The Sizewell C Project

6.10 Volume 9 Rail

Chapter 4 Noise and Vibration

Revision:	1.0
Applicable Regulation:	Regulation 5(2)(a)
PINS Reference Number:	EN010012

May 2020

Planning Act 2008
Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

Contents

Tables

Plates

None Provided.

Figures

Appendices

4. Noise and Vibration

4.1 Introduction

4.1.1 This chapter of **Volume 9** of the Environmental Statement (ES) presents an assessment of the potential noise and vibration effects likely to arise from the construction and operation of proposals relating to rail.

4.1.2 The proposals considered in this volume are as follows:

- The part of the green rail route comprising a temporary rail extension of approximately 1.8 km in length from a junction with the existing Saxmundham to Leiston branch line to the proposed B1122 (Abbey Road) level crossing inclusive (henceforth referred to as the 'proposed rail extension route')) as shown on **Figure 2.1**; and
- The permanent upgrades to the Saxmundham to Leiston branch line (including track replacement and level crossing upgrades) (henceforth referred to as the 'proposed rail improvement works') as shown in **Figure 2.11**.

4.1.3 The proposed green rail route in its entirety comprises of a temporary rail extension of approximately 4.5km from the existing Saxmundham to Leiston branch line to a terminal within the main development site. The part of the green rail route between the proposed B1122 (Abbey Road) level crossing and the terminal within the main development site is detailed in **Volume 2, Chapters 1** to **4** and assessed in **Volume 2 Chapter 11**.

4.1.4 Once the construction of Sizewell C is complete, the proposed rail extension route would be removed and the land reinstated, however the other rail improvement works would be permanent.

4.1.5 Detailed descriptions of the proposed development sites (referred to throughout this volume as the 'site' as relevant to the location of the works), the proposed development and different construction, operation, and removal and reinstatement phases are provided in **Chapter 2** of this volume of this ES. A glossary of terms and list of abbreviations used in this chapter is provided in **Volume 1, Appendix 1A**.

4.1.6 This assessment has been informed by data presented in the following technical appendices:

- **Appendix 4A:** Rail construction assumptions; and
- **Appendix 4B**: Operational rail noise assessment.

4.2 Legislation, policy and guidance

4.2.1 **Volume 1, Appendix 6G** identifies and describes legislation, policy and guidance of relevance to the assessment of the potential noise and vibration impacts associated with the Sizewell C Project across all ES volumes.

4.2.2 This section provides an overview of the specific legislation, policy and guidance of relevance to the assessment of the proposed development.

a) International

4.2.3 There is no international legislation and policy that is relevant to the noise and vibration assessment of the proposed development.

4.2.4 The Overarching National Policy Statement for Energy (NPS EN-1) (Ref. 4.1), and the National Policy Statement for Nuclear Power Generation (NPS EN-6) (Ref. 4.2) include requirements that are relevant to the noise and vibration assessment. A summary of the relevant NPS EN-1 and NPS EN-6 requirements, together with consideration of how these requirements have been taken into account are discussed in detail in **Volume 1, Appendix 6G**.

4.2.5 Part III of the Control of Pollution Act 1974 (Ref. 4.3) gives local authorities powers to control noise from construction sites, and enable developers to apply for prior consent for construction works. Section 72 of that Act defines what is meant by "best practicable means" and requires that regard be had to relevant codes of practice, one of which is British Standard BS5228 (parts 1 and 2) (Ref. 4.4 and 4.5).

4.2.6 Other relevant policy, as described in **Volume 1, Appendix 6G**, comprise:

- National Planning Policy Framework (NPPF) 2019 (Ref. 4.6).
- Planning Practice Guidance (PPG) 2019 (Ref. 4.7).
- Noise Policy Statement for England (NPSE) 2010 (Ref. 4.8).
- Government's 25 Year Environment Plan 2019 (Ref. 4.9).

b) Regional

4.2.7 No regional policy is deemed relevant to the assessment for this site.

c) Local

4.2.8 Local policy relating to noise and vibration assessment is found in:

- Suffolk Coastal District Council Local Plan Core Strategy and Development Management Polices (2013) (Ref. 4.10); and
- Suffolk Coastal District Council Final Draft Local Plan (2013) (Ref. 4.11).

4.2.9 The requirements of these, as relevant to the noise and vibration assessment, are set out in **Volume 1**, **Appendix 6G**.

d) Guidance

4.2.10 In addition to these policy requirements, this assessment has been undertaken in accordance with the following guidance documents:

- World Health Organisation Regional Office for Europe Environmental Noise Guidelines for the European Region 2018 (Ref. 4.12)
- Calculation of Rail Noise (CRN) (Ref. 4.13);
- British Standard BS 6472-1: 2008 Guide to evaluation of human exposure to vibration in buildings Part 1: Vibration sources other than blasting (Ref 4.14)
- British Standard BS 8233:2014 – Guidance on sound insulation and noise reduction for buildings (Ref. 4.15);
- Association of Noise Consultants (ANC) Measurement and assessment of groundborne noise and vibration 2012 (Ref. 4.16)
- British Standard BS 7385-2: 1993 Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from groundborne vibration (Ref 4.17)
- British Standard BS 5228-1 Noise: 2009+A1: 2014 – Code of Practice for noise and vibration control at open construction sites – Noise (Ref. 4.4); and
- British Standard BS 5228-2 Vibration: 2009+A1: 2014 – Code of Practice for noise and vibration control at open construction sites – Vibration (Ref. 4.5).

4.2.11 Further details on this guidance, as relevant to the noise and vibration assessment for the proposed development is contained in **Volume 1**, **Appendix 6G**.

4.3 Methodology

a) Scope of the assessment

4.3.1 The generic EIA methodology is detailed in **Volume 1**, **Chapter 6**.

4.3.2 The full method of assessment for noise and vibration that has been applied for the Sizewell C Project is included in **Volume 1**, **Appendix 6G**.

4.3.3 This section provides specific details of the noise and vibration methodology applied to the assessment of the proposed development and a summary of the general approach to provide appropriate context for the assessment that follows. The scope of the assessment considers the impacts of the construction, operation, and, where relevant, the removal and reinstatement phases of the proposed development.

4.3.4 A screening exercise, as detailed below, has been undertaken for the upgrades on the level crossings on the Leiston to Saxmundham branch line. Where the works are considered to have potential likely significant effects, these have been assessed. The screening exercise considered the impacts of the upgrade works and operational use of the Saxmundham to Leiston branch line.

4.3.5 The scope of this assessment has been established through a formal EIA scoping process undertaken with the Planning Inspectorate. A request for an EIA Scoping Opinion was initially issued to the Planning Inspectorate in 2014, with an updated request issued in 2019 (**Volume 1, Appendix 6A**).

4.3.6 Comments raised in the EIA Scoping Opinion received in 2014 and 2019 have been taken into account in the development of the assessment methodology. These are detailed in **Volume 1**, **Appendices 6A** to **6C**.

b) Consultation

4.3.7 The scope of the assessment has also been informed by ongoing consultation and engagement with statutory consultees throughout the design and assessment process. Details of the consultation process are provided in Volume 1, Appendix 6G.

4.3.8 The following matters have been developed in consultation with the local authorities:

- Assessment criteria;
- Noise source data; and

- Assessment approach (both noise and vibration).

c) Environmental Screening

4.3.9 The proposed development has the potential to result in environmental effects which could be significant and therefore these works have been considered in the environmental assessment.

4.3.10 An environmental screening exercise was undertaken to identify which of the level crossing upgrade works on the Saxmundham to Leiston branch line may give rise to environmental effects that could potentially be significant. This concluded that four level crossing upgrade works should be taken forward to the assessment of likely effects on noise.

4.3.11 The remaining four level crossing upgrade works have been screened out of the noise and vibration assessment as they are not likely to give rise to significant environmental effects.

4.3.12 **Table 4.1** provides a summary of the environmental screening exercise.

Table 4.1: Summary of environmental screening exercise

Proposed Level Crossing Improvement	Summary of potential effects	Screened in or out of the assessment
Bratts Black House	The works to install a Miniature Stop Light (MSL) would involve no significant noise or vibration sources	Screened out.
Knodishall	Working methods have the potential to produce some short duration high noise levels at the closest noise sensitive premises	Screened in – construction phase noise only.
West House	Working methods have the potential to produce some short duration high noise levels at the closest noise sensitive premises	Screened in – construction phase noise only.
Snowdens	The works to create a MSL would involve no significant noise or vibration sources	Screened out.
Saxmundham Road	Working methods have the potential to produce some short duration high noise levels at the closest noise sensitive premises	Screened in – construction phase noise only.
Buckles Wood	The works to create a MSL would involve no significant noise or vibration sources	Screened out.
Summerhill	The works to create a MSL would involve no significant noise or vibration sources	Screened out.

Proposed Level Crossing Improvement	Summary of potential effects	Screened in or out of the assessment
Leiston	Working methods have the potential to produce some short duration high noise levels at the closest noise sensitive premises	Screened in – construction phase noise only.
All crossings	Operational phase noise	Potential for audible warning alarms to result in a significant adverse effect. Screened in.

d) Study area

4.3.13 Noise and vibration effects have been considered for receptors within 300m of the line upgrade or construction works and results reported for those which would experience levels above a negligible effect.

4.3.14 Noise and vibration effects have been considered for receptors 300m of the operational rail line and results reported for those which would experience levels above a negligible effect.

e) Assessment scenarios

4.3.15 The assessment has considered noise and vibration arising from the following scenarios:

- construction of proposed development (rail extension route, branch line upgrade and level crossing upgrades); and
- removal and reinstatement phase of the proposed rail extension route.

4.3.16 The assessment has also considered noise, vibration and groundborne noise from:

- operation of the proposed development (including the Saxmundham to Leiston branch line in the early years and the branch line and rail extension route in later years); and
- additional freight trains using the East Suffolk line.

f) Assessment criteria

4.3.17 As described in **Volume 1**, **Chapter 6**, the EIA methodology considers whether impacts of the proposed development would have an effect on any resources or receptors. Assessments broadly consider the magnitude of impacts and value/sensitivity of resources/receptors that could be affected in order to classify effects.

4.3.18 The effect of noise and vibration on a receptor or community is dependent on the magnitude of the impact, the sensitivity of the receptor, and may also depend on other factors such as the existing acoustic environment.

4.3.19 A detailed description of the assessment methodology used to assess the potential effects on noise and vibration arising from the proposed development is provided in **Volume 1, Appendix 6G**.

4.3.20 A summary of the assessment criteria used in this assessment is presented in the following sub-sections.

i. Sensitivity

4.3.21 The criteria used in noise and vibration assessment for determining the sensitivity of receptors are set out in **Table 4.2**.

Table 4.2: Assessment of the value or sensitivity of receptors for noise and vibration

Sensitivity	Description
High	Receptors that are highly sensitive to noise or vibration such as theatres, auditoria, recording studios, concert halls and highly vibration sensitive structures or uses such as certain laboratories medical facilities or industrial processes.
Medium	Noise and vibration sensitive receptors such as permanent residential buildings, hospitals and other buildings in health/community use, buildings in educational use, hotels and hostels.
Low	Receptors with limited sensitivity to noise and vibration such as offices, libraries buildings in religious use, and other workplaces with a degree of sensitivity due to the need to concentrate.
Very Low	Receptors of very low sensitivity to noise and vibration such as industrial or commercial buildings and transient or mobile receptors.

4.3.22 There is one receptor that would fall into the 'high sensitivity' category for noise impacts, which is the Pro Corda Music School at Leiston Abbey. Specifically, the school runs courses for children with special educational needs and disabilities, including residential courses. In addition, Pro Corda host festivals, music courses, theatre workshops and concerts at Leiston Abbey. SZC Co. is committed to further liaison with Pro Corda to take account of their specific needs relating to noise impacts and any required mitigation.

4.3.23 Other than Pro Corda Music School at Leiston Abbey, the majority of receptors that are considered in this chapter are considered to be of 'medium sensitivity'.

ii. Magnitude

Construction noise and vibration

4.3.24 The approach taken to evaluate noise effects for all construction work associated with the project on occupiers of dwellings and other permanent residential accommodation is that outlined in Part 1 of BS 5228. This recommends that, for dwellings, significant effects may occur when the site noise level, rounded to the nearest decibel, exceeds the value listed in **Table 4.3**. The table is used as follows: for the appropriate period (daytime, evening, night-time, weekends), the pre-construction ambient noise level is determined and rounded to the nearest 5 dB. This rounded value is compared to the Category A criteria in **Table 4.3** and depending on whether the rounded values are below, equal to, or above the Category A values, the Category A, B or C criteria will apply to the construction works as an indicator of significant effects. Further detail is provided in **Volume 1 Appendix 6G**.

Table 4.3: Thresholds of potential significant construction effects at dwellings, from Part 1 of BS 5228.

Period	Assessment Category		
	A	B	C
Day: Weekdays, 0700-1900 Saturday, 0700-1300	65 dB $L_{Aeq,T}$	70 dB $L_{Aeq,T}$	75 dB $L_{Aeq,T}$
Evenings and weekends: Weekdays 1900-2300 Saturdays 1300-2300 Sundays 0700 - 2300	55 dB $L_{Aeq,T}$	60 dB $L_{Aeq,T}$	65 dB $L_{Aeq,T}$
Every day 2300 - 0700	45 dB $L_{Aeq,T}$	50 dB $L_{Aeq,T}$	55 dB $L_{Aeq,T}$

Notes:

Assessment Category A: impact criteria to use when baseline ambient sound levels (rounded to the nearest 5 dB) are less than these values;

Assessment Category B: impact criteria to use when baseline ambient sound levels (rounded to the nearest 5 dB) are the same as category A values; and

Assessment Category C: impact criteria to use when baseline ambient sound levels (rounded to the nearest 5 dB) are higher than category A values.

If the ambient sound level exceeds the Assessment Category C threshold values given in the table (i.e. the ambient sound level is higher than the above values), then an impact is deemed to occur if the total LAeq,T sound level for the period increases by more than 3 dB due to construction activity.

4.3.25 A significant effect is deemed to occur where the relevant criteria is exceeded for the following periods of time:

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

4.3.26 Where an assessment conclusion identifies a significant effect, it is on the basis that the effect is assumed to meet both the noise level criteria and the duration criteria, unless otherwise stated. Where there is uncertainty as to whether the duration criteria will be met, a precautionary approach has been adopted and it is assumed that the works will continue for a sufficient period to meet the duration criteria.

4.3.27 The values to be used to assess the magnitude of impact for construction are as shown in **Table 4.4**.

Table 4.4: Values to be used to assess the magnitude of noise impact for construction work

Sensitivity of receptor	Period	Magnitude of impact				Parameter
		Very low	Low	Medium	High	
High	Any	Bespoke assessment method to be used				
Medium and low	Day	Below baseline values	Baseline noise levels	ABC(1) (2)	ABC(1) (2) + 10	$L_{Aeq, 12h}$, dB
	Evening					$L_{Aeq, 4h}$, dB
	Night					$L_{Aeq, 8h}$, dB
Very low	Any	Bespoke assessment method to be used				

Notes:

(1) ABC indicates the significance threshold from Table 4.3 above, based on the "ABC method" from BS 5228-1

(2) Where levels are predicted as free field values, the ABC criteria are reduced by 3dB, to account for the difference between free field and façade levels

4.3.28 For the assessment of magnitude of construction vibration, **Table 4.5** will be used.

Table 4.5: Values to assess the magnitude of vibration impact from all construction sources (day or night)

Sensitivity of receptor	Magnitude of impact				Parameter
	Very low	Low	Medium	High	
High	Bespoke assessment method to be used				
Medium and low	<0.3	0.3	1	>10	PPV mm/s
Very low	No assessment normally required				

4.3.29 Construction vibration will be considered significant if the magnitude of impact is medium or high at a low or medium sensitive receptor, and occurs for a duration exceeding:

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

4.3.30 As with the assessment of construction noise, where an assessment conclusion identifies a significant effect, it is on the basis that the effect is assumed to meet both the vibration level criteria and the duration criteria, unless otherwise stated. Where there is uncertainty as to whether the duration criteria will be met, a precautionary approach has been adopted and it is assumed that the works will continue for a sufficient period to meet the duration criteria.

Operational noise and vibration

4.3.31 For the assessment of railway noise, the magnitude of noise levels will be considered against the criteria in **Table 4.6** for medium and low sensitivity receptors.

4.3.32 Where the resultant noise level from a change is below a threshold at which an adverse effect might begin to occur, the effect would be negligible, so the values in **Table 4.6** only apply where the resultant "with development" levels are above this threshold.

4.3.33 It may be appropriate to adopt the same categories for high sensitivity receptors, however these should be judged on a case-by-case basis.

Table 4.6: Impact scale for comparison of future railway noise against existing railway noise.

Change in Noise Level dB(A)	Subjective Response	Magnitude of Impact
0	Not present	No change*
0.1 to 0.9	Unlikely to be noticeable	Very low*
1.0 to 2.9	Present but unlikely to be intrusive	Low*
3.0 to 9.9	Present and potentially intrusive, particularly at higher end of scale	Medium*
10.0+	Present and disruptive	High*

*Note: *Where the resultant noise level is below a low threshold of effect (see **Table 4.7**), then the effect would be negligible, irrespective of the magnitude of change.*

4.3.34 In addition to the use of the impact scale set out in **Table 4.6** to assess the potential impact of changes in railway noise on existing lines, consideration has been given to short duration or peak event noise. At night, the L_{Amax} criteria from **Table 4.7** would apply in addition to the assessment criteria in **Table 4.6** for freight movements to and from the Sizewell C main development site on the East Suffolk line.

Table 4.7: Thresholds for magnitude of noise impact for new or altered railway lines at different sensitivities (all values are free field).

Sensitivity of receptor	Period	Magnitude of impact (1)				Parameter
		Very low	Low	Medium	High	
High	Any	Bespoke assessment method to be used				
Medium	Day	<50	50(2)	60	66	$L_{Aeq, 16h}$, dB
	Night	<40	40(2)	55	59	$L_{Aeq, 8h}$, dB
		<60	60(2)	70	77	L_{Amax}, dB
Low	Day or night	<50	55(2)	65	66	$L_{Aeq, 8h}$, dB
Very low	Any	No assessment normally required				

Notes: (1) consideration of the scale of any changes in railway noise should also be considered, where there is existing railway noise. (2) These are the values to use for the lowest threshold of effect referred to in Table 4.6 above

4.3.35 The potential impact of vibration from rail movements has been assessed against the criteria set out in **Table 4.8**, which are based on the criteria set out in BS 6472-1 and described in more detail in **Volume 1, Appendix 6G**.

Table 4.8: Magnitude of impact from railway vibration.

Sensitivity of receptor	Period(1)	Magnitude of impact				Parameter
		Very low	Low	Medium	High	
High	Bespoke assessment method to be used					
Medium	Day	≤0.2	0.2-0.4	0.4-0.8	>0.8	VDV $m/s^{1.75}$
	Night	≤0.1	0.1-0.2	0.2-0.4	>0.4	
Low	Day	≤0.4	0.4-0.8	0.8-1.6	>1.6	
	Night	Night time assessment not normally required				
Very low	Day	≤0.8	0.8-1.6	1.6-3.2	>3.2	
	Night	Night time assessment not normally required				

Note: (1) day is 0700 to 2300 hours and night is 2300 to 0700 hours.

4.3.36 The criteria set out in **Table 4.8** apply at the point of entry into the human body, i.e. within the affected properties, and where appropriate, consideration has been given to appropriate transfer functions.

4.3.37 The potential impact of groundborne noise from rail movements has been assessed against the criteria set out in **Table 4.9**, the derivation of which is set out in **Volume 1, Appendix 6G**.

Table 4.9: Magnitude of impact from groundborne noise due to railway movements (internal values).

Sensitivity of receptor	Period	Magnitude of impact				Parameter
		Very low	Low	Medium	High	
High	Bespoke assessment method to be used					
Medium	Any	<35	35	45	50	L_{ASmax}, dB
Low	Any	<35	35	45	50	
Very low	Any	Assessment not normally required				

4.3.38 **Table 4.10** shows the magnitudes of impact for receptors of different sensitivity for operational sources such as those expected at the level crossings where improvements are proposed.

Table 4.10: Magnitude of impact for receptors of different sensitivity for noise from operational level crossings (all values are free field).

Sensitivity of receptor	Period	Magnitude of impact				Parameter
		Very low	Low	Medium	High	
High	Any	Bespoke assessment method to be used				
Medium	Day	<50	50	55	60	$L_{Aeq, 16h}$, dB
	Night	<40	40	45	55	$L_{Aeq, 8h}$, dB
		<60	60	65	70	L_{Amax}, dB
Low	Day or night	<55	55	60	65	$L_{Aeq, 8h}$, dB
Very low	Any	No assessment normally required				

4.3.39 In addition to the potential effect on human receptors, consideration has been given to the potential for building damage, as a result of railway vibration. Guidance in British Standard BS5228-2 (Ref. 4.5) concerning the potential impact of vibration on buildings refers to British Standard BS7385-2 (Ref.

4.17) and this relates to both "transient" and "continuous" exposure to vibration from a variety of sources (and their related frequencies). In the case of both rail and construction generated vibration, the main frequency will be above 15Hz and thus, according to this guidance, a threshold at which minor cosmetic damage may start to occur is 20mm/s Peak Particle Velocity (PPV).

4.3.40 The meaning of continuous in this guidance relates to sources which last sufficiently long that they could lead to some resonance. Therefore, although any rail and construction generated vibration would be short-lived and intermittent, as some such vibration could cause resonance, it should be considered as continuous for the purposes of the guidance in these standards.

4.3.41 The guidance in these standards suggests that the guideline value be reduced by up to 50% if a source is continuous. Therefore, to provide a robust threshold level for the assessment of both rail and construction vibration for structures of medium or lower sensitivity, a precautionary value of 10 mm/s, PPV has been used.

iii. Classification of effects

4.3.42 Following the classification of the magnitude of the impact and the value/sensitivity of the receptor/feature, the effect is classified as shown in **Table 4.11** below. Definitions of each of the different levels of effect, which can be adverse, beneficial or neutral are shown in **Table 4.12**.

Table 4.11: Classification of effects.

		Value/Sensitivity of Receptor			
		Very Low	Low	Medium	High
Magnitude	Very low	Negligible	Negligible	Negligible	Negligible
	Low	Negligible	Minor	Minor	Moderate
	Medium	Minor	Minor	Moderate	Major
	High	Minor	Moderate	Major	Major

Table 4.12: Effect definitions

Effect	Description
Major	The noise causes a material change in behaviour attitude or other physiological response. Adverse change may result in the potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished or improved due to change in acoustic character of the area.
Moderate	Effects that may result in moderate changes in behaviour, attitude or other physiological response. Adverse effects may result in some reported sleep disturbance. Changes to the acoustic character of the area such that there is a perceived change in the quality of life.
Minor	Effects that may result in small changes in behaviour attitude or other physiological response. Adverse effects may result in some minor reported sleep disturbance. Small changes to the acoustic character of the area such that there is a low perceived change in the quality of life.
Negligible	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.

4.3.43 Following the classification of an effect as detailed in **Tables 4.11** and **4.12**, a clear statement is made as to whether the effect is 'significant' or 'not significant'. As a general rule, major and moderate effects are considered to be significant and minor and negligible effects are considered to be not significant. However, professional judgement is also applied where appropriate. In addition to considering these tables, other project-specific factors, such as the number of receptors affected and the duration and character of the impact need to be considered where these have a potential bearing on significance.

iv. Use of LOAEL and SOAEL values in the assessment

4.3.44 The NPSE, the NPSs and the PPG require the assessment of noise and vibration against the lowest observed adverse effect levels (LOAEL) and the significant observed adverse effect level (SOAEL). These will differ dependent on variables such as the level and character of the noise or vibration source, timings of when it would occur, its duration, existing sounds present and the frequency of the occurrence of the source.

4.3.45 Each different source type requires its own specific value for LOAEL and SOAEL, which depends on these factors. Each source has therefore been considered separately and levels for LOAEL and SOAEL defined for different sensitivities. The methodology for assigning significance differs from the general methodology set out in **Volume 1 Chapter 6,** as it does not allow for these variables to be properly considered. Each source has therefore been

considered separately and values for LOAEL and SOAEL defined for different sensitivities.

4.3.46 In line with the NPSE, the concept of LOAEL and SOAEL has been established for the assessment of noise and vibration generating activities associated with the proposed main development site and associated developments. **Table 4.13** sets out the generic descriptions for and actions recommended in relation to these categories.

Table 4.13: Generic effect descriptions and actions recommended.

Effect	Description	Action
Below LOAEL	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No specific measures required.
Between LOAEL and SOAEL	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Mitigate and reduce to a minimum.
Above SOAEL	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Avoid

4.3.47 Actual values for the noise and vibration sources assessed vary, dependent on the source of noise, as recommended in the various noise assessment standards and sources of guidance.

4.3.48 The descriptions and actions recommended in **Table 4.13** are based on the guidance in the NPSE and associated guidance in the PPG. This approach was discussed in meetings with the local authorities between 2015 and 2019.

4.3.49 For construction noise, the LOAEL is considered to be equal to the existing baseline ambient level. SOAEL values are shown in **Table 4.14**.

Table 4.14: SOAEL values from noise from all construction work (all values are façade levels).

Day	Time (hours)	Averaging Period T	Significant Observed Adverse Effect Level $L_{Aeq,T}$ (dB)
Mondays to Fridays	0700 – 0800	1 hour	70
	0800 – 1800	10 hours	75
	1800 – 1900	1 hour	70
	1900 – 2300	4 hours	65
Saturdays	0700 – 0800	1 hour	70
	0800 – 1300	5 hours	75
	1300 – 1400	1 hour	70
	1400 - 2300	1 hour	65
Sundays & Public Holiday	0700 – 2300	1 hour	65
Any night	2300 – 0700	1 hour	55

Note: (1) Duration of exceedance must occur for 10 or more days or nights in any 15 consecutive days or nights; or for a total number of days exceeding 40 days or nights in any 6 consecutive months.

4.3.50 **Table 4.15** sets outs the LOAEL and SOAEL values adopted for construction vibration and the derivation of these values are detailed in **Volume 1 Appendix 6G** and **Annex 6G.1.**

Table 4.15: LOAEL and SOAEL values for construction vibration (all construction sources) for human receptors.

LOAEL	SOAEL	Parameter
0.3	10.0	PPV mm/s

4.3.51 The LOAEL and SOAEL values for railway noise are set out in **Table 4.16** and the derivation of these values is detailed in **Volume 1 Appendix 6G** and **Annex 6G.1.**

Table 4.16: LOAEL and SOAEL values for railway noise (all free-field values).

Time Period	LOAEL	SOAEL
Day (07:00-23:00)	50dB $L_{Aeq,16hr}$	66dB $L_{Aeq,16hr}$
Night (23:00-07:00)	40dB $L_{Aeq,8hr}$	59dB $L_{Aeq,8hr}$
	60dB L_{Amax}	77dB L_{Amax}

4.3.52 The LOAEL and SOAEL values for railway vibration are set out in **Table 4.17** and the derivation of these values is detailed in **Volume 1 Appendix 6G** and **Annex 6G.1.**

Table 4.17: LOAEL and SOAEL values (internal) for groundborne vibration from rail movements on the green rail route and refurbished branch line and East Suffolk line at night.

Receptor sensitivity	Period	LOAEL	SOAEL	Parameter
High	Would require site specific criteria.			VDV, $m/s^{1.75}$
Medium	Day (07:00 to 23:00 hours).	0.2	0.8	
	Night (23:00 to 07:00 hours).	0.1	0.4	
Low	Day (07:00 to 23:00 hours).	0.4	1.6	
Very low	Day (07:00 to 23:00 hours).	0.8	3.2	

4.3.53 The criteria set out in **Table 4.17** apply at the point of entry into the human body, i.e. within the affected properties.

4.3.54 The LOAEL and SOAEL values for groundborne noise from the railway are set out in **Table 4.18** and the derivation of these values are detailed in **Volume 1 Appendix 6G** and **Annex 6G.1.** Receptors with high sensitivity would need a bespoke assessment, taking account of specific sensitivities and local circumstances.

Table 4.18: LOAEL and SOAEL values (internal) for groundborne noise from rail movements on the green rail route and refurbished branch line and East Suffolk line at night.

Receptor type	Period	LOAEL	SOAEL	Parameter
Medium	At any time during occupation / use	35	50	L_{ASmax}, dB
Low		35	50	

4.3.55 **Table 4.19** sets outs the LOAEL and SOAEL values for the operation of improved level crossings and the derivation of these values are detailed in **Volume 1 Appendix 6G** and **Annex 6G.1.**

Table 4.19: LOAEL and SOAEL values for noise from operational level crossings (free-field values).

Time Period	LOAEL	SOAEL
Day (07:00-23:00)	50dB $L_{Aeq, 16h}$	60dB $L_{Aeq, 16h}$
Night (23:00-07:00)	40dB $L_{night, outside}$	55dB $L_{Aeq, 8h}$
	60dB, L_{Amax}	70dB, L_{Amax}

g) Assessment methodology

i. Baseline Surveys

4.3.56 Baseline noise was determined by monitoring to determine levels and character of sounds present.

4.3.57 Since it was often not possible to survey at the exact locations of all receptors, measurements taken in nearby locations with similar sound levels and characters were used and, where there was a single dominant sound (road traffic noise), this was measured close to the road and estimates made of levels at nearby receptors by correcting for their distance from the road.

ii. Construction Assessment

4.3.58 Various construction activities have been considered for the construction and removal and reinstatement phase, and the noise impacts then assessed at each of the noise sensitive receptors.

4.3.59 Each different construction works (branch line upgrading, new rail construction and construction of crossings) has been broken into phases of work and noise levels calculated and report at nearby receptors for each phase. Where there is the potential for two sets of works to be carried out simultaneously, the combined noise level from both sets of works has been considered.

4.3.60 Calculations have been carried out to predict noise levels for the periods of interest during busy periods within each phase of work at each receptor.

iii. Operational Assessment

4.3.61 Noise and vibration from train movements has been predicted by modelling using 3D noise modelling software incorporating the calculation method described in CRN (Ref. 4.13). Both L_{Aeq} and L_{Amax} levels have been predicted for all movements resulting from the construction of Sizewell C power station between the point where the Felixstowe branch separates from the East Suffolk line to the east of Westerfield and the site. No analysis has been carried out beyond the Westerfield junction, as that part of the line (and beyond) already has regular night time freight train movements and so the proposed additional trains would not result in a change to noise effects.

4.3.62 The potential for adverse impacts from the operational use of the improved level crossings has been considered. It is likely that the L_{Amax} levels will be the most important consideration, particularly at night, due to the relatively low number of train movements.

h) Assumptions and limitations

4.3.63 The following assumptions have been made in this assessment:

- Construction methodology for the rail extension route would be as set out in **Appendix 4A**;
- All new and replacement track would be continuously welded rail to reduce rail noise; and
- Trains have been assumed (when modelling the L_{Aeq} values) to be pulling HTA 4x Axle Hopper wagons.

4.3.64 All other assumptions concerning the mode of operation of the branch line, the green rail route and the East Suffolk line are described in **Appendix 4B**.

4.3.65 The following limitation has been identified:

- Sound energy produced as a result of excitation of the structure of the metal bridge over Valley Road has not been considered.

4.4 Baseline environment

4.4.1 This section presents a description of the baseline environmental characteristics within the site and in the surrounding area.

a) Current baseline

4.4.2 Baseline noise levels have been measured at a number of locations. Further detail can be found in **Volume 1, Chapter 11, Appendix 11A**. These locations were chosen to provide representative levels at nearby noise sensitive receptors. **Figure 4.1** shows the locations of noise and vibration receptors (and groups of receptors) considered within this chapter

4.4.3 Noise survey locations which provide baseline data for areas which have the potential to be affected by noise associated with the construction, operation and removal and reinstatement (where relevant) of the proposed development are identified in **Table 4.20**, along with a summary of the levels measured. Summaries of each baseline measurement position, along with plans identifying the locations; photo of the sites and a summary graph of the measurement results are provided in **Volume 2, Chapter 11, Appendix 11A**.

Table 4.20: Summary of baseline noise survey data

Location code	Location name	Typical day time level, dB		Typical night time level, dB	
		L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}
Hill Farm	MS11	45	37	33	25
Leiston Abbey (rear)	MS12	42	38	30	27
Old Abbey Farm Lodge	MS13	71	42	50	28
Abbey Cottage	MS14	56	41	40	30
Old Abbey Care Home	MS15	47	43	34	30
Cakes and Ale Caravan Site	MS18	50	42	40	33
Leiston North	MS19	70	40	60	30
The Gatehouse, Saxmundham Road	MS21	70	40	50	30
Leiston Station	MS22	65	45	45	30
Leiston Centre	MS23	47	40	40	30

Location code	Location name	Typical day time level, dB		Typical night time level, dB	
		L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}
Valley Road, Leiston	MS24	45	40	35	28
Leiston Rail Crossing, King George's Avenue	MS29	65	45	50	35
Crown Lodge	MS30	60	45	45	30
Leiston West	MS33	45	38	33	30
Leiston Abbey Courtyard	MS38	43	35	30	26
Leiston Abbey Residential Block	MS39	45	37	35	26
Cakes and Ale Entrance	MS40	53	36	40	26
Sizewell Gap	MS41	54	45	45	40
Halfway Cottages (Sizewell Gap Road)	MS42	53	45	40	35
Heath View, Eastern end	MS45	46	40	40	35
Heath View, Southern end	MS46	42	37	30	28
Little Bealings	RR1	47	38	40	30
Martlesham Creek	RR2	48	40	40	35
Woodbridge, Deben Road	RR3	50	40	40	33
Bromeswell	RR4	57	40	45	37
Campsea Ashe	RR5	50	38	40	30
Benhall	RR6	47	40	47	30
Saxmundham, Alma Place	RR7	58	44	45	30
Clay Hills	RR8	50	38	40	31
Melton	RR9	51	47	48	41

4.4.4 Vibration baseline surveys were carried out at three locations as shown in **Volume 2, Chapter 11, Appendix 11A**. Data for all sites is also presented in the appendix.

4.4.5 Vibration data at all sites was very low, with the highest Vibration Dose Value (VDV) reading in any axis being 0.10m/s$^{1.75}$ during the day and 0.05m/s$^{1.75}$ at night.

4.4.6 Using the values in **Table 4.20**, representative baseline ambient levels can be estimated at each receptor considered either by using values measured close to that receptor; by considering typical levels in the area or by correcting for distance, where a premises is set back from a road and the measurement was taken close to a road and road traffic noise was dominant. Representative daytime ambient levels are shown in **Table 4.21**.

Table 4.21: Representative ambient day time noise levels at each receptor or receptor group

Receptor number	Receptor / receptor group name	Representative ambient day time level, $L_{Aeq,t}$ dB	Rationale
1	Aldhurst Farm Cottage	53	As measured at MS40
2	Buckleswood House	53	As measured at MS40
3	105 Abbey Road	53	Measured at MS19 and corrected for distance
4	99 Abbey Road	58	Measured at MS19 and corrected for distance
5	Leiston House Farm	45	Typical level measured in area (MS33)
6	Fisher's Farm	45	As measured at MS11
7	Leiston Abbey residential accommodation	45	As measured at MS39
8	Old Abbey Farm/care house	47	As measured at MS15

Receptor number	Receptor / receptor group name	Representative ambient day time level, $L_{Aeq,t}$ dB	Rationale
9	Harling Way / BuckleswoodBuckleswood Road	45	As measured at MS33
10	Clayhills Road	51	As measured at RR8
11	Cottage Farm	45	Typical level measured in area (MS33)
12	Kelsale Covert	51	As measured at RR8
13	Westhouse Crossing Cottage	45	Typical level measured in area (MS33)
14	Crossing Cottages	45	Typical level measured in area (MS33)
15	Crossing East	65	Measured at MS21 and corrected for distance
16	Westward House	47	As measured at MS23
17	Carr Avenue	47	As measured at MS23
18	Valley Terrace	45	As measured at MS24

b) Future baseline

4.4.7 The following developments are proposed in the vicinity of the rail line:

- 187 new dwellings at Johnsons Farm, Saxmundham Road, Leiston (application reference DC/16/1961/OUT).
- 77 new dwellings on land to the rear of St Margarets Crescent, Leiston (application reference DC/16/2104/OUT).
- 6 new flats and land at Colonial House, Station Road, Leiston (application reference DC/17/3773/FUL).

- 2 new dwellings at 2 Abbey Road, Leiston (application reference DC/16/5035/OUT).
- 100 new dwellings, employment (B1) use and public-house (A3/A4) use on land east of Abbey Road, Leiston (application reference DC/16/1322/OUT).
- 15 new dwellings at the Former Leiston & District Constitutional Club, Leiston. (application reference: DC/19/2040/FUL).
- 7 new dwellings at The Mill, 22 Carr Avenue, Leiston (application reference DC/17/4645/OUT).
- 18 new dwellings on land west of Mill Cottage, Leiston (application reference DC/16/0931/FUL).
- 20 new dwellings at Gas Works, Carr Avenue, Leiston. (application reference DC/16/0527/OUT).

4.4.8 The committed developments at Johnsons Farm and St Margarets Crescent are in close proximity to an existing receptor group 9: Harling Way / Buckleswood Road and the baseline conditions presented receptor 9 are considered representative for these potential future receptors.

4.4.9 The committed developments at Colonial House, 2 Abbey Road, The Mill, 22 Carr Avenue, and Mill Cottage, are in close proximity to an existing receptor group 17: Carr Avenue and the baseline conditions presented for receptor 17 are considered representative for these potential future receptors.

4.4.10 The committed development at Gas Works, Carr Avenue is in close proximity to an existing receptor group 18: Valley Terrace and the baseline conditions presented for receptor 18 are considered representative for these potential future receptors.

4.4.11 The committed developments at land east of Abbey Road, Leiston and the Former Leiston & District Constitutional Club are further from the rail line than any of the receptor considered and are in areas which would experience a negligible effect noise and vibration arising from the construction and operation of the rail line. Future baseline at these developments would not be altered by the proposed upgrade and use of the rail line and neither would these developments affect the baseline at any of the receptors at which rail noise or vibration is assessed as above a negligible effect.

4.4.12 There are no other committed development(s) or forecast changes that would materially alter the baseline conditions during the construction and operation phases of the proposed rail route.

4.5 Environmental design and mitigation

4.5.1 As detailed in **Volume 1**, **Chapter 6**, a number of primary mitigation measures have been identified through the iterative EIA process and have been incorporated into the design and construction planning of the proposed green rail route. Tertiary mitigation measures are legal requirements or are standard practices that would be implemented as part of the proposed development.

4.5.2 The assessment of likely significant effects of the proposed development assumes that primary and tertiary mitigation measures are in place. For noise and vibration, these measures are identified in this section, with a summary provided on how the measures contribute to the mitigation and management of potentially significant environmental effects.

a) Primary mitigation

4.5.3 Primary mitigation is often referred to as 'embedded mitigation' and includes modifications to the location or design to mitigate impacts, these measures become an inherent part of the proposed development. Primary mitigation measures include:

- There would be no train movements through Leiston at night east of Saxmundham Road Level Crossing the early years prior to operation of the full green rail route;
- the upgraded Saxmundham to Leiston branch line track would be continuously welded rail which would reduce noise generation; and
- speed limit restrictions are proposed for freight trains using this line as a result of the construction of Sizewell C nuclear power station at night on parts of the East Suffolk line. In general, the maximum speed along the line would be limited to 20mph, however, in three locations: Woodbridge and Melton, Campsea Ashe and Saxmundham, trains would be required to travel no faster than 10mph. Locations of these speed limits are shown in **Figures 4.2**, **4.3** and **4.4**.

b) Tertiary mitigation

4.5.4 Tertiary mitigation will be required regardless of any EIA assessment, as it is imposed, for example, as a result of legislative requirements and/or standard sectoral practices.

4.5.5 The standard of good practice outlined in BS 5228-1 (Ref. 8) would be followed, as set out in the **Code of Construction Practice** (**CoCP**). Tertiary mitigation for the control of noise and vibration would include, but may not be restricted to the following measures:

- selection of quiet plant and techniques in accordance with good practice in BS5228-1 for all construction, demolition and earthwork activities;
- switching off equipment when not required;
- use of reversing alarms that ensure proper warning whilst minimising noise impacts off-site; and
- provision of training and instruction to construction site staff on methods and techniques of working to minimise off-site noise and vibration impacts.

4.5.6 BS 5228-2 gives detailed advice on standard good practice for minimising impacts from construction vibration. The key requirements of BS5228-2 are set out in the **CoCP** (Doc Ref. 8.11).

c) Other Mitigation

4.5.7 A **Noise Mitigation Scheme (Volume 2 Appendix 11H**) is proposed as part of the DCO Section 106 obligations, so that noise insulation or temporary rehousing may be provided where specified noise criteria are exceeded.

4.5.8 NPS EN-1 indicates that noise insulation is a valid form of mitigation, as part of a package of noise mitigation measures, stating at paragraph 5.11.13:

> *"In certain situations, and only when all other forms of noise mitigation have been exhausted, it may be appropriate for the IPC to consider requiring noise mitigation through improved sound insulation to dwellings."*

4.5.9 Similarly, paragraph 010 of the PPG for noise refers to the use if insulation when seeking to address noise impacts:

> *"In general, for developments that are likely to generate noise, there are 4 broad types of mitigation:*
>
> - *engineering: reducing the noise generated at source and/or containing the noise generated;*
> - *layout: where possible, optimising the distance between the source and noise-sensitive receptors and/or incorporating good design to minimise noise*

transmission through the use of screening by natural or purpose built barriers, or other buildings;

- *using planning conditions/obligations to restrict activities allowed on the site at certain times and/or specifying permissible noise levels differentiating as appropriate between different times of day, such as evenings and late at night, and;*
- *mitigating the impact on areas likely to be affected by noise including through noise insulation when the impact is on a building*." (emphasis added)

4.5.10 Offering temporary rehousing where short term construction noise is forecast to exceed specified levels is also commonly regarded as best practice for projects involving significant construction activity.

d) Monitoring

4.5.11 Routine monitoring would be carried out during construction in accordance with the **CoCP** (Doc Ref. 8.11) and EDF Energy would have a system for the receipt and recording of any noise or vibration complaints from occupiers of noise sensitive receptors, and procedures for investigating and acting appropriately as necessary upon those complaints.

4.6 Assessment

a) Introduction

4.6.1 This section presents the findings of the noise and vibration assessment for the construction, operation and the removal and reinstatement of the proposed development.

4.6.2 This section identifies any potentially significant effects that are predicted to occur and **section 4.7** identifies any secondary mitigation and monitoring measures that are required to minimise any adverse significant effects.

4.6.3 The assessment has considered the following activities as follows:

- Construction noise
  - Rail extension route
  - Abbey Road level crossing
  - Buckleswood Road level crossing
  - Saxmundham to Leiston branch line upgrades

  - Saxmundham to Leiston branch line level crossing upgrades
- Construction vibration
  - Saxmundham to Leiston branch line upgrade works
  - Rail extension route
- Operational noise
  - Rail extension route and Saxmundham to Leiston branch line
    - Early years
    - Later years
  - East Suffolk line between Westerfield junction and Saxmundham junction
- Operational vibration and groundborne noise
  - Rail extension route and Saxmundham to Leiston branch line upgrades.
    - Early years
    - Later years
  - East Suffolk line between Westerfield junction and Saxmundham junction
- Noise from removal and re-instatement
  - Rail extension route

b) Construction

4.6.4 A description of the construction methods is provided in **Chapter 2** of this volume. Associated environmental control measures are detailed in the **CoCP** and are summarised in **section 4.5** above.

4.6.5 For the purpose of this assessment, construction site working hours are considered as Monday to Saturday between 07:00 to 19:00 hours (with fixed and mobile plant items operating between 08:00 and 18:00 hours only).

c) Construction noise

i. Rail extension route

4.6.6 The assumptions about plant, working methods and how these construction works have been modelled are shown in detail in **Appendix 4A.**

4.6.7 The construction phases for the rail extension route have been broken down into the following phases:

- Earthworks (including track profile and bunding);
- Laying out of continuously welded rail (CWR);
- Installation of track; and
- Ballasting, tamping and stabilisation.

4.6.8 Locations identified as potentially being affected by noise from rail extension route construction works are listed in **Table 4.22**, along with predicted noise levels from construction activities for each phase of work when activities are taking place at their closest point to the receptors. All receptors are taken to be medium sensitivity. Details of these calculations, the assumptions which support them and the analysis of results are in **Appendix 4A**.

Table 4.22: Summary of predicted rail extension route construction noise levels when construction activities are closest to each receptor (free field values).

Receptor Reference	Predicted Sound Level $L_{Aeq,day}$ dB			
	Earthworks	Laying of CWR	Installation of track	Ballasting and tamping
Aldhurst Farm Cottage	53	52	54	49
Buckleswood House	48	43	45	41
105 Abbey Road	54	53	55	50
99 Abbey Road	53	47	49	45
Leiston House Farm	48	43	45	39
Fisher's Farm	50	48	50	45
Leiston Abbey residential	51	44	47	42

Receptor Reference	Predicted Sound Level $L_{Aeq,day}$ dB			
	Earthworks	Laying of CWR	Installation of track	Ballasting and tamping
Old Abbey Farm / Old Abbey Care Home	47	36	39	34
Harling Way / Buckleswood Road	51	48	50	46

4.6.9 **Table 4.23** shows the effects of these levels at each receptor during each phase, based on each receptor being of medium sensitivity.

Table 4.23: Summary of predicted rail extension route construction noise levels when construction activities are closest to each receptor.

Receptor Reference	Effect of predicted noise level			
	Earthworks	Laying of CWR	Installation of track	Ballasting and tamping
Monday to Friday 07:00 to 19:00 hours and Saturday 07:00 to 13:00 hours				
Aldhurst Farm Cottage	Minor, **not significant**	Negligible	Minor adverse, **not significant**	Negligible
Buckleswood House	Negligible	Negligible	Negligible	Negligible
105 Abbey Road	Minor adverse, **not significant**	Minor adverse, **not significant**	Minor adverse, **not significant**	Negligible
99 Abbey Road	Negligible	Negligible	Negligible	Negligible
Leiston House Farm	Minor adverse, **not significant**	Negligible	Minor adverse, **not significant**	Negligible
Fisher's Farm	Minor adverse, **not significant**	Minor adverse, **not significant**	Minor adverse, **not significant**	Minor adverse, **not significant**
Leiston Abbey residential	Minor adverse, **not significant**	Negligible	Minor adverse, **not significant**	Negligible
Old Abbey Farm / Old Abbey Care Home	Minor adverse, **not significant**	Negligible	Negligible	Negligible
Harling Way / Buckleswood Road	Minor adverse, **not significant**	Minor adverse, **not significant**	Minor adverse, **not significant**	Minor adverse, **not significant**

Receptor Reference	Effect of predicted noise level			
	Earthworks	Laying of CWR	Installation of track	Ballasting and tamping
Saturday 13:00 to 19:00 hours				
Aldhurst Farm Cottage	Minor adverse, **not significant**	Negligible	Minor adverse, **not significant**	Negligible
Buckleswood House	Negligible	Negligible	Negligible	Negligible
105 Abbey Road	Minor adverse, **not significant**	Minor adverse, **not significant**	Minor adverse, **not significant**	Negligible
99 Abbey Road	Negligible	Negligible	Negligible	Negligible
Leiston House Farm	Minor adverse, **not significant**	Negligible	Minor adverse, **not significant**	Negligible
Fisher's Farm	Minor adverse, **not significant**	Minor adverse, **not significant**	Minor adverse, **not significant**	Minor adverse, **not significant**
Leiston Abbey residential	Minor adverse, **not significant**	Negligible	Minor adverse, **not significant**	Negligible
Old Abbey Farm / Old Abbey Care Home	Minor adverse, **not significant**	Negligible	Negligible	Negligible
Harling Way / Buckleswood Road	Minor adverse, **not significant**	Minor adverse, **not significant**	Minor adverse, **not significant**	Minor adverse, **not significant**

4.6.10 There is the potential for an increase in adverse effect on Saturdays between 13:00 and 19:00 hours due to the reduction in impact thresholds for occurs outside of Monday to Friday 07:00 to 19:00 hours and Saturday 07:00 to 13:00 hours.

4.6.11 All of the effects are expected to be either minor adverse or negligible during the construction of the rail extension route. These are considered to be **not significant**.

4.6.12 Minor adverse effects are predicted at the residential elements of Leiston Abbey; however, SZC Co. will liaise further with the occupants, who include Pro Corda, to take account of the potentially more sensitive activities that include, amongst other things, indoor and outdoor music performance and tuition. As a high sensitivity receptor, a higher category of effect is possible, which could be moderate adverse or major adverse, depending on the timing of the works relative to the activities at the Abbey. This is considered to be **significant**.

4.6.13 It can be seen from **Table 4.22** that the construction SOAEL of 75dB for the weekday daytime period of 08:00 to 18:00 hours would not be exceeded at any of the assessed receptors, even when the free-field values are adjusted by +3dB to obtain façade levels. Similarly, the lower SOAELs that are adopted for the periods outside of the main weekday daytime works are also predicted to not be exceeded at any receptor, even when the free-field values are adjusted by +3dB to obtain façade levels.

4.6.14 It is inevitable that construction noise will vary over the course of any given day, and the predicted levels in **Table 4.22** are considered to be a reasonable representation of the likely construction noise levels for time periods other than the 12 hour period used in the calculations.

4.6.15 The LOAEL, which for construction noise is taken to be equal to the existing baseline sound levels, is likely to be exceeded at all of the receptor locations for at least some of the time during the construction works. This will be mitigated and minimised through the measures described in the **section 4.5** in this chapter and through the implementation of the **CoCP**.

ii. B1122 (Abbey Road) level crossing

4.6.16 The assumptions about plant, working methods and how these construction works have been modelled are shown in detail in **Appendix 4A**.

4.6.17 The construction phases have been broken down into the following phases:

- Earthworks;
- Paving-surfacing; and
- Track/crossing installation.

4.6.18 All receptors listed are medium sensitivity. Noise levels shown in **Table 4.24** are predicted to occur when activities are taking place at their closest point to the receptors.

Table 4.24: Summary of predicted construction noise levels at the nearest receptor locations to the Abbey Road level crossing during the periods when construction activities are closest to each receptor (free field values).

Receptor Reference	Predicted Sound Level $L_{Aeq,day}$ dB				
	Road re-alignment earthworks	Road realignment surfacing	Earthworks for crossing	Surfacing for crossing	Crossing track laying
Aldhurst Farm Cottage	36	36	30	32	27
Buckleswood House	26	29	21	25	19
105 Abbey Road	57	57	46	46	44
99 Abbey Road	36	39	33	36	30
Leiston House Farm	19	23	15	18	15
Fisher's Farm	29	30	23	25	21
Leiston Abbey residential accommodation	44	44	37	37	35
Old Abbey Farm / Old Abbey Care Home	35	36	30	31	27
Harling Way / Buckleswood Road	24	28	17	21	16

4.6.19 The B1122 (Abbey Road) crossing and road realignment works (including the Lover's Lane junction) are expected to take around eight months to complete. Within this overall phase are the earthworks for the temporary realignment of B1122 (Abbey Road).

4.6.20 These predicted B1122 (Abbey Road) level crossing and road realignment construction noise levels are considered to be very low magnitudes of impact at all receptors except 105 Abbey Road, which is predicted to have a low magnitude of impact during the earthworks and surfacing for the road re-alignment. When combined with the medium sensitivity of the receptors, the resulting effects would be considered as negligible at all receptors, except for

minor adverse effects at 105 Abbey Road during earthworks and surfacing for the road re-alignment. This is considered to be **not significant**.

4.6.21 Negligible effects are predicted at the residential elements of Leiston Abbey. SZC Co. will liaise further with the occupants, who include Pro Corda, to take account of the potentially more sensitive activities that involve, amongst other things, indoor and outdoor music performance. Even though the activities at Leiston Abbey are regarded as being of high sensitivity, this would still be regarded as a negligible effect, and therefore **not significant**.

4.6.22 It can be seen from **Table 4.24** that the construction SOAEL of 75dB for the weekday daytime period of 08:00 to 18:00 hours would not be exceeded at any of the assessed receptors, even when the free-field values are adjusted by +3dB to obtain façade levels. Similarly, the lower SOAELs that are adopted for the periods outside of the main weekday daytime works are also predicted to not be exceeded at any receptor, even when the free-field values are adjusted by +3dB to obtain façade levels.

4.6.23 It is inevitable that construction noise will vary over the course of any given day, and the predicted levels in **Table 4.24** are considered to be a reasonable representation of the likely construction noise levels for time periods other than the 12 hour period used in the calculations.

4.6.24 The LOAEL, which for construction noise is taken to be equal to the existing baseline sound levels, is likely to be exceeded at all of the receptor locations for at least some of the time during the construction works. This will be mitigated and minimised through the measures described in the **section 4.5** in this chapter and through the implementation of the **CoCP**.

iii. Buckleswood Road level crossing

4.6.25 The assumptions about plant, working methods and how these construction works have been modelled are shown in detail in Appendix 4A.

4.6.26 The construction phases have been broken down into the following phases:

- Earthworks;
- Paving-surfacing; and
- Track/crossing installation.

4.6.27 All receptors listed are medium sensitivity. Noise levels shown in **Table 4.25** are predicted to occur when activities are taking place at their closest point to the receptors.

Table 4.25: Summary of predicted construction noise levels at the nearest receptor locations to the Buckleswood Road level crossing during the periods when construction activities are closest to each receptor (free field values).

Receptor Reference	Predicted Sound Level $L_{Aeq,day}$ dB				
	Road re-alignment earthworks	Road re-alignment surfacing	Earthworks for crossing	Surfacing for crossing	Crossing track laying
Aldhurst Farm Cottage	32	33	28	28	24
Buckleswood House	40	39	35	35	31
105 Abbey Road	16	20	12	16	14
99 Abbey Road	29	30	23	25	20
Leiston House Farm	31	33	26	28	22
Fisher's Farm	38	37	34	34	30
Leiston Abbey residential accommodation	27	28	21	23	18
Old Abbey Farm/care house	22	24	17	19	15
Harling Way / Buckleswood Road	54	53	41	40	36

4.6.28 The Buckleswood Road level crossing works are expected to take around five to six months to complete.

4.6.29 When taking account of the medium sensitivity of the receptors, there would be a moderate adverse effect at the closest properties in Harling Way / Buckleswood Road during earthworks and surfacing for the temporary road re-alignment. This would be **significant.**

4.6.30 There would be a negligible effect for all other receptors during all phases; This is considered to be **not significant**.

4.6.31 Negligible effects are predicted at the residential elements of Leiston Abbey. SZC Co. will liaise further with the occupants, who include Pro Corda, to take account of the potentially more sensitive activities that involve, amongst other things, indoor and outdoor music performance. Even though the activities at Leiston Abbey are regarded as being of high sensitivity, this would still be regarded as a negligible effect, and therefore **not significant**.

4.6.32 It can be seen from **Table 4.25** that the construction SOAEL of 75dB for the weekday daytime period of 08:00 to 18:00 hours would not be exceeded at any of the assessed receptors, even when the free-field values are adjusted by +3dB to obtain façade levels. Similarly, the lower SOAELs that are adopted for the periods outside of the main weekday daytime works are also predicted to not be exceeded at any receptor, even when the free-field values are adjusted by +3dB to obtain façade levels.

4.6.33 It is inevitable that construction noise will vary over the course of any given day, and the predicted levels in **Table 4.25** are considered to be a reasonable representation of the likely construction noise levels for time periods other than the 12 hour period used in the calculations.

4.6.34 The LOAEL, which for construction noise is taken to be equal to the existing baseline sound levels, is likely to be exceeded at all of the receptor locations for at least some of the time during the construction works. This will be mitigated and minimised through the measures described in the **section 4.5** in this chapter and through the implementation of the **CoCP**.

iv. Saxmundham to Leiston branch line upgrades

4.6.35 Construction works associated with the upgrade of the Saxmundham to Leiston branch line comprise two main phases:

- Removal and replacement of existing trackform; and
- Tracklaying, ballasting, tamping and stabilisation.

4.6.36 The assumptions about plant, working methods and how these construction works have been modelled are shown in detail in **Appendix 4A**.

4.6.37 All receptors listed are medium sensitivity. Noise levels shown in **Table 4.26** are predicted to occur when activities are taking place at their closest point to the receptors.

Table 4.26: Summary of predicted construction noise levels and corresponding magnitudes at the nearest receptor locations to the branch line upgrade works during the periods when construction activities are closest to each receptor.

Receptor Reference	Predicted Sound Level $L_{Aeq,day}$ dB		Predicted Impact Magnitude	
	Track removal	Track laying	Track removal	Track laying
Clayhills Road	52	52	Low	Low
Cottage Farm	58	58	Low	Low

Receptor Reference	Predicted Sound Level $L_{Aeq,day}$ dB		Predicted Impact Magnitude	
	Track removal	Track laying	Track removal	Track laying
Kelsale Covert	86	86	High	High
Westhouse Crossing Cottage	84	84	High	High
Crossing Cottages	72	72	Medium	Medium
Crossing East	57	57	Very Low	Very Low
Harling Way	82	82	High	High
Leiston House Farm	55	55	Low	Low
Westward House	82	82	High	High
Carr Avenue	71	71	Medium	Medium
Valley Terrace	79	79	High	High

4.6.38 The Saxmundham to Leiston branch line upgrade works are expected to take around nine months to complete. These effects would be considered significant if undertaken for prolonged periods. However, it is expected that the noise-producing works would last less than a month at each site and there would no working on Sundays. Levels on the noisiest days would be relatively high as the upgrading work passes by each individual receptor, but would last for a brief period of typically one to two days. The duration of the noise-producing works overall is likely to be no more than a few days. The construction noise levels would therefore not be at the levels set out in **Table 4.26** at any one receptor for more than 10 days in any 15 consecutive day period and would not last more than 40 days in a six month period.

4.6.39 Taking account of the short duration of the works, it is considered that construction works during the branch line upgrades are **not significant**.

4.6.40 It can be seen from **Table 4.26** that the construction SOAEL of 75dB for the weekday daytime period of 08:00 to 18:00 hours is predicted to be exceeded at five receptors, when the free-field values are adjusted by +3dB to obtain façade levels. The lower SOAELs that are adopted for the periods outside of the main weekday daytime works are predicted to be exceeded at two additional receptors, when the free-field values are adjusted by +3dB to obtain façade levels.

4.6.41 However, the works are expected to last at the levels shown in **Table 4.26** for less than 10 days in any 15 consecutive day period and less than 40 days in a six month period. On this basis, the construction SOAEL is not expected to be exceeded.

4.6.42 It is inevitable that construction noise will vary over the course of any given day, and the predicted levels in **Table 4.26** are considered to be a reasonable representation of the likely construction noise levels for time periods other than the 12 hour period used in the calculations.

4.6.43 The LOAEL, which for construction noise is taken to be equal to the existing baseline sound levels, is likely to be exceeded at all of the receptor locations for at least some of the time during the construction works. This will be mitigated and minimised through the measures described in the **section 4.5** in this chapter and through the implementation of the **CoCP**.

v. Saxmundham to Leiston branch line level crossing upgrades

4.6.44 As identified in **section 4.3**, four level crossing upgrades are considered to have the potential to result in significant environmental effects and have therefore been assessed in further detail. It is considered that the remaining four proposed level crossing upgrades would not result in significant effects during their construction or operation due to the small scale of the proposed upgrade works.

4.6.45 The following sections summarise the outcome of the assessment of the likely construction effects as a result of the level crossing upgrade works screened in to the assessment. For each site a summary of the likely effects is provided.

Leiston level crossing, Knodishall level crossing, West House level crossing and Saxmundham Road level crossing

4.6.46 Works at all of these level crossings would be relatively close to the nearest noise sensitive premises. The working method is not yet known, but it is likely that the noisiest activities will occur during breaking of hardstanding (where required) and compaction of material. Small scale plant and equipment are likely to be used and, given the distances between the working areas and the noise sensitive premises, high noise levels are likely to occur at the closest receptors for a few hours on one or two of the working days for the noisiest activities.

4.6.47 For the remainder of the works, levels are likely to be between 60 and 70dB, $L_{Aeq,T}$ when construction plant is in use. However, plant will not be in use constantly and typical day time levels have been estimated to be between 65 and 70dB, $L_{Aeq,T}$, for the few days that it is likely to take to complete the work.

4.6.48 The noise-producing works would last less than a month at each site and thus, given the duration of the noise levels, the effects for a medium sensitivity receptors are considered to be **not significant**.

4.6.49 The overall construction noise levels are predicted to be below the construction SOAEL of 75dB for the weekday daytime period of 08:00 to 18:00 hours, which is therefore not expected to be exceeded, even when the free-field values are adjusted by +3dB to obtain façade levels. The lower SOAELs that are adopted for the periods outside of the main weekday daytime works may be exceeded at the closest receptors.

4.6.50 However, the works are expected to last at the predicted levels for less than 10 days in any 15 consecutive day period and less than 40 days in a six month period. On this basis, the construction SOAEL is not expected to be exceeded.

4.6.51 It is inevitable that construction noise will vary over the course of any given day, and the predicted levels are considered to be a reasonable representation of the likely construction noise levels for time periods other than the 12 hour period used in the calculations.

4.6.52 Exceedances of the SOAEL will be avoided by managing the works in a way that avoids the noisiest activities at the most sensitive parts of the day, secured through the **CoCP**. Where such works cannot be managed in this manner, exceedances of the SOAEL will be avoided through the provision of noise insulation under the **Noise Mitigation Scheme** (**Volume 2 Appendix 11H**).

4.6.53 The LOAEL, which for construction noise is taken to be equal to the existing baseline sound levels, is likely to be exceeded at all of the receptor locations for at least some of the time during the construction works. This will be mitigated and minimised through the measures described in the **section 4.5** in this chapter and through the implementation of the **CoCP**.

d) Cumulative rail effects

4.6.54 This section provides a description of the identified cumulative rail effects that are anticipated to occur on noise and vibration receptors between the individual environmental effects arising from construction of the proposed rail extension route and proposed rail improvement works.

4.6.55 **Chapter 2**, **Plate 2.1** presents the indicative construction programme for the proposed development. This shows that the rail extension route and the B1122 (Abbey Road) and Buckleswood Road level crossings work would overlap and occur at the same time.

4.6.56 Whether construction noise from different phases of work would combine to give higher cumulative noise levels will be a function of when the works occur and the location of each phase of work in relation to the receptor. The predicted construction noise levels presented in **Tables 4.22, 4.24** and **4.25** are the worst case daily levels when works are at their closest to each receptor. Although it is possible, it is unlikely that the noisiest phase of works for the level crossings would occur at the same time that the rail extension route works are also at their closest point. One reason for this is that there would be a limit to the amount of plant equipment that could physically operate in the same construction site location.

4.6.57 If construction activities associated with the construction of the rail extension route did overlap with activities associated with the construction of either the B1122 (Abbey Road) or Buckleswood Road level crossings then cumulative construction noise levels would still not give rise to significant adverse effects. For example, the closest receptors to the works are at 105 Abbey Road. If the rail extension route track laying works (55 dB $L_{Aeq,T}$) were to occur at the same time as the earthworks associated with the diversion of B1122 (Abbey Road) (57dB $L_{Aeq,T}$), then the overall cumulative predicted construction noise level at 105 Abbey Road would be 59 dB $L_{Aeq,T}$, which will remain below the threshold at which a significant adverse effect would occur. The lowest impact magnitude that would translate to a significant adverse effect is 60dB, $L_{Aeq,T}$ for the most sensitive period during which work may occur, i.e. on a Saturday between 13:00 and 19:00 hours.

4.6.58 The indicative construction programme for the proposed development at **Plate 2.1**, **Chapter 2**, shows that the rail extension route earthworks and Saxmundham to Leiston branch line upgrade phase works may overlap and occur at the same time.

4.6.59 If the initial earthwork activities associated with the construction of the rail extension route did overlap with the proposed improvement works then cumulative construction noise levels would still not give rise to significant adverse effects. For example, the closest receptor to both work phases is Leiston House Farm. If the rail extension route earthworks (48 dB $L_{Aeq,T}$) were to occur at the same time as the branch line track removal/replacement track work (55dB $L_{Aeq,T}$), then the overall cumulative predicted construction noise level would be 56 dB $L_{Aeq,T}$, which would remain below the threshold at which a significant adverse effect would occur (60dB, $L_{Aeq,T}$) at all times.

i. Inter-relationship effects

4.6.60 Inter-relationship effects with noise and vibration for amenity and recreation, ecological receptors and heritage receptors are considered within **Chapters 7, 8** and **9** of this volume respectively. Inter-relationship effects on human

health receptors are considered further in **Volume 2**, **Chapter 28** Health and Wellbeing of this volume and in **Volume 10**, **Chapter 2**.

e) Construction vibration

4.6.61 During the track installation phase for the rail extension route and Saxmundham to Leiston branch line upgrades, tamping and stabilisation works would be carried out and these works would involve short duration periods of vibratory compaction. Using the vibration curves from **Volume 1, Appendix 6G, Annex 6G.2**, it can be seen that a vibration magnitude of 0.3mm/s, PPV is not expected to occur at receptors beyond a distance of approximately 50m, and a vibration level of 1mm/s, PPV is not expected to occur at receptors beyond a distance of 25m.

4.6.62 On the basis of medium sensitivity receptors, it is possible that there would be moderate adverse effects at receptors within 25m of the works, and minor adverse effects at properties between 25m and 50m from the works.

4.6.63 Receptors would need to be within 5m of the works for the vibration level to reach the high impact magnitude of 10mm/s. Should this level be reached, the medium sensitivity of the receptors would result in a major adverse effect.

4.6.64 Major or moderate adverse effects would normally be considered to be significant, however, the duration of the potential impacts will be short, lasting no more than one to two days. Overall this is considered to be **not significant**.

4.6.65 Exceedances of the construction vibration SOAEL of 10mm/s are possible at properties within 5m of the tamping and stabilisation works. Should this be the case, the provisions set out in the **Noise Mitigation Scheme** (**Volume 2 Appendix 11H**) will be applied to avoid the exceedance.

4.6.66 The LOAEL of 0.3mm/s is predicted to be exceeded at receptors within 50m of the railway line for the duration of the works.

f) Operation

i. Airborne noise

4.6.67 Details of the assessment approach, assumptions and calculation of operational noise are provided in **Appendix 4B**. The Appendix provides tables of results and includes predicted noise contours for a number of scenarios and noise parameters.

4.6.68 The assessment concludes that, on the East Suffolk line, with the exception of the section of line through Saxmundham, the daytime existing and existing

plus proposed contours show no discernible difference, since the addition of a single freight train to the existing rail traffic on this line resulted in a negligible effect. At Saxmundham, due to the need for trains to stop to change the points, there is a less than 1dB difference in the daytime levels as a result of the additional movement. This is a very low magnitude of change.

4.6.69 On the Saxmundham to Leiston branch line, two dwellings are expected to be exposed to low magnitude L_{Aeq} levels at night in the early years and three are expected to be exposed to a low magnitude L_{Aeq} level at night in later years. All other receptors would experience very low magnitude of L_{Aeq} level at all times.

4.6.70 Taking account of the medium sensitivity of the receptors, these impact magnitudes would result in minor adverse or negligible effects. These are considered to be **not significant**.

4.6.71 The predicted values are below the L_{Aeq}-based SOAEL adopted for railway noise, so no exceedances are expected. The L_{Aeq}-based LOAEL for railway noise may be exceeded at two dwellings in the early years and three dwellings in the later years. These will be mitigated and minimised through the measures described in **section 4.5**.

4.6.72 In relation to L_{Amax} levels on the Saxmundham to Leiston branch line at night, during early year operations, two receptors are expected to be subject to noise levels of between 60 and 70dB, which are considered to be low magnitude impacts, and two receptors are predicted to be subject to levels of more than 77dB, which are considered to be high magnitude impacts. The two dwellings subject to the highest maximum noise levels are Kelsale Covert and Westhouse Crossing Cottage.

4.6.73 When taking account of the medium sensitivity of the receptors, these would be considered to be minor adverse effects at two receptors, which are considered to be **not significant**, and major adverse effects at two receptors, which are considered to be **significant**.

4.6.74 In later years, two receptors are predicted to be subject to noise levels of between 60 and 70dB, which are considered to be low magnitude impacts, one receptor is predicted to be subject to levels of between 70 and 77dB, which is considered to be a medium magnitude of impact, and three receptors are predicted to be subject to levels of more than 77dB, which is considered to be a high magnitude impact. The dwellings that would be subject to high magnitude impact are Crossing East, Kelsale Covert and Westhouse Crossing Cottage.

4.6.75 When taking account of the medium sensitivity of the receptors, these would be considered to be minor adverse effects at two receptors, which are considered to be **not significant**, a moderate adverse effect at one receptor, and major adverse effects at three receptors, which are considered to be **significant**.

4.6.76 The impacts from the new or upgraded line is predicted to exceed the railway L_{Amax} SOAEL for railway noise at three locations, all as a result of maximum noise levels. Where no other options are available to reduce these noise levels, the provisions set out in the **Noise Mitigation Scheme** (**Volume 2 Appendix 11H**) will be applied to avoid the exceedance.

4.6.77 The railway L_{Amax} LOAEL is expected to be exceeded at three further receptors (or groups of receptors). These will be mitigated and minimised through the measures described in **section 4.5**, and additional proposals described in **section 4.7**.

4.6.78 The potential adverse effects from trains on the East Suffolk line have been considered.

4.6.79 No individual breakdown of noise levels for each premises has been carried on the East Suffolk line since the total number of properties along the line is very large; however the contours in **Annexes E** and **F** to **Appendix 4B** have been used to identify the levels to which premises would be exposed. The effect of the additional trains during the daytime would be negligible, but at night the increase in noise level and the maximum noise levels would both result in moderate or major adverse effects that are considered significant for some receptors. For all receptors, the most significant effects are determined by the maximum levels which are predicted using the L_{Amax} parameter.

4.6.80 Contours in **Annex F** in **Appendix 4B** show zones in which noise levels would be below 60dB, indicating a negligible effect based on medium sensitivity receptors; between 60 and 70dB, L_{Amax}, to indicate where minor adverse effects would be experienced based on medium sensitivity receptors; and above 70dB, L_{Amax} where moderate adverse effects would be experienced based on medium sensitivity receptors .

4.6.81 A 77dB contour has also been shown to indicate which receptors would experience a major adverse effect, based on medium sensitivity receptors.

4.6.82 In reviewing the potential noise levels research has been undertaken to identify the estimated number of properties which may be impacted, as shown in **Table 4.27**.

Table 4.27: Estimated numbers of properties exposed to different noise levels from proposed night time use of the East Suffolk line between Saxmundham and Westerfield junction

Above level, L_{Amax}, dB (free field)	Estimated number of properties	Effect
60-79	390-410	Minor adverse, not significant
70-77	150-160	Moderate adverse, significant
Over 77	40-50	Major adverse, significant

4.6.83 These numbers should be considered in context. The East Suffolk line is already an operational rail line and Network Rail could, if it wished, run additional freight trains along it at any time without the need to carry out an assessment of potential effects.

4.6.84 The predicted noise levels are not sufficiently high to trigger an offer of noise insulation under The Noise Insulation (Railways and Other Guided Transport Systems) Regulations 1996 (Ref. 4.18), were it to apply. In practice, the Regulations do not apply to variations in use of an existing operational railway and, even if they did, eligibility would be judged on a L_{Aeq} basis and the relevant thresholds would not be reached.

4.6.85 There are currently no regular freight trains using the East Suffolk line at night, but there are two passenger trains per night and an engineering train runs on the line approximately twice per year. There are also two passes of a rail head treatment train (the “leaf blower”) every night for approximately ten weeks per year in October to December.

4.6.86 These night time trains result in L_{Amax} levels as shown in **Table 4.28** below, at a reference distance of 10 metres, alongside levels predicted for Sizewell C Project freight train movements at the same reference distance. The noise levels for existing movements are higher than those predicted for the Sizewell related night time train movements in this case.

Table 4.28: Existing night time maximum noise levels on East Suffolk line, all free field values at a distance of 10 metres

Train type	Frequency	Typical level
Existing passenger trains	2 per night	76

Train type	Frequency	Typical level
Engineering train	2 per year	90
Rail head treatment trains	140 per year (Averages to 0.38 per night)	90
Sizewell freight – 10mph	5 per night	77
Sizewell freight – under load		89
Sizewell freight – 20mph		85

4.6.87 It can be seen from **Table 4.27** that approximately 40 to 50 properties are predicted to be subject to railway noise levels above the L_{Amax}-based SOAEL of 77dB. Exceedances of the SOAEL will be avoided by the use of the quietest trains available, strategically-located speed restrictions, changes to the operational practices on the East Suffolk line, and where necessary, through the provision of noise insulation under the **Noise Mitigation Scheme** (**Volume 2 Appendix 11H**). The proposed **Noise Mitigation Scheme** does recognise the potential eligibility of L_{Amax}-based noise levels, notwithstanding that such an approach is not normally applied.

4.6.88 The L_{Amax}-based LOAEL is predicted to be exceeded at up to approximately 600 properties close to the railway line. These will be mitigated and minimised through the use of the quietest trains available, strategically-located speed restrictions, changes to the operational practices on the line, and the measures described in **section 4.5**.

ii. Vibration and groundborne noise from the operation of the rail extension route and branch line

4.6.89 Vibration and groundborne noise has been assessed as described in **Volume 1, Appendix 6G, Annex 6G.2**. On the East Suffolk line, these levels are only considered for night time movements, since the trains pass regularly during the daytime at present and the proposed single additional movement would have a negligible effect.

4.6.90 Given the distances to the receptors from the rail extension route and the Saxmundham to Leiston branch line and the number of train movements, vibration levels, in terms of the VDV, are predicted to be below a very low magnitude of impact, which would result in a negligible effect for a medium sensitivity receptor.

4.6.91 To generate vibration levels that have any potential to result in building damage, using 10mm/s, PPV as a precautionary threshold, a distance of less

than one metre would be required to reach such a level. There are no buildings within this distance of either the rail extension route or the Saxmundham to Leiston branch line.

4.6.92 Based on a broad assumption regarding general ground conditions in the area, measurements of freight train vibration at sites in the region and ground propagation conditions as set out in **Volume 1**, **Chapter 6**, **Appendix 6G**, **Annex 6G.2**, groundborne noise levels are predicted for different train speeds at different distances from the line as shown in **Table 4.29**.

Table 4.29: Predicted ground borne noise levels at different train speeds and distances from the line

Speed	Distance from rail line	Level exceeded, dB, L_{ASmax}	Magnitude of impact
10mph	<5m	>50	High
	5-14m	45-50	Medium
	14-42m	35-45	Low
	>42m	<35	Very low
20mph	<10m	>50	High
	10-20m	45-50	Medium
	20-50m	35-45	Low
	>50m	<35	Very low

4.6.93 New or upgraded tracks will be designed to achieve an L_{ASmax} level below 45dB within any adjacent property, which will limit any impacts to no greater than a low magnitude. Where possible, a lower design threshold will be targeted.

4.6.94 The design of the track would result in the SOAEL for groundborne railway noise not being exceeded at any receptors. The LOAEL may be exceeded at some locations, depending on the final design of the track support system. However, the steps that are to be taken to control the generation of groundborne noise are considered to mitigate and minimise any adverse effects on health and quality of life.

4.6.95 A different situation is encountered along the East Suffolk line, where existing properties are located close to an existing railway line, carrying a high number of trains during the daytime and a smaller number of trains at night.

4.6.96 Based on the same assumptions on ground conditions, measurement data and worst-case propagation conditions, it has been calculated that the SOAEL of 50dB L_{ASmax} will not be exceeded at any property located more than 5m or 10m from the East Suffolk line if the additional Sizewell C Project freight trains travel at 10mph or 20mph respectively.

4.6.97 While it is possible that there are receptors within 5m or 10m of the East Suffolk line that will have groundborne noise levels that exceed the SOAEL where the Sizewell C Project freight trains would travel at 10mph or 20mph respectively, speed limits will be imposed along the East Suffolk line to avoid exceeding the SOAEL at as many properties as possible. The locations of the speed limits have been identified so that the Sizewell C Project freight trains are slowed as they travel past built-up areas, where there may be a greater likelihood for properties close the line. The locations of the proposed speed limits are shown in **Figures 4.2, 4.3** and **4.4**.

4.6.98 The groundborne noise LOAEL of 35dB is likely to be exceeded at receptors close to the line. However, this will be mitigated and minimised through the use of vibration-isolating track support systems, where appropriate on the rail extension route and Saxmundham to Leiston branch line and by managing train speeds along the East Suffolk line through the imposition of speed limits.

iii. Operation of the Saxmundham to Leiston branch line level crossing upgrades

4.6.99 Based on the information available, potential noise impacts from the operation of the upgraded crossings would be from audible alarms which are designed to warn pedestrians when barriers are about to be lowered. It is assumed that trains would not be required to sound horns at any additional locations as a result of the introduction of upgrades to level crossings.

4.6.100 Industry guidance on noise levels at crossings suggests that default sound levels are 80dB day and 70dB night, but can be varied as necessary to set to suit local circumstances. It is understood that these values apply to levels as measured at 1 metre.

4.6.101 Where the maximum noise level from the alarms is below 60dB L_{Amax}, the potential impact would be no greater than very low, which for a medium sensitivity receptor, would result in a negligible effect. This outcome would occur at any receptor 10m or more from a level crossing alarm, even if that alarm were to generate the higher value of 80dB (at 1m).

4.6.102 If the level crossing were adjusted so that it generated the lower 70dB level at a distance of 1m, a receptor would only need to be 4m away from the alarm for the effect to fall to a very low magnitude of impact, and therefore be considered a negligible effect for a medium sensitivity receptor.

4.6.103 Since it should be possible to site all such alarms at a distance greater than 4m from all noise sensitive receptors, it would be possible to operate the level crossings at night without giving rise to more than negligible effects. There is no L_{Amax} impact threshold for the daytime as the L_{Amax} threshold is linked to sleep disturbance. These are considered to be **not significant**.

4.6.104 The predicted noise levels from the operation of the level crossing are below both the SOAEL and LOAEL. There are therefore expected to be no exceedances of either SOAEL or LOAEL from their operation.

iv. Inter-relationship effects

4.6.105 Inter-relationship effects with noise and vibration for amenity and recreation, ecological receptors and heritage receptors are considered within **Chapters 7, 8** and **9** of this volume respectively. Inter-relationship effects on human health receptors are considered further in **Volume 2**, **Chapter 28** Health and Wellbeing of this volume and in **Volume 10**, **Chapter 2**.

g) Removal and reinstatement

i. Noise

4.6.106 The removal and reinstatement phase of the rail extension route comprises the following phases.

- Track removal; and
- Removal of ballast, trackform and reprofiling.

4.6.107 The assumptions about plant, working methods and how these construction works have been modelled are shown in detail in **Appendix 4A**. Primary and tertiary mitigation would be the same as described in **section 4.5**.

4.6.108 Locations identified as potentially being affected by noise from rail extension route removal and reinstatement works are listed in **Table 4.30** below, along with predicted noise levels from activities for each phase of work when activities are taking place at their closest point to the receptors. All receptors are taken to be medium sensitivity.

Table 4.30: Summary of predicted rail extension route construction noise levels when removal and reinstatement activities are closest to each receptor.

Receptor Reference	Predicted Sound Level $L_{Aeq,day}$ dB	
	Track removal	Removal of ballast, trackform and profiling
Aldhurst Farm Cottage	52	52
Buckleswood House	43	47
105 Abbey Road	53	54
99 Abbey Road	47	51
Leiston House Farm	43	46
Fisher's Farm	48	49
Leiston Abbey residential	44	48
Old Abbey Farm / Old Abbey Care Home	36	44
Harling Way / Buckleswood Road	48	50

4.6.109 The removal and reinstatement works are predicted to give rise to noise levels that would, at worst, be low magnitude impacts. When combined with the medium sensitivity of the receptors, this would result in minor adverse effects. These are considered to be **not significant**.

4.6.110 Minor adverse effects are predicted at the residential elements of Leiston Abbey; however, SZC Co. will liaise further with the occupants, who include Pro Corda, to take account of the potentially more sensitive activities that include, amongst other things, indoor and outdoor music performance and tuition. As a high sensitivity receptor, a higher category of effect is possible, which could be moderate adverse or major adverse, depending on the timing of the works relative to the activities at the Abbey. This is considered to be **significant**.

4.6.111 It can be seen from **Table 4.29** that the construction SOAEL of 75dB for the weekday daytime period of 08:00 to 18:00 hours would not be exceeded at any of the assessed receptors, even when the free-field values are adjusted by +3dB to obtain façade levels. Similarly, the lower SOAELs that are adopted for the periods outside of the main weekday daytime works are also

predicted to not be exceeded at any receptor, even when the free-field values are adjusted by +3dB to obtain façade levels.

4.6.112 It is inevitable that construction noise will vary over the course of any given day, and the predicted levels in **Table 4.29** are considered to be a reasonable representation of the likely construction noise levels for time periods other than the 12 hour period used in the calculations.

4.6.113 The LOAEL, which for construction noise is taken to be equal to the existing baseline sound levels, is likely to be exceeded at all of the receptor locations for at least some of the time during the construction works. This will be mitigated and minimised through the measures described in the **section 4.5** in this chapter and through the implementation of the **CoCP**.

ii. Vibration

4.6.114 Vibration during removal and reinstatement phase would be produced during earthworks. Using the vibration curves from **Volume 1, Appendix 6G, Annex 6G.2**, it can be seen that a vibration magnitude of 0.3mm/s, PPV is not expected to occur at receptors beyond a distance of approximately 40m. Below this level, vibration effects would be negligible at medium sensitivity receptors.

4.6.115 There are not anticipated to be any vibration sensitive receptors within 40m of the earthmoving works during this phase of work. Therefore vibration effects at all receptor locations would be negligible, **not significant**.

4.6.116 The SOAEL of 10mm/s and the LOAEL of 0.3mm/s would not be exceeded by these works.

4.7 Mitigation and monitoring

a) Introduction

4.7.1 Primary and tertiary mitigation measures which have been accounted for as part of the assessment are summarised in **section 4.5**. Where other mitigation is required to avoid a significant adverse effect, or mitigate and minimise adverse effects, this is referred to as secondary mitigation as described below.

b) Mitigation

i. Construction and removal and reinstatement

4.7.2 During the road re-alignment earthworks and surfacing during the construction of Bucklewood Crossing, a significant adverse noise effect has been predicted for some of the closest receptors at Harling Way / Buckleswood Road. Mitigation would be required to reduce noise in this area during this construction work.

4.7.3 Exact working methods and plant to be used will not be determined until a contractor is appointed, and therefore precise details of additional mitigation measures cannot yet be given. Accordingly, and as set out in the **CoCP** (Doc Ref. 8.11) it is likely the mitigation measures could include selection of alternative plant or working methods, barrier screening and/or stand-off margins and/or alternative plant.

4.7.4 Barrier screening and/or minimum stand-off margins could be provided, but the exact location and height of screening would be dependent on a number of factors, including:

- the detailed construction programme and equipment specifications;
- on-site constraints (space, topography or other ecological or geographical feature which may prevent or limit screening);
- the disbenefit arising from visual impact of screening;
- the environmental impact from the construction of screening; and
- the amount of time over which the reduction would be required.

4.7.5 A balance will need to be struck between the above factors to decide on the extent of screening in each set of circumstances. It is likely that some reduction would be possible in some locations during the construction phase, but the benefit of screening in relation to noise impact in many circumstances may be outweighed by the disbenefit in relation to visual impacts.

4.7.6 Reductions in noise levels at receptors may also be achieved by altering working methods, such as phased working, reduced complement of plant in close proximity and reducing or avoiding noisier activities during Saturday between 13:00 and 19:00 hours.

4.7.7 All listed receptors are considered to be of medium sensitivity, except the Pro Corda Music School at Leiston Abbey which is a high sensitivity receptor. As indicated in **section 11.6**, this could lead to higher categories of effect than would otherwise occur in respect of Leiston Abbey as a receptor. These

effects are considered significant where the effect on Leiston Abbey during construction is predicted to be a minor adverse effect. SZC Co. will undertake a further bespoke assessment for impacts from the Sizewell C Project on the Pro Corda Music School at Leiston Abbey. The results of this assessment would inform any additional mitigation requirements which will be secured through further planning obligations. SZC Co. is committed to further liaison with Pro Corda to take account of their specific needs relating to noise impacts and any required mitigation.

4.7.8 No other significant adverse noise or vibration effects requiring mitigation have been identified during the construction or removal and reinstatement phases.

ii. Operation – airborne noise

4.7.9 Significant adverse effects are expected occur for some dwellings when trains move at night.

4.7.10 SZC Co. will develop a Rail Noise Mitigation Strategy in consultation with Network Rail and the rail freight operator, informed by the further detailed assessments, to establish the package of measures to be implemented to mitigate noise impacts on the Saxmundham to Leiston branch line and the East Suffolk line.

4.7.11 It may be possible to use quieter locomotives to pull trains and further work is planned to evaluate the potential effectiveness of this.

4.7.12 Some mitigation of noise levels may also be possible at Saxmundham, where, under present arrangements, trains using the Saxmundham to Leiston branch line for the Sizewell C Project would need to stop at Saxmundham and then pull away under load twice each time they pass. This is because the system in place for changing points and ensuring branch line safety requires this. Further details of this system are provided in **Annex G** of **Appendix 4B**. In essence, it involves:

- At Saxmundham, each train wishing to enter or leave the Saxmundham to Leiston branch line stops at a “ground frame” and one of the train drivers gets off the train, goes to the ground frame, gets the release of the points from the signal box and takes control of the points.
- The driver on the ground then changes the points so that the train can continue and remains at the ground frame.
- The train then pulls away and once it is clear of the points, stops again and the driver on the ground changes the points back, walks back to the train and the train continues on its way.

4.7.13 At the same time as the points change occurs, the driver on the ground deals with the staff (as described in **Annex G** of **Appendix 4B**).

4.7.14 These train stops and starts (pulling away under load) will result in higher noise levels for people living nearby since they require the train to pull away underload twice where otherwise it might move at a slow steady speed and therefore would produce less noise. To remove the need for these two stops, it may be possible to move to an automatic points system and an axle counter could be installed to monitor line use instead of the staff system. Other alternatives may also be possible to remove the need for trains to stop here.

4.7.15 If the system were to be upgraded, this would be expected to result in lower noise levels in Saxmundham. To gauge the difference between noise levels with the existing system and the potential new system, both options have been assessed.

4.7.16 The resulting reduction in levels on the East Suffolk line would lead to the numbers of properties experiencing different degrees of adverse effects as shown in **Table 4.31**.

Table 4.31: Predicted noise effects on the East Suffolk line after secondary mitigation

Above level, L_{Amax}, dB (free field)	Estimated number of properties	Effect
60-79	320-350	Minor adverse, not significant
70-77	100-110	Moderate adverse, significant
Over 77	5-10	Major adverse, significant

4.7.17 It can be seen from **Table 4.31** that the secondary mitigation measures described in this section, would reduce the number of properties predicted to be subject to maximum noise levels above the L_{Amax}-based SOAEL to between five and ten. Any properties that are still expected to be subject to noise levels that exceed the SOAEL will be fall under the provisions of the **Noise Mitigation Scheme** (**Volume 2 Appendix 11H**) to avoid exceeding the SOAEL.

4.7.18 The L_{Amax}-based LOAEL is predicted to be exceeded at up to approximately 460 properties close to the railway line. The secondary measures taken are considered to have mitigated and minimised the adverse effects on health and quality of life.

iii. Operation – Groundborne noise

4.7.19 When track is being upgraded on the Saxmundham to Leiston branch line or laid for the rail extension, vibration-isolating track support systems will be used to achieve an L_{ASmax} level of below 45dB within any adjacent property. There would therefore be no impacts that are greater than a low magnitude and no significant effects.

4.7.20 The calculations that support the analysis in this chapter are necessarily based on general assumptions regarding the way in which vibration propagates away from the railway line.

4.7.21 For the East Suffolk line, should there be any properties within 5m or 10m of the line where Sizewell C freight trains travel at 10mph or 20mph respectively, further, more detailed assessment would be undertaken to determine the site-specific exposure to groundborne noise to fully quantify the likelihood of residual adverse effects.

4.7.22 As described above, SZC Co. will develop a Rail Noise Mitigation Strategy in consultation with Network Rail and the rail freight operator, which will be informed by these further detailed assessments.

4.8 Residual effects

4.8.1 The following tables (**Tables 4.32, 4.33, 4.34, 4.35, 4.36** and **4.37**) present a summary of the noise and vibration assessment.

4.8.2 **Tables 4.32**, **4.34** and **4.36** relate to the construction, operational and removal/reinstatement phases respectively, identifying the receptors likely to be impacted, the level of effect and, where the effect is deemed to be significant, the tables include the mitigation proposed and the resulting residual effect.

4.8.3 **Tables 4.33, 4.35** and **4.37** also relate to the construction and operational phases respectively, identifying the assessment outcomes against LOAEL and SOAEL.

Table 4.32: Summary of effects for the construction phase

Receptor	Impact	Primary or Tertiary Mitigation	Assessment of effects	Additional Mitigation	Residual Effects
Harling Way, Buckleswood Road	Construction noise from Buckleswood Rd crossing during road re-alignment work.	**CoCP** (Doc Ref. 8.11), including routine monitoring	Moderate adverse	Screening, working methodology to be considered – to designed once details of construction approach has been further developed.	Negligible or minor (**not significant**)
	Construction noise from Buckleswood Rd crossing during other phases of construction work.		Negligible or Minor adverse	None required	Negligible or minor (**not significant**)
	Vibration from Buckleswood Rd crossing during all phases of construction.		Negligible	None required	Negligible (**not significant**)
Pro Corda Music School at Leiston Abbey	Construction noise from Rail extension route	CoCP (Doc Ref. 8.11), including routine monitoring	Moderate or major adverse	Mitigation will be subject to further dialogue to tailor it to Pro Corda's particular requirements. The agreed mitigation will be incorporated into the **Noise Monitoring and Management Plan** under the **CoCP** (Doc Ref. 8.11)	Moderate or major adverse (**significant**) although further mitigation may reduce this to negligible (**not significant**)

Receptor	Impact	Primary or Tertiary Mitigation	Assessment of effects	Additional Mitigation	Residual Effects
All noise and vibration sensitive receptors, excluding Pro Corda Music School at Leiston Abbey	Construction noise and vibration from Rail extension, Abbey Road crossing and Buckleswood Rd crossing, branch line crossings and branch line updgrade.	CoCP (Doc Ref. 8.11), including routine monitoring	Negligible or Minor adverse	None required	Negligible or minor (**not significant**)

Table 4.33: Summary of assessment against LOAEL / SOAEL for construction

Phase of Works or Activity	Assessment Against with SOAEL/LOAEL	Comment
Construction noise	No exceedances of the SOAEL expected during main weekday construction hours nor of the lower SOAELs outside the main weekday daytime hours. LOAEL likely to be exceeded at some points during construction works at all receptors.	No action required to avoid significant adverse effects on health and quality of life. Exceedances of the LOAEL will be mitigated and minimised through the adoption of the measures detailed in **section 4.5** on Environmental Design and Mitigation, and through the implementation of the **CoCP**.
Construction vibration	SOAEL may be exceeded at receptors within 5m of track tamping works. LOAEL may be exceeded by receptors within 50m of track tamping works.	Any exceedance of the SOAELs will be avoided by managing the works in a way that avoids prolonged working in close proximity to the closest receptors, secured through the **CoCP**. Where such works can not be managed in this manner, exceedances of the SOAEL will be avoided through the provisions under the **Noise Mitigation Scheme**. Exceedances of the LOAEL will be mitigated and minimised through the adoption of the measures detailed in **section 4.5** on Environmental Design and Mitigation, and through the implementation of the **CoCP**.

Table 4.34: Summary of effects for the operational phase

Receptor	Impact	Primary or Tertiary Mitigation	Assessment of effects	Additional Mitigation	Residual Effects
Kelsale Covert, Westhouse Crossing Cottage	Branch line – early years noise at night	Continuously welded rail. Speed restrictions. No rail movements at night through Leiston.	Major adverse	Noise Mitigation Scheme.	Major adverse (**significant**)
Crossing Cottage, Cottage Farm			Minor adverse		Minor adverse (**not signiticant**)
All other receptors			Negligible		Negligible (**not significant**)
All receptors	Branch line – early years noise during the day		Negligible		Negligible (**not significant**)
Kelsale Covert, Westhouse Crossing Cottage, Crossing East	Rail extension and branch line –later years noise at night	Continuously welded rail. Speed restrictions.	Major adverse	Noise Mitigation Scheme.	Major adverse (**significant**)
Crossing Cottage			Moderate adverse		Moderate adverse (**significant**)
105 Abbey Road, Cottage Farm			Minor adverse		Minor adverse (**not signiticant**)
All other receptors			Negligible		Negligible, (**not significant**)
All receptors	Rail extension and branch line – early years noise during the day		Negligible		Negligible, (**not significant**)

Receptor	Impact	Primary or Tertiary Mitigation	Assessment of effects	Additional Mitigation	Residual Effects
Between 40 and 50 properties within 77dB, L_{Amax} contours shown in **Annex F** to **Appendix 4B**	East Suffolk line – night time noise	Speed restrictions.	Major adverse	Rail Noise Mitigation Strategy, including change arrangements at Saxmundham junction. Noise Mitigation Scheme.	Major adverse (**significant**) for 5-10 properties
Between 150 and 160 properties between the 70 and 77dB, L_{Amax} contours shown in **Annex F** to **Appendix 4B**	East Suffolk line – night time noise	Speed restrictions.	Moderate adverse	Rail Noise Mitigation Strategy, including change arrangements at Saxmundham junction.	Moderate adverse (**signfiicant**) for 100-110 properties
Between 390 and 410 properties between the 60 and 70dB, L_{Amax} contours shown in **Annex F** to **Appendix 4B**	East Suffolk line – night time noise	Speed restrictions.	Minor adverse	Rail Noise Mitigation Strategy, including change arrangements at Saxmundham junction.	Minor adverse (**not significant**) for 320-350 properties
All other receptors	East Suffolk line – night time noise	Speed restrictions.	Negligible	None	Negligible (**not significant**)
All receptors	East Suffolk line – day time noise	Speed restrictions.	Minor adverse or negligible	Rail Noise Mitigation Strategy, including change arrangements at Saxmundham junction.	Minor adverse or negligible (**not significant**)

Receptor	Impact	Primary or Tertiary Mitigation	Assessment of effects	Additional Mitigation	Residual Effects
All receptors where a 10mph night time speed limit is proposed (in Woodbridge, Melton, Campsea Ashe and Saxmundham) within 5 metres of the operational tracks	Groundborne noise on East Suffolk line	Speed restrictions.	Major adverse	Further detailed assessment. Rail Noise Mitigation Strategy.	Major adverse (**significant**)
All receptors where a 20mph night time speed limit is proposed within 10 metres of the operational tracks	Groundborne noise on East Suffolk line	Speed restrictions	Major adverse	Further detailed assessment. Rail Noise Mitigation Strategy.	Major adverse (**significant**)
All receptors where a 10mph night time speed limit is proposed (in Woodbridge, Melton, Campsea Ashe and Saxmundham) between 5 and 14 metres from the operational tracks	Groundborne noise on East Suffolk line	Speed restrictions	Moderate adverse	Further detailed assessment. Rail Noise Mitigation Strategy.	Moderate adverse (**significant**)
All receptors where a 20mph night time speed limit is proposed between 10 and 20 metres from the operational tracks	Groundborne noise on East Suffolk line	Speed restrictions	Moderate adverse	Further detailed assessment. Rail Noise Mitigation Strategy.	Moderate adverse (**significant**)

Receptor	Impact	Primary or Tertiary Mitigation	Assessment of effects	Additional Mitigation	Residual Effects
All receptors where a 10mph night time speed limit is proposed (in Woodbridge, Melton, Campsea Ashe and Saxmundham) between 14 and 42 metres from the operational tracks	Groundborne noise on East Suffolk line	Speed restrictions	Minor adverse	Further detailed assessment. Rail Noise Mitigation Strategy.	Minor adverse **(not significant**)
All receptors where a 20mph night time speed limit is proposed between 20 and 50 metres from the operational tracks	Groundborne noise on East Suffolk line	Speed restrictions	Minor adverse	Further detailed assessment. Rail Noise Mitigation Strategy.	Minor adverse (**not significant**)
All receptors within 20 metres of the operational tracks	Groundborne noise on branch line and rail extension route	Speed restrictions	Moderate or major adverse	Rail Noise Mitigation Strategy, including further assessment and use of vibration-isolating track support systems, where appropriate	Minor adverse or negligible, (**not significant**)
All receptors between 20 and 50 metres from the operational tracks	Groundborne noise on branch line and rail extension route	Speed restrictions	Moderate or major adverse	Rail Noise Mitigation Strategy, including further assessment and use of vibration-isolating track support systems, where appropriate	Minor adverse or negligible (**not significant**)
All other receptors	Groundborne noise	Speed restrictions	Negligible	None	Negligible (**not significant**)

Table 4.35: Summary of assessment against LOAEL / SOAEL for operation

Phase of Works or Activity	Assessment Against SOAEL/LOAEL	Comment
Noise from railway line	Rail extension route: L_{Amax} SOAEL expected to be exceeded at three receptors, with the L_{Amax} LOAEL expected to be exceeded at three further receptors. East Suffolk line: L_{Amax} SOAEL expected to be exceeded at 40-50 receptors, with the L_{Amax} LOAEL expected to be exceeded at up to 570 further receptors.	Exceedances of the SOAEL will be avoided through the Rail Noise Mitigation Strategy including alternative operating procedures, and through the provisions in the **Noise Mitigation Scheme**. Adverse effects on health and quality of life will be mitigated and minimised through alternative operating procedures, quietest rolling stock, and imposition of speed limits.
Vibration from railway line	No exceedances of the SOAEL or LOAEL expected.	No action required to avoid significant adverse effects on health and quality of life. No further mitigation required to mitigate and minimise adverse effects on health and quality of life.
Groundborne noise from railway line	SOAEL expected to be exceeded at receptors within 5m of the line for trains travelling at 10mph and within 10m of the line for trains travelling at 20mph. LOAEL likely to be exceeded at receptors within 50m of railway line, but not closer than 5m or 10m, for trains travelling at 10mph and 20mph respectively	Design of rail route extension to use vibration-isolating track support systems to avoid exceeding the SOAEL. For the East Suffolk line, further targeted, detailed assessments to be undertaken at locations that are identified as exceeding the SOAEL. Further measures to avoid the SOAEL contingent on those further assessments. Adverse effects on health and quality of life will be mitigated and minimised through imposition of speed limits.

Phase of Works or Activity	Assessment Against SOAEL/LOAEL	Comment
Noise from operation of level Crossings	No exceedances of the SOAEL or LOAEL expected.	No action required to avoid significant adverse effects on health and quality of life. No further mitigation required to mitigate and minimise adverse effects on health and quality of life.

Table 4.36: Summary of effects for the reinstatement phase

Receptor	Impact	Primary or Tertiary Mitigation	Assessment of effects	Additional Mitigation	Residual Effects
All noise and vibration sensitive receptors, excluding Pro Corda Music School at Leiston Abbey	Noise and vibration	**CoCP** (Doc Ref. 8.11), including routine monitoring	Negligible or Minor	None	Negligible or minor (**not significant**)
Pro Corda Music School at Leiston Abbey	Noise	**CoCP** (Doc Ref. 8.11), including routine monitoring	Moderate or major adverse	Mitigation will be subject to further dialogue to tailor it to Pro Corda's particular requirements. The agreed mitigation will be incorporated into the **Noise Monitoring and Management Plan** under the **CoCP** (Doc Ref. 8.11)	Moderate or major adverse, **significant** although further mitigation may reduce this to negligible (**not significant**)

Table 4.37: Summary of assessment against LOAEL / SOAEL for removal and reinstatement phase

Phase of Works or Activity	Assessment against SOAEL/LOAEL	Comment
Noise from removal and reinstatement works	No exceedances of the SOAEL expected. LOAEL may be exceeded at some points during construction works at all receptors.	No action required to avoid significant adverse effects on health and quality of life. Exceedances of the LOAEL will be mitigated and minimised through the adoption of the measures detailed in **section 4.5** on Environmental Design and Mitigation, and through the implementation of the **CoCP**.
Vibration from construction removal and reinstatement works	No exceedances of SOAEL or LOAEL expected.	No action required to avoid significant adverse effects on health and quality of life. No requirement for further mitigation to mitigate and minimise adverse effects on health and quality of life.

References

4.1 DECC (2011) Overarching National Policy Statement (NPS) for Energy (NPS EN-1) https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/47854/1938-overarching-nps-for-energy-en1.pdf [Accessed July 2019]

4.2 DECC (2011) National Policy Statement for Nuclear Power Generation (NPS EN-6) https://www.gov.uk/government/publications/national-policy-statements-for-energy-infrastructure [Accessed July 2019]

4.3 Part III of the Control of Pollution Act 1974

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

4.5 British Standard BS 5228-2 Vibration: 2009+A1: 2014 – Code of Practice for noise and vibration control at open construction sites – Vibration.

4.6 MHCLG (2019) National Planning Policy Framework https://www.gov.uk/government/publications/national-planning-policy-framework--2 [Accessed July 2019]

4.7 MHCLG (2019) Planning Practice Guidance https://www.gov.uk/government/collections/planning-practice-guidance [Accessed July 2019]

4.8 NPSE (2010) Noise Policy Statement for England https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69533/pb13750-noise-policy.pdf [Accessed Jan 2020]

4.9 DEFRA (2018) Government's 25 Year Environment Plan. https://www.gov.uk/government/publications/25-year-environment-plan [Accessed July 2019]

4.10 ESC (2013) Suffolk Coastal District Council Core Strategy and Development Management Policies https://www.eastsuffolk.gov.uk/planning/local-plans/suffolk-coastal-local-plan/existing-local-plan/core-strategy-and-development-management-policies/ [Accessed July 2019]

4.11 ESC (2019) Suffolk Coastal District Council Final Draft Local Plan https://www.eastsuffolk.gov.uk/planning/local-plans/suffolk-coastal-local-plan/local-plan-review/final-draft-local-plan/ [Accessed July 2019]

4.12 World Health Organisation Regional Office for Europe Environmental Noise Guidelines for the European Region 2018 http://www.euro.who.int/en/health-topics/environment-and-health/noise/publications/2018/environmental-noise-guidelines-for-the-european-region-2018 [Accessed Jan 2020]

4.13 Calculation of Railway Noise (CRN). Department of Transport 1995

4.14 British Standard BS 6472-1: 2008 Guide to evaluation of human exposure to vibration in buildings Part 1: Vibration sources other than blasting;

4.15 British Standard BS 8233:2014 – Guidance on sound insulation and noise reduction for buildings, BSI Standards Publication 2014;

4.16 Association of Noise Consultants (ANC) Measurement and assessment of groundborne noise and vibration 2012;

4.17 British Standard BS 7385-2: 1993 Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from groundborne vibration.

4.18 The Noise Insulation (Railways and Other Guided Transport Systems) Regulations 1996