CHAPTER 10: NOISE & VIBRATION

10.1 INTRODUCTION

10.1.1 This chapter has been written by Peter Brett Associates LLP and addresses the likely significant environment effects of the construction and operational phases of the Proposed Development on the noise and vibration climate of the surrounding area. In particular, it considers the likely significant environmental effects of the existing and future noise climate to the proposed use of the Project Site, the effect of operational noise from the Project Site to the existing and future noise climate and the effect of the construction noise and vibration to existing and proposed noise sensitive receptors.

10.1.2 The chapter describes the methods used to establish the baseline conditions which currently exist at the Project Site and surrounding areas, the potential direct and indirect effects of the Proposed Development arising from noise and vibration, the mitigation measures required to prevent, reduce or offset the effects and the residual impacts.

10.1.3 This chapter assesses two development scenarios.

- the Primary Test scenario, which includes the proposed residential development; and
- the Sensitivity Test scenario, which includes the proposed residential development and a primary school on site.

10.1.4 A description of the technical terminology used in this chapter is provided in Technical Appendix 10.1.

10.2 ASSESSMENT CRITERIA & METHODOLOGY

Previous Assessment

10.2.1 No noise or vibration assessments are known to have been undertaken previously for the Project Site.

Scoping Opinion

10.2.2 The Council's Environmental Health Officer provided the following comments to the EIA Scoping Request:

'The EIA Scoping Report dated April 2018 sets out technical details of the noise and vibration assessment to be reported in the ES in Chapter 10. The Chapter includes details of the Assessment Criteria and Methodology; Baseline Environment; Likely Impacts & Effects; and Mitigation Envisaged which are welcomed and agreed.'

Legislative Context

Control of Pollution Act (1974)

10.2.3 The Control of Pollution Act 1974 (COPA) Section 61, sets out procedures for contractors to obtain 'Prior Consent' for demolition and construction works within agreed noise limits

10.2.4 The provisions set out in COPA include that prior to the start of demolition and construction, there would be an assessment of demolition and construction noise impacts taking account of the methods of working to be employed. Applications for prior consent would be made to the local authority. These would contain a method statement of the proposed works and the steps that would be taken to minimise and mitigate noise to acceptable levels and time periods during the whole demolition and construction period.

10.2.5 Sections 60 and 61 describe the process that developers and local authorities will be required to perform to gain permission for potentially noisy demolition and construction works.

10.2.6 Using COPA local authorities may impose limitations on working hours, plant and machinery used, and noise levels emitted from sites.

Environmental Protection Act (1990)

10.2.7 Under Part III of the Environmental Protection Act 1990, local authorities have a duty to investigate noise complaints from premises (land and buildings) and vehicles, machinery or equipment in the street. This includes noise arising from demolition and construction sites.

10.2.8 If the Environmental Health Officer (EHO) from the local authority is satisfied that the problem complained about amounts to a statutory nuisance, then the authority must serve an abatement notice on the person responsible or in certain cases the owner or occupier of the property. The notice could require that the noise or nuisance must be stopped altogether or limited to certain times of the day.

Planning Policy and Guidance

National Planning Policy

The National Planning Policy Framework (NPPF)

10.2.9 The revised National Planning Policy Framework was published on 24 July 2018 and sets out the government's planning policies for England and how these are expected to be applied.

10.2.10 With respect to noise, Paragraph 170 states that:

"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;

[…]".

10.2.11 Paragraph 180 of the NPPF states that:

"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 and living conditions, as well as the potential sensitivity of 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 quality of life;

b) Identify and protect tranquil areas which may have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason;

[…]."

10.2.12 The NPPF goes on to advise, in Paragraph 182, that:

"Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed".

Noise Policy Statement for England (NPSE)

10.2.13 The Noise Policy Statement for England was published in March 2010. The document seeks to clarify the underlying principles and aims in existing policy documents, legislation and guidance that relate to noise. It also sets out the long term vision of Government noise policy:

"To promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development."

10.2.14 The NPSE clarifies that noise should not be considered in isolation of the wider benefits of a scheme or development, and that the intention is to minimise noise and noise effects as far as is reasonably practicable having regard to the underlying principles of sustainable development.

10.2.15 The first two aims of the NPSE follow established concepts from toxicology that are applied to noise impacts, for example, by the World Health Organisation. They are:

NOEL – No Observed Effect Level - 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; and

LOAEL – Lowest Observed Adverse Effect Level - the level above which adverse effects on health and quality of life can be detected.

10.2.16 The NPSE extends these to the concept of a significant observed adverse effect level.

SOAEL – Significant Observed Adverse Effect Level - The level above which significant adverse effects on health and quality of life occur.

10.2.17 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"*.

Planning Practice Guidance (PPG)

10.2.18 The Government's PPG on noise provides guidance on the effects of noise exposure, relating these to people's perception of noise, and linking them to the NOEL and, as exposure increases, the LOAEL and SOAEL.

10.2.19 As exposure increases above the LOAEL, the noise begins to have an adverse effect and consideration needs to be given to mitigating and minimising those effects, taking account of the economic and social benefits being derived from the activity causing the noise. As the noise exposure increases, it will then at some point cross the SOAEL boundary.

10.2.20 The LOAEL is described in PPG (Paragraph: 005 Reference ID: 30-005-20140306) as the level above which *"noise starts to cause small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life."*

10.2.21 PPG identifies the SOAEL (Paragraph: 005 Reference ID: 30-005-20140306) as the level above which *"noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area."*

Local Planning Policy

Current Planning Policy

10.2.22 The adopted Development Plan for South Gloucestershire includes the Core Strategy, and the Policies, Places and Sites Plan. The relevant policies to this ES chapter include PSP8 and PSP21.

10.2.23 Policy PSP8 – Residential Amenity, states:

'Development proposal(s) will be acceptable provided that they do not create unacceptable living conditions or have unacceptable impact on the residential amenity of occupiers of the development or nearby properties.

Unacceptable impacts could result from (but are not restricted to):

a. Loss of privacy and overlooking;

b. Overbearing and dominant impact;

c. Loss of light (daylight/sunlight);

d. Noise or disturbance; and

e. *Odours, fumes or vibration.'*

10.2.24 Policy PSP21 – Environmental Pollution and Impacts, states:

'Development proposals will be acceptable where they clearly demonstrate that development is sited and designed to prevent unacceptable risks and avoid unacceptable levels of pollution

adversely impacting, by way of; fumes, dust, noise, vibration, odour, light or other forms of air, land, water pollution, exposure to contaminated land or land instability, directly or cumulatively, on:

- *environmental amenity; and*
- *the health, safety and amenity of users of the site or the surrounding area.*

Account will be taken of:

- *The impact of existing sources of noise or other pollution on the new development; and*
- *The impact of the new development on existing uses by reason of its sensitivity to noise or other pollution.*

A. Potentially Polluting Development

[…]

B. Development Sensitive to Pollution

New development proposals sensitive to existing pollution sources, including fumes, dust, noise, vibration, odour, light or other forms of air, land or water pollution, will be acceptable where the pollution can be satisfactorily mitigated.

Development proposals sensitive to pollution will be acceptable where they would not threaten through the imposition of undue operational constraints, existing uses considered desirable for reasons of safeguarding, economic or wider social needs.

C. Noise, Air Quality and Contaminated Land

Noise

Noise generating development that would lead to significant adverse effects, including cumulative effects, on health and amenity from noise and vibration will be acceptable where an appropriate scheme of noise mitigation through design is provided. The scheme must be provided to an appropriate standard.

Account will be taken of:

1) *the location, design and layout of the proposed development;*
2) *existing levels of background noise and the potential for a cumulative impact;*
3) *measures to reduce or contain generated noise;*

4) hours of operation and servicing; and

5) increased HGV traffic generated from the development.

Development proposals that would introduce noise-sensitive receptors in locations likely to be affected by existing sources of noise, shall be accompanied by an assessment of environmental noise and an appropriate scheme of mitigation measures.

In assessing such a scheme, account will be taken of:

6) the location, design and layout of the proposed development;

7) measures to reduce noise within the development to acceptable levels, including both internal and external areas; and

8) the need to maintain adequate levels of natural light and ventilation to habitable areas of the development.

[…]'

Guidance/ Best Practice

South Gloucestershire's Planning and Noise Specific Guidance Note 1 (March 2015)

10.2.25 The document is intended to provide a clear idea of the standards expected in relation to noise and vibration

10.2.26 To provide the context for the ES Chapter the following best practice guidance has been considered, in accordance with SGC's Planning Specific Guidance Note.

British Standard 8233: 2014 'Guidance on Sound Insulation and noise reduction for buildings'

10.2.27 BS 8233, in relation to this planning application, sets out desirable guideline values in habitable rooms, such as living rooms and bedrooms.

10.2.28 The guideline values relate to steady external noise without a specific character, previously termed 'anonymous noise'. According to the standard, noise has a specific character if it contains features such as a distinguishable, discrete and continuous tone, is irregular enough to attract attention, or has strong low-frequency content, in which case lower noise limits might be appropriate. Examples of noise with a character may include tonal/intermittent plant noise emissions, music playback, and workshop noise. Examples of external steady noise sources may include environmental noise sources such as busy road traffic.

10.2.29 The desirable internal ambient noise levels for dwellings are presented in Table 10.1.

Table 10.1: BS 8233 Desirable Internal Ambient Noise Levels for Dwellings

Activity	Location	07:00 to 23:00 hours	23:00 to 07:00 hours
Resting	Living room	35 dB $L_{Aeq,16h}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16h}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16h}$	30 dB $L_{Aeq,8h}$
*Note 4 Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,f}$, depending on the character and number of events per night. Sporadic noise events could require separate values.			
Note 5 If relying on closed windows to meet the guide values, there needs to be an appropriate alternative source of ventilation that does not compromise the façade insulation or the resulting noise levels.			
Note 7 Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved.			

*A selection of the available notes

10.2.30 The standard also provides advice in relation to design criteria for external noise. It states that:

> *"for traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognised that these guideline values are not achievable in all circumstances where development might be desirable.*
>
> *In higher noise 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."*

British Standard 7445: 2003 Description and Measurement of Environment Noise – Part 1: Guide to Quantities and Procedures

10.2.31 BS 7445-1 describes methods and procedures for measuring noise from all sources which contribute to the total noise climate of a community environment, individually and in combination. The results are expressed as equivalent continuous A-weighted sound pressure levels, $L_{Aeq,T}$.

10.2.32 BS 7445-1 states that sound level meters that are used should conform to Type 1 (or Type 2 as a minimum) as described in BS EN 61672:2013 Electroacoustics. Sound Level Meters should be calibrated according to the instructions of the manufacturer and field calibration should be undertaken at least before and after each series of measurements.

World Health Organization, Guidelines for Community Noise, 1999 (WHO)

10.2.33 The World Health Organisation (WHO) Guidelines for Community Noise (1999) also sets out guidance on suitable internal and external noise levels in and around residential properties. The following internal noise levels are recommended by the WHO:

- 35 dB $L_{Aeq,T}$ in living rooms over a 16 hour day; and
- 30 dB $L_{Aeq,T}$ in bedrooms during the 8 hour night.

10.2.34 With respect to the night-time maximum noise levels, the WHO guidelines state:

> *"For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB L_{AFmax} more than 10-15 times per night."*

British Standard 4142:2014 Methods for Rating and Assessing Industrial and Commercial Sound

10.2.35 BS 4142 describes methods for rating and assessing sound of an industrial and/or commercial nature. The methods described in the standard 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.

10.2.36 The standard is used to determine the rating levels for sources of sound of an industrial and/or commercial nature and the ambient, background and residual sound levels at outdoor locations. These levels could be used for the purposes of investigating complaints; assessing sound from the proposed, new, modified or additional source(s) of sound of an industrial and/or commercial nature; and assessing sound at proposed new dwellings or premises used for residential purposes. However, the determination of noise amounting to a nuisance is beyond the scope of the standard.

10.2.37 The procedure contained in BS 4142 assesses the significance of sound which depends upon the margin by which the rating level of the specific sound sources exceeds the background sound level and the context in which the sound occurs/will occur.

10.2.38 An initial estimate of the impact of the specific sound is obtained by subtracting the measured background sound level from the rating level and considering the following:

- 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; and

- 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.

10.2.39 Where the initial estimate of the impact needs to be modified due to the context, the following factors should be considered:

- The absolute level of sound;
- The character and level of the residual sound compared to the character and level of the specific sound; and
- The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions such as:
    - Façade insulation treatment;
    - Ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and
    - Acoustic screening.

British Standard 5228:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites

10.2.40 BS 5228: 2009+A1:2014 gives recommendations for basic methods of noise and vibration control relating to construction and open sites where work activities/operations generate significant noise and/or vibration levels.

Calculation of Road Traffic Noise (CRTN): 1988

10.2.41 CRTN is a Department of Transport (DoT) memorandum that describes the procedure to calculate the road traffic noise at a given receptor location.

DEFRA 'Method for Converting the UK Road Traffic Noise Index $L_{A10,18h}$ to the EU Noise Indices for Road Noise Mapping'

10.2.42 The 'Method for Converting the UK Road Traffic Index $L_{A10,18h}$ to the EU Noise Indices For Road Noise Mapping' was published by Defra, TRL and Casella Stanger in 2006 and is used to convert noise levels from $L_{A10,18h}$ to day, evening and night-time $L_{Aeq,T}$. This methodology has been adopted in the noise model to convert $L_{A10,18h}$ to $L_{Aeq,16h}$ and $L_{Aeq,8h}$ for the day and night-time periods respectively.

Design Manual for Roads and Bridges, Volume 11 (DMRB)

10.2.43 Volume 11, Section 3, Part 7 (Highways Agency et al. 2011) of the DMRB provides guidance on the assessment of the impacts that projects relating to roads (including change of traffic flows) may have on the levels of noise.

10.2.44 DMRB suggests that a 1 dB (A) change in noise level is achieved by an increase in traffic flow of 25 % or a decrease of 20 % where all other factors remain the same.

Professional Practice Guidance on Planning and Noise, 2017

10.2.45 The Professional Practice Guidance on Planning and Noise (ProPG) provides non-statutory guidance on the assessment and management of noise within the planning system in England.

10.2.46 The ProPG references the guidance on internal ambient noise levels detailed in BS8233:2014, as presented in Table 10.1 above, and extends these through the following notes (selected):

"NOTE 4: Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{max,F}$, depending on the character and number of events per night. Sporadic noise events could require separate values. In most circumstances in noise-sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45 dB $L_{Amax,F}$ more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability and regularity of noise events.

NOTE 5: Designing the site layout and the dwellings so that the internal target levels can be achieved with open windows in as many properties as possible demonstrates good acoustic design. Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any facade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the "open" position and, in this scenario, the internal L_{Aeq} target levels should not normally be exceeded, subject to the further advice in Note 7.

NOTE 7: Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal L_{Aeq} target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved. The more often internal L_{Aeq} levels start to exceed the internal L_{Aeq} target levels by more than 5 dB, the more that most people are likely to regard them as "unreasonable". Where such exceedances are predicted, applicants should be required to show how the relevant number of rooms affected has been kept to a minimum. Once internal L_{Aeq} levels exceed the target levels by more than 10 dB, they are highly likely to be regarded as "unacceptable" by most people, particularly if such levels occur more than occasionally. Every effort should be made to avoid relevant rooms experiencing "unacceptable" noise levels at all

and where such levels are likely to occur frequently, the development should be prevented in its proposed form."

Baseline Data Collection

10.2.47 A baseline environmental sound survey was undertaken at three locations on the Project Site (Locations LT1 – LT3 – see Figure 10.1) between Thursday 11 January 2018 and Friday 12 January 2018 to establish the prevailing sound climate across the Project Site.

10.2.48 Table 10.2 provides a description of the measurement locations, along with an indication of the dominant noise source.

Table 10.2: Description of Survey Locations

Location	Description	Dominant Noise Source
1	To the northwest of the site, approximately 5 m south of Oldbury Lane. Located at an approximate height of 1.5 m above ground level in a free-field position.	Road traffic from Oldbury Lane.
2	To the northeast of the site, approximately 5 m south of Oldbury Lane. Located at an approximate height of 1.5 m above ground level in a free-field position.	Road traffic from Oldbury Lane.
3	To the centre of the site, around 350 m to the south of the Oldbury Lane. Located at an approximate height of 1.5 m above ground level in a free-field position.	Distant road traffic.

10.2.49 The locations were selected in order to establish typical incident road induced noise levels along the main roads around the Project Site, which were the only noise sources identified in relation to the Project Site.

10.2.50 A large range of statistical noise parameters were acquired, but the A-weighted noise parameters $L_{Aeq,T}$, $L_{A90,T}$ and L_{AFmax} are considered to be the most relevant in the context of this assessment. These are presented in the baseline section of this chapter.

10.2.51 Table 10.3 provides details of the instrumentation used during the survey.

Table 10.3: Instrumentation Used During Baseline Sound Survey

Item	Manufacturer	Type	Serial Number	Laboratory Calibration Date
Sound Calibrator	RION	NC-74	34546655	14/02/2017
Sound Level Meter	RION	NL-52	542901	30/08/2016
½" Pre-polarised microphone		UC-59	06478	30/08/2016
Pre-amplifier		NH-25	42929	30/08/2016
Sound Level Meter	RION	NL-52	1043458	15/02/2017
½" Pre-polarised microphone		UC-59	07233	15/02/2017
Pre-amplifier		NH-25	43487	15/02/2017
Sound Level Meter	RION	NL-62	930517	31/01/2018
½" Pre-polarised microphone		UC-59	00598	31/01/2018
Pre-amplifier		NH-26	00559	31/01/2018

10.2.52 On-site calibration checks were performed before and after all measurements with no significant deviation being observed.

10.2.53 Weather conditions remained calm and dry throughout the survey periods. The meteorological conditions were considered acceptable for environmental sound surveys.

10.2.54 The surveys were undertaken in general accordance with the requirements in BS 7445 Part 1:2003.

Assessment Methodology

10.2.55 This noise and vibration chapter considers the potential noise and vibration effects associated with construction and operation of the site, concluding on the environmental significance of each. In line with the NPPF and associated NPSE, the LOAEL and SOAEL (as presented in sections 10.2.11 and 10.2.12) are defined for each potential effect, against which predicted noise and vibration levels are assessed, before mitigation measures are proposed where exceedances of the LOAEL and/or SOAEL are identified.

Significance Criteria

10.2.56 In accordance with the NPPF, NPSE and PPG for noise, LOAEL and SOAEL have been proposed for each noise and vibration source under assessment in this ES Chapter.

10.2.57 In respect of the EIA Regulations, the beneficial and adverse effect levels of noise and vibration effects have been related to the significance levels. Based on the descriptions of the adverse

effect levels in the PPG for noise, recommended actions for each significance level have been provided. The noise and vibration significance criteria are presented in Table 10.4.

Table 10.4: Noise and Vibration Significance Criteria

Significance Level	Impact and Action
Major Beneficial	A major source of noise/vibration has been removed from the climate as a result of the development coming into being.
Moderate Beneficial	A moderate source of noise/vibration has been removed from the climate as a result of the development coming into being.
Minor Beneficial	A minor source of noise/vibration has been removed from the climate as a result of the development coming into being.
Negligible	Noise/vibration has no effect and no specific measures are required.
NOEL	
Minor Adverse	Noise/vibration is perceptible but does not cause a change in behaviour/attitude. No specific mitigation measures are required.
LOAEL	
Moderate Adverse	Noise/vibration is perceptible but causes a slight change in behaviour/attitude. Noise/vibration should be mitigated and kept to a minimum
SOAEL	
Major Adverse	Noise/vibration causes a change in attitude and/or behaviour. This level should be avoided.

10.2.58 Moderate and major adverse effects are considered significant for the purposes of this EIA.

Construction Impacts – Noise

10.2.59 The noise levels generated by construction activities and experienced by any nearby sensitive receptors depend upon a number of variables, the most significant of which are:

- the noise generated by plant or equipment used on-site, or on-site activities, generally expressed as sound power levels (L_W);
- the periods of operation of the plant on the site, known as its 'on-time';
- the distance between the noise source and the receptor; and
- the attenuation provided by ground absorption and any intervening barriers.

10.2.60 Construction noise predictions have been undertaken, using the methodology outlined in BS 5228-1: 2009+A1:2014 Code of practice for noise and vibration control on construction and

open sites: Part 1: Noise (BSI, 2014). This document predicts noise as an equivalent continuous A- weighted sound pressure level over a defined time period such as one hour ($L_{Aeq,1h}$).

10.2.61 BS 5228-1: 2009+A1:2014 contains a database of the noise emissions from individual items of equipment, activities and routines to predict noise from construction activities at identified receptors. The prediction method gives guidance on the effects of different types of ground, barrier attenuation and how to assess the impact of fixed and mobile plant.

10.2.62 The assessment of construction noise effects at residential properties has been undertaken according to the 'example method 1 – the ABC method' as defined in BS 5228-1: 2009+A1:2014, Annex E. Table 10.5 below provides guidance in terms of appropriate threshold values for residential receptors, based upon existing ambient noise levels.

Table 10.5: BS 5228 Recommended Construction Noise Limits

Assessment Category and Threshold Value Period	Threshold Value in Decibels ($L_{Aeq, T}$) (dB)		
	Category A [A]	Category B [B]	Category C [C]
Night Time (23.00-07.00)	45	50	55
Evenings and Weekends[D]	55	60	65
Daytime (07.00-19.00) and Saturdays (07.00-13.00)	65	70	75

Note 1: A significant effect has been deemed to occur if the total LAeq T noise level, including construction, exceeds the threshold level for the Category appropriate to the ambient noise level.

Note 2: If the ambient noise level exceeds the threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a significant effect is deemed to occur if the total LAeq noise level for the period increases by more than 3 dB due to construction activity.

Note 3: Applied to residential receptors only.

A) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.

B) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as Category A values.

C) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.

D) 19.00-23.00 weekdays, 13.00-23.00 Saturdays and 07.00-23.00 Sundays.

10.2.63 In accordance with the NPPF and NPSE Explanatory Note, it is also important to identify receptors that exceed the LOAEL and SOAEL, and ensure adverse effects are mitigated and minimised.

10.2.64 The LOAEL and SOAEL for residential properties have been defined in Tables 10.6 and 10.7, based on current ambient noise levels around the site presented in the baseline section.

Table 10.6: Construction Noise Effect Levels for Residential Buildings fronting Oldbury Lane (façade levels)

Time Period, T	LOAEL $L_{Aeq,T}$ (dB)	SOAEL $L_{Aeq,T}$ (dB)
Daytime (07:00 – 19:00 and Saturdays 07:00 – 13:00)	70	75
Evenings and Weekends (19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays)	60	65
Any Night (23:00 – 07:00)	50	55

Table 10.7: Construction Noise Effect Levels for Residential Buildings not fronting Oldbury Lane (façade levels)

Time Period, T	LOAEL $L_{Aeq,T}$ (dB)	SOAEL $L_{Aeq,T}$ (dB)
Daytime (07:00 – 19:00 and Saturdays 07:00 – 13:00)	65	70
Evenings and Weekends (19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays)	55	60
Any Night (23:00 – 07:00)	45	50

Construction Impacts – Vibration

10.2.65 The effects of human response to whole body vibration in buildings are defined in BS 6472-1: 2008 (BSI, 2008). This gives effects in terms of Vibration Dose Value (VDV). However, for human response to construction related vibration, it is considered more appropriate to use the Peak Particle Velocity (PPV) measure, as suggested in BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites (BSI, 2014). Part 2: Vibration.

10.2.66 The limit of human perception to vibration is between approximately 0.15 $mm.s^{-1}$ and 0.3 $mm.s^{-1}$ PPV. The sensitivity of the human body also varies according to different frequencies of vibration, with perception generally possible between 1 Hz to 80 Hz.

Whole Body Vibration

10.2.67 Table 10.8 adapts the guidance on the annoyance effects of vibration as provided in BS 5228-2:2009+A1:2014 Annex B.

10.2.68 The onset of significant effects (the LOAEL) is classified as 1 mms^{-1} PPV, the level at which construction vibration can be tolerated with prior warning.

Table 10.8: Guidance on Effects of Vibration Levels

Vibration Level PPV mm/s	Description of Effects	Adverse Effect Level
<0.3	Vibration is unlikely to be perceptible in even the most sensitive situations for most vibration frequencies associated with construction	NOEL
0.3 to 1	Increasing likelihood of perceptible vibration in residential environments	LOAEL
1 to 10	Increasing likelihood of complaint in residential environments, but can be tolerated at the lower end of the scale if prior warning and explanation has been given to residents	
>10	Vibration is likely to be intolerable for any more than a very brief exposure to a level of 10 $mm.s^{-1}$	SOAEL

Building Damage

10.2.69 BS 7385-2: 1993 Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from re-radiated vibration provides guidance on vibration levels likely to result in cosmetic damage, and is referenced in BS 5228-2:2009+A1:2014. Guide values for transient vibration, above which cosmetic damage could occur, are suggested in Table 10.9.

Table 10.9: Transient Vibration Guide Values for Cosmetic Damage

Type of Building	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
	4 Hz to 15 Hz	15 Hz and Above
Reinforced or framed structures; Industrial and heavy commercial buildings	50 $mm.s^{-1}$ at 4 Hz and above	
Unreinforced or light framed structures; Residential or light commercial buildings	15 $mm.s^{-1}$ at 4 Hz increasing to 20 $mm.s^{-1}$ at 15 Hz	20 $mm.s^{-1}$ at 15 Hz increasing to 50 $mm.s^{-1}$ at 40 Hz and above
NOTE 1: Values referred to are at the base of the building. NOTE 2: For un-reinforced or light framed structures and residential or light commercial buildings, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded.		

Operational Impacts - Acoustic Model

10.2.70 The baseline sound survey results established the existing sound climate at the specific time and location of the survey. An acoustic model was prepared to complement the baseline studies and to predict the likely significant noise impact arising from the operation of the Proposed

Development. Furthermore, the acoustic model was used to determine any areas that require mitigation and to test and demonstrate the efficacy of any proposed mitigation measures.

10.2.71 Acoustic modelling has been undertaken using SoundPLAN v8.0. The following scenarios were modelled:

- 2018 Baseline;
- 2028 without Development;
- 2028 Primary Test with Development; and
- 2028 Sensitivity Test with Development.

10.2.72 The site topography and existing buildings have been included within the model and so corrections for these factors are included.

10.2.73 The Park Farm development to the east of the Project Site is currently under construction, however it has been assumed to be completed for the purposes of the acoustic model and the assessment,

10.2.74 SoundPLAN v8.0 uses the CRTN methodology to model noise from road traffic. The methodology is used to determine noise levels from roads using variables such as the volume and speed of traffic.

10.2.75 Defra's 'Method for Converting the UK Road Traffic Index $L_{A10,18h}$ to the EU Noise Indices for Road Noise Mapping' has been adopted in the noise model to convert $L_{A10,18h}$ to $L_{Aeq,16h}$ and $L_{Aeq,8h}$ for the day and night time periods.

10.2.76 The noise model has been based on the traffic flows identified in the Transport Assessment (see Chapter 9). The future scenarios have been based on the assessment year 2028, when the development will be completed, with maximum traffic associated with the development in operation.

10.2.77 In accordance with Chapter 9, the future traffic data includes the cumulative effects associated with the future traffic growth and cumulative schemes.

10.2.78 An additional scenario has been considered in the Transport chapter and assessed in this chapter. The additional scenario incorporates the changes in traffic flows due to having a Primary School as part of the proposed development on site.

Suitability for Residential Use

Internal Noise Level from Transportation Noise

10.2.79 Incident façade levels should not be considered in isolation of the sound reduction provided by the external building fabric. The guidance within PPG states that *"consideration should also be given to whether adverse internal effects can be completely removed by closing windows and, in the case of new residential development, if the proposed mitigation relies on windows being kept closed most of the time. In both cases a suitable alternative means of ventilation is likely to be necessary. Further information on ventilation can be found in the Building Regulations."* (006 Reference ID: 30-006-20141224)

10.2.80 Based on the advice within BS 8233:2014 and ProPG, an indoor noise level of 35 dB $L_{Aeq,16h}$ during the daytime and 30 dB $L_{Aeq,8h}$ during the night-time may be considered as the LOAEL for transportation noise. An indoor noise level of 45 dB L_{Amax} during the night-time may be considered as the LOAEL for transportation noise.

10.2.81 An indoor noise level 50 dB $L_{Aeq,16h}$ during the daytime and 45 dB $L_{Aeq,8h}$ during the night-time has been set as the SOAEL for transportation noise.

10.2.82 Research findings on adverse effects on non-restorative sleep indicate that adverse effects on sleep can be avoided if the maximum noise level inside the bedroom does not exceed 65 dB when more than 20 discreet events occur. This may be considered the SOAEL level. It may also be argued that if less than 20 discreet events occur during the night-time, the internal L_{AMax} SOAEL level could be 70 dB.

External Noise Level from Transportation Noise

10.2.83 For the daytime level, the information used to support the WHO Guidelines for Community Noise indicate that daytime sound levels of less than 50 dB $L_{Aeq,16h}$ cause little or no serious annoyance in the community.

10.2.84 BS8233:2014 states that it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments.

10.2.85 Therefore, outdoor sound levels of between 50 and 55 dB $L_{Aeq,16h}$ during the daytime are considered the LOAEL for airborne noise.

10.2.86 Sound levels of 65 dB $L_{Aeq,16h}$ during the daytime are considered the SOAEL for transportation noise for outdoor amenity areas at residential dwellings, which is consistent with the daytime trigger level in the UK's Noise Insulation Regulations.

10.2.87 A summary of the proposed LOAEL and SOAEL internal and external noise levels is provided in Table 10.10. These levels will form the basis of the assessment.

Table 10.10: Internal and External Adverse Levels for Proposed Dwellings

Internal/External	Level	Daytime (07:00 to 23:00 hrs) Free Field (dB)	Night-time (23:00 to 07:00 hrs) Free Field (dB)
$L_{Aeq,T}$ Internal Noise Level from Transportation Noise	LOAEL	35	30
	SOAEL	50	45
L_{Amax} Internal Noise Level from Transportation Noise	LOAEL	N/A	45
	SOAEL	N/A	65 (if more than 20 events)
		N/A	70 (if less than 20 events)
$L_{Aeq,T}$ External Noise Level from Transportation Noise	LOAEL	50-55	N/A
	SOAEL	65	N/A

Noise from Increased Road Traffic

10.2.88 The impact of the Proposed Development on the noise climate in the surrounding areas is based on the change in noise levels at noise sensitive receptors due to the increase in the volume of road traffic generated by the Proposed Development.

10.2.89 The Design Manual for Road and Bridges (DMRB) provides two magnitude scales of impact for the change in noise levels in the 'short-term' and in the 'long-term'. This assessment uses long-term future year assessment criteria to assess the full and permanent effects of the Proposed Development. These are presented in Table 10.11 in terms of adverse effect levels.

Table 10.11: Adverse Levels for Existing Dwellings from Development Traffic

Adverse Effect in Level (increase in Noise Levels)	Change in $L_{A10,18h}$ Noise Levels in Long-term due to Road Traffic	Significance Level
SOAEL	10+	Major
	5 to 9.9	Moderate
LOAEL	3 to 4.9	Minor
	0.1 to 2.9	Negligible
NOEL	0	No Change

Noise from Fixed Plant and Building Services

10.2.90 Guidance in BS 4142 has been utilised to address noise from fixed plant and building services associated with the Proposed Development.

10.2.91 British Standard 4142 describes methods for rating and assessing sound of an industrial and/or commercial nature. The methods described in the standard 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.

10.2.92 The procedure contained in BS4142 assesses the significance of sound which depends upon the margin by which the rating level of the specific sound sources exceeds the background sound level and the context in which the sound occurs/will occur.

10.2.93 Table 10.12 illustrates the adopted scale of significance for residential receptors.

Table 10.12: Building Services Plant Adverse Levels

Rating Level – Background Noise Level dB	Adverse Effect Level
<0	NOEL
+5 to +10	LOAEL
>+10	SOAEL

10.2.94 Noise limits are recommended at the nearest proposed and existing noise sensitive receptors having regards to the background noise levels measured in the baseline noise survey. The limits are defined at 1 metre from the façade of the receptors.

10.2.95 The assessment criterion adopted is a rating level equal to 5 dB above the background noise level.

Geographical Scope

10.2.96 The assessment covers the noise impact at future noise sensitive receptors on the Project Site and also includes the noise impact at existing noise sensitive receptors up to approximately 2 km from the Project Site boundaries.

10.2.97 Noise sensitive receptors are any occupied premises outside the Project Site used as a dwelling, place of worship, educational establishment, hospital or similar institution, or any other property likely to be adversely affected by an increase in noise level.

10.2.98 For the purpose of this chapter, these include the areas of Morton, Lower Morton, Upper Morton and dwellings along Oldbury Lane (including Park Farm).

Temporal Scope

10.2.99 This noise and vibration chapter considers the potential noise and vibration effects associated with both the construction phase and the operational phase of the Proposed Development.

10.2.100 The assessment scenarios have been based on the design year when the development will be completed, with maximum traffic associated with the Proposed Development in operation. The assessment will also include impacts of new dwellings when they are occupied as these will then become noise sensitive receptors during subsequent construction phases.

Assumptions & Limitations

Baseline Sound Survey

10.2.101 It has been assumed that the traffic flows during the noise survey were representative of normal movements.

10.2.102 The site engineer noticed nothing unusual in terms of the noise climate at the times of the attended surveys. This chapter refers, within the limitations stated, to the environment of the site in the context of the surrounding area at the time of the inspections.

Construction Noise Assessment

10.2.103 BS 5228:2009 Annex E (Informative) states that noise predictions should be undertaken to determine eligibility for noise insulation or temporary re-housing. However, the informative also states that these assessments should be undertaken when a contractor has been appointed and detailed method statements on the construction programme and plant to be used are available.

10.2.104 Although a detailed construction methodology is yet to be determined, it is reasonable to assume for the purposes of this chapter, that the main construction phases are likely to include site levelling/clearance, ground excavation, concreting, building construction and new internal road construction. The internal building construction phase, and the servicing and fitting out of new buildings, is normally not a significant source of noise or vibration for local receptors.

Acoustic Model

10.2.105 In the absence of a detailed masterplan, due to the outline nature of the application, the site has been modelled as an open site with no buildings present. The modelling of the current parameter plan would result in unrealistic noise contours as the area are presented as ‘blocks’.

10.2.106 This is deemed a worst case assessment as the screening of noise that would be associated with the buildings is not included in the assessment.

10.3 CONSULTATION

10.3.1 Consultation took place with SGC through the EIA Scoping, and as set out above, this included the agreement of the proposed survey and assessment methodologies by the Environmental Health Officer.

10.4 BASELINE ENVIRONMENT

Sound Survey Results

10.4.1 A summary of the sound survey results are presented in Table 10.13. Full survey results are provided in Technical Appendix 10.2.

Table 10.13 Sound Survey Results

Location	Period	$L_{Aeq,T}$ dB	Typical* L_{AFmax} dB	Typical $L_{A90,15mins}$ dB
LT1	Daytime (07:00 – 23:00 hours)	65	83	44
	Night-time (23:00 – 07:00 hours)	55	78	34
LT2	Daytime (07:00 – 23:00 hours)	62	80	45
	Night-time (23:00 – 07:00 hours)	52	75	32
LT3	Daytime (07:00 – 23:00 hours)	46	61	43
	Night-time (23:00 – 07:00 hours)	38	51	31

* Based on the 10-15th highest recorded L_{AMax} sound level during the time period.

10.4.2 The daily daytime ($L_{Aeq,16h}$), night-time ($L_{Aeq,8h}$) and typical L_{A90} and L_{Amax} sound levels at each measurement position have been calculated from the survey data.

10.4.3 The highest baseline noise levels were recorded along Oldbury Lane. Centrally and away from the road traffic source, noise levels dropped significantly.

10.4.4 The results of the sound survey were used to calibrate the acoustic model.

Acoustic Model

10.4.5 The baseline daytime and night-time noise contours can be found in Figures 10.2 and 10.3.

10.4.6 The contours show that the highest noise levels on site will be along Oldbury Lane. Noise levels adjacent to Oldbury Lane could be up to around 65 dB $L_{Aeq,16h}$ during the daytime and up to around 55 dB $L_{Aeq,8h}$ during the night-time.

10.5 INHERENT DESIGN MITIGATION

10.5.1 The assessment has been made taking account of the measures that have been incorporated into the Parameter Plans and is assumed inherent design/ embedded mitigation to minimise any potentially significant effects; for example, the set back of development from Oldbury Lane.

10.6 POTENTIAL ENVIRONMENTAL IMPACTS & EFFECTS

Construction Impacts and Effects

Noise

10.6.1 Construction noise could potentially increase the ambient noise levels at existing noise-sensitive receptors and proposed noise-sensitive receptors that are inhabited for the duration of the construction works.

10.6.2 Precise details of the types of construction methods and plant likely to be used during the construction phases have yet to be formulated. At this stage in the scheme's design, it is therefore not possible to state precisely where plant will operate and for how long during the working day.

10.6.3 Although a detailed construction methodology is yet to be determined, it is reasonable to assume for the purposes of this chapter, that the main construction phases are likely to include site levelling/clearance, ground excavation, concreting, building construction and new internal road construction. The internal building construction phase, and the servicing and fitting out of new buildings, is normally not a significant source of noise or vibration for local receptors.

10.6.4 An assessment of the likely construction noise impact at noise sensitive receptors has been undertaken, based on typical plant noise levels provided within BS 5228.

10.6.5 Details of typical construction plant noise levels at the standard reference distance of 10 m provided by BS 5228 in the absence of noise controls such as screening and operational constraints are given below in Table 10.14. Highest noise levels tend to be associated with plant that will be employed during earthmoving and concreting.

Table 10.14: Typical Construction Plant Noise Levels

Plant	Typical dB L_{Aeq} Sound Pressure Level at 10 m
Earth moving	85
Supply vehicles	80
Auger piling	85
Truck concrete mixer	80
Poker vibrators	84
Crane	74
Vibratory roller	76
Asphalt spreader	80
Wheeled loader	76
Compressors	74
Welding Generators	42

10.6.6 As a detailed construction methodology is yet to be determined, the assessment of construction noise and vibration considers a worst case scenario, where each activity occurs at a point on the site boundary closest to the receptor, for the full duration of the assessment period and without any mitigation measures in place, such as screening or operational restrictions. Table 10.15 details the results of the assessment for typical construction activities, at different distances from the Project Site boundary.

Table 10.15 Predicted Indicative Construction Noise Levels

Activity	Predicted Indicative Construction Noise Levels, $L_{Aeq,1h}$ in dB					
	10 m from construction phase boundary	20 m from construction phase boundary	50 m from construction phase boundary	100 m from construction phase boundary	200 m from construction phase boundary	500 m from construction phase boundary
Earthmoving	85	79	71	65	59	53
Concreting	86	80	72	66	60	54
Road pavement	80	74	66	60	54	48

10.6.7 Tables 10.16 and 10.17 present the revised predicted construction levels assessed against significant effects. The difference between the proposed LOAEL and the predicted indicative construction noise levels is also presented in brackets.

10.6.8 In order to define the noise level criteria in accordance with the ABC method of BS 5228, the measured daytime ambient noise levels have been analysed.

10.6.9 Ambient noise levels at residential receptors (existing and proposed) fronting Oldbury Lane would be around 65 dB $L_{Aeq,T}$ (see Table 10.13). Therefore, category B (see Table 10.5) would be representative for these dwellings.

10.6.10 Ambient noise levels at residential receptors (existing and proposed) not fronting Oldbury Lane would be below 60 dB $L_{Aeq,T}$ (see Table 10.13). Therefore, category A (see Table 10.5) would be representative for these dwellings.

Table 10.16: Predicted Construction Levels Assessed Against Significant Effects at Residential Receptors fronting Oldbury Lane (Category B)

Activity	Predicted Indicative Construction Noise Levels, $L_{Aeq,1h}$ in dB (difference with proposed LOAEL of 70 dB $L_{Aeq,T}$, in dB)					
	10 m from construction phase boundary	20 m from construction phase boundary	50 m from construction phase boundary	100 m from construction phase boundary	200 m from construction phase boundary	500 m from construction phase boundary
Earthmoving	Major (+15)	Major (+9)	Moderate (+1)	Minor (-5)	Neutral (-11)	Neutral (-17)
Concreting	Major (+16)	Major (+10)	Moderate (+2)	Minor (-4)	Neutral (-10)	Neutral (-16)
Road pavement	Major (+10)	Moderate (+4)	Minor (-4)	Neutral (-10)	Neutral (-16)	Neutral (-22)

Table 10.17: Predicted Construction Levels Assessed Against Significant Effects at Residential Receptors not fronting Oldbury Lane (Category A)

Activity	Predicted Indicative Construction Noise Levels, $L_{Aeq,1h}$ in dB (difference with proposed LOAEL of 65 dB $L_{Aeq,T}$, in dB)					
	10 m from construction phase boundary	20 m from construction phase boundary	50 m from construction phase boundary	100 m from construction phase boundary	200 m from construction phase boundary	500 m from construction phase boundary
Earthmoving	Major (+20)	Major (+14)	Major (+6)	Minor (0)	Minor (-6)	Neutral (-12)
Concreting	Major (+21)	Major (+15)	Major (+7)	Moderate (+1)	Minor (-5)	Neutral (-11)
Road pavement	Major (+15)	Major (+9)	Moderate (+1)	Minor (-5)	Neutral (-11)	Neutral (-17)

10.6.11 As a result of the construction works, it is likely that the effect on the majority of noise sensitive receptors surrounding the different construction phases boundaries, would be either Temporary **Minor Adverse** or **Negligible**.

10.6.12 The exception to this is likely to be the nearest existing noise sensitive receptor along Oldbury Lane, around 30 m from the Project Site boundary, including receptors from the Park Lane

development. Here, predicted noise levels are likely to exceed the proposed SOAEL for construction noise. This is considered likely to result in a **Major Adverse** effect.

10.6.13 The effect on proposed noise-sensitive receptors that are inhabited for the duration of the later construction phases could be **Major Adverse** for future receptors located around 50 m or less from the construction phase boundary.

Vibration

10.6.14 With respect to potential vibration impacts on sensitive uses adjacent to the Project Site, or any receptors inhabited for the duration of the later construction phases, the construction of new development is not normally seen to be a significant source of vibration unless piling operations are required.

10.6.15 It is understood that piling is not expected to be required. As such, the Proposed Development is not predicted to result in any vibration impacts or effects during the construction phase, and thus the impact is **Negligible**.

Occupation Impacts and Effects

Proposed Dwellings

Calculated Incident Sound Levels – from Road Traffic

Primary Test

10.6.16 The acoustic model was used to create façade noise maps showing the predicted façade noise levels at the Proposed Development based on the Land Use Parameter Plan.

10.6.17 The following noise contour maps for the future (year 2028) daytime and night-time with development scenarios were produced using the acoustic model:

- Daytime: Noise grid map with a grid resolution of 5 m by 5 m, at a distance of 1.5 metres above ground level (representative of the ground floor and outdoor amenity areas) showing the $L_{Aeq,16h}$ sound pressure levels. This is presented in Figure 10.4.
- Night-time: Noise grid map with a grid resolution of 5 m by 5 m, at a distance of 4 metres above ground level (representative of a first floor window) showing $L_{Aeq,8h}$ sound pressure levels. This is presented in Figure 10.5.

10.6.18 The calculated incident sound levels for the façades are presented in Table 10.18 below.

Table 10.18: Calculated Incident Sound Levels

façade	Period		Incident Sound Levels (dBA)
Along Oldbury Lane	Daytime (07:00 – 23:00 hours)	dB $L_{eq,T}$	65
	Night-time (23:00 – 07:00 hours)	dB $L_{eq,T}$	55
		dB L_{FMax}	78

10.6.19 The modelling results presented in Table 10.18 have been used to determine the impacts and the potential mitigation required at the facades of proposed dwellings.

Sensitivity Test

10.6.20 Daytime and night-time noise contour maps for the allocation test scenario are presented in Appendix 10.2, Figures 10.6 and 10.7 respectively.

10.6.21 The calculated incident sound level for this scenario are similar to those presented in Table 10.18.

Sound Levels in External Amenity Areas – Road Traffic

Primary Test

10.6.22 Noise levels across most of the Project Site are likely to fall below the proposed LOAEL, which is likely to result in a **Minor Adverse** effect.

10.6.23 Noise levels at the site, on land proposed for residential use directly facing Oldbury Lane could exceed the proposed LOAEL but be below the SOAEL, which is likely to result in a **Moderate Adverse** effect.

Sensitivity Test

10.6.24 The noise levels across the site are similar to those presented for the "Primary Test" scenario. Therefore, the resulting impacts with regards to adverse impacts are the same as concluded for the Primary Test scenario.

Internal Sound Levels

Primary Test

10.6.25 The calculated incident sound levels have been used to determine the likely internal sound levels in the proposed dwellings due to environmental sound in general accordance with the guidance set out in BS8233:2014.

10.6.26 The exact construction proposals are yet to be determined. However, a preliminary assessment has been undertaken based on typical construction details and their typical acoustic

performance. The preliminary calculations have been based on background ventilation being provided through natural ventilation solutions in the form of trickle vents.

10.6.27 Approved Document L (Conservation of Fuel and Power) and Approved Document F (Ventilation) seek to limit uncontrollable ventilation and ensure adequate ventilation respectively.

10.6.28 It is likely to be possible to meet the acoustic requirements through suitably specified natural ventilation solutions, subject to a detailed acoustic assessment as part of detailed reserved matter applications.

10.6.29 Purge ventilation is required throughout dwellings to aid the removal of high concentrations of pollutants and water vapour. It is commonly provided by simply opening windows and doors. Even though purge ventilation is recommended through opening windows, the temporary and intermittent occurrence of this does not normally result in an unacceptable increase of internal noise levels.

10.6.30 Table 10.19 details the approximate reductions that could typically be expected from the assumed building fabric constructions.

Table 10.19: Typical Sound Reductions of Various Building Fabric Constructions

Construction	Typical Attenuation (dB)
Conventional double glazing (4 / 16 / 4)	30
Hit and miss trickle ventilator (8000 mm^2)	30
Brick/block cavity wall	50
Tiles on timber joists with plasterboard ceilings and thermal insulation	40-45

10.6.31 Based on the calculated incident sound levels and the above typical building fabric construction details, Table 10.20 sets out the likely resulting internal noise levels.

Table 10.20: Calculated Worst Case Internal Sound Levels

Dwelling Façade	Calculated Worst Case Internal Noise Levels		
	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)	
Along Oldbury Lane	35 dB $L_{Aeq,T}$	25 dB $L_{Aeq,T}$	48 dB L_{Amax}

10.6.32 Based on the results of the sound survey and the assumed building fabric constructions, the suggested internal noise levels are likely to be met during both daytime and night-time periods at dwellings across most of the Project Site. Effects are therefore expected to be **Negligible** or **Minor Adverse** at the majority of the noise sensitive receptors.

10.6.33 Internal sound levels at dwellings directly facing Oldbury Lane are likely to fall above the LOAEL and below the SOAEL during the night-time. This is likely to result in a **Moderate Adverse** effect.

Sensitivity Test

10.6.34 The calculated incident sound levels provided in Figures 10.6 and 10.7 have been used to determine the likely internal sound levels in the worst case proposed dwellings, across the Application Site. The results and conclusions are the same as those presented for the Primary Test scenario.

Non-residential Uses - Building Services Plant

10.6.35 The rating level of fixed plant and building services associated with the proposed community hub should be controlled through careful design. Details of which will come forward as part of future reserved matter applications.

Education Site – Sensitivity Test Scenario

10.6.36 School sites are assessed at the detailed design stage when building and playground/outdoor teaching areas are known. The assessment is based on the guidance provided in Building Bulletin 93 (BB93). It should be noted that BB93 is part of the building regulations (Approved Document E, Requirement E4) and therefore it is a matter for the building control.

10.6.37 Whilst a detailed assessment has not been undertaken, based on a preliminary review, the predicted daytime noise levels at the proposed school locations are not anticipated to exceed acceptable levels for educational purposes provided appropriate building fabric specifications are designed into the scheme, at the detailed design stage, in order to comply with internal noise requirements from BB93.

10.6.38 Based on the results of the acoustic model, the internal noise levels are likely to be met with conventional glazing and natural ventilation.

Change in Ambient Levels – Existing Receptors

Primary Test

10.6.39 Figure 10.8 presents the predicted change in noise levels based on the traffic flow predictions for 2028 Primary Test scenario; including growth and relevant cumulative schemes.

10.6.40 The contours show that the change in ambient noise levels during the daytime at existing receptors, would be below the LOAEL, as set out in Table 10.11, and would therefore be deemed **Negligible**.

Sensitivity Test

10.6.41 Figure 10.9 presents the predicted change in noise levels based on the traffic flow predictions for 2028 Sensitivity Test scenario; including growth and relevant cumulative schemes.

10.6.42 The contours show that the change in ambient noise levels during the daytime at existing receptors, would be below the LOAEL, as set out in Table 10.11, and would therefore be deemed **Negligible**.

10.7 ADDITIONAL MITIGATION, COMPENSATION & ENHANCEMENT MEASURES

Construction

10.7.1 Construction noise levels at the nearest noise sensitive receptors can be mitigated by careful phasing of the construction works as well as controlling the operation time and duration of each activity to reduce the noise impact at the receptor. For example, restricting works from a particular activity to 2 hours out of a 10-hour day would typically reduce overall 10-hour noise levels from that activity by 7 dB.

10.7.2 In practice, the main construction activities will tend to take place towards the central area of the Project Site, away from the Project Site boundary, which will further mitigate construction noise at the nearest noise sensitive receptors, reducing the noise impact considerably.

10.7.3 The following advice is based on the guidance provided in BS5228-1:2009+A1:2014 and should be applied to minimise the noise breakout from the construction activities affecting noise sensitive receptors:

- Ensuring the use of quiet working methods, the most suitable plant and reasonable hours of working for noisy operations, where reasonably practicable;
- Locating noisy plant and equipment as far away from dwellings as reasonably possible, and where practical, carry out loading and unloading in these areas;
- Screening plant to reduce noise which cannot be reduced by increasing the distance between the source and the receiver (i.e. by installing noisy plant and equipment behind large site buildings);
- Shutting down any machines that work intermittently or throttling them back to a minimum;
- Orientating plant that is known to emit noise strongly in one direction so that the noise is directed away from houses, where possible;
- Closing acoustic covers to engines when they are in use or idling; and

- Lowering materials slowly, whenever practicable, and not dropping them.

10.7.4 A Construction Environmental Management Plan (CEMP) will be agreed with the Local Planning Authority prior to commencement of construction. However, a review of appropriate construction noise mitigation would be required when a principal contractor has been appointed and detailed method statements, construction programme and descriptions of the proposed plant are available. This would be secured via a suitably worded planning condition

Operation

Outdoor Living Space (from road traffic noise)

10.7.5 Based on the results of the acoustic model and the calculated façade sound levels presented in Table 10.18, the LOAEL for external amenity areas are likely be exceeded on land within approximately 60 m of Oldbury Lane without any further mitigation.

10.7.6 Therefore, gardens should be located behind dwellings fronting the road, so that they are screened by the buildings they serve. As an example, a row of 2 storey terraced dwellings is likely to provide approximately 10-15 dB reduction in noise levels.

10.7.7 The layout of the buildings and the orientation will be considered, via a suitably worded planning condition requiring a detailed noise assessment within future reserved matters applications.

Internal Noise Levels

10.7.8 Based on the results of the acoustic model and the assumed building fabric constructions, the proposed LOAEL for internal noise during the daytime and night-time periods across the Project Site; with the exception of during the night-time for dwellings fronting Oldbury Lane.

10.7.9 To achieve the proposed criteria during both the daytime and night-time periods, enhanced acoustic glazing and uprated acoustic trickle vents are likely to be required for dwellings facing Oldbury Lane.

10.7.10 A detailed assessment would be undertaken during the reserved matters stage to ascertain the exact acoustic specification requirements for the various elements of the external building fabric. This is likely to include detailed specifications for glazing and ventilation options. This will be secured via a suitably worded planning condition.

Non-residential Uses - Building Services Plant

10.7.11 Building services plant associated with the proposed non-residential uses could impact on nearby proposed dwellings.

10.7.12 The noise from fixed plant has been proposed to meet 5 dB above background noise levels at nearby proposed dwellings. The limits should apply to the cumulative noise from all fixed plant items and should include any corrections for acoustic features.

10.7.13 Table 10.21 provides the suggested plant noise limit to be met at the nearest proposed dwelling based on the results of the environmental noise survey.

Table 10.21: Proposed Fixed Plant Noise Limits

Time Period	Proposed Limit $L_{Aeq,T}$ dB
Daytime	49
Night-time	39

10.7.14 An assessment of building services plant should be undertaken at the detailed design stage to minimise the impact from plant noise emissions. They should not exceed 5 dB above the background noise levels. This will be secured via a suitably worded planning condition.

10.8 RESIDUAL ENVIRONMENTAL IMPACTS & EFFECTS

Construction

10.8.1 Noise and vibration levels as a result of the construction works will be minimised by implementing the mitigation methods advised in BS5228-1:2009+A1:2014 via the CEMP.

10.8.2 With mitigation, it is expected that construction noise could be reduced to below the LOAEL, which is likely to be a Temporary **Minor Adverse** effect, at the worst affected noise sensitive receptors for both scenarios.

Operation

Proposed Dwellings

10.8.3 Mitigation measures have been identified for the proposed noise sensitive receptors. With the recommended mitigation in place the noise level targets set for the proposed uses on site are expected to be met; therefore, the residual effect of the development on noise and vibration levels would be **Negligible** for both scenarios.

Existing Receptors

10.8.4 The results of the assessment show that the increase in noise levels due to road traffic would be classed as **Negligible** for all noise sensitive receptors for both scenarios.

Building Services Plant and Commercial Processes

10.8.5 With the proposed mitigation in place, the impact would be deemed **Negligible** for all noise sensitive receptors for both scenarios.

10.9 CUMULATIVE EFFECTS

Construction

10.9.1 Potential cumulative construction effects could occur should construction occur at the same time on the schemes identified in Chapter 5. However, significant cumulative effects are unlikely to occur as each development is anticipated to have a CEMP in place, such that the individual construction phase effect is not significant, alone or in combination.

Operation

10.9.2 The '2028 With Development' scenarios includes maximum traffic flows associated with the Proposed Development, and the relevant cumulative schemes as identified in Chapter 9. It assumes full build out of these schemes by 2028. Therefore, the cumulative effects are already included within this assessment for the purposes of the operational impacts.

10.10 ASSESSMENT SUMMARY

10.10.1 The effects identified are summarised in Table 10.22 below:

Table 10.22: Noise & Vibration Assessment Summary

Environmental Effect	Sensitivity of Receptor	Nature of Impact	Significance	Additional Mitigation	Residual Significance of Effect	Confidence Level
Construction Effects						
Noise from construction activities	High	Temporary	Up to Major Adverse	Proposed CEMP	Minor Adverse	High
Vibration from Construction activities	High	Temporary	Negligible	Proposed CEMP	Negligible	High
Operation Effects						
Sound levels in external amenity areas – Road traffic	High	Permanent	Up to Moderate Adverse	It is recommended that gardens and external amenity area are placed at the rear of the dwellings such that the dwellings provide shielding from road traffic noise. The layout of the buildings and the orientation should be considered as part of future reserved matter approvals in order to ensure gaps between dwellings are reduced such that no garden area has a line-of-sight/overlooks the roads.	Negligible	High
Internal sound levels	High	Permanent	Up to Moderate Adverse	Enhanced acoustic glazing and uprated acoustic trickle vents are likely to be required for dwellings facing Oldbury Lane. This can be controlled through planning condition/future reserved matter approvals.	Negligible	High
Plant Noise from proposed non-residential uses	High	Permanent	Up to Major Adverse	Detailed design will minimise the impact from building services and fixed plant on receptors.	Negligible	High
Education Site	High	Permanent	Up to Minor Adverse	Appropriate building fabric specifications will be designed into the scheme.	Negligible	High
Change in ambient levels	High	Permanent	Negligible	N/A	Negligible	High
Cumulative Effects						
Effect	**Description**			**Mitigation**	**Significance**	**Confidence Level**
Change in ambient levels	Changes in ambient noise due to changes in traffic flows.			N/A	Negligible	High

Table 10.23: Mitigation Implementation

Mitigation Measure	Implementing Agent(s)	Legal Instrument	Compliance Target	Implementation Timescale
Layout and orientation of buildings.	Developer	Reserved Matter Approval	BS8233:2014	Before construction
Enhanced acoustic glazing and uprated acoustic trickle vents in higher noise areas.	Developer	Planning Condition	BS8233:2014	Before construction
Cumulative building services noise emissions limits through design.	Developer	Planning Condition	BS4142:2014	Before construction
Implementation of a CEMP – to include: - Ensuring the use of quiet working methods, the most suitable plant and reasonable hours of working for noisy operations, where reasonably practicable - Locating noisy plant and equipment as far away from dwellings as reasonably possible, and where practical, carry out loading and unloading in these areas. - Shutting down any machines that work intermittently or throttling them back to a minimum. - Closing acoustic covers to engines when they are in use or idling. - Lowering materials slowly, whenever practicable, and not dropping them. - Screening plant to reduce noise which cannot be reduced by increasing the distance between the source and the receiver (i.e. by installing noisy plant and equipment behind large site buildings). - Orientating plant that is known to emit noise strongly in one direction so that the noise is directed away from houses, where possible.	Contractor	Planning Condition	BS5228:2009+A1:2014	Before construction