15. Noise and Vibration

15.1. Introduction

15.1.1. RSK Environment Ltd (RSK) was appointed by Catesby Estates Ltd and Miller Homes Ltd to undertake a revised ES Chapter in support of a planning application for the proposed residential development on Whitford Road, Bromsgrove. The proposed development is for up to 490 residential units including A1 retail, local shops and access to public open space.

15.1.2. This chapter sets out the assessment of potential noise effects associated with the proposed development.

15.1.3. National and local policies are described and standard assessment methodologies identified. The assessment consists of the likely impact of noise upon the surrounding existing sensitive receptors and the impact of the existing noise environment on future proposed noise sensitive receptors.

15.1.4. Mitigation measures, where required, have been proposed to further minimise effects of noise from the proposed development; likely residual effects after these measures have been employed are then presented.

15.1.5. An Environmental Statement and Noise Impact Assessment were originally submitted by RSK in 2016 and revised in 2018. Since the 2018 assessment, the traffic model used to assess the impacts of the proposed development at Whitford Road has been updated as part of post submission consultation.

15.1.6. Since the amenity of the front gardens facing west could be subjected to noise levels above the guidance values as set out in the 'Worcester Regulatory Services – Noise Control Technical Guidance', a buffer zone/distance was established. Therefore, a revised master plan of the proposal has incorporated a new layout scheme for the worst case affected dwellings adjacent to the M5 (only).

15.1.7. A subsequent 'Regulation 22' notice (of the 2011 EIA Regulations), was issued on 22 April 2020 requesting further information. Specifically, with regards to noise, the request stated,

"Updated baseline noise surveys (or justification to explain why the original data remains valid). It is noted that the noise assessment has been updated but this is based upon data collected during 2017".

15.1.8. As a direct response to the Regulation 22 request, it should be noted that the impact assessment of the proposed development is based on the incorporation of the road traffic noise data for the built (2021) development scenario and not the baseline data obtained in 2017. By adopting this approach, the assessment uses the most stringent interpretation of the input parameters to inform the assessment of operational impacts on existing and proposed (development) receptors. An updated baseline survey would therefore have no bearing on the outcomes of the previous and this updated Chapter.

15.1.9. A revised version of the ES Chapter related to noise and vibration has been prepared, inclusive of the most recent traffic count data, planning policies/guidance, and one which offers further clarity on the Regulation 22 request.

15.2. Policy Context

Noise Policy Statement for England (NPSE): 2010

15.2.1. The Noise Policy Statement for England is published by the Department for Environment, Food and Rural Affairs (Defra) and sets out the approach to noise within the Government's sustainable development strategy.

15.2.2. The significance of impacts from noise within the NPSE are defined as follows:

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.

15.2.3. Extending these concepts for the purpose of the 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 three aims of the NPSE are stated as:

- Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.
- Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.
- Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

National Planning Policy Framework (NPPF): 2019

15.2.4. Since its publication by the Department for Environment, Food and Rural Affairs in 2010 the Noise Policy Statement for England (NPSE) has been the Central Government noise policy that has been available to inform the consideration of environmental noise in relation to the consenting of everything from small scale residential development to national infrastructure. The National Policy Planning Framework (NPPF), as updated by the Ministry of Housing, Communities and Local Government in 2019, has noise aims that are consistent with NPSE.

15.2.5. The noise policy aims as stated in NPSE are:

Noise Policy Aims

Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

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

15.2.6. In order to translate these aims into practical guidance the NPSE uses the same terminology as used by the World Health Organisation (WHO), in the Night Noise Guidelines for Europe, 2009 by referring to the Lowest Observed Adverse Effect Level (LOAEL). The NPSE extends this concept to define the level above which significant

adverse effects on health and quality of life can be detected, hence the Significant Observed Adverse Effect Level (SOAEL).

15.2.7. The NPSE notes "It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times". The second aim of the NPSE refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur.

15.2.8. Not having quantified effect thresholds in the NPSE means that relevant standards and guidance are used to put forward values for the LOAEL and SOAEL for the proposed development under consideration. The suitability of internal noise levels within a development for its intended uses can be determined with reference to BS8233.

15.3. Consultation

15.3.1. The proposed method represented within this report was presented to the senior technical officer at Worcester Regulatory Service (WRS) dated on the 21/04/17. The technical officer agreed with the methodology and the monitoring locations for the noise survey and assessment update.

15.4. Guidance and Methodology

Construction Noise

British Standard 5228-1: 2009+A1: 2014 'Code of Practice for noise and vibration control on construction and open sites – Noise'

15.4.1. Construction phase noise impacts arising from equipment, vehicular movements and activities related to the demolition of the site and construction of the proposed development are assessed by calculating the change in ambient noise level ($L_{Aeq,T}$) as a result of such activities using the methods described by BS 5228-1.

15.4.2. The method for assessing the significance of noise from demolition and construction activities are provided within Annex E of BS 5228.

15.4.3. One such method of applying significance to noise effects is repeated in Table 15.1.

Table 15.1 - Threshold of significant effect at receptors

Assessment Category and Threshold Value Period (L_{Aeq})	Threshold Value in decibels (dB)		
	Category A[1]	Category B[2]	Category C[3]
Night-time (23.00–07.00)	45	50	55
Evenings and weekends [4]	55	60	65
Daytime (07.00–19.00) and Saturdays (07.00–13.00)	65	70	75

[1] Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.
[2] Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values.
[3] Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.
[4] 19.00–23.00 weekdays, 13.00–23.00 Saturdays and 07.00–23.00 Sundays.

15.4.4. A significant effect has been deemed to occur if the total (construction plus baseline ambient) noise level, exceeds the threshold level for the Category appropriate to the ambient noise level for a month or more. If the baseline ambient noise level exceeds the Category C values then a significant effect is deemed to occur if the total noise level for the period increases by more than 3 dB due to construction activity.

15.4.5. Works for a shorter duration that might result in a significant effect are considered by using the trigger levels for sound insulation and time criteria from Annex E.4 of BS 5228-1.

15.4.6. Exceedance of identified levels as shown in Table 15.2 trigger a responsibility on the developer to provide noise insulation. The standard suggests that noise insulation should be provided if the trigger levels in Table 15.2 (or a noise level 5 dB above the existing noise level, whichever is higher) are predicted to be exceeded for a period of ten or more days of working in any fifteen consecutive days, or for a total of days exceeding 40 in any six month period.

Table 15.2 - Criteria for assessing eligibility for noise insulation

Time	Relevant Time Period	Averaging Time, T	Noise Trigger Level, dB $L_{Aeq, T}$ 1)
Monday to Friday	07.00 – 08.00	1 h	70
	08.00 – 18.00	10 h	75
	18.00 – 19.00	1 h	70
	19.00 – 22.00	3 h	65
	22.00 – 07.00	1 h	55

Time	Relevant Time Period	Averaging Time, T	Noise Trigger Level, dB $L_{Aeq, T}$ 1)
Saturday	07.00 – 08.00	1 h	70
	08.00 – 13.00	5 h	75
	13.00 – 14.00	1 h	70
	14.00 – 22.00	3 h	65
	22.00 – 07.00	1 h	55
Sunday & Public Holidays	07.00 – 21.00	1 h	65
	21.00 – 07.00	1 h	55
Note 1) Equivalent continuous A-weighted noise level predicted or measured at a point 1m in front of the most exposed windows or doors leading directly to a habitable room (living room or bedroom) in an eligible dwelling.			

Operational Noise – Road Traffic Noise

Calculation of Road Traffic Noise (CRTN), 1988

15.4.7. The *'Calculation of Road Traffic Noise'* (CRTN) produced by the Department of Transport / Welsh Office provides a method for the prediction of noise from road traffic.

15.4.8. The prediction method uses two-way, 18-hour, Annual Average Weekday Traffic (AAWT) flows for road links and with corrections for speed, road surface, road gradient and screening to determine the $L_{10, 18hour}$ "Basic Noise Level" at a reference distance of 10 metres from the edge of the nearside carriageway of the road. The 18-hour period is defined between 06:00 and 24:00.

15.4.9. The 2006 DEFRA update to CRTN, *'Method For Converting The UK Road Traffic Noise Index LA10,18h To The EU Noise Indices For Road Noise Mapping'*, is a guide for converting the calculated $L_{A10, 18hour}$ value into an averaged daytime, evening and night-time level ($L_{Aeq, T}$) for the site, using the formulae in Table 15.3:

Table 15.3 - TRL conversion calculations

Non-motorway roads	Motorways
$L_{day} = 0.95 \times L_{A10,18h} + 1.44$ dB	$L_{day} = 0.98 \times L_{A10,18h} + 0.09$ dB
$L_{evening} = 0.97 \times L_{A10,18h} - 2.87$ dB	$L_{evening} = 0.89 \times L_{A10,18h} + 5.08$ dB
$L_{night} = 0.90 \times L_{A10,18h} - 3.77$ dB	$L_{night} = 0.87 \times L_{A10,18h} + 4.24$ dB
$L_{Aeq, 16h} = 10Log_{10} [1/16] (12 \times 10^{L_{day}/10} + 4 \times 10^{L_{evening}/10})$	

Design Manual for Roads and Bridges (DMRB), 2020

15.4.10. The Design Manual for Roads and Bridges LA 111 'Noise and Vibration' (DMRB) provides advice on the assessment of noise and vibration impacts due to road traffic.

15.4.11. Two sets of criteria are presented for assessing the impact of traffic noise changes, one for the short term and another for the long term, which takes into account the difference in the human perception of short- and long-term environmental noise changes. In the short term a change in road traffic noise of 1 dB $L_{A10,18hour}$ is the smallest that is considered perceptible whilst in the longer term a 3 dB $L_{A10,18hour}$ change is considered just perceptible. A change in road traffic flow of 25% is generally predicted to give rise to a change in noise of approximately 1 dB(A).

15.4.12. The criteria from DMRB for short and long-term effects has been adopted to determine significance of the effect of road traffic noise; criteria are presented in Table 15.4:

Table 15.4 - DMRB criteria for determining magnitude of impact

Short Term		Long Term	
Change in noise level, $L_{A10,18hr}$ dB	**Magnitude of impact**	**Change in noise level, $L_{A10,18hr}$ dB**	**Magnitude of impact**
0	No Change	0	No Change
0.1 – 0.9	Negligible	0.1 – 2.9	Negligible
1.0 – 2.9	Minor	3.0 – 4.9	Minor
3.0 – 4.9	Moderate	5.0 – 9.9	Moderate
5.0 +	Major	10.0 +	Major

Operational Noise – Fixed Plant Noise (associated with A1 retail and/or local shop)

British Standard 4142: 2014+A1:2019 'Methods for rating and assessing industrial and commercial sound'

15.4.13. BS 4142: 2019 describes the methods for rating and assessing noise from industrial or commercial sources, including manufacturing processes, fixed installations and plant equipment, loading of goods and sound from mobile plant. The standard is applicable for the purpose of assessing sound at proposed new dwellings, through the determination of a rating level of an industrial or commercial noise source.

15.4.14. Where certain acoustic features are present at the assessment location, a character correction should be applied to the specific sound level to give the rating level to be used in the assessment.

- 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 +5dB is likely to be an indication of adverse impact depending on the context.
- 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.

15.4.15. Where the initial estimate of the impact needs to be modified due to the context, all pertinent factors should be taken into account, including:

- The absolute level;
- The character and level of the residual sound;
- The sensitivity of the receptor and whether dwellings will already (or likely) to incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as: i) façade insulation treatments, ii) ventilation and/or cooling, and iii) acoustic screening.

Operational Noise – Site Suitability

British Standard 8233:2014 'Guidance on sound insulation and noise reduction for buildings'

15.4.16. Since the development site is situated close to existing transportation sources, noise ingress into the proposed dwellings on site is a significant consideration in the assessment of the site. The assessment of noise ingress and determination of facade noise insulation has been assessed using BS 8233:2014. BS 8233 recommends the following design criteria for residential dwellings:

Table 15.5 - BS 8233 Internal ambient noise levels for dwellings

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Room	35 dB $L_{Aeq,16hr}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hr}$	-
Sleeping (Daytime resting)	Bedroom	35 dB $L_{Aeq,16hr}$	30dB $L_{Aeq,8hr}$

15.4.17. BS 8233 provides guidance for noise in gardens and outdoor amenity space. It suggests that, *"it is desirable that the external 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."* The guidance does go on to say that these guideline values are not

achievable in all circumstances and in some areas*, "such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited."*

World Health Organisation (WHO) 'Guidelines for Community Noise', 1999

15.4.18. The 1999 World Health Organisation (WHO) 'Guidelines for Community Noise' state that in a dwelling the critical effects of noise are on annoyance, speech interference and sleep. The Guidelines present a set of values for the onset of health effects from noise exposure within specific environments. The guideline values are typically set based upon the lowest levels of noise that affect health (critical health effect) for general populations.

15.4.19. In relation with night noise, this document states the following:

"For a good night's sleep, the equivalent sound level should not exceed 30 dB(A) for continuous background noise, and individual noise events exceeding 45 dB(A) should be avoided. In setting limits for single night-time noise exposures, the intermittent character of the noise has to be taken into account. This can be achieved, for example, by measuring the number of noise events, as well as the difference between the maximum sound level and the background sound level. Special attention should also be vibrations; and to noise sources with low-frequency components". In relation with the analysis of short events during night; "For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB LAmax more than 10–15 times per night".

Professional Practice guidance on Planning and Noise (ProPG): 2017

15.4.20. The Professional Practice Guidance on Planning and Noise is written to provide practitioners with guidance on a recommended approach to the management of noise within the planning system in England. The CIEH, IOA and the ANC have worked together to produce the guidance which encourages better acoustic design for new residential development and aims to protect people from the harmful effects of noise. This Professional Practice Guidance is based on the best knowledge available at the

time of publication. It does not constitute an official government code of practice and neither replaces nor provides an authoritative interpretation of the law or government policy on which users should take their own advice as appropriate.

15.4.21. In relation with achieving internal noise values with open windows ProPG states that: "Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the "open" position and, in this scenario, the internal LAeq target levels should not normally be exceeded".

15.4.22. ProPG encourages the use of acoustic design as a means to inform the site masterplans and is key to avoiding or reducing to a minimum any adverse effects on any sensitive internal or external spaces. In considering acoustic design, consideration should be given by the developer to the management of noise through a hierarchy of potential mitigation measures which may include:

- Maximising the separation distance between source and receiver;
- Incorporate noise barriers (where applicable) to screen the development site (or individual plots) from significant sources of noise;
- Use existing features to reduce noise propagation across the site;
- Orientate the buildings in a manner which reduces the noise levels within habitable rooms (particularly bedrooms);
- Building envelope design to mitigate the noise to acceptable levels, whilst providing adequate ventilation.

Significance criteria

15.4.23. This noise and vibration chapter has used a topic specific assessment framework for assessing the significance of effect. The following text and tables define the magnitude of effects that are used to determine the significance of effect outlined in this chapter.

15.4.24. The area surrounding the development is predominantly residential. As residences are classed as being of the highest sensitivity, these would be the governing receptors in terms of impact. Therefore, for the purposes of the assessment of noise, all residential receptors are considered as being of 'high' sensitivity.

Magnitude of effect

15.4.25. The 'magnitude of effect' is used to describe a numerate impact in effect terms and is used differently for each of the various aspects of change to the noise environment. Table 15.6 presents a summary of the criteria for effect:

Table 15.6 - Magnitude of effect criteria

Effect	Criteria			
	Construction Noise	**Road Traffic (Short Term)**	**Road Traffic (Long Term)**	**Fixed Plant Noise**
High	Construction noise greater than noise insulation trigger level	Change in $L_{A10,\ 18\ hour}$ of 5.0 dB or more	Change in $L_{A10,\ 18\ hour}$ of 10.0 dB or more	10 dB or more above existing background noise (L_{A90})
Medium	Construction noise greater than the relevant threshold of significance but below noise insulation trigger level	Change in $L_{A10,\ 18\ hour}$ of 3.0 - 4.9 dB	Change in $L_{A10,\ 18\ hour}$ of 5.0 - 9.9 dB	5 - 9.9 dB above existing background noise (L_{A90})
Low	Construction noise greater than ambient noise level but less than or equal to than the relevant threshold of significance	Change in $L_{A10,\ 18\ hour}$ of 1.0 - 2.9 dB	Change in $L_{A10,\ 18\ hour}$ of 3.0 - 4.9 dB	3 - 4.9 dB above existing background noise (L_{A90})
Negligible	Construction noise below Ambient Noise Level	Change in $L_{A10,\ 18\ hour}$ of 0.1 - 0.9 dB	Change in $L_{A10,\ 18\ hour}$ of 0.1 - 2.9 dB	0.1 - 2.9 dB above existing background noise (L_{A90})

Significance of effect

15.4.26. As this assessment considers one level of sensitivity, the normal approach to significance cross referencing sensitivity and magnitude of impact has been substituted with a dual approach. Impacts are considered significant if the magnitude of effect is either moderate or major as per Table 15.7 below. Mitigation will be applied where a significant effect has been determined.

Table 15.7 - Matrix of significance

		Sensitivity of receptor/ Receiving Environment to Change/ Effect		
		High	**Medium**	**Low**
Magnitude	**High**	Major Adverse Significance	Moderate Adverse Significance	Minor Adverse Significance

		Sensitivity of receptor/ Receiving Environment to Change/ Effect		
		High	**Medium**	**Low**
	Medium	Moderate Adverse Significance	Minor Adverse Significance	Not significant
	Low	Minor Adverse Significance	Not significant	Not significant
	Negligible	Not significant	Not significant	Not significant

15.4.27. The LOAEL (lowest observed adverse effect level) and SOAEL (significant observed adverse effect level) for each aspect of the assessment have been based on relevant guidance documents and example criteria from recent and similar projects. Based on the magnitude of effect and in line with NPSE, a LOAEL would occur where there is an exceedance of the minor effect level and SOAEL where these is an exceedance of the major effect level for receptors that are of high sensitivity.

Limitations and assumptions

15.4.28. As detailed methods and phasing of construction are not available currently, the construction noise assessment is necessarily conservative. The activity levels have been used to determine worst case noise levels at existing receptors adjacent to the development site through the means of spreadsheet calculations. Once the exact construction plant, phasing and timings have been determined, a further assessment would be considered in line with appropriate methodology, which would feed into the site-specific Construction Noise and Vibration Management Plan (CNVMP).

15.4.29. In addition, vibration effects from construction activity have been scoped out of the assessment due to the relative distance between source and receiver, and unlikelihood of any significant vibratory methods of construction being used on the site.

15.4.30. At this stage, specific details of the locations and noise levels of any fixed plant is unknown, therefore a conclusive assessment of noise from any proposed building services plant cannot be undertaken. Proposed criteria for new and existing residential property have been included which provide a set of design targets that any fixed plant should be designed to in order to meet the requirements of BS 4142: 2014+ A1: 2019, to not exceed the existing background noise ($L_{90,T}$).

15.5. Baseline Environment

Baseline Noise Monitoring

15.5.1. A baseline noise level survey was undertaken on 3rd - 4th of May 2017. An unattended sound level meter was located centrally within the proposed site for a period of 24 hours to quantity typical noise levels emanating from the M5 motorway located approximately 170 metres to west and 280 metres to the east of Whitford Road.

15.5.2. Attended short term noise monitoring was conducted at three locations for periods of 3-hours to the requirements of the shortened CRTN methodology (i.e between 10:00 – 17:00). One measurement was located to the western boundary of the site adjacent with the M5 motorway. A second attended noise monitoring position was located east adjacent to Whitford Road, and a third position was located north of site at Timberhonger Lane. All measurement locations where chosen to give further information of the current noise levels of the surrounding roads.

15.5.3. The following tables show the results obtained from each of the measurement locations.

Table 15.8 - Noise monitoring results - Unattended noise survey

Date	Time period	Start Time	Duration (hh:mm)	$L_{Aeq, T}$ dB	$L_{Amax, T}$ dB*	$L_{A10, T}$ dB	$L_{A90, T}$ dB
Wed - 03/05/17	Day	13:48	09:12	62.0	81.8	63.3	58.8
	Night	23:00	08:00	59.3	82.0	60.7	52.9
Thurs - 04/05/17	Day	07:00	06:48	61.6	75.9	63.0	59.0
Daytime Resultant, $L_{Aeq, 16hour}$				**61.8**	**81.8**	**63.2**	**58.9**
Night Resultant, $L_{Aeq, 8hour}$				**59.3**	**82.0**	**60.7**	**52.9**

** Highest Lmax during assessment period*

Table 15.9 - Noise monitoring results - Attended survey

Road	Date	Start Time	Duration (hh:mm)	$L_{Aeq, T}$ dB	$L_{Amax, T}$ dB*	$L_{A10, T}$ dB	$L_{A90, T}$ dB
M5	03/05/2017	10:40	03:00	78.4	91.3	82.2	70.9
Whitford Road	04/05/2017	10:24	03:30	70.2	98.2	74.7	48.3
Timberhonger Lane	03/05/2017	10.56	03:15	62.3	95.8	61.8	59.4

** Highest Lmax during assessment period*

15.6. Potential Effects

Construction Noise

15.6.1. The activity noise levels used in the assessment of construction noise are summarised in Table 15.10.

Table 15.10 – Activity noise levels

Activity	Activity Noise Level at 10m, dB $L_{Aeq, T}$
Earthworks and De-vegetation	80
Foundations	75
General Construction	78
Access Road	79

15.6.2. As detailed methods and phasing of construction are not available currently, the construction noise assessment is necessarily conservative. The activity levels have been used to determine worst case noise levels at existing receptors adjacent to the development site through the means of spreadsheet calculations (adopting the calculation methods provided in BS 5228-1:2019 +A1: 2014).

15.6.3. Based on the baseline noise levels obtained during a representative daytime period, those nearest receptors to the development site along Sunningdale Road and Whitford Road, would fall within the Category A criteria (65 dB $L_{Aeq, 12hrs}$) for construction noise impacts, in accordance with BS 5228-1:2019 +A1: 2014.

15.6.4. Worst-case noise predictions assume that all the plant and equipment is in operation at the closest point to each receptor (site boundary) summarised in Table 15.11.

Table 15.11 – Construction noise assessment

Receptor	BS5228 Criteria	Predicted Noise Level, dB $L_{Aeq,T}$			
		Earthworks and De-veg	Foundations	General Construction	Access Road
Sunningdale Road	65	70	65	69	69
Whitford Road	65	66	60	65	65

15.6.5. Based on an indicative assessment of construction noise impacts from a variety of likely activities, noise levels would likely exceed the Category A threshold for daytime operations, without mitigation in place. Further discussion on proposed mitigation and residual impact, is provided in Section 15.7.

Operational Noise – Road Traffic Noise

15.6.6. In order to quantify potential noise impacts at receptor locations during the operational phase of the development, two assessment scenarios (short term and long term) are assessed. The scenarios assessed were as follows:

- Scenario 1 – 'Do-Minimum' in the opening year (2021) against 'Do-Something' in the opening year (2021);
- Scenario 2 – 'Do-Minimum' in the opening year (2021) against 'Do-Something' scenario in the future year (2030).

15.6.7. The 'do-minimum' data includes the baseline traffic counts without the development and the 'do-something' data includes traffic counts with the development in place, plus those committed developments previously consented.

15.6.8. The future assessment year data (2030) has been growthed up to the end of the local plan period; further growth beyond this (up to +15 years opening) would prove inconclusive at this stage. Traffic count data is provided in Table 15.12:

Table 15.12 – Development traffic counts

Road Link	2021 Base + Committed		2021 Opening + Committed		2030 Future + Committed	
	AAWT 18hr	HGV%	AAWT 18hr	HGV%	AAWT 18hr	HGV%
1	13831	5.8	11606	2.0	11712	2.0
2	8581	2.7	16378	4.9	16552	4.9
3	14830	5.4	11816	2.0	11923	2.0
4	8442	2.7	16226	5.0	16412	5.0
5	9909	2.6	11606	2.0	11712	2.0
6	14779	3.9	13906	1.9	14033	1.9
7	15561	4.5	16459	3.5	16643	3.5

1 - A448 Kidderminster Road East of Whitford Road / Kidderminster Road junction
2 - Whitford Road (south of Whitford Road / Kidderminster Road junction)
3 - A448 Kidderminster Road West of Whitford Road / Kidderminster Road junction
4 - Whitford Road south of southern site access
5 - Fox Lane north of Fox Lane / Rock Hill Junction
6 - B4091 Rock Hill East of Fox Lane / Rock Hill junction
7 - B4091 Rock Hill West of Fox Lane / Rock Hill junction

15.6.9. The change in basic noise level (in dB) has been calculated in accordance with the CRTN methodology and assessed against the short-term significance criteria set out in DMRB LA111 (Table 3.54a).

15.6.10. The impact of operational traffic is considered to be of minor adverse significance when the predicted noise level exceeds 1 dB in the short term and 3 dB in the long term. Predicted noise level increases of less than this would be negligible.

Table 15.13 – Change in road traffic noise levels

Road Link	Noise level increase, dB $L_{A10, 18hr}$	
	Scenario 1 – Opening Year	Scenario 2 – Future Year
1	+0.5	+0.5
2	+1.1	+1.2
3	+0.3	+0.3
4	+1.1	+1.2
5	+1.2	+1.3
6	+0.3	+0.4
7	+0.4	+0.4

- *Assumed road speed of 48 kph for all roads*
- *Scenario 1 – 'Do-Minimum' in the opening year (2021) against 'Do-Something' in the opening year (2021);*
- *Scenario 2 – 'Do-Minimum' in the opening year (2021) against 'Do-Something' scenario in the future year (2030).*

15.6.11. The predictions show that the effect of the development (including those cumulative developments in the area, specifically 'Perryfields') on traffic noise in the short term would increase noise levels by a maximum of 1.2 dB(A) along Fox Lane (north of Fox Lane / Rock Hill Junction). An increase of this magnitude would be of minor adverse significance in the short term.

15.6.12. Long term noise impacts from road traffic noise would increase existing noise levels by a maximum of 1.3 dB(A). Noise increases of this magnitude would be negligible.

Operational Noise – Fixed Plant Noise (associated with A1 retail and/or local shop)

15.6.13. Fixed plant noise from the development has been assessed in line with the requirements of BS 4142:2014 +A1:2019. At this stage, the amount, positioning and type of any potential fixed plant is unknown therefore, criteria at nearest existing receptor locations to the development based on the results of the baseline monitoring have been provided.

15.6.14. Based on the analysis of background noise levels ($L_{90, T}$), the rating noise level of any fixed plant should not exceed 59 dB(A) during the daytime and 53 dB(A) during the night-time; this is based on the measured averaged data set obtained from the long

term noise monitoring survey. Statistical modal analysis of the individual 1-hour daytime and 15-min night-time samples, indicated a higher level of representative background noise level. To ensure a conservative assessment, the lower averaged levels have been utilised to inform future assessment criteria.

15.6.15. Assuming fixed plant items can be designed to adhere to the adopted criteria, this is an indication that rated noise levels would not exceed the existing background noise and provide a positive indication of 'a low impact' on the proposed and nearest existing sensitive receptors (in accordance with BS 4142:2014 +A1:2019). Mitigation of any proposed fixed plant can be secured through an appropriately worded planning condition.

Operational Noise - Site Suitability

15.6.16. A computer noise model of the site has been constructed using SoundPLAN (v8.2) noise prediction software of the proposed development site inclusive of existing buildings and the proposed development plan. It should be noted that the 2021 opening year scenario (inclusive of committed developments) has been incorporated within the noise model to predict the impact of future transportation noise on the proposed development receptors. The assessment has adopted this approach, rather than being informed by the 2017 baseline monitoring data, to allow for a conservative scenario of impacts whilst ensuring that any proposed mitigation measures, ensure future compliance with the relevant design target criteria.

15.6.17. The highest predicted daytime noise level would likely be along the north-western boundary of the site, where the separation distance between the M5 and likely building facades would be at its minimum. Predicted levels within the north-west portion of the site are 69 dB $L_{Aeq,16\ hours}$ during the daytime at ground floor and 67 dB $L_{Aeq,8\ hours}$ at 1st floor during the night.

15.6.18. Predicted noise levels along the eastern perimeter, facing Whitford Road, would understandably experience a lower noise level as a result of the reduced road traffic levels. Predicted noise levels at those indicative facades would be 64 dB $L_{Aeq,16\ hours}$ during the daytime at ground floor and 58 dB $L_{Aeq,8\ hours}$ at 1st floor during the night.

15.6.19. Within the development, noise levels are much lower, due to screening afforded by the intervening buildings, shielding the noise from the M5 and Whitford Road.

15.6.20. Façade mitigation would be required to the development buildings in order to ensure appropriate internal conditions are met.

15.6.21. The majority of external noise levels within those areas assigned for amenity space is predicted to be below the recommended upper guidance limit of 55dB $L_{Aeq,16\ hours}$, with the exception of those receptors within the north-west portion of the site (adjacent to the M5), likely to experience a marginal exceedance of 2 dB(A) above the upper limit. An exceedance of this level is considered to be negligible and in line with the guidance provided in BS 8233: 2014 which states that where exceedances occur, "*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. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited*".

15.6.22. No additional mitigation is required for external amenity spaces, assuming the buildings can effectively be used as a screening element.

15.6.23. Daytime and night-time outputs, in the form of noise contour maps are provided in Appendices 15.1 – 15.2.

15.6.24. An additional night-time assessment has been prepared for the measured 10th highest maximum noise level (in line with the WHO guidance) to predict internal noise levels. Maximum (L_{max}) noise predictions are understandably higher than the daytime ($L_{Aeq,\ 16\ hour}$) and night-time ($L_{Aeq,\ 8hour}$) averaged levels however, predictions are not sufficient to increase the level of mitigation required to achieve the design target thresholds.

15.7. Mitigation

Construction

15.7.1. Site hoarding should be provided that doubles as a noise barrier. Such hoarding should include the installation of a 2m high temporary noise barrier at the eastern and southern site boundaries, which cuts the line of sight between source and receiver. This barrier will consist on a close boarded wooden fence, with no gaps;

15.7.2. With the hoarding in place, the mitigated noise impact levels are summarised in Table 15.14.

Table 15.14 – Post-mitigation Construction Activity Noise

Receptor	BS5228 Criteria	Predicted Noise Level, dB $L_{Aeq,T}$			
		Earthworks and De-veg	Foundations	General Construction	Access Road
Sunningdale Road	65	65	60	64	64
Whitford Road	65	61	55	59	60

15.7.3. Predicted noise levels, with the assumed mitigation in place, would achieve the adopted (Category A) noise criteria at nearest residential locations. It is recommended that once the exact construction plant, phasing and timings have been determined, a further assessment would be considered in line with appropriate methodology, which would feed into the site-specific Construction Noise and Vibration Management Plan (CNVMP).

15.7.4. In addition to the specific site hoarding, it is recommended that mitigation for construction noise concentrate on those examples provided in BS 5228, whilst taking into account the Best Practicable Means (BPM) approach:

- Site inspections shall include checks to ensure that plant is being operated with any specified acoustic covers in place. Excessively noisy plant shall be removed from the Site for repair or maintenance. Quieter construction methods will be used, where required and where considered reasonable and feasible;
- Where generators are operated overnight, measures shall be taken to minimise noise levels at the nearest dwellings;
- Equipment will be switched off when not in use (including during breaks and down times of more than 30 minutes);
- Where possible, noisy plant should not be used simultaneously and/or close together to avoid cumulative noise impacts;
- Equipment and excavation work sites should be oriented, where possible, to reduce noise emissions to sensitive receivers;
- Sunday working shall be undertaken only in emergencies or with prior approval from the local authority;
- Contact will be made with local authorities, where required to ensure that planned designated routes are set in place to minimise disturbance;

- Vehicle weight limits will be taken into consideration and permits obtained from transport authorities if warranted;
- Site speed limits will be set to minimise noise and vibration levels if required;
- As far as reasonably practicable, noise from reversing alarms will be managed through the following hierarchy of techniques:
- The Site layout will be designed to limit and where reasonably practicable, avoid the need for the reversing of vehicles. Measures will be undertaken to ensure that drivers are familiar with the worksite layout.
- Banksmen will be utilised to avoid the use of reversing alarms.
- Reversing alarms incorporating one of more of the features listed below or any other comparable system will be used where reasonably practicable:
    - Highly directional sounders;
    - Use of broad band signals;
    - Self adjusting output sounders;
    - Flashing warning lights; and
    - Reversing alarms will be set to the minimum output noise level required for health and safety compliance.
- The contractor shall aim to be a proactive and considerate neighbour; any potentially affected residents shall be approached in advance of any potential disturbance and kept informed as works progress. A noise complaint handling procedure will be established and responded to quickly.

Operational Noise - Site Suitability

15.7.5. The insertion loss performance of a partially open window is widely accepted as being between 10 - 15 dB(A). The level of attenuation necessary for the indoor areas of those residential facades facing the north-west portion of the M5 motorway is 37 dB(A), assuming those facades would be occupied for sleep at night. The required level of attenuation can be achieved using high specification glazing products; the exact type to be confirmed during the detailed design of the development.

15.7.6. Windows will need to remain closed (although not sealed) to achieve the required level of mitigation and, as such, alternative means of ventilation (in the form of mechanical ventilation) will also be required. The building fabric should also be designed and constructed to ensure that a 37 dB(A) reduction is achieved. This would

represent a reasonably high specification of façade and roof, with supplementary ventilation system.

15.7.7. The most exposed façades are likely to rely on closed windows to ensure internal ambient noise levels can be met. Therefore, a suitable ventilation system, compliant with Building Regulations Part F compliant and acoustically attenuated, will be required. Any ventilation should also allow for potential overheating scenarios, taking into account the the Associate of Noise Consultants (ANC) publication 'Acoustics Ventilation and Overheating – Residential Design Guide.

15.7.8. Less exposed units will benefit from a slightly lower specification façade and ventilation system, although this should be confirmed at detailed design following building layouts.

15.7.9. At proposed residences near to the motorway, the general design principle should be to have ancillary rooms such as storerooms, bathrooms/toilets and kitchen/dining rooms facing the motorway, with bedrooms and living rooms on the sheltered façades. However, it is understood that this may not be practicable in all situations.

15.7.10. No additional mitigation is required for external amenity spaces, assuming the buildings can effectively be used as a screening element.

15.8. Residual Effects

Construction Noise

15.8.1. A construction phase assessment has been undertaken for the development. Based on appropriate control measures and BPM, the proposed construction works are likely to exceed the existing ambient noise level at those nearest receptors but remain within the appropriate Category A (65 dB $L_{Aeq, 12hour}$) noise threshold. It should be noted that the noise predictions assume activities would operate at the closest separation distance between source and receiver, in reality this would not be the case due to the movement of construction works within the development site. The residual effect of construction noise is considered to be temporary, and of minor adverse significance.

Operational Noise – Road Traffic

15.8.2. The operational effect of road traffic noise levels on the nearby network has been determined. The effect of road traffic noise would be of minor adverse significance in

the short term and have a negligible impact in the long term. Development scenarios have included those committed developments.

Operational Noise – Fixed Plant Noise (associated with A1 retail and/or local shop)

15.8.3. Noise limits for the operation of any proposed fixed plant as part of the development have been suggested as part of this assessment. The recommended noise limits are based on existing background noise levels at those nearest receptors and include any possible rating penalties required to account for distinctive acoustic characteristics. Assuming future fixed plant would be designed accordingly, the residual effect of such installations is negligible and not significant.

Operational Noise – Site Suitability

15.8.4. Based on mitigation imbedded within the design, particularly through the use of high specification double glazed windows and supplementary ventilation systems, the criteria for internal noise levels (within BS 8233: 2014 and WHO) of the proposed residential dwellings would be met. The impact of external noise sources on the development would therefore result in a negligible effect.

15.9. Cumulative Effects

15.9.1. The cumulative impact of the development in terms of noise is restricted to the impact of changing road traffic levels. Road traffic noise levels provided by the appointed traffic consultant have included the development plus further committed developments in the area, namely Perryfields. The assessment has been undertaken in accordance with the criteria outlined in DMRB.

15.10. Summary

15.10.1. RSK Environment Ltd (RSK) was appointed by Catesby Estates Ltd and Miller Homes Ltd to provide a revised ES Chapter in support of a planning application for the proposed residential development on Whitford Road, Bromsgrove. The proposed development is for up to 490 residential units including A1 retail, local shops and access to public open space.

15.10.2. An Environmental Statement and Noise Impact Assessment were originally submitted by RSK in 2016 and revised in 2018. Since the 2018 assessment, the traffic model used

to assess the impacts of the proposed development at Whitford Road has been updated as part of post submission consultation. Furthermore, a 'Regulation 22' notice (of the 2011 EIA Regulations), was issued on 22 April 2020 requesting further information. As such, a revised ES Chapter submission has been prepared, inclusive of the most recent traffic count data and planning policies/guidance.

15.10.3. The assessment utilises new noise propagation modelling using the revised traffic counts, to re-assess the site suitability (based on the 2021 development scenario) and changes in road traffic noise (short and long-term).

15.10.4. The assessment indicates that the residual effect of construction noise is considered to be temporary, and of minor adverse significance, assuming appropriate mitigation measures are incorporated.

15.10.5. Operational noise impacts, inclusive of road traffic noise and potential fixed plant are negligible and not significant in the long-term. A marginal exceedance in the short term for road traffic noise impacts is calculated along three adjacent roads resulting in a minor adverse impact.

15.10.6. Based on mitigation imbedded within the design, particularly through the use of high specification double glazed windows and supplementary ventilation systems, the criteria for internal noise levels (within BS 8233: 2014 and WHO) of the proposed residential dwellings would be met.

15.11. References

- National Planning Policy Framework – Department for Communities and Local Government. March 2012.
- Noise Policy Statement for England (NPSE). DEFRA, 2010.
- British Standard 8233: 2014, Sound insulation and noise reduction in buildings – code of practice. British Standards Institution.
- BS 4142:2014+A1:2019, Methods for rating and assessing industrial and commercial sound. British Standards Institution.
- BS 5228-1:2009+A1:2014, Code of Practice for Noise and Vibration Control on Construction and Open Sites - Part 1: Noise. British Standards Institution.
- Calculation of Road Traffic Noise, 1988. Department of Transport, Welsh Office HMSO.
- Design Manual for Roads and Bridges - LA111, 2020. Highways Agency.

- ProPG: Planning & Noise - Professional Practice Guidance on Planning & Noise, 2017
- Worcester Regulatory Services Noise Control Guidance Development Control 2nd Edition July 2015 – Section 7
- Worcestershire regulatory Services Code of Best Practice for demolition and Construction Sites 1st Edition July 2011
- World Health Organization (WHO) - Guidelines for Community Noise, 1999