Proposed Residential Development Noise Impact Assessment

Land off Hermitage Park, Lepton, Huddersfield, HD8 0JU

Miller Homes Limited

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SLR Project No.: 403.065678.00001

18 November 2024

Revision: 01

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
01	18 November 2024	M. Ranger	S. Skingle	M. Dawson

Basis of Report

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1.0 Introduction

Miller Homes Limited has appointed SLR Consulting Limited (SLR) to undertake a noise impact assessment for a proposed residential development on Land off Hermitage Park, Lepton, Huddersfield, HD8 0JU (the Site).

This document has been prepared to support a reserved matters planning application with Kirklees Council (CC) for the creation of 80 No. new residential dwellings.

Outline planning permission was previously granted by KC on 10th November 2023 under Application Number: 2022/60/91735/W, for the following development at the Site:

> *"Outline application, with access and layout, for the erection of 80 dwellings and associated work"*

The above-listed planning approval included Conditions 13 and 31 comprising noise-related requirements for glazing and ventilation, pertinent to this assessment. These have been provided within corresponding detail and reasons as below.

> *"13. The development, specifically the installation of windows, shall be undertaken in accordance with the specifications detailed within section 6.7 of the hereby approved Acoustic Planning Report, ref. "0752/APR1 Rev. 2". The windows so installed shall thereafter be retained.*
>
> *Reason: In the interest of amenity, to mitigate harmful noise pollution, in accordance with, to accord with the aims of Policies LP24 and LP52 of the Kirklees Local Plan."*
>
> *"31. Prior to the installation of windows, a ventilation scheme for rooms where windows need to be kept closed to prevent excessive noise levels, as detailed within Acoustic Planning Report, ref. "0752/APR1 Rev. 2", shall be submitted to and approved in writing by the Local Planning Authority. The ventilation scheme shall provide the following information:*
>
> - *Identify which rooms of which plots referenced back to the approved Noise Assessment require a ventilation system*
> - *The acoustic specification of the proposed ventilation system demonstrating that when operated it will not cause indoor noise target levels to be exceeded*
> - *The ventilation scheme must demonstrate that the air intake is located away from the sources of noise and/or poor air quality.*
>
> *All works which form part of the approved scheme shall be completed prior to occupation of that dwelling and retained and maintained thereafter.*
>
> *Reason: To protect the amenity of occupiers of the proposed development from noise or disturbance from nearby noise pollution, to accord with the aims of Policies LP24 and LP52 of the Kirklees Local Plan."*

The above-listed conditions have referenced a specific report[1] (herein "the outline noise assessment") that included data from a site-based survey undertaken in September 2020. Given the significant time elapsed since the original site work was carried out, this report has

[1] Hermitage Park Lepton Acoustic Planning Report 0752/APR1, Revision 2. Lighthouse Enterprises UK Limited t/a Lighthouse Acoustics, 30 September 2022.

posed no reliance upon the outline noise assessment. A new survey has been undertaken on which compliance with Conditions 13 and 31 of approval 2022/60/91735/W have been further appraised herein.

This assessment has been prepared in review of noise impacts from transportation sources on the intended occupiers of the proposed development. It has been developed in accordance with Professional Practice Guidance (ProPG) Planning and Noise – New Residential Development (2017).

This report has been prepared and checked by suitably qualified persons as defined in Section 7.0. 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 development Site occupies nominally 1.7 hectares of open land and is situated on an area leading from Hermatige Park in Lepton. The Site is bound to the north by existing residential premises, east by woodland and to the south by arable land.

Figure A below has been prepared to highlight the geolocated development land with a red site boundary, with an aerial view for context.

Figure A: Site Location with Aerial View

2.1 Incident Noise Sources

The Site is notably influenced by local roads immediately outside of the redline boundary, as including the B6433 Rowley Road immediately north and the A29 Penistone Road nominally 300 m from the west boundary extents. The A642 Wakefield Road has been noted at least 600 m north from the Site boundary.

The educational premises of Rowley Lane Junior, Infant & Nursery School lies north of the Site, on the opposite side existing residential locations and Rowley Road.

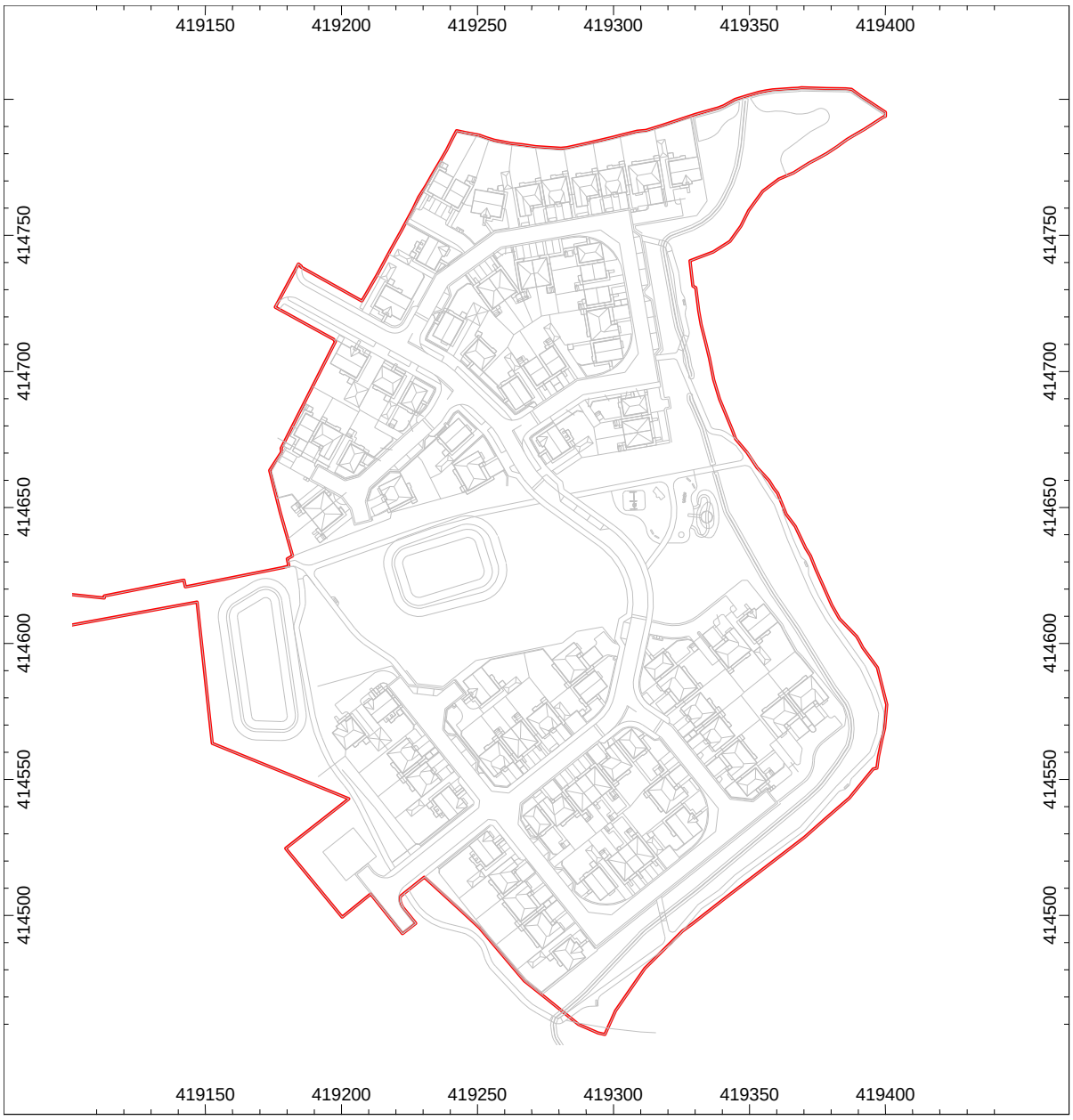
No commercial premises have been noted in proximity to the proposed development.

2.2 Proposed Development

Appendix B has included proposed scheme development plans.

The development per Figure B below has proposed 80 No. new residential dwellings with a single access route leading from Hermatige Park to the northwest. A public open space has been proposed to the central to the scheme with further open space to the west. A pumping station has been noted to the southwest of the scheme adjacent to Plots 51 – 52.

Figure B: Proposed Development



3.0 Planning and Noise Guidance

3.1 Noise Policy Statement for England (NPSE)

Inter alia, the NPSE *"seeks to clarify the underlying principles and aims in existing policy documents, legislation and guidance that relate to noise".* The aims and this statement apply to all forms of noise including environmental noise, neighbour noise and neighbourhood noise. These noise types are qualified from the NPSE as follows:

- "Environmental noise" includes noise from transportation sources.
- "Neighbour noise" includes noise from inside and outside people's homes; and
- "Neighbourhood noise" which includes noise arising from within the community such as industrial and entertainment premises, trade and business premises, construction sites and noise in the street.

The Statement sets out the long-term vision of the Government's noise policy, which is to *"promote good health and a good quality of life through the effective management of noise within the context of policy on sustainable development."*

It is recognised that the statement expresses the long-term desired policy outcome, whereby using the words of "promote" and "good" recognises that it is not possible to have a single objective noise-based measure that is either mandatory or applicable to all sources of noise in all situations.

The concept of the "effective management of noise" applies to all types of noise and that the solution could be more than simply minimising the noise.

The NPSE provides definitions of health and quality of life as follows:

> *"2.12 The World Health Organisation defines health as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity, and recognises the enjoyment of the highest attainable standard of health as one of the fundamental rights of every human being.*
>
> *2.13 It can be argued that quality of life contributes to our standard of health. However, in the NPSE it has been decided to make a distinction between "quality of life" which is a subjective measure that refers to people's emotional, social and physical wellbeing and "health" which refers to physical and mental wellbeing.*
>
> *2.14 It is recognised that noise exposure can cause annoyance and sleep disturbance both of which impact on quality of life. It is also agreed by many experts that annoyance and sleep disturbance can give rise to adverse health effects. The distinction that has been made between 'quality of life' effects and 'health' effects recognises that there is emerging evidence that long term exposure to some types of transport noise can additionally cause an increased risk of direct health effects. The Government intends to keep research on the health effects of long-term exposure to noise under review in accordance with the principles of the NPSE."*

The policy promotes the effective management and control of noise, within the context of Government policy on sustainable development and includes three aims to:

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

This Statement adopts established concepts from toxicology that are currently being applied to noise impacts. This concept details effect levels, at which an exposure may be classified

into a specific category. The classification categories as detailed within the NPSE are as follows:

- No Observed Effect Level (NOEL) - the level below which no effect can be detected. Below this level no detectable effect on health and quality of life due to noise can be established;
- Lowest Observable Adverse Effect Level (LOAEL) - the level above which adverse effects on health and quality of life can be detected; and
- Significant Observed Adverse Effect Level (SOAEL) - the level above which significant adverse effects on health and quality of life occur.

The second aim of the NPSE to *"mitigate and minimise adverse impacts on health and quality of life"* refers to the situation where noise impact lies somewhere between the LOAEL and SOAEL. This requires that all reasonable steps are taken to mitigate adverse effects on health and quality of life while accounting for the guiding principles of sustainable development. The NPSE states *"this does not mean that such adverse effects cannot occur".*

In defining the upper limit of SOAEL the NPSE states that *"it is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all source of noise in all situations. Consequently, the SOAEL is likely to be different for difference noise sources, for different receptor and at different times…"*. Consequently, values of SOAEL will differ between sources and situations.

3.2 National Planning Policy Framework (NPPF)

The National Planning Policy Framework (NPPF) was introduced by The Department for Communities and Local Government in March 2012, with the latest revision dated 19th December 2023.

The NPPF defines the Government's planning policies for England and sets out the framework, within which local authorities must prepare their local and neighbourhood plans, reflecting the needs and priorities of their communities. The Government's stated purpose in producing the NPPF was to streamline policy, so the planning process is less restrictive, to give a more easily understood framework for delivering sustainable development.

Under the heading of Section 15 conserving and enhancing the natural environment, the NPPF states the requirement to prevent unacceptable environmental impacts including noise:

> *"180. Planning policies and decisions should contribute to and enhance the natural and local environment by: …*
>
> *e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability…"*

Paragraph 191 of the NPPF further provides commentary on noise as follows:

> *"191. Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:*
>
> *a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life*[69]

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason…"

Foot Note 69 - See Explanatory Note to the Noise Policy Statement for England (Department for Environment, Food & Rural Affairs, 2010).

The NPPF acknowledges that there is a host of existing sources of national and international guidance which can be used, in conjunction with the Framework, to inform the production of Local Plans and decision making.

3.3 Planning Practice Guidance – Noise (PPGN)

PPGN provides guidance on how planning can manage potential noise impacts in new development, with interpretation and implementation of planning policy contained in the NPPF and NPSE. This was introduced in 2014 with the most recent version issued in July 2019.

The PPGN noise exposure hierarchy table introduces a new threshold of the NOAEL no observed adverse effect level, being between the NOEL and LOAEL and where the noise has no adverse effect where exposure to it does not cause any change in behaviour, attitude or other physiological response.

The PPGN clearly established whether noise is likely to be a concern, following policy statements and requirements of the NPSE and NPPF with additional categorisation and guidance as follows:

"At the lowest extreme, when noise is not perceived to be present, there is by definition no effect. As the noise exposure increases, it will cross the 'no observed effect' level. However, the noise has no adverse effect so long as the exposure does not cause any change in behaviour, attitude or other physiological responses of those affected by it. The noise may slightly affect the acoustic character of an area but not to the extent there is a change in quality of life. If the noise exposure is at this level no specific measures are required to manage the acoustic environment.

As the exposure increases further, it crosses the 'lowest observed adverse effect' level boundary above which the noise starts to cause small changes in behaviour and attitude, for example, having to turn up the volume on the television or needing to speak more loudly to be heard. The noise therefore starts to have an adverse effect and consideration needs to be given to mitigating and minimising those effects (taking account of the economic and social benefits being derived from the activity causing the noise).

Increasing noise exposure will at some point cause the 'significant observed adverse effect' level boundary to be crossed. Above this level the noise causes a material change in behaviour such as keeping windows closed for most of the time or avoiding certain activities during periods when the noise is present. If the exposure is predicted to be above this level the planning process should be used to avoid this effect occurring, for example through the choice of sites at the plan-making stage, or by use of appropriate mitigation such as by altering the design and layout. While such decisions must be made taking account of the economic and social benefit of the activity causing or affected by the noise, it is undesirable for such exposure to be caused.

At the highest extreme, noise exposure would cause extensive and sustained adverse changes in behaviour and / or health without an ability to mitigate the effect of the noise. The impacts on health and quality of life are such that regardless of the benefits of the activity causing the noise, this situation should be avoided."

It is qualified further to the above statements that the word "level" does not necessarily refer to a single value of noise exposure and that several factors may need to be considered to determine what noise would amount to an adverse or significant adverse effect. Specifically stating:

> *"Although the word 'level' is used here, this does not mean that the effects can only be defined in terms of a single value of noise exposure. In some circumstances adverse effects are defined in terms of a combination of more than one factor such as noise exposure, the number of occurrences of the noise in a given time period, the duration of the noise and the time of day the noise occurs."*

PPGN also provides additional guidance in what is required from the agent of change following circumstances described by Paragraph 187 of the NPPF. It states that the agent of change must *"define clearly the mitigation being proposed to address any potential significant adverse effects that are identified"*.

The guidance also provides there are four broad types of mitigation including:

- *"engineering: reducing the noise generated at source and/or containing the noise generated;*
- *layout: where possible, optimising the distance between the source and noise-sensitive receptors and/or incorporating good design to minimise noise transmission through the use of screening by natural or purpose built barriers, or other buildings;*
- *using planning conditions/obligations to restrict activities allowed on the site at certain times and/or specifying permissible noise levels differentiating as appropriate between different times of day, such as evenings and late at night, and;*
- *mitigating the impact on areas likely to be affected by noise including through noise insulation when the impact is on a building."*

Use of toxicology thresholds of NOEL, LOAEL and SOAEL for the assessment of noise impacts is reinforced within PPGN, which includes a noise exposure hierarchy table to define human perception at these effect levels, as titled *"when noise could be a concern"* and shown below in Table A.

Table A: Planning Practice Guidance Noise Exposure Hierarchy Table

Response	Example of Outcomes	Increasing Effect Level	Action
NOEL – No observed effect level			
Not present	No effect	NOEL	No specific measures required
No observed adverse effect level			
Present and not intrusive	Noise can be heard but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
LOAEL – Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for	Observed Adverse Effect	Mitigate and reduce to a minimum

Response	Example of Outcomes	Increasing Effect Level	Action
	some of the time because of the noise. Potential for sleep disturbance. Affects acoustic character of the area and creates a perceived change in quality of life.		
SOAEL – Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Present and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

3.4 ProPG Planning and Noise (2017)

ProPG: Planning & Noise – Professional Practice Guidance on Planning & Noise, New Residential Development was developed by a working group consisting of representatives from the Association of Noise Consultants (ANC), Institute of Acoustics (IOA), Chartered Institute of Environmental Health (CIEH) and practitioners from a planning and local authority background.

This guidance was made effective in May 2017 to provide a recommended approach to the management of noise within the planning system in England. It has drawn upon legislation, guidance and standards available at the time of publication to reflect the Noise Policy Statement for England (NPSE), the National Planning Policy Framework (NPPF) and Planning Practice Guidance (PPG-Noise) and other authoritative sources of guidance.

ProPG has been noted to advocate two sequential stages covering an ‘initial noise risk assessment’ at Stage 1 then a ‘full assessment’ at Stage 2 considering four key elements.

- Element 1 – Good acoustic design process.
- Element 2 – Internal noise level guidelines.
- Element 3 – External amenity area noise assessment.
- Element 4 – Assessment of other relevant issues.

ProPG has provided a summary of internal noise level guidelines as part of Stage 2 assessment requirements. These guidelines values have been derived from British Standard BS 8233:2014 *Guidance on Sound Insulation and Noise Reduction for Buildings* (BS 8233) and *The World Health Organisation Guidelines for Community Noise* (1999).

Table B: ProPG Internal Ambient Noise Levels, dB

Activity	Location	07:00 – 23:00 dB $L_{Aeq,16h}$	23:00 – 07:00 dB $L_{Aeq,8h}$
Resting	Living room	35	-
Dining	Dining room/area	40	-
Sleeping (daytime resting)	Bedroom	35	30 45 dB $L_{Amax(F)*}$
*Not normally exceeded more than 10 times per night.			

3.4.1 Application for Commercial Sources

The scope of ProPG considers new residential development will be predominantly exposed to airborne noise from transportation sources. If exposed to noise of an industrial and/or commercial nature, this shall be considered at Stage 1 of the ProPG approach.

ProPG guidance has advocated the methodology of BS 4142[2] in establishing the impact of industrial and/or commercial sound. If rated as lower than adverse subject to context following BS 4142, its contribution may be included in the degree of risk established for the Site. If considered to be dominant, such as being rated at least adverse subject to context following BS 4142, then the ProPG risk assessment should not be applied to the industrial or commercial noise. In low-risk cases a subjective judgement of dominance has been advocated as sufficient, based on the audibility of the industrial and/or commercial sound.

Where commercial impacts have been viewed satisfied by the design of the scheme and remain less than adverse including context, then the ProPG Stage 1 risk assessment allows that any commercial impacts may be included within its assessment.

> *"In the special case where industrial and/or commercial noise is present on the Site but is "not dominant" (i.e. where the impact would be rated as lower than adverse (subject to context) if a BS4142:2014 assessment was to be carried out), its contribution may be included in the noise level used to establish the degree of risk in Stage 1 and may also be included in the consideration of Stage 2 Element 2 Internal Noise Level Guidelines (and if included, this should be clearly stated)."*

3.4.2 Overheating Ventilation

The AVO Guide[3] was published for application by practitioners when following Stage 2 Element 1 of good acoustic design within ProPG. This extended guidance document has aimed to assist designers to adopt an integrated approach to the acoustic design within the context of the ventilation and thermal comfort requirements.

It has been acknowledged from The AVO Guide that there is a need to address how the ventilation strategy and overheating mitigation impacts of the impacts on the acoustic conditions and whether a more-informed strategy is required in the mitigation of overheating.

The Building Regulations 2010 Overheating: Approved Document O[4] has since regulated the requirements for overheating ventilation and noise at night.

[2] British Standard BS 4142:2014 +A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound.

[3] ANC IOA Acoustics Ventilation and Overheating Residential Design Guide, Version 1.1. The Association of Noise Consultants & Institute of Acoustics, January 2020.

[4] The Building Regulations 2010 Requirement O1: Overheating Mitigation, 2021 Edition. As applicable to a building notice or full planning application submitted after 15th June 2022.

4.0 Environmental Survey Summary

The following section has referred to a study of environmental sound levels carried out between Monday 4th and Wednesday 6th November 2024. This has included the quantification of sound levels affecting the proposed development.

4.1 Equipment

Sound pressure level measurements were carried out using the following equipment listed in Table C, confirming to Class 1 acoustic accuracy for sound level meters and matched calibrators.

The sound level meter was calibrated before the measurements using the handheld acoustic calibrator and further checked upon completion of the survey. No significant drift was observed with calibration offsets of ≤ 0.4 dB. The calibration chain of equipment has been maintained traceably to national standards, no greater than one year for sound calibrators and two years for sound level meters.

Table C: Sound Monitoring Equipment

Location	Description	Make	Model	Serial Number	Laboratory Calibration Date	Certificate Number
1	Sound Level Meter	Cirrus	CR:171B	G303356	08/12/2023	204430
	½" Microphone	Cirrus	MK:224	214834D		204436
	Outdoor kit	Cirrus	MK172	2356		204430
	Calibrator	Cirrus	CR:515	97641	08/12/2023	204416
2	Sound Level Meter	Cirrus	CR:171B	G061094	23/01/2023	186304
	½" Microphone	Cirrus	MK:224	212196C		186304
	Outdoor kit	Cirrus	MK170	o207		206378
	Calibrator	Cirrus	CR:515	72210	01/12/2024	214066
	Weather Station	Davis Instruments	Vantage Vue 6250UK	MT211213028	N/A	N/A
3	Sound Level Meter	Cirrus	CR:171B	G080284	29/05/2024	215127
	½" Microphone	Cirrus	MK:224	216418A		215129
	Outdoor kit	Cirrus	MK170	1015		206374
	Calibrator	Cirrus	CR:515	59336	12/01/2024	206392
4	Sound Level Meter	Cirrus	CR:171B	G068726	26/07/2023	196042
	½" Microphone	Cirrus	MK:224	216365A		196042
	Outdoor kit	Cirrus	MK170	o307		206406
	Calibrator	Cirrus	CR:515	102979	20/11/2023	203083

4.2 Weather Conditions

Weather conditions were viewed to be acceptable for environmental sound level measurements.

Data from the weather station at Location 2 has been provided within Appendix C to explain a range of favourable conditions. Average wind speeds fell at or below 1 m/s, temperatures ranged from 8 – 16 °C and there was an absence of rainfall.

The prevailing wind direction during the study was south-easterly, as providing a neutral conditions and negative vector with respect to Rowley Road.

4.3 Measurements

Sound pressure levels were measured on and about the Site with respect to incident noise sources and proposed development housing locations. Each monitoring location was free field and 1.5 m above ground, except for Location 1.

The location and purpose of each measurement has been described below:

- Location 1: Northwest boundary. The purpose of this location was to understand the extent of local and distant road traffic noise, predominantly from the local source of Rowley Lane to the north, but also with some contribution from the distant A642 Wakefield Road further north. This location was south of existing residential dwellings, mounted 3 m above ground level to ensure direct line-of-site to Rowley Lane beyond existing boundary fencing.
- Location 2: Southwest boundary. The purpose of this location was to understand the extent of road traffic noise emanating from distant sources to the west.
- Location 3: East boundary. The measurement was spaced immediately inside the woodland area to the east of the Site, to understand the lower-level of sound for inset locations within the Site.
- Location 4: Northeast boundary. Like Location 1 and spaced further east.

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

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

Graphical results describing unattended data have been provided for the above-listed Locations and sound level metrics at 15-minute histories within Appendix C.

The sound level meters were otherwise configured to record one-second time history as allowing the recalculation of other time-history metrics in following of overarching guidance and manufacturers recommendations.

The on-site monitoring Locations have been shown on the plan of Figure C below.

Figure C: Baseline Monitoring Locations

4.4 Sound Climate

A full witnessed log of events has been obtained to describe main sound sources incident on the Site during times of site attendance. Routine audio recordings were otherwise recorded to retrospectively understand the prevailing sound climate in unattended conditions.

Observations in and around the Site have included the following notes summarised below:

- Road traffic noise from Rowley Road was most influential at Locations 1 and 4 with vehicles passing along at low speed. Distant road traffic was faintly audible from the west, most noticeable towards Location 2.
- Sound from the natural environment included birdsong.
- Intermittent noise was noted from high altitude aircraft overhead.

- Community noises including dogs barking in neighbouring gardens, being dominant at times, as well as school children at Rowley Lane Junior, Infant & Nursery School.
- Occasional construction noise from distant housing site to the southwest, such that extraneous petrol saw or reversing sirens were audible.
- At Location 4, significant extraneous noise included a local resident using electric hand tools, such as a drill and saw, which have been excluded from the dataset.
- No sounds of an industrial or commercial nature were readily discernible at any point around the Site to warrant further consideration or specific noise assessment.

4.4.1 Dominance of Industrial and Commercial Sound

A site walkaround at different times of attendance (in addition to the post-measurement review of audio recordings), has highlighted that industrial and commercial sound was “not present” on the application Site during times of environmental surveying.

Any audible noise emission from such sources must be considered with respect to noise impact assessment under the NPPF and Agent of Change principle.

In low-risk Sites such as the witnessed case, a subjective judgement of dominance has been advocated as sufficient, based on the inaudibility of the industrial and/or commercial sound, in following of ProPG guidance per Section 3.4.1.

4.5 Baseline Survey Results

4.5.1 Period Averages and Maxima

Period average summaries for the purposes of transportation noise considerations have been provided within Table D below. Ranges have been shown where different values were recorded across different days of the survey.

Table D: Summary of Period Average Sound Levels

Date Range	Location	Period	Time HH:MM	Average Equivalent Level, dB $L_{Aeq,\,T}$	Maximum Night Level*, dB $L_{Amax(F)}$
Mon 04/11/2024 Wed 06/11/2024	1	Day	07:00 – 23:00	55	-
		Night	23:00 – 07:00	39	61
	2	Day	07:00 – 23:00	42 – 51	-
		Night	23:00 – 07:00	33 – 35	53 – 55
	3	Day	07:00 – 23:00	41 – 50	-
		Night	23:00 – 07:00	32	53
	4	Day	07:00 – 23:00	50 – 55 **	-
		Night	23:00 – 07:00	36	57

* Not normally exceeded 10 times per night, based on 2-minute time history of dB $L_{Amax(F)}$.

** Upper value recalculated to exclude extraneous local hand tool activities.

Night-time levels have been established from the period between 23:00 – 07:00, with all data of maxima reviewed in terms of 2-minute dB $L_{Amax(F)}$ values, with the 10th highest reported, to accord with an opinion paper of a suitable method[5].

A difference of greater than 15 dB between dB $L_{Amax(F)}$ and dB $L_{Aeq,8h}$ night values have been noted at all locations. This has promoted some significance of maximum sound levels beyond the average equivalent levels within residential design. However, even for the closest Locations 1 and 4 to Rowley Road whereby road traffic noise was greatest, the magnitude of 10th maximum levels has remained 'low' in the region of 57 – 61 dB $L_{Amax(F)}$.

4.5.2 Residual and Background Sound Levels

The 'typical' residual and background sound levels have been reported in Table E in accordance with BS 4142, with background levels as established from histograms of the recorded dB $L_{A90,15min}$ data at Locations 2.

This measurement location has been used to directly reflect the nearest receptor to the proposed pumping station southwest of the proposed scheme.

In line with Section 8.1.4 of BS 4142, the monitoring duration has reflected the range of sound levels for the period assessed. In practice, there has been no single level for background sound where this is a fluctuating parameter. A representative value tending to the mode has been used, which is neither the lowest nor mean average value of dB $L_{A90,T}$ according to the assessment standard. Data has been split into day, evening and night periods given multi-modal data for Location 2 because of road traffic noise.

Table E: Summary of Measured Residual and Background Sound Levels

Measurement Details				Residual sound level dB $L_{Aeq,15min}$		Background sound level dB $L_{A90,15min}$	
Date Range	**Location**	**Period**	**Time HH:MM**	**Range**	**Typical***	**Range**	**Typical***
Mon 04/11/2024 Wed 06/11/2024	2	Day	07:00 – 19:00	22 - 60	41	20 - 42	36
		Evening	19:00 – 23:00	28 - 60	34	24 - 42	32
		Night	23:00 – 07:00	22 - 45	29	20 - 39	23
* Typical residual sound levels have been equated at times of typical background sound.							

.

[5] 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.

5.0 ProPG Assessment

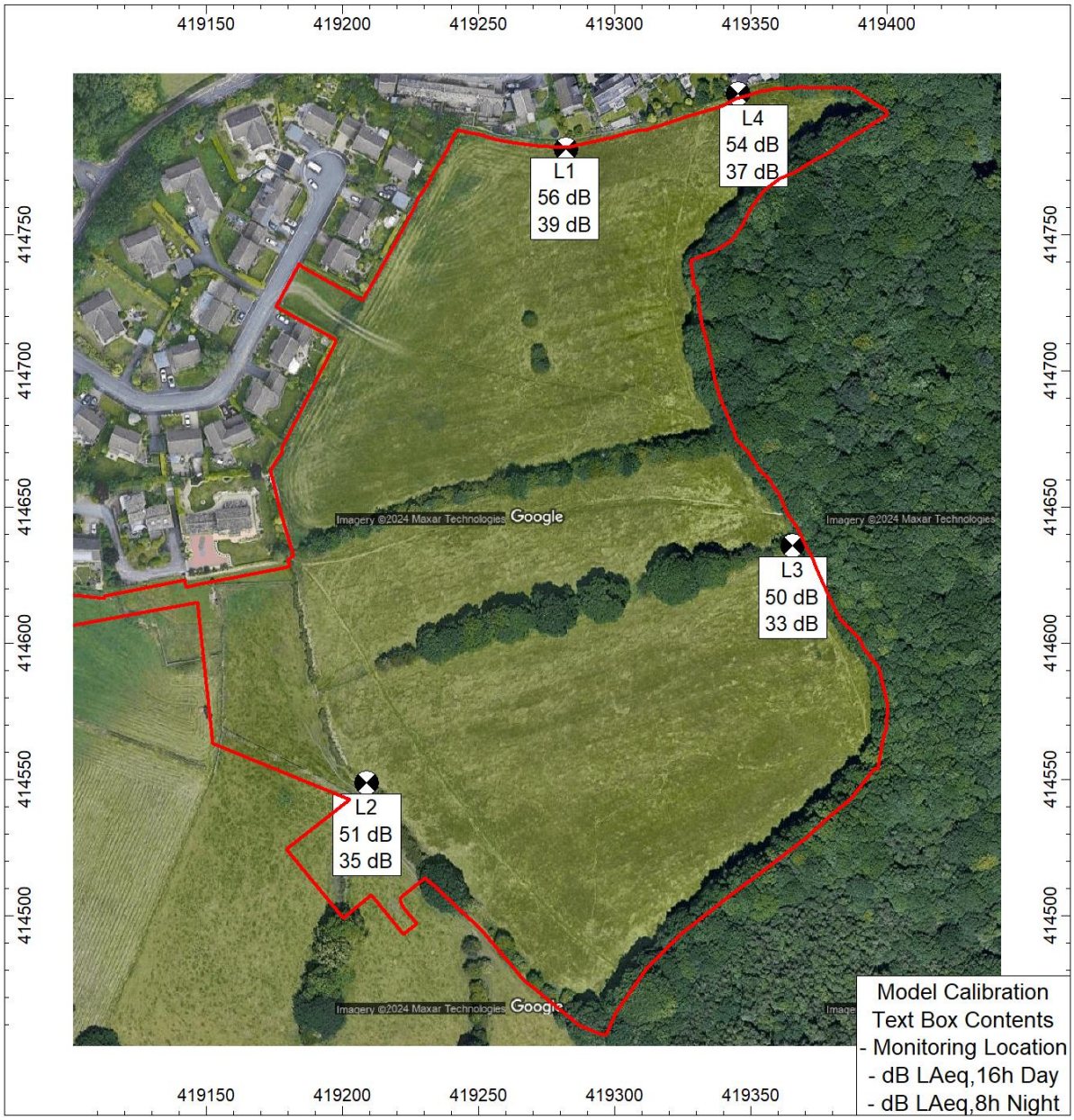
The assessment method of ProPG has been applied to the development to understand the risks and design requirements to mitigate environmental transportation noise sources.

5.1 Transportation Noise Model

A noise model has been developed using the results of Table D of this report to define the sound level outside of each façade of the residential development. The modelling has used industry standard calculation software CadnaA, as implementing UK standard calculation protocols including the Calculation of Road Traffic Noise (CRTN, 1988).

The model has been developed assuming mixed ground (G = 0.5) and reflection order of 2, further to the input data of Table D. This has been shown per Figure D below showing parity of results within 1 dB for all locations.

Figure D: Model Calibration



No noise model has been created to explain night maxima across the Site given that propagation from a line source would not occur in the same manner for average equivalent and maximum noise levels. Maximum noise measurements from Locations 1 and 4 can be directly applied to the first row of houses along Rowley Road and where previously acknowledged at 'low'. For the rest of the development, a nominal reduction can be expected due to shielding provided by the first row as well as a general 6 dB per doubling of distance from each road traffic noise source.

5.2 Development

The following noise level plots of Figure E and Figure F have been created for respective day and night time periods, based on the calibrated noise model, to show exposure for each plot of the development with the scheme 'as proposed'. This has included the development building with façade evaluation tool highlighting exposure by colours on building façades, generally aligning with the risk hierarchy of ProPG.

Figure E: Noise Exposure Per Building Façade – Ground Floor Day

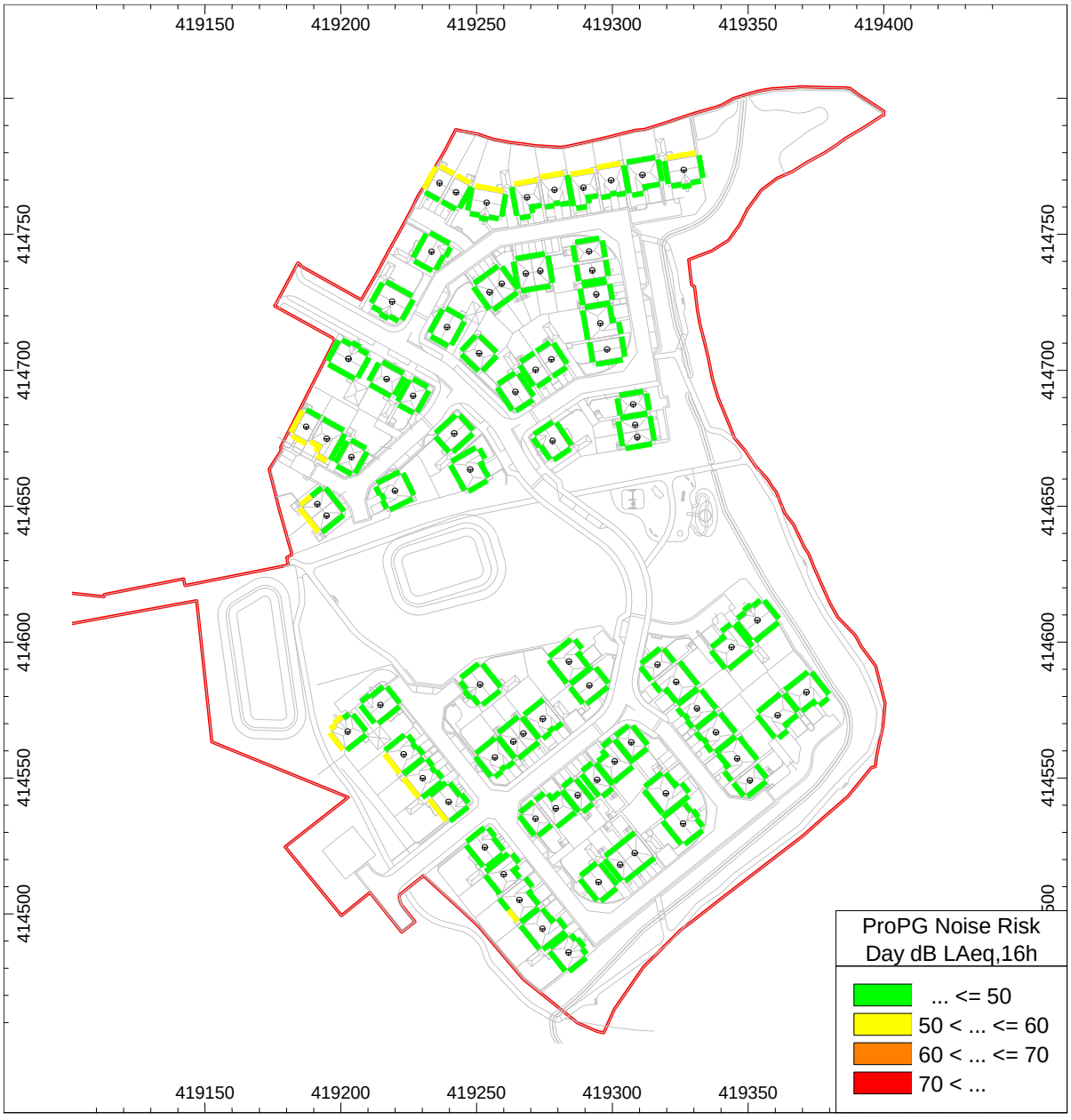
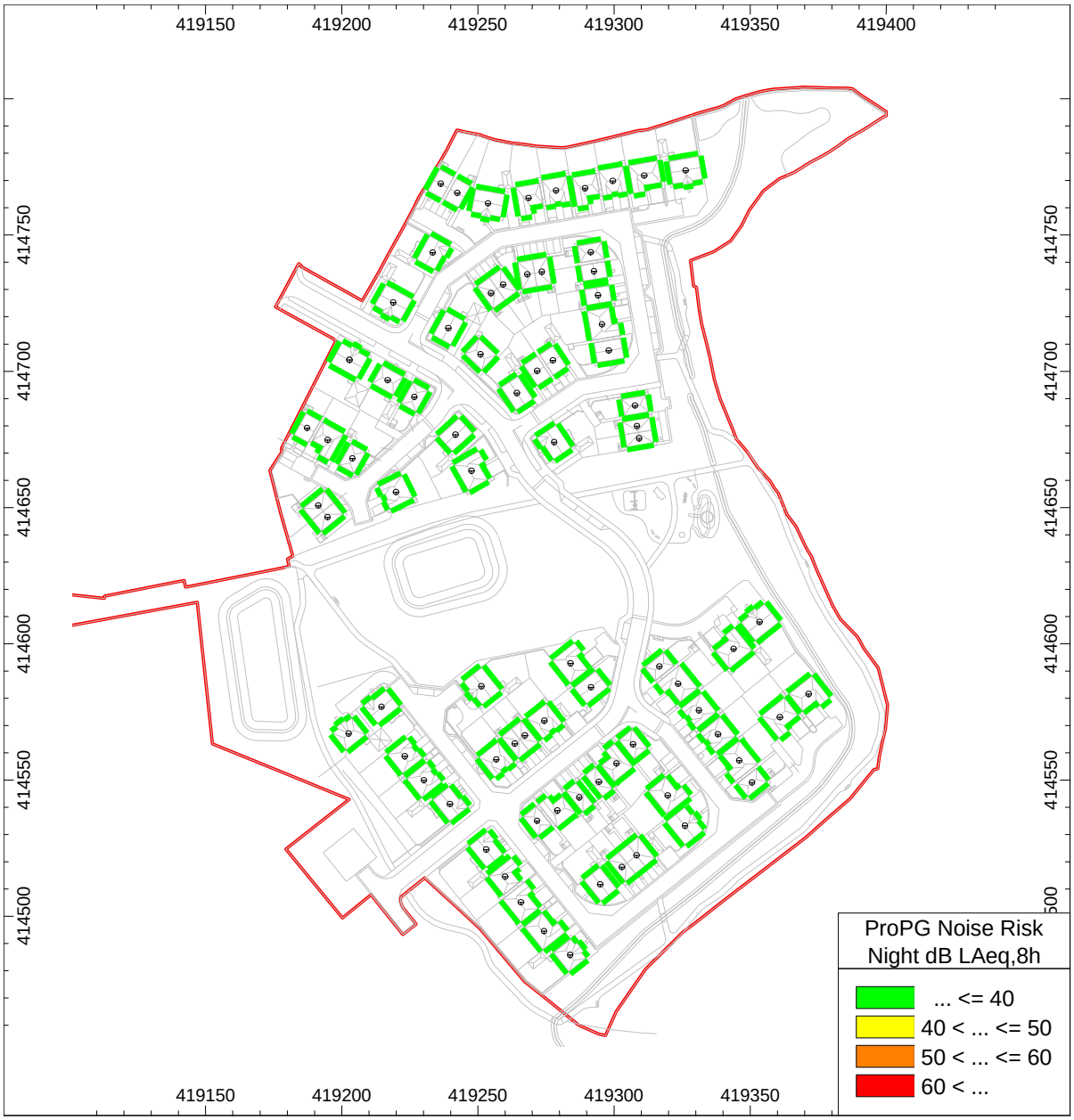


Figure F: Noise Exposure Per Building Façade – First Floor Night



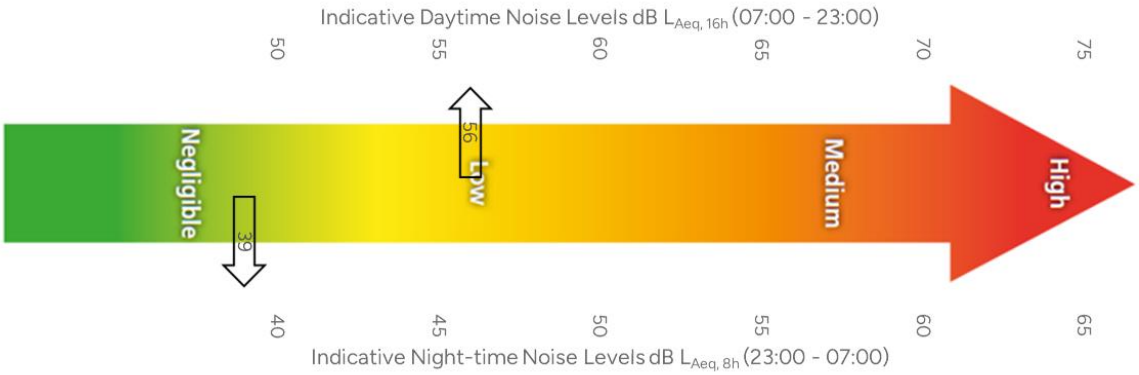
5.3 Stage 1 – Initial Risk Assessment

The following period sound pressure levels of Table F have been used for an initial site risk assessment according to Stage 1 of ProPG. Figure F provides an indication of risk in accordance with the ProPG noise risk hierarchy.

Table F: Summary Assessment of Worst-Case External Noise Levels

Location	Period	Hours	Indicative Noise Level
Plots 14 - 17 north façades (worst-case)	Daytime	07:00 – 23:00	56 dB $L_{Aeq,16h}$
	Night-Time	23:00 – 07:00	39 $L_{Aeq,8h}$ 61 dB $L_{Amax(F)}$

Figure G: ProPG Indicative Risk Assessment



The dominant sound across the Site was noted from the transportation sources, with highest levels and potentially greatest impacts estimated due to proximity to Rowley Road. Further consideration at night has been given due to maximum sound levels from passing vehicles, low associated noise risks have been summated from low-speed traffic at distance.

The development has been considered to fall within 'low risk' noise levels, where ProPG notes that:

> *"At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development".*

Commercial activities were not during the site visit and have been considered "not present" on the proposed residential development. The assessment of ProPG risk has therefore included any negligible contribution from commercial sources, where commensurate mitigating means have otherwise been derived mindful of transportation impacts.

5.4 Stage 2 – Full Assessment

5.4.1 Good Acoustic Design Process

ProPG has stated it is imperative for acoustic design to be considered at an early stage of the development control process to avoid unreasonable acoustic conditions and prevent those which are unacceptable. The following processes have been considered as part of Good Acoustic Design (GAD) principles on this Site, in following of ProPG.

Given the dominant sources as road traffic providing the low risk across the developing land space, there has been considered no benefit in moving residential rooms of the proposal away from this source.

The plan layouts of each dwelling type have not been reviewed in this assessment. It has been acknowledged that 'good acoustic design' generally requires facing less-sensitive rooms (i.e. kitchens, utility rooms and bathrooms) towards the dominant incident noise sources.

It has been understood that all proposed dwellings are to be formed by traditional means with masonry insulated façades, along with an insulated and tiled roof. The sound insulation of these components has been deemed least consequential to resulting internal ambient noise levels, where the acoustic performance of glazing and ventilation elements will typically remain as dictating.

5.4.2 Internal Noise Level Guidelines

ProPG has provided a summary of internal noise level guidelines as part of Stage 2 assessment that have been replicated in Table B of this assessment. The method adopted to achieve suitable internal noise level guidelines has been based upon information contained within the recent ANC publication, The AVO Guide. This has provided an approach as to how the competing aspects of thermal and acoustic comfort can be managed and has been written to reflect the requirements of ProPG and overarching planning requirements.

Given the worst-case ProPG Stage 1 assessment as 'low risk', glazing and ventilation façade components have been based upon single figure decibel values.

The range of whole dwelling ventilation strategies for development has been taken from The Building Regulations 2010 Approved Document F Volume 1: Dwellings Requirement F1: Means of Ventilation (2021 edition) (ADF). An outline appraisal for suitability has been provided using Table B2 of the AVO Guide, in Table G below, highlighting that any ventilation strategy could be appropriate for the proposed development.

Table G: Outline Appraisal of Different Ventilation Strategies (Worst-Case)

Ventilation strategy according to ADF	Typical windows and vent	Higher acoustic performance windows and vent
Intermittent extract fans	✓	✓
Passive stack ventilation	✓	✓
Continuous mechanical extract (CMEV)	✓	✓
Continuous mechanical supply and extract with heat recovery (MVHR)	✓	✓

It should be considered as part of good acoustic design that minimising the quantity of penetrations through a building façade should be favoured in higher noise level areas. However, the ventilation strategy in context to the proposed development and external noise risk has not been viewed particularly important for external noise break-in.

For any mechanical ventilation system, the ventilation routes should face away from the incident noise source, which for northern-most plots means these should face south. This provision would reduce noise travelling into the habitable room via the ductwork. Where this is not possible the intake and exhaust ducts should incorporate appropriate attenuation to control intrusive noise to meet the criteria in Table B.

The following specifications of Figure H have been based on calculations to the detailed method in section G2.1 of BS 8233 (equivalent to the method in BS EN 12354-3).

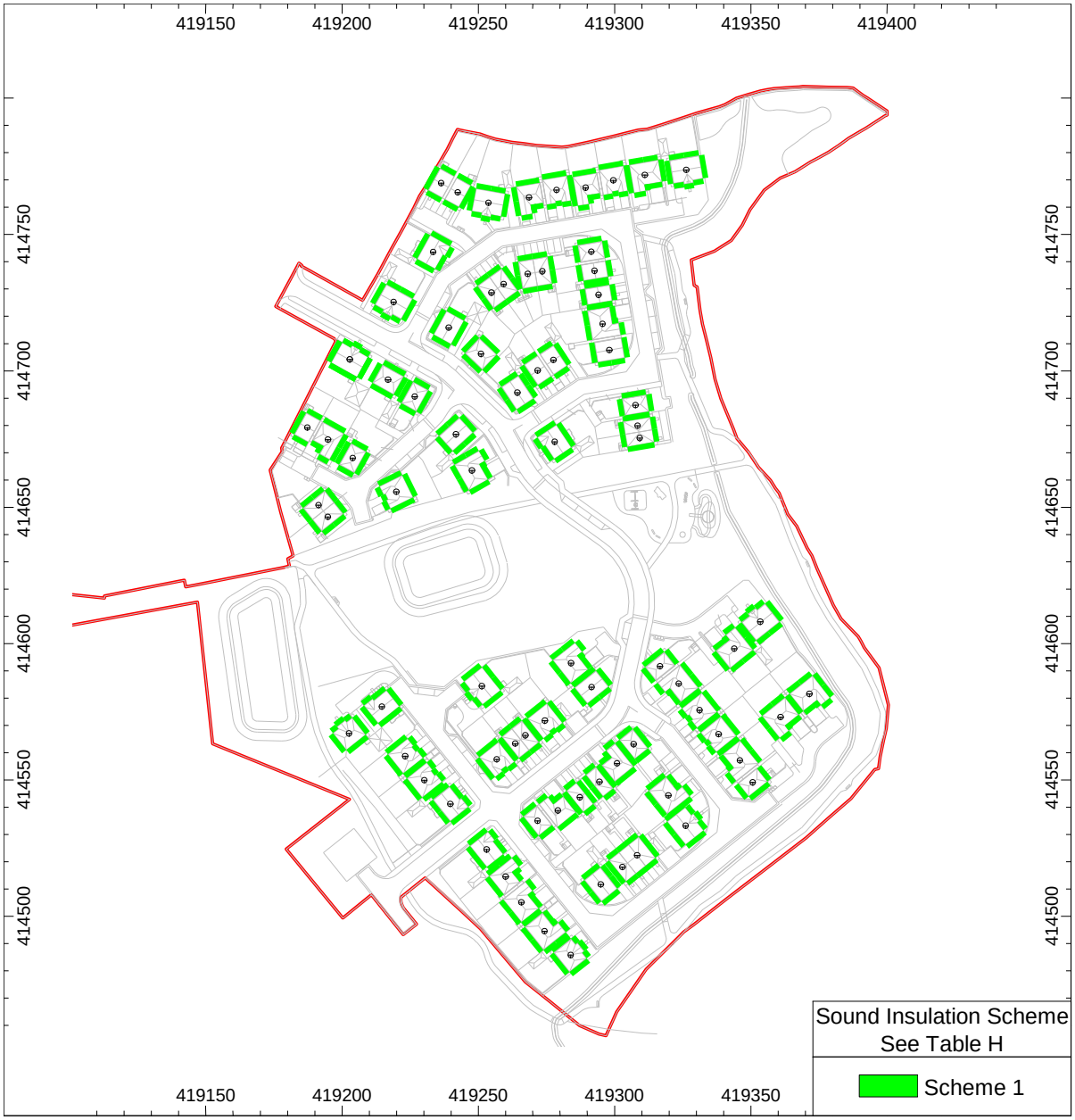
Table H: Specifications for Windows and Ventilators

Example Location (See Figure H)	Element	Specification	Typical Configuration
1. A standard house type.	Windows	≥ 27 dB $R_w + C_{tr}$	4 mm double glazing standard glass types (e.g. 4-16-4).
	Background ventilator	≥ 31 dB $D_{ne,w} + C_{tr}$	Standard* window trickle vent as rated.
* This specification has relied upon no greater than 2 No. ventilators per habitable room.			

An adaptation term has been provided for all specifications following the method ISO 717-1:2020. This has included a comparison between the normalised, A-weighted sound spectrum for day and night against the adaptation curves for *C* and C_{tr}. The relevant spectrum adaptation term C_{tr} has been confirmed by visual comparison to measured spectra.

The specification for sound insulation across the scheme has been provided in Figure H below. It has been illustrated that the common specifications can apply throughout the development.

Figure H: Illustration of Sound Insulation Scheme



5.4.3 Overheating Risk

The advice in this section has so far considered the internal ambient noise level with closed windows under Building Regulations ventilation conditions. The AVO guide has informed that acoustic assessments should also be formed for the overheating ventilation condition, which in the first instance has been considered with open windows.

A simplistic insertion loss of 13 dB has been initially considered from external free field to internal reverberant level through a partially open window, per AVO Stage 1 approach. It has been further acknowledged that acoustic losses for a fully open window may be much less and in the region of 4 – 9 dB depending on the Overheating Risk Location.

On this basis the following summary of Table I has been provided as an initial consideration of the worst-affected façades with both closed and open windows. Use of a 9 dB external to internal loss follows the Simplified Method for a Moderate Risk Location as per Section 4 of the following Guide[6].

Table I: Estimated IANLs from Different Ventilation Conditions

Level 1 Risk Assessment following the AVO Guide			Internal Ambient Noise Levels (IANLs)		
Location	**Windows**	**Ventilation Condition**	**Day dB $L_{Aeq,16h}$**	**Night dB $L_{Aeq,8h}$**	**Max dB $L_{Amax(F)}$**
Plots 14 - 17 north façades (worst-case)	Closed vents open	Building	34	17	39
	Partially open	Overheating	43	26	48
	Fully open		47	30	52

In case of closed windows, building ventilation conditions have been shown to provide suitable internal ambient noise levels following ProPG and AVO, given that predicted values in Table I do not exceed those in Table B.

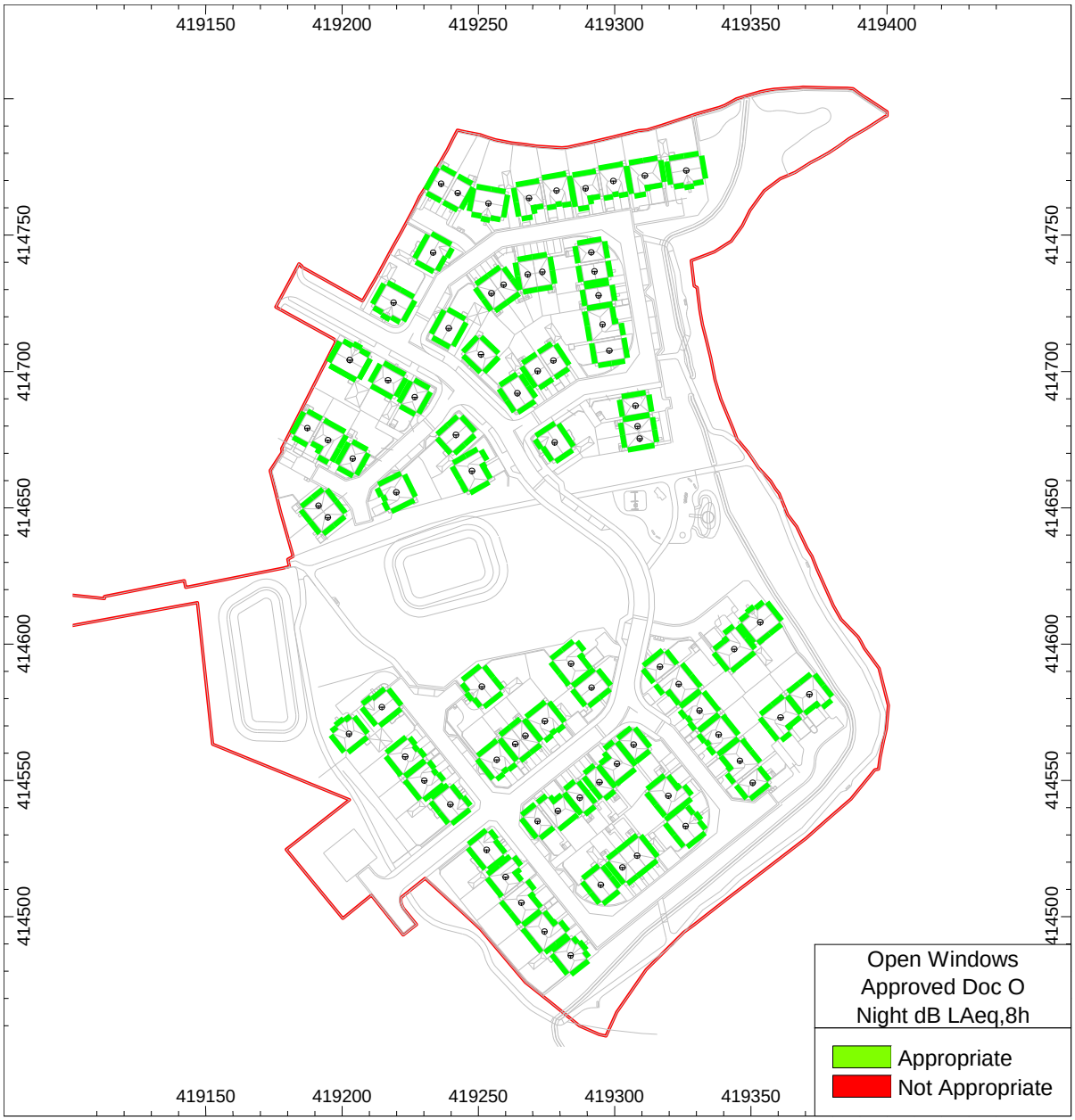
In the case of partially or fully open windows, the above listed sound levels have been compared against the simplified requirements for meeting Requirement O1 of Building Regulations Approved Document O: Overheating, provided at ≤ 40 dB $L_{Aeq,T}$ and 55 dB $L_{Amax(F)}$ at night (23:00 – 07:00) in all areas of the Site.

It has been considered that achieving suitable IANL conditions with open windows, whether fully or partially open, would be possible for all façades across the development.

Figure I below has been prepared to demonstrate that simplified methods can be applied on a site-wide basis, where opening windows in accordance with a simplified method would remain appropriate.

[6] Guide to Demonstrating Compliance with the Noise Requirements of Approved Document O, July 2022, v1.0

Figure I: ADO Simplified Method Suitability



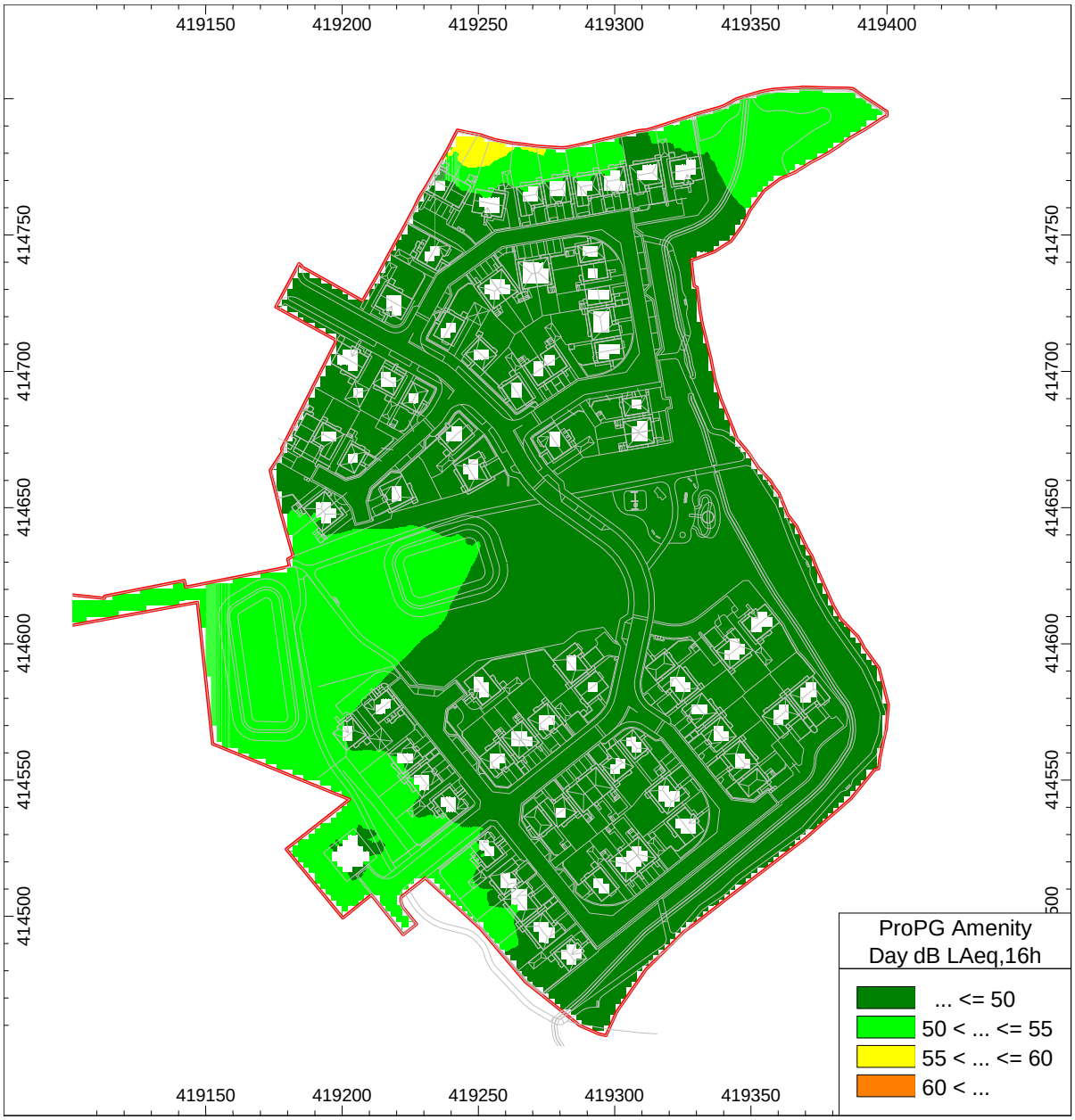
5.4.4 External Noise Level Guidelines

Amenity areas have been provided within the scheme as private garden and open spaces around the development.

At the worst-case Plots 14 – 17 to the north of the scheme, summary assessment data within Table F has indicated that external noise levels would tend towards the upper ProPG guidance limit of 50 – 55 $L_{Aeq,16h}$. With greater distance from Rowley Road, the inclusion of screening from the dwellings themselves as well as standard garden fencing or walls, all Plots and the remainder of the development would comfortably comply with ProPG guidance to provide suitably protected, quiet and tranquil outdoor space within this development.

Figure J below has been prepared to illustrate amenity area levels with the proposed development. This imagery has been formed without any standard boundary fencing where a nominal 5 dB reduction would be expected in general terms. The use of acoustic boundary fencing has not been viewed a requirement anywhere within the proposed scheme.

Figure J: External Amenity Noise Levels



5.5 Other Matters

A pumping (booster) station has been proposed to the southwest of the Site as adjacent to Plots 51 – 52. Both the detail of equipment to be contained within the pump station and the design of the building fabric remain unknown at this stage of reserved matters planning. Notwithstanding, the pumping station would be subject to other guidance, such as that from the Sewerage Sector as defining the necessary stand-off distance and typical equipment levels. It has also been considered commonplace for pump stations to accompany new residential development.

If necessary to avoid the possibility of adverse effects on the newly formed residential development, a noise condition could be used as requiring detailed assessment of the pump station in following of British Standard BS 4142:2014 +A1:2019 *Methods for Rating and Assessing Industrial and Commercial Sound* (BS 4142). Such approach would identify appropriate noise control for the pumping station once details have been established.

To afford a 'low impact' according to BS 4142, the rating sound level of all pump station plant, accounting for the specific sound at Plots 51 – 52 and any feature correction of the industrial sound, should not exceed the background sound level during the relevant time of assessment. Rating sound level limits have been set per Table J below based on the lowest measured, representative values at any Location, further to Table E.

Table J: Rating Sound Level Limits for New Pumping Station

Period	Time HH:MM	BS 4142 Rating Sound Level Limits, dB $L_{Ar,Tr}$
Day	07:00 – 19:00	≤ 36
Evening	19:00 – 23:00	≤ 32
Night	23:00 – 07:00	≤ 23 *
*At night, background sound levels have been noted as 'very low' in following of BS 4142, where a practical lower limit of 30 dB $L_{Ar,Tr}$ outside the residential building would be unlikely to cause adverse effects in context.		

It has been estimated that the lowest rating sound level limit during the night would readily allow for the provision of pumps in a building nominally 29 m away from the nearest dwelling. For example, pumps causing approximately 80 dB $L_{Aeq,T}$ within a reverberant and brick-built enclosure would be expected to result in specific sound levels less than 30 dB $L_{Aeq,T}$ at 29 m given simple assumptions to proposed scale and likely building form.

The resulting levels would likely be conducive to low impact when considering likely sound characteristics of a constant source that could operate during any time of the day or night.

6.0 Conclusions

This document has been prepared for Miller Homes Limited by SLR Consulting Limited to support a proposed residential development on Land off Hermitage Park, Lepton, Huddersfield, HD8 0JU.

An updated environmental survey has been undertaken across the development Site to inform the proposed residential development against external environmental noise.

Stage 1 assessment in accordance with ProPG has provided that the site is influenced by transportation noise. The initial site noise risk assessment has been categorised in the worst case as 'low risk' on the future occupants of the new noise sensitive development. Commercial activity noises have not been observed anywhere about the Site, further to Agent of Change considerations and ProPG.

Stage 2 assessment in accordance with ProPG has reviewed a good acoustic design process, internal ambient noise levels, external amenity areas and other matters. Commensurate design specifications have been established considering current industry guidance against the proposed scheme layout. It has been realised that suitable internal and external amenity standards can be readily achieved by the development.

A scheme of transportation noise control has been provided for all plots of the development, further to Conditions 13 and 31 of outline approval, as including:

- Any building ventilation strategy, according to Part F of the Building Regulations.
    - Note this is not critical to environmental noise break-in to any plot.
    - Ventilation paths ideally south facing for northern most plots.
- A standard scheme of façade insulation for habitable living rooms and bedrooms, per Table H and Figure H, as encompassing basic acoustic specifications for glazing and trickle ventilators.
    - The quantity of trickle ventilators in a façade must be controlled per Table H or updated if greater than 2 No.
- No additional provisions for overheating ventilation in bedrooms, per Figure I, where partial or fully open bedroom windows would remain acceptable at night.

Further information from the updated environmental survey has been provided with respect to the proposed pumping (booster) station to the southwest of the proposed scheme. Adverse impacts from this source would not be expected given commensurate control of the plant to accord with rating sound level limits according with BS 4142 per Table J.

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

A recommendation is made to the decision maker to grant with noise conditions where necessary to ensure that significant adverse effects will be avoided for the proposed dwellings, by use of a commensurate scheme of control as outlined within this report.

7.0 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

Steve Skingle, BSc. (Hons) PgDip MIOA MAES
Technical Director – Acoustics & Vibration

Michelle Dawson, BSc. PgDip MIOA
Technical Director – Acoustics & Vibration

Appendix A Glossary of Terminology

Proposed Residential Development Noise Impact Assessment

Land off Hermitage Park, Lepton, Huddersfield, HD8 0JU

Miller Homes Limited

SLR Project No.: 403.065678.00001

18 November 2024

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 L10 is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L90 is the 'average minimum level' and is often used to describe the background noise. It is common practice to use the L10 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 Scheme Drawing

Proposed Residential Development Noise Impact Assessment

Land off Hermitage Park, Lepton, Huddersfield, HD8 0JU

Miller Homes Limited

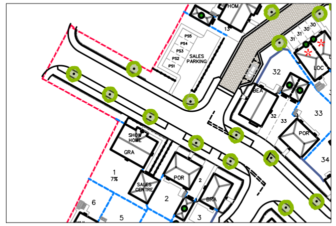
SLR Project No.: 403.065678.00001

18 November 2024

SCHEDULE OF ACCOMODATION

Ref	Housetype	Type	Parking	Storey	Bed	Sq Ft	No	Total Sq Ft
AFFORDABLE								
BAY	Baymont	Semi	PS	2	2	850	4	3400
		End	PS	2	2	850	4	3400
		Mid	PS	2	2	850	2	1700
LOC	Lockton	Semi	PS	2	3	1001	6	6006
					SUB TOTAL		**16**	**14506**
OPEN MARKET								
WHI	Whitton	Det	PS	2	2	947	7	6629
BRA	Braxton	Det	PS	2	2	996	8	7968
POR	Portstone	Det	SG	2	3	1212	2	2424
DEN	Denstone	Det	INT	2	3	1368	9	12312
CHE	Cherrystone	Det	INT	2	3	1296	6	7776
BEA	Beauwood	Det	SG	2	4	1379	6	8274
SAN	Sandalwood	Det	SG	2	4	1422	2	2844
HOM	Homesford	Det	DDG	2	5	1568	5	7840
DEF	Denford	Det	INT	2	5	1640	12	19680
GRA	Grayford	Det	SG	2	5	1780	6	10680
			DDG	2	5	1780	1	1780
					SUB TOTAL		**64**	**88207**
					TOTAL		**80**	**102713**

SALES AREA EXTRACT



PLANNING LAYOUT LAYERS KEY

- 1800mm PIER AND PANEL WALL
- 1800mm TIMBER FENCE
- 2000mm ACCOUSTIC FENCE
- 1100mm METAL RAILINGS
- 600mm KNEE HIGH RAIL
- 1200mm POST & RAIL
- APPLICATION BOUNDARY
- LOCKABLE GATE
- AFFORDABLE / AFFORDABLE RENT
- AFFORDABLE / SHARED OWNERSHIP
- TREES
- VISIBILITY SPLAYS
- CARS (VISITOR PARKING)
- BIN COLLECTION POINT
- BINS
- CYCLE SHEDS
- BLOCK PAVING (SHARED SURFACES)
- BLOCK PAVING (RAISED TABLE)

Rev	Date	Description	Drawn	Check
A	17.07.24	AFFORDABLE TENURE UPDATED IN LINE WITH CLIENTS REQUEST.	JP	VS

.\JRP TEMPLATES IN AUTOCAD 2021\Title Block Logo - 2021.jpg

NORTH

1:500 SCALE

10m 50m

CLIENT: MILLER HOMES

DRAWING NUMBER: 22:5611:01 A

PROJECT: HERMITAGE PARK, LEPTON

SCALE @ A0: 1:500

DRAWING: SITE LAYOUT

DRAWN: JP **DATE:** OCT '24

CHECKED: VS **DATE:** OCT '24

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01 / SITE LAYOUT

Appendix C Survey Summary Results

Proposed Residential Development Noise Impact Assessment

Land off Hermitage Park, Lepton, Huddersfield, HD8 0JU

Miller Homes Limited

SLR Project No.: 403.065678.00001

18 November 2024

Figure C1: Time History Graph, Sound Pressure Level – Location 1

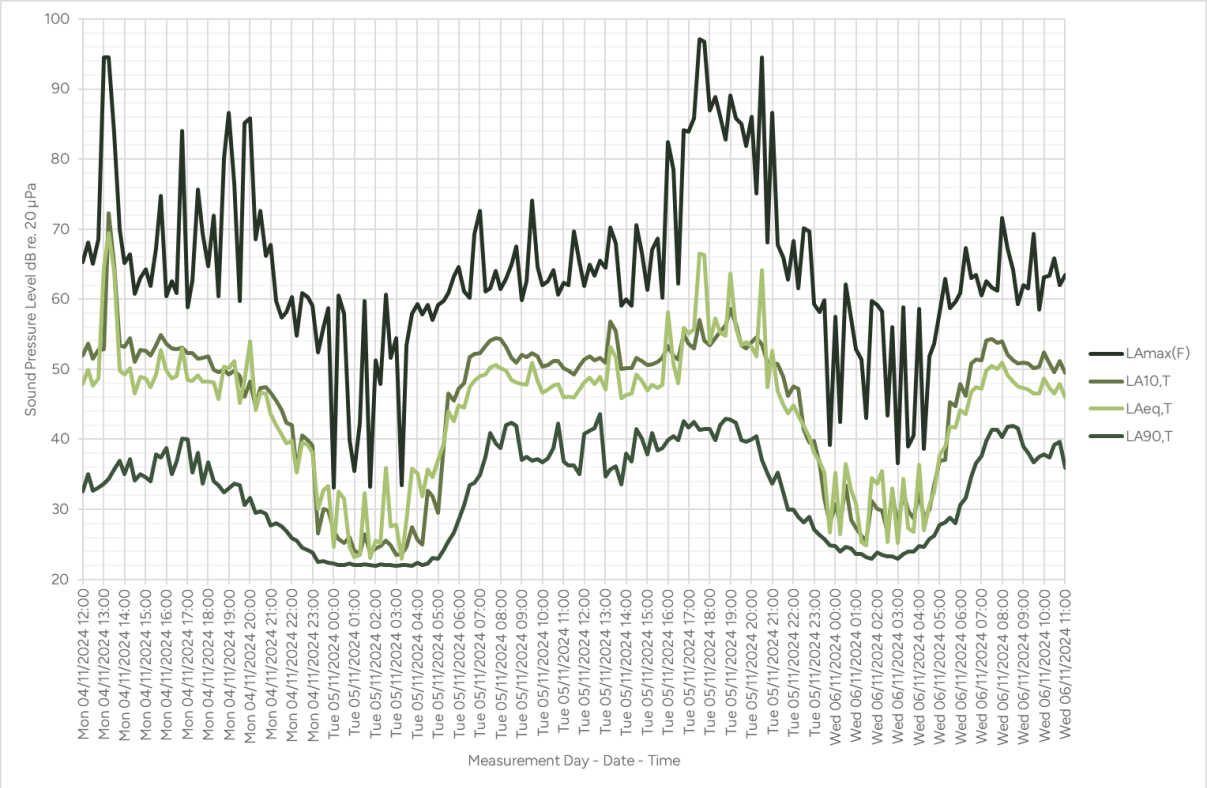


Figure C2: Time History Graph, Sound Pressure Level – Location 2

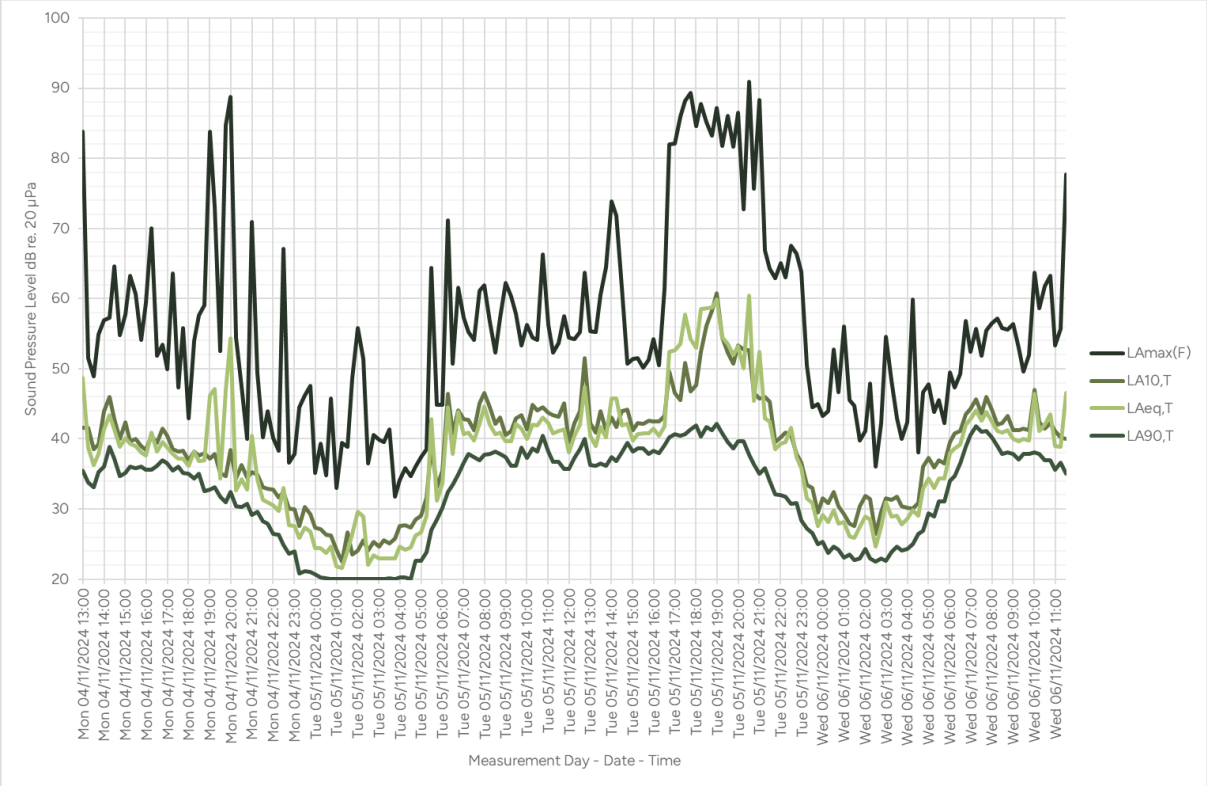


Figure C3: Time History Graph, Sound Pressure Level – Location 3

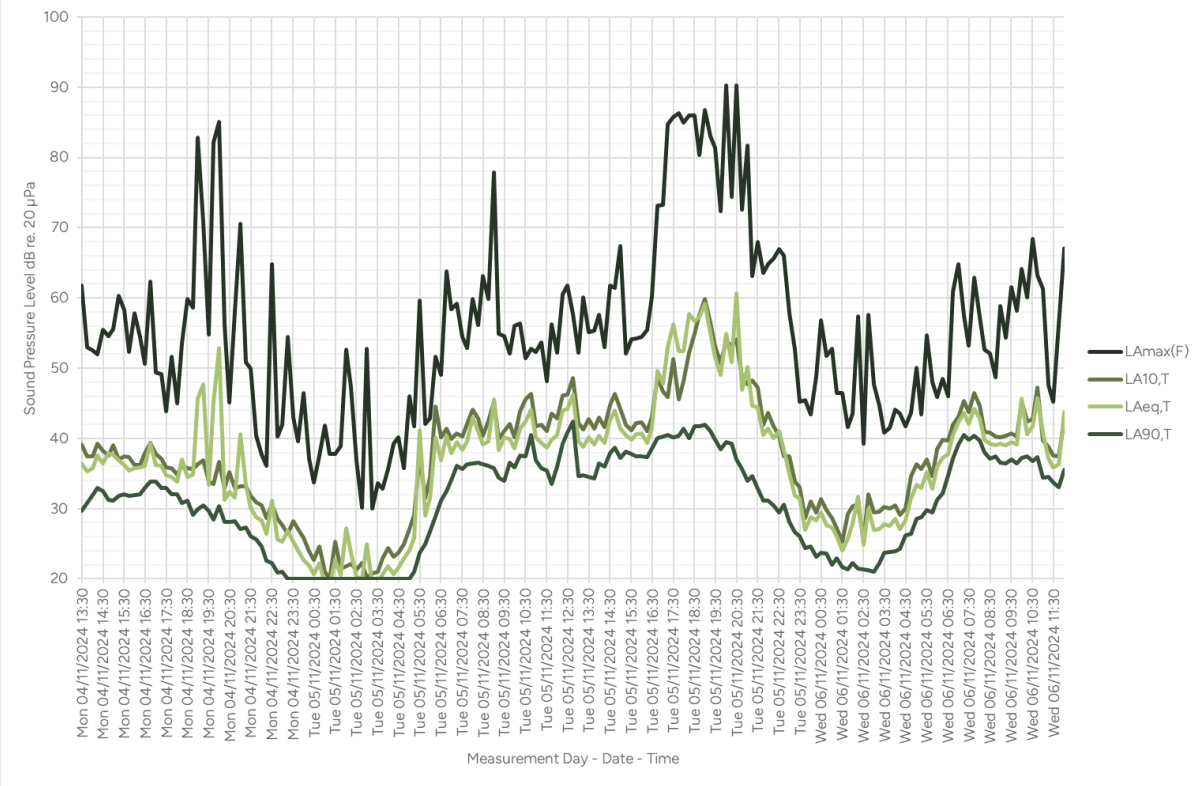


Figure C4: Time History Graph, Sound Pressure Level – Location 4

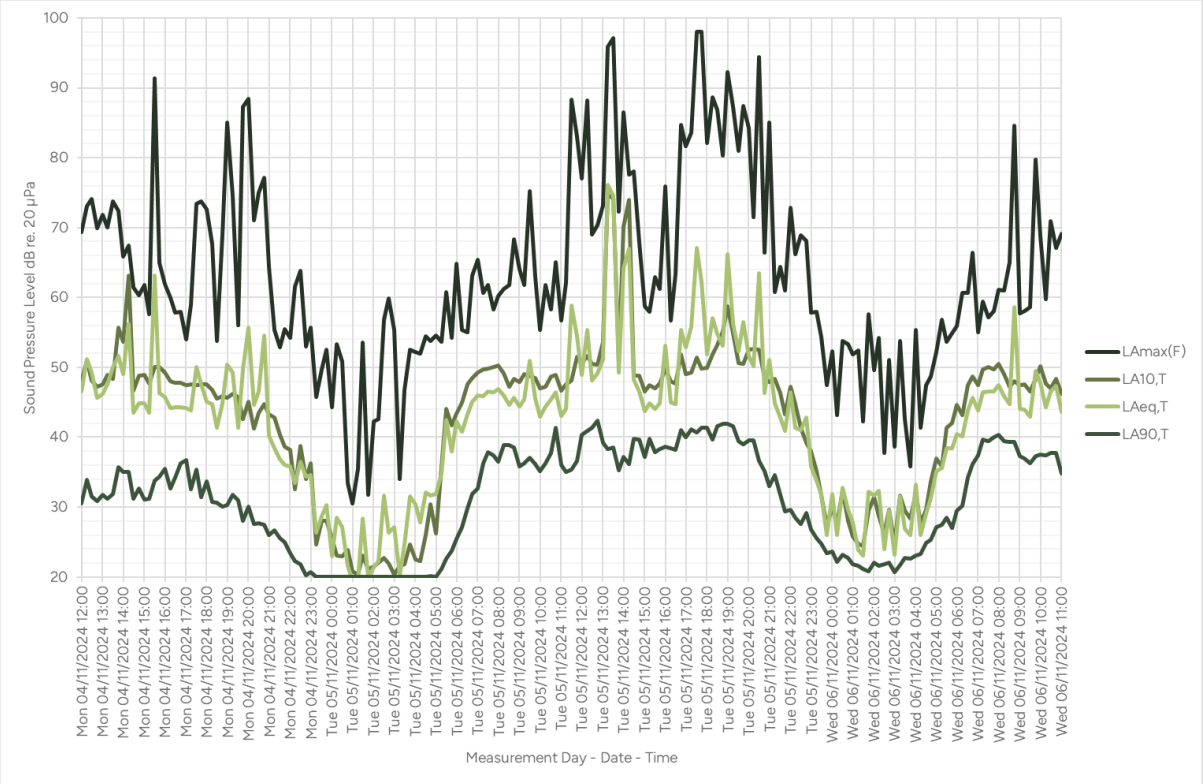


Figure C5: Time History Graph, Weather Conditions

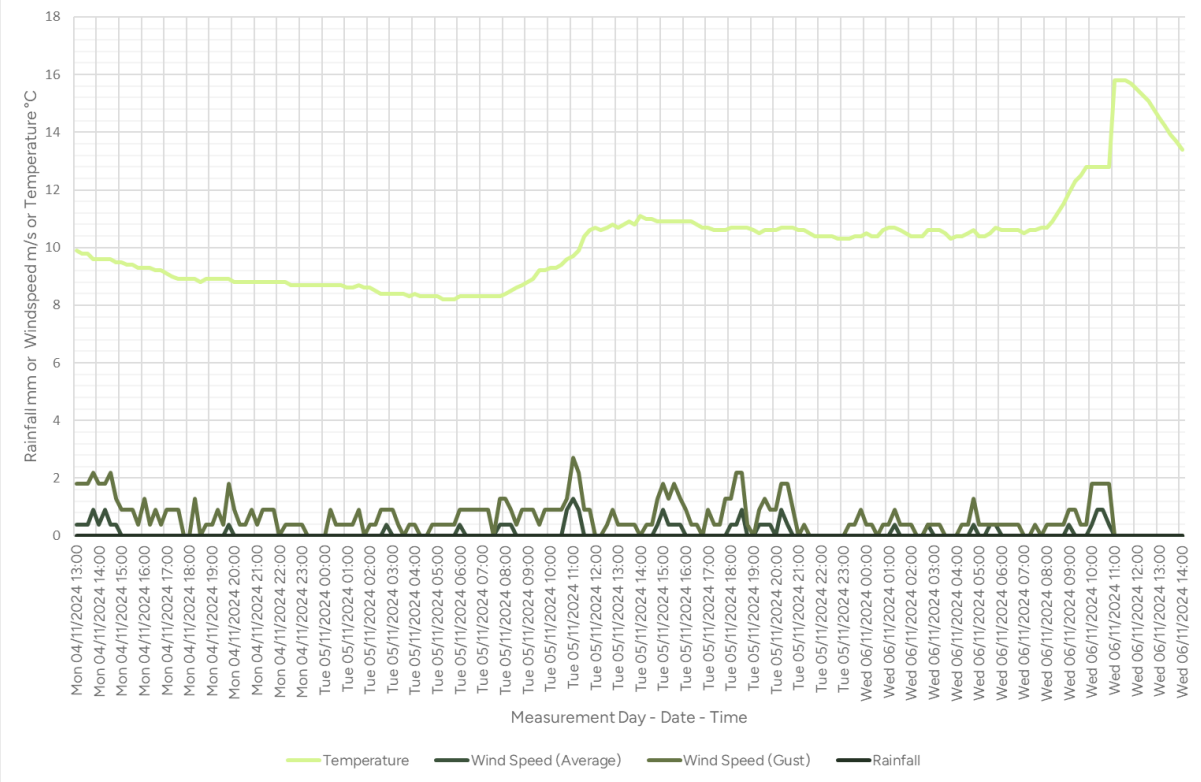
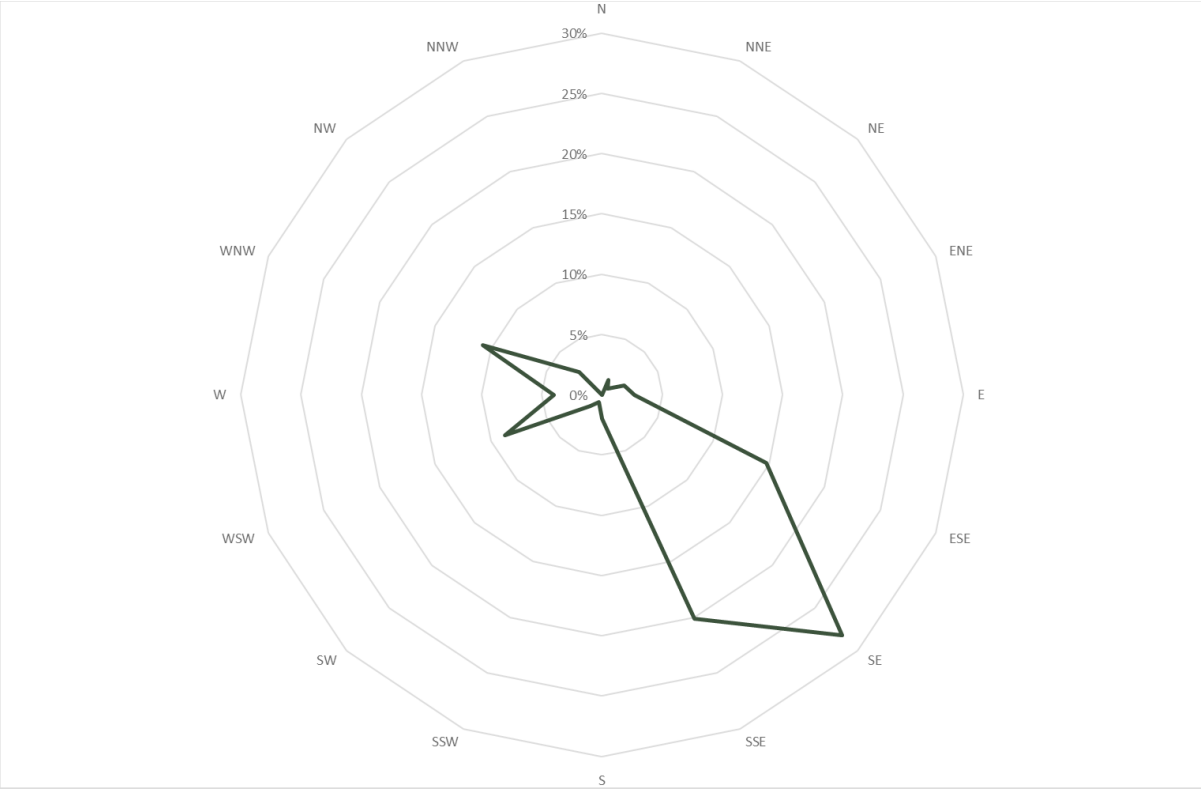
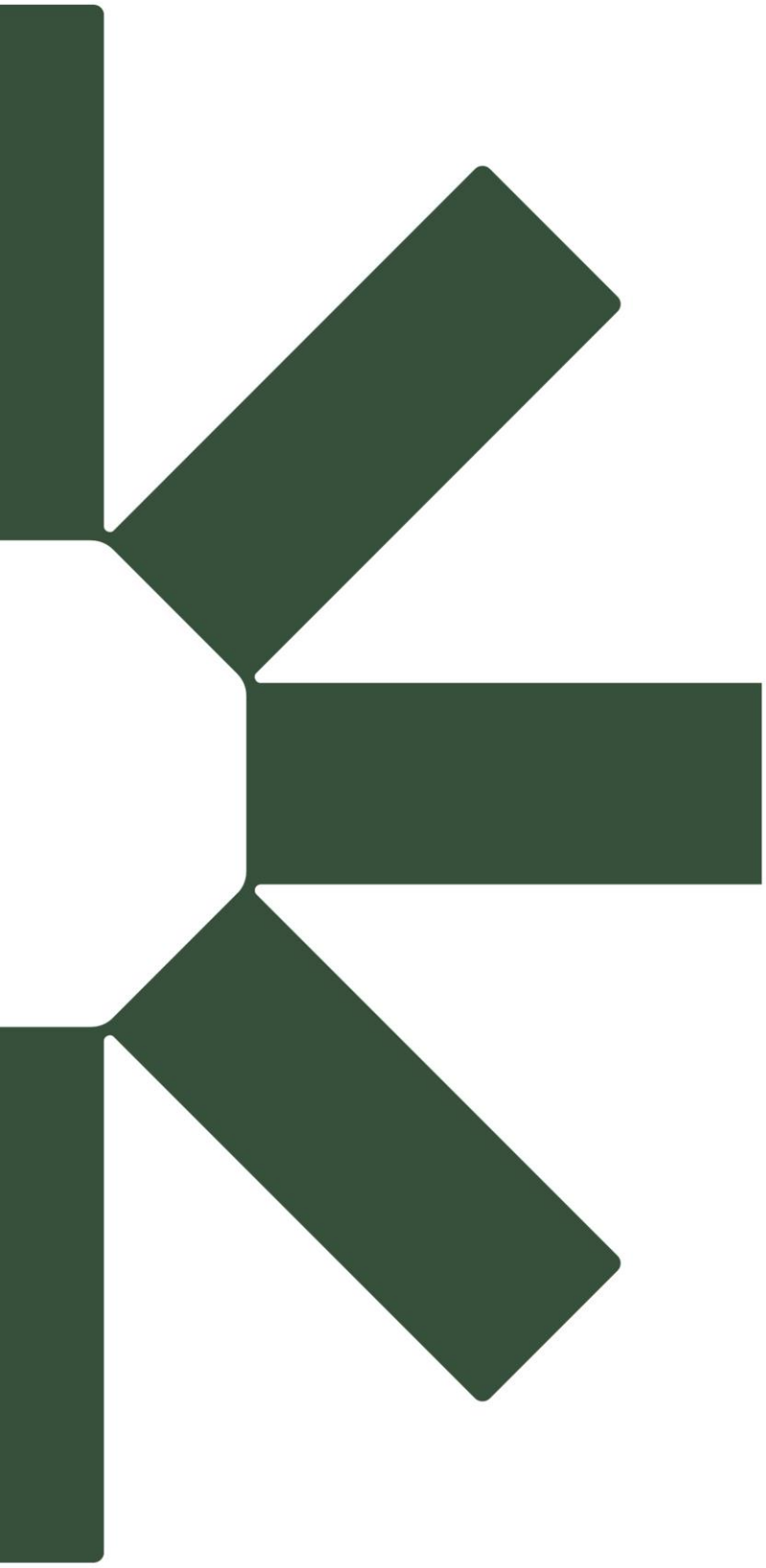


Figure C6: Wind Direction Polar Plot





Making Sustainability Happen