NORTH FALLS

Offshore Wind Farm

PRELIMINARY ENVIRONMENTAL INFORMATION REPORT

Chapter 26 Noise and Vibration

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Glossary of Acronyms

AAWT	Annual Average Weekday Traffic
BNL	Basic Noise Level
BPM	Best Practicable Means
BS	British Standard
BSI	British Standards Institution
CEA	Cumulative Effects Assessment
CEMP	Construction Environmental Management Plan
CNVMP	Control of Noise and Vibration Management Plan
CoPA	Control of Pollution Act 1974
CRTN	Construction of Road Traffic Noise
CTMP	Construction Traffic Management Plan
CTR	Construction Traffic Receptor
dB	Decibel
DCO	Development Consent Order
DEFRA	Department for the Environment and Rural Affairs
DMRB	Design Manual for Roads and Bridges
EIA	Environmental Impact Assessment
ES	Environmental Statement
ETG	Expert Topic Group
HDD	Horizontal Directional Drill
HGV	Heavy Goods Vehicle
IEMA	Institute of Environmental Management and Assessment
IPC	Infrastructure Planning Commission
ISO	International Standards Organisation
km	Kilometre
LFR	Landfall Receptor
LOAEL	Lowest Observed Adverse Effect Level
NAC	Noise Advisory Council
NNG	Night Noise Guideline
NOEL	No Observed Effect Level
NPPF	National Planning Policy Framework
NPPG	National Planning Practice Guidance
NPS	National Policy Statements
NPSE	Noise Policy Statement for England
NSIP	Nationally Significant Infrastructure Project
NVSR	Noise and Vibration Sensitive Receptor
OAE	Observed Adverse Effect
PEIR	Preliminary Environmental Information Report
PPG	Planning Practice Guidance

PPV	Peak Particle Velocity
SOAEL	Significant Observed Adverse Effect Level
SSR	Substation Receptor
TRRL	Transport and Road Research Laboratory
UK	United Kingdom
WHO	World Health Organisation

Glossary of Terminology

The Applicant	North Falls Offshore Wind Farm Limited (NFOW)
The Project or 'North Falls'	North Falls Offshore Wind Farm, including all onshore and offshore infrastructure.
Evidence Plan Process (EPP)	A voluntary consultation process with specialist stakeholders to agree the approach, and information to support, the EIA and HRA for certain topics.
Expert Topic Group (ETG)	A forum for targeted engagement with regulators and interested stakeholders through the EPP.
Horizontal directional drill (HDD)	Trenchless technique to bring the offshore cables ashore at the landfall. The technique will also be used for installation of the onshore export cables at sensitive areas of the onshore cable route.
Jointing bays	Underground structures constructed at regular intervals along the onshore cable route to join sections of cable and facilitate installation of the cables into the buried ducts.
Landfall	The location where the offshore cables come ashore.
Landfall compound	Compound at landfall within which HDD or other trenchless technique would take place.
Landfall search area	Locations being considered for the landfall, comprising the Essex coast between Clacton-on-Sea and Frinton-on-Sea.
Offshore cable corridor	The corridor of seabed from array areas to the landfall within which the offshore export cables will be located.
Onshore cable corridor(s)	Onshore corridor(s) within which the onshore export cables and associated infrastructure will be located. A final onshore cable route for which consent will be sought will be selected from within these corridor(s).
Onshore substation	A compound containing electrical equipment required to transform and stabilise electricity generated by the project so that it can be connected to the National Grid.
Onshore substation zone	Area within which the onshore substation will be located.
Onshore substation construction compound	Area set aside to facilitate construction of the onshore substation. Will be located adjacent to the onshore substation (location not yet defined).
Onshore project area	The boundary in which all onshore infrastructure required for the Project will be located (i.e. landfall; onshore cable route, accesses, construction compounds; onshore substation and National Grid substation extension), as considered within the PEIR.
Trenchless crossing compound	Areas within the cable corridor which will house trenchless crossing (e.g. HDD) entry or exit points.

26 Noise and Vibration

26.1 Introduction

1. This chapter of the Preliminary Environmental Information Report (PEIR) considers the likely significant effects of the North Falls Offshore Wind Farm (hereafter 'North Falls' or 'the Project') on noise and vibration. The chapter provides an overview of the existing environment for the proposed onshore project area, followed by an assessment of likely significant effects for the construction, operation, and decommissioning phases of the Project.
2. This chapter has been written by Royal HaskoningDHV, with the assessment undertaken with specific reference to the relevant legislation and guidance, of which the primary sources are the National Policy Statements (NPS). Details of these, and the methodology used for the Environmental Impact Assessment (EIA) and Cumulative Effects Assessment (CEA), are presented in Section 26.4.
3. The assessment should be read in conjunction with following linked chapters (Volume I):
    - Chapter 23 Onshore Ecology;
    - Chapter 24 Onshore Ornithology;
    - Chapter 27 Traffic and Transport;
    - Chapter 28 Human Health;
    - Chapter 31 Socio-Economics; and
    - Chapter 32 Tourism and Recreation.
4. Additional information to support the noise and vibration assessment (Volume III):
    - Appendix 26.1 Baseline Noise Survey and Acoustic Terminology;
    - Appendix 26.2 Road Traffic Noise Assessment; and
    - Appendix 26.3 Construction Noise and Vibration Assessment.

26.2 Consultation

5. Consultation with regard to noise and vibration has been undertaken in line with the general process described in Chapter 6 EIA Methodology (Volume I). The key elements to date have included scoping and the ongoing technical consultation via the Traffic and Transport, Air Quality, Climate Change and Noise and Vibration Expert Topic Group (ETG). The feedback received has been considered in preparing the PEIR as summarised in Table 26.1.
6. This chapter will be updated following the consultation on the PEIR in order to produce the final assessment, which will be presented in an Environmental Statement (ES) that will be submitted with the Development Consent Order (DCO) application. Full details of the consultation process will also be presented in the Consultation Report as part of the DCO application.

Table 26.1 Consultation responses

Consultee	Date / Document	Comment	Response / where addressed in the PEIR
Planning Inspectorate	August 2021 / Scoping Opinion: Proposed North Falls Offshore Wind Farm	Scoping Opinion Section 5.8 'Onshore noise and vibration'. 5.8.1. The Scoping Report states that the onshore substation will be designed to achieve negligible levels of ground borne vibration, including through use of isolation pads / mounts in accordance with industry standards. The Inspectorate acknowledges that it is unlikely that there would be significant effects arising from vibration impacts, however, at this stage the location of the onshore substation has not been confirmed, and it is therefore not possible to confirm the distance to any potentially affected human and ecological receptors. The Scoping Report also notes potential for emergency generators at the onshore substation, and it is unclear whether this would result in vibration impact. This matter should therefore be scoped into the ES where significant effects are likely.	The closest noise and vibration sensitive receptors (NVSRs) to the onshore substation within the scope of this assessment are identified in Section 26.5.1. The minimum distance from any NVSR to the onshore substation zone is over 200m. As discussed in Section 26.4.3.7, any operational vibration emissions from the onshore substation plant will be significantly attenuated by propagation over this distance, such that perceptible levels of vibration will not occur at the identified NVSRs. Noise and vibration impacts on terrestrial protected species are considered within Chapter 23 Onshore Ecology and Chapter 24 Onshore Ornithology (Volume I).
		5.8.2. The Inspectorate notes that vibration affecting human receptors is scoped into the construction and decommissioning phases of the Proposed Development, but no reference is made to vibration affecting ecological receptors. As the onshore components of the Proposed Development are still subject to areas of search, and there is potential for activity that would generate vibration impacts to be located in proximity to identified ecological receptors, the Inspectorate does not consider that sufficient information is available to conclude that there would be no likely significant effects and this matter should not be scoped out of the ES.	Noise and vibration impacts on terrestrial protected species are considered within Chapter 23 Onshore Ecology and Chapter 24 Onshore Ornithology (Volume I)**.**
		5.8.3. On the basis that road traffic associated with operational maintenance of the underground cables and onshore substation would be minimal as described in paragraph 672 of the Scoping Report and would therefore not result in a large increase from the baseline conditions as described in section 3.9.1.1 of the Scoping Report, the Inspectorate agrees that significant effects in respect of road traffic noise are unlikely to occur. However, the ES should clarify the anticipated number and routeing of road vehicle movements during the operational phase, including those associated with operational maintenance of offshore components.	Details of operational phase road traffic are provided in Chapter 27 Traffic and Transport (Volume I).

Consultee	Date / Document	Comment	Response / where addressed in the PEIR
		5.8.4. On the basis that the only components of the Proposed Development located in nearshore locations would be buried cable at the landfall site, which would not result in any operational noise, the Inspectorate agrees that this matter would not give rise to likely significant effects and can therefore be scoped out of the ES.	Agreed.
		5.8.5. Table 3.22 identifies broad categories of receptors and their sensitivity value in respect of noise. The ES should also identify receptors and their sensitivity value for the purposes of the assessment of vibration impacts.	Receptor sensitivity to noise and vibration has been identified, as described in Section 26.4.3.2.
		5.8.6. The Scoping Report states that a baseline noise survey will be undertaken to establish baseline conditions once the onshore scoping area has been refined but does not explain how the baseline vibration conditions will be established. The ES should explain how the baseline vibration conditions have been established which may require completion of a baseline vibration survey or confirmation that the vibration baseline will be assumed as negligible or zero.	Baseline vibration levels are assumed to be negligible, as discussed in Section 26.5.2.
		5.8.7. The Inspectorate notes that there is reference to the results of geophysical surveys and grab sampling informing the methodologies required for installing offshore infrastructure and the assessment process for offshore airborne noise. This contradicts the information presented in section 2.1 of the Scoping Report, which states that the impact of offshore airborne noise to onshore receptors is scoped out of the ES on the basis that the distance of activity from receptors (approximately 22.5km) would result in no likely significant effects. The approach should be clarified in the ES, and where there is potential for likely significant effects to onshore receptors from offshore airborne noise this should be assessed in the ES. The Inspectorate notes that the impact of nearshore airborne noise to human and ecological receptors during construction and decommissioning is scoped into the ES.	The distance of 22.5km stated in section 2.1 of the Scoping Report refers to the distance of works in the Array areas from the onshore receptors. Due to this large separation distance, airborne noise impacts from works in the Array areas will be negligible at the identified onshore NVSRs and are therefore scoped out of this assessment. There is the potential for noise impacts on the identified NVSRs from nearshore works, these are discussed in Section 26.6.1.1. As discussed in Section 26.3.2, decommissioning noise impacts are anticipated to be no worse than those during construction of the Project. Hence, these impacts are scoped out of this assessment.
		5.8.8. Information should be provided in the ES on the types of vehicles and plant to be used during the construction phase. Where uncertainty exists over the likely vehicles and equipment	Information on construction vehicles and plant is provided in Appendix 26.3 (Volume III). The vehicles and plant have been assumed to be at a worst-case location for a receptor; further

Consultee	Date / Document	Comment	Response / where addressed in the PEIR
		to be used the assessment should adopt a 'worst case' for receptors, i.e. that within the application boundary the vehicles and plant are at the closest possible point to a receptor.	details on the calculation procedures are provided in Appendix 26.3 (Volume III).
Tendring District Council	ETG Meeting 1, July 2021	Tendring District Council were presented with the proposed data collection and assessment methodologies. No comments were provided.	N/a
	ETG Meeting 2, May 2022	Tendring District Council were presented with the identified noise sensitive receptors and proposed baseline noise measurement locations around the onshore substation zone and landfall. No baseline monitoring proposed along the onshore cable corridor(s). Tendring District Council requested an additional monitoring point in Great Holland.	Final monitoring locations are shown in Figure 26.1 (Volume II). Monitoring locations have changed since the consultation due to access restrictions, as discussed in Appendix 26.1 (Volume III). Agreed that construction road traffic noise impact assessment would be based on calculated noise level changes and would not require measurement of baseline noise levels.

26.3 Scope

26.3.1 Study area

7. The study area for noise and vibration has been defined on the basis of the nearest NVSRs to the onshore project area including the landfall search area, onshore cable corridor(s) and onshore substation zone, and the nearshore works.

8. The nearest NVSRs to the onshore substation zone, landfall search area and those with the potential to be affected by road traffic noise are shown on Figures 26.1, 26.2 and 26.3 (Volume II) respectively. Due to the linear nature of the onshore cable corridor(s) works, the assessments of the associated noise and vibration did not require specific NVSRs to be identified. The noise and vibration study area also includes road traffic links with the potential to be affected by the Project during the construction phase, as defined in Chapter 27 Traffic and Transport (Volume I).

26.3.2 Realistic worst case scenario

9. The final design of North Falls will be confirmed through detailed engineering design studies that will be undertaken post-consent. In order to provide a precautionary but robust impact assessment at this stage of the development process, realistic worst case scenarios have been defined in terms of the potential effects that may arise. This approach to EIA, referred to as the Rochdale Envelope, is common practice for developments of this nature, as set out in Planning Inspectorate Advice Note Nine (2018). The Rochdale Envelope for a project outlines the realistic worst case scenario for each individual impact, so that it can be safely assumed that all other scenarios within the design envelope will have less impact. Further details are provided in Chapter 6 EIA Methodology (Volume I).

10. The realistic worst-case scenarios for the likely significant effects scoped into the EIA for the noise and vibration assessment are summarised in Table 26.2. These are based on North Falls parameters described in Chapter 5 Project Description (Volume I), which provides further details regarding specific activities and their duration.

Table 26.2 Realistic worst case scenarios

Potential impact	Parameter	Notes
Construction works causing noise or vibration level increases at sensitive receptors	Standard working hours are 07:00 to 19:00 hours, Monday to Saturday, with no activities on Sundays or bank holidays. <u>Landfall HDD (temporary works) physical parameters:</u> • HDD temporary works area (4 circuits) = 100 x 200m • Transition joint bay size = 4 x 15m • No. of transition joint bays = 4 • Maximum HDD depth = 20m • Maximum number of HDD = 5, of which a maximum of two could work simultaneously • Construction duration 13 months (of which HDD = 6 months) • HDD to include 24 hour / 7 days working where required <u>Cable corridor(s) construction physical parameters:</u> • Working width = 60m open trench, 82m at shallow HDD crossings, 122m at deeper HDD crossings • Corridor length = 24km • Cable trench width (max.) = 3.75m • No. of trenches = 4 • Maximum cable burial depth = 2m • Minimum cable burial depth at = 0.9m • Haul road width = 6m • Jointing bays = 80 - 192 (approximately every 500m) buried below ground • Jointing bay construction footprint (per bay) = 13 x 5m • Jointing bay depth = 2m • Temporary construction compound footprint = 150 x 150m (general cable construction compounds) to 100 x 100m (small cable construction compounds). • No. of compounds (est.) = 7 • Trenchless crossing compound dimensions = 80 x 120m (major crossings) 40 x 120m (minor crossings) • Overall duration = 18 months • Cable installation = 12 months • Major HDD (each location) = 8 months (of which HDD = 4 months) • Minor HDD crossings = 2 months • Major HDD crossings to include 24 hour / 7 days working where required.	The significance of a construction noise effect depends on the noise level and duration of exposure. Consideration should be given to both the spatial impacts (proximity to receptors) and temporal (duration) aspect of each of the activities. Construction works noise emissions from the works are primarily a function of the type and number of plant required, as detailed in Appendix 26.3 (Volume III). Construction noise levels at NVSRs around the landfall have been calculated assuming all construction plant is operating simultaneously in an area which represents the closest potential approach of 50% of the landfall compound area. Construction noise levels due to onshore cable corridor(s) works have been calculated assuming all construction plant is operating simultaneously in a 60m wide area at the closest approach of the onshore cable corridor(s) representing a monthly average noise level. Overall duration of cable corridor(s) works includes establishing / reinstating temporary construction compounds and haul roads, cable installation (trench excavation, duct installation, cable jointing), HDD (includes compound establishment, HDD, and reinstatement).

Potential impact	Parameter	Notes
	Onshore substation (temporary works) physical parameters: • Permanent substation footprint = 267 x 300m • Construction compound footprint = 150 x 250m • Construction duration = 6 months preparation, 24 months construction	Construction noise levels at NVSRs around the onshore substation zone have been calculated assuming all construction plant is operating simultaneously in an area which represents the closest potential approach of 50% of the total permanent footprint.
Onshore substation operation causing noise or vibration level increases at sensitive receptors	Onshore substation physical parameters: Permanent substation footprint = 267 x 300m	Operational noise emissions depend on the number and type of plant proposed at the onshore substation. This information is not currently known, as discussed in Section 26.6.2.1.
Decommissioning works causing noise or vibration level increases at sensitive receptors	No final decision has yet been made regarding the final decommissioning policy for the onshore project infrastructure including landfall, onshore cable corridor(s) and onshore substation. It is also recognised that legislation and industry best practice change over time. However, it is likely that the onshore project equipment, including the cable, will be removed, reused, or recycled where possible and the transition bays and cable ducts being left in place. The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and will be agreed with the regulator. It is anticipated that for the purposes of a worst-case scenario, the impacts will be no greater than those identified for the construction phase.	

26.3.3 Summary of mitigation embedded in the design

11. This section outlines the embedded mitigation relevant to the noise and vibration assessment, which has been incorporated into the design of North Falls (Table 26.3). Where other mitigation measures are proposed, these are detailed in the impact assessment (Section 26.6), where applicable.

Table 26.3 Embedded mitigation measures

Parameter	Mitigation measures embedded into North Falls design
Mitigation by site selection	The onshore project area and onshore substation zone have been defined following an extensive site selection process, which has accounted for environmental, engineering, planning and land requirements to identify an optimal project location. The site selection process is described in detail in Chapter 4 Site Selection and Assessment of Alternatives (Volume I). The site selection process has included consideration of the nearby residential properties and other NVSRs and distances to these have been maximised, particularly in relation to the location of the onshore substation zone. As part of ongoing project design refinement in advance of the Project's DCO application, it is proposed that where potentially significant noise effects have been identified, onshore project infrastructure will be moved wherever practicable to a location a sufficient distance from NVSRs to reduce potential effects to a non-significant level. Attempts will be made to avoid significant effects in this way before use of other mitigation measures, such as noise mitigation screening, are considered. At the time of writing, the design refinement process is ongoing and the refined project design will be presented in the Project's ES.
Construction phase noise	Commitment to Best Practicable Means (BPM) implemented during the construction phase, detailed in the Construction Noise and Vibration Management Plan (CNVMP) which will be included as part of the Code of Construction Practice (CoCP) secured through a DCO Requirement. An Outline CoCP will be submitted with the DCO application.
Construction phase vibration	Construction plant with the potential to generate high levels of vibration (piling, HDD works and vibratory ground compaction) will not be used at locations within 8m of any vibration sensitive structure.
Operational substation noise	Each main source of sound at the proposed onshore substation, which has the potential to emit tonal sound, can be fully enclosed if required; although this has the potential to introduce other environmental impacts (e.g. landscape and visual effects) which must be considered. Certain equipment, such as the transformers and the shunt reactors, can be fully enclosed for operational and engineering reasons and, as such, a high degree of noise control can be applied to this equipment. Using these embedded measures, the substation will be designed to achieve the operational noise limits identified through the PEIR assessment.
Operational substation vibration	The substation plant will be designed and installed as to minimise vibration transmission from any plant items which might generate vibration. This control of vibration at source is necessary to maximise life of the plant and minimise maintenance. Typically, placing vibration isolation mounts into concrete pads would ensure that groundborne vibration is not perceptible beyond the immediate area of the substation.

26.4 Assessment methodology

26.4.1 Legislation, guidance and policy

26.4.1.1 National Policy Statements

12. The assessment of likely significant noise and vibration effects has been made with specific reference to the relevant National Policy Statements (NPS). These

are the principal decision making documents for Nationally Significant Infrastructure Projects (NSIPs). Those relevant to the Project are:

- Overarching NPS for Energy (EN-1) (Department of Energy and Climate Change (DECC) 2011a);
- NPS for Renewable Energy Infrastructure (EN-3) (DECC 2011b);
- NPS for Electricity Networks Infrastructure (EN-5) (DECC 2011c);
- Draft Overarching NPS for Energy (EN-1) (BEIS 2021a);
- Draft NPS for Renewable Energy Infrastructure (EN-3) (BEIS 2021b); and
- Draft NPS for Electricity Networks Infrastructure (EN-5) (BEIS 2021c).

13. The UK Government announced a review of the existing NPSs within its December 2020 Energy White Paper (HM Government, 2020) and issued a draft version of Overarching NPS for Energy EN-1, NPS for Renewable Energy Infrastructure EN-3 and NPS for Electricity Networks Infrastructure EN-5 for consultation on 6th September 2021 (BEIS, 2021a; BEIS, 2021b; BEIS, 2021c). At the time of writing this PEIR chapter, final versions of the revised NPSs are not available.

14. The specific assessment requirements for noise and vibration, as detailed in the NPS, are summarised in Table 26.4 together with an indication of the section of the PEIR chapter where each is addressed.

Table 26.4 NPS assessment requirements

NPS Requirement	NPS Reference	PEIR Reference
Overarching NPS for Energy (EN-1)		

Where noise impacts are likely to arise, the applicant should include:
• A description of the noise generating aspects of the development proposal leading to noise impacts including the identification of any distinctive tonal, impulsive or low frequency characteristics of the noise;
• Identification of noise sensitive premises and noise sensitive areas that may be affected;
• The characteristics of the existing noise environment;
• A prediction of how the noise environment will change with the proposed development;
  ○ In the shorter term such as during the construction period;
  ○ In the longer term during the operating life of the infrastructure;
  ○ At particular times of the day, evening and night as appropriate;
• An assessment of the effect of predicted changes in the noise environment on any noise sensitive premises and noise sensitive areas; and
• Measures to be employed in mitigating noise.
• The nature and extent of the noise assessment should be proportionate to the likely noise impact.
	EN-1, paragraph 5.11.4	Refer to Section 26.4.3 for the assessment methodology for assessing potential noise and vibration impacts, Section 26.5 for details on the existing noise environment including the identification of NVSRs and Section 26.6 where any changes in noise levels, as a result of North Falls, are assessed, and any potential effects and potential mitigation measures are identified.

NPS Requirement	NPS Reference	PEIR Reference
The noise impact of ancillary activities associated with the development, such as increased road and rail traffic movements, or other forms of transportation, should also be considered.	EN-1, paragraph 5.11.5	Refer to Section 26.6.1.2 where any changes in noise levels as a result of North Falls from ancillary works, for example vehicle movements, are assessed and any potential effects and potential mitigation measures are identified.
Operational noise, with respect to human receptors, should be assessed using the principles of the relevant British Standards and other guidance. Further information on assessment of particular noise sources may be contained in the technology specific NPSs. In particular, for renewables (EN-3) and electricity networks (EN-5) there is assessment guidance for specific features of those technologies. For the prediction, assessment and management of construction noise, reference should be made to any relevant British Standards and other guidance which also give examples of mitigation strategies.	EN-1, paragraph 5.11.6	Any changes in noise levels as a result of North Falls are assessed in Section 26.6, and any potential effects and potential mitigation measures are identified. The current relevant British Standards (BS) have been used within this assessment, as detailed in Section 26.4.
The applicant should consult EA and NE, or the Countryside Council for Wales (CCW), as necessary and in particular with regard to assessment of noise on protected species or other wildlife. The results of any noise surveys and predictions may inform the ecological assessment. The seasonality of potentially affected species in nearby sites may also need to be taken into account.	EN-1, paragraph 5.11.7	Noise effects on terrestrial protected species is considered within Chapter 23 Onshore Ecology and Chapter 24 Onshore Ornithology (Volume I).
The Project should demonstrate good design through selection of the quietest cost-effective plant available; containment of noise within buildings wherever possible; optimisation of plant layout to minimise noise emissions; and, where possible, the use of landscaping, bunds or noise barriers to reduce noise transmission.	EN-1, paragraph 5.11.8	The embedded mitigation measures described in Section 26.3.3 and proposed mitigation measures described in Section 26.6 demonstrate good design has been adopted.
The IPC [Infrastructure Planning Commission] should not grant development consent unless it is satisfied that the proposals will meet the following aims: • avoid significant adverse impacts on health and quality of life from noise; • mitigate and minimise other adverse impacts on health and quality of life from noise; and • where possible, contribute to improvements to health and quality of life through the effective management and control of noise.	EN-1, paragraph 5.11.9	These aims are met by adoption of the embedded and proposed mitigation as discussed above, as shown in Section 26.6 which concludes that significant residual impacts are not anticipated.
NPS for Renewable Energy Infrastructure (EN-3)		
EN-3 contains relevant policy in relation to the assessment of transmission infrastructure for renewable energy installations, however there is no information specific to this noise and vibration chapter.		
NPS for Electricity Networks Infrastructure (EN-5)		
While standard methods of assessment and interpretation using the principles of the relevant British Standards are satisfactory for dry weather conditions, they are not appropriate for assessing	EN-5, paragraph 2.9.8 and paragraph 2.9.9	North Falls does not include any requirement for additional overhead lines. As such, further operational assessment of rain-

NPS Requirement	NPS Reference	PEIR Reference
noise during rain. This is when overhead line noise mostly occurs, and when the background noise itself will vary according to the intensity of the rain. Therefore, an alternative noise assessment method to deal with rain-induced noise is needed, such as the one developed by National Grid as described in report TR (T) 94,199319. This follows recommendations broadly outlined in ISO 1996 (BS 7445:1991) and in that respect, is consistent with BS 4142:1997. The IPC [now the Planning Inspectorate and the Secretary of State] is likely to be able to regard it as acceptable for the applicant to use this or another methodology that appropriately addresses these particular issues.		induced noise is not considered necessary.
Draft Overarching NPS for Energy (Draft EN-1)		

Where noise impacts are likely to arise from the proposed development, the applicant should include the following in the noise assessment:
• a description of the noise generating aspects of the development proposal leading to noise impacts, including the identification of any distinctive tonal, impulsive, low frequency or temporal characteristics of the noise
• identification of noise sensitive receptors and noise sensitive areas that may be affected
• the characteristics of the existing noise environment
• a prediction of how the noise environment will change with the proposed development
  ○ in the shorter term, such as during the construction period
  ○ in the longer term, during the operating life of the infrastructure
  ○ at particular times of the day, evening and night (and weekends) as appropriate and at different times of year
• an assessment of the effect of predicted changes in the noise environment on any noise-sensitive receptors, including an assessment of any likely impact on health and well-being where appropriate, and noise-sensitive areas
• if likely to cause disturbance, an assessment of the effect of underwater or subterranean noise
• measures to be employed in mitigating the effects of noise - applicants should consider using best available techniques to reduce noise impacts
	Draft EN-1, paragraph 5.12.4	Refer to Section 26.4.3 for the assessment methodology for assessing potential noise and vibration impacts, Section 26.5 for details on the existing noise environment including the identification of NVSRs and Section 26.6 where any changes in noise levels, as a result of North Falls, are assessed, and any potential effects and potential mitigation measures are identified.

The noise impact of ancillary activities associated with the development, such as increased road and rail traffic movements, or other forms of transportation, should also be considered.	Draft EN-1, paragraph 5.12.6	Refer to Section 26.6.1.2 where any changes in noise levels as a result of North Falls from ancillary works, for example vehicle movements, are assessed and any potential effects and potential mitigation measures are identified.
Operational noise, with respect to human receptors, should be assessed using the principles of the relevant British Standards125	Draft EN-1, paragraph 5.12.7	Any changes in noise levels as a result of North Falls are assessed in Section 26.6, and

NPS Requirement	NPS Reference	PEIR Reference
and other guidance. Further information on assessment of particular noise sources may be contained in the technology specific NPSs. In particular, for renewables (EN-3) and electricity networks (EN-5) there is assessment guidance for specific features of those technologies. For the prediction, assessment and management of construction noise, reference should be made to any relevant British Standards and other guidance which also give examples of mitigation strategies.		any potential effects and potential mitigation measures are identified. The current relevant British Standards (BS) have been used within this assessment, as detailed in Section 26.4.
Some noise impacts will be controlled through environmental permits and parallel tracking is encouraged where noise impacts determined by an environmental permit interface with planning issues (i.e. physical design and location of development). The applicant should consult EA and/or the SNCB, as necessary, and in particular with regard to assessment of noise on protected species or other wildlife. The results of any noise surveys and predictions may inform the ecological assessment. The seasonality of potentially affected species in nearby sites may also need to be taken into account.	Draft EN-1, paragraph 5.12.8	Noise effects on terrestrial protected species is considered within Chapter 23 Onshore Ecology and Chapter 24 Onshore Ornithology (Volume I).
The project should demonstrate good design through selection of the quietest or most acceptable cost-effective plant available; containment of noise within buildings wherever possible, taking into account any other adverse impacts that such containment might cause e.g. on landscape and visual impacts; optimisation of plant layout to minimise noise emissions; and, where possible, the use of landscaping, bunds or noise barriers to reduce noise transmission. A development must be undertaken in accordance with statutory requirements for noise. Due regard must be given to the relevant sections of the Noise Policy Statement for England, the NPPF, and the government's associated planning guidance on noise.	Draft EN-1, paragraph 5.12-9	The embedded mitigation measures described in Section 26.3.3 and proposed mitigation measures described in Section 26.6 demonstrate good design has been adopted.
The Secretary of State should not grant development consent unless it is satisfied that the proposals will meet the following aims: • avoid significant adverse impacts on health and quality of life from noise; • mitigate and minimise other adverse impacts on health and quality of life from noise; and • where possible, contribute to improvements to health and quality of life through the effective management and control of noise.	Draft EN-1, paragraph 5.12.10	These aims are met by adoption of the embedded and proposed mitigation as discussed above, as shown in Section 26.6 which concludes that significant residual impacts are not anticipated.
Draft NPS for Renewable Energy Infrastructure (Draft EN-3)		
Draft EN-3 contains relevant policy in relation to the assessment of transmission infrastructure for renewable energy installations, however there is no information specific to this noise and vibration chapter.		
Draft NPS for Electricity Networks Infrastructure (Draft EN-5)		
For the assessment of noise from overhead lines, the Applicant must use an appropriate method to determine the sound level produced by the line in both dry and wet weather conditions, in addition	Draft EN-5, paragraph 2.12.9	North Falls does not include any requirement for additional overhead lines. As such, further operational assessment of rain-

NPS Requirement	NPS Reference	PEIR Reference
to assessing the impact on noise-sensitive receptors. For instance, the Applicant may use an appropriate noise modelling tool or tools for the prediction of overhead line noise and its propagation over distance. When assessing the impact of noise generated by overhead lines in wet weather relative to existing background sound levels, the Applicant should consider the effect of varying background sound levels due to rainfall. The Secretary of State is likely to regard it as acceptable for the Applicant to use a methodology that demonstrably addresses these criteria.		induced noise is not considered necessary.

26.4.1.2 Other legislation, policy and guidance

15. In addition to the NPS, there are a number of pieces of legislation, policy and guidance applicable to the assessment of noise and vibration.

26.4.1.2.1 Environmental Protection Act 1990

16. The Environmental Protection Act 1990 prescribes 'noise (and vibration) emitted from premises (including land) so as to be prejudicial to health or a nuisance' as a statutory nuisance.

17. Local Authorities are required to investigate any public complaints of noise and if they are satisfied that a statutory nuisance exists, or is likely to occur or recur, they must serve a noise abatement notice. A notice is served on the person responsible for the nuisance. It requires either the abatement of the nuisance; or works to abate the nuisance to be carried out; or it prohibits or restricts the activity. Contravention of a notice without reasonable excuse is an offence. A right of appeal to the Magistrates Court exists within 21 days of the service of a noise abatement notice.

18. No statutory noise limits exist for determining a nuisance; therefore, the Local Authority can take account of various guidance documents and existing case law when investigating complaints. Lower noise level limits are generally applied when considering the acceptability of a planning permission than those which would be used when considering whether an existing noise source amounts to a statutory nuisance. Demonstrating the use of BPM to minimise noise levels is an accepted defence against a noise abatement notice.

19. When considering a planning application, Local Authority Environmental Health Officers are obliged to consider whether the development under consideration has the potential to cause a statutory nuisance and to use the planning process to avoid this outcome if possible.

26.4.1.2.2 Control of Pollution Act 1974

20. The Control of Pollution Act 1974 (CoPA) requires that BPM (as defined in Section 72 of CoPA) are adopted to control construction noise on any given site as far as reasonably practicable. Sections 60 and 61 of the CoPA provide the main legislation regarding enabling works and construction site noise and vibration. If noise complaints are received, a Section 60 notice may be issued by Tendring District Council with instructions to cease work until specific conditions to reduce noise have been adopted.

21. Section 61 of the CoPA provides a means to apply for prior consent to carry out noise generating activities during construction. Once prior consent has been agreed under Section 61, a Section 60 notice cannot be served provided the agreed conditions are maintained on-site.

22. Whilst construction noise and vibration are factors which can be considered during the planning process, Local Authorities have alternative powers under Sections 60 and 61 of CoPA to regulate these issues if complaints arise.

26.4.1.2.3 National Planning Policy Framework

23. The National Planning Policy Framework (NPPF) (as revised in 2021) forms the basis of the Government's planning policies for England and how these should be applied. Section 15, Paragraph 174 of the NPPF states planning policies and decisions should contribute to and enhance the natural and local environment by:

"e)……preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution……"

24. Furthermore, Section 15, Paragraph 185 states:

"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason….."

26.4.1.2.4 Noise Policy Statement for England, 2010

25. The Noise Policy Statement for England (NPSE) document was published by Defra in 2010 and paragraph 1.7 states three policy aims:

"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- Avoid significant adverse impacts on health and quality of life;
- Mitigate and minimise adverse impacts on health and quality of life; and
- Where possible, contribute to the improvement of health and quality of life."

26. The Explanatory Note contained within the NPSE introduces the following concepts to aid in the establishment of significant effects:

- No Observed Effect Level (NOEL): the level below which no effect can be detected. Below this level no detectable effect on health and quality of life due to noise can be established;

- Lowest Observable Adverse Effect Level (LOAEL): the level above which adverse effects on health and quality of life can be detected; and
- Significant Observed Adverse Effect Level (SOAEL): the level above which significant adverse effects on health and quality of life occur.

27. The aims of the NPSE can therefore be interpreted as follows (within the context of Government policy on sustainable development):

- The first aim is to avoid noise levels above the SOAEL; and
- To consider situations where noise levels are between the LOAEL and SOAEL. In such circumstances, all reasonable steps should be taken to mitigate and minimise the effects. However, this does not mean that such adverse effects cannot occur.

28. The NPSE states:

"It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations". (Paragraph 2.22, NPSE, March 2010).

29. Furthermore, paragraph 2.22 of the NPSE acknowledges that:

"Further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise".

26.4.1.2.5 National Planning Practice Guidance (NPPG) 2019

30. The National Planning Practice Guidance (NPPG, July 2019), states that noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment. When preparing local or neighbourhood plans, or making decisions about new development, there may also be opportunities to consider improvements to the acoustic environment. No material changes were made to the 2021 NPPF for noise and no update to the NPPG is expected.

26.4.1.3 Local planning policy

31. The onshore project area falls under the jurisdiction of the following county council and local planning authorities:

- Essex County Council; and
- Tendring District Council.

32. No Essex County Council policies have been identified which are relevant to the potential noise and vibration impacts of the Project.

33. The Tendring District Council Core Strategy (2011 - 2031) is the key document in the Local Plan. The document provides a detailed framework for the control of development and use of land that guides planning decisions in the Tendring district.

34. Policy DP1 of the Core Strategy, Part C, Impacts and Compatibility, states "New development should be compatible with surrounding uses and minimise any adverse environmental impacts. The following criteria must be met:

- The development will not have a materially damaging impact on the privacy, daylight or other amenities of occupiers of nearby properties;

- The development, including any additional road traffic arising, will not have a materially damaging impact on air, land, water (including ground water), amenity, health or safety through noise, smell, dust, light, heat, vibration, fumes of other forms of pollution or nuisance; and
- The health, safety or amenity of any occupants or users of the proposed Development will not be materially harmed by any pollution from an existing or committed use."

26.4.1.4 Guidance documents

26.4.1.4.1 BS 4142:2014+A1:2019 – Methods for rating and assessing industrial and commercial sound

35. This standard describes a method for rating and assessing sound of an industrial and/or commercial nature. This method uses a *rating level* to assess the likely effects from sound of an industrial or commercial nature on people who might be inside or outside a dwelling or premises used for residential purposes upon which the sound is incident.

26.4.1.4.2 BS 5228:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: noise

36. Part 1 of BS 5228 provides recommendations for basic methods of noise and vibration control relating to construction and open sites where work activities/operations generate significant noise and/or vibration levels. It also provides guidance on methods of predicting and measuring noise and assessing its impact on those exposed to it.

26.4.1.4.3 BS 5228:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 2: vibration

37. Part 2 of BS 5228 gives recommendations for basic methods of vibration control on construction and open sites where work activities generate significant vibration levels. It also provides guidance on predicting and assessing vibration levels from construction and a database of measured vibration levels during piling activities.

26.4.1.4.4 BS 7385-2: 1993 Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from groundborne vibration

38. This standard provides guidance regarding the potential for vibration to result in building damage, including basic principles for carrying out vibration measurements and processing the data. It includes guide values for transient and continuous vibration, above which there is a likelihood of cosmetic damage.

26.4.1.4.5 BS 7445:2003 Part 1 and BS 7445:1991 Part 2 – Description and measurement of environmental noise

39. Provides details of the instrumentation and measurement techniques to be used when assessing environmental noise and defines the basic noise quantity as the continuous A-weighted sound pressure level (L_{Aeq}). Part 2 of BS 7445 replicates International Standards Organisation (ISO) 1996-2.

26.4.1.4.6 BS 8233:2014 – Guidance on sound insulation and noise reduction for buildings

40. Provides a methodology to calculate the noise levels entering a building through facades and facade elements and provides details of appropriate measures for sound insulation between dwellings. It includes recommended internal noise

levels which are provided for a variety of situations and are based on World Health Organisation (WHO) recommendations.

26.4.1.4.7 Calculation of Road Traffic Noise (CRTN) 1988

41. Provides a method for calculating noise levels from the Annual Average Weekday Traffic (AAWT) flows and from measured noise levels. Since publication in 1988 this document has been the accepted standard for predicting noise levels from road traffic in the UK. The calculation methods take account of variables including percentage of heavy goods vehicles (HGVs), road surfacing, gradient, screening by barriers and relative height of source and receiver.

26.4.1.4.8 Design Manual for Roads and Bridges (DMRB), LA 111 Noise and Vibration, Revision 2 (2021)

42. LA111 Noise and Vibration provides detailed methodologies for the assessment of construction and operational noise and vibration impacts from major road schemes. It provides guideline significance criteria in terms of both absolute noise and vibration levels (LOAELs and SOAELS for use in relation to the NPSE) and the change in noise levels due to a scheme.

26.4.1.4.9 A guide to measurement and prediction of the equivalent continuous sound level L_{eq}, report by a working party for the technical sub-committee of the Noise Advisory Council (NAC) (1978)

43. Provides a method for the prediction of road traffic noise levels at 10m from the nearside carriageway edge which is similar to the CRTN methodology. In brief, the methodology requires separate calculations to be undertaken for Light Vehicles/Cars and HGVs. The calculated noise levels are added together to establish the overall noise level for a given link. This method can be used when traffic flows are below the minimum at which CRTN is validated.

26.4.1.4.10 ISO 9613-2:1996 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation

44. Specifies an engineering method for calculating the attenuation of sound due to propagation outdoors, enabling prediction of sound levels at a specified distance from a source.

26.4.1.4.11 WHO (1999) Guidelines for Community Noise

45. These guidelines present health-based noise limits intended to protect the population from exposure to excess noise. They present guideline limit values at which the likelihood of particular effects, such as sleep disturbance or annoyance, may increase. The guideline values are 50 or 55dB L_{Aeq} during the day, related to annoyance, and 45dB L_{Aeq} or 60dB L_{Amax} at night, related to sleep disturbance.

46. In Section 4 ‘Guideline Values’, these guidelines state:

    “The effects of noise in dwellings, typically, are sleep disturbance, annoyance and speech interference. For bedrooms the critical effect is sleep disturbance. Indoor guideline values for bedrooms are 30dB L_{Aeq} for continuous noise and 45dB L_{Amax} for single sound events. Lower noise levels may be disturbing depending on the nature of the source.”

26.4.1.4.12 WHO (2009) Night Noise Guidelines for Europe

47. These guidelines provide an extension to the WHO Guidelines for Community Noise (1999). Based on evidential review, in Section 5.6 'Recommendations for Health Protection', they conclude that:

    "Below the level of 30dB $L_{night,outside}$, no effects on sleep are observed except for a slight increase in the frequency of body movements during sleep due to night noise. There is no sufficient evidence that the biological effects observed at the level below 40dB $L_{night,outside}$ are harmful to health. However, adverse health effects are observed at the level above 40dB $L_{night,outside}$.

    Therefore, 40dB $L_{night,outside}$ is equivalent to the LOAEL for night noise."

48. Additionally, the Abstract to the guidelines states:

    "Considering the scientific evidence on the thresholds of night noise exposure indicated by $L_{night,outside}$ as defined in the Environmental Noise Directive (2002148/EC), an $L_{night,outside}$ of 40dB should be the target of the night noise guideline (NNG) to protect the public, including the most vulnerable groups such as children, the chronically ill and the elderly. $L_{night,outside}$ value of 55dB is recommended as an interim target for those countries where the NNG cannot be achieved in the short term for various reasons, and where policy-makers choose to adopt a stepwise approach."

26.4.1.4.13 WHO (2018) Environmental Noise Guidelines for the European Region

49. The Abstract to this guidance state:

    "The main purpose of these guidelines is to provide recommendations for protecting human health from exposure to environmental noise originating from various sources: transportation (road traffic, railway and aircraft) noise, wind turbine noise and leisure noise. They provide robust public health advice underpinned by evidence, which is essential to drive policy action that will protect communities from the adverse effects of noise."

50. These guidelines have not been adopted in any UK policy to date. Paragraph 2.4.3 states "The GDG [Guideline Development Group] agreed to set guideline exposure levels based on the definition: 'noise exposure levels above which the GDG is confident that there is an increased risk of adverse health effects. … The guideline exposure levels presented are therefore not meant to identify effect thresholds (the lowest observed adverse effect levels for different health outcomes). This is a difference in approach from prior WHO guidelines, like the Night Noise Guidelines for Europe (WHO Regional Office for Europe, 2009), which explicitly aimed to define levels indicating no adverse health effects." It follows that the guideline exposure levels do not constitute LOAELs or SOAELs as defined in the NPSE.

26.4.1.4.14 Institute of Environmental Management & Assessment (IEMA), Guidelines for Environmental Noise Impact Assessment (2014)

51. The IEMA 'Guidelines for Environmental Noise Impact Assessment' (IEMA Guidelines) provide guidance on how to undertake a noise impact assessment, with particular focus on the context of an EIA. They describe the process of scoping, defining a baseline, prediction of noise level changes and determination of the significance of the effect. They aim to apply to all types of proposed development.

52. Further detail on wider legislation, policy and guidance relevant to this noise and vibration assessment is provided in Chapter 3 Policy and Legislative Context (Volume I).

26.4.2 Data sources

26.4.2.1 Site specific

53. To provide site specific and up to date information on which to base the impact assessment, a baseline sound survey within the vicinity of the landfall and onshore substation was conducted during June 2022, as described in Section 26.5.1. The scope and extent of the baseline survey was agreed with Tendring District Council.

26.4.2.2 Other available sources

54. Other sources that have been used to inform the assessment are listed in Table 26.5.

Table 26.5 Other available data and information sources

Data Set	Spatial Coverage	Year	Notes
Google Maps aerial photography	Onshore Noise and Vibration Study Area	2021	
Environment Agency Lidar topographical data	Onshore Noise and Vibration Study Area	2020	Open Licence Data
Local Authority Local Plans	Onshore Noise and Vibration Study Area	2008 & 2015	
Ordnance Survey mapping	Onshore Noise and Vibration Study Area	2022	
Noise Impact Assessment, Proposed Battery Energy Storage Site – Land West of Lawford Sub-Station	Land west of Lawford Substation and closest NVSR	2021	

26.4.3 Impact assessment methodology

55. Chapter 6 EIA Methodology (Volume I) explains the general impact assessment methodology applied to North Falls. The following sections describe the methods used to assess the likely significant effects on noise and vibration.

26.4.3.1 Definitions

56. For each potential impact, the assessment identifies receptors within the study area which are sensitive to that impact and implements a systematic approach to understanding the impact pathways and the level of impacts (i.e. magnitude) on given receptors.

57. In general, the potential impacts of noise and vibration in the scope of this assessment can be classified as disturbance to humans and, in the case of vibration, damage to structures.

26.4.3.2 Sensitivity

58. In accordance with the IEMA Guidelines for Environmental Noise Impact Assessment, the sensitivity of receptors to disturbance as a result of noise and vibration effects has been classified. This classification is based on the receptor function, using experience on other projects and professional judgement, as defined in Table 26.6.

Table 26.6 Definition of receptor sensitivity to disturbance-related noise and vibration

Sensitivity	Definition	Example
High	Receptors where noise or vibration level changes will significantly affect their function.	Certain hospital wards (e.g. operating theatres or high dependency units), recording studios, laboratories with highly vibration sensitive equipment.
Medium	Receptors where noise and/or vibration level changes may cause disturbance, protection is required but some tolerance is expected.	Residential accommodation, private gardens, hospital wards, care homes, schools, libraries, universities, research facilities and national parks (during the day).
Low	Receptors where noise and/or vibration level changes may cause some distraction or disturbance.	Offices, shops (including cafes), outdoor amenity areas during the day (including recreation, public amenity space/play areas), long distance footpaths (including Public Rights of Way (PRoW), dog walking routes, bird watching areas, footpaths and other walking routes, visitor attractions, cycling routes including rural roads), doctor's surgeries, sports facilities where spectator noise is not a normal part of the event and places of worship.
Negligible	Receptors where noise and/or vibration level changes are not expected to be detrimental.	Warehouses, light industry, car parks, and agricultural land.

59. Regarding sensitivity to vibration damage, classification by sensitivity is not considered appropriate or necessary. BS 7385-2, Section 5 'Factors to be considered in building response' states that this depends on "*the type of foundation, underlying ground conditions, the building construction and the state of repair of the building*". In Section 7.5.2 'Important buildings', the standard states that *"Important buildings which are difficult to repair may require special consideration on a case-by-case basis. A building of historical value should not (unless it is structurally unsound) be assumed to be more sensitive.*" The adopted magnitude of impact criteria (discussed in Section 26.4.3.5) account for building type.

26.4.3.3 Magnitude of impact: construction noise

60. Annex E of BS 5228-1 contains a number of example methodologies for identifying significant construction noise effects based on fixed thresholds or noise level changes. For the purposes of this assessment the 'ABC' method has been utilised for assessment of impacts on residential receptors. This approach is based on setting the threshold for the onset of potentially significant adverse effects (i.e. the SOAEL) depending on the existing ambient noise level. Receptors with low existing ambient noise levels (Category A) have a lower threshold than those with high existing ambient noise levels (Category C). Higher thresholds are set for normal daytime construction working hours, compared to the more sensitive evening/weekend and night time periods.

61. As a conservative approach, the threshold for the onset of any adverse effect (i.e. the LOAEL) is set at a construction noise level equal to the existing ambient noise level. Construction noise levels between the LOAEL and the SOAEL have the potential to result in adverse effects but would not normally be classed as significant adverse effects. However, noise mitigation measures would still be considered/applied in such locations to seek to keep all effects to a minimum,

as per the second aim of the NPSE. Table 26.7, which is adapted from Table E.1 in BS 5228, sets out the construction noise SOAEL and LOAEL proposed for the assessment of impacts on residential receptors.

Table 26.7 Construction noise Threshold Values based on the ABC method (BS 5228)

Assessment category and Threshold Value period ($L_{Aeq,T}$)	SOAEL $L_{Aeq,T}$dB (façade)			LOAEL $L_{Aeq,T}$dB (façade)
	Category A [A]	Category B [B]	Category C [C]	
Night time (23.00 – 07.00)	45	50	55	Existing ambient
Evenings and weekends [D]	55	60	65	
Daytime (07.00 – 19.00) and Saturdays (07.00 – 13.00)	65	70	75	
NOTE 1 A potential significant effect is indicated if the $L_{Aeq,T}$ noise level arising from the site exceeds the threshold level for the category appropriate to the ambient noise level. NOTE 2 If the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total $L_{Aeq,T}$ noise level for the period increases by more than 3dB due to site noise NOTE 3 Applied to residential receptors only.				
[A] Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values.				
[B] Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.				
[C] Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than category A values.				
[D] 19.00–23.00 weekdays, 13.00–23.00 Saturdays and 07.00–23.00 Sundays.				

62. The magnitude of the construction noise impact is based on the difference between the predicted construction noise level and the LOAEL and SOAEL values, adapted from the criteria in Table 3.16 of the DMRB, as shown in Table 26.8.

Table 26.8 Magnitude criteria for construction noise impacts

Magnitude of impact	Construction noise level
High	Above or equal to SOAEL +5dB
Medium	Above or equal to SOAEL and below SOAEL +5dB
Low	Above or equal to LOAEL and below SOAEL
Negligible	Below LOAEL

63. Section E.3.2 of BS 5228-1 states that: “If the site noise level exceeds the appropriate category value [Threshold Value], then a potential significant effect is indicated. The assessor then needs to consider other Project-specific factors, such as the number of receptors affected and the duration and character of the impact, to determine if there is a significant effect.” The following demonstrates how these other factors have been considered to determine the effect significance:

- The predicted construction noise level and change in noise level during the works at the receptor;

- The duration and magnitude of the impact. Construction noise levels above the Threshold Value (for residential receptors) for less than one month would not normally be considered significant, to accord with the 5dB change method in BS 5228-1;
- The timing of the impact, night time impacts being more likely to be considered significant than daytime impacts;
- The location of the impact at the NVSR; for example, a receptor may contain areas which are more or less sensitive than others, such as in a school, office spaces or kitchens would be considered less sensitive than classrooms; and
- The nature, times of use and design of the receptor; for example a NVSR which is not used at night would not be considered sensitive to night-time construction works.

64. Given the length of the onshore cable corridor(s), it was not practical to measure baseline sound levels at receptors along the entire corridor potentially affected by noise from construction of these elements of the Project. In the absence of these baseline noise data, the existing noise levels at residential receptors have been assumed to be low, so the Category A Threshold Values presented in Table 26.7 are deemed applicable. This is the industry-standard approach for the assessment of construction noise impacts from linear schemes, it considers the worst-case possible impacts and was agreed with the ETG.

65. Noise levels for the construction phase have been calculated using the methods and guidance in BS 5228-1. The standard provides methods for predicting receptor noise levels from construction works based on the number and type of construction plant and activities operating on site, with corrections to account for:

- The 'on-time' of the plant, as a percentage of the assessment period;
- Distance from source to receptor;
- Acoustic screening by barriers, buildings or topography; and
- Ground type.

66. The predictions undertaken are indicative only, as they are based on a preliminary understanding of the likely construction schedule, activities and plant to be used. This information may change once a construction contractor is appointed post-consent.

67. The DMRB LA111 states that "*A study area of 300m from the closest construction activity is normally sufficient to encompass noise sensitive receptors*". On this basis, and as agreed in consultation with the ETG, the assessment of construction noise impacts only extends to NVSRs which are no further than 300m from the onshore project area.

26.4.3.4 Magnitude of impact: construction phase road traffic noise

68. Construction traffic noise impacts along existing roads have been estimated based on the Calculation of Road Traffic Noise (CRTN) methodology for the calculation of the Basic Noise Level (BNL) at a reference distance of 10m from the nearside carriageway. Calculations have been undertaken for both the 'with'

and 'without' construction traffic scenarios for the peak construction year, for each road link in the construction traffic model.

69. To undertake the BNL calculations, details of the road network study area for the construction phase traffic assessment were provided by the traffic EIA specialists, along with AAWT 18hr flows, % HGVs and speed data for each road link, as detailed in Chapter 27 Traffic and Transport (Volume I) and Appendix 27.1 Transport Assessment (Volume III). The Transport Research Laboratory (TRL) publication *'Converting the UK traffic noise level $L_{A10,18h}$ to EU noise indices for noise mapping'* (Transport Research Laboratory, 2002) has been used to determine night-time traffic noise levels.

70. For those links on which the predicted traffic flows are below the validated CRTN range (<1000 vehicles per 18hrs), the alternative calculation method detailed in '*A Guide to Measurement and Prediction of the Equivalent Continuous Sound Level L_{eq}, Report by a Working Party for the Technical Sub-committee of the Noise Advisory Council'* (NAC) has been used. This alternative methodology predicts the noise level at 10m from the nearside carriageway edge, similar to CRTN methodology. The NAC alternative methodology was applied for both 'with development construction phase flows' and 'without development construction phase flows' noise level predictions. Following this approach ensures that the resulting noise level change is determined based on following the same calculation approach i.e. CRTN without development and CRTN with development, NAC without development and NAC with development.

71. In order to determine impacts, the assessment of construction traffic noise compares the calculated BNLs with and without the construction traffic. Any changes in day or night-time noise levels due to a corresponding change in volume and composition have been assessed using the impact magnitude criteria detailed in Table 26.9, which is reproduced from Table 3.17 of the DMRB.

Table 26.9 Magnitude criteria for relative change due to construction road traffic

Magnitude of impact	Increase in BNL of closest public road used for construction traffic (dB)
High	≥5.0
Medium	≥3.0 to <5.0
Low	≥1.0 to <3.0
Negligible	<1.0

72. The LOAEL and SOAEL for construction traffic noise during the daytime period are defined in the DMRB as 55dB $L_{A10,18hr}$ and 68dB $L_{A10,18hr}$ respectively. The calculated BNLs used to determine the change in road traffic noise levels are the noise level at 10m from the carriageway edge, depending on traffic flow parameters only i.e. total flow, vehicle speed and % HGV. They do not account for actual distance to the receptor, the presence of screening, angle of view or road gradient. Therefore, these BNLs cannot be compared directly with the LOAELs and SOAELs in Table 26.10.

73. Where the change in BNL indicates a potentially significant effect, further calculations of absolute road traffic noise levels have therefore been undertaken in accordance with the methodology in CRTN. Computational noise modelling software has been used to predict the 'baseline' and 'with construction' road traffic noise levels at the NVSRs within 50m of the identified road link.

74. For temporary impacts due to construction traffic noise, predicted 'with project' road traffic noise levels which are less than the LOAEL are considered to represent an impact of no worse than minor magnitude (i.e. not significant), irrespective of the change in BNL. For effects between the LOAEL and SOAEL, the duration of the impact must be considered, in addition to the magnitude of the change, when determining whether an impact is significant.

26.4.3.5 Magnitude of impact: construction vibration

75. Ground-borne vibration can result from construction works and may lead to perceptible levels of vibration at nearby receptors which, at higher levels, can cause annoyance to residents. In extreme cases, cosmetic or structural building damage can occur, but only at extremely high vibration levels and such cases are rare.

76. Typically, perceptible ground-borne vibration is only emitted by 'heavy' construction works such as piling, deep excavation, or dynamic ground compaction.

77. The response of a building to ground-borne vibration is affected by the type of foundation, ground conditions, the building construction and the condition of the building. BS 7385-2 provides guide values for transient vibration which are "judged to give a minimal risk… of vibration-induced damage." and is referenced in BS 5228-2, as shown in Table 26.10. BS 5228-2 states that for continuous vibration (such as that induced by vibratory compaction), the thresholds might need to be reduced by up to 50%.

Table 26.10 Transient vibration guide values at the building foundation for cosmetic damage

Type of building	Peak component particle velocity in frequency range of predominant pulse	
	4 Hz to 15 Hz	15 Hz and above
Reinforced or framed structures Industrial and heavy commercial buildings	50 $mm.s^{-1}$ at 4 Hz and above	
Un-reinforced or light framed structures Residential or light commercial type buildings	15 $mm.s^{-1}$ at 4 Hz increasing to 20 $mm.s^{-1}$ at 15 Hz	20 $mm.s^{-1}$ at 15 Hz increasing to 50 $mm.s^{-1}$ at 40 Hz and above
Note 1: Values referred to are at the base of the building. Note 2: For unreinforced or light framed structures and residential or light commercial buildings, a maximum displacement of 0.6mm (zero to peak) is not to be exceeded.		

78. BS 7385-2 states that minor damage occurs at a vibration level twice that of cosmetic damage and major damage occurs at a vibration twice that of minor damage. The values in Table 26.10 refer to the likelihood of cosmetic damage. ISO 4866:2010 '*Mechanical Vibration and Shock – Vibration of Fixed Structures*

– *Guidelines for the Measurement of Vibrations and Evaluation of Their Effects on Structures'* defines three different categories of building damage:

- Cosmetic – formation of hairline cracks in plaster or drywall surfaces and in mortar joints of brick/concrete block constructions;
- Minor – formation of large cracks or loosening and falling of plaster or drywall surfaces or cracks through brick/block; and
- Major – damage to structural elements, cracks in support columns, loosening of joints, splaying of masonry cracks.

79. This guidance can be used to define the potential impact as identified in Table 26.11 for continuous vibration for unreinforced or light framed structures and residential or light commercial buildings. Using the below criteria, reinforced or framed structures, industrial and heavy commercial buildings would be classified as of 'low' sensitivity to vibration damage. Unreinforced or light framed structures and residential or light commercial buildings are classified as of medium sensitivity to structural vibration damage.

Table 26.11 Construction vibration criteria for assessing building damage

Damage risk	Impact magnitude	Continuous vibration level (ppv, $mm.s^{-1}$) at the building foundation		
		Frequency of 4 Hz	Frequency of 15Hz	Frequency of 40 Hz and above
Major	High	≥30	≥40	≥100
Minor	Medium	15 to <30	20 to <40	50 to <100
Cosmetic	Low	6 to <15	10 to <20	25 to <50
Negligible	Negligible	<6	<10	<25

80. The vibration level and effects presented in Table 26.12 are taken from Table B-1 of BS 5228-2. These levels and effects are based on human perception of vibration in residential environments.

Table 26.12 Construction vibration criteria for assessing human perception in buildings

Vibration limit PPV ($mm.s^{-1}$)	Interpreted significance to humans	Magnitude of impact	NPSE/PPG Category
<0.14	Vibration unlikely to be perceptible	Negligible	NOEL
0.14 to 0.3	Vibration might just be perceptible in the most sensitive situations for most vibration frequencies associated with construction		LOAEL
0.3 to 1.0	Vibration might just be perceptible in residential environments	Low	
1.0 to <10.0	It is likely that vibration at this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents	Medium	SOAEL
>10.0	Vibration is likely to be intolerable for any more than a brief exposure to this level	High	

81. Predicted construction vibration levels at receptors which exceed a value of 1 $mm.s^{1}$ have the potential to result in a significant effect. However, the same additional project-specific factors which can influence the construction noise

effect significance (as discussed in Section 26.4.3.3) are considered relevant to vibration impacts. Hence, the same process for considering these other factors should be used to determine the vibration effect significance.

82. Comparison of the criteria in Table 26.11 and Table 26.12 shows that the levels at which building damage may occur are significantly above those which are considered tolerable by the occupants. The assessment therefore applies the criteria for human annoyance. Assuming that the vibration impacts will be controlled to avoid significant annoyance effects, then building damage is not anticipated.

83. Annex E of BS 5228-2:2009+A1:2014 contains empirical formulae derived by Hiller and Crabb (2000) from field measurements relating to resultant PPV, with several other parameters for vibratory compaction, dynamic compaction, percussive and vibratory piling, the vibration of stone columns and tunnel boring operations. Use of these empirical formulae enables resultant PPV to be predicted and for some activities (vibratory compaction, vibratory piling and vibrated stone columns) they provide an indicator of the probability of these levels of PPV being exceeded.

84. Consequently, calculations following these methodologies were carried out for the anticipated construction activities with the potential to result in perceptible vibration at receptors. Reasonable worst-case assumptions were applied regarding ground conditions and energy levels to determine set-back distances at which critical vibration levels may occur, as detailed in Appendix 26.3 Construction Noise and Vibration Assessment (Volume III).

85. The DMRB LA111 states that “A study area of 100m from the closest construction activity with the potential to generate vibration is normally sufficient to encompass vibration sensitive receptors”. On this basis, and as agreed in consultation with the ETG, the assessment of vibration impacts only extends to NVSRs which are no further than 100m from the onshore project area. The closest identified NVSRs to the proposed landfall and onshore substation locations are further than 100m away; hence, assessment of vibration impacts due to construction of the landfall and onshore substation has been excluded from the assessment scope.

86. The DMRB LA111 states that “a maintained road surface will be free of irregularities as part of project design and under general maintenance, so operational vibration will not have the potential to lead to significant adverse effects”. On this basis, and as agreed in consultation with the ETG, the assessment of vibration impacts due to construction traffic using public roads has been excluded from the assessment scope.

26.4.3.6 Magnitude of impact: operational noise

87. Operational noise from the proposed onshore substation has been assessed in accordance with BS 4142 which is the accepted UK standard for rating and assessing the impact of sound of an industrial and/or commercial nature and is referred to in NPS EN-1.

88. BS 4142 describes methods for rating and assessing sound of an industrial and/or commercial nature using outdoor sound levels to assess the likely effects

of sound on people who might be inside or outside a residential dwelling upon which sound is incident.

89. The basis of BS 4142 is a comparison between the *background sound level* in the vicinity of residential locations and the *rating level* of the noise source under consideration. The relevant parameters in this instance are as follows:

- *Background sound level* – $L_{A90,T}$ – defined in the standard as the 'A' weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F (Fast) and quoted to the nearest whole number of decibels;
- *Specific sound level* – $L_{Aeq,Tr}$ – the equivalent continuous 'A' weighted sound pressure level produced by the specific sound source at the assessment location over a reference time interval, T_r (1 hour during the daytime hours (07:00 to 23:00 hours) and 15 minutes during night-time hours (23:00 to 07:00 hours));
- *Residual Sound Level* - $L_{Aeq,T}$ – the equivalent continuous 'A' weighted sound pressure level at the assessment location in the absence of the specific sound source under consideration, over a given time interval, T; and
- *Rating level* – $L_{Ar,Tr}$ – the *specific sound level* plus a "character correction" if required for the acoustic features of the noise such as tonality, impulsivity and intermittency.

90. When comparing the *background sound* and the *rating* levels, the standard states that:

"a) Typically, the greater the difference, the greater the magnitude of impact;

b) A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context;

c) A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context; and

d) The lower the rating level relative to the measured background sound level the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context".

91. When assessing the noise from a source, it is necessary to have regard to the acoustic features that may be present in the source noise at the receptors. Section 9.1 of BS 4142 states:

"Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features are present at the assessment location, add a character correction to the specific sound level to obtain the rating level".

92. For clarity, an explanation of each character correction type (taken from BS 4142:2014+A1:2019, page 13 and 14) is provided here:

- Tonality - for sound ranging from not tonal to prominently tonal a correction of between 0dB and +6dB for tonality can be applied. Subjectively, this can be converted to a penalty of 2dB for a tone which is just perceptible at the noise receptor, 4dB where it is clearly perceptible, and 6dB where it is highly perceptible;
- Impulsivity - a correction of up to +9dB can be applied for sound that is impulsive. Subjectively, this can be converted to a penalty of 3dB for impulsivity which is just perceptible at the noise receptor, 6dB where it is clearly perceptible, and 9dB where it is highly perceptible;
- Intermittency - when the specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time. If intermittency is readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied; and
- Other sound characteristics - where the specific sound feature characteristics that are neither tonal nor impulsive, nor intermittent, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied.

93. To predict the noise from the operation of the onshore substation, it is necessary to understand the plant that will be incorporated and its sound emissions. At this stage in design development, this information is not available; however, it is anticipated to be provided prior to preparation of the ES.

94. Once the required information is available, the onshore substation sound levels will be predicted at the identified receptors using 3-D noise modelling software which will be set to implement the International Standard (ISO) 9613-2 prediction methodology. The model will incorporate proposed buildings and noise sources located at the onshore substation. The model will also include nearby residential dwellings and other buildings in the study area, intervening ground cover and topographical information.

95. In the absence of predictions, substation sound level limits have been recommended, based on the measured *background/ambient sound levels* and in accordance with relevant standards, guidance and policy.

96. The magnitude of impact of the predicted substation sound levels will be based on a quantitative assessment of noise impact using BS 4142, as shown in Table 26.13. Separate assessments will be undertaken of day and night-time impacts; the overall magnitude of impact will be based on the worst-case time period.

Table 26.13 Operational noise magnitude of impact criteria

Rating level dB $L_{Ar,Tr}$	Magnitude of Impact
= Measured L_{A90}	Negligible
L_{A90} + up to 5dB	Minor
Measured L_{A90} + >5dB to <10dB	Moderate
Measured L_{A90} + ≥10dB	High

97. The BS 4142 methodology is interpreted to mean that a difference between the *background sound level* and *rating level* of 5dB equates to the LOAEL and a difference of 10dB equates to the SOAEL. In accordance with BS 4142, a

suitable operational noise limit is that the *rating level* does not exceed the *background sound level* by more than 5dB, as this is the threshold at which adverse impacts are anticipated.

98. BS 4142 also requires that the context is considered. Of particular relevance to this assessment is the absolute sound level; on this point Section 11 'Assessment of the impacts' of the standard states that "*Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.*" The standard offers no guidance about what *background* and *rating levels* are considered low; however, the 1997 version of the standard stated that *background sound levels* below around 30dB L_{A90}, and *rating levels* below around 35dB L_{ArTr}, were considered very low and therefore outside the scope of the assessment method. The Association of Noise Consultants produced guidance on the application of BS 4142 (BS 4142:2014+A1:2019 Technical Note, Association of Noise Consultants, March 2020) which states (Section 11 'Assessment of impacts' under subheading 'Context', 'Subclause 11(1)') that "*similar values* [i.e. *background sound levels* below around 30dB L_{A90}, and *rating levels* below around 35dB L_{ArTr}] *would not be unreasonable in the context of BS 4142, but that the assessor should make a judgement and justify it where appropriate."*

99. The WHO Night Noise Guidelines for Europe (NNG) have been used to establish alternative LOAEL and SOAEL values for night-time operational noise which could be applied when *background sound levels* are low. In summary, the NNG found that below the level of 30dB(A) $L_{night,outside}$ (equivalent to a free-field $L_{Aeq,23:00\ to\ 07:00}$) there are no observed effects on sleep. Furthermore, there is no evidence that biological effects observed at levels below 40dB(A) $L_{night,outside}$ are harmful to health. However, the NNG found that "*closer examination of the precise impact will be necessary in the range between 30dB and 55dB as much will depend on the detailed circumstances of each case*" (Section 5.6 'Recommendations for health protection') and Table 5.2 of the document states that the threshold for the wellbeing effect of "*complaints*" is 35dB $L_{night,outside}$. At levels above 55dB(A) $L_{night,outside}$, the NNG detailed that adverse health effects occur frequently and there is limited evidence that the cardio-vascular system is coming under stress.

100. Therefore, based on the NNG, the following effect levels for assessing against the NPSE categories are applicable:

- 30dB(A) $L_{night,outside}$ - NOEL;
- 35dB(A) $L_{night,outside}$ - LOAEL; and
- 55dB(A) $L_{night,outside}$ - SOAEL.

101. Of additional relevance to the contextual analysis is the change in ambient sound levels; Table 7-14 of the Guidelines for Environmental Noise Impact Assessment (IEMA, 2014) refers to impacts from change in sound levels. The impact of operational noise from the Project will be present immediately when operation starts; hence, the criteria applied to impacts which occur in the short-term are relevant. Table 26.14 outlines these sound level change criteria.

Table 26.14 IEMA sound level change criteria

Short Term Impact Classification	Sound level change dB $L_{Aeq,T}$ (positive or negative) T = either 16hr day or 8hr night
Negligible	≥ 0 and < 1
Minor	≥1 and <3
Moderate	≥3 and <5
Major	≥5

102. Operational noise effects may be considered significant depending on the margin by which the *rating level* of the specific sound source exceeds the *background sound level* and also the context in which the sound occurs. Magnitude of impacts described as moderate or major in Table 26.13 may be considered significant, depending on the context.

26.4.3.7 Magnitude of impact: operational vibration

103. Whilst the selection of the final onshore substation electrical plant has not yet been made, some of it is likely to be vibration sensitive; hence, to prevent damage, the onshore substation will be designed to achieve very low levels of ground-borne vibration within the substation itself. This will be achieved using industry standard mitigation measures applied to items of plant with the potential to generate significant levels of vibration, such as vibration isolation pads/mounts for proposed super grid transformers.

104. In terms of the potential for impacts at receptors, these very low levels of vibration within the onshore substation will be further attenuated due to propagation with distance. The closest NVSR is in excess of 200m from the onshore substation zone. This further attenuation will ensure that the operation of the substation will not result in perceptible levels of vibration at receptors and no further assessment of operational phase vibration impacts is required.

26.4.3.8 Significance of effect

105. The assessment of significance of an effect is a function of the sensitivity of the receptor and the magnitude of the impact (Chapter 6 EIA Methodology, Volume I). The determination of significance is guided by the use of a significance of effect matrix, as shown in Table 26.15.

106. Definitions of each level of significance for noise disturbance are provided in Table 26.16, based on the NPPG and IEMA Guidelines.

107. Likely significant effects identified within the assessment as major or moderate are regarded within this chapter as significant. Appropriate additional mitigation has been identified, where possible, in consultation with the regulatory authorities and relevant stakeholders. The aim of mitigation measures is to avoid or reduce the overall significance of effect to determine a residual effect upon a given receptor.

Table 26.15 Significance of effect matrix

Sensitivity	Impact magnitude: High	Medium	Low	Negligible
High	*Major*	*Major*	*Moderate*	*Minor*
Medium	*Major*	*Moderate*	*Minor*	*Negligible*
Low	*Moderate*	*Minor*	*Negligible*	*Negligible*
Negligible	*Minor*	*Negligible*	*Negligible*	*Negligible*

Table 26.16 Definition of effect significance for noise

Significance	Definition
Major	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.
Moderate	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
Minor	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.
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.

26.4.4 Cumulative effects assessment methodology

108. The CEA considers other plans, projects and activities that may result in cumulative effects with North Falls. Chapter 6 EIA Methodology (Volume I) provides further details of the general framework and approach to the CEA.

109. For noise and vibration, these activities include on-site construction noise, noise associated with construction road traffic and operational phase noise associated with the onshore substation.

26.4.5 Transboundary effects assessment methodology

110. The transboundary assessment considers the potential for transboundary effects to occur on noise and vibration sensitive receptors as a result of North Falls. Chapter 6 EIA Methodology (Volume I) provides further details of the general framework and approach to the assessment of transboundary effects.

111. There are no transboundary effects with regard to onshore noise and vibration as the onshore project area would not be sited in proximity to any international

boundaries. Transboundary impacts are therefore scoped out of this assessment and are not considered further.

26.4.6 Assumptions and limitations

112. Any measurement of existing ambient or *background sound levels* will be subject to a degree of uncertainty. Environmental sound levels vary between days, weeks, and throughout the year due to variations in source levels and conditions, meteorological effects on sound propagation and other factors. Hence, any measurement survey can only provide a sample of the ambient levels. Every effort is made to ensure that measurements are undertaken in such a way as to provide a representative sample of conditions, such as avoiding periods of adverse weather conditions, and school holiday periods (which are often considered to result in atypical sound levels). However, a small degree of uncertainty will always remain in the values taken from such a measurement survey.

113. For the assessment of construction noise associated with the landfall works, noise predictions were undertaken assuming all construction plant is concurrently operating in an area approximately half the size of the landfall compound, at the closest approach of the landfall search area boundary to the NVSR. The same assumption was made for the substation construction works. These assumptions ensure that a worst-case assessment is presented, as in reality most of the works will be undertaken further away from the NVSRs.

114. The construction road traffic noise assessment is reliant on the traffic data provided by the transport specialists working on the Project. Hence, any assumptions made in the generation of these data (as discussed in Chapter 27 Traffic and Transport, Volume I) are also inherently assumed within this assessment.

115. For the road traffic noise calculations, all roads were assumed to be surfaced with standard hot rolled asphalt. Based on the advice in DMRB LA 111 Noise and vibration, a road surface correction of -1.0 dB is applied at speeds below 75 km/h and -0.5 dB at and above 75 km/h.

116. Calculations of likely construction vibration levels have been undertaken. In some instances, it has been necessary to calculate vibration levels at distances beyond their validated range; hence, the result should only be treated as an approximation. This is noted where relevant in Section 26.6.1.5.

117. The design of the onshore substation is not finalised; hence, it has not been possible to predict its operational emissions. The assessment of this impact has therefore been limited to identification of appropriate noise limits which should not be exceeded.

26.5 Existing environment

26.5.1 Baseline noise environment

118. An understanding of the baseline noise environment is required to determine the significance of potential noise effects during both construction and operational phases.

119. Five NVSR locations at the landfall, labelled with the prefix LFR, have been identified, seven with the potential to be impacted by construction traffic, labelled CTR, and 10 at the onshore substation, labelled SSR. These are presented in Table 26.17 and shown in Figure 26.1 (SSR), Figure 26.2 (LFR) and Figure 26.3 (CTR) (Volume II).

Table 26.17 Onshore NVSRs included in the assessment

NVSR identifier	Coordinates		Classification	Sensitivity
	X	Y		
Landfall				
LFR1	623310	218604	Recreational	Medium
LFR2	623378	218912	Recreational	Medium
LFR3	623230	219271	Residential	Medium
LFR4	621945	219290	Residential	Medium
LFR5	621687	217231	Residential	Medium
Construction Traffic				
CTR1	611274	226570	Residential	Medium
CTR2	611220	226577	Residential	Medium
CTR3	611136	226669	Residential	Medium
CTR4	610919	226875	Residential	Medium
CTR5	610883	226905	Residential	Medium
CTR6	610679	227055	Residential	Medium
CTR7	610645	227079	Residential	Medium
Substation				
SSR1	608680	230165	Residential	Medium
SSR2	609263	230087	Residential	Medium
SSR3	609483	229369	Residential	Medium
SSR4	609065	228936	Residential	Medium
SSR5	608752	228575	Residential	Medium
SSR6	608445	228489	Residential	Medium
SSR7	607697	227797	Residential	Medium
SSR8	607269	228398	Residential	Medium
SSR9	607181	228948	Residential	Medium
SSR10	607249	229662	Residential	Medium

26.5.1.1 Survey procedures

120. The baseline noise survey comprised of unattended contiguous 15-minute measurements for a total of approximately 24-hours at the landfall location and 11 to 12 days at the onshore substation. Measurements were conducted in accordance with current guidance including BS 4142 and BS 7445.

121. No baseline noise measurements were obtained along the onshore cable corridor(s) to inform the construction phase noise assessment. It was agreed during the EPP with Tendring District Council, that a conservative approach

would be to use the lowest threshold (for the BS 5228:2009+A1:2014 'ABC method') at all identified NVSRs for the assessment of construction noise.

122. Measurement locations (representative of individual or groups of NVSRs) were identified and agreed with Tendring District Council, as provided in Table 26.18 and displayed in Figure 26.1 (Volume II) for the onshore substation and Figure 26.2 (Volume II) for the landfall search area. Also displayed is the NVSR represented by the measurement location.

Table 26.18 Baseline sound survey measurement locations

NVSR identifier	Coordinates		Represented Receptors
	X	Y	
Landfall			
LFM1	623316	218954	LFR1, LFR2 and LFR5
LFM2	623253	219263	LFR3
LFM3	622002	219278	LFR4
Onshore substation			
SSM1	608736	230032	SSR1
SSM2	609218	230001	SSR2 and SSR3
SSM3	609148	229057	SSR4
SSM4	608433	228510	SSR5, SSR6 and SSR7
SSM5	607201	228946	SSR8 and SSR9
SSM6	607511	229516	SSR10

123. Details of the baseline survey sound procedures are provided in Appendix 26.1 (Volume III).

26.5.1.2 Survey results

124. The purpose of the baseline noise measurement survey at the landfall was to enable the assessment of potential landfall construction noise impacts. To inform the assessment, the measured L_{Aeq} levels have been separated into the daytime, evening and weekends and night-time periods specified in BS 5228-1, as shown in Table 26.19.

Table 26.19 Measured baseline sound levels for construction assessment – landfall

Measurement Location	Start Date and Time (dd/mm/yy, hh:mm)	End Date and Time (dd/mm/yy, hh:mm)	L_{Aeq} (dB)		
			Daytime	Evenings and Weekends	Night-time
LFM1	07/07/22, 13:30	08/07/22, 13:15	50	41	35
LFM2	07/07/22, 13:45	08/07/22, 13:45	43	41	34
LFM3	07/07/22, 12:15	08/07/22, 12:30	48	41	28

125. The purpose of the baseline noise measurement survey at the onshore substation was to enable the assessment of potential onshore substation construction and operational noise impacts. To inform the construction

assessment, the measured L_{Aeq} levels have been separated into the daytime, evening and weekends and night-time periods specified in BS 5228-1, as shown in Table 26.20. To inform the operational noise assessment, the measured L_{Aeq} and L_{A90} levels have been separated into the daytime and night-time periods specified in BS 4142, as shown in Table 26.21.

Table 26.20 Measured baseline sound levels for construction assessment – onshore substation site

Measurement Location	Start Date and Time (dd/mm/yy, hh:mm)	End Date and Time (dd/mm/yy, hh:mm)	L_{Aeq} (dB) Daytime	Evenings and Weekends	Night-time
SSM1	08/07/22, 16:00	20/07/22, 10:30	44	39	35
SSM2	08/07/22, 16:30	20/07/22, 10:30	46	43	34
SSM3	07/07/22, 16:30	19/07/22, 08:00	41	38	32
SSM4	07/07/22, 16:45	18/07/22, 23:15	44	39	34
SSM5	07/07/22, 19:15	18/07/22, 21:30	47	44	35
SSM6	08/07/22, 17:45	20/07/22, 09:45	45	42	36

Table 26.21 Measured baseline sound levels for operation assessment – onshore substation site

Measurement Location	L_{Aeq} (dB)		L_{A90} (dB)	
	Daytime	Night-time	Daytime	Night-time
SSM1	42	35	30	22
SSM2	45	34	33	22
SSM3	40	32	29	21
SSM4	42	34	26	23
SSM5	46	35	32	25
SSM6	44	36	34	24

26.5.2 Baseline vibration environment

126. No significant sources of vibration have been identified in the vicinity of the Project; hence, baseline vibration levels are assumed to be negligible. The adopted construction vibration assessment criteria, described in Section 26.4.3.5, are independent of the baseline vibration levels; therefore, an understanding of the baseline vibration environment is not required.

26.5.3 Future trends in baseline conditions

127. In the event that North Falls is not developed, an assessment of the future baseline noise conditions has been carried out and is described within this section.

128. As discussed in Section 26.4.1.2, UK planning policy such as the NPPF (para. 185) requires that new development incorporates mitigation measures to reduce potential adverse noise impacts to a minimum; hence, in general, developments which significantly increase noise in the study area would not be expected to be granted consent. In addition to planning controls there is a clear trend for noise from vehicle, commercial and industrial sources to be driven down in compliance with stricter legislation and guidance as well as consumer expectations.

129. The baseline noise monitoring survey identifies the existing soundscape within the study area and the sources which are contributing to it. In the absence of evidence to the contrary, it is reasonable to assume that the contributing noise sources will not change over time. Hence, changes in future baseline noise levels will depend on the change in noise emissions from the identified sources.

130. In general, the dominant sources contributing to the baseline sound climate were aircraft, road traffic and sounds typical of a rural environment, such as bird call and farm machinery. Road traffic and aircraft noise levels depend on road traffic flows and individual vehicle noise levels. Traffic flows and aircraft movements are generally expected to increase in line with expectations for macro-economic expansion; however, as discussed above, vehicle and aircraft noise levels are expected to reduce over time. Farm machinery noise levels would also be expected to reduce as old equipment is replaced with newer, quieter versions.

131. It is reasonable to anticipate that the trend for increased economic activity to increase baseline noise levels would be balanced out by the effect of planning controls and reductions in source noise emissions. This would result in no change in overall baseline noise conditions in the study area.

26.6 Assessment of significance

26.6.1 Potential effects during construction

26.6.1.1 Impact 1: Noise of landfall and nearshore works

26.6.1.1.1 Magnitude of impact

132. The noisiest onshore works at the landfall will comprise site preparation, excavation of transition bays and the HDD works. The site preparation and excavation works will be undertaken during the standard working hours for the Project (07:00 to 19:00 hours, Monday to Saturday, with no activities on Sundays or bank holidays), and the HDD activities will involve 24 hour working for short periods of time during active drilling.

133. Nearshore works associated with construction of the offshore cable corridor have the potential to impact the identified NVSRs at the landfall site. The magnitude of these impacts will primarily depend on the length of the HDD, which will determine the distance from the vessels undertaking the works to the NVSRs. The length of the HDD is not known at this stage; hence, it has not been possible to assess these impacts. The impact of offshore cable corridor works will be assessed in the ES for the Project.

134. Based on the measured sound levels reported in Table 26.19, in accordance with the methodology specified in Table 26.7, all the landfall NVSRs are category A i.e. the Threshold Values for construction noise impacts are:

- Daytime: 65dB L_{Aeq} ;
- Evenings and weekends: 55dB L_{Aeq} ; and
- Night-time: 45dB L_{Aeq} .

135. Assumptions regarding construction plant for each activity are provided in Appendix 26.3 Construction Noise and Vibration Assessment (Volume III) in addition to the predicted noise level at each NVSR.

136. Landfall construction noise predictions were undertaken assuming all construction plant is concurrently operating in an area approximately half the size (i.e. around 10,000m^2) of the landfall compound area at the closest approach of the landfall search area to the NVSR, and at one additional hypothetical location in the centre of the landfall search area. This approach considers a worst-case scenario for potential monthly average construction noise impacts as well as identifying the potential for mitigation by project design. The construction works will be undertaken during the standard working hours for the Project.

137. The maximum predicted daytime construction noise levels at the landfall NVSRs are 56dB L_{Aeq} (LFR1), 57dB L_{Aeq} (LFR2, 3 and 4) and 52dB L_{Aeq} (LFR5). These are below the daytime Threshold Value of 65dB L_{Aeq} and between 3dB below and 2dB above the evening and weekend Threshold Value of 55dB L_{Aeq} respectively. This impact occurs during site access and temporary construction compound establishment works, should the landfall compound be located as close as possible to the NVSR, as a worst-case. It should be noted that the landfall compound could only be at a worst-case location for one NVSR and that, if this occurs, noise levels at all other NVSRs would be lower than the worst-case, as shown in Appendix 26.3 Construction Noise and Vibration Assessment (Volume III). The results in Appendix 26.3 Construction Noise and Vibration Assessment (Volume III) show that, if the landfall compound is in the centre of the landfall search area, predicted noise levels at NVSRs are below the daytime and evening and weekend Threshold Values.

138. LFR1, 2 and 5 are represented by monitoring location LFM1, the measured ambient sound level at this location was 50dB L_{Aeq} during the daytime and 41dB L_{Aeq} during the evening and weekend. According to the criteria in Table 26.8, the predicted worst-case construction noise levels at these NVSRs represents an impact of low magnitude during the daytime reference period. During the evening and weekend reference period, potential worst-case impacts of low magnitude are predicted at LFR5 and medium magnitude at LFR1 and 2.

139. LFR3 and LFR4 are represented by monitoring location LFM2 and LFM3 respectively, the measured ambient sound levels at these locations were 43dB L_{Aeq} (LFM2) and 48dB L_{Aeq} (LFM3) during the daytime and 41dB L_{Aeq} during the evening and weekend (both locations). According to the criteria in Table 26.8, the maximum predicted construction noise levels at these NVSRs represent an impact of low magnitude during the daytime and medium magnitude during the evening and weekend reference period.

140. If the landfall compound is in the centre of the landfall search area, the predicted construction noise levels are below the evening and weekends Threshold Value; hence, impacts are no worse than low magnitude.

141. The maximum predicted night-time construction noise levels at the landfall NVSRs are 55dB L_{Aeq} (LFR2), 54dB L_{Aeq} (LFR1, 3 and 4) and 50dB L_{Aeq} (LFR5) i.e. 5 to 10dB above the Threshold Value of 45dB L_{Aeq}. The measured night-time ambient sound levels were 28dB L_{Aeq} (LFR4), 34dB L_{Aeq} (LFR3) and 35dB L_{Aeq} (LFR1, 2 and 5). According to the criteria in Table 26.8, the predicted construction noise levels represent an impact of high magnitude during the night at all landfall NVSRs.

142. If the landfall compound is in the centre of the landfall search area, the predicted night-time construction noise levels are between 1 and 6dB below the Threshold Value, resulting in impacts of low magnitude at all landfall NVSRs.

26.6.1.1.2 Significance of effect

143. NVSRs surrounding the landfall location are identified to be of medium sensitivity; hence, the predicted construction noise impacts result in effects of minor significance, i.e. not significant in EIA terms, during the daytime reference period. Without mitigation, the worst-case impacts during the evenings and weekends reference periods are anticipated to result in effects of moderate significance, which is considered significant in EIA terms.

144. During the night-time reference period, without mitigation, the predicted worst-case high impact magnitude is anticipated to result in major adverse effects, which is significant in EIA terms.

145. These analyses do not account for the precise duration of the potential impact as this information is not yet known. A worst-case assumption has been made that each phase of the works will last for at least one month. In addition, the location of the landfall compound has not yet been determined, which is why the closest approach of the landfall search area to the NVSRs has been used as a worst-case assumption. Further analysis of potential impact durations from the selected landfall compound area, plus analysis based on a refined landfall compound location, will be undertaken in the ES.

146. As discussed in Table 26.3, the site selection and design process, which can be used to minimise Project noise effects, is incorporated into this assessment as an embedded mitigation measure. Hence, the identified potentially significant effects can be reduced by moving the landfall compound location further from the NVSRs, avoiding the need for additional mitigation. For example, a potential location in the centre of the landfall search area has been identified which, if used for the landfall compound, would reduce all effects to no worse than minor adverse i.e. not significant. Movement of the landfall compound will be considered during ongoing project design refinement, undertaken between now and the submission of the Project's DCO application.

26.6.1.1.3 Additional mitigation

147. The assessment presented in Section 26.6.1.1.2 is based on locating the landfall compound at a worst-case potential location for each NVSR inside the landfall search area. Depending on the eventual landfall compound location, effects may not be significant and additional mitigation may not be required.

148. Where, in spite of the embedded mitigation, including the project design process and BPM, significant effects are anticipated to remain, the following further mitigation measures will be considered and included in the Control of Noise and Vibration Management Plan (CNVMP), where applicable and practicable:

- Limiting working hours to avoid the most noise-sensitive times such as weekends;
- Selection of quieter plant, equipment or working methods;
- Use of additional silencers and/or enclosures around noisy equipment;
- Reduced numbers of plant during sensitive periods;
- Reduced on-time of plant during sensitive periods;
- Increased separation distance between works and NVSRs;
- Interspersing of noisy works between quieter works to provide periods of respite;
- Phasing of the works to ensure that the noisiest operations are performed during the least sensitive times and vice-versa; and
- Review of the construction programme to minimise the duration of the works at the closest approach to properties where possible to give periods of respite.

149. Additional measures may be required to mitigate landfall construction noise impacts if, following design refinement and the implementation of the measures outlined above, significant noise effects are still predicted. These could include temporary screening around the landfall compound.

150. BS 5228-1 indicates that screening provides 5 to 10dB of attenuation, but the effectiveness is dependent on the position of the barrier between the source and receiver and its height. The standard states: "*assume an approximate attenuation of 5 dB when the top of the plant is just visible to the receiver over the noise barrier, and of 10 dB when the noise screen completely hides the sources from the receiver*".

151. During the daytime, the receiver location will be at ground floor (assumed to be 1.5m above ground level); however, during the night-time, the receiver location is at the upper floors of the property, assumed to be 4m above ground level. Based on the worst-case predicted noise impacts, it may be necessary for the barrier to completely screen the noise sources from the receptor, thereby providing 10 dB of attenuation. This would only be required if the duration of high predicted night-time noise levels at receptors is at least one month.

152. This assessment will be repeated for the ES once the final landfall location has been selected. The outline CNVMP (submitted as part of the DCO application) will include appropriate mitigation for any significant effects identified. The final design of any screening required to avoid significant effects will be determined by the contractor appointed to construct the works and will be included in the final CNVMP.

26.6.1.1.4 Significance of residual effect

153. After implementation of the specific noise control measures, and on the basis that a 10dB noise reduction is achievable with screening, the magnitude of the impact would be reduced to negligible during the day and evening and low at night. These equate to residual effects of negligible significance during the day and evening, and minor adverse significance at night, which is not significant in EIA terms.

26.6.1.2 Impact 2: Noise of onshore cable corridor(s) works

26.6.1.2.1 Magnitude of impact

154. The onshore cable construction works includes the establishment and use of temporary compounds, excavation and backfill of jointing bays, cable pulling and HDD compounds and crossings. At this stage in the project design, sufficient information on the location of these works is not available, therefore, these impacts have not been assessed in detail. These impacts will be assessed and reported on in the ES.

155. The outline construction programme indicates that the enabling works such as fencing, soil stripping, haul road and temporary compound construction are likely to be completed at least one month before the trench excavation and cable installation works in a similar location begin. As a result, when determining monthly average construction noise levels, noise impacts from site preparation and the remaining cable installation works have been assessed separately.

156. The onshore cable construction works are currently planned to be undertaken during the standard working hours for the Project (07:00 to 19:00 hours, Monday to Saturday, with no activities on Sundays or bank holidays).

157. The outline construction schedule splits the onshore cable corridor(s) into five sections, the length of each section and duration of the site preparation and trench excavation, duct installation and trench backfill works are shown in Table 26.22. The construction is likely to proceed along a number of work fronts moving along the cable corridor(s), therefore the construction will not be static for the entire duration of the works.

Table 26.22 Cable corridor construction schedule breakdown

Corridor Section	Length (m)	Site Preparation Works		Trench Excavation, Duct Installation and Trench Backfill Works	
		Duration (Months)	Progression Rate (Metres per Month)	Duration (Months)	Progression Rate (Metres per Month)
1	3,600	5	720	9	400
2	1,100	2	550	3	367
3	5,000	5	1,000	10	500
4	4,900	5	980	9	544
5	6,000	6	1,000	10	600

158. Based on the results in the above table, the distances from a NVSR to the onshore cable corridor(s) have been calculated at which the predicted

construction noise levels over a worst-case month result in low, medium and high impacts, in accordance with the criteria in Table 26.8, as shown in Table 26.23. As ambient noise levels are not known, it is not possible to predict the minimum distance at which negligible impacts are anticipated.

Table 26.23 Distances (in m) from NVSR to onshore cable corridor(s) at which impacts are predicted.

Corridor Section	Site Preparation			Trench Excavation, Duct Installation and Trench Backfill Works		
	Low	Medium	High	Low	Medium	High
Daytime working						
1	>112	112 - 43	<43	>118	118 - 50	<50
2	>129	129 - 53	<53	>122	122 - 53	<53
3	>90	90 - 31	<31	>107	107 - 42	<42
4	>92	92 - 31	<31	>102	102 - 39	<39
5	>90	90 - 31	<31	>97	97 - 36	<36
Evening and weekend working						
1	>443	443 - 240	<240	>404	404 - 228	<228
2	>460	460 - 257	<257	>404	404 - 231	<231
3	>415	415 - 210	<210	>395	395 - 217	<217
4	>420	420 - 211	<211	>391	391 - 234	<234
5	>415	415 - 210	<210	>386	386 - 227	<227

159. As stated in Section 26.4.3.3, in accordance with the DMRB, construction noise impacts are only anticipated at NVSRs within 300m of the works, irrespective of the results in Table 26.23 which identify the potential for impacts at further distances.

160. Ordnance Survey Address Base data has been used to identify medium and high sensitivity NVSRs within the distance bands in Table 26.23 from the onshore cable corridor(s) works (limited to a maximum of 300m). No high sensitivity NVSRs were identified. The number of medium sensitivity NVSRs potentially exposed to impacts of medium or high magnitude are shown in Table 26.24, these are also illustrated in Figure 26.4 (site preparation) and Figure 26.5 (trench excavation, duct installation and trench backfill works) (Volume II). The numbers reported below includes some double-counted properties at the joins between the corridor sections.

Table 26.24 Number of NVSRs at which impacts are predicted

Corridor Section	Site Preparation		Trench Excavation, Duct Installation and Trench Backfill Works	
	Medium	High	Medium	High
Daytime working				

Corridor Section	Site Preparation		Trench Excavation, Duct Installation and Trench Backfill Works	
	Medium	High	Medium	High
1	37	33	36	36
2	4	1	3	1
3	42	12	48	18
4	11	4	11	5
5	6	5	8	5
Evening and weekend working				
1	61	200	74	187
2	2	16	3	14
3	191	206	185	212
4	40	31	28	42
5	17	29	15	31

26.6.1.2.2 Significance of effect

161. The identified NVSRs in Table 26.24 are of medium sensitivity; hence, without mitigation, the predicted construction noise impacts of medium and high magnitude result in effects of moderate and major significance respectively, which is considered significant in EIA terms.

162. As discussed in relation to the landfall works, embedded mitigation includes refinement of the onshore cable corridor(s) during the site selection and design process. This refinement will be used to minimise noise effects, primarily by maximising the distance from the onshore cable construction works to the closest NVSRs where feasible.

163. The final onshore cable route and design has not yet been finalised; therefore, the assessment will be updated once the cable route has been determined and the distances between the works and the NVSRs can be included in the assessment. These results will be reported in the ES.

26.6.1.2.3 Additional mitigation

164. As discussed in Section 26.6.1.1.3, the assessment is based on locating the onshore cable installation works at a worst-case potential location for each NVSR inside the onshore cable corridor(s). Depending on the eventual onshore cable location, effects may not be significant and additional mitigation may not be required.

165. Similar measures to mitigate noise impacts from the landfall works (outlined in Section 26.6.1.1.3) may also be required for the onshore cable installation works.

166. As with the landfall works, the outline CNVMP will include appropriate mitigation for any significant effects identified and be secured through a DCO Requirement. The final design of any screening (should it be required) to reduce

significant effects will be determined by the contractor appointed to construct the works and will be included in the final CNVMP along with standard BPM.

26.6.1.2.4 Significance of residual effect

167. Incorporating a 10dB reduction in predicted construction noise level from screening, the distances from an NVSR to the onshore cable corridor(s) at which predicted impacts are of low and medium magnitude have been calculated, as shown in Table 26.25. However, it should be noted that in practice, implementation of embedded mitigation and the additional mitigation measures as set out in Section 26.6.1.1.3 may mean noise levels are reduced sufficiently that physical screening of the works may not be required. The predicted daytime working noise levels do not exceed the high impact criterion; hence, impacts of high magnitude are not anticipated.

Table 26.25 Distances (in m) from NVSR to onshore cable corridor(s) at which impacts are predicted with mitigation

Corridor Section	Site Preparation			Trench Excavation, Duct Installation and Trench Backfill Works		
	Low	Medium	High	Low	Medium	High
Daytime working						
1	>11	≤11	N/a	>15	≤15	N/a
2	>16	≤16		>16	≤16	
3	>7	≤7		>11	≤11	
4	>7	≤7		>10	≤10	
5	>7	≤7		>9	≤9	
Evenings and weekend working						
1	>112	112 - 43	<43	>108	108 - 50	<50
2	>129	129 - 53	<53	>122	122 - 55	<55
3	>90	90 - 31	<31	>107	107 - 42	<42
4	>92	92 - 31	<31	>102	102 - 39	<39
5	>90	90 - 31	<31	>97	97 - 36	<36

168. The number of NVSRs at which impacts are predicted with mitigation are shown in Table 26.26, these are also illustrated in Figure 26.6 (site preparation) and Figure 26.7 (trench excavation, duct installation and trench backfill works) (Volume II).

Table 26.26 Number of NVSRs at which impacts are predicted with mitigation

Corridor Section	Site Preparation		Trench Excavation, Duct Installation and Trench Backfill Works	
	Medium	High	Medium	High
Daytime working				
1	13	0	15	0

Corridor Section	Site Preparation		Trench Excavation, Duct Installation and Trench Backfill Works	
	Medium	High	Medium	High
2	0	0	0	0
3	5	0	5	0
4	0	0	0	0
5	0	0	1	0
Total	18	0	21	0
Evening and weekend working				
1	34	32	29	35
2	3	1	3	1
3	40	11	47	16
4	9	2	9	3
5	5	5	7	5
Total	91	51	95	60

169. Impacts of medium and high magnitude are predicted to result in moderate and major adverse effects, which are considered significant in EIA terms. However, these do not account for the embedded or additional mitigation measures which can be implemented before physical screening , as described in Section 26.6.1.2.3. For example, working restrictions may be feasible such that works during the 'evening and weekend' times are relatively quiet. At this stage in the Project's design development, it is not possible to quantify the change in construction noise effects which will occur due to these measures.

170. Significant effects have been predicted on the basis of draft construction plant lists and programme. The draft plant lists have been prepared on a conservative basis to represent a likely worst-case over the duration of the construction programme and reflects the current understanding of the likely plant requirements. Actual selection of plant and plant on-times are subject to change once the Project is consented and a construction contractor is appointed. As such, it is considered that the predicted construction noise levels are representative of a worst-case, and that actual construction noise levels would likely be lower than predicted, for most of the works' duration. The assessment is therefore representative of the envelope in which noise impacts may occur, whilst in practice the noise impacts may be lower than predicted.

171. The final CNVMP will identify the mitigation measures required to ensure significant noise effects do not occur. With the implementation of these measures, residual construction noise effects due to the cable corridor works are not anticipated to be significant in EIA terms.

26.6.1.3 Impact 3: Noise of onshore substation works

26.6.1.3.1 Magnitude of impact

172. Substation construction noise predictions were undertaken assuming all construction plant is concurrently operating in an area approximately half the size (i.e. around 50,000m^2) of the onshore substation footprint at the closest approach of the onshore substation zone to the NVSR (see Figure 26.1 (Volume II) for location of NVSR and monitoring locations). This approach considers a reasonable worst-case scenario for potential monthly average construction noise impacts. The construction works will be undertaken during the standard working hours for the Project.

173. Based on the measured sound levels reported in Table 26.20 and in accordance with the methodology specified in Table 26.7, the category A Threshold Values are applicable to all the substation NVSRs.

174. Assumptions regarding construction plant for each activity are provided in Appendix 26.3 Construction Noise and Vibration Assessment (Volume III) in addition to the predicted noise level at each NVSR.

175. The predicted substation construction noise levels are all below the daytime Threshold Value irrespective of the location of the onshore substation, meaning that daytime impacts are no worse than low magnitude.

176. The following predicted construction noise levels are equal to or exceed the evening and weekend Threshold Value, assuming that the onshore substation is as close as possible to the identified NVSR:

- SSR4 – equal to the Threshold Value during the ground works/formation of platform and building fabrication and HV plant installation phases;
- SSR5 – exceedances of 2dB during the ground works/formation of platform and building fabrication and HV plant installation phases;
- SSR6 – exceedances of 5dB (building foundation works), 6dB (ground works/formation of platform) and 7dB (building fabrication and HV plant installation);
- SSR7 – exceedances of 1dB (building foundation works) and 3dB (ground works/formation of platform and building fabrication and HV plant installation phases);
- SSR8 – equal to the Threshold Value during the ground works/formation of platform.

177. The predicted construction noise levels at the worst-affected NVSR (SSR6) are between 55 and 62dB L_{Aeq} depending on the activity and assuming the onshore substation is at the worst-case location. NVSR SSR6 is represented by monitoring location SSM4, the measured ambient sound level at this location was 44dB L_{Aeq} during the daytime and 39dB L_{Aeq} during the evening and weekend. According to the criteria in Table 26.8, the predicted worst-case construction noise level at this NVSR represents an impact of low magnitude during the daytime and high magnitude during the evening and weekend reference period. The predicted worst-case construction noise levels at SSR4,

SSR5, SSR7 and SSR8 equate to an impact of medium magnitude during the evening and weekend reference period.

178. If the onshore substation is located at the closest point of the onshore substation zone to SSR1, SSR9 or SSR10, the predicted construction noise levels are below the evening and weekends Threshold Value, resulting in impacts of low magnitude at all substation NVSRs.

26.6.1.3.2 Significance of effect

179. NVSRs surrounding the substation location are identified to be of medium sensitivity; therefore, the predicted construction noise impacts result in effects of minor significance, considered not significant in EIA terms, during the daytime reference period. Without mitigation, and assuming the onshore substation is at the closest approach of the onshore substation zone to the NVSR, the potential worst-case impacts during evenings and weekends reference periods at SSR4, SSR5, SSR7 and SSR8 are anticipated to result in effects of moderate adverse significance, and at SSR6 are anticipated to result in effects of major adverse significance. Effects of moderate or major adverse significance are considered significant in EIA terms. Substation construction works will only take place during standard construction hours so there will be no night-time working.

180. If the onshore substation is located at the closest point of the onshore substation zone to SSR1, SSR9 or SSR10, the effect of construction noise during the evening and weekends is no worse than minor adverse significance at all substation NVSRs, which is not significant.

181. Based on the outline construction schedule, each of the identified phases of onshore substation construction works is expected to last for more than one month, therefore the duration of impacts is unlikely to alter the conclusion regarding effect significance. However, the calculations have assumed that the construction works will be undertaken in the worst-case location in the onshore substation zone for each NVSR i.e. at the closest approach of the onshore substation zone to the NVSR. Updated calculations will be undertaken to inform the Project ES on the basis of the final onshore substation location.

182. As discussed in relation to the landfall works, embedded mitigation includes the ongoing site selection and design refinement process. This will be used to minimise noise effects, primarily by maximising the distance from the onshore substation to the closest NVSRs where feasible.

26.6.1.3.3 Additional mitigation

183. The assessment presented in Section 26.6.1.3.2 is based on locating the onshore substation at a worst-case potential location for each NVSR inside the onshore substation zone. Depending on the eventual onshore substation location and the durations of the works, effects may not be significant and additional mitigation may not be required.

184. Should significant construction noise effects remain, following the onshore substation design refinement process, the same measures to mitigate noise impacts from the landfall works may also be required for the onshore substation construction works. According to the current calculations, if the substation is located at the closest approach of the onshore substation zone to SSR6, temporary acoustic screening will be required which can completely hide the

noise sources from the receiver, thereby providing 10dB of mitigation. If it is located at the closest approach to SSR4, SSR 5, SSR 7 or SSR 8, temporary acoustic screening would be needed which provides 5dB of mitigation.

185. As with the landfall and onshore cable corridor(s) works, the outline CNVMP will include appropriate mitigation for any significant effects identified. The final design of the screening and any other mitigation measures required to avoid significant effects will be determined by the contractor appointed to construct the works and will be included in the final CNVMP.

26.6.1.3.4 Significance of residual effect

186. After implementation of the specific noise control measures and additional mitigation, and on the basis that a 10dB noise reduction is achievable with screening (should it be required), the magnitude of the impact would be reduced to no worse than low during the day and evening and weekend reference periods. These equate to residual effects of no worse than minor adverse, therefore not considered significant in EIA terms.

26.6.1.4 Impact 4: Noise from off-site construction traffic

187. The Transport Assessment provided in Appendix 27.1 (Volume III) of Chapter 27 Traffic and Transport (Volume I) details those roads links subject to increased vehicle movements during the Project's construction. These road links are presented in Figure 27.1 (Volume II).

188. Traffic data for these road links were provided for a baseline year plus growth ('without the Project' scenario) and baseline year plus growth plus development ('with the Project' scenario) and details for the total traffic flow per link, the composition of the flow with %HGV and speed data were provided in the Transport Assessment provided in Appendix 27.1 (Volume III).

189. The earliest realistic year that construction works could start is 2026; therefore, this is considered the worst-case year for assessment. As discussed in Chapter 27 Traffic and Transport (Volume I), it is anticipated that later years would have higher baseline traffic flows and therefore a lesser significance of effect.

190. The traffic noise assessment comprises the following situations:

- 2026 baseline versus 2026 baseline + Peak Construction; and
- 2026 baseline versus 2026 baseline + Average Construction.

191. The peak construction traffic against the 2026 baseline is considered the worst-case situation for assessment purposes as it represents the earliest year for the start of construction works and the maximum likely construction traffic flows.

192. For each situation (detailed above) and road link, a BNL was calculated using the CRTN or NAC methodology to determine the short-term relative change from construction traffic associated with the Project. The road links assessed are provided in full detail in Appendix 26.2 Road Traffic Noise Assessment (Volume III).

26.6.1.4.1 Magnitude of impact

193. The construction road traffic noise assessment predicts changes in $L_{A10,18hr}$ (CRTN) and $L_{Aeq,18hr}$ (NAC). A <1dB change in BNL (a negligible magnitude of impact according to Table 26.9) is predicted at 36 of the road links during peak construction traffic flows. Changes of 1 to 2.9dB (low impact) are predicted on

five road links and ≥ 5dB (high) at one link (link 4 (Bentley Road between the onshore cable corridor(s) and the A120)). Separate BNL calculations using the forecast average construction traffic flows indicate the same number of links experiencing negligible and low impacts, the only change is that the impact on Bentley Road is moderate. These calculations are detailed in full in Appendix 26.2 Road Traffic Noise Assessment (Volume III).

26.6.1.4.2 Sensitivity of receptors

194. The seven NVSRs identified with the potential to be impacted by construction traffic noise (CTR1 to CTR7 listed in Table 26.17 and shown in Figure 26.3 (Volume II)) are all the residential properties within 50m of Bentley Road. These are all medium sensitivity receptors and no other NVSRs have been identified along this link.

195. To assess a potential worst-case, there are assumed to be residential NVSRs along all the identified remaining road links i.e. receptors of medium sensitivity.

26.6.1.4.3 Significance of effect

196. The worst-case effects on NVSRs due to the identified negligible and low magnitude impacts will be of negligible and minor significance respectively, not considered significant in EIA terms.

197. To further analyse the potential impacts associated with the traffic on Bentley Road, road traffic noise levels at the identified NVSRs have been calculated for comparison with the LOAEL and SOAEL criteria in Table 26.10, as shown in Appendix 26.2 Road Traffic Noise Assessment (Volume III). Table 26.27 provides the predicted impacts according to the criteria in Table 26.9 and comparison with the identified LOAEL and SOAELs.

Table 26.27 Predicted road traffic noise impacts

NVSR	Change in road traffic noise level due to construction traffic (dB $L_{A10,18h}$)	Magnitude of Impact	Difference between predicted traffic noise level and LOAEL (dB $L_{A10,18h}$)		Difference between predicted traffic noise level and SOAEL (dB $L_{A10,18h}$)	
			Baseline traffic	Baseline plus peak construction traffic	Baseline traffic	Baseline plus peak construction traffic
CTR1	4.3	Medium	0	5	-13	-8
CTR2	6.4	High	7	13	-6	0
CTR3	5.1	High	-2	3	-15	-10
CTR4	5.6	High	4	10	-9	-3
CTR5	3.5	Medium	12	16	-1	3
CTR6	2.3	Low	3	6	-10	-7
CTR7	4.5	Medium	0	5	-13	-9

198. Table 26.27 shows that impacts of medium magnitude are predicted at three NVSRs and high magnitude at a further three NVSRs. At medium sensitivity NVSRs, these impacts equate to effects of moderate and major adverse significance respectively, therefore significant in EIA terms.

199. These effects relate to the peak (i.e. worst-case week) construction traffic flow across the entire construction schedule which is a very short duration; hence, on its own, this change does not indicate a significant effect. However, the average construction traffic flow data (which has been averaged across the periods of the construction schedule when any construction traffic is forecast to use the identified link) is considered to potentially underestimate the noise impact; hence, the peak flows have been used to assess the potential worst-case impact. This approach may be revisited at the ES stage once more traffic flow data are available.

200. For those NVSRs at which predicted 'with peak construction' road traffic noise levels are below the SOAEL, the effects of construction traffic noise impacts are considered not significant, irrespective of the noise level change. Hence, without mitigation, significant noise effects in EIA terms are only anticipated at CTR2 (major adverse) and CTR5 (moderate adverse).

26.6.1.4.4 Additional mitigation

201. Proposed measures to mitigate potentially significant road traffic noise effects on CTR2 and CTR5 could include:

- Temporary screening between the road and the NVSR. This is potentially feasible for CTR2 and, if line of sight from the road is blocked, this should reduce road traffic noise levels by around 10dB. However, the façade of CTR5 is directly next to the road and there is not space available to introduce screening to this NVSR;
- A reduction in peak LV trips through the promotion of car-sharing or contractor provided minibuses, etc;
- A reduction in peak daily HGV trips through measures such as:
    - Stockpiling of materials to reduce peak daily HGV demand;
    - Backhauling, i.e. using laden vehicles to import stone and export excavated material;
    - Optimising the size of HGVs to reduce the total number;
    - Incentivising the appointed construction Contractor to seek engineering refinements to reduce material quantities and therefore HGV numbers; and
    - The reuse of materials onsite to reduce offsite HGV trips, e.g. using excavated materials to form bunds, etc.
- A temporary reduction in the speed limit along Bentley Road.

26.6.1.4.5 Significance of residual effect

202. If possible, temporary screening which blocks the line of sight from the road to CTR2 would reduce the 'with construction' road traffic noise levels such that residual effects would be negligible, therefore not significant in EIA terms.

203. Additional calculations of the 'with peak construction traffic' road traffic noise levels have been undertaken, including a temporary 30 mph speed limit on Bentley Road, as shown in Appendix 26.2 Road Traffic Noise Assessment (Volume III). Table 26.28 provides the predicted mitigated impacts according to

the criteria in Table 26.9 and comparison with the identified LOAEL and SOAELs.

Table 26.28 Predicted road traffic noise impacts with 30mph speed limit on link 4

NVSR	Change in road traffic noise level due to construction traffic (dB $L_{A10,18h}$)	Magnitude of Impact	Difference between predicted traffic noise level and LOAEL (dB $L_{A10,18h}$)		Difference between predicted traffic noise level and SOAEL (dB $L_{A10,18h}$)	
			Baseline traffic	Baseline plus peak construction traffic	Baseline traffic	Baseline plus peak construction traffic
CTR1	2.9	Low	0	3	-13	-10
CTR2	4.9	Medium	7	12	-6	-2
CTR3	3.6	Medium	-2	2	-15	-11
CTR4	4.2	Medium	4	8	-9	-5
CTR5	2.7	Low	12	15	-1	2
CTR6	1.7	Low	3	5	-10	-8
CTR7	3.1	Medium	0	3	-13	-10

204. Table 26.27 shows that predicted residual impacts with this speed limit in place are low at 3 NVSRs and medium at 4 NVSRs. However, predicted noise levels at all NVSRs are below the SOAEL except at CTR5 (exceedance of 2 dB). The impact due to noise level change at CTR5 is low, equating to an effect of minor adverse significance. Hence, residual effects with this mitigation measure in place are not significant in EIA terms.

205. The final package of embedded and additional mitigation measures to avoid significant noise effects will be identified in the final Construction Traffic Management Plan (CTMP) or CoCP, preparation of which will be secured by DCO Requirement. As demonstrated above, mitigation measures are available to reduce the currently identified effects to a non-significant level.

26.6.1.5 Impact 5: Construction vibration

206. As discussed in Section 26.4.3.5, the assessment of construction vibration impacts is confined to the onshore cable corridor(s). As discussed in Section 26.4.3.5, the closest identified NVSRs to the landfall search area and onshore substation zone are further than 100m away; hence, no vibration impacts are anticipated due to construction of the landfall or onshore substation.

207. The construction actvities with the potential to emit significant vibration have been identified. Table 26.29 lists the minimum set-back distances at which the vibration level criteria relevant to the potential for human annoyance and cosmetic building damage (for transient vibration at a frequency of 4 Hz) may occur for these activities. Set back distances were derived using the calculation methods provided in BS 5228-2.

208. The operation of HDD rigs is likely to generate similar levels of vibration to rotary bored piling due to the similar mechanisms involved. Table D.6 of BS 5228-2:2009+A1:2014 shows that vibration from rotary bored piling activities is unlikely to exceed 1.0mm.s^{-1} at a distance of approximately 7m.

209. The calculations for impacts upon humans (i.e. PPV levels 0.3 to 10 mm.s^{-1}) assume a frequency independent vibration transfer function (level multiplied by 1.8) between outdoors and indoors, based upon measurements by D.J Martin (1980) described in the TRRL report 'Ground vibrations from impact pile driving during road construction'. There is a 5% probability that the predicted vibration levels are exceeded. Further detail on the assumptions made to undertake these calculations are provided in Appendix 26.3 Construction Noise and Vibration Assessment (Volume III).

Table 26.29 Predicted distances at which vibration levels may occur

Activity	Set-back distance at which vibration level (PPV indoors, ground-floor) occurs		
	0.3 mm.s^{-1}	1.0 mm.s^{-1}	10 mm.s^{-1}
Rotary Piling (HDD) based on Ref.100 Table D.6 BS 5228-2	44m	13.1m	1.3m
Vibratory compaction (start-up)	123m*	48m	7.2m
Vibratory compaction (steady state)	87m	38m	7.3m

26.6.1.5.1 Magnitude of impact

210. The exact locations of the HDD plant associated with the trenchless crossing works is not known at this stage; hence, the distance to the nearest NVSRs is not known. An embedded mitigation measure (see Table 26.3) is that these works will be at least 8m from the closest NVSR. The vibration level inside a property due to HDD works at 8m away has been calculated to be 1.6 mm.s^{-1}, equating to disturbance impacts of medium magnitude. The calculated vibration levels for ground compaction are around 9 mm.s^{-1} during start-up and steady state operation of the compaction plant, equating to disturbance impacts of medium magnitude.

211. As detailed in Table 26.29, the set-back distances for the HDD works of >13.1m, vibratory compactors/rollers of >48m for start-up and >38m for steady state operation, would represent a low magnitude of disturbance impacts.

212. Regarding the potential for structural damage, TRL Report 429 '*Groundborne vibration caused by mechanised construction works'* (D.M. Hiller, and G.I. Crabb (2000)) shows that the frequency of vibration generated by compaction using rollers exceeds 15 Hz. According to the criteria in Table 26.11, at a frequency of 15Hz, the building damage impact will be negligible if the vibration level at the building foundation does not exceed 10mm.s^{-1}. The outdoor free-field vibration levels emitted by ground compaction have been calculated, these indicate (with a 95% confidence) that the level is unlikely to exceed 10mm.s^{-1} at a distance of at least 5m from the works. Table 26.29 shows that vibration levels emitted by HDD works are lower than those due to vibratory ground compaction; hence, consideration of ground compaction vibration impacts is a worst-case. A set back distance of 8m between any vibration sensitive structure and works with the potential to emit high levels of vibration is an embedded mitigation measure in the project design; hence, the impact of structural vibration damage would be no greater than negligible magnitude.

26.6.1.5.2 Significance of effect

213. The identified NVSRs are of medium sensitivity; hence, the predicted worst-case impacts of medium magnitude on human receptors due to the trenchless

crossing works are anticipated to result in effects of moderate adverse significance. This impact would only be present whilst the drill head is within 13m of an NVSR. Typically, HDD works progress at around 40m per day; hence, vibration levels are only likely to exceed 1mm.s^{-1} for less than a day. Such a short duration of exposure means that vibration effects on human NVSRs due to HDD works will be no greater than minor adverse significance, which is not significant in EIA terms.

214. The worst-case vibratory compaction works are predicted to cause impacts on human receptors of medium magnitude (when the compactor is within 48m of the NVSR). However, the duration of vibratory compaction works within 48m of a NVSR is likely to be very short; hence, an exceedance of the 1mm.s^{-1} threshold does not necessarily imply a significant adverse effect. As discussed in Section 26.6.1.2.1, the onshore cable corridor(s) works are anticipated to progress at a rate of around 400m per month (20m per working day). The onshore cable corridor(s) works include activities other than ground compaction; hence, the rate of progression of ground compaction will be even quicker. On that basis, ground compaction is only likely to be within 48m of any NVSR for two to three days. Such a short duration of exposure means that vibration effects on human NVSRs due to ground compaction will be no greater than minor adverse significance, therefore not significant in EIA terms.

215. Building damage impacts due to vibration from ground compaction are predicted to be of negligible magnitude; hence, worst-case effects will be of negligible significance, which is considered not significant in EIA terms.

26.6.1.5.3 Additional mitigation

216. The outline CNVMP to be submitted with the DCO application will identify whether any vibration mitigation measures are required to avoid significant effects. These could comprise the following:

- Choosing alternative, lower impact equipment or methods wherever possible;
- Scheduling the use of vibration-causing equipment, at the least sensitive time of day;
- Routing, operating or locating high vibration sources as far away from sensitive areas as possible;
- Sequencing operations so that vibration-causing activities do not occur simultaneously;
- Isolating the equipment causing the vibration on resilient mounts; and
- Keeping equipment well maintained.

26.6.1.5.4 Significance of residual effect

217. Following the implementation of BPM and any additional mitigation measures identified in the CNVMP, the construction vibration effects are expected to be no greater than minor adverse significance, which is considered not significant in EIA terms.

26.6.2 Potential effects during operation

26.6.2.1 Impact 6: Onshore substation noise

218. As discussed in Section 26.4.3.6, to predict the noise from the operation of the onshore substation, it is necessary to understand the plant that will be incorporated and its sound emissions. At this stage in the project design, this information is not available. Modelling and assessment of predicted onshore substation sound levels will be undertaken and reported in the ES for the Project.

219. In the absence of predictions, substation noise level limits have been recommended, based on the measured *background/ambient sound levels* and in accordance with relevant policy.

26.6.2.1.1 Magnitude of impact

220. The magnitude of impact criteria presented in Table 26.13, along with the measured *background sound levels* have been used to determine the *rating levels* of the substation noise at which low, medium and high impacts would be anticipated, according to the initial numerical assessment in BS 4142, as shown in Table 26.30.

Table 26.30 Operational noise rating level thresholds for the onset of impacts

NVSR	Time period	Measured *background sound level* (dB L_{A90})	Rating level of substation noise resulting in the identified impact (dB $L_{Ar,Tr}$)		
			Low	Medium	High
SSR1	Day	30	31 to 35	36 to 39	≥40
	Night	22	23 to 27	28 to 31	≥32
SSR2	Day	33	34 to 38	39 to 42	≥43
	Night	22	23 to 27	28 to 31	≥32
SSR3	Day	33	34 to 38	39 to 42	≥43
	Night	22	23 to 27	28 to 31	≥32
SSR4	Day	29	30 to 34	35 to 38	≥39
	Night	21	22 to 26	27 to 30	≥31
SSR5	Day	26	27 to 31	32 to 35	≥36
	Night	23	24 to 28	29 to 32	≥33
SSR6	Day	26	27 to 31	32 to 35	≥36
	Night	23	24 to 28	29 to 32	≥33
SSR7	Day	26	27 to 31	32 to 35	≥36
	Night	23	24 to 28	29 to 32	≥33
SSR8	Day	32	33 to 37	38 to 41	≥42
	Night	25	26 to 30	31 to 34	≥35
SSR9	Day	32	33 to 37	38 to 41	≥42
	Night	25	26 to 30	31 to 34	≥35
SSR10	Day	34	35 to 39	40 to 43	≥44
	Night	24	25 to 29	30 to 33	≥34

221. The *rating levels* in Table 26.30 include any character corrections (for tonality, intermittency, impulsivity or other sound characteristics) which may be

applicable to the substation *specific sound levels*, as discussed in Section 26.4.3.6.

222. Whilst the sound emitted by some of the onshore substation plant is likely to include tonal components, the embedded mitigation measures within the detailed design phase will minimise the tonality of the overall onshore substation sound emissions. With these measures implemented, based on professional experience of other similar substations, tonality is unlikely to be audible outside the onshore substation footprint. Any remaining tonality will be further attenuated by propagation with distance to NVSRs. It is therefore considered unlikely that tonality will be perceptible at the NVSRs.

223. The sound emissions from the onshore substation plant and equipment will be present 24 hours a day, 7 days a week and are relatively continuous; hence, no penalty corrections for intermittency or impulsivity are required. If a penalty is applicable for tonality, it would not be appropriate to apply the "other sound characteristics" penalty, as this is only applicable where no other penalty has been applied.

26.6.2.1.2 Significance of effect

224. The sensitivity of the NVSRs is medium; hence, impacts of low, medium and major magnitude equate to effects of minor, moderate and major significance respectively. However, to determine the significance of the effect of the operational noise, it is necessary to consider the context. Of particular relevance to this assessment is the very low (i.e. below 30dB L_{A90}) *background sound levels* during the night. Section 26.4.3.6 identifies a LOAEL for operational noise of 35dB(A) $L_{night,outside}$, the $L_{night,outside}$ is equivalent to the *specific sound level* without a rating correction. Substation sound levels equal to or below this level would not be anticipated to result in significant effects, irrespective of the difference to the *background sound level*.

225. An onshore substation sound *rating level* limit of 35dB $L_{Ar,Tr}$ is proposed for inclusion in a DCO Requirement. This considers a potential worst-case in that it incorporates a rating correction to the specific sound level. With this DCO Requirement in place, the maximum allowable *specific sound level* is 35dB L_{Aeq}; however, depending on the rating corrections which are applicable, the actual allowable *specific sound level* may be lower than this. Compliance with this limit, which will be secured by DCO Requirement, will ensure that the onshore substation operational noise impacts are not significant in EIA terms.

26.6.3 Potential effects during decommissioning

226. No decision has been made regarding the final decommissioning policy for the onshore infrastructure as it is recognised that industry best practice, rules and legislation change over time. It is likely the cables would be pulled through the ducts and recycled, with the transition pits and ducts capped and sealed then left *in situ*.

227. A full EIA will be carried out ahead of any decommissioning works. The programme for onshore decommissioning is expected to be similar in duration to the construction phase of the Project consecutively i.e. 36 months. The detailed activities and methodology for decommissioning will be determined

later within the project lifetime, in line with relevant policies at that time, but would be expected to include:

- Dismantling and removal of electrical equipment;
- Removal of cabling from site;
- Removal of any building services equipment;
- Demolition of the buildings and removal of fences; and
- Landscaping and reinstatement of the sites.

228. Whilst details regarding the decommissioning are currently unknown, it is anticipated that the impacts would be no greater than those during construction.

229. The decommissioning methodology cannot be finalised until closer to the time of decommissioning but would be in line with relevant policy at that time.

26.7 Potential monitoring requirements

26.7.1.1 Construction noise

230. Where NVSRs may be exposed to construction noise for extended periods, or could be exposed to significant construction noise effects, noise monitoring may be required to quantify construction noise levels. Results of monitoring should be used to identify any potential impacts, inform investigations into the cause of any impacts and to aid in the determination of additional mitigation measures, as appropriate, to reduce and avoid the impacts identified.

231. Monitoring may consist of long-term monitoring at fixed locations or of short-term sample measurements, as appropriate. Details of monitoring which may be required will be specified in the CNVMP.

26.7.1.2 Construction vibration

232. If, for any reason, vibratory ground-compaction works may be in operation in close proximity to buildings and there is the potential for cosmetic building damage, building conditions should be assessed prior to and after the construction phase, and any damage made good. No reason for ground compaction works to be in close proximity to buildings has been identified to date. Requirements for building condition surveys and any vibration monitoring which may be required will be specified in the CNVMP.

26.7.1.3 Operational noise

233. Once the Project is constructed, commissioned, and operating normally, operational noise levels will be monitored to confirm that they do not give rise to any significant effects. The methodology for operational noise monitoring, including the locations and duration of monitoring, and the criteria to be met, will be agreed in advance with Tendring District Council, as secured by a DCO Requirement.

26.8 Cumulative effects

26.8.1 Identification of potential cumulative effects

234. The first step in the CEA process is the identification of which residual effects assessed for North Falls on their own have the potential for a cumulative effect with other plans, projects and activities. This information is set out in Table 26.31. Only potential effects assessed in Section 26.6 as greater than negligible significance are included in the CEA (i.e. those assessed as 'negligible' are not taken forward as there is no potential for them to contribute to a cumulative effect).

Table 26.31 Potential cumulative effects

Impact	Potential for cumulative effect	Rationale
Construction		
Impact 1: Noise of landfall and nearshore works	Yes	Construction works associated with other projects in similar locations to the North Falls construction activities have the potential to result in cumulative effects, where there is a temporal overlap.
Impact 2: Noise of onshore cable corridor(s) works	Yes	
Impact 3: Noise of onshore substation works	Yes	
Impact 4: Noise from off-site construction traffic	Yes	There is the potential for road traffic introduced by the construction of North Falls and traffic introduced by other nearby projects to result in cumulative road traffic noise impacts, where there is a temporal overlap.
Impact 5: Construction vibration	Yes	There is the potential for cumulative construction vibration impacts with projects that are introducing nearby sources of vibration to the onshore cable corridor(s), where there is a temporal overlap.
Operation		
Impact 6: Onshore substation noise	Yes	There is the potential for cumulative operational noise impacts with projects that are introducing industrial / commercial noise sources nearby to the onshore substation.

26.8.2 Other plans, projects and activities

235. The second step in the cumulative assessment is the identification of the other plans, projects and activities that may result in cumulative effects for inclusion in the CEA (described as 'project screening'). This information is set out in Table 26.32, together with a consideration of the relevant details of each, including current status (e.g. under construction), planned construction period, closest distance to North Falls, status of available data and rationale for including or excluding from the assessment.

236. The project screening has been informed by the development of a CEA project list which forms an exhaustive list of plans, projects and activities within the study area (Section 26.3.1) relevant to North Falls. The list has been appraised,

based on the confidence in being able to undertake an assessment from the information and data available, enabling individual plans, projects and activities to be screened in or out.

Table 26.32 Summary of projects considered for the CEA in relation to noise and vibration (Project screening)

Project	Status	Construction period	Closest distance from the onshore project area (km)	Confidence in data	Included in the CEA (Y/N)	Rationale
National Infrastructure Planning						
Bradwell B new nuclear power station	Pre-application	Predicted 9-12 years	21	High	No	The projects are greater than 1km from North Falls, therefore there would be no potential for cumulative noise or vibration impacts. As detailed in Chapter 27 Traffic and Transport (Volume I), traffic and transport study area for these projects does not overlap with the North Falls onshore project area. these schemes have been screened out of the CEA for construction road traffic noise impacts.
East Anglia TWO Offshore Wind Farm	Approved (DCO Issued 2022)	Mid 2020s	47	High	No	
Sizewell C Project	Approved (DCO Issued 2022)	2022 – 2034	49	High	No	
Lake Lothing Third Crossing	Approved (DCO Issued 2020)	Over 2 years	76	High	No	
Manston Airport		Information unavailable.	53	High	No	
Thanet Extension Offshore Wind Farm	Application refused	Application refused	52	High	No	
Sea Link	Pre-application	Information unavailable	20	High	No	
Ipswich Rail Chord	Approved (DCO Issued 2012)	Built	17	High	No	
Richborough Connection Project	Approved (DCO	Built	55	High	No	

Project	Status	Construction period	Closest distance from the onshore project area (km)	Confidence in data	Included in the CEA (Y/N)	Rationale
	Issued 2017)					
Kentish Flats Extension	Approved (DCO Issued 2013)	Built	46	High	No	
Galloper Offshore Wind Farm	Approved	Built	15	High	No	
Nautilus Interconnector	Pre-application	Pre-application	44	Low	No	The location of onshore infrastructure associated with this project is not known, however, it is highly unlikely to be within close proximity to the onshore project area so will not likely have a cumulative effect on noise and vibration.
Five Estuaries Offshore Wind Farm	Pre-application	2028-2030	Scoping area directly overlaps with North Falls onshore project area.	High	Yes	There is potential for the construction phases of the proposed project and North Falls to overlap and traffic movements for both projects could use the same road links. This project has therefore been considered in the CEA for noise and vibration.
East Anglia GREEN	Pre-application	2027-2031	Scoping area directly overlaps with North Falls onshore project area.	Low	Yes	The proposed substation area for East Anglia GREEN is in close proximity to North Falls onshore substation zone. This project has therefore been considered in the noise and vibration CEA.
A12 Chelmsford to A120 Widening Scheme	Pre-examination	Information unavailable.	27	Medium	No	As detailed in Chapter 27 Traffic and Transport (Volume I), no cumulative traffic effects are anticipated. The project is greater than 1km from North Falls, therefore there would be no

Project	Status	Construction period	Closest distance from the onshore project area (km)	Confidence in data	Included in the CEA (Y/N)	Rationale
						potential for cumulative noise and vibration impacts.
Essex County Council						
Elmstead Hall, Elmstead, Colchester, Essex	Approved	Information unavailable.	5	N/A	No	As detailed in Chapter 27 Traffic and Transport (Volume I), no cumulative traffic effects are anticipated for these projects. The projects are greater than 1km from North Falls, therefore there would be no potential for cumulative noise and vibration impacts.
St. George's Infant School and Nursery, Barrington Road, Colchester, Essex, CO2 7RW	Approved	Information unavailable.	9	N/A	No	
Wilson Marriage Centre, Barrack Street, Colchester, Essex, CO1 2LR	Approved	Information unavailable.	9	N/A	No	
Wivenhoe Quarry, Alresford Road, Wivenhoe, Essex, CO7 9JU	Report being prepared	Information unavailable.	7	N/A	No	
Old Heath County Primary School, Old Heath Road, Colchester, Essex, CO2 8DD	Approved	Information unavailable.	8	N/A	No	
Crown Quarry (Wick Farm), Old Ipswich Road, Ardleigh, CO7 7QR	Approved	Information unavailable.	6	N/A	No	
Wivenhoe Quarry, Alresford Road Wivenhoe, Essex CO7 9JU	Approved	Information unavailable.	7	N/A	No	
Wivenhoe Quarry, Alresford Road Wivenhoe, Essex CO7 9JU	Approved	Information unavailable.	7	N/A	No	
Martells Quarry, Slough Lane, Ardleigh, Essex, CO7 7RU	Out for consultation	Information unavailable.	3	N/A	No	

Project	Status	Construction period	Closest distance from the onshore project area (km)	Confidence in data	Included in the CEA (Y/N)	Rationale
Land at: Elmstead Hall, Elmstead, Colchester, Essex	Approved	Information unavailable.	5	N/A	No	
Land at Martells Quarry, Slough Lane, Ardleigh, Essex, CO7 7RU	Approved	Information unavailable.	3	N/A	No	
Land to the south of Colchester Main Road, Alresford, Nr Colchester, C07 8DB	Report being prepared	Information unavailable.	6	N/A	No	
Tendring Education Centre, Jaywick Lane, Clacton On Sea, Essex, CO16 8BE	Approved	Information unavailable.	6	N/A	No	
Crown Quarry (Ardleigh Reservoir Extension), Wick Farm, Old Ipswich Road, Tendring, Colchester, CO7 7QR	Approved	Information unavailable.	6	N/A	No	
35 Roach Vale, Colchester, CO4 3YN	Approved	Information unavailable.	6	N/A	No	
Boxted Bridge, Boxted, Essex, CO4 5TB	Report being prepared	Information unavailable.	9	N/A	No	
Lufkins Farm, Great Bentley Road, Frating, CO7 7HN	EIA not required	Information unavailable.	6	N/A	No	
Tendring District Council						
Land Between The A120 and A133, To The East of Colchester and of Elmstead Market	Awaiting decision	Information unavailable.	3	High	No	As detailed in Chapter 27 Traffic and Transport (Volume I), no cumulative traffic effects are anticipated for these projects.

Project	Status	Construction period	Closest distance from the onshore project area (km)	Confidence in data	Included in the CEA (Y/N)	Rationale
Hamilton Lodge Parsons Hill Great Bromley Colchester Essex CO7 7JB	Approval - Outline	Information unavailable.	2	N/A	No	The projects are greater than 1km from North Falls, therefore there would be no potential for cumulative noise and vibration impacts.
Land adjacent to Lawford Grid Substation Ardleigh Road Little Bromley Essex CO11 2QB	Approved	Information unavailable.	0.3	High	Yes	As detailed in Chapter 27 Traffic and Transport (Volume I), no cumulative construction traffic effects are anticipated for this project. The proposed battery energy storage scheme is located in close proximity to the onshore substation zone for North Falls. If the project construction overlaps with the construction of the North Falls substation, cumulative noise impacts could occur, depending on the eventual North Falls onshore substation location. Depending on the eventual North Falls onshore substation location, cumulative operational noise effects could also occur.

26.8.3 Assessment of cumulative effects

237. Following a review of projects (presented in Table 26.32) which have the potential to overlap temporally or spatially with North Falls, three developments have been scoped into the CEA for this chapter, these are:

- East Anglia GREEN;
- Five Estuaries Offshore Wind Farm ('Five Estuaries'); and
- Land adjacent to Lawford Grid Substation Ardleigh Road Little Bromley Essex CO11 2QB (for construction and operation of a 50MW Battery Energy Storage System ('Little Bromley BESS').

238. These three projects are further considered further in Table 26.33 and Table 26.34 during construction and operation respectively. The assessments will be undertaken again for the ES, based on the level of information regarding these other projects that is available at that time.

Table 26.33 Cumulative effects from other projects on noise and vibration during construction

Project	Construction Impacts 1 to 3: Noise of landfall and nearshore, onshore cable corridor(s) and substation works	Construction Impact 4: Construction phase road traffic noise	Construction Impact 5: Construction phase vibration
Five Estuaries Offshore Wind Farm	The Five Estuaries onshore search area overlaps a very similar geographical area to the North Falls onshore project area. The Five Estuaries onshore search area will include a landfall, onshore cable corridor(s) and onshore substation, and nearshore works will also be required. Although exact location details are not known at this stage, the Applicant is in regular and on-going dialogue with Five Estuaries Offshore Wind Farm Ltd. and has established that the location of the landfall, onshore cable corridor(s) and onshore substations will be broadly the same as North Falls and that construction could occur at the same time and for a similar duration. The overlapping nature of both project areas means that there is the potential for cumulative noise impacts associated with Five Estuaries construction activities, as they intersect the onshore project boundary and therefore the 300m construction phase study areas for each project are likely to overlap. It is anticipated that a construction noise assessment would be undertaken and BPM will be recommended for Five Estuaries. If the construction schedules for North Falls and Five Estuaries overlap temporally and spatially, the appointed North Falls construction contractor will be required to coordinate with the Five Estuaries contractor, to minimise the potential for cumulative impacts to be significant. The methods for liaison with the other contractors and final noise mitigation measures will be specified in the final CNVMP. Based on the aim to coordinate between the North Falls works and Five Estuaries, no likely significant cumulative construction noise effects	At the time of drafting this PEIR, the level of information publicly available for Five Estuaries would not be sufficient to undertake a CEA of construction traffic noise. With reference to Chapter 27 Traffic and Transport (Volume I), the Applicant is in regular and on-going dialogue with Five Estuaries Offshore Wind Farm Ltd and has established that the location of the landfall, onshore cable corridor(s) and onshore substations will be broadly the same as North Falls and construction could occur at the same time and for a similar duration. If the construction schedules for North Falls and Five Estuaries overlap temporally, the appointed North Falls construction contractor will be required to coordinate with the Five Estuaries contractor, to minimise the potential for cumulative impacts to be significant. The methods for liaison with the other contractors and traffic mitigation measures will be specified in the final CTMP. Based on the aim to coordinate between the North Falls works and Five Estuaries, no likely significant cumulative construction road traffic noise effects are predicted over and above the effects of North Falls. With these measures in place, cumulative construction road traffic noise effects are anticipated to be not significant in EIA terms. The Applicant will incorporate relevant new information presented by Five Estuaries within the CEA in the ES.	If the construction schedules for North Falls and Five Estuaries overlap temporally and spatially, there is the potential for cumulative vibration effects to occur. Hence, the appointed North Falls construction contractor will be required to coordinate with the Five Estuaries contractor, to minimise the potential for cumulative impacts to be significant. The methods for liaison with the other contractors and final vibration mitigation measures will be specified in the final CNVMP. It is anticipated that a construction vibration assessment would be undertaken and BPM will be recommended for Five Estuaries. Based on the aim to coordinate between the North Falls works and Five Estuaries, no likely significant cumulative construction vibration effects are predicted over and above the effects of North Falls. With these measures in place, cumulative construction vibration effects are anticipated to be not significant in EIA terms. The Applicant will incorporate relevant new information presented by Five Estuaries within the CEA in the ES.

Project	Construction Impacts 1 to 3: Noise of landfall and nearshore, onshore cable corridor(s) and substation works	Construction Impact 4: Construction phase road traffic noise	Construction Impact 5: Construction phase vibration
	are predicted over and above the effects of North Falls. With these measures in place, cumulative construction noise effects are anticipated to be not significant in EIA terms. The Applicant will incorporate relevant new information presented by Five Estuaries within the CEA in the ES.		
East Anglia GREEN	A new onshore substation is proposed to be built as part of the East Anglia GREEN proposals by National Grid, close to the North Falls onshore substation zone. North Falls is planned for construction at the earliest from 2026, compared to 2027 to 2031 for East Anglia GREEN. If the construction schedules for North Falls and East Anglia GREEN overlap temporally and spatially, there is the potential for cumulative construction noise effects. It is anticipated that a construction noise assessment would be undertaken and BPM will be recommended for the East Anglia GREEN project. If the construction schedules for North Falls and East Anglia GREEN overlap temporally and spatially, the appointed North Falls construction contractor will be required to coordinate with the East Anglia GREEN contractor, to minimise the potential for cumulative impacts to be significant. The methods for liaison with the other contractors and final noise mitigation measures will be specified in the final CNVMP. Based on the aim to coordinate between the North Falls works and East Anglia GREEN, no likely significant cumulative construction noise effects	At the time of drafting this PEIR the latest publicly available information for East Anglia Green comprises of non-statutory consultation (National Grid, 2022). The level of information contained within these documents would not be sufficient to undertake a full CEA of construction traffic noise. However, the Applicant is in regular and on-going dialogue with National Grid and will seek to continue working closely with National Grid, and with statutory consultees to assess potential cumulative effects. This approach complies with the relevant EIA Regulations and is consistent with that taken for other applications, where relevant environmental information has become available after the point of the DCO application submission. If the construction schedules for North Falls and East Anglia GREEN overlap temporally, there is the potential for cumulative traffic noise effects to occur. The appointed North Falls construction contractor will be required to coordinate with the East Anglia GREEN contractor, to minimise the potential for cumulative impacts to be significant. The methods for liaison with the other	If the construction schedules for North Falls and East Anglia GREEN overlap temporally and spatially, there is the potential for cumulative vibration effects to occur. Hence, the appointed North Falls construction contractor will be required to coordinate with the East Anglia GREEN contractor, to minimise the potential for cumulative impacts to be significant. The methods for liaison with the other contractors and final vibration mitigation measures will be specified in the final CNVMP. It is anticipated that a construction vibration assessment would be undertaken and BPM will be recommended for East Anglia GREEN. Based on the aim to coordinate between the North Falls works and East Anglia GREEN, no likely significant cumulative construction vibration effects are predicted over and above the effects of North Falls. With these measures in place, cumulative construction vibration effects are anticipated to be not significant in EIA terms. The Applicant will incorporate relevant new information presented by East Anglia GREEN within the CEA in the ES.

Project	Construction Impacts 1 to 3: Noise of landfall and nearshore, onshore cable corridor(s) and substation works	Construction Impact 4: Construction phase road traffic noise	Construction Impact 5: Construction phase vibration
	are predicted over and above the effects of North Falls. With these measures in place, cumulative construction noise effects are anticipated to be not significant in EIA terms. The Applicant will incorporate relevant new information presented by East Anglia GREEN within the CEA in the ES.	contractors and traffic mitigation measures will be specified in the final CTMP. Based on the aim to coordinate between the North Falls works and East Anglia GREEN, no likely significant cumulative construction road traffic noise effects are predicted over and above the effects of North Falls. With these measures in place, cumulative construction road traffic noise effects are anticipated to be not significant in EIA terms. The Applicant will incorporate relevant new information presented by East Anglia GREEN within the CEA in the ES.	
Little Bromley BESS	A detailed construction noise assessment was not undertaken for the proposed Little Bromley BESS project. Nevertheless, the relevant construction contractor should implement BPM to comply with the requirements of CoPA. If the construction schedules for North Falls and Little Bromley BESS overlap temporally and spatially, the appointed North Falls construction contractor will be required to coordinate with the Little Bromley BESS contractor, to minimise the potential for cumulative impacts to be significant. The methods for liaison with the other contractors and final noise mitigation measures will be specified in the final CNVMP. Based on the aim to coordinate between the North Falls works and Little Bromley BESS, no likely significant cumulative construction noise effects are predicted over and above the effects of North Falls.	As discussed in Chapter 27 Traffic and Transport (Volume I), significant cumulative construction traffic effects are not anticipated with the Little Bromley BESS; hence, cumulative construction traffic noise effects are anticipated to be not significant and are scoped out of the CEA.	A detailed construction vibration assessment was not undertaken for the proposed Little Bromley BESS project. Nevertheless, the relevant construction contractor should implement BPM to comply with the requirements of CoPA. If the construction schedules for North Falls and Little Bromley BESS overlap temporally and spatially, there is the potential for cumulative vibration effects to occur. Hence, the appointed North Falls construction contractor will be required to coordinate with the Little Bromley BESS contractor, to minimise the potential for cumulative impacts to be significant. The methods for liaison with the other contractors and final vibration mitigation measures will be specified in the final CNVMP. Based on the aim to coordinate between the North Falls works and Little Bromley BESS, no likely significant cumulative construction vibration effects are predicted over and above the effects of North Falls.

Project	Construction Impacts 1 to 3: Noise of landfall and nearshore, onshore cable corridor(s) and substation works	Construction Impact 4: Construction phase road traffic noise	Construction Impact 5: Construction phase vibration
	With these measures in place, cumulative construction noise effects are anticipated to be not significant in EIA terms. The Applicant will incorporate relevant new information presented by Little Bromley BESS within the CEA in the ES.		With these measures in place, cumulative construction vibration effects are anticipated to be not significant in EIA terms. The Applicant will incorporate relevant new information presented by Little Bromley BESS within the CEA in the ES.

Table 26.34 Cumulative effects from other projects on noise and vibration during operation

Project	Operation Impact 1: Operational noise
Five Estuaries Offshore Wind Farm	The level of information available regarding the Five Estuaries project is not sufficient to undertake a full CEA of potential operational noise impacts. The Applicant is in ongoing dialogue with the developer and a detailed cumulative operational assessment will be undertaken in the CEA in the ES, depending on the information available at the time. It is expected that similar noise limits as described in Section 26.6.2.1 would be set in order for consent to be granted for Five Estuaries, meaning that cumulative effects would remain non-significant in EIA terms.
East Anglia GREEN	The level of information available regarding the East Anglia GREEN project is not sufficient to undertake a full CEA of potential operational noise impacts. The Applicant is in ongoing dialogue with the developer and a detailed cumulative operational assessment will be undertaken in the CEA in the ES, depending on the information available at the time. It is expected that similar noise limits as described in Section 26.6.2.1 would be set in order for consent to be granted for East Anglia GREEN, meaning that cumulative effects would remain non-significant in EIA terms.
Little Bromley BESS	The noise impact assessment submitted with the planning application for the Little Bromley BESS (Professional Consult (2017), Noise Impact Assessment, Proposed Battery Energy Storage Site – Land West of Lawford Sub-Station) has been reviewed. This includes an assessment of operational noise impacts at the closest NVSR to the proposed BESS, which is Waterhouse Farm (SSR8 as identified in Table 26.17). Baseline noise measurements and operational noise predictions were undertaken at this NVSR and reported in the Noise Impact Assessment. At this stage in the North Falls design, prior to selection of a final onshore substation location within the onshore substation zone, it has not been possible to undertake a detailed assessment of cumulative operational noise effects with the proposed Little Bromley BESS. Assessment of the cumulative operational noise effects will be considered in detail within the CEA in the ES when sufficient information is available. The Noise Impact Assessment for Little Bromley BESS concluded that predicted operational noise effects were compliant with the 'No Observed Adverse Effect Level' as detailed in the NPPG. It is therefore anticipated to be highly likely for cumulative effects with North Falls to remain non-significant in EIA terms.

26.9 Transboundary effects

239. There are no transboundary effects with regard to noise and vibration as the onshore infrastructure for North Falls is within the UK and is not located near to any international boundaries. Transboundary effects are therefore scoped out of the assessment and are not considered further.

26.10 Interactions

240. The PEIR chapters outlined in Section 26.1 were identified as having inter-relationships with noise and vibration and are shown in Table 26.35.

Table 26.35 Noise and vibration interactions

Topic and description	Related chapter (Volume I)	Where addressed in this chapter	Rationale
Construction			
Impact 1: Noise of landfall and nearshore works Impact 2: Noise of onshore cable corridor(s) works Impact 3: Noise of onshore substation works Impact 5: Construction vibration	Chapter 23 Onshore Ecology	N/A	Potential noise impacts at ecological receptors addressed separately in Chapter 23 Onshore Ecology (Volume I).
	Chapter 24 Onshore Ornithology	N/A	Potential noise impacts at ecological receptors addressed separately in Chapter 24 Onshore Ornithology (Volume I).
	Chapter 32 Tourism and Recreation	N/A	Potential noise impacts addressed separately in Chapter 32 Tourism and Recreation (Volume I).
	Chapter 28 Human Health	Section 26.4	Increase in noise or vibration levels at NVSRs associated with North Falls have the potential to result in human health effects.
Impact 4: Noise from off-site construction traffic	Chapter 24 Traffic and Transport	Section 26.4.3.4	Noise emissions from traffic movements associated with construction of North Falls have the potential to impact on local amenity.
	Chapter 28 Health	Section 26.4	Increase in noise levels at NVSRs associated with traffic generated by North Falls construction have the potential to result in human health effects.
Operation			
Impact 6: Operational noise	Chapter 23 Onshore Ecology	N/A	Potential noise impacts at ecological receptors addressed separately in Chapter 23 Onshore Ecology (Volume I).
	Chapter 24 Onshore Ornithology	N/A	Potential noise impacts at ecological receptors addressed separately in Chapter 24 Onshore Ornithology (Volume I).
	Chapter 32 Tourism and Recreation	N/A	Potential noise impacts addressed separately in Chapter 32 Tourism and Recreation (Volume I).
	Chapter 28 Health	Section 26.4	Increase in noise or vibration levels at NVSRs associated with North Falls have

Topic and description	Related chapter (Volume I)	Where addressed in this chapter	Rationale
			the potential to result in human health effects.
Decommissioning			
Inter-relationships and the identified impacts associated with the decommissioning phase would be no greater than those identified for the construction phase.			

26.11 Inter-relationships

241. The impacts identified and assessed in this chapter have the potential to interrelate with each other. The areas of potential inter-relationships between impacts are presented in Table 26.36. This provides a screening tool for which impacts have the potential to interrelate. Table 26.37 provides an assessment for each receptor as related to these impacts. Decommissioning impacts are excluded from the scope of this assessment and therefore excluded from the screening exercise.

242. Within Table 26.37 the impacts are assessed relative to each development phase (i.e., construction, operation or decommissioning) to see if (for example) multiple construction impacts affecting the same receptor could increase the significance of effect upon that receptor. Following this, a lifetime assessment is undertaken which considers the potential for impacts to affect receptors across all development phases.

Table 26.36 Inter-relationships between impacts - screening

Potential interactions between impacts						
	Impact 1: Construction noise from landfall and nearshore works	Impact 2: Construction noise from onshore cable corridor(s) works	Impact 3: Construction noise from onshore substation works	Impact 4: Noise from off-site construction traffic	Impact 5: Construction vibration	Impact 6: Operational noise
Impact 1: Construction noise from landfall and nearshore works		Y	N	Y	Y	N
Impact 2: Construction noise from onshore cable corridor(s) works	Y		Y	Y	Y	Y
Impact 3: Construction noise from onshore substation works	N	Y		Y	Y	Y
Impact 4: Noise from off-site construction traffic	Y	Y	Y		Y	N
Impact 5: Construction vibration	Y	Y	Y	Y		N
Impact 6: Operational noise	N	Y	Y	N	N	

Table 26.37 Inter-relationship between impacts – phase and lifetime assessment

Receptor	Highest Significance Level	Phase Assessment	Lifetime Assessment
Human receptors	Impact 1: **not significant** with the implementation of mitigation measures detailed in Section 26.6.1.1.3. Impact 2: **not significant** with the implementation of mitigation measures detailed in Section 26.6.1.2.3. Impact 3: **not significant** with the implementation of mitigation measures detailed in Section 26.6.1.3.3. Impact 4: **not significant** with the implementation of mitigation measures detailed in Section 26.6.1.4.4. Impact 5: **not significant** with the implementation of mitigation measures detailed in Section 26.6.1.5.3.	**Construction Phase** **No greater than individually assessed impact** Impacts 1-5 range from negligible to major adverse effect significance at residential receptors before mitigation measures. With the inclusion of mitigation the effects are considered to range from negligible to minor adverse impact significance. The NVSRs exposed to construction noise and/or vibration impacts at the end of the onshore cable corridor(s) closest to the substation may experience inter-related noise and vibration impacts due to the construction of these elements of the Project. The potential for such impacts to occur depends on factors including the construction programme and location of onshore substation, which are not known in sufficient detail at this stage. The ES will include an assessment of these inter-related impacts, depending on the level of detail available. Resultant impacts will be controlled by the implementation of the mitigation measures specified in the final CNVMP which will ensure residual construction noise and vibration effects are not significant. Given the predicated effect significance and that each impact will be managed with BPM it is considered that there would either be no interactions or that these would not result in greater impact than assessed individually.	**No greater than individually assessed impact** Noise and vibration impacts from the landfall and onshore cable corridor(s) will only occur during the construction and decommissioning phases of the Project. These impacts will be temporally separated by the operational phase (approximately 30 years); therefore, these impacts will not combine to increase their significance level. The construction and operation of the onshore substation has the potential to result in inter-related noise effects as the most exposed NVSRs will be the same for both phases, essentially extending the duration of their exposure to noise associated with the Project. However, the adopted operational noise level criteria are sufficiently stringent to avoid significant effects over the lifetime of the Project, irrespective of their duration. Therefore, it is considered that these impacts would not combine to increase the significance level.
	Impact 6: **not significant** assuming compliance with operational noise limits which will be secured by DCO Requirement, as discussed in Section 26.6.2.1.	**Operational Phase** **No greater than individually assessed impact** Only one impact is identified; hence, there is no potential for inter-relationships over the operational phase	

26.12 Summary

243. This chapter has assessed the potential noise and vibration effects of the construction and operation of North Falls on onshore NVSRs.

244. This chapter has been developed with regard to the legislative and policy framework outlined in Section 26.4.1 and further informed by consultation with Tendring District Council.

245. The existing noise and vibration environment at NVSRs has been characterised using a site-specific baseline noise survey and following current best practice and guidance.

246. Construction phase noise and vibration assessments were undertaken based on a preliminary understanding of the mobile/fixed construction plant and machinery required to build the Project at the landfall, onshore cable corridor(s) and onshore substation. With the application of BPM and additional mitigation measures to be specified in the final CNVMP, the residual effect upon all receptors was assessed to be not significant in EIA terms.

247. Construction road traffic noise impacts were assessed based on a preliminary understanding of the traffic flows likely to be generated by the construction of the Project. Calculations of road traffic noise levels with and without the construction of the Project concluded that residual effects will be no greater than minor adverse i.e., not significant in EIA terms.

248. The assessment of operational phase noise identified appropriate noise level limits at nearby NVSRs for inclusion in a DCO Requirement. Compliance with these limits will ensure that operational noise effects are not significant in EIA terms.

249. An assessment summary is provided in Table 26.38.

Table 26.38 Summary of potential likely significant effects on noise and vibration

Potential impact	Receptor	Sensitivity	Magnitude of impact	Pre-mitigation effect	Mitigation measures proposed	Residual effect
Construction						
Impact 1: Noise of landfall and nearshore works	Residential properties	Medium	Low (daytime), medium (evenings and weekends) and high (night)	Minor adverse (daytime), moderate adverse (evenings and weekends) and major adverse (night)	BPM and screening if required	Negligible (daytime, evenings and weekends) and minor adverse (night)
Impact 2: Noise of onshore cable corridor(s) works	Locations where noise and/or vibration level changes may cause disturbance, e.g. residential properties, hospital wards, care homes, schools, libraries, universities, research facilities and national parks (during the day).	Medium	Negligible to high	Negligible to major adverse	BPM, additional mitigation and screening if required to be specified in final CNVMP, as discussed in Section 26.6.1.2.3.	Negligible to minor adverse
Impact 3: Noise of substation works	Residential properties	Medium	Low (daytime) and high (evening and weekend)	Minor adverse (daytime) and major adverse (evenings and weekends)	BPM, additional mitigation and screening if required to be specified in final CNVMP.	Negligible (daytime) and minor adverse (evenings and weekends)
Impact 4: Noise from off-site construction traffic	Locations where noise and/or vibration level changes may cause disturbance, e.g. residential properties, hospital wards, care homes, schools, libraries, universities, research facilities and national parks (during the day).	Medium	Negligible (36 road links), low (five links) and high (link 4 only, based on peak construction traffic flows)	Negligible to major adverse	Screening and additional traffic management measures to be specified in final CTMP, potentially including a temporary speed limit on Bentley Road, as discussed in Section 26.6.1.4.4.	Negligible to minor adverse
Impact 5: Construction vibration	Locations where noise and/or vibration level changes may cause disturbance, e.g. residential properties, hospital wards, care homes, schools, libraries, universities, research facilities and national parks (during the day).	Medium	Negligible to medium	Negligible to moderate adverse	BPM, additional mitigation and screening if required to be specified in final CNVMP, as discussed in Section 26.6.1.2.3.	Negligible to minor adverse

Potential impact	Receptor	Sensitivity	Magnitude of impact	Pre-mitigation effect	Mitigation measures proposed	Residual effect
	Vibration sensitive structures (potential for damage)	Medium	Negligible	Negligible	BPM and no vibration generating works within 8m of a sensitive structure.	Negligible
Impact 6: Operational noise	Residential properties	Medium	Not determined	Not significant	Compliance with operational noise limit specified in proposed DCO Requirement	Not significant

26.13 References

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