A358 Taunton to Southfields Dualling Scheme

Preliminary Environmental Information Report - Chapter 11
Noise and Vibration

HE551508-ARP-ENV-ZZ-RP-LA-000002

27/09/21

Table of contents

Table of Tables

11 Noise and vibration

11.1 Introduction

11.1.1 This chapter assesses the potential noise and vibration impacts of the construction and operation of the proposed scheme. This follows the methodology set out in the *Design Manual for Roads and Bridges* (DMRB), LA 111 *Noise and vibration* [1]. Annex E/1 of DMRB LA 111 *Noise and vibration* provides instruction on how to take account of government noise policy when assessing road schemes.

11.1.2 This chapter details the methodology followed for the assessment, summarises the regulatory and policy framework related to noise and vibration and describes the existing environment in the area surrounding the proposed scheme. Following this, the mitigation and the preliminary assessment of residual effects associated with the proposed scheme are discussed, along with the limitations of the assessment.

11.1.3 An explanation of technical terms is given in Appendix 11.1 Glossary of acoustic terminology.

11.2 Legislative and policy framework

11.2.1 As documented in the Preliminary Environmental Information (PEI) Report Chapter 1 Introduction, the primary basis for deciding whether or not to grant a Development Consent Order (DCO) is the *National Policy Statement for National Networks* (NPSNN) [2], which sets out policies to guide how DCO applications will be decided and how the effects of national networks infrastructure should be considered. Table 11-1 identifies the NPSNN policies relevant to noise and specifies where in this chapter information is provided to address the policy.

Table 11-1 Relevant NPSNN policies for applicant's noise and vibration

Relevant NPSNN paragraph reference	Requirement of the NPSNN	Where in the chapter is information provided to address this policy.
5.186	NPSNN states that excessive noise can impact on the *"...use and enjoyment of areas of value (such as quiet places) and areas with high landscape quality"*.	Section 11.9 Assessment of likely significant effects include non-residential sensitive receptors but outdoor amenity such as public rights of way (PRoW) will be considered in more detail in the Environmental Statement (ES).
5.187	*Noise resulting from a proposed development can also have adverse impacts on wildlife and biodiversity. Noise effects of the proposed development on ecological receptors should be assessed in accordance with the Biodiversity and Geological Conservation section of this NPS*.	The noise impact data from this assessment has been used in Chapter 8 Biodiversity.
5.188	NPSNN notes that the degree of noise impact will depend on:	Section 11.9 Assessment of likely significant effects

Relevant NPSNN paragraph reference	Requirement of the NPSNN	Where in the chapter is information provided to address this policy.
	• *Construction noise and the inherent operational noise from the proposed development and its characteristics* • *The proximity of the proposed development to noise sensitive premises (including residential properties, schools and hospitals) and noise sensitive areas (including certain parks and open spaces)* • *proximity of the proposed development to quiet places and other areas that are particularly valued for their tranquillity, acoustic environment or landscape quality such as National Parks, the Broads or Areas of Outstanding Natural Beauty; and* • *the proximity of the proposed development to designated sites where noise may have an adverse impact on the special features of interest, protected species or other wildlife.*	Proximity is taken into account in the detailed operational noise modelling and the distance calculations for construction reported in Section 11.9 No such features have been identified in the noise study area at this stage. The effects of noise and vibration on ecological receptors have not been included in this chapter. However, the noise impact data from this assessment has been used in Chapter 8 Biodiversity.
5.189	*Where a development is subject to Environmental Impact Assessment (EIA) and significant noise impacts are likely to arise from the proposed development, the applicant should include the following in the noise assessment, which should form part of the environment statement:* • *a description of the noise sources including likely usage in terms of number of movements, fleet mix and diurnal pattern. For any associated fixed structures, such as ventilation fans for tunnels, information about the noise sources including the identification of any distinctive tonal, impulsive or low frequency characteristics of the noise. [continued below]*	Section 11.4 Assessment assumptions and limitations.
	• *identification of noise sensitive premises and noise sensitive areas that may be affected.*	Paragraph 11.3.3 Value of receptor.
	• *the characteristics of the existing noise environment.*	Section 11.6 Baseline conditions.
	• *a prediction on how the noise environment will change with the proposed development:* • *in the shorter term such as during the construction period* • *in the longer term during the operating life of the infrastructure*	Construction effects are detailed in section 11.9 Assessment of likely significant effects and impact bands are shown graphically on Figure 11.6 Construction noise study area and impact bands.

Relevant NPSNN paragraph reference	Requirement of the NPSNN	Where in the chapter is information provided to address this policy.
	• *at particular times of the day, evening and night as appropriate*	Operational effects are detailed in section 11.9 Assessment of likely significant effects and noise level changes are shown graphically in Figure 11.3 Operational noise difference contour map – opening year (2023), Figure 11.4 Operational noise difference contour map between Do-Minimum opening year (2023) and Do-Something future year (2038) and tabulated in Appendix 11.4 Predicted operational noise levels and reporting tables. The above sections describe day effects for construction noise and day and night effects for operational noise.
	• *an assessment of the effect of predicted changes in the noise environment on any noise sensitive premises and noise sensitive areas.*	Construction effects are detailed in section 11.9 Assessment of likely significant effects and impact bands are shown graphically on Figure 11.6 Construction noise study area and impact bands. Operational effects are detailed in section 11.9 Assessment of likely significant effects and noise level changes are shown graphically in Figure 11.3 Operational noise difference contour map – opening year (2023), Figure 11.4 Operational noise difference contour map between Do-Minimum opening year (2023) and Do-Something future year (2038) and tabulated in Appendix 11.4 Predicted operational noise levels and reporting tables.
	• *measures to be employed in mitigating the effects of noise. Applicants should consider using best available techniques to reduce noise impacts.*	Section 11.8 Design, mitigation and enhancement measures sets out embedded mitigation in the current design. Full consideration of mitigation measures will be presented in the ES.
5.190	*The potential noise impact elsewhere that is directly associated with the development, such as changes in road and rail traffic movements elsewhere on the national networks, should be considered as appropriate.*	Areas within 50m of other non-scheme road links, or beyond 600m from new or altered scheme roads, with the potential to experience short-term Basic Noise Level[1] (BNL) change of more than 1dB(A) in are considered in paragraphs 11.9.80 to 11.9.84.
5.191	*Operational noise, with respect to human receptors, should be assessed using the principles of the relevant British Standards and*	The magnitude of impacts related to construction noise and operational noise

[1] BNL: the 'Basic Noise Level' at a reference distance of 10m from the nearside carriageway edge, as defined in CRTN.

Relevant NPSNN paragraph reference	Requirement of the NPSNN	Where in the chapter is information provided to address this policy.
	other guidance. The prediction of road traffic noise should be based on the method described in Calculation of Road Traffic Noise. The prediction of noise from new railways should be based on the method described in Calculation of Railway Noise. For the prediction, assessment and management of construction noise, reference should be made to any relevant British Standards and other guidance which also give examples of mitigation strategies	are given in paragraphs 11.3.12 and 11.3.17 respectively.
5.192	*The applicant should consult Natural England with regard to assessment of noise on designated nature conservation sites, protected landscapes, protected species or other wildlife. The results of any noise surveys and predictions may inform the ecological assessment. The seasonality of potentially affected species in nearby sites may also need to be taken into account.*	The noise impact data from this assessment has been used in Chapter 8 Biodiversity.
5.193	*Developments must be undertaken in accordance with statutory requirements for noise. Due regard must have been given to the relevant sections of the Noise Policy Statement for England, National Planning Policy Framework and the Government's associated planning guidance on noise.*	Assessment of significance is described in paragraph 11.3.30.
5.194	*The project should demonstrate good design through optimisation of scheme layout to reduce noise emissions and, where possible, the use of landscaping, bunds or noise barriers to reduce noise transmission.*	Operational mitigation is described in paragraphs 11.8.6 - 11.8.7. Whilst no specific noise mitigation, such as noise barriers, have been considered in the modelling undertaken to inform this PEI Report, noise mitigation will be considered for the ES.
5.195	*The Secretary of State should not grant development consent unless satisfied that the proposals will meet, the following aims, within the context of Government policy on sustainable development:* • *avoid significant adverse impacts on health and quality of life from noise as a result of the new development* • *mitigate and minimise other adverse impacts on health and quality of life from noise from the new development* • *contribute to improvements to health and quality of life through the effective management and control of noise, where possible.*	Provided in Table 11-25 Scheme compliance with government policy.

Relevant NPSNN paragraph reference	Requirement of the NPSNN	Where in the chapter is information provided to address this policy.
5.198	*Mitigation measures for the project should be proportionate and reasonable and may include one or more of the following:* • *engineering: containment of noise generated* • *materials: use of materials that reduce noise, (for example low noise road surfacing)* • *lay-out: adequate distance between source and noise-sensitive receptors; incorporating good design to minimise noise transmission through screening by natural or purpose built barriers* • *administration: specifying acceptable noise limits or times of use (e.g., in the case of railway station Public Address (PA) systems).*	Provided in section 11.8 Design, mitigation and enhancement measures.
5.199	*For most national network projects, the relevant Noise Insulation Regulations will apply. These place a duty on and provide powers to the relevant authority to offer noise mitigation through improved sound insulation to dwellings, with associated ventilation to deal with both construction and operational noise. An indication of the likely eligibility for such compensation should be included in the assessment. In extreme cases, the applicant may consider it appropriate to provide noise mitigation through the compulsory acquisition of affected properties in order to gain consent for what might otherwise be unacceptable development. Where mitigation is proposed to be dealt with through compulsory acquisition, such properties would have to be included within the development consent order land in relation to which compulsory acquisition powers are being sought.*	Provided in Noise insulation eligibility paragraph 11.9.79.
5.200	*Applicants should consider opportunities to address the noise issues associated with the Important Areas as identified through the noise action planning process.*	Provided in section 11.9 Assessment of likely significant effects under noise important area headings.

Legislation

The Environmental Noise (England) Regulations 2006

11.2.2 The *Environmental Noise (England) Regulations 2006* [3] enact the requirements for noise action planning to promote good health and good quality of life (wellbeing) through the effective management of noise. The *Environmental Noise (England) (Amendment) Regulations 2018* [4] provide for new common noise assessment methods for five-yearly Action Plans.

11.2.3 Regulation 15(1)(a) of *The Environmental Noise (England) Regulations 2006* is amended by *The Environment (Amendment etc.) (EU Exit) Regulations 2019* [5] which now state action plans must:

- aim to prevent and reduce environmental noise where necessary and particularly where exposure levels can induce harmful effects on human health
- aim to preserve environmental noise quality where it is good

Control of Pollution Act 1974

11.2.4 The *Control of Pollution Act 1974 (c.40)* [6] gives the Local Authority powers to control construction site noise. This may include specific controls to restrict certain activities identified as causing particular problems. Conditions regarding hours of operation will generally be specified and noise and vibration limits at certain locations may be applied in some cases. All requirements must adhere to established guidance and be consistent with best practicable means to control noise and vibration only as far as is necessary to prevent undue disturbance.

Land Compensation Act 1973

11.2.5 Part 1 of the *Land Compensation Act 1973 (c.26)* [7] entitles property or landowners to apply for compensation if the value of their property goes down because of pollution or disturbance from the use of a new or altered road – this includes for reasons of increased noise.

Noise Insulation Regulations 1975

11.2.6 The *Noise Insulation Regulations 1975* (NIR) [8] define the conditions under which dwellings are eligible for noise insulation to control internal noise levels. The conditions relate to the level of traffic noise at the façade, the increase in noise levels as a result of the highway, and the contribution of the new or altered highway to the noise level received at the façade. In summary, noise insulation qualification criteria require that:

- the façade noise threshold of 68dB$L_{pA10,18h}$ is met or exceeded
- there must be a noise increase of at least 1dB(A) compared to the prevailing noise level immediately before the works to construct or improve the highway were begun
- the noise caused by traffic on new or altered roads makes an effective contribution of at least 1dB(A)
- the property is 300m or less from the nearest point on the carriageway of a highway to which the *Noise Insulation Regulations 1975* apply

National planning policy

11.2.7 The UK government's noise policy is set out in the *Noise Policy Statement for England (NPSE)* [9]. In legislative and policy terms, noise is taken to include vibration.

11.2.8 Government noise policy sets three aims, which are to be met within the context of government policy on sustainable development:

- To avoid significant adverse impacts on health and quality of life.
- To mitigate and reduce adverse impacts on health and quality of life.
- Where possible, contribute to the improvement of health and quality of life.

11.2.9 The same three aims are also reflected in:

- The *National Planning Policy Framework* (NPPF) [10]
- *Planning Practice Guidance – Noise* (PPG-Noise) [11]
- The *National Policy Statement for National Networks* (NPSNN) [12]

11.2.10 PPG-Noise provides guidance on the application of government noise policy. PPG-Noise sets out in the linked noise exposure hierarchy table that unacceptable adverse effects on health and quality of life due to noise exposure (set at a level higher than significant adverse impacts on health and quality of life) should be 'prevented'[2].

11.2.11 Thresholds for identifying adverse effect levels in terms of government noise policy are not clearly defined numerically in NPSE, NPPF, PPG-Noise, or NPSNN. The threshold values adopted for this assessment were taken from DMRB LA 111 *Noise and vibration* and are set out in section 11.3 Assessment methodology.

Local planning policy

11.2.12 Local planning policy relevant to noise and vibration is found within the *South Somerset Local Plan (2006-2008)* [13] and the *Taunton Deane Borough Council Adopted Core Strategy 2011-2028* [14].

South Somerset planning policy

11.2.13 Noise and vibration policy is contained within Policy EQ7: Pollution control:

"Development that, on its own or cumulatively, would result in air, light, noise, water quality or other environmental pollution or harm to amenity, health or safety will only be permitted if the potential adverse effects would be mitigated to an acceptable level by other environmental controls, or by measures included in the proposals. This may be achieved by the imposition of planning conditions or through a planning obligation."

Somerset West and Taunton planning policy

11.2.14 Noise and vibration policy is captured in policies DM1 General requirements and DM5 Use of resources and sustainable design.

11.2.15 Policy DM1 sets out that:

"Proposals for development, taking account of any mitigation measures proposed, will be required to meet the following criteria, in addition to any other Development Management policies which apply in a particular case:…

b. Additional road traffic arising, taking account of any road improvements involved, would not lead to overloading of access roads, road safety problems or environmental degradation by fumes, noise, vibrations or visual impact…

e. Potential air pollution, water pollution, noise, dust, lighting, glare, heat, vibration and other forms of pollution or nuisance which could arise as a result of the development will not unacceptably harm public health or safety, the amenity of

[2] PPG-Noise (noise exposure hierarchy table) defines an unacceptable adverse effect as 'present and very disruptive', with outcomes described as 'Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory'.

individual dwellings or residential areas or other elements of the local or wider environment."

11.2.16 Policy DM5 sets out the requirement to:

"Minimise the emission of pollutants, including noise, water and light pollution into the wider environment."

Standards and guidance

11.2.17 Details of relevant noise and vibration guidance and standards considered as part of the assessment in this chapter have been provided in Appendix 11.2 Noise and vibration guidance and standards. The key documents referred to in this assessment are:

- DMRB LA 111 *Noise and vibration* (2020).
- *Calculation of Road Traffic Noise,* HMSO (1988). [15]
- TAG Unit A3 *Environmental Impact Appraisal* (2021). [16]
- British Standard (BS) 5228-1:2009+A1:2014 [17] *and* BS 5228-2:2009+A1:2014 [18] *Code of practice for noise and vibration on construction and open sites.*
- BS 7385-2: 1993 *Evaluation and measurement for vibration in buildings – Guide to damage levels from groundborne vibration.* [19]

11.3 Assessment methodology

11.3.1 The assessment methodology is outlined in this section.

11.3.2 Note that the noise and vibration assessment has been based on the Design Fix 1 proposed scheme design for this PEI Report due to the time required to complete modelling of noise impacts following scheme design freeze. The assessment will be updated to reflect the Design Fix 2 scheme design for the ES.

Value of receptor

11.3.3 In addition to residential receptors, DMRB LA 111 *Noise and vibration* identifies a range of non-residential properties as noise sensitive, which should also be considered in the assessment. These include hospitals, healthcare facilities, education facilities, community facilities, designated quiet areas, international and national or statutorily designated sites, and PRoW. Cultural heritage assets which are not included within the preceding descriptions are considered in Chapter 6 Cultural heritage.

11.3.4 DMRB LA 111 *Noise and vibration* does not specifically assign levels of sensitivity to different types of noise sensitive receptor. However, sensitivity has been considered in the assessment based on the type of receptor (e.g. the presence of noise sensitive non-residential receptors above). More detailed consideration of the use of receptors and the context of the impact (e.g. times of use of the receptor) will be given in the ES.

Baseline approach

<u>Construction</u>

11.3.5 DMRB LA 111 *Noise and vibration* states that construction baseline shall be determined via one or more of the following methods:

- Noise measurements, based upon actual survey data.
- Predicted noise levels (noise model outputs).
- Existing noise mapping undertaken by public bodies or as part of other developments.

11.3.6 Due to the national lockdown which was in place during the preparation of this report due to the Covid-19 pandemic, baseline noise surveys were not undertaken and instead the construction baseline has been based entirely on predicted (modelled) noise levels.

11.3.7 As per DMRB LA 111 *Noise and vibration*, construction vibration has been assumed to be absent in the baseline scenario for the purpose of construction vibration assessment.

Operation

11.3.8 DMRB LA 111 *Noise and vibration* states that the operational baseline shall be determined from Do-Minimum[3] noise levels in each assessment year and that noise monitoring should be used to inform baseline noise modelling results and to provide data for public consultation purposes.

11.3.9 As outlined above, baseline noise surveys were not undertaken during the preparation of this report due to the national lockdown which would have resulted in atypical baseline noise levels as a result of lower than usual traffic flows. A baseline noise survey is planned be undertaken, once traffic levels are considered to be representative of typical baseline conditions, to inform the ES.

11.3.10 Baseline noise levels have been predicted at each noise sensitive receptor using a detailed noise model calculating in accordance with *Calculation of Road Traffic Noise* (CRTN) [15].

11.3.11 Baseline noise levels for the construction and operational noise assessments have been determined by modelling of the Do-Minimum noise levels for the opening year (2023) and the future year (2038). This is based on the assumed opening year in the PCF stage 2 traffic assessment on which this assessment has been based. This will be updated in the ES to reflect the currently expected opening year of 2028 based on updated PCF stage 3 traffic assessments.

Magnitude of impacts

Construction noise

11.3.12 The noise assessment from the construction of the proposed scheme has been determined according to DMRB LA 111 *Noise and vibration* which makes reference to BS 5228–1:2009+A1:2014 [17]. This standard provides information on the prevention and control of construction noise and includes a procedure for predicting construction noise. Calculations of noise levels in distance bands have been based on typical noise levels for construction processes (taken from BS 5228 and based on experience from similar road construction projects). Calculations have assumed that the ground cover between the noise source and the receptor is predominantly soft, however, at this stage no account has been taken of topography or screening (e.g. where the works would be in cutting or sensitive receptors are screened by other buildings) hence presenting a worst-

[3] Do-Minimum is the scenario without the proposed scheme.

case scenario. Predicted construction noise levels include a 3dB façade reflection correction.

11.3.13 Construction noise levels have been predicted as the logarithmic average noise level over the daytime assessment period as an $L_{Aeq,T}$[4,5]. The predictions are based on the following range of activities, considered to represent the worst-case activities, which are likely to continue for more than the significance time period thresholds (see paragraph 11.3.37):

- Excavation of cuttings (major – including rock breaking)
- Excavation of cuttings (minor)
- Road construction (sub-base - representing noisiest road construction activity)
- Earthworks (major)
- Earthworks (minor)
- Structures (assumes augered piling methods)

11.3.14 For each activity the likely variation in the working area for the period assessed has been taken into account.

Construction vibration

11.3.15 Groundborne vibration during the construction of the proposed scheme may potentially arise due to the use of compaction plant or rock-breaking machinery. Should impact piling be required this may also give rise to vibration impacts. Impacts at sensitive receptors would be dependent on their proximity to the works, the intensity with which the equipment is operated and the intervening ground conditions.

11.3.16 BS 5228–2:2009+A1:2014 [18] provides a methodology for predicting typical levels of vibration from certain types of construction activities, based on case study data and empirical models. This and data from similar road construction projects have been used, where appropriate, to consider the likelihood that vibration from the works may exceed the thresholds for perception and disturbance.

Operational noise

11.3.17 Traffic noise level calculations were carried out according to DMRB LA 111 *Noise and vibration* which makes reference to the CRTN methodology. Noise levels were calculated across a grid of receptor positions over the study area to produce contours of noise level exposure. Additional calculations were also conducted at specific assessment locations to represent noise sensitive receptors (NSR) (e.g. residential properties). The study area is defined in DMRB LA 111 *Noise and vibration* and described in paragraph 11.6.1 and shown in Figure 11.1 Noise study area, non-residential sensitive receptors and baseline noise contour. The noise contours are shown on the figure are representative of the noise levels at 4 metres (m) above local ground level (i.e. first-floor level for a typical house, generally worst case in terms of exposure to noise from the highway).

[4] The equivalent continuous sound level ($L_{Aeq,T}$) is the level of a notional steady sound, which at a given position and over a defined period of time (T), would have the same A-weighted acoustic energy as the fluctuating noise.

[5] For the purposes of this assessment, T is assumed to be a 12-hour working day.

11.3.18 The traffic data used in the model were those forecasted under the Do-Something[6] and Do-Minimum scenarios in the opening year and those in the future assessment year (long-term) at PCF stage 2. In this case taken as 2023 for opening year, and 2038 for the future assessment year.

11.3.19 The traffic modelling approach and data verification is described in the PCF stage 2 *Combined Modelling and Appraisal* (ComMA) report [20].

11.3.20 For the purposes of this assessment, the $L_{A10,18h}$ results are converted to the corresponding L_{Aeq} scale for daytime noise, i.e. $L_{Aeq,16h}$ (see Appendix 11.1 Glossary of acoustic terminology). This provides a direct comparison with the quantitative L_{Aeq} criteria described later for assessing significance with respect to the government's noise policy (NPSE). The $L_{Aeq,16h}$ scale has also been adopted for traffic noise assessment as part of the government's TAG unit A3 *Environmental impact appraisal* [16] which will be undertaken alongside the ES.

Operational night-time noise

11.3.21 The LA 111 methodology requires that night-time noise is also assessed. The L_{night} descriptor is used to represent the noise level at dwellings between the hours of 23:00 and 07:00. A procedure known as 'Method 3' from the Transport Research Laboratory (TRL) report PR/SE/451/02 [21] was used for predicting L_{night} noise levels. Method 3 uses daily traffic flow data for converting predicted 18 hour daytime noise levels ($L_{A10,18h}$) to night-time noise levels. This method was considered appropriate as there was nothing atypical in the proportionate traffic flow volumes for this route between daytime and night-time[7].

11.3.22 The assessment of impact magnitude for night-time noise follows the same method as that for daytime.

Assessment of significance

Approach to assessment of effects – all sources and receptors

11.3.23 The method for identifying likely significant effects of noise and vibration from construction and operation of the proposed scheme, as required by the EIA Regulations, is aligned with DMRB LA 111 *Noise and vibration* and government noise policy.

11.3.24 It follows from government noise policy NPSE, PPG-Noise and NPSNN that thresholds should be set to define the onset of the following levels of effect:

- Significant Observed Adverse Effect Levels (SOAEL) to identify the onset of significant impacts on health and quality of life.
- Lowest Observed Adverse Effect Levels (LOAEL) to identify the onset of adverse impact on health and quality of life.

Significant adverse effects on health and quality of life

11.3.25 Where the calculated noise or vibration exceeds the relevant SOAEL threshold – criteria defined in Table 11-2 to Table 11-9, then this is assessed as a likely

[6] Do-something is the scenario with the proposed scheme.

[7] Appendix A2 of DMRB LA 111 *Noise and vibration* notes that TRL Method 3 provides reliable results for most UK roads. Exceptions to this can include roads where the proportion of night-time traffic to daytime traffic is atypical.

significant adverse effect at each receptor[8]. Above the SOAEL threshold, such noise levels are perceived as 'present and disruptive' according to the assessment framework referred to in PPG-Noise. The NPSE states that these effects should be avoided.

Adverse effects on health and quality of life

11.3.26 The assessment also identifies likely adverse effects where the calculated noise or vibration is less than the SOAEL but greater than the relevant LOAEL. Between these thresholds, such noise levels are perceived as 'present and intrusive' according to the assessment framework referred to in PPG-Noise. The NPSE states that these effects should be mitigated and reduced to a minimum.

11.3.27 These effects may be identified in this assessment as likely significant adverse effects. This describes effects at lower noise exposures that are an adverse impact on health and quality of life and are assessed as 'significant' in the EIA, but which are 'not significant' in terms of government noise policy (paragraph 11.3.24).

11.3.28 In this case, the basis for determining a likely significant effect is primarily the change in noise caused by the proposed scheme, with consideration of other factors such as the existing level of noise exposure.

11.3.29 The DMRB LA 111 *Noise and vibration* criteria used to assess the significance of effects (adverse and beneficial) for different receptor types and noise exposure levels are described under 'Assessment criteria', from paragraph 11.3.30.

Assessment criteria

11.3.30 The assessment uses criteria as set out in DMRB LA 111 *Noise and vibration* that responds to the requirements of:

- government policy set out in NPSE, NPPF, NPSNN and PPG-Noise
- relevant regulations, guidance and standards
- best practice as set by previous relevant projects

Construction noise assessment criteria

11.3.31 Potential adverse effect thresholds in government policy terms have been established based upon DMRB LA 111 *Noise and vibration* which refers to the ABC Method described in BS5228-1:2009+A1:2014 [17]. These thresholds, described in Table 11-2, have been used to establish assessment criteria for construction noise levels. The numerical thresholds for the ABC method are defined in Table 11-4.

11.3.32 These criteria have been used to derive LOAEL and SOAEL thresholds for this assessment. Note that although BS5228-1 only sets out these thresholds as an example for residential receptors, DMRB LA 111 *Noise and vibration* requires them to be used for all types of receptor

[8] Any beneficial effects would also be identified due to noise reductions.

Table 11-2 LOAEL and SOAEL thresholds for construction noise at all receptors in terms of government policy (from DMRB LA 111 Noise and vibration)

Time period	LOAEL	SOAEL
Day (07:00-19:00 weekday and 07:00-13:00 Saturdays)	Baseline noise levels $L_{Aeq,T}$	Threshold level determined as per BS 5228-1 Section E3.2 and Table E.1 (see below)
Night (23:00-07:00)	Baseline noise levels $L_{Aeq,T}$	Threshold level determined as per BS 5228-1 Section E3.2 and Table E.1
Evening and weekends (time periods not covered above)	Baseline noise levels $L_{Aeq,T}$	Threshold level determined as per BS 5228:2009 + A2014 section E3.2 and Table E.1

11.3.33 The threshold of potential adverse effect described in Table E.1 of BS5228-1 according to the ABC method is reproduced in Table 11-3.

Table 11-3 Threshold of potential significant effect at dwellings according to ABC method (from Table E.1, BS 5228–1:2009 + A1:2014)

Assessment category and threshold value period	Threshold value, dB(A)		
	Category A	Category B	Category C
Night-time (23:00 – 07:00)	45	50	55
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75
Other: Weekday evenings (19:00 – 23:00) Saturdays (13:00 – 23:00) Sundays (07:00 – 23:00)	55	60	65
Category A: threshold value to use when ambient noise levels (rounded to the nearest 5dB) are less than these values Category B: threshold value to use when ambient noise levels (rounded to the nearest 5dB) are the same as Category A values Category C: threshold value to use when ambient noise levels (rounded to the nearest 5dB) are higher than Category A values.			

11.3.34 Using the DMRB LA 111 *Noise and vibration* methodology, the construction noise impact level is determined from Table 11-4.

Table 11-4 Magnitude of impact and construction noise descriptions (from DMRB LA 111 Noise and vibration)

Magnitude of impact	Construction noise level
Major	Above or equal to SOAEL +5dB
Moderate	Above or equal to SOAEL and below SOAEL +5dB
Minor	Above or equal to LOAEL and below SOAEL
Negligible	Below LOAEL

11.3.35 Construction traffic BNL increases should be calculated for roads within the construction traffic study area. The magnitude of impact is then determined using Table 11-5.

Table 11-5 Magnitude of impact for construction traffic noise (from DMRB LA 111 Noise and vibration)

Magnitude of impact	Increase in Basic Noise Level (BNL) of closest public road used for construction traffic (dB)
Major	Greater than or equal to 5.0
Moderate	Greater than or equal to 3.0 and less than 5.0
Minor	Greater than or equal to 1.0 and less than 3.0
Negligible	Less than 1.0

11.3.36 When full carriageway closures are required at night on major roads during the construction period, the resultant increase in traffic on local roads is highly likely to cause disturbance and therefore a major magnitude of construction noise impact is determined at any NSRs within the diversion route study area[9].

11.3.37 From DMRB LA 111 *Noise and vibration*, construction noise and construction traffic noise is taken as a significant effect for all NSRs where it is determined that a major or moderate magnitude of impact would occur for a duration exceeding either of the following:

- Ten 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 vibration assessment criteria

11.3.38 DMRB LA 111 *Noise and vibration*, which refers to BS 5228-2:2009+A1:2014 [18], states that Peak Particle Velocity (PPV) vibration levels are considered to be an appropriate vibration parameter to be used when considering construction vibration, and the standard provides guidance upon the 'instantaneous' human response to vibration in buildings in terms of overall vibration velocity levels (Table 11-6)[10]. These criteria have been used to derive LOAEL and SOAEL thresholds for this assessment.

Table 11-6 LOAEL and SOAEL thresholds of likely effects of vibration for building occupants (from DMRB LA 111 Noise and vibration, derived from BS 5228-2:2009+A1:2014)

Time period	LOAEL	SOAEL	Notes
All time periods	0.3mm/s PPV	1.0mm/s PPV	LOAEL is set at the lowest level at which vibration may be perceptible in residential environments. SOAEL is set where levels can be tolerated with prior warning (ref BS5228:2).

11.3.39 Using the DMRB LA 111 *Noise and vibration* methodology, the construction vibration impact level is determined from Table 11-7.

[9] Note that this exercise has not been undertaken at present due to lack of information on night-time closures and diversion routes.

[10] BS 5228-2 notes in Table B.1: 'The values are provided to give an initial indication of potential effects, and where these values are routinely measured or expected then an assessment in accordance with BS 6472-1 or -2, and/or other available guidance, might be appropriate to determine whether the time varying exposure is likely to give rise to any degree of adverse comment.' Consideration has been given to other guidance with regard to time varying exposure where appropriate – the BS 6472 guidance makes use of the 'Vibration Dose Value' metric (VDV).

Table 11-7 Magnitude of impact and vibration level (from DMRB LA 111 Noise and vibration)

Magnitude of impact	Construction vibration level
Major	Above or equal to 10mm/s
Moderate	Above or equal to SOAEL and below 10mm/s PPV
Minor	Above or equal to LOAEL and below SOAEL
Negligible	Below LOAEL

11.3.40 Construction vibration is taken as a significant effect for all vibration sensitive receptors where it is determined that a major or moderate magnitude of impact would occur for a duration exceeding either of the following:

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

11.3.41 Risk of damage to buildings from groundborne vibration is assessed using the criteria in Table 11-8. The criteria are derived from BS 5228-2:2009+A1:2014 [18], and BS 7385, Part 2 [19]. This ensures there is no risk of the lowest damage category ('cosmetic') being exceeded, as defined in BS ISO 4866 [22]. However, effects in terms of even cosmetic damage to buildings would occur only for vibration exposures much higher than the lowest perceptible levels.

Table 11-8 Vibration impact criteria for buildings (conservative criteria below which there is no risk of cosmetic damage)

Category of building	Peak particle velocity[1] (mm/s)	
	Transient[2] vibration	Continuous[3] vibration
Potentially vulnerable building	6	3
Structurally sound buildings	12	6

Notes:
[1] At the building foundation
[2] Transient relative to building response e.g. from percussive piling
[3] Continuous relative to building response e.g. from vibratory piling, vibrating rollers

Operational noise assessment criteria

11.3.42 Adverse effect levels have been set in in accordance with DMRB LA 111 *Noise and vibration* which references government noise policy (including NPPF, NPSE, NPSNN, and PPG-Noise). The thresholds also relate to the guidance from the World Health Organization (WHO) *Guidelines for Community Noise* [23], WHO *Night Noise Guidelines for Europe* [24], WHO *Environmental Noise Guidelines* [25][11], the *Noise Insulation Regulations* 1975 [8], and best practice from other projects. These criteria have been used to derive LOAEL and SOAEL thresholds for this assessment as shown in Table 11-9.

[11] The WHO Environmental Noise Guidelines for the European Region (2018) recommend traffic noise levels below 53dBL_{den} (i.e. day/evening/night) and 45dBL_{night} to avoid adverse health effects. It should be noted that the thresholds for lowest observed adverse effect level (LOAEL) for this assessment are set at lower noise exposures (i.e. more sensitive criteria) to represent the onset of adverse health effects associated with traffic noise

Table 11-9 Operational noise LOAELs and SOAELs for all receptors (from LA 111)

Time period	LOAEL	SOAEL	Notes
Day (06:00-24:00)	55dB$L_{A10,18h}$ (façade) 50dB$L_{Aeq,16h}$ (free-field)	68dB$L_{A10,18h}$ (façade) 63dB$L_{Aeq,16h}$ (free-field)	The daytime LOAEL is based on the onset of moderate community annoyance, and the daytime SOAEL is based on the Noise Insulation Regulations threshold.
Night	40dB$L_{Aeq,8hr}$ $L_{night,outside}$ (free-field)	55dB$L_{Aeq,8hr}$ $L_{night,outside}$ (free-field)	The night time LOAEL is defined using the WHO Night Noise Guidelines, and the night time SOAEL is equivalent to the levels above which cardiovascular health effects become the major public health concern (WHO Night Noise Guidelines).

11.3.43 The magnitude of the impact and effect caused by short-term and long-term change in noise levels attributable to the proposed scheme is evaluated in accordance with Table 11-10 and Table 11-11 respectively.

Table 11-10 Magnitude of noise impact in the short term (from DMRB LA 111 Noise and vibration)

Noise change [dB(A)]	Magnitude of impact in the short term
0	No change
0.1 – 0.9	Negligible
1.0 – 2.9	Minor
3.0 – 4.9	Moderate
5.0 +	Major

Table 11-11 Magnitude of noise impact in the long term (from DMRB LA 111 Noise and vibration)

Noise change [dB(A)]	Magnitude of impact in the long term
0	No change
0.1 – 2.9	Negligible
3.0 – 4.9	Minor
5.0 – 9.9	Moderate
10.0 +	Major

11.3.44 The initial assessment of likely significant effect on noise sensitive buildings is determined using Table 11-12.

Table 11-12 Initial assessment of operational noise significance (from DMRB LA 111 Noise and vibration)

Significance	Short term magnitude of change
Significant	Major
Significant	Moderate
Not significant	Minor
Not significant	Negligible

11.3.45 DMRB LA 111 *Noise and vibration* goes on to say that for NSRs where the magnitude of change in the short term is minor, moderate or major at noise sensitive buildings, Table 11-13 shall be used, together with the output of Table 11-12 to determine final significance. For the purposes of this PEI Report, only assessment factor 3 from Table 11-13 has been used to give an initial indication of significance. Full consideration of all factors will be undertaken and reported in the ES.

Table 11-13 Determining final operational significance on noise sensitive buildings (from DMRB LA 111 Noise and vibration)

Assessment factor	Local circumstance	Influence on significance judgement
1	Noise level change (is the magnitude of change close to the minor to moderate boundary?)	1) Noise level changes within 1 dB of the top of the 'minor' range can indicate that it is more appropriate to determine a likely significant effect. Noise level changes within 1 dB of the bottom of a 'moderate' range can indicate that it is more appropriate to consider a change is not a likely significant effect.
2	Differing magnitude of impact in the long term and/or future year to magnitude of impact in the short term	1) Where the long-term impact is predicted to be greater than the short-term impact, it can be appropriate to conclude that a minor change in the short term is a likely significant effect. Where the long term impact is predicted to be less than the short term it can be appropriate to conclude that a moderate or major change in the short term is not significant. 2) A similar change in the long term and non-project noise change can indicate that the change is not due to the project and not an indication of a likely significant effect.
3	Absolute noise level with reference to LOAEL and SOAEL (by design this includes sensitivity of receptor)	1) A noise change where all do-something absolute noise levels are below SOAEL requires no modification of the initial assessment. 2) Where any do-something absolute noise levels are above the SOAEL, a noise change in the short term of 1.0dB (decibel) or over results in a likely significant effect.
4	Location of noise sensitive parts of a receptor	1) If the sensitive parts of a receptor are protected from the noise source, it can be appropriate to conclude a moderate or major magnitude change in the short term and/or long term is not a likely significant effect. 2) Conversely, if the sensitive parts of the receptor are exposed to the noise source, it can be more appropriate to conclude a minor change in the short term and/or long term is a likely significant effect. 3) It is only necessary to look in detail at individual receptors in terms of this circumstance where the decision on whether the noise change gives rise to a significant environmental effect is marginal.
5	Acoustic context	1) If a project changes the acoustic character of an area, it can be appropriate to conclude a minor magnitude of change in the short term and/or long term is a likely significant effect.
6	Likely perception of change by residents	1) If the project results in obvious changes to the landscape or setting of a receptor, it is likely that noise level changes will be more acutely perceived by the NSRs. In these cases, it can be appropriate to conclude that a minor change in the short term and/or long term is a likely significant effect.

Assessment factor	Local circumstance	Influence on significance judgement
		2) Conversely, if the project results in no obvious changes for the landscape, particularly if the road is not visible from the receptor, it can be appropriate to conclude that a moderate change in the short term and/or long term is not a likely significant effect.

11.3.46 For residential receptors where noise impacts occur in areas below the LOAEL, there would be no noise effect in government policy terms (Table 11-11). However, there could be noise effects in EIA terms for certain cases in very quiet, rural settings. This aligns with the requirement in DMRB LA 111 *Noise and vibration* to consider 'changes to the landscape or setting', as referred to in the final row of Table 11-13. The absence of man-made sound is a factor (amongst other aspects of the setting) in assessing areas as having a particularly tranquil character. Tranquillity is assessed as part of Chapter 7 Landscape.

Stakeholder engagement

11.3.47 A request was made to South Somerset District Council (SSDC), Somerset West and Taunton Council (SWTC), and Somerset County Council (SCC) to respond to consultation on the methodology and any noise and vibration sensitivities within the study area. The Environmental Health Officer (EHO) at SSDC and SWTC reported that they accepted the assessment approach.

11.3.48 The EHO at SWTC commented that night-time measurements are desirable during baseline noise surveys. The Royal Naval Air Station (RNAS) Merryfield is located approximately 2km to the east of the proposed scheme. The site is used by aircraft, especially helicopters, which would fly over the study area. These types of activities are not considered as typical activities in the area. Therefore, consideration should be given during the baseline surveys.

11.3.49 Details of construction activities will be discussed with the relevant local authorities, prior to and during the construction works. This will include prediction and evaluation methods, location of sensitive receivers, the resulting noise and vibration levels and mitigation controls.

11.3.50 The Councils agreed to construction works hours 08:00-18:00 Monday-Friday, 08:00-13:00 Saturday. Considering the size of the proposed scheme, it may be inevitable that construction working may require extended working hours. In which case, it requires prior agreement before commencement of construction works.

11.3.51 For the operational noise assessment, the Councils agreed that the DMRB highway noise assessment methodology (DMRB LA 111 *Noise and vibration*) would be appropriate to assess noise effects to NSRs potentially impacted by the proposed scheme.

11.4 Assessment assumptions and limitations

Construction

11.4.1 Detail of construction methods, programme and hours of working (including potential for night-time working) were not available at the time of writing and therefore a high-level worst-case assessment has been presented based on noise levels from typical road construction activities derived from similar road

projects. Areas where impacts may occur around particular proposed scheme elements such as cuttings, earthworks and structures have been taken from the current proposed scheme design as shown in Figure 2.1 General Arrangement.

11.4.2 The construction assessment does not take into account screening, including from existing buildings, which will result in worst-case predictions of significant effects; however, propagation has been assumed to be over soft ground, providing additional sound attenuation compared with hard reflective ground.

11.4.3 Predictions have been made based on works being undertaken by teams (or gangs) of construction workers undertaking the same activity spaced at 100m centres along the proposed scheme. For each team or gang, it has been assumed that they work in an area of 50m along the trace of the proposed scheme each day.

11.4.4 No information about construction traffic was available at the time of writing and hence no assessment could be undertaken for this PEI Report. This will be addressed in the ES once further information is available.

11.4.5 No information about diversion routes at night was available at the time of writing and hence no assessment could be undertaken for this PEI Report. This will be addressed in the ES once further information is available.

11.4.6 A generic qualitative assessment of construction vibration has been undertaken in the absence of detail of proposed methods of construction and plant lists.

11.4.7 Due to a programme of works not being available it has not been possible to assess the duration that impacts are likely to occur for, however, it is likely that the assessed activities would all endure for longer than the temporal significance thresholds.

Operation

11.4.8 Road traffic flows and speeds used in the assessment were based on traffic assessment undertaken at PCF stage 2. Traffic modelling to inform PCF stage 3 is ongoing and the noise assessment will be updated using the latest traffic data and reported in the ES.

11.4.9 Ordnance Survey (OS) MasterMap© Highways Network has been used to generate the road centre lines for modelling.

11.4.10 No benefit of lower noise surfaces has been assumed for this assessment at this stage as the existing A358 road surface is unknown. This is to avoid overstating the benefit of a new low noise surface in the case where one may already exist. Assumptions on road surfaces for Do-Minimum (DM) and Do-Something (DS) roads will be updated and reported in the ES.

11.5 Study area

11.5.1 The determination of the assessment study area (as shown in Figure 11.1 Noise study area, non-residential sensitive receptors and baseline noise contour) has been based on the methodology in DMRB LA 111 *Noise and vibration* (requirements are described below). DMRB LA 111 *Noise and vibration* allows for the study area to be extended where considered appropriate according to the needs of the assessment and stakeholder expectations, as described below.

Construction

11.5.2 For construction noise and vibration, the study area shall include all NSRs:

- that are potentially affected by construction noise or vibration
- in areas where there is a reasonable stakeholder expectation that a construction noise or vibration assessment will be undertaken

Noise

11.5.3 DMRB LA 111 *Noise and vibration* notes that a study area of 300 metres from the closest construction activity is normally sufficient to encompass NSRs, although variations in the study area can be defined for individual projects. BS 5228 (referenced within DMRB LA 111 *Noise and vibration*) notes that the prediction results should be treated with caution at distances greater than this.

11.5.4 DMRB LA 111 *Noise and vibration* requires that a diversion route study area be defined where a project requires full carriageway closures during the night (23:00-07:00) to enable construction works to take place. DMRB LA 111 *Noise and vibration* states that the study area shall include a 25-metre width from the kerb line of the diversion route. No information is currently available for diversion routes and therefore this will be considered further in the ES.

11.5.5 DMRB LA 111 *Noise and vibration* specifies that a construction traffic study area shall be defined to include a 50m width from the kerb line of public roads with the potential for an increase in BNL of 1dB(A) or more as a result of the addition of construction traffic to existing traffic levels.

11.5.6 Information on additional construction traffic is not available at present and therefore no study area has been defined for this element.

Vibration

11.5.7 DMRB LA 111 *Noise and vibration* notes that a study area of 100m from the closest construction activity with the potential to generate vibration is normally sufficient to encompass vibration sensitive receptors. However, variations in the study area can be defined for individual projects.

11.5.8 In the absence of detailed construction methodology, no quantitative assessment has been undertaken at the present time. The vibration study area is shown on Figure 11.7 Construction vibration study area.

Operation

11.5.9 The assessment procedure requires that an operational noise[12] impact study is defined to include:

- NSRs that are potentially affected by operational noise changes generated by the proposed scheme, either on the route of the proposed scheme or other roads not physically changed by the proposed scheme
- NSRs in areas where there is a reasonable stakeholder expectation that noise assessment is undertaken

[12] DMRB LA 111 *Noise and vibration* Paragraph 1.4 notes that: *"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".*

11.5.10 For most projects the following areas are suitable, but DMRB LA 111 *Noise and vibration* notes that the assessor can reduce or extend this such that it is proportionate to the risk of likely significant effects:

- The area within 600m of new road links or road links physically changed or bypassed by the proposed scheme.
- The area within 50m of other road links with potential to experience a BNL change of more than 1dB(A) in the short term or 3dB(A) in the long term, as a result of the proposed scheme.

11.5.11 At this stage of the assessment, the study area as described above is considered adequate to assess the potential impacts and effects of the proposed scheme.

11.6 Baseline conditions

11.6.1 The baseline noise conditions (i.e. Do-Minimum 2023) for the construction and operational noise assessments have been determined by the CRTN noise prediction model for a forecast traffic scenario of 2023. This has provided a detailed coverage of noise levels across the entire study area.

11.6.2 Figure 11.1 shows the locations of sensitive non-residential receptors[13], the predicted traffic noise level contours for the baseline year (i.e. Do-Minimum 2023) and noise important areas (NIA) [26]. The NIAs identify dwellings in areas of relatively high noise exposure recognised by the Department for Environment, Food and Rural Affairs (Defra).

11.6.3 DMRB LA 111 *Noise and vibration* requires that noise level calculations are carried out to compare noise changes between the Do-Minimum and Do-Something scenarios to assess the impact of the proposed scheme.

Future baseline

11.6.4 The DM future year scenario (2038) represents the future baseline taking into account any expected traffic changes as a result of other committed development or infrastructure that would occur without the proposed scheme in operation by 2038. Only sensitive receptors that would be in existence prior to the opening year of the proposed scheme are included in the assessment in the future year.

11.7 Potential impacts

Construction impacts

11.7.1 Considering the scale of the proposed scheme, it is likely that project-related noise and vibration associated with construction of the proposed scheme would have the potential to adversely affect noise or vibration sensitive receptors, on both the online and offline sections of the proposed scheme. Moderate to major construction noise related impacts are likely at receptors within distances of around 50m from the construction works, with minor impacts occurring at greater distances. It is also likely that stakeholders, more than 300m from the construction works, in areas such as Hatch Beauchamp, would have an expectation that a construction noise impact assessment would be undertaken for their properties. At present the assessment focusses on areas within 300m of the

[13] Residential areas can also be identified from the basemapping.

works but consideration of other areas where there is a stakeholder expectation of construction noise assessments will be given following public consultation and reported in the ES.

11.7.2 Construction vibration impacts may occur at the closest NSRs to works such as piling and compaction activities.

11.7.3 Construction noise and vibration are therefore scoped-in to the assessment.

Operational impacts

11.7.4 Operational noise impacts are likely to occur due to a combination of alignment changes and speed and flow increases as a result of a new improved road standard. The greatest adverse impacts would occur where the proposed scheme would be closer to nearby NSRs than the existing highway. Minor changes in alignment, particularly where the receptors are some distance from the existing highway, would be less likely to result in impacts as the proportionate change in distance would be small. Conversely, there are locations where the proposed scheme would be substantially further from receptors such that there is the potential for significant beneficial effects.

11.7.5 Changes in traffic on non-scheme roads as a result of the proposed scheme could give rise to adverse or beneficial changes at adjacent properties.

11.8 Design, mitigation and enhancement measures

11.8.1 The proposed scheme alignment has been designed to minimise environmental effects resulting from noise impacts. Additional opportunities for embedded mitigation are being considered through the process of design development and consideration of good design principles.

Construction mitigation

11.8.2 The construction noise and vibration assessments assume that the works would be undertaken following the principles and processes to be set out in the Environmental Management Plan (EMP) which will be produced as part of the ES and submitted as part of the DCO application. The EMP will include a commitment for a Noise and Vibration Management Plan (NVMP) to be prepared in advance of construction for the consented project. This will include the requirement to undertake noise and vibration monitoring to ensure compliance with, and early warning of exceedances of agreed threshold levels.

11.8.3 Best Practicable Means (BPM) is assumed as embedded mitigation to control construction noise in the form of low noise emission plant and processes (as specified in BS 5228 Annex B – *Noise sources, remedies and their effectiveness*).

11.8.4 Further consideration of specific mitigation measures will be considered in the ES once more detail is known about the proposed construction programme and logistics.

11.8.5 If situations arise where, despite the implementation of BPM and any specific mitigation measures on-site, the noise exposure exceeds the criteria that will be defined in the EMP, the contractors may offer noise insulation to affected properties, or ultimately, temporary re-housing; however, it is not anticipated that the latter will be required for the proposed scheme.

Operational mitigation

11.8.6 The alignment of the proposed scheme (horizontal and vertical) has been considered as part of the design factors to minimise noise impacts.

11.8.7 No specific noise mitigation has been considered in the modelling undertaken to inform this PEI Report. Mitigation options are being considered currently and where found to be effective and sustainable will be incorporated into the proposed scheme design and reported on in the ES.

Enhancement

11.8.8 Further to the avoidance and mitigation measures integrated along the length of the proposed scheme to reduce adverse noise effects, consideration will be given to developing enhancements during detailed design of the proposed scheme. For example, when more design detail can be confirmed, there may be opportunities to provide noise fence barriers in certain areas, if it can be shown that this would provide beneficial enhancements with regard to noise.

11.8.9 Any such enhancement would have to be shown to be sustainable based on the following tests:

- Stakeholder engagement and consultation responses
- Engineering practicability
- Consideration of noise benefit compared to cost of the mitigation
- Other environmental effects potentially caused by the mitigation (e.g. landscape or visual effects)

11.9 Assessment of likely significant effects

Construction effects

Noise

11.9.1 Construction noise effects have been calculated based on reasonable worst-case assumptions taking into account the main construction activities expected and the likely durations and on-times of individual plant items. At the time of the assessment, information about the programme and construction methods was not available and hence the assessment has been based on data from similar road projects. Assumptions are set out in section 11.4 and Appendix 11.3 Construction plant list and assumptions.

11.9.2 In the absence of detailed information, the primary activities most likely to give rise to significant effects have been assessed taking into account the current scheme design as follows:

- Excavation of cuttings (major – including rock breaking)
- Excavation of cuttings (minor)
- Road construction (sub-base – representing noisiest activity)
- Earthworks (major)
- Earthworks (minor)
- Structures (assumes augered piling methods)

11.9.3 The majority of these activities are assumed to be linear (i.e. taking place along the proposed scheme) e.g. cuttings, earthworks and road construction (sub-base). The activities associated with the structures stage, including Stoke Road

overbridge, Ashill junction, Mattock's Tree Green junction, Hatch Beauchamp junction and other overbridges and underbridges (see Table 11-14) will take place in particular locations of the proposed scheme (see Figure 2.1 General Arrangement) and so affect only some of the receptors.

11.9.4 Other activities which are likely to be required but are not assessed quantitatively are:

- Site clearance, tree and vegetation removal
- Boundary fence
- Topsoil strip
- Drainage
- Surface water channel
- Pavement and surfacing

11.9.5 Data from previous road schemes would indicate that these activities would not exceed the predicted levels for the other assessed activities; however, in-combination they would serve to increase the time period of impact at individual receptors. This will be assessed further as the design of the construction works and programming progresses and be reported in the ES.

11.9.6 Compounds are proposed within the Nexus 25 development, north-west of Stoke Road overbridge and east of Mattock's Tree Green junction. These locations are all next to existing busy roads and therefore it would not be expected that the levels of noise from the compounds would be significant in these locations. Further assessment of the compounds and construction traffic travelling along haul roads and the public road network to access the compounds will be undertaken once more information is available and be reported in the ES.

11.9.7 Construction impacts for the assessed activities have been predicted in distance bands based on the assumed plant lists and on-times set out in Appendix 11.3 Construction plant list and assumptions. It has been assumed that works are undertaken by work gangs spaced at 100m centres and it has been assumed that they work up and down a 50m trace along the proposed scheme daily which presents a reasonable 'worst-case' assessment.

11.9.8 The predicted impact band distances for each activity are set out in Appendix 11.3 Construction plant list and assumptions. It should be noted that all predictions at this stage do not include the benefit of screening e.g. rows of houses beyond the front row, in built-up areas, are likely to experience much reduced levels of construction noise than those predicted. The assessment is therefore worst-case.

11.9.9 Baseline (Do-Minimum 2023) noise levels have been predicted at each affected property using the road traffic noise model based on the ground floor façade facing towards the proposed scheme works. The baseline noise levels have been used to determine the appropriate BS5228 Category (see Table 11-3). The predicted construction noise level at each property has then been compared with the applicable BS5228 category to determine the DMRB LA 111 *Noise and vibration* impact magnitude.

11.9.10 DMRB LA 111 *Noise and vibration* requires that significance of effect be determined based on whether a moderate or major magnitude of impact is likely to endure for ten or more days in any consecutive 15 days, or 40 days in a consecutive six-month period at any individual receptor.

11.9.11 The results of the impact assessment are shown in Table 11-14 showing impacts related to individual locations (including structures, earthworks and cuttings associated with individual proposed scheme elements) and the total combined impacts including other linear works away from specific structures (note some properties would be impacted by multiple activities).

Table 11-14 Predicted major and moderate construction noise impacts at residential and non-residential receptors

Location	Properties predicted to experience a major impact	Properties predicted to experience a moderate impact	Total
Ashill junction	3	3	6
Griffin bridge	1	1	2
Kenny overbridge	2	2	4
Mattock's Tree Green junction	18	6	24
New Cad Brook underbridge	0	4	4
Stoke Road overbridge	131	82	213
Hatch Beauchamp junction overbridge	1	0	1
New High Bridge underbridge	3	0	3
Venner's bridge (watercourse)	5	0	5
Total impacts for all works*	**199**	**146**	**345**
* Includes earthworks, cuttings and sub-base activities not specific to a particular junction or structure.			

11.9.12 In summary, based on the preliminary assessment a total of 199 properties are predicted to experience major impacts during one or more construction activities and 146 properties are predicted to experience moderate impacts. It is likely that durations of these works would exceed ten days in 15 consecutive days or 40 days in a consecutive six months and therefore temporary direct significant adverse effects are predicted at these receptors.

11.9.13 The above impacts all relate to noise levels predicted to exceed the SOAEL threshold. There may be further negligible or minor impacts affecting properties between the LOAEL and SOAEL.

11.9.14 Figure 11.6 Construction noise study area and impact bands shows the construction predicted noise level bands graphically; however, note that not all properties predicted to experience noise levels above 65dB $L_{Aeq,T}$ would experience a moderate or major impact dependent on the baseline noise level (and hence BS5228 category threshold).

11.9.15 Impacts at night-time will be assessed once more detail of the programme and working hours are known and be reported in the ES.

11.9.16 The potential requirements for diversion routes during the night-time, in the case of full carriageway closures, are not yet known. If required, a full assessment of these routes will be undertaken and reported in the ES.

Vibration

11.9.17 A quantitative vibration assessment has not been undertaken at this time due to the lack of detail available on the types of plant and processes that will be used during construction.

11.9.18 Experience on similar road construction projects would indicate that activities with the potential to give rise to vibratory impacts include vibratory compaction plant during earthwork and road pavement construction activities, rock breaking for cuttings and impact piling if required.

11.9.19 BS 5228–2:2009+A1:2014, as referred to in DMRB LA 111 *Noise and vibration*, provides a methodology for predicting typical levels of vibration from compaction and impact piling, based on case study data and empirical models. An empirical method for predicting vibration from rock breaking is not provided but would be expected to be of equal or lesser impact than impact piling.

11.9.20 Based on typical levels from vibratory compaction plant[14], there is a low risk that the SOAEL for human annoyance (1mm/s (millimetres per second) would be exceeded at properties beyond 100m from the compaction works. Above this level, impacts would be considered significant if lasting for more than ten days in any consecutive 15 days or 40 days in any consecutive six-month period. This takes into account the potential magnification factor for vibration at the first floor of buildings and is therefore worst-case.

11.9.21 Based on the empirical formulae of BS5228-2, it would be expected that impact piling in most soil types would give rise to vibration levels below SOAEL at 100m at the foot of buildings. It is possible that due to magnification effects, vibration levels at upper storeys of buildings may be somewhat higher and therefore it is possible that moderate vibration impacts from impact piling could extend beyond 100m. However, it would be expected that, in accordance with BPM, piling works will be undertaken with low vibration piling methods wherever reasonably practicable. Should it become apparent that impact piling methods may be necessary, a full assessment will be undertaken and reported in the ES.

11.9.22 The levels above which damage to property (risk of cosmetic damage) may occur are much higher than those for human annoyance. The potential for these levels to be reached will be limited to properties within very close proximity to the works e.g. around 20m for impact piling or vibratory compaction in most soil types[15]. A full assessment of the potential for these effects will be undertaken and reported in the ES once further information regarding construction methods has been developed. Where potential impacts are identified, mitigation measures (such as alternative plant and operating conditions) would be put in place to avoid these impacts.

11.9.23 Actual vibration levels will be dependent on ground conditions, coupling between the ground and the structure and resonances within the receptor building. DMRB LA 111 *Noise and vibration* also sets out that a study area of 100m is normally sufficient to encompass vibration sensitive receptors. The construction vibration

[14] In calculations the data for the BOMAG BW 213 D-4 vibratory compactor were assumed.

[15] Note that impact piling is transient in nature which affords it a higher threshold of significance than vibratory compaction which is continuous in nature (see Table 11-8).

study area is shown together with the locations of buildings on Figure 11.7 Construction vibration study area.

Operational effects

11.9.24 Daytime and night-time traffic noise levels within the study area have been predicted and are assessed in terms of direct and indirect effects for:

- Residential receptors exceeding the SOAEL
- Residential receptors between the LOAEL and SOAEL
- Non-residential receptors

11.9.25 Table 11-16 to Table 11-25 summarise the assessment of the significant effects for daytime and night-time resulting from the proposed operational scheme in the opening year.

11.9.26 Figure 11.2 shows the noise level contours in the Do-Something scenario in the opening year (2023). Figure 11.3 Operational noise difference contour map – opening year (2023) shows the noise difference contours (i.e. the changes in noise) resulting from the proposed operational scheme between the Do-Minimum and Do-Something scenarios in the opening year (2023) and Figure 11.4 shows the noise difference contours between the Do-Minimum scenario in the opening year and the Do-Something scenario in the future year (2038). Figure 11.5 shows the significantly affected receptors with beneficial or adverse effects. These figures should be referred to for the following assessment description. The noise contours shown on these figures are representative of the noise levels at 4m above local ground level. Appendix 11.4 Predicted operational noise levels and reporting tables provides tabulated noise level results at selected NSRs within the study area.

Assessment of significant effects

11.9.27 In the paragraphs below, the overall noise impacts are summarised separately for settlements around the proposed scheme, west to east, i.e.:

- Taunton
- Ruishton
- Henlade
- Thornfalcon and Mattocks Tree Green Junction
- West Hatch and Meare Green
- Hatch Beauchamp
- Hatch Green
- Ashfill
- Rapps
- Horton Cross

11.9.28 The following sections summarise the numbers of receptors affected above the SOAEL threshold, and the numbers affected between the SOAEL and LOAEL thresholds. Effects below the LOAEL are assumed to be not significant for the purposes of this PEI Report. Further consideration will be given in the ES to special cases, in quiet rural settings, where noise effects could be significant.

11.9.29 Further details on the type of effect as well as effects in NIAs and on non-residential locations (e.g. schools, places of worship, community facilities etc.) are described. The assessment is based upon the change in noise caused by the

proposed scheme, with consideration of other factors relating to the context of the impact such as the level of noise exposure with and without the proposed scheme.

Taunton

Residential receptors

11.9.30 Table 11-15 summarises significant effects on residential receptors in the Taunton area within the detailed calculation area within 600m of the proposed scheme.

Table 11-15 Summary of preliminary significant operational noise effects (Taunton)

Type of effects	Number of dwellings
Significant adverse above the SOAEL	-
Significant beneficial above the SOAEL	-
Significant adverse (between LOAEL and SOAEL)	-
Significant beneficial (between LOAEL and SOAEL)	-
Not significant	1,024

11.9.31 In Taunton, noise levels would be subject to negligible change (i.e. less than 1dB(A) increase or decrease). No dwellings in the Taunton area are predicted to experience an adverse or beneficial significant effect.

Noise important areas

11.9.32 There is one NIA (NIA ID 3496) in the Taunton area also within the A358 study area. Residential receptors situated in the vicinity of NIA ID 3496 are affected by traffic on the A358 to the north-west of M5 junction 25 and although they are predicted to experience noise levels above the SOAEL, there would be a negligible change with the proposed scheme in operation.

Ruishton

Residential receptors

11.9.33 Table 11-16 summarises significant effects in the Ruishton area within 600m of the proposed scheme.

Table 11-16 Summary of preliminary significant operational noise effects (Ruishton)

Type of effects	Number of dwellings
Significant adverse above the SOAEL	-
Significant beneficial above the SOAEL	-
Significant adverse (between LOAEL and SOAEL)	-
Significant beneficial (between LOAEL and SOAEL)	1
Not significant	405

11.9.34 There is one dwelling with a moderate level of beneficial impact predicted in the opening year of the proposed scheme. This would be subject to direct permanent likely significant beneficial effects. This dwelling is situated on Bushy Cross Lane close to the existing A358.

Noise important areas

11.9.35 There is one NIA (NIA ID 3497) which is partially within this assessment area along the existing A358. The one dwelling has already been reported in paragraph 11.9.34.

Henlade

Residential receptors

11.9.36 Table 11-17 summarises significant effects on residential receptors in the Henlade area within the detailed calculation area within 600m of the proposed scheme.

Table 11-17 Summary of preliminary significant operational noise effects (Henlade)

Type of effects	Number of dwellings
Significant adverse above the SOAEL	2
Significant beneficial above the SOAEL	55
Significant adverse (between LOAEL and SOAEL)	108
Significant beneficial (between LOAEL and SOAEL)	37
Not significant	47

11.9.37 There are two dwellings situated on Stoke Road subject to direct permanent likely significant adverse effects above SOAEL as a result of the proposed scheme. The level of adverse impact would be major for those dwellings in the opening year.

11.9.38 There are 55 dwellings currently exceeding the SOAEL where noise reductions would occur as a result of the proposed scheme. At these 55 dwellings, noise exposure would fall below the SOAEL threshold with the proposed scheme in operation. The noise reductions would be greater than 1 dB(A) in the opening year. As the baseline noise level would be above the SOAEL, this level of reduction to below the SOAEL threshold is assessed as a direct permanent likely significant beneficial effect for those 55 dwellings. These dwellings are situated along the existing A358.

11.9.39 There are 108 dwellings predicted to be subject to major or moderate adverse noise impacts in the opening year between LOAEL and SOAEL. These are assessed as direct permanent likely significant adverse effects as a result of the proposed scheme. These dwellings are located along Lipe Lane, the A358, Stoke Road, in Ivy house park and Greenway Lane.

11.9.40 There are 37 dwellings subject to direct permanent likely significant beneficial effects between the LOAEL and SOAEL as a result of the proposed scheme. The level of beneficial impact would be major or moderate for all these dwellings in the opening year. These beneficial effects are generally located around the existing A358.

Non-residential sensitive receptors

11.9.41 Ivy House Social Club would be subject to moderate noise reductions between 3 and 5dB(A). This is assessed as a direct permanent likely significant beneficial effect.

Noise important areas

11.9.42 There is one NIA (NIA ID 3497) which is partially within this area along the existing A358. Noise exposure levels at dwellings in NIA ID 3497 would fall below the SOAEL with the proposed scheme in operation. The noise reductions would be greater than 1dB(A) in the opening year, and because the baseline noise levels would be above the SOAEL, these reductions are assessed as direct permanent likely significant beneficial effects.

Thornfalcon and Mattock's Tree Green junction

Residential receptors

11.9.43 Table 11-18 summarises significant effects on residential receptors in the Thornfalcon and Mattock's Tree Green junction area within the detailed calculation area within 600m of the proposed scheme.

Table 11-18 Summary of preliminary significant operational noise effects (Thornfalcon and Mattock's Tree Green junction)

Type of effects	Number of dwellings
Significant adverse above the SOAEL	5
Significant beneficial above the SOAEL	7
Significant adverse (between LOAEL and SOAEL)	42
Significant beneficial (between LOAEL and SOAEL)	5
Not significant	57

11.9.44 There are five dwellings currently exceeding the SOAEL where noise increases would occur as a result of the proposed scheme. These dwellings are situated on the A378 where Mattock's Tree Green junction would be connected to the existing A378 and along the existing A358. The noise increases would be greater than 1 dB(A) in the opening year and hence these are assessed as direct permanent likely significant adverse effects above SOAEL as a result of the proposed scheme.

11.9.45 For a further seven dwellings that would already exceed the SOAEL in the baseline year in the absence of the proposed scheme, there would be noise reductions as a result of the proposed scheme. For four of these dwellings, noise exposure with the proposed scheme would fall below SOAEL. These dwellings are all adjacent to the existing A358. Noise reductions would be greater than 1dB(A) in the opening year, and because the baseline noise levels would be above the SOAEL, these reductions at seven dwellings are assessed as direct permanent likely significant beneficial effects.

11.9.46 There are 42 dwellings with a moderate or major magnitude of adverse impact predicted with the proposed scheme in the opening year between the LOAEL and the SOAEL. These would be subject to direct permanent likely significant adverse effects. Most of these are scattered properties on the west and east side of the proposed scheme.

11.9.47 There are five dwellings subject to direct permanent likely significant beneficial effects between the LOAEL and SOAEL as a result of the proposed scheme. The level of beneficial impact would be major or moderate for all these dwellings in the

opening year. These beneficial effects are generally located around Thornfalcon facing the existing A358.

Non-residential sensitive receptors

11.9.48 Somerset Progressive School is situated immediately to the west of the existing A358 and noise levels currently exceed the SOAEL. Noise increases would occur as a result of the proposed scheme. This school would be subject to a noise increase of between 3 and 5dB(A) above SOAEL. This level of increase in noise levels are assessed as direct permanent likely significant adverse effects as a result of the proposed scheme.

Noise important areas

11.9.49 There are five NIAs that lie within the study area along the existing A358 in this area. Most properties are currently exposed to noise levels above the SOAEL.

11.9.50 At NIA 3498, there are two properties which would be subject to a reduction in noise levels with the proposed scheme. The level of beneficial impact would be major or moderate for these dwellings in the opening year. Hence these properties would be subject to direct permanent likely significant beneficial effects.

11.9.51 At NIA 3499, there are two properties currently exceeding the SOAEL situated at this location. One property would be subject to an increase in noise level and greater than 1dB(A) in the opening year. This is assessed as direct permanent likely significant adverse effects above SOAEL as a result of the proposed scheme. The other property would be subject to a reduction in noise level greater than 1dB(A) in the opening year. This is assessed as direct permanent likely significant beneficial effects in the opening year with the proposed scheme. These properties are situated between the existing A358 and the proposed scheme and property facades face either the existing A358 or the proposed scheme.

11.9.52 At NIA 12939, there is a single dwelling at this location would be subject to noise increase of more than 10dB(A). These noise increases are assessed as a direct permanent likely significant adverse effect. This is as a result of a large noise change on the façade of the building facing the new alignment (opposite to the façade currently with the highest noise level).

11.9.53 At NIA 3500, there are three dwellings at this location. Two dwellings would be subject to a reduction in noise levels and are assessed as direct permanent likely significant beneficial effect and one dwelling would be subject to an increase in noise levels and is assessed as a direct permanent likely significant adverse effect. This is due to the introduction of the junction and associated slip roads in this area as part of the proposed scheme.

11.9.54 At NIA 3501, there is only one dwelling currently, which is subject to a compulsory purchase order and therefore has not been assessed.

West Hatch and Meare Green

Residential receptors

11.9.55 Table 11-19 summarises significant effects on residential receptors in West Hatch and Meare Green area within the detailed calculation area within 600m of the proposed scheme.

Table 11-19 Summary of preliminary significant operational noise effects (West Hatch and Meare Green)

Type of effects	Number of dwellings
Significant adverse above the SOAEL	-
Significant beneficial above the SOAEL	-
Significant adverse (between LOAEL and SOAEL)	22
Significant beneficial (between LOAEL and SOAEL)	-
Not significant	13

11.9.56 There are 22 dwellings with a moderate or major level of adverse impact predicted with the proposed scheme in the opening year. These would be subject to direct permanent likely significant adverse effects between the LOAEL and SOAEL as a result of the proposed scheme. Most of these are scattered properties on the either side of the proposed scheme.

Hatch Beauchamp

Residential receptors

11.9.57 Table 11-20 summarises significant effects on residential receptors in the Hatch Beauchamp area within the detailed calculation area within 600m of the proposed scheme.

Table 11-20 Summary of preliminary significant operational noise effects (Hatch Beauchamp)

Type of effects	Number of dwellings
Significant adverse above the SOAEL	-
Significant beneficial above the SOAEL	-
Significant adverse (between LOAEL and SOAEL)	55
Significant beneficial (between LOAEL and SOAEL)	-
Not significant	171

11.9.58 There are 55 dwellings with a moderate level of adverse impact predicted with the proposed scheme in the opening year. These would be subject to direct permanent likely significant adverse effects between the LOAEL and SOAEL as a result of the proposed scheme. All of these are situated on the eastern side of the proposed scheme.

Hatch Green

Residential receptors

11.9.59 Table 11-21 summarises significant effects on residential receptors in Hatch Green area within the detailed calculation area within 600m of the proposed scheme.

Table 11-21 Summary of preliminary significant operational noise effects (Hatch Green)

Type of effects	Number of dwellings
Significant adverse above the SOAEL	2

Type of effects	Number of dwellings
Significant beneficial above the SOAEL	1
Significant adverse (between LOAEL and SOAEL)	21
Significant beneficial (between LOAEL and SOAEL)	3
Not significant	6

11.9.60 There are two dwellings currently exceeding the SOAEL where noise increases would occur as a result of the proposed scheme. These dwellings are situated on the existing A358. There would be major or moderate adverse impacts at these dwellings in the opening year which are assessed as direct permanent likely significant adverse effects.

11.9.61 For a further individual dwelling that would already exceed the SOAEL in the baseline year in the absence of the proposed scheme, there would be a noise reduction as a result of the proposed scheme. This dwelling is Windsor House. Noise exposure would fall below the SOAEL with the proposed scheme in operation. The noise reductions would be greater than 1dB(A) in the opening year, and because the baseline noise levels would be above the SOAEL, this reduction at Windsor House is assessed as a direct permanent likely significant beneficial effect.

11.9.62 There are 21 dwellings with a moderate or major level of adverse impact predicted with the proposed scheme in the opening year. These would be subject to direct permanent likely significant adverse effects. Most of these are scattered properties on the west and east side of the proposed scheme.

11.9.63 There are three dwellings subject to direct permanent likely significant beneficial effects between the LOAEL and SOAEL as a result of the proposed scheme. The level of beneficial impact would be moderate for all these dwellings in the opening year. These beneficial effects are generally located on the west of the proposed scheme on Bickenhall Lane, Bickenhall.

Noise important areas

11.9.64 There is one NIA (NIA ID 12940) that lies within the A358 study area along the existing A358. Windsor House is within this NIA and is currently exposed to noise levels above SOAEL as discussed above and would be subject to direct permanent likely significant beneficial effects.

Ashill

Residential receptors

11.9.65 Table 11-22 summarises significant effects on residential receptors in the Ashill area within the detailed calculation area within 600m of the proposed scheme.

Table 11-22 Summary of preliminary significant operational noise effects (Ashill)

Type of effects	Number of dwellings
Significant adverse above the SOAEL	11
Significant beneficial above the SOAEL	1
Significant adverse (between LOAEL and SOAEL)	115
Significant beneficial (between LOAEL and SOAEL)	2
Not significant	14

11.9.66 There are 11 dwellings currently exceeding the SOAEL where noise increases would occur as a result of the proposed scheme. These dwellings, on Wood Road and in Kenny would be subject to noise increases as a result of the proposed scheme (moderate to major adverse impact range) which are assessed as direct permanent likely significant adverse effects.

11.9.67 For a further individual dwelling, Kendalwood on the existing A358, that would already exceed the SOAEL in the baseline year in the absence of the proposed scheme, there would be noise reductions as a result of the proposed scheme. For Kendalwood, noise exposure would fall below the SOAEL with the proposed scheme in operation. The noise reductions would be greater than 1dB(A) in the opening year, and because the baseline noise levels would be above the SOAEL, these reductions are assessed as direct permanent likely significant beneficial effects.

11.9.68 There are 115 dwellings with a moderate or major level of adverse impact predicted with the proposed scheme in the opening year between LOAEL and SOAEL. These would be subject to direct permanent likely significant adverse effects. The majority of these are situated to the south side of the proposed scheme, with just a few scattered dwellings also affected to the north of the proposed scheme. These receptors are mostly situated more than 100m from the proposed scheme.

11.9.69 There are two dwellings subject to direct permanent likely significant beneficial effects between the LOAEL and SOAEL as a result of the proposed scheme. The level of beneficial impact would be major or moderate for these dwellings in the opening year. These effects would be as a result of changes in road traffic noise associated with non-scheme roads. These beneficial effects are generally located along Wood Road, beyond around 450m from the proposed scheme.

Non-residential sensitive receptors

11.9.70 The Blessed Virgin Mary church and Ashill Community Primary School are situated approximately 400m from the proposed scheme and would be subject to noise increases as a result of the proposed scheme (moderate adverse impact) in the opening year. These non-residential sensitive receptors are subject to direct permanent likely significant adverse effects between the LOAEL and SOAEL as a result of the proposed scheme.

11.9.71 Ashill Village Hall is situated approximately 200m from the proposed scheme and would be subject to an increase in noise levels as a result of the proposed scheme (major adverse impact) in the opening year. This non-residential sensitive receptor is subject to direct permanent likely significant adverse effects between the LOAEL and SOAEL as a result of the proposed scheme.

Noise important areas

11.9.72 There is one NIA (NIA ID 3502) that lies within the A358 study area along the existing A358. There is a single property at NIA 3502, Kendalwood, is currently exposed to noise levels above the SOAEL. This residential property would be subject to a direct permanent likely significant beneficial effect.

Rapps

Residential receptors

11.9.73 Table 11-23 summarises significant effects on residential receptors in Rapps area within the detailed calculation area within 600m of the proposed scheme.

Table 11-23 Summary of preliminary significant operational noise effects (Rapps)

Type of effects	Number of dwellings
Significant adverse above the SOAEL	-
Significant beneficial above the SOAEL	-
Significant adverse (between LOAEL and SOAEL)	32
Significant beneficial (between LOAEL and SOAEL)	-
Not significant	40

11.9.74 There are 32 dwellings with a moderate or major level of adverse impact predicted with the proposed scheme in the opening year. These would be subject to direct permanent likely significant adverse effects between the LOAEL and SOAEL as a result of the proposed scheme. All of these are scattered properties on the west and east side of the proposed scheme.

Non-residential sensitive receptors

11.9.75 St Aldhelm & St Eadburgha's church would be subject to a moderate impact in the opening year and minor impact in the future year (long term). This non-residential sensitive receptor would be subject to noise levels between the LOAEL and SOAEL as a result of the proposed scheme, hence this is assessed as a direct permanent likely significant adverse effect.

Horton Cross

Residential receptors

11.9.76 Table 11-24 summarises significant effects on residential receptors in Horton Cross area within the detailed calculation area within 600m of the proposed scheme.

Table 11-24 Summary of preliminary significant operational noise effects (Horton Cross)

Type of effects	Number of dwellings
Significant adverse above the SOAEL	5
Significant beneficial above the SOAEL	-
Significant adverse (between LOAEL and SOAEL)	14
Significant beneficial (between LOAEL and SOAEL)	-
Not significant	138

11.9.77 There are five dwellings currently exceeding the SOAEL where noise increases would occur as a result of the proposed scheme. These five dwellings would be subject to minor adverse noise impacts in the opening year. As the predicted noise levels would be above the SOAEL, noise increases are assessed as direct permanent likely significant adverse effects. These dwellings are situated along the existing unaltered section of the A358 branching out from Southfields

roundabout to the west but are also affected by the new and altered sections of the A358 to the north-east.

11.9.78 There are 14 dwellings subject to direct permanent likely significant adverse effects between the LOAEL and SOAEL as a result of the proposed scheme. The level of adverse impact would be moderate for all these dwellings in the opening year. These adverse effects are generally located on the west side of the proposed scheme along the existing unaltered section of the A358 off Southfields roundabout.

Noise insulation eligibility

11.9.79 The assessment has indicated that there are 32 dwellings that would exceed the criteria to be eligible for noise insulation under the NIR. LA 111 (Annex E/2) requires that potential noise insulation eligibility is considered as part of the assessment. The potential noise insulation qualifiers will be confirmed based on the mitigated scheme design and updated traffic modelling and reported in the ES.

Non-scheme road links beyond 600m from the proposed scheme where noise levels change by 1dB(A) in the opening year

11.9.80 In the wider area where the current traffic patterns would be indirectly influenced as a result of the proposed scheme, dwellings located within 50m from the road edges would be subject to reductions in noise levels (as shown by green squares on Figure 11.5 Operational noise significantly affected receptors) on the following roads:

- Shoreditch Road, B3170 and Chestnut Drive in Taunton
- Thurlbear Road in Orchard Portman
- Staple Hill and New Road in Staple Fitzpaine
- Unnamed roads between Staple Fitzpaine and Buckland St Mary
- Pound Road in Horton

11.9.81 Indirect noise reductions would occur at 43 receptors (41 dwellings and two non-residential receptors) that would already exceed the SOAEL in the baseline year in the absence of the proposed scheme. At 21 receptors (including one non-residential receptor), noise exposure would fall below the SOAEL with the proposed scheme in operation. The noise reductions would be greater than 1dB(A) in the opening year (short term), and because the baseline noise levels would be above the SOAEL, these are assessed as indirect permanent likely significant beneficial effects.

11.9.82 There are 168 receptors (165 dwellings and 3 non-residential receptors) that would experience indirect permanent likely significant beneficial effects between the LOAEL and SOAEL. The level of beneficial impact would be major or moderate for all these dwellings in the opening year. These are assessed as indirect permanent likely significant beneficial effects.

11.9.83 Dwellings located on the following road would be subject to increases in noise levels (as shown by red squares on Figure 11.5 Operational noise significantly affected receptors):

- Windmill Hill and Stoke Road in North Curry
- Meare Green

- Curload Road in Curload
- Stanmoor Road in Burrowbridge
- Headwell and Higher Street in Curry Mallet
- Broadway Road in Boradway
- Hanning Road in Horton

11.9.84 Indirect noise increases would occur at 374 receptors (366 dwellings and 8 non-residential receptors) that would be subject to moderate or major adverse noise impacts between LOAEL and SOAEL. These are assessed as indirect permanent likely significant adverse effects. This would be as a result of changes in road traffic noise associated with non-scheme roads in the listed areas above.

11.9.85 The government policy objectives (see paragraph 11.2.8) are also defined in the *England National Application Annex* to DMRB LA 111 *Noise and vibration*. In accordance with the assessment requirements, the proposed scheme's compliance against these objectives is set out in Table 11-25.

Table 11-25 Proposed scheme compliance with government policy

Government policy objective (NPSNN)	Compliance with policy requirements
Aim 1: Avoid significant adverse impacts on health and quality of life from noise as a result of the new development. (NPSE describes this aim in relation to impacts above the SOAEL)	Significant adverse impacts from construction noise and vibration would be avoided through construction BPM mitigation, and noise insulation where established thresholds are exceeded. These controls would follow the principles and processes set out in the EMP to be developed alongside the ES. Some significant adverse effects are reported in this assessment for construction noise. Mitigation, as far as is practicable and sustainable, would be detailed in the NVMP that will be prepared as required by the EMP which will be produced alongside the ES, following dialogue with local authorities. For operational noise, a number of properties are predicted to be subject to significant adverse effects above the SOAEL. Screening and other potential mitigation measures will be considered where effective to practicably, and sustainably, avoid these impacts. Noise insulation measures will be offered where appropriate (see paragraph 11.9.79).
Aim 2: Mitigate and minimise other adverse impacts on health and quality of life from noise from the new development. (NPSE describes this aim in relation to impacts between the LOAEL and SOAEL)	Adverse impacts from construction noise and vibration would be mitigated and minimised through construction BPM mitigation. These controls would follow the principles and processes set out in the EMP to be developed alongside the ES. Some significant adverse effects for operational noise between the LOAEL and SOAEL are reported in this assessment. All appropriate measures will be applied in these cases as far as it is practicable and sustainable to do so to mitigate and minimise these effects.
Aim 3: Contribute to improvements to health and quality of life through the effective management and control of noise, where possible. (Applies to all noise levels)	Beneficial effects would occur at communities, outdoor amenity areas in some NIAs as a result of the proposed scheme.

11.10 Monitoring

11.10.1 The requirements of DMRB LA 111 *Noise and vibration* (Section 4) regarding monitoring and evaluation shall be followed.

11.10.2 The prediction and assessment methodologies set out in section 11.3 Assessment methodology of this chapter would be used to support the verification of the effectiveness of any mitigation measures which may be incorporated into the proposed scheme. Monitoring of the effectiveness would be carried out as part of Highways England's project evaluation procedures, which evaluates how highway schemes are delivered and would highlight any issues with meeting the accepted design.

11.10.3 Where access is required onto private land for monitoring purposes, prior consultation would be undertaken with the occupier and appropriate arrangements would be made to enable the monitoring to be undertaken.

11.10.4 Highways England has a duty under Regulation 6 of the NIR to assess noise levels following the opening of the proposed scheme to traffic. The purpose of this is to establish the buildings previously not identified as qualifying for an original offer of carrying out or making a grant in respect of carrying out noise insulation work, which may have become eligible by increased traffic flow. Assessments would be carried out in accordance with the obligations set out in the NIR.

11.11 Summary

11.11.1 Construction noise and operational traffic noise have been assessed in terms of government policy and EIA significance. These different types of effect are explained in paragraph 11.3.23.

Construction assessment

11.11.2 A high-level construction noise assessment has been undertaken based on data from similar road construction projects and the proposed scheme design.

11.11.3 The principal activities considered with the potential to cause noise effects are cutting and earthworks, structures and road construction works.

11.11.4 At the time of preparation of this report, no information was available for haul roads, construction traffic flows on public highways, night-time works and night-time diversion routes and therefore these will be assessed and reported in the ES.

11.11.5 A qualitative vibration assessment has been undertaken at this stage, due to the lack of available detail on types of plant and processes that will be used during construction.

Significant effects

11.11.6 Based on the high-level worst-case assessment presented for construction noise, direct temporary likely significant adverse noise effects have been assessed at 345 residential and non-residential properties during the daytime only (see Table 11-14). These are direct effects above the SOAEL threshold, as described in government policy.

11.11.7 Experience on similar road construction projects would indicate that there is a low risk of significant vibration effects beyond approximately 100m from vibratory

works, based on the usual methods of piling that would be employed for this type of project. Further assessment will be undertaken and reported in the ES, when there is a clearer understanding of the likely methods of construction to be employed.

Operational assessment

11.11.8 Daytime and night-time traffic noise levels within the study area (see Figures 11.1-11.4) have been predicted and are assessed in terms of:

- residential receptors exceeding the SOAEL
- residential receptors between the LOAEL and SOAEL
- non-residential receptors

Significant effects

11.11.9 Based on the detailed assessment of operational noise the following significant effects have been identified:

Exceeding the SOAEL

11.11.10 Twenty-six sensitive receptors are assessed as being subject to direct permanent likely significant adverse effects where there is at least a 1dB(A) impact as a result of the proposed scheme. These sensitive receptors are situated in close proximity to the proposed scheme in Henlade, Thornfalcon, Mattock's Tree Green junction, Hatch Green, Ashill and Horton Cross.

11.11.11 Eighty-one sensitive receptors that would already exceed the SOAEL would be subject to larger than negligible noise reductions as a result of the proposed scheme. These receptors would be subject to reduction in noise levels such that the noise exposure with the proposed scheme in operation would fall below the SOAEL. All the above noise reductions would be greater than 1dB(A) and because the baseline noise levels would be above the SOAEL, these reductions are assessed as direct permanent likely significant beneficial effects. The majority (60) of these properties are located in Henlade, Thornfalcon, Mattock's Tree Green junction and Hatch Green. Otherwise, receptors are located on Shoreditch Road (Taunton), Thurlbear Road (Orchard Portman), and unnamed roads between Staple Fitzpaine and Buckland St Mary.

11.11.12 A further 26 sensitive receptors that would already exceed the SOAEL in the baseline would be subject to larger than negligible noise reductions with the proposed scheme in operation but noise exposure would remain above SOAEL. These reductions are assessed as indirect permanent likely significant beneficial effects. These properties are located in Thornfalcon, Mattock's Tree Green junction, Ashill, Orchard Portman and Staple Fitzpaine.

Between LOAEL and SOAEL

11.11.13 Approximately 413 sensitive receptors would be subject to direct permanent likely significant adverse effects between the LOAEL and SOAEL. These receptors are located in Henlade, Thornfalcon, Mattock's Tree Green junction, West Hatch, Hatch Beauchamp, Hatch Green, Ashill, Rapps and Horton Cross. All of these are assessed as direct permanent likely significant adverse effects.

11.11.14 Approximately 374 receptors that would be subject to indirect permanent likely significant adverse effects between the LOAEL and SOAEL. This is because of changes in road traffic noise associated with non-scheme roads. These properties

are located in North Curry, Meare Green, Curload, Burrowbridge and Broadway. All of these are assessed as indirect permanent likely significant adverse effects.

11.11.15 Approximately 49 sensitive receptors would be subject to direct permanent likely significant beneficial effects between the LOAEL and SOAEL. These dwellings are located near the existing alignment in Ruishton, Henlade, Thornfalcon and Mattock's Tree Green junction.

11.11.16 There are approximately 168 properties would be subject to indirect permanent likely significant beneficial effects between the LOAEL and SOAEL. These dwellings are located in Hatch Green, Ashill, Staple Fitzpaine, Buckland St Mary and Horton.

Noise Important Areas (NIAs)

11.11.17 There are nine Noise Important Areas near the existing A358 where most NSRs would be subject to reductions in noise levels as a result of the proposed scheme, with the exception of NIA ID 3496 where there would be no change in noise level and one property in each of NIA 3499, NIA 3500 and NIA 12939 where there would be increases in noise level.

Further work

11.11.18 As part of the EIA, the preliminary operational assessment will be updated to reflect the Design Fix 2 scheme design.

11.11.19 The operational assessment will be updated to include the PCF stage 3 traffic modelling outputs and updated road surface information.

11.11.20 Additional noise mitigation will be incorporated into the design and updated significant effects will be reported in the ES.

11.11.21 An assessment of noise impacts from night-time construction works and diversion routes at night will be undertaken if applicable and reported in the ES.

11.11.22 An assessment of noise impacts of construction traffic on site haul roads and the public highway will be undertaken and reported in the ES.

Abbreviations List

Please refer to PEI Report Chapter 17 Abbreviations.

Glossary

Please refer to PEI Report Chapter 18 Glossary.

References

[1] Highways England, Transport Scotland, Welsh Government and Department for Infrastructure Northern Ireland, “Design Manual for Roads and Bridges LA 111, Noise and Vibration,” 2020.

[2] Department for Transport, “National Networks National Policy Statement,” 2014.

[3] “The Environmental Noise (England) Regulations 2006. SI 2006/2238,” HMSO, London, 2006.

[4] “The Environmental Noise (England) (Amendment) Regulations 2018. SI 2018/1089,” HMSO, London, 2018.

[5] “The Environmental (Amendment etc.) (EU Exit) Regulations 2019. SI 2019/458,” HMSO, London, 2019.

[6] “Control of Pollution Act 1974. c.40,” HMSO, London, 1974.

[7] “Land Compensation Act 1973. c.26,” HMSO, London, 1973.

[8] “The Noise Insulation Regulations 1975. SI 1975/1763,” HMSO, London, 1975.

[9] Department for Environment, Food & Rural Affairs, “Noise Policy Statement for England,” 2010.

[10] Ministry of Housing, Communities & Local Government, “National Planning Policy Framework,” 2021.

[11] Ministry of Housing, Communities & Local Government, “Planning Practice Guidance - Noise - GOV.UK,” 6 March 2019. [Online]. Available: https://www.gov.uk/guidance/noise--2. [Accessed 17 May 2021].

[12] Department for Transport, “National policy statement for national networks,” 2014.

[13] South Somerset District Council, “South Somerset Local Plan 2006-2028,” 2015.

[14] Taunton Deane Borough Council, “Adopted Core Strategy 2011-2028”.

[15] Department of Transport and Welsh Office, “Calculation of Road Traffic Noise,” TSO, London, 1988.

[16] Department of Transport, “TAG Unit A3, Environmental Impact Appraisal, Section 2,” 2021. [Online]. Available: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/983703/tag-unit-a3-environmental-impact-appraisal.pdf.

[17] “BS 5228-1:2009+A1:2014, Code of practice for noise and vibration control on construction and open sites - Noise,” BSI, 2014.

[18] “BS 5228-2:2009+A1:2014, Code of practice for noise and vibration control on construction and open sites – Vibration,” BSI, 2014.

[19] BS 7385-2:1993, Evaluation and measurement for vibration in buildings – Guide to damage levels from groundborne vibration, BSI, 1993.

[20] Highways England, “A358 Taunton to Southfields Dualling - PCF Stage 2 Combined Modelling and Appraisal Report,” 2018.

[21] P. &. N. P. Abbott, “PR/SE/451/02, Converting the UK traffic noise index LA10,18h to EU noise indices for noise mapping,” TRL, 2002.

[22] BS ISO 4866:2010, Mechanical vibration and shock – Vibration of fixed structures – Guidelines for the measurement of vibrations and evaluation of their effects on structures, BSI, 2010.

[23] World Health Organization, “Guidelines for community noise,” 1999.

[24] World Health Organization, “Night Noise Guidelines For Europe,” 2009.

[25] World Health Organization, “Environmental Noise Guidelines for the European Region,” 2018.

[26] UK Government, “Noise Action PLanning Important Areas Round 2 England,” 2019. [Online]. Available: https://data.gov.uk/dataset/fc786717-3756-4fd1-9c7d-c082331e40e4/noise-action-planning-important-areas-round-2-england. [Accessed: 19-Nov-2019].

[27] South Somerset District Council , “South Somerset Local Plan (2006-2028),” 2015.