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Hydrock

Land at Rectory Farm (North), Yatton

Noise Impact Assessment

For *Persimmon Homes*

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Executive Summary

Hydrock Consultants is appointed to provide acoustic consultancy services in relation to the proposed development at Land at Rectory Farm (North).

A noise survey of the site was undertaken over the period of 14 February - 15 February 2023 to determine the likely prevailing noise levels of the development site during both daytime and night-time hours. This has been used to provide preliminary advice on the sound insulation and ventilation design of the façades.

BS 8233:2014 internal noise limits can be achieved in all proposed dwellings using standard double glazing and non-acoustic trickle ventilators.

An Acoustics, Ventilation and Overheating assessment has been conducted which concludes that Approved Document O internal noise level criteria can be achieved during summertime overheating periods using partially open windows.

A cumulative traffic assessment has been conducted which determined that the majority of assessed road links are to experience a negligible impact when assessed in line with DMRB criteria using calculated CRTN Basic Noise Levels for future development scenarios.

Although noise levels will increase at receptors along Shiners Elms compared to the baseline, predicted façade levels for future development scenarios remain low enough for BS 8233:2014 internal noise limits to be achieved using standard double glazing and non-acoustic trickle ventilators therefore it is seen that no further mitigation is required.

Plant Noise Limits have been set at noise sensitive receptors that should be assessed in accordance with BS 4142:2014.

Noise Impact Assessment

Land at Rectory Farm (North)

1. Introduction

Hydrock is appointed to provide acoustic consultancy services in relation to the proposed development at Land at Rectory Farm (North), Chescombe Road, Yatton, BS49 4EU.

It is recognised that this is an outline planning application (with means of access from Shiners Elms for discharge at this time) with other detailed matters for subsequent determination through reserved matters

A noise survey of the site was carried out over the period 14/02/2023 - 15/02/2023 to determine ambient noise levels affecting the proposed development and background sound levels at existing noise sensitive receptors.

These measurements have been used to determine the extent of any mitigation necessary to meet best practice guidance and local policy requirements for acoustic conditions in and around the new dwellings.

Noise emissions limits for fixed plant and equipment associated with the development have been proposed based on the existing background sound levels at receptors.

It is recognised that this is an outline planning application (with means of access from Shiners Elms for discharge at this time) with other detailed matters for subsequent determination through reserved matters.

2. Outline Description of the Development

Proposals have been made for an outline planning application for the development of up to 190 homes (including 50% affordable homes), 0.13ha of land reserved for Class E uses, allotments, car parking, earthworks to facilitate sustainable drainage systems, open space and all other ancillary infrastructure and enabling works with means of access from Shiners Elms for consideration. All other matters (means of access from Chescombe Road, internal access, scale, layout, appearance and landscaping) reserved for subsequent approval.'

The proposed development site is shown in Figure 1.

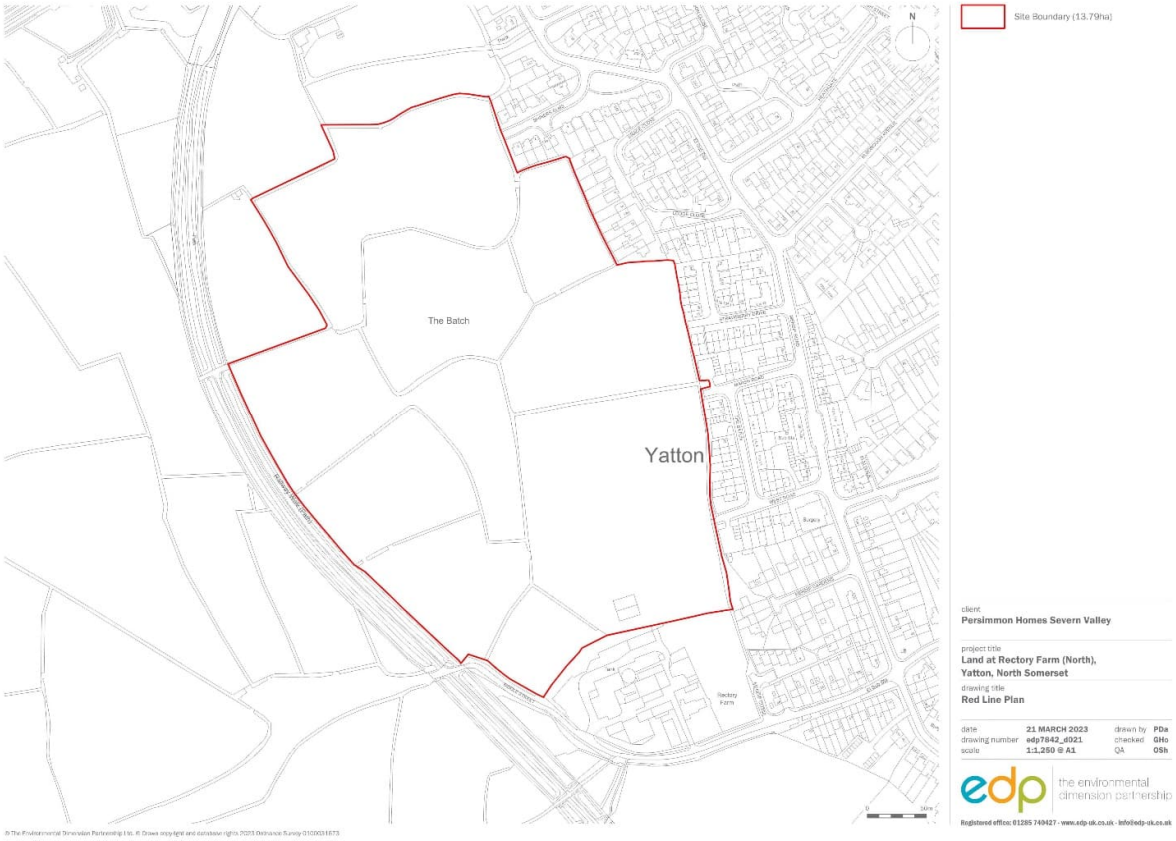


Figure 1: Proposed Development Site

3. Assessment Methodology

3.1 Policy and Guidance

The assessment methodology is based on the following policy and guidance documents:

- National Planning Policy Framework (NPPF);
- Noise Policy Statement for England (NPSE);
- World Health Organisation "Guidelines for Community Noise", Berglund et. al., 1999 (WHO Guidelines);
- Approved Document O – Overheating 2021' ("ADO").
- BS 8233:2014 – "Guidance on sound insulation and noise reduction for buildings"; and
- BS 4142:2014 + A1 2019 – "Methods for rating and assessing commercial and industrial sound".
- CRTN
- Design Manual for Roads and Bridges LA111 Noise and Vibration Revision 2

A review of the relevant planning policy and acoustics guidance is provided in Appendix A.

3.2 Local Policy

The Local Planning Authority applicable to the proposed development is North Somerset Council. The Core Strategy document covers noise and vibration as set out below.

North Somerset Core Strategy

The North Somerset Core Strategy was adopted in January 2017. Policy CS3 relates to noise and vibration and states the following.

'CS3: Environmental impacts and flood risk assessment

Development that, on its own or cumulatively, would result in air, water or other environmental pollution or harm to amenity, health or safety will only be permitted if the potential adverse effects would be mitigated to an acceptable level by other control regimes, or by measures included in the proposals, by the imposition of planning conditions or through a planning obligation.

Clause 3.38

The first part of the policy applies where any of the following problems exists or a risk of it occurring is identified, whether or not it arises as a consequence of a development proposal:

l) Noise.

o) Vibration.

Clause 3.39

The policy approach is precautionary and the aim will always be to resolve issues constructively through agreed proposals for mitigation or compensation wherever appropriate. However, there will be circumstances where this is not possible and the adverse effects predicted, even allowing for all practical mitigation measures, are such as to justify refusal. Developers can assist a speedy decision by early discussion of likely requirements for supporting technical information and by ensuring that all relevant documentation accompanies the planning application.

Clause 3.42

The National Planning Policy Framework paragraph 123 and Noise Policy Statement for England (Defra March 2010) set the planning policy context for sensitive / noise / related developments. Housing, hospitals and schools as well as other uses such as libraries and some other community facilities may be sensitive to an

unacceptable degree of noise disturbance. In applying this policy, the council will have regard to the scale, nature and type of existing land uses in the surrounding area.'

Supplementary Planning Guidance

There is no specific Supplementary Planning Guidance document for noise (or vibration), but North Somerset Council provide the following outline advice for noise assessments to support Planning Applications:

'Noise assessments should be prepared by suitably qualified acousticians. They should usually outline the existing noise environment, the potential noise sources from the development, or the noise sources likely to affect the development, together with any mitigation measures proposed.'

4. Noise Survey

4.1 Methodology

A noise survey of the site was undertaken over the period of Tuesday 14th February- Wednesday 15th February 2023 to measure ambient sound levels affecting the proposed dwellings. The noise measurement locations are shown in Figure 2.

Figure 2: Measurement Positions

Measurements were undertaken in accordance with the guidance outlined in BS 4142:2014 and BS 7445-1:2003.

Measurement positions were in free field, i.e. at least 3.5m from building facades.

Measurements were taken 1.5m above ground.

A wind shield was fitted to the monitoring equipment at all times.

Details of the monitoring locations and equipment used are provided in Table 1.

Table 1: Survey Equipment

Monitor Location	Equipment Used				Type of Measurement	Time Interval	Description of Noise Climate
	Manufacturer	Instrument	Type	Serial No./ Version			
ML 1	Rion	Sound Level Meter	NL52	01254313	Long term unattended	15 min	Passing planes and Domestic activity from nearby garages
		Pre-Amplifier	NH25	76628			
		Microphone	UC59	12139			
ML 2	01dB	Sound Level Meter	Fusion	12076	Long term unattended	$L_{90,15mins}$ else 5min	Passing planes and Farm activity from bordering farm, occasional train pass heard
		Pre-Amplifier	pre22 n°	12076			
		Microphone	40CD	288008			
ML 3 & 4	Bruel & Kjaer	Sound Level Meter	2250	3009207	Short term attended	See table 4	
		Pre-Amplifier	ZC 0032	23772			
		Microphone	4189	3005149			
ML 1	Rion	Acoustic Calibrator	NC74	35157401	Calibration	N/A	94.0 dB @ 1kHz, drift within normal tolerances
ML 2	01dB	Acoustic Calibrator	CAL31	89092	Calibration	N/A	
ML 3 & 4	Bruel & Kjaer	Acoustic Calibrator	4231	3015450	Calibration	N/A	

A record of the weather conditions as published by www.timeanddate.com is presented in Table 2.

Table 2: Weather Data

Period	Mean Temperature Degrees Celsius	Events	Wind Speed m/s	Prominent Wind Direction
Tues 14 Feb 2023	12	Clear	2	S
Wed 15 Feb 2023	11	Overcast	2	SW

Average recorded wind speeds during the survey did not exceed 5 m/s and therefore wind noise would not have significantly affected measurements. There was no rainfall recorded during the survey.

5. Survey Results

5.1 Long Term Measurements

Three main acoustic parameters were measured using a time interval as stated in Table 1:

- $L_{Aeq,T}$ dB, defined as the 'A' weighted equivalent continuous sound pressure level. Over a defined time period 'T', it is the sound pressure level equivalent to the acoustic energy of the fluctuating sound signal. It is often referred to as the 'ambient noise level'.
- $L_{Amax,F,T}$ dB, defined as the 'A' weighted maximum sound pressure level that occurred during the time period 'T' acquired using a 'fast' time weighting (i.e. a sample every 125ms). It is commonly used to describe the highest noise level that occurred during an event such as a vehicle pass-by.
- $L_{A90,T}$ dB, defined as the 'A' weighted sound pressure level exceeded for 90% of the measurement period 'T'. It is a statistical parameter and cannot be directly combined with other acoustic parameters. It is generally used to describe the prevailing background noise level.

The noise level time histories over the full measurement period for each day at both Positions is presented in Appendix B.

A summary of the 16-hour daytime (0700hrs to 2300hrs) and 8-hour night time (2300hrs to 0700hrs) $L_{Aeq,T}$ for both positions are presented in Table 3. The $L_{Aeq,T}$ levels presented are the logarithmic average of the period.

Additionally presented is a summary of the average L_{Amax} levels during daytime (0700hrs to 2300hrs), and the levels exceeded 10 times during night time (2300hrs to 0700hrs as well as the lowest typical day (07:00 - 23:00 hours) and night-time (23:00 - 07:00 hours) background sound levels during survey. The full background sound measurement results are presented in Appendix B in the form of distribution plots showing the number of 15-minute background sound level measurements at each integer for each period.

Table 3: Summary of Long term Measured Noise Levels

Measurement Location	Period	Average (dB, $L_{Aeq,t}$) **16**hour day, **8**hour night	Background mode (dB, $L_{A90,15min}$)	Maximum (dB, $L_{Amax\ 5min}$)	Maximum (dB, $L_{Amax,5min}$) exceeded **10** times
ML 1	Daytime	51	36	79	74
	Night time	46	31	74	56
ML 2	Daytime	51	37	79	75
	Night time	44	33	73	61

5.2 Short term Attended Measurement

Short term attended measurements were undertaken at ML3 and ML4 on 14/02/2023. The results are presented in Table 4.

Table 4: Short term attended measurement 3

Position	Start	Duration	Average Level (dB, $L_{Aeq,\ t}$)	Background Level (dB, L_{A90})	Maximum Level (dB, L_{Amax})	Acoustic climate
ML **3**	14/02/2023 12:36	5 min	41	39	50	Distant M5 traffic, bird song
ML **4**	14/02/2023 12:48	15 min	49	38	67	Distant M5 traffic, Louder bird song, 2 jet plane passes

5.3 Assessment

A description of the impact of predicted facade noise levels is provided in Table 7 using following guidance:

- BS8233:2014;
- World Health Organisation (WHO) Guidelines for Community Noise, 1999;
- Professional Practice Guidance – Planning and Noise (ProPG), ANC, IOA and CIEH, May 2017;
- Acoustics, Ventilation and Overheating – Residential Design Guide ANC, IOA, Jan 2020.

Table 5: Significance Criteria for Road Traffic and other Anonymous Noise affecting Dwellings

Magnitude of Impact	Daytime External Noise Level, dB $L_{Aeq\ 16\ hour}$ (**07:00 23:00** hours)	Night time External Noise Level, (dB $L_{Aeq\ 8\ hour}$) (**23:00 07:00** hours)		External Amenity (Gardens and Balconies) Without Design Mitigation	Description of Effect Without Design Mitigation
Low	< 56	<50	<65	External areas won't require mitigation.	Lowest Observed Adverse Effect. Good internal acoustic conditions will be achieved with windows closed and ventilation provided by a trickle vent. When windows are open to cool an overheating room, conditions will normally still be reasonable, as defined in BS8233:2014.

The EIA Screening Opinion from North Somerset Council made reference to rail and concrete plant noise however no noise was experienced from the concrete plant and rail noise was low impact given the frequency of train passes and distance to the development boundary.

6. Acoustic Specification of Façade Elements

Sound insulation calculations for habitable rooms within the proposed development have been prepared in accordance with BS EN 12354-3 to determine the extent of the sound insulation required to control noise levels and achieve internal noise limits recommended in BS 8233:2014.

Calculations have been undertaken on the basis of:

- Brickwork exterior finish
- Lightweight internal plasterboard linings (2x12.5mm wallboard or equivalent).

Calculated to provide the minimum sound insulation of 51 dB R_w.

Alternative façade constructions and sound insulation values may be suitable. Suitability would be subject to detailed assessment and further calculations at the appropriate design stage.

The required window and ventilator sound insulation performances are set out in Tables 6 with a view to meeting the internal requirements of BS8233:2014

Table 6: Required Window and Ventilator Acoustic Performance

Façade Element	Minimum Required Acoustic Performance	
	Living Room	Bedroom
Glazing (dB, R_w)	31	31
Trickle Ventilator (dB, $D_{n,e,w}$)	23	23

Calculations with example building materials are given in Appendix D as the design progresses, qualified comment should be sought on acoustic suitability and evidence of lab performance values should be made available by manufacturers. If glazing areas / sizes change, then the assessment should be revisited.

7. Acoustics, Ventilation and Overheating

An Acoustics, Ventilation, and Overheating assessment has been undertaken to enable compliance with the acoustic requirements of Building Regulations Approved Document O.

7.1.1 Target Criteria

The residential development will be required to comply with the requirements of 'Approved Document O – Overheating 2021' ("ADO").

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

> *'...the overheating mitigation strategy should take account of the likelihood that windows will be closed during sleeping hours (11pm to 7am).*
>
> *Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits:*
>
> *a. 40 dB $L_{Aeq,T}$, averaged over 8 hours (between 11pm and 7am).*
>
> *b. 55 dB L_{AFmax}, more than 10 times a night (between 11pm and 7am).'*

7.2 Overheating Assessment

An initial assessment has been undertaken to determine the extent of facades which are able to use 'partially open' windows to mitigate summertime overheating during night time periods to achieve Approved Document O mandatory internal noise criteria.

The assessment has been undertaken based on the as-measured environmental noise levels, the predicted façade noise levels and the corresponding predicted daytime and night time internal ambient noise levels, as based on a typical open window providing a minimum of 9 dB attenuation, seen to be representative of a 'partially open window'. Results of the assessment are shown below in Table 7:

Table 7: Approved Document O Noise Level Assessment

	Night Time Average (dB, $L_{Aeq,8\ hour}$)	Night Time Maximum (dB, $L_{Amax,\ 5min}$) exceeded 10 times
Predicted Façade Noise Levels	46	61
Predicted Internal Noise Levels with Partially Open Window	37	52

Assessment results show that predicted internal noise levels with a partially open window achieve the Approved Document O requirements, therefore partially open windows can be used to mitigate overheating. Further assessment of open areas will be required at a later stage.

7.3 Purge Ventilation Requirements

The use of opening windows for rapid purge ventilation (i.e. to expel paint fumes or burnt toast odours as per Approved Document F) is acceptable at all facade. This is on the basis that windows will be opened for short periods and may be closed at occupant discretion once odours are purged.

8. External Amenity Areas

The development is proposed to include external amenity areas, such as gardens and balconies.

BS 8233:2014 provides guidance on external noise levels for the protection of private amenity spaces of residential properties and states that:

'It is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, 55 dB $L_{Aeq,T}$ should be regarded as the upper guideline value.'

However, it is recognised that these guideline values are not achievable in all circumstances where development might be desirable. 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.

The survey locations indicate that most of the proposed garden areas will fall below the ideal 50 dB L_{Aeq} Lower guideline value and all will fall below the 55 dB acceptable upper guideline value.

9. Cumulative Road Traffic Assessment

9.1 Assessment Criteria

9.1.1 Design Manual for Roads and Bridges, LA 111 Noise and Vibration

An approach to assessing noise and vibration effects from roads is described in Design Manual for Roads and Bridges (DMRB). The DMRB approach to assessing noise and vibration impact is to compare the noise levels for the 'do something' (with scheme) scenario against levels that would occur if the proposed development did not take place, i.e. 'do minimum' (without scheme) scenario.

The assessment methodology considers the change in noise levels due to the scheme in the short and long term and provides a description of the magnitude (reproduced in Table 8).

Table 8: Short-Term and Long-Term Magnitude of Change in Road Traffic Noise, according to DMRB

Level of Magnitude	Short Term Change in Noise Level L**10**,**18**hour dB(A)	Long Term Change in Noise Level L**10**,**18**hour dB(A)	Significance of Impact – as described in DMRB
High	≥ 5.0	≥ 10.0	Major
Medium	3.0-4.9	5.0-9.9	Moderate
Low	1.0-2.9	3.0-4.9	Minor
Negligible	0.1-0.9	0.1-2.9	Negligible
	0.0	0.0	No Change

DMRB is intended for use in the assessment of new or altered highways. However, it provides a useful reference for considering the impact of traffic increases due to other types of development.

9.2 Assessment

In order to assess changes in noise levels caused by increases in traffic flows, Hydrock have calculated Basic Road Noise Level ("BNL") for each modelled road link. The BNL has been calculated based on the methodology described in CRTN and traffic data provided by the transport planners. The BNL describes the annual average road noise level (L_{A10}, dB) over 18-hours at a normalised distance of 10m from the kerb. The BNL is used to give an indication of the noise change due to the traffic of the Proposed Development.

Some of the road links included within the assessment have low predicted flows (<1000 veh/18-hour day). CRTN states the following with regards to low traffic flows:

> *"Calculations of noise level for traffic flows below 50 veh/h or 1000 veh/18-hour day are unreliable and measurements should be taken when evaluating such cases."*

As noted previously this is an outline planning application as Hydrock are unable to take measurements of the future Do-Something or Do-Minimum scenarios, and no alternative methodology for calculating noise levels from roads with low traffic flows is available, Hydrock have used the CRTN BNL calculation for all road links associated with the proposed development.

Table 9 presents the predicted CRTN BNL values for the 2025 Do-Minimum and Do-Something scenarios, along with the predicted dB noise change.

Appendix E contains the traffic flow data received from the transport planners used to calculate CRTN BNL.

Table 9: Summary of Cumulative Road Traffic Increases on Noise Levels

Road Link		Predicted CRTN BNL (dB, $L_{A10,18\ hour}$)		dB Noise Change
No.	Name	**2025** plus Committed Dev. (Do-Minimum)	**2025** plus Committed Dev. Plus Dev. (Do-Something)	Change due to proposed development
1	Shiners Elms	41.2[1]	52.9[1]	11.7
2	Mendip Road N	56.5	57.4	0.9
3	Grassmere Road	56.3	57.2	0.9
4	B3133 High Street N	66.2	66.4	0.2
5	Mendip Road S	56.5	57.3	0.8
6	Heathgate	54.3[1]	55.7[1]	1.4
7	Chescombe Road	57.2	57.7	0.5
8	B3133 High Street S	65.7	65.8	0.1

[1]Traffic flows below 1000 veh/18-hour day therefore calculations of noise level may be unreliable.

9.2.1 Analysis

Table 9 shows that the predicted increase in road noise levels for the majority of road links assessed is less than 1 dB, and therefore impact can be considered negligible when assessed in line with DMRB criteria as presented in Table 8.

Road Link 6, Heathgate, is predicted to see a 1.4 dB increase in noise levels caused by traffic flow associated with the proposed development. Impact for this road link and associated receptors can therefore be considered minor when assessed in line with DMRB Short Term change criteria as presented in Table 8.

9.2.1.1 Road Link 1 – Shiners Elms

Road Link 1, Shiners Elms, is currently a Cul-de-sac with no through access, and is proposed to become an access road for the proposed development. As such, there is a significant increase in predicted traffic flows between the Do-Minimum and Do-Something scenarios, resulting in a significant increase in calculated CRTN BNL values.

In order to further assess the potential impact on existing noise sensitive receptors located along Shiner's Elms, Hydrock have inputted the calculated CRTN BNL for both scenarios into 'CadnaA' Environmental Noise Modelling software, and have calculated predicted noise levels at the facades of all impacted dwellings.

Table 10 presents the predicted façade noise level for the 'worst-case' receptor along Shiners Elms, which is predicted to undergo the highest change in predicted façade noise levels between the Do-Minimum and Do-Something scenarios. It can be seen that there is a predicted 7 dB maximum change in predicted façade noise level. Appendix F contains noise plots exported from 'CadnaA' Environmental Noise Modelling software which show predicted façade noise levels for all receptors along Shiners Elms.

Table 10: Summary of Worst-case Noise Impact on receptors along Shiners Elms.

Link Road Receptors	Predicted Façade Noise Level – Worst Case Receptor along Shiners Elms (dB, $L_{A10,18\ hour}$)		dB Noise Change
	2025 plus Committed Dev. (Do Minimum)	**2025** plus Committed Dev. Plus Dev. (Do-Something)	Change due to proposed development
Shiners Elms	46	53	7

Table 10 shows that the maximum predicted increase in façade noise level for receptors along Shiners Elms is 7 dB. When assessed in line with the DMRB criteria presented in Table 8, this suggests a 'major' impact is likely when assessed against the baseline. However, it is important to assess the absolute noise level, and consider this in context. Receptors situated along Mendip Road and other local residential roads are likely to be currently experiencing façade noise levels that exceed predicted facade noise levels at Shiners Elms for both modelled scenarios.

The predicted façade noise levels at receptors situated along Shiners Elms are low enough such that BS 8233:2014 internal ambient noise levels can be achieved within Living Rooms and Bedrooms using standard double glazing and non-acoustic trickle ventilators for both modelled scenarios, which is likely to be the current façade specification for the existing receptors.

External noise levels within back garden amenity areas for all receptors along Shiners Elms are predicted to fall comfortably below BS 8233:2014 upper guideline values of 55 dBA for both scenarios.

It is therefore seen that, although assessment of changes in noise levels in line with DMRB criteria suggest a 'major' impact is likely for receptors along Shiners Elms when assessed against the baseline, predicted absolute façade noise levels remain low and internal noise levels within all affected dwellings are likely to readily achieve BS 8233:2014 criteria with no additional mitigation.

10. Plant Noise Limits

The proposed development 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).

It is proposed to control building services emissions as per the Table below.

Table 11: Proposed Plant Noise Limits

Period	Measured Background Sound Level (dB L_{A90})	Required Margin Below Background (dB)	Proposed Plant Noise Limit (dB L_{Ar})
Day (07:00 to 23:00)	36	0	36
Night (23:00 to 07:00)	31	0	31

Hydrock propose that the rating noise level from any plant cannot exceed the pre-existing background noise levels.

The noise limits above are 'free-field' levels at any height above ground and 1.0m from the nearest noise sensitive property façade. It applies to the overall cumulative operation of building services plant 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 for the cumulative level from all simultaneously operational plant to not exceed the above level.

If the plant noise will contain specific tones or intermittent character, then further penalties should be applied.

During night time periods, noise contribution would need to be equal or less than the typical existing background noise levels, which indicates a low impact when assessed in accordance with BS 4142:2014.

In absolute terms 36 dB and 31 dB is low and internal noise levels in a bedroom at night are predicted to achieve guidance internal noise level criteria presented within BS 8233:2014 and the WHO Guidelines for Community Noise, even when assessed through an open window.

11. Summary and Conclusions

Hydrock Consultants is appointed to provide acoustic consultancy services in relation to the proposed development at Land to the north of Rectory Farm, Yatton.

A noise survey of the site was undertaken over the period of 14 February - 15 February 2023 to determine the likely prevailing noise levels of the development site during both daytime and night-time hours. This has been used to provide preliminary advice on the sound insulation and ventilation design of the façades.

BS 8233:2014 internal noise limits can be achieved using standard double glazing and non-acoustic trickle ventilators.

An Acoustics, Ventilation and Overheating assessment has been conducted which concludes that Approved Document O internal noise level criteria can be achieved during summertime overheating periods using partially open windows.

A cumulative traffic assessment has been conducted which determined that the majority of assessed road links are to experience a negligible impact when assessed in line with DMRB criteria using calculated CRTN Basic Noise Levels for future development scenarios.

Although noise levels will increase at receptors along Shiners Elms compared to the baseline, predicted façade levels for future development scenarios remain low enough for BS 8233:2014 internal noise limits to be achieved using standard double glazing and non-acoustic trickle ventilators therefore it is seen that no further mitigation is required.

Plant Noise Limits have been set at noise sensitive receptors that should be assessed in accordance with BS 4142:2014.

In conclusion, assuming the mitigation measures and design requirements outlined in this report are implemented, the development will meet the requirements of National and Local Policy and guidance.

Appendix A Relevant guidance

Noise policy Statement for England (NPSE)

The NPSE is intended to apply to environmental noise and neighbourhood noise of all forms but excluding noise occurring in the workplace.

The NPSE cites concepts from toxicology and advises that impacts should be considered with regards to health effects and quality of life:

> *"There are two established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation. They are:*
>
> *NOEL No Observed Effect Level*
>
> *This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.*
>
> *LOAEL Lowest Observed Adverse Effect Level*
>
> *This is the level above which adverse effects on health and quality of life can be detected.*
>
> *Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.*
>
> *SOAEL – Significant Observed Adverse Effect Level*
>
> *This is the level above which significant adverse effects on health and quality of life occur."*

The NPSE does not provide any numerical thresholds for determining the magnitude of a noise impact. Moreover, the document advises that it is not possible to have *"a single objective noise-based measure…that is applicable to all sources of noise in all situations"*. It further advises that the sound level at which an adverse effect occurs is *"likely to be different for different noise sources, for different receptors and at different times."*

National Planning Policy Framework

The 'National Planning Policy Framework, July 2021, Ministry of Housing, Communities and Local Government' (NPPF) sets out the United Kingdom Government's planning policies for adoption in England and how they should be applied.

The main aims of the NPPF are set out in section 11, as stated below.

'Planning policies and decisions should:

- *Encourage multiple benefits from both urban and rural land, including through mixed use schemes and taking opportunities to achieve net environmental gains – such as developments that would enable new habitat creation or improve public access to the countryside;*
- *recognise that some undeveloped land can perform many functions, such as for wildlife, recreation, flood risk mitigation, cooling/shading, carbon storage or food production;*
- *give substantial weight to the value of using suitable brownfield land within settlements for homes and other identified needs, and support appropriate opportunities to remediate despoiled, degraded, derelict, contaminated or unstable land;*
- *promote and support the development of under-utilised land and buildings, especially if this would help to meet identified needs for housing where land supply is constrained and available sites could be used more effectively (for example converting space above shops, and building on or above service yards, car parks, lock-ups and railway infrastructure); and*

- *support opportunities to use the airspace above existing residential and commercial premises for new homes. In particular, they should allow upward extensions where the development would be consistent with the prevailing height and form of neighbouring properties and the overall street scene, is well designed (including complying with any local design policies and standards), and can maintain safe access and egress for occupiers.'*

The NPPF makes reference to guidance contained in 'Noise Policy Statement for England (NPSE), March 2010, Department for Environmental, Food and Rural Affairs' (NPSE). The NPSE is intended to apply to all forms of noise, other than noise occurring in the workplace and includes environmental noise and neighbourhood noise of all forms.

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

Planning Practice Guidance

The Ministry of Housing, Communities and Local Government publishes guidance on the internet in the form of the 'Planning Practice Guidance' (PPG). The guidance of PPG provides greater level of details in relation to the relevance of noise for planning following the introduction of the NPPF and NPSE.

The Planning practice guidance will be updated in due course to reflect changes to the National Planning Policy Framework. The most recent version of the noise guidance is from March 2014. Should this guidance be updated, the 2014 version will be superseded.

It is stated under the heading 'How to Determine the Noise Impact' that the following should be considered by local authorities:

- *'whether or not a significant adverse effect is occurring or likely to occur;*
- *whether or not an adverse effect is occurring or likely to occur; and*
- *whether or not a good standard of amenity can be achieved.'*

The assessed noise should include the overall effect of the development, inclusive of the construction stage once completed.

The guidance process includes identifying where noise exposure is above or below the significant observed adverse effect level and the lowest observed adverse effect level for a given situation as required by the NPSE.

The observed effects are defined in Table 1 which is taken from the section headed '*How to Recognise when Noise could be a concern?*'

Table 12: PPG Noise Guidance

Perception	Examples of Outcome	Increasing Effect Level	Action
Not noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable 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

Perception	Examples of Outcome	Increasing Effect Level	Action
		Lowest Observed Adverse Effect Level	
Noticeable 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; closing windows for some of the time because of the noise. Potential for non-awakening sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
		Significant Observed Adverse Effect Level	
Noticeable and disruptive	The noise causes a material change in behaviour and / or attitude, e.g. having to keep windows closed most of the time, avoiding certain activities during periods of intrusion. 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

Under the section heading '*What factors influence whether noise could be a Concern?*' the subjective nature of noise is discussed. It is stated that there is no simple relationship between noise levels and the impact on those affected. It is all dependent on how various factors combine in particular situations, which include:

- *'The source and absolute level of the noise together with the time of day it occurs. Some types and level of noise will cause a greater adverse effect at night than if they occurred during the day – this is because people tend to be more sensitive to noise at night as they are trying to sleep. The adverse effect can also be greater simply because there is less background noise at night;*
- *For non-continuous sources of noise, the number of noise events, and the frequency and pattern of occurrence of the noise;*
- *The spectral content of the noise (i.e. whether or not the noise contained particular high or low frequency content) and the general character of the noise (i.e. whether or not the noise contains particular tonal characteristics or other particular features). The local topology and topography should also be taken into account along with the existing and, where appropriate, the planned character of the area.'*
- *'Consideration should also be given to whether adverse internal effects can be completely removed by closing windows and, in the case of new residential development, if the proposed mitigation relies on windows being kept closed most of the time. In both cases a suitable alternative means of ventilation can be found in the Building Regulations;*
- *In cases where existing noise sensitive locations already experience high noise levels, a development that is expected to cause even a small increase in noise may result in a significant adverse effect occurring even though little to no change in behaviour would be likely to occur.*

» *If external amenity spaces are an intrinsic part of the overall design, the acoustic environment of those spaces should be considered so that they can be enjoyed as intended.'*

Similarly, to the NPSE, no specific noise parameters are defined in the guidance or target noise levels established for comparison.

ProPG: Planning & Noise - Professional Guidance on Planning & Noise - New Residential Development

The Professional Practice Guidance on Planning and Noise (May 2017) provides guidance on transportation noise affecting new residential developments. The guidance was prepared by a working group formed from members of the Institute of Acoustics (IoA), the Association of Noise Consultants (ANC) and the Chartered Institute of Environmental Health (CIEH). It is specifically for assessing noise from predominantly transportation sources. The guidance promotes a two stage assessment approach:

» Stage 1 – Initial Site Noise Risk Assessment; and,

» Stage 2 – Full assessment and systematic appraisal of four key elements.

The Stage 1 initial risk assessment provides an indication of the likely risk of adverse effects from noise assuming in the first instance that no mitigation were included within the proposals. The risk assessment is based on measured or predicted noise levels during a "typical worst case" 24-hour period. Figure 1 of the document presents the Stage 1 assessment and indicates that higher noise levels result in increased noise risk without mitigation. This is summarised in Figure A1 below. Figure A1 (Figure 1 of ProPG) does not directly relate noise levels to specific risk categories although a negligible noise risk broadly correlates to noise levels not exceeding 50dB $L_{Aeq, 16hr}$ (daytime) and 40 dB $L_{Aeq, 8hr}$ (night).

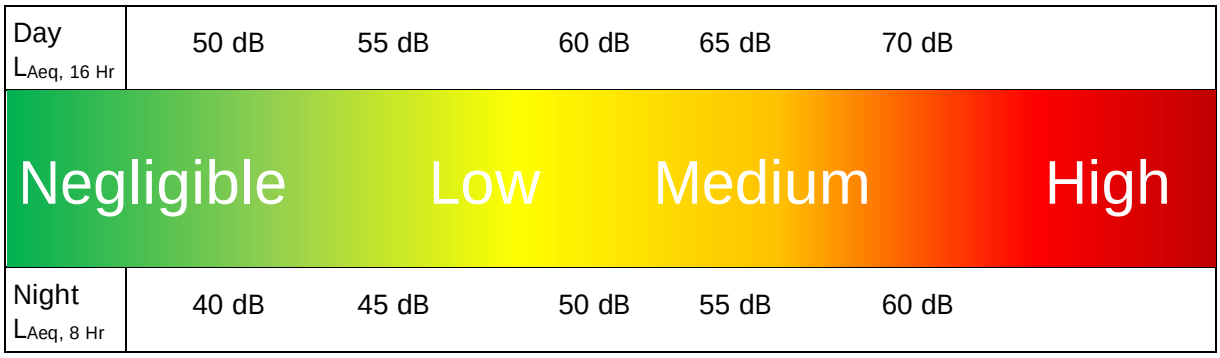


Figure A1: ProPG Stage 1 Noise Risk Assessment (adapted from ProPG Figure 1)

Where the initial noise assessment indicates a higher risk of adverse noise effects, a Stage 2 assessment is required. The Stage 2 assessment is more involved than the Stage 1 and requires systematic consideration of four elements:

Element **1** – Good Acoustic Design Process

The acoustic design of a building and any mitigation should be considered at an early stage of the design process. Following a good acoustic design process is considered a part of achieving a good design as required by the NPSE and NPPF. Guidance on the requirements for providing an Acoustic Design Statement (ADS) is given in Figure 3 of ProPG.

Element **2** – Internal Noise Level Guidelines

Guidance on internal noise levels can be found in BS8233:2014 Guidance on sound insulation and noise reduction for buildings. Figure 2 of the ProPG summarises the guidance from BS8233 but with a number of additions. The internal noise criteria presented in Figure 2 of ProPG and the relevant notes are presented in Table 1 below.

Element **3** – External Amenity Area Noise Assessment

The guidance of the ProPG reflects and extends on the advice of BS8233 and PPG Noise. The guidance in the ProPG presents five points for consideration, the first being "If the external amenity spaces are an intrinsic part of the overall design, the acoustic environment of those spaces should be considered so that they can be enjoyed as intended".

Element **4** – Assessment of Other Relevant Issues

"Other relevant issues" within the context of the ProPG include relevant national and local policy which may have a bearing on the development.

Design Manual for Roads and Bridges LA111 Noise and Vibration Revision 2

An approach to assessing noise impacts from roads is described in Design Manual for Roads and Bridges (DMRB). The DMRB approach to assessing noise impact is to compare the noise levels for the 'do something' (with scheme) scenario against levels that would occur if the proposed development did not take place, i.e 'do minimum' (without scheme) scenario.

The assessment methodology considers the change in noise levels due to the scheme in the short and long term and provides a description of the magnitude (reproduced in Table 11.6). The short-term impact relates to the noise change on the first day of operation of the scheme. The long-term impact relates to the difference in noise levels between the do minimum scenario in the opening year and the do something scenario 15 years in the future. It should be noted that the DMRB methodology is intended for the assessment of noise from new and altered highways and is not applicable to this scheme in all regards. Nevertheless, it provides a useful objective method of assessing the noise impact resulting from increases in traffic flow due to the PD.

Table 13: Short-Term and Long-Term Magnitude of Change in Road Traffic Noise, according to DMRB

Level of Magnitude	Short Term Change in Noise Level $L_{10,18hour}$ dB(A)	Long Term Change in Noise Level $L_{10,18hour}$ dB(A)
High	≥ 5.0	≥ 10.0
Medium	3.0-4.9	5.0-9.9
Low	1.0-2.9	3.0-4.9
Negligible	**0.1-0.9**	**0.1-2.9**

British Standard 4142:2014+A1:2019

The standard method for assessing noise from commercial and industrial premises is British Standard BS 4142 *"Method for rating and assessing industrial and commercial sound"*. The standard is applicable for assessing noise affecting *"dwellings or premises used for residential purposes"*.

A BS 4142 assessment is made by determining the difference between the specific noise under consideration and the background sound level, as represented by the L_{A90} parameter, determined in the absence of the commercial sound. The L_{A90} parameter is defined as the level exceeded for 90% of the measurement time. This parameter therefore excludes short duration noise events, such as individual vehicle movements, and represents the underlying continuous noise.

The commercial or industrial sound is assessed in terms of the equivalent continuous noise level, L_{Aeq}. The equivalent continuous noise level (L_{Aeq}) of the commercial or industrial sound, over the applicable assessment period, is known as the specific sound level.

A character correction penalty can be applied to the specific sound level where the commercial noise exhibits distinguishable tones, impulsiveness, intermittency or other characteristics which "*are otherwise readily distinctive against the residual acoustic environment*".

The specific noise level with the character correction (if necessary) is known as rating level (L_{Ar}) and the difference between the background noise and the rating level is determined to make the BS 4142 assessment. The following is then considered.

"*a) Typically, the greater this difference, the greater the magnitude of the impact.*

b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.

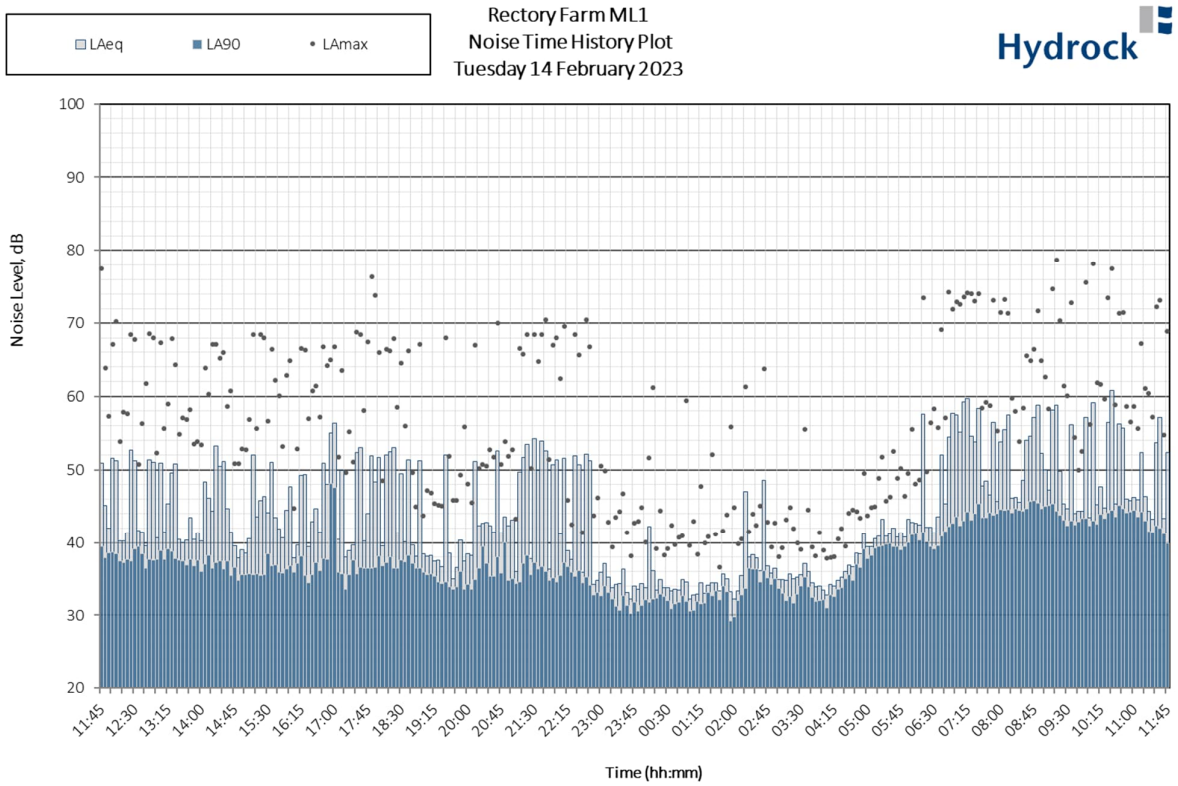
d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."

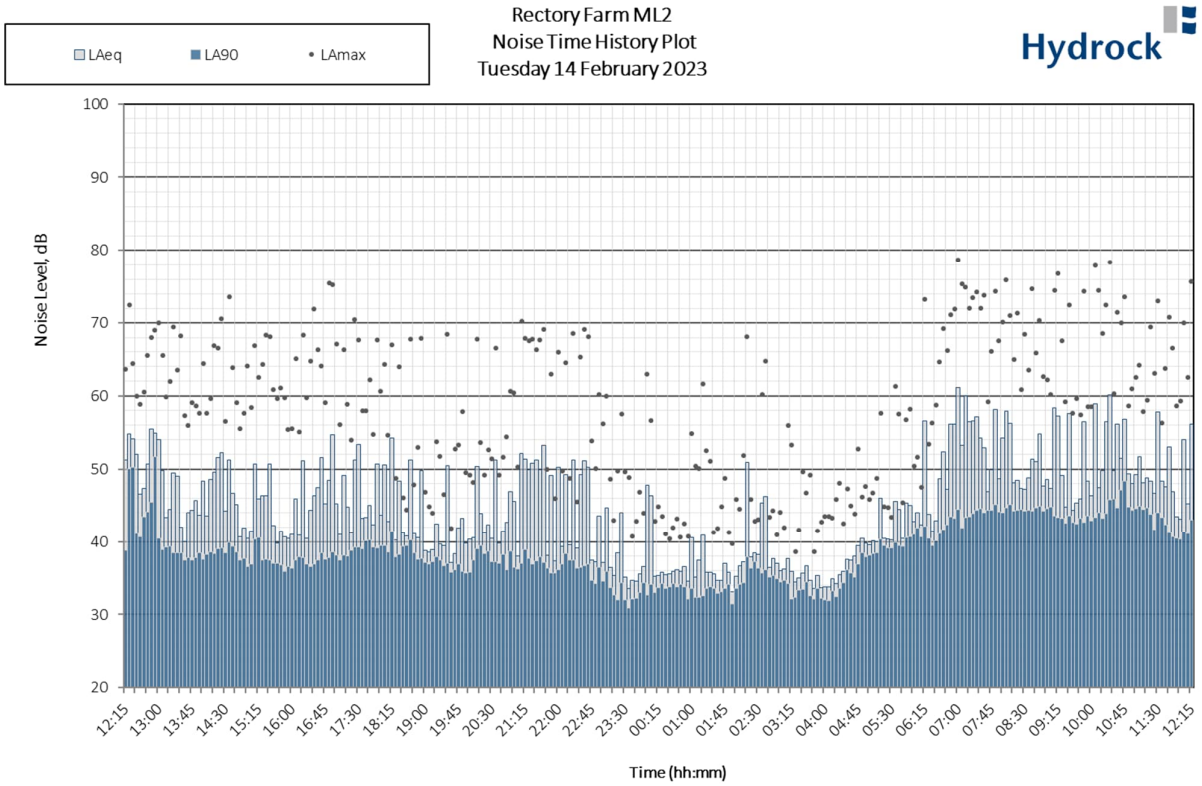
The standard highlights the importance of considering the context in which a sound occurs. Factors including the absolute sound level, the character of the sound, the sensitivity of the receptor and the existing acoustic character of the area should be considered when assessing the noise impact. The use of the proposed premises for short term holiday rentals is also pertinent to the consideration of context.

The standard notes the need to consider absolute sound levels where background sound levels are low:

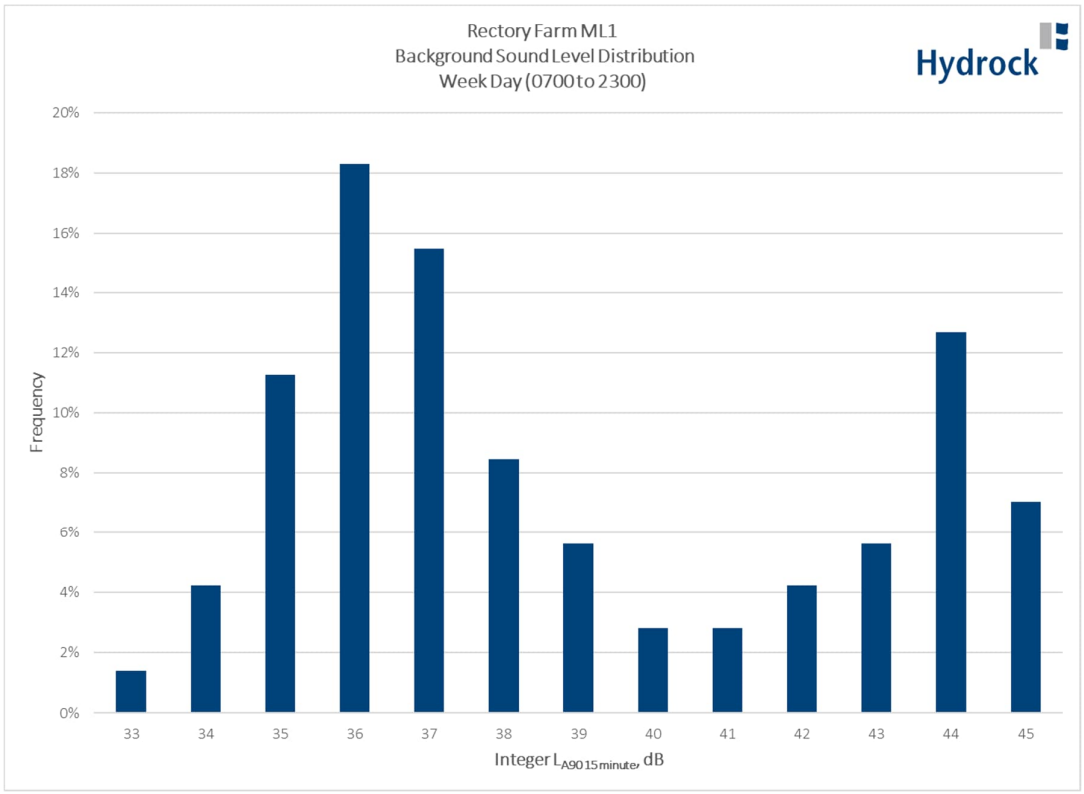
"*For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low. Where the background sound levels and rating level are low, absolute levels might be as, or more, relevant than margin by which the rating level exceeds the background. This is especially true at night.*"

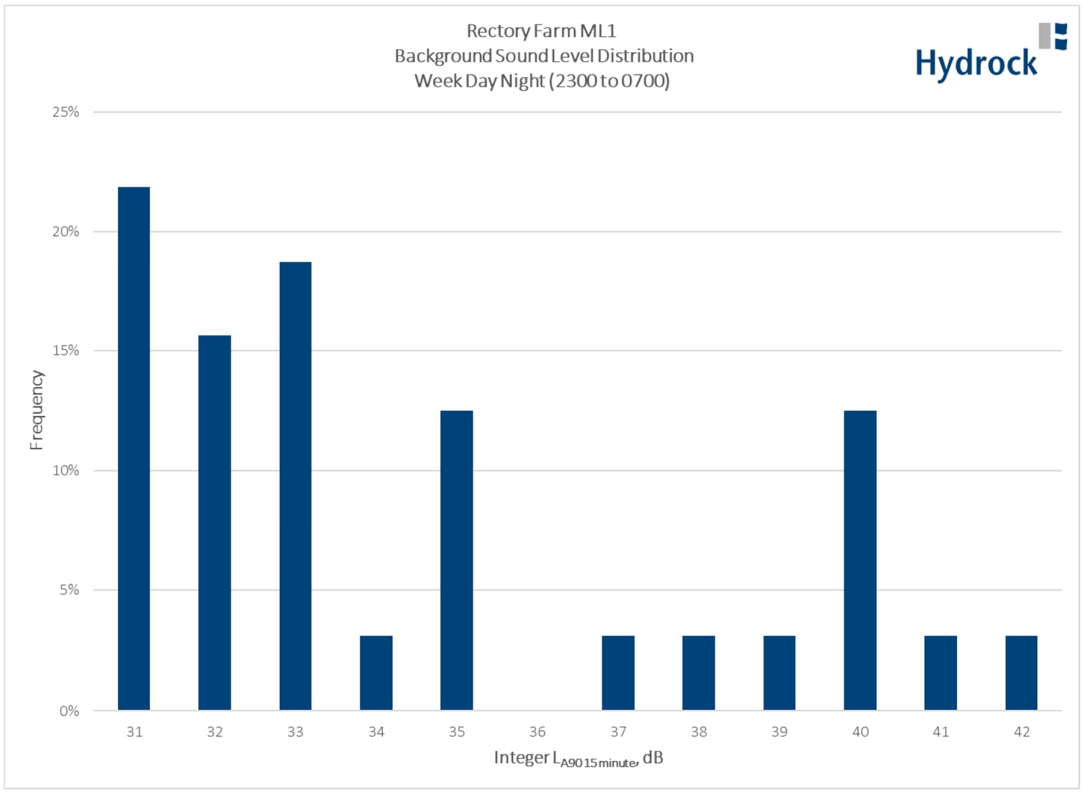
Appendix B Measurement Time Histories

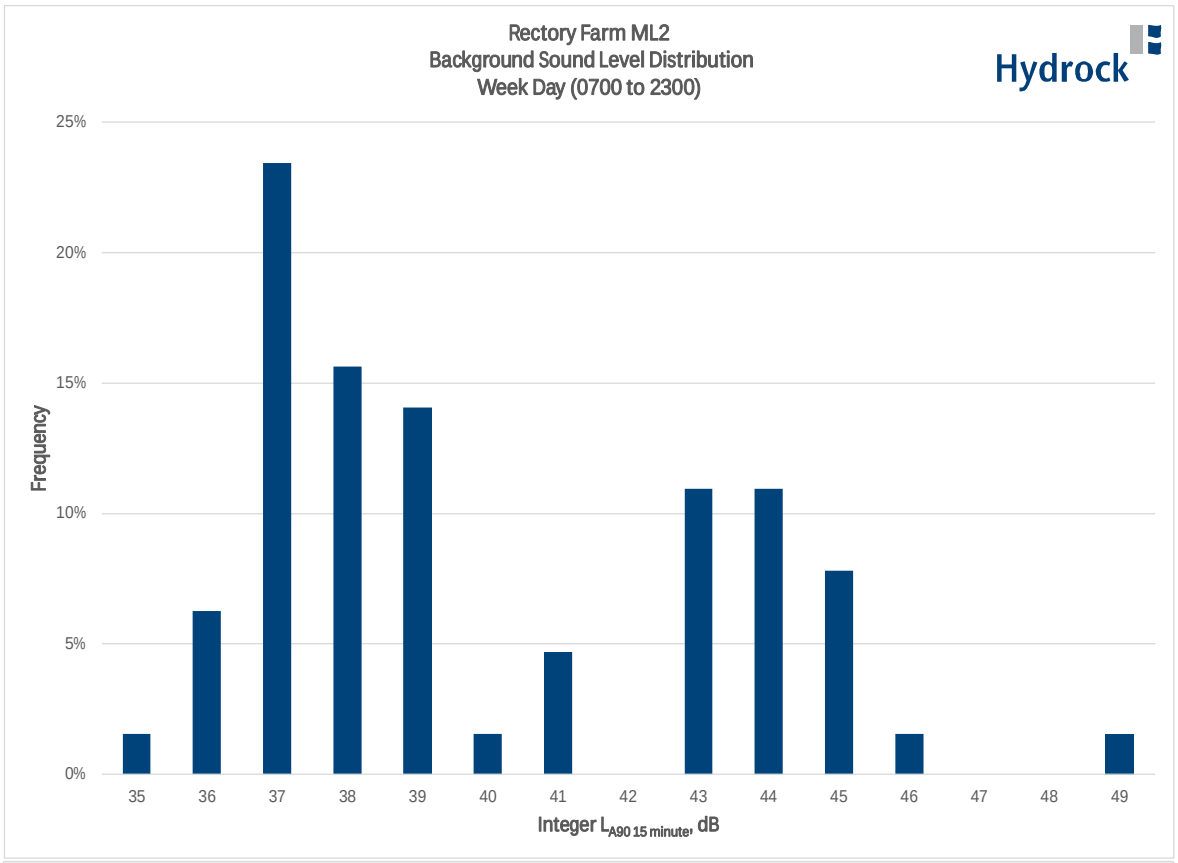


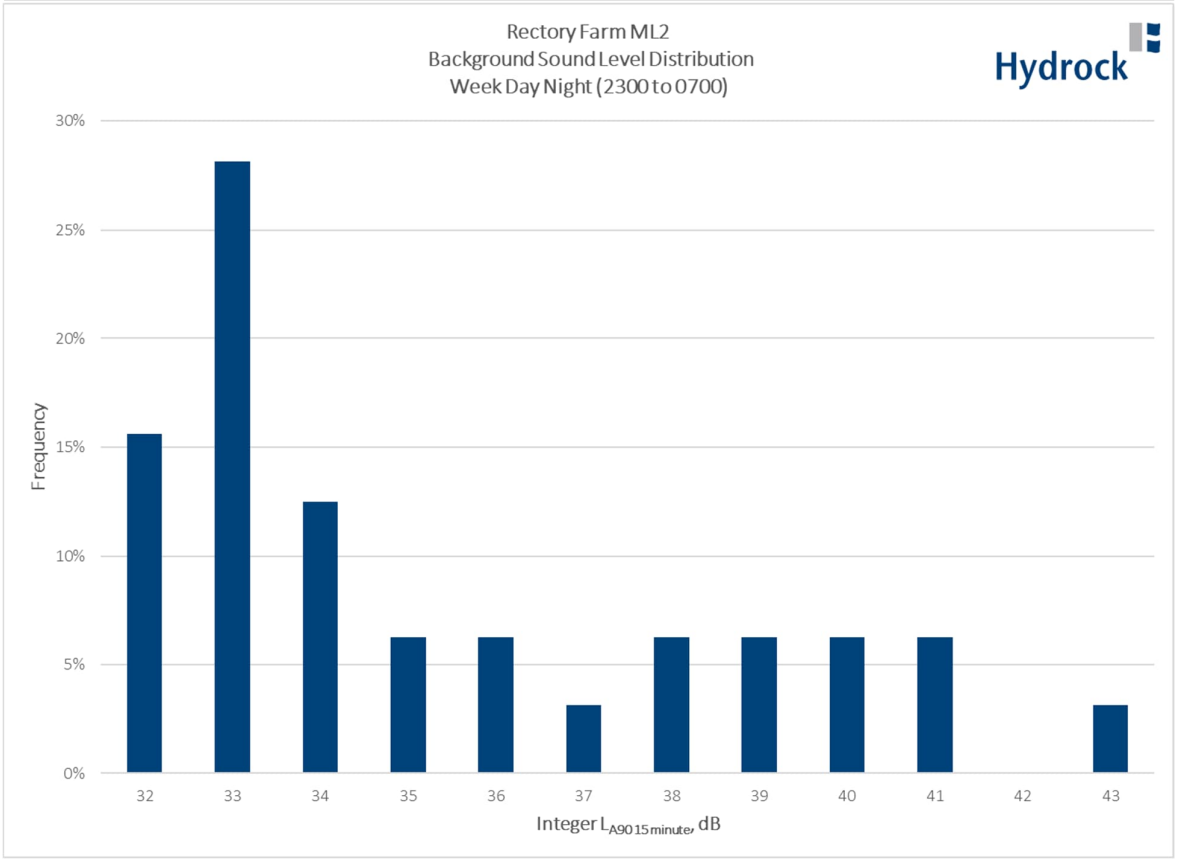

Rectory Farm ML2
Noise Time History Plot
Tuesday 14 February 2023
LAeq
LA90
LAmax
Noise Level, dB
100
90
80
70
60
50
40
30
20
12:15
13:00
13:45
14:30
15:15
16:00
16:45
17:30
18:15
19:00
19:45
20:30
21:15
22:00
22:45
23:30
00:15
01:00
01:45
02:30
03:15
04:00
04:45
05:30
06:15
07:00
07:45
08:30
09:15
10:00
10:45
11:30
12:15
Time (hh:mm)

Appendix C Background Distribution Plots






Rectory Farm ML2
Background Sound Level Distribution
Week Day (0700 to 2300)
Hydrock
25%
20%
15%
10%
5%
0%
Frequency
35 36 37 38 39 40 41 42 43 44 45 46 47 48 49
Integer $L_{A90\,15\,minute}$, dB


Rectory Farm ML2
Background Sound Level Distribution
Week Day Night (2300 to 0700)
Hydrock
30%
25%
20%
15%
10%
5%
0%
Frequency
32 33 34 35 36 37 38 39 40 41 42 43
Integer $L_{A90\,15\,minute}$, dB

Appendix D Example Façade Noise Ingress Calculations

Hydrock

Building Envelope Sound Insulation Calculation According to EN 12354-3

Project Land at Rectory farm	Date 20/02/2023
Façade All	Room: Living (Day time)

Incident noise levels

	Term	Label	Octave band centre frequency (Hz)							dB(A)
			63	125	250	500	1 k	2 k	4 k	
Leq,ff	Measured Leq	**Spectrum Adjustment Terms (Leq)**	**3.6**	**-2.1**	**0.7**	**-0.4**	**-4.8**	**-15.4**	**-23.6**	**51**
	Measured spectrum	Adjusted Spectrum (Leq)	**54.6**	**48.9**	**51.7**	**50.6**	**46.2**	**35.6**	**27.4**	51.0
		K	3	3	3	3	3	3	3	
Lmax,ff	Measured Lmax	**Spectrum Adjustment Terms (Lmax)**	**-1.9**	**-4.8**	**-1**	**0.8**	**-6.4**	**-13.3**	**-18.3**	**75**
		Adjusted Spectrum (Lmax)	**73.1**	**70.2**	**74**	**75.8**	**68.6**	**61.7**	**56.7**	75.0
		K	6	6	6	6	6	6	6	

Room Details

	Term	Derivation	Value	Term	Derivation	Value
	V	Volume (m3)	26.4	Sew	Sf - Swi	8.5
	RT	RT (secs)	**0.5**	Srr	Area of ceiling (m2)	**15.0**
	Sf	Facade area (inc. window) (m2)	**10.0**	S	Sf + Srr	25.0
	Sr	Roof Area (exposed side) (m2)	**11.0**	Ao	Ref Area for Dnew	10.0
	Swi	Window area (m2)	**1.5**	Attenuation to roof		**0.0**

Sound Insulation Calculation elements

	Term	Label/element	Octave band centre frequency (Hz)							Rw
			63	125	250	500	1 k	2 k	4 k	
vent openings	Dn,e	**23 Dne,w: Trickle: Lowest Performer**	28	29	21.7	31.9	29.8	29.3	23.4	
	A0/S x 10-Dn/10	B	0.00063	0.00050	0.00270	0.00026	0.00042	0.00047	0.00183	
		Leq Internal SPL	27.3	20.6	30.7	19.4	17.1	7.0	4.7	27
		Lmax Internal SPL	45.8	40.8	50.8	41.9	36.8	30.6	34.0	51
window	Rwi	**4/12/4 double glazing**	22	24	20	25	35	38	35	31
	Swi/S x 10-Rwi/10	C	0.00038	0.00024	0.00060	0.00019	0.00002	0.00001	0.00002	
		Leq Internal SPL	28.1	19.2	25.0	18.3	3.9	-9.4	-12.1	22
		Lmax Internal SPL	49.6	43.5	50.3	46.5	29.3	19.7	20.2	46
Primary wall	Rew	**Example Wall from BS8233 (Brick and Block)**	36	40	44	45	51	56	58	51
	Sew/S x 10-Rew/10	D	0.00009	0.00003	0.00001	0.00001	0.00000	0.00000	0.00000	
		Leq Internal SPL	21.6	10.8	8.5	5.9	-4.5	-19.9	-27.6	9
		Lmax Internal SPL	43.1	35.1	33.8	34.1	20.9	9.2	4.7	33
Louvre area	Rrr	**Example Roof from BS8233**	22	28	34	40	45	49	52	44
	Sr/S x 10-Rrr/10	E	0.00379	0.00095	0.00024	0.00006	0.00002	0.00001	0.00000	
		Leq Internal SPL	38.1	25.2	21.0	13.3	3.9	-10.4	-19.1	20
		Lmax Internal SPL	59.6	49.5	46.3	41.5	29.3	18.7	13.2	43

Calculated Internal Noise Levels

	10 Log (B+C+D+E)	F	-23.1	-27.6	-24.5	-32.9	-33.4	-33.1	-27.3	
	A (furnished)	Room Absorption	8	11	14	16	16	15	8	
	10 log (S/A)	G	4.7	3.6	2.5	1.9	1.9	2.2	4.7	
Leq	Calc Tolerance	T								
	Internal Leq,2	L+F+G+K+T	**39.2**	**27.8**	**32.7**	**22.7**	**17.8**	**7.7**	**7.8**	**26.3**

Hydrock

Building Envelope Sound Insulation Calculation According to EN 12354-3

Project Land at Rectory farm	Date 20/02/2023
Façade All	Room: Bed (Night time)

Incident noise levels

	Term	Label	Octave band centre frequency (Hz)							dB(A)
			63	125	250	500	1 k	2 k	4 k	
Leq,ff	Measured Leq	Spectrum Adjustment Terms (Leq)	3.6	-2.1	0.7	-0.4	-4.8	-15.4	-23.6	46
	Measured spectrum	Adjusted Spectrum (Leq)	49.6	43.9	46.7	45.6	41.2	30.6	22.4	46.0
		K	3	3	3	3	3	3	3	
Lmax,ff	Measured Lmax	Spectrum Adjustment Terms (Lmax)	-1.9	-4.8	-1	0.8	-6.4	-13.3	-18.3	61
		Adjusted Spectrum (Lmax)	59.1	56.2	60	61.8	54.6	47.7	42.7	61.0
		K	6	6	6	6	6	6	6	

Room Details

Term	Derivation	Value	Term	Derivation	Value
V	Volume (m3)	26.4	Sew	Sf - Swi	8.5
RT	RT (secs)	0.5	Srr	Area of ceiling (m2)	15.0
Sf	Facade area (inc. window) (m2)	10.0	S	Sf + Srr	25.0
Sr	Roof Area (exposed side) (m2)	11.0	Ao	Ref Area for Dnew	10.0
Swi	Window area (m2)	1.5	Attenuation to roof		0.0

Sound Insulation Calculation elements

	Term	Label/element	Octave band centre frequency (Hz)							Rw
			63	125	250	500	1 k	2 k	4 k	
vent openings	Dn,e	23 Dne,w: Trickle: Lowest Performer	28	29	21.7	31.9	29.8	29.3	23.4	
	A0/S x 10-Dn/10	B	0.00063	0.00050	0.00270	0.00026	0.00042	0.00047	0.00183	
		Leq Internal SPL	22.3	15.6	25.7	14.4	12.1	2.0	-0.3	22
		Lmax Internal SPL	31.8	26.8	36.8	27.9	22.8	16.6	20.0	37
window	Rwi	4/12/4 double glazing	22	24	20	25	35	38	35	31
	Swi/S x 10-Rwi/10	C	0.00038	0.00024	0.00060	0.00019	0.00002	0.00001	0.00002	
		Leq Internal SPL	23.1	14.2	20.0	13.3	-1.1	-14.4	-17.1	17
		Lmax Internal SPL	35.6	29.5	36.3	32.5	15.3	5.7	6.2	32
Primary wall	Rew	Example Wall from BS8233 (Brick and Block)	36	40	44	45	51	56	58	51
	Sew/S x 10-Rew/10	D	0.00009	0.00003	0.00001	0.00001	0.00000	0.00000	0.00000	
		Leq Internal SPL	16.6	5.8	3.5	0.9	-9.5	-24.9	-32.6	4
		Lmax Internal SPL	29.1	21.1	19.8	20.1	6.9	-4.8	-9.3	19
Louvre area	Rrr	Example Roof from BS8233	22	28	34	40	45	49	52	44
	Sr/S x 10-Rrr/10	E	0.00379	0.00095	0.00024	0.00006	0.00002	0.00001	0.00000	
		Leq Internal SPL	33.1	20.2	16.0	8.3	-1.1	-15.4	-24.1	15
		Lmax Internal SPL	45.6	35.5	32.3	27.5	15.3	4.7	-0.8	29

Calculated Internal Noise Levels

	10 Log (B+C+D+E)	F	-23.1	-27.6	-24.5	-32.9	-33.4	-33.1	-27.3	
	A (furnished)	Room Absorption	8	11	14	16	16	15	8	
	10 log (S/A)	G	4.7	3.6	2.5	1.9	1.9	2.2	4.7	
Leq	Calc Tolerance	T								
	Internal Leq,2	L+F+G+K+T	34.2	22.8	27.7	17.7	12.8	2.7	2.8	21.3
Lmax	Calc Tolerance	T								
	Internal Lmax,2	M+F+G+K+T	46.7	38.1	44.0	36.9	29.2	22.8	26.1	38.9

Appendix E Traffic Flow Data and Calculated CRTN BNL

		Mon - Friday (807 two-way additional movements)								
Link No.	Link Name.	Speed kph	2025 Base + Com. Dev. AAWT				2025 Base + Com. Dev. + Dev. AAWT			
			AAWT	HGV	HGV%	dB	AADT	HGV	HGV%	dB
1	Shiners Elms	48.3	32	0	0.0%	39.5	483	0	0.0%	52.9
2	Mendip Road N	48.3	1093	5	0.5%	56.5	1343	5	0.4%	57.4
3	Grassmere Road	48.3	1050	0	0.0%	56.3	1300	0	0.0%	57.2
4	B3133 High Street N	48.3	10320	112	1.1%	66.2	10802	112	1.0%	66.4
5	Mendip Road S	48.3	1104	5	0.5%	56.5	1305	5	0.4%	57.3
6	Heathgate	48.3	652	11	1.6%	54.3	902	11	1.2%	55.7
7	Chescombe Road	48.3	1297	0	0.0%	57.2	1459	0	0.0%	57.7
8	B3133 High Street S	48.3	9021	112	1.2%	65.7	9345	112	1.2%	65.8

Appendix F Shiners Elms Traffic Noise Model Plots

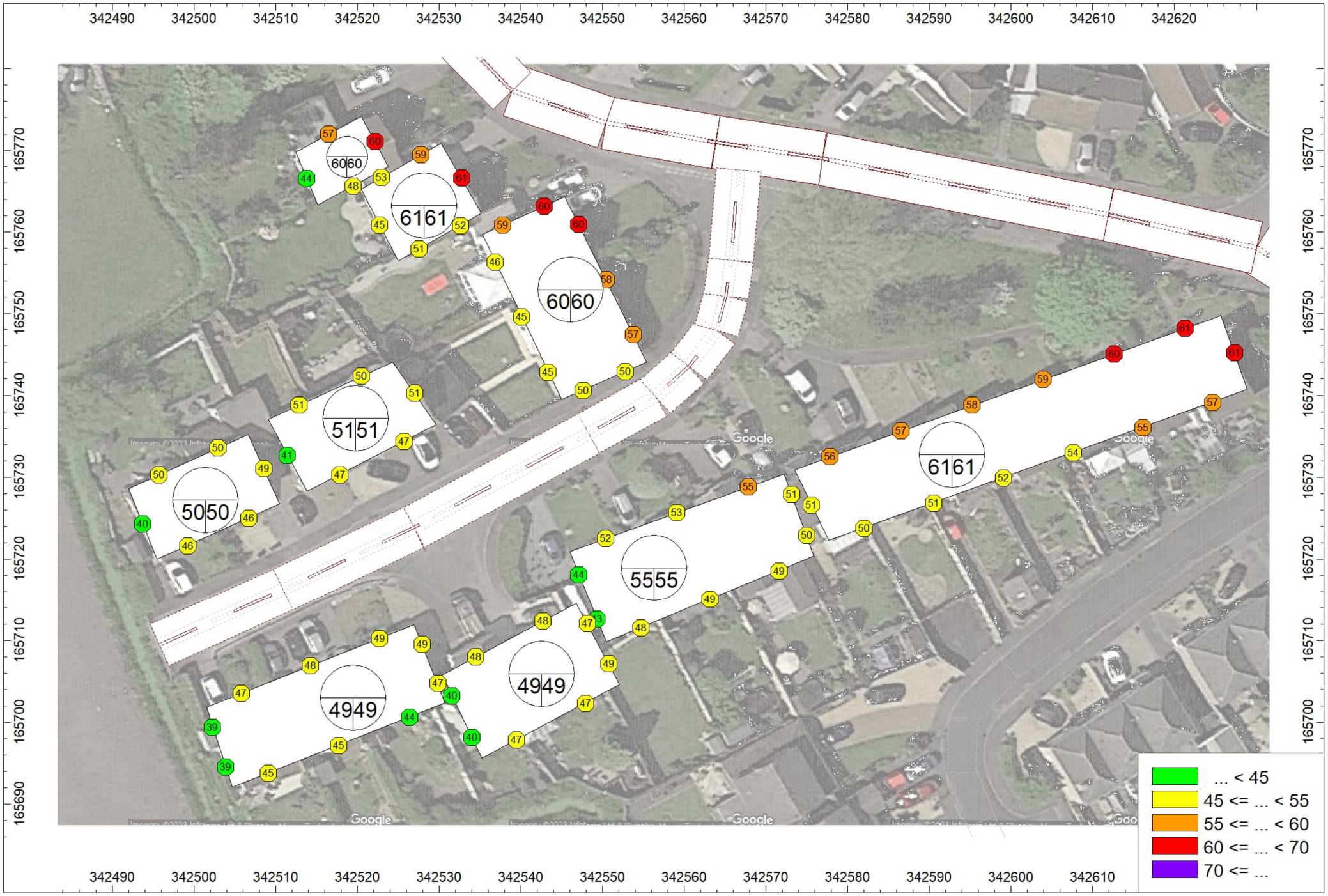


Figure 3 Committed Development year of opening 2025 (Do minimum) modelled daytime noise levels based on AAWT figures (Shiners Elms link 1)

Figure 4 Committed + Proposed Development year of opening 2025 (Do Something) modelled noise levels based on AAWT figures (Shiners Elms link 1)