The Sizewell C Project

6.9 Volume 8 Freight Management Facility

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

Figures

Plates

None Provided.

Appendices

None Provided.

4 Noise and Vibration

4.1 Introduction

4.1.1 This chapter of **Volume 8** of the **Environmental Statement (ES)** presents an assessment of the noise and vibration effects arising from the construction, operation and removal and reinstatement of the freight management facility (referred to throughout this volume as the 'proposed development'). This includes an assessment of potential impacts, the significance of effects, the requirements for mitigation, and the residual effects.

4.1.2 Given the level of noise and vibration sources and distance between the closest noise and vibration sensitive receptors, adverse effects are not predicted. However, this chapter presents a summary of the noise and vibration effects during the worst-case construction, operational and removal and reinstatement phases, in order to demonstrate this.

4.1.3 Detailed descriptions of the freight management facility site (referred to throughout this volume as the 'site'), the proposed development and the different phases of development are provided in **Chapters 1** and **2** of this volume of the ES. A glossary of terms and list of abbreviations used in this chapter is provided in **Volume 1**, **Appendix 1A** of the **ES**.

4.1.4 Changes in noise levels on the wider road network are considered within **Volume 2, Chapter 11**.

4.1.5 This assessment has been informed by data presented in **Appendix 4A** of this chapter: Construction and operational 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 noise and vibration assessment.

a) International

4.2.3 No international legislation or policy that is relevant to the noise and vibration assessment for this site.

b) National

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).

c) Regional

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

d) 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 (Ref. 4.10); and
- Suffolk Coastal District Council Final Draft Local Plan (Ref. 4.11).

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

e) 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);
- Guidance in the Design Manual for Roads and Bridges LA111 (DMRB) (Ref. 4.13);
- Calculation of Road Traffic Noise (CRTN) (Ref. 4.14);
- British Standard BS8233: 2014 – Guidance on sound insulation and noise reduction for buildings (Ref. 4.15);
- British Standard BS5228-1 Noise: 2009+A1: 2014 – Code of Practice for noise and vibration control at open construction sites – Noise (Ref. 4.4); and
- British Standard BS5228-2 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 Environmental Impact Assessment (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 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**).

4.3.4 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**.

i. Consultation

4.3.5 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 have been provided in **Volume 1, Appendix 6G.**

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

- assessment criteria;
- noise source data; and
- assessment approach (both noise and vibration).

b) Study area

4.3.7 The geographical extent of the study area would generally include all areas around the site which might result in a low adverse effect (or greater). However, since there are no noise sensitive premises within this area, the area has been expanded to the closest noise sensitive receptor instead. **Figure 4.1** identifies the nearest sensitive receptors (1 and 2 Keepers Cottages) which are approximately 350m from the site.

c) Assessment scenarios

4.3.8 The assessment considers the worst-case or noisiest periods of activity during construction, operation (at the time when the vehicle flow rates are predicted to be at their highest) and removal and reinstatement phases. Only these worst-case situations are described, in order to demonstrate that there would be no adverse effects (given the distances between source and receptors).

d) Assessment criteria

4.3.9 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.

4.3.10 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**. A summary of the assessment criteria used in this assessment is presented in the following section.

i. Sensitivity

4.3.11 The criteria used in the noise and vibration for determining the sensitivity to receptors are set out in **Table 4.1**.

Table 4.1: 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.

4.3.12 No high sensitivity receptors have been identified within the study area. The nearest sensitive receptors (1 and 2 Keepers Cottages) are considered to be of medium sensitivity.

ii. Magnitude

4.3.13 The approach taken to evaluate noise effects for all construction work associated with the Sizewell C 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 4.2**. 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 4.2** 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 impacts. Further detail is provided in **Volume 1 Appendix 6G**.

Table 4.2: 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 $L_{Aeq,T}$ sound level for the period increases by more than 3 dB due to construction activity.

4.3.14 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.

4.3.15 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.

4.3.16 The values to be used to assess the magnitude of impact for construction work from all construction work are as shown in **Table 4.3**.

Table 4.3: 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 4.2** 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.

4.3.17 For the assessment of magnitude of construction vibration, **Table 4.4** will be used.

Table 4.4: 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				

4.3.18 Construction vibration will be considered significant if the magnitude of impact is medium or high at a medium or high sensitivity 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.

4.3.19 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.

4.3.20 **Table 4.5** shows the magnitudes of impact for receptors of different sensitivity for operational sources such as those expected at the proposed development.

Table 4.5: Magnitude of impact for receptors of different sensitivity for noise from operation of freight management facilities (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				

iii. Classification of effects

4.3.21 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 4.6**. Definitions of each of the different levels of effect, which can be adverse, beneficial or neutral are shown in **Table 4.7**.

Table 4.6: 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 4.7: 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.

4.3.22 Following the classification of an effect as detailed in **Tables 4.6** and **4.7**, 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

4.3.23 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.

4.3.24 Each different source type requires its own specific value for LOAEL and SOAEL, which depends on these factors. The methodology for assigning significance differs from the general methodology set out in **Volume 1 Chapter 6** of the **ES,** 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.

4.3.25 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 proposed associated developments. **Table 4.8** sets out descriptions for and actions recommended in relation to these categories.

Table 4.8: 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

4.3.26 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.

4.3.27 The descriptions and actions recommended in **Table 4.8** 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.

4.3.28 For construction noise, the LOAEL is considered to be equal to the existing baseline ambient level. SOAEL values are as shown in **Table 4.9**.

Table 4.9: SOAEL values for noise from all construction work associated with the proposed development (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.

4.3.29 **Table 4.10** sets outs the LOAEL and SOAEL values adopted for construction and vibration and the derivation of these values are detailed in **Volume 1 Appendix 6G** and **Annex 6G.1**.

Table 4.10: LOAEL and SOAEL values for construction vibration.

LOAEL	SOAEL	Parameter
0.3	10.0	PPV mm/s

4.3.30 **Table 4.11** sets outs the LOAEL and SOAEL values for the freight management facility and the derivation of these values are detailed in **Volume 1 Appendix 6G** and **Annex 6G.1.**

Table 4.11: LOAEL and SOAEL values for noise from operation of the freight management facility (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}

e) Assessment methodology

i. Baseline Surveys

4.3.31 No baseline monitoring was undertaken as part of the assessment since the existing noise climate would not influence the outcome of the assessment (predicted noise and vibration are considered against absolute values).

ii. Construction and operational assessment

4.3.32 Key plant items and activities during construction, operation and removal and re-instatement phases were identified which have the potential to give rise to off-site noise or vibration levels. Levels were then predicted by calculation (accounting for noise propagation due to distance) for each noise sensitive receptor in the vicinity, and these levels compared to assessment criteria relevant to the noise or vibration source.

4.3.33 No assessment has been made of operational vibration, since there would be no sources generating vibration of any significance on site and the closest receptors are located 350 metres away.

4.3.34 All receptors are taken to be medium sensitivity.

f) Assumptions and limitations

4.3.35 The following assumptions have been made in this assessment:

- Construction, operation and removal and reinstatement would be carried out as described in **Chapter 2** of this volume;
- It is assumed that construction works would only take place 07:00 to 19:00 Monday to Saturday. No evening or night-time works during construction have been assessed. However, if night-time working was required, for example for unplanned dewatering, East Suffolk Council (ESC) will be notified in advance and noise control measures agreed, as necessary; and
- When assessing vibration propagation, typical worst-case ground conditions have been assumed, which propagate vibration more easily than other common ground types.

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 As described in **section 4.3** the assessment of construction noise and operational noise does not require a knowledge of baseline noise levels, and where baseline noise levels would not result in a change to the assessment conclusion, it is not considered necessary to capture baseline noise baseline.

4.4.3 In this case, since the distance between the site boundary and the closest noise sensitive receptors, 1 and 2 Keepers Cottages, is approximately 350 metres (m) and initial calculations showed that there would be no adverse effect, it was not considered necessary to obtain no baseline data.

4.4.4 It is worth noting that since 1 and 2 Keepers Cottages are approximately 100m from the A14 dual carriageway to Felixstowe, noise from existing road traffic is likely to be substantial there.

b) Future Baseline

Future baseline is not likely to change substantially from existing and, in any event, would make no difference to the assessment conclusions. There are no new schemes in the area that would introduce noise sources that would

alter the existing environment and no new committed developments which would result in receptors any closer than those considered as existing receptors.

4.5 Environmental design and mitigation

4.5.1 As detailed in **Volume 1**, **Chapter 6** of the **ES**, 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 development. 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, the following primary and tertiary mitigation measures have been embedded into the design and construction management of the proposed development.

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. However, the closest noise sensitive receptor is more than 300 metres from the site and initial calculations indicated that there would be no adverse noise and vibration effects; no specific noise or vibration measures have been incorporated into the design.

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 would be followed, as set out in the **Code of Construction Practice** (**CoCP**) (Doc Ref. 8.11). Tertiary mitigation for the control of construction noise would include:

- selection of quiet plant and techniques in accordance with good practice in BS5228 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).

4.5.7 During construction, a **Construction Traffic Management Plan** (Doc Ref. 8.7) and a **Construction Workforce Travel Plan** (Doc Ref. 8.8) will be implemented to help reduce and manage the effects of traffic generated by the Sizewell C Project (see **Volume 2**, **Chapter 10** for more detail).

c) Other Mitigation

4.5.8 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.

4.5.9 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."*

4.5.10 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)* (Ref. 4.7).

4.5.11 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.

4.6 Assessment

a) Introduction

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

4.6.2 This section identifies any likely significant effects that are predicted to occur and **section 4.7** then highlights any secondary mitigation and monitoring measures that are proposed to minimise any adverse effects, if required.

b) Construction

i. Noise

4.6.3 A description of the construction methods is provided in **Chapter 2** of this volume. Associated environmental control measures are detailed in the **CoCP** (Doc Ref. 8.11) and are summarised in **section 4.5**. The hours of working for the construction phases have been discussed during consultation meetings with Suffolk County Council and East Suffolk Council. For the purposes of this assessment, construction site overall working hours are therefore considered as follows:

- Monday to Saturday 07:00–19:00 hours.

4.6.4 The working hours fall entirely within the daytime assessment period of 07:00 to 19:00 hours and therefore, for work taking place during a weekday working and work between 07:00 and 13:00 hours on Saturday, only the daytime criteria in **Table 4.3** apply to this part of the assessment. For work taking place between 13:00 and 19:00 hours on a Saturday, the "Evenings and Weekends" criteria in **Table 4.3** would apply.

4.6.5 Noise during construction would be generated principally from the following sources during each phase of construction work:

- Enabling works: chainsaws for site clearance.
- Earthworks and excavations: excavators, dump trucks, bulldozers and vibratory roller during the formation of proposed landscape bunds on east and west boundaries.
- Laying of surfaces: petrol-driven concrete cutter and vibratory compaction.
- Construction of buildings: excavator.
- Access road surfacing: planer, paver, road roller.

4.6.6 Of these, the noisiest period is expected to occur during the second phase of earthworks and excavations, when the landscape bunds are formed. On the basis that there might two bulldozers, two excavators and associated dump trucks all carrying out this work close to the boundary of the site, the noise level at a reference distance of 40m is calculated as 70dB, $L_{Aeq,12\ hours}$ free field.

4.6.7 Assuming that there were to be no screening due to any topographical features, the noise level at the closest receptors, 1 and 2 Keepers Cottages, which are approximately 350m from the site boundary, is predicted to be no more than 51dB $L_{Aeq,12\ hours}$ free field This is no more than a low magnitude of impact, irrespective of ambient level.

4.6.8 When combined with the medium sensitivity of the receptors, this will result in no more than a minor adverse effect. This is considered to be **not significant**.

4.6.9 The predicted construction noise level is predicted to be below both the construction SOAEL of 75dB for the weekday daytime period of 0800 to 1800 hours and the lower SOAELs that are adopted for the periods outside of the main weekday daytime works, even when the predicted free field values are adjusted by +3dB to obtain façade values. There is expected to be no exceedance of the SOAEL from the construction works.

4.6.10 The LOAEL, which for construction noise is taken to be equal to the existing baseline sound levels, may be exceeded at the closest receptor locations for at least some of the time during the construction works. This will be mitigated and minimised through the measures described in **section 4.5** on Environmental Design and Mitigation, and through the implementation of the **CoCP**.

4.6.11 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.

ii. Vibration

4.6.12 The approach taken for predicting vibration levels is described in **Volume 1, Appendix 6G** and **Annex 6G.2** of the **ES**. Using Figures 1 and 2 from this, it can be seen, that for earthmoving, including bulldozers; breakers, crushers and small twin drum vibratory rollers, there would be a negligible vibration effect beyond a distance of 40m from the activity. For plant which produces higher vibration levels (such as large single drum compactors), there would be a negligible vibration effect beyond a distance of 90m from the activity.

4.6.13 Since the closest vibration sensitive receptors (1 and 2 Keepers Cottages) are approximately 350m from the boundary, vibration levels are expected to be below the level that would result in a very low magnitude of impact. When combined with the medium sensitivity of the receptors, a negligible effect is expected. This is considered to be **not significant**.

4.6.14 There are predicted to be no exceedances of the SOAEL of 10mm/s nor of the LOAEL of 0.3mm/s as a result of these works.

iii. Inter-relationship effects

4.6.15 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**.

c) Operation

i. Noise

4.6.16 The proposed development would be operational for a minimum of 7.5 hours a day for five days a week, up to a maximum of 24 hours a day seven days a week during peak construction period of the Sizewell C main development site.

4.6.17 The potential activities associated with the operation of the proposed development that could give rise to noise impact at the closest receptors are limited to HGV movements.

4.6.18 The peak number of movements which would take place in any 24 hour period would be 425 heavy goods vehicles (during peak construction in 2028). Assuming that a third of these HGVs arrive and leave at night, which is considered a worst-case proportion of that peak number of movements, the highest noise levels that are predicted to occur is 35dB $L_{Aeq,8h}$ and 49dB L_{Amax}.

4.6.19 These values are based on the following assumptions:

- An HGV arriving, manoeuvring, parking and pulling away (including some engine idling) will last for 5 minutes per vehicle and generate sound levels of 90dB L_{AE} and 79dB L_{Amax}, both measured at a distance of 10 metres, free field.
- There would be approximately 140 HGVs in an 8 hour night.
- The closest manoeuvring and parking area within site would be approximately 440 metres from nearest dwelling, and the furthest would be furthest would be 650 metres away. The 140 HGVs are assumed to be split over five rows of parking spaces, the closest of which is taken to be 400m from the receptor and the furthest 650m from the receptor. The intermediate three rows would be spaced approximately equally between these two.
- The calculation assumes normal hemispherical spreading of sound with no additional attenuation due to ground or air absorption, or screening.
- The $L_{Aeq,8h}$ values is obtained by summing the contributions from all 140 HGVs.

- The L_{Amax} value is obtained by taking the maximum sound level from a single HGV at the closest possible distance, i.e. 440m.

- A +3dB correction is applied to account for façade reflections.

4.6.20 In summary, worst case night time levels at the closest receptor, assuming no reduction from screening, is predicted to be 35dB, $L_{Aeq, 8\ hours}$ and 49dB, L_{Amax} free field. These predicted values would be a very low magnitude of impact, which when taking account of the medium sensitivity of the closest receptors, would result in negligible effects. These are considered to be **not significant**.

4.6.21 The predicted values are below both the SOAEL and LOAEL. There are therefore expected to be no exceedances of either SOAEL or LOAEL from the operation of the proposed development.

ii. Inter-relationship effects

4.6.22 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**.

d) Removal and reinstatement

i. Noise

4.6.23 During this work, the highest off-site noise level would occur during landscape re-instatement. Assuming that there might be two bulldozers, two excavators and associated dump trucks carrying out this work close to the boundary of the site, the noise level at a reference distance of 40m would be 70dB, $L_{Aeq, 12\ hours}$.

4.6.24 Assuming that there were to be no screening due to any topographical features, the noise level at the closest receptors, 1 and 2 Keepers Cottages, which are approximately 350m from the site boundary, is predicted to be no more than 51dB $L_{Aeq,12\ hours}$ free field. This is no more than a low magnitude of impact.

4.6.25 When combined with the medium sensitivity of the receptors, this will result in no more than a minor adverse effect. This is considered to be **not significant**.

4.6.26 The predicted construction noise level is predicted to be below both the construction SOAEL of 75dB for the weekday daytime period of 0800 to 1800 hours and the lower SOAELs that are adopted for the periods outside of the main weekday daytime works, even when the predicted free field values are adjusted by +3dB to obtain façade values. There is expected to be no exceedance of the SOAEL from the removal and reinstatement works.

4.6.27 The LOAEL, which for construction noise is taken to be equal to the existing baseline sound levels, may be exceeded at the closest 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**.

4.6.28 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.

ii. Vibration

4.6.29 The approach taken for predicting vibration levels is described in **Volume 1, Appendix 6G** and **Annex 6G.2**. Using **Figures 1** and **2** from **Annex 6G.2**, it can be seen, that for earthmoving, including bulldozers; breakers, crushers and small twin drum vibratory rollers, there would be a negligible vibration effect beyond a distance of 40m from the activity. For plant which produces higher vibration levels (such as large single drum compactors), there would be a negligible vibration effect beyond a distance of 90m from the activity.

4.6.30 Since the closest vibration sensitive receptors (1 and 2 Keepers Cottages) are located approximately 350m from the boundary, vibration levels are expected to be below the level that would result in a very low magnitude of impact. When combined with the medium sensitivity of the receptors, a negligible effect is expected. This is considered to be **not significant**.

4.6.31 There are predicted to be no exceedances of the SOAEL of 10mm/s nor of the LOAEL of 0.3mm/s as a result of these works.

iii. Inter-relationship effects

4.6.32 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** of this volume and in **Volume 10**, **Chapter 2**.

4.7 Mitigation and monitoring

a) Introduction

4.7.1 As described in **section 4.5,** there are no noise or vibration specific mitigation measures embedded in the design of the proposed development. The standard of good practice outlined in BS 5228-1 and BS 5228-2 would be followed, as set out in the **CoCP** (Doc Ref. 8.11). No further mitigation or monitoring is required.

4.8 Residual effects

4.8.1 The following tables (**Tables 4.12, 4.13, 4.14, 4.15, 4.16** and **4.17**) present a summary of the noise and vibration assessment.

4.8.2 **Tables 4.12, 4.14** and **4.16** relate to the construction, operational and 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 4.13, 4.15** and **4.17** also relate to the construction, operational and reinstatement phases respectively, identifying the assessment outcomes against LOAEL and SOAEL.

Table 4.12: Summary of effects for the construction phase

Receptor	Impact	Primary or Tertiary Mitigation	Assessment of effects	Additional Mitigation	Residual Effects
1 and 2 Keepers Cottages	Construction noise	The standard of good practice outlined in BS 5228-1 and BS5228-2 would be followed, as set out in the **CoCP** (Doc Ref.8.11).	No higher than minor adverse	None required	No higher than minor adverse (**not significant**)
1 and 2 Keepers Cottages	Construction vibration		Negligible	None required	Negligible (**not significant**)

Table 4.13: Summary of assessment against LOAEL / SOAEL for construction

Phase of Works or Activity	Assessment Against SOAEL/LOAEL	Comment
Noise from construction 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 works	No exceedances of SOAEL or LOAEL.	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.

Table 4.14: Summary of effects for the operational phase

Receptor	Impact	Primary or Tertiary Mitigation	Assessment of effects	Additional Mitigation	Residual Effects
1 and 2 Keepers Cottages	Noise and vibration from operation of the proposed development	The standard of good practice outlined in BS 5228-1 and BS5228-2 would be followed, as set out in the **CoCP** (Doc Ref.8.11).	Negligible	None required	Negligible (**not significant**)

Table 4.15: Summary of assessment against LOAEL / SOAEL for operation

Phase of Works or Activity	Assessment Against SOAEL/LOAEL	Comment
Noise from construction 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.
Vibration from construction 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.

Table 4.16: Summary of effects for the removal and reinstatement phase

Receptor	Impact	Primary or Tertiary Mitigation	Assessment of effects	Additional Mitigation	Residual Effects
1 and 2 Keepers Cottages	Noise levels during removal and reinstatement works	The standard of good practice outlined in BS 5228-1 and BS5228-2 would be followed, as set out in the **CoCP** (Doc Ref.8.11).	No higher than minor adverse	None required	No higher than minor adverse (**not significant**)
1 and 2 Keepers Cottages	Vibration from removal and reinstatement activities		Negligible	None required	Negligible (**not significant**)

Table 4.17: Summary of assessment against LOAEL / SOAEL for removal and reinstatement works

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 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 BS5228-1 Noise: 2009+A1: 2014 – Code of Practice for noise and vibration control at open construction sites – Noise

4.5 British Standard BS5228-2 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

4.13 Guidance in the Design Manual for Roads and Bridges (DMRB)

4.14 Calculation of Road Traffic Noise (CRTN)

4.15 British Standard BS8233:2014 – Guidance on sound insulation and noise reduction for buildings