



Acoustic Survey and Assessment for Proposed Conversion of a Barn to Residential Development at, Evenwood, 10 Lacon Holdings, Soulton Road, Soulton.

Prepared for:

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1. Introduction

- 1.1. Martin Environmental Solutions has been commissioned to undertake an acoustic assessment to support a planning application for the conversion of a redundant barn at Evenwood, 10 Lacon Holdings, Soulton Road, Soulton to residential accommodation.

Site Location and Context

- 1.2. The development site is situated to the west of Evenwood and east of Cefnog Farm, the farm contains several open barns containing cattle along the boundary with the development site. to the north the road and to the south open fields.
- 1.3. An aerial Photograph is enclosed in Figure 1.
- 1.4. Concerns have been raised by the Council over the potential impact of noise (and odour) from the farm on the development site and the proposed future occupants, and hence the reason for this assessment and report.



2. Policy and Guidance

- 2.1. The impact of noise can be a material consideration in the determination of planning applications. The planning system has the task of guiding development to the most appropriate locations. It is recognised that on occasions it will be difficult to reconcile some land uses, such as housing, hospitals, or schools, with other activities that generate high levels of noise. However, the planning system is tasked to ensure that, wherever practicable, noise-sensitive developments are separated from major sources of noise (such as road, rail and air transport and certain types of industrial development).
- 2.2. The Government's publication of the National Planning Policy Framework (NPPF), updated in February 2019, states that planning policies and decisions should prevent new and existing development from contributing to or being put at unacceptable risk from, of being adversely affected by unacceptable levels of noise pollution.
- 2.3. The Government have also issued the Noise Policy Statement for England (NPSE). The NPSE clarifies the Government's underlying principles and aims in relation to noise and sets a vision to promote good health and a good quality of life through the effective management of noise while having regard to the Government's sustainable development strategy. The NPSE aims to mitigate and minimise adverse impacts on health and quality of life through the effective management and control of noise.
- 2.4. The NPSE introduces the following terms, although no sound levels are given to represent these, many authorities have identified the sound level criteria in line with the World Health Organisation, BS8233:2014 and BS4142: 2014 levels. The terms introduced by the NPSE are:
- NOEL – No Observed Effect Level (<30dB(A) inside <50dB(A) outside, 10dB below background)
- LOAEL – Lowest Observed Adverse Effect Level (30-35dB(A) inside 50-55dB(A) outside, background to +5dB)
- SOAEL – Significant Observed Adverse Effect Level (>35dB(A) inside, >55dB(A) outside, >+10dB above background)
- 2.5. The sound levels within the brackets of the previous paragraph are those determined as appropriate levels to indicate the relevant effect levels represented by the NPSE.



- 2.6. Other commonly used examples of standards utilised by Local Planning authorities for the consideration of noise impacts include comparison of the likely noise levels to be experienced at a development, with levels that have been recommended by the World Health Organisation (WHO) as Guidelines for the prevention of Community Noise Annoyance and within BS8233: 2014.
- 2.7. The WHO recommended noise levels for outdoor amenity areas (gardens) that should not be exceeded are 55dB(A) $L_{Aeq,16hr}$ in order to avoid 'Serious Community Annoyance' or 50dB(A) $L_{Aeq,16hr}$ to avoid 'Moderate Community Annoyance' during the day. For indoor levels WHO set 35dB(A) $L_{Aeq,16hr}$ during the day to prevent Moderate Annoyance and 30 dB(A) $L_{Aeq,8hr}$ at night to prevent sleep disturbance.
- 2.8. The WHO guidance also recommends that maximum sound levels at night should not regularly exceed 45dB(A) within bedrooms to prevent sleep disturbance. Regularly is considered to be more than 10 times during any 8-hour night-time period.
- 2.9. BS 8233:2014 'Guidance on sound insulation and noise reduction for buildings' also specifies desirable noise levels to be achieved inside dwellings.
- 2.10. BS 8233:2014 'Sound insulation and noise reduction for buildings – Code of Practice' also specifies desirable noise levels to be achieved inside dwellings. BS 8233 presents two levels, the first between the hours of 07:00 – 23:00 and the second between 23:00 -07:00.
- 2.11. The daytime period suggests internal noise levels of 35dB $L_{Aeq,16hr}$, for resting in living rooms and bedrooms while for night-time a level of 30dB $L_{Aeq,8hr}$ is recommended. Criteria for external areas mirrors that within the WHO guidance.
- 2.12. In addition, the 'ProPG Planning & Noise, Professional Practice Guidance on Planning & Noise, New Residential Development' provides a 4-staged approach to undertaking a risk assessment in relation to anticipated sound levels at new residential development and the provision of mitigation measures. The guidance is principally aimed at sites exposed predominantly to noise from transportation sources.



2.13. The first stage consists of an initial noise risk assessment, based on indicative day and night-time noise levels. Simply put, the higher the ambient noise in an area the greater the impact. The levels given are shown below although it should be noted that these are in excess of both the WHO and BS 8233: 2014 guidance documents.

Noise Risk Category*	Potential Effect if Unmitigated	Pre-Planning Application Guidance
0 – Negligible $L_{Aeq,16hr} < 50dB$ $L_{Aeq,8hr} < 40dB$	May be noticeable but no adverse effect on health and quality of life	In this category the development is likely to be acceptable from a noise perspective, nevertheless a good acoustic design process is encouraged to improve the existing environment and/or safeguard against possible future deterioration and to protect any designated tranquil areas. A noise assessment may be requested to demonstrate no adverse impact from noise. Application need not normally be delayed on noise grounds.
1 – Low $L_{Aeq,16hr} 50-63dB$ $L_{Aeq,8hr} 40-55dB$	Adverse effect on health and quality of life	In this category the development may be refused unless a good acoustic design process is followed and is demonstrated via a Level 1 Acoustic Design Statement which confirms how the adverse impacts of noise on the new development will be mitigated and minimised and that a significant adverse impact will not arise in the finished development. Planning conditions and other measures to control noise may be required.
2 – Medium $L_{Aeq,16hr} 63-69dB$ $L_{Aeq,8hr} 55-60dB$ $L_{AFmax} > 80dB^{**}$	Significant adverse effect on health and quality of life	In this category the development is likely to be refused unless good acoustic design process is followed and is demonstrated via a Level 2 Acoustic Design Statement which confirms how the adverse impacts of noise on the new development will be mitigated and minimised, and clearly demonstrates that a significant adverse noise impact will not arise in the finished development. Planning conditions and other measures to control noise will normally be required.
3 – High $L_{Aeq,16hr} > 69dB$ $L_{Aeq,8hr} > 60dB$ $L_{AFmax} > 80dB^{**}$	Unacceptable adverse effect of health and quality of life	In this category the development is very likely to be refused on noise grounds, even if a good acoustic design process is followed and is demonstrated via a Level 2 Acoustic Design Statement. Applicants are advised to seek expert advice on possible mitigation measures. Advice on the circumstances when the refusal of a new housing on noise grounds should normally be anticipated is included in the ProPG.

2.14. Stage 2, consists of a full assessment of the prevailing ambient noise and requires 4 elements to be considered:

- I. Element 1 – Good Acoustic Design
- II. Element 2 – Internal Noise Level Guidelines
- III. Element 3 – External Amenity Area Noise Assessment
- IV. Element 4 – Assessment of Other Relevant Issues

2.15. A good acoustic design is implicit in meeting the requirements of the NPPF and can help to resolve many potential acoustic issues.



2.16. Details of the criteria considered suitable are provided above for both internal and external sound levels. Element 4 includes such issues as local and national policy, likely occupants, wider planning objectives.



3. The Assessment

- 3.1 On site monitoring was undertaken over the 11th and 12th of July 2021 to obtain prevailing sound levels for the area. At the time of the monitoring, it had been arranged to bring the cattle into the barns and these remained throughout the monitoring period including feeding.
- 3.2 On the afternoon of the second day the cattle were to undergo a TB check as the herd is being sold. This resulted in elevated sound levels during the inspection period.
- 3.3 The sound level meter was set up to the rear of the development site along the eastern boundary with the farm, placed so the microphone was higher than the dividing concrete wall and directly opposite a large open barn and a farmyard with cattle present.
- 3.4 The meter was field calibrated before and after the measurement with no significant variation. Full calibration certificates are available on request.
- 3.5 The weather at the time was variable, mainly dry, and warm with some short light showers. Wind was light and came from the east.
- 3.6 The full results are available in Appendix A, with a summary in the table below.

Start Time	End Time	Duration	L _{Aeq}	L _{A90}	L _{AMax}
11/07/2021 14:00	11/07/2021 23:00	08:59:59	51.7	34.1	83.9
11/07/2021 23:00	12/07/2021 07:00	08:00:00	47.9	23.7	80.4
12/07/2021 07:00	12/07/2021 19:00	12:00:00	56.2	37.1	87.0

- 3.7 The regularly exceeded night-time maximum sound level has been identified as 73.3dB L_{AMax}, see the graph in Appendix A. The maximum sound levels were all attributed to birds and cattle. The background sound level generally dominated by bird calls, cattle and passing traffic.
- 3.8 Average sound levels are slightly above the recommended criteria for outdoor amenity space and given a 15dB attenuation¹ for an open window above those identified within the guidance documents detailed in section 2 of the report. Therefore, further mitigation measures are required.

¹ BS8233: 2014; Guidance on sound insulation and noise reduction for buildings



- 3.9 The proposed development will see the existing horse-shoe shaped barn converted into a residential dwelling. The rear wall facing the farm is to be a solid cavity brick wall, with two windows into the kitchen. The south end is to have a large window overlooking the fields into the lounge. The rest of the property has windows looking over the central courtyard area.
- 3.10 The site currently has a 1.5m high concrete precast panel wall along the boundary with the farm and it has been confirmed that this barrier will be increased in height.
- 3.11 It is recommended that the barrier be increased to at least 2.5m in height. This will provide a reduction of between 11.8dB -19.1dB from the cattle in the adjoining barns. A further distance attenuation of over 3dB will be experienced to the lounge window and 26dB to the far end of the garden.
- 3.12 Assuming the dominant noise is from the cattle next door this would result in a sound level of 34.1dB(A) at the lounge window and 18.4dB(A) at the far side of the garden. (See Appendix B for calculations). Below the guideline criterion of 50dB(A).
- 3.13 This barrier would also result in suitable internal sound levels within the property. In addition, the property itself would protect the central courtyard area further limiting the noise heard from the farm.
- 3.14 However, as identified some of the prevailing background sound level is coming from other sources e.g. birds, traffic and it is therefore suggested that an additional layer of protection is applied to the site by ensuring all windows to habitable rooms are fitted with a standard 6/12/6 double glazing unit. This will provide a sound reduction, $R_w(C;C_{tr})$, of 33(-1;-3). Therefore, adequate to protect the future occupants from the existing sound levels during the day and night, including the maximum night-time sound levels.
- 3.15 The rest of the structure achieving a higher performance than the glazing. Windows must also be fitted carefully to ensure there are no gaps around the framework and then the frame is sealed to the surrounding brickwork across the entire frame and not just along the edges.
- 3.16 In order to be able to keep windows closed additional ventilation provision must be made for the property. As such it is recommended that a ventilation system is used incorporating acoustic trickle ventilators for all windows to habitable rooms to the



proposed properties. The ventilators must achieve a similar or better performance to the windows when open and several suitable models are available from suppliers including the Greenwood DN Vent providing 34dB (C_{tr}) attenuation or the Titon, Trimvent Select S13 Ventilator providing 33dB (C_{tr}) attenuation. Other models and manufacturers are available.



4 Conclusion

- 4.1 On-site monitoring has identified existing background sound levels will result in an adverse impact on the proposed properties. As such additional mitigation measures are required.
- 4.2 This has been identified as an increased barrier along the boundary with the farm to a height of 2.5m. This increased barrier, which can then have planting placed in front of it will be sufficient to protect the property from the adverse sound levels both internally and externally.
- 4.3 It is however recommended that standard double-glazing units with trickle window vents are fitted to all habitable rooms to guarantee a suitable internal sound level can be achieved.
- 4.4 The inclusion of the above mitigation measures to all habitable rooms will ensure that the internal and external sound levels are acceptable and will result in a No Observe Effect on the future residents in line with the Noise Policy Statement for England.
- 4.5 As such the development will meet the objectives of the National Planning Policy Framework in ensuring that no significant adverse impact is experienced by the future residents. The development is therefore considered to be acceptable in terms of noise.

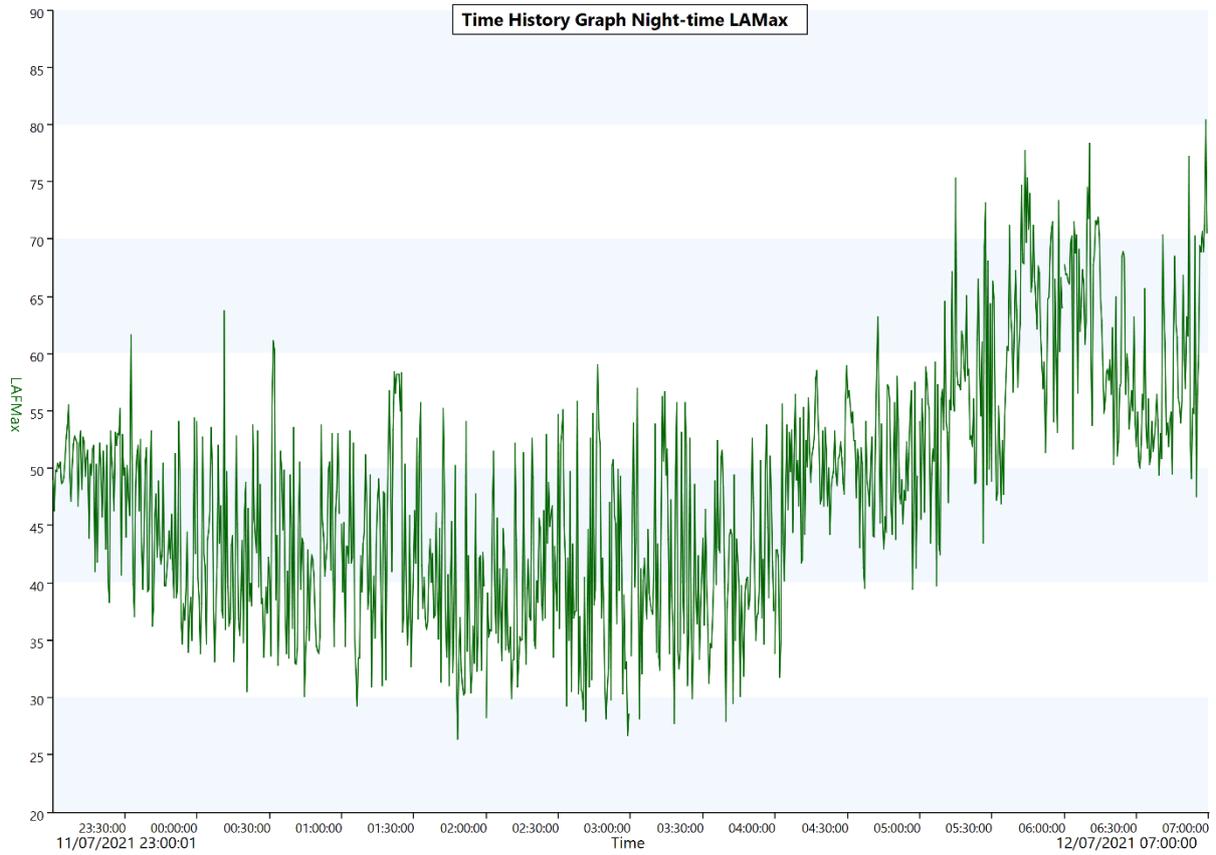
Figure 1 – Aerial Photograph





Appendix A – Full Monitoring Results

Time	L _{Aeq} (dB)	L _{AMax} (dB)	L _{A90} (dB)
11/07/2021 14:00	55.6	77.9	37.1
11/07/2021 15:00	56.3	83.9	37.5
11/07/2021 16:00	50.3	69.1	36.3
11/07/2021 17:00	46.2	70.3	34.1
11/07/2021 18:00	50.3	80.0	34.5
11/07/2021 19:00	52.1	81.4	37.4
11/07/2021 20:00	49.9	79.7	33.8
11/07/2021 21:00	38.5	68.2	31.1
11/07/2021 22:00	40.6	66.0	32.1
11/07/2021 23:00	40.3	61.6	29.9
12/07/2021 00:00	35.7	63.8	24.7
12/07/2021 01:00	33.9	58.4	22.8
12/07/2021 02:00	31.4	59.1	22.3
12/07/2021 03:00	34.2	56.9	22.2
12/07/2021 04:00	41.3	63.2	29.4
12/07/2021 05:00	52.2	77.7	32.7
12/07/2021 06:00	54.6	80.4	34.2
12/07/2021 07:00	57.5	77.0	38.0
12/07/2021 08:00	56.5	83.8	36.7
12/07/2021 09:00	53.2	82.3	35.9
12/07/2021 10:00	52.6	80.7	34.8
12/07/2021 11:00	57.6	85.3	35.4
12/07/2021 12:00	55.6	87.0	37.2
12/07/2021 13:00	53.9	82.1	35.5
12/07/2021 14:00	54.4	77.8	34.7
12/07/2021 15:00	60.1	84.9	39.4
12/07/2021 16:00	58.2	85.3	38.2
12/07/2021 17:00	56.5	80.7	36.9
12/07/2021 18:00	48.4	78.0	35.0





Appendix B – Calculations

Barrier Calculation to far side of garden

$$10 \log \left(3 + \frac{40\delta}{\lambda} \right)$$

where; δ = path difference

λ = wavelength,

$$\lambda = \frac{\text{speed of sound (330 m/s)}}{\text{frequency (Hz)}}$$

	m
Distance Receiver to barrier	20
Height of barrier	2.5
Distance source to barrier	20
Height of receiver	1.5
Height of source	1.5
receiver to barrier	0.024984
source to barrier	0.024984
Path difference	0.049969
Barrier attenuation (dB)	11.78018

Distance attenuation

$$Dist \text{ att} = 10 \log \left(\frac{r}{R} \right)$$

$$Dist \text{ att} = 10 \log \left(\frac{1}{20} \right)$$

$$Dist \text{ att} = 26dB$$