



Gravity

Smart Campus

Gravity LDO Environmental Statement

**Volume 1 – Chapters 10:
Acoustics**

10 Noise and Vibration

10.1 Introduction

- 10.1.1 This chapter reports the findings of the assessment of the likely significant effects of noise and vibration as a result of the Proposed Development at Gravity (hereafter referred to as the 'Proposed Development').
- 10.1.2 The purpose of this assessment is to identify the likely impact of the Proposed Development on the local noise and vibration climate during the construction and operational phases and determine the suitability of the Site for the Proposed Development.
- 10.1.3 This assessment and ES chapter has been produced by Stantec who are sponsoring members of the Institute of Acoustics (IOA), and registered members of the Acoustic Noise Consultants (ANC). In accordance with Regulation 18(5) of the Town and Country Planning (Environmental Impact Assessment) Regulations 2017, as amended, a statement outlining the relevant expertise and qualifications of competent experts appointed to prepare this ES is provided in **Appendix 1.6**.
- 10.1.4 Appendices submitted with the chapter are:
- Appendix 10.1 – Glossary of Acoustic Terminology
 - Appendix 10.2 - Figures
 - Appendix 10.3 - Instrumentation
 - Appendix 10.4 – Traffic Data
 - Appendix 10.5 – Time History Graphs
 - Appendix 10.6 – Operational Sound Levels

10.2 Policy, Legislation, Guidance and Standards

National Legislation

Control of Pollution Act (1974)

- 10.2.1 The Control of Pollution Act (CoPA) 1974 covers a wide range of environmental pollution including noise. Parts of the Act have been superseded by the Environmental Protection Act 1990.
- 10.2.2 Section 60 of the Act relates to the 'Control of Noise on Construction Sites' and Section 61 relates to obtaining 'Prior Consent for Work on Construction Sites'. These parts of the Act are often used in conjunction with other standards to determine acceptable noise levels in relation to construction, hours of operation and specific working methods or mitigation.
- 10.2.3 A Section 61 application outlines the proposed construction works, hours of operation and a mitigation plan to reduce noise and vibration impact through the use of Best Practicable Means. It allows prior consent to be agreed between the contractor and the council and assists with protecting the contractor from legal action being taken under Section 60 of CoPA or Section 80 of the Environmental Protection Act 1990.

Environmental Protection Act (1990)

10.2.4 The Environmental Protection Act (EPA) 1990 requires local authorities to investigate noise complaints from premises (land and buildings) and vehicles, machinery, or equipment in the street. This includes noise arising from construction sites.

10.2.5 If the local authority is satisfied that noise from a development amounts to a statutory nuisance, i.e. where the noise is such that it may be deemed prejudicial to health, or that would unreasonably and substantially interfere with the use or enjoyment of a home or other premises; 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 may require that the noise or nuisance is completely stopped or limited to certain times of the day.

National Planning Policy

National Planning Policy Framework (2021)

10.2.6 The revised National Planning Policy Framework (NPPF) was published in July 2021. In respect of noise, paragraph 174 states that in relation to conserving and enhancing the natural environment:

“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 ... noise pollution...”

10.2.7 In relation to ground conditions and pollution, paragraph 185 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, living conditions and the natural environment, as well as the potential sensitivity of the Site or the wider area to impacts that could arise from the development. In doing so they should:

- *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;*
- *Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason...”*

10.2.8 In relation to the integration of new development with existing premises and community facilities, paragraph 187 states 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.”

10.2.9 The NPPF indicates that the Noise Policy Statement for England (NPSE) should be used to define the “significant adverse impacts”. In this respect, the NPPG requires that local planning

authorities' plan-making and decision taking should take account of the acoustic environment, and in doing so consider:

- Whether or not a significant adverse effect is occurring or likely to occur.
- Whether or not an adverse effect is occurring or likely to occur.
- Whether or not a good standard of amenity can be achieved.

10.2.10 In line with the Explanatory Note of the Noise Policy Statement for England, this would include identifying whether the overall effect of the noise exposure (including the impact during construction wherever applicable) is, or would be, above or below the significant observed adverse effect level..."

Noise Policy Statement for England (2010)

10.2.11 The Noise Policy Statement for England (NPSE) was published by DEFRA in March 2010 and clarifies the underlying principles and aims of existing policy documents that relate to noise. It also sets out the long-term vision of Government noise policy which is: *"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"*.

10.2.12 The NPSE states 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 its effects as far as is reasonably practicable having regard to the underlying principles of sustainable development.

10.2.13 Paragraphs 2.20 and 2.21 define 'significant adverse' and 'adverse' impacts as applied to noise 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.

Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur."

10.2.14 Paragraph 2.22 clarifies that:

"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. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available."

10.2.15 The three aims of the NPSE are defined as follows:

“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.” (Note: Applies when the impact lies somewhere between the LOAEL and SOAEL and does not mean that adverse effects cannot occur)

“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.”

- 10.2.16 It is necessary to define the LOAEL and SOAEL for the potential source of noise to relate the potential impact to the aims and requirements of the NPSE.

National Planning Practice Guide (2019)

- 10.2.17 The Government's Planning Practice Guidance (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.
- 10.2.18 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.
- 10.2.19 The LOAEL is described in PPG (Paragraph: 005 Reference ID: 30-005-20190722) as the level above which *"noise starts to cause small changes in behaviour and/or attitude, for example, having to turn up the volume on the television or needing to speak more loudly to be heard. The noise therefore starts 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)."*
- 10.2.20 PPG identifies the SOAEL (Paragraph: 005 Reference ID: 30-005-20190722) as the level above which *"noise causes a material change in behaviour such as keeping windows closed for most of the time or avoiding certain activities during periods when the noise is present. If the exposure is predicted to be above this level the planning process should be used to avoid this effect occurring, for example through the choice of sites at the plan-making stage, or by use of appropriate mitigation such as by altering the design and layout. While such decisions must be made taking account of the economic and social benefit of the activity causing or affected by the noise, it is undesirable for such exposure to be caused."*

Local Planning Policy

Sedgemoor District Council – Developers Noise Assessment Guide (2020)

- 10.2.21 Sedgemoor District Council (SDC) has created guidance for the assessment of noise to assist developers where noise may be a material planning consideration. The guidance applies to developments where noise may have the ability to affect existing and proposed receptors.
- 10.2.22 The guidance provides a table of SDC's accepted noise limits. **Table 10.1** details the acceptable noise limits.

Location	Daytime 07:00 – 23:00		Night-time 23:00 – 07:00
	Preferred	Upper Limit	
Living room	N/A	35 dB LAeq, 16hr	N/A
Dining Room/ Area	N/A	40 dB LAeq, 16hr	N/A
Bedroom	N/A	35 dB LAeq, 16hr	30 dB LAeq, 8 hr 45 dB LAFmax*
Private Amenity Areas and Gardens	50 dB LAeq, 16hr	55 dB LAeq, 16hr	N/A

*No more than 10 times per night

Table 10.1 Sedgemoor District Council Acceptable Noise Limits for Residential Development

Sedgemoor Local Plan 2011 – 2032 (February 2019)

10.2.23 SDC adopted their Local Plan on 20th February 2019. The Local Plan sets out the adopted policies for development and growth across the district.

10.2.24 Policy D13 – Sustainable Transport and Movement states:

“[...] Proposals will:

[...] Contribute to reducing adverse environmental issues, including air, light and noise pollution [...].”

Policy D14 – Managing the Transport Impacts of Development states:

“Development proposals that will have a significant transport impact should:

- *Be supported by an appropriate Transport Assessment, Air Quality Assessment, Noise and Vibration Assessment [...].”*

10.2.25 Policy D24 – Pollution Impacts of Development states:

“Development proposals that are likely to result in levels of air, noise, light or water pollution (including groundwater), vibration or soil contamination that would be unacceptably harmful to other land uses, human health, or the built and natural environment will not be supported. Where there are reasonable grounds to suggest that a development proposal may result in a significant adverse environmental impact, taking into account the sensitivity of the location, the Council will require planning applications to be supported by assessments relating to [...] Noise pollution and/or vibration [...].”

10.2.26 Policy D25 – Protecting Residential Amenity states:

“Development proposal that would result in the loss of land of recreational and/or amenity value, or unacceptably impact upon the residential amenity of occupants of nearby dwellings and any potential future occupants of nearby or proposed dwellings, will not be supported. Particular consideration will be given to (but not limited to) the extent that the proposal could result in unacceptable impact relating to:

[...] noise or disturbance; [...].”

Bridgwater Vision (December 2015)

- 10.2.27 The Bridgwater Vision document provides a framework for the continued planned growth of Bridgwater.
- 10.2.28 A key objective for the Strategic Framework is to help to create a safe and attractive public realm for all with an enhanced environment for pedestrians and cyclists.
- 10.2.29 One of the objectives of the access and movement strategy is to reduce the transport related impacts on air and noise quality.

Puriton Energy Park Supplementary Planning Document (March 2012)

- 10.2.30 This Supplementary Planning Document was prepared by the council to guide and inform development of the brownfield site of the former Royal Ordnance Factory to support the allocation in the Core Strategy of the former ROF site as an Energy Park, with priority for renewable and low carbon energy generation and other energy related or complimentary uses. The SPD elaborates on policies in the Council's Core Strategy and is closely aligned to current corporate policy.

Other Relevant Policy, Standards and Guidance

British Standard 8233: 2014 'Guidance on Sound Insulation and Noise Reduction for Buildings'

- 10.2.31 BS 8233, in relation to this development, sets out desirable guideline values in habitable rooms, such as living rooms and bedrooms.
- 10.2.32 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.
- 10.2.33 The desirable internal ambient noise levels for dwellings are presented in **Table 10.2**.

Activity	Location	Desirable Internal Ambient Noise Level	
		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			

Table 10.2 BS 8233 Desirable Internal Ambient Noise Levels for Dwellings

10.2.34 The Standard also provides advice in relation to desirable levels 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 recognized 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.”

10.2.35 With respect to industrial noise, Paragraph 6.5.2 states:

“Where industrial noise affects residential or mixed residential areas, the methods for rating the noise in BS 4142 should be applied. BS 4142 describes methods for determining, at the outside of a building:

- a) noise levels from factories, industrial premises or fixed installations, or sources of an industrial nature in commercial premises; and*
- b) background noise level.”*

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

10.2.36 BS 4142:2014 +A1:2019 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 incidental.

10.2.37 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 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.

10.2.38 The standard should not be used to assess sound from the passage of vehicles on public roads and railway systems; recreational activities; music and other entertainment; shooting grounds; construction and demolition; domestic animals; people; public address systems for speech and other sources falling within the scopes of other standards or guidance. The standard cannot be applied to the derivation of indoor sound levels arising from sound levels outside, or the assessment of indoor sound levels.

10.2.39 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. It is noted that a BS 4142 assessment is reliant on measuring relevant background sound levels.

10.2.40 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 the 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.

10.2.41 In order to consider the context, BS 4142 advises that 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 to provide rapid or purge ventilation; and
 - Acoustic screening.

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

10.2.42 BS 7445-1 describes methods and procedures for measuring noise from all sources which contribute to the total noise climate of the community's environment, individually and in combination. The results are expressed as equivalent continuous A-weighted sound pressure levels, $L_{Aeq, T}$.

10.2.43 BS 7445-1 states that sound level meters that are used for noise measurements should conform to the 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.

British Standard 5228-1:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites Part 1 Noise

10.2.44 British Standard 5228-1 does not provide limits for demolition and construction noise. The standard provides a 'best practice guide' for noise control and includes sound power level (L_w) data for individual plant as well as a calculation method for the prediction of noise from demolition and construction activities.

British Standard 5228-1:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites Part 2 Vibration

10.2.45 BS 5228-2 provides advice on the human response to demolition and construction vibration. BS 5228-2 suggests that, for demolition and construction activities, it is considered

appropriate to provide guidance in terms of the peak particle velocity (PPV) as measured outside the building.

Professional Practice Guidance on Planning and Noise, 2017

10.2.46 The Professional Practice Guidance on Planning and Noise (ProPG) provides guidance on a recommended approach to the management of noise within the planning system in England.

10.2.47 The scope of ProPG is limited to new residential development that will be predominantly exposed to airborne noise from transport sources.

10.2.48 Noise sources other than airborne transport (i.e. industrial, commercial, entertainment, etc.) and ground-borne noise and vibration fall outside of the scope of ProPG.

10.2.49 ProPG details a two-stage approach to the consideration of noise issues including:

- Stage 1 – an initial noise risk assessment of the Proposed Development site; and
- Stage 2 – a systematic consideration of four key elements.

10.2.50 **Table 10.3** summarises the noise risk categories as defined in ProPG for Stage 1 of the assessment process.

Site Noise Risk Level	Indicative Noise Levels excluding Mitigation (dB L _{Aeq,T})		Pre-Planning Application Advice
	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)	
High	> 70	> 60	Increased risk that development may be refused on noise grounds. The risk may be reduced by following a good acoustic design process
Medium	60 – 70	50 - 60	The Site is likely to be less suitable from a noise perspective and an application may be refused unless a good acoustic design process is followed
Low	50 – 60	40 – 50	The Site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed
Negligible	< 50	< 40*	The Site is likely to be acceptable from a noise perspective
* Site Noise Risk Level should not be considered negligible where there could be more than 10 noise events with L _{Amax,f} > 60 dB			

Table 10.3 Stage 1 ProPG Risk Categories

10.2.51 Stage 2 comprises 4 key elements which are undertaken in parallel:

- Element 1 – demonstrating a ‘Good Acoustic Design Process’;
- Element 2 – observing internal ‘Noise Level Guidelines’;
- Element 3 – undertaking an ‘External Amenity Area Noise Assessment’; and
- Element 4 – consideration of ‘Other Relevant Issues’.

10.2.52 Following a good acoustic design process involves considering acoustics at an early stage in the design process; avoid 'unreasonable' acoustic conditions and prevent 'unacceptable' acoustic conditions; and achieve an integrated, optimum solution without overdesign.

10.2.53 Demonstration of good acoustic design must include:

- Checking the feasibility of relocating or reducing noise levels from relevant sources;
- Consider options for planning the Site or building layout;
- Consider the orientation of proposed building(s);
- Select construction types and methods for meeting building performance requirements;
- Consider the effects of noise control measures on ventilation, fire regulation, health and safety, CDM, etc.;
- Assess the viability of alternative solutions; and
- Assess external amenity areas noise.

10.2.54 With respect to internal noise levels, ProPG recommends that noise levels set out in BS 8233 are used for residential development. However, an additional criterion is proposed by ProPG for night-time L_{Amax} levels as follows:

"[...] 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."

10.2.55 With respect to external noise levels, ProPG again makes reference to the guideline levels detailed in BS 8233 stating that:

"The acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50 – 55 dB $L_{Aeq, 16hr}$."

10.2.56 The final element indicates that the assessment should consider 'Other Relevant Issues' which may include:

- Compliance with relevant national and local policy;
- Magnitude and extent of compliance with ProPG;
- Likely occupants of the development;
- Acoustic design verses unintended adverse consequences;
- Acoustic design verse wider planning objectives.

Calculation of Road Traffic Noise 1988 (CRTN)

10.2.57 CRTN describes the procedures for traffic noise calculation and is suitable for environmental assessments of schemes where road traffic noise may have an impact. The 'Method for converting the UK road traffic noise index $L_{A10, 18hr}$ to the EU indices for road noise mapping'

(TRL, Casella Stanger, 2006) can be used to convert $L_{A10, 18 \text{ hr}}$ road traffic noise levels to $L_{Aeq, 16 \text{ hr}}$ daytime and $L_{Aeq, 8 \text{ hr}}$ night-time ambient noise levels.

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

10.2.58 The 'Method for Converting the UK Road Traffic Index $L_{A10, 18 \text{ hr}}$ to the EU Noise Indices For Road Noise Mapping' was published by Defra, TRL and Casella Stanger in 2006 and can be used to convert $L_{A10, 18 \text{ hr}}$ (06:00 – 00:00 hours) sound levels from vehicular movements on a road to daytime, evening and night-time sound levels ($L_{Aeq, T}$) from vehicular movements on a road.

Department of Transport 1995: Calculation of Railway Noise

10.2.59 The Calculation of Railway Noise (CRN) (Department for Transport, 1995) describes procedures for calculating noise from moving railway vehicles and other types of vehicles which run on rails. It includes consideration of a number of factors including vehicle class, speed, distance attenuation and barrier attenuation.

10.2.60 Noise levels are measured or predicted in terms of the $L_{Aeq, 18 \text{ h}}$ or $L_{Aeq, 6 \text{ h}}$.

World Health Organization, Environmental Noise Guidelines for the European Region, 2018, W.H.O.

10.2.61 The World Health Organization (WHO) Environmental Noise Guidelines for the European Region (2018) sets out guidance on suitable external noise levels from specific noise sources including road traffic railway, aircraft, wind turbine and leisure noise, based on evidence, to inform policy makers.

10.2.62 The guidelines refer to L_{den} and L_{night} dB values for road traffic, railway, aircraft and railway noise, which is a sound descriptor not commonly used to assess site suitability within the UK. More commonly utilised descriptors are the daytime average ($L_{Aeq, 16 \text{ h}}$) and night-time average ($L_{Aeq, 8 \text{ h}}$) noise levels.

10.2.63 With respect to indoor noise levels, the guideline document states that *"the GDG (Guideline Development Group) recommends that all CNG indoor guideline values and any values not covered by the current guidelines (such as industrial noise and shopping areas) should remain valid."* As such, further reference is made to the WHO Guidelines for Community Noise (CNG), 1999.

World Health Organization, Guidelines for Community Noise, 1999, W.H.O.

10.2.64 The WHO 'Guidelines for Community Noise' details guidance on suitable internal and external sound levels in and around residential properties. The following internal sound levels are recommended by the WHO:

- 35 dB $L_{Aeq, 16 \text{ hours}}$ in living rooms during the daytime (07:00 to 23:00 hours); and
- 30 dB $L_{Aeq, 8 \text{ hours}}$ in bedrooms during the night-time (23:00 to 07:00 hours).

10.2.65 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."

10.2.66 In addition to the above, the guidelines suggest that daytime sound levels of above 50 dB $L_{Aeq, 16 \text{ h}}$ are of 'moderate annoyance' in the community with daytime sound levels above 55 dB $L_{Aeq, 16 \text{ h}}$ of 'serious annoyance'.

10.2.67 The above levels are in-line with guidance detailed in BS8233:2014 and ProPG Planning and Noise.

Design Manual for Road and Bridges (2020) – Design Manual for Road and Bridges LA 111 Traffic Noise and Vibration

10.2.68 The Design Manual for Roads and Bridges (DMRB) is considered to be the regulatory standard for the design of a new road or improvements to an existing road. LA 111 provides guidance on the environmental assessment of noise and vibration emissions and includes likely significant effects from:

- Construction noise;
- Construction vibration; and
- Operational noise.

10.2.69 Paragraph 1.5 of the DMRB states:

“Operational vibration is scoped out of the assessment methodology as a maintained road surface will be free of irregularities as part of project design and under general maintenance, so operational vibration will not have the potential to lead to significant adverse effects.”

Construction Noise

10.2.70 The calculation of construction noise levels should follow the methodology outlined in BS 5228-1:2009+A1:2014 and should include:

- Construction plant in use on the project;
- Construction compounds; and
- Traffic on haul roads not part of the public highway.

Construction Vibration

10.2.71 The calculation of construction vibration levels should follow the methodology outlined in BS 5228-2:2009+A1:2014 for all activities with the potential to adversely affect vibration sensitive receptors.

Operational Road Traffic Noise

10.2.72 DMRB states that an operational road traffic noise study area should be defined where the need for further assessment has been established and should include all noise sensitive receptors that are potentially affected by operational noise changes generated by the project, either on the route of the project or other roads not physically changed by the project. The document notes that a study area of 600 m from new road links or link physically changed or bypassed by the project is normally sufficient for most projects.

10.2.73 DMRB states that the operational noise baseline shall be determined from Do Minimum noise levels in each assessment year.

10.3 Consultation

10.3.1 Consultation with the Environmental Health Officer (EHO) at SDC was undertaken on 8 July 2021 to discuss and agree the survey and assessment methodologies.

10.3.2 Comments from the EHO have been included below, along with our responses.

Environmental Sound Survey

"I would suggest that a 24 hrs noise survey is sufficient. 7 days data, 24 hrs/day, would provide more detail as to the current background levels."

10.3.3 The environmental sound survey was conducted over a seven-day period with continuous noise monitoring.

Residential Use – Internal Noise Levels

"There is no mention of impact noise L_{Amax} Levels. These should be included."

10.3.4 An assessment of internal L_{max} has been undertaken, as per the Guidelines for Community Noise, which repeats the WHO guidelines:

"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."

Incident Noise Levels at Private Outdoor Amenity Areas

"Woolavington and Puriton are neither city centres, nor large urban areas. We would anticipate the background ambient level is pretty low typically with M5 traffic noise being dominant source? Please see our SDC EH Developers Guide, which details the external level we would be requiring, notably an upper limit of 55 dB $L_{Aeq, 16 hr}$."

10.3.5 The SDC EH Developers guide has been reviewed as part of our Policy, Legislation, Guidance, and Standards section and guidance has been applied where appropriate.

Construction Phase

"A Phased CEMP will be crucial; especially if the residential part of the development is occupied during/prior to the rest of the development, and to protect local residents."

10.3.6 A Framework Demolition and Construction Environmental Management Plan (FDCEMP – **Appendix 4.1**) has been proposed as part of the embedded mitigation of the Proposed Development. Operational Traffic

"We would suggest a 'worst case' operational traffic noise assessment would be prudent especially given the B2 / B8 uses – though these will be subject to development site layout."

10.3.7 Operational traffic movements on the local road network have been included within this assessment, along with an assessment in accordance with BS 4142, which looks at the potential impact of HGV movements on the Site.

Commercial Development

"It is challenging to assess the potential noise impact without specifics of what each commercial unit will contain. Though if class-use specific applications are submitted; there should be the opportunity to access impact at that stage."

10.3.8 Commercial development has been assessed at an outline stage in this ES. A detailed assessment of the proposed commercial units should be assessed at a later stage, when uses have been finalised.

10.4 Methodology

Study Area

- 10.4.1 For the purposes of this assessment, noise and vibration sensitive receptors are considered to be any existing occupied premises adjacent to or in the vicinity of the Site used as a dwelling, place of worship, educational establishment, hospital or similar institution, or any other property likely to be adversely affected by noise or vibration. Noise sensitive receptors proposed within the development area are also included within the study area.
- 10.4.2 For the benefit of this chapter, the study area considers an area bound by the M5 to the west, the Huntspill River to the north, the B3141 to the west and Woolavington Road to the south.
- 10.4.3 The study area also includes existing noise sensitive receptors along the links that could be significantly affected by changes in traffic flows as a result of traffic generated by the Proposed Development. The change in traffic flows has been assessed along all links provided by the traffic model.

Baseline Data Collection

Procedure

- 10.4.4 An unattended environmental sound survey was undertaken between approximately 14:45 hours on 15 July 2021 and approximately 10:15 hours on 23 July 2021 in order to determine the existing sound climate across the Site and the surrounding area.
- 10.4.5 The survey was undertaken over a seven-day period. Measurements were made over 15-minute periods of the L_{Aeq} , L_{A90} , and L_{AFMax} sound levels.
- 10.4.6 The sound level meters were located in environmental cases. The microphones were connected to the meters via an extension cable and fitted with the manufacturer's windshield.
- 10.4.7 The instrumentation used in the survey (including calibration information) is listed in **Appendix 10.2**.
- 10.4.8 Field calibrations were performed before and after the measurements with no significant fluctuations recorded (< 0.5 dB). Calibration certificates are available upon request.

Measurement Locations

- 10.4.9 Sound measurements were undertaken at seven positions on and around the Site. The measurement positions are detailed in **Appendix 10.2, Figure 10.1**, and described in **Table 10.4**. The microphones were located approximately 1.5 m above ground level in a free-field position at all locations.

Position	Description
LT 1	The microphone was located to the northwest of the Site, adjacent to the Great Western Railway Line. The meter was located approximately 10 m from the closest track edge.
LT 2	The microphone was located in the northwest corner of the Site, within the ROF fence boundary.
LT 3	The microphone was located to the southwest of the Site, in a field adjacent to Rookery Close. The microphone was located approximately 20 m north of Puriton Allotments and 240 m west of Gravity Access Road.
LT 4	The microphone was located within the Site boundary along West Approach Road. The microphone was located approximately 2 m from the road edge.
LT 5	The microphone was located within the Site boundary to the southeast. The microphone was located approximately 5 m from Woolavington Road.
LT 6	The microphone was located within the Site boundary to the southeast. The microphone was located approximately 180 m back from Woolavington Road, in line with existing receptors located along Whiteley Meadows.
LT 7	The microphone was located in the northeast corner of the Site, within the ROF fence boundary.

Table 10.4 Description of Survey Locations

Meteorological Conditions

10.4.10 Due to the nature of the survey (i.e. unattended), it is not possible to accurately comment on the meteorological conditions throughout the entire survey period. However, based on a review of publicly available weather forecasts and observations at the beginning and end of the survey period, the weather conditions are detailed in **Table 10.5**.

Date	Description				
	Temperature (°C)	Precipitation (mm)	Cloud Cover (%)	Wind Speed (m/s)	Wind Direction
15/07/2021	18	0	10	< 5	NW
16/07/2021	21	0	10	< 5	NE
17/07/2021	23	0	0	< 5	NE
18/07/2021	24	0	0	< 5	NE
19/07/2021	24	0	0	< 5	N
20/07/2021	24	0	0	< 5	W
21/07/2021	23	0	0	< 5	NE
22/07/2021	23	0	50	< 5	E
23/07/2021	21	0	80	< 5	E

Table 10.5 Meteorological Conditions

10.4.11 These conditions are therefore considered suitable for obtaining representative sound level measurements.

Baseline Year

10.4.12 The year 2032 has been identified as the assessment year for operational effects to be included in the ES. This year has been identified as it is the end of the current Local Plan

period and a date by which it is reasonable to assume that the development approved by the LDO will have been delivered.

- 10.4.13 The sound data collected has been used, along with the baseline traffic data provided, to verify the acoustic model. A future baseline scenario has then been modelled using traffic data provided for a 2032 future without development scenario. This is considered an appropriate method of taking account of the changes in sound levels between the survey and the assessment year.

Sensitive Receptors

- 10.4.14 Based on a review of the baseline conditions, **Table 10.6** presents the receptors with the potential to be significantly affected by the Proposed Development. This considers the location of the receptor and its relationship with the Site. **Figure 10.2, Appendix 10.2** also details the approximate locations of the identified receptors.

Reference	Receptor
A	Farm building approximately 900 m north of Site along Withy Grove
B	Farm building approximately 550 m northeast of Site along B3141
C	Residential receptors at western edge of Woolavington village, approximately 30 m southeast of Site
D	Residential receptors along Woolavington road, approximately 40 m south of Site
E	Residential receptors at eastern edge of Puriton, approximately 120 m southwest of Site
F	Residential receptors at eastern edge of Puriton, approximately 380 m southwest of Site
G	Proposed residential receptors, on the south eastern part of Site

Table 10.6 Noise Sensitive Receptors

- 10.4.15 The Proposed Development also includes temporary housing for construction personnel. As it is not yet known where these will be located, a reference has not been given to these temporary receptors. However, they have been included in the relevant assessments.

Assessment of Significance

Significance of Impacts

- 10.4.16 This section summarises the approach adopted to apply noise and vibration related legislation, planning policy and industry standard guidance to the EIA process.

Potential Impacts in Terms of Noise and Vibration

- 10.4.17 The PPG provides advice regarding how to determine the impact of noise, including whether a significant adverse effect or adverse effect is occurring or likely to occur and whether a good standard of amenity can be achieved.
- 10.4.18 It provides more descriptive detail for the definitions of NOEL, LOAEL, and SOAEL but refrains from using numerical values. **Table 10.6** summarises the noise exposure hierarchy, based on the likely average response of those affected by potential noise and vibration impacts.

Response	Examples of Outcomes	Impact in Noise and Vibration Terms	Action
Very Noticeable Improvement	Causes a material change in behaviours and/or attitude e.g. individuals engage in activities which may have been avoided in the past. Quality of life enhanced due to change in character of the area.	Major	N/A
Noticeable Improvement	Improved noise climate results in small changes in behaviour and/or attitude e.g. turning down the volume of television, speaking more quietly, opening windows. Affects the character of the area such that there is a perceived change in the quality of life.	Moderate	N/A
Just Noticeable Improvement	Noise impact can be heard but does not result in any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	Minor	N/A
No Observed Effect Level (NOEL)			
Not present	No Effect	Negligible	No specific measures required.
No Observed Adverse Effect Level (NOAEL)			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude, or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	Minor	No specific measures required.
Lowest Observed Adverse Effect Level (LOAEL)			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude, or other physiological response, 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 small actual or perceived change in the quality of life.	Moderate	Mitigate and reduce to a minimum.
Significant Observed Adverse Effect Level (SOAEL)			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, 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.	Major	Avoid
Very disruptive and harmful	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g., regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g., auditory and non-auditory.	Substantial	Prevent

Table 10.6 Noise Exposure Hierarchy and Effect Levels

10.4.19 The impact in noise and vibration terms has been assessed with consideration to the proposed LOAELs and SOAELs based on the guidance set out in PPG and other relevant policy and standards.

Likely Significant Effects in EIA Terms

- 10.4.20 **Chapter 5** sets out the general methodology for the assessing the impact in terms of EIA significance.
- 10.4.21 The approach to assessing and assigning significance to an environmental effect relied upon the context of the results of the assessment undertaken in noise and vibration terms.
- 10.4.22 Effects that are described as ‘minor’ or ‘negligible’ in EIA terms are determined to be ‘not significant’, and effects that are described as ‘moderate’ or ‘major’ in EIA terms are determined to be ‘significant’ in the context of the EIA Regulations.
- 10.4.23 The level of effects and significance in EIA terms has been determined based on the results of the assessments and is discussed further in the ‘Assessment Approach’ section discussed below.

Scope

- 10.4.24 The assessment of the Proposed Development utilises a wide range of applicable standards and guidance. However, the principal guidance documents used to inform the assessment are as detailed in **Table 10.7**.

Assessment Type	Reference Document
Instrumentation and Measurement Procedures	BS 7445: Part 1:2003 Description and Measurement of Environmental Noise. Guide to Quantities and Procedures
Construction Noise and Vibration Impact	Design Manual for Roads and Bridges BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites
Construction Impact from Road Traffic	Design Manual for Roads and Bridges Department of Transport 1988: Calculation of Road Traffic Noise
Operational Impact from Road Traffic	Design Manual for Roads and Bridges Department of Transport 1988: Calculation of Road Traffic Noise
Assessment of Industrial Uses	British Standard 4142:2014 +A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound
Suitability of Site for Residential Use	British Standard 8233: 2014 ‘Guidance on Sound Insulation and Noise Reduction for Buildings’ Professional Practice Guidance on Planning and Noise, 2017

Table 10.7 Assessment Methodologies

Data Sources

Acoustic Model

- 10.4.25 An acoustic model has been prepared using SoundPLAN v8.2 to assess noise levels across the study area. The model includes the effect of topography and existing buildings.
- 10.4.26 SoundPLAN v8.2 uses the CRTN methodology to model noise from road traffic and includes variables such as the volume and speed of traffic.
- 10.4.27 The acoustic model includes traffic data provided by the transport consultants and detailed in **Appendix 10.3**. The trip generation assessment and methodology are outlined in **Chapter 9: Transport and Access**.

10.4.28 The cumulative effects have been assessed based on the predicted future traffic data. The scenarios include vehicular movements associated with the occupation of committed developments in the vicinity of the Site.

10.4.29 The following scenarios have been modelled:

- 2032 Future Baseline; and
- 2032 With Development.

Assessment Approach

Demolition and Construction Noise

10.4.30 BS 5228:2009+A1:2014 'Code of Practice for Noise and Vibration Control on Construction and Open Sites' does not provide specific limits for construction noise, but it does define methods of assessing the significance. The standard also provides information on demolition and construction noise and vibration reduction measures promoting a 'Best Practice Means' approach to control noise and vibration. A method for determining the sound levels associated with demolition and construction activities is also detailed and considers the numbers and types of equipment operating, their associated Sound Power Level (L_w), and the distance to receptors, along with the effects of any screening.

10.4.31 Based on the guidance detailed in table E.1 of BS 5228:2009+A1:2014, **Table 10.8** below defines the threshold of potential significant effects at dwellings.

Assessment Category and Threshold Value Period	Threshold Value in dB ($L_{Aeq, T}$)		
	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
<p>Note 1 – A potential significant effect is indicated if the $L_{Aeq, T}$ noise level arising from the Site exceeds the threshold level for the category appropriate to the ambient noise level.</p> <p>Note 2 – If the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise levels is higher than the above values), then a potential significant effect is indicated if the total $L_{Aeq, T}$ noise level for the period increase by more than 3 dB due to site noise.</p> <p>Note 3 – Applied to residential receptors only.</p>			
<p>A) Category A: Threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.</p> <p>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.</p> <p>C) Category C: Threshold values to use when the ambient noise levels (when round to the nearest 5 dB) are higher that category A values.</p> <p>D) 19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays</p>			

Table 10.8 Threshold of Potential Significant Effect at Dwellings

10.4.32 With reference to BS5228, normal demolition and construction hours are Monday to Friday between 07:00 to 19:00 and Saturday 08:00 to 13:00.

10.4.33 For assessment purposes it is assumed no demolition or construction work will take place on Sundays or Bank Holidays.

10.4.34 As this is a high-level assessment, the calculations have been based on normal construction hours. If occupiers identify a requirement to work outside of these hours, this will be controlled through the compliance process application. This will be based on the specific construction activities that are required for evening and/or night-time periods.

10.4.35 **Table 10.9** defines the construction noise adverse impact levels for residential buildings.

Magnitude of Impact in Noise Terms	Construction Sound Level $L_{Aeq,T}$ (dB) at Residential Receptor
Substantial**	Above or equal to the Threshold Level* + 10 dB
Major	Above or equal to the Threshold Level* + 5 dB and below the Threshold Level* + 10 dB
Moderate	Above or equal to the Threshold Level* and below the Threshold Level* + 5 dB
SOAEL	
Minor	Above or equal to the Ambient Sound Level and below the Threshold Level*
LOAEL	
Negligible	Below the Ambient Sound Level
*Threshold level determined as per BS 5228:1 Section E3.2 and Table E.1	

Table 10.9 Construction Noise Impact Levels for Residential Buildings

Demolition and Construction Vibration

10.4.36 The effects of human response to whole body vibration in buildings are defined in BS 6472-1: 2008 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.

10.4.37 The limit of human perception to vibration is between approximately 0.15 mm/s and 0.3 mm/s 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.

10.4.38 Based on the above guidance **Table 10.10** details the proposed assessment criteria.

Magnitude of Impact in Vibration Terms	Vibration Level PPV mm/s	Description of Effects
Major	> 10	Vibration is likely to be intolerable for any more than a very brief exposure.
Moderate	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.
SOAEL		
Minor	0.3 to 1	Increasing likelihood of perceptible vibration in residential environments.
LOAEL		
Negligible	< 0.3	Vibration is unlikely to be perceptible in even the most sensitive situations for most vibration frequencies associated with construction.

Table 10.10 Construction Vibration Impact Levels

10.4.39 Table B.2 of BS 5228-2:2009+A1:2014 provides guidance on PPV vibration limits for transient excitation for different building types. **Table 10.10** outlines the transient vibration guide values for cosmetic damage to buildings. Consideration will be given to the guideline values detailed in **Table 10.11** in determining the significance of construction vibration.

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 at 4 Hz and above	
Un-reinforced or light framed structures. Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above
<p>Note 1 Values referred to are at the base of the building.</p> <p>Note 2 At frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded.</p>		

Table 10.11 Transient Vibration Guide Values for Cosmetic Damage

10.4.40 In addition to the above, section 3.19 of DMRB states that construction vibration shall constitute a significant effect in EIA terms where it is determined that a substantial, major or moderate magnitude of impact will occur for a duration exceeding:

- 10 or more days or nights in any 15 consecutive days or nights.
- A total number of days exceeding 40 in any six consecutive months.

Construction Traffic

10.4.41 The assessment of noise due to construction traffic on the existing sound climate in surrounding areas is based on the change in sound levels at noise sensitive receptors due to

a change in the volumes of road traffic generated by the construction of the Proposed Development.

10.4.42 The change in noise level has been calculated by comparing the construction traffic flows with the baseline traffic flows.

10.4.43 Assessment for this ES Chapter uses short-term assessment criteria taken from DMRB to assess the temporary construction impact. **Table 10.12** details the proposed assessment criteria.

Magnitude of Impact in Noise Terms	Change in Noise Level $L_{A10,18h}$ (dB) at Noise Sensitive Receptor
Major	≥ 5.0
Moderate	3.0 to 4.9
Minor	1.0 to 2.9
Negligible	< 1.0

Table 10.12 Change in Noise Levels Due to Construction Traffic

10.4.44 Where the impact in noise terms is above negligible, the assessment of effects, and therefore determining whether an effect is significant or not has taken into account the following factors:

- Proximity of calculated change to the minor/moderate boundary;
- Consideration of the calculated change in the long term;
- Absolute noise level with reference to relevant criteria in BS 8233:2014;
- The context of the specific noise sensitive receptor; and
- Acoustic context of the area and likely perception of change by the receptor.

10.4.45 In addition to the above, section 3.19 of DMRB states that construction noise and construction traffic noise shall constitute a significant effect in EIA terms where it is determined that a substantial, major or moderate magnitude of impact will occur for a duration exceeding:

- 10 or more days or nights in any 15 consecutive days or nights;
- A total number of days exceeding 40 in any 6 consecutive months.

Operational Internal and External Noise Levels for Proposed Residential Receptors

10.4.46 Internal and external noise levels for proposed receptors have been assessed in accordance with BS 8233. As SDC have specified their required noise levels for these receptors, this has been used in the assessment,

Level	Proposed LOAEL and SOAEL Levels for Transportation Noise Affecting New Residential Premises	
	Daytime (07:00 – 23:00 hours)	Night-time (23:00 – 07:00 hours)
Internal Noise Levels		
LOAEL	35 dB LAeq, 16 hr	30 dB LAeq, 8 hr
		45 dB LAmax 10-15 times per night
SOAEL	50 dB LAeq, 16 hr	45 dB LAeq, 8 hr
		65 dB LAMax if more than 20 events
		80 dB LAMax if less than 20 events
External Amenity Areas (Free Field Levels)		
LOAEL	50 dB LAeq, 16 hr	-
SOAEL	65 dB LAeq, 16 hr	-

Table 10.13 Internal and External Noise Criteria for Habitable Rooms Due to Transportation Noise

10.4.47 It is assumed that outdoor incident noise levels in external areas used for amenity (i.e. gardens/balconies) are only of concern during the daytime hours, as people are unlikely to make frequent use of the outdoor amenity areas during night-time hours.

Operational Road Traffic Noise Affecting Existing Receptors

10.4.48 Operational road traffic noise impacts have been assessed in accordance with guidance outlined in DMRB LA 111, implementing the calculation methodology of the CRTN.

10.4.49 The prediction method takes into account factors such as the traffic flow, composition and speed, the alignment and distance of the road relative to the receiving property in order to calculate the dB LA10 18 hour noise level.

10.4.50 The prediction of road traffic noise has been undertaken using the commercially available, proprietary noise mapping software Soundplan V8.2, which uses the CRTN calculation methodology, and is therefore appropriate for use in the prediction of noise for this scheme.

10.4.51 DMRB LA 111 provides a classification for the magnitude of change in road traffic noise. **Table 10.14** below presents the magnitude of impact in noise terms to assess the full and permanent effects of the Proposed Development.

Magnitude of Impact in Noise Terms	Change in Noise Levels at Noise Sensitive Receptor (dB LA10,18h, or L _{night})
Major	≥ 10.0
Moderate	5.0 to 9.9
Minor	3.0 to 4.9
Negligible	< 3.0

Table 10.14 Magnitude of Change in Noise Terms

Building Services Plant and Operational Noise from the Employment Uses

10.4.52 Building services plant noise and operational noise impacts from the Employment Uses have been assessed in accordance with guidance outlined in BS 4142.

10.4.53 Based on BS 4142, the proposed LOAEL and SOAEL values are provided in **Table 10.15**.

Magnitude of Impact in Noise Terms	Rating Level ($L_{A,T,r}$ dB) at Noise Sensitive Residential Receptor
Major	Greater than or equal to 10 dB above the typical background sound level, depending on context.
SOAEL	
Moderate	5-9.9 dB above the typical background sound level, depending on context.
LOAEL	
Minor	0-4.9 dB above the typical background sound level, depending on context.
Negligible	Less than the typical background sound level, depending on context.

Table 10.15 Proposed LOAEL and SOAEL for Existing and Proposed Building Services Plant and Industrial/Commercial Sources

Limitations

Baseline Sound Survey

- 10.4.54 The engineer noticed nothing unusual in terms of the sound climate at the time of the survey and the conditions were considered to be representative of typical conditions at the survey positions. This report refers, within the limitations stated, to the environment of the Site in the context of the surrounding area at the time of the inspections. Environmental conditions can vary. No warranty is given as to the possibility of changes in the environment of the Site and surrounding area at differing times.
- 10.4.55 All COVID-19 restrictions had been removed at the time of the survey and it is considered that the measured noise levels are representative of typical conditions.

Construction Noise Assessment

- 10.4.56 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.
- 10.4.57 The details of the types of construction methods and plant likely to be used during the construction phases are yet to be finalised. Therefore, at this stage in the scheme's design, it is not possible to state precisely where plant will operate and for how long during the working day. However reasonable assumptions have been made to inform the assessment of construction noise presented in this assessment.

10.5 Baseline Conditions

Current State of the Environment

- 10.5.1 Sound levels across the Site are currently dominated by vehicular movements on the surrounding road network, which includes the M5.
- 10.5.2 Vehicular noise from train movements on the Bristol to Exeter railway line also contribute to the noise levels on the Site.
- 10.5.3 The results of the survey are presented in the time history graphs in **Appendix 10.4**. A summary of the survey results is detailed in **Table 10.16**.

Date	Period, T	Parameter	Sound Level at Measurement Position						
			LT1	LT2	LT3	LT4	LT5	LT6	LT7
Thursday 15 July	Daytime (15:00 – 23:00 hours)	L _{Aeq,T}	60	Not Recorded					
		L _{A90,1hour} **	43						
	Night-time (23:00 – 07:00 hours)	L _{Aeq,T}	55						
		L _{Amax} *	67						
		L _{A90,15mins} **	42						
Friday 16 July	Daytime (07:00 – 23:00 hours)	L _{Aeq,T}	61	52	49	47	56	51	46
		L _{A90,1hour} **	41	49	46	41	38	41	40
	Night-time (23:00 – 07:00 hours)	L _{Aeq,T}	55	47	47	39	43	35	39
		L _{Amax} *	64	61	55	61	67	50	55
		L _{A90,15mins} **	45	42	39	30	25	25	35
Saturday 17 July	Daytime (07:00 – 23:00 hours)	L _{Aeq,T}	60	47	46	44	57	53	44
		L _{A90,1hour} **	43	42	41	35	36	38	38
	Night-time (23:00 – 07:00 hours)	L _{Aeq,T}	47	47	47	39	43	35	42
		L _{Amax} *	58	59	59	56	66	56	56
		L _{A90,15mins} **	42	43	40	33	27	28	39
Sunday 18 July	Daytime (07:00 – 23:00 hours)	L _{Aeq,T}	59	46	44	45	50	41	45
		L _{A90,1hour} **	42	40	37	33	32	37	38
	Night-time (23:00 – 07:00 hours)	L _{Aeq,T}	55	51	49	41	44	39	42
		L _{Amax} *	58	59	58	58	68	53	53
		L _{A90,15mins} **	44	46	43	36	30	32	36
Monday 19 July	Daytime (07:00 – 23:00 hours)	L _{Aeq,T}	60	46	44	47	48	42	63
		L _{A90,1hour} **	42	41	39	34	33	37	40
	Night-time (23:00 – 07:00 hours)	L _{Aeq,T}	57	49	48	47	42	41	44
		L _{Amax} *	83	59	59	58	64	52	52
		L _{A90,15mins} **	45	43	42	38	33	35	38
Tuesday 20 July	Daytime (07:00 – 23:00 hours)	L _{Aeq,T}	60	50	47	47	48	46	52
		L _{A90,1hour} **	39	47	44	38	36	40	42
	Night-time (23:00 – 07:00 hours)	L _{Aeq,T}	56	49	46	40	40	37	43
		L _{Amax} *	79	60	58	57	66	55	54
		L _{A90,15mins} **	42	43	41	34	28	29	36
Wednesday 21 July	Daytime (07:00 – 23:00 hours)	L _{Aeq,T}	60	49	47	46	48	42	53
		L _{A90,1hour} **	40	45	44	35	34	37	41
	Night-time (23:00 – 07:00 hours)	L _{Aeq,T}	58	48	47	43	47	36	42
		L _{Amax} *	86	59	59	60	66	56	58
		L _{A90,15mins} **	44	43	40	32	26	27	35
Thursday 22 July	Daytime (07:00 – 23:00 hours)	L _{Aeq,T}	60	63	46	50	53	43	47
		L _{A90,1hour} **	50	42	41	34	35	36	40
	Night-time (23:00 – 07:00 hours)	L _{Aeq,T}	57	44	44	41	42	38	37
		L _{Amax} *	83	56	56	59	65	56	53
		L _{A90,15mins} **	48	39	35	29	24	27	32

* Based on the 90th percentile measured L_{Amax} level.

** Calculated based on the statistical distribution of background sound levels during the measurement period in general accordance with guidance in BS 4142:2014

***07:00 – 23:00 hours at LT1, 12:00 – 23:00 hours at all other locations

Table 10.16 Summary of Measured Environmental Sound Survey Results

- 10.5.4 The sound survey was undertaken between 15 July 2021 and 23 July 2021 at LT1 and between 16 July 2021 and 23 July 2021 at all other locations.

2032 Baseline

- 10.5.5 The future baseline scenario has been modelled using traffic data provided for a 2032 future baseline scenario.
- 10.5.6 Approved developments (or those considered likely to have been approved and implemented by 2032) are factored into the 2032 baseline, and therefore the assessment of likely significant cumulative effects with these developments is inherent to the assessment and has not be reported separately.
- 10.5.7 The noise contours for the 2032 Baseline scenario are presented in **Figure 10.3, Appendix 10.2**.

10.6 Embedded Mitigation

Railway Infrastructure

- 10.6.1 The reinstated railway line and extension is positioned to the north west of the Development Site, away from proposed and existing noise sensitive receptors. This allows the proposed commercial and industrial structures to provide acoustic screening to existing and proposed residential receptors.

Proposed Noise Sensitive Receptors

- 10.6.2 Proposed noise sensitive receptors have been positioned in the south of the Proposed Development, in the vicinity of existing noise sensitive receptors. In the context of the Development Site as a whole, this area will be less affected by the railway and the M5 due to the distance from these existing environmental noise sources.

Plant Noise

- 10.6.3 The rating noise level of fixed plant and equipment noise should be controlled through careful design so that local specific target noise levels are achieved. This will require a further detailed noise assessment as more information becomes available on the likely commercial activities on the Site and their location.
- 10.6.4 Plant should be selected, located and attenuated consistent with the usual practice of Sedgemoor District Council with regards to plant noise. It is likely that a combination of the following environmental noise control techniques would be implemented via the design guide and compliance processes:
- Enclosing noise generating plant within the building envelope;
 - Selecting 'low noise' plant items;
 - Positioning air intake/discharge louvres away from noise sensitive receptors;
 - Orientating air intake/discharge louvres away from noise sensitive receptors;

- Attenuation of air intake/discharge louvres with duct mounted attenuators; and
- Sound insulating plant housings/enclosures.

10.6.5 The rating level of fixed plant and building services associated with the Proposed Development will be controlled, by incorporating appropriate mitigation measures, to ensure they do not exceed the background levels.

Framework Demolition and Construction Environment Management Plan

10.6.6 The embedded mitigation included as part of the noise and vibration assessment includes the Framework Demolition and Construction Environmental Management Plan (FDCEMP), which is secured through the Compliance Form.

10.6.7 The appointed contractor will submit Section 61 applications to SDC under the Control of Pollution Act 1974 for planned construction activities that may result in temporary disturbance at noise sensitive receptors

10.6.8 The following advice is based on the guidance provided in BS5228-1:2009+A1:2014 and will be applied as appropriate to minimise the noise breakout from the construction activities affecting noise sensitive receptors. They have been incorporated into the FDCEMP:

- 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;
- Lowering materials slowly, whenever practicable, and not dropping them; and
- Use of temporary acoustic barriers, where appropriate, and other noise containment measures, such as screens, sheeting and acoustic hoardings at the construction site boundary to minimise noise breakout and reduce noise levels at the potentially affected receptors.

10.6.9 In addition to the above, all reasonable steps will be taken to keep the local community informed of proposed construction operations. Measures for community liaison will be dealt with by a Community Liaison Officer to co-ordinate the dissemination of information (for example, by means of a regular newsletter) and to programme those operations at time that would minimise the potential for disturbance.

10.6.10 The above range of environmental management controls represent measures that are regularly and successfully applied to large-scale construction projects in order to minimise noise and vibration effects on local communities. The application of similar control measures during the construction phases would likewise support that the works proceed with the minimum disturbance to local residents.

10.7 Assessment of Likely Effects

Demolition and Construction Effects

Demolition and Construction Noise

- 10.7.1 Construction noise could potentially increase the ambient noise levels at existing noise-sensitive receptors and proposed noise-sensitive receptors if inhabited during the construction works.
- 10.7.2 Precise details of the types of construction methods and plant are still to be determined; however, the assessment considers construction activities during the following principal stages.
- Site preparation works
 - Demolition, foundations and substructure works
 - Building erection and superstructure works
 - Road works
 - Landscaping works, internal building construction and fit-out.
- 10.7.3 Internal building construction, and the servicing and fitting out of new buildings is normally not a significant source of noise or vibration and is not considered further.
- 10.7.4 Construction works will take place for a period of 10 or more days in any 15 consecutive days.
- 10.7.5 A detailed construction methodology and sequence is yet to be determined. Requirement for further assessment of construction noise mitigation will be incorporated in the FDCEMP.
- 10.7.6 The assessment assumes that the construction activities are distributed across the Site in accordance with the parameter plans.
- 10.7.7 An assessment of construction noise at each receptor has been undertaken, based on typical plant noise level data contained within Annex C of BS 52881:2009+A1:2014.
- 10.7.8 For the purposes of the construction noise assessment, **Table 10.17** details the calculated ambient noise levels at the identified receptors and the associated threshold level determined in accordance BS5228:1 Section E3.2 and Table E.1. There is a possibility that the residential part of the Proposed Development will be built and occupied before the commercial and industrial part of the Proposed Development are completed. The future proposed residential receptors have therefore been included in the construction assessment.
- 10.7.9 Due to limitations in the acoustic model calculation of the ambient noise level, it is not possible to calculate the 10-hour L_{Aeq} for direct comparison with the threshold levels detailed in BS5228. The calculated 16-hour L_{Aeq} therefore forms the basis of the assessment. It is not expected that this would significantly affect the results of the assessment, as the presented $L_{Aeq,16h}$ are expected to be lower than the $L_{Aeq,10h}$.

Receptor	Noise Sensitive Receptor Description	Calculated Ambient Noise Level (dB L _{Aeq,16h})	Threshold Level (dB L _{Aeq,10h})
A	Farm building approximately 900 m north of Site along Withy Grove	58	65
B	Farm building approximately 550 m northeast of Site along B3141	49	65
C	Residential receptors at western edge of Woolavington village, approximately 30 m Southeast of Site	47	65
D	Residential receptors along Woolavington road, approximately 40 m South of Site	57	65
E	Residential receptors at eastern edge of Puriton, approximately 120 m Southwest of Site	52	65
F	Residential receptors at eastern edge of Puriton, approximately 380 m Southwest of Site	54	65
G	Proposed residential receptors on the southern part of the Site, along Woolavington Road	52	65

Table 10.17 Calculated Ambient Level and Associated Threshold Level at each Receptor

Existing Noise Sensitive Receptors

10.7.10 **Table 10.18** details the results of the assessment for typical construction activities, calculated as the dB L_{Aeq,10h} to the noise sensitive receptors.

Receptor	Calculated Construction Noise Level (dB L _{Aeq,10h}) during Construction Stage at Noise Sensitive Receptor				
	Site Preparation Works	Demolition, Foundations and Substructure Works	Building Erection and Superstructure Works	Road Works	Landscaping Works and Fit-Out
A	33	29	31	34	22
B	37	33	35	38	26
C	62	58	60	63	52
D	60	56	58	61	49
E	50	46	48	51	40
F	40	36	38	41	30

Table 10.18 Typical Construction Plant Noise Levels

10.7.11 **Table 10.19** details the likely impact in noise terms of each construction stage at the assessment receptors, with the embedded mitigation in place.

Receptor	Calculated Impact in Noise Terms at Noise Sensitive Receptor				
	Site Preparation Works	Demolition, Foundations and Substructure Works	Building Erection and Superstructure Works	Road Works	Landscaping Works and Fit-Out
A	Negligible	Negligible	Negligible	Negligible	Negligible
B	Negligible	Negligible	Negligible	Negligible	Negligible
C	Minor	Minor	Minor	Minor	Minor
D	Minor	Negligible	Minor	Minor	Negligible
E	Negligible	Negligible	Negligible	Negligible	Negligible
F	Negligible	Negligible	Negligible	Negligible	Negligible

Table 10.19 Assessment of Impact for Construction Activity Noise

10.7.12 Calculations indicate that, the impact is likely to be a negligible to a moderate temporary short-term adverse impact in noise terms depending on the construction stage and receptor location.

10.7.13 As construction is likely to continue for 10 or more days in any 15 consecutive days, the impact in EIA terms is considered to be moderate and significant at receptors C and D, when relevant activities are being undertaken in proximity, and minor and not significant at receptors A, B, E and F.

Proposed Noise Sensitive Receptors

10.7.14 The assessment considers the effect of the demolition and construction on proposed residential receptors.

10.7.15 **Table 10.20** details the results of the assessment for typical construction activities, calculated as the dB $L_{Aeq,10h}$ to the noise sensitive receptors.

Receptor	Calculated Construction Noise Level (dB $L_{Aeq,10h}$) during Construction Stage at Noise Sensitive Receptor				
	Site Preparation Works	Demolition, Foundations and Substructure Works	Building Erection and Superstructure Works	Road Works	Landscaping Works and Fit-Out
Proposed Residential (G)	52	48	50	53	41

Table 10.20 Typical Construction Plant Noise Levels

10.7.16 **Table 10.21** details the potential impact in noise terms of each construction stage at the assessment receptors, with the embedded mitigation in place.

Receptor	Calculated Impact in Noise Terms at Noise Sensitive Receptor				
	Site Preparation Works	Demolition, Foundations and Substructure Works	Building Erection and Superstructure Works	Road Works	Landscaping Works and Fit-Out
Proposed Residential (G)	Minor	Negligible	Negligible	Minor	Negligible

Table 10.21 Assessment of Impact for Construction Activity Noise

- 10.7.17 Calculations indicate that, the impact is likely to be a negligible to a minor temporary short-term adverse impact in noise terms depending on the construction stage at future proposed receptors.
- 10.7.18 The noise impact is negligible to minor and the impact in EIA terms is considered to be minor and not significant at receptor G.
- 10.7.19 The Proposed Development also includes temporary housing for construction personnel. As it is not yet known where these will be located, a worst-case scenario has been assumed. The lowest ambient level presented in **Table 10.17** has been assumed.
- 10.7.20 Based on the highest typical construction plant noise levels presented in **Tables 10.19 and 10.21**, the impact could be up to a minor temporary short-term adverse impact in noise terms depending on the construction stage.
- 10.7.21 The impact in EIA terms is likely to be minor and not significant.

Construction Traffic Noise

- 10.7.22 The construction traffic noise assessment considers the change in ambient noise levels at existing receptors as a result of changes in the 18-hour AAWT traffic flows between the potential future traffic flows with and without the construction traffic.
- 10.7.23 As this is a high-level assessment, the calculations have been based on normal construction hours. If occupiers identify a requirement to work outside of these hours, this will be controlled through the compliance process application.
- 10.7.24 **Table 10.22** below presents the predicted change in noise levels, between the '2032 with development and construction traffic' scenario and the '2032 Baseline' scenario, based on the traffic flow predictions for 2032 along the road links provided by the transport consultants. The baseline scenario includes the consented HEP construction traffic.

Road Link	Calculated Change in Noise Level	Impact in Noise Terms
Woolavington Road East between Entrance Rbt and Proposed Residential Access	<1 dB	Negligible
Woolavington Road East between Proposed Residential Access and Woolavington School	<1 dB	Negligible
Woolavington Road East between Woolavington School and B3141 Crossroads	<1 dB	Negligible
B3139 Causeway	<1 dB	Negligible

Road Link	Calculated Change in Noise Level	Impact in Noise Terms
B3141 Woolavington Hill	<1 dB	Negligible
Woolavington Road West, west of Entrance Rbt	<1 dB	Negligible
A39 East of Puriton Hill Link Road Rbt	<1 dB	Negligible
A39 between Puriton Hill Link Road Rbt and M5 Jct 23	<1 dB	Negligible
M5 Motorway mainline north of Jct 23	<1 dB	Negligible
M5 Motorway mainline south of Jct 23	<1 dB	Negligible
A38 between Jct 23 and Dunball Rbt	<1 dB	Negligible
A38 North of Dunball Rbt	<1 dB	Negligible

Table 10.22 Predicted Change in Noise Levels from Construction Traffic

10.7.25 Calculations indicate that the impact on the identified roads is likely to be negligible in both noise and EIA terms, which is not significant.

Construction Vibration

10.7.26 At this stage in the design, it is not confirmed if piling activity or other significant vibration generating activities will be required during the construction of the Proposed Development. It has been assumed that piling will be required for the construction of the proposed commercial and industrial uses. It has also been assumed that if piling is required in the vicinity of residential dwellings, auger piling will be used.

10.7.27 The closest existing vibration sensitive receptors are likely to be approximately 30 m away from the closest demolition and construction works occurring on Site. BS 5288-2 provides indicative levels of vibration associated with auger piling, which indicates a level of 0.2 mm/s peak particle velocity (PPV) at distance of 9 m. Based on this indicative level, vibration levels as a result of auger piling are therefore likely to be below the proposed LOAEL and have a negligible impact.

10.7.28 The impact in EIA terms is therefore considered to be minor and not significant.

Operational Effects

10.7.29 The acoustic model has been used to calculate the effect of the Proposed Development on sound levels at the identified receptors.

External Noise Levels – Proposed Receptors

10.7.30 **Figure 10.4, Appendix 10.2** presents the daytime $L_{Aeq, 16 \text{ hr}}$ noise level contours across the proposed residential area at a height of 1.5 m for the 2032 With Development scenario.

10.7.31 Impacts are likely to vary across residential area so will be between approximately 47 and 57 dB $L_{Aeq, 16 \text{ hr}}$. It is therefore likely that noise levels at the worst affected receptors across the Site will fall above the LOAEL but below the proposed SOAEL during the daytime, corresponding to an impact up to moderate in noise terms.

10.7.32 The acoustic modelling has been undertaken as an open site and it is expected that noise levels would reduce across the Site as new buildings would offer shielding from the sources of noise.

10.7.33 Without mitigation, the impact in EIA terms is likely to be moderate and significant.

Internal Noise Levels - Proposed Receptors

- 10.7.34 A noise strategy that seeks to deliver the optimum acoustic outcome for the Site, without design compromises that will adversely affect living conditions and the quality of life of the inhabitants, is secured within the Compliance Form.
- 10.7.35 Appropriate acoustic specification of building facade elements will result in appropriate internal conditions being achieved in residential dwellings across the Site.

Change in Ambient Levels – Existing Receptors

- 10.7.36 The road traffic noise assessment considers the change in ambient noise levels at existing receptors as a result of changes in the 18-hour AAWT traffic flows between the potential future traffic flows with and without the Proposed Developments. The Without Development scenario includes the consented HEP construction traffic
- 10.7.37 **Figure 10.5, Appendix 10.2** presents the change in the $L_{10, 18 \text{ hr}}$ noise levels due to road traffic. The comparison is made between the 2032 Baseline and the 2032 With Development scenarios.
- 10.7.38 The impact along the link roads presented identified in **Table 10.2** is likely to be minor to negligible in noise terms.
- 10.7.39 The impact in EIA terms is therefore considered to be minor to negligible and not significant.

Rail Infrastructure Assessment

- 10.7.40 An assessment of sound from the proposed rail infrastructure has been undertaken to determine the likely noise impact on the existing and proposed noise sensitive residential receptors.

Calculation Parameters

- 10.7.41 The precise locations and details of building services, fixed plant and activities related to the proposed uses are unknown. However, based on discussions with the design team, the following noise generating activities have been included in the acoustic model:
- Gantry Crane - Movement
 - Gantry Crane – Broadband Alarm
 - Gantry Crane – Spreader Impact
 - Gantry Crane – Container Placement
 - Reach Stacker
 - Telehandler
 - HGV movements on site (including reversing alarms) (19 per hour each way, 38 in total)
 - Train movements on site
- 10.7.42 **Appendix 10.5** presents the operational source levels for the activities listed above. All noise generating activities have been assumed to be operational 24 hours per day.

Background Sound Levels

10.7.43 Background sound levels during the operational periods are derived from the environmental sound survey locations LT 2, 3, 4, 6 and 7 which are considered representative of the future development receptors.

10.7.44 Based on the results of the environmental sound surveys, typical background sound levels on the development site vary between 33 and 43 dB during the day. Typical background sound levels during the night-time period (23:00 – 07:00) vary between 29 and 39 dB.

Acoustic Feature Corrections

10.7.45 Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound levels and the background sound level. The calculated specific sound level should therefore be modified in accordance with the following guidance.

10.7.46 BS 4142 offers the following guidance on the subjective assessment of acoustic feature corrections.

“Tonality

For sound ranging from not tonal to predominantly tonal the Joint Nordic Method gives a correction of between 0 dB and + 6 dB for tonality. Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible.

Impulsivity

A correction of up to + 9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible and 9 dB where it is highly perceptible.

Other Sound Characteristics

Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment a penalty of 3 dB can be applied.

Intermittency

When the specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time... If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.”

10.7.47 Based on a review of the source data, the calculated specific sound levels at the receptor, and a subjective assessment at the location of the existing dwellings, no acoustic feature correction has been applied as specific sources are not likely to be individually distinguishable at the receptor locations.

Assessment Results

10.7.48 The model was used to calculate the combined rating level at the proposed receptors based on the specific sound levels of each item of plant/operation relating to the proposed rail infrastructure. The calculations in SoundPLAN have been undertaken using the industry standard ISO 9613 2:1996.

10.7.49 **Tables 10.23** below present the results of the BS4142 assessment at each receptor during the night. This is considered a worst-case assessment.

Description	Summary of Numerical Assessment Results at Receptor Locations						
	A	B	C	D	E	F	G
Calculated Specific Level at Receptor (dB L _{Aeq,15mins})	25	26	4	7	20	20	7
Acoustic Feature Corrections	0	0	0	0	0	0	0
Calculated Rating Level at Receptor (dB L _{Ar,15mins})	25	26	4	7	20	20	7
Background Sound Level (dB L _{A90,T})	39	34	29	33	38	38	33
Difference between Rating Level and Background Sound Level (dB)	-14	-8	-25	-26	-18	-18	-26
Assessment of Impact	Indication of a low impact, depending on the context						

Table 10.23 BS4142 Assessment Summary

10.7.50 Calculations show that noise from the rail infrastructure is likely to have a low impact at all existing and proposed noise sensitive receptors during both the daytime and the night-time, depending on the context.

10.7.51 In considering the context of proposals, the effects of the proposed rail infrastructure on all existing and proposed noise sensitive receptor are likely to be negligible in noise terms.

10.7.52 This is therefore considered a negligible impact in EIA terms, which is not significant.

Plant Noise Assessment

10.7.53 The Proposed Development includes a number of non-residential uses. Some of these uses are generally associated to a greater degree with the potential to have a noise impact on nearby noise sensitive receptors.

10.7.54 The impact in EIA terms is likely to be negligible and not significant at all receptors.

10.8 Further Mitigation

Operation

Proposed Noise Sensitive Residential Receptors

10.8.1 A noise strategy that seeks to deliver the optimum acoustic outcome for the Site, without design compromises that will adversely affect living conditions and the quality of life of the inhabitants, will be put in place at the next design stage.

10.8.2 Appropriate acoustic specification of building facade elements will result in appropriate internal conditions being achieved in residential dwellings across the Site.

10.8.3 Based on a review of external noise levels it is expected that appropriate internal noise levels can be achieved with the use of acoustic double glazing and acoustic trickle ventilation at properties directly adjacent to roads. Away from roads, it is expected that appropriate internal noise levels can be achieved with the use of standard double glazing and trickle ventilation.

- 10.8.4 Purge ventilation is required throughout all buildings to aid the removal of high concentrations of pollutants and water vapour. It is commonly provided simply by opening windows and doors. Internal noise levels will increase as a result of opening windows, however, due to the temporary and intermittent occurrence this is not expected to result in an unacceptable increase in internal noise levels.
- 10.8.5 The mitigation outlined above is indicative for the purposes of the LDO in order to identify feasible mitigation options but is not sufficient for the procurement of building elements. A detailed acoustic assessment should be undertaken as part of the design of the scheme to establish the acoustic performance requirements of the various building elements.
- 10.8.6 Mitigation measures are unlikely to be required for the majority of external private amenity areas. However, amenity areas close to the existing and proposed noise sources in the area are likely to require mitigation measures to be considered during the next design of the scheme including:
- Consideration of the layout of the buildings and the orientation to maximise acoustic screening of noise sensitive external areas from nearby noise sources.
 - Use of acoustic barriers to reduce noise levels in areas adjacent to the existing and proposed noise sources.

10.9 Residual Effects

Demolition and Construction Phase

Demolition and Construction Noise and Vibration

- 10.9.1 It is considered that, with mitigation in place as detailed in the FDCEMP, the residual effects of the construction noise and vibration are likely to be up to moderate temporary adverse when relevant activities are being undertaken in proximity to relevant receptors. However, further assessment of construction noise and vibration mitigation may be required as appropriate when detailed method statements and construction programme are available. Monitoring of noise and vibration is not proposed where the mitigation measures are implemented in accordance with the FDCEMP.

Construction Traffic Noise

- 10.9.2 The change in noise levels at existing noise sensitive receptors as a result of construction traffic is likely to be negligible at all noise sensitive receptors. The residual effects in EIA terms are likely to be beneath the level of perception, which is negligible and not significant.

Operational Phase

Residential Areas

- 10.9.3 By incorporating appropriate mitigation measures outline above, operational noise affecting proposed noise sensitive residential properties can be reduced to a minor impact by shielding external amenity areas from the noise sources. The residual effects in EIA terms are likely to be up to minor, which would be not significant.
- 10.9.4 The change in noise levels at noise sensitive receptors as a result of traffic generated by the Proposed Development is likely to be up to minor and not significant at the worst affected noise sensitive receptors.
- 10.9.5 With appropriate mitigation the overall impact on internal noise levels in the proposed dwellings is negligible and not significant.

Rail Infrastructure

10.9.6 The effects of the proposed rail infrastructure on all existing and proposed noise sensitive receptor are likely to be negligible in noise terms.

10.9.7 This is likely to be a negligible impact in EIA terms, which is not significant.

Proposed Non-Residential Uses

10.9.8 By incorporating appropriate mitigation measures, it is likely that the effects associated with the proposed non-residential uses would be negligible and are therefore not significant in EIA terms.

10.10 Monitoring

10.10.1 No significant adverse effects have been identified and therefore monitoring is not required.

10.11 Summary

Introduction

10.11.1 A noise and vibration assessment has been undertaken to determine the likely significant effects from, and upon, the Proposed Development.

10.11.2 Consultation was undertaken with the Sedgemoor District Council Environment Health Department to agree the assessment methodologies through the EIA scoping process.

10.11.3 An unattended environmental sound survey was undertaken between 15 July 2021 and 23 July 2021 in order to determine the existing sound climate across the Site and at locations considered representative of the nearest noise sensitive receptors.

10.11.4 An acoustic model based on up to date traffic data has been created to complement the baseline studies and to predict the likely road traffic noise impact arising from the operation of the Development. It forms the basis of the assessment.

Demolition and Construction

10.11.5 A qualitative assessment has been undertaken of the likely noise and vibration impacts associated with the demolition and construction phase of the Proposed Development. Noise thresholds for the construction activities have been proposed at the nearest existing receptors in accordance with British Standard 5228-1:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites and Guidelines on Noise Control for Construction Sites.

10.11.6 It is considered that, with mitigation in place as detailed in the FDCEMP, the residual effects are likely to be up to minor adverse, which is not significant. However, further assessment of construction noise and vibration mitigation may be required as appropriate when detailed method statements and construction programme are available.

10.11.7 Construction traffic has been assessed by considering the change in ambient noise levels at existing receptors as a result of changes in traffic flows during the construction phase. The change in noise levels at existing noise sensitive receptors as a result of construction traffic is likely to be negligible at all noise sensitive receptors, which is not significant.

Operation

- 10.11.8 The potential noise impact on the residential areas of the Proposed Development has been assessed. Mitigation measures are unlikely to be required for the majority of external private amenity areas. However, private external amenity areas close to the existing and proposed noise sources in the area are likely to require mitigation measures to be considered during the next design of the scheme. This is likely to be a minor impact and not significant.
- 10.11.9 Based on the calculated external noise levels it is expected that appropriate internal noise levels can be achieved with the use of acoustic double glazing and acoustic trickle ventilation at properties directly adjacent to roads. Away from roads, it is expected that appropriate internal noise levels can be achieved with the use of standard double glazing and trickle ventilation, which is likely to be a minor impact and not significant.
- 10.11.10 With appropriate mitigation the overall impact on internal noise levels in the proposed dwellings is negligible and not significant.
- 10.11.11 The change in noise levels as a result of traffic generated by the Proposed Development has been assessed. The results of the assessment show that the changes in noise levels due to the changes in road traffic are likely to be negligible at all noise sensitive receptors, which is not significant.
- 10.11.12 The potential noise impact of the proposed rail infrastructure has been assessed. The results of the assessment show that the impact is likely to be negligible at all noise sensitive receptors, and no specific mitigation is proposed at this stage.
- 10.11.13 It is considered that, with embedded mitigation in place, the impact of plant noise would be negligible and not significant.

10.12 References

- 10.12.1 Acoustics and Noise Consultants et al (2017); ProPG: Planning and Noise. Ingenious Design.
- 10.12.2 British Standards Institution (2014); BS 8233:2014 Guidance on sound insulation and noise reduction for buildings. London: BSI.
- 10.12.3 British Standards Institution (2003); BS 7445:2003 Description and Measurement of Environment Noise – Part 1: Guide to Quantities and Procedures. London: BSI.
- 10.12.4 British Standards Institution (2014); BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open Sites Part 1 Noise. London: BSI.
- 10.12.5 British Standards Institution (2014); BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open Sites Part 2 Vibration. London: BSI.
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