}$ at the dwelling curtilage then on the basis of current guidance in the (English) ADO reasonable internal conditions can be met with windows open (40dB $L_{Aeq,\ T}$ and 55dB L_{AFMax}).

This allows occupants to not have to choose between significantly adverse acoustics and thermal comfort.

Presently ambient average noise levels (dB $L_{Aeq,\ 8\ hour}$) achieve the above anticipated reasonable external recommended limit, however as identified maximum noise level events exceed the external recommended limit by circa 7dB.

Thus, although overheating risk is likely low, the risk of noise disturbance during overheating is noted because of maximum noise level events from aircraft.

There may be concerns over noise impacting dwellings during overheating scenarios with windows open at night, often with occupants being forced to choose between acoustic and thermal comfort. Although to an extent this can be offset with opening of windows during the daytime (detailed thermal modelling would need to be undertaken to identify the benefits of this practice more completely).

Whilst specific noise levels are not a building regulation concern in Wales there is emerging guidance that noise in the overheating condition should be considered at planning stage.

Design parameters are not yet understood for ventilation to dwellings as this assessment deals primarily with site allocation and suitability assessment to TAN11 however, the Acoustics, Ventilation and Overheating Guide provides additional guidance on potential ventilation strategies which achieve higher levels of attenuation than that of an open window, whilst also avoiding (as best as practical) mechanical means of ventilation and could therefore be considered.

Table R below summarises natural or passively attenuated ventilation options from an acoustic perspective, where opening windows to combat overheating is acoustically unacceptable or marginal in outcome.

Table R: Alternative Passive Acoustically Controlled Ventilation and Overheating Control Air Path Mechanisms

Design Option	Description and Reference	|Approximate Level Difference (External Free Field to Internal Reverberant)	Improvement Relative to Window.	
			Background Ventilation Condition	Overheating Cooling & Ventilation Condition.
Standard Opening Windows	Window(s) open sufficiently to provide an acoustic free area equivalent to 2% of the floor area. (Background ventilation)	Background Ventilation Condition 13dB	Not Applicable.	
	Window(s) open sufficiently to provide a acoustic free area equivalent to 5% of the floor area. (Moderate overheating risk)	Overheating Control 9dB (Moderate overheating risk).		
	Window(s) open sufficiently to provide an acoustic free area equivalent to 15% of the floor area. (High overheating risk)	Overheating Control 4dB (High overheating risk)		
Open Windows with Sound Attenuation Balconies	Windows as above, Balconies may have a solid balustrade, or be enclosed to maintain a further degree (maintaining an open area for ventilation). Absorption may be provided to the soffit, and other surfaces.	17-23dB	4-10dB	
Attenuated or Plenum Windows.	Dual (Paired) Window Sets -typical spacing 200mm with staggered openings, and acoustically absorptive reveals.	17-24dB	4-11dB	
Attenuated Vents or Louvres.	Ventilation openings with integral means of acoustic attenuation. Typically, this could comprise acoustic louvres, or acoustically attenuated ducted grills to atmosphere.	17-29dB	4-16dB	
Attenuated windows or vents/ louvres with sound attenuating balconies	Combined use of balconies to provide screening and acoustically attenuated windows or vents. Refer to above for description of each element.	21-39dB	8-26dB	

Ultimately the above methods would be subject to detailed design although provision should be made for suitable grill, balcony or acoustic louvre locations if this approach is targeted.

Note:

At higher noise exposures (where an insertion loss of greater than 21-39dB is required). Ultimately option to control noise ingress (particularly in the overheating control scenario) will likely depend on mechanical or mechanically assisted means.

- Options could include:
- Reversible heat pumps to provide a cooling function.
- Adiabatic cooling attachments associated with MVHR.
- Oversized MVHR to provide a higher air change
- Boosted Purge Fan Provision with MVHR to facilitate air changes.

The above would ultimately be subject to detailed design and assessment of a more formal site plan for modelling purposes, and it is assumed a Stage 2 assessment including TM59 thermal modelling would be undertaken at the appropriate design stage to inform suitable design strategies giving consideration to overheating control with windows open during the day, and an acoustically controlled night time strategy to avoid awakenings of occupants.

Additional strategies for controlling solar gains are enclosed in Appendix C to this document.

9.0 External Amenity Noise Level Assessment

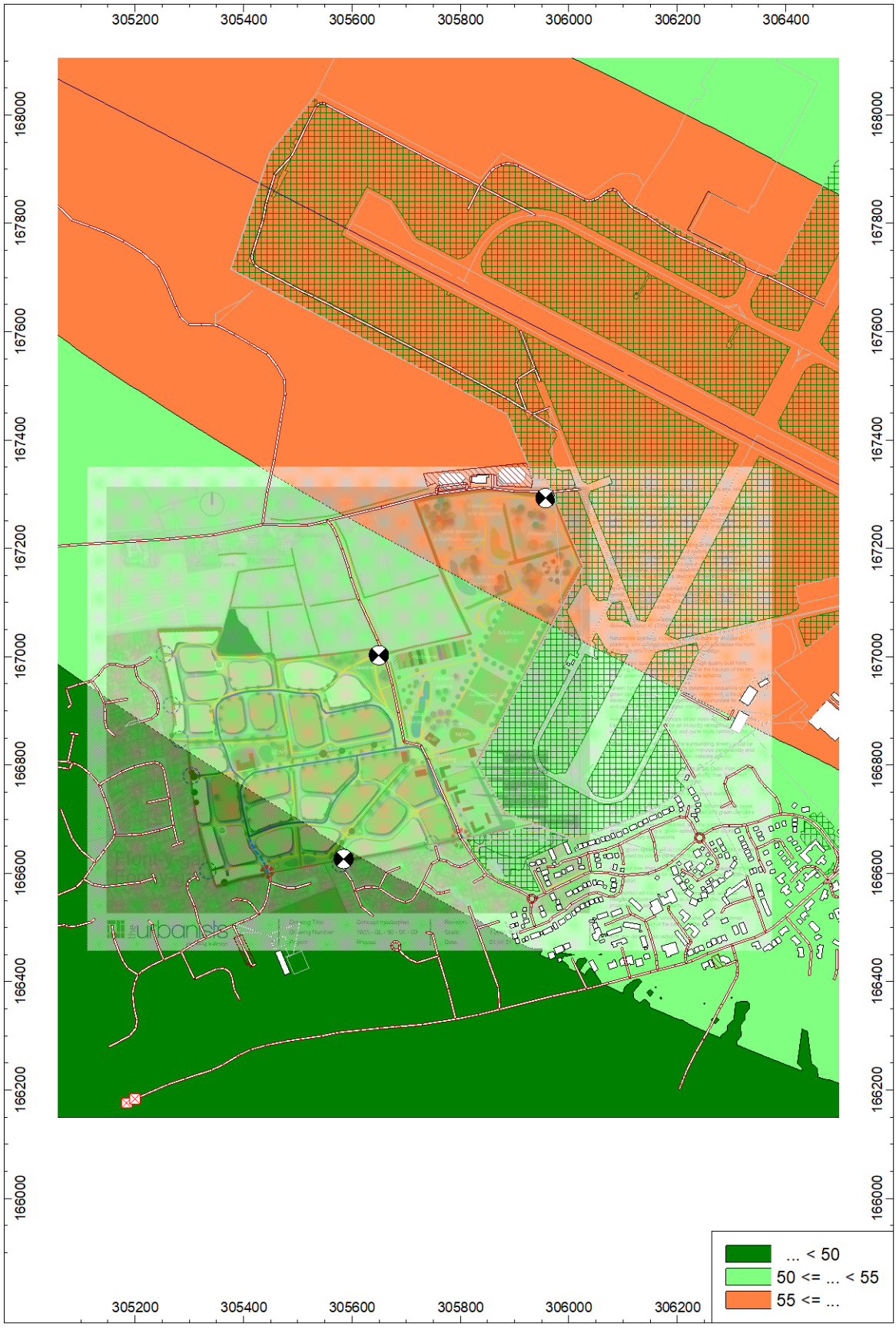
It is generally accepted that private amenity spaces i.e. gardens, should have an area within them such that daytime noise levels are below the lower guideline value of ≤50 dB $L_{Aeq,T}$ to provide a suitable climate for leisure and relaxation.

However, it is not necessarily essential for the entire garden to achieve this, nor is it often practical in environments with relatively high prevailing noise levels to do so.

As such, it is normally considered reasonable to provide mitigation measures to protect external amenity where external noise levels would otherwise exceed 50-55 dB $L_{Aeq,T}$ on the basis that part of the garden will achieve these levels.

Figure I presents the daytime average ambient noise levels across the site, in the context of the above criteria from BS8233 and ProPG.

Figure I: Prediction of Unmitigated Garden Amenity Noise Risk (Night Time dB $L_{Aeq,16\ hour\ LAeq}$).



It is evident that all of the area of the site proposed for residential massing falls below the upper threshold of 55dB $L_{Aeq,\ 16\ hour}$ with some areas centrally falling at or below the lower threshold of 50dB $L_{Aeq,16\text{-}hour}$ which is also acceptable.

Generally, when a private amenity space or garden is near a building and orientated away from key noise sources by being behind the building, screening effects from those buildings will still be useful, in addition 1.8m-2m close boarded fences will also offer effective screening in the immediate surround constituting the “shadow zone” to that fencing structure.

Layouts should consider clustering building massing around private amenity areas (where practical), with particular attention paid towards frontages orientated to the north to screen amenity spaces and green zones.

For external areas that are used for public amenity space, whilst it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. It is also recognized that these guideline values are not achievable in all circumstances (nor specifically applicable or mandatory) 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 as stated in BS8233:2014.

In most instanced public amenity spaces fall below the upper limit, however some areas of public amenity towards the north and east experience noise levels of 55-56dB just above the upper threshold, (although typically a 1dB difference would not be considered significant or perceptible).

In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces but should not be prohibited.

On this basis public garden amenity noise levels marginally exceeding the guidelines should not be considered not a reason for the site to not be suitable for residential uses generally provided mitigation is implemented as best as practicable, soundscaping measures such as the introduction of biophonic ecological sources, or interventions such as water features, and musical acoustic installations can significantly enhance and contribute to a positive soundscape in these scenarios and locations.

10.0 Future Airport Expansion

It is recognised that there is an expectation of expanding services at Cardiff Airport in future.

In the context of this document, it is clear this should be considered to some extent in relation to the feasibility in acoustics terms of site allocation.

Should movements at Cardiff Airport double as is indicated by many sources, the proposed site for allocation could be expected to experience an increase of around 3dB in average noise level terms across the site, day and night (depending on flight schedules as they emerge).

Note: at these levels of noise impact Cardiff Airport might be expected to publish noise 57dBA contours as per airports like London City, Bristol and Gatwick.

Which would assist acoustic engineers in making detailed noise impact assessments for adjacent land uses at the appropriate time.

In terms of the site classification, daytime noise levels may then fall into the lower end of NEC Category B where TAN11 states:

> *"Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection."*

At night the site would still fall into NEC Category B as it does at present still being towards the lower end of the predefined range of noise levels identified by TAN11.

With regards to maximum noise level events, generally the magnitude of events would be unlikely to increase as individual aircraft activity noise levels would not be dissimilar, however frequency of events may increase particularly at night. The NEC Category as identified would not be impacted by this.

However, consideration should be given to mitigation of these maximum noise level events in this scenario.

It may be prudent at detailed planning to allow for enhancements to sound insulation of building envelopes and glazing such that more aircraft maximum noise level events at night are controlled to <45dB L_{AFMax} indoors due the uptick in frequency of occurrence from a more complete 24-hour operation cycle at the airport.

Note: with the indicated magnitude of noise incident during maximum noise level events from aircraft this approach is not anticipated to be problematic, and would be entirely feasible with typical building materials, and modern energy efficient ventilation methods incorporating passively attenuated natural or mechanical means.

11.0 Mechanical Plant and Services Atmospheric Design Noise Limits

11.1 Overview-Plant and Services Provision

The proposed development dwellings may incorporate building services plant which can potentially vent to external locations or have externally located plant items.

These can produce audible noise and may require noise control measures (and potentially vibration control dependent on location).

Therefore, to protect existing sensitive receptors in the vicinity the below noise design limits should be adhered to for residential plant and services servicing houses and apartment, (such as air source heat pumps (ASHP), Mechanical Ventilation and Heat Recovery (MVHR) or Mechanical Extract Ventilation (MEV).

Based upon review of the survey data captured, survey location 2 is indicated as having typically lower median L_{A90} background sound levels these are summarised in Table S below.

Table S: Median Typical Background Sound Levels

Period	Median dB L_{A90}
Daytime 07:00-23:00	30
Night-time 23:00-07:00	27

BS4142 states:

> *"Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night."*

On this basis consideration is given to the internal ambient noise level limits from BS8233:2014 of 35dB $L_{Aeq,}$ and 30dB L_{Aeq} day and night respectively. Generally, receptors will be internal to existing dwellings particularly at night.

Thus, assuming (worst case) an open window for background ventilation at existing dwellings provides an insertion loss of 13dB, provided new noise sources are at least 10 dB below these levels internally impacts can be expected to be low in magnitude as experienced at sensitive receptors.

On this basis the below limits are suggested in context.

11.2 Plant and Services Design Limits

It is there proposed to control daytime building plant and services emissions as per Table T below across the site to protect residential amenity at the nearest existing dwelling.

Table T: Derived New Plant and Services Noise Limits

Period	Proposed External L_{ATr} dB BS4142 Design Criterion	Resultant Internal Noise Level at Existing Dwelling dB L_{Aeq}	Exceedance of BS8233:2014 Internal Ambient Nosie Level Criterion dB	Impact Assessment
Daytime 07:00-23:00	38	38-13=25	-10	Low
Night Time 23:00-07:00	33	33-13=20	-10	Low

Therefore, based on the guidance provided, if plant and services were designed to the above design rating level limit would constitute a “Low Impact” when assessed in accordance with BS4142 and giving consideration to BS8233:2014.

The external design rating level limits above are ‘free-field’ levels at any height above ground.

It applies to the overall cumulative operation of building services plant associated with the scheme without any specific tone or character.

It must be considered that the above represents a cumulative rating level limit and therefore individual items of plant should be designed to provide sufficient margin below this for the cumulative level from all simultaneously operational plant to not exceed the above.

If the plant noise will contain specific tones or intermittent character, then further penalties should be applied as per the guidance in BS4142 during assessment.

12.0 Conclusions

This document has been prepared to inform future design proposals for the proposed land proposed for residential allocation south of Cardiff Airport at Rhoose.

When considered in the context of TAN11. The site is influenced by dominant air traffic although the absolute magnitude is not high where residential masing is proposed.

The initial site noise risk assessment has been categorised in the worst case as NEC Category B during the night.

Stage 2 assessment in accordance with ProPG has considered and in principle good acoustic design processes highlighted, internal ambient noise levels, external amenity areas and other matters.

Commensurate design specifications have been suggested considering current industry guidance.

It has been realised that suitable internal and external amenity standards can be readily achieved by the scheme subject to optimising the site layout and a “Good Acoustic Design” process being carried forward to outline and detailed planning respectively.

Consideration has been given to future expansion of operations of the airport, it is considered this will not impact the TAN11 NEC category at night but will increase the TAN11 NEC category during the day from A to B, which should still not preclude the feasibility of development for residential use in future.

On the basis that design guidance within this report is adopted, it follows that any significant adverse noise impacts could be readily avoided in a finished development as to accord with overarching national and local planning requirements for new residential development in Wales.

13.0 Closure

The assessment has required a suitable level of technical ability and has been undertaken by a Suitably Qualified Person (SQP). An individual with all the following credentials has been considered a SQP for this assessment:

- Has a minimum of three years' verifiable experience (within the last five years) of providing noise impact assessments in planning. Such experience has clearly demonstrated a practical understanding of factors affecting acoustics in relation to the proposed development use and in the built environment in general, including acting in an advisory capacity to provide recommendations and design advice in planning, and;
- Holds a recognised acoustic qualification and membership of an appropriate professional body. The primary professional body for acoustics in the UK is the Institute of Acoustics.

This assessment has been led and managed by a SQP as defined above.

Where some elements of the assessment (e.g. measurements) have been carried out by an acoustician who does not meet the requirements above, this has been undertaken with the direct guidance and supervision of a SQP who has reviewed, agreed and overseen the measurement methodology and any results obtained.

The SQP confirms that the relevant measurements and calculations:

- Represent good industry practice in accordance with available guidance.
- Are appropriate given the development being assessed and scope of works proposed.
- Avoid invalid, biased and exaggerated claims.

The checker and author of this document confirm that they both comply with the definition of a SQP defined in this Section.

Regards,

SLR Consulting Limited

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Appendix A Glossary of Terms

Noise Impact Assessment

Rhoose, VoG, Masterplan Site Allocation

PMG Ltd

SLR Project No.: 403.064974.00001

16 August 2023

The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0dB (the threshold of hearing) to over 120dB. An indication of the range of sound levels commonly found in the environment is given in the following table.

Table A-1: Sound Levels Commonly Found in the Environment

Sound Level	Location
0 dB(A)	Threshold of hearing
20 to 30 dB(A)	Quiet bedroom at night
30 to 40 dB(A)	Living room during the day
40 to 50 dB(A)	Typical office
50 to 60 dB(A)	Inside a car
60 to 70 dB(A)	Typical high street
70 to 90 dB(A)	Inside factory
100 to 110 dB(A)	Burglar alarm at 1m away
110 to 130 dB(A)	Jet aircraft on take off
140 dB(A)	Threshold of Pain

A.1 Acoustic Terminology

dB (decibel) The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure (of 20 µPa).

dB(A) A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.

$L_{Aeq, T}$ $L_{Aeq, T}$ is defined as the notional steady sound level which, over a stated period T, would contain the same amount of acoustical energy as the A-weighted fluctuating sound measured over that period.

$L_{A10, T}$ & L_{A90} If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The Ln indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence LA10 is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L_{A90} is the 'average minimum level' and is often used to describe the background noise. It is common practice to use the L_{A10} index to describe traffic noise.

$L_{Amax(F)}$ $L_{Amax(F)}$ is the maximum A-weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.

Appendix B Survey Graphical Summary Results

Noise Impact Assessment

Rhoose, VoG, Masterplan Site Allocation

PMG Ltd

SLR Project No.: 403.064974.00001

16 August 2023

Figure C - 1: Time History Graph – Location NMP1, dB

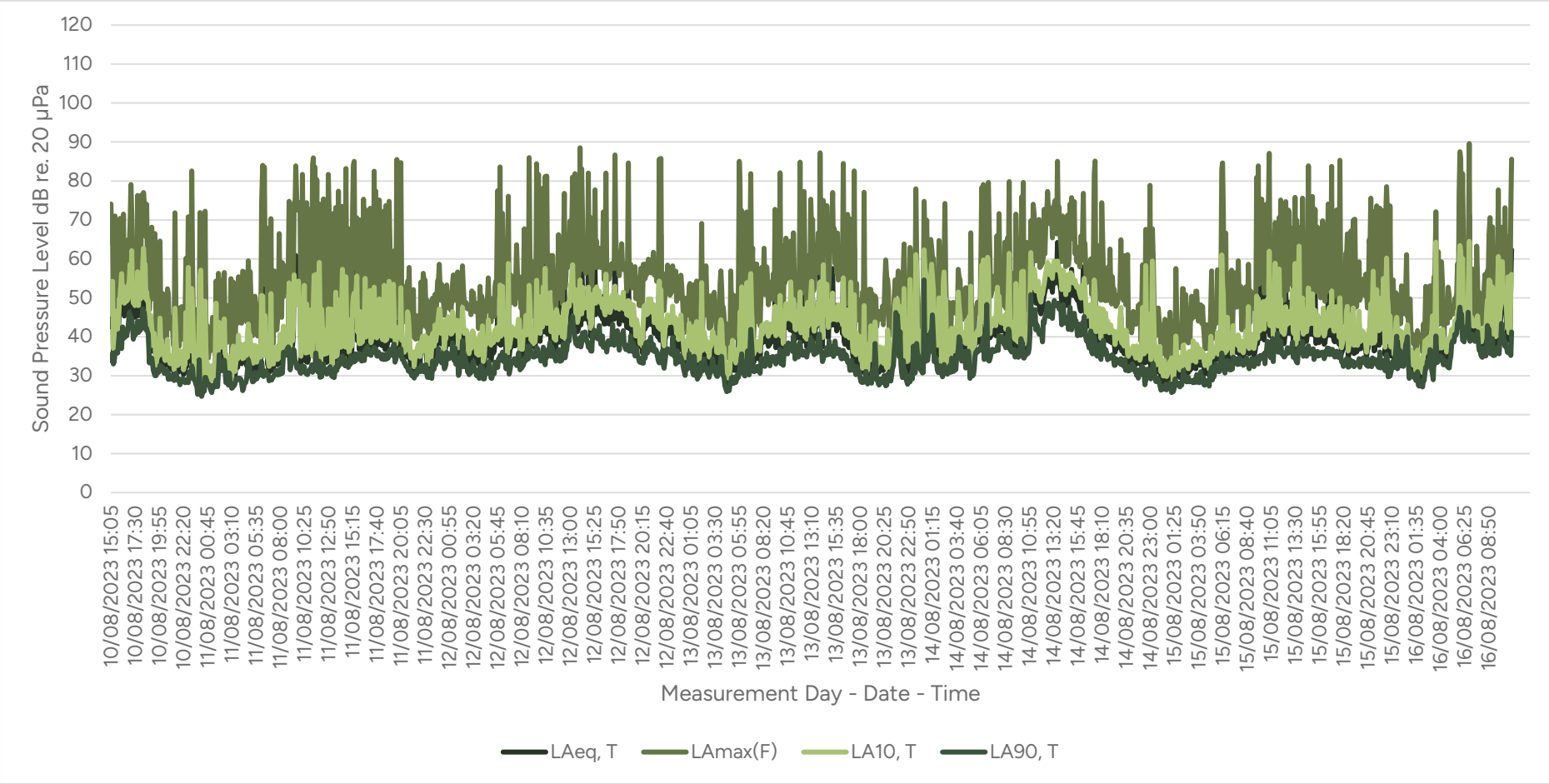


Figure C - 2: Time History Graph – Location NMP2, dB

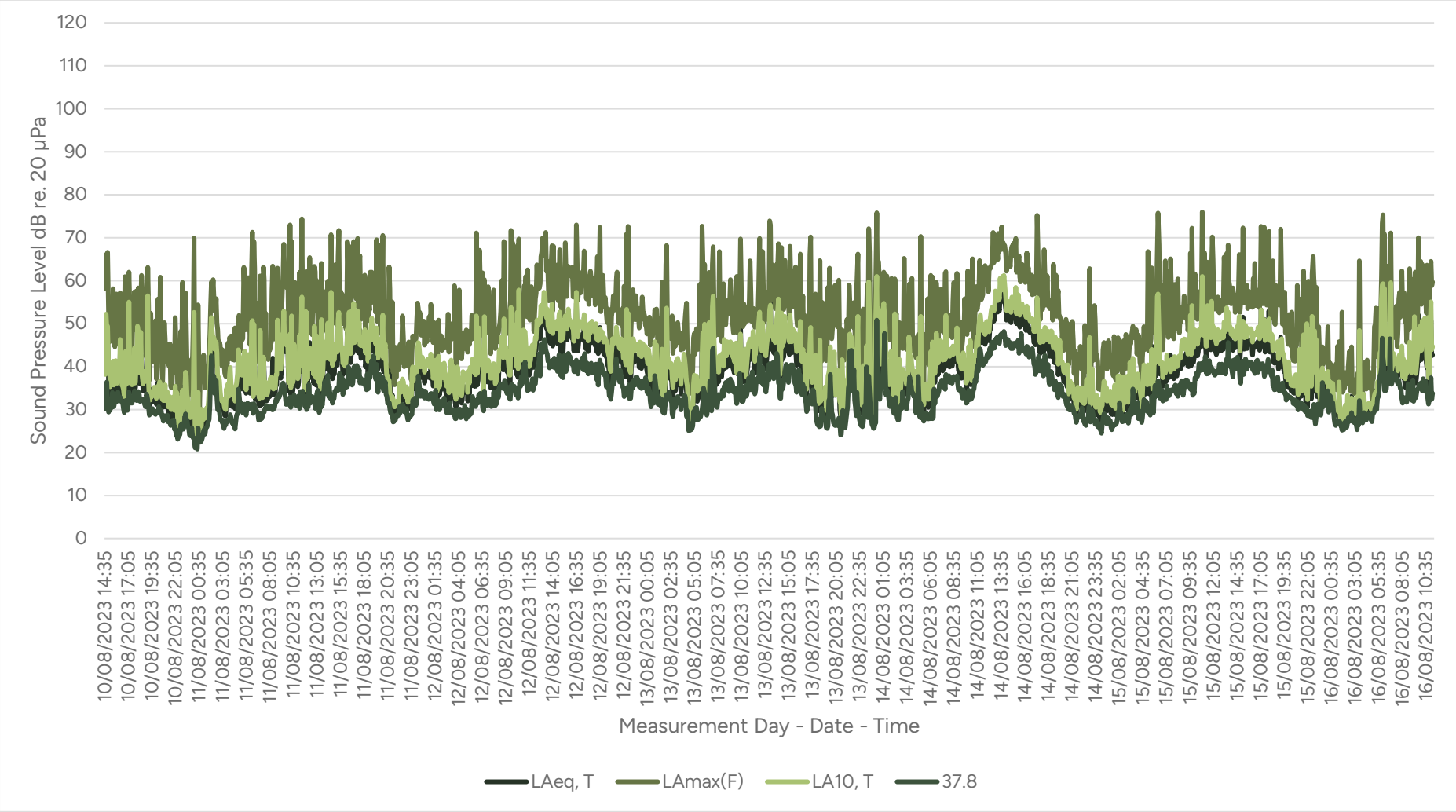


Figure C - 3: Time History Graph – Location NMP3, dB

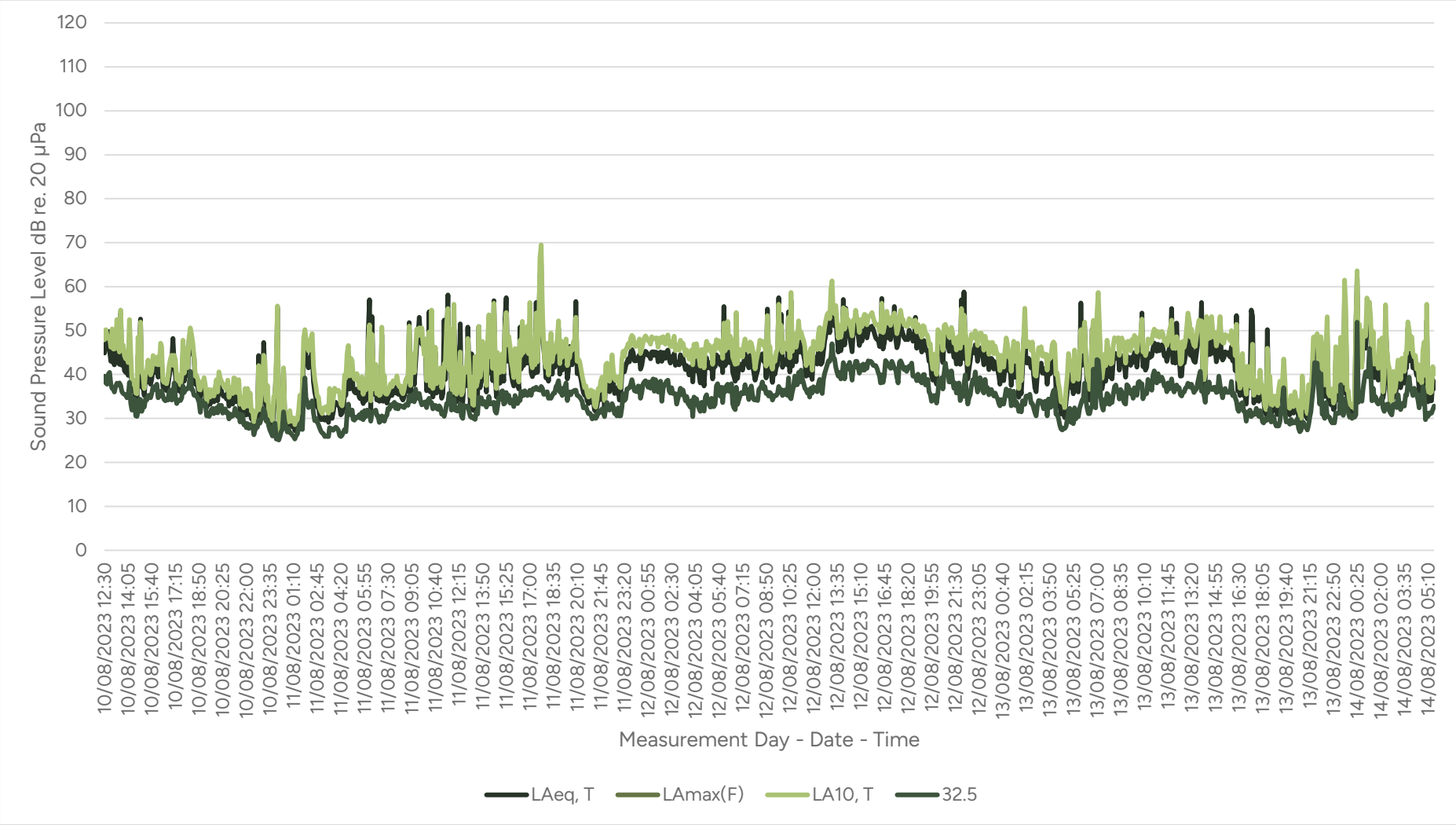
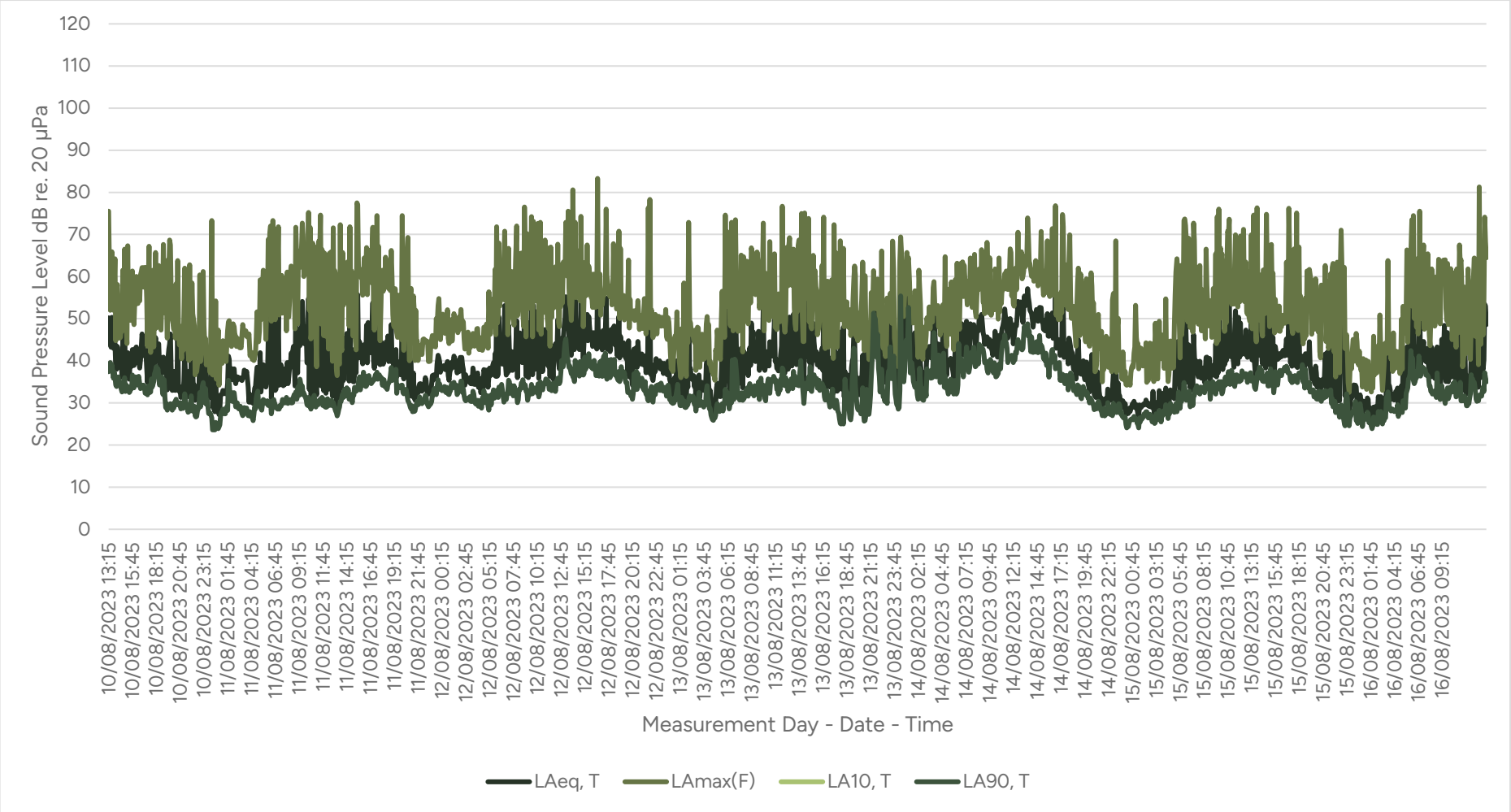


Figure C - 4: Time History Graph – Location NMP4, dB



Appendix C Overheating Control Addition Guidance

Noise Impact Assessment

Rhoose, VoG, Masterplan Site Allocation

PMG Ltd

SLR Project No.: 403.064974.00001

16 August 2023

C.1 Acceptable Strategies for Reducing Overheating Risk

Limiting solar gains

Solar gains in summer should be limited by any of the following means.

Fixed shading devices, comprising any of the following

i. i. Shutters.

ii. External blinds.

iii. Overhangs.

iv. Awnings.

Glazing design, involving any of the following solutions.

i. Size.

ii. Orientation.

iii. g-value.

iv. Depth of the window reveal.

Building design

– for example, the placement of balconies.

Shading provided by adjacent permanent buildings, structures or landscaping.

Although internal blinds and curtains provide some reduction in solar gains, they should not be taken into account when considering whether requirement O1 of ADO has been met.

Foliage, such as tree cover, can provide some reduction in solar gains.

However, it should not be taken into account when considering whether requirement O1 of ADO has been met.

NOTE: Examples of solar shading and their effectiveness are provided in the Building Research Establishment's BR 364 Solar Shading of Buildings

C.2 Removing Excess Heat

Excess heat should be removed from the residential building by any of the following means in order of hierarchy (likely controlled by noise risk)

a. Opening windows (the effectiveness of this method is improved by cross-ventilation).

b. Ventilation louvres in external walls.

c. A mechanical ventilation system.

d. A mechanical cooling system

The building should be constructed to meet requirement O1 of ADO using passive means as far as reasonably practicable.

It should be demonstrated to the building control body that all practicable passive means of limiting unwanted solar gains and removing excess heat have been used first before adopting mechanical cooling.

Any mechanical cooling (air-conditioning) is expected to be used only where requirement O1 of ADO cannot be met using openings.

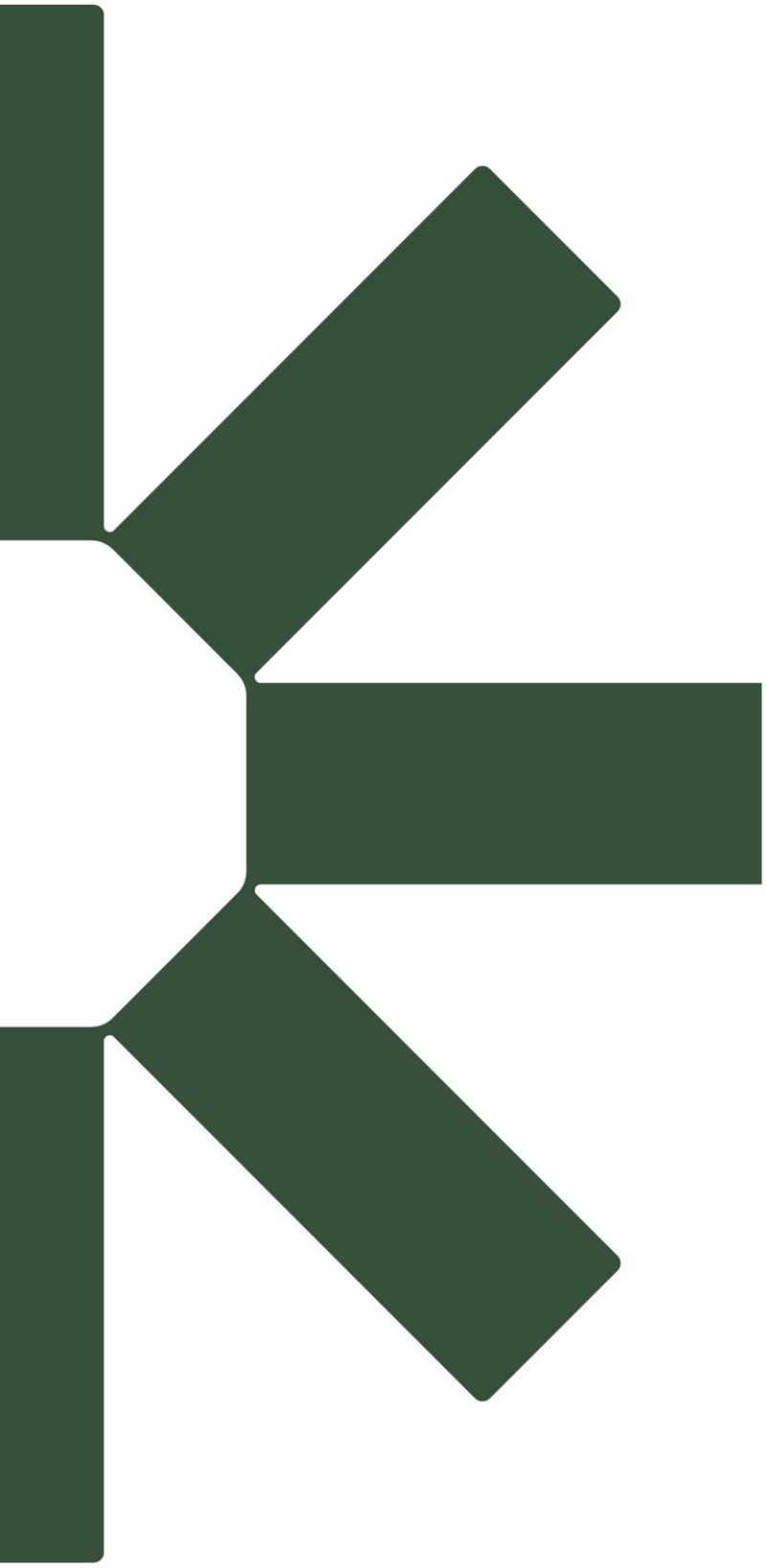
NOTE: Any method to reduce overheating risk in residential buildings must comply with all other parts of the Building Regulations.

Particular attention should be paid to the requirements of Part F and the guidance in Approved Document F, Volume 1: Dwellings on noise and maintenance.

NOTE: A system for purge ventilation should be provided in each habitable room to demonstrate compliance with Part F of the Building Regulations.

The guidance in Section 1 of Approved Document F, Volume 1: Dwellings should be followed for the minimum standards for purge ventilation.

A larger amount of purge ventilation may be required than that in Approved Document F, Volume 1: Dwellings in order to satisfy requirement O1 of ADO on providing an adequate means to remove excess heat from the indoor environment



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