

ENVIRONMENT

Richborough Estates Ltd and Mr. & Mrs. Adcock

Hinckley North,
Hinckley

Noise Impact Assessment

210683

ENVIRONMENT

Richborough Estates Ltd and Mr. & Mrs. Adcock

Hinckley North,
Hinckley

Noise Impact Assessment

Birmingham
Livery Place, 35 Livery Street, Colmore Business District
Birmingham, B3 2PB
T: 0121 233 3322

Leeds
Whitehall Waterfront, 2 Riverside Way
Leeds, LS1 4EH
T: 0113 233 8000

London
11 Borough High Street
London, SE1 9SE
T: 0207 407 3879

Manchester
11 Portland Street
Manchester, M1 3HU
T: 0161 233 4260

Nottingham
5th Floor, Waterfront House, Station Street
Nottingham, NG2 3DQ
T: 0115 924 1100

March 2022

DOCUMENT ISSUE RECORD

Document Number:	HIN-BWB-ZZ-ZZ-RP-YA-0001_NIA_S1_P03
BWB Reference:	210683-03

Revision	Date of Issue	Status	Author:	Checked:	Approved:
1	09/03/22	Issue	Alicia Druce BEng (Hons), AMIOA	Michaela Moffatt BSc (Hons) MSc AMIOA	Dawit Abraham MSc, MIOA
2	21/03/22	Issue	Alicia Druce BEng (Hons), AMIOA	Michaela Moffatt BSc (Hons) MSc AMIOA	Dawit Abraham MSc, MIOA
3	23/03/22	Issue	Alicia Druce BEng (Hons), AMIOA	Michaela Moffatt BSc (Hons) MSc AMIOA	Dawit Abraham MSc, MIOA

Notice

This document has been prepared for the sole use of the Client in accordance with the terms of the appointment under which it was produced. BWB Consulting Limited accepts no responsibility for any use of or reliance on the contents of this document by any third party. No part of this document shall be copied or reproduced in any form without the prior written permission of BWB.

EXECUTIVE SUMMARY

BWB Consulting Ltd was appointed by Richborough Estates Ltd and Mr. & Mrs. Adcock to undertake an environmental noise assessment for a proposed residential development with a proposed school element at Hinckley North, Hinckley.

This assessment has been undertaken based on the results of a baseline noise survey undertaken in January 2022 and additional baseline monitoring undertaken in February 2022 at the Site. The results of the survey have been assessed in accordance with current standards and guidance, following consultation with Hinckley and Bosworth Borough Council.

The noise assessment shows that with appropriate consideration to noise mitigation measures, a commensurate level of protection can be afforded to future noise sensitive receptors on the Site.

For proposed dwellings located closest to Normandy Way, the external criterion would be achieved with localised barriers of up to 2m in height around the external amenity areas.

For the facades, facing onto Stoke Road, all criteria would be achieved with double glazing with an example configuration of 4mm pane / 12mm airgap / 4mm pane, which would need to provide a minimum performance of $R_w + C_{tr}$ of 27 dB. Acoustic trickle ventilators, which achieve a minimum performance of $D_{n,e,w} + C_{tr}$ 35 dB would be required, for worst affected properties located closest to Stoke Road.

For the facades of the properties located closest to Normandy Way, all criteria would be achieved with double glazing with an example configuration of 8mm / 12mm / 10mm pane, which would need to provide a minimum performance of $R_w + C_{tr}$ of 33dB. Acoustic trickle ventilators such as the Greenwood Airvac Acoustic Airbrick AAB-4000 which achieves a minimum performance of $D_{n,e,w} + C_{tr}$ 40 dB would be required for the worst affected properties located closest to Normandy Way.

For the properties located closest to the existing dairy farm, all criteria would be achieved with double glazing with an example configuration of 4mm pane / 12mm airgap / 4mm pane, which would need to provide a minimum performance of $R_w + C_{tr}$ of 27 dB. Acoustic trickle ventilators, which achieve a minimum performance of $D_{n,e,w} + C_{tr}$ 35 dB would be required for worst affected properties located closest to the dairy farm and associated milking operations.

Based on the results of the assessment, it has been demonstrated that the Site is suitable for residential development.

CONTENTS

EXECUTIVE SUMMARY	iii
1. INTRODUCTION.....	1
Appointment & Background.....	1
Site Setting	1
Proposed Development	2
2. STANDARDS AND GUIDANCE	4
National Planning policy Framework (NPPF)	4
BS 8233:2014: Guidance on Sound Insulation and Noise Reduction for Buildings	4
World Health Organisation (WHO) 1999: Guidelines for Community Noise	5
BS 4142:2014+A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound	5
The Design Manual for Roads and Bridges (DMRB): LA111 Noise and Vibration (Revision 2)	6
Consultation with Hinckley and Bosworth Borough Council	7
3. BASELINE NOISE MONITORING.....	8
Summary.....	8
Survey Methodology	8
Measurement Equipment.....	9
Meteorological Conditions.....	9
Measurement Results	9
Additional Baseline Noise Monitoring.....	10
Survey Methodology	11
Measurement Equipment.....	11
Meteorological Conditions.....	12
Measurement Results	12
4. Assessment	13
Noise Model	13
Noise From Road Traffic	14
Noise from Proposed School on Proposed Residential	16
Noise from Existing Dairy Farm on Proposed Residential	17
Development Generated Road Traffic	17
5. Mitigation.....	20
External Living Areas.....	20
Internal Living Areas	20
Summary	23
6. CONCLUSION AND RECOMMENDATIONS	25

FIGURES

Figure 1.1: Site Location

Figure 1.2: Proposed Masterplan

Figure 3.1: Baseline Noise Survey Positions

Figure 3.2: Additional Monitoring Location

Figure 4.1: Noise Contour Plot without Mitigation, dB $L_{Aeq,16h}$, 1.5m above ground

Figure 4.2: Noise Contour Plot without Mitigation, dB $L_{Aeq,8h}$, 14m above ground

Figure 5.1: Noise Contour Plot with Mitigation, dB $L_{Aeq,16h}$, 1.5m above ground

Figure 5.2: Proposed Glazing and Ventilation Strategy – Stoke Road

Figure 5.3: Proposed Glazing and Ventilation Strategy – Normandy Way

APPENDICES

APPENDIX A: Glossary of Terms

APPENDIX B: Full Survey Results

1. INTRODUCTION

Appointment & Background

- 1.1 BWB Consulting Ltd was appointed by Richborough Estates Limited and Mr. & Mrs. Adcock (the Client) to undertake a noise impact assessment for a proposed residential led development at Hinckley North, Hinckley (the Site). This assessment is to support an outline planning application for the Site.
- 1.2 This assessment has been undertaken based on the results of a baseline noise survey undertaken at the Site. The results of the survey have been assessed in accordance with current standards and guidance, following consultation with Hinckley and Bosworth Borough Council (HBBC).
- 1.3 Where appropriate, consideration has been given to noise mitigation measures to demonstrate how an appropriate level of protection could be afforded to proposed Noise Sensitive Receptors (NSRs) within the Site.
- 1.4 This report is necessarily technical in nature, so to assist the reader, a glossary of acoustic terminology can be found in **Appendix A**.

Site Setting

- 1.5 The Site currently comprises open farmland and is bound by Normandy Road to the south with existing commercial premises situated beyond and Stoke Road to the west. To the north-west lies an existing farm with an existing residential building. To the north and to the east, the Site is bordered by open farmland.
- 1.6 The location of the Site is shown in **Figure 1.1**.

Figure 1.1: Site Location



Proposed Development

- 1.7 The Proposed Development will comprise residential dwellings, associated infrastructure and a proposed school aspect. The layout is shown below in **Figure 1.2**.

Figure 1.2: Proposed Masterplan



2. STANDARDS AND GUIDANCE

National Planning policy Framework (NPPF)

- 2.1 Published in 2012, and most recently revised in July 2021, this document sets out the Government's planning policies for England. It makes the following reference to noise in the section entitled Conserving and enhancing the natural environment:

"174. 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. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans."

- 2.2 It also makes the following references to noise in the Section entitled *Ground conditions and pollution*:

"185. 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 life⁶⁰;

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.

⁶⁰ See Explanatory Note to the Noise Policy Statement for England (Department for Environment, Food & Rural Affairs, 2010)."

BS 8233:2014: Guidance on Sound Insulation and Noise Reduction for Buildings

- 2.3 This standard provides guidance for the control of noise in and around buildings. The guidance provided within the document is applicable to the design of new buildings, or refurbished buildings undergoing a change of use, but does not provide guidance on assessing the effects of changes in the external noise levels to occupants of an existing building.
- 2.4 The guidance provided includes appropriate internal and external noise level criteria which are applicable to dwellings for steady external noise sources. It is stated that it is

desirable that the internal ambient noise level does not exceed the following criteria set out in **Table 2.1**:

Table 2.1: Summary of Internal Ambient Noise Levels to be achieved in Habitable Rooms when Assessed in Accordance with BS 8233

Activity	Location	Period	
		07:00 to 23:00 Hours, i.e. Daytime	23:00 to 07:00 Hours, i.e. Night-time
Resting	Living Room	35 dB LAeq, 16 Hour	-
Dining	Dining Room/area	40 dB LAeq, 16 Hour	-
Sleeping (daytime resting)	Bedroom	35 dB LAeq, 16 Hour	30 dB LAeq, 8 Hour

- 2.5 Whilst BS 8233:2014 recognises that a guideline value may be set in terms of SEL or LA_{Fmax} for the assessment of regular individual noise events that can cause sleep disturbance during the night-time, a specific criterion is not stipulated. Accordingly, reference has been made in this assessment to the World Health Organisation (WHO) 1999: *Guidelines for Community Noise* below.
- 2.6 With respect to external amenity space such as gardens and patios it is stated that it is desirable that the noise level does not exceed 50 dB LAeq,T, with an upper guideline value of 55 dB LAeq,T which would be acceptable in noisier environments. It is then confirmed that higher external noise criteria may be appropriate under certain circumstances such as within city centres urban areas, and locations adjoining the strategic transportation network, where it may be necessary to compromise between elevated noise levels and other factors such as convenience of living, and efficient use of land resource.

World Health Organisation (WHO) 1999: Guidelines for Community Noise

- 2.7 The LA_{Fmax} Criterion in BS8233 is largely concordant with the World Health Organisation (WHO) guidance: 1999: *Guidelines for community noise*. This document draws upon guidance from Vallet and Vernay, which states:

“For good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB LA_{Fmax} more than 10-15 times per night”

BS 4142:2014+A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound

- 2.8 The BS4142:2014+A1:2019 Standard describes methods for rating and assessing the following:
- Sound from industrial and manufacturing processes;
 - Sound from fixed installations which comprise mechanical and electrical plant and equipment;
 - Sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and

- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train movements on or around an industrial and/or commercial site.
- 2.9 The methods use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident. The Standard advises the purpose of the methodology includes the assessment of sound from any plant and activities associated with existing industrial and/or commercial uses at proposed residential dwellings.
- 2.10 If appropriate, the specific sound level of the source ($L_{Aeq,T}$) is corrected, by the application of one or more corrections for acoustic features such as tonal qualities and/or distinct impulses, to give a 'rating' level ($L_{Ar,Tr}$). The Standard effectively compares and rates the difference between the rating level of the specific sound and the typical background sound level ($L_{A90,T}$) in the absence of the specific sound.
- 2.11 The Standard advises that the time interval ('T') of the background sound measurement should be sufficient to obtain a representative or typical value of the background sound level at the time(s) the source in question operates or is proposed to operate in the future.
- 2.12 Comparing the rating level with the background sound level, BS 4142 states:

"Typically, the greater this difference, the greater the magnitude of impact.

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

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

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 Design Manual for Roads and Bridges (DMRB): LA111 Noise and Vibration (Revision 2)

- 2.13 This document sets out procedures for undertaking the environmental assessment of new road schemes, including the assessment of noise impacts from road traffic. In particular, it describes a method for assessing the severity of a noise impact, in terms of the number of people who will be bothered by any noise increases/decreases due to a new road scheme. When undertaking a DMRB assessment, the methodology contained within the Department for Transport 1988 document Calculation of Road Traffic Noise (CRTN) should be used to calculate levels of road traffic noise.
- 2.14 Although the DMRB strictly applies to new road schemes, the principles of the approach contained within the document can also be applied to the assessment of noise from road traffic in general. The Proposed Development has the potential to affect road traffic noise levels along existing roads, hence there is a need for such an assessment.

- 2.15 The DMRB assessment methodology suggests that the magnitude of noise changes from a project should be classified into levels of impact. LA111 considers how the magnitude of change can be affected by whether a noise level change occurs in the short term (e.g. as a result of a sudden opening of a scheme), or in the long term (e.g. gradually over time, such as that associated with natural traffic growth).
- 2.16 The example classification scale for short term and long-term changes, are presented below:

Table 2.1: Classification of Magnitude of Noise Impacts in the Short Term

Noise Change, dB LA10, 18h	Magnitude of Impact
0	No Change
0.1 to 0.9	Negligible
1.0 to 2.9	Minor
3.0 to 4.9	Moderate
5.0+	Major

Table 2.2: Classification of Magnitude of Noise Impacts in the Long Term

Noise Change, dB LA10, 18h	Magnitude of Impact
0	No Change
0.1 to 2.9	Negligible
3.0 to 4.9	Minor
5.0 to 9.9	Moderate
10.0+	Major

Consultation with Hinckley and Bosworth Borough Council

- 2.17 In January 2022, consultation was undertaken with Mr. Simon Smith, Senior Environmental Health Officer at Hinckley and Bosworth Borough Council via email. A response was received from Mr. Smith on 21st January, agreeing the methodology and noting that any potential impact from the existing farm to the north should also be considered.
- 2.18 Following the baseline noise survey, further consultation was undertaken with Mr Smith, where it was also agreed that noise associated with the existing commercial premises to the south need not to be considered within the assessment as road traffic was dominant during periods of observation.

3. BASELINE NOISE MONITORING

Summary

- 3.1 A baseline noise survey has been undertaken to determine noise levels incident on the Site due to road traffic on Stoke Road to the west and Normandy Way to the south. The measurement positions adopted during the survey are identified in **Figure 3.1**.

Figure 3.1: Baseline Noise Survey Positions



Survey Methodology

Noise Measurement Position 1 (NMP1)

- 3.2 Noise monitoring was undertaken at NMP1 over a 24-hour period commencing at 14:45 on Thursday 27th January 2022. The microphone at NMP1 was established at 1.8 m above local ground level and at 4 m from the nearside kerb edge of Stoke Road. The noise climate at NMP1 was dominated by road traffic on Stoke Road. During lulls in road traffic on Stoke Road, noise from Normandy Way to the south was audible.

Noise Measurement Position 2 (NMP2)

- 3.3 Noise monitoring was undertaken at NMP2 over a 24-hour period commencing at 15:00 on Thursday 27th January 2022. The microphone at NMP2 was established at 1.8 m above local ground level and at 15 m from nearside kerb edge of Normandy Way to the south. The noise climate at NMP2 was dominated by road traffic on Normandy Way.

Measurement Equipment

- 3.4 The baseline noise survey was undertaken using the Class 1 specification noise measurement equipment detailed in **Table 3.1**. Equipment was calibrated using a portable calibrator immediately before and after the measurements with no significant drift in calibration observed. The sound level meters, pre-amplifiers and microphones were calibrated to UKAS standards at an accredited laboratory within the 24 months prior to the measurements. The portable calibrators were calibrated within the 12 months preceding the date of the survey.

Table 3.1: Noise measurement equipment

Position	Equipment	Make & Model	Serial Number	Calibration due Date
NMP1	Sound Level Meter	SVAN 971	80342	27/08/2022
	Microphone	ACO 7052E	71683	
	Preamp	SV18	71576	
NMP2	Sound Level Meter	SVAN 971	60745	23/08/2023
	Microphone	ACO 7052E	64535	
	Preamp	SV18	66815	
Both	Calibrator	B&K DB0311	449050	19/08/2022

Meteorological Conditions

The weather throughout the survey remained conducive to environmental noise measurement, it being dry with negligible winds (<5ms⁻¹).

Measurement Results

- 3.5 A summary of measured sound pressure levels at NMP1 and NMP2 is presented in **Table 3.2 – Table 3.5** below and overleaf. A full summary of the survey data is presented in **Appendix B**.

Table 3.2: Summary of Measured Sound Pressure Level at NMP1

Period	Start Time	Period (T)	dB LAeq,T	dB LA90,T ²	dB LAfmax ³
Daytime	27/01/2022 14:45	16-hours	68 ¹	53	-
Night-Time	27/01/2022 23:00	8-hours	58	36	83

¹ logarithmic average LAeq,15mins noise level between 14:45 – 23:00 on 27/01/22 and between 07:00 – 14:45 on 28/01/22
² arithmetic average LA90,15mins during measurement period
³ 10th Percentile LAfmax noise levels during measurement period

Table 3.3: Summary of Octave Band Measured Sound Pressure Levels at NMP1

Period	Sound Pressure Level (dB) per Octave Band (Hz)							
	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Daytime	67	60	61	62	66	61	50	41
Night-Time	58	50	49	51	56	50	38	27

Table 3.4: Summary of Measured Sound Pressure Level at NMP2

Period	Start Time	Period (T)	dB L _{Aeq,T}	dB L _{A90,T} ²	dB L _{AFmax} ³
Daytime	27/01/2022 15:00	16-hours	62 ¹	56	-
Night-Time	27/01/2022 23:00	8-hours	56	37	74

¹ logarithmic average L_{Aeq,15mins} noise level between 15:00 – 23:00 on 27/01/22 and between 07:00 – 15:00 on 28/01/22
² arithmetic average L_{A90,15mins} during measurement period
³ 10th Percentile L_{AFmax} noise levels during measurement period

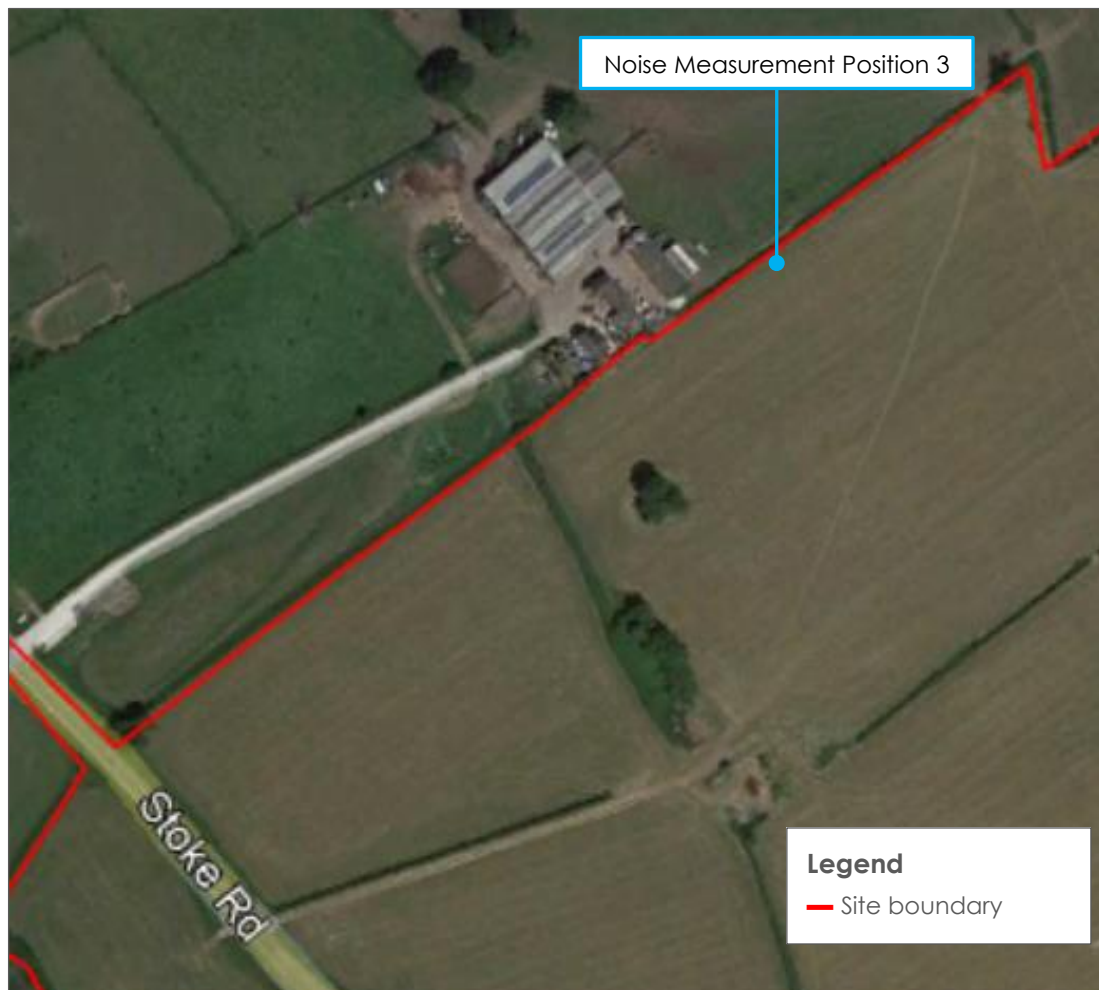
Table 3.5: Summary of Octave Band Measured Sound Pressure Levels at NMP2

Period	Sound Pressure Level (dB) per Octave Band (Hz)							
	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Daytime	70	64	60	53	59	56	46	39
Night-Time	63	57	53	45	52	50	40	30

Additional Baseline Noise Monitoring

- 3.6 Further baseline noise monitoring was undertaken in February 2022 to determine noise levels associated with the existing dairy farm to the north of the Site.
- 3.7 It is noted that the dairy farm operates with an electronic milking system and is likely to be operational 24/7. Therefore, unattended monitoring was undertaken over both a weekday and weekend period to ensure a robust assessment. The measurement position adopted for the additional monitoring is shown below in **Figure 3.2**.

Figure 3.2: Additional Monitoring Location



Survey Methodology

Noise Measurement Position 3 (NMP3)

- 3.8 Noise monitoring was undertaken at NMP3 over a 96-hour period commencing at 14:00 on Friday 25th February 2022. The microphone at NMP3 was established at 1.8 m above local ground level and at approximately 60 m from the milking building associated with the dairy farm. The noise climate at NMP3 was dominated by distant road traffic on Stoke Road with occasional noise from livestock also audible during periods of attendance.

Measurement Equipment

- 3.9 The baseline noise survey was undertaken using the Class 1 specification noise measurement equipment detailed in **Table 3.6**. Equipment was calibrated using a portable calibrator immediately before and after the measurements with no significant drift in calibration observed. The sound level meters, pre-amplifiers and microphones were calibrated to UKAS standards at an accredited laboratory within the 24 months

prior to the measurements. The portable calibrators were calibrated within the 12 months preceding the date of the survey.

Table 3.6: Noise measurement equipment

Position	Equipment	Make & Model	Serial Number	Calibration due Date
NMP3	Sound Level Meter	01dB FUSION	12076	03/03/2023
	Microphone	GRAS 40CD	331856	
	Pre-Amp	01dB PRE22	1805399	
	Calibrator	01dB CAL21	34675323	14/07/2022

Meteorological Conditions

- 3.10 The weather throughout the majority of survey remained conducive to environmental noise measurement, it being dry with negligible winds (<5ms⁻¹). Some periods of rain were observed during the night-time period on the 28th February, therefore these have been excluded from the assessment in **Section 4**.

Measurement Results

- 3.11 A summary of measured sound pressure levels at NMP3 is presented in **Table 3.7** below. A full summary of the survey data is presented in **Appendix B**.

Table 3.7: Summary of Measured Sound Pressure Level at NMP3

Period	Start Time	Period (T)	dB L _{Aeq,T} ¹	dB L _{A90,T} ²	dB L _{Afmax} ³
Daytime	25/02/2022 14:00	9-hours	50	46	-
Night-Time	25/02/2022 23:00	8-hours	51	37	69
Daytime	26/02/2022 07:00	16-hours	53	48	-
Night-Time	26/02/2022 23:00	8-hours	46	38	64
Daytime	27/02/2022 07:00	16-hours	52	46	-
Night-Time	27/02/2022 23:00	8-hours	49	36	64
Daytime	28/02/2022 07:00	16-hours	54	38	-
Night-Time	28/02/2022 23:00	8-hours	56	32	64
Daytime	01/03/2022 07:00	3-hours	62	46	-

¹ logarithmic average L_{Aeq,1hour} and L_{Aeq,15mins} noise level for the daytime and night-time periods respectively

² arithmetic average L_{A90,15mins} during measurement period

³ 10th Percentile L_{Afmax} noise levels during measurement period

4. ASSESSMENT

- 4.1 The results of the baseline noise survey undertaken in January 2022 and February 2022 have been used as a basis for the noise assessment of the Site's suitability for residential development. The assessment considers noise from road traffic, noise associated with the dairy farm to the north and from the proposed school aspect of the development.
- 4.2 Although schools are recognised as sensitive receptors, given the distance from the external noise generating sources to the indicative location of the proposed school, it is considered that all internal classroom criteria would be achieved in accordance with *BB93: Acoustic Design of Schools: Performance Standards*¹. Therefore, no further assessment works have been undertaken within this report.

Noise Model

- 4.3 A detailed noise model has been generated in order to calculate the daytime and night-time noise propagation across the Site from road traffic on both Normandy Way and Stoke Road and noise associated with the existing dairy farm. The following prediction methodologies were adapted for the modelling exercise:
- The noise model was set up to apply the noise prediction methodology set out in the 1988 Department of Transport and the Welsh Office document Calculation of Road Traffic Noise for road traffic noise sources;
 - The noise data collected from the Site was used to calibrate the road traffic noise sources;
 - Mapping of the Site and the surrounding area was calibrated into the noise model based on known Ordinance Survey grid reference points;
 - Indicative ground topography was approximated using Lidar Data available from the DEFRA Website;
 - Off-site buildings which would provide screening to the Site have been incorporated as reflective façades;
 - To reflect the local ground cover, ground absorption was set to $G = 0.5$ (50% acoustically absorptive ground);
 - The model was set to include second order reflected noise from solid structures;
 - Noise levels in outdoor amenity spaces have been predicted with the grid height set at 1.5m; and,
 - Incident noise levels at windows of habitable rooms have been predicted at 4m.
- 4.4 NMP1 and NMP2 have been included into the model as a road source and the resultant road traffic noise has been adjusted until the model is equal to the noise levels at both measurement locations for the daytime and night-time periods.
- 4.5 NMP3 has been included within the model as a vertical area source at a height of approximately 2.5m and the resultant noise level associated with the dairy farm has

¹ Building Bulletin 93': Acoustic Design of Schools: Performance Standards Feb 2015

been adjusted until the model is equal to the noise level at the measurement period for the daytime and night-time periods.

- 4.6 The site layout, shown in **Figure 1.2**, has been incorporated into the model, and the free-field level at the nearest façades has been calculated. Noise contours have been calculated showing the external free-field noise level in external areas, across the Proposed Development Site. The predicted noise levels have been used to inform the assessment.

Noise From Road Traffic

External Daytime Noise Levels

- 4.7 The daytime noise contour plot shown in **Figure 4.1** indicates that for the majority of the Site, noise levels in outdoor living areas will be below the lower 'desirable' guideline value of 50dB $L_{Aeq,T}$ in line with BS8233 and WHO guidance. However, the upper 'desirable' guideline value of 55dB $L_{Aeq,16hr}$ will be exceeded for plots closest to Normandy Way. Therefore, mitigation will be required, and consideration has been given to measures in **Section 5**.

Figure 4.1: Noise Contour Plot without Mitigation, dB $L_{Aeq,16h}$, 1.5m above ground

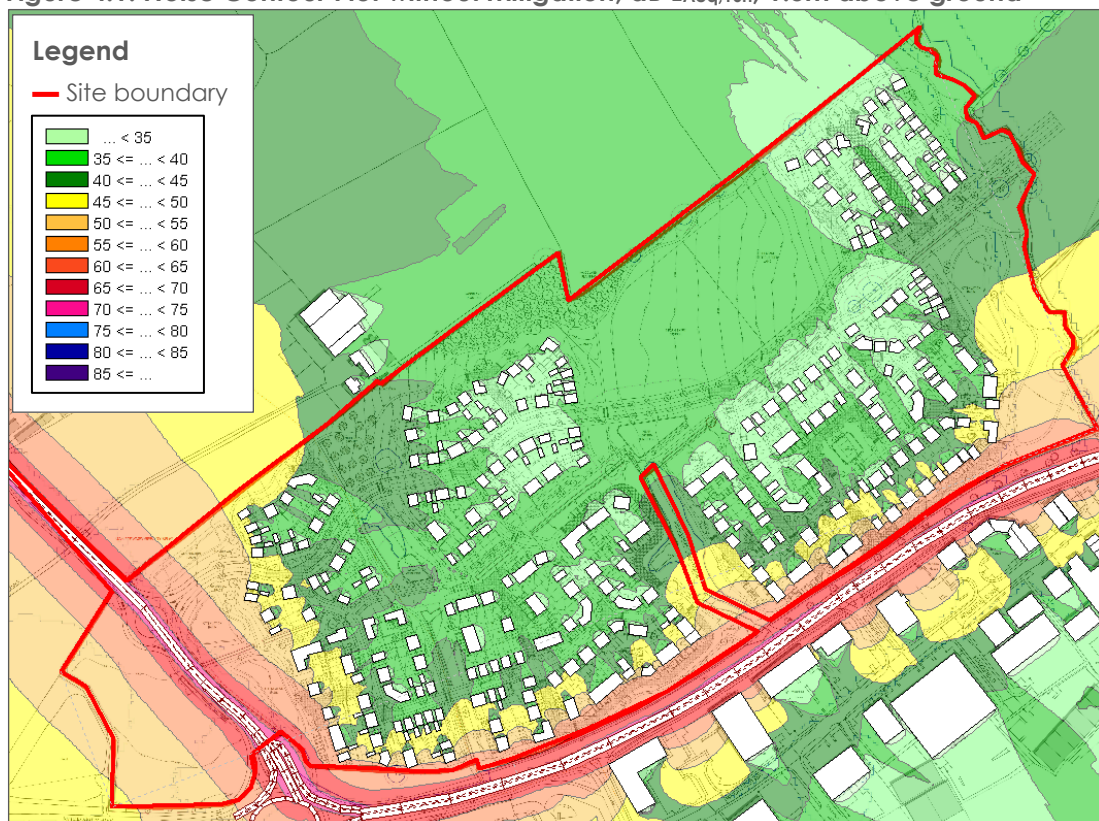
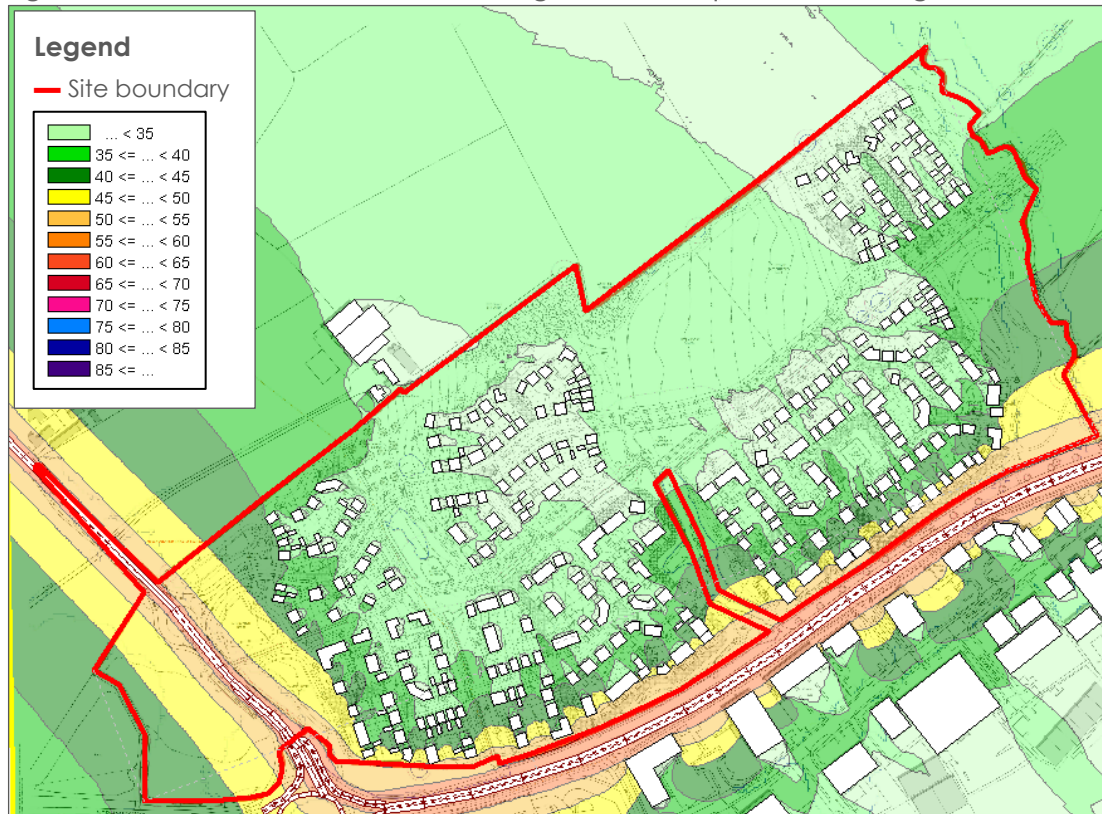


Figure 4.2: Noise Contour Plot without Mitigation, dB $L_{Aeq,8h}$, 14m above ground



Internal Noise Levels

Road Traffic on Stoke Road

- 4.8 Noise levels measured at NMP1 have been used as the basis for the assessment of road traffic noise from Stoke Road to the west.
- 4.9 The results of the noise modelling indicate that the nearest proposed façade to Stoke Road would be exposed to free-field levels of 64dB $L_{Aeq,16hr}$ and 54dB $L_{Aeq,8hr}$ for daytime and night-time, respectively. The typical L_{AFmax} level has been calculated as a point source and the free-field level at the façade has been predicted as 74dB. This is based on the 10th highest measured night-time L_{AFmax} level of 83dB.
- 4.10 Assuming a 15dB loss through a partially opened window, this would result in internal levels of 49dB $L_{Aeq,16h}$ and 39dB $L_{Aeq,8h}$ for daytime and night-time, respectively. A partially opened window would also result in an internal level of 59dB L_{AFmax} during the night-time. Therefore, the criteria of 35dB for the daytime and 30dB and 45dB for the night-time, are likely to be exceeded, assuming partially opened windows. Consideration has been given to mitigation in **Section 5**.

Road Traffic on Normandy Way

- 4.11 Noise levels measured at NMP2 have been used as the basis for the assessment of road traffic noise from Normandy Way to the south.

- 4.12 The results of the noise modelling indicate that the nearest proposed façade to Normandy Way would be exposed to free-field levels of 65dB $L_{Aeq,16hr}$ and 59dB $L_{Aeq,8hr}$ for daytime and night-time, respectively. The typical L_{AFmax} level has been calculated as a point source and the free-field level at the façade has been predicted as 73dB. This is based on the 10th highest measured night-time L_{AFmax} level of 74dB.
- 4.13 Assuming a 15dB loss through a partially opened window, this would result in internal levels of 50dB $L_{Aeq,16h}$ and 44dB $L_{Aeq,8h}$ for daytime and night-time, respectively. A partially opened window would also result in an internal level of 58dB L_{AFmax} during the night-time. Therefore, the criteria of 35dB for the daytime and 30dB and 45dB for the night-time, are likely to be exceeded, assuming partially opened windows. Consideration has been given to mitigation in **Section 5**.

Noise from Proposed School on Proposed Residential

- 4.14 It is likely that the proposed school aspect will have noise generating sources which could impact on the proposed nearby sensitive receptors. However, at this stage the exact location and number of plant is not known. Therefore, it is considered prudent to set fixed plant limits.
- 4.15 Given that a rating level equal to the background sound level is an indication of a 'low impact' in accordance with BS 4142+A1:2019, it is considered appropriate that the cumulative impact of all external plant should be specified so that the rating level is less than or equal to the prevailing background noise levels:
- A rating level limit of 38 dB during the daytime; and
 - A rating level limit of 32 dB during the night-time.
- 4.16 The above rating level limits should apply at least 3.5 metres from the façade of the nearest noise sensitive receptor, i.e. in free-field conditions.
- 4.17 In accordance with BS 4142+A1:2019, assessments of plant noise emissions should include appropriate rating corrections for tonal, irregular or intermittent plant where applicable, before comparison with the above limits. Once details of proposed fixed plant items are available, noise from any fixed plant can be assessed, to ensure that the above limits can be met.
- 4.18 It should be noted that the derived rating level limits would be applicable to the total noise from the simultaneous operation of all external plant serving the Proposed Development. As such, noise emissions from individual items of plant will need to be lower than the given limits, although the exact limit for each individual item of plant will be dependent upon its type, noise characteristics, location etc. This issue is best addressed during the detailed design stage
- 4.19 It is recommended that a further noise assessment is undertaken to determine the potential noise impact from the proposed school at a later stage, once further detail is available.

Noise from Existing Dairy Farm on Proposed Residential

- 4.20 To the north of the Site, lies an existing dairy farm with an associated milking building approximately 60m from the Site boundary. Information provided by the Client states that the farm contains an automatic milking system and therefore can operate at anytime. This assessment has been undertaken on this basis as a worst-case assessment, assuming 24/7 operations.
- 4.21 It is noted that the data measured during the additional baseline noise survey showed sporadic events with an increased noise level, however the event lasted a maximum of 15mins at a time and occurred once during all night-time periods between 0600 – 0700. Therefore, it is considered that this rise in noise level is not associated with the milking operations. The assessment has been undertaken using the worst-case overall measured levels for both the daytime and night-time periods, as detailed in **Section 3**.
- 4.22 The results of the noise modelling indicate that the nearest proposed façade to the existing farm to the north would be exposed to free-field levels of 54dB $L_{Aeq,16hr}$ and 51dB $L_{Aeq,8hr}$ for daytime and night-time, respectively. The 10th highest measured night-time L_{AFmax} level of 69dB has been used to inform the assessment.
- 4.23 Assuming a 15dB loss through a partially opened window, this would result in internal levels of 39dB $L_{Aeq,16h}$ and 36dB $L_{Aeq,8h}$ for daytime and night-time, respectively. A partially opened window would also result in an internal level of 54dB L_{AFmax} during the night-time. Therefore, the criteria of 35dB for the daytime and 30dB and 45dB for the night-time, are likely to be exceeded, assuming partially opened windows. Consideration has been given to mitigation in **Section 5**
- 4.24 As gardens are proposed to be located on the screened side of dwellings, all external criteria would be met with no mitigation in place, therefore no consideration has been given to mitigation for external amenity areas.

Development Generated Road Traffic

- 4.25 An increase in road traffic due to the Proposed Development has the potential to increase the noise levels at NSRs in the vicinity of the Site.
- 4.26 Traffic data has been provided by the project transport consultant as 18-hour Annual Average Weekday Traffic (AAWT) and an 8-hour AAWT. The traffic data has been provided for the following scenarios:
- 2024 Opening Year – Base; and
 - 2024 Opening Year – Base + Proposed Development.
- 4.27 The Basic Noise Level (BNL), as referenced in the Calculation of Road Traffic (CRTN), has been calculated for the roads nearest to the NSRs, to predict the change in noise level between opening year with and without the development.

- 4.28 The results of the traffic assessment have been used as the basis for determining the change in road traffic noise levels that would result from development generated traffic.
- 4.29 Road traffic noise calculations have been carried out in accordance with CRTN, and have been undertaken for a notional receptor location 10m from the edge of the carriageway of each road considered, and 1.5m above ground level. A notional receptor has been used because the change in traffic noise level adjacent to any given road will be the same at all distances where noise from that route is dominant. Traffic noise calculations have been undertaken to establish the change in the weekday daytime $L_{A10,18h}$ noise level and the weekday night-time $L_{A10,8h}$ noise level.
- 4.30 To quantify short term effects, calculations have been undertaken for the opening year both with and without the Proposed Development and for the opening year, with and without development. Road traffic speeds have been applied based on information provided by the Transport Consultant. The results are presented in **Table 4.1**.

Table 4.1: Opening Year Road traffic BNLs, daytime 18-hour, dB(A)

Road Link	No development, BNL	With development, BNL	Change in noise level due to Proposed Development
Stoke Road	65.8	66.5	+0.7
A47 Normandy Way	71.0	71.6	+0.6
Stoke Road	65.2	65.7	+0.5
A47 Normandy Way	69.9	70.7	+0.8
A47 Normandy Way	71.8	72.5	+0.7
B4667 Ashby Road	68.2	68.2	No Change
A47 Normandy Way	70.8	71.2	+0.4
A447 Ashby Road	70.4	71.0	+0.6
A5	75.1	75.3	+0.2
A47 Dodwells Road	71.4	71.7	+0.3
B4666 Coventry Road	69.0	68.8	-0.1
A5	73.9	73.9	+0.1
A47 The Long Shoot	72.2	72.5	+0.2
A5	73.3	73.4	+0.1

- 4.31 For the road links assessed in the opening year, there is predicted to be up to a +0.8dB increase in noise level due to development generated traffic. In accordance with DMRB, this is likely to result in a negligible impact during the daytime periods as a result of the additional road traffic in the short term, which is not considered significant.
- 4.32 Based on the above, no further consideration of mitigation is considered warranted at this time.

5. MITIGATION

- 5.1 In **Section 4**, it has been determined that consideration should be given to mitigation measures for external and internal habitable areas of the Proposed Development to provide a commensurate level of protection for future occupants.

External Living Areas

Site Suitability for Residential Use - Noise From Road Traffic

- 5.2 Noise levels in outdoor living areas located closest to Normandy Way are above the recommended guideline noise level. Therefore, mitigation would be required to reduce noise levels from road traffic to within acceptable levels as recommended in BS8233 and WHO.
- 5.3 Results of the noise modelling indicate that mitigation in the form of localised acoustic barriers are required around the plots located closest to Normandy Way. The location and heights are presented in Error! Reference source not found..
- 5.4 The barriers must extend from ground level to at least the specified height, be solid i.e. imperforate and have a minimum superficial mass of 15kg/m². Any penetrations or junctions should be treated to maintain acoustic integrity. shows the resultant external noise contours with barrier mitigation in place.

Figure 5.1: Noise Contour Plot with Mitigation, dB LAeq,16h, 1.5m above ground



Internal Living Areas

- 5.5 It is widely considered that first amelioration measure available to an occupant will be to close windows. Therefore, in order to assess the noise mitigation required to ensure an adequate level of protection against noise, it is appropriate to explore in the first instance the protection that could be afforded by the sound insulation performance of the external building fabric, and in particular the glazing elements.
- 5.6 Detailed noise break-in calculations have been undertaken in accordance with the rigorous method from section G.2 from BS 8233 based on the frequency spectra measured on-site and the following assumptions:

- Façade make up of 2x103mm brick (75mm gap + plast);
 - Room dimensions (W3m x L4.4m x H3m) and window sizes (30% window, 70% wall);
 - Glazing area of 2m²;
 - A reverberation time of 0.5 seconds; and,
 - A single 2500mm² ventilator per habitable room.
- 5.7 The break-in calculations have been undertaken for the 1st floor, to provide a worst-case scenario.

Road Traffic on Stoke Road

- 5.8 To achieve the daytime internal noise criterion of 35 dB $L_{Aeq,16h}$ adopted for this assessment, based on the façade closest to Stoke Road experiencing 64 dB $L_{Aeq,16h}$ free-field at the facade, a reduction of 29 dB(A) would be required for habitable rooms. To achieve the internal criteria of 30 dB $L_{Aeq,8h}$ and 45 dB L_{AFmax} during the night-time, adopted for this assessment, a reduction of up to 29 dB(A) would be required for habitable rooms.
- 5.9 For the facades facing onto Stoke Road, all criteria would be achieved with double glazing with an example configuration of 4mm pane / 12mm airgap / 4mm pane, which would need to provide a minimum performance of $R_w + C_{tr}$ of 27 dB. Acoustic trickle ventilators, which achieve a minimum performance of $D_{n,e,w} + C_{tr}$ 35 dB would be required, for worst affected properties located closest to Stoke Road.
- 5.10 For all remaining dwellings, which are located further back from the road and afforded screening from the development itself, all criteria would likely be achieved with open windows.

Road Traffic on Normandy Way

- 5.11 To achieve the daytime internal noise criterion of 35 dB $L_{Aeq,16h}$ adopted for this assessment, based on the façade closest to Normandy Way experiencing 65 dB $L_{Aeq,16h}$ free-field at the facade, a reduction of 30 dB(A) would be required for habitable rooms. To achieve the internal criteria of 30 dB $L_{Aeq,8h}$ and 45 dB L_{AFmax} during the night-time, adopted for this assessment, a reduction of up to 29 dB(A) would be required for habitable rooms.
- 5.12 For facades of the properties located closest to Normandy Way, all criteria would be achieved with double glazing with an example configuration of 8mm / 12mm / 10mm pane, which would need to provide a minimum performance of $R_w + C_{tr}$ of 33dB. Acoustic trickle ventilators such as the Greenwood Airvac Acoustic Air Brick AAB-4000 which achieve a minimum performance of $D_{n,e,w} + C_{tr}$ 40 dB would be required for the worst affected properties located closest to Normandy Way.

- 5.13 For all remaining dwellings, which are afforded screening by the development itself, all criterion would likely be achieved with standard double glazing with a configuration of 4mm pane/ 12mm pane / 4mm pane, which would need to provide a minimum performance of $R_w + C_{tr}$ of 27 dB. Trickle ventilators with an indirect air path which achieve a minimum performance of $D_{n,e,w} + C_{tr}$ 32 dB would be required.
- 5.14 The above presents solutions to satisfy the proposed internal ambient noise limits within habitable rooms during normal ventilation conditions to meet Part F minimum ventilation. Purge ventilation is acceptable via openable windows.
- 5.15 **Table 5.1** shows the resultant internal noise levels in the worst affected rooms for the first row of dwellings facing both Stoke Road and Normandy Way.

Table 5.1: Predicted external and internal noise levels, with mitigation, dB

Room	Predicted External Noise Level, free-field			Resultant Internal Noise Level		
	L _{Aeq,16h}	L _{Aeq,8h}	L _A F _{max}	L _{Aeq,16h}	L _{Aeq,8h}	L _A F _{max}
Bedroom (First Row of Dwellings – Stoke Road)	64	54	74	34	23	43
Bedroom (First Row of Dwellings – Normandy Way)	65	59	73	32	25	39

Site Suitability for Residential Use - Noise from Existing Dairy Farm

- 5.16 In **Section 4**, it has been determined that consideration should be given to mitigation measures for internal habitable areas at the eastern side of the Proposed Residential Development to provide a commensurate level of protection against noise associated with the existing commercial premises adjacent to the eastern Site boundary.
- 5.17 To achieve the daytime internal noise criterion of 35 dB L_{Aeq,16h} adopted for this assessment, based on the façade closest to the existing dairy farm to the north experiencing 54 dB L_{Aeq,16h} free-field at the facade, a reduction of 19 dB(A) would be required for habitable rooms. To achieve the internal criteria of 30 dB L_{Aeq,8h} 45 dB L_AF_{max} during the night-time, adopted for this assessment, a reduction of up to 24 dB(A) would be required for habitable rooms.
- 5.18 All criteria would be achieved with standard thermal double glazing such with a configuration of 4mm pane / 12mm airgap / 4mm pane, which would need to provide a minimum $R_w + C_{tr}$ of 27 dB. Trickle ventilators with an indirect air path, which achieve a minimum performance of $D_{n,e,w} + C_{tr}$ 32 dB would be required, for worst affected properties located closest to the existing dairy farm and the milking operations.

- 5.19 It is noted from the Client that there is likely to be a bund included within the finalised masterplan, which will be situated in between the proposed dwellings to the north and the existing dairy farm. Therefore, it is likely that the predicted levels at the nearest facades will be less than those stated within this assessment and mitigation may be reduced. However, this will need to be determined at the more detailed design stage.

Summary

- 5.20 **Figure 5.2** and **Figure 5.3** overleaf detail the plots requiring the mitigation strategy needed to afford protection to future occupants due to road traffic noise on both Stoke Road and Normandy Way respectively.

Figure 5.2: Proposed Glazing and Ventilation Strategy – Stoke Road



Figure 5.3: Proposed Glazing and Ventilation Strategy – Normandy Way



6. CONCLUSION AND RECOMMENDATIONS

- 6.1 BWB Consulting Ltd was appointed by Richborough Estates Ltd and Mr. & Mrs. Adcock to undertake an environmental noise assessment for a proposed residential development with a proposed school element at Hinckley North, Hinckley.
- 6.2 This assessment has been undertaken based on the results of a baseline noise survey undertaken in January 2022 and additional baseline monitoring undertaken in February 2022 at the Site. The results of the survey have been assessed in accordance with current standards and guidance, following consultation with Hinckley and Bosworth Borough Council.
- 6.3 The noise assessment shows that with appropriate consideration to noise mitigation measures, a commensurate level of protection can be afforded to future noise sensitive receptors on the Site.
- 6.4 For proposed dwellings located closest to Normandy Way, external criteria would be achieved with localised barriers of up to 2m in height around the external amenity areas.
- 6.5 For the facades, facing onto Stoke Road, all criteria would be achieved with double glazing with an example configuration of 4mm pane / 12mm airgap / 4mm pane, which would need to provide a minimum performance of $R_w + C_{tr}$ of 27 dB. Acoustic trickle ventilators, which achieve a minimum performance of $D_{n,e,w} + C_{tr}$ 35 dB would be required, for worst affected properties located closest to Stoke Road.
- 6.6 For the facades of the properties located closest to Normandy Way, all criteria would be achieved with double glazing with an example configuration of 8mm / 12mm / 10mm pane, which would need to provide a minimum performance of $R_w + C_{tr}$ of 33dB. Acoustic trickle ventilators such as the Greenwood Airvac Acoustic Airbrick AAB-4000 which achieve a minimum performance of $D_{n,e,w} + C_{tr}$ 40 dB would be required for the worst affected properties located closest to Normandy Way.
- 6.7 For the properties located closest to the existing dairy farm, all criteria would be achieved with double glazing with an example configuration of 4mm pane / 12mm airgap / 4mm pane, which would need to provide a minimum performance of $R_w + C_{tr}$ of 27 dB. Acoustic trickle ventilators, which achieve a minimum performance of $D_{n,e,w} + C_{tr}$ 35 dB would be required, for worst affected properties located closest to the dairy farm and associated milking operations.
- 6.8 Based on the results of the assessment, it has been demonstrated that the Site is suitable for residential development.

APPENDICES

APPENDIX A: Glossary of Terms

Noise

Noise is defined as unwanted sound. Human ears are able to respond to sound in the frequency range 20 Hz (deep bass) to 20,000 Hz (high treble) and over the audible range of 0 dB (the threshold of perception) to 140 dB (the threshold of pain). The ear does not respond equally to different frequencies of the same magnitude but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting mechanism is used. This reduces the importance of lower and higher frequencies, in a similar manner to the human ear.

Furthermore, the perception of noise may be determined by a number of other factors, which may not necessarily be acoustic. In general, the impact of noise depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period of time. In some cases, the time of day and other acoustic features such as tonality or impulsiveness may be important, as may the disposition of the affected individual. Any assessment of noise should give due consideration to all of these factors when assessing the significance of a noise source.

The most widely used weighting mechanism that best corresponds to the response of the human ear is the 'A'-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or L_{Aeq} , L_{A90} etc., according to the parameter being measured.

The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective, but as a general guide a 10 dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB(A) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions.

Acoustic Terminology

Term	Description
dB (decibel)	The scale on which sound pressure level is expressed. Sound pressure level is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure (2x10 ⁻⁵ Pa).
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} is defined as the notional steady sound level which, over a stated period of time (T), would contain the same amount of acoustical energy as the A - weighted fluctuating sound measured over that period.
L _{Amax}	L _{Amax} 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.
L ₁₀ and L ₉₀	If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L _n indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L ₁₀ is the level exceeded for 10% of the time, and the L ₉₀ is the level exceeded for 90% of the time.
Free-field Level	A sound field determined at a point away from reflective surfaces other than the ground with no significant contributions due to sound from other reflective surfaces. Generally as measured outside and away from buildings.
Façade Level	A sound field determined at a distance of 1m in front of a large sound reflecting object such as a building façade.

APPENDIX B: Full Survey Results

Figure B1: Measurement Results from NMP1

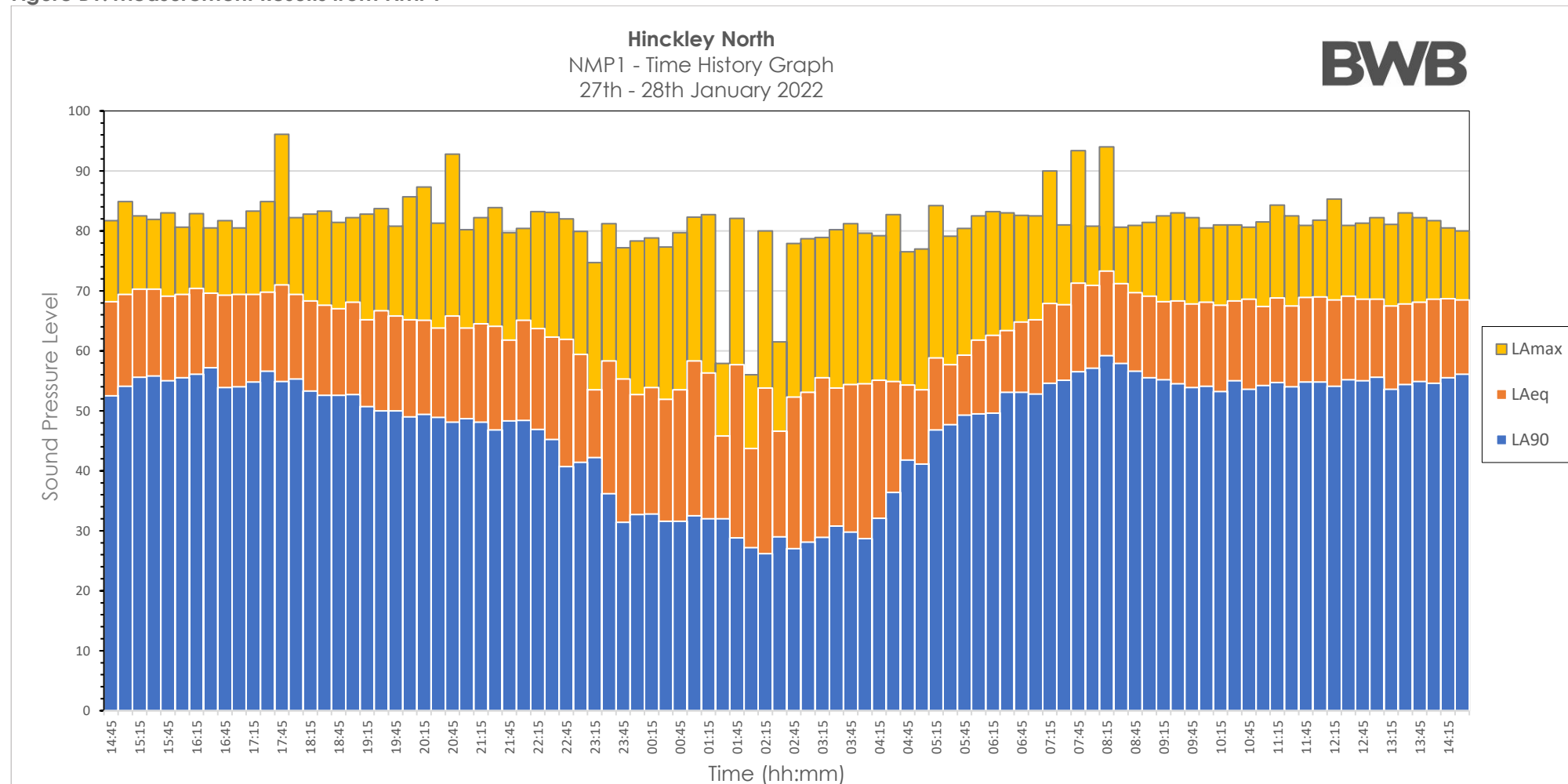


Figure B2: Measurement Results from NMP2

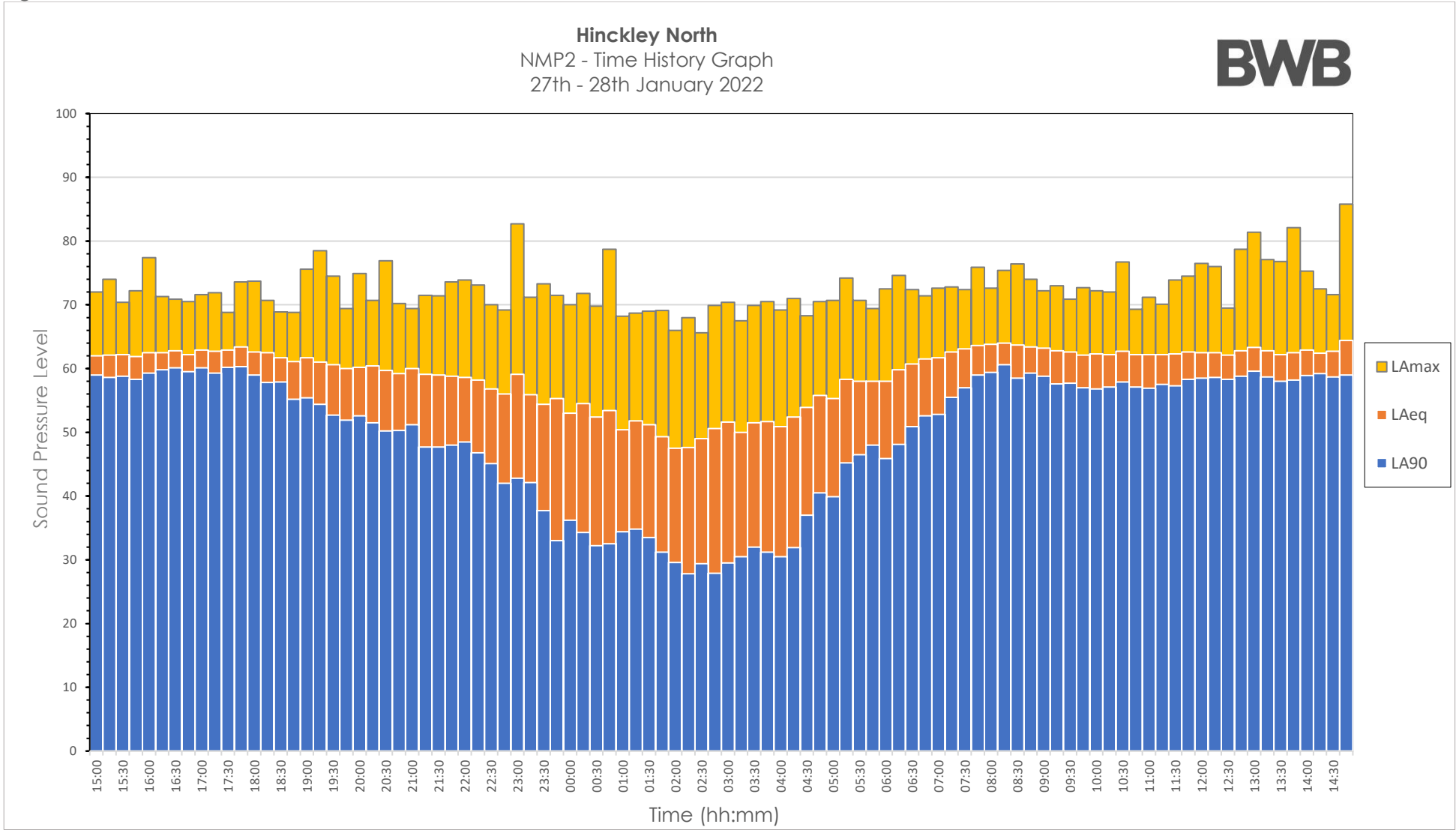


Figure B3: Measurement Results from NMP3

